

Australian Standard™

Gas laundry dryers



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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 4554—2005

Gas laundry dryers

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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™

Gas laundry dryers

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PREFACE

This Standard was prepared by the Standards Australia Committee AG-001 Gas Appliances to supersede AS 4554/AG 104—2002, *Gas laundry dryers*.

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 domestic outdoor gas barbecues.

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, *Gas Installations* provides essential requirements and basic standards for gas installations.

The principal differences between this edition and AS 4554/AG 104—2002, are:

- Minor amendment to definition.
- Clause 3.1.2 last paragraph deleted.
- Clause 5.6.1 and M.O.T. amended to include zero clearances where none are specified in AS 5601.
- Clause 5.11.3/4/5/7 and M.O.T 5.11—95 km/h amended to 65 km/h.
- M.O.T. 5.2.2 and Figure—Spillage test rig replaced by dew plate.
- Clause 3.6.23 (now 3.6.2.2.6) amended.
- New Clause 3.6.1.3.
- Clause 5.11.1 amended.
- ‘Z’ gas added to M.O.T. 4.2 and 4.4.
- M.O.T. 4.2/3 amended to include missing step.
- Flame abnormality definition amended.
- Clause 5.9.2 and M.O.T. 5.9.2.

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 Gas laundry dryers

SECTION 1 SCOPE AND DEFINITIONS

1.1 SCOPE

These requirements apply to laundry dryers, intended for use with natural gas, town gas, liquefied petroleum gas and tempered liquefied petroleum gas up to a nominal gas consumption of 500 MJ/h.

NOTE: 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 these requirements.

1.2 DEFINITIONS

1.2.1 Appliance flueway

A port or passage conveying flue gases within the appliance.

1.2.2 Appliance flueway terminal

A protective device fitted to the exit of an appliance flueway of a flueless appliance.

1.2.3 Appliance regulator

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

1.2.4 Atmospheric burner

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

1.2.5 Authority

Means the authority having jurisdiction or such authority as delegated. (Technical Regulator).

1.2.6 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.

1.2.7 Automatic ignition

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

1.2.8 Available gas (Line gas)

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

1.2.9 Balanced flue appliance

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

1.2.10 Burner port

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

1.2.11 Bypass adjuster

An adjusting screw for setting the flow through a bypass.

1.2.12 Certified

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

1.2.13 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.

1.2.14 CO/CO₂ ratio

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

1.2.15 Combustible materials

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

1.2.16 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.

1.2.17 Cross lighting

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

1.2.18 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.

1.2.19 Direct ignition device

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

1.2.20 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.

1.2.21 Drying load

The amount of dry laundry (in kg) specified by the appliance manufacturer.

1.2.22 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.

1.2.23 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.

1.2.24 Flame failure response time

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

1.2.25 Flame lift

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

1.2.26 Flame proving period

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

1.2.27 Flame safeguard

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

1.2.28 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.

1.2.29 Flash tube

A device for igniting a gas burner in which a flame is made to travel to the burner ports through a tube in which an inflammable mixture of gas and air has been induced.

1.2.30 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.

1.2.31 Flue connection

A device incorporated in an appliance for the connection of a flue or draught diverter, barometric device, fan or similar part.

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 shall be deemed to be the flue connection.

1.2.32 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.

1.2.33 Flue system

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

1.2.34 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).

1.2.35 Forced draught burner

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

1.2.36 Gas

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

1.2.36.1 *Natural gas (NG)*

A hydrocarbon gas consisting mainly of methane.

1.2.36.2 *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.

1.2.36.3 *Town gas (TG)*

A gas manufactured from coal or petroleum feedstocks.

1.2.36.4 *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.

1.2.36.5 *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).

1.2.37 Gas consumption

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

1.2.38 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 based upon ISO 6976 given in AS 4646.

1.2.39 Indoor flueless appliance

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

1.2.40 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.

1.2.41 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.

1.2.42 Intermittent pilot

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

1.2.43 Interrupted pilot

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

1.2.44 Jointing compound

A manufactured liquid, paste like or semisolid material used to seal joints.

1.2.45 Jointing material

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

1.2.46 Light back

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

1.2.47 Linting

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

1.2.48 Lockout

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

1.2.49 Lower explosive limit (LEL)

The lowest percentage of gas in air in which combustion can be self-sustaining at standard temperature (15°C) and absolute pressure (101.325 kPa) conditions.

1.2.50 LPG

See Gas.

1.2.51 Manual ignition**1.2.51.1 *Direct manual ignition***

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

1.2.51.2 *Remote manual ignition*

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

1.2.52 Mixing tube

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

1.2.53 Natural draught burner

See Atmospheric burner.

1.2.54 Natural draught flue

A flue that is operated only by the buoyancy effect of the hot gases in it.

1.2.55 Natural gas

See Gas.

1.2.56 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.

1.2.57 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.

1.2.58 Normal test gas pressure

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

1.2.59 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.

1.2.60 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.

1.2.61 Over-temperature cut-out device

A manual reset or non-resetting device that functions to shut off the gas supply to a burner or burners to prevent temperature exceeding a predetermined level.

1.2.62 Permanent pilot

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

1.2.63 Pilot

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

1.2.64 Power flued

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

1.2.65 Primary air

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

1.2.66 Primary air ports

The openings in an aerated burner for primary air.

1.2.67 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.

1.2.68 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;
 - (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.

1.2.69 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.

1.2.70 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).

1.2.71 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 based upon ISO 6976 given in AS 4646.

1.2.72 Room sealed appliance

An appliance designed such that air for combustion does not enter from, or combustion products enter into, the room in which the appliance is located.

1.2.73 Rotary laundry dryer

A rotary laundry dryer is one in which the clothes are tumbled in a stream of hot air.

1.2.74 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.

1.2.75 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.

1.2.76 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.

1.2.77 Secondary air

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

1.2.78 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.

1.2.79 Simulated natural gas (SNG)

See Gas.

1.2.80 Specific gravity

See Relative density.

1.2.81 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.

1.2.82 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.

1.2.83 Static laundry dryer

A static laundry dryer is one in which the clothes are hung on rods or similar form of suspension in a gas heated cabinet.

1.2.84 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).

1.2.85 Tempered liquefied petroleum gas (TLP)

See Gas.

1.2.86 Terminal

See Flue terminal.

1.2.87 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 ($\text{H}_2 + \text{CO} + \text{O}_2 < 1\%$, $\text{N}_2 + \text{CO}_2 < 2\%$);
- (c) 95% for propane ($\text{H}_2 + \text{CO} + \text{O}_2 < 1\%$, $\text{N}_2 + \text{CO}_2 < 2\%$);
- (d) 95% for propylene ($\text{H}_2 + \text{CO} + \text{O}_2 < 1\%$, $\text{N}_2 + \text{CO}_2 < 2\%$); and
- (e) 95% for butane ($\text{H}_2 + \text{CO} + \text{O}_2 < 1\%$, $\text{N}_2 + \text{CO}_2 < 2\%$).

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.

1.2.88 Thermostat

A device that automatically maintains a predetermined temperature in an appliance or component.

1.2.89 Thermostat bypass

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

1.2.90 Town gas

See Gas.

1.2.91 Turndown gas consumption

- (a) If the turndown is limited, the lowest turndown to which the burner control can be set, or
- (b) 25% of nominal gas consumption for infinite turndown gas controls except:
 - (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.

1.2.92 Wobbe index (wobbe number)

The Wobbe index of a gas is:

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

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 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. 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 Power failure

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

2.1.4 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.

2.1.5 Programmable electronic systems

Where a Programmable Electronic System (PES) is employed for safety related functions of burner management systems, 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).

2.1.6 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 AS 4617.

2.1.7 Classification of safety 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	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 2.1.10 for fitting of safety shut off systems.

2.1.8 Provision of pressure regulator

A certified gas pressure regulator shall be provided with each appliance intended for operation on NG, TG, and TLP. 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.

2.1.9 Means for gas pressure measurement

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 suit 6 mm bore flexible tubing and shall contain a limiting orifice not exceeding 0.7 mm or equivalent restriction.

2.1.10 Safety shut off system

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

2.1.11 Bypass for thermostatically controlled burners

Appliances incorporating thermostatically controlled burners shall include a bypass or other means to ensure automatic reignition of the burner except that safety shut off controls before such burners shall not be bypassed.

2.1.12 Gas filters

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

2.1.13 Protection of ports and injectors

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

2.1.14 Aeration adjustment for Universal LPG appliances

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

2.1.15 Sealing of gas consumption adjusting devices

Gas consumption adjusting devices where provided shall be sealed against unauthorized alteration to setting.

2.1.16 Provision to shut off main burner

Provision shall be made to shut off gas to the main burner without extinguishing the pilot (if fitted).

2.1.17 Door catch design

Door catches shall be so designed that they can be opened easily from inside by a light manual pressure.

2.1.18 Electrically operated automatic valves

Electrically operated automatic gas valves used in appliances shall be of the type that will close upon current failure.

2.1.19 Reignition after power failure

When an appliance is fitted with automatic ignition other than from a permanent pilot, restoration of power after power failure shall not open the main automatic gas control until the main burner ignition device is re-energized.

2.1.20 Protection of components from water

The design or construction of an appliance shall be such that the burner, pilot, controls and electrical equipment are protected so that they will not be affected by water during the normal handling or operation of the appliance.

2.1.21 Flash tubes

The ignition of the main burner of an automatic appliance shall not depend on flash tubes or other remote ignition devices. The source of ignition shall be adjacent to the main burner.

2.1.22 Ignition of room sealed appliances

In the case of room sealed appliances the means of ignition shall be incorporated as part of the appliance.

2.1.23 Manual operation of automatic valves

When an automatic valve is used to control the gas supply to main burners, means shall not be provided for the manual operation of the valve in the event of current failure.

2.1.24 Resistance to corrosion

All surfaces shall be resistant to corrosion under normal conditions of use and installation.

2.1.25 Damage of clothes, sharp edges

Appliances shall be free from sharp edges, corners or projections that might damage clothes. Parts with which the user, assembler, installer or service person are likely to come in contact shall not have sharp points or edges.

2.1.26 Means of exhaust discharge

Appliances with a gas input—

- (a) less than 10 MJ/h shall have means provided to discharge exhaust products outside the building; or
- (b) greater than 10 MJ/h shall be provided with flue connections.

2.1.27 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.

2.1.28 Static laundry dryers

2.1.28.1 *Prevention of damage to clothes*

A protective grid shall be fitted above the burner to prevent clothing being damaged should it fall off the hanging rods.

2.1.28.2 *Openings in protective grid*

The openings in a protective grid shall be either less than 6.5 mm wide or less than 1.6 cm² in area.

2.1.28.3 *Hanging rods*

Hanging rods shall be—

- (a) smooth so as not to cause damage to laundry under normal operating conditions;
- (b) located so that they cannot readily become dislodged when in use; and
- (c) readily removable for loading.

2.1.29 Rotary laundry dryers

2.1.29.1 *Interlock of drum rotation and door*

Appliances shall be so designed that both the rotation of the drum and the supply of gas to the main burner are prevented while the door is open.

2.1.29.2 *Electric motors*

Electric motors shall be designed for continuous duty and shall be protected with temperature or current sensitive devices that will prevent motor winding temperatures from exceeding those rated in Australian Standards.

2.1.29.3 *Automatic ignition*

Rotary laundry dryers shall be equipped with automatic ignition.

2.1.29.4 *Exhaust connection*

Rotary laundry dryers shall be provided with means for exhaust duct connection, or other means for disposal of moisture and lint.

2.1.29.5 *Lint removal*

Appliances shall be designed so that lint accumulation in any part of the appliance can be readily removed.

2.1.29.6 *Provision of lint trap*

A lint trap or other means shall be provided for minimizing the discharge of lint from the exhaust of the appliance.

2.1.29.7 *Means to clean lint trap*

The lint trap shall be readily removable for cleaning without disconnecting the exhaust duct.

2.1.29.8 *Door fit when closed*

Doors when closed shall fit closely and tightly around the entire perimeter.

2.1.29.9 *Adjustment of fan belt tension*

On belt driven blowers or fans means for adjusting or maintaining belt tension shall be provided.

2.1.29.10 *Provision of thermostat*

All rotary laundry dryers shall be thermostatically controlled.

2.1.29.11 *Provision of over temperature cut out*

An over-temperature cut-out device that functions independently of the operating temperature control device shall be provided.

2.2 STRENGTH AND STABILITY

2.2.1 Adequacy of means of support

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

2.2.2 Support of components

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.

2.2.3 Location of 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.

2.2.4 Burner supports

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

2.2.5 Gas manifolds

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

2.3 DURABILITY

2.3.1 Continuation of satisfactory operation

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

2.3.2 Positioning of regulators

Regulators shall be so placed that breather holes cannot easily be blocked, and overheating and the possibility of ignition of gas leaking from the breather holes are minimized.

2.3.3 Protection of electric lamp

Electric lamps shall be protected from damage.

2.3.4 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 cracking effect. Nickel alloys having less than 1% nickel such as AISI 416/SUS 416 steel shall be acceptable.

2.3.5 Restriction on gauze over primary air ports

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

2.3.6 Protection of vitreous enamel

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

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

2.4 ELECTRICAL REQUIREMENTS

2.4.1 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 for suitability of electrical components shall be provided to the testing authority.

2.4.2 Connection of electrical components

Electrical components or assemblies that 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).

2.4.3 Accessibility to electrical components

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

2.4.4 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 carried out in accordance with Clause 8.10 of AS/NZS 3100: 2002.

2.4.5 Plug and socket connections

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

2.4.6 Protection against accidental contact

Electrical parts other than extra low voltage terminals shall be enclosed so as to provide protection against accidental contact. Checking shall be carried out in accordance with Clause 8.10 of AS/NZS 3100: 2002.

2.5 MATERIALS

2.5.1 Suitability of materials and finishes

Materials and finishes, including dressings and lubricants used in the construction of an appliance shall be suitable for the conditions of use e.g. corrosion, temperature, handling, etc. Materials containing asbestos are prohibited.

2.5.2 Materials in contact with gas

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

2.5.3 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, and
- (b) the temperature shall not exceed 80°C.
- (c) the alloy shall not swell, crumble or develop cracks when exposed to saturated water vapour at 97°C for 10 d.

2.5.4 Thermal insulation

Thermal insulation shall—

- (a) not produce obnoxious odours, fumes, nor corrode materials with which it is in contact;
- (b) be fitted in such a way that it is not rendered ineffective or objectionable by—
 - (i) settling;
 - (ii) dislodgment; or
 - (iii) condensation during the normal operation of the appliance; and
- (c) be protected against rodents, birds, etc.

2.5.5 Suitability of materials used in electrical construction

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

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

2.5.6 Materials used in gas appliances

Materials used in gas appliances shall comply with the following Standards, 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—2000, Section 3.
- (h) Steel fittings to AS D26.
- (i) Copper alloy fittings to AS D26 and AS 3688.
- (j) Copper capillary fittings to AS 3688 with silver brazing rod to AS 1167.1—1993, Table 2, alloy classification B2 or a comparable rod.

2.5.7 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.

2.6 INSTALLATION REQUIREMENTS

2.6.1 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.

2.6.2 Gas inlet connection thread

The gas inlet connection shall have a thread in accordance with AS 1722.1.

2.6.3 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, using normal tools.

2.6.4 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.

2.6.5 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.

2.6.6 Flue adaptors

Flue connections, both vertical and horizontal, for an appliance 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.

Flue connections or adaptors designed for twin metal flue pipe shall comply with the requirements of AS 4567.

Flue connections or adaptors designed for single wall metal flue pipe shall conform to the dimensions given below.

TABLE 2.2
CIRCULAR FLUE CONNECTION

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

TABLE 2.3
RECTANGULAR FLUE CONNECTION (SPIGOT)

Nominal size mm	Dimensions of flue connection mm	
	Width	Depth
250 x 50	247 $^{+0}_{-5}$	45 $^{+0}_{-5}$
300 x 65	295 $^{+0}_{-5}$	60 $^{+0}_{-5}$

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.

2.6.7 Flue terminal and draught diverter construction

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

2.7 MAINTENANCE REQUIREMENTS

2.7.1 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 and operating:

- Aeration controls. (It is acceptable for the adjustment to be finalized with the burner removed, provided the setting will not be disturbed during replacement.)
- Pilots.
- Thermostat bypasses where provided.
- Thermostat calibration.
- Regulator adjustments.

- (f) Gas consumption adjusters.
- (g) Ignition devices.
- (h) Safety devices.
- (i) Belt tension adjusters.

2.7.2 Accessibility for replacement

Components that require removing for service work 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 (gas).
- (f) Pilot head assemblies, pilot injectors.
- (g) Clocks and timers.
- (h) Door springs or other door control mechanisms.
- (i) Burners.
- (j) Ignition devices.
- (k) Drip trays.
- (l) Automatic control equipment.
- (m) Safety shut off systems.
- (n) Electric light globes.
- (o) Fans, electric motors and drives.
- (p) Belts.

2.7.3 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.

2.7.4 Inaccessible nuts or bolts

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

2.7.5 Insertion and removal of gas injectors

Screw-in burner injectors shall be made so that they can be inserted and removed without damage.

2.7.6 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 listed in the Table 2.4 to remake the fittings, the joints shall comply with the requirements of Clause 3.3.

TABLE 2.4
TORQUE VALUES

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

- (f) The component parts shall be made of materials with a melting point not less than 430°C.

2.7.7 Design of valve handles, movable dials and pointers

Valve handles, movable dials and pointers shall be so designed that they are not capable of being incorrectly assembled and shall be securely attached to their spindles.

2.7.8 Security of valve handles, movable dials and pointers

Valve handles, movable dials and pointers shall not contain loose parts which may become detached when the handles are removed.

2.7.9 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.

2.8 DESIGN FOR USE

2.8.1 Accessibility by the user

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

2.8.2 Accidental change of setting

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

2.8.3 Adjusting devices, locking arrangements

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.

2.8.4 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.

2.8.5 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.

2.8.6 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.

2.8.7 Proving of 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.

2.8.8 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.

2.8.9 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 so designed that unburnt gas cannot be discharged from one burner while the other is alight, except in the case of initial lighting of a burner fitted with a flame safeguard.

2.8.10 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. Parts intended to be removed by the user shall be such that their incorrect replacement is obvious.

2.8.11 Sharp edges

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

2.8.12 Handles and knobs

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

2.9 MARKINGS

2.9.1 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) Total nominal gas consumption in MJ/h and 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) Any additional information called for in other Sections of this Standard.
- (k) Commercial appliances shall bear a permanent label on the front of the appliance, stating:
‘THE LINT SCREEN ON THIS APPLIANCE MUST BE CLEANED AT LEAST DAILY’.
- (l) Instructions as required in Clause 2.10.3.3.
- (m) The appropriate warning label as shown in Figure A5.

These markings shall be located on the outside of the appliance in a position where they can be easily read by the operator when the appliance is in the installed position.

2.9.2 Indication of function of gas valves

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.

2.9.3 Identification of gas valves

Each valve, including pilot valves, shall be identified with the burner it controls.

2.9.4 Gas type

Appliances shall be provided with clear markings readily accessible and easy to read—

- (a) stating the type of gas for which it has been manufactured and adjusted. The colour of the text shall be that appropriate to the gas specified as shown in the schedule in Clause 2.9.5.
- (b) for appliances intended for use with a flexible connection having a bayonet fitting, referring the installer to the gas supplier for confirmation of the gas type, if any doubt exists.

2.9.5 Gas type indication

Where a colour code only 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) NG: Black.
- (b) TG: Dark blue.
- (c) Universal LPG: Signal red.
- (d) Propane: Orange.
- (e) Butane: Grass green.
- (f) TLP: Pink.
- (g) All gases: Primrose.

2.9.6 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 of the injector. In the case of pilot injectors a colour coding in accordance with Clause 2.9.5 is acceptable. Alternatively the injector size may be nominated on the data plate.

2.9.7 Temporary markings on appliances

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

2.9.8 Packaging

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

‘TO BE INSTALLED ONLY BY AN AUTHORIZED PERSON’.

The packing case shall also display a clear marking indicating the maximum packaged weight in kilograms.

2.9.9 Room sealed appliance or a power flued appliance

A room sealed appliance or a power flued appliance venting through a wall shall be provided with a durable label stating:

‘THIS TERMINAL MUST ALWAYS VENT DIRECTLY TO OUTDOORS’.

This label shall be fixed to the flue terminal or guard.

2.10 INSTRUCTIONS

2.10.1 Installation

2.10.1.1 *Instructions to be supplied with the appliance*

Each appliance shall be supplied with written and diagrammatic installation instructions that include at least 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 5601, local authority, gas, electricity, and any other relevant statutory regulations.
- (d) Overall dimensions of the appliance and location by measurement of connecting points of gas, flues, etc.
- (e) The alternative types of installations that may be made.
- (f) Details of the methods of connection and alternatives.
- (g) The removal of any transit protection.
- (h) Recommended location of the appliance; clearance from cupboards and fixings, walls, curtains, floors, or other combustible materials.
- (i) Special conditions of installation that may be required as the result of the Certification Test.
- (j) Special conditions that must be avoided, e.g. marine environment, and any conditions necessary to ensure optimum performance.
- (k) Reference to AS 5601 for pipe sizing details.
- (l) Details for other trades, when method of installation affects other trades, e.g. details for a bricklayer. Also where electrical connections are required, details should be given for an electrician.
- (m) Details of any assembly work required to be done by the installer.
- (n) Details of the location of combustion air openings.

- (o) Definite instructions to test the operation of the appliance and instruct the user before leaving.
- (p) Details of the necessary testing and instructions for minor adjustments.
- (q) The procedure to be adopted if the appliance cannot be adjusted to perform correctly.
- (r) Details of flueing including:
 - (i) Size.
 - (ii) Position of flue outlet.
 - (iii) Materials and methods that may be used and respective locations, i.e. termination of all types of flueing recommended.
- (s) Details of ventilation including:
 - (i) Size and location of openings for draught diverter dilution.
 - (ii) Where an appliance can be installed in a cupboard or housing or is designed to be installed in a cupboard or housing, diagrams showing method of installation, ventilation requirements, clearances and minimum dimensions of cupboard or housing.
 - (iii) The minimum free area for ventilation into the room required to provide combustion, dilution and make up air.
- (t) The statements:
 - ‘DO NOT USE OR STORE FLAMMABLE MATERIALS IN THE APPLIANCE STORAGE DRAWER OR NEAR THIS APPLIANCE.’
 - ‘DO NOT SPRAY AEROSOLS IN THE VICINITY OF THIS APPLIANCE WHILE IT IS IN OPERATION.’
 - ‘DO NOT MODIFY THIS APPLIANCE.’

2.10.2 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;
 - (iv) thermostat;
 - (v) gas control and manifold panel;
 - (vi) bottom and side panels; and
 - (vii) thermocouple
- (c) parts replacement—
 - (i) fan;
 - (ii) over-temperature cut-out device;
 - (iii) electronic ignition; and
 - (iv) electrical equipment and components
- (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'.

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

2.10.3 Operating

2.10.3.1 *Instructions to be supplied with the appliance*

Manufacturer's instructions shall be supplied with each appliance, covering each separate function of the appliance, and such dismantling, cleaning and assembly as is necessary for the user. These instructions—

- (a) shall specify the need to regularly remove any lint accumulation from within the appliance and from the lint trap;
- (b) shall state the maximum drying load (dry weight);
- (c) shall—
 - (i) assist the user to recognize abnormal operation that requires service;
 - (ii) recommend a maintenance schedule for the life expectancy of the appliance;
 - (iii) include a reference as to where service and any necessary replacement parts may be obtained; and
 - (iv) state that fresh air ventilation openings shall not be blocked and or sealed; and
- (d) shall include a prominently printed warning
'THIS APPLIANCE SHALL NOT BE USED TO DRY OFF SOLVENTS OR DRY-CLEANING FLUIDS.'

Drafts of these instructions shall be submitted with the appliance for tests.

2.10.3.2 *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. Where necessary, lighting instructions shall require a safe purge before the appliance is relit.

2.10.3.3 *Appliances without a permanent flue*

The following statement shall be included in the installation instructions of appliances without a permanent flue:

'THIS DRYER MUST NOT BE INSTALLED IN A LAUNDRY OF SMALLER VOLUME THAN 11 m³.

THE ROOM MUST CONTAIN FIXED VENTILATION IN ACCORDANCE WITH LOCAL AUTHORITY REGULATIONS.

FOR USE IN LAUNDRY AREAS ONLY.'

SECTION 3 PRELIMINARY TESTS – LINE GASES

NOTE: Before commencing testing in this Section refer to Clause 2.1.1.

3.1 GENERAL REQUIREMENTS

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.

3.1.1 Test gases

Tests in all parts of this Standard (except Section 4 which requires the use of special gases in addition to those listed here) 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 5.8 and 5.11 where test gas ‘Y’ shall be used.

NOTE: 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.

NOTE: 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 to ensure that nominal 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 3.1.1) with the inlet pressure set at normal test gas pressure (see Clause 1.2.58).

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 Provision 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 that shall—
 - (i) 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.
 - (ii) be used with a saturator to ensure saturation of the gas.
NOTE: 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 14.0 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.

3.4 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 applied in conjunction with a mercury vapour system or thermopile as a thermal generator, 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 $\pm 20\%$ from the nominal outlet pressure 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 SAFETY SHUT OFF SYSTEMS

3.6.1 Requirements applicable to all

3.6.1.1 *Aerated pilots*

- (a) Aerated pilots when lit back, shall either ignite the main burner promptly and without undue noise or cause a safety 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 safety shut off 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 *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 ignition system shall shut down safely.

3.6.1.5 *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 1 min of igniting the operating flame.

3.6.1.6 *Flame safeguard system*

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

3.6.1.7 *Flame travel at ignition*

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

3.6.1.8 *Cessation of means of ignition*

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.

3.6.1.9 *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.

3.6.1.10 *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.

3.6.1.11 *Safety shut off system self check*

Safety shut off 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.

3.6.1.12 *Flame failure*

Flame failure of the supervised burners shall result in lockout in accordance with Clause 2.1.10 (see Clause 3.6.2.1.4 for reignition attempt conditions for automatic atmospheric burners and Clause 3.6.2.2.3 for forced and induced draught burners).

3.6.1.13 *Flame establishment period for intermittent pilot*

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

3.6.1.14 *Shut off time for flame safeguard 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 150 MJ/h;
- (c) 45 s where atmospheric type main burners are used and the total gas consumption exceeds 150 MJ/h up to and including 500 MJ/h; or
- (d) 3 s for all other types of main burner.

3.6.1.15 *Proving of 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.

3.6.1.16 *Appliances equipped for exhaust duct connections*

In appliances equipped for exhaust duct connections, the means for lighting the main burner shall cause effective ignition without delay. The burner shall not exhibit any flame abnormality and the flame shall not be forced outside the combustion chamber when a static pressure of 75 Pa is applied at the outlet of the exhaust duct.

3.6.2 Automatic burner ignition systems—additional requirements

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

where

V is the volume of the combustion chamber in m³

T is 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.

NOTES: 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 - nominal gas consumption exceeds that permitted in 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 cycles after flame failure*

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 if—

- (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 is 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 *Gas flow rate at ignition*

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 is the volume of the combustion chamber in m³

T is the start flame establishment period in seconds.

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.

NOTES: 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 - nominal gas consumption exceeds that permitted in 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 after flame failure*

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 pre-purge;
- (b) each reignition commences with a pre-purge and the requirements of Clause 3.6.2.2.1 are met; and
- (c) the duration of the pre-purge period is sufficient to ensure that the volume of the purging medium is at least 5 times the purge volume.

3.6.2.2.4 *Pre-purge period*

A pre-purge period sufficient to ensure purging of at least 5 times the purge volume shall be provided prior to any ignition attempt except where purging continues during the ‘burner off’ part of the cycle.