

Australian Standard[®]

Decorative gas log and other fuel effect appliances



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- Appliance and Component Testing
 - Association of Accredited Certification Bodies
 - Australian Gas Association
 - Consumers' Federation of Australia
 - Department of the Environment, Water, Heritage and the Arts
 - Energy Networks Association
 - Gas Appliance Manufacturers Association of Australia
 - Gas Association of New Zealand
 - Gas Technical Regulators Committee
 - Gas Utilisation Institute
 - LP Gas Australia
 - Master Plumbers, Gasfitters and Drainlayers New Zealand
 - Ministry of Economic Development (New Zealand)
 - New Zealand Employers and Manufacturers Association (Central)
-

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Decorative gas log and other fuel effect appliances

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee AG-001, Gas Appliances. This edition is a minor revision of AS 4558—2000 (AG 108—2000) which it supersedes. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to retain this Standard as an Australian Standard rather than develop it as an Australian/New Zealand Standard.

The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with uniform minimum requirements for the safety, performance and use of decorative gas log and other fuel effect appliances.

This Standard 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;
- (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.

AS/NZS 5601, *Gas installations*, provides essential requirements and basic standards for gas installations.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in footnotes to tables are deemed to be requirements of this Standard.

While Australian Standards mostly do not do so, all the Australian Technical Regulators agree that this Standard should include appropriate requirements for particular appliances or components to be certified.

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STANDARDS AUSTRALIA

Australian Standard**Decorative gas log and other fuel effect appliances**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies design, construction and marking requirements and test methods for decorative gas log, coal or other fuel effect fires with gas consumptions not exceeding 72 MJ/h. Two types of appliances are covered as defined in Clause 1.2.

The scope of this Standard is limited to appliances that are designed primarily to have a decorative appearance.

The following are excluded from the scope of this Standard:

- (a) Appliances intended for space heating (in the form of radiant or convected heat). Requirements for such appliances are set out in AS 4553.
- (b) Indoor flueless appliances.

Figures referred to in the text and methods of test (M.O.T) are set out in Appendices A and G.

Methods of test are set out in Appendix B. The M.O.T. number corresponds to the relevant clause in the text.

1.2 CLASSIFICATION

Two types of appliances are defined as follows:

- 1 *Type 1* An appliance that consists of an assembly or kit that comprises a burner, simulated fuel effect logs or coals, grate and decorative surround and that is designed to be installed in a fireplace of indeterminate specifications and in which the chimney is intended to convey flue products to outside air.

An 'assembly or kit' shall have the burner, gas manifold and controls provided as a single assembly and may require assembly of such parts as logs, granules, grate and decorative surround.
- 2 *Type 2* An appliance that consists of a complete assembly that includes a fire box/surround and a conventional fabricated flue system. The flue shall be either supplied with the appliance or clearly specified by the manufacturer in the installation instructions.

NOTES:

- 1 Open flued Type 2 appliances are required by Clause 2.1.23 have a draught diverter or alternative system as an integral part of the appliance to prevent an unsafe condition caused by changes of pressure in the flue.
- 2 Type 2 appliances may be installed into masonry fireplaces provided the fabricated flue is included as a chimney liner.
- 3 Other statutory and regulatory requirements may be applicable to the product(s) that fall within the scope of this Standard. It is the manufacturer's, importer's or distributor's responsibility (as appropriate) to ensure that products comply with such requirements.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1375 Industrial fuel-fired appliances (known as the SAA Industrial Fuel-fired Appliances Code)
- 1722 Pipe threads of Whitworth form
- 1722.2 Part 2: Fastening pipe threads
- 1881 Zinc alloys—Casting ingots and castings—Quality requirements
- 4553 Gas space heating appliances
- 4567 Twin wall metal flues—Gas appliances

AS

- 4617 Manual shut off gas valves
- 4620 Thermoelectric flame safeguards
- 4625 Electronic flame safeguards and flame detectors
- 4629 Automatic shut off valves and vent valves
- 4646 Gas appliance standards—Definitions and calculations

AS/NZS

- 2286 Space heaters—Secondary guards
- 3500 Plumbing and drainage
- 3500.0 Part 0: Glossary of terms
- 3820 Essential safety requirements for electrical equipment
- 5601 Gas installations

AS ISO

- 7.1 Pipe threads where pressure-tight joints are made on the threads—Dimensions, tolerances and designation

ISO

- 6976 Natural gas—Calculation of calorific values, density, relative density and Wobbe index from composition

EN

- 298 Automatic gas burner control systems for gas burners and gas burning appliances with or without fans

SPEIGHT, J., *Lange's Handbook of Chemistry*, 16th ed. USA: McGraw-Hill Professional, 2004

1.4 DEFINITIONS

For the purpose of this Standard the definitions below apply.

1.4.1 Appliance flueway

A port or passage conveying flue gases within the appliance.

1.4.2 Appliance regulator

A device fitted to an appliance to control the gas pressure or gas volume delivered to that appliance.

1.4.3 Atmospheric burner

A burner system where all the air for combustion is introduced by the inspiring effect of a gas injector and/or by the natural draught in the combustion chamber without mechanical assistance.

1.4.4 Authority having jurisdiction

The authority having statutory (legal) control.

1.4.5 Automatic ignition

The lighting of gas at a burner without a manual operation whenever gas flows from the burner.

1.4.6 Automatic operation

The use of a sequence of operations that, once initiated, does not require any intermediate manual operation.

1.4.7 Automatic shut-off valve

An automatic valve used to shut-off gas supply to an appliance.

1.4.8 Available gas (line gas)

Readily available gas with similar characteristics to the reference test gas.

1.4.9 Balanced flue appliance

A room sealed appliance that has combustion air ducted from, and combustion products ducted to, a common terminal assembly located externally.

1.4.10 Burner port

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

1.4.11 Bypass

An integral part of a gas control that enables a preset volume of gas to bypass the control.

1.4.12 Calibration

The determination of the relationship between the measured or indicated value of a parameter and its true value.

1.4.13 Certified/Certification

Assessed by a Certifying Body, and having a certificate number to demonstrate compliance with a Standard.

1.4.14 Certifying Body

A body acceptable to the Technical Regulator that provides assurance of compliance of appliances and components with nominated standards or other accepted safety criteria.

1.4.15 CO/CO₂ ratio

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

1.4.16 Combination gas control

An assembly of two or more different control functions in a single body.

1.4.17 Combustible materials

Materials made of or surfaced with wood, compressed paper, plant fibres or other materials that will ignite and burn.

1.4.18 Combustion products

Constituents resulting from the combustion of a fuel with oxygen, including the inerts associated with the fuel and the oxygen but excluding any other diluent or contaminant.

1.4.19 Compression fitting

1.4.19.1 General

Compression fittings and components are as defined in AS/NZS 3500.0.

1.4.19.2 Type 1 (non-manipulative) compression fitting

A fitting for a compression joint that does not require any working of the tube other than cutting square. The joint is made tight by means of a loose compression ring that grips the outside wall of the tube when the coupling nut is tightened.

1.4.19.3 Type 2 (manipulative) compression fitting

A fitting in which the joint is made by flaring, croxing, capping or beading the end of the tube which is then compressed by the coupling nut against the shaped end of the corresponding section in the fitting.

1.4.20 Cross lighting

Lighting of one burner from another either directly or by means of an intermediate flame.

1.4.21 Determined gas consumption

Gas consumption rate, measured in megajoules per hour (MJ/h), using reference gas at specified test pressures and with ambient conditions corrected to standard temperature and pressure.

1.4.22 Direct ignition device

A device that provides ignition of a burner without the use of another flame.

1.4.23 Draught diverter

A device, without moving parts, fitted in the flue of an appliance for isolating the combustion system from the effects of pressure changes in the secondary flue.

1.4.24 Electronic flame safeguard

A flame safeguard utilizing electronic components to perform its function.

1.4.25 Excess air

Air in excess of that required for complete combustion that is mixed unchanged with the combustion products, in the combustion chamber.

1.4.26 External surfaces

All surfaces of an appliance other than working surfaces. External surfaces include—

- (a) handles for carrying or intended to be held for long periods while the appliance is operating;
- (b) controls or handles that are touched for short periods when the appliance is operating but are not required to be gripped; and
- (c) all other external surfaces not closer than 25 mm to a working surface.

1.4.27 Fan assisted combustion system

A system in which all or part of the combustion air is supplied and/or in which the products of combustion are evacuated by mechanical means that is an integral part of the appliance.

1.4.28 Flame abnormality

A flame condition that results in appreciable yellow tipping and carbon deposition (except in the case of appliances specifically designed for a luminous effect), lifting, floating, lighting back or objectionable odour.

NOTES:

- 1 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.
- 2 In appliances designed specifically for a luminous effect, yellow tipping or limited carbon deposition within the appliance are not considered abnormal.

1.4.29 Flame detector

A device that is sensitive to flame properties and initiates a signal when flame is detected.

1.4.30 Flame establishment period

The total time for which the fuel valve is energized, beginning with the first energization of the valve and ending when the flame supervision system is first required to supervise the flame.

1.4.31 Flame failure response time

The time taken for the flame safeguard to detect loss of flame and de-energize the shut-off valve.

1.4.32 Flame proving period

The supervised period following the flame establishment period and before any further operation other than shut-down is permitted.

1.4.33 Flame safeguard

A safety device that automatically cuts off the gas supply if the actuating flame is extinguished.

1.4.34 Flame safeguard system

A system consisting of a flame detector(s) plus associated circuitry, integral components, valves and interlocks the function of which is to shut off the fuel supply to the burner(s) in the event of ignition failure or flame failure.

1.4.35 Flue

The passage through which flue gases are conveyed from an appliance to a discharge point, excluding draught diverter, barometric device, fan or similar part.

1.4.36 Flue connection

A device incorporated in an appliance for the connection of a flue system.

NOTE: Where the draught diverter, barometric device, fan or similar component is an integral part of the appliance, the discharge point of the integral part is deemed to be the flue connection.

1.4.37 Flue cowl

A fitting placed at the flue terminal of an open flued appliance, designed to prevent the entry of rain or the disturbing effect of wind while not interfering with the discharge of flue gases.

1.4.38 Flue gases

Combustion products plus all diluents and contaminants intermixed with the combustion products. These include, where applicable, excess air, dilution air, process air, and waste products from the process.

1.4.39 Flue system

The passage through which flue products are conveyed from an appliance to a discharge point (i.e. flue terminal), including draught diverter, barometric device, fan or similar part.

1.4.40 Flue terminal

The point at which flue products discharge from a flue. It is the point where a flue system discharges into a flue cowl (if fitted).

1.4.41 Forced draught

All or part of the air for combustion is provided under positive pressure by mechanical means.

1.4.42 Gas

A combustible fuel gas that may be one of the following.

1.4.42.1 *Natural gas (NG)*

A hydrocarbon gas consisting mainly of methane.

1.4.42.2 *Simulated natural gas (SNG)*

A gas comprising a mixture of LP Gas and air, in the approximate proportions of 55% gas and 45% air for commercial propane.

1.4.42.3 *Town gas (TG)*

A gas manufactured from coal or petroleum feedstocks.

1.4.42.4 *Tempered liquefied petroleum gas (TLP)*

A gas comprising a mixture of LP Gas and air, in the approximate proportions of 27% gas and 73% air for commercial propane.

1.4.42.5 *Liquefied petroleum gas (LP Gas)*

A gas composed predominantly of any of the following hydrocarbons, or any combination of them in the vapour phase—propane, propene (propylene), butane, butene (butylene).

1.4.43 Gas consumption

The rate of energy consumed by an appliance under specific conditions and expressed in MJ/h.

1.4.44 Heat sources

Surfaces that, for the satisfactory performance of the appliance, are required to be at high temperature.

Examples of heat sources are—

- (a) radiant elements;
- (b) burner components and flame;
- (c) radiant heat reflector(s);
- (d) heat exchangers; and
- (e) burning fuel.

1.4.45 Heating value, gross (at constant pressure)

The number of megajoules liberated when one cubic metre of dry gas, at standard conditions of temperature (15°C) and absolute pressure (101.325 kPa), is completely burnt in air with all the water formed by the combustion process in the liquid state and with the products of combustion at standard conditions.

NOTE: Calculation of heating value is based upon ISO 6976 as given in AS 4646.

1.4.46 Indoor flueless appliance

An indoor appliance designed to discharge its combustion products into the same room or space in which it is installed.

1.4.47 Induced draught

All or part of the air for combustion is introduced by providing suction in the combustion chamber by mechanical means.

1.4.48 Injector

A device that causes air to mix with a stream of gas. In the case of an aerated burner it incorporates an orifice discharging gas into the mixing throat or tube.

1.4.49 Intermittent pilot

A pilot that is automatically ignited each time the burner is started, and is automatically extinguished with the main burner.

1.4.50 Interrupted pilot

A pilot that is automatically ignited each time the burner is started, and is automatically extinguished at the end of the main flame establishment period.

1.4.51 Jointing compound

A manufactured liquid, paste-like or semi-solid material used to seal joints.

1.4.52 Jointing material

A manufactured solid material that may be in tape, cord or sheet form, used to seal joints.

1.4.53 Lift (flame)

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

1.4.54 Light back

Transfer of the flame from burner port(s) into the body of the burner or back to the injector.

1.4.55 Linting

Blocking of a burner port or air opening by dust or fluff.

1.4.56 Lockout

A safety shut-down condition of the control system that requires a manual reset in order to restart.

1.4.57 LP Gas

See Gas.

1.4.58 Manual ignition

1.4.58.1 Direct manual ignition

The lighting of a burner by the use of a handheld ignition device.

1.4.58.2 Remote manual ignition

The lighting of a burner by a manual operation where the ignition activating device is remote from the ignition point.

1.4.59 Mixing tube

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

1.4.60 Natural draught burner

See Atmospheric burner.

1.4.61 Natural gas

See Gas.

1.4.62 Nominal gas consumption

The appliance gas consumption, in megajoules per hour (MJ/h), as stated in manufacturer's specifications, data plates, instructions and general communications.

NOTE: This is the fundamental quantity on which all methods of test are based and is the starting point for all performance requirements.

1.4.63 Nominal test point pressure

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

1.4.64 Normal test gas pressure

0.75 kPa for TG and TLP, 1.13 kPa for NG and SNG, 2.75 kPa for LP Gas.

1.4.65 Open flued appliance

An indoor appliance designed to be connected to an open flue system, its combustion air being drawn from the room or space in which it is installed.

1.4.66 Overload gas consumption

120% of nominal gas consumption for all gases other than LP Gas. For LP Gas, it is the gas consumption that results when gas at a pressure of 3.5 kPa is supplied to the appliance inlet.

1.4.67 Permanent pilot

A pilot that is permanently alight while the appliance is in service and is controlled independently of the main burner.

1.4.68 Pilot

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

1.4.69 Power flued

A flue system in which products of combustion are removed from the appliance by a fan in the flue.

1.4.70 Primary aeration control

An adjustable device for controlling primary air to a burner.

1.4.71 Primary air

That portion of the total air required for combustion that is mixed with the gas prior to burning on the burner ports.

1.4.72 Primary air ports

The openings in an aerated burner for primary air.

1.4.73 Primary flue

That portion of the flue system conveying flue products from an appliance to the draught diverter, barometric device, fan or similar part when fitted.

1.4.74 Primary guard

A guard supplied integral with or separate from an appliance and intended to prevent direct contact with, or close approach to, heat sources(s).

NOTE: A primary guard is principally intended to reduce risk of accidental ignition of flammable materials; however, if personal contact occurs, it does not necessarily prevent accidental burning.

1.4.75 Programmable electronic system (PES)

A system based on one or more central processing units (CPUs), connected to sensors and/or actuators, for the purpose of control, protection or monitoring.

NOTES:

- 1 The term 'PES' extends to and includes all elements in the system such as—
 - (a) sensors and/or other input devices;
 - (b) data links and/or other communication paths; and
 - (c) actuators and/or other output devices.
- 2 The term 'PES' includes system software such as executive, users and communication, etc which is configured to operate a process.
- 3 The term 'PES' is used to cover systems incorporating a wide range of programmable electronic devices and includes systems incorporating:
 - (a) Microprocessors.
 - (b) Programmable Controllers (PCs).
 - (c) Programmable Logic Controllers (PLCs).
 - (d) Programmable State Controllers.
 - (e) Other computer based devices.
- 4 A 'PES' can include a microprocessor-based temperature, pressure, air/fuel ratio, or level controller or monitor.

1.4.76 Purge volume

The purge volume includes the combustion chamber and all areas where combustion products and combustible vapours, dusts or gases may accumulate in the appliance or process up to the vertical connection of a flue or chimney that discharges directly to atmosphere.

1.4.77 Reference gas

The gas corresponding to an average of the gases most currently distributed, and for which the appliance has been specifically designed (see Test gases).

1.4.78 Regulator

A device that automatically regulates the outlet pressure or the outlet volume of gas passing through it to a predetermined value. Regulators may be adjustable (usually spring-loaded) or non-adjustable (usually weight-loaded).

1.4.79 Relative density

The ratio of the mass of a volume of gas to the mass of the same volume of dry air under the same conditions of temperature and pressure.

NOTE: Calculation of relative density is based upon ISO 6976 as given in AS 4646.

1.4.80 Room sealed appliance

An indoor appliance that is sealed from the room in which it is installed so that it directly discharges combustion products to, and takes air from, outside the building.

1.4.81 Safety shut-down

The action of shutting off all gas and ignition energy by means of a safety control such that restart cannot be accomplished without a full start cycle.

1.4.82 Safety shut-off system

An arrangement of valves and associated control systems that shuts off the supply of gas when required, by a device that senses the approach to an unsafe condition.

1.4.83 Safety shut-off valve

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

1.4.84 Safety system

A system that causes the gas supply to be shut off before the carbon monoxide in the ambient air exceeds a specified concentration and before the oxygen in the ambient air falls below a specified concentration.

1.4.85 Secondary air

Air required for completion of combustion, admitted to the combustion zone after combustion with primary air has commenced.

1.4.86 Secondary flue

That portion of the flue system conveying flue products from the draught diverter, barometric device, fan or similar part to the flue terminal.

1.4.87 Secondary guard

A guard supplied integral with or separate from an appliance and intended to prevent deliberate or accidental contact with any surfaces that are at such a temperature as would cause thermal damage to body tissue. A secondary guard is for use in situations where young children or the infirm may be at risk.

1.4.88 Self-latching gas valve

A gas valve with a built-in safety catch that locks automatically when the valve is turned off. A separate and distinct movement is required to unlock before the valve can be turned on.

1.4.89 Simulated natural gas (SNG)

See Gas.

1.4.90 Specific gravity

See Relative density.

1.4.91 Spillage

A condition in which the combustion products are not cleared by the flue, but escape from the appliance or the draught diverter relief openings.

1.4.92 Start gas

The gas flowing at a pilot burner or, when no pilot burner is fitted, at a main burner during the flame establishment period for initial ignition.

1.4.93 Surface combustion burner

A burner where combustion takes place on the surface of a perforated or porous material or gauze.

1.4.94 Technical Regulator

The Government appointed person, body or authority that has jurisdiction over gas safety legislation (or other entity authorized by that person, body or authority).

1.4.95 Temperature limit device

A device that automatically interrupts the gas flow when the temperature at the control point reaches a pre-determined limit.

1.4.96 Tempered liquefied petroleum gas (TLP)

See Gas.

1.4.97 Terminal

See Flue terminal.

1.4.98 Test gases

The test gases used in this Standard are defined in Table 1.1, which is 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) 99% for Hydrogen and Nitrogen;
- (b) 95% for Methane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (c) 95% for Propane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (d) 95% for Propylene ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$); and
- (e) 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 may not be less than the above values.

1.4.99 Thermostat

A temperature control device that automatically maintains a pre-determined temperature in an appliance or component.

1.4.100 Town gas

See Gas.

1.4.101 Tray type burner

A main burner that utilizes granular or other porous media for the distribution of gas over a defined area.

1.4.102 Turndown gas consumption

Either of the following:

- (a) If the turndown is limited, the lowest turndown to which the burner control can be set; or
- (b) 25% of the nominal gas consumption for infinite turndown gas controls with the following exceptions:
 - (i) Where a burner is under thermostatic control, the bypass rate is the turndown position.
 - (ii) Where no bypass is provided, the marked turndown setting will apply.

1.4.103 Valve

A device for the purpose of controlling or shutting off flow.

1.4.104 Wobbe index (Wobbe number)

The Wobbe index of a gas is—

$$\frac{\text{Heating value}}{\sqrt{\text{Relative density}}}$$

1.4.105 Working surfaces

Surfaces through which heat passes to the space being heated, e.g. hot air discharge grilles and transparent materials.

TABLE 1.1
TEST GAS TABLE

Test gas	Application	Composition percent							Characteristics*		
		Hydrogen	Methane	Propane	Propylene	Butane	Nitrogen	Air	Heating value MJ/m ³	Relative density	Wobbe index MJ/m ³
N	NG	—	97.5	1	—	—	1.5	—	37.8	0.571	50.0
Na		—	86	14	—	—	—	—	45.7	0.692	55.0
Nb		13	87	—	—	—	—	—	34.4	0.492	49.1
Nc		—	90	—	—	—	10	—	34.0	0.596	44.0
S		—	—	55	—	—	—	45	52.1	1.296	45.7
X	LP Gas	—	—	100	—	—	—	—	95.8	1.553	76.9
Y		—	—	—	—	100	—	—	125.7	2.078	87.2
Z		—	—	—	100	—	—	—	88.5	1.476	72.9
T	TLP	—	—	27	—	—	—	73	25.4	1.142	23.8
Ta		—	—	29	—	—	—	71	27.3	1.153	25.5
Tb		—	—	25	—	—	—	75	23.6	1.131	22.1
A	TG	50	—	18	—	—	32	—	23.0	0.619	29.2
B		65	—	7	—	—	28	—	14.5	0.423	22.2
C		28	—	18	—	—	54	—	20.3	0.817	22.5
D		50	—	15	—	—	35	—	20.2	0.602	26.0

* 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, strictly those gases shown in the table shall be used.

NOTE: The listed characteristics for test gas 'Y' are based on the properties of iso-butane.

SECTION 2 DESIGN AND CONSTRUCTION

2.1 GENERAL

2.1.1 Preliminary specification

Testing shall not commence until the manufacturer's written description of the appliance and instructions for installation and operation (sufficient for testing) have been submitted.

NOTE: Do not dismantle the appliance for individual component or specification study until testing has been completed.

2.1.2 Physical inspection

Before any physical performance testing as set out in Sections 3, 4 and 5 takes place the appliance shall satisfy the design and construction and other requirements as set out in this Section to ensure that it does not possess any obvious features that would prevent its certification. If the appliance is not considered satisfactory, no time will be spent in testing until the manufacturer has made the necessary adjustments.

2.1.3 Certification of safety components

All components relating to the safety of the gas burning operation shall be separately certified or shall be certified as part of the appliance against the requirements of the relevant component Standard(s).

NOTE: This includes, for example, automatic ignition systems, flame safeguards and pressure switches whether or not these carry gas.

2.1.4 Programmable electronic systems

Where a Programmable Electronic System (PES) is employed for safety related functions of burner management system, the PES shall—

- (a) conform to the relevant requirements of AS 4625 and EN 298 (or equivalent); or
- (b) be certified by a body recognized by the Certifying Body to the requirements of EN 298 (or equivalent).

2.1.5 Manual shut off gas valves

Manual shut-off valves fitted to an appliance shall be certified as Type 1 or Type 2 in accordance with the classification specified in AS 4617.

2.1.6 Classification of safety shut-off valves

The minimum classification of the safety shut-off valve fitted shall be selected in accordance with Table 2.1.

TABLE 2.1
SAFETY SHUT-OFF VALVE(S) SELECTION AND CLASSIFICATION

Burner type	Standard and classification
Atmospheric	AS 4620 or AS 4629, Class 3
Induced draught	AS 4629, Class 3
Forced draught with air pressure not exceeding 3 kPa	AS 4629, Class 2
Forced draught with air pressure exceeding 3 kPa	AS 4629, Class 1

NOTE: Refer to Clause 2.7.4 for fitting of flame safeguard systems.

2.1.7 Power failure

During a power failure the appliance shall not be activated automatically when the gas controls are in the 'OFF' position.

2.1.8 Burners with granular media

Burner systems employing granular media are permitted provided that all of the following items are complied with:

- (a) Granular media shall be specified to include the following:
 - (i) Clear definition of the type of material.
 - (ii) Size and size distribution.
 - (iii) Maximum and minimum depth of bed in the assembled appliance.
- (b) Combustion performance shall not adversely affected by partial removal or displacement or settling of the granular media.

2.1.9 Positioning of logs or coals

Positioning of logs or coals shall be positive and shall prevent any accidental rearrangement or displacement from the designed position unless it can be demonstrated that any possible rearrangement does not adversely affect combustion.

2.1.10 Tray type burners—prevention of spillage

Appliances using tray type burners with granular or other porous media through which the gas passes before ignition shall be fitted with a non-aerated burner unless it can be shown that deterioration of the granular or porous material in normal use does not result in the spillage of unburnt gas from the primary air port.

2.1.11 Tray type burners—turndown limits

Appliances using tray type burners with granular or other porous media through which gas passes before ignition shall be fitted with a device that limits turndown gas consumption to prevent flame abnormality at the turndown condition.

2.1.12 Sharp edges

Parts with which the installer, service person or user is likely to come in contact shall not have sharp points or edges.

2.1.13 Handles and knobs

Handles and knobs shall be so designed as to minimize accidental touching of hot surfaces.

2.1.14 Continuity of satisfactory operation

Construction of the appliance shall be such that continuity of satisfactory operation can be expected during normal usage.

2.1.15 Insulation

Insulation shall be fitted in such a way that it is not rendered ineffective or objectionable by settling, dislodgment or condensation during the normal operation of the appliance.

Insulation shall be protected against rodents.

2.1.16 Protection of vitreous enamel

Screw heads in contact with cover coat vitreous enamel shall be provided with means of preventing enamel damage.

NOTE: This provision is optional in the case of ground coat or wiped areas.

2.1.17 Means of support

The appliance shall be provided with adequate means of support that shall not allow the appliance to rock on a level surface or have sharp edges in contact with the floor.

2.1.18 Compliance in alternative forms

If an appliance is so designed that certain components may be fitted or omitted, e.g. legs, the appliance shall comply with all requirements in its alternative forms.

2.1.19 Means of ignition for room sealed appliances

The means of ignition for room sealed appliances shall be incorporated as part of the appliance.

2.1.20 Locking means for adjusting devices

Adjusting devices shall be provided with locking arrangements 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.

2.1.21 Fitting of primary guard

A primary guard shall be fitted in the following circumstances:

- (a) To all external surfaces which fail the fabric drape test (see Clause 3.3.4).
- (b) To all external surfaces which during operation reach a temperature in excess of 95°C above ambient, except working surfaces and surfaces within 25 mm of a working surface.
- (c) To all heat sources and external surfaces within 25 mm of working surfaces which during operation reach a temperature in excess of 200°C above ambient.
- (d) To all working surfaces with an open area less than 85% of the total area of the working surface, which during operation reach a temperature in excess of 200°C above ambient.

Type 1 appliances are exempt from this Clause provided that no part of the appliance projects significantly beyond the 'face' of the masonry of the fireplace.

2.1.22 Means for gas pressure measurement

Readily accessible means shall be provided to allow the gas pressure in the appliance to be measured while the appliance is in operation.

Pressure test points shall be designed to accept 6 mm bore flexible tubing and contain a limiting orifice not exceeding 1.0 mm or equivalent restriction.

2.1.23 Draught diverters for Type 2 appliances

Open flued Type 2 appliances shall have a draught diverter or alternative system as an integral part of the appliance to prevent an unsafe condition caused by changes of pressure in the flue. The relief opening of whichever system is used shall be connected directly to the same space from which the air for combustion is drawn.

2.2 MATERIALS AND STANDARDS

2.2.1 General

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 installation and 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.

2.2.2 Materials containing asbestos

Materials containing asbestos shall not be used.

2.2.3 Materials in contact with gas

Materials in contact with gas shall be suitable for all gases.

2.2.4 Zinc based alloys

Zinc based alloys shall not be used in contact with water.

Where failure of a zinc based alloy may affect the safe operation of the appliance—

- (a) the alloy shall comply with AS 1881—TYPE ZN AL 4;
- (b) the alloy shall not be exposed to a temperature exceeding 80°C during normal operation of the appliance; and
- (c) under the conditions of Paragraph B1 of Appendix B the alloy shall not swell, crumble or develop cracks.

2.2.5 Components required to be placed in a flame

Pilot burners, thermocouples and other components required to be placed in a flame shall be resistant to the effects of heat and corrosion. When refractory alloys are being used they shall not produce a catalytic effect. Nickel alloys having less than 1% nickel, such as AISI 416 steel, shall be acceptable.

2.2.6 Spark electrodes

Spark electrodes shall—

- (a) be made of high grade alumina cement or equivalent; and
- (b) have the firing tip made of nickel–chromium steel or equivalent.

2.2.7 Protection of aluminium tubing

Aluminium tubing in areas of restricted ventilation shall be provided with a protective barrier to prevent corrosion due to contact with condensation, insulation and other materials of the appliance.

2.2.8 Thermal insulation

Thermal insulation shall not produce obnoxious odours or fumes or corrode materials with which it is in contact.

2.2.9 Compression fittings

Compression fittings on gas lines shall comply with the following conditions:

- (a) They shall be made to an acceptable Standard and the mating surfaces shall be compatible.
- (b) The nominal outside diameter of the tube shall not exceed 20 mm.
- (c) Loose olives, where used, shall be symmetrical to prevent incorrect assembly.
- (d) Shear olives, where used, may be asymmetrical.
- (e) After making and breaking the fittings ten times, applying the torque value as listed in Table 2.2 to remake the fittings, the joints shall comply with the requirements of Clause 3.4.
- (f) The component parts shall be made of materials with a melting point not less than 430°C.

TABLE 2.2
TORQUE VALUES

Nominal size mm	Torque Nm
6	15
8	20
10	35
15	50
20	75

2.3 ELECTRICAL SYSTEMS

2.3.1 Connection to the mains electrical supply

NOTE: Appliances intended for connection to the mains electrical supply may be required by electrical safety regulations to comply with the requirements of AS/NZS 3820.

2.3.2 Motor bearings suitability

Details and specifications shall be supplied by the manufacturer showing that bearings of motors, blowers or fans are of a type suitable for the temperatures to which they are subjected in normal operation.

Normal operation shall mean operating at nominal gas consumption with the fan operating at all fan speeds (including the 'OFF' position if the appliance will function in that condition).

2.4 INSTALLATION REQUIREMENTS

2.4.1 Fixing of gas inlet connection

The gas inlet connection shall be firmly fixed. The regulator shall be anchored to prevent rotation while making the connection. This requirement shall be deemed to be met if the regulator can be held in position by means of a spanner while making the connection in accordance with the manufacturer's installation instructions.

2.4.2 Gas inlet connection thread

The gas inlet connection shall have a thread in accordance with AS ISO 7.1 or AS 1722.2.

2.4.3 Access to connections

The gas inlet connection shall be so located that sufficient free space is available for the union connection to be made or disconnected.

2.5 MAINTENANCE REQUIREMENTS

2.5.1 Dismantling and replacement by the user

Any dismantling required by the user 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.

2.5.2 Insertion and removal of gas injectors

Removable gas injectors shall be made so that they can be inserted and removed without damage.

2.5.3 Assembly and attachment of handles, dials and pointers

Valve handles, movable dials and pointers shall be so designed that they are incapable of being incorrectly assembled. They shall be securely attached to their spindles and shall not contain loose parts which may become detached when they are removed.

2.5.4 Accessibility for adjustment

Components and integral parts that may require adjustment shall be accessible for such adjustment. In particular, the following shall be readily and easily adjusted without risk of injury while the appliance is installed:

- (a) Aeration controls. (It is acceptable for the adjustment to be finalized with the burner removed, provided the setting will not be disturbed during removal.)
- (b) Pilots.
- (c) Thermostat bypasses where provided.
- (d) Thermostat calibration.
- (e) Regulator adjustments.
- (f) Ignition devices.
- (g) Safety devices.
- (h) Slow lighting adjusters.

2.5.5 Accessibility for replacement

Components that require to be removed for service shall be so made and attached to the appliance that they can be removed and replaced. In particular, except in the case of appliances readily disconnected and easily handled by one person, the following components shall be readily removed from and replaced in the appliance without undue risk of injury and without moving the appliance from the installed position:

- (a) Regulator diaphragms and valves (body exempt).
- (b) Gas valve plugs.
- (c) Injectors.
- (d) Thermostats complete including sensing elements. Thermostat valve plug and bypass adjuster to be separately removable.
- (e) Filters.
- (f) Pilot head assemblies, pilot jets.
- (g) Clocks and timers.
- (h) Door springs and other door control mechanisms.
- (i) Burners.
- (j) Ignition devices.
- (k) Radiant elements.
- (l) Flue baffles when flue cleaning is necessary.
- (m) Slow lighting adjusters.
- (n) Automatic control equipment.
- (o) Safety shut-off systems.
- (p) Electric lamps.
- (q) Fans, electric motors and drives.

2.5.6 Screwed connections

Components and assemblies of components with screwed connections shall be provided with flats for spanners unless accessible unions are provided on inlet and outlet connections.

2.5.7 Inaccessible nuts or bolts

Nuts or bolts in inaccessible positions securing parts requiring to be removed for service shall be captive.

2.6 PRESSURE REGULATORS

2.6.1 Provision of a pressure regulating device

A certified gas pressure regulator shall be provided with each appliance intended for operation on natural gas, town gas, and tempered LP Gas. Where practicable, the regulator should be fitted within the perimeter of the appliance.

Regulator outlet pressures nominated by the appliance manufacturer shall not exceed—

- (a) town gas, TLP: 0.63 kPa; and
- (b) natural gas: 1.00 kPa

2.6.2 Positioning of pressure regulators

Regulators shall be so placed that—

- (a) breather holes cannot easily be blocked; and
- (b) overheating and the risk of ignition of any gas leaking from the breather holes is minimized.

2.7 GAS CONTROLS AND SAFETY SHUT-OFF SYSTEMS

2.7.1 General

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

2.7.2 Accessibility by the user

Where controls are required to be operated by the user, they shall be accessible and easily operated.

2.7.3 Accidental change of settings of valves, dials and pointers

Gas valves, movable dials and pointers shall be designed or located to avoid accidental change of setting in use.

2.7.4 Provision of flame safeguard

A flame safeguard system shall be fitted to every appliance so that, in the event of flame failure at the point of supervision, the flame safeguard system shall shut off all the gas to the appliance.

2.7.5 Safety system for Type 1 appliances

Type 1 appliances shall be equipped with a system that shuts off gas supply before incomplete combustion occurs and complies with the requirement of Clause 5.7.1.

2.7.6 Automatic reignition means

Thermostatically controlled burners shall include a bypass or other means to ensure automatic reignition of the burner. However, safety shut-off valve(s) shall not be bypassed.

2.7.7 Safety controls for exposed burners

Appliances fitted with exposed burners shall not have exposed controls capable of activating and sustaining ignition by momentary operation.

2.7.8 Main burner automatic shut-off valve

For appliances with automatic ignition all gas to the main burners shall pass through at least two automatic shut-off valves in series that may or may not be in a single control body.

2.8 COMBUSTION AIR SUPPLY AND CONTROLS

2.8.1 Combustion air supply equipment

The combustion air supply equipment shall be supplied with the appliance and shall be correctly sized and arranged to ensure an air flow adequate for all operating conditions specified by the manufacturer.

2.8.2 Combustion air flow proving interlock

The combustion air flow proving devices shall be interlocked to cause lockout or prevent an ignition attempt unless the devices are in the 'no flow' condition prior to the start-up of their respective supply fans.

2.8.3 Prevention of combustion air backflow

Where air at pressure is pre-mixed with the fuel gas, effective means shall ensure air does not pass back into the gas line.

2.9 IGNITION, PILOTS AND MAIN BURNERS

2.9.1 Burners with remote manual ignition

The remote manual ignition of a burner, including pilots, shall be visible or visibly indicated to the user while operating the ignition devices and the appropriate gas controls.

2.9.2 Burners with direct manual ignition

The direct manual ignition of a burner, including pilots, shall be accessible and visible while operating the appropriate gas controls.

2.9.3 Prevention of injury at ignition

The method of ignition shall be such that it is not necessary to place the hand in a position where injury may occur when ignition takes place.

2.9.4 Manually operated burners in an enclosed compartment

Where manually operated burners are enclosed in a compartment in which an explosive accumulation of gas can occur, it shall be necessary to open the compartment to light the burner.

2.9.5 Burners interconnected by flues or passages

When two or more burners are enclosed in the same compartment, or compartments that are interconnected by flues or other passages, the gas system shall be designed such that—

- (a) each burner has a flame safeguard; or
- (b) there is safe and reliable cross ignition between the burners (see Clause 4.6).

2.9.6 Means for turning off pilot burner gas supply

Means shall be provided for turning off the gas supply to a pilot burner.

2.9.7 Viewing of flames

It shall be possible to view burner flames either directly or by use of a mirror with doors closed and a panel or part removed.

2.9.8 Proving of burner or pilot ignition

It shall be possible to prove that a burner or pilot is alight when the appliance is in operation in the installed position.

2.9.9 Positive location of flash lighting tubes

Flash lighting tubes shall be positively located in relation to 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.

2.9.10 Support of pilots, igniters and flame sensing devices

Pilot burners, 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.

2.9.11 Location of burner mixing tubes

Burner mixing tubes shall be positively located 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.

2.9.12 Burner supports

Burner supports shall be such that the burners cannot be easily displaced in normal usage.

2.9.13 Fixing of gas manifolds

Gas manifolds shall be firmly fixed to prevent displacement during handling and installation.

2.9.14 Protection of ports and injectors

Any ports and injectors of main and pilot burners that may be exposed in their normal operation to falling particles shall be protected against blockage.

2.9.15 Restriction on gauze over primary air ports

Gauze shall not be fitted over primary air ports of burners other than pilot burners.

2.9.16 Pilot gas filters

Gas filters shall be provided for continuously burning pilots of 0.5 MJ/h or less capacity (optional for LP Gas).

2.9.17 Aeration adjustment for universal LP Gas appliances

For universal LP Gas appliances, primary burner aeration shall be non-adjustable.

2.9.18 Securing of removable burner components

Removable burner components, when in position, shall be secure and shall be designed so they cannot be disturbed in normal usage.

2.10 FLUEING REQUIREMENTS

2.10.1 Design of air entry and combustion product discharge

Appliances shall be so designed that flueway terminals, draught diverter relief openings and openings for the entry of air for combustion are part of the appliance structure and are unlikely to be obstructed by cabinets, walls or partitions on or in which the appliance is installed. In the case of appliances specifically designed to be built-in, any clearance necessary to the safe and effective operation of the appliance shall be ensured by means of permanently attached spacers.

2.10.2 Design of flue connection

The flue connection shall provide means to prevent partial or complete blockage of flueways caused by the fitting of a flue pipe.

Flues and flue connections shall comply as follows:

- (a) For appliances having a maximum gas consumption of up to 50 MJ/h, intended to be used with a twin wall metal flue, the horizontal flue connection shall be a rectangular spigot conforming to the following external dimensions:

Width	247 $\begin{smallmatrix} +0 \\ -5 \end{smallmatrix}$ mm
Depth	45 $\begin{smallmatrix} +0 \\ -5 \end{smallmatrix}$ mm
Minimum length of engagement	25 mm

The use of an adaptor whose termination conforms to these dimensions and which is supplied with the appliance shall be considered satisfactory.

- (b) For Type 2 appliances having a maximum gas consumption of up to 50 MJ/h, intended to be used with a twin wall metal flue complying with AS 4567, the vertical flue connection shall be a spigot with a minimum length of engagement of 13 mm. The use of an adaptor meeting this requirement and supplied with the appliance shall be considered satisfactory.
- (c) Flue connections, both vertical and horizontal, for appliances having a gas consumption greater than 50 MJ/h shall be designed to accommodate both single wall and twin wall circular or rectangular metal flue pipe. The use of an adaptor to achieve this purpose will be considered satisfactory.
- (d) Flue connections or adaptors designed for twin wall metal flue pipe shall comply with the requirements of AS 4567.
- (e) Flue connections or adaptors designed for single wall metal flue pipe shall conform to the dimensions in Table 2.3 and Table 2.4.

TABLE 2.3
CIRCULAR FLUE CONNECTION

Nominal pipe diameter	Diameter of flue connection	
	Internal dimension of socket	External dimension of spigot
75	78 $\begin{smallmatrix} +3 \\ -0 \end{smallmatrix}$	73 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$
100	104 $\begin{smallmatrix} +3 \\ -0 \end{smallmatrix}$	98 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$
125	129 $\begin{smallmatrix} +3 \\ -0 \end{smallmatrix}$	123 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$
150	153 $\begin{smallmatrix} +3 \\ -0 \end{smallmatrix}$	148 $\begin{smallmatrix} +0 \\ -3 \end{smallmatrix}$

millimetres

TABLE 2.4
RECTANGULAR FLUE CONNECTION (SPIGOT)

Nominal size	Dimensions of flue connection	
	Width	Depth
250 × 50	247 ⁺⁰ ₋₅	45 ⁺⁰ ₋₅
300 × 65	295 ⁺⁰ ₋₅	60 ⁺⁰ ₋₅

millimetres

In all cases, the minimum length of engagement shall not be less than 13 mm for vertical flue connection and 25 mm for horizontal flue connection.

2.10.3 Flue terminal and draught diverter construction

Appliance flueway terminals and draught diverters shall be constructed so that they cannot be installed in other than the correct position.

2.10.4 Flue terminal openings

In order to ensure against the entry of birds, no opening of the flue terminal shall permit the entry of a ball of 16 mm diameter.

2.11 MARKINGS AND LABELS

2.11.1 Indication of function

The 'OFF' position of all gas valves shall be clearly indicated. Gas valves serving more than one function shall have the position of each function including any special lighting position clearly indicated.

2.11.2 Markings on packaging or appliance

The packaging, or the appliance where there is no packaging, shall be marked in a prominent position with—

- (a) the text 'TO BE INSTALLED ONLY BY AN AUTHORIZED PERSON';
- (b) the text 'PRIMARILY A DECORATIVE APPLIANCE NOT CERTIFIED AS A SPACE HEATER';
- (c) the text 'THE INSTRUCTIONS PACKAGED WITH THIS APPLIANCE CONTAIN IMPORTANT INFORMATION ABOUT INSTALLATION AND USE';
- (d) the maximum packaged weight in kilograms; and
- (e) the methods of installation for which the appliance is certified.

2.11.3 Gas type label

A label shall be firmly attached in a prominent position on each appliance stating the type of gas for which it has been manufactured and adjusted. Its colour shall be that appropriate to the gas specified as shown in the schedule in Clause 2.11.4.

2.11.4 Gas type colour code

Where a colour code is used to indicate the type of gas for which an appliance or component is to be used, it shall comply with the following:

- (a) Natural gas: Black
- (b) Town gas: Dark blue
- (c) Universal LP Gas: Signal Red
- (d) Propane only: Orange

- (e) Butane only: Grass green
- (f) Tempered LP Gas: Pink
- (g) All gases: Primrose.

2.11.5 Identification of injectors

Removable injectors shall carry an identifying cipher. The cipher shall be in the form of numerals indicating the orifice size in millimetres or the BS number. In the case of pilot injectors, a colour coding in accordance with Clause 2.11.4 is acceptable. Alternatively the injector size may be marked on the appliance.

2.11.6 Marking of fans

The direction of rotation of fans shall be clearly and permanently marked where incorrect fitting of a fan is possible.

2.11.7 Markings on appliances

Appliances shall be provided with clear and permanent markings readily accessible and easy to read and such markings shall include the following:

- (a) Certificate holder's trade name or identifying symbol.
- (b) Model designation.
- (c) Month and year of manufacture or serial number where this is documented to show month and year of manufacture.
- (d) Gas or gases for which the appliance is intended to be used.
- (e) Nominal gas consumptions in MJ/h, test point pressures in kPa for each gas nominated in (d) above.
- (f) For main burners with an adjustable bypass and which are ignited by a pilot, the main burner test point pressure in kPa at the bypass rate for each gas nominated in (d) above.
- (g) Electrical markings as required by the appropriate electricity authority.
- (h) For appliance connected to mains electrical supply, wiring diagrams except where electrical equipment is limited to one electric lamp.
- (i) The certification number.
- (j) Where an appliance is required to be installed on a non-combustible floor, the marking—
 'TO BE INSTALLED ON A NON-COMBUSTIBLE FLOOR'.
- (k) Special conditions of installation as required by Clause 2.12.2.1 (j).
- (l) Instructions as required in Clause 2.12.3.1 (e).
- (m) Any additional information called for in other sections of this Standard.
- (n) The size of the flue cowl for which the appliance is certified.
- (o) In the case of Type 1 appliances, the statement—
 'FOR USE ON NON-COMBUSTIBLE FIRE RESISTIVE FLUED FIREPLACES,
 WITH PERMANENT CHIMNEY OPENING NOT LESS THAN 40 000 mm² OR AS
 OTHERWISE SPECIFIED BY THE MANUFACTURER'.
- (p) The statement—
 'PRIMARILY A DECORATIVE APPLIANCE NOT CERTIFIED AS A SPACE
 HEATER'.

- (q) In the case of Type 1 appliances the following statement:
‘AFTER INSTALLING APPLIANCE CHECK THAT CHIMNEY DRAWS PROPERLY’.
- (r) The appropriate warning label as shown in Figure A1.
This label shall be located on the outside of the appliance in a position where it can be easily read by the operator when the appliance is in the installed position.

2.11.8 Marking of doors and covers

Those doors, covers, and other components to be left open, closed or removed during operation shall be indicated with a permanent marking. Access panels that are required to be left in position during operation shall be indicated by a permanent marking.

2.11.9 Warning label regarding removing of components

If the removal of any part of the appliance could cause interference with flueing or entry of combustion air, a suitable warning label shall be attached to the appliance.

2.11.10 Flue terminal marking

A room sealed appliance venting through a wall shall be provided with a durable marking stating—

‘THIS TERMINAL MUST ALWAYS VENT DIRECTLY TO OUTDOORS.’

This marking shall be fixed to or integral with the flue terminal or its guard.

2.11.11 Markings for primary guards

An appliance that is fitted with a primary guard shall have a label attached that carries the following minimum information in bold capital letters not less than 3 mm in height—

‘THE GUARD IS FITTED TO THIS APPLIANCE TO REDUCE THE RISK OF FIRE OR INJURY FROM BURNS AND NO PART OF IT SHOULD BE PERMANENTLY REMOVED.

FOR PROTECTION OF YOUNG CHILDREN OR THE INFIRM, A SECONDARY GUARD IS REQUIRED’.

2.11.12 Appliances not protected by primary guards

For all Type 1 appliances and for Type 2 appliances with external surfaces which are not protected by a primary guard and which exceed 95°C above ambient, a label carrying the following minimum information shall be permanently attached to the appliance in a prominent position or adjacent to the gas controls:

‘TO REDUCE THE RISK OF FIRE OR INJURY FROM BURNS AND FOR THE PROTECTION OF YOUNG CHILDREN OR THE INFIRM, A SECONDARY GUARD IS RECOMMENDED’.

2.11.13 Flash lighting tubes

Flash lighting tubes that are used for the manual ignition of burners shall have the point of ignition suitably marked, unless this is obvious.

2.12 INSTRUCTIONS

2.12.1 Documents remaining with user

Any document referencing servicing instructions, supplied with the appliance and remaining with the consumer, shall contain a warning that servicing shall be carried out only by authorized personnel.

2.12.2 Installation

2.12.2.1 General

Each appliance shall be supplied with installation instructions which include reference to the following:

- (a) Model or type of appliance.
- (b) Gas or gases for which the appliance is intended and data such as gas consumptions, pressures, etc, or reference to the appliance data plates.
- (c) The requirements of AS/NZS 5601 and the local authority – gas, electricity, etc.
- (d) Overall dimensions of the appliance and location by measurement of connecting points of gas, electricity, etc.
- (e) The alternative types of installations which may be made. In the case of Type 1 appliances, the manufacturer shall state the minimum fireplace depth and maximum height of the fireplace (front) opening for which the appliance has been certified.
- (f) The minimum size of the flue (diameter/cross-sectional area and height) and flue cowl.
- (g) As applicable (which is whenever an appliance is not intended or designed for a fireplace installation), the following note:

‘NOTE: NOT INTENDED FOR FIREPLACE INSERT’

- (h) Details of the methods of connection and alternatives.
- (i) Required surroundings of the appliance, clearance from cupboards and fixings, walls, curtains, floors, or other combustible materials.
- (j) Special conditions of installation, that may be required as the result of the certification test.
- (k) Special conditions which shall be avoided, e.g. marine environment, and any condition necessary to ensure optimum performance.
- (l) Details of any assembly work required to be done by the installer. Parts that have to be assembled on site shall be clearly identifiable, and identified by illustration in the installation instructions.
- (m) Definite instructions to test the operation of the appliance before leaving.
- (n) Details of the necessary testing and instructions for minor adjustments.
- (o) Instructions on the procedure to be adopted if the appliance cannot be adjusted to perform correctly.
- (p) Wiring diagram of electrical connections to the unit.
- (q) In the case of Type 1 appliances, instructions stating that the appliance shall be installed in a fire-resistant fireplace with a proved draught. Testing techniques and/or equipment for checking the effectiveness of the flue draught shall also be provided.
- (r) Warning to the user to only use logs or coals supplied by the manufacturer for the particular model.
- (s) In the case of Type 1 appliances the recommendation that a secondary guard complying with AS/NZS 2286 be installed.
- (t) In the case of Type 1 appliances a statement that the installer must check that all the products of combustion are entering the flue after 10 min when the appliance is operated from cold, by traversing the perimeter of the fireplace opening or canopy, as applicable, using a smoke generator (e.g. a smoke match).

2.12.2.2 *Console appliances*

Console appliances shall be provided with a clearly defined and prominent instruction warning against building the appliance into bookcases, walls etc. Where manufacturers provide an insulated outer casing specifically designed to allow installation in walls, clear instruction shall be given for its use.

2.12.2.3 *Built-in appliances*

Appliances intended as 'built-in' units shall be provided with clearly defined and prominent instructions for installation which shall specify the use of non-combustible materials for the immediate surrounds of the appliance, unless certified for direct installation.

2.12.3 **Operating**

2.12.3.1 *General*

Each appliance shall be supplied with operating instructions, covering each separate function of the appliance and such dismantling, cleaning and assembly as is necessary for the user, and that include reference to—

- (a) a clear explanation of programming and the effect of any power supply interruption for programmed appliances;
- (b) information to assist the user to recognize abnormal operation which requires service;
- (c) a recommended maintenance schedule for the life expectancy of the appliance;
- (d) where service and any necessary replacement parts may be obtained;
- (e) clear and complete instructions for lighting and/or shut-down where incorrect procedures can result in a hazardous condition;
- (f) where necessary, a safe purge before the appliance is re-lit;
- (g) where symbols are used to indicate the functions of operating controls, the meanings of these symbols; and
- (h) appliances incorporating a live fuel effect, and designed to operate with luminous flames, may exhibit slight carbon deposition.

2.12.3.2 *Safety warnings*

2.12.3.2.1 *General*

The instructions shall contain the statements—

'DO NOT PLACE ARTICLES ON OR AGAINST THIS APPLIANCE.'

'DO NOT USE OR STORE FLAMMABLE MATERIALS NEAR THIS APPLIANCE.'

'DO NOT SPRAY AEROSOLS IN THE VICINITY OF THIS APPLIANCE WHILE IT IS IN OPERATION.'

'PRIMARILY A DECORATIVE APPLIANCE—NOT CERTIFIED AS A SPACE HEATER.'

'DO NOT MODIFY THIS APPLIANCE.'

2.12.3.2.2 *Appliances fitted with primary guards*

For an appliance fitted with a primary guard, the instructions shall contain the statement—

'THE GUARD IS FITTED TO THIS APPLIANCE TO REDUCE THE RISK OF FIRE OR INJURY FROM BURNS AND NO PART OF IT SHOULD BE PERMANENTLY REMOVED.

FOR PROTECTION OF YOUNG CHILDREN OR THE INFIRM, A SECONDARY GUARD IS REQUIRED'.

2.12.4 Servicing

Servicing instructions shall be available and they shall include reference to—

- (a) removal of covers and other parts for access to all components;
- (b) removal of components for service—
 - (i) burner equipment;
 - (ii) pilot and flame safeguard;
 - (iii) ignition system; and
 - (iv) thermostat.
- (c) parts replacement—
 - (i) fan;
 - (ii) glass panel;
 - (iii) over-temperature cut-out device; and
 - (iv) heat exchanger.
- (d) adjustments—
 - (i) pilot;
 - (ii) aeration;
 - (iii) thermostat calibration, where applicable; and
 - (iv) ignition (spark gap).
- (e) fault finding chart; and
- (f) wiring diagram.

Servicing instructions shall clearly state 'DO NOT MODIFY THIS APPLIANCE'.

2.12.5 Inclusion of warning to prohibit unauthorized servicing

Servicing instructions remaining with the consumer shall contain a warning that servicing shall be carried out only by authorized personnel.

SECTION 3 PRELIMINARY TESTS — LINE GASES

3.1 GENERAL REQUIREMENTS

3.1.1 Introduction

The nominal gas consumption in MJ/h as specified by the manufacturer, is the fundamental quantity on which all methods of test are based and is the starting point for all performance requirements.

Before commencing testing in this Section refer to Clause 2.1.1.

3.1.2 Test gases

Tests in all parts of this Standard (except Section 4 which requires the use of some special gases in addition to those listed here) shall be carried out using the following test gases:

- (a) Appliances intended for use with natural gas shall be tested using available natural gas but in the case of dispute or borderline results test gas 'N' shall be used.
- (b) Appliances intended for use with town gas shall be tested using available town gas but in the case of dispute or borderline results test gas 'D' shall be used.
- (c) Appliances intended for use with propane only shall be tested with test gas 'X'.
- (d) Appliances intended for use with butane only shall be tested with test gas 'Y'.
- (e) Universal LP Gas appliances are intended for use with Propane, Butane or any mixture of Propane and Butane and shall be tested with test gas 'X' for all performance tests except for Sections 5.7 and 5.8 where test gas 'Y' shall be used.

Nominal gas consumption shall be rated on test gas 'X' and this is the figure to be stated on the appliance data plate.

- (f) Appliances intended for use with tempered LP Gas shall be tested with test gas 'T'.

NOTE: See Table 1.1 for gas characteristics.

3.1.3 Appliances designed for various flue configurations

Appliances designed for various flue configurations shall be tested for compliance with the requirements of this Standard in all of these configurations.

3.1.4 Appliances with granular media

For appliances with burner systems which employ granular media, it may be necessary to repeat selected tests in Section 3 and Section 4 to ensure that the combustion performance is not adversely affected by partial removal or displacement or settling of the granular media.

3.2 PREPARATION FOR TESTING

3.2.1 Electrical safety requirements

The appliance shall comply with the following electrical safety requirements:

- (a) When the appliance is disconnected from the power supply the measured resistance between the earth pin of the plug and any exposed metal on the appliance shall not exceed 1 ohm for rotating parts and 0.1 ohm for all other parts.

- (b) When the appliance is disconnected from the power supply the measured insulation resistance between current carrying conductors and any exposed metal shall not be less than 1 megohm. The resistance for double insulated equipment shall not be less than 10 megohms.

All appliance switches shall be in the 'ON' position.

3.2.2 Setting up appliance for testing

The appliance shall be set up in accordance with the manufacturer's instructions unless otherwise specified in these certification test requirements and checked that gas consumption, aeration, temperature settings and other adjustments have been made in accordance with the manufacturer's recommendations. Adjustments should be made with the test gas which is applicable (see Clause 3.1.2) with the inlet pressure set at normal test gas pressure (see Clause 1.4.64).

Type 1 appliances shall be tested in an appropriate fireplace or an equivalent fabricated enclosure and flue duct which conforms with the manufacturers minimum specification for flue cowl size, enclosure dimensions/depth and fireplace opening height and width. Unless otherwise stated the test enclosure shall be flued with 0.6 m of flue.

Type 2 appliances with forced or induced draught combustion systems shall be tested with a flue system which simulates the maximum flow resistance for which the appliance has been designed.

3.2.3 Appliance regulators not to be removed during testing

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

3.2.4 Protection from accidental draughts

The appliance under test shall be protected from accidental draughts.

3.2.5 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 except as necessitated by the requirements.

3.2.6 Gas pressure and gas volume test equipment

The following equipment shall be used for the control of testing pressures and the measurement of gas volume:

- (a) A wet test gas meter, which shall be calibrated before use.
NOTE: A graph should be provided showing the error or correction factor of the meter over as wide a range as possible.
The following also applies to the test gas meter:
 - (i) A saturator is used with a wet test gas meter to ensure saturation of the gas.
 - (ii) It is permitted to use a calibrated dry gas meter or a calibrated flow meter for test purposes, but in case of dispute, the wet meter shall be the reference standard.
- (b) An adjustable regulator of adequate capacity fitted to the meter inlet.
- (c) Pressure gauges connected to meter inlet, appliance inlet and pressure test point, to read to the nearest 10 Pa.
- (d) A thermometer, graduated to at least 0.5°C installed to measure the gas temperature. The meter water temperature gives a sufficiently accurate figure.
- (e) A barometer to measure atmospheric pressure in the laboratory correct to 30 Pa.
- (f) A means of determining within 1% the heating value of the gas being used.

- (g) A means of determining within 2% the relative density of the gas being used.

3.3 PRIMARY GUARDS

3.3.1 Primary guard attachment

Primary guards shall be permanently attached to the appliance and withstand a pull of 20 N in various directions without permanent damage or distortion. The attachment may be by a hinge(s) provided that a catch or similar device holds the guard in place in the closed position.

3.3.2 Primary guard openings

Openings in a primary guard or openings between the edge of the guard and the appliance shall comply with the following requirements:

- (a) Major dimensions excluding horizontal openings, where the minor dimension exceeds 6 mm: not greater than 150 mm.

NOTE: Limitations on vertical openings are intended to prevent entry of fabrics.

- (b) Minor dimension: less than 6 mm or greater than 12 mm where finger entrapment is possible, but not greater than 35 mm.

NOTE: An opening with dimensions within the range 6 mm to 12 mm is such that a child's finger may be inserted with relative ease, but may be withdrawn only with difficulty.

3.3.3 Protection from contact with the heat source

When the cone specified in accordance with Figure G1 is applied to any opening in or around the guard with a force not exceeding 5 N, the cone shall not contact any heat source which has a temperature exceeding 200°C above ambient when the appliance, at its maximum setting, has been discharging heat at steady rate for a period of not less than 30 min.

3.3.4 Fabric drape test

A piece of fabric material shall not ignite or smoulder within 10 s of being placed over and in contact with an operating appliance.

3.3.5 Impact resistance

Guards shall comply as follows:

- (a) With the exception of guards that include slats of glass or similar material packed alongside each other, guards that include glass or similar material shall withstand impact energy of 0.50 J without damage.
- (b) Guards that include slats of glass or similar material packed alongside each other shall withstand impact energy of 0.25 J without permanent damage.

3.3.6 Surface finish

All exposed surfaces of a primary guard shall be smoothly finished to prevent the possibility of abrasion or laceration to the user, or the snagging of clothing.

3.4 GAS LEAKAGE

3.4.1 Gas circuit soundness

The fully assembled appliance shall be gas tight when subjected to an inlet gas pressure of 14.0 kPa—

- (a) on initial set-up; and
- (b) at the conclusion of all certification tests.

3.4.2 Control of bleed line gas

Bleed lines from diaphragm type automatic valves shall terminate in a location such that—

- (a) ignition of the bleed gas by the main burner or pilot is assured; and
- (b) blockage of the bleed line tip is prevented.

3.5 GAS CONSUMPTION

3.5.1 Tolerance on determined gas consumption

The determined gas consumption in MJ/h of each burner shall be within 5% of nominal gas consumption.

3.5.2 Determined gas consumption of permanent pilots

The determined gas consumption of each continuously burning pilot shall not be more than 0.5 MJ/h except where—

- (a) heat is employed for operating a safety device, in which case it shall not exceed 1.0 MJ/h; or
- (b) it is used as part of a safety system.

3.6 GAS PRESSURE REGULATORS

Except for LP Gas operated appliances, the regulator outlet pressure shall not vary by more than $\pm 20\%$ from the nominal outlet pressure when the appliance inlet pressure is varied from 1.13 kPa up to 5.0 kPa for natural gas appliances and 0.75 kPa up to 3.0 kPa for town gas and TLP appliances.

3.7 IGNITION AND SAFETY SHUT-OFF SYSTEMS

3.7.1 Requirements applicable to all

3.7.1.1 *Aerated pilots*

Ignition and safety shut-off systems shall comply with the following:

- (a) Aerated pilots when lit back, shall either ignite the main burner promptly and without undue noise or cause a shut-off valve to close.
- (b) Aerated pilots when their primary air opening is closed, shall either ignite the main burner promptly and without undue noise or cause the safety shut-off valve to close.

3.7.1.2 *Ignition at reduced pilot rate*

When the pilot flame is turned down to the point where it will just actuate the flame safeguard system, the main burner, operating at any rate at which its control will permit, shall light safely and reliably from that pilot flame.

3.7.1.3 *Means of ignition other than permanent pilot*

For any means of ignition other than a permanent pilot, when the voltage supplied to the appliance is lowered to any point where the main gas valves will still actuate, the main burner, operating at any rate at which its control will permit, shall light safely and reliably from that means of ignition, or the appliance shuts down safely.

3.7.1.4 *Multi-port pilots*

Multi-port pilots shall conform with Clauses 3.7.1.1 and 3.7.1.2 with all ports blocked other than the one activating the flame safeguard sensor.

3.7.1.5 *Holding time for thermoelectric flame safeguard*

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 one minute of igniting the operating flame.

3.7.1.6 *Flame safeguard required*

Burner systems ignited by automatically or remotely controlled ignition systems shall be supervised by a certified flame safeguard system.

3.7.1.7 *Flame travel at ignition*

Flames shall travel freely to all ports on a burner when gas is ignited on any one port.

3.7.1.8 *Cessation of ignition spark*

The ignition spark or other means of ignition shall cease at the end of the start flame establishment period except where an interrupted pilot is used and then it may continue until the main flame is established, provided that after the pilot flame establishment period is completed, the electric spark shall not be able to activate the pilot flame detector.

3.7.1.9 *Commencement of ignition after purge period*

Where a pre-ignition purge period is included, the means of ignition shall commence immediately after the purge period is completed.

3.7.1.10 *Proving of start flame*

Gas shall not flow beyond the start flame establishment period unless the start flame has been proven. Where the start rate is less than the maximum rate the start flame shall be proven before the gas rate increases beyond the start flame rate.

3.7.1.11 *Self-check for safety shut-off systems*

Safety shut-off systems shall incorporate a self-check of integral circuitry to prove that the system is not in the flame proved condition prior to start-up. Manually-operated thermoelectric flame safeguards are exempt from this requirement.

3.7.1.12 *Flame failure*

Flame failure of the supervised burners shall result in lockout in accordance with Clause 2.7.4 (see Clause 3.7.2.1.4 for re-ignition attempt conditions for automatic atmospheric burners).

3.7.1.13 *Flame establishment period for intermittent pilot*

Where an interrupted or intermittent pilot is used, the main flame establishment period shall not exceed 5 s.

3.7.1.14 *Shut-off time for safety shut-off system*

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—

- (a) 90 s where atmospheric type main burners are used and the total gas consumption is up to and including 50 MJ/h;
- (b) 60 s where atmospheric type main burners are used and the total gas consumption exceeds 50 MJ/h up to and including 72 MJ/h; or
- (c) for all other types of main burner 3 s, or up to 6 s provided the appliance satisfactorily meets delayed ignition tests up to twice the flame failure response period.

3.7.1.15 *Interrupted pilot*

Where an interrupted pilot is used the main flame shall be proved on its own at the end of the main flame establishment period.

3.7.2 Automatic burner ignition systems—Additional requirements

NOTE: Systems based on permanent pilots are exempted from this Section.

3.7.2.1 *Atmospheric burners*

3.7.2.1.1 *Start flame establishment period*

The start flame establishment period shall not exceed 5 s except—

- (a) for start gas rates up to 50 MJ/h – 15 s; and
- (b) for start gas rates up to 4 MJ/h – 90 s.

3.7.2.1.2 *Ignition gas flow rate*

The gas flow rate at the time of ignition shall meet one of the following criteria:

- (a) The gas flow rate in MJ/h shall not exceed $200 \frac{V}{T}$

where

V = the volume of the combustion chamber in cubic metres (m³); and

T = the start flame establishment period, in seconds.

OR

- (b) The energy released during the start flame establishment period shall not exceed 0.1 MJ.

OR

- (c) The energy released during the start flame establishment period shall satisfactorily meet delayed ignition tests up to twice the flame establishment period.

NOTE: As this is a safety test under abnormal operation, explosive noise and flame rollout may be acceptable provided—

- (a) there is no damage to the appliance;
- (b) the burner does not light back; and
- (c) there is no danger to persons or adjacent property.

3.7.2.1.3 *Start flame proving period*

Where the nominal gas consumption of the supervised burner exceeds the maximum gas flow rate permitted in Clause 3.7.2.1.2, then there shall be a start flame proving period of not less than the flame failure response time or 5 s, whichever is the greater.

3.7.2.1.4 *Number of reignition attempts*

The total number of re-ignition cycles after flame failure, and prior to lockout, shall be limited to 5.

Flame safeguard systems shall respond to flame failure or loss of flame detector signal by initiating a re-ignition cycle within 2 s.

The first re-ignition cycle following loss of flame shall comply as follows:

- (a) The ignition source is applied immediately.

OR

- (b) Safety shut-down is followed by a full start cycle including mechanical pre-ignition purge sufficient to ensure that the volume of the purging medium is at least 5 times the purge volume.

OR

- (c) Safety shut-down followed by a delay of not less than 5 min before a re-ignition attempt.

Subsequent re-ignition cycles shall be in accordance with (b) or (c) above.

3.7.2.2 *Forced or induced draught burners*

3.7.2.2.1 *Ignition gas flow rate*

The gas flow rate at the time of ignition shall meet one of the following criteria:

- (a) The gas flow rate in MJ/h shall not exceed $200 \frac{V}{T}$

where

V = the volume of the combustion chamber in m^3 ; and

T = is the start flame establishment period in s.

OR

- (b) Throughout the flame establishment period, the gas concentration in relation to the proved air flow rate for that period shall not exceed 50% of the lower explosive limit (LEL) for natural and town gases, or 25% of the LEL for other fuels provided that—
 - (i) the gases during the start gas flame establishment period are thoroughly mixed with the air flow except in the immediate vicinity of the burner; and
 - (ii) the preheated air temperature does not exceed 400°C;

OR

- (c) The energy released during the start flame establishment period shall satisfactorily meet delayed ignition tests. These tests shall be carried out at various delay periods up to twice the flame establishment period.

NOTE: As this is a safety test under abnormal operation, explosive noise and flame rollout may be acceptable provided—

- (a) there is no damage to the appliance;
- (b) the burner does not light back; and
- (c) there is no danger to persons or adjacent property.

3.7.2.2.2 *Start flame proving period*

Where the nominal gas consumption of the supervised burner exceeds the maximum gas flow rate permitted in Clause 3.7.2.2.1, then there shall be a start flame-proving period of not less than 5 s.

3.7.2.2.3 *Number of re-ignition attempts*

Up to 5 re-ignition attempts after flame failure may be made prior to lockout provided—

- (a) the main burner shut-off valve is closed within 3 s of loss of flame and remains closed during the pre-ignition purge;
- (b) each re-ignition commences with the pre-ignition purge and the requirements of Clause 3.7.2.2.1 are met; and
- (c) the duration of the pre-ignition purge period is sufficient to ensure that the volume of the purging medium is at least 5 times the purge volume.

3.7.2.2.4 *Pre-ignition purge period*

A pre-ignition purge period sufficient to ensure purging of at least five times the heat exchanger volume shall be provided prior to any ignition attempt except where purging is continuous during the burner 'OFF' part of the cycle.

SECTION 4 LIMIT GAS TESTS

4.1 GENERAL

Appliances shall comply with the requirements listed below when supplied with the appropriate limit gases from the following list and under the limiting conditions specified in each Clause:

- | | |
|----------------------------------|--|
| (a) Natural gas appliances: | Limit gases Na, Nb and Nc, with an additional test for compatibility with gas S. |
| (b) Propane appliances: | Limit gases X and Z. |
| (c) Butane appliances: | Limit gas Y. |
| (d) Universal LP Gas appliances: | Limit gases X, Y and Z. |
| (e) TLP appliances: | Limit gases Ta, Tb and T. |
| (f) Town gas appliances: | Limit gases A, B and C. |

For natural gas appliances, all tests on limit gases shall be performed with the aeration adjustment (if provided) set on Nc gas. If results are satisfactory on Na, Nb, and Nc but not on S gas, the aeration may be reset on S gas for a repeat test on this gas only. If results are satisfactory a note shall be made in the test report that aeration has been reset.

For town gas appliances, aeration may be reset for each limit gas.

For TLP gas appliances, the aeration shall be set on T gas.

Where there is a possibility that the displacement of any coals, logs or media may interfere with the ignition or combustion of any burner, including pilots, the tests required in this Section 4 shall be repeated with the media in the displaced position. (see Clauses 2.1.8 and 2.1.9)

Before commencing testing in this Section refer to Clause 2.1.1.

4.2 CO/CO₂ RATIO LIMITS FOR ANY INDEPENDENT BURNER—UNDERLOAD

The CO/CO₂ ratio of the combustion products of any independent burner, of an appliance operating at the test conditions specified below, shall not exceed 0.02 after 10 min for Type 1 and Type 2 appliances.

Burners intended for luminous effect and with adjustable aeration setting shall be tested at the minimum aeration setting.

The limiting conditions shall be as listed in Table B2.

4.3 CO/CO₂ RATIO LIMITS FOR ANY INDEPENDENT BURNER—OVERLOAD

The CO/CO₂ ratio of the combustion products of any independent burner, of an appliance operating at the test conditions specified below, shall not exceed 0.02 after 10 min for Type 1 and Type 2 appliances.

Burners intended for luminous effect and with adjustable aeration setting shall be tested at the minimum aeration setting.

The limiting conditions shall be as listed in Table B3.

4.4 CO/CO₂ RATIO LIMITS FOR PERMANENT PILOTS—OVERLOAD

The CO/CO₂ ratio of the combustion products of a permanent pilot of an appliance operating at the test conditions specified below, shall not exceed 0.02 after 10 min for Type 1 and Type 2 appliances.

Pilots shall be tested using the appliance inlet pressures in Table B4.

4.5 FLAME ABNORMALITY

The burner(s) of Type 1 and Type 2 appliances shall exhibit no flame abnormality (see Definitions) or safety shut-down shall occur at maximum and minimum limiting conditions whether the appliance is hot or cold (5°C).

Type 1 appliances shall be tested in an appropriate fireplace or an 'equivalent' fabricated enclosure and flue duct which conforms with the manufacturer's specification for flue diameter, enclosure dimensions and area of the fireplace opening.

Type 2 appliances shall comply in the following conditions:

- (a) When the flue outlet of the appliance is closed.
- (b) When a draught having a velocity head of up to 7.5 Pa is applied to the flue outlet for 1 min.
- (c) When an updraught having a velocity head of up to 7.5 Pa is applied to the flue outlet for 1 min.

NOTE: A velocity head of 7.5 Pa is equivalent to a flow velocity of 3.5 m/s

The limiting conditions shall be as specified in Table B5.

4.6 BURNER IGNITION AT MAXIMUM AND MINIMUM LIMITING CONDITIONS

On carrying out the normal lighting procedure, a burner (other than a pilot burner) shall ignite completely and quietly within 5 s for all gases, at maximum and minimum limiting conditions, specified in Table B6, whether the appliance is hot or cold (5°C). The time shall be measured from the first flow of gas.

In the case of mains ignition systems a voltage equivalent to both 85% and 110% of the nominal supply voltage shall be applied to the appliance.

In the case of battery-operated ignition systems, a voltage equivalent to 80% of the nominal voltage for each battery shall be applied.

Five successive ignition tests shall be applied. Satisfactory ignition shall occur in all five tests.

4.7 DELAYED IGNITION AT MAXIMUM AND MINIMUM LIMITING CONDITIONS

When 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 safety shut-off system, the burner shall at both maximum and minimum limiting conditions whether the appliance is hot or cold (5°C)—

- (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