

AS 5601—2004

Australian Standard®

GAS INSTALLATIONS

Gas Installations

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AGA Certification Services
Australian Liquefied Petroleum Gas Association
Energy Networks Association
Gas Appliance Manufacturers Association of Australia
Gas Technical Regulators Committee

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Australian Standard™

Gas installations

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PREFACE

This Standard was prepared by the Standards Australia Committee AG-006, Gas Installation to supersede AS 5601—2002 (AG 601—2002). It is a revision of the 2002 edition and incorporates both technical and editorial amendments.

The intention of this Standard is to provide essential requirements and deemed to comply 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 accommodates some variation of requirements among the regulatory jurisdictions. Such variations are identified in the page margin adjacent to the particular Clause. Appendix L sets out the detail of these variations or additions under the appropriate Clause number.

Where the Standard has acquired legal standing, its requirements are mandatory (variations/exceptions being indicated as described above). 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 the inclusion of them in an informative appendix.

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.

Terms or words that are indicated by italics in the body of the text are defined terms or words. This does not apply to any italics used in the Preface or headings or figures. Section 1 contains the definitions of such terms or words as they apply to the Standard.

In this edition a number of technical changes have been made and include, amongst others, the following—

- (A) the materials approved for use with the inclusion of composite pipe and fittings;
- (B) clearances for flue terminals;
- (C) a number of installation requirements for specific appliances; and
- (D) the inclusion of supply pressure in the pipe sizing tables.

Clause renumbering has been carried out as necessary.

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STANDARDS AUSTRALIA

Australian Standard
Gas installations

SECTION 1 SCOPE, APPLICATION AND
DEFINITIONS**1.1 SCOPE**

This Standard sets out requirements for *consumer piping*, flueing, ventilation and *appliance* installations which are associated with the use or intended use of fuel gases such as *town gas*, *natural gas*, *liquefied petroleum gas* in the vapour phase, *tempered liquefied petroleum gas*, *simulated natural gas* or any similar substance.

The requirements cover piping systems from the outlet of—

- (a) the *consumer billing meter* installation; or
- (b) the first *regulator* on a fixed *gas installation* where an *LP Gas* container is installed on the same site; or
- (c) the first *regulator* on site (if no *meter* is installed) where *LP Gas* is reticulated from storage off the site;

to the inlet of the *appliance*.

This Standard does not apply to portable or *mobile appliances* connected directly, or by *hose assembly*, to an *LP Gas cylinder*.

Requirements for installations for *caravans* and marine craft including location of storage *cylinders*, piping systems and *appliances* are also provided in this Standard.

NOTES:

- 1 The location of *consumer billing meters* is determined by the *network operator*; however, some guidelines for the locating of these *meters* are detailed in Appendix A.
- 2 The terms pipe, piping, tube and tubing are used throughout this Standard. They are to be considered to have the same meaning.

Unless specifically covered in this Standard, where *consumer piping* is to operate at a *pressure* exceeding 200 kPa, consult with the *technical regulator*.

Appliances provided for in this Standard include those *certified* by a *certifying body* and those otherwise acceptable to the *technical regulator*.

The *appliance* installation requirements cover location, ventilation, combustion air, flueing and commissioning of the *appliance*.

1.2 APPLICATION OF THIS STANDARD

The requirements of this Standard are to be used in conjunction with, but do not take precedence over, any statutory regulations which may apply in any area. The *technical regulator* may determine the extent of application of this Standard.

Where no requirement is given, good practice is to apply. In any matter of uncertainty the *technical regulator* is to be consulted.

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 shall not apply retrospectively to existing installations.

NOTE: 'Commenced', for the purpose of this Clause, means the point at which site or equipment construction has begun.

1.3 REFERENCED DOCUMENTS

A list, with titles, of documents referred to in this Standard is given in Appendix B.

1.4 DEFINITIONS

For the purposes of this Standard the following definitions apply unless otherwise qualified:

NOTE: Any variations of these defined terms that are also printed in italics have a corresponding meaning.

1.4.1 Accessible

Access can be gained without hazard or undue difficulty for inspection, repair, renewal, or operational purposes.

1.4.2 ALPGA

Australian Liquefied Petroleum Gas Association Ltd.

1.4.3 Appliance

An assembly, other than a *vehicle refuelling appliance* (VRA), part of which uses gas to produce flame, heat, light, power or special atmosphere and includes the following:

1.4.3.1 Type A appliance

An *appliance* for which a *certification* scheme exists.

1.4.3.2 Type B appliance

An *appliance*, with *gas consumption* in excess of 10 MJ/h, for which a *certification* scheme does not exist.

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

1.4.3.3 Balanced flue appliance

An *appliance*, which has air for combustion, ducted from, and *combustion products* ducted to, a common terminal.

1.4.3.4 Elevated cooking appliance

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

1.4.3.5 Flueless/Flueless appliance

An *appliance* designed not to discharge its *flue gases* through a *flue*.

1.4.3.6 Freestanding cooking appliance

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

1.4.3.7 Mobile appliance

An *appliance* fitted with wheels that are designed to be easily moved by one person.

1.4.3.8 Portable/ Portable appliance

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

1.4.3.9 Room-sealed/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.

1.4.4 Appliance gas pressure regulator

See ‘*Gas pressure regulator*’.

1.4.5 AS

When followed by numbers or letters and numbers means an Australian Standard published by Standards Australia.

1.4.6 ASTM

When followed by letters or letters and numbers means a Standard published by the American Society for Testing and Materials.

1.4.7 Atmospheric burner

See ‘*Burner*’.

1.4.8 Automatic changeover regulator

See ‘*Gas pressure regulator*’.

1.4.9 Balanced flue appliance

See ‘*Appliance*’.

1.4.10 Bathroom

A 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, etc.

1.4.11 Bedroom

A room used or intended to be used for sleeping.

1.4.12 BS

When followed by numbers or letters and numbers means a British Standard published by the British Standards Institution.

1.4.13 Breather vent

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

1.4.14 Burner

A device that positions a flame in the desired location by delivering *gas* and air to that location in such a manner that continuous ignition is accomplished and includes the following:

1.4.14.1 *Atmospheric burner*

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

1.4.14.2 *Forced draught burner*

A system where all of the air, oxygen or a mixture of the two used for combustion is provided under *pressure*.

1.4.14.3 *Induced draught burner*

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

1.4.15 Caravan

A structure that is or was 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. Included is any associated annex and the like, whether permanently or temporarily attached to, or adjoining, the main portion of the structure.

NOTE: 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.

1.4.16 Certified/Certification

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

1.4.17 Certifying body

A body acceptable to the *technical regulator* that provides assurance of compliance of *appliances* and components with nominated Standards and other accepted safety criteria.

1.4.18 Combustible material

A material which will ignite and burn and includes material which has been flameproofed.

1.4.19 Combustible surface

A surface made of *combustible material*.

1.4.20 Combustion products

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

1.4.21 Common flue

See '*Flue*'.

1.4.22 Compressed natural gas/CNG

Natural gas stored under *pressure* in a *cylinder*.

1.4.23 Condensate

The liquid, which separates from a *gas* (including *flue gas*) due to a reduction in temperature.

1.4.24 Condensation

See '*Condensate*'.

1.4.25 Consumer billing meter

See '*Meter*'.

1.4.26 Consumer piping

A system of pipes, *fittings*, components and equipment which conveys *gas* from the outlet of the *consumer billing meter* installation, or for *gases* stored in a *tank* or *cylinder* from the outlet of the first *gas pressure regulator*, to the *appliance* inlet.

NOTE: In the case of a reticulated *LP Gas* system, the '*first gas pressure regulator*' refers to the first *regulator* on the site if no *meter* is installed.

1.4.27 Consumer piping gas pressure regulator

See '*Gas pressure regulator*'.

1.4.28 Cupboard

An enclosed recess constructed primarily for storage purposes.

1.4.29 Cylinder

A container, for the storage of Dangerous Goods of Class 2, which has a capacity of more than 100 millilitres but no more than 500 litres as per AS 2030.1 and includes the following:

NOTE: Capacity is often referred to as '*water capacity*' and is the total internal volume.

1.4.29.1 Exchange cylinder

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

1.4.29.2 In situ fill cylinder

A *cylinder* that is filled at the consumer's *premises*.

1.4.30 Deck

A floor or platform extending from side to side of a marine craft and includes the following:

1.4.30.1 Upper deck

That part of the decking designed to prevent water entering the hull of a marine craft, generally at the gunwale line.

1.4.30.2 Main deck

The level immediately below the *upper deck*.

1.4.30.3 Lower deck

The level immediately below the *main deck*.

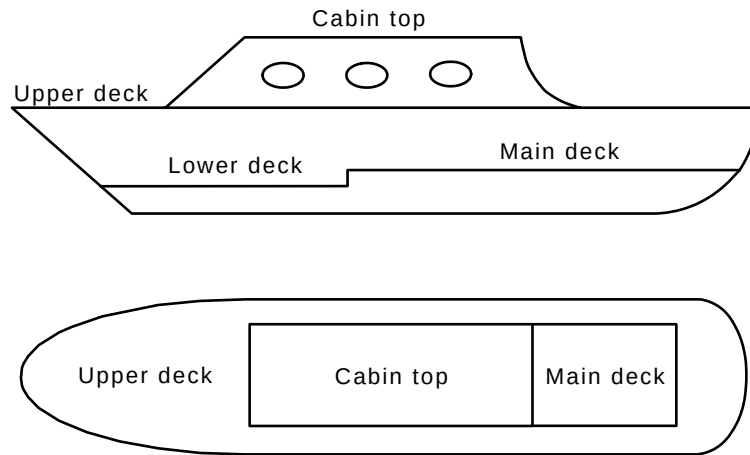


FIGURE 1.1 VIEWS OF MARINE CRAFT SHOWING DECKS

1.4.31 Decorative gas log fire

An *appliance*, which simulates a solid fuel, fire, its primary function lying in the aesthetic effect of the flames, and includes the following:

1.4.31.1 Type 1

Decorative gas log fires without an *enclosure* and designed to be installed in an existing fireplace with a chimney, which acts as a *flue*.

1.4.31.2 Type 2

Decorative gas log fires supplied with an *enclosure* and designed to be freestanding, with a *flue* that vents the *flue gases* outside the building.

1.4.32 Direct-fired air heater

An *appliance* for heating a forced air stream where the *combustion products* are released with the heated air.

1.4.33 DN (diametre nominale)

See 'nominal size'.

1.4.34 Double block and vent safety shut off system

A *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.

1.4.35 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 *flue*.

1.4.36 Elevated cooking appliance

See '*Appliance*'.

1.4.37 Enclosure

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

1.4.38 Excess air

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

1.4.39 Excess flow valve

A normally open valve that closes automatically when a predetermined flow rate in a particular direction is exceeded.

1.4.40 Exchange cylinder

See 'Cylinder'.

1.4.41 Fault pressure

Means—

- (a) for piping, components and equipment; 1.5 times the *rated working pressure*; or
- (b) where the *pressure* in (a) is unknown, the *pressure* to which that portion of the *gas installation* has been tested.

NOTE: In respect to (a), for *consumer piping*, the appropriate *pressure* is that of the item having the lowest *rated working pressure* in the system.

1.4.42 Fire damper

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

1.4.43 Fire resistant material

A material having thermal and physical properties suitable for use in protecting a *combustible surface*, etc.

NOTE: Refer to Appendix C.

1.4.44 Fitting

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

1.4.45 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 *gas* supply to the *burner(s)* in the event of ignition failure or flame failure.

1.4.46 Flue

The passage through which *flue gases* are conveyed from an *appliance* to a discharge point. Types of *flue* include:

1.4.46.1 Common flue

A *flue* conveying the *flue gases* from two or more *appliances*.

1.4.46.2 Natural draught flue

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

1.4.46.3 Open flue

A *flue* system containing a *draught diverter* or canopy.

1.4.46.4 Power flue

A *flue* from which the *flue gases* are removed by a fan or other exhausting device installed in the *flue*.

1.4.46.5 Twin wall flue

A type of *flue* in which the inner *flue* conduit is encased by an outer casing of specific dimensions.

1.4.47 Flue brick

A hollow brick designed specially for use as a *flue*.

1.4.48 Flue cowl

A device placed at the end of an *open flue* designed to prevent the entry of rain and minimize the disturbing effect of wind while not hindering the discharge of *flue gases*.

1.4.49 Flue gases

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

1.4.50 Flue terminal

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

1.4.51 Flueless

See '*Appliance*'.

1.4.52 Forced draught burner

See '*Burner*'.

1.4.53 Freestanding cooking appliance

See '*Appliance*'

1.4.54 Gas

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

1.4.54.1 Natural gas (NG)

A hydrocarbon *gas*, consisting mainly of methane.

1.4.54.2 Liquefied petroleum gas (LP Gas)

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

1.4.54.3 Simulated natural gas (SNG)

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

1.4.54.4 Tempered liquefied petroleum gas (TLP)

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

1.4.54.5 *Town gas (TG)*

A *gas* manufactured from coal or petroleum feed stocks.

1.4.55 **Gas consumption**

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

1.4.56 **Gas installation**

A combination of the following used or intended to be used in the supplying and utilisation 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.

1.4.57 **Gas load**

The total *gas consumption* of all downstream *appliances*.

1.4.58 **Gas pressure regulator**

A device that automatically regulates the outlet *pressure* of the *gas* passing through it to a predetermined value and includes the following:

NOTE: In more 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.

1.4.58.1 *Appliance gas pressure regulator*

A *gas pressure regulator* fitted to an *appliance*.

1.4.58.2 *Automatic changeover regulator*

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

1.4.58.3 *Consumer piping gas pressure regulator*

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

1.4.58.4 *Cylinder regulator*

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

1.4.58.5 *Zero regulator*

A *gas pressure regulator* that operates at zero or near zero (atmospheric) *pressure*, usually in conjunction with an air-gas proportioning device.

1.4.59 **Gastight/Gastightness**

Tested to the appropriate requirement and any *pressure* drop or leakage rate does not exceed a limit specified by the *technical regulator*.

1.4.60 **High-rise building**

A building having five or more storeys above ground level.

1.4.61 Hob

That part of a cooking *appliance* that supports the *trivet*. Usually constructed of enamelled steel, stainless steel or toughened glass.

1.4.62 Hose assembly

A flexible tube or pipe complete with end couplings.

1.4.63 Hot-tap

The connection of a branch to *consumer piping* whilst the pipe contains *gas*.

1.4.64 Hot water boiler

Any vessel wherein water is intended to be heated to a temperature exceeding 99°C by the application of heat from the *combustion products* to the vessel without the generation of steam.

1.4.65 Ignition source

A source of energy sufficient to ignite a flammable mixture and includes but is not limited to naked flames, exposed incandescent material, electrical welding arcs, and any electrical or mechanical equipment not suitable for use in hazardous locations.

1.4.66 Induced draught burner

See 'Burner'.

1.4.67 In situ fill cylinder

See 'Cylinder'.

1.4.68 Insulating joint

A joint or *fitting* designed to prevent the flow of electric current across the joint or *fitting*.

1.4.69 Interlock

A 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.

1.4.70 Lockout

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

1.4.71 Lower explosive limit

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

1.4.72 Main run

The run of *consumer piping* from the *meter*, or for *gas* stored in *cylinders* the first *gas pressure regulator*, to the furthest *appliance* position.

1.4.73 Manual shut off valve

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

1.4.74 Meter

A device used to measure the volume of *gas* passing through it and includes the following:

1.4.74.1 Consumer billing meter

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

1.4.74.2 Sub-meter

A *meter* for measuring *gas*, which has already passed through a *consumer billing meter*.

1.4.75 Mobile appliance

See '*Appliance*'.

1.4.76 Natural draught burner

See '*Atmospheric burner*'.

1.4.77 Natural draught flue

See '*Flue*'.

1.4.78 Network

A *gas* distribution system comprising a pipe, or system of pipes, for transporting *gas*, but excluding *consumer piping*.

1.4.79 Network operator

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

1.4.80 Nominal size (DN)\Nominal diameter (DN)

A numerical designation of size, in millimetres (mm) which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

1.4.81 Non-return valve

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

1.4.82 Open flue

See '*Flue*'.

1.4.83 Operating pressure

The *gas pressure* that the *consumer piping* or the *appliance* is or will be subjected to under normal operating conditions.

NOTE: For *pressure* testing purposes *operating pressure* is the lockup *pressure* of the next upstream *regulator*.

1.4.84 Outdoor

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

1.4.85 Over-pressure protection

A system preventing the *pressure* in piping or an *appliance* from exceeding a predetermined value.

1.4.86 Permanent joint

A joint that is not intended to, and cannot readily, be disassembled. Examples are brazed, welded, crimped and hydraulically compressed joints.

1.4.87 Pigtail

A short length of small bore pipe or a *hose assembly* used for the high-pressure connection between an *LP Gas cylinder* and the *cylinder regulator* or the *cylinder manifold*.

1.4.88 Plant room

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

1.4.89 POL fitting (Prest-O-Lite)

The common name for a standard union with left-hand thread, used for connecting to an *LP Gas cylinder* valve.

1.4.90 Pool heater

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

1.4.91 Portable/Portable appliance

See '*Appliance*'.

1.4.92 Power flue

See '*Flue*'.

1.4.93 Premises

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

1.4.94 Pressure

Pressure above atmospheric *pressure*, or gauge *pressure*.

1.4.95 Purge/purging/purged

With respect to *consumer piping* means—

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

NOTE: The purpose of *purging* is to prevent the presence in the piping of an explosive mixture of *gas* and air.

1.4.96 Push-on connector

A method of attaching a laboratory bunsen *burner* to *consumer piping* in which a flexible tube end slides over a special nipple and is held by friction. The tube is usually made of rubber or synthetic rubber.

1.4.97 Quick-connect device

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

NOTE: *Quick-connect devices* are sometimes referred to as bayonet *fittings*.

1.4.98 Range hood

A mechanical extraction unit, used in domestic *premises*, to collect contaminated air from above a cooking *appliance*, pass the air through a filtration system and then either discharge it from the room or recirculate it back into the room.

1.4.99 Rated working pressure

The maximum allowable inlet *pressure* specified by the manufacturer.

1.4.100 Regulator

See '*Gas pressure regulator*'.

1.4.101 Residential garage

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

1.4.102 Room-sealed/Room-sealed appliance

See '*Appliance*'.

1.4.103 Riser

A vertical section of the *consumer piping*.

1.4.104 Safety shut off system

An arrangement of valves and associated controls, which shut off the supply of *gas* when required, by a device, which senses the approach of an unsafe condition.

1.4.105 Safety shut off valve

A valve used to shut off the *gas* supply automatically when a signal is generated indicating the approach of an unsafe condition.

1.4.106 Steam boiler

Any 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.

1.4.107 Sub-meter

See '*Meter*'.

1.4.108 Tailpipe

The provision, placed at a low point in the *consumer piping*, to collect water and from which it can be removed.

1.4.109 Tank

A container, (other than a *cylinder*), designed in accordance with AS 1210 for the storage of Dangerous Goods of Class 2 in either the liquid or gaseous form.

1.4.110 Technical regulator

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

1.4.111 Temperature limit device

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

1.4.112 Trivet

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

1.4.113 Type A appliance

See '*Appliance*'.

1.4.114 Type B appliance

See '*Appliance*'.

1.4.115 Valve train

A combination of valves, *regulators*, pipe pieces, unions, etc., which form an integrated system for flow or *pressure* control and safe operation of a *burner*.

1.4.116 Vehicle refuelling appliance/VRA

A device for refuelling motor vehicles with *natural gas* and with a capacity not exceeding 6 m³/h.

1.4.117 Vent line

A pipe which is connected to a *gas pressure regulator*, relief valve or a *double block and vent safety shut off system*, and will convey escaping *gas* to a safe location.

1.4.118 Vent valve

A 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.

1.4.119 Water heater

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

1.4.120 Zero regulator

See '*Gas pressure regulator*'.

SECTION 2 GENERAL WORK AND SAFETY REQUIREMENTS

NOTE: The *technical regulator* may require notification before work commences and confirmation that completed work is in accordance with this Standard and any other relevant requirements.

2.1 ALTERATIONS, REPAIRS AND EXTENSIONS TO CONSUMER PIPING

Where *consumer piping* is to be altered, repaired or extended, the work shall be performed with the *gas* supply turned off.

NOTES:

- 1 Where this is not practicable, see Clause 2.8.
- 2 Before turning off a *gas* supply it is advisable to notify the consumer of the pending withdrawal of the *gas* supply.

2.2 TURNING ON A GAS SUPPLY

Before allowing *gas* under *pressure* into any *gas installation*, all openings from which *gas* can escape shall be sealed or isolated.

2.3 GAS SUPPLY AND TYPE TO BE VERIFIED BEFORE COMMENCING AN INSTALLATION

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

- (a) Whether a *gas* supply is available to the *premises*.
- (b) The type of *gas* available.
- (c) The *pressure* of the *gas* available at the inlet to the *consumer piping*.

NOTE: The *network operator* can provide this information.

2.4 PURGING

2.4.1 Purging before commencing work

Before commencing work on *consumer piping* that contains or has contained *gas*, the piping shall be *purged* with air or an inert gas. The accumulation of any *gas* in the vicinity of the work shall be prevented.

NOTES:

- 1 Where *purging* is not practicable, see Clause 2.8.
- 2 Some information for *purging* procedures is given in Appendix D.

2.4.2 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 are to be individually *purged*.

NOTE: Some information for *purging* procedures is given in Appendix D.

2.5 SEALING OF OPEN PIPE ENDS

2.5.1 Open ends to be sealed while work is in progress

Where alteration, repair or extension to *consumer piping* necessitates the removal of a *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 for the duration of the work. When the work site is vacated all open ends shall be sealed.

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

2.5.2 Future connection outlets and disconnected outlets to be sealed

Where an outlet has been provided for connection of an *appliance* but is not to be used immediately, and the outlet is not fitted with a Type 1 or Type 2 *quick-connect device* which complies with AG 212 (to be AS 4627), it shall be sealed using a plug, cap, blank flange or a capped or plugged *manual shut off valve*.

This also applies where an *appliance* is disconnected and not immediately re-connected.

2.6 TESTING OF PIPING

2.6.1 Testing a new gas installation

Immediately 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. This enables any repairs that may be necessary to be carried out before the piping is made inaccessible.

2.6.2 Testing after alteration, repair or extension

Where work has been carried out which might affect the *gastightness* of any part of a *gas installation*, the *gas installation* shall be tested, in accordance with Appendix E, immediately before supply is restored.

2.7 SUBSTANCES FOR TESTING AND LOCATING GAS LEAKS

Air, the gas for which the system is designed, or an inert gas shall be the only substances used within *consumer piping* for testing or the locating of *gas leaks*.

WARNING: OXYGEN IS NOT TO BE USED AS A SUBSTITUTE FOR AIR.

2.8 HOT-TAPPING OF BRANCH FITTING TO CONSUMER PIPING

Where it is necessary to *hot-tap* a branch into *consumer piping*, the *technical regulator* shall be consulted prior to the commencement of any work.

2.9 INCREASING THE OPERATING PRESSURE OF EXISTING CONSUMER PIPING

Where the *operating pressure* of existing *consumer piping* is to be increased, all of the following shall apply:

- (a) The materials and components in the existing installation shall be suitable for the increased *operating pressure*.

- (b) The *consumer piping* and *appliances* are to be tested in accordance with Appendix E.

NOTES:

- 1 It is the *network operator's* responsibility to adjust the *gas pressure* available at the inlet to the *consumer billing meter*.
- 2 The *technical regulator* may require to be informed where the *operating pressure* is to be increased.
- 3 See Section 3 for duty limits of materials and components.

2.10 DEALING WITH A DANGEROUS GAS INSTALLATION OR APPLIANCE

Where a danger is known to exist due to a defective *gas installation* or *appliance*, the situation shall be made safe and the consumer notified immediately.

NOTE: The *technical regulator*, *network operator* or *LP Gas* supplier, as applicable, may require to be specifically advised of these situations.

2.11 SAFE WORKING PRACTICES

2.11.1 Methods of locating gas leaks

Soap and water solution applied externally or other suitable *gas* detecting equipment shall be the only methods used to locate a *gas* leak. Matches, candles or any other *ignition source* shall not be used.

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

Where there is a *gas* leak or a suspected *gas* leak or *gas* is present in the atmosphere, the *gas* supply to the area shall be isolated and precautions taken to minimize the possible accidental ignition of the *gas*. Smoking, open flames, welding or other *ignition sources* shall not be permitted in the vicinity.

NOTE: Suitable warning signs should be used and depending on the severity of the situation it may be necessary to evacuate people from the area and to contact the *technical regulator*, *network operator* or *LP Gas* supplier as applicable.

2.11.3 Safe discharge of static electricity in plastic piping

When working on *consumer piping* constructed of plastics, measures shall be taken to ensure the safe discharge of any static electricity that may be present in the piping or become present during work.

NOTE: 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.

2.11.4 Electrical safety bonding or bridging

Where a metal pipe is to be cut, or an *appliance*, component or *fitting* is to be disconnected from *consumer piping*, a suitable 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.

2.11.5 Clearing a blockage in consumer piping

Where a blockage is to be cleared from the *consumer piping*, all of the following shall apply:

- (a) The *consumer billing meter* and all *appliances* are to be disconnected or isolated before any suction or force is applied.
- (b) Only air or inert gas is to be used to clear the blockage.
- (c) On completion of the work the *consumer piping* is to be tested in accordance with Appendix E.

WARNING: OXYGEN IS NOT TO BE USED AS A SUBSTITUTE FOR AIR.

SECTION 3 MATERIALS AND COMPONENTS

NOTE: A material or component which—

- (a) is not listed in this Section; or
- (b) is listed in this Section by type but is outside the scope of the Standard specified, may be submitted to the *technical regulator* for consideration as to its acceptability for use.

3.1 MATERIALS AND COMPONENTS—GENERAL

3.1.1 Material and component condition

Materials and components shall be free of damage and defects.

3.1.2 Material and components to be suitable

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

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

3.1.3 Substitution of components

Except for substitution with components belonging to the same proprietary system, no part of a proprietary system shall be substituted by any other part without the written approval of the manufacturer of the proprietary system. Transitions from conventional piping to the proprietary system shall be made with the appropriate proprietary components.

3.1.4 Reuse of materials and components

Before a pipe, *fitting* or any other item removed from any existing *gas installation* is reused it shall comply with Clauses 3.1.1 and 3.1.2.

A flange gasket shall not be reused.

3.2 MATERIAL

3.2.1 Consumer piping material requirements

Pipe, *fittings* and jointing shall comply with Table 3.1.

NOTES:

- 1 For piping materials for *caravans*, see Clause 6.2.5, and for marine craft see Clause 6.3.6.
- 2 Where the operating pressure will exceed 200 kPa refer to the *technical regulator*.

3.2.2 Consumer piping restrictions

The *consumer piping* elements covered by Table 3.1 are subject to the following restrictions:

- (a) A *push-on connector* shall only be used in accordance with Clause 5.2.20.

- (b) A brass *fitting* shall not be buried in the ground unless made of a dezincification-resistant alloy or effectively coated to avoid contact with the surrounding backfill.

NOTE: A brass *fitting* made of dezincification-resistant alloy is identified by the marking 'DR'.

- (c) A *manual shut off valve* constructed of plastics shall not be used above ground.
- (d) A lead *meter* connection shall not be installed in a new installation or when modifying an existing installation.
- (e) The *fittings* types—
- (i) non-metallic *fittings*;
 - (ii) *fittings* that depend on metallic surface to non-metallic surface contact to provide a *gastight* seal; and
 - (iii) metallic *fittings* of the olive or compression type that contain non-metallic components.

shall not be used above ground. When used underground the assembled joints must be designed and installed so as to prevent 'pull-out' during service.

- (f) A *fitting* using an 'O' ring(s) to provide the *gastight* seal must be designed and installed so as to prevent 'pull-out' during service.

3.2.3 Prohibited fittings

The following *fittings* shall not be used:

- (a) A capillary *fitting* containing soft-solder.
- (b) A plain nipple (running/parallel thread).
- (c) A single plastic/rubber olive type *fitting* other than in a *permanent joint*.
- (d) A long screw (connector).
- (e) An internally threaded UPVC *fitting*.

3.2.4 Flue cowls

A *flue cowl* shall comply with AG 604 (to be AS 4566) and be *certified*.

3.2.5 Fire resistant material

Fire resistant material shall comply with the requirements of Appendix C.

3.2.6 Flue material

Material for a *flue* shall comply with Table 3.2.

3.2.7 Gasket material

The material for a gasket shall be suitable for the *operating pressure* and temperature of the system and shall be compatible with the chemical constituents of *town gas*, *natural gas* and *LP Gas*.

A metal gasket shall be suitable for the application and have a melting point exceeding 500°C.

NOTE: An aluminium 'O' ring and a spirally wound metal gasket are acceptable.

3.2.8 Jointing compounds and materials

Jointing compounds and materials shall—

- (a) comply with AG 208 (to be AS 4623) and be *certified*; and
- (b) be suitable for the application.

3.2.9 Vent line material

A *vent line* shall be constructed of the following material as appropriate:

- (a) Metal pipe and *fittings*, which comply with Table 3.1, when in or under a building.
- (b) Composite pipes and fittings, which comply with Table 3.1, when in or under a building.
- (c) Metal pipe and *fittings*, or UPVC pipe and *fittings* suitable for exposed conditions when *outdoors*.

TABLE 3.1
CONSUMER PIPING MATERIALS AND DUTY LIMITS (see Note 1)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
7	Black steel to AS 1074	External corrosion protection required	Malleable cast iron <i>fitting</i> to AS 3673	External corrosion protection required	Taper external and parallel internal threads to AS 1722.1	Maximum permissible size is DN 100 External corrosion protection required
	Medium grade	Not permitted in the ground unless coated with high-density polyethylene (PE) to AS/NZS 1518 (See Note 2), or covered with a proprietary wrapping which is acceptable to the <i>technical regulator</i>	Copper alloy screwed pipe <i>fitting</i> to AS 3688			
	Screwed ends or plain ends		Screwed flange, carbon steel or steel alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type External corrosion protection required		
			Steel butt-welded pipe <i>fitting</i> to BS 1640 Part 1, or Part 3, or to ASME B16.9	External corrosion protection required	Butt weld to AS 4041 Class 2 piping	Where welding is to be carried out, the <i>technical regulator</i> may require the welder to be authorized
			Socket-welded <i>fitting</i> to BS 3799 or to ASME B16.11	External corrosion protection required	Fillet weld to AS 4041 Class 2 piping	External corrosion protection required
			Welded flange carbon steel or steel alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type External corrosion protection required	Slip-on type flanges: Double fillet weld to AS 4041, Class 2 piping Other type flanges: Butt weld to AS 4041, Class 2 piping	

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
7	Galvanized steel to AS 1074 Medium grade Screwed ends or plain ends	Not permitted in the ground beneath a building	Malleable cast iron <i>fitting</i> to AS 3673	<i>Fitting</i> to be galvanized	Taper external and parallel internal threads to AS 1722.1	Maximum permissible size is DN 100 External corrosion protection of bare threads is required where installed in the ground
			Copper alloy screwed <i>fitting</i> to AS 3688 Screwed flange, cast iron, carbon steel or steel alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not to be connected directly to pipe in the ground without the use of an insulation coupling Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type External corrosion protection required		
100	Galvanized steel to AS 1074 Medium grade Screwed ends or plain ends	Not permitted in the ground beneath a building	Wrought steel <i>fitting</i> to BS EN 10241 Copper alloy screwed <i>fitting</i> to AS 3688	<i>Fitting</i> to be galvanized Not to be connected directly to pipe in the ground without the use of an insulation coupling	Taper external and parallel internal threads to AS 1722.1	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
			Screwed flange, carbon steel or steel alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type External corrosion protection required		
	Stainless steel pipe, corrugated semi-rigid, to BS 7838	Not permitted for use as final connection to an <i>appliance</i>	Components that terminate with a BSP thread and specified or provided by the pipe manufacturer	Operating limit of 7 kPa applies where malleable cast iron <i> fittings </i> are used	Mechanical joining using components specified or provided by the pipe manufacturer	Joints to be <i>accessible</i> for inspection and renewal. Not to be welded or jointed by any other method

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Galvanized and black steel pipe to— AS 1074 medium grade, or API SPEC 5L Grade B, or ASTM A53/A5 3M Grade B, or ASTM A106 Grade A or B Screwed ends	Not permitted in the ground	Wrought steel <i>fitting</i> to BS EN 10241 (BSP) or to BS 3799 (NPT)	External corrosion protection required	Up to 100 kPa, taper external and parallel internal threads to AS 1722.1 or NPT to ASME B1.20.1	Up to 7 kPa, maximum permissible size is DN 100
		External corrosion protection required	Copper alloy screwed <i>fitting</i> to AS 3688			Over 7 kPa, maximum permissible size is DN 80
		Pipe to be joined with screwed connections is to comply with the following (refer to 'jointing' for size limitation):	Screwed flange, carbon steel or steel alloy to AS 2129 Table D, or to ASME B16.5	Not to be used for joining pipe lengths unless other joining methods are impracticable	Over 100 kPa, taper external and taper internal threads to AS 1722.1 or NPT to ASME B1.20.1	External corrosion protection required
			Class 150 or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Flanges forming a joint are to be of the same size and face type		
		Nom size (DN)	Nom OD mm	Min wall thickness mm		
		8	13.7	2.2		
		10	17.1	2.3		
		15	21.3	2.8		
		20	26.7	2.9		
		25	33.4	3.4		
		32	42.2	3.6		
		40	48.3	3.7		
		50	60.3	3.9		
		65	73.0	5.2		
		80	88.9	5.5		
		100	114.3	6.0		

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Galvanized and black steel pipe to— AS 1074 medium grade or API SPEC 5L Grade B, or ASTM A53/A53M Grade B, or ASTM A106 Grade A or B, Plain ends	Not permitted in the ground unless coated with high density polyethylene (PE) to AS/NZS 1518 (See Note 2), or covered with a proprietary wrapping acceptable to the <i>technical regulator</i> Not permitted in the ground beneath a building External corrosion protection required Pipe to be joined by welding is to comply with the following:	Butt-welded fitting to BS 1640 Part 1 or Part 3, or to ASME B16.9	External corrosion protection required	Butt weld to AS 4041 Class 2 piping	Where welding is to be carried out, the <i>technical regulator</i> may require the welder to be authorized External corrosion protection required
			Welded flange, carbon steel or steel alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and type External corrosion protection required	Slip-on type flanges: Double fillet weld to AS 4041, Class 2 piping Other type flanges: Butt weld to AS 4041, Class 2 piping	
			Socket-welded <i>fitting</i> to BS 3799, or to ASME B16.11	External corrosion protection required	Fillet weld to AS 4041, Class 2 piping	

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Copper tube to AS 1432 Type A or B with or without plastic coating applied by the manufacturer	Not permitted in the ground beneath a building at <i>pressures</i> exceeding 7 kPa unless plastic coated or covered with a proprietary wrapping acceptable to the <i>technical regulator</i> Plastic coated copper tube is available in sizes up to DN 100 Where plastic coated copper tube is used underground or where adverse environmental conditions exist, all joints and <i>fittings</i> are to be protected and made watertight For sizes over DN 200, tube is to be to AS 1572 with copper alloy designation C12200 to AS 2738 and a minimum wall thickness of 2.64 mm	Copper alloy flared compression <i>fitting</i> to AS 3688 or to AS D26	Not permitted in the ground beneath a building	Flared compression	Not permitted in the ground beneath a building
			Copper alloy brazing capillary <i>fitting</i> to AS 3688		Open flame brazing to BS EN 14324	Brazing alloy to comply with AS 1167.1, Table 2, alloy classification B2
			Junctions may be formed in 'hard drawn' tube only	To be formed with appropriate mechanical branch forming tools		Canary colour - (minimum silver content 1.8%) or a comparable rod
			Socket formed in tube (spigot and socket joining lengths of tube)	To be formed with appropriate tube expanding tool		
			Brazing flange, copper alloy to AS 2129, Table D	Not permitted in the ground beneath a building Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type		
			Screwed flange, carbon steel, steel alloy or copper alloy to— AS 2129 Table D, or ASME B16.5 Class 150, or BS 1560-3.1 Class 150 (Class 125 for cast iron valves or <i>regulators</i>)	Not permitted underground Not to be used for joining pipe lengths unless other joining methods are impracticable Flanges forming a joint are to be of the same size and face type	Up to 100 kPa, taper external and parallel internal threads to AS 1722.1 Over 100 kPa, taper external and taper internal threads to AS 1722.1	<i>Fitting</i> to be brazed to the pipe, not screwed Up to 7 kPa, maximum permissible size is DN 100 Over 7 kPa, maximum permissible size is DN 80
			Composite loose ring socket flange complying with AS 1432, AS 2129 Table D or ASME B16.5 Class 150 and AS 3688 where appropriate			

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
70	UPVC to AS 1464.1 Class 100, Type 1, 2 or 3, or Class 450 Type 3	Not permitted beneath a building Not permitted above ground	Solvent-cement <i>fitting</i> to AS/NZS 1477, Class 12 or Class 18	Internally threaded <i>fittings</i> are not permitted	Solvent-cement jointing or mechanical joints carried out to AS 3723	PTFE (Teflon) tape is the only thread sealant to be used on plastics <i>fittings</i> Priming fluid and solvent cement to be as specified by the pipe manufacturer
200	Polyethylene to AS/NZS 4130	Not permitted beneath a building Not permitted above ground	Compression <i>fitting</i> or electrofusion <i>fitting</i> which is acceptable to the <i>technical regulator</i> Mechanical compression <i>fitting</i> in accordance with ASTM D 2513 Butt-fusion welding carried out to AS 3723	An internal stiffener is required with compression <i>fittings</i>	Electrofusion, butt-fusion, or mechanical joints carried out to AS 3723	The <i>technical regulator</i> may require the installer to be authorized PTFE (Teflon) tape is the only thread sealant to be used on plastics <i>fittings</i>
200	Polyamide (Nylon 11 and 12) to AS 2944.1, Class 300 or Class 400	Not permitted beneath a building Not permitted above ground	Polyamide <i>fitting</i> to AS 2944.2, Class 150 for <i>pressures</i> not exceeding 150 kPa and Class 400 for <i>pressures</i> not exceeding 200 kPa	An internal stiffener is required with compression <i>fittings</i>	Adhesive jointing, or mechanical joints carried out to AS 3723	The <i>technical regulator</i> may require the installer to be authorized Adhesive is to be as specified by the pipe manufacturer PTFE (Teflon) tape is the only thread sealant to be used on plastics <i>fittings</i>

(continued)

TABLE 3.1 (continued)

Operating limit kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
70	(a) Polyethylene/aluminium/ polyethylene (PE/AL/PE) and cross-linked polyethylene/aluminium/ cross-linked polyethylene (PE-X/AL/PE-X) composite pipe to AS 4176	(a) and (b) not permitted for use as final connection to an <i>appliance</i> (a) and (b) ensure compliance with any instructions or warnings issued by the relevant manufacturer or supplier	(a) To AS 4176 (b) To ISO 14531-1	Same temperature limitations as for pipe	Joints to be formed using method(s) and tool(s) acceptable to manufacturer	The <i>technical regulator</i> may require the installer to be authorized
	(b) Cross-linked polyethylene/aluminium/ polyethylene (PE- X/AL/PE) composite pipe Inner cross-linked polyethylene layer to ISO 14531-1	(a) PE/AL/PE not to be used for applications where the operating temperature exceeds 60°C PE-X/AL/PE-X not to be used for applications where the operating temperature exceeds 80°C (b) PE-X/AL/PE not to be used for applications where the operating temperature exceeds 60°C				

NOTES:

- For piping materials for *caravans* and marine craft refer to Clauses 6.2 and 6.3 respectively.
- High-density PE coated pipe may be used above ground in an indoor location.



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3.3 COMPONENTS

3.3.1 Automatic shut off valves

An automatic shut off valve shall comply with AG 214(to be AS 4629)and be *certified*.

3.3.2 Fabricated pipe branch

A fabricated pipe branch shall comply with AS 4041 or AS 1697, as applicable.

3.3.3 Hose assemblies

A hose shall only be used as a complete assembly and—

- (a) other than for *vehicle refuelling appliance* applications, the *hose assembly* shall comply with AS/NZS 1869 and be *certified*, and be suitable for the application; and
- (b) for *vehicle refuelling appliance* applications, the *hose assembly* shall comply with AG 807 (to be AS 4571) and be *certified*.

NOTE: For *hose assemblies* for *caravans* see Clauses 6.2.5.3 and 6.2.5.9, and for marine craft see Clauses 6.3.6.3 and 6.3.6.5.

3.3.4 Limited flexibility connectors

Limited flexibility connectors shall comply with AG 216(to be AS 4631) and be *certified*.

3.3.5 Manual shut off valves

A *manual shut off* valve shall comply with the following:

- (a) Subject to (b), meet the Type 1 or Type 3 valve requirements of AG 201(to be AS 4617) and be *certified*.
- (b) Be capable of being connected to the inlet piping such that, when the outlet piping is disconnected, the valve will remain securely attached to the inlet piping.

3.3.6 Mating threads

All mating threads shall be to the same Standard or Specification and be in accordance with the requirements of Table 3.1.

3.3.7 Quick-connect devices

A *quick-connect device* shall comply with AG 212 (to be AS 4627) and be *certified*.

3.3.8 Swivel joints or couplings

A swivel joint or coupling shall be suitable for the application.

3.3.9 Vent valves

A *vent valve* shall comply with AG 214 (to be AS 4629) and be *certified*.

TABLE 3.2
FLUE MATERIALS

Material	Protective finish	Application (Temperature restrictions)	Limitations (see Note)
Aluminium alloy 1100, 3003 0.7 mm thickness AS/NZS 1734	None	Any <i>appliance</i> (Not to exceed 300°C)	Only where <i>accessible</i> for inspection and renewal Internal <i>flues</i> not to exceed 12 m in length, external <i>flues</i> not to exceed 7 m
Aluminium alloy 1100, 3003 (flexible liner and flexible flue connector) (a) Chimney liner flex—2 ply 0.26 mm thickness (b) Single wall flexible connector— 0.31 mm thickness	None	Any <i>appliance</i> (Not to exceed 300°C)	(a) is suitable for use as a chimney liner (b) is suitable where changes of direction are required (e.g., as an alternative to <i>flue</i> elbows) Neither (a) nor (b) to be used where mechanical damage could occur
Bricks (clay building) Cement or lime mortar joints	None	Any <i>appliance</i> (Not to exceed 300°C)	Only slight <i>condensation</i> allowable, minimum wall thickness of <i>flue</i> 50 mm
Bricks	Inside face lined with acid-resisting tiles embedded in acid-resisting jointing material	Any <i>appliance</i> , particularly suitable for heavy <i>condensation</i> (Not to exceed 300°C)	<i>Flues</i> lined with non-absorbent tiles shall have provision made for <i>condensate</i> drainage
Bricks	Faced with water and acid-proof cement mix	Any <i>appliance</i> (Not to exceed 300°C)	Only slight <i>condensation</i> allowable
Copper not less than 0.5 mm thickness	None	Any <i>appliance</i> (Not to exceed 300°C)	Only slight <i>condensation</i> allowable
Fibre cement, light grade (asbestos free)	Autoclaved	Any <i>appliance</i> (Not to exceed 300°C)	Only slight <i>condensation</i> allowable
Fibre cement, heavy grade (asbestos free)	Autoclaved	High temperature <i>flues</i> (Above 300°C)	None

(continued)

TABLE 3.2 (continued)

Material	Protective finish	Application (Temperature restrictions)	Limitations (see Note)	
Fire bricks, set in fireclay	None	Especially very high temperature <i>flues</i> (Above 300°C)	None	
<i>Flue bricks</i> (see definition)	None or glazed internally	Any <i>appliance</i> but if <i>condensation</i> is heavy, internally glazed <i>flue bricks</i> shall be used (Not to exceed 300°C)	<i>Technical regulator</i> to be consulted prior to commencement of work Joints to be acid-resisting Bricks glazed internally shall have provision made for <i>condensate</i> drainage Provision of an air gap between the <i>flue brick</i> and the finished wall may be necessary to minimize heat transfer Non-glazed, only slight <i>condensation</i> is allowable	
Mild steel 1.6 mm thickness	None	High-temperature <i>flues</i> (Above 300°C)	Only where <i>accessible</i> for renewal	
Mild steel 0.6 mm thickness 0.8 mm thickness 1.0 mm thickness	Aluminised 122 g/m ² , or Z275 zinc to AS 1397, or aluminium zinc to AS 1397	Any <i>appliance</i> (Not to exceed 300°C)	Only where <i>accessible</i> for inspection and renewal Internal <i>flues</i> not to exceed 12 m in length, external <i>flues</i> not to exceed 7 m	
			Wall thickness mm	Maximum <i>flue</i> diameter mm
			0.6 0.8 1.0	100 200 300
Precast concrete bricks or blocks	None	Any <i>appliance</i> (Not to exceed 300°C)	Only slight <i>condensation</i> allowable, minimum wall thickness of <i>flue</i> 50 mm	
Stainless steel 0.5 mm thickness 0.7 mm thickness	300 and 430 series Grade	Any <i>appliance</i> (Not to exceed 500°C)	Wall thickness mm	Maximum <i>flue</i> diameter mm
			0.5 0.7	100 200

(continued)

TABLE 3.2 (continued)

Material	Protective finish	Application (Temperature restrictions)	Limitations (see Note)	
<i>Twin wall flue, complying with AG 605(to be AS 4567)</i>	As per AG 605 (to be AS 4567)	To prevent heat transfer to adjacent structures and to minimize <i>condensation</i> (Not to exceed 300°C) <i>Certified appliances</i> with a <i>draught diverter</i> will meet this maximum <i>flue gas</i> temperature requirement		
UPVC to AS/NZS 1260	None	Low temperature <i>flues</i> (Not to exceed 60°C)	None	

NOTE: In addition to the listed limitations, consideration needs to be given to the deleterious effect of some *flue* products from some *appliances*, e.g., pottery kilns, incinerators, atmosphere generators or the like.

SECTION 4 INSTALLING CONSUMER PIPING

NOTE: Table 3.1 also contains some installation requirements.

4.1 CONSUMER PIPING—GENERAL

4.1.1 Condition of pipe and fittings

Pipe and *fittings* shall be clear and free from cutting burrs, defects in structure or threading, cutting oil or grease, weld or braze deposits, flux residues and other such contaminants.

4.1.2 Prohibition of earthing through consumer piping

Consumer piping shall not be used as an earth for any electrical supply system.

NOTE: This Clause does not preclude the application of equipotential bonding in accordance with AS/NZS 3000.

4.1.3 Protection of pipes from building materials

Before commencing a *gas installation*, it shall be established if any material used in the building construction is corrosive. Where there is such material present, pipes shall be suitably protected.

4.1.4 Handling of pipe

Unloading, hauling, handling and installing of pipe shall be carried out with care to avoid damage to the pipe or to any protective coating.

4.1.5 Condition of pipe during installation

Precautions shall be taken to prevent the entry of dirt or other foreign matter from entering the pipe during installation.

4.1.6 Restriction on repair of defective pipe or fitting

Pipe or a *fitting* shall not be repaired except for repair of a defective welded or brazed joint. Where a defective pipe or *fitting* is found it shall be replaced.

4.1.7 Pipe installation not to reduce building strength or fire resistance

The design strength or fire resistance of a building, or part of a building, shall not be reduced by the installation of a pipe.

4.1.8 Restriction on use of thread sealant

Thread sealant, or any other sealing material, shall not be applied to a compression joint.

NOTES:

- 1 A compression joint includes a flare, a union, and a *POL* connection to a *cylinder* valve.
- 2 In Table 3.1 the only thread sealant permitted for use on a plastics *fitting* is PTFE (teflon) tape.

4.1.9 Welding of metallic pipe

Welding procedures and tests shall be in accordance with AS 1697 or AS 4041.

NOTES:

- 1 The *technical regulator* may require the welder to be authorized.
- 2 Where bronze welding is to be carried out, the *technical regulator* may require to be specifically advised prior to the commencement of this work.

4.1.10 Bending pipe

Every bend and offset in a pipe shall be free from any buckle, crack, or other evidence of physical damage to the pipe or its protective coating.

4.1.11 Re-making a flanged joint

Where a flanged joint is to be re-made, the gasket shall be renewed.

4.1.12 Identification of pipework

Except in single occupancy residential *premises*, above ground *consumer piping* shall be identified when any one of the following applies:

- (a) The *operating pressure* of the *consumer piping* exceeds 7 kPa.
- (b) The location of the pipe is such that it is not readily identifiable as *consumer piping*.

The identification marking shall comply with Figure 4.1.

The identification markings are to be placed—

- (c) at spacings of not more than 8 m;
- (d) adjacent to branches, junctions, valves, wall and floor penetrations; and
- (e) on all *tailpipes*.

NOTE: Durable adhesive pipe markers may be used for identifying *consumer piping*.

The identification is to comply with AS 1345 in all other respects.

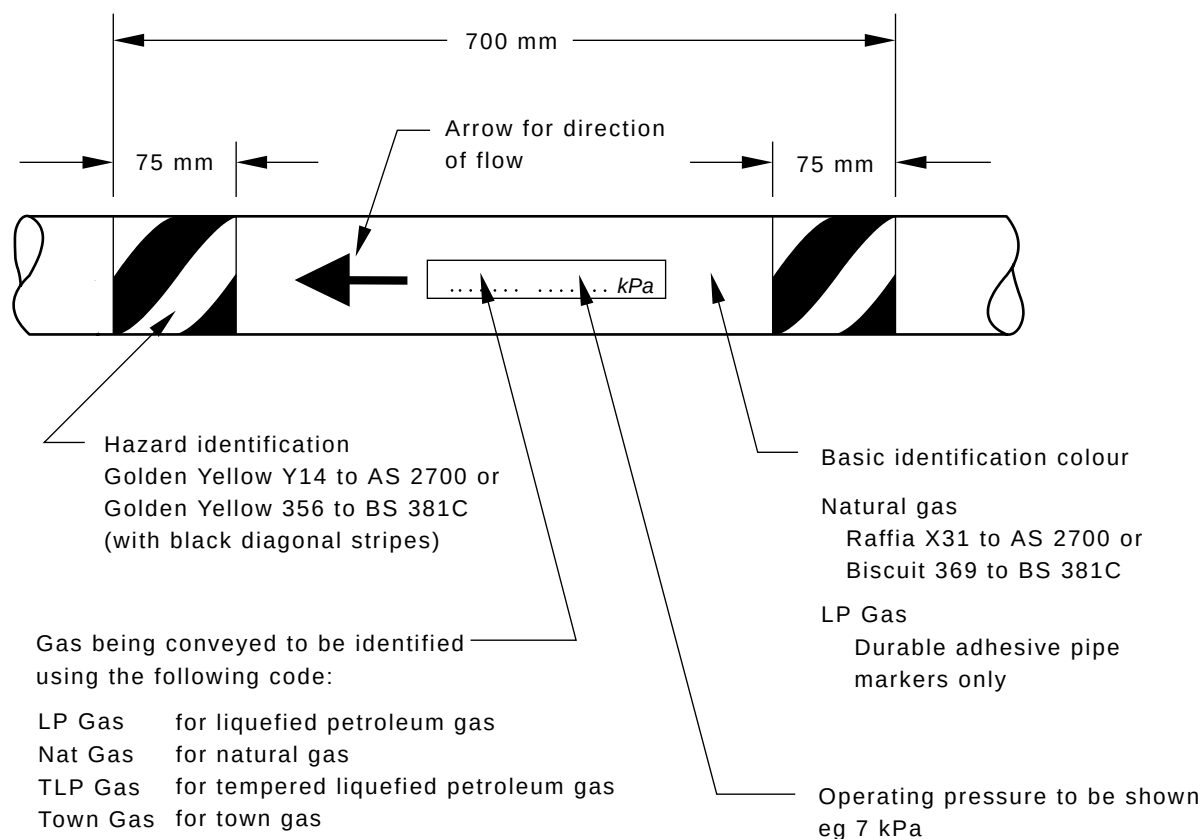


FIGURE 4.1 IDENTIFICATION OF PIPEWORK

4.2 DESIGN OF CONSUMER PIPING

NOTE: Where *consumer piping* is intended to operate at a *pressure* exceeding 7 kPa, or for *LP Gas* 140 kPa, the *technical regulator* may require plans and specifications to be submitted prior to the commencement of work on the installation.

4.2.1 Pressure rating of piping and components

All piping and components in a *consumer piping* system up to and including the next downstream *gas pressure regulator* shall be able to withstand a *pressure* of not less than—

- (a) 100% of the inlet *pressure* to the next upstream *regulator*; or
- (b) the setting of any *over-pressure protection* fitted to the next upstream *regulator*.

NOTES:

- 1 This Clause also applies if there is no *gas pressure regulator* installed in the *consumer piping* system.
- 2 It will be necessary to determine, from the *network operator* or *LP Gas* supplier the maximum *pressure* that could occur under *gas pressure regulator* fault conditions at the outlet of the *consumer billing meter* or the outlet of the *cylinder* or *tank regulator*.

4.2.2 Requirements where pressurized air, oxygen or a stand-by gas is to be used in conjunction with the fuel gas

NOTE: If air, oxygen or another *gas* is mixed with the fuel *gas*, an explosive mixture may result. Therefore, where work involving air, oxygen or stand-by *gas* in conjunction with *consumer piping* is to be carried out, the *technical regulator* may require to be specifically advised prior to the commencement of any work.

Where pressurized air, oxygen or a stand-by *gas* is to be used in conjunction with the fuel *gas*, a suitable protective device, to avoid contamination of the fuel *gas*, shall be installed in the *consumer piping* as close as possible to and upstream of the point of interconnection of any *gas* and air, oxygen or stand-by *gas* line.

NOTES:

- 1 A *gas* and combustion air mixing device incorporating a normally closed double diaphragm *zero regulator* used in conjunction with a proportional mixing device requires no further protection unless connected directly to an air or oxygen supply which operates at a *pressure* exceeding 7 kPa.
- 2 Suitable protective devices include—
 - (a) a *non-return valve*;
 - (b) a three-way valve that completely closes one side before opening the other;
 - (c) a reverse flow detector that controls a positive shut off valve;
 - (d) a normally-closed air-actuated positive shut off *pressure regulator* (e.g., *zero regulator* used in conjunction with a proportional mixing device); or
 - (e) a *flame safeguard system* incorporating Class 1 automatic shut off valves, which comply with AG 214 (to be AS 4629) and are *certified*.

4.2.3 Consumer piping size—General

The diameter(s) of *consumer piping* shall be sufficient to ensure adequate *gas* supply to the *appliance(s)* and shall be determined by calculation using recognized formulae or tables.

4.2.4 Pipe size for consumer piping supplying a Type A appliance

The diameter of piping, intended to supply a *Type A appliance*, shall be such that the minimum pressure in Table 4.1 is available at the *appliance* inlet.

The minimum *pressure* shall be available at each *appliance* with all *appliances* connected to the *consumer piping* operating at maximum *gas consumption*.

TABLE 4.1
‘TYPE A’ APPLIANCE—MINIMUM INLET PRESSURE

Gas type	Minimum pressure at appliance inlet kPa (Note 1)
<i>NG, SNG</i>	1.13
<i>TG, TLP</i>	0.75
<i>LP Gas</i>	2.75

NOTE: The *appliance* inlet is the inlet to the first *appliance* control device other than the *appliance manual shut off* valve if fitted.

4.2.5 Flexibility of piping

Consumer piping shall be designed to have sufficient flexibility to prevent all of the following:

- (a) Excessive stress in the piping material and attached equipment caused by thermal expansion and contraction.
- (b) Excessive bending or loading at joints.
- (c) Undesirable forces or movements at points of connection to equipment or at anchorage or guide points.

NOTES:

- 1 The *technical regulator* may require formal calculations where reasonable doubt exists regarding adequate flexibility of the system. Reference should be made to AS 4041 for guidance.
- 2 The requirements of the Clause may be satisfied by use of one or more of the following:
 - (a) Bends, loops or offsets formed in the piping.
 - (b) Flexible joints or couplings of the type designed to absorb thermal expansion and contraction.
 - (c) Expansion joints.
- 3 See also Clauses 4.2.6, 4.3 and 4.12.3.

4.2.6 Pipe alignment at expansion joint

Pipe alignment guides shall be used with an expansion joint. The guides shall be fitted in accordance with the manufacturer's recommendations.

4.2.7 Means of disconnection

Where a *manual shut off* valve is installed in *consumer piping*, an appropriate means of disconnection shall be provided at the outlet of the valve.

4.2.8 Building isolation

Except in the case of single occupancy residential *premises*, where more than one building is to be supplied with *gas* from one *consumer billing meter* or *gas* storage vessel, all of the following shall apply:

- (a) The *consumer piping* is to include a *manual shut off* valve at the point of entry to each building.

NOTE: The consumer piping should be designed to ensure that when a valve is turned off, the *gas* supply to only one building is affected.

- (b) The valve is to be *accessible* and external to the building.
- (c) A durable permanent sign is to be located in a prominent position adjacent to the valve. The sign is to include the following wording—

‘GAS VALVE’

4.2.9 Emergency valve (Steam boilers and hot water boilers)

4.2.9.1 Provision of emergency valve

When a *steam boiler* or *hot water boiler* is installed, an emergency single-action quarter-turn *manual shut off valve* of the ball type, to isolate the *gas* supply, shall be provided and—

- (a) be located in a safe, *accessible* position remote from the boiler; and
- (b) be clearly identified by means of an appropriate sign.

4.2.9.2 Location of emergency valve for boiler in plant room or boiler house

When a *steam boiler* or *hot water boiler* is installed in a *plant room* or boiler house, the emergency valve required in Clause 4.2.9.1 shall be located outside the *plant room* or boiler house.

4.3 SUPPORT OF CONSUMER PIPING

4.3.1 Consumer piping support system requirements

The *consumer piping* support system shall comply with all of the following:

- (a) Be capable of supporting the piping system.

NOTES:

To satisfy this requirement consideration needs to be given to—

- 1 the construction and dimensions of the supporting device and its components;
 - 2 the method and strength of attachment to the supporting structure as well as the stability of the supporting structure; and
 - 3 the possibility of damage to exposed *consumer piping* spanning joists or bearers.
- (b) Firmly restrain the piping in the intended position and control movement of the piping system.
 - (c) Have any component of the supporting system, which is to be in contact with the pipe, made of material that is compatible with the *consumer piping* material.

4.3.2 Spacing of supporting devices

The spacing of supporting devices shall not exceed those given in Table 4.2.

TABLE 4.2
SPACING OF SUPPORTING DEVICES

Nominal size (DN)	Vertical or horizontal run spacing m			
	Steel pipe	Copper pipe	Semi-rigid stainless steel pipe	Composite pipe
8	2	1	—	—
10	2	1.5	—	—
12	—	—	0.5	0.75
15	2	1.5	0.5	1
18	—	1.5	—	—
20	2.5	1.5	0.5	1.25
25	2.5	2	0.5	1.5
32	3	2.5	0.5	2
40	3	2.5	—	—
50	3	3	—	—
65	3	3	—	—
80	4	4	—	—
100	4	4	—	—
125	4	4	—	—
150	4	4	—	—
200	4	4	—	—

NOTE: For *caravans* see Clause 6.2.5.10 and for marine craft see Clause 6.3.6.7.

4.3.3 Diameter of rod hangers

The diameter of rod hangers shall comply with Table 4.3.

TABLE 4.3
DIAMETER OF ROD HANGERS

Nominal size (DN)	Minimum rod diameter for single rod hangers (See Note) mm
up to 50	9.5
65 to 90	12.7
100 to 125	15.8
150 to 200	19.0

NOTE: Where two rod hangers are to be used at a support point, the minimum diameter indicated by the table may be reduced by one standard size for all rods greater than 9.5 mm.

4.4 CORROSION CONTROL

4.4.1 Joining of electrochemically incompatible materials in the ground

Where electrochemically incompatible materials buried in the ground are to be joined, a suitable *insulating joint* shall be used for the connection.

4.4.2 Requirement where coated steel pipe emerges from the ground

Where steel pipe coated with high density polyethylene or coated with an appropriate proprietary wrapping is to emerge from the ground, the coating or wrapping shall be extended at least 300 mm out of the ground.

NOTE: This requirement applies to all locations where the *consumer piping* enters or leaves the ground.

4.4.3 Requirement where consumer piping is to include cathodic protection

Where *consumer piping* is to include cathodic protection, a suitable *insulating joint* shall be fitted—

- (a) where the *consumer piping* emerges from the ground; and
- (b) with a clearance of at least 300 mm from the ground.

NOTE: This requirement applies to all locations where the *consumer piping* enters or leaves the ground.

4.4.4 Consumer piping in a corrosive environment

Where a pipe or *fitting* is to be installed in a corrosive environment the pipe or *fitting* shall be protected.

NOTE: The sheathing, coating or wrapping of a pipe or *fitting*, installing of cathodic protection, sacrificial anodes or rectifier units, dependent on the situation, will satisfy this requirement.

4.4.5 Proving effectiveness of pipe protection

Where *consumer piping* is to be in the ground and protection is required by Clause 4.4.3 or Table 3.1, the effectiveness of such protection shall be proved by recognized methods.

4.4.6 Corrosion protection of uncoated or bare steel pipe

Uncoated or bare steel *consumer piping* shall be protected against corrosion as soon as possible after installation and before commissioning by—

- (a) removing oil and grease by the use of a suitable solvent;
- (b) removing loose mill scale and rust; and
- (c) after completion of (a) and (b), applying an adequate paint system, which will provide durable protection.

NOTES:

- 1 When the pipe surface has been prepared the following is considered an adequate paint system, provided the piping will not be subjected to harsh environmental conditions:
 - (a) Apply a coat of zinc phosphate iron oxide primer to the piping, (ensure a good coverage has been obtained).
 - (b) After the primer is dry, apply two coats of high gloss external enamel paint. The first coat is to dry before the second coat is applied.

- 2 Where harsh environmental conditions exist or regular maintenance of the protection will be difficult, a higher standard of preparation and protection should be used.

4.5 CONSUMER PIPING GAS PRESSURE REGULATORS

4.5.1 Requirements for a consumer piping gas pressure regulator

A *regulator* shall be acceptable to the *technical regulator* and comply with all of the following:

- (a) Be constructed of material, and use lubricants, suitable for the particular application.
- (b) Have a capacity suitable for the designed *gas load* and allowable *pressure* drop for the particular application.
- (c) Meet the requirements of Clause 4.2.1.

4.5.2 Consumer piping gas pressure regulator installation requirements

A *consumer piping gas pressure regulator* shall be installed in accordance with all of the following:

- (a) Above ground unless the *technical regulator* permits otherwise.
- (b) In a well-ventilated place.
- (c) Protected from the entry and accumulation of water (e.g., sprinkler water, rainwater, etc) and other foreign matter.
- (d) Readily *accessible* for maintenance and adjustment.
- (e) In a place where it will not be subjected to excessive temperature.
- (f) Positioned to minimize the possibility of ignition of any discharge from a *breather vent*.

NOTE: For the discharge of a *breather vent* within an *enclosure* or room see Clause 4.7.9.

- (g) Positioned to minimize exposure to physical damage.

NOTE: Particular attention should be given to the risk of impact from falling ice and snow, where appropriate.

4.5.3 Prohibited locations for a consumer piping regulator

A *consumer piping gas pressure regulator* shall not be installed in any of the following locations:

- (a) A lift shaft or lift motor room.
- (b) A room specifically intended for electrical switch gear.
- (c) A fire-isolated stairway or passageway.
- (d) A fire hydrant duct or hose reel cabinet.
- (e) Sprinkler or hydrant pump room.
- (f) In such a position that would obstruct egress from a building.
- (g) In a cavity wall.