

AS/NZS 5601.1:2022
(Incorporating Amendment No. 1)



Australian/New Zealand Standard™

Gas installations

Part 1: General installations



AS/NZS 5601.1:2022

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- Association of Accredited Certification Bodies
- Association of Hydraulic Services Consultants Australia
- Australian Building Codes Board
- Australian Gas Association
- Australian Industry Group
- Boating Industry Association
- Caravan Industry Association of Australia
- Department of Mines, Industry Regulation and Safety — Building and Energy WA
- Energy Networks Australia
- Energy Safe Victoria
- Gas Appliance Manufacturers Association of Australia
- Gas Energy Australia
- Gas Technical Regulators Committee
- Gas Utilisation Institute, New Zealand
- Hydraulic Consultants Association Australasia
- LPG Association of New Zealand
- Master Plumbers Australia and New Zealand
- Resources Safety and Health Queensland
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Australian/New Zealand Standard™

Gas installations

Part 1: General installations

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Preface

This Standard was prepared by the Standards Australia/Standards New Zealand Committee AG-006, Gas Installations, to supersede AS/NZS 5601.1:2013.

An exemption to SG-009, *Preparation of Standards for Legislative Adoption*, Clause 10 Reference to Approval Procedures or Bodies (Attachment 1) for AS/NZS 5601.1 *Gas Installations*, Part 1: *General installations*, and the retention of regulatory requirements relating to specific jurisdictions has been approved as a one-off for this publication by the Standards Development Accreditation Board (SDAC) on 6 August 2020.

A1 This Standard incorporates Amendment No. 1 (March 2023). The start and end of changes introduced by the Amendment are indicated in the text by tags including the Amendment number 1. **A1**

The objective of this Standard is to provide essential requirements and deemed-to-conform solutions, and to promote uniform standards of *gas* installation.

This Standard is not to be regarded as a design specification or an instruction manual for untrained persons.

This Standard has no legal standing in its own right, but may acquire legal standing in either of the following circumstances:

- (a) Where adopted by a government or other authority having jurisdiction over relevant installations.
- (b) Where adopted as part of an installation specification.

Regulatory bodies (*Technical Regulators*) may adopt this Standard. The Standard lists some variation of requirements among the regulatory jurisdictions in [Appendix M](#).

New Zealand instituted legislative changes in 1992 which removed the responsibility for inspection and certification of *gas* installations from the *gas* suppliers and instituted a regime of *gas* certification by a person authorized under the Plumbers, Gasfitters, and Drainlayers Act 2006.

Where the Standard has acquired legal standing, its requirements in Australia are mandatory (variations/exceptions being indicated as stated above).

For New Zealand, it is intended that only the performance requirements ([Section 2](#)) will be mandatory.

Matters of an advisory or explanatory nature are indicated in the following manners:

- (i) The word “NOTE(S)” followed by a statement(s).
- (ii) By inclusion in an informative appendix.
- (iii) By inclusion in examples or caution statements.

Terms or words that are indicated by *italics* in the body of the text are defined terms or words. This indication of italics does not apply to the text in the Preface, headings or figures. [Section 1](#) contains the definitions of such terms or words as they apply to the Standard.

This Standard includes a statement that its requirements do not apply retrospectively. [Section 2](#) of this Standard details the various aspects of a gas installation that contribute to its safety, stating essential safety requirements and performance criteria for compliance with legislative requirements for safety of gas installations. [Section 3](#) to [6](#) provide additional deemed to satisfy solutions for conformance to the performance criteria.

The means of conformance in [Sections 3](#) to [6](#) are not the only means of conformance to the performance criteria in [Section 2](#).

Major changes from AS/NZS 5601.1:2013 include the following:

- (A) New definition for an “ignition source”.
- (B) [Section 2](#) has been separated into “Essential safety requirements” and “Performance based design requirements”.
- (C) Brazing prohibited within 1 m of a joint with non-metallic components.
- (D) New drawings for consumer piping located in cavities.
- (E) Prohibition on the installation of multilayer pipe above-ground external to buildings.
- (F) Provision of emergency isolation for multilayer pipe, including a new definition for a fire safety system.
- (G) Increased clearance requirement between domestic cooking appliances and rangehoods to align with IEC 60335-2-31, *Household and similar electrical appliances — Safety, Part 2-31: Particular requirements for rangehoods and other cooking fume extractors*.
- A1 (H) Restrictions on the use of semi-rigid connectors in the installation of commercial catering equipment. A1
- (I) New requirements for the protection of combustible surfaces adjacent to commercial catering equipment.
- (J) New pipe sizing graphs and tables based upon the Churchill friction factor equation.
- (K) Effect of altitude on gas supply pressure for high rise building installations.
- (L) Revised requirements for the location of flue terminals under a covered area, in a recess, or on a balcony.
- (M) New requirement for the isolation of installations in educational institutions.
- (N) New requirements for freestanding commercial catering equipment with under-equipment connection.
- (O) New requirements for the connection of freestanding commercial catering equipment using a hose assembly.

Statements expressed in normative terms in footnotes to tables and figures are deemed to be requirements of this Standard. Notes to the text contain information and guidance. They are not an integral part of the Standard.

Notes to tables are for information and guidance only.

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

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NOTES

Australian/New Zealand Standard

Gas installations

Part 1: General installations

Section 1 Scope and general

1.1 Scope, exclusions and application

1.1.1 Scope

This Standard specifies requirements and means of conformance for the design, installation and commissioning of *gas installations* that are associated with the use or intended use of *natural gas*, *LP Gas*, or *biogas*.

NOTE 1 In Australia, AS 4564 includes requirements for general purpose natural gas including biogas, and AS 4670 includes requirements for LP Gas.

NOTE 2 In New Zealand, NZS 5442 includes requirements for reticulated natural gas and NZS 5435 includes requirements for LP Gas.

1.1.2 Exclusions

This Standard does not apply to —

- (a) *portable or mobile appliances* (such as barbecues or patio heaters) that are connected directly, or by *hose assembly*, to an *LP Gas cylinder*;
- (b) automotive CNG compressors and refuelling stations;
- (c) installations in vehicles for automotive use; or
- (d) caravans and boats (refer to AS/NZS 5601.2 with the exception of the installation of commercial catering equipment).

1.1.3 Application

1.1.3.1 Conformance

The user of this Standard is expected to be familiar with the properties and characteristics of fuel *gases* and the principles of combustion, ventilation and flueing applicable to the safe installation and operation of *appliances*.

The requirements of this Standard shall be used in conjunction with, but do not take precedence over, statutory regulations that may apply in any area. Where no requirement is given, good practice shall apply.

NOTE 1 In a matter of uncertainty, advice should be sought.

This Standard applies to new installations, alterations and extensions commenced after its publication date or the date of adoption by the relevant *Technical Regulator*. It does not apply retrospectively to existing installations or to their repair. However, modifications to existing installations shall conform to the requirements of this Standard.

NOTE 2 Although this Standard does not apply to the repair of an appliance in an existing installation, immediate steps should be taken to make safe any unsafe *appliance(s)* or *gas* installation.

[Section 2](#) of this Standard includes performance requirements for the design, installation, and commissioning of *gas* installations, including those operating at pressures exceeding 200 kPa.

NOTE 3 For additional guidance in Australia, refer to AS 4041 and the specific requirements of the *Technical Regulator*.

[Clause 2.1](#) includes some specific limitations as the performance requirements cannot be reliably met if those prohibitions are breached.

NOTE 4 When required by the *Technical Regulator*, a risk assessment and HAZOP should be conducted on the *gas* installation to ensure that appropriate safety measures, additional to those specified in this Standard are provided. The scope of this analysis will depend on the size, nature and complexity of the *gas installation*.

[Sections 3](#) to [6](#) of this Standard contain a means of conformance for installations designed to operate with a *gas operating pressure* not exceeding 200 kPa.

1.1.3.2 Application in Australia

These requirements cover *gas* installations downstream of the outlet of —

- (a) the *consumer billing meter* installation;
- (b) the first regulator on a fixed *gas* installation where an *LP Gas tank* or cylinder(s) is installed on site; or
- (c) the first regulator on site (if no meter is installed) where *LP Gas* is reticulated from offsite storage.

NOTE 1 For the point of supply in a *biogas* installation, refer to the relevant *Technical Regulator*.

Approval for any variation to the requirements of [Sections 3](#) to [6](#) or the normative appendices may need to be obtained from the appropriate *Technical Regulator*.

NOTE 2 [Appendix M](#) also contains special jurisdictional variations.

1.1.3.3 Application in New Zealand

The requirements of this Standard cover *gas* installations downstream of the point of supply [as defined in the *Gas (Safety and Measurement) Regulations 2010*].

NOTE 1 For the point of supply in a *biogas* installation, refer to the relevant *Technical Regulator*.

NOTE 2 The *Technical Regulator* does not provide approvals for variations to the means of conformance in [Sections 3](#) to [6](#). References to approval by the *Technical Regulator* are not applicable. The installation certifier is responsible for ensuring that the installation, including any variations, meets the requirements of [Section 2](#).

Where a Standard is cited as part of a means of conformance, any Standard with equivalent performance requirements may be used as an alternative means of conformance.

1.1.3.4 Interpretation

Where the term “installation” is used, it is deemed to include the pipework, *appliances*, *flues*, air ducts, ventilation and other ancillary items.

The terms pipe, piping, tube and tubing are used throughout this Standard. They are to be considered to have the same meaning.

NOTE Where it is necessary to distinguish between different *gas* types, the international grouping based on the *Wobbe Index*, as shown in [Table 1.1.3.4](#), may be used.

Table 1.1.3.4 — Wobbe index

Family	Wobbe index	Typical gas
Second	39.1 to 55.0	Natural <i>gas</i>
Third	73.5 to 87.5	<i>LP Gas</i>
NOTE Reference to any of the typical <i>gases</i> in this Standard is deemed to be a reference to all <i>gases</i> in that family unless otherwise specified.		

1.2 Normative references

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

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

AS 1074, *Steel tube and tubulars for ordinary service*

AS 1210, *Pressure vessels*

AS 1345, *Identification of the contents of pipes, conduits and ducts*

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

AS 1397, *Continuous hot-dip metallic coated steel sheet and strip — Coatings of zinc and zinc alloyed with aluminium and magnesium*

AS 1432, *Copper tubes for plumbing, gasfitting and drainage applications*

AS 1464.1, *Plastics pipes and fittings for gas reticulation - Unplasticized PVC (UPVC), Part 1: Pipes*

AS 1530.1, *Methods for fire tests on building materials, components and structures, Part 1: Combustibility test for materials*

AS 1572, *Copper and copper alloys — Seamless tubes for engineering purposes*

AS 1668.2, *The use of ventilation and airconditioning in buildings, Part 2: Mechanical ventilation in buildings*

AS 2129, *Flanges for pipes, valves and fittings*

AS 2738, *Copper and copper alloys—Compositions and designations of refinery products, wrought products, ingots and castings*

AS 2944.1, *Plastics pipes and fittings for gas reticulation, Part 1: Polyamide pipes*

AS 2944.2, *Plastics pipes and fittings for gas reticulation, Part 2: Polyamide fittings*

AS 3688, *Water supply and gas systems—Metallic fittings and end connectors*

AS 3814, *Industrial and commercial gas-fired appliances*

AS 4041, *Pressure piping*

AS 4176.8, *Multilayer pipes for pressure applications—Part 8: Multilayer pipe systems for consumer gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) —Specifications for systems (ISO 17484-1:2006, MOD)*

AS 4551, *Domestic gas cooking appliances*

AS 4553, *Gas space heating appliances*

AS 4566, *Flue cowl — Gas appliances*

AS 4567, *Twin wall metal flues — Gas appliances*

AS 4617, *Manually operated gas valves*

AS 4623, *Jointing compounds and materials for use in gas pipe joints*

AS 4627, *Quick-connect devices for gas*

AS 4629, *Automatic shut-off valves and vent valves*

AS 4631, *Semi-rigid connectors for gas*

AS 4632, *Over-pressure and under-pressure shut-off devices*

AS 5200.053, *Plumbing and drainage products, Part 053: Stainless steel pipes and tubes for pressure applications*

AS D26, *Tube fittings with Dryseal American standard taper pipe and unified threads for automotive and industrial use*

AS ISO 7.1, *Pipe threads where pressure-tight joints are made on the threads, Part 1: Dimensions, tolerances and designation*

AS ISO 6993.1, *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels (ISO 6993-1:2006, MOD), Part 1: Pipes for a maximum operating pressure of 1 bar (100 kPa)*

AS ISO 6993.3, *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels (ISO 6993-1:2006, MOD), Part 3: Fittings and saddles for a maximum operating pressure of 1 bar (100 kPa)*

AS/NZS 1167.1, *Welding and brazing—Filler metals, Part 1: Filler metal for brazing and braze welding*

AS/NZS 1260, *PVC-U pipes and fittings for drain, waste and vent application*

AS/NZS 1477, *PVC pipes and fittings for pressure applications*

AS/NZS 1518, *External extruded high-density polyethylene coating systems for pipes*

AS/NZS 1530.3, *Methods for fire tests on building materials, components and structures, Part 3: Simultaneous determination of ignitability, flame propagation, heat release and smoke release*

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

AS 1668.1, *The use of ventilation and airconditioning in buildings, Part 1: Fire and smoke control in buildings*

AS/NZS 1734, *Aluminium and aluminium alloys—Flat sheet, coiled sheet and plate*

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

AS/NZS 2208, *Safety glazing materials in buildings*

AS/NZS 2492, *Cross-linked polyethylene (PE-X) pipes for pressure applications*

AS/NZS 2537.5, *Mechanical jointing fittings for use with crosslinked polyethylene (PE-X) for pressure applications, Part 5: Plastics pipes and fittings—Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels—Metric series—Specifications—Fittings for mechanical jointing (including PE-X/metal transitions) (ISO 14531-3:2006, MOD)*

AS/NZS 2648.1, *Underground marking tape, Part 1: Non-detectable tape*

AS/NZS 2918, *Domestic solid fuel burning appliances—Installation*

AS/NZS 3500.4, *Plumbing and drainage, Part 4: Heated water services*

AS/NZS 4129, *Fittings for polyethylene (PE) pipes for pressure applications*

AS/NZS 4130, *Polyethylene (PE) pipes for pressure applications*

AS/NZS 4645, *Gas distribution networks (series)*

AS/NZS 5263.1.1, *Gas appliances, Part 1.1: Domestic gas cooking appliances*

NZS 3501, *Specification for copper tubes for water, gas and sanitation*

NZS 4219, *Seismic performance of engineering systems in buildings*

ISO 49, *Malleable cast iron fittings threaded to ISO 7.1*

ASME B1.20.1, *Pipe Threads, General Purpose, Inch*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch*

ASME B16.9, *Factory-Made Wrought Buttwelding Fittings*

ASME B16.11, *Forged Fittings, Socket-Welding and Threaded*

ASTM A53/A53M, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*

ASTM A106/A106M, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*

ASTM A269/A269M, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*

ASTM C518, *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*

B75/B75M, *Standard Specification for Seamless Copper Tube*

BS 1640-1, *Specification for steel butt-welding pipe fittings for the petroleum industry, Part 1: Wrought carbon and ferritic alloy steel fittings*

BS 1640-3, *Specification for steel butt-welding pipe fittings for the petroleum industry, Part 3: Wrought carbon and ferritic alloy steel fittings. Metric units*

BS 3799, *Specification for steel pipe fittings, screwed and socket-welding for the petroleum industry*

BS 7838, *Specification for corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN 50*

EN 1759-1, *Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, class designated, Part 1: Steel flanges NPS 1/2 to 24*

EN 10241, *Steel threaded pipe fittings*

EN 14324, *Brazing. Guidance on the application of brazed joints*

API 5L, *Specification for line pipe*

1.3 Terms and definitions

For the purposes of this Standard the definitions below apply.

1.3.1

accessible

access can be gained without hazard or undue difficulty for inspection, repair, testing, renewal, or operational purposes

1.3.1.1**readily accessible**

access can be gained without hazard, undue difficulty, or use of a tool

1.3.2**appliance**

In New Zealand — same meaning as “gas appliance” in the Gas Act 1992

In Australia — assembly, other than a vehicle refuelling *appliance*, part of which uses *gas* to produce flame, heat, light, power or special atmosphere

1.3.2.1**Type A appliance**

In Australia only — *appliance* for which a *certification* scheme exists

1.3.2.2**Type B appliance**

In Australia only — *appliance*, with *gas consumption* in excess of 10 MJ/h, for which a *certification* scheme does not exist

Note 1 to entry: A *Type A appliance* when used in an industrial/commercial application for which it is not intended is considered to be part of a *Type B appliance*. An example of this is a *certified direct-fired air heater* used as the heating/ventilating device in a spray/bake paint booth.

1.3.2.3**balanced flue appliance**

appliance that has air for combustion ducted from, and *combustion products* ducted to, a common terminal

1.3.2.4**direct-fired air heater**

appliance designed for industrial use in which the *combustion products* are released into the airstream being heated

1.3.2.5**elevated cooking appliance**

cooking *appliance* manufactured with the oven beside the hotplate cooking surface

1.3.2.6**fan-assisted appliance**

appliance incorporating a fan that facilitates the movement of combustion products or flue *gases* through the *appliance*

1.3.2.7**flueless appliance**

appliance designed to operate without a *flue*

1.3.2.8**freestanding cooking appliance**

cooking *appliance* comprising an oven or ovens, a number of open *burners* and usually a grill *burner*, which is designed to be installed on a floor

1.3.2.9**mobile appliance**

appliance that is fitted with wheels and designed to be easily moved by one person

1.3.2.10**open flued appliance**

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

1.3.2.11**portable appliance**

appliance designed to be carried by the user from place to place, as required

1.3.2.12**room-sealed appliance**

indoor *appliance* designed such that it directly discharges *combustion products* to, and takes air for combustion from, outside the building

1.3.3**appliance gas pressure regulator**

see *Gas pressure regulator* ([Clause 1.3.57](#))

1.3.4**authorized person**

person authorized under the legislation of the appropriate jurisdiction

1.3.5**bathroom**

domestic-type room used for bathing, showering or personal cleansing, as distinct from the larger and better-ventilated ablution centres commonly provided in factories, camping areas and sporting facilities, and similar facilities

1.3.6**bedroom**

room used or intended to be used for sleeping, including any combined living/sleeping area

1.3.7**breather vent**

orifice or opening designed to permit atmospheric *pressure* to act on one side of the diaphragm of a regulator or similar device

1.3.8**burner**

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

1.3.8.1**atmospheric burner**

system where all the air for combustion is introduced by the inspiring effect of the *gas* or the natural draught in the combustion chamber or a combination of the two without mechanical assistance

1.3.8.2**forced draught burner**

system where all or part of the air for combustion is introduced by providing positive *pressure* in the combustion chamber by mechanical means

1.3.8.3**induced draught burner**

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

1.3.9**caravan**

structure designed or adapted to be moved from one place to another, whether towed or transported, which is intended for human habitation or use as a workplace, and includes a self-propelled recreational vehicle or mobile home, and any associated annex or similar structure, whether permanently or temporarily attached to, or adjoining, the main portion of the structure

Note 1 to entry: A large structure assembled in a factory and transported to a permanent location is not considered a *caravan*, e.g. portable school classrooms or transportable homes.

1.3.10 certified certification

In Australia — assessed by a *certifying body* and having a certificate number to demonstrate conformance to a Standard

In New Zealand — product satisfying the performance requirements of the cited Standard or an equivalent Standard

1.3.11 certifying body

body, acceptable to the *Technical Regulator*, that provides assurance of conformance of *appliances* and components with nominated Standards and other accepted safety criteria

1.3.12 chimney liner

continuous duct made of a material that conforms to [Table 4.7.4](#) (other than bricks and mortar), that is installed inside a chimney and designed to carry *flue* products from the appliance *flue connection* to the flue terminal

1.3.13 combustible material

material that will ignite and burn and includes material that has been flame-proofed

1.3.14 combustible surface

any material or object made of, or surfaced with, materials that are capable of being ignited and burned

1.3.15 combustion products

constituents resulting from the combustion of a fuel with air, oxygen or a mixture of the two, including the inert *gases* associated with the fuel and the air but excluding any other diluent or contaminant

1.3.16 commissioning

process by which a *gas* installation is tested to verify that it functions according to its design objectives and specifications

1.3.17 competent person

person or body who, through training, qualification or practical experience, or a combination of these, and understanding of the equipment and processes, is able to verify conformance to this Standard

1.3.18 compressed natural gas CNG

natural gas stored under *pressure* in a *cylinder*

1.3.19 condensate

liquid that separates from a *gas* (including *flue gas*) due to a reduction in temperature

1.3.20 condensation

process of forming condensate

1.3.21 consumer piping

system of pipes, fittings and components within the scope of this Standard, and equipment that conveys *gas* to the *appliance* inlet

1.3.22**croxed joint**

joint made by fittings in which the end of the pipe has a raised circular section to seal against the olive

1.3.23**cupboard**

enclosed recess constructed primarily for storage purposes

1.3.24**cylinder**

container for the storage of *LP Gas* with a capacity of more than 120 mL but not more than 500 L, and does not include an aerosol container

Note 1 to entry: Capacity is often referred to as “water capacity” and is the total internal volume.

1.3.24.1**cylinder (exchange)****exchange cylinder**

cylinder filled by weight at a *cylinder* filling installation and changed over at the consumer's *premises*

1.3.24.2**cylinder (in situ fill)****(in situ fill) cylinder**

cylinder that is filled at the consumer's *premises* from a tanker

1.3.25**decorative flame effect fire**

appliance that simulates a solid fuel fire and whose primary function lies in the aesthetic effect of the flames

1.3.25.1**Type 1**

decorative flame effect fire without an *enclosure* and designed to be installed in an existing fireplace with a *chimney* which vents the *flue gases* outside the building

1.3.25.2**Type 2**

decorative flame effect fire supplied with an *enclosure* and designed to be freestanding, with a *flue* that vents the *flue gases* outside the building

1.3.26**DN****nominal diameter**

see *nominal size*

1.3.27**double block and vent safety shut-off system**

safety shut-off system that incorporates *two safety shut-off valves* in series, with the volume between the two valves automatically vented. These valves are mutually energized to cause the *vent valve* to close when the *safety shut-off valves* are open

1.3.28**draught diverter**

device, without moving parts, which can be part of the *appliance* or fitted in the *flue* of an *appliance*, at the junction of the *primary* and *secondary flues*, for isolating the combustion system from the effects of *pressure* changes in the *flue*

1.3.29**enclosure**

compartment, enclosed area or partitioned-off space primarily used for the installation of an *appliance*, gas cylinder, meter, *gas pressure regulator* or other associated equipment

1.3.30**excess air**

air in excess of that required for complete combustion, which is mixed unchanged with the *combustion products*, in the combustion chamber

1.3.31**excess flow valve**

normally open valve which closes automatically when a predetermined flow rate in a particular direction is exceeded

1.3.32**exhaust fan**

mechanical device other than a *rangehood* for moving air from one interior space to another, or to outside of the space

1.3.33**exitway**

all parts of an escape route protected by fire or smoke separations, or by distance when exposed to open air, and terminating at a final exit

1.3.34**fail safe**

mode of failure whereby a safe condition is maintained upon loss of power or actuating force to any control element, or failure of any control element to operate

Note 1 to entry: See also lock-out ([Clause 1.3.72](#)).

1.3.35**fire damper**

device for automatically closing off the flow of air through a ventilation opening in the event of fire

1.3.36**fire-isolated passageway**

corridor, hallway or the like, of fire-resisting construction, which provides egress to or from a *fire-isolated stairway* or *fire-isolated ramp* or to a road or open space

1.3.37**fire-isolated ramp**

ramp within a fire-resisting *enclosure* which provides egress from a *storey*

1.3.38**fire-isolated stairway**

stairway within a fire-resisting shaft and includes the floor and roof or top enclosing structure

1.3.39**fire safety system**

one or any combination of the methods used in a building to —

- (a) warn people of a fire emergency;
- (b) provide for safe evacuation;
- (c) restrict the spread of fire; or
- (d) extinguish a fire,

which includes both active and passive systems

[SOURCE: Definition as released by the Australian Building Codes Board on behalf of the Commonwealth of Australia and States and Territories of Australia, 2019]

1.3.40**flame safeguard system**

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

1.3.41**flue**

passage through which *flue gases* are conveyed from an *appliance*, excluding draught diverter, barometric device, fan or similar part

1.3.41.1**balanced flue**

natural draught flue system in which the *combustion products* are discharged at the same height and atmospheric pressure as the combustion air inlet of a *room-sealed appliance*

1.3.41.2**chimney**

vertical passage usually constructed from masonry or bricks and situated above a fireplace where discharge of the *flue gases* is due to the draught provided by the buoyancy effect of these hot *gases*

1.3.41.3**common flue**

flue system designed to carry *combustion products* from two or more *appliances*

1.3.41.4**flue connection**

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

1.3.41.5**natural draught flue**

flue in which the draught is provided by the buoyancy effect of the hot *gases* within it

1.3.41.6**open flue**

flue system containing a *draught diverter* or canopy

1.3.41.7**power flue**

flue system in which *combustion products* are removed from the *appliance* by a fan in the flue

1.3.41.8**primary flue**

portion of the *flue* that extends from the outlet of the *appliance* combustion chamber or heat exchanger to the inlet of the *draught diverter*

1.3.41.9**secondary flue**

portion of the *flue* that extends from the outlet of the *draught diverter* to the flue terminal

1.3.41.10**twin wall flue**

type of *flue* in which the inner *flue* conduit is encased by an outer casing of specific dimensions that acts as an insulator

1.3.42**flue cowl**

device placed at the *flue* terminal and designed to prevent the entry of rain or birds and minimize the disturbing effect of wind while not hindering the discharge of *flue gases*

1.3.43**flue gases**

combustion products plus all diluents and contaminants

Note 1 to entry: Diluents and contaminants may include *excess air*, dilution air, process air and waste products from the process.

1.3.44**flue terminal**

point at which *flue gases* discharge from a *flue*

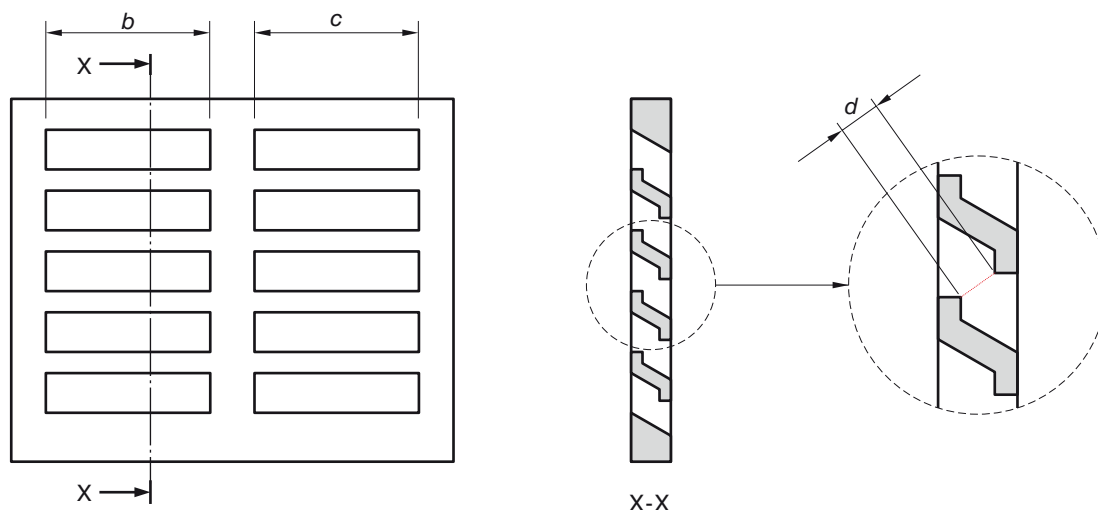
1.3.45**flueway**

port or passage conveying flue gases within the appliance

1.3.46**free area****<free ventilation area>**

unobstructed cross-sectional area of a grille, louver or duct, calculated as the sum of the cross-sectional areas of all unobstructed apertures measured through the plane of minimum area and at right angles to the air flow within the apertures

Note 1 to entry: An example of calculation of free ventilation area is given in [Figure 1.3.46](#).



Free ventilation area $A = (b + c) \times N \times d$, where N is the number of rows of slots and d is the narrowest slot/louvre dimension through which air passes unobstructed

Figure 1.3.46 — Calculation of free ventilation area

1.3.47**gas**

combustible fuel *gas*

1.3.47.1**natural gas****NG**

hydrocarbon *gas*, consisting mainly of methane

1.3.47.2**liquefied petroleum gas****LP Gas**

gas composed predominantly of any of the following hydrocarbons, or any combination of them, in the vapour phase: propane, propene (propylene), butane, butene (butylene) and pentane

1.3.47.3**simulated natural gas****SNG**

gas comprising a mixture of *LP Gas* and air, in the approximate proportions of 55 % *LP Gas* and 45 % air

1.3.47.4**biogas**

mixture of *gases* that is produced by anaerobic microbial decomposition of organic matter and principally comprises methane and carbon dioxide together with lesser amounts of hydrogen sulfide, water vapour or other *gases*

1.3.48**gas consumption**

rate at which *gas* is consumed by an *appliance* under specific conditions and usually expressed in megajoules per hour (MJ/h)

1.3.49**gasfitting****gasfitting work**

In Australia — as defined by state or territory legislation

In New Zealand — as defined in the Plumbers, Gasfitters and Drainlayers Act 2006

1.3.50**gas installation**

combination of the following used or intended to be used in the supply and utilization of *gas*, taken as separate items or as a whole: *consumer piping*, fittings, components, *appliances*, *flues*, *sub-meters*, apparatus or other devices and associated requirements

1.3.51**gas load**

total *gas consumption* of all downstream *appliances*

1.3.52**gas meter**

device used to measure the volume of *gas* passing through it

1.3.53**consumer billing meter**

gas meter that is used to bill the consumer for *gas* used

Note 1 to entry: Also known as a master meter.

1.3.54**sub-meter**

gas meter used for measuring *gas* downstream of a *consumer billing meter* or *cylinder regulator*

Note 1 to entry: Also known as check meter.

1.3.55**gas measurement system****GMS**

combination of the *gas meter* and any associated valves, filters, regulators, *over-pressure protection* and connections

1.3.56**gas pipework**

See *consumer piping* ([Clause 1.3.21](#))

1.3.57**gas pressure regulator**

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

Note 1 to entry: In complex supply systems, the pressure regulation may be in multiple stages in which case the regulator nearest the source of supply is known as the first-stage regulator, followed by a second-stage regulator, and possibly by third or fourth stages.

1.3.57.1**automatic change-over regulator**

combination valve/gas pressure regulator, fitted to an *LP Gas* multiple-cylinder installation which will automatically change over from a cylinder in use to a reserve *cylinder* at a predetermined *pressure*

1.3.57.2**consumer piping gas pressure regulator**

gas pressure regulator installed in the *consumer piping* to reduce the *gas pressure* to a section of *consumer piping*

1.3.57.3**cylinder regulator**

gas pressure regulator on a *cylinder* installation that is subjected to the *gas pressure* directly from the *cylinder*

1.3.57.4**gas appliance regulator**

gas pressure regulator fitted to an *appliance*

1.3.57.5**zero regulator**

gas pressure regulator that controls or maintains the outlet *pressure* to zero or below zero gauge (atmospheric) *pressure*

Note 1 to entry: Usually used in conjunction with an air-gas proportioning device.

1.3.58**gastight**

condition of a *gas installation* or *gas pipework consumer piping* in which for a new installation there is no leakage of *gas* and for existing installations any leakage of *gas* is at a sufficiently low rate that no hazard is likely to ensue

Note 1 to entry: In some jurisdictions the *Technical Regulator* may not allow a leakage rate.

1.3.59**griller**

appliance for cooking food by radiant heat

1.3.60**high-rise building**

building having five or more *storeys* above ground level

1.3.61**hob**

part of a *gas cooking appliance* that supports the *trivet* and is usually constructed of enamelled steel, stainless steel or *toughened safety glass*

1.3.62**hose assembly**

flexible tube or pipe complete with end couplings

1.3.63**hot-tapping**

process of connecting to *consumer piping* whilst the pipe contains *gas*

1.3.64**hot water boiler**

vessel wherein water is intended to be heated to a temperature exceeding 99 °C by the application of heat to the vessel without the generation of steam

1.3.65**ignition source**

source of energy that can ignite an explosive atmosphere

Note 1 to entry: Ignition sources include, but are not limited to, flames, incandescent material, electric sparks, hot surfaces and mechanical impact sparks.

1.3.66**indoor(s)**

within a building, as defined by the appropriate national building code, or within a structure that is enclosed on all sides, as distinct from *quasi-outdoor* areas, balconies and similar areas

Note 1 to entry: See also outdoor ([Clause 1.3.84](#)) and quasi-outdoor ([Clause 1.3.97](#)).

1.3.67**insulating joint**

joint or fitting designed to prevent the flow of electric current across a joint or fitting

1.3.68**interlock**

device or function that ensures that the operation of items of equipment is dependent upon the fulfilment of predetermined conditions by other items of equipment

1.3.69**intrinsically safe**

having a type of protection based on the restriction of electrical energy within apparatus and of interconnecting wiring exposed to the potentially explosive atmosphere to a level below that which can cause ignition by either sparking or heating effects

1.3.70**isolation valve**

valve installed in a piping system for the purpose of isolating the pipework or appliance downstream of the valve from the supply of *gas*

1.3.71**lower explosive limit****LEL**

concentration of flammable gas, vapour or mist in air below which an explosive gas atmosphere will not be formed

Note 1 to entry: *NG/SNG*: nominal LEL 5 %. *LP Gas*: nominal LEL 2 %.

Note 2 to entry: The upper explosive limit (UEL) is the concentration of flammable gas, vapour or mist in air above which an explosive gas atmosphere will not be formed.

Note 3 to entry: The terms LEL and UEL are derived from AS/NZS 60079.10.1. For Australia and New Zealand these are taken to include Lower Flammability Limit and Upper Flammability limit respectively and similar terms used by relevant codes and regulations.

1.3.72**lockout**

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

1.3.73**main run**

run of *consumer piping* from the meter or, the outlet of the first *pressure* regulator at the *LP Gas cylinder*, to the furthest *appliance* position

1.3.74**manual shut-off valve**

manually operated valve that allows an *appliance* or a section of *consumer piping* to be shut off

1.3.75**manufacturer's specification****manufacturer's instruction**

document supplied with, and relevant to, the *appliance* or equipment that provides authoritative instructions on matters such as installation, commissioning, testing, maintenance and operation of the *appliance* or equipment

1.3.76**maximum allowable operating pressure****MAOP**

maximum *pressure* that can be sustained with a factor of safety by the type or class of pipe or *pipe fitting* for its estimated useful life under the anticipated operating conditions

1.3.77**maximum over-pressure**

maximum *pressure* at which the installation or any particular portion of the installation, or individual component, including *appliances*, remains safe

Note 1 to entry: See [Clause 5.11.2.2](#).

1.3.78**may**

indicates the existence of an option

1.3.79**multilayer pipe**

pipe comprising of stress-designed polymeric layers, including one or more stress-designed metallic layers (e.g., PE-X/AL/PE)

Note 1 to entry: Also known as “composite pipe” and “macro-composite pipe”.

1.3.80**network operator**

person or organization that owns or operates all, or part of, a network

1.3.81**nominal size****nominal diameter****DN**

numerical designation of size, in millimetres, common to all components in a consumer *piping* system other than components designated by outside diameters or by thread size

Note 1 to entry: DN is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

1.3.82**non-return valve**

valve designed to operate automatically to prevent reversal of flow in a pipe

1.3.83**operating pressure**

gas pressure that any part of the *gas installation* is or will be subjected to under normal operating conditions

1.3.84**outdoor(s)**

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

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

1.3.85**over-pressure protection**

device or system for preventing the *pressure* in *gas pipework* or in *appliances* from exceeding a predetermined value

1.3.86**permanent joint**

joint that is not intended to, and cannot readily, be disassembled

Note 1 to entry: Examples of permanent joints are brazed, welded, crimped and hydraulically or mechanically compressed joints.

1.3.87**pipe fitting**

component used to join pipes, or to change direction or diameter of a pipe, or to provide a branch, or to terminate a pipe

1.3.88**plant room**

room designed to accommodate one or more *appliances*, or other equipment, in which the *appliances* can be fully maintained, and which is not normally occupied or frequented for extended periods

1.3.89**POL fitting**

(prest-o-lite fitting)

LP Gas union connection having only a left-hand thread

Note 1 to entry: The specification for a *POL fitting* is that of Type 21 in AS 2473.2.

1.3.90**pool heater**

appliance designed for heating water in a swimming pool, spa pool or similar body of water

1.3.91**premises**

property including a house or building and any grounds belonging to it

1.3.92**pressure**

pressure above atmospheric *pressure* (*gauge pressure*)

1.3.93**pressure test point**

pipe fitting that enables the attachment of a hose and *pressure* measuring device to the *gas pipework*

1.3.94**proprietary system**

manufacturer-specific system using matched components, which may require special tools for installation

Note 1 to entry: *Proprietary systems* may be incompatible with those of other manufacturers and may include consumer *pip*ing, *flues*, and fittings.

1.3.95**purge****purging**

with respect to *consumer pip*ing —

- (a) replacing the air in *consumer pip*ing with *gas* or inert *gas*; or
- (b) removing the *gas* from *consumer pip*ing by replacing the *gas* with either air or an inert *gas*.

Note 1 to entry: The purpose of *purging* is to prevent the presence in the piping of an explosive mixture of *gas* and air

1.3.96**push-on connector**

fitting for attaching a laboratory Bunsen *burner* to *consumer pip*ing in which a flexible tube end slides over a special nipple and is held by friction

Note 1 to entry: The tube is usually made of synthetic rubber.

1.3.97**quasi-outdoor(s)**

outdoor area sufficiently weatherproofed to allow the installation of an *appliance certified* for *indoors* without affecting its safety, combustion or integrity

1.3.98**quick-connect device**

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

Note 1 to entry: Type 1 quick-connect devices are sometimes referred to as “bayonet fittings”.

1.3.99**quick-connect device (cylinder)****cylinder quick-connect device**

quick-connect device designed to connect with an *LP Gas cylinder* valve with an external thread

Note 1 to entry: In Australia, the cylinder quick-connect device conforms to AS 4627, Type 27.

Note 2 to entry: In New Zealand, the cylinder quick-connect device conforms to UL 2061.

Note 3 to entry: For New Zealand, acceptable valve types are defined in the Health and Safety at Work (Hazardous Substances) Regulations.

1.3.100**range hood**

mechanical extraction unit to collect contaminated air from above a cooking appliance, pass the air through a filtration system and then either discharge it from the space or recirculate it back into the space

1.3.101**rated working pressure**

maximum allowable inlet *pressure* of any *appliance*, or *pipe* fitting, or any section of *gas* pipework

1.3.102**residential garage**

garage at residential *premises*, which does not include communal car-parking areas or garages being used for commercial purposes

1.3.103**riser**

vertical section of the *consumer piping*

1.3.104**safe path**

part of an *exitway* that is protected from the effects of fire by fire separations, external walls, or by distance when exposed to open air

1.3.105**safety shut-off system**

arrangement of valves and associated controls that shuts off or prevents the supply of *gas* when a limiting condition is met and so avoids an unsafe condition

1.3.106**safety shut-off valve**

valve within a *safety shut-off system* that stops *gas* flow

1.3.107**salamander**

wall or bench mounted kitchen appliance used for grilling or browning of food

1.3.108**semi-rigid connector**

assembly of semi-rigid pipe, with permanently attached end fittings, that is designed for infrequent movement

1.3.109**shall**

indicates that a statement is mandatory

1.3.110**should**

indicates a recommendation

1.3.111**single residential premise**

<Australia> a single dwelling, Class 1a, as defined in the National Construction Code, Volumes 1 and 2

<New Zealand> a detached dwelling, as defined in the New Zealand Building Code

Note 1 to entry: For building classifications refer to:

- (a) In Australia, the National Construction Code (see [Bibliography](#)).
- (b) In New Zealand, the New Zealand Building Code (see [Bibliography](#)).

1.3.112**steam boiler**

vessel wherein steam is intended to be generated at a *pressure* above that of the atmosphere by the application of heat from the *combustion products* to the vessel

1.3.113**storey**

space within a building that is situated between one floor level and the floor level next above, or if no floor above, the ceiling or roof above, but not a space that contains only —

- (a) a lift shaft, stairway or meter room;
- (b) a *bathroom*, shower room, laundry, water closet, or other sanitary compartment;
- (c) accommodation intended for not more than 3 vehicles;
- (d) a combination of the above; or
- (e) a mezzanine

1.3.114**swivel joint**

gastight coupling between two parts allowing one part to rotate without turning the other

1.3.115**tailpipe**

section of pipe, placed at a low point in the *consumer piping*, to collect water and from which it can be removed

1.3.116**tank**

container (other than a *cylinder* or aerosol container) designed for the storage of *LP Gas* in either the liquid or *gaseous* form and, in Australia, conforming to AS 1210

1.3.117**Technical Regulator**

government-appointed person, body or authority that has jurisdiction over *gas* safety legislation (or other entity authorized by that person, body or authority)

1.3.118**temperature limit device**

device that automatically causes the *gas* supply to be interrupted when the temperature at the control point reaches a predetermined limit

1.3.119**toughened safety glass**

glass that has been processed by controlled thermal treatments to increase its strength

Note 1 to entry: For requirements on toughened safety glass, see [Clause C.3](#).

1.3.120**trivet**

grid located over the open *burners* of a *gas* cooking *appliance* to support vessels being heated

1.3.121**valve train**

assembly of valves, *gas pressure regulators*, and other fittings that form an integrated system for flow or *pressure* control and safe operation

1.3.122**vapour barrier**

wall or other barrier constructed and placed with the objective of preventing the passage of vapour from any one place to some other place

1.3.123**vent line**

pipe that is connected to a *gas pressure regulator*, relief valve or a *safety shut-off system*, and will convey escaping *gas* to a safe location

1.3.124**vent valve**

valve in the *vent line* of a *double block and vent safety shut-off system* that closes when energized and automatically opens when de-energized

1.3.125**water heater**

appliance for the supply of water at a temperature not exceeding 99 °C

1.3.126**wherever possible****where practicable**

requirement to be met in all circumstances other than those that would create either a significant operational inconvenience or a greater danger than would otherwise arise

1.3.127**wobbe index**

number produced when the heating value of the *gas* (expressed in MJ/m³) is divided by the square root of the relative density of the *gas*

Note 1 to entry: The groupings of the numbers determine the interchangeability of the *appliances*.

1.4 Work health and safety

Safe working practices shall be employed when working on *gas* installations. The process of installing *appliances* shall take into consideration relevant work health and safety (WHS) requirements. These requirements pertain to all aspects of access, installation, operation and maintenance. Persons installing *appliances* shall be aware of their responsibilities and be trained and qualified in accordance with local WHS requirements. Precautions shall be taken to avoid any electrical hazards present in the *gas* installation.

WARNING — SAFETY PRECAUTIONS NEED TO BE OBSERVED WHEN CUTTING INTO PIPEWORK OR DISCONNECTING FITTINGS AND DEVICES ON PIPEWORK. THERE HAVE BEEN FATALITIES AND INJURIES THAT HAVE BEEN ATTRIBUTED TO GAS SERVICES CARRYING AN ELECTRICAL CURRENT.

1.5 System of units

The International System of Units (SI) is used in this Standard.

NOTE [Appendix B](#) provides a list of conversion factors for other commonly used units.

Section 2 Essential safety and performance-based design requirements

2.1 Essential safety requirements

2.1.1 Limitations on installation of an appliance

An instantaneous *water heater* other than a *room-sealed appliance* shall not be installed in a *bedroom*, *bathroom*, toilet or sleeping area.

NOTE See [Clause 6.10.3.3](#) for special variations set out by *Technical Regulators* in South Australia.

A storage *water heater* with a *gas consumption* exceeding 40 MJ/h shall not be installed in a *bedroom*, *bathroom*, toilet, or sleeping area.

In Australia, a flueless instantaneous *water heater* shall not be installed *indoors*.

A space heater or a *decorative flame effect fire* installed in a *bedroom* shall be *flued* and have a *flame safeguard system*.

A *direct-fired air heater* shall not be installed in residential *premises*, or any type of health care or educational establishment.

A space heater or a *decorative flame effect fire* shall not be installed in a *bathroom* or toilet unless it is a *room-sealed appliance*.

2.1.2 Push-on connectors limited to connecting laboratory Bunsen burners

Push-on connectors shall be used only for connecting laboratory Bunsen burners, and only where —

- (a) the gas pressure will not exceed 3 kPa;
- (b) the Bunsen burner or the outlet of the hose has no valve fitted; and
- (c) a manual shut-off valve is fitted upstream of and adjacent to the inlet end of the hose.

2.1.3 Installation in a cupboard

Where an *appliance* is to be installed in a *cupboard*, a warning notice shall be fixed in a prominent position, on or adjacent to the *appliance*, stating the following:

WARNING: FLAMMABLE OR CORROSIVE MATERIALS MUST NOT BE STORED IN THIS CUPBOARD.

2.1.4 General

Where *gas installations* are designed to the performance requirements of this Section, rather than by using the means of conformance under [Section 3](#) to [Section 6](#), the level of safety, convenience and efficiency of operation shall be not less than an installation carried out according to [Section 3](#) to [Section 6](#). Such designs shall be documented and kept for 7 years.

NOTE 1 For performance-based designs, some *Technical Regulators* will require to be consulted prior to work commencing.

NOTE 2 Written design specification and drawings together with justification for the deviation of the means of conformance may be required by the *Technical Regulator*.

NOTE 3 Where the installation is of a complex nature, the *Technical Regulator* may require the design to be verified by a suitably qualified professional engineer.

NOTE 4 See [Appendix O](#) for a list of symbols used in diagrams of *gas control systems*.

2.1.5 Repair of pipe or pipe fittings

With the exception of brazed or welded joints, pipes and pipe fittings shall not be repaired.

2.2 Performance-based design requirements

2.2.1 General work and safety requirements

2.2.1.1 Verification of gas supply

Before commencing an installation, the *gas* type and *pressure* shall be verified to ensure the *gas* is —

- (a) suitable and safe for the *appliances* and components to be installed; and
- (b) available at an adequate flow rate from the *gas* supply and any existing piping to meet the anticipated maximum load.

2.2.1.2 Work on a gas installation

The following shall apply during work on a *gas* installation:

- (a) Except when hot-tapping is required, any gas installation, or part affected, that contains gas shall be isolated and, if necessary, safely purged before any *gasfitting work* commences on that gas installation. Specialized equipment, skills and safe practices shall be used.
- (b) All parts of an unattended *gas installation* shall be left in a safe condition.
- (c) *Consumer piping* shall be free of debris or other harmful material before that piping is connected to an *appliance* or put into service.
- (d) All air and contaminants shall be *purged* from the *consumer piping* after work on the *consumer piping* has been completed, and before any attempt to commission the *gas installation* or operate any connected *appliance*.

NOTE For guidance on purging, see [Appendix D](#).

2.2.1.3 Sealing of open ends

All open ends of *consumer piping* and outlets intended for future connection of *appliances* or where an appliance is disconnected and not immediately reconnected shall be sealed to be *gastight* and prevent ingress of deleterious materials.

NOTE The closing of a valve will not satisfy this requirement unless the outlet of the valve is sealed.

2.2.1.4 Testing of consumer piping

All new *consumer piping* shall be tested to ensure it is *gastight* before connection to a *gas* supply.

Any section of *consumer piping* that has been isolated from the *gas* supply and altered or extended shall be tested to ensure it is *gastight* before reconnection to the *gas* supply.

2.2.1.5 Testing of gas installations

New *gas installations* shall be tested before connection to the *gas* supply. There shall be no loss of *pressure* during the test period.

Wherever practicable, existing *gas installations* shall be tested to ensure that they are *gastight* before any *gasfitting work* is performed.

2.2.1.6 Safe practices and OHS

Safe work practices shall be employed when working on *gas installations*.

NOTE The *Technical Regulator* and/or other authorities may require to be notified if *hot-tapping* is required.

2.2.1.7 Increasing pressure of gas installations

The suitability of the materials and components for operation at the increased *pressure* shall be verified before the *gas pressure* is increased.

The *gas installation* shall be proved *gastight* at conditions appropriate to the increased *pressure*.

2.2.1.8 Commissioning and recommissioning

Every *gas installation* shall be commissioned prior to use to ensure safe start-up and operation of the *gas installation*, and shall include checks of safety and operating controls.

Following maintenance work on any part of a *gas installation*, the affected part of the installation shall be re-commissioned by checking to ensure safe start-up and operation.

Following a shut-down of an installation, or supply to an installation, the installation shall be checked to ensure *gastight*-ness and safe start-up.

NOTE 1 See [Appendix N](#) for guidelines for commissioning of *Type A appliances*.

NOTE 2 See [Appendix P](#) for a checklist for checking conformance of the installation prior to and during *commissioning*.

2.2.1.9 Decommissioning

Every *gas installation*, or part of a *gas installation*, that is permanently decommissioned shall be disconnected from the *gas supply*, *purged* and sealed.

2.2.2 Materials, fittings and components

2.2.2.1 Materials

Materials, fittings and components used in any *gas installation* shall be stored and handled to prevent damage or deterioration and shall be suitable for use with the —

- (a) type of *gas* being conveyed;
- (b) the *pressure* to which they may be subjected under both operating and fault conditions; and
- (c) the environment in which they are installed.

Materials that are claimed to be fire resistant shall protect *combustible surfaces* from damage resulting from the thermal effects of the operation of *appliances*.

2.2.2.2 Proprietary systems

Proprietary systems shall be —

- (a) suitable for their intended use;
- (b) identifiable; and
- (c) installed as a complete entity in accordance with the *manufacturer's instructions*.

NOTE For industrial and commercial installations, *Technical Regulators* may have specific requirements.

2.2.2.3 Jointing

All interconnecting materials of jointed *pipe fittings* and piping shall be compatible. Jointing compounds and sealing materials shall be suitable for their application.

2.2.3 Consumer piping

2.2.3.1 General

Consumer piping shall be designed and installed to —

- (a) convey *gas* at a predetermined *pressure* and flow rate;
- (b) be *gastight*;
- (c) avoid damage by corrosion, stress or other means; and
- (d) not adversely affect the structural strength and fire resistance of any building or structure.

All *consumer piping* in applications other than single occupancy residential premises shall be identifiable as part of a pipe system for conveying *gas*.

2.2.3.2 Design

Consumer piping shall —

- (a) be designed and installed to safely supply an adequate flow of the *gas* of the type intended and at the *pressure* required or reasonably foreseen;
- (b) be designed to ensure an appropriate *gas* velocity to minimize adverse impacts such as noise and erosion;
- (c) be designed and installed to avoid any obstruction to the *gas* flow;
- (d) include provision, *readily accessible*, for isolating the *gas* supply in the event of an emergency and include plans that show the location of isolation valves;

NOTE 1 In Australia, plans are not a requirement for Class 1 buildings.

- (e) include provision, *accessible*, for isolating the *gas* supply —
 - (i) to facilitate maintenance;
 - (ii) to separate buildings;
 - (iii) to separate occupancies within a building;
 - (iv) to separate floors in multi-storey non-residential buildings; and
- (f) for proprietary piping systems in residential *premises*, be designed to permit future branching and/or repair and located in *accessible* positions where practicable.

NOTE 2 The intent is to permit future extension or connection to a non-compatible piping system to protect the consumer/end user from difficulties that may arise from non-availability of the *proprietary system*. For temperature limitations for multilayer consumer pipes, see [Table 4.2](#).

2.2.3.3 Prevention of reverse flow

Devices designed to prevent reverse flow shall be installed and located immediately upstream of the point of interconnection of piping used to convey different *gases* for mixing within the *consumer piping*.

2.2.3.4 Location

Consumer piping shall —

- (a) be installed in a manner and in a location that protects it from damage;
- (b) be designed and located to minimize any hazardous build-up of *gas* should leakage occur;
- (c) not be placed in any location where it would prejudice egress from a building; and
- (d) be separated from other services to ensure safe operation and maintenance and to minimize any hazard arising from the failure of either the *consumer piping* or any other service.

2.2.3.5 Support of consumer piping

Consumer piping shall be securely supported throughout its length and appropriately restrained to minimize stress from differential movements, with particular regard to those caused by earthquake, vibration, flexing and thermal effects.

2.2.3.6 Provision for clearing condensate

Where *condensate* is likely to occur in *consumer piping*, a means for its removal shall be provided.

2.2.3.7 Gas pressure regulation

A means of regulating the *pressure* of *gas* shall be provided where the *pressure* supplied to any part of a *gas installation* may exceed the *rated working pressure* of that part.

Where provided, the means of regulating the *pressure* of *gas* shall —

- (a) provide and maintain adequate control of the *operating pressure* to all parts of the *gas installation* that it is intended to control; and
- (b) be positioned in a safe location and accessible for maintenance and adjustment.

2.2.3.8 Over-pressure protection

Where an unsafe situation may occur in the event of malfunction or failure of any means of gas pressure regulation, *over-pressure protection* shall be provided.

2.2.3.9 Pressure test points

Pressure test points shall be provided to ensure all parts of the *gas installation* can be safely tested and commissioned.

2.2.3.10 Gas venting

Any vent line shall —

- (a) not affect the performance of the *gas venting device* or *gas installation* to which it is connected;
- (b) terminate at a safe location; and
- (c) have a suitable means of disconnection.

NOTE For *pressures* exceeding 200 kPa, refer to AS/NZS 60079.10.1.

2.2.3.11 Gas pressure raising devices

Devices that raise the *pressure* of *gas* shall not adversely affect either the *gas* supply or the *gas* installation.

2.2.4 Flues

2.2.4.1 General

Every *appliance* that requires a *flue* for safe operation shall be fitted with a *flue*. *Flues* shall be designed and installed to safely discharge *combustion products* from the connected *appliances*. The construction of a *flue* shall not impair the design strength or the fire resistance of the building or structure.

2.2.4.2 Design

Flues shall be designed, constructed and installed to permit the connected *appliances* to operate safely and effectively, taking into account the types of *appliance* to be connected, their location and energy input. If *condensate* is likely to accumulate, a suitably designed and accessible means of safely draining the *flue* shall be provided.

2.2.4.3 Materials

Suitable materials and jointing methods shall be used for the construction of *flues*.

2.2.4.4 Installation

Flues shall be supported independently of the *appliance* unless the *appliance* is designed to support the *flue*. *Flues* shall be securely fixed and supported to ensure stability. Any penetration of the building envelope shall be sealed to prevent ingress of water.

2.2.4.5 Location

The building or structure shall be protected from the thermal effects of *flues*. *Flues* shall be located to prevent damage or interference to or by any other utility or service.

2.2.4.6 Flue draught control

Devices for controlling the draught in a *flue*, such as dampers, shall be designed to prevent the *appliance* operating in an unsafe manner.

2.2.4.7 Flue termination

The entry of any material or substance that could impair the performance of the *flue* or *appliance* shall be prevented.

NOTE The abovementioned material includes the fitment of any mesh screen to the *flue terminal*.

Flue terminals or *flue cowls* shall be located to minimize entry of *combustion products* into any building and to minimize the effects of adverse draught on the performance of the *appliance*. *Flue terminals* or *flue cowls* shall be located to prevent harm to persons.

2.2.4.8 Common flues

Any *appliance* connected to a *common flue* shall not adversely affect the operation of any other appliance connected to the *common flue*. *Common flues* serving *appliances* shall not be used to serve any *appliance* that uses a fuel other than *gas*.

A *common flue* shall be used only where no appliance connected to that *common flue* is likely to discharge a combustible mixture.

2.2.4.9 Power flues

Power flue systems shall be designed to prevent the operation of the *appliance* if the draught fails.

2.2.4.10 Use of existing flues or chimneys

Existing *flues* and *chimneys* shall be used only if they are suitable for the proposed application and permit unrestricted and safe discharge of *combustion products*.

NOTE Refer to the local OHS authority for the replacement of an *appliance* connected to an existing asbestos *flue*, or the maintenance or repair of an existing asbestos *flue*.

NOTE 2 In some jurisdictions Workplace Health and Safety (WHS) has the same meaning as Occupational Health and Safety (OHS).

2.2.5 Installing appliances

2.2.5.1 Pre-installation

Appliances shall be checked before they are installed to ensure they are suitable to operate on the *gas* being supplied and comply with local *certification* requirements.

2.2.5.2 General installation requirements

Appliances and equipment shall be installed in accordance with the *manufacturer's instructions*.

The space in which an *appliance* is installed shall be ventilated to the extent required to ensure safe and effective operation.

Appliances shall be installed so that their operation is not affected by the operation of mechanical devices used to displace air, either within the same space or within a connected space.

All *manufacturer's instructions* accompanying the *appliance* shall be provided to the owner or occupier of the *premises* in which the *appliance* is installed.

Appliances shall be installed so that adjacent *combustible surfaces* are protected from damage resulting from the thermal effects of their operation.

An existing *gas installation* shall be checked for adequate capacity before connecting an additional *appliance*.

Any safety device or system that permits an *appliance* to be operated remotely, automatically or unattended shall be of a type that ensures the *appliance* is *fail safe*.

Electrical supplies to *appliances* shall have an *accessible* and identifiable means of isolation.

Appliances shall be supported or secured to prevent stressing of the *consumer piping* unless the *consumer piping* has been specifically designed and constructed to safely support the *appliance*.

Every *appliance* shall be connected to the fixed *consumer piping* in a manner that minimizes transfer of any stresses arising from the operation or movement of that *appliance*.

A safety device or system designed to isolate the *gas* supply in the event of fire equipment operation shall ensure that the *gas installation* remains safe.

2.2.5.3 Gas appliance location

Appliances shall be located to —

- (a) avoid, or shall be suitably protected against, the effects of corrosive and/or dust laden environments and any likelihood of physical damage;
- (b) permit functional adjustment, safe ignition, access for operation and maintenance, and effective operation of any explosion relief device;
- (c) avoid any hazard to the building or structure, or to the contents of the building;
- (d) avoid undue restriction of the movement of persons;
- (e) minimize the risks associated with the storage, use or release of hazardous or flammable substances in the vicinity or be suitably protected;
- (f) minimize the risk of harm to persons; and
- (g) avoid any negative effects and hazards from the operation of other appliances or equipment.

An *appliance* shall be installed only in a location or on a structure capable of supporting the weight of the *appliance* when fully laden, e.g. a storage *water heater* when it is full of water.

2.2.5.4 Ventilation of the appliance space and air supply to appliances

Ventilation shall ensure proper operation of the *appliance* and *flue* system and maintain safe ambient conditions.

Negative air *pressures* that adversely affect appliance operation shall be avoided except for industrial *appliances*, *gas* engines and *gas* turbines specifically designed for negative air *pressure*.

The air supply to *appliances* shall provide for complete combustion of the *gas* and the effective operation of draught diverters and other components as required.

The air supply to *appliances* shall be free of any substance that could adversely affect the safe operation or durability of the *appliance*.

Where the required air supply relies on a mechanical system, the *gas installation* shall include an *interlock* to prevent the operation of the *appliance* if the mechanical air supply system fails.

2.2.5.5 Valve trains

All *valve trains* shall be designed and installed to prevent the presence of a combustible mixture within the *appliance* before the ignition sequence is activated.

Every *valve train* shall include means to maintain combustion conditions suitable for the safe and effective operation of the *appliance*.

Every fitting used to control the *gas* flow into an *appliance* shall be suitable and safe for its application.

All fittings on the *valve train* supplying any *appliance* shall permit the safe and effective operation of that *appliance*.

Valve trains shall be designed to avoid any particulate matter impairing the operation of any components of the valve train.

All sections of a valve train shall be capable of safely withstanding any *pressure* that could be reasonably foreseen.

There shall be a means of manually isolating the *gas* supply to the *valve train* and a means of disconnection of the *valve train* from the *consumer piping*. This means shall be *accessible* and easily identifiable in normal operation and in an emergency.

2.2.5.6 Appliance connection

A means of disconnection from the *consumer piping* shall be provided for all *appliances*.

2.2.5.7 Commissioning

Every *appliance* shall be commissioned prior to use to ensure safe start-up and operation, and shall include checks of safety and operating controls.

NOTE 1 See [Appendix N](#) for guidelines for *commissioning* of *appliances*.

NOTE 2 See [Appendix P](#) for a checklist for checking compliance of the *gas installation* prior to and during *commissioning*.

NOTE 3 See [Appendix Q](#) for spillage tests for *open flued appliances*.

Section 3 Means of conformance — General requirements and safe work practices

3.1 Gas supply

Before commencing an installation, all of the following shall be established:

- (a) The type of *gas* available.
- (b) The *gas* supply is adequate to satisfy likely simultaneous demands or peak loading.
- (c) The capacity of the gas measurement system (GMS), meter or *cylinder* supply is sufficient to meet the anticipated maximum demand.
- (d) The *pressure* of the *gas* available at the inlet to the *consumer piping*.
- (e) The maximum *pressure* supplied from the outlet of the GMS, meter or *cylinder* in the event of failure of the supply regulator or control.
- (f) Location of GMS or meter (see Note 1).

NOTE 1 For *gas* meter installation, see [Appendix L](#).

NOTE 2 For information on the above, refer to the *gas* supplier or GMS/meter owner.

NOTE 3 In Australia, the *gas* supplier and/or *Technical Regulator* may require, for complex jobs, notification before work commences and confirmation that completed work is in accordance with this Standard and any other relevant requirements.

3.2 Gas demand

The *gas pressure* and flow requirements for all *appliances*, including any existing *appliances* shall be established from the *appliance* data plates or by reference to the *manufacturer's instructions* for the *appliance*.

3.3 Safe work practices

3.3.1 General

Safe working practices shall be employed in accordance with applicable work, health and safety (WHS) requirements, including —

- (a) when working on *gas installations*;
- (b) for locating *gas* leaks;
- (c) for repair of *gas* leaks;
- (d) when *hot-tapping*;
- (e) to avoid any hazard arising from electrical currents in, or voltages on, the *gas installation*; and
- (f) when *purging*.

NOTE Refer to the local OHS authority for the replacement of an appliance connected to an existing asbestos *flue*, or the maintenance or repair of an existing asbestos *flue*.

3.3.2 Isolating gas supply

All existing pipework shall be isolated from its *gas* supply and safely *purged* of *gas* before the work is started, unless such actions would cause significant disruption to existing *appliance* users. In situations where unacceptable disruption to operations would arise from isolating the *gas pipework* from the *gas* supply, a suitable flow stopping and *purging* technique performed by appropriately trained and experienced persons shall be used to isolate the pipework locally.

Purging of a *gas installation* shall be planned to —

- (a) ensure no pockets of *gas* are left behind in any part of the *gas installation*;
- (b) ensure that *gas* is vented from the pipe system to a safe place and level;
- (c) prevent *gas* accumulation;
- (d) provide good ventilation within the vicinity of the *purge* point;
- (e) prevent inadvertent operation of any electronic device; and
- (f) prohibit smoking or naked flames.

Purging shall continue until tests indicate the *gas installation* is completely free of *gas* at all *purge* points.

NOTE Information on *purging* procedures is given in [Appendix D](#).

3.3.3 Purging after completion of work

After performing any work on *consumer piping*, all air or inert *gas* shall be *purged* from the *consumer piping* before any attempt is made to light an *appliance*. All branch lines shall be individually *purged*. *Purging* shall be completed before *appliance* testing and commissioning commences.

3.4 Sealing of open pipe ends

3.4.1 Removal of debris

Before any section of pipework is permanently connected or sealed it shall be checked for debris and moisture and cleared and dried before sealing.

3.4.2 Open ends to be sealed while work is in progress

Where alteration, repair or extension to *consumer piping* necessitates the removal of a *pipe fitting* or an *appliance* or the cutting of an installed pipe, all open ends, other than those at the immediate work area, shall be sealed prior to, and for the duration of, the work. When the work site is vacated, all open ends shall be sealed with an appropriate fitting. Where the consumer piping remains pressurized it shall be checked for gas tightness.

NOTE The closing of a shut-off valve will not satisfy this requirement unless the outlet of the valve is sealed.

3.4.3 Outlet provided for future connection to be sealed

Where an outlet has been provided for the connection of an *appliance* but is not to be used immediately, and the outlet is not fitted with a *quick-connect device*, it shall be sealed using a plug, cap, blank flange or a capped or plugged *manual shut-off valve*.

3.5 Testing of piping

3.5.1 Testing a new gas installation

Before any new *gas installation* is put into operation, the *consumer piping*, *appliances* and *valve trains* shall be tested in accordance with [Appendix E](#).

NOTE *Consumer piping* that is to be installed in an *inaccessible* location should be tested prior to the piping being made *inaccessible* to enable any repairs that may be necessary to be carried out before the piping is made *inaccessible*.

3.5.2 Testing consumer piping after alteration, repair or extension

Where *consumer piping* has been altered, repaired or extended, the section of the installation isolated to carry out the work shall, before being returned to operation, be tested in accordance with [Appendix E](#).

When testing large existing *gas installations*, it may not be practicable to test the whole of the existing installation; in this circumstance the leakage test shall be applied downstream of the last isolation point prior to the alteration, repair or extension.

NOTE Where practicable, an existing *gas installation* should be tested before new *gas* work commences.

3.6 Acceptable substances for testing

Air, the *gas* for which the system is designed, or an inert *gas* shall be the only substances used within *consumer piping* for testing. Oxygen shall not be used as a substitute for air.

3.7 Hot-tapping of branch fitting to consumer piping

When *hot-tapping* a branch into *consumer piping*, the *Technical Regulator* shall be consulted prior to the commencement of any work.

The work shall be planned, coordinated and carried out by a *competent person*.

The planning shall include a documented contingency or emergency plan in the event of *gas* escape, fire or explosion while the work is in progress.

3.8 Increasing the operating pressure of existing consumer piping

Where the *operating pressure* of existing *consumer piping* is to be increased —

- (a) the materials and components in the existing installation shall be confirmed as suitable for the increased *operating pressure*; and
- (b) the *consumer piping* and *appliances* shall be tested in accordance with [Appendix E](#).

NOTE 1 For reticulated systems, it is the GMS/meter owner's (*gas* supplier) responsibility to adjust the *gas pressure* available at the point of supply.

NOTE 2 The *gas* supplier should be informed where the required *operating pressure* cannot be achieved.

3.9 Dealing with dangerous gas installations

Immediate steps shall be taken to make safe any unsafe *gas installation* or *appliance* that may be discovered.

As much of the installation as is necessary shall be isolated to make safe in accordance with regulatory requirements.

NOTE 1 In New Zealand, the *Gas (Safety and Measurement) Regulations 2010* require that when a person carrying out *gasfitting* has reasonable grounds to believe that an installation presents an immediate danger to life and property, the owner or occupier of the property and the *Technical Regulator* have to be notified.

NOTE 2 In Australia, the *Technical Regulator* may require to be informed; the consumer/operator should be notified.

3.10 Methods of locating gas leaks

A non-corrosive soap and water solution or leakage detection fluid applied externally or other suitable *gas* detecting equipment or means shall be the only methods used to locate a *gas* leak. Matches, candles or any other *ignition source* shall not be used.

CAUTION — THE AMMONIA PRESENT IN SOME SOAPS AND DETERGENTS CAN REACT WITH BRASS FITTINGS AND CAUSE SUCH FITTINGS TO CRACK AFTER A SHORT PERIOD OF TIME. THEREFORE, CAUTION SHOULD BE EXERCISED WHEN USING SOAP SOLUTIONS ON BRASS FITTINGS AND ALL CONNECTIONS SHOULD BE RINSED THOROUGHLY WITH FRESH WATER AS SOON AS POSSIBLE AFTER THE APPLICATION OF THE SOAP SOLUTION.

3.11 Safety requirements in the vicinity of gas leaks or suspected gas leaks

Taking into consideration *gas* type and leakage rates, where there is *gas* leak or suspected *gas* leak, action shall be taken to ensure —

- (a) all persons in the vicinity are evacuated to a safe distance;
- (b) the *gas* supply to the *gas installation* is isolated;
- (c) all *ignition sources* are identified and are safely isolated or extinguished where possible;
- (d) all affected confined spaces are well ventilated to safely disperse any accumulating *gas*;
- (e) emergency support services are notified when there is a need; and
- (f) the owner and occupier of the property are notified of the action taken and the remedial options available.

NOTE Warning signs should be used and, depending on the severity of the situation, it may be necessary to evacuate people from the area. Contact the *gas* supplier if the leak is at or upstream of the consumer's point of supply (usually the billing meter).

3.12 Safe discharge of static electricity

When working on *consumer piping* constructed of plastics, any static electricity that may be present in the piping or become present during work shall be discharged safely.

NOTE 1 A method of discharging the static electricity is to wet the ground and dampen the pipe at the work area with a wet cloth. Then drape the cloth from the pipe to the ground to provide a path to earth. Under these conditions any static electricity should now have been discharged safely.

NOTE 2 When working on electronic devices, protection against the build-up of static electrical charge should be considered.

3.13 Electrical safety bonding or bridging

To avoid the risk of potentially fatal electrical shocks where a metal pipe is to be cut, or an *appliance*, component or fitting is to be disconnected from *consumer piping*, an insulated metallic bridging device shall be installed across the intended cut or break to ensure electrical continuity. The bridging device shall not be removed until all work is complete.

3.14 Clearing a blockage in consumer piping

Where a blockage is to be cleared from the *consumer piping* —

- (a) the *consumer billing meter*, all other *gas meters* and *gas pressure regulators*, and all *appliances* shall be disconnected or isolated before any suction or force is applied;
- (b) only *pressure* regulated air or inert *gas* shall be used to clear the blockage; and
- (c) on completion of the work the *consumer piping* shall be tested in accordance with [Appendix E](#).

Section 4 Means of conformance — Materials, fittings and components

4.1 General

A material fitting or component may be required to be submitted to the *Technical Regulator* with supporting evidence for consideration as to its acceptability for use if —

- (a) it is not listed in this Section; or
- (b) it is listed in this Section by type but is outside the scope of the Standard specified.

4.1.1 Suitability for use

Materials, fittings and components shall be free of damage and defects.

Materials, fittings and components selected for a *gas installation* shall be compatible and suitable for use with —

- (a) the *gas* being conveyed;
- (b) the *pressure* to which they will be subjected; and
- (c) the environment in which they will be installed.

4.1.2 Re-use of materials and components

Before a pipe, fitting or any other item removed from any existing *gas installation* is re-used, it shall conform to [Clause 4.1.1](#). Flange *gaskets*, “O” rings and sealing tape shall not be re-used.

4.1.3 Mating parts

Screw threads on mating parts shall be to the same Standard or Specification.

4.2 Materials for consumer piping

In Australia, piping materials and fittings shall be in accordance with an appropriate Standard listed in [Table 4.2](#) and shall be subject to the limitations in [Table 4.2](#).

In New Zealand, piping materials and fittings shall be in accordance with an appropriate Standard listed in [Table 4.2](#) or an equivalent Standard and shall be subject to the limitations in [Table 4.2](#).

Table 4.2 — Consumer piping materials

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
7	Black steel conforming to AS 1074 Medium grade Screwed ends or plain ends	External corrosion protection required	Malleable cast iron fitting	External corrosion protection required	Taper external and parallel internal threads conforming to AS ISO 7.1	Maximum permissible size is DN 100 External corrosion protection required
		High-density PE coated steel pipe may be used above ground in an indoor location	Copper alloy screwed <i>pipe fitting</i> conforming to AS 3688			
		Not permitted in the ground unless coated with high-density polyethylene (PE) conforming to AS/ NZS 1518 or covered with a proprietary wrapping acceptable to the <i>Technical Regulator</i>	Screwed flange, carbon steel or steel alloy conforming to — AS 2129, or ASME B16.5 Class 150, or EN 1759-1 Class 150 (Class 125 for cast iron valves or regulators)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint shall be of the same size and face type External corrosion protection required		
		Not permitted in the ground beneath a building	Steel butt-welded <i>pipe fitting</i> conforming to BS 1640-1 or BS 1640-3, or conforming to ASME B16.9	External corrosion protection required	Butt weld to AS 4041, Class 3 piping	Where welding is to be carried out, the <i>Technical Regulator</i> may require the welder to be authorized External corrosion protection required
			Socket-welded fitting to BS 3799, or conforming to ASME B16.11	External corrosion protection required	Fillet weld conforming to AS 4041 Class 3 piping	
			Welded flange carbon steel or steel alloy conforming to — AS 2129, or ASME B16.5 Class 150, or EN 1759-1 Class 150 (Class 125 for cast iron valves or regulators)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint shall be of the same size and face type External corrosion protection required	Slip-on type flanges: Double fillet weld conforming to AS 4041, Class 3 piping Other type flanges: Butt weld conforming to AS 4041, Class 3 piping	

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
100	Galvanized steel conforming to AS 1074 Medium grade Screwed ends or plain ends	Not permitted in the ground beneath a building	Up to 7 kPa, malleable cast iron fitting conforming to ISO 49 Over 7 kPa wrought steel fitting conforming to EN 10241	Fitting shall be galvanized	Taper external and parallel internal threads conforming to AS ISO 7.1	Up to 7 kPa, maximum permissible size is DN 100 Over 7 kPa, maximum permissible size is DN 80 External corrosion protection of bare threads is required where installed in the ground
			Copper alloy screwed fitting conforming to AS 3688	Not to be connected directly to pipe in the ground without the use of an insulation coupling		
			Screwed flange, cast iron, carbon steel or steel alloy conforming to — AS 2129, or ASME B16.5 Class 150, or EN 1759-1 Class 150 (Class 125 for cast iron valves or regulators)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint shall be of the same size and face type External corrosion protection required		