

Australian Standard[®]

**Radiant gas heaters for outdoor and
non-residential indoor use**



This Australian Standard® was prepared by Committee AG-001, Gas Appliances. It was approved on behalf of the Council of Standards Australia on 25 May 2004. This Standard was published on 10 August 2004.

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 - Appliance and Component Testing
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 - CSIRO Energy Technology
 - Committee AG-001-03
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 - Energy Retailers Association of Australia
 - Gas Appliance Manufacturers Association of Australia
 - Gas Technical Regulators Committee
-

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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 4565—2004

Radiant gas heaters for outdoor and non-residential indoor use

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Technical Committee AG-001 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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NOTES

Australian Standard[®]

Radiant gas heaters for outdoor and non-residential indoor use

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PREFACE

This Standard was prepared by the Standards Australia Working Group AG-001-00-06, Patio heaters, under the responsibility of Standards Australia Committee AG-001, Gas Appliances to supersede AS 4565/AG 405—2001, *Outdoor radiant gas heaters*.

This Standard incorporates Amendment No. 1 (February 2011). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

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 radiant gas heaters for outdoor and non-residential indoor use.

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 5601/AG 601, *Gas Installations* provides essential requirements and basic standards for gas installations.

The principal differences between this edition and AS 4565/AG 405—2001, are:

- (i) Addition of requirements for tabletop appliances.
- (ii) Addition of requirements for appliances for non-residential indoor use.
- (iii) Revision of sections related to outdoor areas.
- (iv) Changes to requirements for guarding.
- (v) Changes to temperature hazard requirements.
- (vi) Changes to cylinder ventilation requirements.
- (vii) Additional requirements for testing on propylene gas.

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 notes to tables and figures are deemed to be requirements of this Standard.

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STANDARDS AUSTRALIA

Australian Standard

Radiant gas heaters for outdoor and non-residential indoor use

SECTION 1 SCOPE AND DEFINITIONS

1.1 SCOPE

These requirements apply to flueless portable and fixed radiant gas heating appliances intended for use in outdoor areas and non-residential indoor areas and for use with natural gas, town gas, liquefied petroleum gas (LPG) or tempered liquefied petroleum gas (TLP) with gas consumption not exceeding 70 MJ/h.

Appliances may be portable or fixed, free standing, mounted or suspended overhead, floor mounted, attached to, or built into, furniture or fixtures.

Appliances may be connected to a fixed piping system, or to a separate or integral refillable LPG cylinder.

NOTES:

- 1 AS 2658 covers various types of portable appliances not exceeding 12 MJ/h (250 g/h): with vapourized LP gas to the inlet at the vapour pressure within the gas container (vapour pressure appliance), AG 403 covers radiant tube heaters.
- 2 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.

1.2 DEFINITIONS

For the purposes of this Standard, the following definitions apply:

1.2.1 Appliance regulator

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

1.2.2 Authority

Means the authority having jurisdiction or such authority as delegated, i.e. Technical Regulator.

1.2.3 Automatic burner

A burner system that on starting follows a self-acting sequence that has been manually or automatically initiated, to provide gas and ignition to the burner without any intermediate manual operation.

1.2.4 Automatic ignition

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

1.2.5 Automatic operation

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

1.2.6 Available gas (line gas)

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

1.2.7 Certified

Assessed by a certifying body, and having a certificate number to demonstrate compliance with a Standard.

1.2.8 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.

1.2.9 Combination gas control

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

1.2.10 Combustible materials

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

1.2.11 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.

1.2.12 Cross lighting

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

1.2.13 Determined gas consumption

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

1.2.14 Dome

The component fitted above the emitter of a patio heater, usually circular, serving the dual purpose of heat reflection and protection of the burner / emitter from the effects of rain.

1.2.15 Flame abnormality

A flame condition that results in lifting, floating, lighting back, carbon deposition or objectionable odour.

1.2.16 Flame detector

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

1.2.17 Flame establishment period

The period that begins when the fuel valve is energized and ends when the flame supervision system is first required to supervise that flame.

1.2.18 Flame failure response time

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

1.2.19 Flame proving period

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

1.2.20 Flame safeguard

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

1.2.21 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.

1.2.22 Forced draught burner

A burner system where all or part of the air for combustion is provided under pressure.

1.2.23 Forced or induced draught combustion system

A combustion system where all or part of the air for combustion is provided by a fan or other mechanical device which is an integral part of the combustion system.

1.2.24 Gas

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

1.2.24.1 *Natural gas (NG)*

A hydrocarbon gas consisting mainly of methane.

1.2.24.2 *Simulated natural gas (SNG)*

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

1.2.24.3 *Town gas (TG)*

A gas manufactured from coal or petroleum feedstock.

1.2.24.4 *Tempered liquefied petroleum gas (TLP)*

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

1.2.24.5 *Liquefied petroleum gas (LPG)*

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).

1.2.25 Gas consumption

The rate of energy consumed by an appliance under specific conditions and expressed in megajoules per hour (MJ/h).

1.2.26 Guard

An integral part of an appliance intended to prevent direct contact with, or close approach to, heat sources.

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

1.2.27 Heat sources

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

Examples of heat sources are—

- (a) radiant elements;
- (b) burner components and flame;
- (c) radiant heat reflectors; and
- (d) burning fuel.

1.2.28 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 AG 701.

1.2.29 Hose

Flexible tube or pipe of multiple construction.

1.2.30 Hose assembly

Flexible hose including end fittings connecting the gas supply to the appliance inlet.

1.2.31 Induced draught burner

A burner system where all or part of the air for combustion is introduced by providing suction in the combustion chamber by mechanical means.

1.2.32 Interlock

A device or function that ensures that the operation of items of equipment is dependent upon the fulfilment of pre-determined conditions by other items of equipment.

1.2.33 Intermittent pilot

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

1.2.34 Interrupted pilot

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

1.2.35 Jointing compound

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

1.2.36 Jointing material

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

1.2.37 Light back

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

1.2.38 Limit device

A device that is actuated by the approach to a hazardous situation in an appliance due to abnormal conditions, and when actuated, causes the gas supply to all burners to shut off with lockout.

1.2.39 Lockout

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

1.2.40 LPG

See Gas.

1.2.41 Manual ignition**1.2.41.1 Direct manual ignition**

The lighting of a burner by the use of a hand held ignition device.

1.2.41.2 Remote manual ignition

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

1.2.42 Mixing tube

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

1.2.43 Mobile appliance

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

1.2.44 Natural gas

See under Gas.

1.2.45 Nominal gas consumption

The appliance gas consumption, in megajoules per hour, 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.

1.2.46 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.

1.2.47 Normal test gas pressure

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

1.2.48 Non-residential indoor areas

An indoor area that is not a living space.

1.2.49 Outdoor

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.

NOTE: Appendix E provides diagrammatical representations of outdoor areas.

1.2.50 Overload gas consumption

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

1.2.51 Permanent pilot

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

1.2.52 Pilot

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

1.2.53 Portable appliance

Complete appliance with all the regulating and safety devices, including stand and, if applicable, a gas cylinder, and designed to be moved from place to place by the user as required.

1.2.54 Primary air

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

1.2.55 Primary air ports

The openings in an aerated burner for primary air.

1.2.56 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.

1.2.57 Purge

To replace air or other gases which may become a hazard from pipework, fittings or appliances.

1.2.58 Quick-connect device

A two-part mating plug and socket assembly for connecting an appliance to a gas supply without the use of tools.

1.2.59 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).

1.2.60 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 AG 701.

1.2.61 Safety shutdown

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.

1.2.62 Safety shut off system

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

1.2.63 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.

1.2.64 Secondary air

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

1.2.65 Simulated natural gas (SNG)

See Gas.

1.2.66 Specific gravity

See Relative density.

1.2.67 Standard conditions

A temperature of 15°C and an absolute pressure of 101.325kPa.

1.2.68 Start gas flame establishment period

The period during which the start gas safety shut off system is permitted to be open before the flame safeguard is required to supervise the start gas flame.

1.2.69 Start gas rate

The restricted gas flow rate admitted either to a separate pilot burner or to the main burner during the start gas flame establishment period.

1.2.70 Table top appliance

An appliance designed specifically for attachment to, and support by, furniture or a fixture.

1.2.71 Tempered liquefied petroleum gas (TLP)

See Gas.

1.2.72 Test gases

The test gases used in these requirements are defined in the Test Gas Table (Table 1.1) that 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 ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (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 shall not be less than the above values.

1.2.73 Town gas

See Gas.

1.2.74 Turndown gas consumption

- (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 except—
 - (i) where a burner is under automatic thermostatic control, the bypass rate is the turndown position;
 - (ii) where no bypass is provided, the marked turndown setting will apply.

1.2.75 Wobbe index (Wobbe number)

The Wobbe index (expressed as MJ/m³) of a gas is:

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

1.2.76 Working surfaces

Surfaces through which heat passes to the space being heated, e.g. hot air grilles, 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	LPG	-	-	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 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.

SECTION 2 DESIGN AND CONSTRUCTION

2.1 GENERAL

2.1.1 Individual component or specification study

The appliance shall not be dismantled 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 must satisfy the requirements as set out in this section to ensure that it does not possess any obvious features which would prevent its certification. If the appliance is not considered satisfactory, adjustments must be made prior to the commencement of testing.

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 PES is employed for safety related functions of burner management systems, the PES shall—

- (a) conform to the relevant requirements of AG 210 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 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 AG 201.

2.1.6 Classification of safety shut off valves

Where a safety shut off system is required, 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	AG 204 or AG 214, Class 3
Induced draught	AG 214, Class 3
Forced draught with air pressure not exceeding 3 kPa	AG 214, Class 2
Forced draught with air pressure exceeding 3 kPa	AG 214, Class 1

NOTE: Refer to Clauses 2.7.5 and 2.7.7 for fitting of safety shut off 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 Sharp edges

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

2.1.9 Continuation of satisfactory operation

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

2.1.10 Protection of vitreous enamel

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

2.1.11 Compliance in alternative forms

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

2.1.12 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.

2.1.13 Alteration of programmed ignition

Adjusting devices for programmed ignition shall be sealed against unauthorized alteration to settings.

2.1.14 Means for gas pressure measurement

Means shall be provided to allow the gas pressure to be measured, and where means for adjustment is provided, adjusted while the appliance is in operation.

Pressure test points shall contain a limiting orifice not exceeding 0.7 mm or equivalent restriction.

2.1.15 Protection of bearings

Fan and motor bearings (where incorporated) shall be protected from dust and lint.

2.1.16 Construction of primary aeration controls

Primary aeration controls shall be constructed so that lint build-up shall have a minimum effect on the flame characteristics, and shall be protected from unauthorized alteration.

2.1.17 Certification of gas hose assembly

Gas hose assembly(ies) shall be certified to AS/NZS 1869 (or equivalent). Limited flexibility connectors shall be certified to AG 216.

2.1.18 Certification of quick connect devices

Quick connect devices if provided, shall be certified to AG 212.

2.1.19 Protection of gas hose assembly

Any part of the gas hose assembly that is enclosed shall be protected against damage along its entire length. Connections required to be completed as part of the assembly of the appliance by the installer or user shall be accessible for soundness testing. Removal or opening of an access plate(s) or door(s) without the use of tools for soundness testing purposes is considered acceptable.

2.1.20 Details of bearings

The manufacturer shall supply details and specifications 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).

2.1.21 Guarding of burners and heat emitters

Guards shall be fitted to all burners and heat emitters intended to be located less than 1.8 m from the ground.

2.1.22 Guards – Design requirements

Guards shall—

- (a) have no opening which exceeds—
 - (i) a major dimension of 126 mm and a corresponding minor dimension of 12 mm; or
 - (ii) a major dimension of 53 mm and a corresponding minor dimension of 20 mm.

These dimensions also apply to any gap between the guard and its immediate surround. However, any opening having a minor dimension of less than 5 mm is ignored.

- (b) have minor dimensions of less than 6 mm; or greater than 12 mm where finger entrapment is possible.

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 only be withdrawn with difficulty.

- (c) have a total open area not less than 50 % of the surface area of the guard;
- (d) prevent inadvertent ignition of flammable material;
- (e) not suffer damage or permanent distortion, or become removed from the appliance when subjected to a force of 20N from any direction;
- (f) be positioned such that no surface protected by the guard can be contacted by the cone shown in Figure A12.

2.2 MATERIALS AND STANDARDS

2.2.1 Weatherproofing

The appliance shall be provided with, or incorporate, adequate weatherproofing. Outer casings of the appliance shall be protected against corrosion.

2.2.2 Suitability of materials and finishes

Materials and finishes, including dressings and lubricants shall be suitable for the conditions of use (e.g. corrosion, temperature, handling, etc).

2.2.3 Materials containing asbestos

Materials containing asbestos are prohibited.

2.2.4 Materials in contact with gas

Materials in contact with gas shall be suitable for all gases. Adhesives used in the gas circuit shall be certified by a body recognized by the Certifying Body.

2.2.5 Materials used in appliances

Materials used in gas appliances shall comply with the following, or equivalent, where applicable:

- (a) Medium or higher grades of black steel pipe to AS 1074.
- (b) Copper-brazed double wall low carbon steel tubing (Bundyweld) to AS 1751. This shall be lead-tin coated or equivalent where corrosion protection is necessary.
- (c) Welded and cold drawn low carbon steel tubing to AS 1450 (S.A.E.-525B).
- (d) Copper pipe to AS 1432.
- (e) Stainless steel tubing to AS 1769.
- (f) Cast iron fittings to AS 1832. Threads to AS 1722.1, taper external and parallel internal.
- (g) Flanges in cast iron, carbon steel, steel alloy or copper alloy to AS 2129, Section 3.
- (h) Steel fittings to AS D26.
- (i) Copper alloy fittings to AS D26.
- (j) Copper alloy fittings to AS 3688.
- (k) Copper capillary fittings to AS 3688 with silver brazing rod to AS 1167.1, Table 2, alloy classification B2 or a comparable rod.

2.2.6 Zinc based alloys

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

Where zinc based alloy is used in any way that may affect the safe operation of the appliance—

- (a) the alloy shall comply with AS 1881 – TYPE ZN AL 4;
- (b) the temperature in use shall not exceed 80°C; and
- (c) the alloy shall not swell, crumble or develop cracks when exposed to saturated water vapour at 97°C for 10 d.

2.2.7 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 used they shall not produce a catalytic effect. Nickel alloys having less than 1% nickel such as AISI 416 / SUS 416 steel shall be acceptable.

2.2.8 Materials used in electrical construction

Materials used in the electrical construction shall be suitable for the application, in particular:

- (a) Electrical insulation shall be of a moisture resistant material.
- (b) High-tension wiring shall be temperature resistant.
- (c) Insulation shall have adequate mechanical and dielectric strength.

2.2.9 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.

2.2.10 Thermal insulation

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

2.2.11 Compression fittings

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

- (a) They shall be made so that 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 five times, applying the torque value as listed in Table 2.2 to remake the fittings, the joints shall comply with the requirements of Clause 3.3.
- (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 REQUIREMENTS

2.3.1 Requirements for electrical components and their installation

Electrical components, and their installation in the appliance, shall comply with the requirements of the appropriate electrical authority. Documentary evidence of the suitability of electrical components shall be provided to the Certifying Body.

2.3.2 Appliances intended for connection to mains electrical supply

Appliances intended for connection to mains electrical supply shall be designed for 240 V single phase or 415 V three phase, 50 Hz a.c. supply.

2.3.3 Accessibility to electrical components

Accessibility shall be provided to adequately service the electrical installation in the appliance.

2.3.4 Connection of electrical components

Electrical components or assemblies which may be required to be removed from an appliance shall not be connected by permanent or soldered joints, except in the case of extra-low voltage circuits (as defined in AS/NZS 3000).

2.3.5 Plug and socket connections

Multiple pin plug and socket connections of electrical components within the appliance shall not be interchangeable.

2.3.6 Protection against accidental contact

Electrical parts other than extra-low voltage terminals shall be enclosed to provide protection against accidental contact. Checking shall be carried out in accordance with AS/NZS 3100.

2.3.7 Protection of low voltage electrical components and wiring

Low voltage electrical components and wiring, if required to be energized to permit servicing of gas components on the appliance, shall be adequately protected against accidental contact. Checking shall be in accordance with AS/NZS 3100.

2.3.8 Protection of wiring and controls against weather conditions

Appliances shall have all controls and electrical wiring adequately protected from damage and weather conditions to ensure safe and reliable operation.

2.4 INSTALLATION REQUIREMENTS

2.4.1 Restraint for portable appliances with hoses, for connection to fixed gas supply

Where a portable appliance is to be connected to a fixed gas supply via a flexible hose connection, a restraining chain or wire of adequate strength shall be fixed to the appliance and a suitable point within 50 mm of each connection point. The length of the chain or wire shall not exceed 80% of the length of the hose assembly.

NOTE: The restraining chain or wire is to prevent stress being imparted onto the hose assembly when the appliance is moved out of its normal operating position.

2.4.2 Fixing of gas inlet connection

For appliances that are designed to be connected to a fixed gas supply system, 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.

2.4.3 Gas connection thread

The gas inlet connection shall have a thread in accordance with the appropriate part of AS 1722.

2.4.4 Access to gas connection

The gas connection shall be so located that sufficient free space is available for the connection to be made or disconnected, using normal tools.

2.4.5 Locking position of variable position burners

Variable position burners shall be provided with means to lock them in each working position.

2.4.6 Heat damage to cylinders, fittings, electrical equipment or hoses

It shall not be possible, across the entire range of adjustment of the appliance, for heat to damage the gas cylinder, fittings, electrical equipment or hoses.

2.4.7 'Text deleted'

2.5 MAINTENANCE REQUIREMENTS

2.5.1 Special tools

Special tools beyond those normally carried by a service fitter shall not be required for adjusting or replacing any component or integral part except those referred to in Clause 2.3.4.

A1

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 undue force. Any replacement shall not require undue force, and incorrect replacement shall be either impossible or completely obvious.

2.5.3 Insertion and removal of gas injectors

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

2.5.4 Assembly and attachment of handles, dials and pointers

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

2.5.5 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:

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

2.5.6 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 without undue force. 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 force or risk of injury and without moving the appliance from the installed position—

- (a) regulator components (except body);
- (b) gas valve plugs;
- (c) injectors;
- (d) filters;
- (e) pilot head assemblies, pilot injectors;
- (f) clocks and timers;
- (g) door springs or other door control mechanisms;
- (h) ignition devices;
- (i) automatic control equipment;
- (j) flame safeguards;
- (k) safety shut off systems;
- (l) fans, electric motors and drives;

- (m) burner(s);
- (n) printed circuit boards.

2.5.7 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.

2.5.8 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 pressure regulators

A certified gas pressure regulator shall be provided with each appliance intended for operation on NG, TG, TLP and LPG. 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) TG, TLP: 0.63 kPa.
- (b) NG: 1.00 kPa.
- (c) LPG: 2.75 kPa.

2.6.2 Positioning of regulators

Regulators shall be placed such that—

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

2.7 GAS CONTROLS AND FLAME SAFEGUARDS

2.7.1 Accessibility by the user

Controls shall be accessible and easily operated by the user.

2.7.2 Accidental changes of settings

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

2.7.3 Self-latching gas valves

Self-latching valves other than pilot valves shall be fitted unless—

- (a) the valve handles are concealed; or
- (b) automatic ignition is provided (see Clause 1.2.4); or
- (c) the valve is spring loaded to return positively to the OFF position.

2.7.4 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.

2.7.5 Fitting of flame safeguards

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.

2.7.6 Reignition of thermostatically controlled burners

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

2.7.7 Main burner automatic shut off valves

Two safety shut off controls in series shall be fitted to appliances intended for automatic operation to shut off all gas to the main burner(s) in the event of flame failure at the point of supervision.

2.8 APPLIANCES INCORPORATING INTEGRAL LPG SUPPLY SYSTEMS

2.8.1 Restriction on provision of integral gas cylinder

Where the radiant heating surface, or combustion product outlet is less than 1.8 m from the ground there shall be no provision for an integral gas cylinder. Table top appliances are exempt from this requirement.

2.8.2 Cylinder mounting

The manufacturer shall provide means for mounting any integral LPG cylinder.

2.8.3 Cylinder retention

The manufacturer shall provide retention means to limit the movement of any integral LPG cylinder. Lateral movement shall not exceed 25 mm at the retention means, and the cylinder or any portion thereof shall not become dislodged from its retention means when a lateral force equal to the full weight of the cylinder is applied in any direction at the centre of the vertical height of the cylinder. Any movement shall not transmit strain to rigid tubing or pipe connections.

2.8.4 Cylinder retention—Interference with cylinder valve

Attachment means shall not interfere with the operation of the cylinder valve. Mounting and retention means shall incorporate adequate adjustment to accommodate the size(s) of the cylinder specified by the manufacturer.

2.8.5 Connectors for an appliance with integral LPG supply system

On an appliance for connection to an integral LPG supply system, a flexible connection or certified semi-rigid, limited flexibility connector shall be provided between the cylinder regulator outlet and inlet connection of the appliance to provide for protection against expansion, contraction, jarring, and vibration.

2.9 ENCLOSURES FOR INTEGRAL LPG SUPPLY SYSTEMS

2.9.1 Ventilation of cylinder enclosure

2.9.1.1 Enclosures for cylinder exceeding 1.25 kg gas capacity

Ventilation openings shall—

- (a) be provided at high and low level; and
- (b) have a total free area at high level of not less than 10 000 mm²; and
- (c) have a total free area at low level of not less than 6 000 mm²; or
- (d) consist of perforations with a total free area of not less than 25% of the sidewall area.

The bottom of the low level (set of) opening(s) shall be at the enclosure base with the upper edge no more than 125 mm above the base.

2.9.1.2 *Enclosures for cylinder not exceeding 1.25 kg gas capacity.*

Ventilation openings shall be provided at high and low level and shall have a total free area of not less than 10% of the sidewall area.

2.9.2 **Accessibility of cylinder valve**

The cylinder valve shall be readily accessible for manual operation. A door in the enclosure to gain access to the cylinder valve is acceptable provided it is non-locking and can be opened without the use of tools. An easily removable cover is also acceptable.

2.9.3 **Clearance from base of appliance**

Except for portable appliances there shall be a minimum clearance of 50 mm between the lower surface of the base of the LPG cylinder enclosure and the ground.

2.9.4 **Connection and disconnection of cylinder**

The design of the appliance shall be such that—

- (a) the LPG cylinder can be connected, disconnected and the connections inspected and tested outside the cylinder enclosure; and
- (b) those connections that could be disturbed when installing the cylinder in the enclosure can be soundness tested inside the enclosure.

2.10 **COMBUSTION AIR SUPPLY AND CONTROLS**

2.10.1 **Combustion air supply equipment**

Combustion air supply equipment supplied with the appliance shall be correctly designed to ensure airflow adequate for all operating conditions specified by the manufacturer.

2.10.2 **Combustion air proving**

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.

2.10.3 **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 supply line.

2.11 **IGNITION, PILOTS AND MAIN BURNERS**

2.11.1 **Pilot burner shut off**

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

2.11.2 **Burner 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.

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

2.11.3 **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.

2.11.4 Manually operated burners enclosed in a 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 gas.

2.11.5 Viewing of burner flames

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

2.11.6 Proving ignition

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

2.11.7 Support of pilot burners, 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.

2.11.8 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.

2.11.9 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.

2.11.10 Burner supports

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

2.11.11 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.

2.11.12 Restriction on gauze over primary air ports

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

2.11.13 Pilot gas filter

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

2.11.14 Aeration adjustment for universal LPG appliances

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

2.12 MARKINGS

2.12.1 Gas type and method of installation and/or use

Information shall be in a prominent position on each appliance and on the carton of each appliance stating the methods of installation and/or use for which it is certified. (Refer Clause 1.1).

2.12.2 Markings on packaging—Installation

Except for portable and mobile appliances, the packing case of every appliance shall be marked in a prominent position:

‘TO BE INSTALLED ONLY BY AN AUTHORIZED PERSON’.

2.12.3 Markings on packaging—Ventilation, prohibited locations, weight and gas type

The packing case of every appliance shall be marked in a prominent position with the following:

- (a) Maximum packaged weight in kilograms.
- (b) Type of gas for which the appliance has been manufactured.
- (c) In the case of appliances for outdoor the text:
 - (i) Do not operate in an enclosed area.
 - (ii) Do not operate in an unventilated area.
 - (iii) Do not operate indoors.
- (d) In the case of appliances for indoor the text:
'Do not operate this appliance in an unventilated area'.

2.12.4 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 2.12.5.

For appliances intended for use with a flexible connection to a fixed gas supply system, additional wording shall refer to the local gas supplier for confirmation of the gas type, if in doubt.

2.12.5 Gas type indication

Where a colour code only is used to indicate the type of gas, it shall comply with the following:

- (a) Natural gas: Black.
- (b) Town gas: Dark Blue.
- (c) Universal LPG: Signal Red.
- (d) Propane only: Orange.
- (e) Butane only: Grass Green.
- (f) Tempered LPG: Pink.
- (g) All gases: Primrose.

2.12.6 Identification of injectors

Removable injectors shall carry an identifying cipher, or alternatively the injector size shall be nominated on the data plate. The cipher shall be in the form of numerals indicating the orifice size in millimetres or the BS number of the injector. In the case of pilot injectors a colour coding in accordance with Clause 2.12.5 is also acceptable.

2.12.7 Marking of fans

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

2.12.8 Other permanent 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) Manufacturer's trade name.
- (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 consumption 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) Wiring diagrams except where electrical equipment is limited to one electric lamp.
- (i) The certificate of compliance number.
- (j) The appropriate warning labels as shown in Figures A1 to A4.
- (k) Special conditions of installation as required by Clause 2.13.1.1, Item (i).
- (l) Instructions as required in Clause 2.13.3.5.
- (m) Any additional information called for in other sections of this standard (Refer to Clause 2.12.12).

2.12.9 Location of warning labels

The labels referred to in Clause 2.12.8 Item (j) shall be located on the outside of the appliance in a position where they are clearly visible to the user when operating the appliance in the installed/operating position. In the case of a portable appliance the labels shall be positioned approximately 1500 mm from ground level.

2.12.10 Marking of doors and covers

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

2.12.11 Marking of parts that may affect combustion

If the removal of any part of the appliance could cause interference with combustion or the entry of combustion air, permanent warning markings shall be attached to the appliance.

2.12.12 Label on guard

An appliance that is fitted with a guard shall have a permanent 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 REMOVED’.

2.12.13 Marking of clearances

For portable appliances, the minimum clearances from combustible materials, as established in Clause 5.5, shall be shown on the warning labels as shown in Figures A1 (b) to A4 (b) (as appropriate).

2.12.14 Warning label used for compliance with Clause 5.6.3.2

Where a warning label is used to comply with the requirements of Clause 5.6.3.2 (a) (ii), a permanent label shall be attached to the appropriate component(s), the label shall be as shown in Figure A5.

Patio heater domes shall have at least 3 labels, equally spaced around the dome and placed in positions where they can be easily seen when the appliance is in the operating position.

The manufacturer shall demonstrate that the label material is resistant to the temperature in the area where it is fitted.

2.13 INSTRUCTIONS

All dimensional details are to be in metric terms.

Additional requirements apply for indoor appliances, see Section 6.

2.13.1 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.

2.13.2 Installer/user

2.13.2.1 *Instructions attached to the appliance*

Each appliance shall be supplied with instructions attached to the appliance in such a manner to ensure that they will reach the installer/user, and that 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 consumption, pressures, etc and reference to the appliance data plate.
- (c) The requirements of the local authority—local gas fitting regulations, municipal building codes, electrical wiring regulations, and any other relevant statutory regulations.
- (d) Overall dimensions of the appliance and location by measurement of connecting points of gas, electricity, etc.
- (e) The alternative types of installation/use.
- (f) Details of the methods of connection, including size and type, and alternatives.
- (g) For other than freestanding or floor mounted appliances, the minimum mounting height.
- (h) Required clearances from combustible materials. e.g., overhead structures, walls, floors, furniture, fixtures and plants.
- (i) Special conditions of installation/use, that may be required as the result of the certification test, e.g., whether the appliance is to be protected from rain.
- (j) Special conditions that must be avoided, e.g., marine environment, and any conditions necessary to ensure optimum performance.
- (k) Details of any assembly work required.
- (l) In the case of a fixed appliance, definite instructions to test the operation of the appliance before leaving.
- (m) Details of the necessary testing and instructions for minor adjustments.
- (n) Instructions on the procedure to be adopted if the appliance cannot be adjusted to perform safely and correctly.
- (o) Wiring diagram of electrical connections to the appliance.
- (p) In the case of appliances intended for outdoor use:
 - (i) The diagrams in Appendix E.
 - (ii) The following text:

‘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.’

(iii) The following text:

‘Any enclosure in which the appliance is used shall comply with one of the following:

An enclosure with walls on all sides, but at least one permanent opening at ground level and no overhead cover.

Within a partial enclosure that includes an overhead cover and no more than two walls.

Within a partial enclosure that includes an overhead cover and more than two walls, the following shall apply:

- at least 25% of the total wall area is completely open, and
- at least 30% of the remaining wall area is open and unrestricted.

In the case of balconies, at least 20% of the total wall area shall be and remain open and unrestricted.’

(q) In the case of appliances intended for non-residential indoor use:

(i) The following text:

‘This appliance must not be used in a room smaller than V cubic metres.

Where V = Five (5) times the rated gas consumption (MJ/h).

NOTE: For example in the case of an appliance with a rated gas consumption of 20 MJ/h, $V = 5 \times 20$, 100 metres.’

(ii) The following text:

‘This appliance must only be used in a well ventilated area.’

- (r) Specific instruction to test for soundness using soapy water, or other appropriate method, after assembly.
- (s) Specific instructions for electrical connections if necessary.
- (t) Removal of any transit protection.
- (u) For appliances designed for installation to fixed gas supply systems—AS 5601/AG 601.

2.13.3 Assembly

2.13.3.1 Appliances in kit form

Appliances that are supplied in kit form shall be provided with assembly instructions (in addition to the instructions in Clause 2.13.1.1) that include, at least, the following:

- (a) Step by step instructions of the assembly of the relevant components, with sufficient text and/or illustrations to ensure correct assembly.
- (b) List of parts, including nuts, bolts, screws, washers, etc., with illustrated identification means.
- (c) List of tools necessary for assembly.
- (d) Specific instruction to test for soundness using soapy water or other appropriate method after assembly.

2.13.4 Operating

2.13.4.1 *Operating instructions supplied with appliance*

Operating instructions shall be supplied with each appliance, covering each separate function of the appliance and such cleaning, assembly and dismantling as is necessary for the user. For programmed appliances, these instructions shall include a clear explanation of programming and the effect of any power supply interruption.

2.13.4.2 *Abnormal operation, maintenance schedule, service and replacement parts*

The instructions shall—

- (a) assist the user to recognize abnormal operation that requires service;
- (b) recommend a maintenance schedule for the life expectancy of the appliance; and
- (c) include a reference as to where service and any necessary replacement parts may be obtained.

2.13.4.3 *Warning statement*

The instructions shall contain the statement:

‘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.’

2.13.4.4 *Text of the guard warning label*

Instructions shall contain the full text of the guard warning label, where fitted (See Clause 2.12.12).

2.13.4.5 *Hazardous condition resulting from incorrect lighting and shutdown procedures*

Where incorrect lighting and shutdown procedures can result in a hazardous condition, appliances shall be provided with clearly defined and complete instructions to warn the user of the potential consequences of improper lighting procedures. Where necessary, lighting instructions shall require a safe delay before the appliance is re-lit.

2.13.4.6 *Authorized person statement*

Except for portable and mobile appliances, the instructions shall contain the statement:

‘TO BE INSTALLED ONLY BY AN AUTHORIZED PERSON’

2.13.4.7 *Appliances intended for outdoor use—Warning against use indoors*

In the case of appliances intended for outdoor use, the instructions shall contain the statement:

‘THIS APPLIANCE SHALL NOT BE INSTALLED OR USED INDOORS’

2.13.4.8 *Warning related to damage by radiant heat*

The instructions shall contain a warning statement to the effect that certain materials or items, when stored under or near the appliance, will be subjected to radiant heat and could be seriously damaged.

2.13.4.9 *Warning to inspect the hose assembly before each use*

The instructions shall contain a warning statement to inspect the hose assembly before each use of the appliance.

2.13.4.10 *Replacement of damaged hose assembly*

The instructions shall state that the hose assembly must be replaced prior to the appliance being put into operation if there is evidence of excessive abrasion or wear, or if the hose is damaged, and that the replacement hose assembly shall be that specified by the manufacturer.

2.13.4.11 *Location of gas hose*

The instructions shall contain information on properly locating the gas hose, including, in the case of hoses connecting appliances to fixed piping systems, locating the hose out of pathways or in areas where the hose may be subject to accidental damage.

2.13.4.12 *Pictorial representations of lighting, shutdown and control operation*

The instructions shall contain lighting and shutdown instructions and control operation, including pictorial representations.

2.13.4.13 *Warnings to be shown in a prominent manner*

The instructions shall also include the following minimum information presented in a readily readable, obvious and prominent manner, such as by being underlined, encircled or printed in a large or different colour type:

- (a) Children and adults should be alerted to the hazards of high surface temperatures, burns and clothing ignition.
- (b) Young children should be carefully supervised when they are in the area of the appliance.
- (c) Clothing or other flammable materials should not be hung from the appliance, or placed on or near the appliance.
- (d) Any guard or other protective device removed for servicing the appliance must be replaced prior to operating the appliance (See Clause 2.12.12).
- (e) Installation of appliances fitted to fixed gas supply systems and repair of all appliances must be carried out by a qualified service person.
- (f) The recommended period between inspections period by a qualified service person.
- (g) A statement that more frequent cleaning may be required as necessary.
- (h) A statement that it is imperative that control compartment, burners and circulating air passageways of the appliance be kept clean.
- (i) The definition of outdoor areas (See Clause 1.2.49) including the diagrams in Appendix E.

2.13.4.14 *Appliance designed for use with an integral LPG supply system*

For an appliance designed for use with an integral LPG supply system, the instructions shall include the following:

- (a) The specific size(s) and capacity(ies) of the cylinder to be used.
- (b) In the case of appliances intended for outdoor use:
 - (i) Instructions to the effect that the appliance shall be used only in an outdoor area and shall not be used in a building, garage or any other enclosed area.
 - (ii) The diagrams in Appendix E.
 - (iii) The following text:

‘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.’

(iv) The following text:

‘Any enclosure in which the appliance is used shall comply with one of the following:

An enclosure with walls on all sides, but at least one permanent opening at ground level and no overhead cover.

Within a partial enclosure that includes an overhead cover and no more than two walls.

Within a partial enclosure that includes an overhead cover and more than two walls, the following shall apply:

- at least 25% of the total wall area is completely open, and
- at least 30% of the remaining wall area is open and unrestricted.

In the case of balconies, at least 20% of the total wall area shall be and remain open and unrestricted.’

(c) In the case of appliances intended for non-residential indoor use:

(i) The following text:

‘This appliance must not be used in a room smaller than V cubic metres.

Where V = Five (5) times the rated gas consumption (MJ/h).

NOTE: For example in the case of an appliance with a rated gas consumption of 20 MJ/h, $V = 5 \times 20$, 100 cubic metres.’

(ii) The following text:

‘This appliance must only be used in a well ventilated area.’

(d) Connection and disconnection instructions for the LPG cylinder and the proper procedure for testing the connection(s) for soundness.

2.13.4.15 Indoor storage of cylinders—Appliances fitted with an integral cylinder

The instructions shall contain the statements to the effect that—

- (a) there is no limitation on the storage of appliances indoors provided that the cylinder is removed from the appliance; and
- (b) storage of an appliance indoors with the cylinder attached is only permitted if the size of the cylinder complies with AS/NZS 1596; otherwise cylinders must be stored outdoors in a well-ventilated area.

2.14 SERVICING

2.14.1 Servicing instructions and maintenance schedule

Servicing instructions and maintenance schedule shall be available at least in draft form prior to the issue of a Certificate of Compliance. These instructions shall include reference to the items listed in Appendix C where applicable.

SECTION 3 PRELIMINARY TESTS FOR LINE GASES

3.1 GENERAL REQUIREMENTS

Before commencing testing in this Section refer to Clause 2.1.1.

3.1.1 Nominal gas consumption

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.

3.1.2 Test gases

Tests in all parts of this code shall be carried out using the following test gases.

NOTE: See Table 1.1 for characteristics.

- (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 LPG 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 Clauses 5.5 and 5.6 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 LPG shall be tested with test gas 'T'.

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 approval test requirements and checked to ensure 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 that is applicable (see Clause 3.1.2) with the inlet pressure set at normal test gas pressure (see Clause 1.2.47).

3.2.3 Appliance regulator 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. 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 GAS LEAKAGE

3.3.1 Gas tightness

The fully assembled appliance shall be gas tight when subjected to an inlet gas pressure of 14 kPa.

3.3.2 Gas tightness after testing

The appliance shall be gas tight (as in Clause 3.3.1) at the conclusion of all certification tests.

3.3.3 Control of bleed lines

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.

3.4 GAS CONSUMPTION

3.4.1 Tolerance on determined gas consumption

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

3.4.2 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 heat is employed for operating a safety device, in which case it shall not exceed 1.0 MJ/h.

3.5 GAS PRESSURE REGULATORS

3.5.1 Pressure regulator performance

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

3.6 IGNITION AND FLAME SAFEGUARD SYSTEMS

3.6.1 Requirements applicable to all ignition and flame safeguard systems

3.6.1.1 *Aerated pilots*

The following shall apply:

- (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.

3.6.1.2 *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.

3.6.1.3 *Multi-port pilots*

Multi-port pilots shall conform to Clauses 3.6.1.1 and 3.6.1.2 with all ports blocked other than the one activating the flame safeguard sensor.

3.6.1.4 *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, the flame safeguard shall hold open within 1 min of igniting the operating flame.

3.6.1.5 *Flame safeguard required*

All burner systems shall be supervised by a certified flame safeguard.

3.6.1.6 *Flame travel at ignition*

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

3.6.1.7 *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 ignition spark shall not be able to activate the pilot flame detector.

3.6.1.8 *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.

3.6.1.9 *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.

3.6.1.10 *Flame safeguard systems—Self-check*

Flame safeguard systems other than thermoelectric types shall incorporate a self-check of integral circuitry to prove that the system is not in the flame proved condition prior to start-up.

3.6.1.11 *Flame failure*

Failure of the supervised burner(s) flame shall result in lockout in accordance with Clause 2.7.5.

3.6.1.12 *Flame establishment period—Intermittent pilot*

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

3.6.1.13 *Flame safeguard system—Shut off time*

The combined time for the flame safeguard 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;
- (c) 3 s for all other types of main burner, or up to 6 s provided the appliance meets delayed ignition tests up to twice the flame failure response period.

3.6.2 Additional requirements for automatic burner ignition systems

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

3.6.2.1 *Atmospheric burners*

3.6.2.1.1 *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;
- (b) for start gas rates up to 4 MJ/h – 90 s.

3.6.2.1.2 *Gas flow rate at ignition*

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

- (a) the energy released during the start flame establishment period shall not exceed 0.1 MJ; or
- (b) 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 roll-out 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.

3.6.2.1.3 *Start flame proving period—Gas flow rate exceeds Clause 3.6.2.1.2*

Where the nominal gas consumption of the supervised burner exceeds the maximum gas flow rate permitted in Clause 3.6.2.1.2, 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.

3.6.2.1.4 *Number of reignition attempts*

The total number of reignition 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 reignition cycle within 2 s.

The first reignition cycle following loss of flame shall comply as follows—

- (a) the ignition source is applied immediately; or
- (b) safety shutdown 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 shutdown followed by a delay of not less than 5 min before a reignition attempt.

Subsequent reignition cycles shall be in accordance with (b) or (c) above.

3.6.2.2 *Forced or induced draught burners***3.6.2.2.1** *Start flame establishment period—Energy release*

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 roll-out 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.

3.6.2.2.2 *Start flame proving period—Gas flow exceeds Clause 3.6.2.2.1*

Where the nominal gas consumption of the supervised burner exceeds the maximum gas flow rate permitted in Clause 3.6.2.2.1, then there shall be a start flame proving period of not less than 5 s.

3.6.2.2.3 *Number of reignition attempts*

Up to 5 reignition 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 prepurge;
- (b) the reignition commences with the prepurge and the requirements of Clause 3.6.2.2.1 are met; and
- (c) failure to reignite results in lockout in accordance with Clause 2.7.5.

3.6.2.2.4 *Prepurge before ignition*

A prepurge period shall be provided prior to any ignition attempt except where purging continues during the ‘burner off’ part of the cycle.

3.6.2.2.5 *Proving of main flame—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.