

AS/NZS 5601.1:2022

(Incorporating Amendments up to and including No. 2)



STANDARDS
Australia



Australian/New Zealand Standard™

Gas installations

Part 1: General installations



This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee AG-006, Gas Installation. It was approved on behalf of the Council of Standards Australia on 18 September 2022 and by the New Zealand Standards Approval Board on 3 August 2022.

This Standard was published on 30 September 2022.

The following are represented on Committee AG-006:

- Access Canberra
- 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
- Victorian Building Authority
- WorkSafe New Zealand

This Standard was issued in draft form for comment as DR AS/NZS 5601.1:2020.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

www.standards.govt.nz

Australian/New Zealand Standard™

Gas installations

Part 1: General installations

Originated in Australia as AS 5601/AG 601—2000.
Originated in New Zealand as NZS 5261:1996.
Revised, amalgamated and redesignated AS/NZS 5601.1:2010.
Previous edition 2013.
Third edition 2022.
Reissued incorporating Amendment No 1 (March 2023).
Reissued incorporating Amendment No 2 (September 2024).

© Standards Australia Limited 2024

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

A2 This Standard incorporates Amendment No. 1 (March 2023) and Amendment No. 2 (September 2024). The start and end of changes introduced by the Amendments are indicated in the text by tags including the Amendment numbers 1 and 2. **A2**

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](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Contents

Preface	ii
Section 1 Scope and general	1
1.1 Scope, exclusions and application	1
1.1.1 Scope	1
1.1.2 Exclusions	1
1.1.3 Application	1
1.2 Normative references	3
1.3 Terms and definitions	6
1.4 Work health and safety	22
1.5 System of units	22
Section 2 Essential safety and performance-based design requirements	23
2.1 Essential safety requirements	23
2.1.1 Limitations on installation of an appliance	23
2.1.2 Push-on connectors limited to connecting laboratory Bunsen burners	23
2.1.3 Installation in a cupboard	23
2.1.4 [Text deleted]	23
2.1.5 Repair of pipe or pipe fittings	23
2.2 Performance-based design requirements	23
2.2.1 General work and safety requirements	23
2.2.2 Materials, fittings and components	25
2.2.3 Consumer piping	26
2.2.4 Flues	28
2.2.5 Installing appliances	29
Section 3 Means of conformance — General requirements and safe work practices	32
3.1 Gas supply	32
3.2 Gas demand	32
3.3 Safe work practices	32
3.3.1 General	32
3.3.2 Isolating gas supply	33
3.3.3 Purging after completion of work	33
3.4 Sealing of open pipe ends	33
3.4.1 Removal of debris	33
3.4.2 Open ends to be sealed while work is in progress	33
3.4.3 Outlet provided for future connection to be sealed	33
3.5 Testing of piping	34
3.5.1 Testing a new gas installation	34
3.5.2 Testing consumer piping after alteration, repair or extension	34
3.6 Acceptable substances for testing	34
3.7 Hot-tapping of branch fitting to consumer piping	34
3.8 Increasing the operating pressure of existing consumer piping	34
3.9 Dealing with dangerous gas installations	34
3.10 Methods of locating gas leaks	35
3.11 Safety requirements in the vicinity of gas leaks or suspected gas leaks	35
3.12 Safe discharge of static electricity	35
3.13 Electrical safety bonding or bridging	36
3.14 Clearing a blockage in consumer piping	36
Section 4 Means of conformance — Materials, fittings and components	37
4.1 General	37
4.1.1 Suitability for use	37
4.1.2 Re-use of materials and components	37
4.1.3 Mating parts	37
4.2 Materials for consumer piping	37
4.3 Consumer piping restrictions	51

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.4	Prohibited types of joints and fittings	51
4.5	Proprietary systems	52
4.5.1	Suitability for intended use	52
4.5.2	Installation of proprietary systems	52
4.5.3	Substitution of components	52
4.5.4	Identification of proprietary piping systems	52
4.6	Material between LP gas cylinder valve and inlet to first regulator	52
4.7	Other materials	52
4.7.1	Gasket material	52
4.7.2	Jointing compounds and materials	53
4.7.3	Vent line material	53
4.7.4	Flue materials and limitations	54
4.8	Components	55
4.8.1	Miscellaneous components	55
4.8.2	Manual shut-off valves	56
4.8.3	Hose assemblies	56
4.8.4	Swivel joints and couplings	56
Section 5	Means of conformance — Installation of consumer piping	57
5.1	General	57
5.1.1	Condition of pipe and pipe fittings	57
5.1.2	Prohibition of earthing through consumer piping	57
5.1.3	Protection from other materials	57
5.1.4	Storage and handling of pipe	57
5.1.5	Condition of pipe during installation	57
5.1.6	Restriction on repair of defective pipe or pipe fitting	57
5.1.7	Jointing	57
5.1.8	Restriction on use of thread sealant	58
5.1.9	Bending pipe	58
5.1.10	Re-making a flanged joint	58
5.1.11	Pipe installation not to reduce building strength or fire resistance	58
5.1.12	Identification of pipework	58
5.2	Design of consumer piping	59
5.2.1	Pressure rating of piping and components	59
5.2.2	Appliance pressure rating	60
5.2.3	Requirements where pressurized air, oxygen or a standby gas is to be used in conjunction with the fuel gas	60
5.2.4	Consumer piping size	60
5.2.5	Flexibility of piping	61
5.2.6	Pipe alignment at expansion joint	61
5.2.7	Occupancy isolation	61
5.2.8	Building isolation	62
5.2.9	Isolation for specific installations	62
5.2.10	Provision of emergency valve (steam boilers and hot water boilers)	63
5.2.11	Provision of fire emergency isolation for multilayer pipe	63
5.2.12	Reversion fittings for proprietary multilayer piping	65
5.3	Location of consumer piping	66
5.3.1	Prohibited locations	66
5.3.2	Piping in an air duct, plenum ceiling, air-handling plenum or ventilating duct	67
5.3.3	Piping not to be subject to physical damage	67
5.3.4	Separation from above-ground low and extra low voltage electrical equipment	67
5.3.5	Piping to not support an electrical conductor	67
5.3.6	Piping to not be exposed to liquid discharge	67
5.3.7	Above-ground piping to not touch the ground	67
5.3.8	Piping in a concealed location other than underground or embedded in concrete	68
5.3.9	Piping passing through a building's exterior wall	68
5.3.10	Piping passing through floors and internal walls	68

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.3.11	Piping in the ground beneath a building.....	69
5.3.12	Ventilation of concealed piping.....	69
5.3.13	Piping embedded in concrete.....	69
5.3.14	Consumer piping in wooden joists or metal-framed walls.....	70
5.3.15	Piping in steel-framed buildings.....	73
5.3.16	Location of multilayer piping.....	73
5.4	Installation of consumer piping buried in the ground.....	74
5.4.1	Consumer piping beneath a building.....	74
5.4.2	Bedding and support of pipe in the ground.....	74
5.4.3	Depth of cover.....	74
5.4.4	Quality of bedding and backfill.....	74
5.4.5	Consolidation of bedding and backfill material.....	74
5.4.6	Marker tape and tracer wire.....	75
5.4.7	Termination of plastics or multilayer pipe and metallic continuation.....	75
5.4.8	Securing a riser.....	75
5.4.9	Separation from underground electrical cable.....	75
5.4.10	Separation from underground electrical earthing electrode.....	75
5.4.11	Separation from underground communication cable.....	76
5.4.12	Separation from underground services.....	76
5.4.13	Crossing other underground services.....	76
5.5	Corrosion control.....	76
5.5.1	Corrosion protection of bare steel.....	76
5.5.2	Corrosion protection of above-ground pipework.....	76
5.5.3	Joining of electrochemically incompatible materials.....	77
5.5.4	Requirement where coated steel pipe emerges from the ground.....	77
5.5.5	Requirement where consumer piping is to include cathodic protection.....	77
5.6	Water and dust clearing provision in consumer piping.....	77
5.6.1	Provision of tailpipe.....	77
5.6.2	Design and location of a tailpipe.....	77
5.6.3	Marking of tailpipes.....	78
5.6.4	Tailpipes that terminate below ground level.....	78
5.6.5	Provision for dust clearing.....	78
5.7	Consumer piping for a high-rise building.....	78
5.7.1	General.....	78
5.7.2	Prohibition on flexible hoses.....	78
5.7.3	Plan of consumer piping to be displayed on site.....	78
5.7.4	Manual shut-off valve in riser and lateral.....	79
5.7.5	Support and flexibility of riser.....	79
5.7.6	Minimizing strain at a lateral.....	79
5.8	Support of consumer piping.....	79
5.8.1	Consumer piping support system requirements.....	79
5.8.2	Spacing of supporting devices.....	80
5.8.3	Diameter of rod hangers.....	80
5.9	Use of hose assemblies.....	80
5.9.1	Hose assembly requirements.....	80
5.9.2	Prohibited location of hose assembly connection point.....	81
5.9.3	Location of connection point for hose assembly.....	81
5.9.4	Hose assembly — Prohibited installation methods.....	81
5.9.5	Hose assembly — Operating conditions.....	81
5.9.6	Hose assembly connecting an appliance.....	82
5.10	Quick-connect devices.....	82
5.10.1	Quick-connect device installed outside above ground.....	82
5.10.2	Quick-connect device socket installation method where subjected to water or dust.....	82
5.10.3	Quick-connect devices installed outdoors below ground.....	82
5.11	Installing gas equipment.....	83
5.11.1	Consumer piping gas pressure regulators.....	83
5.11.2	Over-pressure.....	84

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.11.3	Protection of gas supply system from low pressure where a gas pressure-raising device or a gas engine is installed	85
5.11.4	Pressure test points.....	85
5.11.5	Venting.....	86
5.11.6	Sub-meters.....	91
5.12	Gas pressure-raising devices.....	92
5.12.1	Protection against pulsation.....	92
5.12.2	Connection requirements	92
5.12.3	Required controls.....	92
5.12.4	Requirements of downstream pipe and equipment.....	93
5.13	Ventilation of gas equipment.....	93
5.13.1	General	93
5.13.2	Natural ventilation to outside	93
5.13.3	Natural ventilation via adjacent room	94
5.13.4	Mechanical ventilation.....	94
5.13.5	Ventilation of an enclosure containing a meter or regulator and a gas pressure-raising device.....	95
5.13.6	Ventilation of an enclosure containing gas equipment and an appliance.....	95
5.13.7	Location of openings.....	95
Section 6	Means of conformance — Installation of appliances	96
6.1	Requirements for appliances.....	96
6.1.1	New Zealand requirements.....	96
6.1.2	Australian requirements.....	96
6.1.3	Appliance conversion.....	96
6.2	General installation requirements.....	96
6.2.1	Determination of adequate gas supply	96
6.2.2	Manufacturer's installation instructions.....	97
6.2.3	Restriction on flueless appliances.....	97
6.2.4	Restriction on appliance location.....	97
6.2.5	Temperature limitation on nearby combustible surface.....	98
6.2.6	Appliances using pressurized air or oxygen or having a standby gas connected.....	98
6.2.7	Automatic control to fail safe	98
6.2.8	Electrical requirements.....	98
6.2.9	Restoration of electricity supply	98
6.2.10	Appliance support.....	99
6.2.11	Earthquake restraint.....	99
6.2.12	Gas connections for appliances subject to vibration	99
6.2.13	Connection of an appliance designed to move on castors, rollers or wheels.....	99
6.2.14	Appliance restraint where a hose assembly is used.....	99
6.2.15	Push-on connectors limited to connecting laboratory Bunsen burners.....	99
6.3	Appliance location.....	99
6.3.1	Adverse effect of air movement systems.....	99
6.3.2	Protection from physical damage.....	100
6.3.3	Accessibility.....	100
6.3.4	Hazards to buildings or persons.....	100
6.3.5	Proximity of flammable goods or chemicals.....	100
6.3.6	Presence of water	100
6.3.7	Installation above a source of cooking vapour, steam, grease or heat.....	100
6.3.8	Installation in a cupboard	100
6.3.9	Installation in a bedroom	101
6.3.10	Installation in a residential garage.....	101
6.3.11	Appliance in a roof space.....	101
6.3.12	Location of appliances in residential premises.....	102
6.3.13	Appliance on roof, wall or elevated structure in locations other than single residential premises.....	102
6.3.14	Appliance under a floor.....	103
6.4	Air supply to appliances	103

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.4.1	Adequacy of air supply	103
6.4.2	Quality of air supply	103
6.4.3	Installation where atmosphere is contaminated	103
6.4.4	Specific appliance ventilation requirements	103
6.4.5	Air requirements for appliances	104
6.4.6	Air requirements for appliances — New appliance installations — Australia only	106
6.4.7	Special requirements for flueless space heaters	115
6.4.8	Appliance in a residential garage	115
6.4.9	Mechanical ventilation	115
6.4.10	Interlock for air supply to appliances	116
6.4.11	Air heating appliance in a confined space	116
6.4.12	Combustion and dilution air for an open flued appliances	116
6.5	Gas shut-off when automatic fire equipment operates	116
6.5.1	Interlock of automatic fire-extinguishing equipment with gas supply	116
6.5.2	Interlock of automatic fire damper and gas supply	116
6.5.3	Gas shut-off controls interfaced with fire alarm systems	116
6.6	Appliance connection	116
6.6.1	Restriction on appliance connection	117
6.6.2	Pipe connection	117
6.6.3	Means of isolation	117
6.6.4	Means of disconnection	117
6.6.5	Fitting of an appliance gas pressure regulator	117
6.7	Flue design	118
6.7.1	Provision of a flue	118
6.7.2	Effect on building strength or fire resistance	118
6.7.3	Material	118
6.7.4	Design requirements	118
6.7.5	Flue gases not to cause a nuisance	118
6.7.6	Common or combined flues	118
6.7.7	Draught diverters	119
6.7.8	Power flues	120
6.7.9	Flue cowls	120
6.7.10	Condensate drains	120
6.7.11	Use of existing flue or chimney	120
6.8	Flue installation	120
6.8.1	Provision for removal of appliance	120
6.8.2	Support independent of appliance	121
6.8.3	Soft-soldered flue joints	121
6.8.4	Flue joints	121
6.8.5	Weatherproofing through a roof or wall	121
6.8.6	Chimneys	121
6.8.7	Clearance around a draught diverter	121
6.8.8	Prohibited locations for flues	121
6.8.9	Concealed metal flues	121
6.8.10	Application of twin wall flues	122
6.8.11	Clearance between a single wall flue and a combustible surface	122
6.8.12	Protection of combustible surfaces	122
6.8.13	Protection of adjacent non-combustible materials from heat of flue	123
6.8.14	Clearance from wiring and other services	123
6.9	Flue terminals	123
6.9.1	Terminating an open flue — Location	123
6.9.2	Terminating a flue above a roof	124
6.9.3	Location of flue terminals around the perimeter of a building or structure	124
6.9.4	Flue terminal under a covered area, in a recess or on a balcony	127
6.9.5	Terminating a flue in a roof space	129
6.9.6	Clearances of flue terminals around a GMS (New Zealand only)	129
6.10	Additional requirements for installation of specific appliances	129

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.1	Domestic gas cooking appliances.....	129
6.10.2	Commercial catering equipment.....	134
6.10.3	Instantaneous water heaters.....	138
6.10.4	Storage water heaters.....	138
6.10.5	Pool heaters (including those for swimming, spa and therapeutic pools).....	139
6.10.6	Space heaters.....	140
6.10.7	Overhead radiant heaters.....	141
6.10.8	Patio heaters.....	142
6.10.9	Decorative flame effect fires, other than flame effect gas space heaters.....	143
6.10.10	Ducted air heaters.....	144
6.10.11	Air curtains.....	144
6.10.12	Direct fired air heaters.....	145
6.10.13	Overhead radiant tube heaters.....	145
6.10.14	Laundry dryers.....	146
6.10.15	Gas lights.....	147
6.10.16	Incinerators.....	147
6.10.17	Pottery kiln.....	148
6.10.18	Refrigerator.....	149
6.10.19	Gas barbecues and radiant gas heaters for outdoor use.....	150
6.11	Commissioning.....	150
6.11.1	General.....	150
6.11.2	Australian requirements.....	150
6.11.3	New Zealand requirements.....	151
6.11.4	Commissioning of appliances.....	151
Appendix A	(normative) Location of flue terminals for small gas engine driven <i>appliances</i>	152
Appendix B	(informative) Conversion factors	154
Appendix C	(normative) Thermal protection of combustible materials	155
Appendix D	(informative) Purging	159
Appendix E	(normative) Testing for gastightness	164
Appendix F	(normative) Sizing consumer piping	168
Appendix G	(normative) Determination of maximum breather vent orifice size for devices not vented to outside atmosphere	246
Appendix H	(normative) Flue design	251
Appendix I	(informative) Appliances in outdoor areas	273
Appendix J	(Informative) LP Gas cylinder locations	276
Appendix K	(informative) Gas in high-rise buildings	286
Appendix L	(informative) Consumer billing meter installations	293
Appendix M	(informative) Special requirements in Australian jurisdictions	296
Appendix N	(informative) Guidelines for commissioning of appliances	299
Appendix O	(informative) Symbols used in gas control system diagrams	301
Appendix P	(informative) Gas installation checklist	303
Appendix Q	(normative) Spillage test for open flued appliances	306
Bibliography		314
Index		316
Amendment control sheet		323

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Gas installations

Part 1: General installations

Section 1 Scope and general

1.1 Scope, exclusions and application

1.1.1 Scope

^{A2} This Standard specifies performance-based 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 biomethane.

In addition, the performance-based requirements in Section 2 may be applied to hydrogen, hydrogen blended with natural gas or LP Gas, renewable LP Gas, LP Gas blended with dimethyl ether (DME) and biogas to supply an appliance. See Notes 3 and 4.

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.

NOTE 3 Hydrogen blended natural gas and biomethane that conforms to AS 4564 in Australia and NZS 5442 in New Zealand is considered natural gas in the context of this document.

NOTE 4 Renewable LP Gas and LP Gas blended with dimethyl ether (DME) that conforms to AS 4670 in Australia and NZS 5435 in New Zealand are considered LP Gas in the context of this document.^{A2}

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 is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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)*

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

[A2] [Text deleted] [A2]

AS 4553, *Gas space heating appliances*

AS 4566, *Flue cowls — 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*

[A2] AS 4629:2005, *Automatic shut-off valves and vent valves*

AS 4629.1, *Automatically operated valves for use with gas, Part 1: Shut-off valves*

AS 4629.2, *Automatically operated valves for use with gas, Part 2: Vent valves* **[A2]**

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*

[A2] AS 1869 (all parts), *Hose and hose assemblies for liquefied petroleum gases (LP Gas), natural gas and town gas* **[A2]**

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

[A2] AS 2492, *Cross-linked polyethylene (PE-X) pipes for pressure applications* **[A2]**

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

AS 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*

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

API 5L, *Specification for line pipe*

EN 12566, *Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0,5 bar*

DIN 30652-1, *Excess flow valves – Part 1: Excess flow valves for gas installation* 

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*

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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**

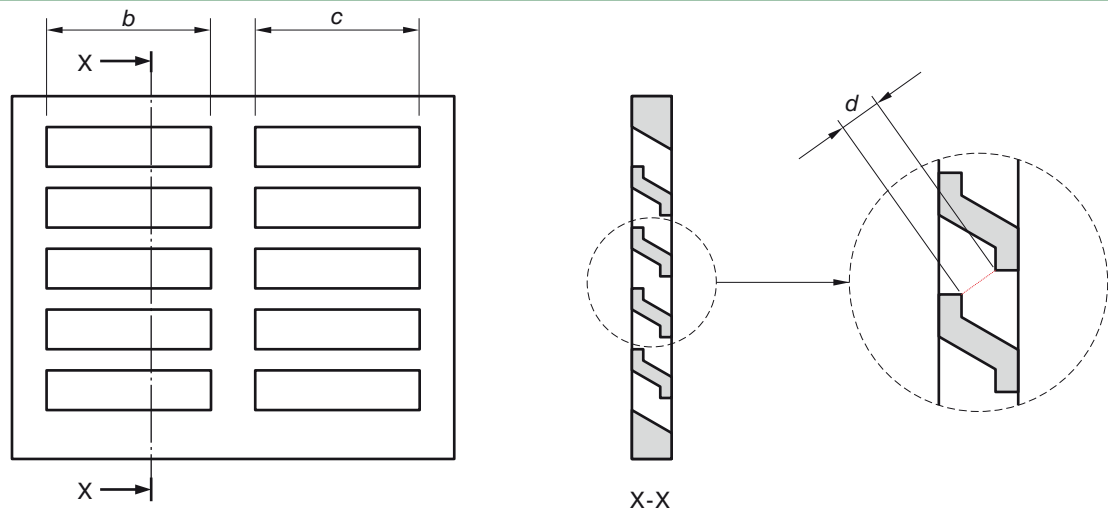
port or passage conveying flue gases within the appliance

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

unobstructed cross-sectional area of a grille, louvre 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](#).

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.



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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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*

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

1.3.57.4

Ⓐ₂ appliance regulator ^{Ⓐ₂}

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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 A_2 AS/NZS IEC 60079.10.1 A_2 . 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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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 *pipings* 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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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 *pipework*, *flues*, and fittings.

1.3.95**purge****purging**

with respect to *consumer piping* —

- (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 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 piping* 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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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  an *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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

1.3.128

down-draught system

down-draught extraction system

ventilation system intended for installation adjacent to household cooking ranges, hobs and similar cooking appliances that draws contaminated air into an internal exhaust duct

1.3.129

overhead radiant heater

space heater installed at a high level and designed to provide an effective output mainly of radiation below the level of the heater

1.3.130

overhead radiant tube heater

overhead radiant heater that employs a heated tube as the radiant element

1.3.131

patio heater

space heater incorporating a dome mounted above the radiant element and designed to provide an effective output mainly of radiation below the level of the dome

Note 1 to entry: A dome is a component fitted above the radiant element of an appliance, other than a radiant tube heater, for the reflection of heat. The dome may also protect the burner/radiant element from the effects of rain. ^{A2}

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.

^{A2} NOTE 1 In Australia, for work health and safety requirements in each jurisdiction refer to <https://www.safeworkaustralia.gov.au/>.

NOTE 2 In New Zealand, for work health and safety information refer to <https://www.worksafe.govt.nz/>. ^{A2}

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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 [Text deleted]

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

2.2.1.1A 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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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. 

2.2.1.1 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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (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](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NOTE For pressures exceeding 200 kPa, refer to ^{A2}AS/NZS IEC 60079.10.1 ^{A2}.

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

^{A2}Any *appliance* connected to a *common flue* shall not adversely affect the operation of any other *appliance* connected to the *common flue*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Common flues serving *appliances* and industrial equipment that use a fuel other than *gas* shall be designed, constructed and installed to avoid potential hazards created by different fuel types.

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

For domestic solid fuel burning appliances refer to AS/NZS 2918 for flueing requirements.

NOTE Potential hazards created by differing fuels include ignition temperature variations, chemical interaction, dust of liquid cloud infiltration and embers from solid fuels that could ignite purging gas from an appliance. ^(A2)

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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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 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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

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](#).

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

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	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
	Medium grade	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			External corrosion protection required
	Screwed ends or plain ends	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	

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

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	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
			Over 7 kPa wrought steel fitting conforming to EN 10241			
			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		

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (continued)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Stainless steel to be Grade 316. Materials, dimensions, design and performance conforming to AS 5200.053 and/or ASME B36.19 M.	Refer to manufacturer for advice where a high concentration of chlorides (salt) is to be found, particularly in a marine environment. Not permitted beneath a building if in the ground or in a concrete slab unless plastics coated or covered with a proprietary wrapping acceptable to the Technical Regulator, see Clause 5.3.13. Where plastics-coated stainless steel tube is used underground or where adverse environmental conditions exist, all joints and fittings shall be protected and made watertight.		Fittings to be compatible with pipe material (Grade 316) and pipe manufacturer's specifications.	Minimum thickness for mechanical jointing is 1.2 mm Minimum thickness for welding is 2.5 mm	Welding shall be Tungsten Inert Gas (TIG) or Manual Metal Arc (MMAW). The Technical Regulator may require welding in accordance with AS 4041 and the installer to be authorized.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Pipe	Limiting conditions
200 (continued)	(continued)	(continued)	Press-fit end connectors conforming to AS 3688 or capillary fittings or threaded end connectors conforming to AS 3688	Fittings for press-fit end connectors shall have yellow HNBR “O” rings. Press-fit end connectors shall not be used for applications where the surface temperature of the pipe connector exceeds 100 °C unless the manufacturer’s specification warrants higher. Press-fit end connectors shall not be used as a final connection to an appliance where the final connection has to be destroyed to disconnect the appliance.	Crimped joint shall be formed using methods and tools in accordance with the manufacturer’s specifications	Not permitted in the ground beneath a building. The Technical Regulator may require the installer to be authorized. Brazing, welding or annealing shall be conducted in accordance with the manufacturer’s specifications, but shall be not less than 1 m from a joint with non-metallic components.
	Stainless steel grade 316 tubing to ASTM A269	As for Grade 316 stainless steel above	Two part ferrule compression tube fittings conforming to AS 3688	Interchanging and intermixing components in fittings is prohibited (see Clause 4.4)	Joints to be formed using method(s) and tool(s) in accordance with the manufacturer’s specifications	Two part ferrule compression tube fittings not permitted in the ground beneath a building

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table 4.2 — Consumer piping materials (continued)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
12.5	Stainless steel pipe, corrugated pliable, conforming to EN 15266	Not permitted for use as final connection to an appliance Not permitted in the ground beneath a building unless plastics coated	Components that terminate with a BSP thread in accordance with the pipe manufacturer's specifications	Not permitted in the ground beneath a building Operating limit of 7 kPa applies where malleable cast iron fittings are used	Mechanical joining using components in accordance with the pipe manufacturer's specifications	Not permitted in the ground beneath a building In other locations, joints shall be accessible for inspection and renewal. Not to be welded or jointed by any other method

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 (continued)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
50 (continued)	(continued)	(continued)	Copper alloy press-fit end connector conforming to EN 15266	Fittings shall have yellow HNBR seals Not to be used for applications where the surface temperature of the pipe connector exceeds 60°C unless the manufacturer's specification warrants higher Not permitted in the ground beneath a building Press-fit end connectors not permitted for use as a final connection to an appliance where the final connection has to be destroyed to disconnect the appliance	Crimped joint shall be formed using method and tools in accordance with the manufacturer's specifications	The Technical Regulator may require the installer to be authorized Brazing, welding or annealing shall be conducted in accordance with the manufacturer's specifications, but shall be not less than 1 m from a joint with non-metallic components Not permitted in the ground beneath a building ⁴²

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe			Fittings		Joining		
	Pipe	Limiting conditions			Fitting	Limiting conditions	Method	Limiting conditions
200	Galvanized and black steel pipe conforming to — AS 1074 medium grade, or API 5L Grade B, or ASTM A53/ A53M Grade B, or ASTM A106 Grade A or B Screwed ends	Not permitted in the ground External corrosion protection required Pipe conforming to API 5L or ASTM A53/ A53M or ASTM A106 to be joined with screwed connections shall conform to the following (refer to “jointing” for size limitation):			Wrought steel fitting conforming to BS EN 10241 (BSP) or conforming to BS 3799 (NPT)	External corrosion protection required	Taper external and parallel internal threads conforming to AS ISO 7.1 or NPT to ASME B1.20.1	Up to 7 kPa, maximum permissible size is DN 100 Over 7 kPa, maximum permissible size is DN 80 External corrosion protection required
					Copper alloy screwed fitting conforming to AS 3688			
					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)			
		Nom. size DN	Nom. OD mm	Min. wall thickness mm	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.			
		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	5.2				
		80	88.9	5.5				
100	114.3	6						

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials(continued)

Operating limit, kPa	Pipe			Fittings		Joining	
	Pipe	Limiting conditions		Fitting	Limiting conditions	Method	Limiting conditions
200	Galvanized and black steel pipe conforming to — AS 1074 medium grade or API 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) conforming to AS/NZS 1518, or covered with a proprietary wrapping acceptable to the Technical Regulator. Not permitted in the ground beneath a building External corrosion protection required High-density PE coated steel pipe may be used above ground in an indoor location Pipe conforming to API 5L or ASTM A53/A53M or ASTM A106 to be joined by welding shall conform to the following:		Butt-welded fitting conforming to BS 1640-1 or BS 1640-3, or conforming to ASME B16.9	External corrosion protection required	Butt weld conforming to AS 4041 Class 3 piping	Where welding is to be carried out, the Technical Regulator may require the welder to be authorized External corrosion protection required
		Nom. size DN	Nom. OD mm	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) Socket-welded fitting conforming to BS 3799, or conforming to ASME B16.11	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 Fillet weld conforming to AS 4041, Class 3 piping	
		Min. wall thickness mm					
		15	21.3				
		20	26.7				
		25	33.4				
		32	42.2				
		40	48.3				
		50	60.3				
		65	73				
		80	88.9				
		100	114.3				
		150	168.3				
		200	219.1				
		250	273.1				
		300	323.8				

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials(*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Copper tube conforming to AS 1432 Type A or Type B with or without plastics coating applied by the manufacturer For sizes over DN 200, tube shall conform to AS 1572 with copper alloy designation C12200 conforming to AS 2738 and a minimum wall thickness of 2.64 mm	Not permitted beneath a building if in the ground or in a concrete slab unless plastics coated or covered with a proprietary wrapping acceptable to the Technical Regulator, see Clause 5.3.13 Where plastics-coated copper tube is used underground or where adverse environmental conditions exist, all joints and fittings shall be protected and made watertight	Copper alloy flared compression fitting conforming to AS 3688 or conforming to AS D26	Not permitted in the ground beneath a building. Mixing of AS 3688 and AS D26 fitting components not permitted	Flared compression	Not permitted in the ground beneath a building
			Copper alloy brazing capillary fitting conforming to AS 3688		Open flame brazing conforming to EN 14324	Brazing alloy to conform to AS/NZS 1167.1, alloy classification B2 Canary colour -(minimum silver content 1.8 %) or a comparable rod Joints in the ground beneath a building shall be kept to a minimum
			Junctions shall be formed in "hard drawn" tube only	To be formed with appropriate mechanical branch forming tools		
			Socket formed in tube (spigot and socket joining lengths of tube)	To be formed with appropriate tube expanding tool		
			Brazing flange, copper alloy conforming to AS 2129	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 shall be of the same size and face type		

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (continued)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Pipe Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200 (continued)	(continued)	(continued)	Screwed flange, carbon steel, steel alloy or copper 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 permitted underground 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	Taper external and taper or parallel internal threads conforming to AS ISO 7.1 or NPT conforming to ASME B1.20.1	Fitting shall 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 conforming to AS 1432, AS 2129 or ASME B16.5 Class 150 and AS 3688 where appropriate			
			Copper and copper alloy press-fit end connector conforming to AS 3688	Fittings shall have yellow HNBR “O” rings Not to be used for applications where the surface temperature of the pipe connector exceeds 100°C unless the manufacturer's specification warrants higher Not permitted in the ground beneath a building Press-fit end connectors not permitted for use as a final connection to an appliance where the final connection has to be destroyed to disconnect the appliance	Crimped joint shall be formed using method and tools in accordance with the manufacturer's specifications	The Technical Regulator may require the installer to be authorized Brazing, welding or annealing shall be conducted in accordance with the manufacturer's specifications, but shall be not less than 1 m from a joint with non-metallic components Not permitted in the ground beneath a building ^(a2)

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
200	Copper tubing conforming to ASTM B75	Not permitted beneath a building if in the ground or in a concrete slab unless plastics coated or covered with a proprietary wrapping acceptable to the Technical Regulator, see Clause 5.3.13. Where plastics-coated copper tube is used underground or where adverse environmental conditions exist, all joints and fittings shall be protected and made watertight	Two part ferrule compression tube fittings conforming to AS 3688	Interchanging and intermixing components in fittings is prohibited (see Clause 4.4)	Joints shall be formed using method(s) and tool(s) in accordance with the manufacturer's specifications	Two part ferrule compression tube fittings not permitted in the ground beneath a building
200	Polyethylene conforming to AS/NZS 4130	Not permitted beneath a building Not permitted above ground	Compression fitting or electrofusion fitting which is acceptable to the Technical Regulator Mechanical compression fitting in accordance with AS/NZS 4129	The Technical Regulator may require internal stiffeners with compression fittings Mechanical compression fittings conforming to AS/NZS 4129 may require internal stiffeners	Electrofusion, butt-fusion, or mechanical joints carried out in accordance with AS/NZS 4645.3	The Technical Regulator may require the installer to be authorized. PTFE (polytetrafluoroethylene (PTFE)) tape shall be the only thread sealant to be used on plastics fittings

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
70	PVC-HI conforming to AS ISO 6993.1	Not permitted beneath a building Not permitted above ground	Solvent-cement fitting conforming to AS/NZS 1477, PN 12 or PN 18 or conforming to AS ISO 6993.3	Internally threaded fittings are not permitted	Solvent-cement jointing or mechanical joints carried out in accordance with AS/NZS 4645.3	PTFE (polytetrafluoroethylene (PTFE)) tape is the only thread sealant that shall be used on plastics fittings
70	PVC-U conforming to AS 1464.1 Class 100, Type 1, 2 or 3, or Class 450 Type 3		Solvent-cement fitting conforming to AS/NZS 1477, Class 12 or Class 18		Solvent-cement jointing or mechanical joints carried out in accordance with AS/NZS 4645.3	Priming fluid and solvent cement shall be in accordance with the pipe manufacturer's specifications
200	Polyamide (Nylon 11 and 12) conforming to AS 2944.1, Class 300 or Class 400	Not permitted beneath a building Not permitted above ground	Polyamide fitting conforming to AS 2944.2	The Technical Regulator may require internal stiffeners with compression fittings	Adhesive jointing, or mechanical joints carried out in accordance with AS/NZS 4645.3	The Technical Regulator may require the installer to be authorized
						Adhesive shall be in accordance with the pipe manufacturer's specifications PTFE (polytetrafluoroethylene (PTFE)) tape shall be the only thread sealant to be used on plastics fittings

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.2 — Consumer piping materials (*continued*)

Operating limit, kPa	Pipe		Fittings		Joining	
	Pipe	Limiting conditions	Fitting	Limiting conditions	Method	Limiting conditions
70	Polyethylene/aluminium/ polyethylene (PE/AL/PE), cross-linked polyethylene/aluminium/ cross-linked polyethylene (PE-X/AL/PE-X) and polyethylene/aluminium/ cross-linked polyethylene (PE/AL/PE-X) <i>multilayer</i> pipe conforming to AS 4176.8	Not permitted above ground external to a building. Shall terminate at least 1 m from the nearest part of an appliance or some greater distance if required to prevent heat damage from the appliance Ensure conformity to any instructions or warnings are in accordance with the manufacturer's instructions PE/AL/PE and PE/AL/PE-X shall not be used for applications where the operating temperature exceeds 60 °C PE-X/AL/PE-X shall not be used for applications where the operating temperature exceeds 80 °C Consumer piping external to the building shall be metallic and extend at least 1 m into the building Consumer piping prior to exiting a wall shall be metallic for at least 1 m	Conforming to AS 4176.8	Same temperature limitations as for pipe Not permitted in the ground beneath a building	Joints shall be formed using method(s) and tool(s) in accordance with the manufacturer's specifications	The Technical Regulator may require the installer to be authorized Consumer piping installed in the ground beneath a building shall be <i>multilayer</i> pipe without joints Brazing, welding or annealing shall be conducted in accordance with the manufacturer's specifications, but shall be not less than 1 m from a joint with non-metallic components ⁴²
70	Cross-linked polyethylene (PE-X) pipes for pressure applications conforming to ⁴² AS 2492 ⁴² , PEX-yellow, PE-X 80 no darker than RAL 1018 and PE-X 100 and PE-X 125 no lighter than RAL 1033	Not permitted beneath a building. Not permitted above ground. Not permitted for use as a final connection to appliances	Compression fitting in accordance with Technical Regulator requirements	The Technical Regulator may require internal stiffeners with compression fittings. Mechanical compression fitting in accordance with ⁴² AS 2537.5 ⁴²	Joints shall be formed using methods and tools in accordance with the manufacturer's specifications	The Technical Regulator may require the installer to be authorized

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.3 Consumer piping restrictions

The *consumer piping* elements covered by [Table 4.2](#) are subject to the following restrictions:

- (a) A *push-on connector* shall only be used in accordance with [Clause 6.2.15](#).
- (b) A brass fitting shall not be buried in the ground unless made of a dezincification-resistant alloy or effectively coated or wrapped to avoid contact with the bedding or backfill.

NOTE 1 A brass fitting made of dezincification-resistant alloy is identified by the marking “DR” or “CR”.
- (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 following fitting types shall not be used above ground:

- (i) Non-metallic fittings.

NOTE 2 Components of joints that are not in direct contact with *gas* may be non-metallic provided they conform to AS 4176.8.

- (ii) Fittings that depend on metallic surface to non-metallic surface contact to provide a *gastight* seal, unless they are of the permanent crimped or sliding compression sleeve type conforming to AS 4176.8.
- (iii) Metallic fittings of the olive or compression type that contain non-metallic components.

When used underground, the assembled joints shall 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 shall be designed and installed so as to prevent “pull-out” during service.

4.4 Prohibited types of joints and fittings

The following fittings or jointing systems shall not be used in *consumer piping*:

- (a) Croxed joints.
- (b) Compression fittings with non-metallic olives, excluding plastics fittings suitable for *gas* and conforming to AS/NZS 4129.
- (c) Compression fittings with metallic olives if not approved for use with *gas* in the *manufacturer’s instructions*.
- (d) Longscrew connectors.
- (e) Internally threaded PVC-U fittings unless manufactured with a reinforcing metal band.
- (f) Capillary fittings containing soft-solder.
- (g) Plain nipples, e.g. running nipple with parallel threads, except where no practical alternative is available.

NOTE A brass external parallel thread screwed into a brass internal parallel thread may be used, provided the joint is welded or a suitable permanent quick-setting thread compound is used and a means of disconnection is provided immediately downstream. Wherever possible, the fitting and pipework should be secured to avoid disturbing the quick-setting thread compound.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.5 Proprietary systems

4.5.1 Suitability for intended use

Before any *proprietary system* is installed, its suitability for the intended application shall be verified taking into account other aspects related to the installation (including measurement systems and *gas* quality), normal and emergency operating conditions, temperature, *gas* composition and environmental conditions reasonably likely to be experienced.

4.5.2 Installation of proprietary systems

Proprietary systems shall be installed in accordance with [Table 4.2](#) and the relevant *manufacturer's instructions*.

NOTE 1 Following the *manufacturer's instructions* does not relieve the obligation to meet the requirements of [Section 2](#) of this Standard.

NOTE 2 Manufacturers of *proprietary systems* may specify installer competence in addition to competence normally expected of persons doing *gas* work.

4.5.3 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 unless specified in accordance with the *manufacturer's instructions* for the *proprietary system*. Transitions from conventional piping to the *proprietary system* shall be made with the appropriate proprietary components, or by extension from a reversion fitting provided by the original installer.

4.5.4 Identification of proprietary piping systems

The maker or trade name of the proprietary system shall be identified on a durable label attached adjacent to the gas meter, LP Gas tank, cylinder(s) or any other supply point.

4.6 Material between LP gas cylinder valve and inlet to first regulator

Materials for piping between the *LP Gas cylinder* valve and the inlet to the first regulator shall be in accordance with AS/NZS 1596.

NOTE Recommendation for materials is given in [Clause J.9](#), [Appendix J](#).

4.7 Other materials

4.7.1 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 type of *gas* to be supplied.

NOTE 1 Aluminium "O" rings and spirally wound metal gaskets are acceptable.

NOTE 2 For details of bolting Standards, refer to AS/NZS 4645.2.

NOTE 3 The manufacturers' nominated *gasket* crush forces often result in relatively high loads when gaskets are used in *gas* applications. It may be necessary to apply specialized lubricants, torque spanners and specially machined washers to prevent flange and fastener damage.

NOTE 4 When using plastics components in a flange gasket system, special attention should be given to uniformity of bolt torque.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.7.2 Jointing compounds and materials

Jointing compounds shall not be used to compensate for ill-fitting joints and shall not be applied to compression joints, union joints, cylinder quick-connect devices, or *POL fittings*.

Jointing compounds and materials shall —

- (a) conform to AS 4623 and, in Australia, be certified;
- (b) be suitable for the application; and
- (c) be used only with chemically compatible materials and where the surfaces have been prepared and cleaned strictly in accordance with the relevant *manufacturer's instructions* for the jointing compound or material.

4.7.3 Vent line material

Vent lines shall be constructed of the following material as appropriate:

- (a) Metal pipe and *pipe fittings* or *multilayer pipe* and *pipe fittings* that are in accordance with [Table 4.2](#) when within a building.
- (b) Metal pipe and *pipe fittings*, or PVC-U pipe and *pipe fittings* suitable for exposed conditions, when outside a building, except PVC-U pipe and *pipe fittings* shall not be used in bushfire prone areas, refer to AS 3959.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.7.4 Flue materials and limitations

Materials and limitations for flues other than those that are *certified* as part of the *appliance* shall be in accordance with [Table 4.7.4](#).

Table 4.7.4 — Flue materials

Materials and limitations	Protective finish	Application and limitations (see Note)	
Low temperature applications (not exceeding 300°C)			
Aluminium alloy 1100, 3003 0.7 mm thickness AS/NZS 1734	None	Only where <i>accessible</i> for inspection and renewal Internal <i>flues</i> not to exceed 12 m in length, external <i>flues</i> shall not exceed 7 m	
Aluminium alloy 1100, 3003 2 ply and 0.26mm thickness (flexible liner)	None	Only suitable for use as a chimney liner (also referred to as a flexible <i>flue</i> liner). Not to be used where mechanical damage could occur	
Aluminium alloy 1100, 3003 0.31mm thickness (flexible <i>flue</i> connector)	None	Only suitable for use as a single wall flexible connector, (where changes of direction are required, e.g. as an alternative to <i>flue</i> elbows). Not to be used where mechanical damage could occur.	
Bricks (clay building) Cement or lime mortar joints	None	Only slight condensation allowable, minimum wall thickness of <i>flue</i> 50 mm	
Bricks	Inside face lined with acid-resisting tiles embedded in acid-resisting jointing material	<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	Only slight <i>condensation</i> allowable	
Copper not less than 0.5 mm thickness	None	Only slight <i>condensation</i> allowable	
Fibre cement, light grade (asbestos free)	Autoclaved	Only slight <i>condensation</i> allowable	
<i>Flue</i> bricks	None or glazed internally	If condensation is heavy, internally glazed <i>flue</i> bricks shall be used Joints shall be acid-resisting Bricks glazed internally shall have provision made for condensate drainage. Non-glazed, only slight condensation is allowable Provision of an air gap between the <i>flue</i> brick and the finished wall may be necessary to minimize heat transfer	
Mild steel 0.6 mm thickness 0.8 mm thickness 1.0 mm thickness	Aluminized 122 g/m ² , or A275 zinc to AS 1397, or aluminium zinc conforming to AS 1397	Only where <i>accessible</i> for inspection and renewal	
		Internal <i>flues</i> shall not exceed 12 m in length, external <i>flues</i> shall not exceed 7 m	
		Wall thickness, mm	Maximum <i>flue</i> diameter, mm
		0.6	100
		0.8	200
		1.0	300

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 4.7.4 (continued)

Materials and limitations	Protective finish	Application and limitations (see Note)	
Concrete bricks or blocks (precast)	None	Only slight <i>condensation</i> allowable, minimum wall thickness of <i>flue</i> 50 mm	
<i>Twin wall flue</i> , conforming to AS 4567	As per AS 4567	To prevent heat transfer to adjacent structures and to minimize condensation <i>Certified appliances</i> with a <i>draught diverter</i> will meet this maximum <i>flue gas</i> temperature requirement	
PVC-U to AS/NZS 1260	None	Low temperature <i>flues</i> shall not exceed 60 °C	
High temperature applications (above 300 °C)			
Fibre cement, heavy grade (asbestos free)	Autoclaved	None	
Fire bricks, set in fireclay	None	Especially very high temperature <i>flues</i>	
Mild steel 1.6 mm thickness	None	Only where <i>accessible</i> for renewal	
Stainless steel 0.5 mm 0.7 mm	300 and 400 Series Grade	Wall thickness, mm	Maximum <i>flue</i> diameter, mm
		0.5	100
		0.7	200
NOTE 1 In addition to the listed limitations, consideration should be given to the deleterious effect of some <i>flue</i> products from some appliances, e.g. pottery kilns, incinerators, atmosphere generators or the like.			
NOTE 2 Refer to local OHS authority for the replacement of an <i>appliance</i> connected to an existing asbestos <i>flue</i> , or the maintenance or repair of an existing asbestos <i>flue</i> .			
NOTE 3 For <i>flue</i> materials, applications and limitations not detailed in this table, see Section 2 .			

4.8 Components

4.8.1 Miscellaneous components

Fabricated pipe branches shall conform to AS 4041 or AS/NZS 4645 series.

Miscellaneous components shall be in accordance with [Table 4.8.1](#), conform to the appropriate Standard and in Australia be *certified*.

Table 4.8.1 — Miscellaneous components

 Component	Standard
Automatic shut-off valves	AS 4629.1 ^a
<i>Manual shut-off valves</i>	AS 4617, Type 1 or Type 3
<i>Quick-connect devices</i>	AS 4627
<i>Vent valves</i>	AS 4629.2 ^b
<i>Flue cowls</i>	AS 4566
Semi-rigid connectors	AS 4631
Hose assemblies	AS 1869 series
^a Single class 1 <i>safety shut-off valves</i> that meet the requirements of AS 4629:2005 are equivalent.	
^b <i>Vent valves</i> that meet the requirements of AS 4629:2005 are equivalent. 	

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

4.8.2 Manual shut-off valves

Manual shut-off valves shall be selected after giving consideration to materials, *pressure* rating, *pressure* drop, service involved, emergency use, and reliability of operation, and shall be —

- (a) of the quarter-turn type;
- (b) open when the handle is in line with the pipe and closed when the handle is across the pipe, and the seat of the handle and the spindle top are such that the handle cannot be fitted in any other way;
- (c) installed so that the valve cannot open under the action of gravity or vibration; and
- (d) 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.

Manual shut-off valves constructed of plastics shall not be used above ground.

4.8.3 Hose assemblies

Hoses shall be used only as a complete assembly and shall be suitable for the application.

4.8.4 Swivel joints and couplings

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Section 5 Means of conformance — Installation of consumer piping

5.1 General

5.1.1 Condition of pipe and pipe fittings

Pipe and *pipe 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.

5.1.2 Prohibition of earthing through consumer piping

Consumer piping shall not be used as a component of an earthing system of any electrical installation or works. Metallic pipework shall be segregated from electrical and other services and from the earth system or, where that is not possible, electrically bonded to control touch potentials to safe levels.

NOTE 1 This Clause does not preclude the application of equipotential bonding in accordance with AS/NZS 3000.

NOTE 2 Segregation may be achieved by a 25 mm separation or greater in air or by insulation having an insulation resistance not less than 1 MΩ when tested at 500 V d.c.

NOTE 3 Separation from earthing electrodes is given in AS/NZS 3000.

NOTE 4 Guidance for high voltage earthing is given in AS 2067.

5.1.3 Protection from other materials

Consumer piping shall be suitably protected from deterioration likely to arise from any process material or the rest of the piping system when dissimilar metallic materials are used.

NOTE Protection may be achieved by the application of corrosion-resistant coatings, *insulating joints* or by sleeving.

5.1.4 Storage and handling of pipe

Metallic pipes shall be stored in such a manner that the potential for corrosion is minimized. Plastics and *multilayer pipes* shall be protected from direct sunlight or any other deteriorating effects. Storage, unloading, hauling, handling and installing of pipe shall be carried out with care to avoid damage to the pipe or to any protective coating.

NOTE For storage, handling and protection of plastics pipes, refer to AS/NZS 4645.3.

5.1.5 Condition of pipe during installation

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

5.1.6 Restriction on repair of defective pipe or pipe fitting

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

5.1.7 Jointing

Jointing of pipe shall be in accordance with [Table 4.2](#) and the following as appropriate:

- (a) The method of bolting welded/screwed flanged joints shall be suitable for the *operating pressure* of the system.
- (b) Welded joints shall be completed using an appropriate welding procedure.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) Capillary joints in copper pipe shall be prepared using purpose designed tools or purpose made proprietary *pipe fittings*.

NOTE Excess flux should be removed after jointing.

- (d) Compression *pipe fittings* and flare *pipe fittings* shall be used only where they are *accessible* for the nut to be tightened to make a *gastight* joint.
- (e) Screwed *pipe fittings* and unions shall be used only in *accessible* and ventilated locations.
- (f) Jointing of plastics and *multilayer pipes* and *pipe fittings* shall be according to the relevant *manufacturer's instructions*.
- (g) Jointing of dissimilar copper pipe sizes shall only be by use of appropriate *pipe fittings* or mechanical tools. The larger pipe shall not be crimped nor shall the smaller pipe be expanded.

5.1.8 Restriction on use of thread sealant

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

NOTE 1 A compression joint includes a flare, a union, and any connection to a *cylinder* valve

NOTE 2 The only thread sealant permitted for use on a plastics *pipe fitting* is PTFE tape.

5.1.9 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.

5.1.10 Re-making a flanged joint

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

5.1.11 Pipe installation not to reduce building strength or fire resistance

The design strength or fire resistance of a building (for example, *fire dampers*, sprinkler systems, alarm systems) shall not be reduced by the installation of *consumer piping*.

NOTE The National Construction Code (Australia) and the New Zealand Building Code may impose additional requirements, especially in commercial or multiple residence dwellings, where consumer *gas* piping is to be run in defined access/egress ways.

5.1.12 Identification of pipework

5.1.12.1 Identification

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 shall conform to AS 1345 in all other respects.

NOTE 1 For identification of proprietary piping systems, see [Clause 4.5.4](#).

NOTE 2 Durable adhesive pipe markers may be used for identifying *consumer piping*.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

5.1.12.2 Marking

The identification markings shall conform to [Figure 5.1.12.2](#).

The identification markings shall be placed —

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

Other *gas* types within the scope of this Standard shall be identified and marked in a manner acceptable to the *Technical Regulator*.

Where *consumer piping* is sleeved (e.g. in a conduit), the sleeving shall be identified in accordance with [Figure 5.1.12.2](#). The identification markings shall be placed in accordance with Items (a), (b) and (c) above.

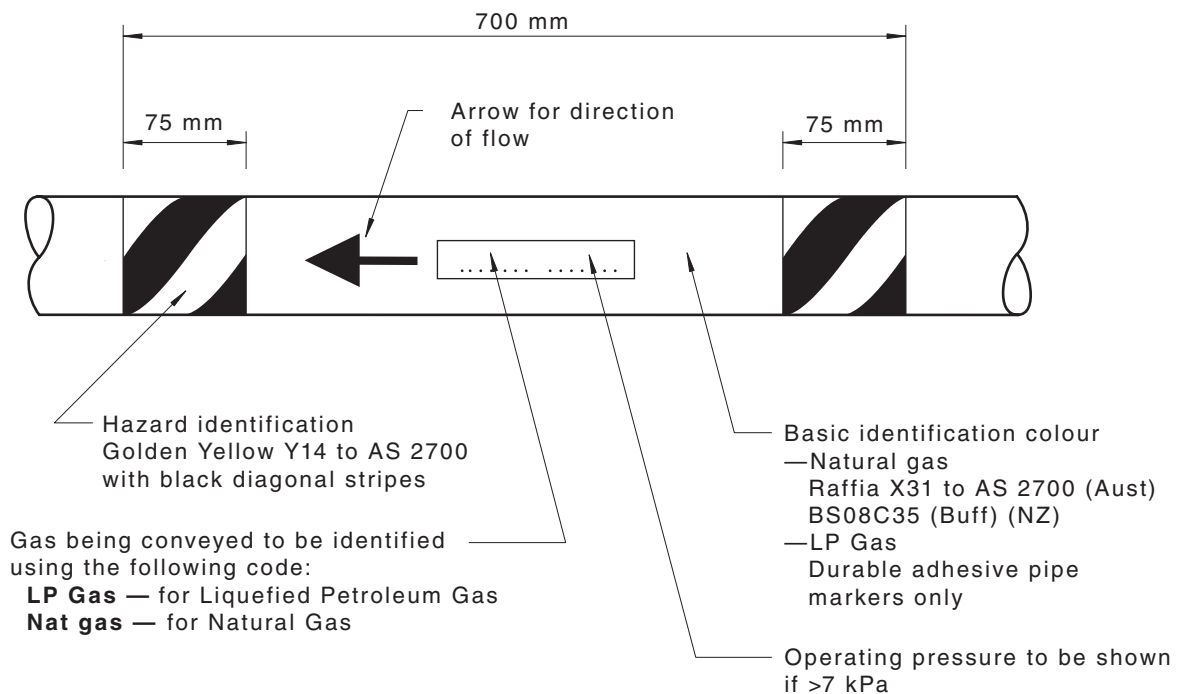


Figure 5.1.12.2 — Identification of pipework

5.2 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.

5.2.1 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 capable of withstanding a *pressure* not less than the lowest of —

- (a) 100 % of the inlet *pressure* of the next upstream regulator;
- (b) where *over-pressure protection* is fitted, the maximum *over-pressure* likely to occur when the next upstream regulator fails; and

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) where no upstream regulator is fitted on the service to the installation, the *maximum allowable operating pressure* of the section of the network supplying the *installation*.

The requirements of this Clause shall apply to *the entire installation* if there is no *consumer piping gas pressure regulator*.

NOTE 1 In most cases the *maximum over-pressure* in Item (b) above for 2nd family *gas (natural gas)* supplies to installations is 7 kPa and for 3rd family *gases (LP Gas)* 14 kPa.

NOTE 2 If the *maximum over-pressure* exceeds 7 kPa for *natural gas* supplies or 14 kPa for *LP Gas* supplies, the *maximum over-pressure* is required to be clearly marked on or adjacent to the *gas service pressure* regulator by the *gas supplier/GMS owner*. It will be necessary to determine from the *network operator* 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.

5.2.2 Appliance pressure rating

If an *appliance* is not capable of remaining safe when exposed to the lowest *pressure* determined in [Clause 5.2.1](#), additional components shall be installed to provide protection against the over-pressurization.

5.2.3 Requirements where pressurized air, oxygen or a standby gas is to be used in conjunction with the fuel gas

Where pressurized air, oxygen or a standby *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 practicable to and upstream of the point of interconnection of any *gas* and air, oxygen or standby *gas* line.

A flashback arrestor shall be installed as close as practicable to the *burner nozzle* when oxygen is being used as part of the working flame process.

NOTE 1 If air, oxygen or another *gas* is mixed with the fuel *gas*, an explosive mixture may result. Therefore, where work involving air, oxygen or standby *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.

NOTE 2 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 that operates at a *pressure* exceeding 7 kPa.

NOTE 3 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 detection device 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*.

5.2.4 Consumer piping size

The *consumer piping* shall be of sufficient diameter to ensure adequate *gas* supply to the $\boxed{A_2}$ *appliance(s)* $\boxed{A_2}$ and shall be determined by —

- (a) the pipe sizing methodology listed in [Appendix F](#);
- (b) pipe sizing tables or calculation provided by the pipe manufacturer; or
- (c) formulae that achieve the outcomes of [Clause 2.2.3.2\(a\)](#).

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

NOTE [Appendix F, Clause F.1.8](#) provides information for the use of a diversity factor when sizing consumer piping for larger installations.

The diameter of piping, intended to supply a *Type A* or domestic-type A_2 appliance shall be such that the minimum pressure specified in [Table 5.2.4](#) is available at the appliance inlet, with all appliances connected to the consumer piping operating at maximum gas consumption.

Table 5.2.4 — Minimum pressure at appliance inlet

Family of gases	Minimum pressure at appliance inlet, kPa
2nd (NG, SNG)	1.13
3rd (LP Gas)	2.75
NOTE The appliance inlet is the appliance connection point upstream of the first appliance control device (e.g. appliance gas regulator), other than the appliance manual shut-off valve, if fitted.	

5.2.5 Flexibility of piping

Consumer piping shall be designed to have sufficient flexibility to prevent —

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

NOTE 1 Formal calculations may be required where reasonable doubt exists regarding flexibility of the system. Reference should be made to AS 4041 for guidance.

NOTE 2 The requirements of this Clause may be satisfied by use of one or more of the following:

- (a) Bends, loops, coils or offsets formed in the piping.
- (b) Flexible joints or couplings of the type designed to absorb thermal expansion and contraction.
- (c) Expansion joints.

NOTE 3 See also [Clauses 5.2.6](#) and [5.7.5](#).

NOTE 4 For information on expansion, stress, anchor points and pipe guiding, see [Appendix K](#).

5.2.6 Pipe alignment at expansion joint

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

5.2.7 Occupancy isolation

In the case of multiple occupancies within the same building —

- (a) the consumer piping to each occupancy shall include a quarter turn manual shut-off valve;
- (b) the valve shall be accessible and, where practicable, external to the occupancy; and
- (c) a durable, permanent sign shall be located in a prominent position adjacent to the valve, identifying it as a gas valve, and if remote from the occupancy identifying the occupancy. Where the valve is located behind an access panel the sign shall be located on the outside of the access panel.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.2.8 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*, the following shall apply:

- (a) The *consumer piping* shall include a quarter turn *manual shut-off valve* at each point of entry of piping to each building.
- (b) The valve shall be *accessible* and external to the building.
- (c) A durable permanent sign shall be located in a prominent position adjacent to the valve. The sign shall include the wording “GAS VALVE”.

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.

5.2.9 Isolation for specific installations

5.2.9.1 Isolation for installations in educational institutions

In installations where a number of *appliances* without *flame safeguard systems* are used, such as a school laboratory, a means of isolation shall be fitted and include all of the following:

- (a) A *readily accessible* quarter turn manual isolation valve at the inlet of the installation.
- (b) An electrically operated solenoid valve to supply gas to the installation. The solenoid valve shall be controlled by a timing device set to the duration the installation is expected to operate.
- (c) A *readily accessible* emergency stop button connected to the electrically operated valve with a key-operated reset function to ensure no gas flows to the installation after restoration of power following a power failure.
- (d) Signage adjacent to the emergency stop button indicating its purpose (see Note).
- (e) Operating instructions for the emergency stop button.
- (f) The system shall require pressure proving of the downstream installation prior to restoration of the gas supply.

NOTE 1 Suggested wording for the signage is “GAS ISOLATION: Turn off when gas is not in use or in the case of emergency. Before turning on, ensure all the appliances (e.g., Bunsen burners) are turned off”.

NOTE 2 See [Clause 6.2.15](#) for the requirements of push on bunsen burner outlets.

NOTE 3 See [Clause 6.6.5\(c\)](#) for requirements around allowable supply pressures for bunsen burners.

5.2.9.2 Commercial kitchen isolation

Where more than one commercial catering appliance is to be connected either of the following shall apply:

- (a) A single quarter turn manual shut-off valve shall be installed to isolate all appliances. The manual shut-off valve shall be *readily accessible* and clearly identified.
- (b) A *readily accessible* emergency stop button, which is clearly identified by a notice (see Note), shall be connected to an electrically operated valve with a key-operated reset function to ensure no gas flows to the installation after restoration of power following a power failure.

NOTE Suggested wording for the notice is “GAS ISOLATION: Turn off when gas is not in use or in the case of emergency. Before turning on, ensure all the appliances are turned off”.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.2.10 Provision of emergency valve (steam boilers and hot water boilers)

When a *steam boiler* or *hot water boiler* is installed, a means of remote emergency shut-off shall be provided. The means of remote emergency shut-off shall be one or more of the following:

- (a) Type 1 manual quarter turn *isolation valve* that meets the requirements of AS 4617.
- (b) Emergency stop button hard-wired into either —
 - (i) a remote class A *safety shut-off valve* that meets the requirements of AS 4629.1 and which isolates *gas* flow when de-energized; or

NOTE Single class 1 *safety shut-off valve* that meet the requirements of AS 4629:2005 are equivalent.

 - (ii) a safety shut-off valve arrangement conforming to the requirements of AS 3814 if fitted to the *appliance*.

The stop button or manual valve shall be —

- (A) located in a safe, *readily accessible* position remote from the boiler; and
- (B) clearly identified by means of a sign.

5.2.11 Provision of fire emergency isolation for multilayer pipe

Where *multilayer pipe* is used as part of *consumer piping*, the following requirements for fire emergency isolation shall apply:

- (a) The installation shall be fitted with a system that will shut off the gas supply when the *fire safety system* operates and alerts the building occupants of the fire.
- (b) The method of isolation shall be a single class A *safety shut-off valve* that meets the requirements of AS 4629.1 and automatically isolates the gas flow to the building when de-energized. This valve shall —
 - (i) operate only when an active *fire safety system* operates; and
 - (ii) be located prior to any *multi-layered pipe* and be as close as practicable to the gas supply point to the building, and readily accessible.

NOTE 1 Single class 1 *safety shut-off valves* that meet the requirements of AS 4629:2005 are equivalent.
- (c) The system shall provide pressure proving of the downstream installation prior to restoration of the gas supply.

Alternatively, for a Class 1a building in Australia, or detached or multi-unit dwelling in New Zealand, a system or devices shall be provided that automatically shuts off the gas supply if gas tightness is adversely affected. The system or devices which shuts off the gas supply shall be —

- (i) in an accessible location prior to any *multilayer pipe* it is designed to protect; and
- (ii) sized, located and commissioned in accordance with the manufacturer's instructions to ensure safe and correct operation and avoid nuisance tripping.

Where multiple devices are required within a building, they shall be in accessible locations and prior to the *multilayer pipe* they are designed to protect.

Excess flow valves shall conform to DIN 30652-1 or an equivalent standard.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Multilayer pipes shall not be installed in buildings where the building design is such that a system or devices to shut off the gas supply cannot be installed. Alternative consumer piping shall be installed in accordance with [Clause 4.2](#).

NOTE 2 *Multilayer piping* has less durability and mechanical strength than metallic piping when subjected to fire.

NOTE 3 In this clause an active *fire safety system* is —

- (a) an automatic active system or manually activated system that provides a fire alarm condition used in a building to notify occupants within the building of a fire emergency by the sounding of an alarm throughout all occupied areas, via an emergency warning and intercom system, or via a paging system; and
- (b) interlocked to the fire detection control and indicating equipment.

More information is provided in the following documents:

- (i) For Australia, refer to AS 1670.1 and AS 2118.
- (ii) For New Zealand, refer to NZS 4512, NZS 4515:2009, and NZS 4541.

NOTE 4 To avoid nuisance trips and unintended interruption to the gas supply to a building, the gas supply should only be shut-off when all the occupants of the building are alerted to the fire incident.

NOTE 5 Local smoke alarms within an apartment that are intended to alert apartment occupants of localized smoke should not shut-off the gas supply to the building.

NOTE 6 Class 1a buildings are defined in the National Construction Code (NCC) (Australia).

NOTE 7 Devices that automatically shut off the gas supply may be activated by methods of sensing pressure loss or excessive gas flow conditions.

NOTE 8 This clause also applies to the alteration of consumer piping using *multilayer pipe* in an existing installation but does not apply to the replacement of an appliance in an existing installation.

NOTE 9 When using a device within a building with mechanical joints (e.g. excess flow valves) see [Clause 5.3.8](#) for piping in a concealed location and [Clause 5.3.12](#) for ventilation in a concealed location.

NOTE 10 The requirements for fire emergency isolation do not apply to *multilayer piping* that is only located below ground external to a building. ^(A2)

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

5.2.12 Reversion fittings for proprietary multilayer piping

In installations in Class 1 buildings in Australia or detached or multi-unit dwellings in New Zealand, where a proprietary multilayer piping system having a *main run* exceeding 10 m in length and connected to more than one *appliance* is being installed, reversion to standard thread conforming to AS ISO 7.1, BSPT, or a standard annealed copper tube, shall be provided at both of the following *accessible* locations:

- (a) In the *main run* immediately prior to the first branch take off point.
- (b) In the *main run* immediately prior to the last branch take off point.

Brazing, welding or annealing shall be conducted in accordance with the *manufacturer's specifications*, but shall be not be less than 1 m from a joint with non-metallic components.

Consumer piping external to the building shall be metallic and extend at least 1 m into the building.

NOTE 1 An example is shown in [Figure 5.2.12\(a\)](#).

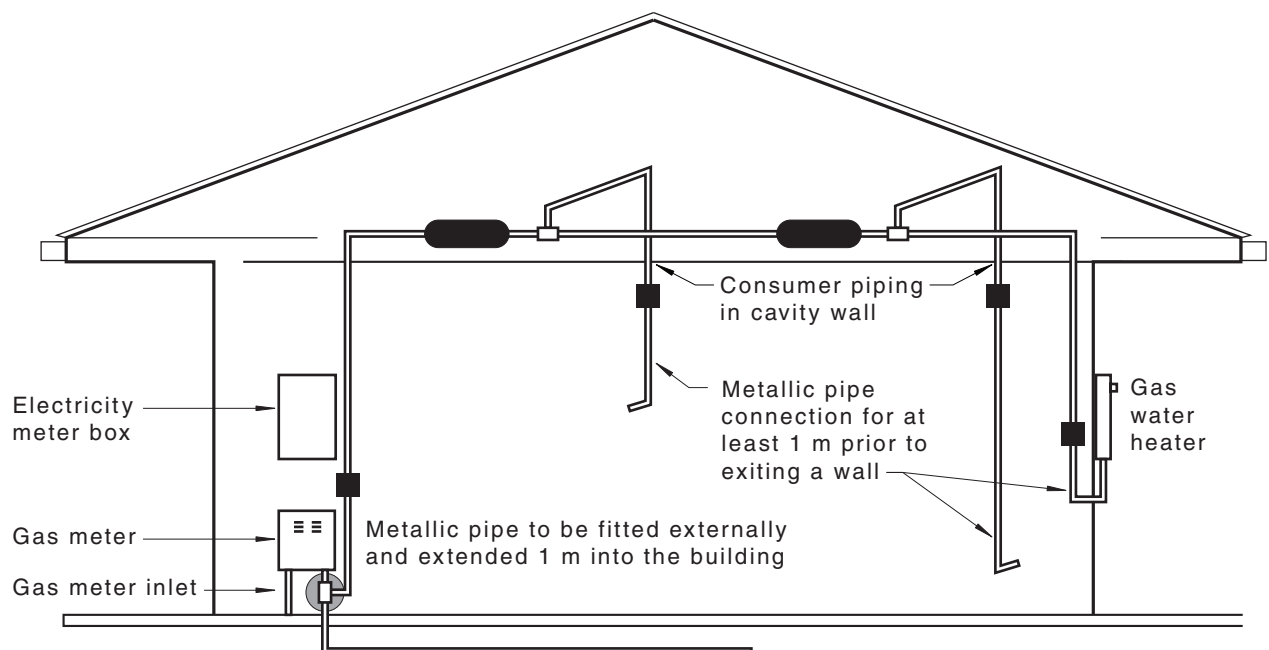
NOTE 2 [Figure 5.2.12\(b\)](#) and [Figure 5.2.12\(c\)](#) show acceptable reversion options for conformance to this Clause.

NOTE 3 The reversion fitting may be incorporated in the upstream side of the branch take off fitting.

NOTE 4 The intent is to allow for 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.

NOTE 5 For definition of Class 1 building, see the National Construction Code (NCC).

A₂



Key



Point of entry into the wall



Reversion fitting (installed only where accessible)



Transition fitting (Refer to Tables 4.2 and 5.3.8) — (permanent joint) inaccessible in cavity wall

(a) Example of reversion fittings installed in a multilayer piping system (composite pipe) A₂

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

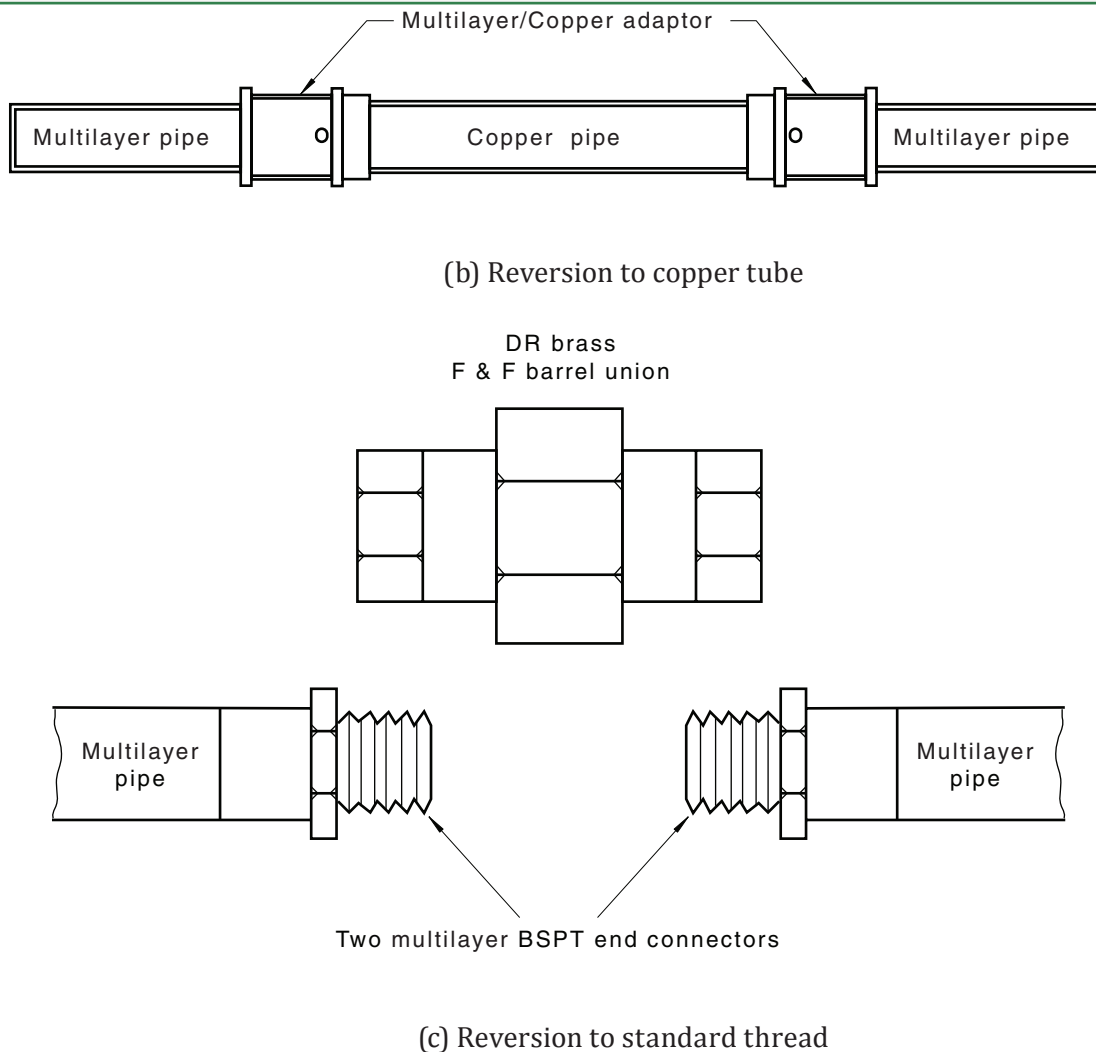


Figure 5.2.12 — Multilayer piping system — Reversion fittings

5.3 Location of consumer piping

5.3.1 Prohibited locations

Consumer piping shall not be installed in any of the following locations:

- (a) Attached to a fence.
- (b) In a lift well.
- (c) In a clothes chute or rubbish chute.
- (d) In a fire hydrant cabinet or fire hose reel cabinet.
- (e) In a *fire-isolated stairway, fire-isolated passageway or fire-isolated ramp, exitway or safe path*.
- (f) In a fire control room.
- (g) In a chimney above the *flue* connection of an appliance.
- A2** (h) In Australia, internally in a Class 1 building that is not serviced by that consumer piping.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (i) In New Zealand, internally in a detached dwelling that is not serviced by that consumer piping. ^(A2)

NOTE 1 Local building regulatory authorities may have additional restrictions for the location of *consumer piping*.

NOTE 2 A brick wall in sound condition used as a fence is generally deemed suitable.

NOTE 3 See also [Clause K.5](#) of [Appendix K](#).

5.3.2 Piping in an air duct, plenum ceiling, air-handling plenum or ventilating duct

Where *consumer piping* is to be in an air duct, air plenum ceiling, air-handling plenum or ventilating duct, all of the following shall apply:

- (a) The *operating pressure* shall not exceed 7 kPa.
- (b) Joints shall be kept to a minimum.
- (c) All joints shall be *permanent joints*.

5.3.3 Piping not to be subject to physical damage

In locations where physical damage may occur, *consumer piping* shall be protected by appropriate means including, but not limited to —

- (a) sleeving;
- (b) barriers; or
- (c) covering.

5.3.4 Separation from above-ground low and extra low voltage electrical equipment

There shall be at least 25 mm separation between any *consumer piping* and any above-ground —

- (a) metal electrical conduit;
- (b) electrical wire or cable not in a conduit; or
- (c) electrical earthing electrode.

Where *consumer piping* is not separated by a suitable electrical insulating material, it shall be 150 mm away from electricity meters and associated control or fuse boxes.

NOTE For guidance for high voltage supplies and earthing cables, refer to AS 2067.

5.3.5 Piping to not support an electrical conductor

Consumer piping shall not be used to support an electrical conductor.

5.3.6 Piping to not be exposed to liquid discharge

Consumer piping shall not be exposed to liquid discharge (e.g. from a *water heater* relief valve or *appliance condensate* drain).

5.3.7 Above-ground piping to not touch the ground

Consumer piping shall not be laid on the ground.

Consumer piping above the ground shall be at least 50 mm clear of the finished ground level.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.3.8 Piping in a concealed location other than underground or embedded in concrete

Where *consumer piping* is to be in a concealed location, other than underground or embedded in concrete, the requirements detailed in [Table 5.3.8](#) shall apply.

Table 5.3.8 — Piping in concealed location

Operating pressure	Accessibility ^a	Is ventilation required? ^b	Required pipe materials and jointing methods
Up to and including 7 kPa	<i>Accessible</i>	Yes	Pipes and jointing as per Table 4.2
	Inaccessible	Yes	Pipes as per Table 4.2 Joints to be kept to a minimum
	<i>Accessible</i> or inaccessible	No	Pipe as per Table 4.2 Joints to be <i>permanent joints</i> and kept to a minimum
Exceeding 7 kPa	<i>Accessible</i>	Yes	Pipes as per Table 4.2 Joints to be <i>permanent joints</i> and kept to a minimum
	Inaccessible	Not to be installed	

^a In this Table *accessible* means access can be gained by, for example, a ceiling access opening or sub-floor door except that in a multi-storey building it means able to be viewed at each floor.

^b For ventilation requirements, see [Clause 5.3.12](#).

5.3.9 Piping passing through a building's exterior wall

Consumer piping passing through an exterior wall of a building shall —

- (a) be metallic.
- (b) be protected against corrosion;
- (c) be sealed at the wall to prevent entry of *gas* into the building in the case of leakage of *gas* outside the building;
- (d) not be subjected to any load from the building; and
- (e) where piping penetrates a *vapour barrier*, the integrity of the vapour barrier be maintained.

5.3.10 Piping passing through floors and internal walls

Where pipework directly passes through cavity floors or cavity walls from one building space to another, it shall be sleeved and sealed to prevent any leaking *gas* migrating between building spaces and to avoid imposition of loads on the piping system.

NOTE Where the pipe is to be sleeved —

- (a) sleeves should be as small as practicable and not bond to the pipe;
- (b) *where practicable*, both ends of sleeves should be sealed to the pipe with a flexible compound; and
- (c) both ends of sleeves that adjoin the structure should be sealed with a suitable building material.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.3.11 Piping in the ground beneath a building

Consumer piping installed in the ground beneath a building shall be —

- (a) copper pipe and joints in accordance with [Table 4.2](#), and any joints kept to a minimum;
- (b) *multilayer* pipe without joints; or
- (c) plastics coated semi-rigid stainless steel without joints.

For South Australia, *consumer piping* installed in the ground beneath a building shall not operate at pressures above 7 kPa unless acceptable to the *Technical Regulator*.

NOTE 1 In Australia, the term “building” includes car parks classified as Class 7a and non-habitable buildings or structures classified as Class 10a under the National Construction Code (NCC).

NOTE 2 In New Zealand, the term “building” includes car parks as defined in the New Zealand Building Code.

NOTE 3 A concrete slab that forms part of a building’s foundation where there is the potential for any leaking gas to migrate into or under the building structure is considered to be part of the building.

5.3.12 Ventilation of concealed piping

Where *consumer piping* is to be installed in a void, duct or sleeve and the conditions in [Clause 5.3.8](#) indicate ventilation is required, all of the following shall apply:

- (a) Ventilation openings shall be provided at each end of a duct or sleeve.
- (b) For voids such as ceiling spaces, ventilation openings shall be positioned relative to each other to provide a flow of air across the entire void.
- (c) The openings shall be in a safe location.
- (d) Each opening shall have a free ventilation area that conforms to [Table 5.3.12](#).

Table 5.3.12 — Ventilation for concealed piping

Cross-sectional area of void, duct or sleeve m ²	Minimum free ventilation area of each opening
Not exceeding 0.05	Full cross-sectional area
Exceeding 0.05 but not exceeding 7.5	0.05 m ²
Exceeding 7.5	0.006 × cross-sectional area of void, duct or sleeve in m ²

5.3.13 Piping embedded in concrete

Where *consumer piping* is to be embedded in a concrete wall or floor, the following, as appropriate, shall apply:

- (a) The piping shall be —
 - (i) copper tube, plastics coated or covered with an appropriate proprietary wrapping.
 - (ii) *multilayer pipe* installed without joints; or
 - (iii) plastics coated stainless steel (Grade 316) without joints.
- (b) The *operating pressure* shall not exceed 7 kPa.
- (c) The amount of cover shall be appropriate for the particular application.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (d) Copper pipe joints and fittings shall be kept to a minimum and be brazed and then covered in a proprietary wrapping.
- (e) Piping shall be placed so that cutting, bending or displacement of any reinforcement from its proper location is not necessary.
- (f) Piping in a floor shall be placed between the top and bottom reinforcement.
- (g) The size of piping shall not reduce the design strength of the concrete slab.
- (h) Piping shall not extend through expansion joints in the concrete.

NOTE The installed piping should be tested for leakage before being embedded in the concrete.

5.3.14 Consumer piping in wooden joists or metal-framed walls

5.3.14.1 General

Consumer piping located in timber- or metal-framed walls shall be installed in accordance with [Clauses 5.3.14.2 to 5.3.14.5](#)

5.3.14.2 Timber wall framework

Holes or notches made in timber studs and plates in walls shall be in accordance with the following:

- (a) The maximum size and spacing of holes or notches in studs shall be in accordance with [Table 5.3.14.2](#) and [Figure 5.3.14.2](#).
- (b) Where pipes are installed in holes or notches, a neutral cure silicone sealant shall be used to fill the annular space.

5.3.14.3 Timber beams, bearers and joists

Holes and notches shall be avoided *wherever possible*. Where *consumer piping* is laid across floor joists and cannot simply be attached to the bottom edge of the joist, it shall be located in notches or circular holes of the minimum practicable size.

Holes or notches made in timber beams, bearers and joists in floors shall be in accordance with [Figure 5.3.14.2](#) and [Figure 5.3.14.3](#).

5.3.14.4 Metal framework

Holes drilled or formed in metal studs or plates shall be accurately sized to enable suitable grommets, insulation or a short sleeve of oversize pipe firmly secured in the framework to be inserted around the pipe, to ensure no direct contact between the pipe and framework but to allow free longitudinal movement of the pipe through the grommet, lagging or sleeve, as shown in [Figures 5.3.14.4\(A\)](#) and [5.3.14.4\(B\)](#).

5.3.14.5 Consumer piping located in cavities

Consumer piping located in cavities shall be installed so as to prevent the transfer of moisture from the outer wall to the inner wall.

NOTE Care should be taken to ensure that the air cavity moisture barrier within an external wall of any building is not bridged with pipe materials. A clear air gap is required between the external wall and the pipe.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 5.3.14.2 — Holes and notches in studs and plates

Symbol	Description	Limits	
		Notched	Not notched
<i>A</i>	Distance between holes and/or notches in stud breadth	Min. $3D$	Min. $3D$
<i>H</i>	Hole diameter (studs and plates)	Max. 25 min (wide face only)	Max. 25 min (wide face only)
<i>C</i>	Notch into stud breadth	Max. 10 mm	Max. 10 mm
<i>E</i>	Notch into stud depth	Max. 20 mm (for diagonal cut in bracing only) (see Note)	Not permitted (see Note)
<i>F</i>	Distance between notches in stud depth	Min. $12B$	N/A
<i>F</i>	Trenches in plates	3 min max.	

Holes or notches shall not be made in cantilevered joists or joists in ceiling or roof spaces except with the approval of a design engineer.

NOTE For New Zealand, refer to NZS 3604.

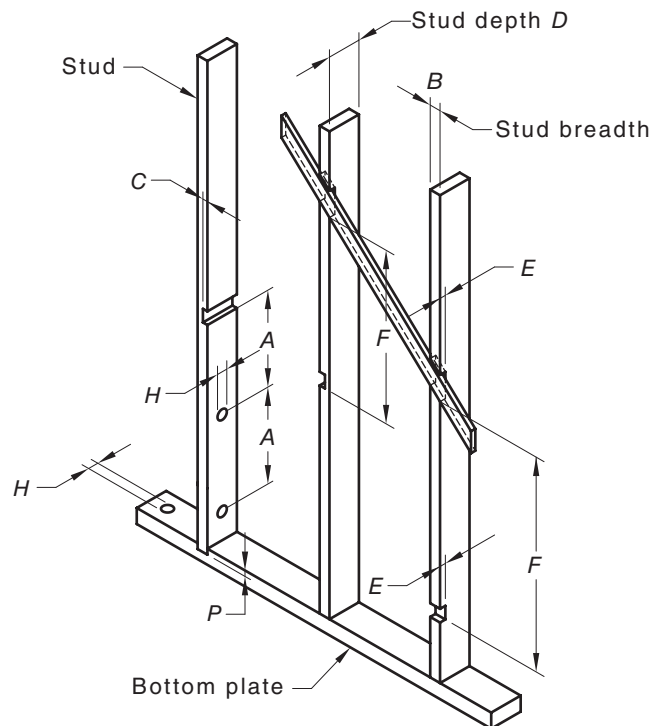


Figure 5.3.14.2 — Notching of wall studs

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

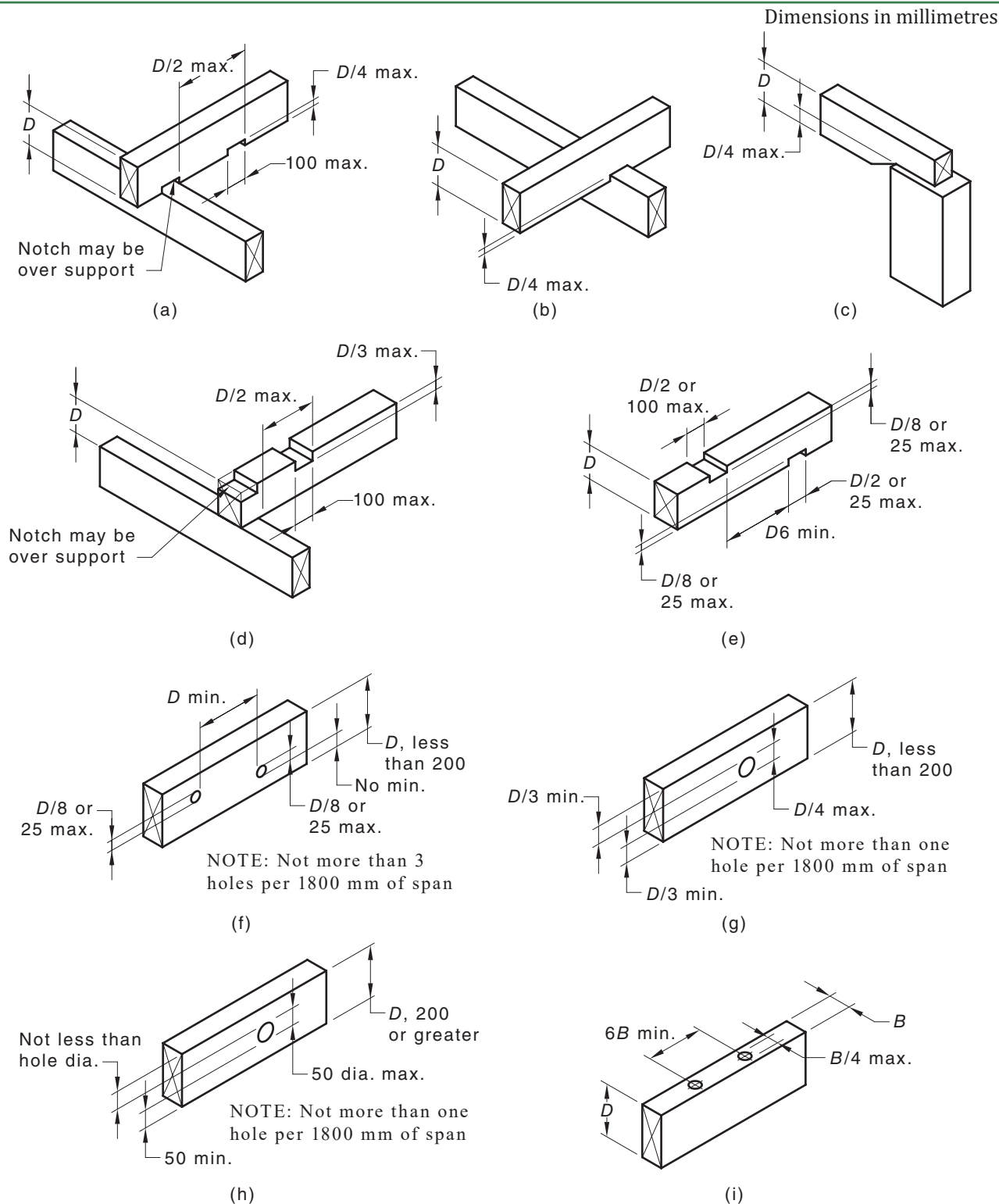


Figure 5.3.14.3 — Notches, cuts and holes in beams, bearers, joists, rafters

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

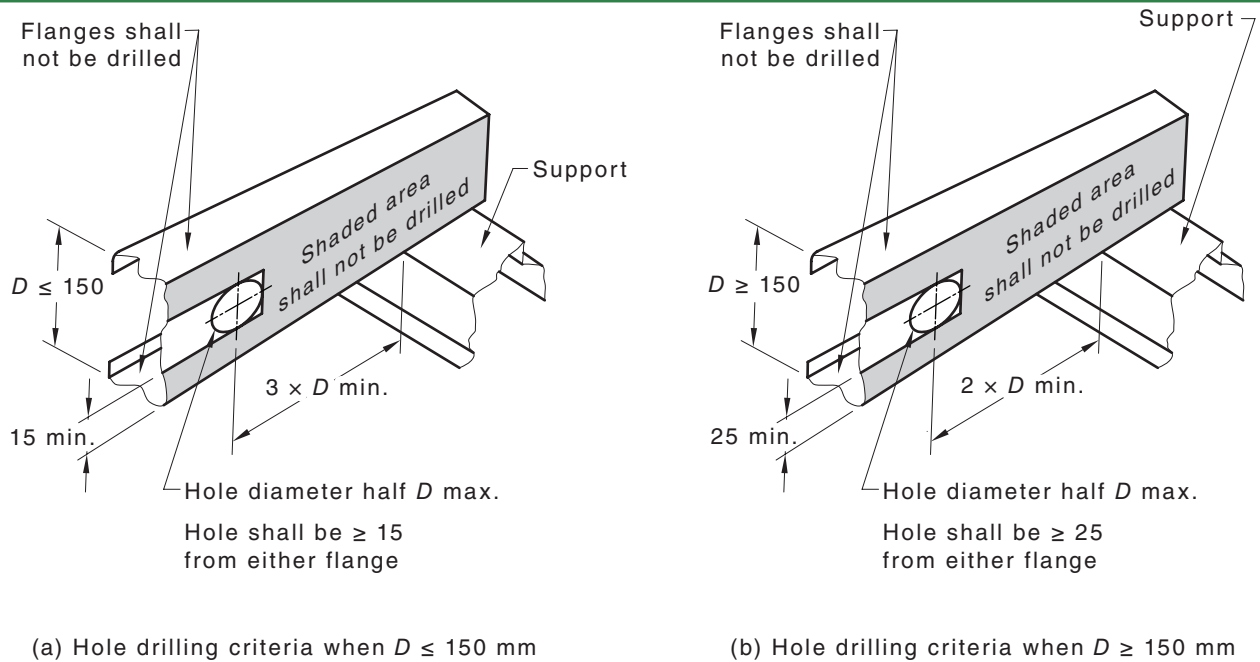


Figure 5.3.14.4(A) — Penetrations to steel floor joists

Dimensions in millimetres

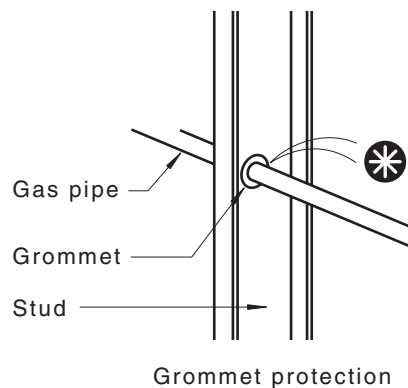


Figure 5.3.14.4(B) — Installation and fixing of services

5.3.15 Piping in steel-framed buildings

Where copper or multilayer piping passes through a steel frame, it shall be protected to prevent abrasion of the pipe and any pipe coating or contact between dissimilar metals.

5.3.16 Location of multilayer piping

Multilayer piping shall not be installed above ground external to a building.

5.4 Installation of consumer piping buried in the ground

5.4.1 Consumer piping beneath a building

Consumer piping buried in the ground beneath a building shall be in accordance with [Table 4.2](#) and [Clause 5.3.11](#).

NOTE 1 The term building refers to any area within the footprint, which includes car parks and verandas.

NOTE 2 A trace wire should be installed with any underground multilayer piping to aid in its detection.

5.4.2 Bedding and support of pipe in the ground

Consumer piping in the ground shall be bedded on a firm compacted surface along its entire length.

NOTE To satisfy this requirement, it may be necessary to trim the trench to “let in” the fittings, collars or flanges to ensure the piping is evenly supported.

5.4.3 Depth of cover

Consumer piping in the ground shall have sufficient depth or be covered in such a way to protect the pipe from physical damage.

The depth of cover shall be in accordance with [Table 5.4.3](#), except where suitable means of protection are used. In no case shall the depth of cover be less than 300 mm.

Pipework in the ground shall be located where it is not liable to mechanical damage or shall be physically protected.

NOTE Means of cover or provision of extra protection include encasement, bridging or design to withstand higher loads.

Table 5.4.3 — Depth of cover for consumer piping

Location	Minimum depth of cover, mm
Roadways (including trafficable areas on private property)	450
Private property (non-trafficable areas)	300

5.4.4 Quality of bedding and backfill

Bedding material and backfill shall —

- (a) be of a type and grade that will not have an adverse effect on the pipe or pipe coating; and
- (b) within 75 mm of the pipe, be free of stones or other materials which could damage the pipe or pipe coating.

NOTE: In some ground conditions it may be necessary to use sand for bedding and backfilling to conform to the requirements of this Clause.

5.4.5 Consolidation of bedding and backfill material

Bedding and backfill material shall be consolidated in a manner so as —

- (a) not to damage the *consumer piping*; and
- (b) to minimize subsequent trench subsidence.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.4.6 Marker tape and tracer wire

Marker tape conforming to the requirements of AS/NZS 2648.1 shall be laid above plastics and multilayer *consumer piping* when installed in an open-cut trench.

NOTE The marker tape should be between 150 mm and 300 mm below finished ground level. Detectable marker tape may be preferred on large installations (e.g. schools, factory complexes, etc.)

When installing consumer piping (e.g. thrust, directional, open-cut trench) a continuous insulated single core tracer wire shall be installed along the pipe, terminating above ground at each riser.

5.4.7 Termination of plastics or multilayer pipe and metallic continuation

Plastics or multilayer *consumer piping* shall terminate horizontally at least 300 mm below ground level and be connected to a metallic *riser* that conforms to the requirements of [Table 4.2](#) for underground pipe.

Galvanized steel shall not be used with plastics *pipe fittings*, as stress cracking and degradation of the pipe fitting can occur.

5.4.8 Securing a riser

The *riser* from buried plastics or multilayer *consumer piping* shall be secured such that stress in the underground pipe is minimized.

NOTE Attaching a short length of the plastics pipe material to the *riser* will assist others in identifying the buried material at a later date.

5.4.9 Separation from underground electrical cable

The separation between any underground *consumer piping* and any electrical supply cable shall be at least —

- (a) 100 mm in any direction, where the electrical supply cable is indicated along its length with marker tape and is provided with mechanical protection in accordance with AS/NZS 3000; or
- (b) 300 mm in any direction, where the electrical supply cable is neither indicated nor protected in accordance with Item (a).

NOTE 1 Means of mechanical protection include any of the following: concrete slabs, continuous concrete pour, bricks designed for protecting electrical supply cables, heavy duty conduit.

NOTE 2 For guidance on high voltage supplies, refer to AS 2067.

5.4.10 Separation from underground electrical earthing electrode

The separation between any underground *consumer piping* and an electrical earthing electrode, for an electrical supply not exceeding 1000 V, shall be at least —

- (a) 500 mm for conductive *consumer piping*; and
- (b) 200 mm for non-conductive *consumer piping*.

NOTE 1 For guidance on high voltage supplies, refer to AS 2067.

NOTE 2 For the purpose of this Clause, plastics piping is considered to be non-conductive and multilayered piping is considered to be conductive.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.4.11 Separation from underground communication cable

The separation between any underground *consumer piping* and a communication cable shall be at least 100 mm.

5.4.12 Separation from underground services

The separation between any underground *consumer piping* and any service, including other *Consumer piping*, other than an electrical or communication service shall be at least —

- (a) 100 mm, for *consumer piping* not exceeding 65 mm nominal size; or
- (b) 300 mm, for *consumer piping* exceeding 65 mm nominal size.

5.4.13 Crossing other underground services

Any underground *consumer piping* crossing any other service shall —

- (a) cross at an angle of not less than 45° (see [Figure 5.4.13](#)); and
- (b) have a vertical separation of not less than 100 mm.

NOTE When using the method of boring around existing services those services should be identified, i.e. service location, pot-holing.

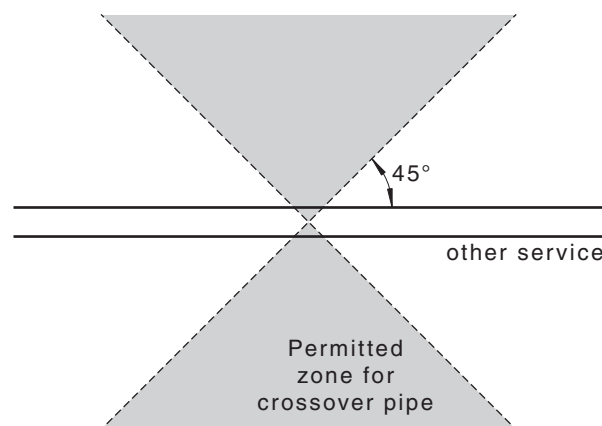


Figure 5.4.13 — Zone for crossover pipe

5.5 Corrosion control

5.5.1 Corrosion protection of bare steel

Uncoated or bare steel *consumer piping* shall be protected against corrosion as soon as practicable after installation and before *commissioning*. Where a pipe or *pipe fitting* is to be installed in a corrosive environment including buried underground, the pipe or *pipe fitting* shall be protected with a suitable wrapping or coating.

5.5.2 Corrosion protection of above-ground pipework

Where corrosion protection is required for above-ground consumer piping, protection shall be provided by an appropriate painting system or by a proprietary coating system.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.5.3 Joining of electrochemically incompatible materials

Where there is potential for corrosion to occur and electrochemically incompatible materials are to be joined, a suitable *insulating joint* shall be used for the connection.

5.5.4 Requirement where coated steel pipe emerges from the ground

Where steel pipe coated with high-density polyethylene or coated with an acceptable proprietary wrapping enters or emerges from the ground, the coating or wrapping shall be extended at least 300 mm out of the ground. If the coating or wrapping is not suitable for exposure to ultraviolet light (UV) it shall be additionally coated with a suitable material.

5.5.5 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* enters or emerges from the ground; and
- (b) with a clearance of at least 300 mm from the finished ground level.

The effectiveness of the cathodic protection system shall be proved as soon as practicable after it is applied.

NOTE 1 The effectiveness of the cathodic protection system should be monitored at least bi-annually or more often as indicated by the site conditions.

NOTE 2 Prior to the installation of any cathodic protection system, the local or State electrolysis authority should be contacted. New cathodic protection systems should not interfere with existing systems or buried structures and system licences may need to be obtained.

5.6 Water and dust clearing provision in consumer piping

5.6.1 Provision of tailpipe

Where *condensate* is likely to occur inside a pipe, a *tailpipe* shall be installed. The *consumer piping* shall be graded to fall to the *tailpipe* at not less than 4 mm per metre run.

NOTE It is preferable for the *consumer piping* to drain to a *tailpipe* near the meter outlet.

5.6.2 Design and location of a tailpipe

Tailpipes shall be designed to —

- (a) terminate with a plug or cap that is easily removed;
- (b) be *accessible* for cleaning and emptying;
- (c) form a trap in which an accumulation of *condensate* will completely fill the *tailpipe*, and then shut off the flow of *gas* before *condensate* can run back into the meter;
- (d) be in a location where the *condensate* is unlikely to freeze;
- (e) be of adequate capacity for the pipe draining to it; and
- (f) be of diameter equal to or larger than the pipe to which it is attached.

NOTE Where the diameter of the *tailpipe* is greater than 25 mm, the cap or plug fitted to the end of the *tailpipe* may be reduced to 25 mm.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.6.3 Marking of tailpipes

Where there are a number of *tailpipes* are installed in different systems in the same *premises* (a block of flats or units), each *tailpipe* shall be clearly and durably marked to indicate the *consumer piping* to which it is connected.

5.6.4 Tailpipes that terminate below ground level

A *tailpipe* that terminates below ground level shall terminate in a well-constructed and drained pit made of a robust material. The size of the pit shall enable the plug or cap to be easily removed. A lid marked "GAS" shall be fitted over the pit.

5.6.5 Provision for dust clearing

A *riser* in excess of 8 m in *consumer piping* supplied from an underground pipe or reticulation system shall have *accessible* provision for dust clearing.

NOTE The provision may be either a plugged tee or cross fitting located at the bottom of the *riser*. Similar clearing provision may be necessary at each change of direction in any horizontal run where considerable dust is present in the *consumer piping*.

5.7 Consumer piping for a high-rise building

5.7.1 General

The design of *consumer piping* for *high-rise buildings* is a specialized area and shall be only carried out by appropriately qualified and experienced persons.

NOTE 1 For guidance, see [Appendix K](#).

NOTE 2 The *Technical Regulator* may require to be specifically advised prior to the commencement of the installation of *consumer piping* in a *high-rise building*.

NOTE 3 The *Technical Regulator* may require the design be verified by an independent competent third party and design records be kept for a minimum of 10 years.

NOTE 4 This requirement also applies to *consumer piping* passing through unventilated spaces in buildings.

NOTE 5 Reference should be made to the applicable building regulations, which specify requirements for the construction of fire-rated pipe ducts, and the construction of *plant rooms* and *enclosures* for *appliances* in *high-rise buildings*.

NOTE 6 Special consideration should be given to *pressure* reducing systems (at higher floors) and seismic valves where appropriate.

5.7.2 Prohibition on flexible hoses

Flexible hoses with rubber lining shall not be used in unventilated areas.

5.7.3 Plan of consumer piping to be displayed on site

A plan of the consumer piping shall be prominently displayed in the fire control room or in another appropriate location. The plan shall be current and shall —

- (a) detail the location of all emergency *manual shut-off valves*; and
- (b) be vermin proof and weatherproof.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.7.4 Manual shut-off valve in riser and lateral

A clearly identified *manual shut-off valve* shall be installed in an *accessible* position —

- (a) at the *gas* entry point to each *riser* where there is more than one *riser*;
- (b) in each lateral branch pipe as close as practicable to the main *riser*; and
- (c) for each tenancy, unless the valve in Item (b) above serves that purpose.

5.7.5 Support and flexibility of riser

A *riser* shall —

- (a) have a pipe-supporting system that is designed to make allowance for expansion and contraction; and
- (b) where the *riser* is inside a building, be sleeved where it passes through each floor and ceiling slab, with any joint within the sleeve being welded or brazed.

NOTE See also [Clauses 5.2.6, 5.3.10](#) and [5.8](#).

5.7.6 Minimizing strain at a lateral

Strain at the junction of a lateral and a *riser*, due to the relative movement between a *riser* and the building, shall be minimized.

5.8 Support of consumer piping

NOTE For pipe with a nominal bore exceeding 200 mm, refer to AS 4041.

5.8.1 Consumer piping support system requirements

The *consumer piping* support system shall —

- (a) be capable of supporting the piping system;
- (b) firmly restrain the piping in the intended position and control movement of the piping system, taking into account any seismic requirements where appropriate; and
- (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 or electrically isolated from such piping system or equipment.

NOTE 1 To satisfy these requirements consideration needs to be given to —

- (a) the construction and dimensions of the supporting device and its components;
- (b) the method and strength of attachment to the supporting structure as well as the stability of the supporting structure;
- (c) the possibility of damage to exposed *consumer piping* spanning joists or bearers; and
- (d) movement due to thermal expansion and contraction.

NOTE 2 For seismic design in New Zealand, refer to NZS 4219.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

5.8.2 Spacing of supporting devices

The spacing of supporting devices shall not exceed those specified in [Table 5.8.2](#), or shall be in accordance with the piping *manufacturer's instructions*.

Table 5.8.2 — Spacing of supporting devices

Nominal size of pipe DN	Vertical or horizontal run spacing, m			
	Steel pipe	Copper or stainless steel pipe	Semi-rigid stainless steel pipe	Multilayer 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	—	2
50–65	3	3	—	2
80–200	4	4	—	—

5.8.3 Diameter of rod hangers

The diameter of rod hangers shall be in accordance with [Table 5.8.3](#).

Table 5.8.3 — Diameter of rod hangers

Nominal size DN, mm	Minimum rod diameter for single rod hangers, mm
Up to 50	10
65 to 90	12
100 to 125	16
150 to 200	20
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 10 mm.	

5.9 Use of hose assemblies

NOTE Refer to specific *appliance* sections for additional requirements. For example, the use of hose assemblies on cooking *appliances*.

5.9.1 Hose assembly requirements

Hose assemblies shall not be joined together and shall be —

- (a) of a continuous length, as short as practicable and, subject to the specific *appliance* requirements, not exceed 3 m;
- (b) of adequate diameter for the maximum *gas consumption* of the *appliance*; and
- (c) in Australia, *certified* to the relevant parts of the AS 1869 series. ^(A2)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.9.2 Prohibited location of hose assembly connection point

A connection point for a *hose assembly* shall not be located in a —

- (a) *bedroom*;
- (b) *bathroom*;
- (c) *sauna*;
- (d) *toilet*;
- (e) *hallway*; or
- (f) *residential garage*.

5.9.3 Location of connection point for hose assembly

A connection point for a *hose assembly* shall be located —

- (a) to avoid traffic across the hose; and
- (b) at least 1 m away from a doorway in a building.

NOTE Where flueless space heaters are permitted by the relevant jurisdiction, there may be a requirement that fixed ventilation openings be provided. Consideration should be given to providing such openings when installing the connection point see [Appendix M](#)).

5.9.4 Hose assembly — Prohibited installation methods

A *hose assembly* shall not pass —

- (a) from one room to another through a doorway with a closable door;
- (b) through a wall, portable partition, ceiling or floor;
- (c) through a fixed partition, unless the opening in the partition is large enough to accommodate the hose and its attachments without causing damage; or
- (d) through the panel or casing of the *appliance* unless the *appliance* is specifically manufactured to avoid damage to the *hose assembly*.

5.9.5 Hose assembly — Operating conditions

Under normal operating conditions, a *hose assembly* shall not be installed where it will be —

- (a) exposed to a temperature exceeding the maximum temperature specified in the *hose manufacturer's instructions*;
- (b) subject to strain, abrasion, kinking or permanent deformation; or
- (c) subject to damage by vermin.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.9.6 Hose assembly connecting an appliance

A hose assembly for an appliance shall be connected to the appliance and the consumer piping by a threaded or other metal connection acceptable to the technical regulator.

Unless prohibited in [Clause 6.10](#) or by manufacturer's installation instructions, a hose assembly for an appliance shall —

- (a) be connected to the appliance and have a manual shut-off valve and union fitted at the inlet end of the hose assembly;
- (b) be connected to the appliance and have a quick-connect device, located at the inlet end of the hose assembly which automatically shuts off the gas supply when disconnected; or
- (c) have a manual shut-off valve at the inlet end of the hose assembly where a quick-connect device, which automatically shuts off the gas supply when disconnected, is located at the appliance end of the hose assembly.

NOTE 1 The method in Item (b) is used where an appliance is to be disconnected from the gas supply by the user, i.e. a portable heater, a barbecue or where the appliance is to be regularly disconnected for cleaning purposes.

NOTE 2 The method in Item (c) may be used where larger appliances are to be disconnected from the gas supply by the user, i.e. for cleaning purposes around commercial catering appliances.

NOTE 3 An appliance restraint may be required (see [Clause 6.2.14](#)).

5.10 Quick-connect devices

NOTE For special requirements set out by the *Technical Regulators* in Western Australia and Victoria, see [Appendix M](#).

5.10.1 Quick-connect device installed outside above ground

A *quick-connect device* socket installed outside shall be at least 300 mm above the ground or floor and shall have a means of securing a safety chain or wire within 50 mm of the *quick-connect device* socket to prevent strain on the hose.

5.10.2 Quick-connect device socket installation method where subjected to water or dust

A *quick-connect device* socket shall be installed so as to avoid entry of water, dust or other debris.

NOTE When installed outside, directing the outlet downward would satisfy this requirement.

5.10.3 Quick-connect devices installed outdoors below ground

A *quick-connect device* socket installed *outdoors* below ground level shall —

- (a) be suitable for the conditions of use; and
- (b) be installed in a purpose-built *enclosure* and —
 - (i) be constructed of *non-combustible material*;
 - (ii) have a lid that is suitable for the environment in which it is located;
 - (iii) have means of drainage; and
 - (iv) have a means of securing a safety chain or wire within 50 mm of the *quick-connect device* socket to prevent strain on the hose.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.11 Installing gas equipment

5.11.1 Consumer piping gas pressure regulators

5.11.1.1 Requirements for a consumer piping gas pressure regulator

Consumer piping gas pressure regulators shall —

- (a) be constructed of material and use lubricants applicable for the particular application;
- (b) be protected by the installation of *over-pressure protection* where the regulator is incapable of withstanding the *maximum over-pressure* of the next upstream regulator under fault conditions;
- (c) have a capacity applicable for the design *gas load* and allowable *pressure drop* for the particular application; and
- (d) meet the requirements of [Clause 5.2.1](#).

5.11.1.2 Consumer piping gas pressure regulator installation requirements

Consumer piping gas pressure regulators shall be —

- (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) *accessible* for maintenance and adjustment;
- (e) not subjected to excessive temperature;
- (f) positioned to minimize the possibility of ignition of any discharge from *a breather vent*;
NOTE 1 For the discharge of a *breather vent* within an *enclosure* or room, see [Clause 5.11.5.7](#).
- (g) positioned to minimize exposure to physical damage; and
- (h) mounted in a horizontal position if weight loaded.

NOTE 2 Particular attention should be given to the risk of impact from falling ice and snow, where appropriate.

NOTE 3 In non-residential installations, it is advisable to install a manual *isolation valve* upstream of a *consumer piping* regulator to allow servicing of the regulator without causing undue supply disruption to other parts of the installation.

5.11.1.3 Prohibited locations for a consumer piping regulator

Consumer piping gas pressure regulators shall not be installed in —

- (a) a lift shaft or lift motor room;
- (b) a room specifically intended for electrical switchgear;
- (c) a fire-separated stairway or passageway;
- (d) a fire hydrant cabinet or hose reel cabinet;
- (e) sprinkler or hydrant pump room;

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (f) in a cavity wall; or
- (g) a position that would obstruct egress from a building.

5.11.1.4 Where a consumer piping gas pressure regulator is required

A consumer piping gas pressure regulator shall be fitted —

- (a) where any *appliance* in the *premises* is not fitted with A_2 an *appliance regulator* A_2 , unless the *gas supply* or *consumer piping pressure* will not exceed 1.5 kPa for *natural gas*, or 3.5 kPa for *LP Gas*;
- (b) where the intended *operating pressure* of the *consumer piping* exceeds the *rated working pressure* of the A_2 *appliance regulator(s)* A_2 ; or
- (c) where the *gas pressure* to a section of *consumer piping* would otherwise exceed the *rated working pressure* of the piping, *pipe fittings* or components in that section.

5.11.1.5 A_2 Where an appliance regulator is not required A_2

Where A_2 an *appliance regulator* A_2 is not required, upstream protection shall be provided and set to the *maximum over-pressure* of the *appliance*.

5.11.1.6 Consumer piping regulator outlet operating pressure notice

Where the outlet *operating pressure* setting of a *consumer piping gas pressure regulator* for *natural gas*, exceeds 1.5 kPa or for *LP Gas* exceeds 3.5 kPa, there shall be a permanent and durable notice in a prominent position near the regulator showing the outlet *pressure* setting.

NOTE The following wording for this notice would be suitable:

THIS REGULATOR OUTLET PRESSURE SETTING IS ... kPa.

5.11.2 Over-pressure

5.11.2.1 Over-pressure protection and its performance

Over-pressure protection shall be provided where the *operating pressure* at the inlet to a *gas pressure regulator* exceeds —

- (a) the *maximum over-pressure* of piping and components supplied by the regulator up to and including the next downstream regulator; and
- (b) one of the following:
 - (i) 7 kPa for *NG* and *SNG*.
 - (ii) 14 kPa for *LP Gas*.

The *over-pressure protection* device shall ensure that piping and components supplied by the regulator up to and including the next downstream regulator will not be subjected to a *pressure* greater than the *maximum over-pressure* for that piping and those components.

NOTE Where the inlet *pressure* to an *appliance gas pressure regulator* will exceed 7 kPa, a *consumer piping* regulator may be required.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.11.2.2 Maximum over-pressure of the installation

For each individual component the *maximum over-pressure* is —

- (a) *the maximum over-pressure* of the component if known; or
- (b) 1.5 times the *rated working pressure* of the component, if known.

The *maximum over-pressure* for any portion of an installation is —

- (i) the lowest *maximum over-pressure* of the components comprising that portion of the installation; or
- (ii) the *pressure* to which that portion of the installation has been tested, if neither of the *pressures* in Item (a) or (b) are known.

5.11.2.3 Requirements where over-pressure protection system shuts off the gas supply

Where an *over-pressure protection* system is of a type that shuts off the *gas* supply —

- (a) the *over-pressure protection* system shall be of a manual reset type to restore supply; and
- (b) a *gas* filter that will prevent the passage of foreign particles larger than 1 mm shall be located upstream of and not more than 5 m from the device that shuts off the *gas* supply.

5.11.3 Protection of gas supply system from low pressure where a gas pressure-raising device or a gas engine is installed

Where a *gas* pressure-raising device or a *gas* engine is to be installed, a low-pressure device shall be installed in the *consumer piping* as close as practicable to the inlet of the *pressure-raising* device or engine. The device shall cut off the power to the *gas* pressure-raising device or engine when the inlet *pressure* falls below 20 % of the *operating pressure* at the sensing point or 0.8 kPa, whichever is the higher.

NOTE 1 This is the minimum allowable figure. The actual setting should be discussed with the *network operator* or *Technical Regulator*. The setting should be as high as possible to provide maximum protection of upstream equipment without causing nuisance shut-downs.

NOTE 2 Such devices include, but are not limited to, a mechanical diaphragm-operated or electrically-operated diaphragm low-pressure shut-off valve.

NOTE 3 See also [Clause 5.12.3](#) for additional requirements for *pressure-raising* devices.

5.11.4 Pressure test points

Pressure test points shall be *accessible* and provided at, or adjacent to, the —

- (a) outlet of *gas* pressure regulators installed in the *gas* pipework;
- (b) inlet and outlet of *pressure-raising* devices installed in the *gas* pipework;
- (c) outlet of the venting device of a *double block and vent safety shut-off system*;
- (d) inlet of an *appliance*, if no appropriate test point is incorporated in the *appliance*; and
- (e) where a permanent *pressure* gauge is fitted, a provision to fit an alternate test point shall be provided.

Where *pressures* exceed 7 kPa, *pressure* test points shall be of the self-sealing type.

NOTE For *pressures* exceeding 7 kPa, the testing equipment should include a mechanical connection to the test point.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.11.5 Venting

NOTE In this Clause, the term “vent terminal” means a vent opening on a regulator or similar device having a diaphragm, or the terminal of a *vent line*.

5.11.5.1 Performance of vent line

A *vent line*, under all operating conditions, shall not adversely affect the operation of the device to which it is connected.

An isolation valve shall not be installed in a vent line.

5.11.5.2 Vent line terminating outside a building

When any of the following are installed inside a building, they shall be fitted with a *vent line* that terminates outside a building:

(a) A *safety shut-off system* that requires venting to atmosphere.

(b) A *gas pressure* relief device.

NOTE This does not apply to a relief device fitted to an *LP Gas cylinder*.

(c) A *consumer piping gas pressure* regulator incorporating a *gas pressure* relief device.

(d) A *breather vent* except where [Clause 5.11.5.7](#) or [5.11.5.8](#) applies.

5.11.5.3 Limitation on interconnection of vent lines

Vent lines shall not be interconnected except where they are *breather vent lines* from the same *appliance*; or *vent lines* from vented *safety shut-off systems* fitted to the same *appliance*.

5.11.5.4 Size of a common vent line

Subject to [Clause 5.11.5.1](#), a common *vent line* shall have a cross-sectional area not less than the sum of the cross-sectional areas of the two largest *vent lines* being interconnected.

5.11.5.5 Size of vent line for a consumer piping gas pressure regulator breather vent or relief device

Subject to [Clause 5.11.5.1](#), the minimum size of any *vent line* for a *consumer piping gas pressure regulator breather vent* or a relief device shall be as follows:

(a) For a *vent line* not exceeding 10 m in length, the size shall be the vent connection size.

(b) For a *vent line* exceeding 10 m but not exceeding 30 m in length, the size shall be one standard pipe size larger than the vent connection size.

NOTE 1 Restrictions due to changes in direction should be considered in determining *vent line* size.

NOTE 2 A *vent line* exceeding 30 m in length needs to be designed taking into account the effects of regulator or relief device inlet *pressure*, *vent line* flow resistance and the duty of the regulator or relief device.

5.11.5.6 Size of vent line for a vented safety shut-off system

The size of a *vent line* for a vented *safety shut-off system* shall be in accordance with [Table 5.11.5.6](#).

NOTE Restrictions due to changes in direction should be considered in determining *vent line* size.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 5.11.5.6 — Vent pipe size for vented safety shut-off systems

Vent valve minimum nominal size	Maximum length, m									
	Vent line nominal size DN									
DN	15	20	25	32	40	50	65	80	100	150
6	60	160	400	NOT APPLICABLE						
8	30	80	200							
10	15	40	100							
15	8	20	50							
20	NOT APPLICABLE	10	25	64						
25		13	32	80						
32				16	40	100				
40		NOT APPLICABLE			20	50	130			
50					25	65	160			
65					32	80	200			
80					40	100	300			

5.11.5.7 Discharge from breather vents

5.11.5.7.1 Non-domestic applications

One of the following criteria shall be used to determine if a *breather vent* may be vented within a room:

- (a) *Breather vents* to be vented within a room or *enclosure* if the effective volume of the room or *enclosure* exceeds the value (V) given by the following equation:

$$V = K d^2 \sqrt{P}$$

where

- V = effective volume of room or *enclosure* that houses the regulator, in cubic metres (not to exceed 1000 m³)
- = floor area × (ceiling height — height of device above floor), for second family *gases*
- = floor area × height of device above floor, for third family *gases*
- K = 8.83, for second family *gases*
- = 14.0, for third family *gases*
- d = *breather vent* hole diameter, in millimetres
- P = inlet *pressure* to the vented device, in kilopascal-gauge (not to exceed 200 kPa)

Where the effective room or enclosure size is known, the maximum diameter of the *breather vent* may be found from the following equation:

$$d = \sqrt{\frac{V}{K\sqrt{P}}}$$

- (b) A *breather vent* to discharge into a room or *enclosure* when the diameter of the *breather vent* orifice does not exceed the maximum value determined in accordance with [Appendix G](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NOTE 1 The equations in criterion (a) are based on an airflow rate of one air change per hour and complete mixing of any vented *gas* within the effective volume.

NOTE 2 The dispersion of vented gas is dependent on many factors and will never be completely uniform; for instance, concentrations in the vicinity of the point of release can be expected to be higher than in the surrounding space.

NOTE 3 The equations in criterion (a) are based on the assumption of a *breather vent* discharge coefficient of 0.60. While this is typical of a *breather vent* with sharp edges, in some cases the discharge coefficient may be higher and this will result in higher *gas* flows requiring larger room or *enclosure* volumes for safe operation.

NOTE 4 Based on the above assumptions, the calculations limit the *gas* concentration to 20 % of the *lower explosive limit* (LEL).

NOTE 5 If the effective volume (and *pressure*) is known and the vent diameter is required, the equation (explicit in diameter) at the end of criterion (a) may be used.

NOTE 6 The limitation on the *breather vent* orifice diameter is related to a possible worst-case safety condition of a ruptured diaphragm (or similar membrane) separating the *gas* within the device from free air outside the device. The aim of this provision is to ensure that the accumulation of *gas* in a room or *enclosure*, as a result of diaphragm rupture, will remain below the *lower explosive limit* (LEL) of the air/*gas* mixture.

NOTE 7 Some devices, such as regulators, employ an orifice below the diaphragm, to control *gas* flow, and a vent opening above the diaphragm, to ensure the correct operation of the regulator. In the event of a diaphragm rupture in these cases, “*breather vent* orifice” means the smaller orifice through which *gas* escapes into a room or *enclosure*. Care should therefore be taken to establish whether the internal orifice or the vent of the device is the smaller.

5.11.5.7.2 Domestic applications

In addition to the requirements of [Clause 5.11.5.7.1](#), in Class 1 and Class 2 buildings (Australia) or in detached or multi-unit dwellings (New Zealand), the *breather vent* diameter in domestic installations shall not exceed 0.7 mm.

NOTE: For building classifications refer to:

- (a) In Australia, the National Construction Code.
- (b) In New Zealand, the New Zealand Building Code.

5.11.5.8 Restriction of breather vent

To avoid fitting a *vent line* to a device having a *breather vent*, the device may have a vent-restricting orifice fitted to it, provided —

- (a) the orifice does not exceed the maximum value determined by [Clause 5.11.5.7](#);
- (b) such a restriction is specified in accordance with the *manufacturer's instructions* for the device; and
- (c) the orifice does not, under all operating conditions, adversely affect the operation of the device.

5.11.5.9 Vent terminal location

NOTE The requirements of this Clause do not apply to a *breather vent* terminal. See [Clause 5.11.1.2\(f\)](#).

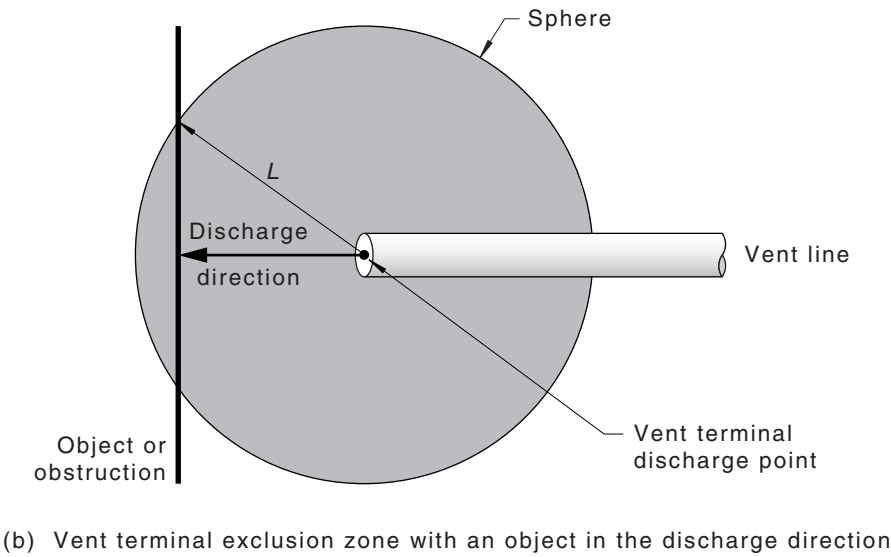
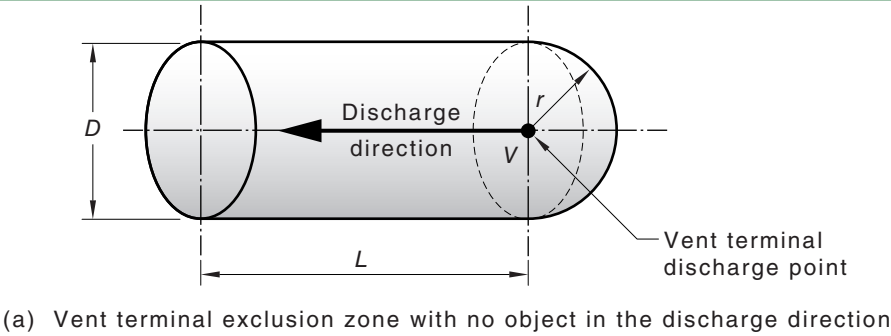
A vent terminal shall be located where *gas* discharge will dissipate without entering buildings or creating any hazard. The point of discharge shall —

- (a) be at least 3 m from a mechanical air inlet into a building unless calculations based on [Figure 5.11.5.9\(a\)](#) give a greater distance; and

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (b) be located so there is no *ignition source* or opening into a building within the exclusion zone shown in [Figure 5.11.5.9\(a\)](#); and
- (c) in cases where there is any object (e.g. wall, ground, etc.) in the direction of discharge and within the exclusion zone of [Figure 5.11.5.9\(a\)](#), be located such that there is a clearance of at least distance L of [Figure 5.11.5.9\(b\)](#) to any *ignition source* or opening in all directions.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)



Vent terminal diameter (not shown)	Exclusion zone, m		
	L	D	r
Not exceeding 50 mm	1.5	1	0.5
Exceeding 50 mm	$1.5T$	T	$0.5T$

NOTE 1 $T = \frac{\text{Vent terminal diameter (mm)}}{50}$, in metres.

NOTE 2 The exclusion zone shown in Illustration (a) depicts a space consisting of a cylinder in the discharge direction and a hemisphere in the opposite direction of discharge from the vent terminal discharge point.

NOTE 3 The exclusion zone only applies up to 200 kPa.

NOTE 4 The dispersion of vented gas is dependent on many factors and will never be completely uniform; for instance, concentrations in the vicinity of the point of release can be expected to be higher than in the surrounding space.

NOTE 5 This clause excludes the first regulator as defined in AS/NZS 1596.

Figure 5.11.5.9 — Vent terminal exclusion zone

5.11.5.10 Vent terminal construction

Vent terminal construction shall prevent the entry and accumulation of water (e.g. sprinkler water, rainwater etc.), birds, insects or other materials that could cause blockage.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.11.5.11 Vent line to be readily removable

The *vent line* shall include a means of disconnection such as a union or flange near the device to be vented, unless the *vent line* can otherwise be readily removed.

5.11.6 Sub-meters

NOTE This Clause provides requirements for the installation of *sub-meters* only. The requirements for *consumer billing meters (master meters)* are determined by the *network operator*. For guidance, see [Appendix L](#).

5.11.6.1 Requirements for sub-meters

Sub-meters shall —

- (a) be constructed of materials, and use lubricants, as applicable for all *gases*; and
- (b) have a capacity as applicable for the design *gas load* and allowable *pressure* drop for the particular application.

5.11.6.2 Prohibited locations of a sub-meter

Sub-meters shall not be located —

- (a) in a lift shaft or lift motor room;
- (b) in a room specifically intended for electrical switchgear (unless all equipment is *intrinsically safe*);
- (c) in a *fire-isolated stairway* or *passageway*;
- (d) in a fire hydrant or hose reel cabinet;
- (e) in a sprinkler or hydrant pump room;
- (f) in a position that would obstruct egress from a building;
- (g) in a *bedroom*;
- (h) in an area where extreme temperatures or sudden extreme changes in temperature may occur;
- (i) on a floor that is frequently wetted;
- (j) on a floor that contains materials that may corrode the meter;
- (k) on the ground;
- (l) in the foundation area under a building;
- (m) in a cavity wall, except where [Clause 5.11.6.4](#) applies; or
- (n) in a roof/ceiling space, except where [Clause 5.3.8](#) and [Clause 5.13](#) apply.

5.11.6.3 Sub-meter location and identification

Sub-meters shall be —

- (a) installed in *accessible* locations with adequate ventilation where they are protected from damage and which permit ease of replacement, maintenance and reading;
- (b) clearly identifiable with the *gas installation* they supply; and

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) suitably connected to piping.

NOTE Possible causes of damage include impact, corrosion, thermal extremes, excessive vibration, steam and dampness.

5.11.6.4 Sub-meter in a recess or meter box in a cavity wall

A recess or meter box in a cavity wall for housing a *sub-meter* shall be —

- (a) constructed of non-combustible material;
- (b) completely sealed from any adjoining recess or cavity;
- (c) of a size to permit ease of replacement and maintenance of the sub-meter; and
- (d) ventilated directly to outside atmosphere and the required ventilation shall be in accordance with the [Clause 5.13.2](#).

5.11.6.5 Ventilation requirements — Sub-meter in an enclosure

Where a *sub-meter* is installed in an *enclosure*, the *enclosure* shall be ventilated in accordance with the requirements of [Clause 5.13.2](#) or [Clause 5.13.4](#) as appropriate.

5.11.6.6 Provision of manual shut-off valve

A *manual shut-off valve* shall be provided in the *consumer piping* upstream of the sub-meter. The valve shall be *accessible* for operation and be as close as practicable to the *sub-meter*.

5.11.6.7 Connection of the sub-meter

Sub-meters shall be attached to the *consumer piping* by suitable connections and shall be supported independently of, and connected to, the *consumer piping* in such a way that strain on the *sub-meter* or connecting piping is minimized.

5.12 Gas pressure-raising devices

NOTE The network operator may require to be specifically advised prior to the installation of a *gas pressure-raising device*.

5.12.1 Protection against pulsation

A pulsation damper or surge *tank* shall be installed where the *gas pressure-raising device* might cause *pressure pulsation* that could harm or adversely affect any part of the *gas installation* or *gas distribution network*.

5.12.2 Connection requirements

A *gas pressure-raising device* shall be attached to the piping by flexible connections to prevent vibrations impacting on *consumer piping*.

5.12.3 Required controls

A *gas pressure-raising device* shall have the following controls on the inlet side in the sequence given:

- (a) A *manual shut-off valve*.
- (b) A manual reset type low *pressure* switch in accordance with [Clause 5.11.3](#).
- (c) A *non-return valve*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.12.4 Requirements of downstream pipe and equipment

Piping and equipment downstream of a *gas pressure*-raising device shall have —

- (a) a *rated working pressure* of not less than the maximum *operating pressure* of the *gas pressure*-raising device;
- (b) a test *pressure* not less than the highest *pressure* likely to occur due to equipment failure; or
- (c) *over-pressure protection* fitted.

5.13 Ventilation of gas equipment

5.13.1 General

Gas equipment in this Clause means a meter, regulator or *gas pressure*-raising device.

Where natural ventilation is used, all or part of the required ventilation may be supplied by air “leaked” into an *enclosure* through gaps in the structure. To determine the amount of adventitious ventilation available, allowance of 700 mm² per m³ of volume of the space being ventilated shall be made.

Where a meter, regulator or *gas pressure*-raising device is to be installed in an *enclosure*, the *enclosure* shall be ventilated by one of the methods detailed in [Clause 5.13.2](#), [5.13.3](#) or [5.13.4](#).

5.13.2 Natural ventilation to outside

5.13.2.1 General

Two permanent openings shall be provided directly to outside, each with a minimum free ventilation area provided as calculated by deducting the allowance in [Clause 5.13.1](#) for adventitious ventilation and using the appropriate formula in either —

- (a) [Clause 5.13.2.2](#); or
- (b) [Clause 5.13.2.3](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

5.13.2.2 Enclosures containing meters or regulators

The minimum free ventilation area (A), for an *enclosure* containing meters or regulators shall be calculated as follows:

$$A = R \times F$$

where

- A = minimum free ventilation area, in square millimetres
- R = equipment rated capacity, cubic metres per hour
- F = 1000 for *pressures* not exceeding 7 kPa; or
= 2000 for *pressures* exceeding 7 kPa but not exceeding 200 kPa

Where more than one meter is installed in an *enclosure*, then the equipment rated capacity shall be the sum of the rated capacities of the meters.

NOTE 1 Where a meter and a regulator are to be installed in an *enclosure* as part of one system, the equipment rated capacity is taken as the badge capacity of the meter in m³/h at 125 Pa *pressure* differential. That is, not the sum of the regulator and meter rated capacities. The *pressure* used to determine F is the highest *operating pressure* in the *enclosure*.

NOTE 2 For a performance based solution under [Section 2](#), a factor of $F = 3\,000$ should be used for *pressures* exceeding 200 kPa but not exceeding 1 050 kPa.

5.13.2.3 Enclosures containing pressure-raising devices

The minimum free ventilation area shall be calculated as follows:

$$A = R \times 3\,000$$

where

- A = minimum free ventilation area, in square millimetres
- R = equipment rated capacity, in cubic metres per hour

5.13.3 Natural ventilation via adjacent room

Where the ventilation is to an adjacent room, the adjacent room shall be non-habitable and the *free area* of each opening shall be twice the requirements of [Clause 5.13.2](#). These requirements shall apply to all subsequent rooms until a room is ventilated to outside. That room shall be ventilated in accordance with [Clause 5.13.2](#).

5.13.4 Mechanical ventilation

Where the ventilation for the *enclosure* is to be provided by mechanical means, this shall be directly to outside and the system shall be in accordance with [Table 5.13.4](#). Fan motors shall be remote from the exhaust duct (indirect drive) or be rated to operate in a Zone 1 hazardous area.

NOTE For classification of areas, refer to [AS/NZS IEC 60079.10.1](#).

Where a combination of natural and mechanical ventilation is to be used to ventilate an *enclosure* —

- (a) exhaust air shall be provided by mechanical means; and
- (b) no *open flued appliance* shall be installed in the *enclosure*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table 5.13.4 — Ventilation of gas equipment — Mechanical ventilation

Gas equipment in enclosure	Minimum airflow to outside L/s ^a	Safety requirement for ventilation failure
Meter and/or regulator	Equipment rated capacity ^c (m ³ /h) × 0.1	An <i>interlock</i> ^b that causes the <i>gas</i> supply to the equipment to shut down and lock-out; OR
<i>Gas pressure</i> -raising device	Equipment rated capacity (m ³ /h) × 0.3	A remote alarm that can only be reset at the <i>enclosure</i>
<i>Gas</i> equipment and an appliance	The greater of minimum airflow rate required for the appliance or equipment ^d	An <i>interlock</i> that causes the <i>gas</i> supply to the appliances in the <i>enclosure</i> to shut down and <i>lock-out</i> AND one of the following: (a) An <i>interlock</i> that causes the <i>gas</i> supply to the equipment to shut down and lock-out; OR (b) A remote alarm that can only be reset at the <i>enclosure</i>
^a Minimum airflow to outside is reliant upon make-up air into the <i>enclosure</i> . ^b For details for sensing devices that are required for these situations, see Clause 6.4.10 . ^c Where a meter and regulator are installed in an <i>enclosure</i> as part of one system, the equipment rated capacity is taken as the badge capacity of the meter in m ³ /h at 125 Pa differential. That is, not the sum of the regulator and meter rated capacities. ^d For the minimum airflow requirements for an appliance, see Clause 6.4.9 .		

5.13.5 Ventilation of an enclosure containing a meter or regulator and a gas pressure-raising device

Where a meter or regulator and a *gas pressure*-raising device are to be installed in the same *enclosure*, the ventilation requirements shall be calculated to provide the greater amount of ventilation to the *enclosure* by using the method in either —

- (a) [Clause 5.13.2.2](#); or
- (b) [Clause 5.13.2.3](#).

5.13.6 Ventilation of an enclosure containing gas equipment and an appliance

Where *gas* equipment and an *appliance* are to be installed in the same *enclosure*, the ventilation requirements shall be calculated by one of the methods in [Clause 5.13](#) or in [Clause 6.4](#), whichever provides the greater amount of ventilation to the *enclosure*.

5.13.7 Location of openings

The ventilation openings shall be located such that adequate ventilation is achieved in all parts of the enclosed area.

For natural ventilation, the openings shall be located to ensure the distance between the top of the upper opening and the ceiling of the *enclosure*, and the distance between the bottom opening and the floor of the *enclosure* does not exceed 5 % of the height of the *enclosure*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Section 6 Means of conformance — Installation of appliances

6.1 Requirements for appliances

6.1.1 New Zealand requirements

The *appliance* shall be checked to ensure that the *appliance* markings and instructions indicate that it is designed to operate on the *gas* to be supplied to the installation and at the range of *pressures* supplied.

NOTE *Gas* (Safety and Measurement) Regulations 2010 express compliance requirements for *appliances*.

6.1.2 Australian requirements

Type A appliances shall be suitable for the type of *gas* to be connected and —

- (a) be *certified*; or
- (b) be acceptable to the *Technical Regulator*.

Type B appliances shall conform to the requirements of AS 3814 and be acceptable to the *Technical Regulator*.

Before a second-hand *appliance* is installed, the *appliance* shall satisfy the safety requirements of the *Technical Regulator*.

6.1.3 Appliance conversion

In Australia, an *appliance* may be converted to suit another *gas* type provided —

- (a) the *appliance* is suitable for that *gas*; and
- (b) the conversion is in accordance with the *manufacturer's instructions*.

NOTE 1 Where an *appliance* is to be converted to a *gas* type, which is not shown on the appliance data plate, the *Technical Regulator* may require to be specifically advised prior to the commencement of the work.

NOTE 2 When converting an appliance from another fuel to *gas*, the conversion should be in accordance with a conversion procedure acceptable to the *Technical Regulator*.

In New Zealand, if an appliance is converted (other than by simple exchange of injectors) its compliance with the *Gas* (Safety and Measurement) Regulations 2010 shall be verified.

6.2 General installation requirements

6.2.1 Determination of adequate gas supply

The maximum consumption of the *appliances* being installed shall be determined, and this load, along with any existing loads, shall be checked to ensure that it can be met —

- (a) for reticulated *gas* supplies, by the *gas* meter or measurement system, and reticulation system; or
- (b) for on-site storage systems, by the storage system and any *gas pressure* regulators, vaporizers, or *pressure* boosters, etc.

Before connecting an additional *appliance* to an existing *consumer piping* system, the existing piping shall be checked for adequate capacity. If found to be unsuitable, the existing *consumer piping* shall be made suitable or separate piping shall be installed.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.2.2 Manufacturer's installation instructions

Appliances shall be installed in accordance with the requirements of this Standard and the *manufacturer's instructions*.

Where there is any conflict between the *manufacturer's instructions* and the requirements of this Standard, the matter shall be referred:

- (a) In Australia, to the *Technical Regulator*.
- (b) In New Zealand, to the A_2 appliance A_2 manufacturer or the New Zealand representative for a ruling.

NOTE This does not relieve any responsibility for conformance to [Section 2](#) of this Standard.

6.2.3 Restriction on flueless appliances

A *flueless appliance* shall not be installed in a —

- (a) bedroom other than a domestic *gas* cooking appliance installed in a combined sleeping/living area in accordance with [Clause 6.10.1.14](#);
- (b) bathroom;
- (c) toilet;
- (d) sauna; or
- (e) spa room.

6.2.4 Restriction on appliance location

An *appliance* shall not be installed —

- (a) internally, unless it is designed for *indoor* installation; or
- (b) externally, unless it is designed for *outdoor* installation.

NOTE 1 An *appliance* designed for *indoor* installation may be installed “externally” in an *enclosure* or a *quasi-outdoor* situation if, following the *manufacturer's instructions*, the relevant requirements of this Standard are satisfied.

NOTE 2 An *appliance* designed for *outdoor* installation may be installed in applications that do not meet the definition of *outdoor(s)* but are well ventilated. Examples are well ventilated commercial or communal car parks, including underground car parks, if acceptable to the *Technical Regulator*.

A_2 Flueless space heaters shall not be installed in rooms where a ducted air heater return-air register or a heat transfer system is located.

The installation of appliances adjacent to battery systems and battery energy storage systems (BESS) shall be taken into account. Appliances shall not be installed within 600 mm horizontally or within 900 mm vertically above a battery system or BESS.

NOTE 3 Refer to AS/NZS 5139 for further information on clearances from appliances to battery systems and BESS. A_2

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.2.5 Temperature limitation on nearby combustible surface

An *appliance* shall be installed such that the surface temperature of any nearby *combustible surface* will not exceed 65°C above ambient.

NOTE 1 *Certified* domestic and small commercial *appliances* installed to the relevant *manufacturer's instructions* should satisfy the intent of this requirement provided they take into account local building practice.

NOTE 2 If there is insufficient space or natural airflow to meet this requirement, creating an air gap between a heat shield and/or insulating material and the combustible substrate may be effective.

NOTE 3 Care should be taken where a *combustible surface* is covered by a non-combustible material. For example, covering a *combustible surface* with stainless steel may not prevent heat transfer and in some circumstances a hazardous situation could arise.

6.2.6 Appliances using pressurized air or oxygen or having a standby gas connected

Where an *appliance* uses pressurized air or oxygen in the combustion process or has a standby *gas* connected, the requirements of [Clause 5.2.3](#) shall apply.

6.2.7 Automatic control to fail safe

Any installation intended for remote, automatic or unattended operation shall include a control system installed in accordance with the relevant *manufacturer's instructions* and the control system shall be *fail safe*.

NOTE An *appliance* that is *certified* and that is intended for remote, automatic or unattended operation is deemed to conform with this requirement.

6.2.8 Electrical requirements

An *appliance* connected to the electricity supply shall be provided with a means of electrical isolation that is adjacent to the *appliance* location and is *accessible* with the *appliance* in the installed position.

Where the *appliance* is installed in a location that is exposed to the weather, the electrical isolation shall be either a weatherproof type, or located in a position that is not exposed to the weather.

NOTE 1 The requirement for electrical isolation of *appliances* is prescribed in AS/NZS 3000.

NOTE 2 In Australia, the means of isolation should be one of the following:

- (a) A plug to an *accessible* switched socket-outlet.
- (b) A plug to a socket-outlet that may be located in an inaccessible position but has a separate switch operating in all live (active and neutral) conductors that is located in an *accessible* position.
- (c) An *accessible* isolating switch (lockable) operating in all live (active and neutral) conductors.

NOTE 3 In New Zealand, the means of isolation should be one of the following:

- (a) A plug to an *accessible* switched socket-outlet.
- (b) A plug to a socket-outlet that may be located in an inaccessible position but has a separate switch operating in all active conductors that is located in an *accessible* position.
- (c) An isolating switch (lockable) operating in all active conductors.

6.2.9 Restoration of electricity supply

Where interruption of the electricity supply can cause shut-down of any part of the gas installation, restoration of the electricity supply shall not be capable of causing a hazard.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.2.10 Appliance support

Every *appliance* shall be supported on, or secured to, a durable structure that is appropriate for the use and location of the *appliance*. The supports shall maintain the *appliance* in a plumb or level position and the means of securing the *appliance* to its support shall be of suitable materials and strength for the purpose. *Appliances* shall not be supported by *gas* pipework unless the pipework has been designed for that purpose. The *appliance* shall be supported and placed so that the weight of the *appliance* will not cause deformation of any part of the building structure and *wherever possible* shall be located directly over or close to a loadbearing member.

6.2.11 Earthquake restraint

For New Zealand, restraints for *appliances* shall be designed in accordance with NZS 4219.

6.2.12 Gas connections for appliances subject to vibration

A *appliance* that may impart significant vibration to the *consumer piping* shall be connected to the *consumer piping* using a *hose assembly*.

6.2.13 Connection of an appliance designed to move on castors, rollers or wheels

An *appliance* designed to move on castors, rollers or wheels shall be connected to the *consumer piping* using a *hose assembly*. A semi-rigid connector shall not be used.

6.2.14 Appliance restraint where a hose assembly is used

Where an *appliance* (other than a portable space heater), having a mass greater than 20 kg and fitted with castors, rollers or wheels, or designed to be slid out for servicing, is connected by a *hose assembly*, the extent of movement of the *appliance* shall be restrained by means other than the *hose assembly*.

The restraint shall be not greater than 80 % of the length of the *hose assembly*.

The restraining means shall be strong enough to restrain the appliance according to the means used to move it.

6.2.15 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.

6.3 Appliance location

6.3.1 Adverse effect of air movement systems

Appliances shall not be installed where the operation of any ventilation system, air distribution system, fan, or air blower could, under any circumstances —

- (a) deprive the *appliance* of the air required for combustion and *draught diverter* dilution; or
- (b) otherwise adversely affect the operation of the *appliance*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NOTE Air extraction systems including extraction fans (e.g. kitchen *rangehoods* and *exhaust fans* in toilets and *bathrooms*), coolers capable of operating in vent mode, heat transfer systems and other similar systems may lower the *pressure* in a building, which can cause the spillage of *combustion products* from *open flued appliances*. This applies particularly to modern buildings which are much more airtight than older buildings and allow much less ventilation through adventitious openings. In buildings with *open flued appliances* and *extraction fans*, the *appliances* should be capable of operating without combustion product spillage whether or not such fans are running. To achieve this it may be necessary to install permanent ventilation in addition to that already required by [Clauses 6.4.5](#) and [6.4.6](#).

Testing for determining if additional ventilation is required shall be in accordance with [Appendix Q](#).

6.3.2 Protection from physical damage

Protection shall be provided if an *appliance* is located where physical damage to the *appliance* is likely to occur.

6.3.3 Accessibility

Appliances shall be installed only in *accessible* locations, with sufficient clearances to allow access to, and removal of, all serviceable components.

NOTE Removal of a panel or door to give access to a control compartment is acceptable.

6.3.4 Hazards to buildings or persons

Appliances shall be installed so as to not cause a hazard to persons, buildings, walls, nearby surfaces, curtains, furniture or opened doors, and not obstruct the free movement of persons.

6.3.5 Proximity of flammable goods or chemicals

An *appliance* shall not be installed in a location where it may ignite flammable vapours or materials or where chemicals may combine with combustion air and cause corrosion or malfunction of the *appliance*.

NOTE 1 Such substances include some cleaning solvents, including those used in dry-cleaning processes.

NOTE 2 For New Zealand, reference should be made to the Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001 for controls on appliances in hazardous areas.

NOTE 3 Refer to [A2](#) AS/NZS IEC 60079.10.1 [A2](#) for classification of hazardous areas.

6.3.6 Presence of water

Where the base of an *appliance* is likely to be subjected to water from any source, the *appliance* support(s) shall be designed, and the surroundings drained, so that water will not remain in contact with the *appliance* base.

6.3.7 Installation above a source of cooking vapour, steam, grease or heat

Where an *appliance*, other than a *room-sealed appliance*, is to be installed above a source of cooking vapour, steam or grease, there shall be a clearance of at least 600 mm between the *appliance* and the source of cooking vapour, steam or grease.

An *appliance* shall not be located vertically above an open flame appliance, fryer, or char grill.

6.3.8 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:

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

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.3.9 Installation in a bedroom

Special provisions apply for the installation of an *appliance* in a bedroom; refer to the specific *appliance* detail for requirements.

6.3.10 Installation in a residential garage

Where an *appliance*, other than a *room-sealed appliance*, is to be located in a *residential garage*, the following applies:

- (a) The *appliance* shall be installed with —
 - (i) the *burners*, including pilots, and combustion air intake to the *appliance* at least 450 mm above the floor; or
 - (ii) within a rigid permanently fixed non-combustible vapour-proof wall at least 450 mm high surrounding the *appliance* and having a clearance to allow an adequate supply of combustion air and access for servicing.
- (b) A warning notice shall be affixed in a prominent position adjacent to the *appliance* or *appliances* stating:
 WARNING: NAKED FLAMES — DANGER — FLAMMABLE VAPOUR NOT PERMITTED WITHIN 3 METRES OF THIS APPLIANCE

6.3.11 Appliance in a roof space

Where an *appliance* is to be located in a roof space, the following, as appropriate, shall apply:

- (a) The roof section in which the *appliance* is to be installed shall be capable of supporting the additional load.
- (b) The *appliance* shall be supported and placed so that the weight of the *appliance* will not cause deformation of any part of the building structure.
- (c) The location of the *appliance* shall allow access for lighting and servicing. Permanent fixed means of access is required where the *appliance* location is beyond the extent of normal steps or ladder.
- (d) A walkway shall be provided from the access point to the *appliance* and shall extend around the *appliance* to the point where access may be required for lighting or servicing. The walkway shall be —
 - (i) at least 600 mm wide from the access point to the *appliance*;
 - (ii) where required around the *appliance*, at least 750 mm;
 - (iii) permanently fixed to the building; and
 - (iv) capable of supporting the weight of a person.
- (e) Where the *appliance* is installed on a combustible platform and the burner of the *appliance* is less than 300 mm above the *appliance* base, then the combustible platform shall be protected by one of the following means:
 - (i) A material conforming to [Appendix C Clause C.3](#). An air gap of not less than 25 mm shall exist between the *appliance* and any protective material.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (ii) Covered with corrosion-resistant sheet metal having a minimum thickness of 0.6 mm. An air gap of not less than 100 mm shall exist between the *appliance* base and the sheet metal.

The protection shall extend to at least the perimeter of the *appliance* base and, where any louvre or fixed opening into the *burner* compartment exists, shall be extended to at least 300 mm beyond the *appliance* base in front of any louvre or fixed opening into the *burner* compartment.

- (f) Permanent artificial lighting shall be provided at the *appliance*, with the switch located adjacent to the access opening.
- (g) Clearances as stated in the *manufacturer's instructions* shall be observed, to provide adequate clearances for servicing and removal of *burners*, fans, and any other components. Ducting shall not reduce such clearances or intrude on the walkway.

NOTE 1 Some manufacturers have additional requirements for drains or the like on some types of *appliances*, the instructions for those appliances need to be consulted for these requirements.

NOTE 2 Local building and OHS requirements take precedence over the means of conformance described in this Clause, which may be inappropriate in some situations and types of construction.

NOTE 3 Where ancillary equipment is part of the *appliance* installation, the platform, walkway and lighting requirements apply to the ancillary equipment.

6.3.12 Location of appliances in residential premises

Appliances in residential premises shall be located such that an additional means of access as indicated in [Clause 6.3.13](#) is not required.

NOTE Consideration should be given to future access for servicing, replacement and to local occupational health and safety requirements.

6.3.13 Appliance on roof, wall or elevated structure in locations other than single residential premises

Where an appliance is to be located on a roof, wall or elevated structure, the following, as appropriate, shall apply:

- (a) The roof section or structure where the appliance is to be installed shall be capable of supporting the additional load.
- (b) The appliance shall be installed more than 1.5 m from the edge of the roof or structure unless the edge of the roof or structure has a parapet wall or an alternative means of fall protection is provided, or a means of safe access acceptable to the Technical Regulator, can be arranged by the property owner or the property owner's representative.

NOTE 1 Other means of access include elevating work platforms, scissor and boom lifts.

- (c) Where an appliance is mounted on a wall, the height of the base of the appliance from the ground or floor level shall not exceed 2.5 m unless permanent means of access, or another means of access, which is acceptable to the Technical Regulator, can be arranged by the property owner or the property owner's representative.

NOTE 2 Consideration should be given to future access for servicing and replacement and to local occupational health and safety requirements.

NOTE 3 Local OHS requirements take precedence over the means of conformance specified in this Clause, which may be excessive or inadequate in some situations and types of construction.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.3.14 Appliance under a floor

Where an appliance is to be installed under the floor of a building, the following, as appropriate, shall apply:

- (a) There shall be a minimum clearance of 200 mm between the lowest part of the floor structure and any part of the appliance.
- (b) To allow access to the appliance —
 - (i) the appliance shall be located within 2 m of the access opening; or
 - (ii) there shall be a minimum clearance of 1.2 m between the lowest part of the floor structure and ground level, maintained from the access opening to the appliance.
- (c) The appliance shall stand on a level concrete base of at least 50 mm in thickness or be suspended above the ground level.
- (d) Fixed artificial lighting shall be provided at the appliance, with the switch located adjacent to the access opening.

6.4 Air supply to A_1 appliances A_1

6.4.1 Adequacy of air supply

A_1 Appliances A_1 shall be installed in locations with proper ventilation for complete combustion of *gas*, proper operation of the *flue* and to maintain the temperature of the immediate surroundings at safe limits, under normal operating conditions.

6.4.2 Quality of air supply

Air supply to *appliances* shall not be contaminated with *combustion products*, or contain materials such as chemicals, dust and fibres, or flammable vapours, which could affect combustion or the safe operation of the *appliance*.

6.4.3 Installation where atmosphere is contaminated

Where an appliance is to be installed in an area where excessive dust or lint or any flammable vapours are present, combustion air shall be ducted from outside.

6.4.4 Specific appliance ventilation requirements

Specific appliance ventilation requirements shall be as follows:

- (a) Multiple cookers in schools and the like in accordance with [Clause 6.10.1.3](#).
- (b) *Decorative flame effect fires* (not flame effect space heaters) in accordance with [6.10.9.5](#).
- (c) Laundry dryers in accordance with [Clauses 6.10.14.4](#) and [6.10.14.5](#).
- (d) Refrigerators in accordance [Clause 6.10.18.3](#).

Where the specific requirements above conflict with those in this [Clause \(6.4\)](#), the requirements above apply.

NOTE 1 For ventilation for flueless space heaters in South Australia, see [Clause 6.10.6.3\(g\)](#) and [Clause M.3.2.1](#)

NOTE 2 For ventilation for flueless space heaters in Western Australia, see [Clauses M.3.1.1](#) and [M.3.2.2](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.4.5 Air requirements for appliances

6.4.5.1 General

6.4.5.1.1 For Australia

This [Clause \(6.4.5\)](#) applies to new *appliance* installations in buildings that were approved for construction prior to the adoption of the 2013 version of this Standard by the relevant *Technical Regulator*.

For new *installations* in buildings that are approved for construction after adoption of the 2013 edition of this Standard by the relevant *Technical Regulator*, see [Clause 6.4.6](#) for new ventilation requirements.

NOTE 1 Check with local Technical Regulator for an adoption date for this Standard.

NOTE 2 Commissioning ([Clause 6.11](#)) requires that installations be tested to ensure the adequacy of ventilation and that other mechanical air supply or exhaust equipment does not have an adverse effect on appliance safety and performance.

NOTE 3 Buildings that have been built prior to the adoption of the 2013 edition of this Standard that have been renovated to improve energy efficiency may need additional ventilation.

6.4.5.1.2 For New Zealand

This [Clause \(6.4.5\)](#) applies to all installations irrespective of the type and time of the installation or the age of the building.

NOTE *Commissioning* ([Clause 6.11](#)) requires that installations be tested to ensure the adequacy of ventilation and that other mechanical air supply or exhaust equipment does not have an adverse effect on *appliance* safety and performance.

6.4.5.2 General requirements

Where an *appliance(s)*, other than a *room-sealed appliance*, is to be installed in a room or *enclosure* other than a *plant room* or *residential garage*, that room or *enclosure* shall be ventilated to ensure proper operation of the *appliance(s)* and the *flue* system, and to maintain safe ambient conditions. Where the total input of the *appliance(s)* exceeds 3 MJ/h for each cubic metre (approximately 800 W/m³) of the room or *enclosure* volume, the space shall be ventilated in accordance with [Clauses 6.4.5.3, 6.4.5.4 and 6.4.5.5](#) in cases where natural ventilation is to be used, or [Clause 6.4.9](#) in cases where mechanical ventilation is to be used, unless otherwise stated in [Clauses 6.4.7](#) (special requirements for flueless space heaters) and [Clause 6.10](#).

NOTE 1 For the purpose of assessing the adequacy of ventilation, the space that cannot be isolated by doors is the “volume of a room”.

Where an *appliance(s)*, other than a *room-sealed appliance*, is to be installed in a plant room or *residential garage*, the plant room or *residential garage* shall be ventilated irrespective of the *gas* consumption of the appliances or the volume of the room.

NOTE 2 As a *room-sealed appliance* draws required air from outside, ventilation of the *enclosure* is not normally required. However, the *enclosure* will require ventilation if an excessive rise in ambient temperature occurs.

NOTE 3 Where the total input of the *appliances* does not exceed 3 MJ/h/m³ per of room/*enclosure* volume, the required air may be provided by adventitious openings, i.e. gaps around doors, windows, etc. However, adventitious ventilation may be inadequate in some modern well-sealed buildings.

NOTE 4 To establish whether the required air is to be provided by adventitious openings or additional ventilation openings, the total input of the *appliance(s)*, *excluding room-sealed appliances*, in the room/*enclosure* in MJ/h is divided by the room/*enclosure* volume in cubic metres. See [Appendix M](#) for ventilation requirements for *flueless* space heaters that may apply.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NOTE 5 For the purpose of assessing the adequacy of ventilation of open plan homes where, for example, the lounge, kitchen, dining room and hall are interconnected without doors, the space in these various zones is combined to constitute the volume. If a door has been removed then the volume should be calculated as if the door was in place.

NOTE 6 For air requirements for multiple cookers in schools and the like, see [Clause 6.10.1.3](#).

6.4.5.3 Natural ventilation

Two permanent openings shall be provided each with a minimum free ventilation area as calculated using the following equation:

$$A = F \times T$$

where

A = minimum free ventilation area, in millimetres squared

F = factor given in [Table 6.4.5.3](#)

T = total *gas consumption* of all *appliances*, excluding *room-sealed appliances*, in megajoules per hour

The minimum dimension of any free ventilation opening shall be 6 mm to minimize linting.

Table 6.4.5.3 — Ventilation

Appliance location	Source of ventilation	Factor F
Appliance in a room or <i>enclosure</i> , other than a <i>plant room</i>	Directly from outside	300
	Via an adjacent room	600
Appliance in a <i>plant room</i>	Directly from outside	150
	Via an adjacent room	300
Appliance in a <i>residential garage</i>	Directly from outside	300
Ventilation shall not be sourced from a ceiling or floor space, due to the possibility of drawing in <i>combustion products</i> and odours.		
NOTE “Directly from outside” means the ventilation path maintains at least the recorded ventilation area required and is unobstructed by building material or insulation. This can be achieved via ducting to an internal space from outside.		

6.4.5.4 Natural ventilation via adjacent room

Where ventilation is via an adjacent room, the requirements of [Clause 6.4.5.3](#) shall apply to all ventilation openings.

For natural ventilation via an adjacent room that vents direct from outside, the ventilation openings between the room, in which the *appliance* is installed, and the adjacent room shall be required. If the total input of the *appliances* does not exceed 3 MJ/h for each cubic metre of the total volume of the *enclosure* and rooms, the ventilation opening in the adjacent room direct to outside is not required.

In cases where natural ventilation is via multiple adjacent rooms, the ventilation opening in the room in which the *appliance* is installed and the first adjacent room shall be required. Ventilation openings between the first and subsequent adjacent rooms are required until a subsequent room is ventilated directly from outside or the total input of the *appliances* does not exceed 3 MJ/h for each cubic metre of the total volume of the *enclosure* and rooms.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

For a *plant room*, the adjacent room shall be a non-habitable room and the adjacent room shall be ventilated directly from outside irrespective of the gas consumption of the *appliances* or the volume of the room.

A *residential garage* shall not be ventilated via an adjacent room.

6.4.5.5 Location of ventilation openings

For appliances with a *flue*, the lower opening shall be located at or below the level of the *burner*, and the upper opening shall be above the level of the *draught diverter*. The position of openings in relation to each other shall be such as to provide a flow of air across the area.

For *flueless* appliances, the openings shall be located to ensure both of the following do not exceed 5 % of the height of the room or *enclosure*:

- (a) Distance between the top of the upper opening and the ceiling of the room or *enclosure*.
- (b) Distance between the bottom of the lower opening and the floor of the room or *enclosure*.

For all *appliances*, the two openings may be combined, provided that the top and bottom of the opening reach the limits set by this Clause.

6.4.6 Air requirements for appliances — New appliance installations — Australia only

6.4.6.1 General

This [Clause \(6.4.6\)](#) applies to new *appliance* installations in buildings that are approved for construction after adoption of the 2013 edition of this Standard by the relevant *Technical Regulator*.

NOTE 1 In Australia, the energy rating of buildings has resulted in a reduction in adventitious ventilation and this can impact on the operation of *open flued appliances*. This [Clause \(6.4.6\)](#) contains reference to permanent ventilation provisions that may be required to ensure safe operation of such *appliances*.

For New Zealand, this [Clause \(6.4.6\)](#) does not apply.

NOTE 2 For ventilation requirements in New Zealand, see [Clause 6.4.5.1.2](#).

6.4.6.2 Ventilation requirements

Where *appliances* are installed in spaces such as a room, *enclosure*, *residential garage* or *plant room*, that space shall be ventilated to ensure proper operation of the *appliance(s)* and any *flue* systems, and to maintain safe ambient conditions. Such ventilation may be achieved by natural or mechanical means.

In the case of natural ventilation, the requirements for all *appliances* other than flueless space heaters are specified in [Table 6.4.6.2](#) with the methodology in [Clause 6.4.6.3](#). The requirements for flueless space heaters are specified in [Clause 6.4.7](#), [Clause 6.10.6.3](#) and [Table 6.10.6.3](#). In the case of mechanical ventilation, the requirements are specified in [Clause 6.4.9](#) unless otherwise specified in [Clause 6.10](#).

As *room-sealed appliances* draw the air required for combustion from outside, ventilation of the space is not required to ensure their proper operation but may be required to avoid excessive rises in ambient temperatures in the space.

NOTE 1 If the *appliance(s)* has the potential to interact with mechanical extraction ventilation (for example, kitchen *rangehoods* and *exhaust fans* in toilets and *bathrooms*), conformance to the requirements [Clause 6.3.1](#) is also required.

NOTE 2 *Commissioning* procedures (see [Clause 6.11.4](#)) require that installations be tested to ensure the adequacy of ventilation and that other mechanical air supply or exhaust equipment does not have an adverse effect on *appliance* safety and performance.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

NOTE 3 In the case of Type B *appliances* that are *room-sealed appliances*, the amount of ventilation required needs to be assessed

6.4.6.3 Calculation of natural ventilation areas

6.4.6.3.1

Spaces containing only open flued appliances

For determining the ventilation requirements for spaces containing only *open flued appliances*, the following methodology shall apply:

- (a) Calculate the space volume (V), in m^3 .
- (b) Divide the total *gas consumption* (T) for *open flued appliance(s)* by the space volume (V) to give the value G . If G is greater than 0.4 MJ/h/m^3 as shown in [Table 6.4.6.2](#) for *open flued appliances*, then additional ventilation openings are required.
- (c) Calculate the *free area* of any required additional ventilation openings [as determined in Step (b) above] by multiplying the *gas* input to the *open flued appliance* by the appropriate ventilation area A , B or C for *open flued appliances* in [Table 6.4.6.2](#).
- (d) Determine the number of ventilation openings and their location in accordance with the applicable space listed in [Table 6.4.6.2](#) for *open flued appliances*.

EXAMPLE 1 A 40 MJ/h *open flued* space heater is installed in a room 10 m long, 5 m wide and 2.4 m high. At least one wall faces directly to outside and the space is to be ventilated by natural means.

- (a) Calculate the room volume, $V = 10 \times 5 \times 2.4 = 120 \text{ m}^3$.
- (b) Divide the total *gas consumption*, T (40 MJ/h), for the *open flued* space heater by the room volume, V (120 m^3), to give the value $G = 40/120 = 0.333 \text{ MJ/h/m}^3$.

Because G is less than 0.4 MJ/h/m^3 as shown in [Table 6.4.6.2](#) for *open flued appliances*, additional ventilation openings are not required.

EXAMPLE 2 A 30 MJ/h *open flued* space heater is installed in a room 5 m long, 5 m wide and 2.4 m high. At least one wall faces directly to outside and the space is to be ventilated by natural means.

- (a) Calculate the room volume, $V = 5 \times 5 \times 2.4 = 60 \text{ m}^3$.
- (b) Divide the total *gas consumption*, T (30 MJ/h), for the *open flued* space heater by the room volume, V (60 m^3), to give the value $G = 30/60 = 0.5 \text{ MJ/h/m}^3$. Because G is greater than 0.4 MJ/h/m^3 as shown in [Table 6.4.6.2](#) for *open flued appliances*, additional ventilation openings are required.
- (c) Calculate the free area of additional ventilation openings:
 - (i) From [Table 6.4.6.2](#) for an *open flued appliance* in a room vented directly to outside, the ventilation opening is to have a *free area* (A) of 450 mm^2 per MJ/h of *appliance gas* input.
 - (ii) *Free area* of ventilation opening, $A = 30 \times 450 = 13\,500 \text{ mm}^2$
- (d) Determine the number of ventilation openings and their location:
 - (i) From [Table 6.4.6.2](#) for an *open flued* appliance in a room vented directly to outside, one ventilation opening in the wall facing direct to outside is required.

EXAMPLE 3 An identical 30 MJ/h *open flued* space heater to the one in Example 2 is again installed in a room 5 m long, 5 m wide and 2.4 m high. This time, however, the space is to be vented by natural means via an adjacent room. The adjacent room has at least one wall facing directly to the outside and measures 3 m long, 3 m wide and 2.4 m high.

From the results of Steps 1 and 2 in Example 2 above, it is concluded that additional ventilation openings are required.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

If a vent is placed between the two adjacent rooms, give consideration to the space volume of the adjacent room and combine this with the space volume for the room in which the *open flued* space heater is installed.

- (a) Calculate the volume for the room in which the *open flued* space heater is installed, $V = 5 \times 5 \times 2.4 = 60 \text{ m}^3$.
- (b) Calculate the volume of the adjacent room $= 3 \times 3 \times 2.4 = 21.6 \text{ m}^3$.
- (c) The combined volume of the two rooms $= 60 + 21.6 = 81.6 \text{ m}^3$.
- (d) Divide the total *gas consumption*, T (30 MJ/h), for the *open flued* space heater by the combined room volume (81.6 m³) to give the value $G = 30/81.6 = 0.36 \text{ MJ/h/m}^3$. Because G is less than 0.4 MJ/h/m³ as shown in [Table 6.4.6.2](#) for *open flued appliances*, the combined volume of the two rooms is large enough to ensure that additional ventilation to outside is not required and, hence, vent B2 from [Table 6.4.6.2](#) is not required.
- (e) Calculate the *free area* of the additional ventilation opening (B1) between the two rooms:
 - (i) From [Table 6.4.6.2](#), for an *open flued appliance* in a room vented via an adjacent room, ventilation openings B1 are to have a *free area* (A) of 650 mm² per MJ/h of *appliance gas* input.
 - (ii) *Free area* of ventilation opening B1 $= 30 \times 650 = 19\,500 \text{ mm}^2$
- (f) Determine the number of ventilation openings and their location:
 - (i) From Step 1, it was determined that additional ventilation of the room where the *appliance* is located is required. Additional ventilation of the adjacent room is not required.
 - (ii) From [Table 6.4.6.2](#), for the case of an *open flued appliance* in a room vented via an adjacent room direct to outside, only one vent between the two rooms, and *free area* of ventilation opening B1 $= 19\,500 \text{ mm}^2$, is required.

6.4.6.3.2 Spaces containing only flueless appliances other than flueless space heaters

For determining the ventilation requirements for spaces containing only *flueless appliances* other than flueless space heaters, the following methodology shall apply:

- (a) Calculate the space volume (V), in m³.
- (b) Divide the total *gas consumption* (T) for *flueless appliances* other than flueless space heaters by the space volume (V) to give the value H . If H is greater than 3 MJ/h/m³ as shown in [Table 6.4.6.2](#) for *flueless appliances*, then additional ventilation openings are required.
- (c) Calculate the *free area* of any required additional ventilation openings (as determined in Step (b) above) by multiplying the *gas* input to the *flueless appliance* by the appropriate ventilation area D , E or F for *flueless appliances* other than flueless space heaters in [Table 6.4.6.2](#).
- (d) Determine the number of ventilation openings and their location in accordance with the applicable space listed in [Table 6.4.6.2](#) for *flueless appliances* other than flueless space heaters.

EXAMPLE 1 A 60 MJ/h freestanding cooking range is installed in a kitchen 5 m long, 5 m wide and 2.4 m high. At least one wall faces directly to outside and the space is to be ventilated by natural means.

- (a) Calculate the kitchen volume, $V = 5 \times 5 \times 2.4 = 60 \text{ m}^3$.
- (b) Divide the total *gas consumption*, T (60 MJ/h), for the freestanding cooking range by the kitchen volume, V (60 m³), to give the value $H = 60/60 = 1 \text{ MJ/h/m}^3$.

Because H is less than 3 MJ/h/m³ as shown in [Table 6.4.6.2](#) for *flueless appliances* other than flueless space heaters, additional ventilation openings are not required.

EXAMPLE 2 A 120 MJ/h freestanding cooking range is installed in a kitchen 4 m long, 4 m wide and 2.4 m high. At least one wall faces directly to outside and the space is to be ventilated by natural means.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (a) Calculate the kitchen volume, $V = 4 \times 4 \times 2.4 = 38.4 \text{ m}^3$.
- (b) Divide the total *gas consumption*, T (120 MJ/h), for the freestanding cooking range by the kitchen volume, V (38.4 m³), to give the value $H = 120/38.4 = 3.125 \text{ MJ/h/m}^3$. Because H is greater than 3 MJ/h/m³ as shown in [Table 6.4.6.2](#) for *flueless appliances* other than flueless space heaters, additional ventilation openings are required.
- (c) Calculate the *free area* of additional ventilation openings:
 - (i) From [Table 6.4.6.2](#) for a *flueless appliance* in a room vented directly to outside, the ventilation opening is to have a *free area* (A) of 300 mm² per MJ/h of *appliance gas* input.
 - (ii) Free area of ventilation opening, $A = 120 \times 300 = 36\,000 \text{ mm}^2$.
- (d) Determine the number of ventilation openings and their location:
 - (i) From [Table 6.4.6.2](#) for a *flueless appliance* in a room vented directly to outside, two ventilation openings in the wall facing direct to outside are required.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.4.6.3.3 Spaces containing both open flued appliances and flueless appliances other than flueless space heaters

For determining the ventilation requirements for spaces containing multiple types of appliances, the following methodology shall apply:

- (a) Calculate the space volume (V), in m^3 .
- (b) Calculate the total *gas consumption* (T), in MJ/h , of all *open flued appliances* and *flueless appliances* other than flueless space heaters.
- (c) Divide the total *gas consumption* of all *appliances* (T) by the space volume (V) to give the value G .
- (d) Check whether the value G calculated in Step (c) is greater than 0.4 MJ/h/m^3 :
 - (i) If not, no additional ventilation is required and there is no need to proceed to Step (e) or beyond.
 - (ii) If yes, additional ventilation is required. Proceed to Step (e).
- (e) Divide the *gas consumption* of only the *flueless appliance(s)* by the space volume (V) to give the value H .
- (f) Check whether the value H calculated in Step (e) is greater than 3 MJ/h/m^3 :
 - (i) If not, proceed to Step (g).
 - (ii) If yes, proceed to Step (h).
- (g) Determine additional ventilation, assuming only the *open flued appliance(s)* that are installed, as follows:
 - (i) Calculate the *free area* of any required additional ventilation openings by multiplying the *gas consumption* for only the *open flued appliances* by the appropriate ventilation area A , B , or C for *open flued appliances* in [Table 6.4.6.2](#).
 - (ii) Determine the number of ventilation openings and their location in accordance with the applicable space listed for *open flued appliances* in [Table 6.4.6.2](#).
- (h) Determine additional ventilation from the total *gas consumption* of all *open flued* and *flueless appliances* other than flueless space heaters (T) with vent sizes and locations determined as per the requirements for *flueless appliances*, as follows:
 - (i) Calculate the *free area* of any required additional ventilation openings by multiplying the total *gas consumption* (T) by the appropriate ventilation area D , E , or F for *flueless appliances* in [Table 6.4.6.2](#).
 - (ii) Determine the number of ventilation openings and their location in accordance with the applicable space listed for *flueless appliances* in [Table 6.4.6.2](#).

EXAMPLE 1 A 30 MJ/h *open flued* space heater is installed along with a 60 MJ/h freestanding cooking range in a kitchen measuring $7.5 \text{ m} \times 5 \text{ m} \times 2.4 \text{ m}$. At least one wall faces directly to outside and the space is to be ventilated by natural means.

- (a) Calculate the space (kitchen) volume, $V = 7.5 \times 5 \times 2.4 = 90 \text{ m}^3$.
- (b) Add the *gas consumption* of the *open flued* space heater and the freestanding cooking range together, $T = 30 + 60 = 90 \text{ MJ/h}$.
- (c) Divide the total *gas consumption*, T (90 MJ/h), by the space volume, V (90 m^3), to give the value $G = 90/90 = 1 \text{ MJ/h/m}^3$.
- (d) Because G is greater than 0.4 MJ/h/m^3 , additional ventilation openings are required.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

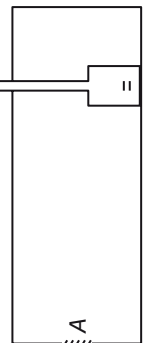
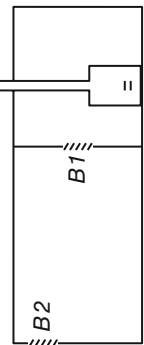
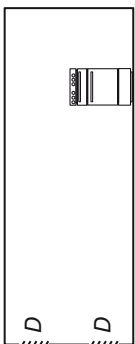
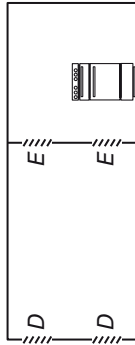
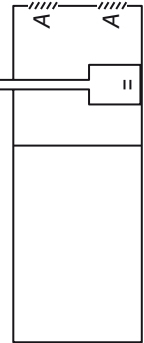
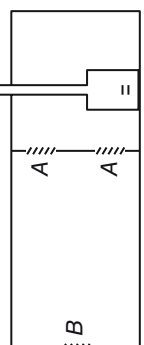
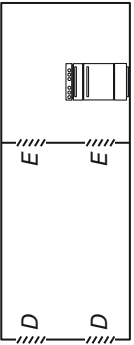
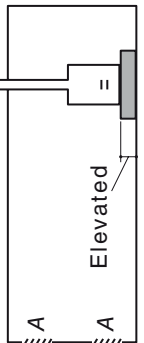
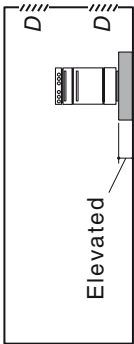
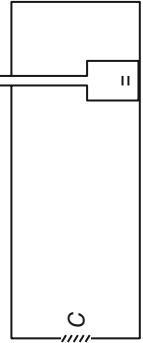
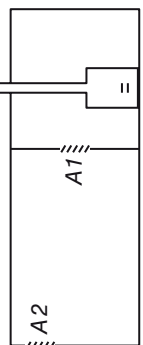
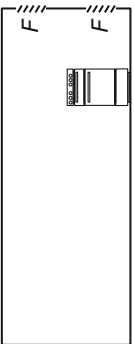
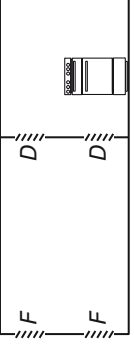
- (e) Divide the *gas consumption* of the freestanding cooking range (60 MJ/h) by the kitchen volume, V (90 m³), to give the value $H = 60/90 = 0.666$ MJ/h/m³. Because the value H is not greater than 3 MJ/h/m³, [Clause 6.4.6.3.3\(g\)](#) above applies.
- (f) From [Table 6.4.6.2](#) for an *open flued appliance* in a room vented directly to outside, the ventilation opening is to have a *free area* (A) of 450 mm² per MJ/h of *open flued appliance gas* input only. Applying [Clause 6.4.6.3.3\(g\)](#) as follows:
 - (i) Free area of ventilation opening, $A = 30 \times 450 = 13\,500$ mm².
 - (ii) From [Table 6.4.6.2](#) for an *open flued appliance* in a room vented directly to outside, one ventilation opening in the wall facing direct to outside is sufficient.

EXAMPLE 2 Parameters are the same as in Example 1; however, the kitchen is much smaller measuring 5 m × 4 m × 2.4 m and the *gas consumption* for the freestanding cooker is much greater at 150 MJ/h.

- (a) Calculate the space (kitchen) volume, $V = 5 \times 4 \times 2.4 = 48$ m³.
- (b) Add the *gas consumption* of the *open flued* space heater and the freestanding cooking range together, $T = 30$ MJ/h + 150 MJ/h = 180 MJ/h.
- (c) Divide the total *gas consumption*, T (180 MJ/h), by the space volume, V (48 m³), to give the value $G = 180/48 = 3.75$ MJ/h/m³.
- (d) Because G is greater than 0.4 MJ/h/m³, additional ventilation openings are required.
- (e) Divide the *gas consumption* of the freestanding cooking range (150 MJ/h) by the kitchen volume, V (48 m³), to give the value $H = 150/48 = 3.125$ MJ/h/m³. Because the value H is greater than 3 MJ/h/m³, [Clause 6.4.6.3.3\(h\)](#) above applies.
- (f) From [Table 6.4.6.2](#) for a *flueless appliance* in a room vented directly to outside, the ventilation openings are to have a *free area* (D) of 300 mm² per MJ/h of the combined *gas* input of *open flued* and *flueless appliance*. Applying [Clause 6.4.6.3.3\(h\)](#) as follows:
 - (i) *Free area* of each ventilation opening, $D = 180 \times 300 = 54\,000$ mm².
 - (ii) From [Table 6.4.6.2](#) for a *flueless appliance* in a room vented directly to outside, two ventilation openings in the wall facing direct to outside are required.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 6.4.6.2 — Natural ventilation for appliances

Appliance	Open Flued appliances		Flueless appliances other than flueless space heaters	
	Direct to outside	Via an adjacent room	Direct to outside	Via an adjacent room
In a room	 Where input $G > 0.4 \text{ MJ/h/m}^3$, $A = T \times 450 \text{ (mm}^2\text{)}$	 Where input $G > 0.4 \text{ MJ/h/m}^3$, $B_1 = B_2 = T \times 650 \text{ (mm}^2\text{)}$	 Where input $H > 3.0 \text{ MJ/h/m}^3$, $D = T \times 300 \text{ (mm}^2\text{)}$	 Where input $H > 3.0 \text{ MJ/h/m}^3$, $D = T \times 300 \text{ (mm}^2\text{)}$, $E = T \times 600 \text{ (mm}^2\text{)}$
In an enclosure	 Where input $G > 0.4 \text{ MJ/h/m}^3$, two vents at high and low levels, $A = T \times 450 \text{ (mm}^2\text{)}$	 Where input $G > 0.4 \text{ MJ/h/m}^3$, two vents to adjacent space, high and low levels, one vent in adjacent space to outside, $A = T \times 450 \text{ (mm}^2\text{)}$, $B = T \times 650 \text{ (mm}^2\text{)}$	 Where input $H > 3.0 \text{ MJ/h/m}^3$, $D = T \times 300 \text{ (mm}^2\text{)}$	 Where input $H > 3.0 \text{ MJ/h/m}^3$, $D = T \times 300 \text{ (mm}^2\text{)}$, $E = T \times 600 \text{ (mm}^2\text{)}$
In a residential garage	 Two vents, $T \times 450 \text{ (mm}^2\text{)}$ Appliance to be elevated in accordance with Clause 6.3.10. No Allowance for adventitious ventilation (see Clause 6.4.8)	Not permitted	 Elevated Two vents, $D = T \times 300 \text{ (mm}^2\text{)}$ Appliance to be elevated in accordance with Clause 6.3.10. No Allowance for adventitious ventilation (see Clause 6.4.8)	Not permitted
In a plant room	 $C = T \times 325 \text{ (mm}^2\text{)}$ No allowance for adventitious ventilation	 $A1 = A2 = T \times 450 \text{ (mm}^2\text{)}$ No allowance for adventitious ventilation	 $F = T \times 150 \text{ (mm}^2\text{)}$ No allowance for adventitious ventilation	 $D = T \times 300 \text{ (mm}^2\text{)}$, $F = T \times 150 \text{ (mm}^2\text{)}$ No allowance for adventitious ventilation

T = Total gas consumption of all applicable appliances, in MJ/h.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Notes to Table 6.4.6.2:

NOTE 1 Where only a single ventilation opening is required in a space, it may be located anywhere along the height of the wall. It may also be located in the roof, ceiling or floor provided it is connected directly to outside (see Note 2). The *free area* required for the single ventilation opening may be achieved by the use of multiple ventilation openings, provided the locations of multiple openings meet other requirements (see requirements for multiple ventilation openings, above).

NOTE 2 “Directly from outside” means the ventilation path maintains at least the required ventilation area and is unobstructed by building material or insulation. This may be achieved via ducting to an internal space from outside.

NOTE 3 For rooms or *enclosures*, where the input of the *appliances* does not exceed the input limits shown (e.g. 0.4 MJ/h/m³ for *open flued appliances* or 3 MJ/h/m³ for *flueless appliances* other than flueless space heaters), the required ventilation may be assumed to be provided by natural ventilation through adventitious openings, for example, through gaps around doors, windows, except for *residential garages* (see Note 5).

NOTE 4 To establish whether the required air can be provided by natural ventilation through adventitious openings or whether additional ventilation openings are required, and to determine the *free area* of any such additional ventilation openings, see Clause 6.4.6.2.

NOTE 5 For natural ventilation:

(a) Natural ventilation via an adjacent room that vents direct to outside, the ventilation openings between the room in which the appliance is installed and the adjacent room are always required. The ventilation opening in the adjacent room direct to outside is not required if the total input of the *appliances* does not exceed the input limit for the combined volume of the two rooms (see Example 3 in Clause 6.4.6.3.1).

(b) In cases where natural ventilation is via multiple adjacent rooms, the ventilation opening in the room in which the *appliance* is installed and the first adjacent room are always required. Ventilation openings between the first and subsequent adjacent rooms are required until a subsequent room is ventilated directly to outside or the total input of the *appliances* does not exceed the input limit for the combined volume of the room in which the *appliance* is installed and all adjacent rooms.

NOTE 6 For the purpose of assessing the adequacy of ventilation, the space that cannot be isolated by doors is the “volume” of that space. For the purpose of assessing the adequacy of ventilation of open plan homes where, e.g. the lounge, kitchen, dining room and hall are interconnected without doors, the space in these various zones is combined to constitute the volume. If a door has been removed then the volume shall be calculated as if the door was in place.

NOTE 7 For air requirements for multiple cookers in schools and the like, see Clause 6.10.1.3.

The requirements of this Table apply unless otherwise stated in [Clause 6.10](#).

The minimum dimension of any additional ventilation openings *A*, *B*, *C*, *D*, *E*, and *F* shall be 6 mm to minimize linting.

Where multiple ventilation openings are mandatory (*residential garages* and *enclosures*) or used for other reasons, the following shall apply:

- (a) For *open flued appliances*, the lower level opening shall be located below the level of the *burner* and the upper level opening above the level of the *draft diverter* or similar device. The position of ventilation openings in relation to each other shall be such as to provide a flow of air across the area. Ventilation openings may be located in the roof, ceiling or floor, provided they are connected directly to outside (see Note 2).
- (b) For *flueless appliances* other than flueless space heaters, the openings shall be located to ensure both of the following do not exceed 5 % of the height of the room or *enclosure*:
 - (i) Distance between the top of the upper opening and the ceiling of the room or *enclosure*.
 - (ii) Distance between the bottom of the lower opening and the floor of the room or *enclosure*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) For all *appliances*, the two openings may be combined, provided the top and bottom of the opening reach the limits set in (a) and (b) above.

For *open flued appliances* in any location, air to the *burner(s)* and the *draught diverter* shall be from the same air space.

For all *appliances* in *residential garages*, ventilation openings shall be directly to outside. No allowance shall be made for natural ventilation via adventitious openings (see [Clauses 6.4.8](#)). For additional general requirements for *appliances* in *residential garages*, see [Clause 6.3.10](#).

Ventilation openings shall be located so that building occupants are not provoked into sealing them against discomfort from cold draughts or noise. Discomfort from cold draughts can be avoided by supplying air directly to *appliances*, locating ventilation openings close to *appliances* (for example, by locating them in the floor), by drawing air from intermediate spaces such as hallways or by ensuring good mixing of incoming cold air by placing external ventilation openings close to ceilings.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.4.7 Special requirements for flueless space heaters

For flueless space heaters in habitable spaces, the total input rating shall not exceed —

- (a) 0.4 MJ/h for each cubic metre of room volume (approximately 100 W/m³) if the flueless space heater is thermostatically controlled; or
- (b) 0.2 MJ/h for each cubic metre of room volume (approximately 50 W/m³) if the flueless space heater is not thermostatically controlled.

In internal spaces such as passageways and lobbies, the total input rating of the flueless space heaters shall not exceed 0.4 MJ/h for each cubic metre of heated volume (100 W/m³), irrespective of whether or not they have thermostatic control.

NOTE 1 Specific local requirements regarding the installation of flueless space heaters are listed in [Appendix M](#) for Victoria and South Australia.

NOTE 2 Specific requirements for installation of flueless space heaters are given in [Clause 6.10.6.3](#).

NOTE 3 For other types of *flueless appliances*, the ventilation requirements of [Clause 6.4.5](#) or [6.4.6](#) apply unless specific ventilation requirements are given in [Clause 6.10](#).

6.4.8 Appliance in a residential garage

Ventilation shall conform to [Clause 6.4.5](#) or [Clause 6.4.6](#) with the additional requirement that the ventilation shall be directly to outside. No allowance shall be made for adventitious ventilation.

NOTE For appliance location in a residential garage, see [Clause 6.3.10](#).

6.4.9 Mechanical ventilation

Where the air supply to *appliances* is to be provided by mechanical means, it shall be drawn directly from the outside in accordance with [Table 6.4.9](#).

Where *appliances* are in a space served by mechanical ventilation, the installation shall be designed and tested to ensure conformance [Clause 6.3.1](#).

Table 6.4.9 — Air requirements — Appliances — Mechanical ventilation

Type of appliance burner	Low level mechanical air supply		High level exhaust			Position of openings in relation to each other
	Minimum airflow required	Location of opening	Mechanical	Natural	Location of opening	
			L/s	Minimum size of opening mm ²		
Atmospheric	<i>Appliance</i> input (MJ/h) × 0.5	As in Clause 6.4.5.5	Between 1/4 and 1/3 of the rate of inlet air required	<i>Appliance</i> input (MJ/h) × 150 as in Clause 6.4.5.3	As in Clause 6.4.5.5	As in Clause 6.4.5.5
Forced or induced draught	<i>Appliance</i> input (MJ/h) × 0.3					

Appliance input shall include the total input of all *appliances* in the area including those using other fuels.

NOTE A smoke match placed in the vicinity of the *draught diverter* of the *appliance* is one method to check that there is sufficient air supply to avoid a *pressure* less than atmospheric at the *appliance*, as required by [Clause 6.3.1](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.4.10 Interlock for air supply to appliances

Where the required air supply to an *appliance* relies on a mechanical system, there shall be an *interlock* to cause the *gas* supply to the *appliance(s)* to be shut off upon failure of the mechanical air supply system. The *interlock* sensor shall *fail safe* and it shall be proved in the no-flow state prior to start-up and shall be one or both of the following, as applicable:

- (a) It shall be of the type that will sense actual air movement.
- (b) Where an air damper is used, it shall ensure supply of *gas* to the *appliance* only while the damper is open to permit proper operation of the *appliance*.

NOTE Except for industrial applications, *appliances* with a permanent pilot need only be *interlocked* to cause the main *burner* to shut off.

6.4.11 Air heating appliance in a confined space

Where an air heating *appliance* is installed in a confined space, the heated and returned air shall be ducted and separated from air for combustion and *draught diverter* dilution.

6.4.12 Combustion and dilution air for an open flued appliances

Where an *open flued appliance* has an atmospheric *burner*, air to the *burner(s)* and the *draught diverter* shall be from the same air space.

6.5 Gas shut-off when automatic fire equipment operates

6.5.1 Interlock of automatic fire-extinguishing equipment with gas supply

Where operation of automatic fire-extinguishing equipment could extinguish an *appliance* flame —

- (a) all *burners* of the *appliance* shall have a *flame safeguard system*; or
- (b) the installation shall be fitted with a system that will shut off the *gas* supply when the fire extinguishing system operates.

The system shall *pressure* prove the downstream installation prior to restoration of the *gas* supply.

6.5.2 Interlock of automatic fire damper and gas supply

Where combustion air to an *appliance* may be affected by the activation of a fire damper, there shall be an *interlock* to cause the *gas* supply to the *appliance* to be shut off if the fire damper is activated.

6.5.3 Gas shut-off controls interfaced with fire alarm systems

Where automatic shut-off of *gas* supply occurs when the fire alarm system is activated, measures shall be provided to prevent the release of unignited *gas* upon restoration of supply.

NOTE Suitable measures to prevent the release of unignited *gas* upon restoration of supply include safeguarding of all *burners*, *pressure* proving or a *burner* shut-off system incorporating the automatic shut-off valve.

6.6 Appliance connection

NOTE For specific *appliance* requirements, see [Clause 6.10](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.6.1 Restriction on appliance connection

Multilayer piping and plastics-coated semi-rigid stainless steel piping shall terminate at a distance of at least 1 m from the nearest part of the *appliance* or some greater distance if required to prevent heat damage from the *appliance*.

Final connections to *appliances* shall be made using *certified manual shut-off valves*, copper tube, steel pipe or a *certified hose assembly* unless, in the case of plastics-coated semi-rigid stainless steel piping, it forms part of a *certified hose assembly* or *semi-rigid connector*.

6.6.2 Pipe connection

Connection pipe size shall be determined in accordance with [Clause 5.2.4](#).

6.6.3 Means of isolation

A means of isolation shall be provided on the inlet connection of an *appliance*, in accordance with [Table 6.6.3](#).

The means of isolation shall be *accessible* for operation and shall be either a *manual shut-off valve* or a Type 1 or Type 2 *quick-connect device*. Where a *hose assembly* is used to connect an *appliance*, the means of isolation shall be located in accordance with [Clause 5.9.6](#).

Table 6.6.3 — Requirements for provision of a means of isolation for an appliance

Appliance type	Is means of isolation required?	
	Type of premises	
	Single residential	Commercial/industrial or residential apartment buildings
Cooking appliances	Optional	Yes
Water heaters including pool heaters	Yes	Yes
Space heaters	Optional	Yes
Ducted heaters	Yes	Yes
Gas lights	Optional	Yes
Others not listed	Yes	Yes

6.6.4 Means of disconnection

The *appliance* connection shall include a means of disconnection. Where a means of isolation is provided to satisfy [Clause 6.6.3](#), the means of disconnection shall be downstream of the means of isolation.

6.6.5 Fitting of an appliance gas pressure regulator

A *gas pressure regulator* shall be fitted to each *Type A appliance* except where any one of the following applies.

- An *LP Gas appliance* is certified without a *gas pressure regulator*.
- The *gas pressure regulator* is an integral part of the appliance.
- The *appliance* is an open burner such as a *gas ring*, laboratory Bunsen, or blow pipe, where the supply pressure cannot exceed 1.5 kPa for *natural gas* or 3 kPa for *LP Gas*. However, a *gas pressure regulator* on an appliance with this type of burner is not to be removed.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Where the *gas pressure regulator* for an *appliance* is supplied as a separate component, it shall be installed as close as practicable to the *appliance* and accessible for servicing and adjustment.

NOTE For *gas pressure* control on *Type B appliances*, refer to AS 3814.

In New Zealand, an *appliance* that is *certified* in accordance with the *Gas (Safety and Measurement) Regulations 2010* shall be treated as a *Type A appliance*.

6.7 Flue design

6.7.1 Provision of a flue

Every *appliance* designed for connection to a *flue* shall be fitted with a *flue*, except where the *Technical Regulator* considers that, because of ventilation or other factors, a *flue* is not required.

6.7.2 Effect on building strength or fire resistance

The design strength or fire resistance of a building shall not be reduced by the installation of a *flue*.

NOTE For construction requirements for buildings in bushfire-prone areas, refer to AS 3959.

6.7.3 Material

Material used in the construction of a *flue* shall be in accordance with [Table 4.7.4](#).

6.7.4 Design requirements

Flues or *chimneys* shall be designed so that, under normal operating conditions of the *appliance*, all *flue gases* are exhausted to outside atmosphere unless otherwise specified in this Standard.

Changes of direction of a *flue* shall be minimized and any change in direction, shape or size shall be gradual to minimize restriction to the flow of *flue gases*.

Natural draught flues fitted to *appliances* shall be designed to run vertically for the maximum possible distance before any change in direction unless the *appliance* is designed to accept a horizontal *flue* connection. Any lateral run in a *flue* shall be as short as practicable and not exceed 50 % of the total *flue* height, and shall rise not less than 20 mm per 1 m run.

The minimum height of a *natural draught flue* shall be as specified in the *manufacturer's instructions* for the *appliance* or a minimum of 1.2 m if not so specified.

The diameter or cross-sectional area of *open flues* shall be in accordance with [Appendix H](#).

6.7.5 Flue gases not to cause a nuisance

Flue gases shall be prevented from entering a building or causing a nuisance to any person in the vicinity.

NOTE Means of prevention include extending the flue to above roof height, special selection of the *flue terminal* and its location, and the use of a *power flue*. Environmental authorities may have additional requirements for such situations.

6.7.6 Common or combined flues

E2 Where more than one *appliance* is connected to a *common flue*, each *appliance* shall have a *flame safeguard system*. No *flue* shall discharge into a *common flue* concurrently carrying *flue gases* from another non-gas appliance except where [Clause 2.2.4.8](#) applies. Additionally, the following applies:

NOTE 1 For industrial applications, see [Clause 2.2.4.8](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (a) The *burners* of the *appliances* connected to the *common flue* shall be of the same type such that all are —
 - (i) *atmospheric burners*;
 - (ii) *forced draught burners*; or
 - (iii) *induced draught burners*.
- (b) The temperature of the *combustion products* entering the *common flue* shall not at any time exceed that given in [Table 6.7.6](#), or a temperature of 100°C below the lowest ignition temperature of any other *gas* present, whichever is the lesser.

NOTE 2 The requirements of Item (b) above may be satisfied by any one of the following:

- (i) Having *draught diverters* or draught stabilizers in positions such that *combustion product* dilution occurs in the *common flue*.
- (ii) Providing a device or method that will achieve sufficient *combustion product* dilution in the *common flue*.
- (iii) Providing a *temperature limit device* in the *flue* at each *appliance*.
- (c) Means to prevent reverse flow in any *appliance* shall be provided.

NOTE 3 The use of a *draught diverter*, *flue break*, or a *flue damper interlocked* with the *appliance* may meet this requirement. ^(A2)

Table 6.7.6 — Maximum allowable combustion product temperatures

Fuel gas	Temperature, °C
NG	440
LP Gas	350
SNG	350

6.7.7 Draught diverters

6.7.7.1 Flue with draught diverters

The *flue* used with an *appliance* shall include a *draught diverter*, except where —

- (a) a *draught diverter* is an integral part of the *appliance*;
- (b) the *appliance* is a *room-sealed appliance*, an incinerator, or a pottery kiln;
- (c) the *appliance* is designed for installation under a ventilated canopy or hood or a ventilated canopy or hood is part of the *appliance* and it is acceptable to the *Technical Regulator*; or
- (d) the *appliance* is designed to operate with a *forced draught burner* or *induced draught burner*.

Where a *draught diverter* is fitted, the *flue* shall discharge the total *flue gases* at the *flue terminal* without spillage from the *draught diverter*.

6.7.7.2 Flue without draught diverters

Where a *draught diverter* is not fitted, one of the following shall be provided, where applicable:

- (a) Means to prevent the discharge of *flue gases* to atmosphere other than at the *flue terminal*, only when such discharge will not affect the operation of the *appliance* and not be a hazard to persons or property.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (b) Means to automatically shut off the main *burner* of an *appliance* designed to operate with a *forced draught burner* or *induced draught burner*, where interruption to the normal free discharge of *flue gases* at the *flue terminal* may be a hazard.

6.7.8 Power flues

Where satisfactory *flue* operation relies on the operation of an extractor fan —

- (a) each *appliance* shall be fitted with a *safety shut-off system*; and
- (b) a sensing device shall be fitted in the *flue* to prevent the flow of *gas* to each *burner* when the fan is ineffective.

NOTE *Appliances* with a permanent pilot need to be *interlocked* to cause only the main *burner* to shut off.

6.7.9 Flue cowls

A *flue cowl* shall be fitted to the *flue terminal* unless the *flue* and *appliance* are designed to operate without a *flue cowl*.

NOTE 1 Where a *flue* and *appliance* do not require a *flue cowl* to be fitted, consideration should be given to minimizing the possibility of objects or substances entering the *flue*.

6.7.10 Condensate drains

When required, condensate products from a *flue* shall be drained away to an appropriate sanitary discharge point. Condensate products shall not come into contact with the floor or other parts of the installation. The materials selected and environment in which the drain will be expected to operate shall be taken into account. Some manufacturers may require condensate products to be treated before discharge.

6.7.11 Use of existing flue or chimney

An existing *chimney* or *flue* shall be used only after examination and correction of any faults.

NOTE Poor design of existing *flues* and *chimneys* can cause *combustion products* to enter into the room.

An existing *chimney* or *flue* that has been used for fuel other than *gas* shall be —

- (a) swept clear of soot and other loose material;
- (b) checked for soundness of construction and freedom from leakage; and
- (c) checked for adequate size.

Any damper plate shall be removed or permanently fixed fully open, except where a damper is necessary and in accordance with the relevant *manufacturer's instructions*.

6.8 Flue installation

6.8.1 Provision for removal of appliance

Where removal of an *appliance* is likely to require the movement or displacement of the *flue*, the *flue* shall be installed so that such movement or displacement does not disturb the roof seal or flashing.

NOTE 1 Provision of a slip socket or bolted sleeve at the *flue* connection to the *appliance* is an acceptable method of connecting the *flue* to an *appliance* and satisfying this requirement.

NOTE 2 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*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.8.2 Support independent of appliance

Flues shall be supported independently of the *appliance* unless the *appliance* is designed to support the *flue*. *Flues* shall be securely fixed and supported by bracket(s) fastened to the building structure at suitable points, to ensure the stability of the *flue* unless the *flue* is designed to be structurally independent of the building.

6.8.3 Soft-soldered flue joints

Flues with any soft-soldered joints shall be designed and supported to prevent stress being imparted to the soft-soldered joints.

6.8.4 Flue joints

Flue joints shall be sealed, with a sealing agent if necessary, and —

- (a) where subjected to the weather, have downward facing sockets; or
- (b) where protected from the weather, have upward facing sockets.

6.8.5 Weatherproofing through a roof or wall

Where a *flue* passes through a roof or an external wall, the penetration shall be made permanently weatherproof.

6.8.6 Chimneys

The brick or masonry work in *chimneys* shall be completely sealed from all cavities to give smooth unobstructed flow paths for *flue gases* and thereby maximize their buoyancy effect. A *flue* pipe extending into a chimney shall —

- (a) be arranged to prevent any falling or loose material from obstructing or entering the *flue* pipe; and
- (b) not extend so far into the *chimney* that it causes a restriction.

Where the integrity of the *chimney* is unsatisfactory, a *chimney liner* shall be installed.

NOTE 1 Seals between any metal *flue* pipes and *chimneys* should be *accessible* for inspection and maintenance.

NOTE 2 Consideration should be given to temperature and condensation issues.

6.8.7 Clearance around a draught diverter

There shall be at least 75 mm clearance between a *draught diverter* relief opening and any wall surface.

6.8.8 Prohibited locations for flues

Flues shall not be located in, or pass through, ducts such as lift wells, clothes chutes, rubbish chutes, air ducts or ventilating ducts from which any leaking *flue gases* could spread within the building.

6.8.9 Concealed metal flues

Where part of a metal *flue* passes through an area where it is not readily examinable, that part shall be —

- (a) metal sleeved;
- (b) twin walled; or

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) stainless steel or other corrosion resistant material.

6.8.10 Application of twin wall flues

Twin wall flue shall only be used as follows:

- (a) Where a *twin wall flue* is used within a cavity wall in a domestic location, the *gas consumption* of the *appliance* shall not exceed 50 MJ/h (14 kW).

- (b) For *appliances* having a *flue gas* temperature of not more than 300°C.

NOTE 1 *Appliances* that are *Certified* and have a *draught diverter* will meet the maximum *flue gas* temperature requirement.

- (c) The clearance between a *twin wall flue* and a *combustible surface* shall be at least 10 mm.

NOTE 2 The clearance is measured from the outer surface of the *flue*, (i.e. not measured from any spacers, which may touch the *combustible surface*).

6.8.11 Clearance between a single wall flue and a combustible surface

The clearance between a single wall *flue* and a *combustible surface* shall be at least that given in [Table 6.8.11](#).

Table 6.8.11 — Required clearance between a single wall flue and a combustible surface

Application	Clearance minimum, mm	
	Unprotected <i>combustible surface</i>	Protected <i>combustible surface</i>
<i>Water heater</i> , space heater or inbuilt oven with:		
(a) <i>Flues</i> not exceeding 150 mm ID	25	25
(b) <i>Flues</i> exceeding 150 mm ID	75	50
(c) <i>Flues</i> 250 mm × 50 mm installed on an outside wall	25	25
Other rectangular <i>flues</i>	75	50
Incinerator — Not sanitary	450	300
Incinerator — Sanitary	75	50
Pottery kiln	600	450
Any other application	The clearance shall ensure the temperature limitation of 50°C above ambient is not exceeded	

6.8.12 Protection of combustible surfaces

Where a *combustible surface* requires protection to satisfy the requirement of [Clause 6.8.11](#) the method used shall provide protection in accordance with AS/NZS 2918 or at least equivalent to one of the following methods:

- (a) Protection of *combustible surfaces* in accordance with [Appendix C Clause C.3](#) attached to the *combustible surface* and covered with sheet metal with a minimum thickness of 0.4 mm as per [Figure 6.8.12 \(a\)](#).
- (b) Sheet metal having a minimum thickness of 0.4 mm spaced out at least 25 mm from the *combustible surface* using non-combustible spacers as per [Figure 6.8.12 \(b\)](#).
- (c) Sleeving the *flue* with a duct of 0.4 mm sheet metal that has an air space around the *flue* of at least 25 mm as per [Figure 6.8.12 \(c\)](#).

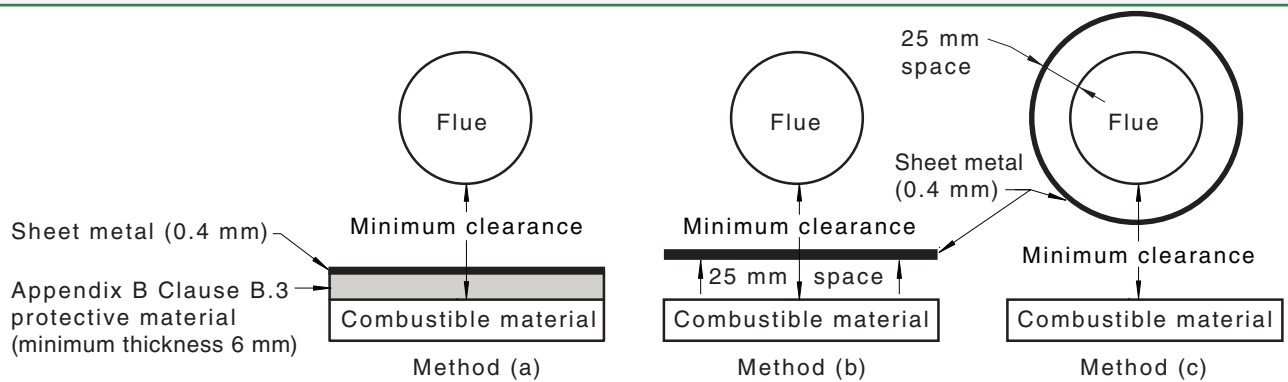


Figure 6.8.12 — Methods of protecting a combustible surface

6.8.13 Protection of adjacent non-combustible materials from heat of flue

Where a *flue* is fitted adjacent to or within a wall or partition made of non-combustible material, provision shall be made to prevent the temperature of the wall or partition external surfaces exceeding 50°C above ambient.

NOTE 1 This requirement also applies to a *combustible surface* near a *flue* or *chimney*, which is protected by a heat shield or as per [Appendix C](#).

NOTE 2 [Clause 6.8.10](#) details minimum clearances between twin wall metal *flue* and *combustible surfaces*. [Clause 6.8.11](#) details these clearances for single wall *flues*. If the requirement of the applicable Clause is met, the intent of this Clause will be satisfied.

NOTE 3 This requirement is to protect materials on or near the external surface of the wall or partition.

6.8.14 Clearance from wiring and other services

The clearance between any services constructed of materials affected by heat from a *flue*, including electrical wiring or fittings, telephone cable, communication wiring or plastics water pipe, shall be not less than —

- (a) 75 mm where the *flue* or *appliance* includes a *draught diverter*; or
- (b) 150 mm where the *flue* or *appliance* does not include a *draught diverter*.

NOTE 1 This clearance may be reduced where the two are separated by thermal insulation material.

NOTE 2 The *flues* of high temperature industrial *appliances* may require additional clearance. Refer to the *manufacturer's installation instructions*.

6.9 Flue terminals

6.9.1 Terminating an open flue — Location

6.9.1.1 General

Flue terminals or *flue cowls* of an *open flue* shall be located in relation to any associated building and to neighbouring structures so that wind from any direction is not likely to create a downdraught in the *flue* or *chimney*.

Except where [Clause 6.9.3](#) applies, *flue terminals* fitted to *open flues* shall —

- (a) be at least 1 m horizontally from an adjacent structure; or

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (b) if less than 1 m horizontally from an adjacent structure, be at least 500 mm above that structure;
- (c) be at least 1.5 m from any opening into a building; and
- (d) be at least 200 mm from another *flue terminal*.

6.9.1.2 Location of a power flue terminal

The *flue terminal* of a *power flue* shall terminate in accordance with [Clause 6.9.2](#) or [6.9.3](#) as appropriate.

NOTE For *power flue* design, see [Clause H.2](#), [Appendix H](#).

6.9.2 Terminating a flue above a roof

Where any *flue terminal* is to be located above a roof, the following applies:

- (a) The *flue terminal* shall be at least 500 mm from the nearest part of the roof.
- (b) If the roof is designed for personal or public use, the end of the *flue* shall be at least 2 m above the roof level and 500 mm above any surrounding parapet and be supported.
- (c) The *flue terminal* shall be at least 200 mm from the nearest part of any *chimney*.

NOTE 1 This distance is measured before the *flue cowl* (if required) is fitted to the *flue terminal*.

NOTE 2 This [Clause \(6.9.2\)](#) does not apply in situations covered by [Clause 6.9.3](#).

6.9.3 Location of flue terminals around the perimeter of a building or structure

The location of the *flue terminal* of a *balanced flue appliance*, *room-sealed appliance*, a *fan-assisted appliance* or an *appliance* designed for outdoor installation shall—

- (a) conform to [Figure 6.9.3](#), [Table 6.9.3](#), [Clause 6.9.4](#) and [Figure 6.9.4](#); and
- (b) where a *flue terminal* discharges *combustion products* in the direction of a property boundary, the flue terminal shall be more than 450 mm from the boundary.

NOTE Reference “*g*” in [Table 6.9.3](#) still applies.

A₂ The location of the *flue terminal* of a small gas engine driven appliance that conforms to the requirements of AS/NZS 5263.1.11 shall conform to the requirements in Appendix A. **A₂**

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

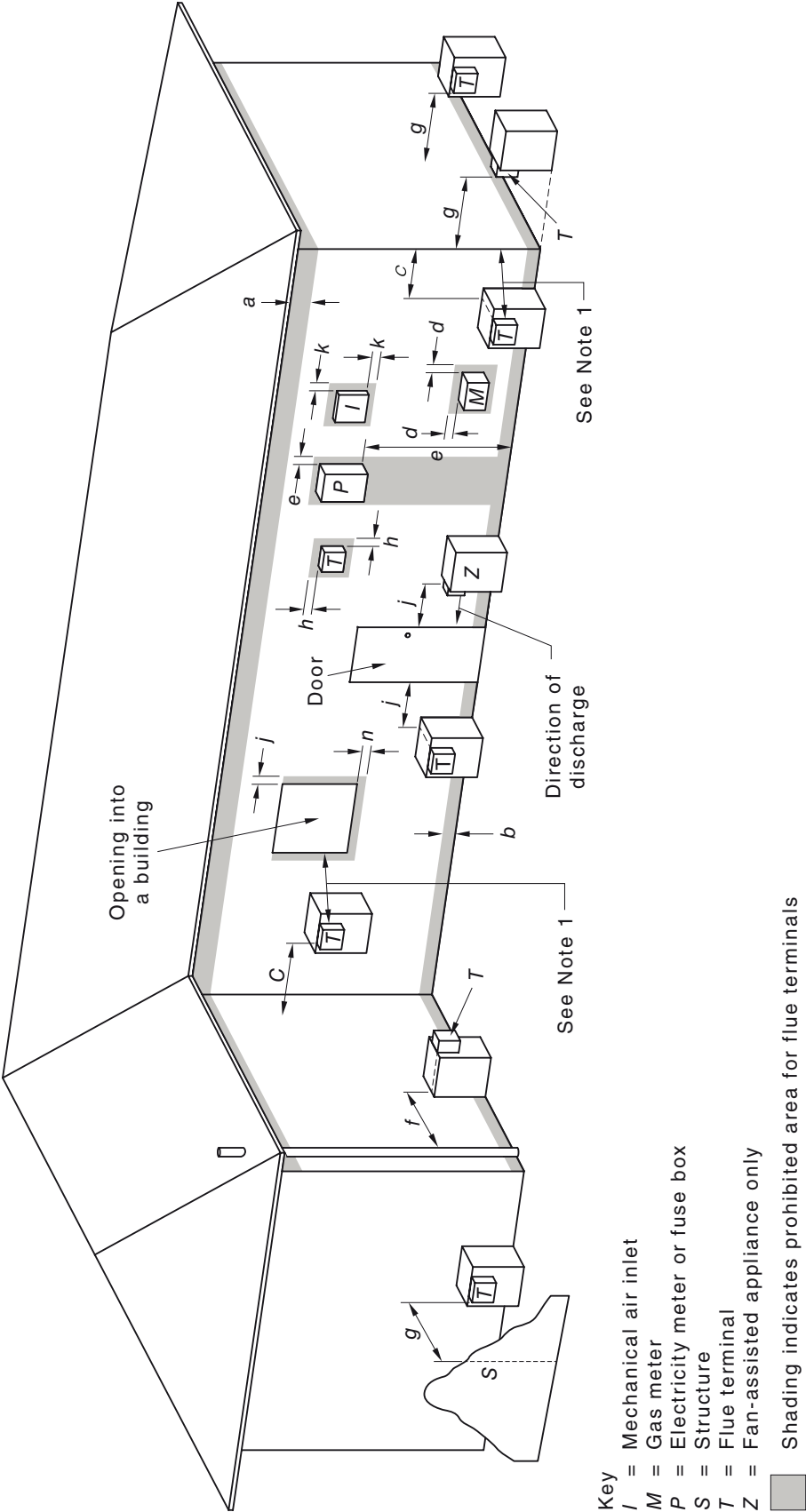


Figure 6.9.3 — Location of flue terminals around the perimeter of a building or structure

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 6.9.3 — Location of flue terminals around the perimeter of a building or structure

Ref.	Item	Minimum clearances, mm	
		Natural draught	Fan-assisted
<i>a</i>	Below eaves, balconies and other projections:		
	For <i>appliances</i> up to 50 MJ/h input	300	200
	For <i>appliances</i> over 50 MJ/h input	500	300
<i>b</i>	From the ground, above a balcony or other surface*	300	300
<i>c</i>	From a return wall or external corner*	500	300
<i>d</i>	From a gas meter (M) [‡]		
	(see Clause 5.11.5.9 for vent terminal location of regulator)	1 000	1 000
	(see Table 6.9.6 for New Zealand requirements)		
<i>e</i>	From an electricity meter or fuse box (P) ^{†, ‡}	500	500
<i>f</i>	From a drain pipe or soil pipe	150	75
<i>g</i>	Horizontally from any building structure* or obstruction facing a <i>flue terminal</i>	500	500
<i>h</i>	From any other <i>flue terminal</i> , <i>flue cowl</i> , or combustion air intake*	500	300
<i>j</i>	Horizontally from an openable window, door, non-mechanical air inlet, or any other opening into a building with the exception of sub-floor ventilation:		
	<i>Appliances</i> up to 150 MJ/h input*	500	300
	<i>Appliances</i> over 150 MJ/h input up to 200 MJ/h input*	1 500	300
	<i>Appliances</i> over 200 MJ/h input up to 250 MJ/h input*	1 500	500
	<i>Appliances</i> over 250 MJ/h input*	1 500	1 500
<i>k</i>	All <i>fan-assisted appliances</i> , in the direction of discharge	—	1 500
	From a mechanical air inlet, including a spa blower	1 500	1 000
	Vertically below an openable window, non-mechanical air inlet, sub-floor ventilation, or any other opening into a building with the exception of weep holes:		
<i>n</i>	For space heaters up to 50 MJ/h input	150	150
	For other <i>appliances</i> up to 50 MJ/h input	500	500
	For <i>appliances</i> over 50 MJ/h input and up to 150 MJ/h input	1 000	1 000
	For <i>appliances</i> over 150 MJ/h input	1 500	1 500

* Unless *appliance* is certified for closer installation.

† Prohibited area below electricity meter or fuse box extends to ground level.

‡ Minimum clearances *d* and *e* also apply to any combustion air intake openings of *appliances*.

NOTE 1: Where dimensions *c*, *j* or *k* cannot be achieved, an equivalent horizontal distance, measured diagonally from the nearest discharge point of the terminal to the opening, may be deemed by the *Technical Regulator* to comply.

NOTE 2: See Clause 6.9.4 for restrictions on a *flue terminal* under a covered area.

NOTE 3: A flue terminal is considered to be a source of ignition. AS/NZS 1596:2014 specifies the minimum clearances required from a *flue terminal* to an *LP Gas cylinder* (see Figure 1.5(A), Appendix I).

NOTE 4: For *minimum clearances* not addressed above, acceptance should be obtained from the *Technical Regulator*.

NOTE 5: Contact the appliance manufacturer if in doubt that the minimum clearances will provide adequate thermal protection of surfaces adjacent to the flue terminal. Additional protective measures may be required.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.9.4 Flue terminal under a covered area, in a recess or on a balcony

Where a *flue terminal* is to be installed under a covered area, in a recess or on a balcony, ready dispersion of combustion products and avoidance of nuisance shall be achieved as follows:

- (a) For partially or fully covered areas and recesses, which are not balconies and which are open on at least two sides, the *flue terminal* shall be located to ensure a free flow of air across it and conform to the requirements of [Clause 6.2.5](#). The *appliance* shall be a *balanced flue appliance*, *room-sealed appliance*, a *fan-assisted appliance* or an *appliance* designed for *outdoor* installation.
- (b) For partially or fully covered areas and recesses, which are not balconies and which are open on only one side, the *flue terminal* shall extend beyond an external corner or the covered area and discharge towards the open side, as illustrated in [Figure 6.9.4 \(a\)](#) and [Figure 6.9.4 \(b\)](#) respectively, to ensure that combustion products discharge to open atmosphere. The *flue terminal* shall be located to conform to the requirements of [Clause 6.2.5](#). The *appliance* shall be a *fan-assisted appliance*.
- (c) For all balconies, regardless of the number of open sides and including partially covered balconies, the *flue terminal* shall extend beyond an external corner or any covered area and discharge towards an open side as illustrated in [Figure 6.9.4 \(c\)](#) to ensure that combustion products discharge to open atmosphere. The *flue terminal* shall be located to conform to the requirements of [Clause 6.2.5](#). The *appliance* shall be a *fan-assisted appliance*.

The minimum clearances as per the table of [Figure 6.9.3](#) shall apply, with the exception of clearance “c”.

NOTE 1 These requirements do not apply to domestic gas barbecues and radiant gas heaters designed for outdoor use. For these appliances, see [Clause 6.10.19](#).

NOTE 2 An eave is not considered a covered area, unless it abuts an adjoining structure.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

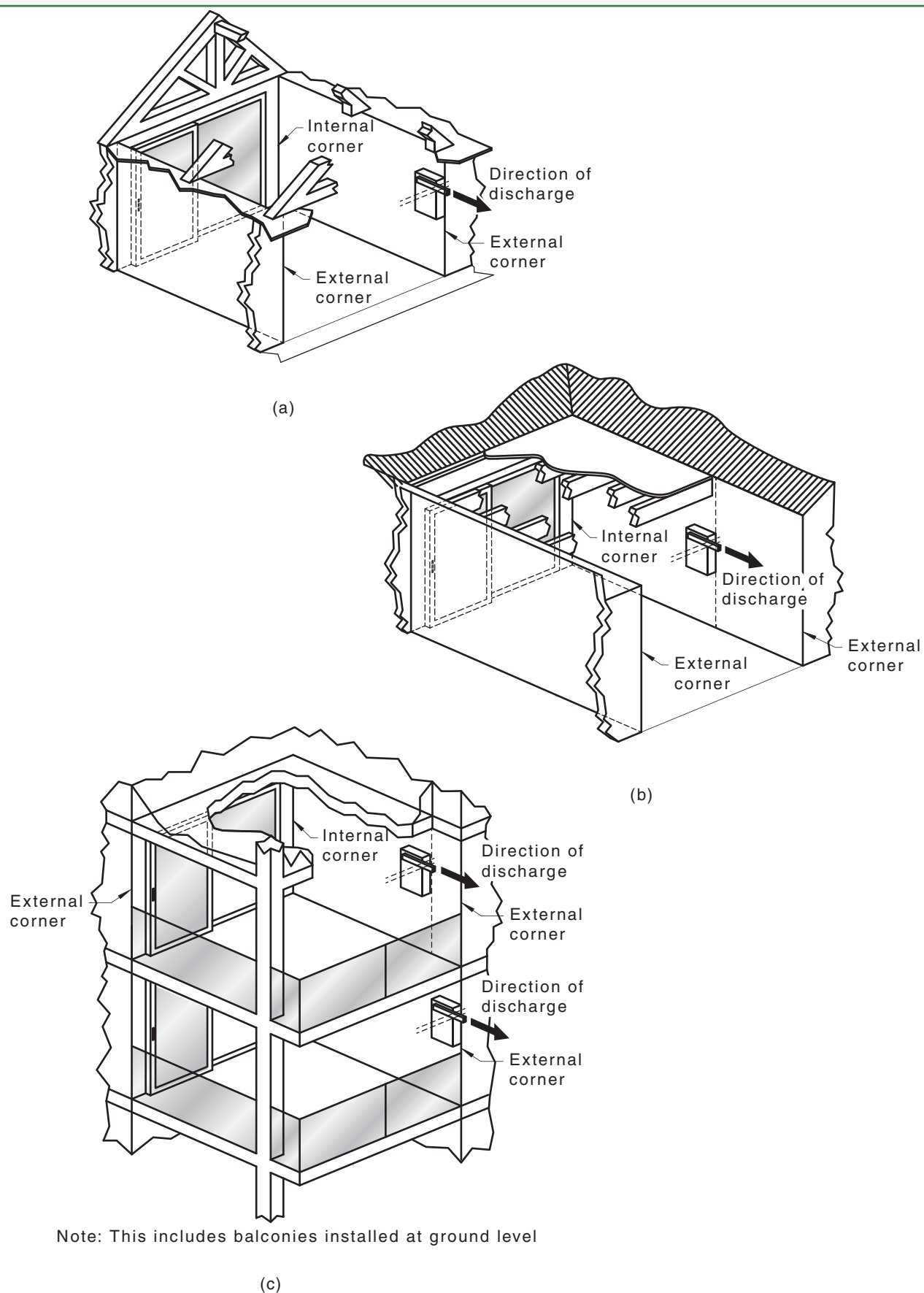


Figure 6.9.4 — Location of *flue terminals* under a covered area, in a recess or on a balcony

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.9.5 Terminating a flue in a roof space

A *flue terminal* shall not be located in a roof space.

6.9.6 Clearances of flue terminals around a GMS (New Zealand only)

For New Zealand only, minimum clearances required for *flue terminals* from *GMS* up to 25 m³/h shall be in accordance with [Table 6.9.6](#). For *GMS* larger than 25 m³/h, the clearance shall be increased so that the *combustion products* do not affect the *GMS* and combustion air to the *appliance* could not contain any vented *gas* or leakage from the *GMS*.

Table 6.9.6 — Minimum clearances required for flue terminals from gas measurement systems (New Zealand only)

Clearances	GMS up to 25 m ³ /h		
	Venting regulator relief valve	Automatic shut-off device regulator	No regulator
Horizontal distance, mm	800	400	400
1 Vertical above, mm	1000	300	300
2 Vertically below (<i>Natural gas</i>), mm	300	300	300
3 Vertically below (<i>LP Gas</i>), mm	1500	800	800
NOTE 1 Clearance distances are measured from the nearest point of the <i>GMS</i> .			
NOTE 2 This table may be used as guidance for check meter installations.			

6.10 Additional requirements for installation of specific appliances

6.10.1 Domestic gas cooking appliances

6.10.1.1 Clearance around a gas cooking appliance, other than for indoor barbecues in residential premises

The required clearance between a gas cooking *appliance* and a *combustible surface* shall be in accordance with the *appliance manufacturer's specification*.

In the event that clearances are not specified and in any event for overhead clearances, minimum clearances and protection of *combustible surfaces* shall be in accordance with [Figure 6.10.1.1](#) and the following:

NOTE For indoor barbecues in residential *premises*, see [Clause 6.10.1.7](#).

(a) *Requirement 1 — Overhead clearances — (Measurement A):*

- (i) The *rangehoods* and *exhaust fans* shall be installed in accordance with the *rangehood*, *exhaust fan* and *appliance manufacturer's instructions*. Where a difference occurs, the greater clearance shall apply. In any event, or where no dimension is specified in the *appliance manufacturer's instructions*, the clearance between the supporting surface for the cooking vessels of the *gas cooking appliance* and a *rangehood* or *exhaust fan* (overhead clearance) shall be not less than 650 mm for a *rangehood*, and not less than 750 mm for an *exhaust fan*.
- (ii) Any other downward facing *combustible surface* less than 650 mm above the supporting surface for the cooking vessels shall be protected for the full width and depth of the *hob* in accordance with [Clause 6.10.1.2](#). This clearance to any overhead surface shall be not less than 450 mm.
- (iii) For existing installations, from the date of adoption of this Standard, where the *appliance* is being replaced, the overhead clearance from the highest part of the

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

highest burner of the *appliance* ^{A1} or the *hob* ^{A1} to the *rangehood* shall be not less than 600 mm unless the *appliance manufacturer's instructions* specifies a greater clearance. Where no dimension is specified in the *manufacturer's instructions*, the overhead clearance from the highest part of the highest burner of the *appliance* to the *rangehood* shall be not less than 600 mm, and not less than 750 mm for an *exhaust fan*.

NOTE 1 Removable accessories such as a wok *trivet* that sits upon a *hobtrivet* are not taken into account in determination of the supporting surface for the cooking vessels.

NOTE 2 Minor elevations in *trivets* such as a wok *trivet* formed into a *trivet* are not taken into account in determination of the supporting surface for the cooking vessels.

(b) *Requirement 2 — Measurements B (side clearances) and C (height)*

Where *B*, measured from the periphery of the nearest *burner* to any vertical *combustible surface*, is less than 200 mm, that surface shall be protected in accordance with [Clause 6.10.1.2](#) to a height (*C*) of not less than 150 mm above the periphery of the nearest *burner* for the full dimension (width or depth) of the cooking surface area. Where the gas cooking *appliance* is fitted with a “splashback”, protection of the rear wall is not required, provided the splashback achieves protection of any *combustible surface* less than 200 mm from the periphery of the nearest *burner* to a height not less than 150 mm above the periphery of the nearest *burner*.

(c) *Requirement 3 — Additional requirements for freestanding and elevated gas cooking appliances — (Measurements D and E)*

Where *D*, the distance from the periphery of the nearest *burner* to a horizontal *combustible surface* is less than 200 mm, then *E* shall be 10 mm or more, or the horizontal *combustible surface* shall be above the *trivet* (see Details I and II in [Figure 6.10.1.1](#)).

NOTE 3 Requirement 3 does not apply to a freestanding or elevated gas cooking *appliance* which is designed to prevent flames or the cooking vessels from extending beyond the periphery of the *appliance*.

NOTE 4 The “cooking surface area” is defined as that part of the *appliance* where cooking normally takes place and does not include those parts of the *appliance* containing control knobs.

NOTE 5 Consideration is to be given to window treatments and painted surfaces on glass splashbacks when located near *gas cooking appliances*.

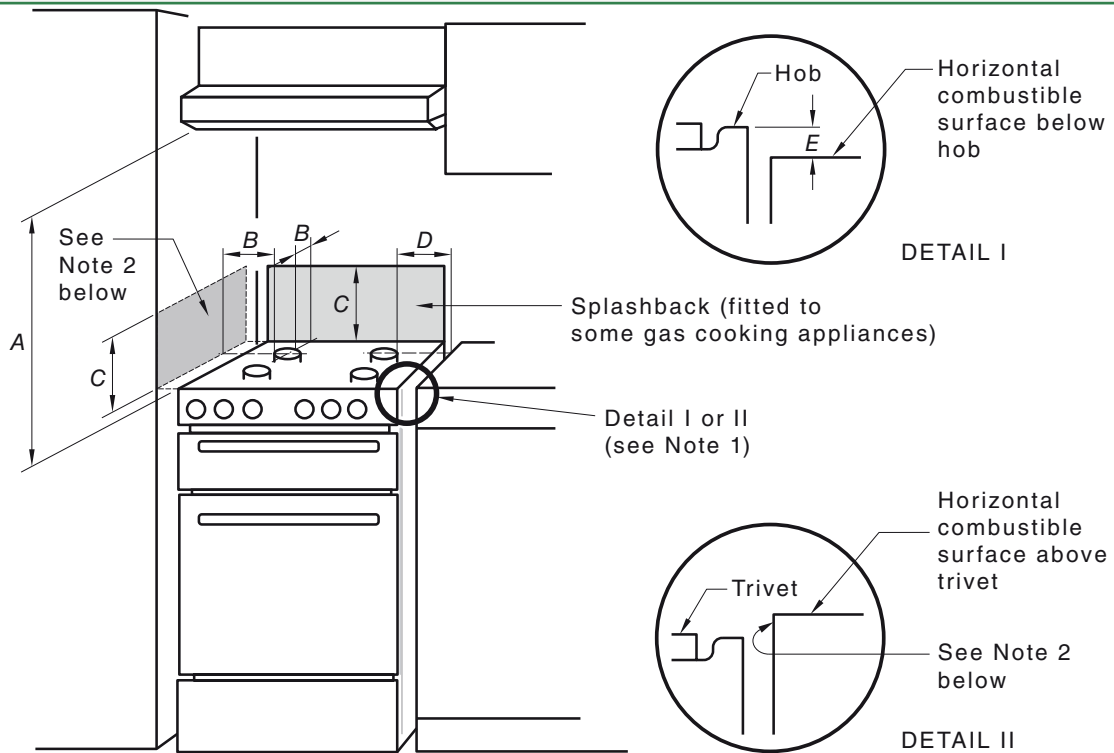
^{A2} (d) *Requirement 4 — Additional requirements for down-draught extraction systems*

Appliances with integral *down-draught extraction systems* shall only be installed if the design conforms to [Clauses 6.1.1](#) or [6.1.2](#).

Appliances shall only be installed with separate *down-draught extraction systems* if they meet the following requirements:

- (i) The *appliance* installation instructions state the *appliance* may be used with the *down-draught extraction system*; and
- (ii) The *down-draught extraction system* installation instructions state that the *down-draught extraction system* may be used with the *appliance*. ^{A2}

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.



NOTE 1 Details I and II relate to Requirement 3 of [Clause 6.10.1.1](#) [Item (c)].

NOTE 2 In this case, any vertical *combustible surface* needs to be protected in accordance with Requirement 2 of [Clause 6.10.1.1](#) [Item (b)].

Figure 6.10.1.1 — Required clearances around domestic gas cooking appliances

6.10.1.2 Protection of a combustible surface near a gas cooking appliance

Any *combustible surface* within the clearance zone specified in [Clause 6.10.1.1](#) shall be protected in accordance with [Appendix C](#) for the applicable facing and backing materials.

6.10.1.3 Multiple gas cooker installations in classrooms

Where multiple domestic *gas cooking appliances* are installed in schools and the like, permanent natural ventilation openings shall be provided direct to outside to ensure that products of combustion are adequately diluted and the effect on indoor air quality is minimized. At least two permanent openings shall be provided at high and low level in accordance with [Clauses 6.4.5.3](#) and [6.4.5.5](#) or [6.4.6.2](#)

6.10.1.4 Clearance above a high level griller

The clearance above the *burner* of a high level *griller* to a *combustible surface* shall be at least that given in [Figure 6.10.1.1](#) unless the *griller* has been *certified* for a lesser clearance.

NOTE A high level *griller* may be separately mounted or be part of another *gas cooking appliance*.

6.10.1.5 Clearance from oven flue of elevated gas cooking appliance

The clearance between an overhead surface and the oven *flue* outlet of an elevated *gas cooking appliance* shall be not less than 200 mm.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.1.6 Connecting an elevated gas cooking appliance

The final *gas* connection length to an elevated *gas* cooking *appliance* shall allow withdrawal of the *appliance* for disconnection, and be either —

- (a) annealed copper pipe; or
- (b) a *hose assembly*.

NOTE The *appliance* may need to be secured against accidental movement if installed on a hard surface.

6.10.1.7 Indoor barbecues in residential premises

Indoor barbecues in residential premises shall be in accordance with **AS/NZS 5263.1.1** and be installed such that —

- (a) measured horizontally, a vertical *combustible surface* less than 200 mm from the cooking surface area is protected in accordance with [Clause 6.10.1.2](#) for a height of 150 mm; and
- (b) the clearances shown in [Table 6.10.1.7](#) are applied. All vertical clearances are measured between any part of the grease filter and nearest part of the cooking surface.

NOTE 1 This [Clause \(6.10.1.7\)](#) applies to barbecues designed for use without a cooking vessel where cooking fats can fall on to and flare up from a heated perforated plate, volcanic rock or similar refractory material.

NOTE 2 Any *combustible surfaces* less than 1200 mm but not less than 600 mm from the cooking surface may be protected in accordance with [Clause 6.10.1.2](#).

NOTE 3 The “cooking surface area” is defined as that part of the barbecue where cooking normally takes place and does not include those parts of the barbecue containing control knobs.

Table 6.10.1.7 — Cooking surface area minimum clearances

Cooking surface area	Minimum clearance, mm
Vertically to an overhead grease filter	1 200
Vertically to a <i>combustible surface</i>	1 200
Vertically to a non-combustible surface	600
Horizontally to a vertical <i>combustible surface</i>	200

6.10.1.8 Installation of LP Gas cook tops in New Zealand

Where the cylinder is located indoors, the following conditions apply:

- (a) The *cylinder* connection system shall be suitable for *indoor* use.
- (b) *Cylinders* shall not be more than 25 L water capacity (9 kg *cylinder*).
- (c) The *cylinder* shall not be in the same compartment as a power point or electrical *appliance* (for example waste disposal unit or dishwasher).
- (d) The compartment in which the *cylinder* is located shall be ventilated directly to the outside of the building, with a vent of at least 1000 mm² at low level.
- (e) *Hose assemblies* in excess of 1 m shall not be used.
- (f) Jubilee clips shall not be used.

Copper piping shall be used where the piping from the *cylinder* to the *LP Gas* cook top, passes through a wall or cupboard.

NOTE For safety, *cylinders* should be located outside the building. See [Appendix J](#) for guidance on installation.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.1.9 Connecting a freestanding cooking appliance using a hose assembly — High level connection

Where a *freestanding cooking appliance* is to be connected with a *hose assembly* using a high level connection, the following shall apply:

- (a) The cooking *appliance* shall be designed and *certified* for that type of connection.
- (b) The *hose assembly* length shall be between 1 m and 1.2 m.
- (c) The height of the *consumer piping* connection point above the floor shall be approximately equal to the height of the cooking *appliance* connection point.
- (d) The connection point in Item (c) shall face downward and be approximately 150 mm to the side of the cooking *appliance* connection point when the *appliance* is in the installed position.

NOTE 1 Requirements in Items (b), (c) and (d) are to ensure the *hose assembly* is kept clear of the floor when the *appliance* is in the installed position. The distance between the connection points enables the cooking *appliance* to be “pushed in” as close as practicable to the rear wall.

- (e) A restraining chain or wire of adequate strength shall be fixed to the *appliance* and the wall within 50 mm of each connection point. The length of the chain or wire shall not exceed 80 % of the length of the *hose assembly*.

NOTE 2 The restraining chain or wire is to prevent stress being imparted onto the *hose assembly* when the cooker is moved out of its normal operating position.

- Ⓐ (f) Where a domestic cooker is connected to *consumer piping* using a *hose assembly*, the *hose assembly* shall be *certified* to the relevant parts of the AS 1869 series, Class B or Class D. Ⓐ

6.10.1.10 Under cooker connection

A *freestanding cooking appliance* having an under-cooker connection point shall not be connected to that point using a *hose assembly* or a *semi-rigid connector*.

6.10.1.11 Stabilization of a freestanding cooking appliance

The method specified in the *manufacturer's instructions* to prevent the tilting of a *freestanding cooking appliance*, when in the installed position, shall be used.

6.10.1.12 Inbuilt oven

The following requirements apply:

- (a) The location of an inbuilt oven shall be such that it will allow operation of the oven and complete removal from the recess.
- (b) The size of the recess shall provide adequate clearance between the casing of the oven and adjacent *combustible material*.

NOTE Refer to *manufacturer's instructions* for details of required clearances.

- (c) The base of the recess shall be capable of supporting the full weight of the oven.
- (d) Unless an inbuilt oven has been *certified* for connection using a *hose assembly* as specified in the *manufacturer's instructions*, and the use of the *hose assembly* conforms to [Clause 5.9](#), the final *gas* connection length shall be of annealed copper pipe and allow sufficient withdrawal of the oven from the recess for disconnection.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (e) An electrical connection in accordance with [Clause 6.2.8](#) shall be *accessible*, located outside and adjacent to the oven recess. Any penetration of a partition for the power supply cord shall be large enough to allow the plug to pass through.

6.10.1.13 Single boiling burners

A single boiling *burner* (ring *burner*) shall stand on a fire-resistant base, and conform to the clearance requirements of [Clause 6.10.1.1](#).

6.10.1.14 Domestic gas cooking appliances in combined living/sleeping areas

In a combined living/sleeping area, a domestic *gas* cooking *appliance* shall only be installed under a *rangehood* or *exhaust fan* that is ducted to outside.

NOTE This Clause applies to buildings approved for construction after adoption of this Standard by the relevant *Technical Regulator*.

6.10.1.15 Domestic gas cooking appliances in commercial installations

Domestic *gas* cooking *appliances* in commercial kitchens shall be installed in accordance with the requirements of [Clause 6.10.2.1](#) to [6.10.2.4](#).

6.10.2 Commercial catering equipment

NOTE Health authorities or national building codes may require an exhaust system to be fitted where these *appliances* are installed. Such systems should conform to AS/NZS 1668.1 and AS 1668.2.

6.10.2.1 Combination cooking ranges

Where two or more *appliances* are to be connected together to form a combination cooking range —

- (a) the *gas* supply to the group of *appliances* shall be from one source;
- (b) where multiple *appliances* are connected, not more than six *appliances* shall be connected together; and
- (c) the connecting pipe shall —
 - (i) be sized to allow all *appliances* to operate at maximum *gas* consumption simultaneously; and
 - (ii) have a *manual shut-off valve*, which will shut off all the *appliances*, fitted in an *accessible* location.

NOTE Supply from more than one source may create a hazard if there is ever a need to turn off the *gas* supply to the group of *appliances* in an emergency.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.2.2 Clearances to a grease filter

The clearance between any part of a grease filter and the nearest part of the cooking surface or *trivet* shall be not less than the clearance specified in [Table 6.10.2.2](#).

Table 6.10.2.2 — Clearances to grease filters

Heat source to grease filters	Appliance	Minimum clearance, mm
Low intensity indirect flame	Kebab cooker, salamander, chicken rotisserie	200 (from top of appliance)
Permanently concealed flame	Solid/flat top griddle/grill plate, deep fryer (top of pan), pasta/noodle cooker, even heat top	600
Naked flame/indirect cooking	Gas hotplate, open burner, stock pot, target top	1050
Intense naked flame where flare/ignition of food typically occurs	Chinese cooking table, wok burner, appliance with user interchangeable or open grill plate (barbecue, broiler – including char, radiant, infrared, automatic and flare types)	1350
Where multiple <i>appliances</i> are serviced by one extraction system, the distance from the cooking surface of each <i>appliance</i> to the grease filter shall be such that the minimum clearance in this Table is applied to each respective <i>appliance</i> .		
NOTE For other commercial catering equipment, refer to the relevant <i>manufacturer's instructions</i> .		

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.2.3 Clearances around commercial catering equipment

The clearance to *combustible surfaces* from commercial catering equipment shall be as specified in the *appliance manufacturer’s instructions* and shall be not less than the clearance specified in [Table 6.10.2.3](#).

Table 6.10.2.3 — Minimum clearances around cooking surface area

Cooking surface area		Minimum clearance, mm
(a)	Above the cooking surface of an <i>appliance</i> not covered in Table 6.10.2.2	600
(b)	Subject to Item (c) below, from a cooking surface area having an open flame and no means of preventing cooking vessels from overhanging the edge of the <i>appliance</i> .	250
(c)	From the side of an open flame <i>appliance</i> , where the <i>combustible surface</i> is at least 100 mm below a cooking surface area	50
(d)	From an <i>appliance flueway</i> or rear of a <i>appliance</i> with a “splashback”	50
(e)	From the rear or side of an <i>appliance</i> which is not an open flame cooking <i>appliance</i>	50
NOTE 1 The cooking surface area is defined as being that part of the <i>appliance</i> where cooking normally takes place and does not include those parts of the <i>appliance</i> containing control knobs. For example, if a timber preparation table is adjacent to a commercial range, and the table has a <i>combustible surface</i> that is 100 mm below the <i>hob</i>, then 50 mm clearance is required from the range. Any <i>combustible surface</i> higher than that would need to have at least 250 mm clearance, or be protected. NOTE 2 Care should be taken where a <i>combustible surface</i> is covered by a non-combustible material. For example, covering a <i>combustible surface</i> with stainless steel will not prevent heat transfer, and in some circumstances a hazardous situation could arise. NOTE 3 See Clause 6.3.7 for requirements regarding <i>appliances</i> above a source of cooking vapour, steam or grease. NOTE 4 When installing combustible material protection behind commercial cooking appliances, the protection should extend from the floor at the lower level and to the underside of the canopy or ceiling, whichever is higher at the highest level. NOTE 5 When installing combustible material protection behind commercial cooking appliances, the protection should extend 50mm either side of the appliance.		

The clearances in [Table 6.10.2.3](#) do not apply where the adjacent surface and structure is non-combustible. Where the combustible materials are within the required clearance zone and the correct clearance is not able to be provided, the combustible materials shall be protected in accordance with [Clause C.2](#). The protective materials may be covered by ceramic tiles or stainless steel to meet appropriate requirements relating to health protection.

6.10.2.4 Commercial catering equipment on a combustible surface

Where commercial catering equipment is marked “TO BE INSTALLED ON A FIRE-PROOF BASE” and is installed on a *combustible surface*, the surface shall be protected in accordance with [Appendix C, Clause C.3](#). The protection shall extend at least 50 mm beyond the perimeter of the *appliance* and be impervious to cooking fats.

6.10.2.5 Commercial catering equipment in residential premises

Commercial catering equipment shall only be installed in residential premises if specified in the *manufacturer’s instructions*. The *gas installation* shall include an exhaust system conforming to AS 1668.1 and AS 1668.2 which is interlocked to the appliance *gas supply*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.2.6 Freestanding commercial catering equipment with under equipment connection

Freestanding commercial catering equipment having a connection point under the equipment shall not be connected to that point using a *hose assembly*.

NOTE It may be necessary to extend the appliance connection point to a higher level acceptable to the *technical regulator*.

6.10.2.7 Connecting freestanding commercial catering equipment using a hose assembly — High level connection

Where freestanding commercial catering equipment is to be connected with a *hose assembly*, the following shall apply:

- (a) The *appliance* shall be designed and *certified* for that type of connection.
- (b) An *appliance* designed to move on castors, rollers or wheels shall be connected to the consumer piping using a hose assembly (see [Clause 6.2.13](#)).
- (c) The height of the consumer piping connection point above the floor shall be approximately equal to the height of the *appliance* connection point.
- (d) Both connection points shall face downward and be approximately 150 mm horizontally apart in separation when in the installed position.
- (e) Where an *appliance*, having a mass greater than 20 kg and fitted with castors, rollers or wheels, or designed to be slid out for servicing, is connected by a *hose assembly*, the extent of movement of the appliance shall be restrained by means other than the *hose assembly*. The *hose assembly* shall be connected in accordance with [Clause 5.9.6](#) (see [Clause 6.2.14](#)). The restraint shall be not greater than 80 % of the length of the *hose assembly*.

NOTE 1 The restraining means should be strong enough to restrain the *appliance* according to the means used to move it.

-  (f) *Hose assemblies* used shall be *certified* to the relevant parts of the AS 1869 series, Class B or Class D. 
 - (g) Means shall be provided between the rear of the *appliance* and the adjacent wall to prevent damage to *hose assemblies* and components when the *appliance* is in its installed position.
- NOTE Examples of how damage can be prevented include 'bump stops', consumer piping covers or enclosing hose assemblies and components within structures that allow appropriate access to gas isolation valves.
- (h) With the *appliance* in the installed position, no part of the *hose assembly* shall be less than 50 mm from the floor or ground.
 - (i) A quarter turn *manual shut-off valve* shall be located at the *consumer piping* connection point prior to the *hose assembly*.

6.10.2.8 Semi-rigid connectors in commercial catering installations

Semi-rigid connectors shall only be used in commercial catering installations where:

- (a) The appliance is permanently fixed to the mounting surface, so that movement is not possible once in the installed position and;
- (b) The semi rigid connector is protected from mechanical stress i.e. bumps and knocks etc.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.2.9 Commercial catering equipment installed in classrooms

Where commercial catering equipment is installed in schools and similar premises, one of the following shall apply:

- (a) Adequate permanent natural ventilation openings shall be provided direct to outside to ensure the products of combustion are diluted and the effects on indoor air quality is minimized. At least two permanent openings shall be provided at high and low level in accordance with [Clauses 6.4.5.3](#) and [6.4.5.5](#) or [6.4.6.2](#).
- (b) The provision of a local exhaust canopy and make-up air system conforming to AS 1668.1 or AS 1668.2.

6.10.3 Instantaneous water heaters

6.10.3.1 Prohibited locations

An instantaneous *water heater*, other than a *room-sealed appliance*, shall not be installed in a —

- (a) *bedroom*;
- (b) *bathroom*;
- (c) toilet; or
- (d) combined living/sleeping room.

6.10.3.2 Flueless instantaneous water heater

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

In New Zealand, flueless instantaneous *water heaters* may be installed *indoors* subject to the following:

- (a) The input of any flueless *water heater* installed indoors shall not exceed 0.4 MJ/h/m³ of room volume (100 W/m³).
- (b) Flueless *water heaters* shall not be fitted underneath projecting shelves or *cupboards*, nor with a clearance less than 150 mm from side walls, and the *flue terminals* shall not be less than 600 mm below ceilings.

NOTE For limitations regarding heated water delivery temperatures from sanitary fixtures used primarily for personal hygiene purposes, refer to AS/NZS 3500.4.

6.10.3.3 Instantaneous water heater within a roof space

In South Australia, an instantaneous continuous flow *water heater* shall not be installed within a roof space unless approved by the *Technical Regulator*

6.10.4 Storage water heaters

When a storage *water heater* is to be installed in a *bathroom* or toilet, the *gas consumption* shall not exceed 40 MJ/h.

NOTE For limitations regarding heated water delivery temperatures from sanitary fixtures used primarily for personal hygiene purposes, refer to AS/NZS 3500.4.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.5 Pool heaters (including those for swimming, spa and therapeutic pools)

6.10.5.1 Prohibited locations

A *pool heater* shall not be installed in the following locations:

- (a) Upstream of a filter or pump.
- (b) Downstream of an automatic chlorinator.
- (c) In a storage area for pool chemicals or flammable materials.

NOTE Pool chemicals may contain chlorine which, when drawn into the *burner*, will quickly cause corrosion and damage to the *pool heater*.

6.10.5.2 Supporting base

A *pool heater* shall, unless otherwise stated in the *manufacturer's instructions*, be installed on a stable non-combustible base.

6.10.5.3 Control systems

Pool heaters shall have the following controls:

- (a) A control system to ensure the water temperature in the pool does not exceed 40°C.
- (b) A manual reset *temperature limit device* independent of the control system to prevent the water temperature in the pool exceeding 45°C.
- (c) Controls to ensure water is flowing through the heater before the main *gas* valve admits *gas* to the *burners*.

6.10.5.4 Pool heater where flow and return water pipes are plastic

Where the water flow and return pipes are plastic, these pipes shall be connected to the heater with a minimum of 1 m of unlagged metallic pipe unless stated otherwise in the *manufacturer's instructions* for the *pool heater*.

NOTE This requirement prevents the plastics pipe being affected by residual heat when the *pool heater* is shut down.

6.10.5.5 Non-return valve

A non-return valve shall be fitted in the water return line between the filter and the *pool heater* unless stated otherwise in the *manufacturer's instructions* for the *pool heater*.

6.10.5.6 Restriction on fitting of a valve in water flow line

A valve shall not be fitted in the water flow line between the *pool heater* and the pool, unless there is an arrangement to vent the system when the valve is closed. Where a pressure relief valve provides such venting, that valve shall be in accordance with AS 1357.1 and be drained in accordance with AS/NZS 3500.4.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.6 Space heaters

6.10.6.1 Limitation on installation

A space heater, other than a *room-sealed appliance*, shall not be installed in a *bathroom* or toilet.

A space heater installed in a bedroom, a room used for sleeping or a room generally kept closed shall be —

- (a) a *room-sealed appliance*; or
- (b) an *open flued appliance* fitted with a flame safeguard system and with permanent ventilation provided in accordance with [Clause 6.4](#), irrespective of the heater rating.

6.10.6.2 Open flued appliance with rear register

Open flued appliances with rear registers shall be installed such that the operation of the air circulation fan does not lower the air *pressure* in the room in which the *appliance* is installed.

NOTE 1 Unequal *pressure* could cause spillage of *flue gases*.

NOTE 2 A relief grille may be required between the rooms to equalize the air *pressure*.

6.10.6.3 Restrictions on installation of flueless space heater

NOTE 1 For information on the installation of flueless space heaters in Victoria, Western Australia and South Australia, see [Appendix M](#).

Where a flueless space heater is to be installed, the following, as appropriate, shall apply:

- (a) The maximum *gas consumption* of the heater(s) shall not exceed that given in [Table 6.10.6.3](#). In residential *premises*, the combined *gas* consumption of all the heaters in the room shall not to exceed 25 MJ/h.
- (b) The room where the heater is to be installed shall be isolated from sleeping rooms.
NOTE 2 The provision of an unventilated door on the sleeping area would satisfy this requirement.
- (c) The heater shall not be recessed in a wall unless the heater is designed and *certified* for such installation.
- (d) There shall be a minimum vertical clearance of 600 mm between the top of the heater and any overmantle, shelf or other projection directly above the heater.
- (e) Where a heater is to be installed in a fireplace, the chimney shall be closed off.
- (f) The air supply requirements of [Clause 6.4](#) shall be met.
- (g) For South Australia, where a quick connect device socket is installed for the future connection of a flueless heater and the capacity is unknown, the room shall have two ventilation openings installed, one at high level and one at low level. Each opening shall have a minimum free area of 25 000 mm².

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table 6.10.6.3 — Maximum gas consumption of flueless space heaters

Appliance location	Appliance type	Maximum gas consumption per cubic metre of room volume, MJ/h/m ³
In habitable space	Thermostatically controlled	0.4
	Not thermostatically controlled	0.2
In passageway or lobby	Either thermostatically or non-thermostatically controlled	0.4
NOTE See Clause 6.4.7 .		

6.10.6.4 Installation of space heater in an institution

Any space heater installed in an institution shall be securely fixed independently of the pipework.

NOTE 1 An institution is to be taken to include a home for the aged, a sanatorium, a convalescent home, a school or a kindergarten.

NOTE 2 Installations in such institutions may require secondary guards to be fitted to the heater and its *flue* outlet.

NOTE 3 Suitable *flue* guards should be obtained from the *appliance* manufacturer.

6.10.7 Overhead radiant heaters

6.10.7.1 General

The requirements of this Clause do not apply to overhead radiant tube heaters.

NOTE For requirements of overhead radiant tube heaters, see [Clause 6.10.13](#).

6.10.7.2 Overhead radiant heaters installed indoors

An overhead radiant heater installed *indoors* shall —

- (a) be at a height conforming to the *manufacturer's instructions*, but not less than 2.5 m above floor level;
- (b) be supported independently of the *consumer piping*;
- (c) have a minimum clearance to *combustible material* above the heater as specified in [Table 6.10.7.2](#) unless protection that ensures the temperature of the *combustible material* does not exceed 65°C above ambient is provided; and
- (d) be able to be accessed in accordance with [Clause 6.3.12](#).

Table 6.10.7.2 — Clearance to combustible material above overhead radiant heaters

Maximum input, MJ/h	Minimum clearance above appliance, mm
6	750
12	900
Greater than 12	1100

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.7.3 Overhead radiant heaters installed outdoors or in quasi-outdoor situations

An overhead radiant heater installed *outdoors* or in a *quasi-outdoor* situation shall —

- (a) be wall-mounted;
- (b) be at a height conforming to the *manufacturer's instructions*, but in no instance be less than 1.8 m above floor level;
- (c) be supported independently of the *consumer piping*; and
- (d) have a minimum clearance to *combustible material* above the heater as specified in [Table 6.10.7.2](#) unless either —
 - (i) protection that ensures the temperature of the *combustible material* does not exceed 65°C above ambient is provided; or
 - (ii) the *appliance* has been *certified* for lesser clearance; and
- (e) be able to be accessed in accordance with [Clause 6.3.12](#).

6.10.8 Patio heaters

6.10.8.1 Limitation on installation

A patio heater *certified* for *outdoor* installation shall not be installed *indoors*.

6.10.8.2 Pole mounted

The installation of a pole-mounted patio heater shall be in accordance with the following:

- (a) A patio heater *certified* for pole mounting shall not be installed in a bracket arrangement unless *certified* for that application.
- (b) It shall be secured to prevent tilting.
NOTE A manufacturer-supplied weighted base is deemed to be acceptable.
- (c) If connected to fixed *consumer piping*, it shall be installed to prevent strain on the *consumer piping*.
- (d) If connected by *hose assembly*, it shall —
 - (i) be located so as not to cause a hazard;
 - (ii) be located with at least the clearances specified in the *manufacturer's instructions* to any *combustible surface*; and
 - (iii) be supplied with a means to prevent stress on the hose, which may be either —
 - (A) a restraining chain or wire of adequate strength for fixing to the *appliance* or table and the *cylinder* with a length not exceeding 80 % of the length of the *hose assembly*; or
 - (B) a device that supports the *cylinder* and prevents displacement.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.8.3 Suspended other than by pole mounting

The installation of a patio heater designed to be suspended other than by pole mounting shall be in accordance with the following:

- (a) It shall be at a height conforming to the *manufacturer's instructions*, but not less than 2.5 m between floor level and the heating surface when installed *indoors* (applies only where the *appliance* is *certified* for indoor installation) or not less than 1.8 m above floor level when installed *outdoors* or *quasi-outdoors*.
- (b) As a minimum, the clearances to any *combustible surface* shall be as specified in the *manufacturer's instructions*.
- (c) It shall be supported independently of the *consumer piping*.

6.10.9 Decorative flame effect fires, other than flame effect gas space heaters

6.10.9.1 Prohibited installation

A *decorative flame effect fire*, other than a *room-sealed appliance*, shall not be installed —

- (a) in a *bathroom* or toilet;
- (b) in a *bedroom* unless it is fitted with a flame safeguard system; or
- (c) if its *gas consumption* exceeds 72 MJ/h.

6.10.9.2 Requirements for fireplace and chimney

Open flame type *decorative flame effect fires (Type 1)* shall be installed in non-combustible fireplaces fitted with a vertical *chimney* or *flue* of a minimum cross-sectional area of 40 000 mm² (i.e. 200 mm × 200 mm, or approximately 230 mm in diameter) or smaller if specified in the *manufacturer's instructions* for the *appliance*. The *chimney*, hearth, fireplace back (where applicable) and other parts of the fireplace shall be of suitable construction for use with solid fuel.

The adequacy and effectiveness of any fireplace and *chimney* into which a *decorative flame effect fire* is installed shall be checked before and after installation. There shall be no significant spillage of *flue gases* under stabilized operating conditions.

NOTE 1 A smoke candle or other suitable device should be used to check for spillage.

NOTE 2 Local building regulations provide requirements for the construction of hearths, *chimneys* and fireplaces into which these *appliances* can be installed.

6.10.9.3 Damper not permitted in chimney or flue

Dampers shall not be fitted in a *chimney*, *flue*, or any fire box associated with the installation of a *decorative flame effect fire*. Any damper that is already in existence shall either be removed or permanently fixed in the fully open position.

NOTE: This requirement does not apply to automatic *flue* dampers that are an integral part of the *appliance*.

6.10.9.4 Flue cowl requirements

The fitting of a *flue cowl* to a *chimney* into which a *Type 1 decorative flame effect fire* is installed is optional, unless specifically required in the *manufacturer's instructions* for the *appliance*. If fitted, the *flue cowl* shall be of 225 mm *nominal diameter*, unless a smaller diameter is specified in the *manufacturer's instructions* for the *appliance*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Where a *flue* is installed for a *Type 1 decorative flame effect fire*, a *flue cowl* shall be fitted. The *flue* and *flue cowl* shall be of 225 mm *nominal diameter* or less if otherwise specified in the *manufacturer's instructions* for the *appliance*.

Where a *Type 2 decorative flame effect fire* is installed, a *flue cowl* of same *nominal diameter* as the *flue* shall be fitted.

6.10.9.5 Ventilation requirements other than for a room sealed appliance

Notwithstanding the requirements of [Clause 6.4.5](#), one or more ventilation openings with a combined free ventilation area of not less than the equivalent cross-sectional area of the *flue cowl* shall be provided for each *decorative flame effect fire*. Where a *flue cowl* is not fitted to a *chimney* for a *Type 1 decorative flame effect fire*, the ventilation opening area shall be in accordance with [Clause 6.4.5.3](#) or 40 000 mm², whichever is the greater. The *chimney* in which the *appliance* is installed shall not be considered as a ventilation opening.

6.10.10 Ducted air heaters

6.10.10.1 Location

Ducted air heaters shall be located to minimize noise transmission to the heated area.

6.10.10.2 Interaction of heating air and air for combustion

A central heating system shall be constructed so that the operation of the circulating fan has no adverse effect on the *flue* system or the ventilating and combustion airflow of the ducted air heater.

6.10.10.3 Ductwork to not prevent lighting or servicing

Ductwork shall not interfere with access for lighting or servicing the *appliance*.

6.10.11 Air curtains

NOTE 1 AS 3814 provides operational limits for air curtains, which should be checked on commissioning.

Air curtains shall —

- (a) be above an external door;
- (b) have an *interlock* provided which causes the main *burner* to shut down when the door commences to close, if the *gas consumption* of the air curtain, or total *gas consumption* of all air curtains in an area, exceeds 0.2 MJ/h/m³ of room volume;

NOTE 2 Where the air curtain is to be installed above automatic doors, some *Technical Regulators* do not require an *interlock* if additional ventilation is provided in the area serviced by the air curtain.

- (c) have the outlet grille —
 - (i) facing vertically downwards;
 - (ii) at least 2 m above floor level; and
 - (iii) with a 75 mm clearance, around the perimeter, to a *combustible surface*; and
- (d) have a clearance of at least 150 mm between the air intake of the *appliance* and a neighbouring structure; and
- (e) have access to the *appliance* in accordance with [Clause 6.3.12](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.12 Direct fired air heaters

NOTE AS 3814 provides operational limits for *direct-fired air heaters* which should be checked on *commissioning*.

6.10.12.1 Prohibited locations

A *direct-fired air heater* shall not be installed in —

- (a) a residential *premises*;
- (b) any type of hospital;
- (c) a nursing home, rest home, convalescent home, sanatorium, rehabilitation centre or centre for the mentally handicapped; or
- (d) a classroom, lecture room or office in an educational institution.

NOTE A school, college or the like, kindergarten, pre-school centre, child minding centre or infant welfare centre is to be considered as an educational institution.

6.10.12.2 Restriction on air supply

The air supply for a *direct-fired air heater* shall be provided directly from outside.

6.10.13 Overhead radiant tube heaters

6.10.13.1 General

For flueless overhead radiant tube heaters, the requirements in [Table 6.10.6.3](#) shall apply.

NOTE Where a multi-burner *flue* system with a common fan is to be installed, the *Technical Regulator* may require to be specifically advised prior to the commencement of any work.

6.10.13.2 Requirements for installation

An overhead radiant tube heater shall —

- (a) be installed at a height conforming to the *manufacturer's instructions*, but not less than 3.5 m above floor level;
- (b) be supported independently of the *consumer piping*; and
- (c) be able to be accessed in accordance with [Clause 6.3.12](#)

6.10.13.3 Requirements for an installation where atmosphere is contaminated

Where an overhead radiant tube heater is to be installed in an area where excessive dust or lint or any flammable vapours are present, the following shall apply:

- (a) Air for combustion shall be ducted from outside.
- (b) The *flue* shall be extended to outside.

NOTE The *Technical Regulator* should be consulted as in some instances this requirement for the *flue* may not be necessary.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.13.4 Clearance requirements

The following clearance requirements apply:

- (a) The clearance from a *combustible surface* or electrical wiring shall ensure that, with continuous operation of the *appliance*, the surfaces or wiring will not exceed 65°C above ambient.
- (b) The *appliance* shall be clear of any sprinkler system, overhead crane or other area where damage or interference to the heater may occur.

6.10.14 Laundry dryers

6.10.14.1 Laundry dryer with exhaust fan

Laundry dryers incorporating an *exhaust fan* shall have —

- (a) a fan *interlock* with the *gas* supply; and
- (b) a high limit switch to shut off the *gas* if safe temperature limits are exceeded.

NOTE For example, safe temperature limits are exceeded because of blockage in the lint trap or *flue*.

6.10.14.2 Exhaust duct required

An exhaust duct shall be fitted where —

- (a) the *gas consumption* of the dryer exceeds 10 MJ/h; or
- (b) the dryer is installed in a *bedroom* or *bathroom*.

6.10.14.3 Exhaust duct requirements

Exhaust ducts shall have a smooth interior surface and shall discharge outside the building. Such ducts shall not discharge into brickwork, *chimneys*, roof spaces or wall cavities.

Where exhaust ducts from dryers are to be combined, the ducting shall be sized in accordance with the *manufacturer's instructions*.

Where an exhaust duct extension is more than 900 mm long, an access opening shall be provided near the dryer for lint removal.

An exhaust duct from a laundry dryer shall not be combined with a *flue* from another *appliance*.

Exhaust ducts shall be terminated according to the *manufacturer's instructions* for the *appliance*.

NOTE 1 “Exhaust duct”, when related to a laundry dryer, is a duct connected to a laundry dryer for the removal of air, water vapour and *combustion products* to a discharge point outside the building. The removal of the *combustion products* is a minor aspect of its function.

NOTE 2 Flexible *flues* and *flue* liners are considered to be smooth.

6.10.14.4 Ventilation requirements

Ventilation openings shall be provided in accordance with the *manufacturer's instructions* for the *appliance* to ensure adequate air supply for combustion and to replace air discharged through the exhaust duct(s).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.14.5 Exhausting into a room or enclosure

Where a laundry dryer with a *gas consumption* of 10 MJ/h or less exhausts into a room or *enclosure*, that room or *enclosure* shall be ventilated.

The minimum ventilation opening shall be 26 000 mm² for each dryer, half to be provided within 300 mm of the ceiling and the remainder within 300 mm of the floor.

6.10.14.6 Dryers for community use — Operating instructions to be displayed

Laundry dryers installed for community or commercial use shall have operating instructions permanently displayed in a prominent position and have a notice permanently and prominently displayed warning the users that clothing or other materials containing flammable solvents shall not be placed in the dryer.

6.10.15 Gas lights

Gas lights shall not be installed in rooms used for sleeping, rooms generally kept closed or *bathrooms*. In other locations the total input rating of *gas* lights shall not exceed 0.2 MJ/h/m³ (50 W/m³) of room volume.

Internal pendant lights shall be supported independently of the supply pipe.

Bracket and pendant lights of the enclosed type shall have a minimum clearance from *combustible materials* of 450 mm vertically and 125 mm horizontally.

6.10.16 Incinerators

NOTE Because of combustion and *flue* considerations it is common for an incinerator to be installed without a *draught diverter*. The *manufacturer's instructions* detail requirements for such installations. In some areas, fire authorities and local environmental authorities have regulations for these types of *appliances*. Those authorities should be contacted before commencing an installation.

6.10.16.1 Required clearances to combustible surfaces

The maximum surface temperature of any *combustible surface* around an incinerator shall not exceed 65°C above ambient, but in no case shall the clearances to *combustible surfaces* be less than those given in [Table 6.10.16.1](#).

Table 6.10.16.1 — Clearance to combustible surfaces around an incinerator

Part of incinerator	Minimum clearance to <i>combustible surface</i> , mm
Sides and top	1 000
The front	1 050
Horizontal surface above the charging door	1 200
The clearance to the horizontal surface above a charging door may be reduced to 600 mm, provided that surface is protected. The protection required shall be at least equal to that given by 0.4 mm sheet metal spaced out 25 mm by non-combustible spacers. The protection shall extend at least 450 mm beyond all sides of the charging door.	

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table 6.10.16.1 (continued)

Part of incinerator	Minimum clearance to <i>combustible surface</i> , mm
An incinerator that is designed to retain the flame within the <i>appliance</i> during loading is exempt from the minimum clearance above the charging door.	

6.10.16.2

Flue for an incinerator

A *flue* connected to an incinerator shall conform to the following, as appropriate:

- (a) It shall terminate to outside atmosphere in a location relative to neighbouring structures so that wind from any direction will not be likely to create downdraught in the *flue*.
- (b) It shall not be interconnected with the *flue* from any other type of *appliance*.
- (c) Where two or more incinerator *flues* are to be combined, the *Technical Regulator* shall be consulted prior to commencement of work.
- (d) If constructed of metal other than stainless steel —
 - (i) it shall be *accessible* for visual examination for the entire length; and
 - (ii) the metal shall be at least as durable as 1.6 mm mild steel.
- (e) It shall have provision for the removal of ash —
 - (i) in any lateral run of *flue* exceeding 3 m; and
 - (ii) in any vertical *flue* exceeding 900 mm.
- (f) If constructed of masonry, there shall be a minimum clearance of 300 mm to *combustible material*. This clearance may be reduced, provided the *combustible material* is shielded or protected. In no case shall the surface temperature of the *combustible material* exceed 65°C above ambient.

6.10.16.3 Operating instructions to be displayed

Operating instructions shall be permanently displayed in a prominent position adjacent to the incinerator. These instructions shall detail types and quantities of waste that may be incinerated, and the cleaning instructions.

6.10.17 Pottery kiln

NOTE Because of combustion and *flue* considerations it is not unusual for a pottery kiln to be installed without a *draught diverter*. The *manufacturer's instructions* detail requirements for such installations. Some Local Government Authorities have requirements for the installation of these *appliances*. The relevant Local Government Authority should be contacted prior to the commencement of any work.

6.10.17.1 Support to be non-combustible and of adequate strength

The floor or supports on which the kiln is to be installed shall be non-combustible and capable of supporting a fully loaded kiln.

6.10.17.2 Flame safeguard system required

A pottery kiln *burner* system shall be fitted with a *flame safeguard system* in accordance with AS 3814.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

6.10.17.3 Clearances between a hood or canopy and combustible material

There shall be a clearance of at least 450 mm between the canopy, hood and ducting, and any *combustible material*, unless the material is protected in accordance with [Appendix C](#).

6.10.17.4 Flueing of a pottery kiln

A *flue* connected to a pottery kiln shall conform to the following, as appropriate:

- (a) It shall terminate to outside atmosphere in a location relative to neighbouring structures so that wind from any direction will not be likely to create downdraught in the *flue*.
- (b) It shall not be interconnected with the *flue* of another *appliance*.
- (c) If constructed of metal other than stainless steel —
 - (i) it shall be *accessible* for visual examination for the entire length; and
 - (ii) the metal shall be at least as durable as 1.6 mm mild steel.
- (d) If constructed of masonry there shall be a minimum clearance of 300 mm to *combustible material*. This clearance may be reduced, provided the *combustible material* is shielded or protected. In no case shall the surface temperature of the *combustible material* exceed 65°C above ambient.

6.10.17.5 Flue dampers

Flue dampers, where fitted, shall be unable to close completely while the kiln *burner* is firing. *Flue* dampers shall not produce unsafe operating conditions irrespective of their position.

6.10.18 Refrigerator

6.10.18.1 Prohibited locations

A refrigerator shall not be located in a pantry, larder or bedroom unless installed in accordance with [Clause 6.10.18.3](#).

6.10.18.2 Required clearances

Unless otherwise specified in the *manufacturer's instructions*, refrigerators shall be installed with a minimum clearance of 50 mm from the back wall, and 300 mm clearance from the *flue* outlet.

6.10.18.3 Requirements where refrigerator is to be in a sealed recess

Where a refrigerator is to be installed in a sealed recess, the recess shall have two openings to outside. One opening shall be located at the top of the recess and the other at the bottom. The free ventilation area of each opening shall be in accordance with [Table 6.10.18.3](#).

Table 6.10.18.3 — Ventilation for a refrigerator in a sealed recess

Refrigerator storage capacity, L	Free area of ventilation, mm ²
Up to 100	32 500
100 to 200	45 000

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table 6.10.18.3 *(continued)*

Refrigerator storage capacity, L	Free area of ventilation, mm ²
Exceeding 200	65 000

6.10.18.4 Requirement for annealed copper tube connection

Where annealed copper tube is to be used for the final *gas* connection to the refrigerator, the tube shall be formed into a loop to avoid work hardening of the tube due to flexing from vibration caused by door operation.

6.10.19 Gas barbecues and radiant gas heaters for outdoor use

Gas barbecues and radiant gas heaters designed for *outdoor* use shall be installed *outdoors*. Clearances to the cooking surface area shall be as specified in [Table 6.10.1.7](#).

The requirements of this Clause do not apply to *appliances* with *flue terminals*.

NOTE 1 For *appliances* with *flue terminals*, see [Clause 6.9](#).

For the application of this Clause, the following *enclosures* shall be considered as *outdoor* areas:

- (a) An *enclosure* with walls on all sides, with at least one permanent opening at ground level and no overhead cover

NOTE 2 For an example, see [Figure I.1, Appendix I](#).

- (b) A partial *enclosure* that includes an overhead cover and not more than two walls

NOTE 3 For examples, see [Figure I.2](#) and [Figure I.3, Appendix I](#).

- (c) A partial *enclosure* that includes an overhead cover and more than two walls, —

- (i) at least 25 % of the total wall area is completely open; and
- (ii) at least 30 % of the remaining wall area is open and unrestricted.

NOTE 4 For examples, see [Figure I.4](#) and [Figure I.5, Appendix I](#).

- (d) In the case of balconies or verandas at least 20 % of the total of the side, back and front wall areas are open and unrestricted.

NOTE 5 If combustion products cannot be readily dispersed, then a performance-based design solution may be implemented in accordance with [Section 2](#) of this document. ^{A2}

6.11 Commissioning

6.11.1 General

Commissioning requirements apply to both new and existing *gas installations*. *Commissioning* of existing *gas installations* is required after making modifications or undertaking servicing or repair activities.

Specific *commissioning* requirements apply for *appliances*.

6.11.2 Australian requirements

A *Type A appliance* shall be commissioned by the *authorized person* who —

- (a) installs the *appliance* when *gas* is available at the time of installation; or
- (b) makes *gas* available to the *appliance* if *gas* was not available at the time of installation.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

A *Type B appliance* shall be commissioned in accordance with the requirements of the *Technical Regulator* and by a person meeting the requirements of the *Technical Regulator*.

NOTE 1 In the case of a non-reticulated *LP Gas* installation, the *commissioning* of the *appliance* is the responsibility of the person who installed the *appliance*.

NOTE 2 Commissioning requirements for *Type B appliances* are detailed in AS 3814.

6.11.3 New Zealand requirements

Every part of a *gas installation* shall be subject to *commissioning* prior to initial use.

If the *gas* supply to the installation is insufficient or otherwise unsuitable, the installer shall notify the *gas* supplier and leave the installation or the *appliance(s)* disconnected.

NOTE Requirements for the testing and *commissioning* of *gasfitting* are specified in the *Gas (Safety and Measurement) Regulations 2010*.

6.11.4 Commissioning of appliances

Commissioning of *appliances* shall only be performed after the installation of all equipment that may impact *appliance* operation (e.g. air movement and extraction systems).

Commissioning of *appliances* shall take full account of the *manufacturer's instructions* and all aspects of the *gas installation* that may impact *appliance* operation.

Commissioning of *appliances* shall include but not be limited to the following:

- (a) Testing and *purging* of the *appliance* and *gas installation*.
- (b) Checks to ensure the *appliance* is in safe working order.
- (c) Ignition of each *burner* of the *appliance* and, where necessary, adjustment in accordance with the *manufacturer's instructions*.
- (d) Checking for flame abnormality in accordance with *manufacturer's instructions*.
- (e) Operating the *appliance* at the maximum *gas consumption* to bring it to normal operating temperature.
- (f) After Step (e), where applicable, testing for spillage of *combustion products*. For an *open flued appliance*, testing shall be performed in accordance with [Appendix Q](#).
- (g) Testing of any safety devices for correct operation.
- (h) Informing the consumer, when present, on the safe and correct operation of the *appliance* and any auxiliary equipment.
- (i) Handing of the *appliance* operating instructions to the consumer, or if the consumer is not present, leaving the instructions in a suitable location on the *premises*.

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

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

A2 Appendix A
(normative)

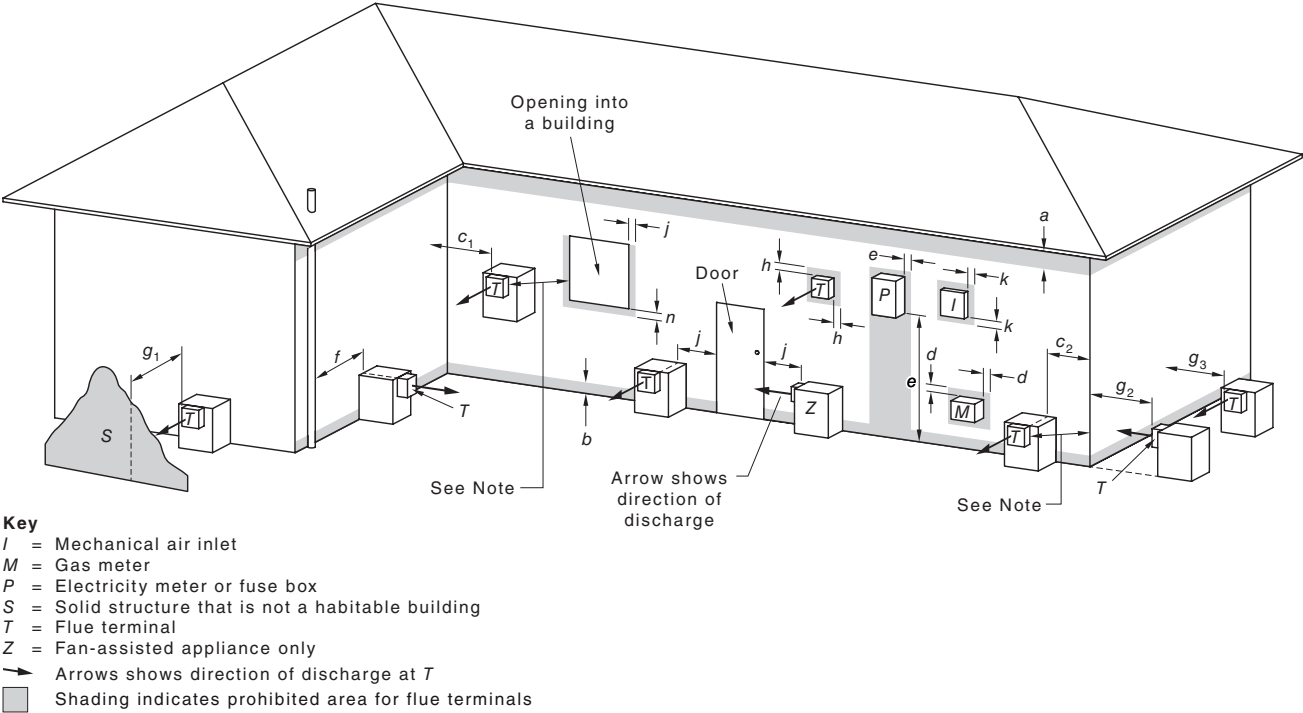
Location of flue terminals for small gas engine driven appliances

The *flue terminal* of outdoor and indoor room-sealed engine driven *appliances* with an energy input not exceeding 1 000 MJ/h shall be located to discharge exhaust gases safely in accordance with [Figure A.1](#) and [Table A.1](#).

The symbols in the figure are explained in [Table A.1](#).

The *flue terminal* of a room-sealed engine driven *appliance*, a fan-assisted engine driven *appliance* or the *flue terminal* of an engine driven *appliance* designed for outdoor installation shall not be installed under a covered area, or in a recess.

NOTE The information in this appendix is based on Appendix AA of AS/NZS 5263.1.11:2020.



NOTE See Note 1 to Table A.1

Figure A.1 — Location of flue terminals

Table A.1 — Location of flue terminals

Ref.	Item description	Distance	Conditions
a	Vertically below eaves, balconies or other projections	1 500	≤ 250 MJ/h
		3 000	> 250 MJ/h ≤ 500 MJ/h
		4 500	> 500 MJ/h unless flued above eave or projection
b	From the ground, above a balcony or other surface	300	Unless appliances mix exhaust with cooling air prior to discharge, then no restriction.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table A.1 (continued)

Ref.	Item description	Distance	Conditions
c_1	From a return wall	1 000	If direction of discharge not towards a return wall or other structure If direction of discharge towards return wall refer to " g_1 " and " g_2 "
c_2	From an external corner	0	No restriction
d	From a gas meter (M) or the terminal location of a gas regulator relief vent	1 000	If direction of discharge not towards meter or the location of a gas regulator relief vent; otherwise refer to " h "
e	From an electricity meter or fuse box (P) Prohibited area extends to ground level Minimum clearance d and e also apply to combustion air intakes	1 000	If direction of discharge not towards meter or fuse box; otherwise refer to " h "
f	From a drain pipe or soil pipe	500	Discharge not to directly impinge on pipe
g_1	From a solid structure that is not a habitable building	1 000	Clearance when direction of discharge toward structure
g_2	From a habitable building	4 500	Clearance when direction of discharge toward a habitable building
g_3	Horizontally from obstruction or a building structure where direction of discharge is parallel to obstruction or building structure	500	Appliances ≤ 500 MJ/h with OEM evidence that fire in enclosure will not ignite combustible structures
		1 500	> 500 MJ/h
h	From any other flue terminal, cowl or combustion air intake	1 500	≤ 250 MJ/h
		3 000	> 250 MJ/h
j	Horizontally from an openable window, door, non-mechanical air inlet, or any other opening into a building including sub-floor ventilation	1 500	Appliances ≤ 250 MJ/h
		4 500	Appliances > 250 MJ/h
k	From a mechanical air inlet, including a spa blower	3 000	Discharge not to be directed towards mechanical air inlet, including a spa blower, unless 1 000 mm above inlet.
n	Vertically below an openable window, non-mechanical air inlet, or any other opening into a building including sub-floor ventilation	Not to be installed	Vertical discharge flues only
		1 500	Horizontal discharge flues, appliances ≤ 250 MJ/h
		4 500	Horizontal discharge flues, appliances > 250 MJ/h

NOTE 1: Where dimensions c , j or k cannot be achieved, an equivalent horizontal distance measured diagonally from the nearest discharge point of the terminal to the opening may be deemed by the Technical Regulator to conform.

NOTE 2: Structure excludes garden shrubs, trees, other permeable partial obstructions or otherwise in accordance with the manufacturer's instructions. ^(A2)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix B (informative)

Conversion factors

The units of measurement used in this Standard are those based on the metric system and in common use within the *gas* industry. The listing in [Table B.1](#) is presented as a ready reference for conversion between different units of measurement.

Table B.1 — Conversion factors

Multiply	By	To give
Length		
metres (m)	3.281	feet (ft)
feet (ft)	0.3048	metres (m)
Area		
square millimetres (mm ²)	0.01	square centimetres (cm ²)
square millimetres (mm ²)	0.00155	square inches (in ²)
square inches (in ²)	645.16	square millimetres (mm ²)
square metres (m ²)	10.764	square feet (ft ²)
square feet (ft ²)	0.0929	square metres (m ²)
Volume		
cubic metres (m ³)	35.315	cubic feet (ft ³)
cubic feet (ft ³)	0.0283	cubic metres (m ³)
Energy		
British thermal units (BTU)	0.001055	megajoules (MJ)
Therms	105.5	megajoules (MJ)
kilowatt hour (kWh)	3.6	megajoules (MJ)
megajoules (MJ)	0.2778	kilowatt hour (kWh)
Power		
megajoules per hour (MJ/h)	0.2778	kilowatts (kW)
kilowatts (kW)	3.6	megajoules per hour (MJ/h)
British thermal units per hour (BTU/h)	0.001055	megajoules per hour (MJ/h)
therms per hour	105.5	megajoules per hour (MJ/h)
Pressure		
millibar (mbar)	0.1	kilopascals (kPa)
kilopascals (kPa)	10.0	millibar (mbar)
pounds per square inch (lb/in ²) (psi)	6.895	kilopascals (kPa)
kilopascals (kPa)	0.145	pounds per square inch (lb/in ²) (psi)
inches water gauge (in.WG) @ 15°C	0.2488	kilopascals (kPa)
kilopascals (kPa) @ 15°C	4.016	inches water gauge (in.WG)
Concentration of gases		
parts per million (ppm)	0.0001	percent (%)
percent (%)	10000.0	parts per million (ppm)
Miscellaneous		
square millimetres per kilowatt (mm ² /kW)	0.2778	square millimetres per (megajoule per hour) (mm ² /(MJ/h))

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix C (normative)

Thermal protection of combustible materials

C.1 Introduction

This Appendix sets out requirements for materials to provide thermal protection of *combustible materials* (combustibles) used in *gas installations* and thereby prevent the combustibles reaching unsafe temperatures.

In *gas installations*, *combustible materials* require thermal protection when clearances from heat sources are insufficient and as otherwise stipulated in this Standard.

In certain applications the protective materials may also be required to support a load. This Appendix specifies the mechanical material properties.

C.2 Specification for materials to provide thermal protection of combustibles

A2 Materials for the thermal protection of combustibles shall have the properties of either (a) or (b) and, in addition, the properties of (c), (d) and (e): **A2**

- (a) When tested to AS 1530.1, the materials shall be deemed not combustible.
- (b) When tested to AS/NZS 1530.3, they shall have indices as follows:
 - (i) Ignitability – zero (0)
 - (ii) Spread of flame – zero (0)
 - (iii) Heat evolved – zero (0)
 - (iv) Smoke developed – zero to one (0 to 1)
- (c) The minimum thicknesses and resulting coefficients of heat transfer shall be in accordance with [Table C.2.2](#).
- (d) If required to support a load, a compressive strength of not less than 1.5 MPa.
- (e) If required to support a load, deform not more than 2 % of its thickness when subjected to a compressive stress of 350 kPa.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table C.2.2 — Criteria for thermal protection of combustibles

Application	Minimum thickness mm	Maximum coefficient of heat transfer (U), W/m ² K ^a
Thermal protection of combustibles adjacent to commercial catering <i>appliance(s)</i>	15	7.5
Thermal protection of combustibles adjacent to <i>appliances</i> other than commercial catering <i>appliance(s)</i>	6	20
^a The maximum coefficient of heat transfer shall be tested in accordance with ASTM C518. Test samples for the method specified in ASTM C518 shall not be exposed to temperatures that will change the specimens in an irreversible manner. Test samples shall be conditioned at 22°C and 50 % R.H. for a period of time until less than a 1 % mass change is observed over a 24 h period. For some materials, such as cellulose, considerably longer times may be required for both conditioning and testing. NOTE 1 The heat transfer coefficient U (W/m²K), thermal resistance R (m²K/W), thermal conductivity k (W/mK) and thickness t (m) of materials are related by the following formulas: $U = 1 / R$, $R = t / k$, $U = k / t$ NOTE 2 "Heat transfer coefficient" is often also referred to as "thermal conductance".		

C.3 Methods of thermal protection of combustible materials adjacent to domestic cooking appliances

Material conforming to the specifications of [Clause C.2](#) or the methods detailed in [Table C.3](#) shall be used for thermal protection of combustible materials adjacent to domestic cooking *appliances*.

Table C.3 — Methods of thermal protection of combustibles adjacent to domestic cooking appliances

Facing material	Minimum thickness mm	Backing material	Minimum thickness mm
Ceramic tiles	5	Gypsum-based wall board	10
		Fibre cement board	6
Toughened safety glass ^{a,b}	5	Gypsum-based wall board	10
		Fibre cement board	6
Sheet metal	0.4	Fibre cement board	12
		Fibre cement board over 10 mm gypsum-based wall board	6
Any other material ^c that satisfies (a) or (b):	-	Fibre cement board	12
(a) When tested to AS 1530.1, be deemed not combustible. (b) When tested to AS/NZS 1530.3, have indices as follows: (i) Ignitability – zero (0) (ii) Spread of flame – zero (0) (iii) Heat evolved – zero (0) (iv) Smoke developed – zero to one (0 to 1)		Fibre cement board over 10 mm gypsum-based wall board	6

^a Toughened safety glass shall conform to AS/NZS 2208.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table C.3 *(continued)*

Facing material	Minimum thickness mm	Backing material	Minimum thickness mm
^b All toughened safety glass used as a cooker splashback shall be marked as “toughened safety glass” to indicate that it is fit for purpose. Where glass is not marked, a document from the manufacturer shall be provided to confirm the glass is toughened and conforms to AS/NZS 2208. ^c Reconstituted stone or quartz surfaces contain polymer resins and may not meet the requirements of Clause C.2(a) or C.2(b). If used, conformance shall be confirmed.			

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

C.4 Examples to determine the required thickness of materials for thermal protection of combustible materials

EXAMPLE 1 Fire-resistant material from supplier “A” has a thermal conductivity of 0.21 W/mK.

What minimum thickness of the material should be used?

For non-commercial catering *appliance(s)*:

$$\begin{aligned} t &= k/U \\ &= 0.21/20 \\ &= 0.0105 \text{ m} \\ &= 10.5 \text{ mm} \end{aligned}$$

For commercial catering *appliance(s)*:

$$\begin{aligned} t &= k/U \\ &= 0.21/7.5 \\ &= 0.028 \text{ m} \\ &= 28 \text{ mm} \end{aligned}$$

EXAMPLE 2 Fire-resistant material from supplier “B” has a thermal conductivity of 0.11 W/mK.

What minimum thickness of the material should be used?

For non-commercial catering *appliance(s)*:

$$\begin{aligned} t &= k/U \\ &= 0.11/20 \\ &= 0.0055 \text{ m} \\ &= 5.5 \text{ mm} \end{aligned}$$

For commercial catering *appliance(s)*:

$$\begin{aligned} t &= k/U \\ &= 0.11/7.5 \\ &= 0.0146 \text{ m} \\ &= 14.6 \text{ mm} \end{aligned}$$

In Example 2, as the value of t is less than the minimum thickness requirement of —

- (a) 6 mm for non-commercial catering *appliance(s)*, material of at least 6 mm is required here; and
- (b) 15 mm for commercial catering *appliance(s)*, material of at least 15 mm is required here.

Appendix D (informative)

Purging

D.1 Introduction

Purging is carried out to avoid the possibility of an explosive air/*gas* mixture existing or forming in *consumer piping, appliances* or confined spaces. *Purging* is the displacement of —

- (a) air, or an inert *gas*, by a fuel *gas*; or
- (b) a fuel *gas* by air, or an inert *gas*.

Nitrogen is the preferred inert *gas*.

D.2 Precautions before purging commences

The following precautions should be taken before *purging* commences:

- (a) Do not commence any *purging* operation until a *purge* area has been defined, made safe and cleared of all *ignition sources* (e.g. naked flames, pilot lights, electrical switchgear, etc).
- (b) Do not allow smoking or cell/mobile phones in or near the *purge* area.

D.3 Purging a sub-meter

Where a *sub-meter* is to be *purged*, a volume of *purging* medium equal to five times the volume held by the meter is required to achieve an acceptable *purge*. Observe the test dial or index to ensure the correct amount has passed through the meter.

NOTE 1 The volume of a meter is indicated on its badge.

NOTE 2 Where the GMS/meter owner or *gas* supplier permits other personnel to *purge* the consumer *billing meter*, the above method should be used.

D.4 Purging a small volume installation with gas to remove air

D.4.1 Pipe length in a small volume installation

A small volume *gas installation* is one with a total installed pipe volume of up to 0.03 m³ (30 L). The values given in [Table D.4.1](#) give volumes in litres per metre of pipe length. These volumes when multiplied by installed pipe length give the volume of the *gas installation*. All branches as well as the *main run* are to be considered in determining the volume of the installation. Where the volume exceeds 30 L, refer to [Clause D.5](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

D.4.2 Commencing the purge

The procedure when commencing the *purge* is as follows:

- (a) Plan a method of *purging* that will ensure that no pockets of air will be left within any part of the *consumer piping*.
- (b) Ensure that all *appliance* connections are *gastight*, all *appliance gas* valves are turned off and there are no open ends.
- (c) Where possible, select an *appliance* located outside (e.g. a *water heater*) or an *appliance* located at the end of the installation (with the longest piping from the meter). Where adequate ventilation cannot be ensured use flexible piping to direct the *purged gas* to outside atmosphere. In other situations, an *appliance* with an open *burner* or *burners* such as a cooking *appliance* may be used for *purging*.
- (d) Ensure the area is well ventilated, unconfined and free of possible *ignition sources*, mechanical air inlets or other potential hazards.
- (e) Branches that do not have an *appliance* connected also require *purging*. Ensure such branches are fitted with a plug or cap.
- (f) Ensure that heavier than air *gases*, e.g. *LP Gas*, are fully dispersed before applying an *ignition source*. Do not *purge* into a combustion chamber or other confined space.

D.4.3 Purging through an appliance fitted with an open burner

The *purge* procedure is as follows:

- (a) Turn on one *burner gas* control valve until the presence of *gas* is detected.
- (b) Let the *gas* flow for a few seconds longer, then turn off and allow sufficient time for any accumulated *gas* to disperse before proceeding.
- (c) Turn on one *gas* control valve again and keep a continuously burning flame at the *burner* until the *gas* is alight and the flame is stable.
- (d) Continue to *purge* until *gas* is available at each *appliance*.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table D.4.1 — Approximate volume of pipe

Pipe material and Standard	Approximate volume of pipe, L/m Nominal size DN															
	15	16	18	20	23	25	32	40	50	63	65	75	80	90	100	110
Copper — NZS 3501	0.13	N/A	N/A	0.28	N/A	0.50	0.79	1.14	2.02	N/A	3.16	N/A	4.55	6.20	8.10	N/A
Copper — AS 1432 (Type B)	0.09	N/A	0.15	0.22	N/A	0.41	0.67	0.99	1.83	N/A	2.92	N/A	4.17	5.75	7.58	N/A
Steel — AS 1074 medium	0.21	N/A	N/A	0.37	N/A	0.59	1.02	1.39	2.21	N/A	3.72	N/A	5.13	N/A	8.68	N/A
PVC-HI — AS ISO 6993.1	0.25	N/A	N/A	0.39	N/A	0.66	1.10	1.44	2.26	N/A	3.72	N/A	5.19	6.78	8.59	N/A
Polyethylene — AS/NZS 4130 series 2 SDR 11	N/A	0.07	N/A	0.15	N/A	0.28	0.52	0.82	1.29	2.04	N/A	2.92	N/A	4.19	N/A	6.28
Polyamide — AS 2944.1 SDR 25	N/A	0.15	0.20	0.25	0.34	0.41	0.67	1.05	1.65	2.60	N/A	3.71	N/A	5.32	N/A	7.95
NOTE 1 All calculations use the mean internal diameter for the specified class of pipe.																
NOTE 2 For multilayer (composite) pipe volumes, refer to <i>manufacturer's specifications</i> .																
NOTE 3 N/A = not applicable; this <i>nominal size</i> does not exist in the relevant Standard.																

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

D.4.4 Purging through an appliance fitted with a flame safeguard system

D.4.4.1 General

Where *purging* is to be carried out through an *appliance* fitted with a flame safeguard device, ensure the main *burner gas* control is turned to the “OFF” position before proceeding as in [Clause D.4.4.2](#) or [D.4.4.3](#).

D.4.4.2 Electronic flame safeguard system fitted

Where an *appliance* is fitted with an electronic *flame safeguard system*, *purging* through the *appliance* is difficult. Manual ignition cannot be achieved.

Carry out the *purge* as follows:

- (a) Isolate the electrical supply to the *appliance*.
- (b) Fit a metallic bridging device across the *appliance* inlet union connection to ensure electrical continuity.
- (c) Slacken the union to allow *gas* to flow out, but do not fully disconnect it.
- (d) Turn on the *appliance manual shut-off valve* (where fitted).
- (e) As soon as the presence of *gas* is detected, tighten the union and test with suitable leak detection solution.
- (f) Allow sufficient time for any *gas* to disperse.
- (g) Remove the bridging device.
- (h) Turn on the power supply and activate the *ignition source*.
- (i) Ignition may not be successful immediately and *lock-out* may occur a number of times before combustion is satisfactory.
- (j) Allow sufficient time for any unburnt *gas* to disperse before re-setting the system.

If the *appliance* is located in a confined space or small room, ensure that all *gas* has dispersed before actuating the *ignition source*. Where adequate ventilation cannot be ensured, connect flexible piping to the outlet of the *appliance manual shut-off valve* to direct the *purged gas* to outside atmosphere.

D.4.4.3 Thermoelectric device fitted

Where an *appliance* is fitted with this type of *flame safeguard system*, *purging* through a pilot alone can be quite time consuming.

To shorten the *purging* time —

- (a) follow the steps (b) to (g) of the procedure in [Clause D.4.4.2](#);
- (b) follow the normal *appliance* lighting sequence, applying a continuously burning flame to the pilot;
- (c) continue to *purge* until the pilot flame remains alight and stable; and
- (d) ensure the *appliance* main *burner* flame is stable and operates satisfactorily.

The use of a continuously burning flame may not be suitable with some *appliances*, for example, *balanced flue appliances*. Such *appliances* are normally fitted with an automatic *ignition source*, which may have to be activated a number of times before successful ignition is achieved.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Do not use an *LP Gas* flame (or any other *gas*) for lighting *appliances* because overheating can damage the thermocouple lead.

D.5 Purging a large volume gas installation

A large volume *gas installation* in this context is one with a total installed pipe volume exceeding 0.03 m³ (see [Table D.4.1](#)).

Purge a large volume *gas installation* to outside atmosphere. Keep *purge* outlet at least 6 m away from any *ignition source* and well clear of any opening into a building.

NOTE For guidance, refer to the technical references listed in the Bibliography.

D.6 Purging consumer piping to remove gas

Where *consumer piping* is to be opened for alteration, repair or extension, isolate the section involved from the *gas* supply at a convenient point, vent the piping to the outside atmosphere and *purge* immediately. If the section involved exceeds the length shown in [Table D.6](#), displace the remaining fuel *gas* using an inert *gas*.

During the *purge*, continuously check the air/*gas* ratios using a calibrated *gas* detector, set for the appropriate *gas*, to indicate when the *purge* is complete.

For large installations and where pipe size exceeds 100 mm, inert *gas* may need to be used as a buffer between air and *gas*. *Purging* procedures for such systems should be prepared on a case by case basis by the *commissioning* engineer or other *competent person*.

NOTE For large volume installations, refer to the technical reference listed in the Bibliography.

Table D.6 — Pipe length above which an inert gas purge is required

Nominal pipe size mm	Approximate pipe length m
50	25
65	15
80	10
100	5
150	3
Over 150	All

Appendix E (normative)

Testing for gastightness

E.1 Scope

This Appendix specifies procedures for *pressure* testing a *gas installation* and associated equipment. The selection of a test instrument is specified in [Clause E.10](#).

E.2 General

For gas installations where the volume of pipework does not exceed 30 L the test period shall be 5 min

Where pipework volume exceeds 30 L, the test period shall be extended by 5 min for every 30 L or part thereof.

NOTE 1 See [Table D.4.1](#) of [Appendix D](#) for guidance on approximate volume of pipework.

NOTE 2 Guidance may be found in the technical references listed under Bibliography.

NOTE 3 Atmospheric temperature variation the pipework is exposed to over the test duration may affect the test *pressure* measured by the test instrument. It is recommended that atmospheric temperature be noted at the start and end of the test period and should be considered when determining the test result.

NOTE 4 For large pipework volumes where the test period is greater than 6 h, the use of testing equipment such as a differential tester should be considered.

E.3 Leakage testing of installations

E.3.1 New installations

The following tests shall be carried out on all new installations:

- (a) A pipework test, described in [Clause E.4](#), on the newly installed pipework before any *appliances* are connected.
- (b) An installation test, described in [E.5](#), including all *appliances*, prior to connection of the *gas* supply.
- (c) A final connection test as described in [Clause E.7](#).

E.3.2 Additions and alterations to installations

The following tests shall be carried out on all additions and alterations to existing installations:

- (a) A leakage test, described in [Clause E.6](#), on the existing installation before commencing work.
- (b) A pipework test, described in [Clause E.4](#), on the newly installed or altered pipework before any *appliances* are connected or reconnected and before being connected to the existing pipework.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (c) Either —
 - (i) an installation test, described in [Clause E.5](#), including all newly installed or repositioned *appliances* and pipework, prior to connection or reconnection to the existing installation; or
 - (ii) a leakage test, described in [Clause E.6](#), including all *appliances* and pipework, after connection or reconnection to the existing pipework.
- (d) A final connection test as described in [Clause E.7](#).

For a satisfactory result to be obtained when the test in Item (c) is a leakage test the *pressure* loss over the test period shall be not greater than the *pressure* loss from the initial leakage test in Item (a).

E.4 Pipework test procedure

The pipework test shall be carried out as follows:

- (a) Ensure the installation is disconnected at the meter or from the cylinder.
- (b) Ensure all open ends are plugged or capped.
- (c) Ensure all *appliances* are isolated.
- (d) ensure all interlocks are in the open position
- (e) Connect a suitable test instrument.
- (f) Pressurize the *consumer piping* to 7 kPa or 1.5 times the operating *pressure*, whichever is the greater.
- (g) Isolate the *pressure* source and allow a period of at least 2 min for the temperature of the testing medium within the *consumer piping* to stabilize.
- (h) For pipework volumes up to 30 L, measure the loss of *pressure* during the test period of 5 min. For pipework volume exceeding 30 L, the test period shall be extended by 5 min for every 30 L or part thereof.

The pipework shall be deemed to be *gastight* and the test satisfactory if there is no loss of *pressure* during the test period.

NOTE The test period does not include the temperature stabilization period required by [Clause E.4\(g\)](#).

E.5 Installation test procedure

The installation test shall be carried out as follows:

- (a) Ensure the installation is disconnected at the meter or from the *cylinder*.
- (b) Ensure all open ends are plugged or capped.
- (c) Ensure all *appliance* valves are closed, and all *manual shut-off valves* opened.
- (d) ensure all interlocks are in the open position
- (e) Connect a suitable test instrument.
- (f) Pressurize the *consumer piping* to *operating pressure* or 2.0 kPa, whichever is the greater.
- (g) Isolate the *pressure* source and allow a period of at least 2 min for the temperature of the testing medium within the *consumer piping* to stabilize.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (h) For pipework volumes up to 30 L, measure the loss of *pressure* during the test period of 5 min. For pipework volume exceeding 30 L, the test period shall be extended by 5 min for every 30 L or part thereof.

The pipework shall be deemed to be *gastight* and the test satisfactory if there is no loss of *pressure* during the test period.

NOTE The test period does not include the temperature stabilization period required by [Clause E.5\(g\)](#).

E.6 Leakage test for existing installations

The leakage test for existing installations shall be carried out as follows:

- (a) Depressurize the installation.
- (b) Ensure the installation is disconnected at the *gas* meter or from the *cylinder*.
- (c) Ensure all *appliance* pilots are turned off and all but the last control device (or tap) on each *appliance* is in the open position.
- (d) ensure all interlocks are in the open position
- (e) Attach a suitable test instrument.
- (f) Pressurize the installation to operating *pressure* or 2.0 kPa, whichever is the greater.
- (g) Isolate the *pressure* source and allow a period of at least 2 min for the temperature of the testing medium within the *consumer piping* to stabilize.
- (h) Measure the loss of *pressure* during a test period of 5 min.

If the *pressure* loss is equal to or less than the maximum *pressure* drop specified in Item (i) or (ii) below, then the test is satisfactory, provided that it is in accordance with the final leakage test in [Clause E.7](#).

If the *pressure* loss is greater than the maximum allowable *pressure* drop, the installation fails the leakage test and the consumer shall be advised so that remedial action can be taken.

The maximum allowable *pressure* drop is as follows:

- (i) In Australia, the *pressure* drop allowed by the *Technical Regulator*, if any.
- (ii) In New Zealand, the *pressure* drop given in [Table E.6](#).

If it is not practicable to disconnect at the meter or from the *cylinder*, this test shall be performed only after specifically ensuring that the meter control valve or the *cylinder* valve is not passing *gas*.

NOTE Watching the test instrument to ensure there is no *pressure* rise does not always ensure there is no leakage but merely shows that the leakage in does not exceed the leakage out.

Table E.6 — Pressure drops for existing installations in New Zealand only

Volume of pipework, L	Maximum pressure drop, kPa
5	1
10	0.5
15	0.35
20	0.25
25	0.2
30	0.1

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

E.7 Testing a connection made after a test procedure

Any connection made after a test has been completed shall be checked for leakage at *operating pressure*. A suitable leak detection solution or other suitable leakage detection method shall be used and the connection left *gastight*.

E.8 Additional tests for LP Gas piping upstream of first stage regulator

The piping, *pipe fittings* and joints between a *LP Gas tank* not exceeding 8 kL, or a *cylinder*, and a first stage *regulator* shall be checked for leakage at *tank or cylinder pressure* using a suitable leak-detection solution or other suitable leakage-detection method. There shall be no bubbling or other visible indication of *gas* leakage.

E.9 Additional tests for systems with a pressure relief device

Where *consumer piping* includes a *pressure* relief device, the piping shall be tested according to the procedure in [Clause E.4](#) at a test *pressure* equal to the setting of the device. The *regulator* adjustment and the device setting shall be sealed on completion of the test to prevent tampering, which could lead to piping being subjected to a *pressure* above test *pressure*.

E.10 Selecting the test instrument

The instrument selected to test a *gas installation* shall be suitable for the application.

NOTE [Table E.10](#) provides guidance on instruments for testing an installation greater than 30 L in capacity.

Table E.10 — Test instruments

Instrument	Test pressure range	Pipe volume	Limitations	Test time
Bubble leak detector	Up to 3 kPa	Up to 0.03 m ³ (30 L)	As <i>gas</i> will be the test medium, only suitable for existing installations	5 min
Manometer (water gauge)	Up to 10 kPa	Up to 0.3 m ³ (300 L)	Only suitable for low <i>pressures</i>	5 min for each 30 L
Manometer (digital read-out)	Up to 200 kPa	Up to 0.3 m ³ (300 L)	Range of instrument and means of connection	5 min for each 30 L
Differential tester	Up to 700 kPa	Any	No <i>pressure</i> indication. Needs to be part of a kit in conjunction with a Bourdon gauge	5 min
Single column compensated gauge	Up to 70 kPa	Up to 0.3 m ³	Instrument range to be selected to suit application	5 min
Electronic transducer pressure gauge/recorder with data or paper tape output	Up to 700 kPa	Any	Used where a record of the test is required	5 min for each 30 L

Appendix F (normative)

Sizing consumer piping

F.1 Introduction

F.1.1 General

The flow graphs ([Figure F.3](#) to [Figure F.14](#)) and tables ([Table F.10](#) to [Table F.69](#)) in this Appendix have been compiled through consistent application of the flow formulas used and make “allowances” for *pressure* drops that occur due to fittings. The “longest length” method of pipe sizing has been used.

All text, graphs and figures in this Appendix form part of the “deemed to conform” solution for pipe sizing and shall be followed correctly and in full in order to validate the design methodology of this Appendix. Engineering validation is not required provided these conditions are all met.

F.1.2 Pipe conditions

The flows have been calculated assuming pipes of minimum internal diameter (which conform to the relevant Standard) that are horizontal and free from defects, deterioration and/or the accumulation of foreign matter. In the case of steel pipe, an internal roughness of 0.045 mm is assumed, while pipes of all other materials (copper, polyamide/nylon, PE and PVC) are taken to be smooth, that is, with zero roughness. Design may need to take into account any significant increases in height in *high-rise buildings* (see [Clause K.13](#)) and the effect this may have on the flow rate of *gases* of different densities.

F.1.3 Fitting allowance

A “fitting allowance” equivalent to a 50 % extension of the length has been incorporated in the graphs and tables. For example, when calculating the flow for a given type of *gas* in a pipe 20 m long and a set of conditions (diameter, *pressure* drop, roughness), the flow has been calculated for 30 m (being 1.5×20) and the value obtained entered in the 20 m column. This allowance should be sufficient in almost all cases of domestic installations (provided the pipework is constructed in a manner consistent with good workmanship). However, for commercial or industrial installations that are “compact” (short runs and numerous fittings) and require large diameter pipe (typically greater than 40 mm), this 50 % fitting allowance may be insufficient.

Similarly, where a section of polyethylene pipe contains several butt welds, the “beads” protruding into the pipe may cause sufficient flow disturbance to result in an excessive pressure loss.

F.1.4 Equations used

An algorithm based on the Churchill’s friction factor equation was used in conjunction with the fundamental isothermal flow calculation for compressible fluids. This calculation involves an iteration procedure that continues until the calculated flow and friction factor are consistent at which point the flow is taken to be correct.

NOTE Due to the dimensional differences of the various products, tables for *multilayer pipe* systems are not included in this Appendix. Pipe sizing information should be obtained from the manufacturer or supplier.

F.1.5 Gas properties

The properties of the *gases* assumed are as shown in [Table F.1.5](#).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.1.5 — Gas properties

Property (unit)	Natural gas	LP Gas (propane)
HHV (MJ/m ³)	38	96
Relative density, RD	0.6	1.5
Viscosity (μPa.s)	12	8
NOTE 1 HHV = higher heating value; also known as gross calorific value.		
NOTE 2 Propane was used in calculations for <i>LP Gas</i> tables and pipe sizing graphs to allow for worst case scenario.		

F.1.6 Excessive gas velocity

Values shown with grey shading in the pipe sizing tables ([Table F.10](#) to [Table F.69](#)) are not recommended because of excessive velocities and should not be used unless verified by a *competent person*. High *gas* velocities through piping may cause noise and, over time accelerated erosion of the pipe or fittings. Any use of values over the velocity threshold constitutes a performance-based solution and is subject to the requirements of [Section 2](#).

F.1.7 Allowable pressure drop

There is no set limit to the allowable *pressure* drop over *gas* pipework specified in an installation, provided it is consistent with supplying the required energy input and excessive velocities do not occur. The maximum design *pressure* drop is determined by the minimum *pressure* at the *gas* equipment inlet and the minimum supply *pressure* to the pipework. The minimum *pressure* required at the *appliance* inlet is given in [Table 5.2.4](#); some *appliances* may require higher *pressures* than those given in [Table 5.2.4](#). The minimum supply *pressure* is usually determined by the *gas* network operator.

Experience has shown that it is good practice to design *gas* pipework with a *pressure* drop across the system of 10 % to 20 % of the supply *pressure* to the system. This practice typically limits the *gas* velocity, minimizing the potential effects of flow noise and long-term erosion of the pipework though confirmation is provided by ensuring that selected pipe sizes do not fall within shaded areas of the tables. Where a selected pipe size gives a point within the shaded area, a velocity constraint can be overcome by selecting the next higher size that carries the required flow of *gas* that is not within a shaded area (usually though not always the next larger size).

An example of the above would be if 20 000 MJ/h was to be carried through 12 m of PVC pipe with an available *pressure* drop of 1.5 kPa. It is seen from [Table F.43](#) that DN 80 mm pipe meets this flow requirement but that the point is in the grey area of the table. Therefore, DN 100 mm pipe would be selected, which can carry the required flow, and the relevant table entry is outside of the grey area.

For “short” pipe sections, where the length to diameter ratio is less than 100, a performance-based solution ([Section 2](#)) will be required. This follows from the shaded areas representing both excessive velocities and/or pipe of low length to diameter ratio, where the flow equations do not accurately apply.

F.1.8 Diversity

Engineering analysis of larger installations may find cost reductions using smaller pipe sizes. This is usually achieved by diversifying the loads connected to the main incoming sections of pipe. Such activities require skills and special considerations that cannot be accommodated in this Appendix, which details only deemed-to-conform solutions for pipe sizing. If it is considered desirable to employ such diversity, this would fall into a performance-based solution ([Section 2](#)).

F.1.9 Intermediate pressure regulation (sub-regulators)

When a master meter supplies *gas* to multiple *sub-meters*, as may occur in a large installation, and there is a further stage of *gas pressure* regulation, that is, one master meter (and *regulator*) at the network

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

connection and downstream meters (and *regulators*), pipe sizing shall be carried out as a two stage process —

- (a) from the network connection meter (*regulator*) to the individual *sub-meters* (sub-*regulators*); and
- (b) from each *sub-meter* (sub-*regulator*) to the *appliances* it serves

F.1.10 Utilizing available high pressure gas

Where the supply *pressure* to the property is sufficiently high, it may be advantageous to utilize such excess *pressure* to reduce pipe sizes and therefore material costs. However, in any utilization of higher available *pressures*, care has to be taken not to exceed velocity limitations.

Comparative pipe sizes with *pressure* drops 0.25, 0.75, 1.5, 10 and 20 kPa are given in [Table F.8](#).

F.2 Information required

When determining the size of piping to be used in an installation using graphs or tables, the following information shall first be obtained:

- (a) The type of *gas* to be used in the installation, its heating value and specific gravity.
- (b) The input rating of each $\boxed{A_2}$ *appliance* $\boxed{A_2}$ (MJ/h) and the required input *pressure*.
- (c) The diversity, if any, arising from use of different *appliances* at different times.
- (d) The piping layout — length of run, and number and type of *fittings*.
- (e) Available *pressure*.
- (f) Allowable *pressure* drop.

F.3 Design procedure using pipe sizing graphs

F.3.1 General

Procedure is applicable to small systems designed to operate at 10 kPa or less. For complex systems or systems designed to operate above 10 kPa, more rigorous design methods may be appropriate:

- (a) Sketch the piping configuration for the installation, indicating the developed length of each pipe run and the input rating of the $\boxed{A_2}$ *appliance* $\boxed{A_2}$ to be connected. Multiply any input ratings in kilowatts by [3.6](#) to convert to MJ/h if necessary. Label each junction and end point, so that each pipe section is uniquely identified.
- (b) Tabulate the pipe runs and, working backwards from the most distant $\boxed{A_2}$ *appliance* $\boxed{A_2}$, calculate the *gas* flow for each pipe section.
- (c) Determine the length of the longest pipe run, that is, from the meter to the most distant $\boxed{A_2}$ *appliance* $\boxed{A_2}$.
- (d) Determine the allowable *pressure* drop considering the supply *pressure* available and the minimum *pressure* required at the *appliance*.
- (e) Divide the allowable *pressure* drop by this length, to determine the allowable drop per metre.
- (f) Starting from the *gas meter*, use this *pressure* drop and the *gas* flow in each pipe section to determine the pipe size for that section from the applicable graph ([Figures F.3](#) to [F.14](#)).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (g) For large, complex or extensive installations, the *pressure* at each point of branching from the main run of the network can be calculated and Steps (d) and (e) repeated for the branch.

The graphs for the *gases* listed in [Table F.1.5](#) allow for an average number of elbows and *fittings*.

These graphs give adequate results for *gases* whose higher heating value and relative density are within $\pm 15\%$ of these values.

F.3.2 Worked example — With allowable pressure drop of 0.0105 kPa/m

F.3.2.1 Introduction

The worked example given in the [Clauses F.3.2.2](#) to [F.3.2.6](#) illustrates the method of pipe sizing for a typical *consumer piping* system. The information required is given in [Table F.2](#).

F.3.2.2 Sketch the layout

Sketch the intended *consumer piping* layout (see [Figure F.1](#)), include the *appliances*, and allocate a letter to each *appliance* position and each pipe junction.

F.3.2.3 Tabulate the pipe runs

Draw up a table with a row for each pipe run (see [Table F.3](#)).

F.3.2.4 Determine the length of the longest pipe run

The longest run of piping from the meter to the furthest *appliance* position is Section AE. The length of this is 19 m (AB + BC + CD + DE).

F.3.2.5 Determine the allowable pressure drop per metre

The design *pressure* drop is 0.2 kPa. Divide this by the length of the longest pipe run, 19 m, to give the allowable *pressure* drop of 0.0105 kPa/m.

F.3.2.6 Determine the required pipe size using the pipe sizing graphs

Select the pipe sizing graph appropriate to the type of *gas* available and the chosen piping material. If copper pipe conforming to NZS 3501 is being used, the applicable graph is [Figure F.4](#) (in this Example, reproduced in [Figure F.2](#) below). Mark the *pressure* drop value of 0.0105 kPa/m on the graph. Find the value of *gas* flow for each pipe section on the graph and read off the size of the pipe required and enter the size in the installation table.

Section AB has a total flow rate of 265 MJ/h. Find 265 on the *gas* flow axis and draw a line up to the line at 0.0105 kPa/m for *pressure* drop. These lines intersect between the curves for 25 mm and 32 mm pipe sizes. The required pipe size is 32 mm, the larger size.

Repeat this procedure for each of the other pipe sections, entering the pipe sizes in the installation table, to give [Table F.4](#).

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

Table F.2 — Information required

Parameter	Value
Type of gas	Natural gas (HHV 39 MJ/m ³ , RD 0.67 — Within 15 % of the values in Table F.1.5)
Appliance ratings	As in Figure F.1
Diversity	Design for full load on all appliances
Piping layout	As in Figure F.1 with pipe lengths as shown
Available pressure	2.0 kPa at meter outlet
Allowable pressure drop	Design for 10 % of available pressure (check that this gives an inlet pressure adequate for each appliance; if not design for a lesser pressure drop).

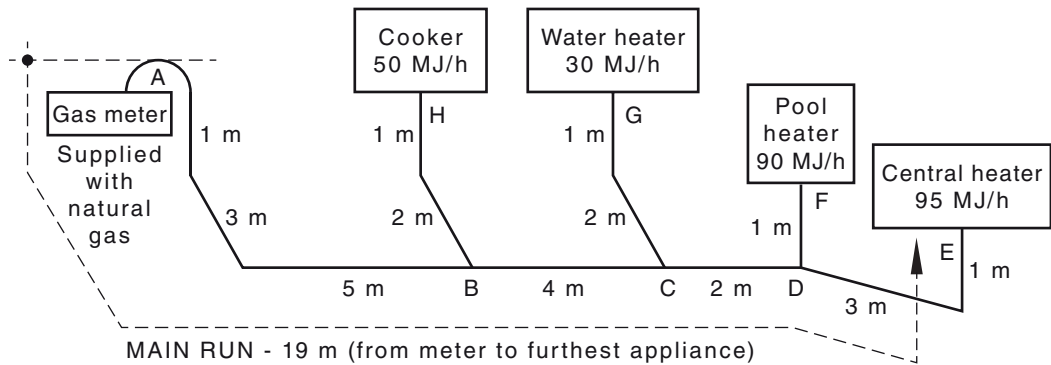


Figure F.1 — Example of consumer piping layout

Table F.3 — Installation details

Pipe section	Length, m	Gas flow, MJ/h	Pipe size, mm
AB	9	50 + 30 + 90 + 95 = 265	
BC	4	30 + 90 + 95 = 215	
CD	2	90 + 95 = 185	
DE	4	95	
DF	1	90	
CG	3	30	
BH	3	50	

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

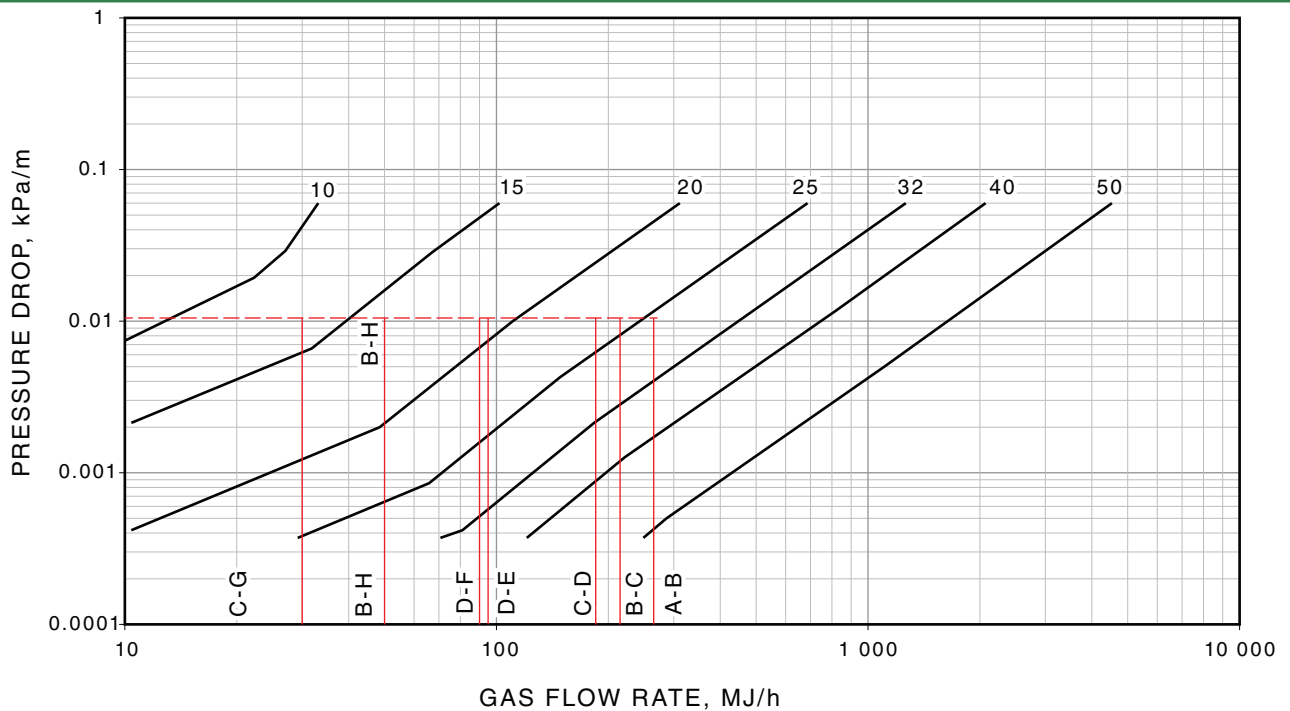


Figure F.2 — Example of required size of piping

Table F.4 — Installation details — Example

Pipe section	Length, m	Gas flow, MJ/h	Pipe size, mm
AB	9	$50 + 30 + 90 + 95 = 265$	32
BC	4	$30 + 90 + 95 = 215$	25
CD	2	$90 + 95 = 185$	25
DE	4	95	20
DF	1	90	20
CG	3	30	15
BH	3	50	20

F.4 Pipe sizing graphs

The pipe sizing charts indicate the flow of *gas*, in megajoules per hour, through pipes of various materials. The heating value quoted in the pipe sizing graph listing is a nominal figure typical of the *gas* that the graph represents. It is not intended to represent any particular *gas* supply in any particular area.

The pipe sizings are listed in [Table F.5](#). The pipe sizing graphs are shown in [Figures F.3, F.4, F.5, F.6, F.7, F.8, F.9, F.10, F.11, F.12, F.13](#) and [F.14](#).

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

Table F.5 — Pipe sizing

Figure	Type of gas	HHV MJ/ m ³	RD	Material
E.3	Natural gas (NG)	38	0.6	Copper to AS 1432 <i>Type B</i>
E.4	Natural gas (NG)	38	0.6	Copper to NZS 3501
E.5	Natural gas (NG)	38	0.6	Steel to AS 1074 Medium Grade
E.6	Natural gas (NG)	38	0.6	Polyamide to AS 2944.1 SDR 25
E.7	Natural gas (NG)	38	0.6	Polyethylene to AS/NZS 4130 SDR 11
E.8	Natural gas (NG)	38	0.6	PVC-HI to AS ISO 6993.1
E.9	PROPANE (LP Gas)	96	1.5	Copper to AS 1432 <i>Type B</i>
E.10	PROPANE (LP Gas)	96	1.5	Copper to NZS 3501
E.11	PROPANE (LP Gas)	96	1.5	Steel to AS 1074 Medium Grade
E.12	PROPANE (LP Gas)	96	1.5	Polyamide to AS 2944.1 SDR 25
E.13	PROPANE (LP Gas)	96	1.5	Polyethylene to AS/NZS 4130 SDR 11
E.14	PROPANE (LP Gas)	96	1.5	PVC-HI to AS ISO 6993.1

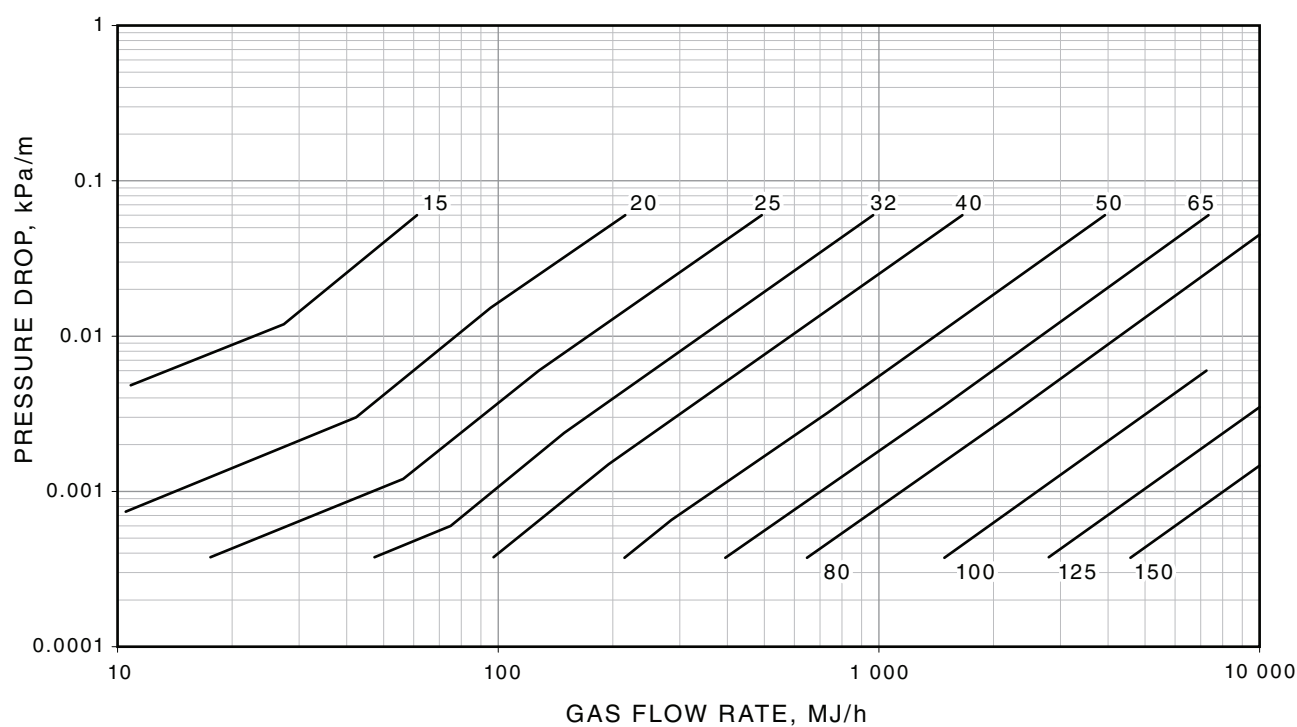


**Figure F.3 — Pipe sizing — Natural gas — Flow through — Copper pipe (AS 1432 Type B) (DN)
(Suitable for supply pressures less than 10 kPa)**

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

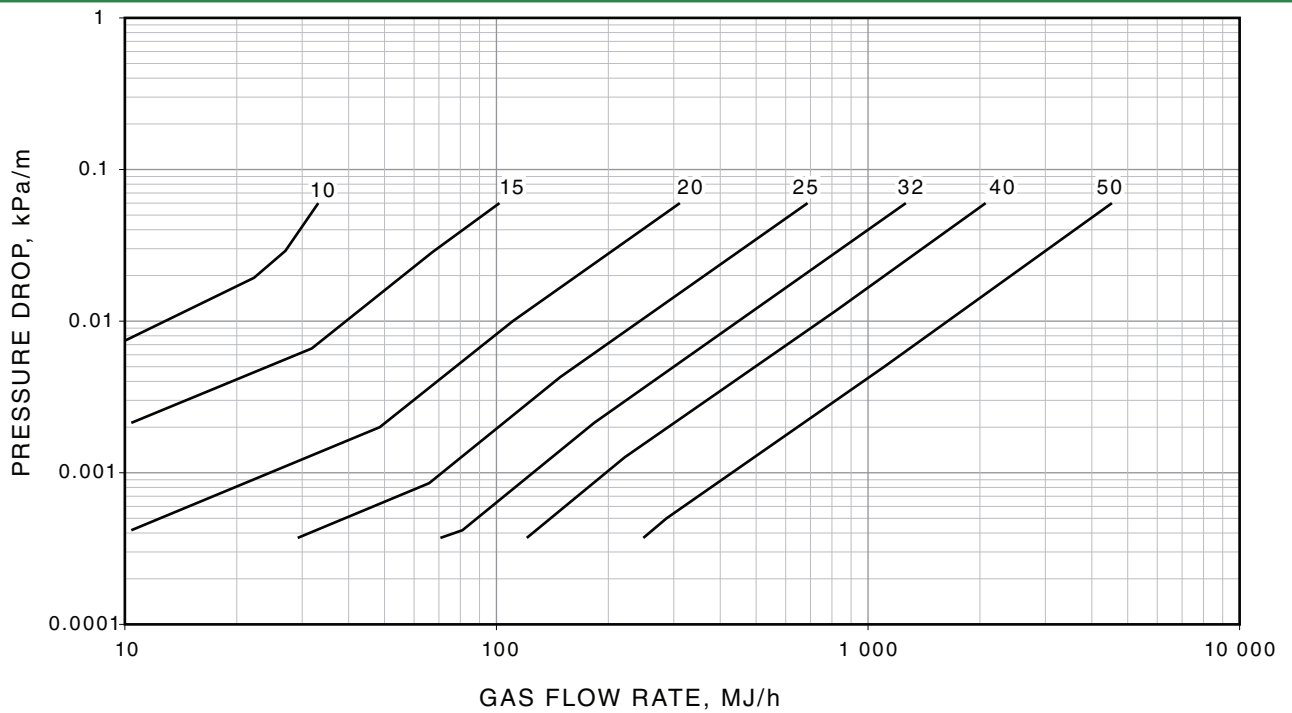


Figure F.4 — Pipe sizing — Natural gas — Flow through — Copper pipe (NZS 3501) (DN)
(Suitable for supply pressures less than 10 kPa)

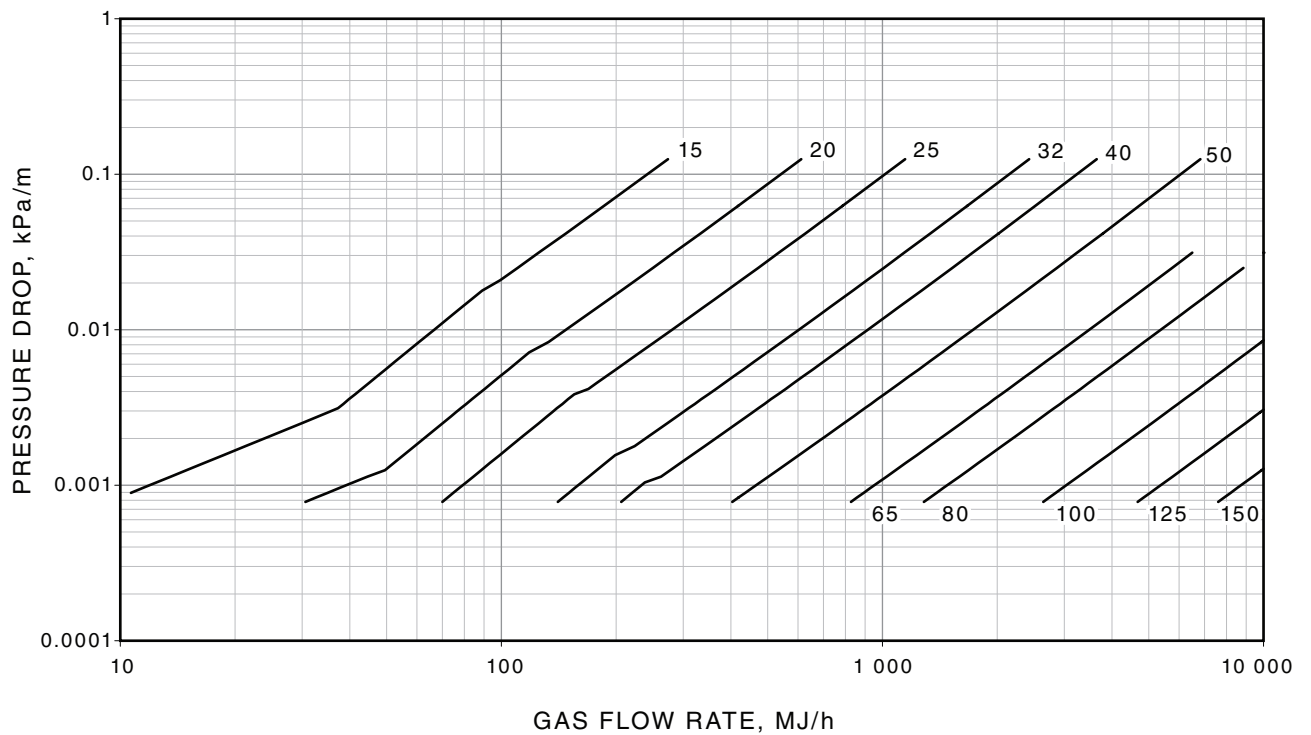


Figure F.5 — Pipe sizing — Natural gas — Flow through — Steel pipe (AS 1074 Medium) (DN)
(Suitable for supply pressures less than 10 kPa)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

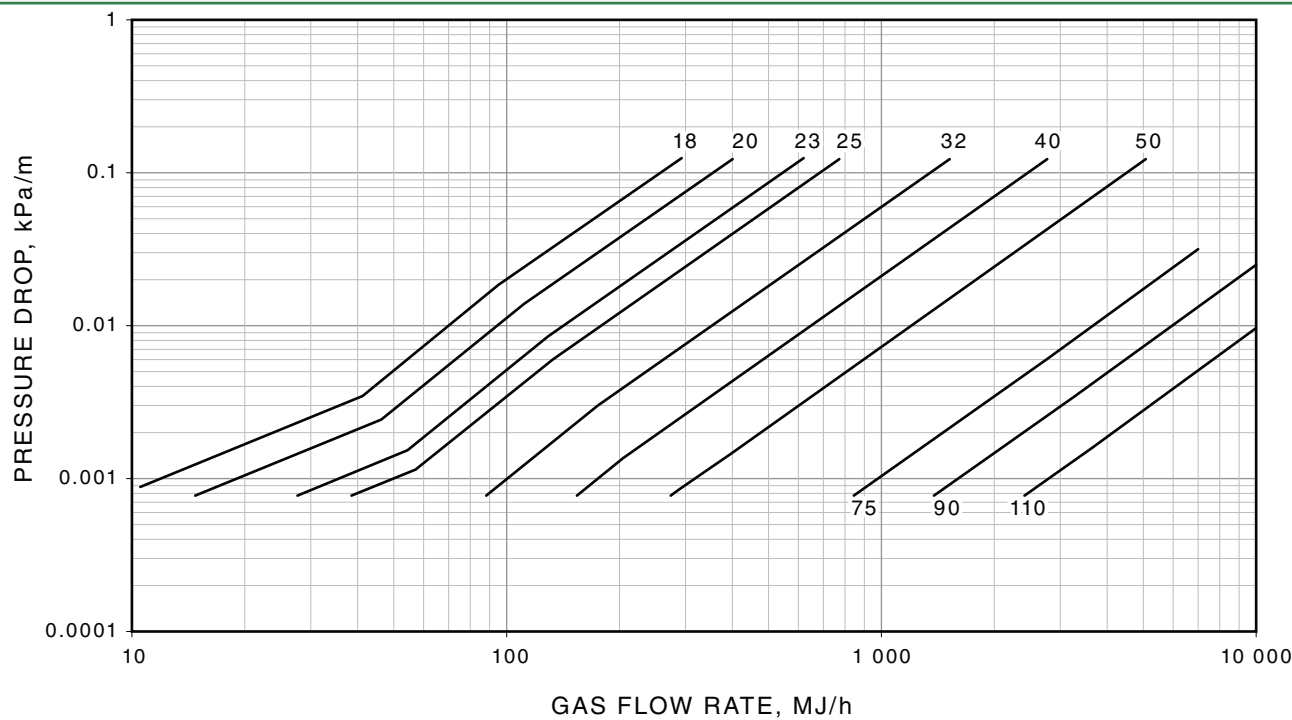


Figure F.6 — Pipe sizing — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (DN) (Suitable for supply pressures less than 10 kPa)

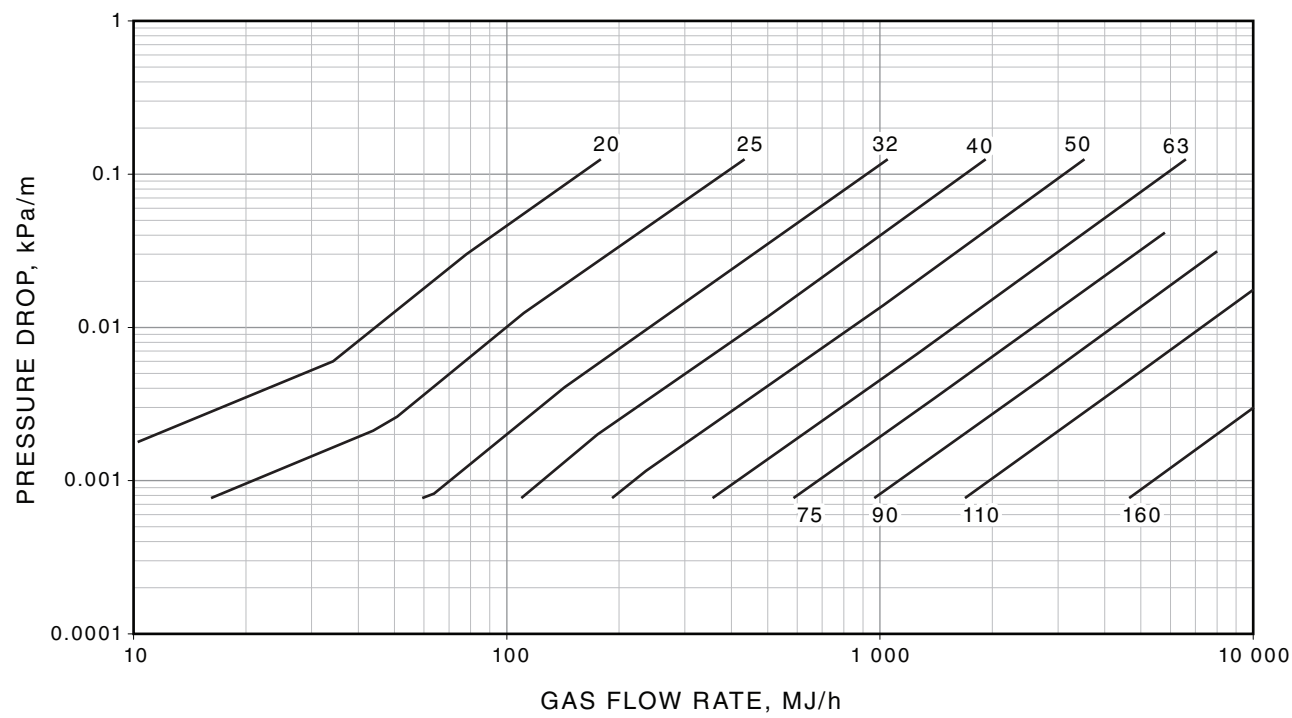


Figure F.7 — Pipe sizing — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (Suitable for supply pressures less than 10 kPa)

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

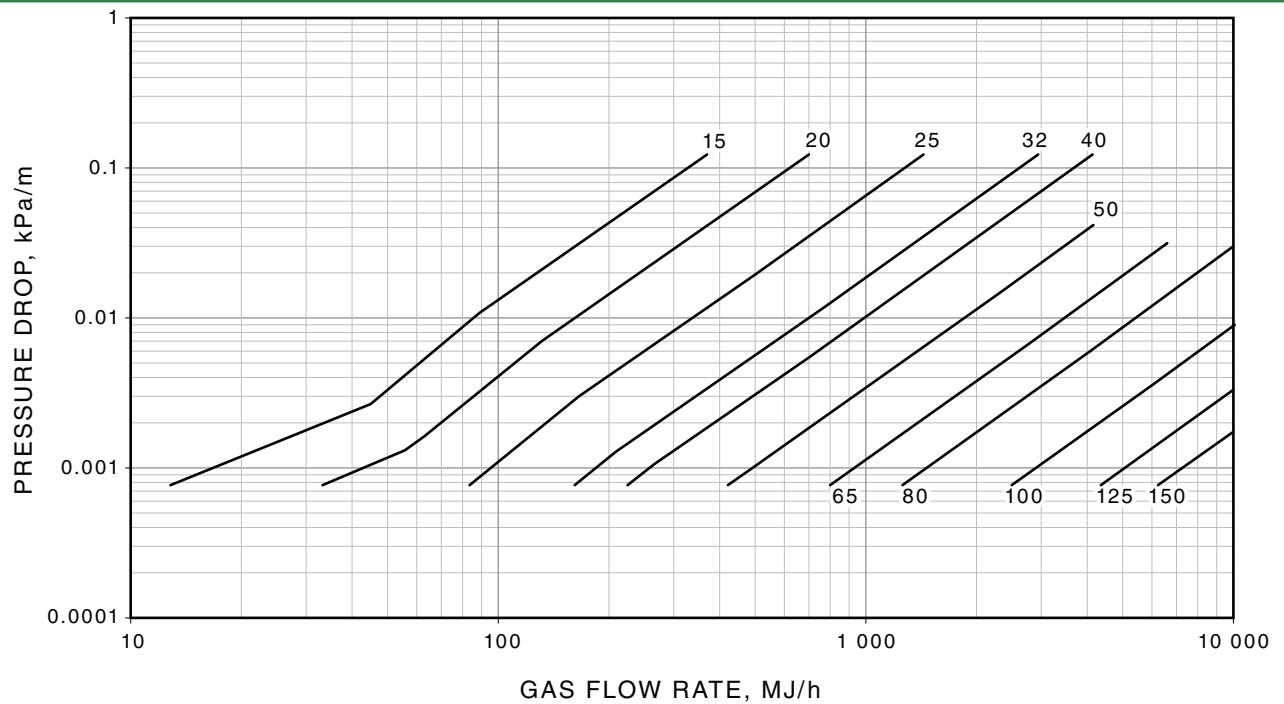


Figure F.8 — Pipe sizing - Natural gas — Flow through — PVC-HI pipe (AS ISO 6993.1) (DN)
(Suitable for supply pressures less than 10 kPa)

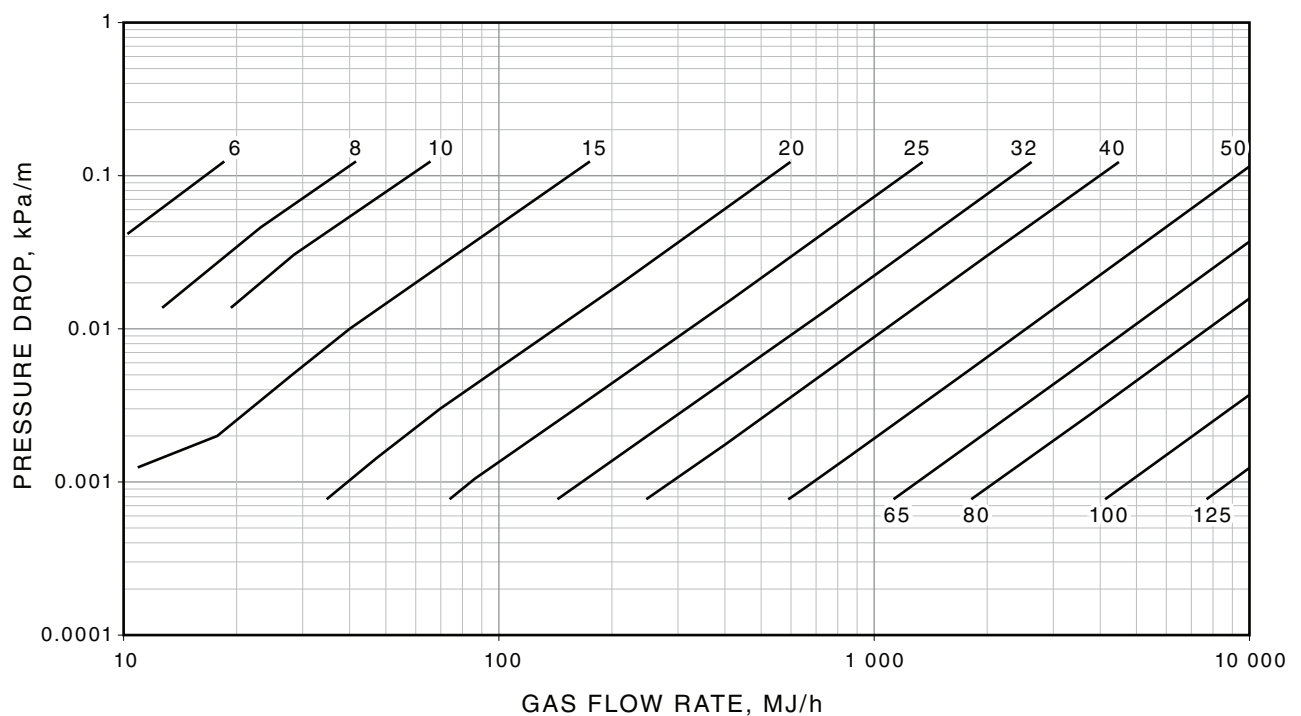


Figure F.9 — Pipe sizing — Propane — Flow through — Copper pipe (AS 1432 Type B) (DN)
(Suitable for supply pressures less than 10 kPa)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

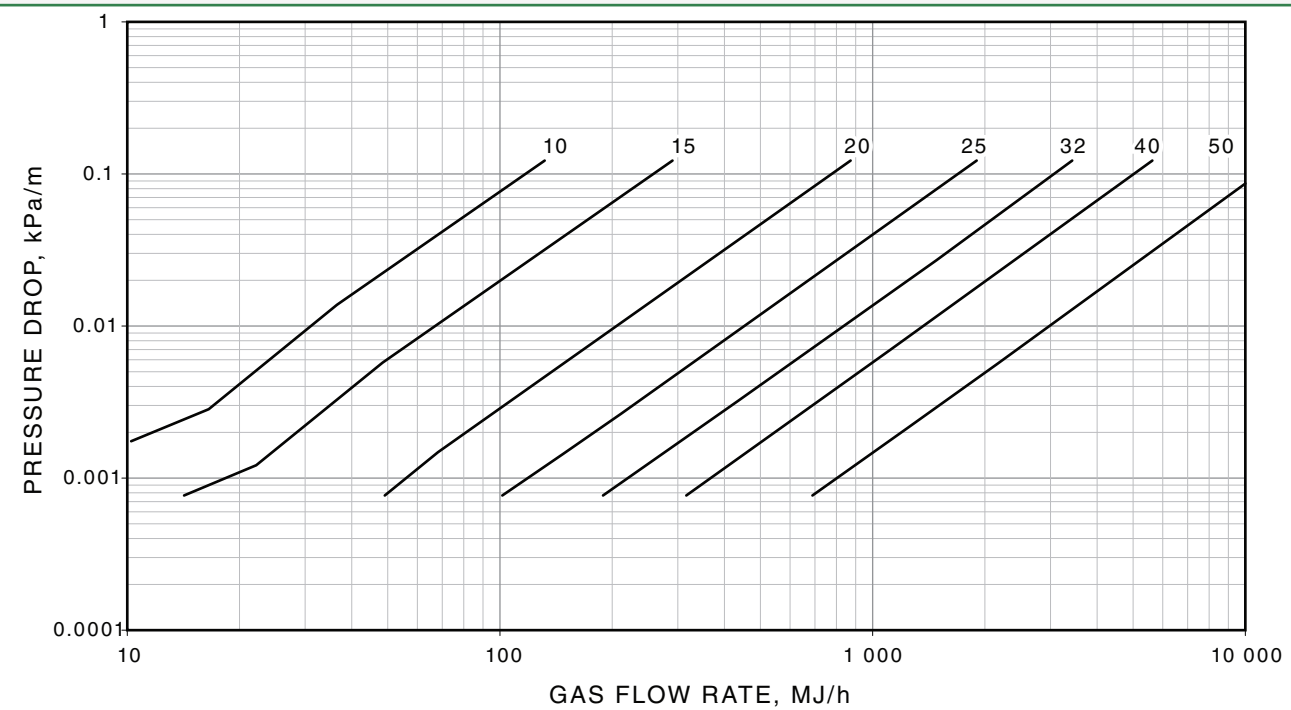


Figure F.10 — Pipe sizing — Propane — Flow through — Copper pipe (NZS 3501) (DN)
(Suitable for supply pressures less than 10 kPa)

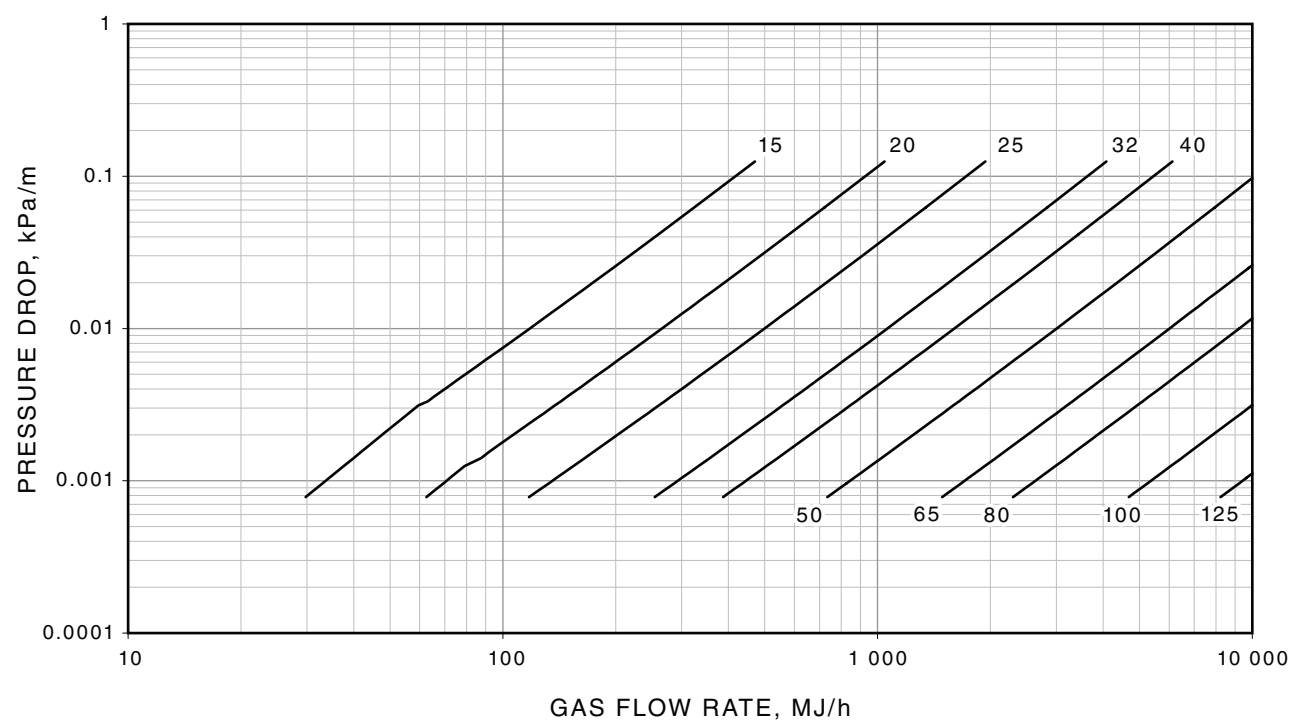


Figure F.11 — Pipe sizing — Propane — Flow through — Steel pipe (AS 1074 Medium) (DN)
(Suitable for supply pressures less than 10 kPa)

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

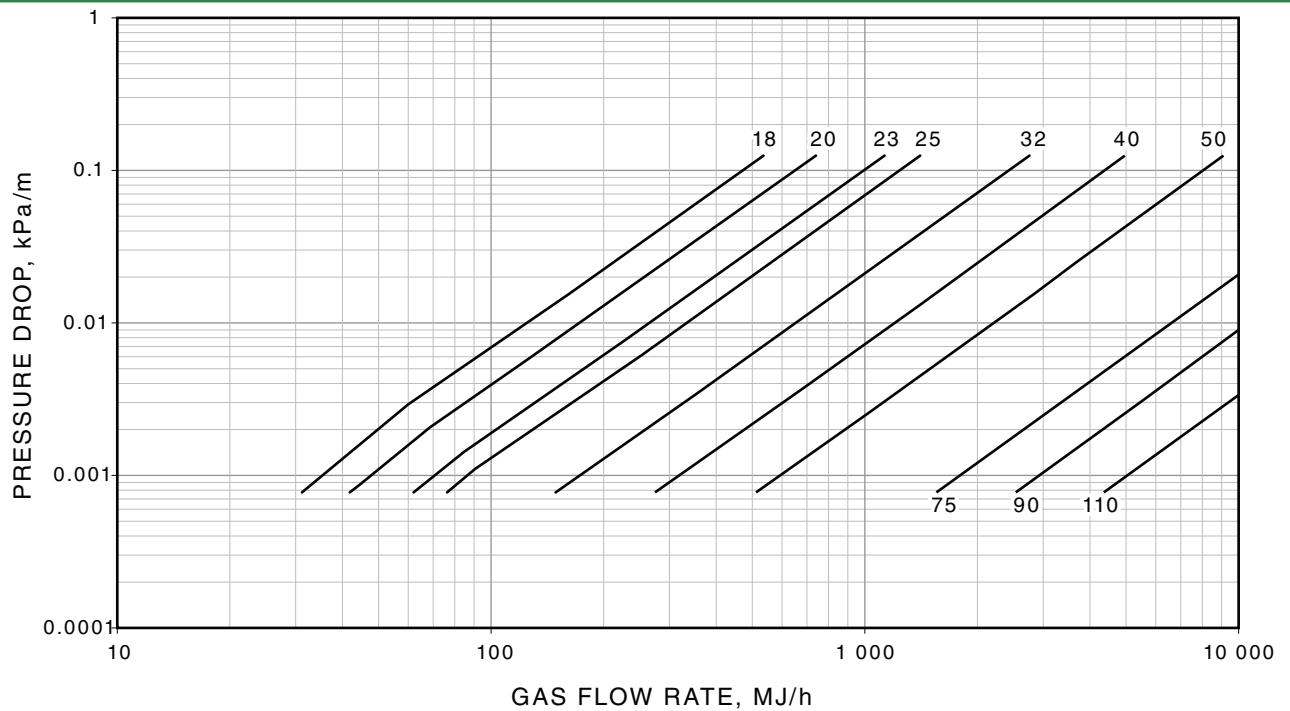


Figure F.12 — Pipe sizing — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (DN) (Suitable for supply pressures less than 10 kPa)

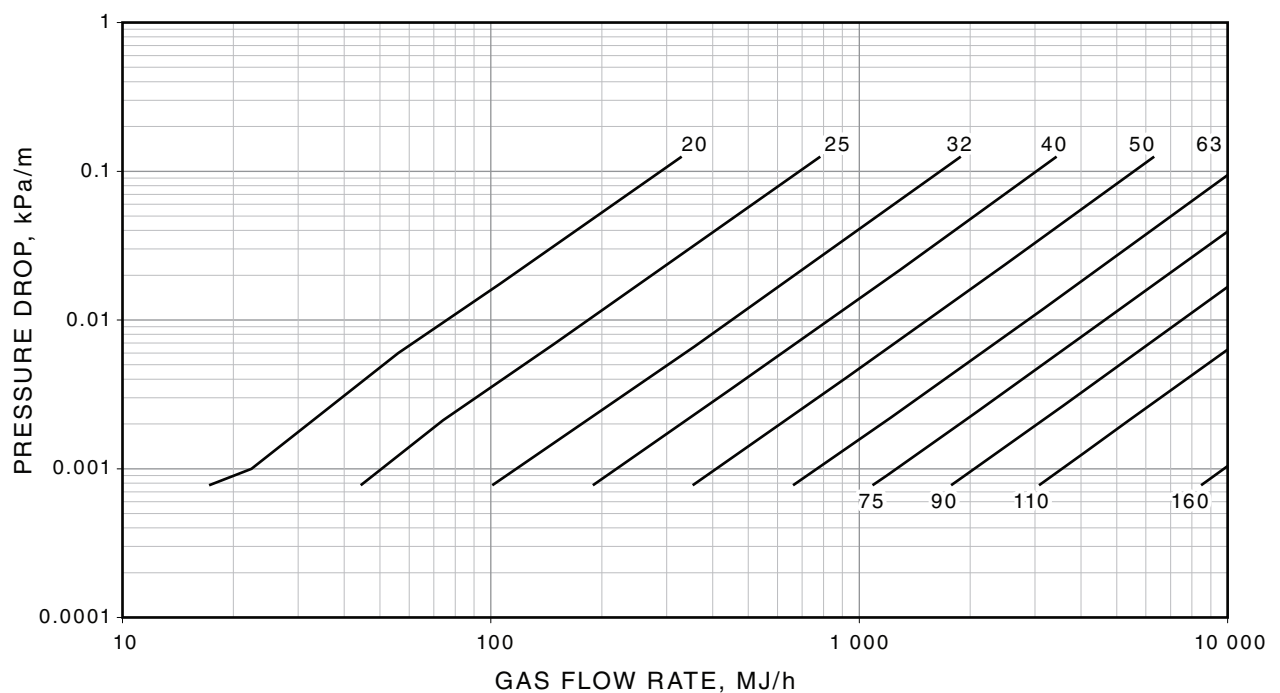


Figure F.13 — Pipe sizing — Propane — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (Suitable for supply pressures less than 10 kPa)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

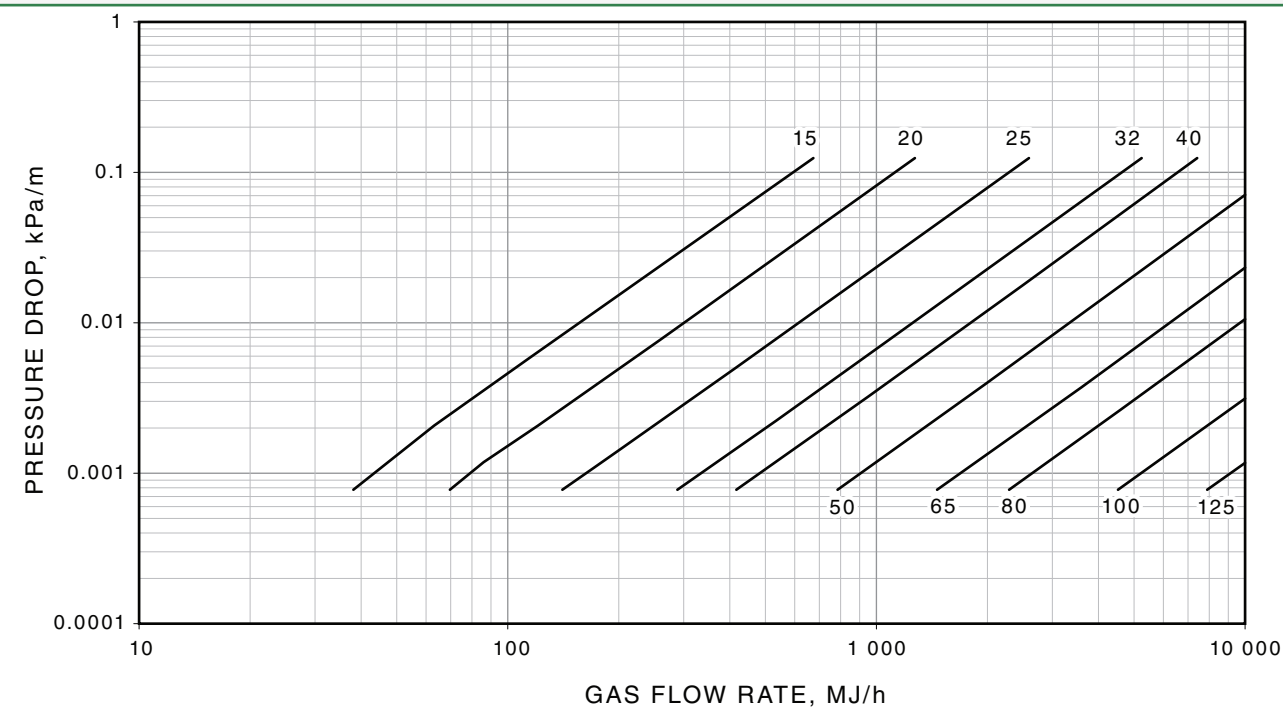


Figure F.14 — Pipe sizing — Propane — Flow through — PVC-HI pipe (AS ISO 6993.1)
(Suitable for supply pressures less than 10 kPa)

F.5 Design procedure using pipe sizing tables

F.5.1 Introduction

This method of sizing *consumer piping* using pipe sizing tables is suitable where the allowable *pressure drop*, measured in kilopascals (kPa), is —

- (a) *Natural gas* — 0.12, 0.25, 0.75, 1.5, 10 or 20.
- (b) *LP Gas* — 0.125, 0.25, 1.5, 10 or 20.

The sizing of *consumer piping* for materials or conditions other than those in the pipe sizing tables of this Appendix shall be determined by —

- (i) pipe sizing tables or calculation provided by the pipe manufacturer; or
- (ii) formulae that achieve the outcomes of [Clause 2.2.3.2](#).

Included, at the top of each table, is an indicative supply *pressure*, or *pressure range*, for which the table is suitable.

NOTE Other conditions include longer pipe runs, complex pipe runs, greater *gas flows*, higher *pressures*, other *pressure drops* and special *appliance* requirements.

F.5.2 Worked example

F.5.2.1 Introduction

A worked example is given to explain a method of pipe sizing for a typical *consumer piping* system that will be using *natural gas* at 2.75 kPa at the start of the *consumer piping* with copper pipe for Australia.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

F.5.2.2 Sketch the piping layout

Sketch the intended *consumer piping* layout (see [Figure F.1](#)), include the *appliance* positions and add the following:

- (a) All pipe lengths, in metres, and the *gas consumption* of each *appliance*, in megajoules per hour (MJ/h).
- (b) Allocate a letter to each branch, commencing at the meter with the letter “A”.
- (c) Allocate a letter to each *appliance* position.

F.5.2.3 Determine the main run

The *main run* is the length of *consumer piping* from the meter to the furthest *appliance* position. The *main run* length is a critical measurement that will be used throughout the pipe sizing calculations.

NOTE The *main run* in [Figure F.1](#) is from the meter to the central heater, which is 19 m.

F.5.2.4 Select the piping material

Select the material that will be used in constructing the *consumer piping* system.

NOTE Copper piping in accordance with AS 1432 is used in the example for Australia.

F.5.2.5 Select the pipe sizing table

Select the appropriate pipe sizing table by taking into consideration the type of *gas* available, the allowable *pressure* drop and the chosen piping material.

NOTE For the example for Australia, use [Table F.12](#), which has an allowable *pressure* drop of 0.75 kPa.

F.5.2.6 Tabulate the pipe runs

Draw up a table with a row for each pipe run, as in [Table F.6](#), as follows:

- (a) Indicate, in the column marked “Pipe section”, each section of *consumer piping* including each branch.
- (b) Indicate, in the column marked “Gas flow”, the amount of *gas*, in megajoules per hour (MJ/h), flowing through each section.
- (c) The column indicating *nominal size* is completed in [Clause F.5.2.7](#).

Table F.6 — Installation details

Pipe section	Main run, m	Gas flow, MJ/h	Nominal size, DN
AB	19	$50 + 30 + 90 + 95 = 265$	
BC	19	$30 + 90 + 95 = 215$	
CD	19	$90 + 95 = 185$	
DE	19	95	
DF	19	90	
CG	19	30	
BH	19	50	

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

F.5.2.7 Select the pipe size

Refer to the appropriate pipe sizing table ([Table F.12](#) for Australia for the example), then as follows:

- (a) Select the *main run* length shown under “Length of straight pipe”. If the *main run* falls between two figures, use the greater length. Therefore, in the example, 20 m is used because the *main run* length is 19 m.
- (b) Section AB has a total flow rate of 265 MJ/h. Follow the 20 m column down until the figure of 265 or the next larger figure is reached, in this case, 374 in [Table F.12](#).
- (c) Read across to the indicated “nominal size”, which is DN 25 in [Table F.12](#) in the example.
- (d) Insert the pipe size in the prepared installation table, [Table F.7](#).
- (e) Determine the pipe size of the remaining sections, continuing to use the *main run* length (20 m in the example), not the individual length of each section.

At Steps (b) and (e), if any values have fallen in grey shaded areas, this indicates that the required flow rate through that pipe size and over that length is not recommended owing to the factors explained more fully in [Clause F.1.6](#). When this occurs, it will be necessary to find a pipe size where the flow rate is possible even though that flow rate appears against a larger pipe size and longer length.

As an example, using [Table F.12](#) with the length of *main run* as 8 m and the load as 15 000 MJ/h, the 80 mm size over 8 m is in grey shade so it is not recommended. Go to the next size that is not grey shaded and will carry 15 000 MJ/h. 100 mm under the 20 m column is not shaded and will therefore carry the load at a lower velocity and *pressure drop*.

Table F.7 — Installation details — Australia — Example

Pipe section	Main run, m	Gas flow, MJ/h	Nominal size, DN
AB	19	50 + 30 + 90 + 95 = 265	25
BC	19	30 + 90 + 95 = 215	25
CD	19	90 + 95 = 185	25
DE	19	95	20
DF	19	90	20
CG	19	30	15
BH	19	50	20

F.5.3 Comparative table showing the required pipe sizes with different pressure drops

As noted in [Clause F.1.10](#), where higher *pressure gas* is available, it is likely that pipe sizes may be reduced by utilizing a higher *pressure drop*. This technique would generally be more applicable in high rise apartments and commercial installations; therefore this table is for illustrative purposes only.

Care needs to be taken to ensure that this does not result in excessive high velocities (points within the shaded areas of the tables) and to verify inlet pressures to *appliance regulators* where located closer to the source do not exceed maximum inlet *pressure* limits.

In [Table F.8](#) below the comparative pipe sizes required for the layout shown in [Figure F.1](#) with Australian copper pipe (AS 1432 *Type B*) at *pressure drops* of 0.12, 0.25, 0.75, 1.5, 10 and 20 kPa are shown. The 0.75 kPa case is identical to the example given above ([Table F.7](#)) . It is seen that utilizing higher *pressures* when available can result in a significant reduction in the pipe sizes required.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.8 — Effect of higher pressures on required pipe sizes

Pipe section	Length, m	Gas flow, MJ/h	Pressure drop 0.12 kPa (Table F.10)	Pressure drop 0.25 kPa (Table F.11)	Pressure drop 0.75 kPa (Table F.12)	Pressure drop 1.5 kPa (Table F.13)	Pressure drop 10 kPa (Table F.14)	Pressure drop 20 kPa (Table F.16)
AB	9	50 + 30 + 90 + 95 = 265	40	32	25	25	15	15
BC	4	30 + 90 + 95 = 215	32	32	25	20	15	15
CD	2	90 + 95 = 185	32	25	25	20	15	15
DE	4	95	25	25	20	20	15	15
DF	1	90	25	25	20	20	15	15
CG	3	30	20	20	15	15	15	15
BH	3	50	20	20	20	15	15	15

F.6 Pipe sizing tables

The pipe sizing tables indicate the flow of *gas*, in megajoules per hour, through pipes of various materials. The heating value quoted in each pipe sizing table listing is a nominal figure typical of the *gas* that the table represents. It is not intended to represent any particular *gas* supply in any particular area.

The pipe sizing tables are listed in [Table F.9](#).

NOTE 1 Use caution — Tables include copper pipe to AS 1432 measured O.D. and copper pipe to NZS 3501 measured I.D.

NOTE 2 In the pipe sizing tables, an em dash (—) or the absence of a smaller pipe size being listed indicates the flow rate value being unsuitably low for the relevant length.

NOTE 3 Propane flows in excess of 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) would generally require validation by a qualified professional engineer. For this reason values above 10 000 MJ/h have been shaded grey and, with the exception of the next higher value, have been suppressed and marked with an asterisk (*).

Table F.9 — Piping sizing tables

Pressure drop, kPa	Supply pressure, kPa	Table No.
Natural gas — Copper pipe to AS 1432 Type B		
0.12	1.25	F.10
0.25	1.5–2.5	F.11
0.75	2.75–5	F.12
1.5	5.0–10	F.13
10	70	F.14
20	140	F.15

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.9 (continued)

Pressure drop, kPa	Supply pressure, kPa	Table No.
Natural gas — Copper pipe to NZS 3501		
0.12	1.25	F.16
0.25	1.5–2.5	F.17
0.75	2.75–5	F.18
1.5	5–10	F.19
10	70	F.20
20	140	F.21
Natural gas — Steel pipe to AS 1074		
0.12	1.25	F.22
0.25	1.5–2.5	F.23
0.75	2.75–5	F.24
1.5	5–10	F.25
10	70	F.26
20	140	F.27
Natural gas — Polyamide pipe to AS 2944.1 SDR 25		
0.12	1.25	F.28
0.25	1.5–2.5	F.29
0.75	2.75–5	F.30
1.5	5–10	F.31
10	70	F.32
20	140	F.33
Natural gas — Polyethylene pipe to AS/NZS4130 SDR11		
0.12	1.25	F.34
0.25	1.5–2.5	F.35
0.75	2.75–5	F.36
1.5	5–10	F.37
10	70	F.38
20	140	F.39
Natural gas — PVC HI pipe to AS ISO 6993.1		
0.12	1.25	F.40
0.25	1.5–2.5	F.41
0.75	2.75–5	F.42
1.5	5–10	F.43
Propane — Copper pipe to AS 1432 Type B		
0.125	2.75–3	F.44
0.25	2.75–3	F.45
1.5	5–10	F.46
10	70	F.47
20	140	F.48

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.9 *(continued)*

Pressure drop, kPa	Supply pressure, kPa	Table No.
Propane — Copper pipe to NZS 3501		
0.125	3	F.49
0.25	3	F.50
1.5	5–10	F.51
10	70	F.52
20	140	F.53
Propane — Steel pipe to AS 1074		
0.25	3	F.54
10	70	F.55
20	140	F.56
Propane — Polyamide pipe to AS 2944.1 SDR 25		
0.125	2.75–3	F.57
0.25	2.75–3	F.58
1.5	5–10	F.59
10	70	F.60
20	140	F.61
Propane — Polyethylene pipe to AS/NZS 4130 SDR11		
0.125	2.75–3	F.62
0.25	2.75–3	F.63
1.5	5–10	F.64
10	70	F.65
20	140	F.66
Propane — PVC HI pipe to AS ISO 6993.1		
0.125	2.75–3	F.67
0.25	2.75–3	F.68
1.5	5–10	F.69

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.10 — Natural gas — Flow through — Copper pipe, (AS 1432 Type B) (MJ/h) (Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)

Nom. diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	—	—	—	—	—	—	—	—	—
8	16	—	—	—	—	—	—	—	—
10	25	16	11	—	—	—	—	—	—
15	61	43	35	30	27	23	19	17	15
20	215	143	113	95	85	78	72	67	63
25	490	328	259	218	192	172	157	145	135
32	962	646	511	433	380	342	312	289	269
40	1648	1110	879	745	655	589	539	499	465
50	3884	2625	2085	1770	1558	1403	1284	1189	1111
65	7301	4947	3935	3344	2946	2656	2432	2254	2107
80	11722	7957	6336	5387	4749	4283	3925	3638	3403
DN	20	25	30	35	40	45	50	55	60
15	14	11	—	—	—	—	—	—	—
20	60	54	49	45	42	37	34	31	28
25	128	114	104	96	90	85	80	77	73
32	253	222	199	182	168	158	150	143	137
40	438	384	345	315	291	272	255	241	229
50	1046	919	827	756	700	653	614	581	552
65	1984	1746	1572	1439	1332	1244	1171	1108	1054
80	3205	2822	2543	2328	2157	2016	1897	1796	1708
100	7253	6393	5766	5283	4898	4580	4314	4086	3888
125	13497	11907	10745	9851	9136	8548	8053	7630	7263
150	21942	19366	17485	16036	14876	13923	13121	12435	11839
DN	65	70	75	80	85	90	100	120	140
15	—	—	—	—	—	—	—	—	—
20	26	24	22	21	—	—	—	—	—
25	71	68	66	64	62	60	56	47	40
32	131	127	122	118	115	112	106	97	89
40	219	209	201	195	189	183	174	159	147
50	527	505	485	467	450	435	409	367	335
65	1006	963	925	891	860	832	783	704	643
80	1631	1563	1502	1447	1397	1352	1272	1144	1046
100	3714	3560	3423	3299	3186	3083	2903	2614	2392
125	6941	6655	6399	6169	5960	5769	5434	4897	4485
150	11317	10853	10438	10064	9725	9415	8870	7998	7328
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
25	35	31	—	—	—	—	—	—	—
32	84	79	75	69	63	58	54	50	47
40	137	130	123	117	112	108	104	100	97
50	310	289	273	259	248	239	230	222	215
65	594	554	521	493	468	446	427	410	395
80	968	903	849	803	763	728	697	669	644
100	2215	2070	1947	1843	1752	1673	1602	1539	1483
125	4155	3884	3656	3462	3293	3145	3013	2896	2790
150	6792	6351	5981	5664	5390	5149	4935	4744	4572

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.11 — Natural gas — Flow through — Copper pipe (AS 1432 Type B) (MJ/h) (Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	11	—	—	—	—	—	—	—	—
8	24	17	12	—	—	—	—	—	—
10	36	25	21	17	14	11	10	—	—
15	94	63	51	44	39	36	33	31	29
20	329	220	174	147	129	115	105	98	91
25	746	501	397	336	295	265	242	224	209
32	1462	985	781	662	582	524	479	443	414
40	2497	1687	1340	1137	1000	901	824	763	713
50	5864	3976	3163	2688	2368	2135	1955	1812	1694
65	10994	7472	5954	5064	4466	4029	3692	3423	3202
80	17617	11996	9567	8144	7185	6485	5946	5515	5160
DN	20	25	30	35	40	45	50	55	60
15	28	23	19	16	14	13	11	10	—
20	87	78	71	66	61	58	55	52	50
25	196	172	154	141	131	123	116	111	106
32	389	342	307	281	259	242	227	215	204
40	671	589	530	485	448	419	394	372	354
50	1595	1404	1264	1157	1071	1001	942	891	847
65	3016	2656	2394	2193	2031	1899	1788	1692	1610
80	4862	4285	3864	3540	3281	3068	2890	2737	2604
100	10966	9675	8731	8005	7424	6946	6545	6201	5903
125	20363	17976	16233	14890	13815	12931	12187	11551	10999
150	33048	29189	26369	24196	22456	21025	19821	18791	17896
DN	65	70	75	80	85	90	100	120	140
15	—	—	—	—	—	—	—	—	—
20	48	46	45	43	41	39	35	29	25
25	102	98	95	92	89	87	82	75	69
32	195	186	179	172	166	161	153	140	129
40	337	323	310	299	288	278	262	235	215
50	809	775	744	717	692	669	630	566	517
65	1538	1473	1416	1364	1317	1275	1199	1079	987
80	2487	2384	2292	2209	2133	2064	1943	1750	1601
100	5641	5409	5201	5014	4844	4690	4417	3981	3646
125	10514	10084	9699	9352	9037	8750	8244	7436	6813
150	17110	16413	15790	15227	14717	14251	13431	12120	11110
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
25	65	61	58	53	49	45	42	39	36
32	121	114	108	103	99	95	91	88	85
40	199	187	177	169	162	156	150	145	140
50	478	446	419	396	376	359	344	330	317
65	913	853	802	758	721	688	659	632	609
80	1482	1384	1303	1233	1172	1119	1071	1029	991
100	3378	3158	2973	2814	2677	2557	2450	2355	2269
125	6316	5907	5563	5269	5014	4791	4592	4415	4255
150	10303	9639	9080	8603	8189	7825	7503	7214	6954

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.12 — Natural gas — Flow through — Copper pipe (AS 1432 Type B) (MJ/h) (Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	20	14	11	—	—	—	—	—	—
8	42	29	24	21	18	17	15	13	12
10	67	44	36	31	28	25	24	22	21
15	179	120	94	80	70	63	58	54	51
20	619	417	330	279	245	221	202	186	174
25	1394	942	747	634	558	502	459	425	397
32	2718	1842	1464	1244	1095	987	904	837	782
40	4624	3141	2501	2126	1874	1690	1548	1435	1341
50	10790	7359	5872	4999	4411	3981	3650	3385	3167
65	20135	13776	11009	9382	8285	7483	6864	6369	5962
80	32142	22049	17641	15046	13294	12012	11023	10232	9580
DN	20	25	30	35	40	45	50	55	60
15	48	43	39	36	34	32	30	29	28
20	164	143	129	118	109	101	95	91	87
25	374	328	295	270	249	233	219	207	197
32	736	648	583	533	494	461	434	410	390
40	1263	1112	1001	917	849	793	746	706	672
50	2984	2630	2371	2172	2013	1883	1773	1679	1597
65	5619	4956	4472	4099	3801	3556	3349	3173	3020
80	9032	7971	7195	6598	6120	5727	5397	5114	4869
100	20279	17913	16182	14848	13781	12902	12163	11530	10981
125	37534	33175	29987	27527	25558	23937	22572	21404	20390
150	60766	53738	48593	44622	41443	38824	36619	34732	33092
DN	65	70	75	80	85	90	100	120	140
15	26	24	23	21	20	—	—	—	—
20	83	80	78	75	73	71	67	61	57
25	188	179	172	166	160	155	145	131	120
32	372	356	342	330	318	308	289	260	237
40	641	614	590	569	549	531	499	449	410
50	1526	1462	1406	1355	1308	1266	1191	1073	981
65	2886	2767	2660	2564	2477	2398	2258	2034	1862
80	4653	4462	4291	4137	3997	3870	3645	3286	3010
100	10499	10071	9688	9343	9029	8743	8240	7434	6815
125	19499	18708	18001	17363	16784	16255	15323	13834	12687
150	31652	30373	29229	28197	27260	26405	24898	22487	20630
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	53	50	48	45	43	41	38	35	33
25	113	106	101	96	92	88	85	82	80
32	219	204	192	182	173	165	158	153	148
40	379	354	333	315	299	285	273	262	252
50	908	849	798	755	718	685	656	630	607
65	1725	1612	1517	1436	1366	1304	1250	1201	1157
80	2789	2608	2455	2325	2212	2112	2024	1946	1875
100	6319	5911	5569	5275	5021	4798	4600	4423	4263
125	11769	11014	10379	9836	9365	8951	8584	8256	7960
150	19143	17921	16892	16012	15248	14577	13982	13449	12969

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.13 — Natural gas — Flow through — Copper pipe (AS 1432 Type B) (MJ/h) (Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)

Nom diam	Length of straight pipe ,in metres								
DN	2	4	6	8	10	12	14	16	18
6	28	20	16	14	12	11	—	—	—
8	64	42	34	29	26	24	22	21	19
10	101	67	53	45	39	36	33	31	29
15	268	179	142	120	105	94	86	80	74
20	919	621	492	418	367	331	302	280	261
25	2060	1397	1111	944	831	749	686	635	594
32	4001	2723	2170	1845	1627	1467	1344	1246	1165
40	6787	4633	3697	3147	2777	2506	2297	2130	1993
50	15755	10812	8649	7374	6514	5884	5398	5009	4689
65	29267	20176	16171	13805	12204	11032	10127	9402	8805
80	46537	32208	25855	22094	19545	17677	16234	15077	14124
DN	20	25	30	35	40	45	50	55	60
15	70	61	56	52	48	46	43	41	39
20	246	216	194	177	164	153	144	136	129
25	559	491	442	405	374	350	329	311	296
32	1097	966	870	797	738	690	649	614	584
40	1878	1654	1491	1366	1266	1183	1114	1055	1004
50	4420	3899	3518	3225	2990	2798	2635	2497	2376
65	8302	7329	6617	6069	5631	5270	4966	4706	4481
80	13321	11766	10629	9752	9050	8473	7987	7571	7210
100	29823	26367	23837	21884	20321	19033	17949	17021	16215
125	55075	48729	44078	40487	37610	35239	33243	31533	30047
150	89006	78798	71312	65527	60889	57066	53846	51088	48691
DN	65	70	75	80	85	90	100	120	140
15	38	36	35	34	33	32	31	28	24
20	123	118	113	109	105	102	96	87	81
25	282	270	260	250	241	233	219	197	180
32	558	534	513	495	477	462	434	391	357
40	959	919	883	851	821	795	748	673	616
50	2271	2177	2093	2018	1949	1887	1776	1601	1465
65	4283	4107	3950	3809	3680	3563	3356	3026	2772
80	6893	6612	6360	6133	5927	5739	5408	4879	4471
100	15507	14879	14316	13809	13349	12929	12188	11004	10091
125	28742	27583	26546	25610	24761	23985	22618	20432	18747
150	46584	44713	43038	41527	40155	38902	36694	33160	30435
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	75	71	67	64	62	59	57	55	53
25	166	155	146	138	131	125	121	117	113
32	330	308	290	274	260	248	238	228	220
40	570	532	500	473	450	429	411	395	380
50	1357	1269	1194	1130	1075	1026	983	945	910
65	2569	2403	2262	2142	2038	1947	1866	1794	1729
80	4145	3878	3652	3460	3293	3146	3016	2900	2795
100	9362	8761	8257	7825	7450	7121	6829	6567	6332
125	17398	16288	15355	14556	13862	13253	12713	12229	11793
150	28254	26459	24948	23655	22533	21547	20672	19889	19183

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.14 — Natural gas — Flow through—Copper pipe (AS 1432 Type B) (MJ/h) (Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	1022	696	554	471	415	374	342	317	296
20	3430	2355	1883	1605	1417	1279	1173	1088	1018
25	7562	5231	4195	3582	3166	2861	2626	2438	2283
32	14467	10081	8109	6935	6138	5552	5099	4736	4437
40	24206	16986	13701	11736	10397	9413	8650	8038	7533
50	54744	38957	31591	27141	24092	21841	20094	18689	17528
65	99352	71616	58366	50280	44710	40583	37372	34784	32643
80	154814	112862	92392	79785	71057	64568	59508	55423	52038
100	326928	243829	201464	174860	156235	142289	131359	122502	115142
125	572706	435904	363305	316857	283984	259196	239669	223787	210551
150	883152	684090	574655	503425	452498	413835	383233	358253	337378
DN	20	25	30	35	40	45	50	55	60
15	279	246	221	202	187	175	164	156	148
20	959	845	762	698	647	605	570	540	513
25	2152	1899	1714	1571	1457	1363	1284	1217	1158
32	4185	3696	3338	3062	2842	2660	2507	2376	2263
40	7108	6282	5678	5211	4837	4530	4271	4049	3856
50	16548	14644	13247	12168	11303	10589	9989	9474	9028
65	30834	27313	24727	22726	21120	19796	18680	17724	16893
80	49175	43597	39493	36314	33762	31655	29880	28357	27033
100	108903	96710	87710	80726	75107	70464	66546	63184	60258
125	199306	177265	160944	148249	138021	129558	122408	116268	110921
150	319603	284663	258712	238484	222160	208637	197202	187373	178809
DN	65	70	75	80	85	90	100	120	140
15	141	135	130	125	121	117	110	99	90
20	490	470	452	435	420	407	383	345	315
25	1107	1061	1021	984	950	920	866	781	715
32	2163	2074	1995	1924	1859	1800	1696	1529	1401
40	3687	3537	3403	3282	3172	3071	2895	2612	2394
50	8635	8286	7974	7692	7436	7203	6792	6133	5626
65	16162	15513	14932	14407	13931	13496	12730	11503	10557
80	25869	24834	23908	23072	22313	21619	20396	18438	16927
100	57683	55394	53343	51492	49810	48273	45561	41216	37861
125	106213	102026	98272	94882	91801	88985	84014	76043	69885
150	171263	164549	158527	153086	148140	143619	135633	122821	112916
DN	160	180	200	220	240	260	280	300	320
15	83	78	73	69	65	63	60	58	56
20	292	273	256	243	231	220	211	202	195
25	662	619	583	551	525	501	480	461	444
32	1299	1214	1144	1083	1031	985	944	907	874
40	2220	2077	1957	1854	1764	1686	1616	1554	1498
50	5220	4886	4606	4365	4157	3973	3811	3665	3534
65	9799	9176	8651	8202	7812	7470	7166	6894	6649
80	15717	14721	13883	13165	12542	11994	11508	11073	10681
100	35173	32958	31093	29496	28109	26889	25807	24837	23963
125	64948	60878	57450	54513	51961	49717	47725	45941	44332
150	104970	98417	92897	88165	84053	80437	77225	74349	71754

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.15 — Natural gas — Flow through — Copper pipe (AS 1432 Type B), (MJ/h) (Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	1801	1234	985	839	740	668	613	568	531
20	5981	4143	3324	2839	2510	2269	2083	1934	1811
25	13079	9147	7368	6307	5584	5054	4643	4313	4042
32	24825	17534	14178	12161	10784	9769	8982	8350	7828
40	41238	29404	23862	20509	18210	16511	15192	14131	13254
50	92007	66833	54632	47140	41961	38115	35118	32700	30698
65	165026	121897	100315	86876	77513	70524	65059	60637	56967
80	254634	190807	157962	137249	122714	111813	103259	96322	90554
100	527854	406711	340819	298157	267751	244716	226510	211667	199273
125	910697	718474	608746	535947	483295	443013	410950	384670	362637
150	1387177	1115977	954719	845388	765243	703363	653783	612942	578564
DN	20	25	30	35	40	45	50	55	60
15	501	441	398	364	337	315	297	281	267
20	1707	1507	1360	1247	1157	1082	1020	966	920
25	3813	3368	3043	2793	2592	2426	2287	2168	2065
32	7388	6533	5907	5424	5036	4717	4449	4218	4019
40	12514	11076	10020	9205	8551	8011	7557	7169	6831
50	29005	25707	23282	21404	19897	18653	17605	16706	15925
65	53860	47795	43324	39858	37071	34770	32829	31164	29716
80	85663	76096	69030	63544	59129	55480	52399	49756	47455
100	188728	168017	152649	140679	131024	123028	116270	110462	105402
125	343827	306729	279077	257470	240000	225507	213239	202683	193479
150	549125	490825	447179	412969	385248	362209	342679	325856	311174
DN	65	70	75	80	85	90	100	120	140
15	255	245	235	227	219	212	199	179	164
20	879	843	810	781	755	731	688	620	568
25	1974	1893	1821	1756	1697	1644	1549	1397	1280
32	3843	3687	3548	3422	3307	3203	3019	2726	2499
40	6534	6270	6034	5821	5627	5451	5140	4642	4258
50	15238	14628	14081	13588	13140	12731	12010	10855	9964
65	28442	27309	26295	25379	24547	23787	22447	20300	18643
80	45429	43629	42016	40559	39236	38027	35893	32473	29832
100	100945	96980	93424	90212	87292	84624	79910	72350	66507
125	185364	178139	171656	165797	160468	155595	146984	133159	122464
150	298217	286676	276312	266941	258413	250612	236820	214659	197497
DN	160	180	200	220	240	260	280	300	320
15	152	142	133	126	120	114	109	105	101
20	526	492	463	438	417	398	381	367	353
25	1187	1110	1046	990	943	901	863	830	800
32	2318	2169	2044	1937	1844	1762	1690	1625	1567
40	3951	3699	3486	3304	3147	3008	2885	2775	2676
50	9251	8664	8170	7747	7379	7057	6770	6514	6283
65	17315	16222	15301	14513	13828	13227	12693	12215	11784
80	27716	25972	24504	23246	22154	21194	20341	19578	18889
100	61820	57955	54700	51910	49485	47353	45460	43765	42235
125	113878	106796	100826	95709	91259	87346	83870	80757	77947
150	183713	172335	162741	154513	147358	141063	135470	130459	125937

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.16 — Natural gas — Flow through— New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	47	33	27	23	18	15	13	11	10
15	102	68	56	48	43	40	37	34	32
20	314	210	165	140	122	110	101	95	90
25	692	464	367	310	272	245	223	206	193
32	1273	856	678	574	504	454	415	383	358
40	2087	1407	1116	946	832	748	685	634	592
50	4538	3069	2439	2070	1823	1642	1503	1392	1301
DN	20	25	30	35	40	45	50	55	60
10	—	—	—	—	—	—	—	—	—
15	29	23	19	16	14	13	11	10	10
20	85	76	69	64	60	57	54	51	49
25	181	159	143	132	124	117	111	105	101
32	336	295	265	242	224	209	196	186	177
40	557	489	439	401	371	346	325	307	292
50	1225	1077	969	886	820	766	720	681	648
DN	65	70	75	80	85	90	100	120	140
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	45	42	39	37	34	32	29	24	21
25	97	93	90	87	85	82	78	71	66
32	170	164	158	153	149	144	137	125	116
40	279	267	256	246	238	230	217	197	183
50	618	592	568	547	528	511	480	431	394
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
25	58	52	46	42	39	36	33	31	—
32	108	102	97	92	88	85	81	76	71
40	171	161	153	146	140	134	129	125	121
50	364	339	319	302	287	276	266	257	248

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.17 — Natural gas — Flow through— New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	71	48	39	34	30	28	26	24	21
15	157	105	82	70	63	57	53	49	47
20	481	322	254	215	189	169	155	143	133
25	1053	709	561	475	418	376	344	318	297
32	1931	1303	1034	877	771	694	635	588	549
40	3159	2137	1697	1441	1268	1142	1046	969	905
50	6846	4645	3697	3142	2769	2497	2287	2120	1982
DN	20	25	30	35	40	45	50	55	60
10	19	15	13	11	—	—	—	—	—
15	44	40	36	33	30	27	24	22	20
20	125	110	100	93	87	82	78	74	71
25	279	245	220	201	185	173	162	154	146
32	517	454	408	373	345	322	302	286	272
40	852	749	674	616	570	532	501	473	450
50	1866	1643	1480	1354	1254	1172	1103	1044	993
DN	65	70	75	80	85	90	100	120	140
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	68	66	63	61	59	58	55	50	44
25	140	135	130	126	122	119	113	103	95
32	259	248	238	229	221	214	201	181	167
40	429	411	395	380	367	355	333	299	273
50	948	908	872	840	811	785	738	664	606
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	38	34	31	—	—	—	—	—	—
25	89	84	80	76	73	70	67	65	61
32	156	147	140	133	128	123	118	114	111
40	252	236	222	211	202	194	187	180	175
50	561	523	492	465	442	421	403	387	373

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.18 — Natural gas — Flow through — New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	135	90	71	60	53	48	45	42	39
15	298	199	158	133	117	105	96	88	82
20	901	607	481	408	358	323	295	273	255
25	1963	1328	1055	895	788	710	650	602	562
32	3582	2430	1934	1643	1448	1305	1195	1107	1035
40	5840	3971	3164	2691	2372	2140	1960	1817	1700
50	12584	8589	6856	5838	5152	4651	4265	3956	3702
DN	20	25	30	35	40	45	50	55	60
10	37	33	30	28	26	25	23	21	19
15	78	69	63	58	54	51	49	46	44
20	240	210	189	173	160	149	140	132	125
25	529	465	418	383	354	330	311	294	279
32	975	858	772	707	654	611	575	544	517
40	1601	1409	1270	1163	1077	1007	947	897	853
50	3488	3074	2773	2540	2355	2202	2074	1964	1869
DN	65	70	75	80	85	90	100	120	140
10	—	—	—	—	—	—	—	—	—
15	43	41	40	38	37	36	34	30	26
20	120	115	110	106	103	100	95	87	80
25	266	255	245	236	228	220	207	186	169
32	494	473	454	438	422	409	384	345	315
40	814	780	749	722	697	675	635	571	522
50	1785	1711	1644	1585	1531	1482	1395	1256	1149
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	75	71	67	64	61	59	57	55	53
25	157	146	138	132	126	121	117	113	109
32	292	272	255	242	229	219	209	201	194
40	483	451	423	401	381	363	348	334	321
50	1064	994	935	885	841	803	769	739	712

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.19 — Natural gas — Flow through — New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	202	135	107	90	79	71	65	60	56
15	443	298	236	200	176	158	144	133	124
20	1334	903	717	608	535	482	441	409	382
25	2894	1967	1566	1331	1173	1057	968	897	839
32	5265	3589	2862	2435	2148	1938	1776	1647	1540
40	8560	5852	4672	3979	3512	3170	2907	2696	2523
50	18354	12610	10091	8607	7604	6870	6303	5850	5477
DN	20	25	30	35	40	45	50	55	60
10	53	47	43	40	37	35	33	32	30
15	117	103	92	84	78	73	69	66	63
20	359	316	284	260	240	224	211	199	189
25	790	695	626	573	530	495	466	441	419
32	1451	1278	1151	1054	977	913	859	814	774
40	2377	2095	1889	1731	1604	1500	1412	1338	1273
50	5163	4555	4111	3769	3495	3270	3081	2919	2778
DN	65	70	75	80	85	90	100	120	140
10	29	28	27	26	26	25	23	19	16
15	60	58	56	54	53	51	49	44	41
20	181	173	166	160	154	149	140	126	115
25	400	383	368	355	342	331	311	280	256
32	739	708	681	656	633	612	576	518	474
40	1216	1165	1120	1079	1042	1009	949	855	782
50	2655	2546	2448	2360	2280	2207	2078	1873	1715
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	38	36	34	33	30	—	—	—	—
20	107	100	95	91	87	84	81	78	75
25	236	221	207	196	186	177	170	163	157
32	439	409	385	364	346	330	316	303	292
40	724	676	636	602	572	546	523	502	484
50	1589	1485	1398	1323	1259	1202	1152	1107	1066

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.20 — Natural gas — Flow through – New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
(DN)	2	4	6	8	10	12	14	16	18
10	777	528	420	357	314	283	259	240	224
15	1678	1146	914	778	686	619	567	525	491
20	4942	3404	2726	2325	2053	1855	1702	1579	1478
25	10547	7322	5881	5025	4445	4019	3690	3426	3209
32	18907	13222	10650	9115	8071	7304	6711	6234	5842
40	30326	21356	17248	14786	13106	11869	10911	10141	9506
50	63434	45273	36756	31597	28059	25445	23415	21781	20431
DN	20	25	30	35	40	45	50	55	60
10	211	186	167	153	141	132	124	117	112
15	463	407	367	336	311	291	274	259	246
20	1393	1228	1108	1015	941	881	829	786	748
25	3026	2671	2412	2212	2052	1920	1809	1715	1633
32	5511	4869	4399	4037	3746	3508	3306	3134	2985
40	8970	7931	7170	6582	6111	5723	5397	5117	4874
50	19291	17075	15449	14193	13185	12354	11655	11056	10535
DN	65	70	75	80	85	90	100	120	140
10	106	102	98	94	91	88	83	74	68
15	235	225	216	208	201	195	183	165	150
20	714	685	658	634	613	593	558	503	460
25	1560	1496	1439	1387	1340	1298	1222	1102	1009
32	2854	2737	2633	2539	2454	2376	2239	2020	1851
40	4661	4472	4302	4149	4011	3884	3661	3304	3029
50	10077	9671	9307	8978	8680	8408	7929	7161	6570
DN	160	180	200	220	240	260	280	300	320
10	63	58	55	52	50	48	46	45	43
15	139	130	122	115	110	105	100	96	92
20	426	398	375	354	337	322	308	296	285
25	935	874	823	779	742	708	679	652	629
32	1716	1605	1512	1432	1363	1302	1248	1200	1157
40	2810	2629	2477	2347	2234	2135	2047	1968	1898
50	6097	5707	5380	5099	4856	4642	4452	4283	4130
NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.									

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.21 — Natural gas — Flow through — New Zealand Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
(DN)	2	4	6	8	10	12	14	16	18
10	1372	938	748	637	562	507	464	431	403
15	2945	2026	1621	1382	1220	1102	1011	938	878
20	8586	5972	4801	4104	3631	3284	3015	2800	2623
25	18171	12769	10305	8830	7824	7084	6511	6051	5671
32	32327	22941	18584	15956	14158	12832	11802	10975	10292
40	51485	36882	29985	25797	22919	20791	19137	17805	16704
50	106318	77528	63472	54813	48818	44360	40883	38077	35751
DN	20	25	30	35	40	45	50	55	60
10	379	334	301	276	255	239	225	213	202
15	827	729	658	603	559	522	492	466	443
20	2474	2184	1972	1809	1679	1571	1481	1403	1336
25	5351	4730	4275	3924	3643	3411	3216	3049	2904
32	9715	8595	7774	7139	6631	6211	5859	5556	5294
40	15774	13966	12639	11612	10789	10111	9539	9049	8623
50	33785	29952	27132	24948	23194	21747	20527	19481	18571
DN	65	70	75	80	85	90	100	120	140
10	193	185	178	171	165	160	150	135	124
15	424	406	390	376	363	352	331	298	273
20	1277	1225	1178	1136	1097	1062	1001	902	826
25	2777	2664	2563	2472	2389	2313	2180	1968	1804
32	5063	4858	4675	4509	4359	4222	3981	3594	3297
40	8249	7917	7619	7351	7107	6885	6493	5865	5381
50	17771	17060	16424	15849	15327	14851	14011	12665	11627
DN	160	180	200	220	240	260	280	300	320
10	114	107	100	95	90	86	82	79	76
15	252	236	222	210	200	190	182	175	169
20	766	716	674	639	608	580	556	535	515
25	1673	1565	1474	1397	1329	1270	1218	1171	1129
32	3058	2862	2698	2556	2434	2327	2231	2146	2069
40	4994	4676	4408	4178	3979	3804	3649	3510	3385
50	10796	10112	9536	9043	8614	8238	7904	7605	7336

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.22 — Natural gas — Flow through — Steel pipe (AS 1074 Medium) (MJ/h) (Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	183	123	98	82	73	67	62	58	55
20	411	279	221	188	165	149	136	122	115
25	772	526	419	356	313	282	258	239	223
32	1641	1122	896	763	673	607	556	516	482
40	2475	1696	1356	1155	1020	921	844	783	732
50	4639	3188	2553	2179	1926	1740	1597	1482	1387
65	9275	6393	5130	4385	3879	3509	3222	2992	2803
80	14225	9822	7891	6749	5975	5407	4968	4616	4325
100	28643	19832	15960	13667	12111	10969	10085	9375	8790
125	49924	34641	27912	23924	21216	19226	17685	16448	15427
150	80270	55797	45005	38603	34253	31055	28578	26589	24946
DN	20	25	30	35	40	45	50	55	60
15	52	46	42	39	37	32	29	26	24
20	109	98	89	82	77	73	69	66	63
25	210	185	166	147	138	130	123	118	113
32	454	399	360	329	304	284	267	253	240
40	690	608	548	501	464	434	408	386	367
50	1308	1153	1040	953	883	826	778	736	700
65	2643	2334	2107	1933	1793	1677	1580	1497	1425
80	4080	3605	3257	2988	2773	2596	2446	2318	2207
100	8296	7338	6635	6092	5657	5299	4996	4738	4513
125	14566	12893	11666	10717	9957	9330	8801	8348	7955
150	23560	20867	18891	17363	16137	15125	14273	13543	12908
DN	65	70	75	80	85	90	100	120	140
15	—	—	—	—	—	—	—	—	—
20	60	58	56	55	53	51	47	40	34
25	108	104	101	97	95	92	87	80	74
32	229	220	202	196	190	185	175	160	148
40	350	336	322	310	300	290	273	235	217
50	669	641	616	593	573	554	521	469	429
65	1362	1305	1255	1210	1168	1131	1065	959	877
80	2110	2023	1946	1876	1812	1754	1652	1489	1363
100	4315	4140	3982	3841	3712	3595	3387	3056	2801
125	7609	7301	7026	6778	6552	6346	5983	5402	4953
150	12349	11853	11408	11007	10643	10310	9723	8784	8059
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
25	69	65	60	55	50	46	43	40	—
32	139	131	124	118	113	109	105	101	98
40	203	191	182	173	166	159	154	148	144
50	396	370	348	329	298	286	276	267	258
65	812	759	714	675	642	613	587	563	542
80	1263	1180	1111	1051	1000	954	914	878	846
100	2596	2428	2286	2165	2060	1968	1886	1813	1747
125	4594	4299	4050	3837	3653	3490	3346	3217	3101
150	7478	7000	6597	6253	5954	5691	5457	5249	5060

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.23 — Natural gas — Flow through — Steel pipe (AS 1074 Medium.) (MJ/h) (Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	275	187	149	126	111	100	90	84	79
20	616	421	335	285	251	227	208	192	180
25	1153	790	631	538	475	429	393	364	341
32	2440	1678	1345	1148	1014	917	841	781	731
40	3673	2531	2030	1735	1534	1387	1273	1182	1107
50	6865	4743	3812	3261	2887	2612	2400	2230	2089
65	13683	9482	7633	6538	5794	5248	4825	4485	4205
80	20947	14541	11718	10043	8906	8070	7423	6903	6474
100	42053	29275	23629	20276	17997	16320	15021	13977	13114
125	73122	51020	41231	35412	31452	28538	26279	24462	22962
150	117320	82023	66356	57032	50684	46009	42383	39468	37058
DN	20	25	30	35	40	45	50	55	60
15	75	67	61	57	53	50	47	45	43
20	169	149	134	119	111	105	100	95	91
25	321	282	254	233	215	201	189	179	170
32	689	607	548	502	465	435	409	387	368
40	1044	921	831	762	706	661	622	589	561
50	1971	1741	1573	1443	1338	1253	1180	1119	1065
65	3969	3510	3173	2914	2705	2533	2389	2265	2157
80	6112	5409	4893	4494	4175	3911	3689	3498	3333
100	12387	10973	9934	9131	8487	7955	7507	7123	6789
125	21695	19232	17423	16023	14899	13971	13189	12518	11934
150	35023	31065	28157	25905	24096	22603	21344	20263	19324
DN	65	70	75	80	85	90	100	120	140
15	42	40	39	37	36	34	30	—	—
20	87	84	81	79	76	74	70	64	59
25	156	150	145	141	137	133	126	115	106
32	352	337	324	312	301	291	274	246	225
40	536	513	493	475	459	444	418	376	344
50	1018	976	938	904	874	846	796	717	656
65	2062	1978	1903	1835	1773	1717	1618	1459	1337
80	3187	3058	2942	2838	2743	2657	2504	2260	2071
100	6495	6234	6000	5789	5597	5422	5113	4619	4237
125	11421	10965	10556	10187	9852	9546	9006	8140	7472
150	18496	17761	17103	16508	15968	15474	14603	13206	12128
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	56	52	50	45	41	—	—	—	—
25	100	94	89	85	81	78	75	73	70
32	200	189	179	171	163	157	151	146	141
40	318	297	279	264	239	230	222	214	207
50	608	568	534	505	480	459	439	422	406
65	1239	1158	1090	1032	982	938	899	863	832
80	1920	1796	1692	1602	1525	1457	1396	1342	1293
100	3931	3679	3467	3286	3128	2990	2867	2757	2658
125	6936	6495	6123	5805	5529	5286	5070	4877	4703
150	11263	10551	9950	9436	8989	8597	8248	7936	7654

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.24 — Natural gas — Flow through — Steel pipe (AS 1074 Medium) (MJ/h) (Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	502	344	276	235	207	187	172	159	149
20	1115	769	617	527	466	421	386	359	336
25	2078	1437	1155	988	874	791	727	675	632
32	4373	3034	2443	2093	1855	1680	1545	1436	1346
40	6563	4562	3678	3153	2797	2534	2331	2168	2033
50	12211	8512	6874	5900	5237	4750	4372	4068	3817
65	24220	16937	13701	11774	10461	9494	8745	8142	7643
80	36962	25901	20974	18037	16035	14560	13415	12494	11733
100	73797	51905	42107	36254	32260	29313	27025	25183	23660
125	127700	90115	73216	63101	56189	51086	47121	43928	41285
150	203942	144380	117470	101330	90287	82128	75786	70674	66442
DN	20	25	30	35	40	45	50	55	60
15	140	123	111	102	94	87	82	78	75
20	317	279	252	231	214	200	188	178	169
25	596	527	475	436	404	378	356	338	321
32	1271	1124	1016	932	866	810	764	724	690
40	1919	1698	1536	1411	1310	1227	1157	1097	1045
50	3605	3193	2891	2657	2469	2314	2183	2071	1973
65	7222	6403	5802	5336	4961	4652	4392	4168	3974
80	11090	9838	8918	8205	7632	7159	6760	6418	6120
100	22372	19865	18020	16590	15441	14491	13690	13002	12403
125	39051	34698	31493	29008	27009	25358	23963	22766	21724
150	62864	55889	50750	46763	43556	40905	38666	36744	35069
DN	65	70	75	80	85	90	100	120	140
15	72	69	67	65	63	61	58	53	49
20	162	155	149	143	138	134	122	111	103
25	307	294	283	273	263	255	240	216	197
32	659	632	608	586	566	548	516	465	426
40	1000	959	922	890	860	832	784	707	648
50	1888	1812	1743	1682	1626	1575	1485	1340	1229
65	3803	3651	3515	3392	3280	3178	2998	2709	2486
80	5858	5625	5416	5228	5056	4900	4623	4180	3838
100	11876	11407	10987	10608	10263	9948	9391	8498	7808
125	20806	19990	19258	18596	17995	17446	16476	14919	13714
150	33595	32283	31106	30043	29077	28194	26633	24128	22190
DN	160	180	200	220	240	260	280	300	320
15	46	43	41	—	—	—	—	—	—
20	97	91	86	82	79	76	73	70	68
25	183	171	154	147	141	135	130	126	122
32	395	369	347	328	312	298	286	274	264
40	601	561	529	500	476	455	436	419	403
50	1140	1066	1004	952	906	865	829	797	768
65	2307	2160	2036	1930	1837	1756	1684	1620	1562
80	3564	3337	3147	2984	2842	2717	2607	2507	2418
100	7255	6798	6413	6083	5797	5545	5321	5120	4939
125	12748	11950	11278	10702	10201	9760	9369	9018	8701
150	20634	19349	18266	17338	16530	15820	15188	14622	14112

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.25 — Natural gas — Flow through — Steel pipe (AS 1074 Medium) (MJ/h) (Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	728	503	404	345	305	276	253	235	220
20	1612	1118	900	770	683	618	568	528	495
25	2993	2082	1679	1439	1277	1157	1064	990	928
32	6276	4381	3540	3040	2699	2448	2254	2097	1968
40	9400	6575	5319	4571	4061	3685	3394	3159	2966
50	17434	12235	9914	8529	7584	6887	6347	5912	5552
65	34439	24267	19701	16970	15104	13727	12658	11797	11084
80	52409	37033	30103	25950	23111	21014	19385	18072	16985
100	104088	73940	60241	52004	46361	42188	38942	36324	34156
125	179212	127948	104460	90288	80560	73357	67748	63222	59471
150	284771	204340	167167	144658	129176	117696	108749	101524	95533
DN	20	25	30	35	40	45	50	55	60
15	208	183	165	151	140	131	124	117	111
20	467	412	373	342	317	297	280	265	252
25	876	775	701	644	598	560	528	500	476
32	1859	1647	1491	1370	1273	1193	1126	1068	1018
40	2802	2484	2250	2069	1923	1803	1702	1615	1539
50	5248	4656	4220	3883	3612	3388	3199	3037	2896
65	10482	9308	8444	7775	7236	6792	6416	6094	5813
80	16066	14276	12957	11934	11112	10432	9858	9365	8935
100	32322	28745	26109	24063	22416	21054	19904	18916	18055
125	56297	50102	45532	41984	39127	36763	34766	33049	31554
150	90461	80555	73243	67562	62985	59198	55997	53246	50848
DN	65	70	75	80	85	90	100	120	140
15	106	102	98	95	89	87	82	75	70
20	241	231	222	214	207	200	188	170	155
25	456	437	420	405	392	379	357	322	295
32	974	934	899	867	838	812	766	691	633
40	1473	1414	1361	1313	1269	1230	1160	1047	961
50	2772	2662	2563	2474	2392	2318	2187	1977	1815
65	5566	5346	5149	4971	4810	4662	4401	3982	3658
80	8557	8221	7920	7647	7400	7174	6774	6132	5636
100	17297	16623	16018	15471	14974	14520	13717	12428	11430
125	30237	29065	28013	27062	26198	25407	24010	21767	20029
150	48735	46854	45167	43641	42254	40985	38742	35138	32346
DN	160	180	200	220	240	260	280	300	320
15	65	61	58	55	53	51	49	48	46
20	144	134	122	117	112	107	103	100	97
25	273	255	240	227	216	206	198	190	183
32	587	549	517	490	466	446	427	410	396
40	891	834	786	745	709	677	649	624	602
50	1685	1578	1488	1410	1343	1284	1231	1185	1142
65	3398	3184	3004	2849	2714	2596	2491	2397	2312
80	5238	4910	4633	4395	4189	4007	3846	3701	3571
100	10629	9967	9410	8931	8515	8149	7824	7532	7269
125	18633	17481	16508	15674	14948	14309	13742	13233	12773
150	30102	28249	26686	25344	24176	23148	22234	21414	20675

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.26 — Natural gas — Flow through — Steel pipe (AS 1074 Medium) (MJ/h) (Pressure drop of 10 kPa; suitable for supply pressures around 70 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	2491	1753	1423	1226	1091	992	915	852	801
20	5452	3852	3133	2703	2409	2191	2022	1886	1773
25	10027	7114	5797	5006	4464	4064	3753	3502	3293
32	20765	14817	12103	10467	9345	8514	7866	7344	6911
40	30866	22109	18086	15656	13985	12747	11783	11004	10358
50	56499	40748	33424	28977	25912	23637	21862	20427	19236
65	109710	79876	65760	57127	51154	46708	43232	40419	38082
80	164899	120901	99807	86834	77830	71115	65858	61599	58058
100	319773	237690	197281	172146	154591	141442	131121	122740	115760
125	538241	405352	338220	295985	266295	243964	226382	212075	200140
150	836467	638083	535246	469789	423464	388467	360828	338286	319446
DN	20	25	30	35	40	45	50	55	60
15	757	673	610	562	523	491	464	440	420
20	1678	1492	1355	1248	1163	1092	1032	981	936
25	3117	2774	2521	2324	2166	2035	1924	1829	1746
32	6545	5829	5301	4891	4560	4286	4055	3856	3683
40	9811	8743	7954	7340	6846	6437	6091	5794	5534
50	18227	16254	14797	13663	12748	11991	11351	10800	10319
65	36101	32223	29353	27119	25316	23823	22559	21471	20522
80	55054	49169	44810	41414	38673	36401	34477	32822	31377
100	109831	98197	89562	82828	77387	72872	69048	65755	62880
125	189986	170030	155191	143603	134231	126448	119851	114168	109205
150	303395	271792	248247	229834	214926	202537	192029	182972	175059
DN	65	70	75	80	85	90	100	120	140
15	402	386	372	359	347	337	318	287	264
20	896	861	830	801	776	752	710	643	591
25	1673	1608	1550	1497	1449	1405	1328	1203	1107
32	3530	3394	3272	3162	3061	2970	2807	2546	2344
40	5306	5102	4920	4754	4604	4467	4224	3833	3530
50	9896	9519	9180	8874	8595	8340	7889	7163	6600
65	19685	18940	18270	17665	17114	16609	15717	14281	13166
80	30103	28967	27947	27025	26185	25416	24056	21867	20167
100	60343	58082	56051	54212	52538	51006	48293	43925	40532
125	104823	100916	97405	94227	91333	88683	83990	76430	70554
150	168069	161836	156232	151158	146537	142304	134807	122724	113328
DN	160	180	200	220	240	260	280	300	320
15	245	229	216	205	195	187	179	172	166
20	549	515	486	461	439	420	403	388	374
25	1029	965	911	865	825	789	758	729	704
32	2181	2047	1934	1836	1751	1677	1610	1551	1497
40	3286	3084	2914	2768	2641	2529	2429	2340	2259
50	6148	5773	5457	5186	4949	4741	4555	4389	4239
65	12269	11527	10900	10362	9892	9479	9111	8781	8483
80	18798	17666	16709	15887	15170	14539	13977	13473	13017
100	37798	35536	33623	31979	30547	29284	28160	27151	26239
125	65819	61898	58583	55733	53248	51058	49107	47357	45774
150	105753	99479	94173	89610	85632	82123	78999	76194	73658

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.27 — Natural gas — Flow through — Steel pipe (AS 1074 Medium), (MJ/h) (Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	4181	2960	2411	2082	1857	1691	1561	1457	1371
20	9112	6483	5292	4575	4085	3722	3439	3211	3022
25	16698	11938	9763	8451	7551	6884	6364	5945	5597
32	34401	24773	20317	17616	15757	14376	13300	12430	11708
40	50970	36881	30303	26302	23542	21490	19889	18594	17518
50	92760	67714	55826	48544	43502	39746	36808	34430	32453
65	178745	132072	109397	95371	85604	78303	72579	67937	64072
80	267186	199187	165569	144616	129965	118982	110356	103348	97509
100	512779	388898	325514	285405	257114	235787	218968	205265	193823
125	855001	658892	555229	488638	441258	405335	376891	353648	334193
150	1317038	1030564	874254	772315	699131	643316	598936	562554	532027
DN	20	25	30	35	40	45	50	55	60
15	1298	1155	1050	968	902	848	802	762	728
20	2862	2550	2320	2141	1996	1877	1776	1689	1614
25	5303	4728	4303	3973	3707	3486	3300	3140	3000
32	11097	9901	9017	8330	7776	7316	6928	6594	6302
40	16607	14825	13506	12481	11653	10967	10387	9888	9452
50	30776	27494	25063	23170	21643	20376	19304	18381	17576
65	60791	54358	49587	45867	42862	40369	38258	36440	34853
80	92547	82808	75575	69932	65370	61584	58376	55612	53200
100	184080	164913	150644	139491	130464	122964	116604	111123	106334
125	317597	284869	260443	241316	225815	212922	201981	192544	184296
150	505936	454352	415749	385464	360885	340421	323038	308035	294914
DN	65	70	75	80	85	90	100	120	140
15	698	671	646	624	605	586	554	502	462
20	1547	1488	1434	1386	1342	1302	1231	1117	1029
25	2877	2767	2668	2579	2498	2424	2293	2082	1918
32	6045	5816	5611	5425	5255	5101	4827	4386	4043
40	9068	8726	8418	8140	7887	7656	7246	6587	6075
50	16865	16232	15663	15149	14681	14252	13493	12272	11323
65	33452	32204	31082	30067	29143	28297	26799	24387	22512
80	51070	49171	47465	45921	44514	43227	40947	37273	34418
100	102104	98332	94941	91871	89075	86513	81977	74664	68976
125	177006	170503	164655	159359	154533	150111	142278	129643	119812
150	283312	272958	263642	255203	247511	240463	227970	207810	192114
DN	160	180	200	220	240	260	280	300	320
15	430	403	381	361	345	330	317	305	294
20	958	899	849	807	769	737	708	682	658
25	1787	1678	1586	1507	1438	1377	1323	1275	1231
32	3768	3540	3348	3182	3038	2911	2798	2697	2605
40	5662	5321	5033	4785	4570	4379	4210	4058	3921
50	10559	9927	9392	8933	8532	8179	7865	7583	7328
65	21002	19752	18695	17786	16994	16295	15673	15115	14610
80	32117	30212	28600	27215	26007	24942	23993	23142	22372
100	64390	60591	57378	54614	52203	50077	48184	46484	44946
125	111881	105310	99749	94964	90791	87109	83830	80885	78221
150	179446	168946	160058	152409	145736	139848	134603	129891	125629

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.28 — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	191	127	100	85	76	69	64	60	57
20	264	176	139	117	103	94	87	81	76
23	405	271	214	180	158	142	130	120	113
25	508	340	269	227	199	179	163	151	141
32	1002	673	533	451	396	356	325	301	281
40	1828	1232	976	827	727	654	598	554	517
50	3368	2275	1806	1533	1349	1215	1112	1029	962
75	10042	6813	5423	4610	4063	3664	3357	3111	2910
90	16220	11023	8784	7472	6590	5946	5450	5053	4727
110	27746	18891	15069	12830	11322	10220	9372	8693	8135
DN	20	25	30	35	40	45	50	55	60
18	54	48	44	40	35	31	28	26	24
20	73	65	59	55	51	48	45	41	38
23	107	96	87	81	76	71	68	65	62
25	132	118	108	100	93	88	83	79	76
32	264	231	208	189	175	164	155	148	142
40	486	427	384	350	324	302	284	268	255
50	905	795	715	654	605	565	531	502	477
75	2740	2412	2173	1989	1843	1722	1621	1534	1459
90	4453	3923	3536	3239	3001	2805	2641	2501	2379
110	7665	6757	6095	5585	5177	4842	4561	4320	4111
DN	65	70	75	80	85	90	100	120	140
18	22	20	—	—	—	—	—	—	—
20	35	32	30	28	27	25	23	—	—
23	59	57	55	53	50	47	42	35	30
25	73	70	68	66	64	62	59	49	42
32	136	131	127	123	119	116	110	100	93
40	243	233	223	215	208	202	191	175	162
50	455	436	419	403	389	376	353	317	289
75	1393	1334	1282	1235	1193	1154	1085	976	892
90	2272	2178	2093	2017	1947	1884	1773	1596	1460
110	3927	3764	3619	3488	3369	3261	3070	2765	2530
DN	160	180	200	220	240	260	280	300	320
18	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
23	—	—	—	—	—	—	—	—	—
25	37	33	30	—	—	—	—	—	—
32	87	82	78	73	67	62	57	53	50
40	151	143	135	129	123	119	114	110	107
50	268	251	238	227	217	209	201	195	188
75	825	770	724	685	650	621	594	570	549
90	1351	1262	1187	1122	1067	1018	975	936	902
110	2343	2189	2060	1950	1854	1770	1695	1629	1569

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.29 — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	292	195	154	130	114	102	93	87	82
20	405	271	214	181	158	142	130	120	112
23	618	415	328	278	244	219	200	185	172
25	775	521	412	349	306	275	251	233	217
32	1522	1026	814	690	606	546	499	462	431
40	2769	1871	1486	1261	1110	1000	915	847	792
50	5087	3447	2742	2329	2052	1849	1694	1569	1467
75	15101	10277	8193	6973	6151	5551	5089	4719	4415
90	24345	16598	13247	11282	9958	8990	8245	7649	7158
110	41550	28389	22682	19332	17073	15422	14150	13131	12293
DN	20	25	30	35	40	45	50	55	60
18	78	70	63	59	55	52	49	47	45
20	105	94	85	79	74	70	66	63	60
23	162	142	128	117	109	103	98	93	89
25	204	179	160	147	136	127	120	115	110
32	406	356	320	292	270	252	237	224	213
40	745	655	589	539	498	465	437	414	393
50	1381	1215	1094	1001	927	866	815	771	733
75	4160	3665	3305	3027	2806	2623	2470	2339	2225
90	6746	5948	5365	4917	4559	4264	4016	3804	3620
110	11588	10224	9228	8460	7847	7342	6918	6555	6240
DN	65	70	75	80	85	90	100	120	140
18	43	42	39	37	35	33	29	25	21
20	58	56	54	52	51	49	47	39	34
23	86	83	80	77	75	73	69	63	58
25	105	102	98	95	92	90	85	78	72
32	203	194	186	180	173	168	159	145	134
40	375	359	345	332	320	310	291	261	238
50	700	670	644	620	598	579	544	489	447
75	2126	2037	1958	1887	1822	1763	1660	1494	1367
90	3459	3316	3188	3073	2968	2873	2705	2436	2230
110	5963	5718	5498	5301	5121	4958	4669	4209	3855
DN	160	180	200	220	240	260	280	300	320
18	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	—	—	—	—
23	55	49	44	40	37	34	32	—	—
25	67	63	60	56	51	47	44	41	38
32	125	118	112	107	102	98	95	92	89
40	220	206	195	186	178	171	165	159	154
50	413	385	362	342	325	310	297	285	274
75	1265	1182	1112	1052	1000	954	914	878	845
90	2065	1930	1816	1719	1635	1561	1495	1437	1384
110	3572	3339	3143	2976	2831	2704	2591	2490	2400

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.30 — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	550	370	293	248	217	195	179	165	154
20	759	511	405	343	302	271	248	229	214
23	1157	781	619	525	462	416	380	352	329
25	1447	978	776	658	579	521	477	442	413
32	2829	1917	1525	1295	1140	1028	941	872	815
40	5122	3481	2772	2357	2078	1874	1717	1591	1488
50	9371	6387	5094	4336	3825	3452	3165	2935	2746
75	27587	18908	15122	12894	11391	10291	9442	8764	8205
90	44295	30443	24378	20804	18389	16621	15257	14165	13265
110	75219	51879	41606	35539	31434	28427	26106	24245	22713
DN	20	25	30	35	40	45	50	55	60
18	145	127	114	104	96	90	85	81	78
20	201	177	159	145	134	125	117	111	105
23	309	271	244	223	206	192	181	171	162
25	388	341	307	280	259	242	227	215	204
32	767	675	607	555	514	480	452	427	406
40	1401	1234	1111	1017	942	881	829	784	746
50	2587	2279	2055	1882	1744	1631	1535	1454	1383
75	7734	6824	6160	5648	5238	4901	4618	4376	4165
90	12508	11042	9971	9146	8486	7942	7485	7094	6755
110	21423	18924	17097	15688	14561	13633	12852	12184	11604
DN	65	70	75	80	85	90	100	120	140
18	75	72	70	67	65	64	60	55	51
20	101	97	94	91	88	86	81	74	69
23	155	148	142	137	132	128	120	109	101
25	195	186	179	172	166	161	151	136	125
32	388	371	357	343	331	321	301	271	247
40	712	682	656	632	610	590	555	499	456
50	1321	1266	1217	1173	1132	1096	1031	928	849
75	3981	3817	3670	3538	3419	3309	3117	2809	2573
90	6457	6193	5956	5743	5549	5373	5062	4565	4183
110	11094	10642	10238	9873	9542	9240	8708	7858	7203
DN	160	180	200	220	240	260	280	300	320
18	48	45	43	40	37	34	32	—	—
20	64	61	57	55	52	50	49	47	45
23	95	89	85	81	77	74	72	69	67
25	117	110	104	99	95	91	88	85	82
32	228	213	200	189	180	172	165	159	154
40	422	394	370	350	332	317	304	291	280
50	786	734	690	653	621	592	567	545	525
75	2384	2229	2098	1986	1890	1805	1729	1662	1601
90	3877	3626	3414	3234	3077	2939	2818	2708	2610
110	6679	6248	5886	5577	5308	5072	4863	4676	4507

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.31 — Natural gas — Flow through — Polyamide pipe, (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)**

Nom diam	Length of straight pipe in metres								
DN	2	4	6	8	10	12	14	16	18
18	816	551	437	370	326	293	268	248	232
20	1125	761	604	512	451	406	371	344	321
23	1711	1159	921	782	689	621	568	526	492
25	2137	1450	1153	980	863	778	712	660	616
32	4164	2835	2259	1921	1694	1528	1400	1298	1213
40	7514	5133	4097	3488	3078	2778	2547	2362	2210
50	13696	9391	7508	6400	5652	5105	4683	4345	4067
75	39996	27644	22179	18946	16757	15153	13914	12921	12103
90	63940	44386	35674	30506	27000	24428	22440	20846	19533
110	107970	75375	60716	51985	46051	41691	38318	35612	33379
DN	20	25	30	35	40	45	50	55	60
18	218	191	172	157	145	135	127	120	114
20	302	265	239	218	202	188	177	167	159
23	463	407	366	335	310	289	272	257	244
25	580	510	459	420	389	363	342	323	307
32	1143	1006	906	830	769	718	676	640	609
40	2082	1835	1654	1515	1404	1313	1236	1171	1114
50	3833	3381	3050	2795	2592	2424	2284	2163	2059
75	11414	10080	9104	8352	7750	7255	6838	6482	6172
90	18426	16281	14712	13502	12534	11736	11065	10490	9992
110	31498	27850	25179	23118	21467	20107	18962	17983	17132
DN	65	70	75	80	85	90	100	120	140
18	109	104	100	96	93	90	85	78	72
20	152	145	139	134	129	125	118	106	97
23	233	223	215	207	199	193	181	163	148
25	293	281	270	260	251	242	228	205	187
32	581	557	535	515	497	481	453	407	372
40	1064	1020	980	944	912	882	830	748	684
50	1967	1886	1813	1748	1688	1634	1538	1386	1269
75	5900	5659	5443	5249	5072	4911	4627	4174	3825
90	9554	9165	8817	8503	8218	7959	7501	6769	6205
110	16384	15720	15126	14590	14104	13660	12878	11628	10664
DN	160	180	200	220	240	260	280	300	320
18	68	64	60	58	55	53	51	49	48
20	91	86	81	78	74	71	69	66	64
23	137	128	121	115	110	105	101	98	95
25	173	161	151	143	136	130	125	121	117
32	344	321	302	286	271	259	248	238	229
40	633	591	556	526	500	477	457	439	423
50	1175	1098	1033	978	930	888	851	817	787
75	3546	3316	3123	2958	2815	2690	2578	2479	2389
90	5755	5384	5072	4806	4574	4371	4191	4030	3885
110	9893	9259	8726	8270	7874	7526	7218	6942	6693

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.32 — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 10 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	5330	3688	2958	2525	2232	2018	1852	1719	1609
20	7281	5055	4060	3469	3069	2775	2547	2365	2215
23	10928	7625	6136	5249	4646	4203	3861	3586	3360
25	13556	9486	7642	6542	5793	5243	4817	4475	4193
32	25795	18232	14746	12650	11218	10163	9345	8688	8145
40	45457	32477	26377	22680	20143	18267	16811	15639	14669
50	80560	58319	47608	41049	36522	33164	30549	28440	26694
75	221086	164864	136208	118214	105619	96188	88796	82807	77831
90	342033	259060	215451	187678	168075	153319	141710	132277	124421
110	554330	427978	358971	314201	282255	258034	238880	223257	210207
DN	20	25	30	35	40	45	50	55	60
18	1517	1339	1208	1108	1027	961	906	858	817
20	2089	1844	1665	1527	1416	1326	1249	1184	1127
23	3169	2799	2529	2320	2153	2015	1899	1800	1714
25	3956	3495	3158	2898	2690	2518	2374	2250	2143
32	7687	6799	6147	5644	5241	4909	4630	4390	4183
40	13851	12261	11094	10192	9469	8872	8370	7940	7566
50	25219	22346	20234	18600	17288	16206	15294	14512	13832
75	73612	65368	59283	54561	50762	47623	44974	42701	40723
90	117751	104686	95020	87506	81454	76449	72221	68591	65431
110	199101	177281	161085	148467	138286	129855	122727	116601	111264
DN	65	70	75	80	85	90	100	120	140
18	780	748	720	694	670	649	611	550	504
20	1077	1033	993	958	925	896	844	760	697
23	1639	1572	1512	1458	1409	1364	1285	1159	1062
25	2049	1965	1890	1823	1762	1706	1607	1450	1329
32	4000	3838	3692	3562	3443	3334	3143	2837	2602
40	7237	6945	6684	6448	6234	6039	5694	5143	4719
50	13235	12704	12229	11800	11410	11055	10428	9424	8650
75	38982	37435	36049	34797	33660	32621	30788	27851	25583
90	62648	60174	57956	55953	54133	52470	49534	44828	41193
110	106562	102380	98628	95239	92158	89342	84369	76391	70224
DN	160	180	200	220	240	260	280	300	320
18	467	436	411	389	370	353	338	325	313
20	645	603	568	538	512	489	468	450	434
23	984	921	867	821	781	746	715	688	663
25	1232	1152	1085	1028	978	935	896	862	830
32	2413	2258	2128	2017	1920	1835	1759	1692	1631
40	4379	4099	3864	3662	3488	3334	3198	3076	2966
50	8030	7519	7090	6723	6403	6123	5874	5652	5451
75	23766	22269	21009	19929	18991	18167	17435	16780	16190
90	38278	35876	33853	32120	30614	29290	28115	27063	26113
110	65277	61198	57762	54817	52258	50008	48009	46219	44605

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.33 — Natural gas — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 20 kPa; suitable for supply pressures around 140 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	5330	3688	2958	2525	2232	2018	1852	1719	1609
20	7281	5055	4060	3469	3069	2775	2547	2365	2215
23	10928	7625	6136	5249	4646	4203	3861	3586	3360
25	13556	9486	7642	6542	5793	5243	4817	4475	4193
32	25795	18232	14746	12650	11218	10163	9345	8688	8145
40	45457	32477	26377	22680	20143	18267	16811	15639	14669
50	80560	58319	47608	41049	36522	33164	30549	28440	26694
75	221086	164864	136208	118214	105619	96188	88796	82807	77831
90	342033	259060	215451	187678	168075	153319	141710	132277	124421
110	554330	427978	358971	314201	282255	258034	238880	223257	210207
DN	20	25	30	35	40	45	50	55	60
18	1517	1339	1208	1108	1027	961	906	858	817
20	2089	1844	1665	1527	1416	1326	1249	1184	1127
23	3169	2799	2529	2320	2153	2015	1899	1800	1714
25	3956	3495	3158	2898	2690	2518	2374	2250	2143
32	7687	6799	6147	5644	5241	4909	4630	4390	4183
40	13851	12261	11094	10192	9469	8872	8370	7940	7566
50	25219	22346	20234	18600	17288	16206	15294	14512	13832
75	73612	65368	59283	54561	50762	47623	44974	42701	40723
90	117751	104686	95020	87506	81454	76449	72221	68591	65431
110	199101	177281	161085	148467	138286	129855	122727	116601	111264
DN	65	70	75	80	85	90	100	120	140
18	780	748	720	694	670	649	611	550	504
20	1077	1033	993	958	925	896	844	760	697
23	1639	1572	1512	1458	1409	1364	1285	1159	1062
25	2049	1965	1890	1823	1762	1706	1607	1450	1329
32	4000	3838	3692	3562	3443	3334	3143	2837	2602
40	7237	6945	6684	6448	6234	6039	5694	5143	4719
50	13235	12704	12229	11800	11410	11055	10428	9424	8650
75	38982	37435	36049	34797	33660	32621	30788	27851	25583
90	62648	60174	57956	55953	54133	52470	49534	44828	41193
110	106562	102380	98628	95239	92158	89342	84369	76391	70224
DN	160	180	200	220	240	260	280	300	320
18	467	436	411	389	370	353	338	325	313
20	645	603	568	538	512	489	468	450	434
23	984	921	867	821	781	746	715	688	663
25	1232	1152	1085	1028	978	935	896	862	830
32	2413	2258	2128	2017	1920	1835	1759	1692	1631
40	4379	4099	3864	3662	3488	3334	3198	3076	2966
50	8030	7519	7090	6723	6403	6123	5874	5652	5451
75	23766	22269	21009	19929	18991	18167	17435	16780	16190
90	38278	35876	33853	32120	30614	29290	28115	27063	26113
110	65277	61198	57762	54817	52258	50008	48009	46219	44605

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.34 — Natural gas — Flow through — Polyethylene pipe(AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	116	77	63	54	49	44	41	38	36
25	281	187	148	125	109	99	92	86	81
32	684	459	362	306	269	242	221	204	190
40	1265	851	674	571	501	451	412	381	356
50	2330	1571	1246	1057	929	837	765	708	662
63	4367	2953	2346	1991	1753	1580	1446	1339	1252
75	7061	4784	3805	3233	2848	2567	2351	2179	2037
90	11438	7763	6181	5256	4633	4179	3829	3549	3319
110	19721	13412	10691	9098	8025	7242	6639	6157	5760
160	53321	36388	29062	24766	21869	19753	18122	16817	15743
DN	20	25	30	35	40	45	50	55	60
20	34	28	23	20	17	15	14	13	11
25	77	69	63	58	54	51	48	45	41
32	179	157	141	131	122	115	109	104	100
40	334	293	263	240	222	207	195	184	176
50	622	547	491	449	415	387	364	344	327
63	1178	1036	932	852	789	736	693	655	623
75	1918	1687	1520	1390	1287	1203	1132	1071	1018
90	3126	2753	2480	2271	2104	1966	1850	1752	1666
110	5427	4782	4311	3949	3660	3422	3223	3052	2903
160	14840	13093	11817	10834	10048	9402	8858	8393	7990
DN	65	70	75	80	85	90	100	120	140
20	—	—	—	—	—	—	—	—	—
25	38	35	33	31	29	28	25	21	—
32	96	92	89	86	84	82	77	71	65
40	169	163	157	152	148	144	136	124	115
50	312	299	287	276	266	257	242	219	202
63	594	569	546	526	508	491	461	414	378
75	972	931	894	861	831	804	756	680	621
90	1591	1524	1465	1411	1362	1318	1240	1115	1020
110	2773	2658	2555	2462	2378	2301	2166	1950	1784
160	7636	7322	7041	6788	6558	6348	5979	5389	4936
DN	160	180	200	220	240	260	280	300	320
20	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—
32	57	51	46	42	38	35	33	30	—
40	108	101	96	92	88	84	81	75	71
50	189	178	169	161	155	148	143	138	134
63	350	326	307	290	277	266	256	248	240
75	574	536	503	476	452	431	413	396	381
90	943	881	828	783	744	710	680	653	628
110	1651	1542	1451	1372	1305	1245	1193	1146	1103
160	4573	4275	4025	3811	3625	3463	3318	3189	3073

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.35 — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	178	119	94	79	70	64	59	55	52
25	430	288	227	192	169	151	138	128	119
32	1041	701	555	470	413	371	339	314	293
40	1920	1295	1028	871	767	690	631	584	546
50	3525	2385	1895	1609	1416	1276	1168	1082	1011
63	6589	4469	3557	3023	2664	2402	2200	2039	1907
75	10634	7227	5757	4897	4318	3895	3570	3310	3096
90	17191	11705	9335	7946	7010	6327	5801	5380	5034
110	29575	20180	16112	13726	12117	10942	10036	9312	8716
160	79620	54549	43643	37232	32904	29739	27298	25344	23735
DN	20	25	30	35	40	45	50	55	60
20	50	44	40	37	35	32	29	26	24
25	112	99	90	84	78	74	70	67	64
32	276	242	217	198	183	171	161	152	145
40	513	451	405	371	343	320	301	284	270
50	952	837	753	689	637	595	560	530	503
63	1795	1580	1423	1303	1206	1127	1061	1004	955
75	2916	2568	2315	2120	1964	1836	1728	1636	1556
90	4743	4180	3769	3453	3201	2993	2819	2669	2540
110	8214	7245	6536	5991	5555	5197	4896	4638	4414
160	22381	19760	17845	16370	15189	14218	13401	12702	12095
DN	65	70	75	80	85	90	100	120	140
20	—	—	—	—	—	—	—	—	—
25	61	59	57	55	54	52	49	43	37
32	139	133	129	125	121	118	112	102	94
40	257	246	237	228	220	212	200	180	166
50	480	460	442	425	411	397	373	335	306
63	911	873	839	808	780	754	710	638	583
75	1486	1424	1369	1319	1273	1232	1159	1043	954
90	2426	2325	2235	2154	2081	2013	1895	1706	1561
110	4218	4044	3888	3748	3620	3504	3300	2973	2722
160	11563	11090	10667	10286	9940	9624	9068	8180	7496
DN	160	180	200	220	240	260	280	300	320
20	—	—	—	—	—	—	—	—	—
25	32	—	—	—	—	—	—	—	—
32	88	83	79	75	72	69	67	63	59
40	155	147	139	133	127	122	118	114	110
50	283	264	248	234	223	214	207	200	193
63	539	503	473	447	425	405	388	372	358
75	882	824	775	733	696	665	636	611	588
90	1445	1350	1270	1202	1143	1091	1045	1004	966
110	2521	2356	2218	2099	1997	1907	1827	1755	1691
160	6949	6500	6122	5799	5518	5272	5054	4859	4683

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.36 — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	337	226	179	151	132	119	109	100	94
25	806	543	430	365	320	288	264	244	228
32	1940	1312	1043	885	779	702	642	595	556
40	3561	2416	1922	1633	1439	1297	1188	1101	1029
50	6510	4429	3530	3002	2647	2388	2189	2029	1898
63	12115	8267	6598	5618	4958	4476	4104	3806	3562
75	19481	13327	10649	9075	8013	7237	6638	6159	5765
90	31372	21518	17215	14682	12972	11721	10756	9984	9348
110	53716	36964	29616	25282	22352	20207	18552	17226	16134
160	143126	99210	79728	68185	60361	54623	50188	46633	43702
DN	20	25	30	35	40	45	50	55	60
20	88	77	70	65	61	57	54	52	50
25	214	188	169	154	142	133	125	118	112
32	523	460	413	378	350	327	307	290	276
40	969	852	768	702	650	607	572	541	514
50	1787	1574	1418	1299	1203	1125	1059	1002	953
63	3356	2958	2668	2444	2265	2118	1995	1889	1798
75	5434	4792	4324	3963	3675	3438	3239	3068	2920
90	8812	7777	7020	6437	5971	5587	5265	4989	4750
110	15215	13435	12134	11131	10329	9669	9113	8638	8226
160	41234	36450	32949	30249	28087	26306	24808	23525	22411
DN	65	70	75	80	85	90	100	120	140
20	48	46	44	43	42	41	38	35	31
25	107	103	99	96	93	90	86	78	73
32	263	252	242	233	225	217	204	183	167
40	491	470	452	435	420	406	382	343	313
50	910	872	838	807	780	754	710	638	584
63	1717	1646	1582	1525	1473	1425	1342	1208	1105
75	2790	2675	2572	2479	2395	2318	2183	1966	1800
90	4539	4353	4186	4036	3899	3775	3555	3205	2936
110	7863	7542	7254	6995	6760	6545	6167	5563	5098
160	21433	20564	19787	19086	18450	17870	16846	15210	13950
DN	160	180	200	220	240	260	280	300	320
20	—	—	—	—	—	—	—	—	—
25	68	64	61	58	55	53	51	50	48
32	155	145	137	131	125	120	116	112	108
40	290	270	254	240	228	217	208	200	192
50	540	504	474	448	426	406	389	374	360
63	1023	956	899	851	809	772	740	711	684
75	1667	1558	1467	1388	1320	1261	1208	1161	1118
90	2720	2543	2395	2267	2157	2060	1975	1898	1829
110	4726	4420	4163	3944	3753	3585	3437	3304	3185
160	12942	12112	11415	10818	10300	9845	9442	9081	8755

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.37 — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	502	338	268	227	199	179	164	151	141
25	1195	808	642	544	479	431	395	365	341
32	2861	1944	1547	1315	1159	1045	957	887	829
40	5234	3568	2845	2421	2135	1926	1765	1637	1531
50	9536	6523	5210	4438	3918	3537	3243	3009	2815
63	17675	12139	9714	8284	7318	6612	6066	5630	5271
75	28323	19521	15644	13354	11805	10670	9795	9093	8516
90	45432	31437	25234	21562	19074	17250	15841	14712	13782
110	77389	53827	43296	37039	32793	29676	27266	25333	23740
160	203749	143424	115901	99412	88168	79890	73476	68324	64070
DN	20	25	30	35	40	45	50	55	60
20	133	116	105	95	88	82	77	74	70
25	321	282	254	232	215	200	188	178	169
32	780	687	618	566	524	489	460	436	414
40	1442	1270	1145	1048	971	908	854	809	769
50	2653	2338	2109	1932	1791	1675	1577	1494	1421
63	4968	4383	3956	3626	3363	3146	2964	2808	2673
75	8029	7088	6400	5869	5445	5096	4802	4551	4333
90	12999	11481	10371	9515	8831	8267	7793	7387	7034
110	22398	19795	17891	16422	15246	14277	13462	12764	12159
160	60484	53521	48417	44476	41318	38715	36524	34647	33016
DN	65	70	75	80	85	90	100	120	140
20	68	65	63	61	59	57	54	50	46
25	161	154	148	143	138	133	125	112	103
32	395	379	364	350	338	327	308	277	253
40	735	704	676	652	629	609	573	515	471
50	1358	1301	1251	1206	1164	1127	1061	955	874
63	2554	2449	2355	2270	2193	2123	1999	1802	1650
75	4142	3972	3820	3683	3558	3445	3245	2926	2680
90	6725	6450	6205	5983	5782	5599	5276	4759	4362
110	11626	11154	10731	10350	10004	9689	9132	8243	7558
160	31583	30310	29171	28144	27211	26360	24858	22457	20606
DN	160	180	200	220	240	260	280	300	320
20	43	41	39	37	35	33	31	—	—
25	96	91	86	82	78	75	73	70	68
32	234	218	205	194	184	175	168	161	155
40	436	407	383	362	344	328	314	302	290
50	809	756	711	673	640	611	585	562	541
63	1528	1428	1344	1273	1211	1156	1108	1064	1025
75	2484	2323	2187	2071	1971	1882	1804	1734	1671
90	4044	3783	3563	3375	3212	3069	2942	2828	2726
110	7010	6559	6180	5856	5575	5328	5108	4912	4736
160	19125	17906	16881	16003	15241	14572	13978	13447	12968

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.38 — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe in metres								
DN	2	4	6	8	10	12	14	16	18
20	1895	1295	1034	880	776	700	641	595	556
25	4437	3053	2444	2084	1840	1662	1524	1414	1324
32	10428	7238	5813	4967	4393	3972	3647	3386	3171
40	18799	13145	10588	9062	8024	7261	6671	6198	5807
50	33677	23756	19200	16464	14597	13222	12156	11300	10593
63	61167	43623	35406	30432	27022	24503	22546	20972	19671
75	96278	69348	56501	48666	43271	39274	36164	33659	31586
90	151308	110238	90221	77900	69372	63033	58090	54101	50795
110	251014	185606	152812	132374	118127	107489	99168	92435	86846
160	623474	476121	397404	346881	311058	284011	262687	245332	230861
DN	20	25	30	35	40	45	50	55	60
20	524	461	416	380	352	329	310	293	279
25	1248	1100	992	909	843	788	742	703	669
32	2991	2640	2384	2186	2028	1898	1788	1695	1613
40	5478	4840	4373	4013	3724	3487	3287	3116	2967
50	9997	8840	7992	7338	6814	6382	6018	5706	5436
63	18573	16439	14873	13663	12693	11893	11219	10642	10140
75	29834	26426	23923	21986	20433	19151	18071	17146	16341
90	48000	42553	38546	35443	32951	30894	29161	27675	26382
110	82113	72874	66062	60781	56535	53028	50070	47532	45324
160	218562	194442	176572	162667	151460	142185	134349	127618	121756
DN	65	70	75	80	85	90	100	120	140
20	266	255	245	236	228	221	208	187	171
25	639	613	589	568	548	531	499	450	412
32	1542	1479	1422	1371	1325	1282	1208	1089	997
40	2837	2721	2617	2524	2439	2362	2226	2008	1840
50	5198	4987	4799	4628	4474	4333	4084	3686	3380
63	9700	9308	8958	8642	8355	8093	7631	6892	6323
75	15634	15006	14444	13936	13476	13055	12313	11126	10211
90	25246	24236	23331	22515	21774	21098	19904	17992	16518
110	43382	41656	40109	38713	37445	36287	34243	30969	28443
160	116593	112002	107885	104167	100788	97699	92246	83502	76745
DN	160	180	200	220	240	260	280	300	320
20	158	147	138	131	124	119	114	109	105
25	381	356	335	317	301	288	275	265	255
32	924	864	813	770	733	700	671	645	621
40	1706	1595	1503	1423	1355	1294	1241	1193	1150
50	3135	2934	2764	2619	2494	2383	2285	2197	2118
63	5867	5492	5177	4907	4673	4467	4284	4121	3974
75	9478	8875	8367	7933	7556	7224	6930	6667	6430
90	15337	14365	13547	12846	12238	11703	11229	10805	10422
110	26419	24751	23348	22146	21102	20184	19370	18641	17983
160	71327	66861	63099	59875	57074	54611	52425	50466	48700

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.39 — Natural gas — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	3322	2288	1832	1562	1380	1246	1143	1061	993
25	7717	5361	4307	3681	3256	2944	2703	2510	2351
32	17967	12624	10187	8728	7734	7002	6436	5981	5605
40	32144	22809	18476	15863	14076	12757	11734	10911	10231
50	57078	40982	33348	28704	25510	23146	21308	19828	18604
63	102590	74737	61163	52808	47026	42728	39376	36671	34430
75	160025	118091	97145	84113	75037	68265	62970	58687	55133
90	248999	186438	154295	134039	119829	109175	100817	94040	88406
110	408053	311165	259552	226469	203031	185344	171405	160064	150610
160	989063	783235	664823	585944	528752	484922	449994	421339	397297
DN	20	25	30	35	40	45	50	55	60
20	936	825	744	682	632	591	557	527	502
25	2217	1957	1767	1621	1504	1407	1326	1257	1196
32	5289	4675	4225	3878	3600	3372	3179	3014	2871
40	9658	8544	7728	7097	6592	6175	5824	5524	5263
50	17570	15558	14082	12940	12023	11268	10632	10086	9612
63	32535	28842	26125	24021	22332	20938	19762	18755	17879
75	52124	46251	41922	38567	35870	33642	31763	30152	28750
90	83627	74284	67384	62026	57715	54152	51145	48563	46317
110	142576	126824	115156	106079	98765	92712	87599	83206	79382
160	376761	336229	305993	282353	263233	247365	233930	222368	212284
DN	65	70	75	80	85	90	100	120	140
20	480	460	442	426	411	398	375	338	309
25	1144	1097	1055	1017	982	951	896	808	740
32	2745	2633	2533	2443	2361	2287	2155	1945	1783
40	5033	4829	4647	4483	4334	4197	3957	3573	3277
50	9196	8826	8494	8195	7924	7676	7239	6540	6001
63	17108	16424	15811	15257	14755	14296	13487	12191	11192
75	27517	26421	25439	24553	23748	23013	21715	19638	18034
90	44340	42582	41007	39585	38293	37113	35030	31691	29114
110	76013	73018	70332	67906	65702	63687	60130	54427	50020
160	203392	195475	188370	181948	176106	170764	161323	146165	134435
DN	160	180	200	220	240	260	280	300	320
20	286	267	251	238	226	216	207	199	191
25	686	641	603	571	544	519	498	478	461
32	1653	1547	1457	1380	1314	1255	1204	1157	1116
40	3040	2845	2682	2541	2420	2313	2218	2133	2057
50	5570	5215	4916	4661	4439	4244	4071	3916	3776
63	10392	9733	9178	8704	8291	7929	7608	7320	7060
75	16750	15692	14801	14038	13376	12794	12277	11815	11398
90	27048	25346	23913	22686	21619	20682	19850	19105	18433
110	46487	43574	41121	39019	37192	35586	34161	32884	31732
160	125018	117249	110700	105086	100204	95911	92097	88680	85597

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.40 — Natural gas — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h) (Pressure drop of 0.12 kPa; suitable for supply pressures around 1.25 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	241	160	126	107	94	86	80	74	70
20	461	308	243	205	180	162	148	136	127
25	947	636	503	426	374	336	307	284	265
32	1925	1297	1028	872	766	690	631	584	545
40	2748	1855	1472	1248	1098	989	905	838	782
50	5107	3456	2747	2332	2054	1851	1694	1569	1467
65	9499	6443	5128	4359	3842	3464	3174	2941	2751
80	14726	10005	7970	6779	5978	5393	4943	4583	4287
100	28870	19660	15683	13353	11784	10638	9755	9049	8468
125	50058	34153	27274	23240	20521	18534	17003	15778	14770
150	71071	48549	38796	33073	29214	26393	24219	22479	21047
DN	20	25	30	35	40	45	50	55	60
15	67	60	54	50	47	44	40	36	33
20	120	108	98	91	85	80	76	73	69
25	249	218	196	179	166	156	147	141	135
32	513	450	404	369	342	319	299	283	269
40	736	647	581	531	492	459	431	408	387
50	1381	1214	1093	1000	925	864	813	769	731
65	2590	2280	2054	1880	1741	1627	1531	1449	1378
80	4038	3557	3206	2936	2720	2543	2394	2266	2156
100	7980	7035	6345	5815	5390	5042	4748	4498	4280
125	13922	12282	11084	10162	9424	8818	8308	7872	7493
150	19843	17511	15809	14497	13449	12586	11860	11239	10701
DN	65	70	75	80	85	90	100	120	140
15	30	28	26	25	23	22	20	—	—
20	67	64	62	60	58	57	51	43	37
25	129	125	120	117	113	110	104	95	88
32	256	245	236	227	219	212	201	183	170
40	370	354	340	327	315	305	286	257	236
50	698	668	642	618	596	577	542	487	445
65	1316	1261	1211	1167	1127	1090	1025	922	843
80	2059	1973	1896	1827	1764	1707	1606	1445	1322
100	4089	3920	3769	3632	3508	3395	3197	2879	2635
125	7161	6866	6602	6365	6149	5952	5606	5053	4627
150	10228	9808	9433	9095	8788	8508	8014	7226	6620
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	32	—	—	—	—	—	—	—	—
25	82	78	74	67	61	57	53	49	46
32	159	150	142	135	130	124	120	116	112
40	221	208	197	188	180	173	167	161	156
50	411	383	360	340	324	309	297	286	277
65	779	727	684	646	614	586	561	538	518
80	1223	1142	1074	1016	966	922	882	847	816
100	2440	2280	2146	2031	1931	1844	1766	1697	1634
125	4287	4008	3773	3572	3398	3245	3110	2989	2880
150	6135	5737	5402	5116	4867	4649	4456	4283	4128

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.41 — Natural gas — flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h) (Pressure drop of 0.25 kPa; suitable for supply pressures within the range 1.5–2.5 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	368	247	195	164	144	129	118	109	102
20	703	472	373	316	277	249	228	211	196
25	1439	970	769	651	573	515	471	436	407
32	2915	1971	1565	1328	1169	1053	964	893	834
40	4155	2813	2236	1899	1672	1507	1380	1278	1195
50	7701	5227	4161	3538	3118	2812	2576	2388	2233
65	14289	9722	7750	6595	5817	5249	4812	4462	4175
80	22111	15070	12025	10239	9037	8158	7481	6940	6494
100	43226	29539	23603	20118	17768	16050	14726	13667	12795
125	74768	51211	40967	34946	30882	27910	25618	23783	22272
150	105980	72702	58203	49673	43912	39698	36447	33843	31700
DN	20	25	30	35	40	45	50	55	60
15	96	86	78	73	68	64	61	58	55
20	185	162	145	133	123	116	110	105	100
25	383	336	302	276	255	238	224	211	201
32	785	690	621	568	525	490	461	436	414
40	1125	989	890	815	754	704	662	627	596
50	2103	1851	1668	1527	1414	1321	1244	1177	1119
65	3933	3465	3124	2862	2652	2480	2335	2211	2103
80	6120	5395	4866	4459	4134	3866	3642	3449	3282
100	12061	10642	9605	8807	8168	7643	7202	6824	6496
125	21001	18541	16743	15358	14250	13338	12571	11915	11346
150	29896	26403	23850	21883	20308	19013	17923	16991	16181
DN	65	70	75	80	85	90	100	120	140
15	53	51	50	48	47	45	41	34	30
20	96	93	90	87	84	82	78	71	66
25	191	183	176	170	164	159	151	137	127
32	395	379	364	350	338	327	307	275	251
40	569	544	523	504	486	470	442	397	363
50	1069	1024	984	948	915	885	833	749	684
65	2009	1925	1851	1783	1722	1667	1568	1412	1291
80	3136	3006	2890	2785	2690	2604	2451	2208	2021
100	6208	5953	5725	5519	5332	5162	4862	4383	4014
125	10846	10402	10005	9647	9323	9027	8505	7671	7029
150	15470	14839	14275	13766	13304	12883	12141	10954	10041
DN	160	180	200	220	240	260	280	300	320
15	26	23	21	19	17	16	15	14	13
20	61	58	53	48	44	41	38	36	33
25	119	112	106	102	97	93	90	87	84
32	232	217	205	195	187	180	173	167	162
40	335	312	294	277	264	252	241	233	225
50	633	591	555	525	499	476	456	438	421
65	1195	1116	1050	994	944	901	863	829	798
80	1871	1748	1645	1557	1481	1414	1354	1301	1253
100	3719	3477	3274	3100	2949	2816	2699	2594	2499
125	6516	6094	5740	5437	5174	4943	4738	4555	4390
150	9310	8710	8205	7773	7399	7070	6778	6517	6282

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.42 — Natural gas — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h) (Pressure drop of 0.75 kPa; suitable for supply pressures within the range 2.75–5kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	692	466	369	312	275	247	226	209	195
20	1313	887	704	597	525	473	432	400	374
25	2674	1812	1441	1224	1078	971	889	824	770
32	5391	3665	2919	2482	2188	1973	1808	1676	1567
40	7665	5219	4161	3540	3122	2817	2582	2394	2239
50	14143	9659	7712	6569	5798	5234	4800	4453	4167
65	26115	17893	14308	12199	10776	9735	8932	8290	7761
80	40265	27657	22141	18892	16697	15090	13851	12858	12041
100	78223	53966	43285	36976	32706	29579	27164	25229	23635
125	134504	93184	74870	64023	56672	51280	47115	43775	41023
150	189844	131923	106124	90813	80425	72801	66907	62179	58282
DN	20	25	30	35	40	45	50	55	60
15	183	161	144	132	122	114	107	101	96
20	352	309	278	254	235	219	206	195	185
25	725	637	574	525	486	453	427	403	384
32	1476	1300	1171	1072	993	928	873	827	786
40	2109	1858	1675	1534	1421	1328	1251	1184	1126
50	3927	3462	3122	2861	2652	2481	2336	2213	2106
65	7316	6454	5825	5341	4953	4635	4367	4137	3938
80	11353	10022	9049	8299	7700	7206	6791	6436	6128
100	22293	19693	17792	16327	15154	14189	13376	12681	12078
125	38705	34211	30924	28388	26358	24686	23280	22075	21030
150	54998	48632	43972	40377	37497	35125	33130	31421	29936
DN	65	70	75	80	85	90	100	120	140
15	92	89	86	83	81	79	75	68	63
20	176	169	162	156	150	145	137	123	114
25	366	351	337	324	313	303	284	255	233
32	751	719	691	666	643	622	585	526	481
40	1076	1031	991	954	922	892	839	755	690
50	2012	1928	1854	1787	1726	1670	1572	1416	1296
65	3764	3609	3470	3345	3232	3129	2947	2656	2432
80	5857	5617	5402	5209	5033	4873	4591	4140	3793
100	11548	11077	10656	10277	9933	9618	9065	8180	7498
125	20111	19296	18566	17908	17311	16766	15805	14269	13086
150	28632	27475	26439	25504	24656	23882	22518	20336	18655
DN	160	180	200	220	240	260	280	300	320
15	59	56	53	50	48	46	44	41	39
20	107	100	95	91	87	84	81	78	75
25	216	201	189	179	170	162	156	151	146
32	445	415	390	369	350	334	320	307	296
40	639	597	561	531	504	481	461	443	426
50	1200	1121	1055	998	949	906	868	834	803
65	2253	2106	1983	1877	1786	1705	1634	1571	1513
80	3515	3287	3095	2931	2789	2664	2554	2455	2366
100	6953	6505	6128	5806	5526	5281	5063	4869	4693
125	12140	11361	10707	10147	9661	9234	8855	8517	8211
150	17310	16203	15272	14476	13785	13178	12639	12157	11723

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.43 — Natural gas — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h) (Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	1026	693	550	467	411	370	338	313	292
20	1940	1316	1046	889	782	705	646	598	559
25	3938	2680	2135	1816	1601	1444	1323	1226	1147
32	7906	5402	4313	3672	3241	2925	2682	2487	2327
40	11216	7680	6137	5230	4617	4169	3824	3547	3320
50	20611	14172	11345	9679	8552	7728	7091	6582	6163
65	37879	26169	20992	17930	15857	14337	13164	12224	11450
80	58176	40347	32416	27714	24525	22187	20379	18931	17736
100	112230	78384	63151	54076	47906	43373	39865	37051	34729
125	191643	134784	108882	93375	82803	75022	68994	64153	60156
150	269115	190241	153981	132193	117310	106340	97834	90997	85351
DN	20	25	30	35	40	45	50	55	60
15	275	242	217	199	184	171	161	152	145
20	526	463	416	381	352	329	309	293	278
25	1080	951	856	784	726	678	638	604	575
32	2193	1932	1742	1596	1479	1383	1302	1233	1173
40	3129	2758	2488	2280	2114	1977	1862	1764	1678
50	5810	5126	4627	4242	3935	3682	3469	3287	3129
65	10798	9535	8612	7900	7331	6862	6468	6130	5837
80	16731	14782	13356	12257	11376	10652	10042	9520	9067
100	32773	28978	26200	24056	22338	20924	19733	18714	17829
125	56787	50245	45451	41750	38783	36339	34281	32518	30987
150	80588	71336	64552	59312	55110	51647	48730	46232	44061
DN	65	70	75	80	85	90	100	120	140
15	138	132	127	122	118	114	107	97	89
20	266	254	244	235	227	219	206	185	169
25	549	526	505	487	470	454	427	384	351
32	1121	1074	1032	995	961	930	875	788	721
40	1603	1537	1477	1424	1375	1331	1253	1129	1033
50	2990	2867	2757	2658	2568	2486	2341	2110	1932
65	5580	5352	5148	4964	4797	4644	4376	3947	3616
80	8669	8316	8000	7715	7457	7221	6805	6141	5629
100	17051	16360	15742	15185	14679	14218	13404	12102	11100
125	29641	28446	27376	26412	25536	24737	23327	21073	19335
150	42153	40458	38941	37573	36331	35197	33197	29997	27531
DN	160	180	200	220	240	260	280	300	320
15	83	79	75	71	68	65	63	61	59
20	156	146	137	130	123	118	114	110	107
25	325	303	285	269	256	244	234	224	216
32	667	623	586	554	527	503	482	463	446
40	956	894	841	796	757	722	692	665	640
50	1790	1674	1575	1492	1419	1355	1299	1248	1202
65	3352	3135	2953	2797	2661	2542	2437	2343	2258
80	5220	4883	4600	4358	4148	3964	3800	3654	3522
100	10298	9638	9083	8608	8196	7835	7514	7226	6968
125	17944	16800	15837	15014	14299	13670	13113	12614	12165
150	25556	23931	22564	21393	20377	19485	18693	17984	17345

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.44 — Propane — Flow through—Copper pipe (AS 1432 Type B) (MJ/h) (Pressure drop of 0.125 kPa; suitable for supply pressures around 3 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	13	—	—	—	—	—	—	—	—
8	28	19	16	13	12	11	—	—	—
10	44	29	24	20	18	17	15	14	14
15	117	78	62	52	46	41	38	35	33
20	406	273	216	183	160	144	132	122	114
25	914	617	489	415	365	328	300	278	260
32	1784	1206	959	814	717	646	591	548	512
40	3038	2059	1638	1392	1226	1106	1013	939	878
50	7107	4830	3849	3275	2889	2607	2390	2216	2073
65	13294	9053	7223	6151	5429	4902	4496	4171	3904
80	*	14505	11584	9871	8716	7873	7223	6703	6275
DN	20	25	30	35	40	45	50	55	60
15	32	28	26	24	22	21	20	19	18
20	107	94	84	77	71	66	63	60	57
25	244	215	193	176	163	152	143	135	128
32	482	424	381	349	323	301	283	268	255
40	826	727	655	599	555	519	488	462	439
50	1953	1721	1552	1421	1317	1232	1160	1098	1045
65	3679	3244	2927	2682	2487	2327	2191	2076	1976
80	5915	5219	4710	4319	4006	3748	3532	3346	3186
100	13289	11735	10599	9724	9023	8447	7963	7548	7188
125	*	*	*	18033	16741	15677	14782	14016	13351
DN	65	70	75	80	85	90	100	120	140
15	—	—	—	—	—	—	—	—	—
20	55	53	51	49	48	47	44	40	37
25	123	117	113	108	105	101	95	86	79
32	243	233	224	215	208	201	189	170	155
40	419	402	386	372	359	347	326	293	268
50	998	956	919	886	855	828	779	701	642
65	1888	1810	1740	1677	1620	1568	1477	1330	1218
80	3045	2919	2807	2707	2615	2532	2384	2149	1969
100	6872	6591	6341	6114	5909	5722	5392	4865	4459
125	12767	12248	11784	11366	10987	10640	10030	9054	8303
150	*	*	*	*	*	*	*	14720	13503
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	35	33	31	—	—	—	—	—	—
25	74	70	66	63	60	58	56	54	52
32	143	134	125	119	113	108	104	100	97
40	248	231	218	206	195	186	178	171	165
50	594	555	522	494	469	448	429	412	397
65	1128	1054	992	939	893	853	817	785	756
80	1824	1705	1606	1520	1446	1381	1324	1272	1226
100	4134	3867	3643	3451	3285	3138	3009	2893	2789
125	7702	7207	6792	6436	6127	5856	5616	5401	5207
150	12530	11729	11055	10479	9978	9539	9149	8800	8486

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.45 — Propane — Flow through — Copper pipe (AS 1432 Type B) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	18	13	11	—	—	—	—	—	—
8	42	28	22	19	17	16	14	13	13
10	66	44	34	29	26	24	22	20	19
15	175	117	93	78	69	62	56	52	48
20	602	406	322	273	240	216	197	183	171
25	1352	914	726	617	543	489	448	415	388
32	2632	1784	1420	1207	1064	959	878	814	761
40	4474	3039	2421	2060	1816	1639	1502	1392	1303
50	10435	7109	5673	4832	4265	3851	3532	3277	3067
65	*	13298	10625	9056	7999	7226	6630	6154	5761
80	*	*	*	14510	12822	11587	10636	9874	9247
DN	20	25	30	35	40	45	50	55	60
15	46	40	37	34	32	30	28	27	26
20	160	141	127	116	107	100	94	89	84
25	365	321	289	264	244	228	215	203	193
32	717	631	568	520	482	450	424	401	381
40	1227	1081	974	892	827	773	727	689	655
50	2890	2548	2299	2107	1954	1828	1722	1631	1552
65	5431	4793	4326	3967	3680	3444	3245	3075	2928
80	8719	7698	6952	6377	5917	5539	5221	4948	4712
100	19541	17266	15602	14320	13294	12449	11739	11130	10602
DN	65	70	75	80	85	90	100	120	140
15	25	24	23	22	22	21	20	—	—
20	80	77	74	71	69	66	63	57	53
25	184	176	169	163	157	152	143	128	117
32	364	349	335	323	312	301	284	255	233
40	626	600	576	555	536	519	488	439	402
50	1483	1422	1367	1318	1273	1232	1160	1045	957
65	2798	2683	2581	2488	2404	2327	2192	1977	1811
80	4504	4320	4156	4007	3872	3749	3533	3187	2920
100	10138	9727	9358	9026	8725	8450	7965	7190	6594
125	*	18039	17359	16746	16190	15682	14787	13355	12252
DN	160	180	200	220	240	260	280	300	320
15	—	—	—	—	—	—	—	—	—
20	49	47	44	42	40	39	37	36	35
25	108	101	95	90	86	82	79	76	74
32	215	201	189	179	170	162	155	149	143
40	372	347	327	309	294	280	268	258	248
50	886	828	779	738	702	670	642	617	594
65	1678	1569	1477	1399	1331	1271	1218	1171	1128
80	2707	2532	2385	2259	2150	2054	1969	1893	1825
100	6116	5724	5394	5111	4866	4651	4460	4289	4136
125	11370	10644	10033	9511	9057	8659	8305	7989	7704
150	*	*	*	15459	14725	14080	13508	12995	12534

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.46 — Propane — Flow through — Copper pipe (AS 1432 Type B) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
6	52	35	28	23	20	18	17	16	15
8	118	79	63	53	46	42	38	35	33
10	185	124	99	83	73	66	60	56	52
15	487	329	261	221	195	176	161	149	139
20	1651	1122	893	760	670	604	553	513	480
25	3674	2506	2000	1703	1503	1356	1244	1154	1079
32	7100	4859	3883	3310	2923	2640	2422	2248	2104
40	11997	8233	6589	5621	4967	4489	4120	3825	3582
50	*	19096	15317	13085	11576	10469	9615	8931	8367
65	*	*	*	*	*	*	17956	16685	15638
DN	20	25	30	35	40	45	50	55	60
15	131	115	103	94	87	82	77	72	69
20	452	398	358	328	304	284	267	253	241
25	1017	897	808	741	687	642	605	573	545
32	1984	1750	1579	1448	1342	1256	1183	1121	1067
40	3377	2981	2691	2468	2290	2143	2020	1914	1822
50	7893	6973	6301	5783	5368	5026	4739	4493	4279
65	14755	13045	11793	10828	10055	9418	8882	8424	8025
80	*	*	*	*	*	15088	14233	13501	12865
DN	65	70	75	80	85	90	100	120	140
15	66	63	60	58	56	54	51	46	42
20	230	220	212	204	197	190	179	161	147
25	521	499	480	462	446	432	407	366	335
32	1020	978	940	906	876	848	798	719	659
40	1742	1671	1607	1549	1497	1449	1365	1231	1128
50	4092	3925	3776	3642	3520	3409	3213	2900	2659
65	7675	7365	7087	6836	6609	6401	6035	5450	4999
80	12306	11810	11365	10965	10601	10269	9684	8748	8027
100	*	*	*	*	*	*	21690	19606	18000
DN	160	180	200	220	240	260	280	300	320
15	39	37	35	33	32	30			
20	136	127	119	113	107	102	98	94	91
25	310	290	273	258	245	234	224	215	207
32	610	570	537	508	483	462	442	425	410
40	1045	977	920	872	829	792	759	730	703
50	2466	2307	2174	2059	1960	1873	1796	1727	1665
65	4638	4341	4091	3878	3693	3530	3385	3256	3140
80	7450	6975	6576	6234	5937	5676	5445	5238	5052
100	16713	15654	14763	14001	13338	12756	12240	11778	11361

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.47 — Propane — Flow through — Copper pipe (AS 1432 Type B) (MJ/h)
(Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	1804	1235	987	841	742	670	615	570	534
20	5994	4141	3322	2837	2509	2268	2083	1934	1811
25	13133	9142	7355	6293	5572	5043	4633	4305	4034
32	*	17535	14151	12129	10751	9738	8953	8323	7804
40	*	*	*	*	*	16450	15134	14076	13202
DN	20	25	30	35	40	45	50	55	60
15	503	443	400	366	340	318	299	283	270
20	1708	1508	1362	1249	1159	1085	1023	969	923
25	3806	3364	3041	2791	2591	2426	2288	2169	2066
32	7365	6515	5892	5411	5026	4708	4441	4212	4013
40	12465	11033	9983	9172	8522	7986	7535	7148	6812
50	*	*	23162	21295	19797	18561	17520	16627	15852
DN	65	70	75	80	85	90	100	120	140
15	258	247	237	229	221	214	201	181	166
20	882	846	814	785	758	734	692	624	572
25	1976	1896	1824	1759	1700	1647	1552	1401	1284
32	3839	3684	3545	3420	3306	3202	3019	2727	2502
40	6517	6255	6020	5808	5616	5441	5131	4637	4255
50	15169	14563	14021	13531	13086	12680	11964	10817	9933
65	*	*	*	*	*	*	*	*	18555
DN	160	180	200	220	240	260	280	300	320
15	154	144	135	128	122	116	111	107	103
20	530	495	467	442	421	402	385	370	357
25	1191	1115	1050	995	947	905	868	835	805
32	2321	2173	2048	1941	1849	1767	1695	1630	1572
40	3950	3698	3487	3306	3149	3011	2888	2779	2680
50	9225	8641	8150	7730	7365	7044	6760	6505	6275
65	17238	16153	15240	14457	13778	13181	12651	12176	11748

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table F.48 — Propane — Flow through — Copper pipe (AS 1432 Type B) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	3154	2174	1742	1487	1315	1188	1091	1013	948
20	10376	7234	5824	4985	4415	3996	3672	3412	3198
25	*	15882	12836	11011	9765	8848	8138	7567	7096
32	*	*	*	*	18775	17030	15675	14584	13683
DN	20	25	30	35	40	45	50	55	60
15	894	789	712	653	606	567	534	506	482
20	3017	2667	2411	2213	2055	1924	1815	1721	1639
25	6699	5927	5362	4925	4575	4287	4044	3836	3655
32	12923	11445	10360	9521	8849	8294	7827	7427	7079
40	*	*	*	16102	14970	14037	13250	12575	11989
DN	65	70	75	80	85	90	100	120	140
15	461	442	425	410	396	383	361	326	298
20	1567	1504	1447	1396	1349	1306	1231	1112	1019
25	3497	3356	3229	3116	3012	2918	2752	2486	2281
32	6773	6501	6258	6039	5840	5658	5337	4824	4428
40	11473	11015	10605	10235	9898	9591	9050	8183	7514
50	*	*	*	*	22986	22278	21029	19027	17481
DN	160	180	200	220	240	260	280	300	320
15	276	258	243	230	219	209	201	193	186
20	945	885	834	790	752	719	689	663	639
25	2117	1982	1868	1771	1687	1612	1547	1488	1435
32	4111	3850	3631	3443	3280	3137	3009	2895	2793
40	6979	6538	6167	5849	5573	5330	5115	4922	4749
50	16243	15223	14364	13628	12989	12427	11928	11482	11079

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.49 — Propane — Flow through — New Zealand only — NZ Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 0.125 kPa; suitable for supply pressures around 3 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	88	59	46	39	35	32	29	27	26
15	195	130	103	87	76	69	63	58	54
20	590	397	315	267	234	211	193	178	167
25	1288	870	690	586	516	464	425	394	368
32	2352	1593	1266	1076	947	854	782	725	677
40	3839	2604	2073	1762	1553	1400	1283	1189	1112
50	8293	5639	4495	3826	3375	3046	2792	2590	2423
DN	20	25	30	35	40	45	50	55	60
10	24	22	20	19	17	16	14	13	12
15	51	45	41	38	36	34	32	30	29
20	157	137	123	113	104	97	91	86	82
25	346	304	274	250	231	216	203	192	183
32	638	561	505	462	428	400	376	356	338
40	1047	922	831	760	704	658	620	586	558
50	2283	2012	1814	1662	1541	1441	1357	1285	1222
DN	65	70	75	80	85	90	100	120	140
10	—	—	—	—	—	—	—	—	—
15	28	27	26	25	24	24	23	19	16
20	78	75	72	70	68	66	62	57	53
25	174	167	160	154	149	144	135	121	111
32	323	309	297	286	276	267	251	226	206
40	533	510	490	472	456	441	415	373	341
50	1168	1119	1076	1037	1001	969	912	821	751
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	49	47	44	42	40	39	37	36	35
25	102	96	91	87	83	80	77	74	72
32	191	178	167	158	150	143	137	131	127
40	316	295	277	262	249	237	227	218	210
50	696	650	611	579	550	525	503	483	465

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.50 — Propane — Flow through — New Zealand only — NZ Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around 3 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	132	88	70	59	52	46	42	39	37
15	290	195	154	130	115	103	94	87	81
20	875	590	469	398	350	315	288	267	249
25	1902	1288	1024	870	766	691	633	586	548
32	3467	2353	1874	1593	1405	1267	1161	1076	1006
40	5649	3841	3061	2605	2298	2073	1901	1763	1649
50	12169	8296	6622	5641	4980	4497	4125	3827	3582
DN	20	25	30	35	40	45	50	55	60
10	35	31	28	26	24	23	22	21	20
15	76	67	60	55	51	48	45	43	41
20	234	206	185	169	157	146	137	130	124
25	516	454	409	374	346	323	304	288	274
32	948	835	752	689	638	596	561	531	505
40	1553	1369	1234	1130	1048	980	922	873	831
50	3376	2978	2687	2463	2284	2136	2013	1907	1815
DN	65	70	75	80	85	90	100	120	140
10	—	—	—	—	—	—	—	—	—
15	40	38	37	36	35	34	32	29	27
20	118	113	108	104	101	97	91	82	75
25	261	250	240	231	223	216	203	183	167
32	482	462	444	428	413	400	376	338	309
40	794	761	731	705	680	658	620	558	510
50	1734	1663	1599	1541	1489	1441	1357	1223	1120
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—
20	70	66	62	60	57	55	53	51	49
25	154	144	135	128	121	116	111	106	102
32	286	267	251	238	226	215	206	198	191
40	472	441	415	393	373	356	341	328	316
50	1037	969	912	864	822	785	752	722	696

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.51 — Propane — Flow through — New Zealand only — NZ Copper pipe (NZS 3501)(MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressure within the range 5–10 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	369	249	198	168	147	133	121	112	105
15	802	543	432	367	323	291	267	247	231
20	2388	1626	1296	1103	973	877	804	746	698
25	5150	3518	2810	2394	2113	1908	1750	1624	1520
32	9325	6390	5111	4358	3850	3479	3192	2963	2774
40	15105	10379	8311	7093	6270	5668	5203	4831	4524
50	*	*	17852	15255	13498	12210	11215	10418	9761
DN	20	25	30	35	40	45	50	55	60
10	99	87	78	71	66	61	58	55	52
15	217	191	172	157	146	136	128	121	115
20	657	579	522	478	443	414	390	369	351
25	1432	1263	1139	1044	968	906	853	808	769
32	2615	2308	2083	1910	1772	1658	1562	1480	1409
40	4266	3767	3402	3120	2895	2710	2554	2421	2305
50	9208	8137	7353	6749	6265	5867	5532	5245	4996
DN	65	70	75	80	85	90	100	120	140
10	49	47	45	44	42	41	38	35	32
15	110	105	101	97	94	91	85	77	70
20	335	321	309	297	287	278	261	235	215
25	735	704	677	653	630	610	575	518	474
32	1347	1292	1242	1197	1157	1120	1055	951	871
40	2204	2114	2033	1960	1894	1834	1728	1559	1428
50	4778	4584	4410	4253	4111	3982	3753	3388	3106
DN	160	180	200	220	240	260	280	300	320
10	—	—	—	—	—	—	—	—	—
15	65	60	57	54	51	49	47	45	44
20	199	186	175	165	157	150	144	138	133
25	439	410	386	365	347	332	318	305	294
32	807	755	710	673	640	611	586	563	543
40	1324	1238	1166	1105	1051	1004	963	926	892
50	2881	2696	2540	2407	2292	2190	2100	2020	1947

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.52 — Propane — Flow through — New Zealand only — NZ Copper pipe (NZS 3501) (MJ/h)
(Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	1375	940	750	639	564	509	467	433	405
15	2950	2027	1622	1383	1222	1104	1013	940	880
20	8612	5969	4794	4098	3626	3280	3012	2798	2621
25	18268	12765	10286	8808	7803	7065	6493	6035	5657
32	*	*	*	15912	14112	12787	11760	10936	10255
DN	20	25	30	35	40	45	50	55	60
10	382	336	303	278	257	241	227	215	204
15	829	732	660	605	561	525	495	469	446
20	2472	2184	1973	1810	1680	1573	1483	1406	1339
25	5338	4720	4267	3918	3638	3408	3214	3048	2903
32	9680	8566	7749	7118	6612	6195	5845	5544	5283
40	15706	13906	12586	11566	10748	10073	9505	9018	8595
50	*	*	*	*	*	*	20422	19383	18479
DN	65	70	75	80	85	90	100	120	140
10	195	187	180	173	167	162	152	137	125
15	426	409	393	379	366	354	334	301	275
20	1280	1228	1181	1139	1101	1066	1004	906	831
25	2777	2664	2564	2473	2390	2315	2183	1971	1807
32	5054	4850	4668	4503	4354	4218	3977	3593	3297
40	8224	7893	7598	7331	7089	6868	6478	5854	5374
50	17685	16979	16347	15777	15259	14786	13952	12616	11586
DN	160	180	200	220	240	260	280	300	320
10	116	108	102	96	92	88	84	81	78
15	255	238	224	212	202	193	185	178	171
20	770	720	679	643	612	585	560	539	519
25	1677	1569	1479	1401	1334	1275	1223	1176	1134
32	3059	2864	2700	2560	2438	2331	2236	2151	2074
40	4989	4672	4405	4177	3979	3805	3650	3512	3387
50	10761	10081	9509	9019	8594	8220	7889	7592	7324
* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to Clause F.1.6 where further, detailed explanation is provided on these values and the use of the tables in general.									

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.53 — Propane — Flow through — New Zealand only — NZ Copper pipe
(NZS 3501) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

For New Zealand Only									
Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
10	2408	1657	1326	1131	1000	903	829	769	720
15	5138	3557	2855	2439	2158	1952	1792	1664	1559
20	14854	10402	8388	7186	6368	5767	5301	4928	4619
25	*	*	17911	15381	13651	12375	11386	10591	9934
DN	20	25	30	35	40	45	50	55	60
10	679	599	541	496	460	430	405	384	366
15	1470	1299	1173	1076	999	935	881	835	796
20	4360	3855	3486	3201	2973	2785	2627	2491	2373
25	9380	8303	7513	6903	6414	6011	5672	5381	5128
32	16963	15029	13608	12509	11628	10901	10289	9764	9307
40	*	*	*	*	*	*	*	15850	15113
DN	65	70	75	80	85	90	100	120	140
10	349	335	322	311	300	290	274	247	226
15	761	729	702	677	654	633	597	538	493
20	2270	2178	2096	2022	1954	1893	1785	1612	1478
25	4906	4709	4532	4373	4228	4096	3864	3491	3204
32	8906	8550	8231	7943	7682	7443	7022	6348	5828
40	14464	13887	13371	12905	12482	12096	11414	10323	9480
50	*	*	*	*	*	*	*	*	20379
DN	160	180	200	220	240	260	280	300	320
10	209	196	184	174	166	158	152	146	140
15	457	428	403	381	363	347	332	320	308
20	1371	1284	1210	1147	1092	1044	1001	963	928
25	2974	2785	2626	2490	2371	2267	2175	2093	2018
32	5412	5069	4781	4534	4320	4131	3964	3815	3680
40	8806	8250	7783	7382	7035	6729	6458	6215	5996
50	18937	17749	16748	15891	15147	14492	13911	13391	12922

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.54 — Propane — Flow through — Steel pipe (AS 1074 Medium (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	477	329	264	226	200	180	166	154	144
20	1058	732	589	504	447	404	371	345	323
25	1968	1365	1100	942	836	757	696	647	607
32	4135	2876	2321	1992	1768	1603	1475	1373	1288
40	6203	4320	3490	2996	2661	2414	2222	2068	1941
50	11536	8051	6511	5595	4972	4514	4158	3872	3636
65	*	16003	12958	11147	9913	9004	8299	7732	7263
80	*	*	*	*	15179	13793	12717	11851	11135
DN	20	25	30	35	40	45	50	55	60
15	136	120	108	99	92	86	81	76	73
20	305	270	244	223	207	194	183	173	165
25	573	507	458	421	391	366	345	327	311
32	1216	1077	975	896	832	780	736	698	665
40	1834	1625	1472	1353	1258	1179	1113	1056	1006
50	3436	3047	2762	2541	2363	2216	2093	1986	1894
65	6867	6096	5529	5089	4736	4444	4198	3987	3803
80	10530	9352	8486	7814	7274	6828	6451	6128	5847
100	*	18845	17110	15764	14682	13788	13032	12384	11819
DN	65	70	75	80	85	90	100	120	140
15	69	67	64	60	59	57	54	49	46
20	157	151	145	140	135	131	123	111	101
25	298	285	274	265	256	248	233	210	192
32	636	611	587	567	548	531	500	451	414
40	963	924	889	858	830	804	758	684	628
50	1813	1740	1676	1617	1564	1515	1430	1292	1186
65	3641	3497	3368	3251	3145	3048	2877	2603	2391
80	5599	5378	5181	5002	4840	4692	4430	4010	3685
100	11322	10879	10482	10124	9798	9500	8974	8129	7476
125	*	*	*	*	17148	16629	15713	14242	13103
DN	160	180	200	220	240	260	280	300	320
15	43	40	—	—	—	—	—	—	—
20	94	88	80	76	73	70	68	65	63
25	178	167	157	148	141	135	129	124	119
32	384	359	338	320	305	291	279	268	258
40	582	545	513	486	463	442	424	408	393
50	1101	1031	972	921	877	839	804	774	746
65	2221	2081	1963	1862	1774	1696	1628	1566	1510
80	3424	3209	3028	2873	2738	2619	2513	2419	2333
100	6951	6518	6153	5839	5567	5327	5114	4924	4751
125	12189	11434	10797	10250	9775	9357	8985	8652	8351
150	*	*	*	*	15812	15139	14541	14004	13520

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.55 — Propane — Flow through — Steel pipe (AS 1074 Medium (MJ/h)
(Pressure drop of 10 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	4049	2864	2334	2017	1800	1640	1515	1415	1331
20	8835	6273	5120	4428	3955	3605	3332	3113	2931
25	16220	11557	9445	8176	7306	6662	6161	5757	5422
32	*	*	19665	17042	15241	13907	12867	12027	11331
DN	20	25	30	35	40	45	50	55	60
15	1261	1124	1022	944	880	828	783	745	712
20	2776	2476	2254	2081	1942	1827	1730	1646	1573
25	5138	4584	4175	3857	3601	3388	3209	3054	2920
32	10741	9589	8737	8075	7541	7099	6725	6403	6122
40	*	14350	13079	12091	11294	10633	10074	9593	9174
50	*	*	*	*	*	*	*	17813	17038
DN	65	70	75	80	85	90	100	120	140
15	683	656	633	612	593	575	544	494	455
20	1509	1452	1400	1354	1311	1273	1204	1094	1008
25	2801	2695	2600	2514	2436	2364	2238	2034	1876
32	5874	5654	5456	5276	5113	4964	4700	4275	3944
40	8804	8474	8178	7910	7666	7443	7048	6412	5919
50	16353	15743	15196	14700	14249	13836	13105	11928	11014
DN	160	180	200	220	240	260	280	300	320
15	423	397	376	357	340	326	313	302	291
20	940	883	835	793	757	726	697	672	649
25	1749	1643	1554	1478	1411	1353	1300	1253	1211
32	3678	3458	3272	3113	2973	2850	2741	2643	2554
40	5521	5192	4913	4674	4466	4282	4118	3971	3839
50	10277	9667	9152	8708	8322	7981	7678	7405	7159
65	*	19202	18183	17306	16542	15869	15269	14730	14243

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.56 — Propane — Flow through — Steel pipe (AS 1074 Medium)
(MJ/h) (Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	6755	4801	3921	3393	3032	2765	2557	2389	2250
20	14693	10488	8581	7433	6647	6064	5611	5245	4941
25	*	*	15802	13702	12259	11190	10357	9684	9126
32	*	*	*	*				20192	19035
DN	20	25	30	35	40	45	50	55	60
15	2133	1903	1734	1602	1496	1408	1333	1269	1213
20	4684	4182	3812	3523	3291	3098	2935	2795	2673
25	8654	7730	7047	6516	6088	5733	5432	5174	4949
32	18054	16136	14718	13613	12723	11984	11359	10821	10352
DN	65	70	75	80	85	90	100	120	140
15	1164	1120	1081	1045	1013	983	931	846	781
20	2565	2469	2383	2305	2234	2169	2054	1868	1725
25	4750	4573	4414	4270	4139	4019	3806	3465	3199
32	9938	9569	9238	8938	8665	8415	7972	7260	6706
40	14875	14324	13829	13381	12974	12600	11940	10875	10048
DN	160	180	200	220	240	260	280	300	320
15	728	684	647	616	588	564	542	522	505
20	1609	1513	1432	1362	1301	1248	1200	1157	1119
25	2985	2808	2659	2530	2418	2319	2231	2151	2080
32	6260	5891	5578	5310	5076	4869	4685	4520	4371
40	9381	8829	8362	7961	7611	7302	7027	6780	6556
50	17425	16404	15539	14796	14148	13576	13067	12610	12196

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.57 — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 0.125 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe in metres								
DN	2	4	6	8	10	12	14	16	18
18	360	242	191	162	142	128	117	108	101
20	497	335	265	224	197	177	162	150	140
23	758	511	405	343	302	272	249	230	215
25	949	640	508	431	379	341	312	289	270
32	1857	1256	998	847	746	672	616	570	533
40	3367	2282	1816	1544	1360	1226	1124	1041	974
50	6170	4191	3339	2841	2505	2260	2072	1921	1797
75	18241	12434	9927	8457	7467	6744	6186	5740	5373
90	*	*	16018	13654	12061	10897	10000	9282	8691
110	*	*	*	*	*	*	*	15896	14888
DN	20	25	30	35	40	45	50	55	60
18	95	83	74	68	63	59	56	53	51
20	132	115	104	95	87	82	77	73	69
23	202	177	159	146	135	126	118	112	106
25	254	223	200	183	169	158	149	140	133
32	502	441	397	363	336	314	295	279	266
40	917	807	727	665	616	576	542	513	488
50	1693	1491	1344	1231	1141	1067	1004	951	905
75	5065	4468	4032	3696	3428	3207	3022	2863	2725
90	8194	7232	6529	5988	5555	5199	4899	4643	4421
110	14039	12398	11198	10274	9534	8926	8414	7976	7596
DN	65	70	75	80	85	90	100	120	140
18	49	47	46	44	43	42	40	36	33
20	66	64	62	60	58	56	53	49	45
23	101	97	93	89	86	84	79	72	66
25	127	122	117	113	109	105	99	89	82
32	253	243	233	224	217	209	197	177	161
40	466	446	429	413	399	386	363	326	298
50	864	828	796	767	740	716	674	607	555
75	2604	2497	2401	2315	2236	2165	2039	1838	1683
90	4225	4052	3897	3758	3631	3515	3312	2986	2736
DN	7262	6966	6701	6462	6245	6047	5699	5142	4713
DN	160	180	200	220	240	260	280	300	320
18	31	—	—	—	—	—	—	—	—
20	42	40	38	36	34	33	32	30	—
23	62	59	56	53	51	49	47	45	44
25	77	72	68	65	62	60	58	56	54
32	149	139	131	124	118	112	108	104	101
40	276	257	242	229	217	207	198	190	183
50	514	480	451	427	406	387	371	356	343
75	1559	1457	1372	1299	1236	1180	1131	1087	1047
90	2536	2372	2233	2115	2012	1922	1843	1771	1707
110	4370	4088	3851	3648	3472	3318	3181	3059	2948

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.58 — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	535	360	285	242	213	191	175	162	151
20	738	498	395	335	294	265	243	224	210
23	1122	759	602	511	450	405	371	344	321
25	1403	949	754	640	564	508	465	431	403
32	2739	1858	1478	1257	1107	998	915	848	793
40	4956	3368	2684	2283	2014	1817	1665	1544	1444
50	9063	6172	4924	4193	3700	3340	3063	2842	2659
75	*	18247	14587	12438	10989	9930	9114	8460	7922
90	*	*	*	*	*	16023	14710	13659	12794
DN	20	25	30	35	40	45	50	55	60
18	142	125	112	102	95	88	83	78	75
20	197	173	156	142	132	123	115	109	104
23	302	266	239	218	202	189	177	168	160
25	379	333	300	274	254	237	223	211	200
32	746	657	592	542	502	469	441	418	397
40	1361	1199	1081	990	917	857	807	764	727
50	2506	2209	1993	1826	1693	1584	1492	1413	1345
75	7470	6594	5954	5461	5067	4742	4469	4236	4033
90	12065	10656	9625	8832	8196	7674	7234	6858	6531
110	*	*	16482	15128	14044	13152	12402	11759	11202
DN	65	70	75	80	85	90	100	120	140
18	71	68	65	63	61	59	56	51	47
20	99	95	91	87	84	82	77	69	64
23	152	146	140	135	130	126	118	106	97
25	191	183	176	169	164	158	149	133	122
32	379	363	349	336	325	314	295	266	243
40	695	666	640	616	595	576	542	488	446
50	1285	1232	1184	1141	1102	1067	1005	905	828
75	3856	3698	3557	3429	3314	3208	3023	2726	2498
90	6244	5990	5762	5557	5370	5200	4901	4422	4054
110	10712	10277	9888	9537	9219	8929	8417	7598	6968
DN	160	180	200	220	240	260	280	300	320
18	44	42	40	38	36	35	33	32	31
20	60	56	53	51	49	47	45	44	42
23	89	84	79	75	72	69	67	64	62
25	113	105	99	93	89	85	82	79	77
32	225	210	197	186	177	169	162	155	149
40	413	386	363	343	326	311	298	286	276
50	767	717	674	638	607	580	555	533	514
75	2316	2166	2040	1932	1838	1756	1683	1618	1560
90	3759	3517	3313	3139	2988	2855	2737	2632	2537
110	6464	6049	5701	5402	5143	4916	4714	4534	4371

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.59 — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	1468	997	794	675	595	536	491	455	426
20	2018	1373	1094	930	820	740	678	629	588
23	3057	2083	1662	1414	1248	1126	1032	957	896
25	3812	2600	2075	1767	1560	1408	1291	1197	1120
32	7387	5056	4041	3445	3042	2748	2521	2340	2190
40	13273	9113	7295	6225	5501	4972	4564	4237	3968
50	*	16601	13310	11369	10055	9093	8350	7755	7265
75	*	*	*	*	*	26785	24618	22880	21448
DN	20	25	30	35	40	45	50	55	60
18	401	353	318	291	270	252	237	224	213
20	554	488	440	403	373	349	328	311	295
23	844	744	671	614	569	532	501	475	452
25	1056	931	839	769	713	667	628	594	566
32	2065	1821	1644	1507	1398	1308	1232	1167	1111
40	3741	3303	2982	2736	2538	2376	2239	2122	2020
50	6853	6053	5469	5019	4658	4361	4112	3898	3713
75	20241	17900	16187	14865	13806	12934	12200	11572	11026
DN	65	70	75	80	85	90	100	120	140
18	204	195	188	181	174	169	159	143	130
20	282	270	260	250	242	234	220	198	181
23	431	413	397	383	370	358	337	303	277
25	540	518	498	480	463	449	422	380	348
32	1062	1018	979	944	912	883	831	749	686
40	1931	1852	1781	1718	1660	1607	1514	1365	1251
50	3550	3405	3276	3159	3053	2957	2787	2514	2305
75	10546	10121	9740	9396	9084	8799	8297	7495	6876
90	*	*	15717	15164	14663	14205	13397	12106	11110
DN	160	180	200	220	240	260	280	300	320
18	121	113	106	100	95	91	87	83	80
20	167	156	147	139	132	126	121	116	112
23	257	240	226	213	203	194	185	178	171
25	322	301	283	268	255	243	233	224	215
32	635	594	559	529	504	481	461	443	427
40	1160	1084	1021	967	920	879	843	810	781
50	2138	2000	1884	1785	1699	1624	1557	1497	1443
75	6381	5974	5631	5338	5084	4860	4662	4484	4325
90	10313	9658	9106	8634	8224	7864	7544	7258	7000
110	*	16537	15596	14790	14091	13477	12931	12443	12003

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.60 — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe in metres								
DN	2	4	6	8	10	12	14	16	18
18	5341	3686	2956	2524	2231	2017	1852	1719	1610
20	7301	5052	4055	3465	3065	2772	2546	2364	2215
23	10967	7620	6126	5239	4638	4196	3855	3581	3355
25	*	9480	7629	6528	5780	5231	4807	4466	4185
32	*	18234	14718	12616	11184	10131	9315	8660	8119
40	*	*	*	*	*	*	16744	15575	14609
DN	20	25	30	35	40	45	50	55	60
18	1519	1341	1211	1110	1030	964	909	861	820
20	2089	1845	1666	1529	1419	1328	1252	1187	1130
23	3165	2797	2528	2320	2153	2016	1901	1802	1717
25	3949	3490	3155	2896	2688	2518	2374	2251	2144
32	7663	6779	6131	5631	5230	4900	4622	4384	4177
40	13794	12212	11051	10154	9435	8842	8343	7915	7543
50	*	*	*	*	17205	16130	15224	14447	13772
DN	65	70	75	80	85	90	100	120	140
18	784	752	723	697	674	652	614	554	508
20	1080	1036	997	961	929	899	847	764	700
23	1641	1575	1515	1461	1412	1367	1289	1163	1066
25	2050	1967	1893	1825	1764	1709	1611	1454	1333
32	3995	3834	3689	3559	3441	3333	3143	2838	2604
40	7217	6927	6667	6433	6220	6026	5684	5136	4714
50	13179	12652	12180	11754	11367	11014	10391	9394	8625
75	*	*	*	*	*	*	*	27694	25445
DN	160	180	200	220	240	260	280	300	320
18	470	440	414	392	373	357	342	328	317
20	649	607	572	542	516	493	472	454	438
23	989	925	871	826	786	751	720	692	667
25	1236	1157	1090	1033	983	940	901	867	835
32	2416	2262	2132	2021	1924	1840	1764	1697	1637
40	4376	4097	3863	3663	3489	3336	3200	3079	2970
50	8010	7503	7076	6711	6394	6115	5868	5646	5447
75	23643	22158	20908	19837	18907	18089	17364	16714	16127

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.61 — Propane — Flow through — Polyamide pipe (AS 2944.1 SDR 25) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
18	9256	6445	5186	4437	3929	3556	3267	3036	2845
20	12613	8815	7103	6082	5388	4878	4484	4167	3906
23	*	13256	10703	9176	8135	7369	6776	6300	5907
25	*	*	*	11418	10128	9177	8441	7849	7360
32	*	*	*	*	*	17713	16304	15171	14234
DN	20	25	30	35	40	45	50	55	60
18	2684	2372	2144	1968	1827	1711	1613	1530	1457
20	3686	3259	2946	2705	2512	2353	2219	2104	2005
23	5575	4932	4461	4097	3805	3565	3363	3190	3039
25	6948	6148	5562	5109	4746	4447	4196	3980	3793
32	13443	11906	10778	9906	9206	8630	8144	7727	7366
40	*	*	*	17818	16567	15535	14665	13919	13270
DN	65	70	75	80	85	90	100	120	140
18	1393	1337	1286	1240	1199	1161	1094	988	906
20	1917	1839	1770	1707	1650	1598	1507	1360	1248
23	2907	2790	2685	2590	2504	2425	2287	2066	1895
25	3628	3482	3351	3233	3126	3028	2855	2579	2367
32	7048	6765	6512	6284	6077	5888	5554	5020	4608
40	12700	12193	11739	11330	10958	10619	10020	9061	8321
50	*	*	*	*	*	*	*	16533	15189
DN	160	180	200	220	240	260	280	300	320
18	840	786	741	702	668	638	612	589	567
20	1157	1083	1021	967	921	880	844	812	783
23	1758	1646	1552	1471	1401	1339	1284	1235	1191
25	2196	2056	1939	1838	1750	1673	1605	1544	1489
32	4279	4007	3779	3583	3414	3264	3132	3014	2907
40	7728	7240	6829	6478	6172	5904	5665	5452	5260
50	14112	13225	12478	11838	11282	10794	10360	9972	9622
75	*	*	*	*	*	*	*	29393	28369

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.62 — Propane — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 0.125 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	221	148	117	99	87	78	71	66	61
25	528	356	282	238	210	189	172	159	149
32	1273	860	682	579	510	459	420	389	363
40	2339	1583	1259	1069	942	849	777	720	673
50	4281	2905	2313	1966	1733	1563	1432	1328	1242
63	7982	5427	4326	3682	3248	2931	2687	2492	2331
75	12860	8757	6987	5950	5251	4741	4348	4034	3775
90	*	14155	11303	9632	8505	7682	7048	6540	6123
110	*	*	*	16599	14665	13251	12162	11290	10572
DN	20	25	30	35	40	45	50	55	60
20	57	51	46	43	40	38	36	34	33
25	140	123	110	101	93	87	82	77	73
32	342	300	270	247	229	213	201	190	180
40	634	558	502	459	425	397	374	354	336
50	1169	1030	928	850	787	735	692	655	623
63	2197	1936	1746	1599	1482	1386	1305	1236	1176
75	3558	3137	2830	2594	2405	2249	2119	2007	1910
90	5771	5092	4596	4214	3908	3657	3445	3265	3108
110	9968	8799	7946	7288	6762	6329	5965	5654	5384
160	27040	23892	21591	19817	18398	17229	16247	15405	14675
DN	65	70	75	80	85	90	100	120	140
20	31	30	29	28	27	27	25	23	—
25	70	67	65	63	61	59	56	51	48
32	172	165	158	152	147	142	133	120	109
40	321	307	295	284	274	265	250	224	205
50	595	570	548	528	510	493	464	417	382
63	1123	1077	1035	997	963	932	877	790	723
75	1825	1750	1682	1622	1566	1516	1428	1286	1177
90	2970	2848	2739	2640	2551	2469	2326	2097	1920
110	5146	4936	4747	4578	4424	4283	4035	3640	3335
160	14033	13464	12954	12495	12078	11698	11027	9955	9129
DN	160	180	200	220	240	260	280	300	320
20	—	—	—	—	—	—	—	—	—
25	45	42	40	38	36	35	34	33	31
32	101	95	90	86	82	79	76	73	71
40	189	177	166	157	149	142	136	131	126
50	353	329	310	293	278	266	254	244	235
63	669	625	588	556	529	505	484	464	447
75	1090	1019	959	908	863	824	790	759	731
90	1779	1663	1566	1483	1411	1347	1291	1241	1196
110	3092	2892	2723	2580	2455	2345	2248	2161	2083
160	8469	7926	7469	7079	6739	6442	6178	5941	5728

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.63 — Propane — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around –3 kPa)**

Nom diam	Length of straight pipe. in metres								
DN	2	4	6	8	10	12	14	16	18
20	328	221	175	148	130	117	107	99	92
25	783	529	419	356	313	282	258	239	223
32	1880	1273	1012	860	757	683	625	579	541
40	3447	2339	1863	1584	1396	1259	1154	1070	1000
50	6297	4283	3414	2906	2563	2313	2121	1967	1840
63	11715	7985	6374	5429	4793	4328	3969	3683	3447
75	*	12864	10277	8760	7737	6989	6413	5952	5572
90	*	*	*	14160	12512	11307	10378	9635	9023
110	*	*	*	*	*	*	*	16604	15554
DN	20	25	30	35	40	45	50	55	60
20	87	76	68	62	58	54	51	48	46
25	210	184	166	151	140	131	123	116	110
32	510	448	404	369	342	319	301	284	270
40	942	830	748	684	634	593	558	528	502
50	1734	1528	1378	1262	1170	1094	1030	976	928
63	3249	2865	2585	2370	2197	2056	1936	1835	1746
75	5253	4635	4184	3837	3559	3330	3138	2974	2831
90	8508	7511	6783	6222	5773	5404	5094	4828	4597
110	14670	12958	11707	10743	9971	9336	8802	8345	7948
160	*	*	*	*	27049	25339	23900	22668	21598
DN	65	70	75	80	85	90	100	120	140
20	44	43	41	40	39	38	36	33	30
25	105	101	97	93	90	87	82	73	67
32	258	247	237	229	221	213	201	180	165
40	480	459	442	425	411	397	374	336	307
50	887	850	817	787	760	736	692	623	570
63	1668	1600	1538	1483	1432	1386	1305	1176	1077
75	2706	2595	2495	2406	2324	2250	2120	1911	1750
90	4395	4215	4054	3909	3778	3658	3447	3109	2849
110	7600	7291	7014	6764	6538	6331	5967	5386	4937
160	20658	19824	19077	18404	17793	17235	16252	14680	13468
DN	160	180	200	220	240	260	280	300	320
20	—	—	—	—	—	—	—	—	—
25	63	59	56	54	51	49	48	46	45
32	152	142	134	126	120	114	109	105	101
40	284	265	250	236	224	214	205	197	189
50	528	493	464	439	417	398	382	367	353
63	998	932	878	831	790	755	723	695	669
75	1622	1517	1428	1352	1287	1229	1178	1132	1091
90	2641	2470	2327	2204	2097	2004	1921	1847	1780
110	4579	4284	4037	3825	3641	3480	3336	3208	3093
160	12499	11701	11031	10457	9958	9521	9133	8785	8472

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.64 — Propane — Flow through — Polyethylene pipe (MJ/h) polyethylene pipe
(AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	907	615	489	415	366	330	302	280	261
25	2141	1457	1161	988	871	786	720	668	625
32	5090	3478	2777	2366	2089	1886	1730	1605	1502
40	9271	6353	5081	4333	3828	3458	3173	2945	2758
50	16816	11562	9261	7905	6989	6318	5800	5386	5044
63	*	*	17189	14688	12995	11754	10796	10029	9396
75	*	*	*	*	*	*	*	*	15128
DN	20	25	30	35	40	45	50	55	60
20	246	216	195	178	165	154	145	137	130
25	588	518	467	428	396	370	349	330	314
32	1415	1248	1126	1032	957	895	843	799	760
40	2600	2294	2071	1899	1761	1648	1553	1472	1401
50	4757	4200	3794	3480	3230	3023	2850	2701	2572
63	8864	7832	7078	6496	6030	5647	5325	5048	4809
75	14274	12619	11408	10474	9726	9110	8592	8148	7762
90	*	*	*	*	15716	14724	13889	13175	12554
DN	65	70	75	80	85	90	100	120	140
20	124	119	114	110	106	103	97	87	79
25	300	287	276	266	257	248	234	210	192
32	726	696	669	645	623	603	568	511	468
40	1339	1284	1235	1190	1150	1113	1049	945	866
50	2459	2358	2269	2187	2114	2047	1929	1740	1594
63	4598	4411	4244	4093	3956	3832	3612	3260	2989
75	7424	7123	6854	6612	6392	6191	5837	5270	4834
90	12008	11524	11090	10699	10345	10021	9450	8536	7832
110	*	*	*	*	*	*	16287	14719	13510
DN	160	180	200	220	240	260	280	300	320
20	73	68	64	61	58	55	53	51	49
25	178	166	156	148	140	134	128	123	119
32	434	405	381	361	343	328	314	302	291
40	802	750	706	669	636	608	582	560	539
50	1478	1383	1302	1233	1174	1122	1075	1034	996
63	2772	2594	2444	2316	2205	2107	2021	1943	1873
75	4485	4198	3957	3750	3571	3413	3274	3149	3036
90	7269	6806	6416	6082	5793	5538	5313	5111	4929
110	12543	11746	11076	10503	10005	9567	9179	8832	8519
160	*	*	*	*	*	25961	24915	23979	23135

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.65 — Propane — Flow through — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 10.0 kPa; suitable for supply pressures around 70 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	3328	2288	1832	1563	1381	1248	1145	1063	995
25	7738	5358	4302	3676	3252	2941	2701	2509	2350
32	18063	12620	10168	8707	7714	6984	6419	5966	5592
40	*	*	*	15819	14030	12713	11692	10872	10195
DN	20	25	30	35	40	45	50	55	60
20	938	827	747	685	635	594	560	530	505
25	2216	1958	1768	1623	1506	1410	1329	1260	1200
32	5277	4665	4218	3873	3596	3368	3177	3012	2870
40	9624	8516	7703	7076	6573	6159	5810	5512	5252
50	17492	15489	14020	12885	11974	11224	10591	10049	9578
63	*	*	*	*	*	*	*	*	17792
DN	65	70	75	80	85	90	100	120	140
20	483	463	445	429	414	401	378	340	312
25	1147	1100	1058	1020	986	955	900	812	744
32	2745	2633	2534	2444	2363	2288	2157	1948	1786
40	5024	4821	4640	4477	4328	4193	3954	3572	3277
50	9164	8797	8468	8171	7901	7655	7221	6526	5991
63	17027	16347	15739	15189	14691	14235	13432	12146	11153
DN	160	180	200	220	240	260	280	300	320
20	289	270	254	241	229	219	209	201	194
25	690	645	608	575	548	523	502	482	465
32	1657	1551	1462	1385	1319	1261	1209	1163	1121
40	3041	2847	2684	2545	2423	2317	2222	2138	2062
50	5562	5209	4912	4658	4437	4243	4071	3917	3778
63	10359	9704	9154	8682	8272	7913	7593	7307	7049
75	*	15627	14743	13986	13328	12751	12238	11778	11364

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

**Table F.66 — Propane — Polyethylene pipe (AS/NZS 4130 SDR 11) (MJ/h)
(Pressure drop of 20.0 kPa; suitable for supply pressures around 140 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
20	5791	4013	3223	2755	2437	2204	2025	1880	1762
25	13361	9344	7531	6450	5715	5174	4756	4421	4144
32	*	21869	17708	15205	13495	12234	11256	10469	9820
40	*	*	*	*	*	*	*	*	17854
DN	20	25	30	35	40	45	50	55	60
20	1662	1468	1326	1217	1129	1057	996	945	900
25	3910	3458	3126	2870	2666	2497	2355	2233	2127
32	9272	8208	7427	6824	6341	5942	5606	5319	5069
40	16865	14941	13529	12436	11560	10837	10228	9707	9253
50	*	*	*	*	*	*	*	17655	16834
DN	65	70	75	80	85	90	100	120	140
20	860	825	793	765	739	716	675	609	558
25	2035	1952	1878	1812	1752	1696	1599	1444	1324
32	4850	4655	4480	4323	4180	4049	3819	3451	3167
40	8854	8500	8183	7896	7636	7399	6981	6311	5794
50	16112	15470	14896	14377	13906	13476	12717	11502	10564
DN	160	180	200	220	240	260	280	300	320
20	517	484	456	432	411	393	376	362	349
25	1229	1150	1084	1027	978	935	896	862	831
32	2940	2753	2595	2461	2344	2241	2150	2068	1995
40	5380	5039	4753	4507	4294	4107	3941	3792	3658
50	9813	9195	8674	8228	7841	7500	7198	6928	6684
63	18232	17088	16124	15299	14582	13952	13392	12891	12440

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.67 — Propane — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h)
(Pressure drop of 0.125 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	453	305	241	204	179	161	148	136	127
20	861	580	460	390	343	309	283	262	244
25	1755	1187	943	801	705	635	582	539	503
32	3544	2403	1912	1625	1432	1292	1183	1097	1026
40	5043	3424	2727	2319	2044	1844	1690	1567	1465
50	9324	6343	5057	4305	3798	3428	3143	2915	2728
65	17263	11765	9392	8001	7064	6379	5852	5430	5082
80	*	*	14545	12398	10950	9893	9077	8425	7888
100	*	*	*	*	*	19406	17815	16541	15492
DN	20	25	30	35	40	45	50	55	60
15	120	105	94	86	80	74	70	66	63
20	230	202	181	166	153	143	134	127	121
25	474	417	375	343	317	296	279	264	251
32	966	850	766	701	649	607	571	540	514
40	1380	1216	1096	1003	929	869	818	774	737
50	2570	2266	2043	1872	1735	1623	1528	1447	1377
65	4790	4226	3813	3496	3242	3033	2857	2707	2577
80	7437	6563	5925	5433	5040	4717	4445	4212	4010
100	14610	12902	11654	10692	9923	9290	8757	8302	7906
125	*	*	*	*	17265	16168	15245	14455	13770
DN	65	70	75	80	85	90	100	120	140
15	61	58	56	55	53	52	49	45	41
20	115	110	106	102	98	95	89	81	75
25	239	229	220	212	204	198	186	167	152
32	491	470	452	435	420	406	382	344	314
40	703	674	648	624	603	583	549	494	451
50	1316	1261	1212	1168	1129	1092	1028	926	847
65	2463	2361	2270	2189	2114	2047	1927	1737	1591
80	3833	3676	3535	3408	3293	3188	3003	2708	2481
100	7559	7250	6975	6726	6501	6295	5932	5352	4906
125	13167	12633	12154	11723	11332	10975	10345	9339	8564
150	*	*	*	*	*	*	*	13311	12210
DN	160	180	200	220	240	260	280	300	320
15	39	36	35	33	32	30			
20	70	66	63	60	57	55	53	51	49
25	141	131	123	117	111	106	102	99	96
32	291	271	255	241	229	218	209	201	193
40	418	390	367	347	330	314	301	289	278
50	785	733	690	653	621	592	567	545	525
65	1474	1378	1297	1228	1168	1115	1069	1027	989
80	2299	2150	2025	1917	1824	1742	1670	1605	1547
100	4549	4256	4009	3798	3615	3455	3312	3185	3070
125	7944	7435	7006	6639	6321	6042	5794	5572	5372
150	11392	10604	9995	9473	9020	8623	8270	7955	7670

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

**Table F.68 — Propane — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h)
(Pressure drop of 0.25 kPa; suitable for supply pressures around 3 kPa)**

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	672	453	360	305	268	241	221	204	191
20	1273	861	684	581	511	461	422	390	365
25	2590	1756	1397	1188	1047	944	864	801	749
32	5216	3545	2825	2404	2120	1913	1753	1626	1521
40	7413	5045	4023	3425	3022	2727	2501	2320	2170
50	13677	9327	7447	6345	5602	5059	4641	4306	4031
65	*	17268	13803	11769	10398	9395	8622	8004	7494
80	*	*	*	*	*	14550	13357	12402	11616
DN	20	25	30	35	40	45	50	55	60
15	180	158	142	130	120	112	105	99	94
20	343	302	272	248	230	215	202	191	182
25	705	621	559	512	474	443	417	394	375
32	1433	1263	1138	1043	966	903	850	805	766
40	2045	1803	1626	1490	1381	1291	1216	1152	1096
50	3799	3351	3024	2773	2571	2406	2266	2147	2044
65	7066	6237	5632	5165	4792	4485	4227	4006	3814
80	10954	9673	8737	8016	7439	6964	6565	6223	5927
100	*	18978	17151	15742	14615	13687	12906	12238	11658
DN	65	70	75	80	85	90	100	120	140
15	90	86	83	80	77	74	70	63	58
20	173	166	159	153	148	143	135	121	110
25	358	343	330	318	307	297	279	251	229
32	732	701	674	649	627	607	571	514	470
40	1047	1004	965	930	898	869	818	737	674
50	1953	1873	1801	1736	1677	1623	1529	1378	1262
65	3646	3497	3363	3243	3134	3034	2858	2578	2362
80	5666	5435	5228	5042	4873	4718	4446	4012	3677
100	11148	10696	10291	9926	9595	9293	8760	7909	7253
125	*	*	*	17271	16697	16173	15250	13774	12637
DN	160	180	200	220	240	260	280	300	320
15	55	52	49	47	45	43	41	40	39
20	102	95	89	85	81	78	75	72	70
25	212	198	186	176	167	159	152	146	141
32	435	407	382	362	344	328	314	302	291
40	624	583	549	519	494	471	451	434	418
50	1169	1093	1029	974	926	885	848	815	785
65	2189	2047	1928	1826	1738	1660	1591	1530	1474
80	3409	3189	3004	2846	2709	2589	2482	2386	2300
100	6728	6297	5934	5624	5354	5118	4908	4720	4551
125	11727	10978	10349	9810	9342	8932	8567	8241	7947
150	*	*	*	13981	13316	12732	12214	11751	11333

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table F.69 — Propane — Flow through — PVC-HI pipe (AS ISO 6993.1) (MJ/h) (Pressure drop of 1.5 kPa; suitable for supply pressures within the range 5–10 kPa)

Nom diam	Length of straight pipe, in metres								
DN	2	4	6	8	10	12	14	16	18
15	1842	1252	998	848	748	675	618	573	536
20	3463	2362	1884	1604	1416	1278	1172	1087	1017
25	6989	4782	3822	3258	2877	2599	2384	2212	2071
32	13961	9588	7676	6550	5790	5233	4804	4460	4177
40	*	13597	10896	9303	8226	7438	6829	6342	5940
50	*	*	*	17142	15169	13723	12606	11711	10974
DN	20	25	30	35	40	45	50	55	60
15	505	445	401	367	340	318	299	283	269
20	958	844	761	698	646	605	569	539	513
25	1952	1722	1554	1425	1321	1236	1164	1103	1050
32	3938	3477	3140	2880	2672	2501	2357	2234	2127
40	5602	4948	4469	4101	3806	3563	3358	3184	3032
50	10353	9149	8269	7590	7047	6599	6223	5901	5621
65	*	16940	15318	14067	13064	12239	11544	10949	10432
DN	65	70	75	80	85	90	100	120	140
15	257	246	237	228	220	213	200	180	165
20	490	470	451	435	420	407	383	345	315
25	1003	962	925	892	862	834	785	708	648
32	2033	1950	1876	1809	1748	1692	1594	1438	1317
40	2899	2780	2675	2579	2493	2414	2274	2052	1881
50	5375	5157	4962	4785	4626	4480	4223	3812	3496
65	9978	9575	9215	8889	8594	8325	7850	7090	6504
80	15450	14828	14272	13770	13314	12898	12164	10991	10086
DNN	160	180	200	220	240	260	280	300	320
15	152	142	134	126	120	115	110	105	101
20	292	273	257	243	231	220	211	203	195
25	600	561	528	500	476	454	435	418	403
32	1221	1142	1076	1019	969	926	888	853	822
40	1744	1631	1537	1456	1385	1324	1269	1220	1176
50	3243	3035	2860	2710	2580	2466	2365	2274	2192
65	6036	5651	5326	5049	4808	4597	4409	4241	4090
80	9362	8767	8265	7836	7464	7137	6847	6587	6353
100	18371	17208	16229	15391	14664	14025	13457	12950	12492

* Indicates flow capacities that exceed 10 000 MJ/h (equivalent to some 10 000 L per day of liquid propane) and such a large installation generally requires validation by a qualified professional engineer.

NOTE Use of values printed in shaded areas is not recommended and require professional advice. Refer to [Clause F.1.6](#) where further, detailed explanation is provided on these values and the use of the tables in general.

Appendix G (normative)

Determination of maximum breather vent orifice size for devices not vented to outside atmosphere

G.1 Introduction

[Tables G.1](#), [G.2](#), [G.3](#) and [G.4](#) list the minimum effective volume of a room or *enclosure* where a release of *gas* from a device is not expected to represent a hazard. The effective volume takes into account the relative density of the *gas*, and is defined as —

- (a) for second family *gases*, the proportion of the volume of the room or *enclosure* above the device; or
- (b) for third family *gases*, the proportion of the volume of the room or *enclosure* below the device.

[Tables G.1](#), [G.2](#), [G.3](#) and [G.4](#) are designed for use with *natural gas* or *LP Gas* (Propane) for *gas pressures* ranging from 1.25 kPa to 200 kPa and device *breather vent* diameters from 0.1 mm to 10 mm. For installations outside these criteria, see [Clause 5.11.5.7](#).

[Tables G.1](#), [G.2](#), [G.3](#) and [G.4](#) assume the following:

- (i) A uniform airflow through the effective volume of one air change per hour.
- (ii) In the case of an escape, uniform dispersal of *gas* throughout the effective volume.
- (iii) A *breather vent* discharge coefficient of 0.60.

NOTE These assumptions may be invalid and result in the formation of a localized unacceptable air-*gas* concentration in the vicinity of the device. In such instances, consideration should be given to venting the device to the atmosphere.

G.2 Using the tables

To use [Tables G.1](#), [G.2](#), [G.3](#) and [G.4](#) —

- (a) select the applicable table for *gas* type, *gas pressure* (P), room or *enclosure* effective volume (V) and vent diameter (d); and
- (b) from values of V , d or P , if any two are known, the remaining unknown value may be determined by identifying the two known values in the table and reading the unknown value.

NOTE If the exact known value is not in the Table, use the closest larger value of P , and/or the closest smaller value of d and/or V .

G.3 Example using a table (see [Table G.1](#))

Using *natural gas*, an inlet *pressure* of 2.75 kPa, an *enclosure* with a floor area of 6 m² and a height of 2.4 m, and the device mounted at 600 mm above the floor, the following procedure determines the *breather vent* orifice size:

- (a) Select [Table G.1](#).
- (b) Calculate the effective *enclosure* volume as —

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

$$V = (2.4 - 0.6) \times 6.0 = 10.8 \text{ m}^3$$

- (c) Find value 2.75 in the Column for P , and read across the row until a value of 10.8 m³ or the closest smaller value (9.4 m³) is found.
- (d) Find the value for d of 0.8 mm, i.e. a maximum value.

Table G.1 — Minimum effective volume (V) — Natural gas — Device inlet pressure (P) between 1.25 kPa and 7 kPa

Device inlet pressure (P), kPa	Minimum effective volume (V), m ³																		
	Breather vent orifice diameter (d), mm																		
	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.5	2	3	4	5	6	7	8	9	10
1.25	0.39	0.89	1.6	2.5	3.6	4.8	6.3	8.0	9.9	22.2	39	89	158	247	355	484	632	800	987
1.50	0.43	0.97	1.7	2.7	3.9	5.3	6.9	8.8	10.8	24.3	43	97	173	270	389	530	692	876	1081
1.75	0.47	1.1	1.9	2.9	4.2	5.7	7.5	9.5	11.7	26.3	47	105	187	292	421	572	748	946	
2.00	0.50	1.1	2.0	3.1	4.5	6.1	8.0	10.1	12.5	28.1	50	112	200	312	450	612	799	1011	
2.25	0.53	1.2	2.1	3.3	4.8	6.5	8.5	10.7	13.2	30	53	119	212	331	477	649	848		
2.50	0.56	1.3	2.2	3.5	5.0	6.8	8.9	11.3	14.0	31	56	126	223	349	503	684	894		
2.75	0.59	1.3	2.3	3.7	5.3	7.2	9.4	11.9	14.6	33	59	132	234	366	527	718	937		
3.00	0.61	1.4	2.4	3.8	5.5	7.5	9.8	12.4	15.3	34	61	138	245	382	551	749	979		
3.25	0.64	1.4	2.5	4.0	5.7	7.8	10.2	12.9	15.9	36	64	143	255	398	573	780	1019		
3.50	0.66	1.5	2.6	4.1	5.9	8.1	10.6	13.4	16.5	37	66	149	264	413	595	809			
3.75	0.68	1.5	2.7	4.3	6.2	8.4	10.9	13.9	17.1	38	68	154	274	427	616	838			
4.00	0.71	1.6	2.8	4.4	6.4	8.7	11.3	14.3	17.7	40	71	159	283	442	636	865			
4.25	0.73	1.6	2.9	4.6	6.6	8.9	11.7	14.7	18.2	41	73	164	291	455	655	892			
4.50	0.75	1.7	3.0	4.7	6.7	9.2	12.0	15.2	18.7	42	75	169	300	468	674	918			
4.75	0.77	1.7	3.1	4.8	6.9	9.4	12.3	15.6	19.2	43	77	173	308	481	693	943			
5.00	0.79	1.8	3.2	4.9	7.1	9.7	12.6	16.0	19.7	44	79	178	316	494	711	967			
5.25	0.81	1.8	3.2	5.1	7.3	9.9	12.9	16.4	20.2	46	81	182	324	506	728	991			
5.50	0.83	1.9	3.3	5.2	7.5	10.1	13.3	16.8	20.7	47	83	186	331	518	745	1015			
5.75	0.85	1.9	3.4	5.3	7.6	10.4	13.6	17.2	21.2	48	85	191	339	529	762				
6.00	0.87	1.9	3.5	5.4	7.8	10.6	13.8	17.5	21.6	49	87	195	346	541	779				
6.25	0.88	2.0	3.5	5.5	7.9	10.8	14.1	17.9	22.1	50	88	199	353	552	795				
6.50	0.90	2.0	3.6	5.6	8.1	11.0	14.4	18.2	22.5	51	90	203	360	563	810				
6.75	0.92	2.1	3.7	5.7	8.3	11.2	14.7	18.6	22.9	52	92	206	367	574	826				
7.00	0.93	2.1	3.7	5.8	8.4	11.4	15.0	18.9	23.4	53	93	210	374	584	841				

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table G.2 — Minimum effective volume (V) — Natural gas — Device inlet pressure (P) between 7 kPa and 200 kPa

Device inlet pressure (P), kPa	Minimum effective volume (V), m³																		
	Breather vent orifice diameter (d), mm																		
	0.1	0.15	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.5	2	2.5	3	4	5	6
7	0.23	0.53	0.93	1.5	2.1	3.7	5.8	8.4	11.4	15.0	18.9	23.4	53	93	146	210	374	584	841
8	0.25	0.56	1.0	1.6	2.2	4.0	6.2	9.0	12.2	16.0	20.2	25.0	56	100	156	225	400	624	899
9	0.26	0.60	1.1	1.7	2.4	4.2	6.6	9.5	13.0	17.0	21.5	26.5	60	106	166	238	424	662	954
10	0.28	0.63	1.1	1.7	2.5	4.5	7.0	10.1	13.7	17.9	22.6	27.9	63	112	175	251	447	698	1005
12.5	0.31	0.70	1.2	2.0	2.8	5.0	7.8	11.2	15.3	20.0	25.3	31	70	125	195	281	500	780	
15	0.34	0.77	1.4	2.1	3.1	5.5	8.5	12.3	16.8	21.9	27.7	34	77	137	214	308	547	855	
17.5	0.37	0.83	1.5	2.3	3.3	5.9	9.2	13.3	18.1	23.6	30	37	83	148	231	332	591	923	
20	0.39	0.89	1.6	2.5	3.6	6.3	9.9	14.2	19.3	25.3	32	39	89	158	247	355	632	987	
25	0.44	1.0	1.8	2.8	4.0	7.1	11.0	15.9	21.6	28.3	36	44	99	177	276	397	706	1104	
30	0.48	1.1	1.9	3.0	4.4	7.7	12.1	17.4	23.7	31	39	48	109	193	302	435	774		
35	0.52	1.2	2.1	3.3	4.7	8.4	13.1	18.8	25.6	33	42	52	118	209	326	470	836		
40	0.56	1.3	2.2	3.5	5.0	8.9	14.0	20.1	27.4	36	45	56	126	223	349	503	894		
45	0.59	1.3	2.4	3.7	5.3	9.5	14.8	21.3	29.0	38	48	59	133	237	370	533	948		
50	0.62	1.4	2.5	3.9	5.6	10.0	15.6	22.5	31	40	51	62	140	250	390	562	999		
60	0.68	1.5	2.7	4.3	6.2	10.9	17.1	24.6	34	44	55	68	154	274	427	616	1094		
70	0.74	1.7	3.0	4.6	6.6	11.8	18.5	26.6	36	47	60	74	166	296	462	665			
80	0.79	1.8	3.2	4.9	7.1	12.6	19.7	28.4	39	51	64	79	178	316	494	711			
90	0.84	1.9	3.4	5.2	7.5	13.4	20.9	30	41	54	68	84	188	335	524	754			
100	0.88	2.0	3.5	5.5	7.9	14.1	22.1	32	43	57	72	88	199	353	552	795			
125	0.99	2.2	3.9	6.2	8.9	15.8	24.7	36	48	63	80	99	222	395	617	889			
150	1.1	2.4	4.3	6.8	9.7	17.3	27.0	39	53	69	88	108	243	433	676	973			
175	1.2	2.6	4.7	7.3	10.5	18.7	29.2	42	57	75	95	117	263	467	730	1051			
200	1.2	2.8	5.0	7.8	11.2	20.0	31	45	61.2	80	101	125	281	500	780				

NOTE 1 This Table is based on $V = 8.83 d^2 \sqrt{P}$

NOTE 2 Effective room volume = floor area × (ceiling height – device height above floor).

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table G.3 — Minimum effective volume (V) — LP Gas — Device inlet pressure (P) between 1.25 kPa and 7 kPa

Device inlet pressure (P), kPa	Minimum effective volume (V), m³																		
	Breather vent orifice diameter (d), mm																		
	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.5	2	3	4	5	6	7	8	9	10
1.25	0.63	1.41	2.5	3.9	5.6	7.7	10.0	12.7	15.7	35.2	63	141	250	391	563	767	1002	1268	1565
1.50	0.69	1.54	2.7	4.3	6.2	8.4	11.0	13.9	17.1	38.6	69	154	274	429	617	840	1097	1389	1715
1.75	0.74	1.7	3.0	4.6	6.7	9.1	11.9	15.0	18.5	41.7	74	167	296	463	667	907	1185	1500	
2.00	0.79	1.8	3.2	4.9	7.1	9.7	12.7	16.0	19.8	44.5	79	178	317	495	713	970	1267	1604	
2.25	0.84	1.9	3.4	5.3	7.6	10.3	13.4	17.0	21.0	47	84	189	336	525	756	1029	1344		
2.50	0.89	2.0	3.5	5.5	8.0	10.8	14.2	17.9	22.1	50	89	199	354	553	797	1085	1417		
2.75	0.93	2.1	3.7	5.8	8.4	11.4	14.9	18.8	23.2	52	93	209	371	580	836	1138	1486		
3.00	0.97	2.2	3.9	6.1	8.7	11.9	15.5	19.6	24.2	55	97	218	388	606	873	1188	1552		
3.25	1.01	2.3	4.0	6.3	9.1	12.4	16.2	20.4	25.2	57	101	227	404	631	909	1237	1615		
3.50	1.05	2.4	4.2	6.5	9.4	12.8	16.8	21.2	26.2	59	105	236	419	655	943	1283			
3.75	1.08	2.4	4.3	6.8	9.8	13.3	17.4	22.0	27.1	61	108	244	434	678	976	1328			
4.00	1.12	2.5	4.5	7.0	10.1	13.7	17.9	22.7	28.0	63	112	252	448	700	1008	1372			
4.25	1.15	2.6	4.6	7.2	10.4	14.1	18.5	23.4	28.9	65	115	260	462	722	1039	1414			
4.50	1.19	2.7	4.8	7.4	10.7	14.6	19.0	24.1	29.7	67	119	267	475	742	1069	1455			
4.75	1.22	2.7	4.9	7.6	11.0	15.0	19.5	24.7	30.5	69	122	275	488	763	1098	1495			
5.00	1.25	2.8	5.0	7.8	11.3	15.3	20.0	25.4	31.3	70	125	282	501	783	1127	1534			
5.25	1.28	2.9	5.1	8.0	11.5	15.7	20.5	26.0	32.1	72	128	289	513	802	1155	1572			
5.50	1.31	3.0	5.3	8.2	11.8	16.1	21.0	26.6	32.8	74	131	295	525	821	1182	1609			
5.75	1.34	3.0	5.4	8.4	12.1	16.4	21.5	27.2	33.6	76	134	302	537	839	1209				
6.00	1.37	3.1	5.5	8.6	12.3	16.8	21.9	27.8	34.3	77	137	309	549	857	1235				
6.25	1.40	3.2	5.6	8.8	12.6	17.2	22.4	28.4	35.0	79	140	315	560	875	1260				
6.50	1.43	3.2	5.7	8.9	12.8	17.5	22.8	28.9	35.7	80	143	321	571	892	1285				
6.75	1.45	3.3	5.8	9.1	13.1	17.8	23.3	29.5	36.4	82	145	327	582	909	1309				
7.00	1.48	3.3	5.9	9.3	13.3	18.1	23.7	30.0	37.0	83	148	333	593	926	1333				

NOTE 1 This Table is based on $V = 14 d^2 \sqrt{P}$

NOTE 2 V = effective room volume = floor area × device height above floor.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table G.4 — Minimum effective volume (V) — LP Gas — Device inlet pressure (P) between 7 kPa and 200 kPa

Device inlet pressure (P), kPa	Minimum effective volume (V), m³																	
	Breather vent orifice diameter (d), mm																	
	0.1	0.15	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.5	2	2.5	3	4	5
7	0.37	0.83	1.5	2.3	3.3	5.9	9.3	13.3	18.1	23.7	30	37	83	148	232	333	593	926
8	0.40	0.89	1.6	2.5	3.6	6.3	9.9	14.3	19.4	25.3	32	40	89	158	247	356	634	990
9	0.42	0.95	1.7	2.6	3.8	6.7	10.5	15.1	20.6	26.9	34	42	95	168	263	378	672	1050
10	0.44	1.0	1.8	2.8	4.0	7.1	11.1	15.9	21.7	28.3	36	44	100	177	277	398	708	
12.5	0.49	1.1	2.0	3.1	4.5	7.9	12.4	17.8	24.3	32	40	49	111	198	309	445	792	
15	0.54	1.2	2.2	3.4	4.9	8.7	13.6	19.5	26.6	35	44	54	122	217	339	488	868	
17.5	0.59	1.3	2.3	3.7	5.3	9.4	14.6	21.1	28.7	37	47	59	132	234	366	527	937	
20	0.63	1.4	2.5	3.9	5.6	10.0	15.7	22.5	31	40	51	63	141	250	391	563	1002	
25	0.70	1.6	2.8	4.4	6.3	11.2	17.5	25.2	34	45	57	70	158	280	438	630		
30	0.77	1.7	3.1	4.8	6.9	12.3	19.2	27.6	38	49	62	77	173	307	479	690		
35	0.83	1.9	3.3	5.2	7.5	13.3	20.7	29.8	41	53	67	83	186	331	518	745		
40	0.89	2.0	3.5	5.5	8.0	14.2	22.1	32	43	57	72	89	199	354	553	797		
45	0.94	2.1	3.8	5.9	8.5	15.0	23.5	34	46	60	76	94	211	376	587	845		
50	0.99	2.2	4.0	6.2	8.9	15.8	24.7	36	49	63	80	99	223	396	619	891		
60	1.1	2.4	4.3	6.8	9.8	17.4	27.1	39	53	69	88	108	244	434	678	976		
70	1.2	2.6	4.7	7.3	10.5	18.7	29.3	42	57	75	95	117	264	469	732	1054		
80	1.3	2.8	5.0	7.8	11.3	20.0	31	45	61	80	101	125	282	501	783			
90	1.3	3.0	5.3	8.3	12.0	21.3	33	48	65	85	108	133	299	531	830			
100	1.4	3.2	5.6	8.8	12.6	22.4	35	50	69	90	113	140	315	560	875			
125	1.6	3.5	6.3	9.8	14.1	25.0	39	56	77	100	127	157	352	626	978			
150	1.7	3.9	6.9	10.7	15.4	27.4	43	62	84	110	139	171	386	686	1072			
175	1.9	4.2	7.4	11.6	16.7	29.6	46	67	91	119	150	185	417	741				
200	2.0	4.5	7.9	12.4	17.8	32	49	71	97.0	127	160	198	445	792				

NOTE 1 This Table is based on $V = 14 d^2 \sqrt{P}$

NOTE 2 Effective room volume = floor area × device height above floor.

Appendix H (normative)

Flue design

H.1 Natural draught flue design

NOTE For *power flue* design, see [Clause H.2](#).

H.1.1 Application

This Appendix applies only to *flue* design for *open flued appliances* that incorporate a *draught diverter* or the function of a *draught diverter*. For *flue* design for other types of *appliances* contact the *appliance* manufacturer.

H.1.2 Manufacturer's instructions

In case of any conflict between the content of this Appendix and *appliance* or component manufacturer's instructions, the manufacturer's instructions shall take precedence. If in doubt contact the manufacturer.

H.1.3 Introduction

The tables and procedures relating to [Clause H.1](#) have been based on information from the American Gas Association. The tables have been calculated to allow for approximately 50 % *burner* excess air and approximately 100 % *draught diverter* dilution air.

Natural draught flues required to convey *flue gases* with greater quantities of excess air, dilution air, or other *combustion products* shall be designed for the total quantity of *flue gas* discharge, using sound engineering practice.

[Tables H.1](#), [H.2](#), [H.3](#), [H.4](#), [H.5](#), [H.6](#) and [H.7](#) show the extent and limitations of *natural draught flues*, relative to the thermal input, height, total length, diameter and other important factors to suit a wide variation in *flue* configuration.

[Table H.8](#) shows equivalent sizes for round and rectangular *natural draught flues*.

[Table H.9](#) shows the relationship between percentage carbon dioxide (% CO₂), volume of *flue gases* and amount of *excess air*.

H.1.4 Factors influencing natural draught flue design

H.1.4.1 Heat loss

In determining the correct size and configuration for a *natural draught flue*, the heat losses that will occur due to the materials used and the environment in which the *flue* will be located shall be considered. Since the motive force in a *flue* is due to the heat of the *flue gases*, the ideal conditions are those in which heat losses from the *flue* are very low.

Materials which are insulated against heat loss (e.g. *certified twin-wall flue*) or materials of low thermal conductivity are particularly suitable when the *flue* is located *outdoors* or is very long.

Non-insulated *flue* materials when located *indoors* and not exposed to draught may be classified as "low heat loss" in applying the *flue* tables contained in this Standard. The same materials when located *outdoors* shall be classified as "high heat loss".

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

H.1.4.2 Resistance to flow of flue gases

Resistance to the flow of *flue gases* shall be considered in the design of the *flue*. The capacities shown in the tables for *flues* with laterals make an allowance for two 90° changes of direction.

Where more than two 90° changes of direction are required, the *flue* shall be sized using one of the following methods:

- (a) A 10 % capacity reduction shall be made to the table for each additional bend or change of direction (e.g. one additional change, 90 % of table capacity or two additional changes, 80 % of table capacity).
- (b) The *flue* diameter shall be increased from the *draught diverter* outlet size to one size larger.

For calculation purposes, the flue capacity shall be increased by approximately 60 % of the difference in capacity of the actual appliance or draught *diverter flue size*, and the capacity of a similar flue one size larger.

NOTE 1 Any further increase in size is not recommended because it will not have a similar corresponding effect.

When using the tables to determine the *flue* size of wall furnaces and room heaters (but not forced air central heaters), *appliance gas consumption* shall be regarded as 40 % greater than the nominal figure on the data plate

NOTE 2 For example, a wall furnace having a *gas consumption* of 40 MJ/h would need to be sized for 40×1.4 , that is, 56 MJ/h).

H.1.5 Designing natural draught flues for individual appliances

H.1.5.1 Design procedure

The procedures for using the tables for individual natural draught *flues*, whether for low heat loss or high heat loss, are identical to the procedures used for *common flues*.

[Table H.2](#) or [H.3](#) shall be used, as appropriate, based on the type of material selected and the location of the *flue* in regard to heat loss.

- STEP 1 Determine the total *flue* height (*H*) of the system and the length of any lateral (see [Figure H.1](#).)
- STEP 2 Refer to [Table H.2](#) for low heat loss situations or [Table H.3](#) for high heat loss situations.

Read down the “Total height of *flue*” column at the left of the appropriate table until a height equal to the height of the *flue* or the next lower *flue* height figure is listed.
- STEP 3 Select the horizontal row for the appropriate “Length of lateral” (*L*), (zero for straight vertical systems).
- STEP 4 Read across to the first column that shows a capacity equal to or greater than the *appliance gas consumption* (after any factor indicated by [Clause H.1.4.2](#) has been applied).
- STEP 5 If the *flue* diameter shown at the top of the column listing the *appliance gas consumption* (or corrected *gas consumption*) is equal to or larger than the *appliance flue* outlet, use the diameter indicated in the table.

If the diameter indicated is less than the *appliance flue* outlet size, the smaller diameter may be used only where —

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (a) the *flue* height is greater than 3 m;
- (b) *flues* exceeding 300 mm in diameter are not reduced by more than two sizes (600 mm to 500 mm is a two size reduction); or
- (c) *flues* 300 mm in diameter or less are not reduced by more than one size (200 mm to 175 mm is a one size reduction).

Under no circumstances shall a 75 mm *flue* be connected to an *appliance* having a 100 mm *flue* outlet.

H.1.5.2 Example of natural draught flue design for an individual appliance

A *water heater* is to be installed with a *flue* configuration as in [Figure H.1](#).

Total height is 2.5 m and length of lateral is 600 m.

Appliance gas consumption is 120 MJ/h.

Appliance flue connection (draught diverter) is 125 mm diameter.

The *flue* will be located in a duct within the building except for 600 mm through the roof.

- STEP 1 Because the *flue* will be inside the building, the appropriate table will be [Table H.2](#).
- STEP 2 Under the column headed “Total height of *flue*” locate 2.5 m.
- STEP 3 Locate the line in the next column corresponding to a lateral of 0.6 m.
- STEP 4 Reading across the line to the right, note that the figures in the first two columns (i.e. 42 and 79) are less than the *appliance gas consumption* (120 MJ/h). The figure in the third column is greater than the *appliance gas consumption* and so the diameter (125 mm) at the top of this column would be suitable. Therefore, a 125 mm diameter *flue* would be used.

If it is essential to locate the 2.5 m of vertical *flue* on an external wall using non-insulated materials, then [Table H.3](#) would need to be used. Adopting the former procedure, [Table H.3](#) indicates that a 150 mm diameter *flue* would be required.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

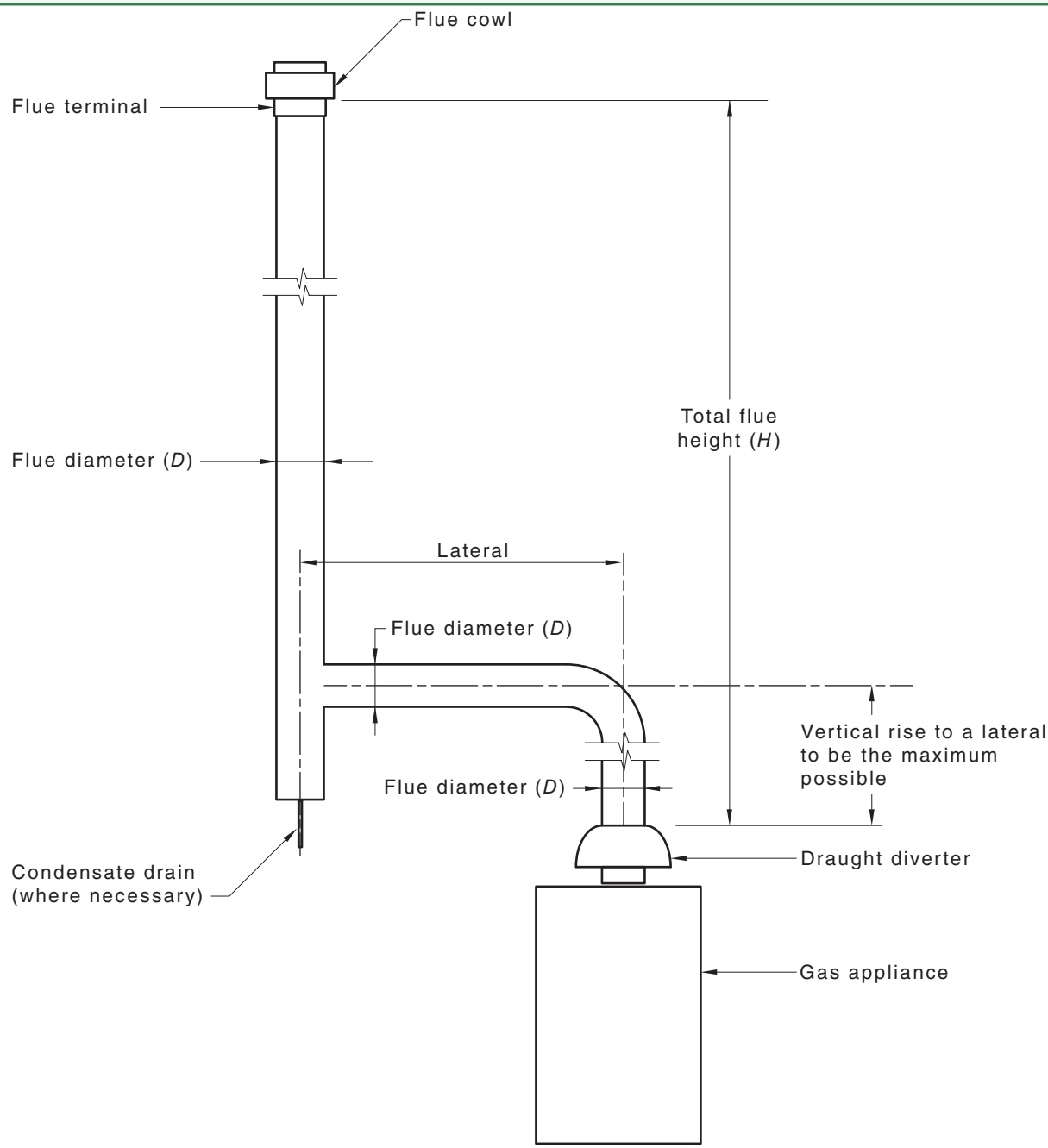


Figure H.1 — Natural draught flues for individual appliances

H.1.6 Common natural draught flues (combined and multiple flues)

NOTE See [Clauses 6.7.4](#), [6.7.6](#), [6.10.16.2](#) and [6.10.17](#) for *common flue* limitations.

H.1.6.1 Design principles

A common natural draught *flue* shall be designed on the same basic principles for heat loss and flow as with an individual *appliance flue*. There are, however, a number of important additional matters that need to be applied when designing a *common flue*. The most critical operating condition is when only one *appliance* is in use, particularly if the *gas consumption* is low compared with other *appliances* connected to the same *common flue*.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

The *common flue* tables, [Tables H.4, H.5, H.6](#) and [H.7](#), shall apply when the individual *draught diverter* outlets from *appliances* connected to the *common flue* are within range of [Table H.1](#). [Tables H.4, H.5, H.6](#) and [H.7](#) shall be used, as appropriate, for low heat loss or high heat loss situations.

If the largest *draught diverter* outlet exceeds the range in [Table H.1](#), then the *flue* connector rise shall be increased by 300 mm in excess of that shown in [Table H.4](#) and [Table H.6](#) (see [Figure H.5](#)).

Table H.1 — Common flue — Maximum draught diverter size

Smaller draught diverter diameter, mm	Maximum diameter of larger diverter, mm
75	200
100	250
125	300
150	400
175	450
200	500
250	600

H.1.6.2 Performance of common natural draught flue

Satisfactory performance of a *common natural draught flue* system depends on careful design of the *flue* connector, that is, the part of the system connecting the individual *appliances* from the *draught diverter* outlet to the *common flue* (see [Figure H.2](#) and [Figure H.4](#)).

The *flue* connector configuration in diameter, lateral, rise and total length is of major importance not only to prevent spillage at the *appliance draught diverter* but also to contribute to the correct performance of the *common flue*. In all cases the *flue* connector diameter shall be equal to or larger than the *draught diverter* outlet size.

H.1.6.3 Flue connector — Change of direction

The *flue* connector tables, [Table H.4](#) and [Table H.6](#), allow for two 90° changes of direction. If a further change of direction is necessary, then —

- (a) the next size larger *flue* connector shall be provided;
- (b) the *flue* connector rise shall be increased by 300 mm; or
- (c) 10 % shall be deducted from each additional change of direction from the listed capacity in the table.

H.1.6.4 Resistance to flow of flue gases — Manifolds and laterals

Where a *common flue* has a manifold or lateral at the base (see [Figure H.4](#)) the design shall allow for additional resistance to flow due to the change of direction. The (L) lines in [Table H.5](#) include an allowance for this increased resistance.

The length of a manifold or lateral shall be as short as practicable, and designed in accordance with [Table H.2](#) and [Table H.3](#). Where these Tables do not cover the particular installation, the lateral *flue* shall not exceed 50 % of the total *flue* height.

Where two or more *appliances* are installed to operate simultaneously, and not independently of each other, the manifold and vertical *flue* may be designed as an individual *appliance flue* using [Table H.2](#) or [Table H.3](#). The manifold shall then be designed as a lateral length.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

H.1.6.5 Design of common natural draught flue — Appliances at different levels

H.1.6.5.1 Design factors

The *flue* connector from the first or lowest *appliance* to the common natural draught *flue* may be designed as an individual natural draught *flue* to the first interconnection or tee.

The other *appliance flues* joining the *common flue* shall be designed using the *common flue* tables ([Table H.5](#) and [Table H.7](#)).

In applying the tables to several *appliances* installed at different levels, the “total height of *flue*” shall be the rise in the *flue* connector plus the vertical height between the connection to the *common flue* and the next connection above (see [Figure H.2](#)). For the top floor *appliance*, the total *flue* height shall be the rise in the *flue* connector plus the vertical height from the connection with the *common flue* to the *flue* terminal.

NOTE Consideration should be given to providing a separate *flue* for the top *appliance* if its total height will be insufficient.

Where the diameter of the *common flue* is more than seven times the diameter of the *flue* connector, the rise of the *flue* connector shall be increased by 300 mm more than that shown in the tables (see [Figure H.5](#)).

H.1.6.5.2 Example of common natural draught flue design for appliances at different levels

Water heaters are to be installed on each of four levels in a building (see [Figure H.2](#).)

The height between floors is 3 m and each *appliance* has a 100 mm *flue* outlet and a *gas consumption* of 50 MJ/h. The length of each lateral is 600 mm.

STEP 1 The lowest *appliance flue* is designed using [Table H.2](#) “Individual *appliance flues*”. For 0.6 m lateral and 3 m total height, a 100 mm *flue* diameter has a capacity for a *gas consumption* up to 85 MJ/h which is above that required (i.e. 50 MJ/h).

STEP 2 The tee connection to receive the second *appliance flue* and the next section of *common flue* should have capacity to serve the two *appliances*, i.e. 100 MJ/h, but first the *flue* connector size is determined.

From [Table H.4](#), under “Least total height” locate 3 m. Reading across, note that with 0.3 m *flue* connector rise, a 100 mm *flue* has capacity for 53 MJ/h, which is adequate.

STEP 3 The *common flue* size to carry 100 MJ/h is determined next. From [Table H.5](#), under “Least total height”, locate 3 m. As the *common flue* is vertical, without change of direction and the *appliances* are individually attached, Type V (for vertical) applies.

Read across to the right to find that a 125 mm *common flue* is satisfactory up to 131 MJ/h.

STEP 4 The third *appliance* is now considered for addition to the *common flue*, which then requires capacity for 150 MJ/h. Two alternatives may be considered:

- (a) Design the third section of *common flue* using the same total height between connections as previously, that is, 3 m on the assumption that the top floor *appliance* will be connected to the *common flue*.
- (b) Design on the basis that the top floor *appliance* will not be joined to the *common flue* but *flued* separately. This then provides an increase in the total *flue* height above the third *appliance*. Assume that this is now 6 m.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Reading [Table H.5](#), for alternative (a): Under “Least total height” 3 m, reading across the table, a 150 mm *common flue* would be suitable, having capacity up to 188 MJ/h;

or

Reading [Table H.5](#), for alternative (b): Under “Least total height” 6 m, reading across the table, a 125 mm *common flue* would be suitable, having a capacity up to 169 MJ/h.

This illustrates the increase in capacity through additional total height. The choice between the two alternatives may be decided on the grounds of economy and availability of space.

H.1.6.5.3 Alternative method using oversize common natural draught flue

An alternative method of designing *flues* for *high-rise buildings* is to provide an oversize *common flue* of constant diameter over its total length, and then design the connectors as individual *flues* (see [Figure H.3](#)). They are then classified as self-venting. The *common flue* acts as a duct for the conveyance of *flue gases* but not necessarily contributing to satisfactory draught in the *flue* connectors.

H.1.6.6 Design of natural draught common flue — Appliances at same level

H.1.6.6.1 Total flue height

In applying the tables to several *appliances* installed at the same level, the “total *flue* height” shall be the rise in the *flue* connector to the manifold plus the vertical height between the *flue* connector and the top of the *common flue* (see [Figure H.4](#)).

H.1.6.6.2 Example of flue design for appliances at same level

Four *water heaters* are to be installed on the ground floor of a four-storey building and connected through a manifold to a *common flue* (see [Figure H.4](#)).

Each *appliance* has a 100 mm *flue* outlet, a *gas consumption* of 50 MJ/h and will operate independently.

The space available limits the *flue* connector rise to 600 mm. The spacing between the connectors is 750 mm.

STEP 1 The *flue* connector size is determined from [Table H.4](#). The total height from the *appliance draught diverter* to the *flue terminal* is 18 m. In order to have a rise in the manifold it is assumed that the connector rise of the *appliance* farthest from the *common flue* is 300 mm.

From [Table H.4](#), with a total height of 18 m and a rise of 0.3 m, a 100 mm diameter *flue* connector has a capacity of 70 MJ/h, which is adequate.

STEP 2 The manifold should be sized as a *common flue* since all *appliances* do not operate simultaneously. Using [Table H.5](#), the Type L line is used. For a total height of 18 m, on the Type L line, a 150 mm diameter *flue* has a capacity of 273 MJ/h that is greater than the total *appliance gas consumption* of 200 MJ/h.

A 125 mm diameter *flue* cannot be used as it has a capacity of only 188 MJ/h.

STEP 3 Ensure the manifold length “A” (see [Figure H.4](#)) does not exceed 50 % of total *flue* height.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

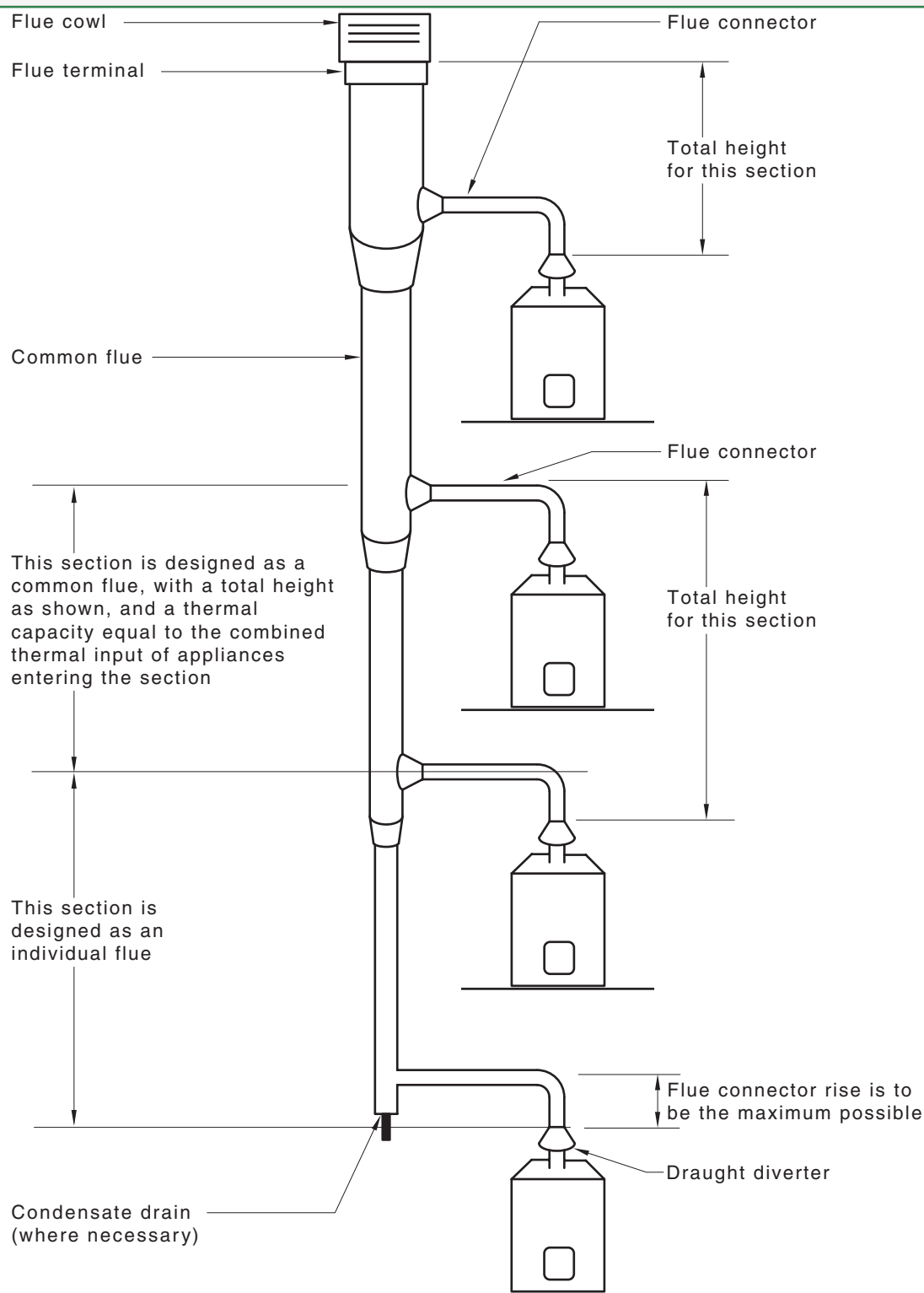
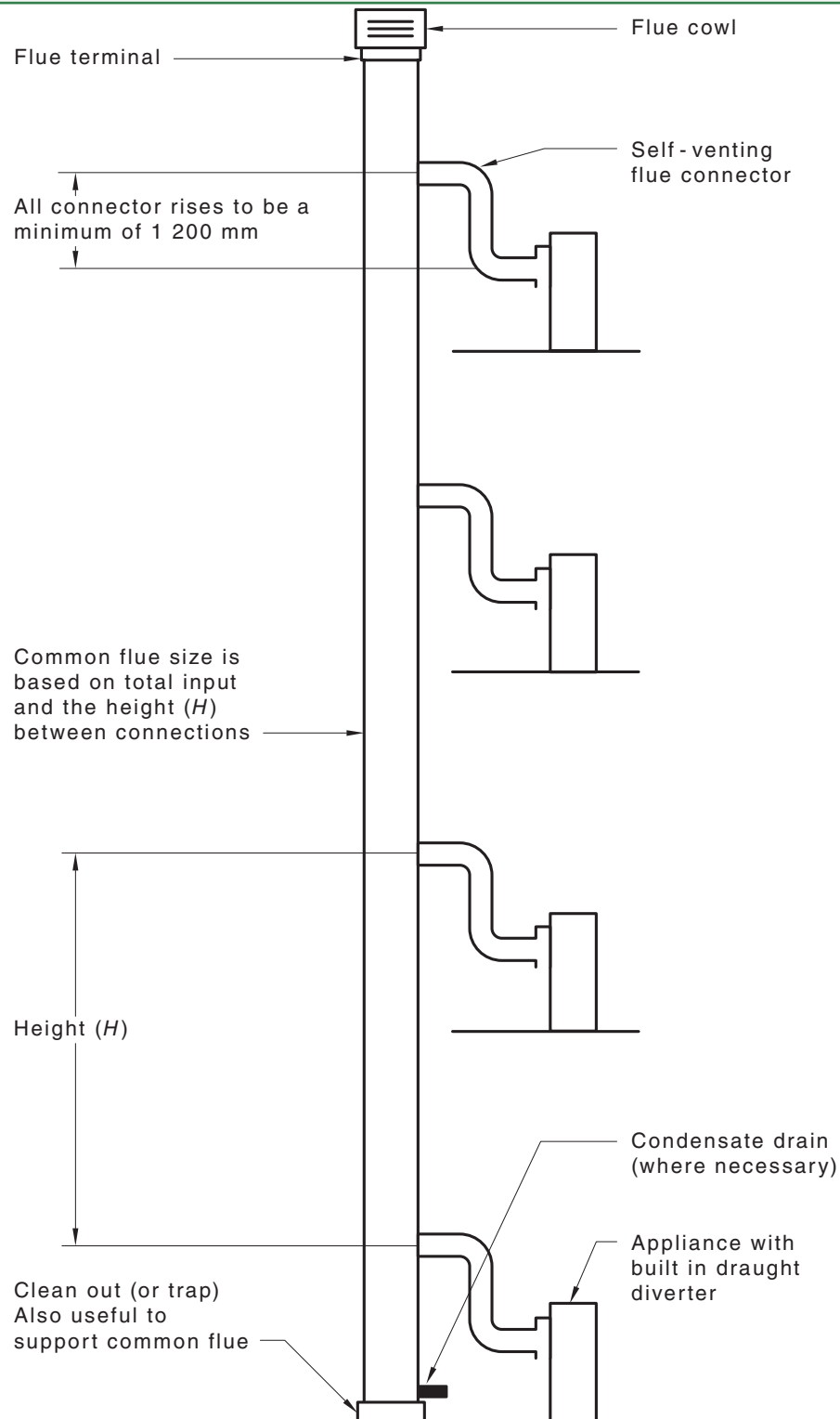


Figure H.2 — Common natural draught flue for appliances installed at different levels

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)



NOTE A self-venting *flue* connector does not depend on the *common flue* for its performance. The minimum connector rise of 1200 mm is designed so that each *flue* performs as an individual *flue*.

Figure H.3 — Common natural draught flue for appliances installed at different levels and using self-venting flue connectors

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

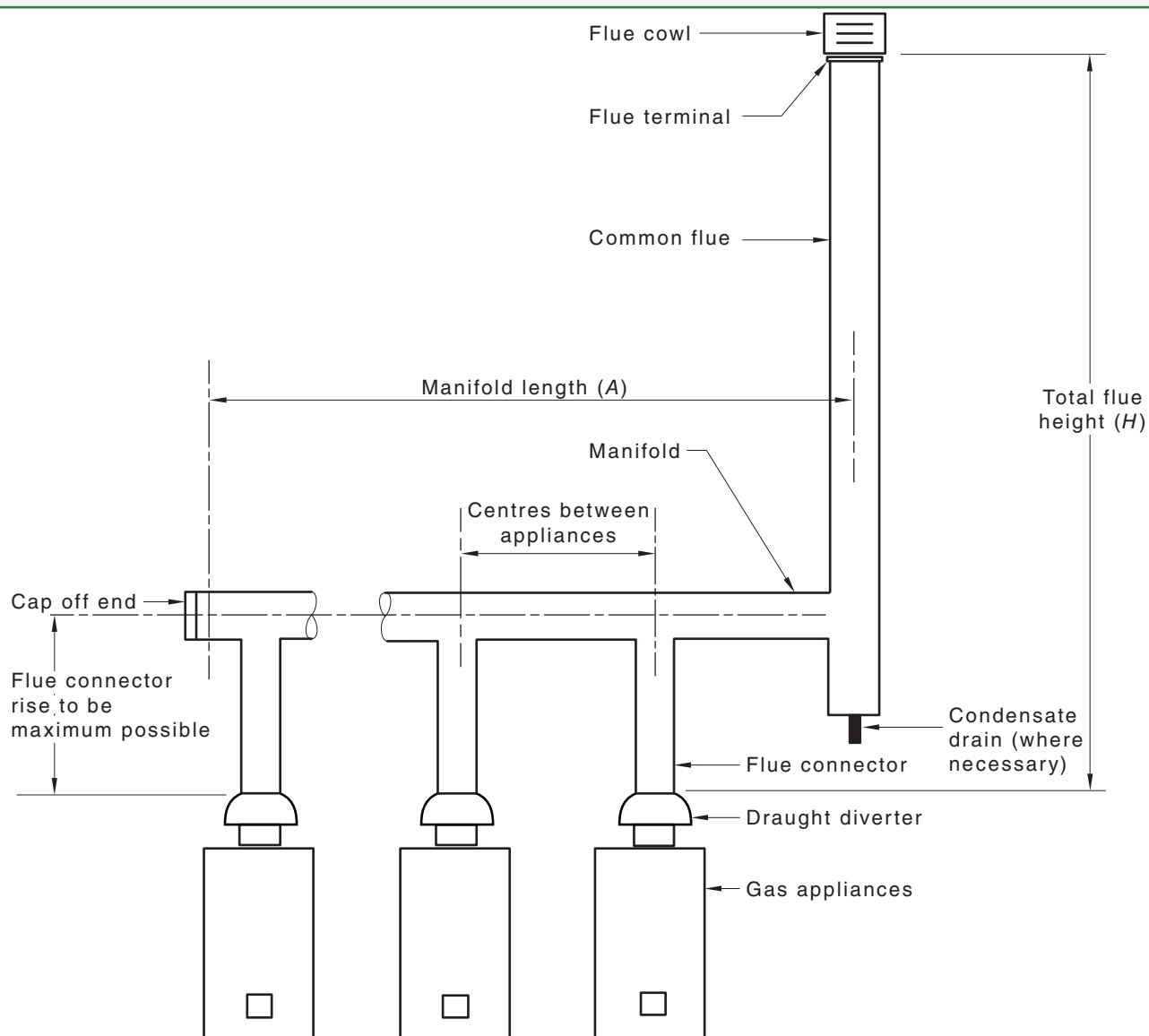


Figure H.4 — Common natural draught flue for appliances installed at the same level

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

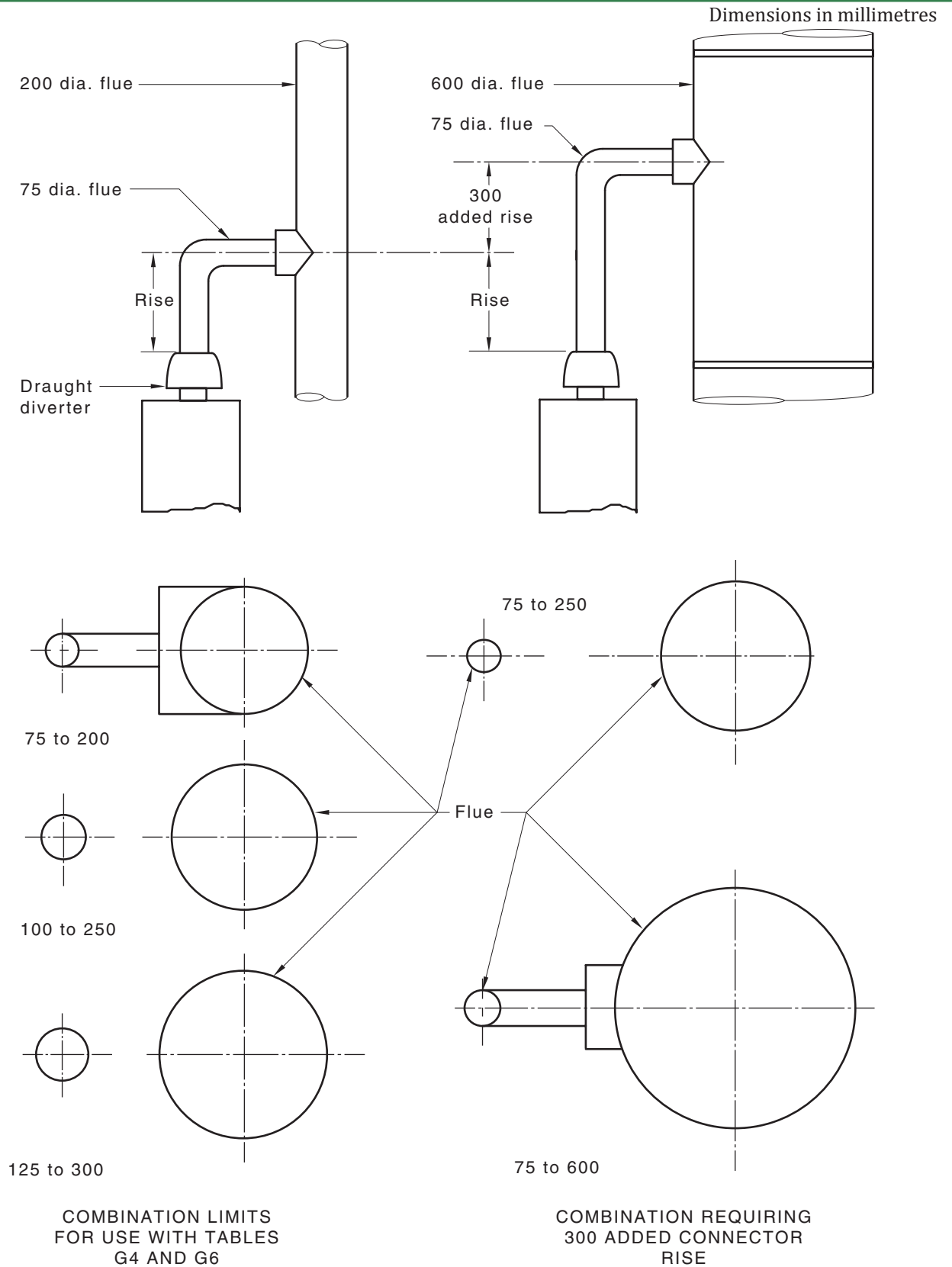


Figure H.5 — Combining a small natural draught flue into a large natural draught flue

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table H.2 — Individual appliance flues — Low heat loss materials and environments (indoor locations or insulated flues)

Total height of flue (<i>H</i>) m	Length of lateral (<i>L</i>) m	Capacity of flue, MJ/h													
		Diameter of flue (<i>D</i>), mm													
		75	100	125	150	175	200	250	300	350	400	450	500	550	600
2.0	0.0	49	91	149	216	301	390	601	897	1234	1614	2068	2564	3112	3714
	0.6	38	71	111	166	229	301	480	686	939	1234	1561	1952	2342	2817
	1.5	34	64	106	157	216	288	459	665	918	1213	1551	1920	2332	2796
2.5	0.0	53	99	164	248	338	438	696	1023	1393	1836	2342	2901	3545	4231
	0.6	42	79	127	190	261	340	543	786	1076	1414	1794	2226	2701	3218
	1.5	40	74	121	181	252	329	531	772	1066	1403	1778	2205	2685	3210
3.0	0.0	56	106	175	269	364	475	760	1118	1530	2031	2585	3218	3914	4695
	0.6	44	85	136	206	288	375	591	897	1192	1561	1994	2469	2996	3576
	1.5	42	81	131	197	279	364	578	879	1173	1541	1974	2443	2971	3556
4.5	0.0	61	118	197	301	411	554	886	1308	1815	2395	3060	3819	4653	5592
	0.6	51	98	158	237	333	437	712	1039	1424	1867	2384	2954	3598	4304
	1.5	47	94	154	231	323	422	696	1029	1396	1844	2358	2930	3571	4280
	3.0	44	87	147	220	307	399	670	1013	1359	1805	2314	2889	3526	4239
6.0	0.0	64	126	213	324	454	607	981	1424	2005	2659	3429	4283	5254	6330
	0.6	54	106	175	263	365	496	797	1161	1604	2110	2711	3376	4125	4959
	1.5	51	101	169	254	356	482	779	1142	1578	2085	2683	3348	4093	4919
	3.0	46	94	158	241	339	467	749	1102	1540	2047	2638	3302	4041	4853
	4.5	41	89	151	230	329	450	728	1076	1504	2018	2605	3261	4010	4844
9.0	0.0	68	135	232	354	501	686	1118	1635	2289	3081	3977	5011	6172	7448
	0.6	59	118	195	295	416	564	913	1382	1899	2511	3218	4020	4906	5908
	1.5	55	114	190	288	406	553	898	1360	1873	2479	3186	3991	4876	5857
	3.0	51	106	180	275	391	536	875	1323	1828	2427	3133	3945	4826	5772
	4.5	—	100	172	263	377	517	850	1287	1785	2374	3081	3897	4776	5686
	6.0	—	95	162	250	362	499	827	1250	1741	2321	3028	3851	4726	5602
12	0.0	70	139	241	372	528	723	1203	1825	2532	3408	4410	5560	6858	8292
	0.6	62	124	209	314	443	611	1013	1498	2110	2806	3608	4537	5549	6668
	1.5	57	120	203	306	435	599	1005	1478	2079	2767	3569	4492	5502	6623
	3.0	54	114	194	296	422	581	965	1457	2031	2703	3505	4418	5427	6549
	4.5	50	108	184	286	410	562	936	1414	1875	2639	3401	4346	5351	6477
	6.0	—	101	176	275	398	544	907	1382	1931	2595	3376	4273	5275	6404
18	0.0	—	143	249	394	564	770	1319	2026	2849	3851	5001	6330	7786	9495
	0.6	—	132	225	348	496	686	1118	1693	2374	3186	4136	5233	6467	7803
	1.5	—	126	217	342	487	674	1104	1674	2351	3159	4104	5203	6422	7762
	3.0	—	120	207	331	474	656	1078	1643	2313	3113	4051	5154	6346	7680
	4.5	—	115	196	321	460	638	1054	1612	2276	3068	3998	5105	6292	7611
	6.0	—	—	186	310	446	621	1030	1581	2238	3033	3946	5056	6195	7536
	7.6	—	—	175	300	433	603	1005	1550	2200	2977	3893	5005	6120	7640
24	0.0	—	—	252	405	580	797	1361	2131	3038	4115	5381	6805	8440	10286
	0.6	—	—	229	369	522	721	1208	1836	2595	3503	4547	5750	7111	8651
	1.5	—	—	217	363	514	711	1194	1817	2571	3474	4514	5712	7071	8605
	3.0	—	—	206	352	501	695	1171	1785	2533	3427	4459	5650	7006	8529
	6.0	—	—	—	331	476	664	1125	1723	2455	3333	4352	5524	6875	8376
	4.5	—	—	—	342	488	679	1148	1757	2494	3379	4406	5587	6941	8452
	7.6	—	—	—	321	464	648	1102	1691	2416	3285	4298	5462	6810	8300
30	0.0	—	—	—	422	591	812	1382	2163	3112	4273	5592	7069	9073	10867
	0.6	—	—	—	396	538	739	1234	1920	2690	3693	4853	6119	7596	9284
	1.5	—	—	—	382	531	730	1223	1902	2670	3666	4816	6085	7556	9238
	3.0	—	—	—	368	519	716	1204	1873	2638	3622	4756	6030	7991	9161
	4.5	—	—	—	354	507	703	1186	1842	2604	3578	4696	5976	7424	9084
	6.0	—	—	—	—	496	689	1167	1812	2571	3534	4635	5921	7359	9007
	7.6	—	—	—	—	484	675	1148	1783	2538	3490	4574	5866	7292	8930
	9.1	—	—	—	—	473	661	1129	1753	2506	3446	4515	5806	7227	8853

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table H.3 — Individual appliance flues — High heat loss materials and environments (outdoor locations with non-insulated flues)

Total height of flue (H) m	Length of lateral (L) m	Capacity of flue, MJ/h													
		Diameter of flue (D), mm													
		75	100	125	150	175	200	250	300	350	400	450	500	550	600
2.0	0.0	41	74	122	179	245	329	528	791	—	—	—	—	—	—
	0.6	33	58	99	149	205	274	438	654	—	—	—	—	—	—
	1.5	30	54	93	135	187	255	411	633	—	—	—	—	—	—
2.5	0.0	44	80	133	195	266	359	572	860	1224	1604	—	—	—	—
	0.6	34	64	108	162	222	300	476	717	1023	1340	—	—	—	—
	1.5	31	59	100	149	205	279	454	684	995	1308	—	—	—	—
3.0	0.0	47	89	146	213	294	392	639	962	1393	1846	2279	3102	—	—
	0.6	37	71	117	177	246	328	563	802	1161	1540	2005	2585	—	—
	1.5	34	64	110	161	227	305	506	764	1129	1505	1965	2541	—	—
4.5	0.0	52	96	159	235	329	445	722	1097	1530	2099	2722	3418	4241	5180
	0.6	41	76	129	196	274	369	601	913	1277	1751	2268	2849	3534	4326
	1.5	37	71	116	179	253	343	570	870	1242	1712	2236	2801	3479	4271
	3.0	32	61	109	167	235	325	542	839	1182	1646	2152	2722	3387	4178
6.0	0.0	56	107	172	266	361	496	812	1255	1772	2416	3165	3988	4937	6066
	0.6	44	84	143	222	302	414	676	1044	1477	2015	2638	3323	4115	5064
	1.5	40	78	130	203	279	384	644	997	1438	1973	2587	3264	4051	4998
	3.0	34	69	121	188	260	364	602	960	1372	1899	2500	3165	3946	4885
	4.5	—	58	110	172	241	344	580	918	1319	1825	2416	3075	3890	4779
9.0	0.0	59	114	193	291	405	558	926	1445	2026	2775	3608	4558	5697	7227
	0.6	46	89	156	243	338	465	770	1203	1688	2310	3007	3798	4748	6014
	1.5	—	82	145	222	312	433	732	1139	1646	2260	2948	3735	4677	5934
	3.0	—	72	132	207	289	409	692	1108	1572	2173	2849	3629	4558	5803
	4.5	—	—	119	187	272	386	659	1055	1509	2094	2754	3518	4442	5676
	6.0	—	—	109	172	253	363	629	1013	1445	2015	2659	3408	4326	5549
15	0.0	—	127	222	327	467	622	1034	1635	2321	3165	4115	5275	6583	8229
	0.6	—	100	180	274	390	519	865	1361	1931	2638	3429	4399	5486	6858
	1.5	—	—	168	247	361	500	823	1298	1880	2578	3362	4333	5407	6763
	3.0	—	—	154	233	335	481	770	1255	1794	2479	3249	4220	5275	6604
	4.5	—	—	—	211	308	429	744	1192	1725	2384	3139	4093	5138	6467
	6.0	—	—	—	195	291	405	707	1139	1656	2289	3028	3967	5001	6330
24	0.0	—	—	—	—	—	—	—	—	2659	3587	4695	5855	7332	9115
	0.6	—	—	—	—	—	—	—	—	2216	2986	3904	4959	6119	7638
	1.5	—	—	—	—	—	—	—	—	2156	2919	3776	4879	6024	7524
	3.0	—	—	—	—	—	—	—	—	2057	2806	3703	4748	5866	7332
	4.5	—	—	—	—	—	—	—	—	1978	2701	3576	4600	5718	7174
	6.0	—	—	—	—	—	—	—	—	1899	2595	3450	4452	5570	7016

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table H.4 — Maximum flue connector pipe carrying capacity — Low heat loss materials and environments

Least total height (<i>H</i>) m	Connector rise (<i>L</i>) m	Capacity of flue, MJ/h							
		Diameter of flue (<i>D</i>), mm							
		75	100	125	150	175	200	250	300
1.5	0.3	26	46	74	107	145	190	295	426
	0.6	32	56	88	127	171	225	351	506
	0.9	35	63	98	142	193	253	396	570
1.8	0.3	27	49	76	110	150	195	305	439
	0.6	33	58	91	131	177	232	364	523
	0.9	37	65	101	147	199	262	407	587
2.4	0.3	28	51	80	115	156	205	320	463
	0.6	34	60	95	136	185	243	378	544
	0.9	38	68	107	153	209	272	424	612
3.0	0.3	30	53	82	119	162	211	331	477
	0.6	35	62	98	141	192	251	392	565
	0.9	39	71	110	158	216	283	440	633
4.5	0.3	32	56	88	127	172	226	351	506
	0.6	37	66	104	150	204	267	416	599
	0.9	42	75	117	169	230	302	468	675
6	0.3	33	59	92	132	180	236	366	528
	0.6	39	70	110	157	213	280	437	629
	0.9	44	78	122	177	241	317	492	709
9	0.3	35	62	98	141	192	251	392	565
	0.6	41	74	116	167	228	298	463	667
	0.9	46	83	131	188	255	334	521	751
12	0.3	37	65	102	148	200	262	410	591
	0.6	43	77	121	175	237	311	486	702
	0.9	49	88	136	197	267	349	549	789
18	0.3	39	70	110	158	215	281	440	633
	0.6	46	83	130	188	255	333	521	751
	0.9	53	94	146	211	287	375	586	844

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table H.5 — Maximum common flue carrying capacity — Low heat loss materials and environments

Least total height (<i>H</i>) m	Common flue type (L or V)	Capacity of flue, MJ/h										
		Diameter of flue (<i>D</i>), mm										
		100	125	150	175	200	250	300	350	400	450	500
1.5	L	51	80	115	157	206	327	480	665	876	1118	1403
	V	63	100	145	196	255	404	578	793	1036	1308	1614
1.8	L	55	87	123	169	222	343	494	747	976	1234	1524
	V	69	109	155	211	274	433	620	860	1124	1419	1751
2.4	L	61	96	137	188	243	385	549	837	1092	1382	1709
	V	77	120	172	235	306	491	688	962	1255	1593	1962
3.0	L	66	103	150	204	264	417	599	913	1192	1509	1862
	V	83	131	188	255	332	522	751	1050	1372	1735	2142
4.5	L	77	120	173	236	306	485	692	1063	1387	1757	2173
	V	96	152	217	295	385	596	870	1222	1593	2015	2490
6.0	L	85	134	192	264	343	538	768	1188	1551	1962	2427
	V	108	169	242	327	427	675	966	1361	1783	2258	2785
9	L	99	155	223	306	396	622	890	1400	1830	2310	2859
	V	124	195	281	380	496	781	1081	1609	2099	2659	3281
12	L	111	173	249	338	443	696	997	1574	2057	2606	3218
	V	138	214	311	427	554	865	1245	1809	2363	2986	3693
18	L	—	188	273	371	485	760	1161	1846	2405	3049	3766
	V	—	236	342	464	607	950	1456	2121	2764	3505	4326
24	L	—	—	290	395	515	807	1300	2057	2690	3408	4199
	V	—	—	363	494	644	1008	1625	2374	3091	3914	4842
30	L	—	—	—	404	528	823	1408	2258	2943	3724	4600
	V	—	—	—	505	659	1029	1762	2585	3376	4273	5275

NOTE 1 TYPE L: Applies to *common flues* having a manifold at the base or an offset in the *common flue*.

NOTE 2 TYPE V: Applies when all connectors are individually attached directly to a straight vertical *common flue*.

Table H.6 — Maximum flue connector pipe carrying capacity — High heat loss materials and environments

Least total height (<i>H</i>) m	Connector rise (<i>L</i>) m	Capacity of flue, MJ/h					
		Diameter of flue (<i>D</i>), mm					
		75	100	125	150	175	200
1.8 to 2.4	0.3	22	42	72	108	154	216
	0.6	30	56	91	131	188	248
	0.9	36	64	103	155	215	290
4.5	0.3	24	46	81	123	189	253
	0.6	32	59	97	141	205	280
	0.9	37	68	108	164	228	314
9.0 and over	0.3	26	52	89	136	200	285
	0.6	33	61	102	153	223	311
	0.9	38	72	113	173	245	339

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table H.7 — Maximum common flue carrying capacity — High heat loss materials and environments

Least total height (<i>H</i>)	Capacity of common flue, MJ/h						
	Diameter of common flue (<i>D</i>), mm						
m	100	125	150	175	200	250	300
1.8	51	82	117	164	216	338	—
2.4	58	94	135	185	247	385	533
3.0	62	100	143	200	264	417	591
4.5	75	121	177	241	322	506	728
6.0	84	136	196	274	359	580	833
9.0	—	155	227	317	422	686	992
15.0	—	—	—	380	517	855	1255

Table H.8 — Equivalent sizes for round and rectangular flues

Round flue diameter mm	Rectangular flue size								
	mm								
100	100 × 100								
125	125 × 100	100 × 125	—	—	75 × 200				
150	200 × 100	150 × 125	125 × 150	100 × 175	100 × 200				
175	275 × 100	200 × 125	175 × 150	150 × 175	125 × 200				
200	375 × 100	275 × 125	225 × 150	225 × 175	175 × 200	150 × 225			
225	500 × 100	375 × 125	300 × 150	250 × 175	225 × 200	200 × 225			
250		475 × 125	375 × 150	300 × 175	275 × 200	250 × 225	200 × 250		
300			500 × 150	425 × 175	350 × 200	350 × 225	300 × 250	250 × 300	
350				600 × 175	500 × 200	475 × 225	450 × 250	350 × 300	300 × 350
400					700 × 200	600 × 225	575 × 250	450 × 300	400 × 350
450						850 × 225	725 × 250	575 × 300	500 × 350
500							975 × 250	750 × 300	625 × 350

NOTE Sizes outside those shown are not normally used.

H.2 Power flue design

NOTE 1 For definition of *power flue*, see [Clause 1.3.41.7](#).

NOTE 2 For *appliances* with *atmospheric burners*, see [Clause H.1](#).

H.2.1 Power flue applications

NOTE For natural draught *flue* design, see [Clause H.1](#).

A *power flue* may be used for one or more *appliances* where any of the following conditions apply:

- The *appliance(s)* may not be suitable for use with a *natural draught flue*.
- It will be very difficult or very expensive to extend the *flue* of an *appliance* above roof level.
- Spillage is occurring at the *appliance* due to insufficient *flue* draught. This may be due to unfavourable *flue* configuration or inadequate size.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (d) It is desirable to reduce the concentration of the *flue gases* to a maximum of 1 % carbon dioxide (CO₂) when they are to be discharged at a low level, that is, up to 4 m from ground level.

H.2.2 Power flue design requirements

H.2.2.1 Appliance design

The *appliance* design shall be such that there are no negative effects on performance due to *pressure* changes that the operation of the *power flue* may cause.

NOTE This is achieved for *appliances* that incorporate a *draught diverter* or where the design incorporates the function of a *draught diverter*.

H.2.2.2 Air supply

H.2.2.2.1 General

Air supply to *appliances* shall be in accordance with the requirements of [Clause 6.4](#).

H.2.2.2.2 Provision of dilution air for a power flue

Air for diluting the *combustion products* may be taken from either the *plant room* or from outside directly into the *flue* before the fan (see [Figure H.6](#)). Provision shall be made for supplying a quantity of dilution air equal to the flow through the *power flue* fan.

H.2.2.2.3 Flue design requirements

[Figure H.6](#) illustrates the use of a common *power flue* with horizontal discharge and *appliances* at the same level. [Figure H.7](#) illustrates the use of a common *power flue* with vertical discharge and *appliances* at different levels.

NOTE Use of the “equal friction design method” is recommended for calculating air flows and *pressure* losses. A velocity of 3 m/s is recommended.

H.2.2.3 Requirement for individual appliance dampers

Where multiple *appliances* are vertically separated by 2.5 m or more and where *flue* sizing is based on the “equal friction” design method, a pivoted fixed-blade damper or blast gate shall be incorporated in the *flue* connector of individual *appliances* to achieve the correct air flow (see [Figure H.7](#)).

H.2.2.4 Location and sizing of the power flue fan

The *power flue* fan shall be located downstream of *flue* system connections to *appliances*.

In order to select a suitable *power flue* fan, it is necessary to determine the volume and temperature of the *flue gases*. Before this can be done the percentage of CO₂ in the *flue gases* shall be decided.

If discharge is at low level, 1 % CO₂ may be used in the design formula. For other situations, values between 4 % and 8 % may be used. These values will give *flue gas* temperatures of 140°C and 220°C respectively.

For *appliances* with modulating *burners*, the carbon dioxide concentration in the *flue* shall be considered when the *appliance* is operating at normal rate, that is, 8 % CO₂ in the combustion chamber.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

The quantity of *flue gases* to be handled by the fan may be determined by the following simplified formula, which is accurate for most fuel *gases* currently distributed. A suitable fan may then be selected.

$$Q = \frac{T}{R}$$

where

- Q = volume of *flue gases*, litres per second.
- T = total *gas consumption* of *appliances* connected to *flue*, megajoules per hour.
- R = desired % CO₂ concentration by volume in the *flue gases* at the discharge point

[Table H.9](#) indicates the relationship between % CO₂, the volume of *flue gases* per MJ/h of *gas consumption* and the amount of excess air in the *flue gases*.

Table H.9 — Flue gases — Relationship between % CO₂, volume flow rate and % excess air

CO ₂ , %	Volume flow rate L/s/ MJ/h	Excess air, %
10	0.1	33
9	0.11	50
8	0.13	67
7	0.14	90
6.7	0.15	100
6	0.17	120
5	0.2	170
4.4	0.23	200
4	0.25	230
3.3	0.3	300
3	0.33	400
2.2	0.45	500
2	0.5	570
1.7	0.6	700
1.2	0.8	1000
1	1	1200
0.8	1.2	1500
0.6	1.6	2000
0.5	2	2600

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

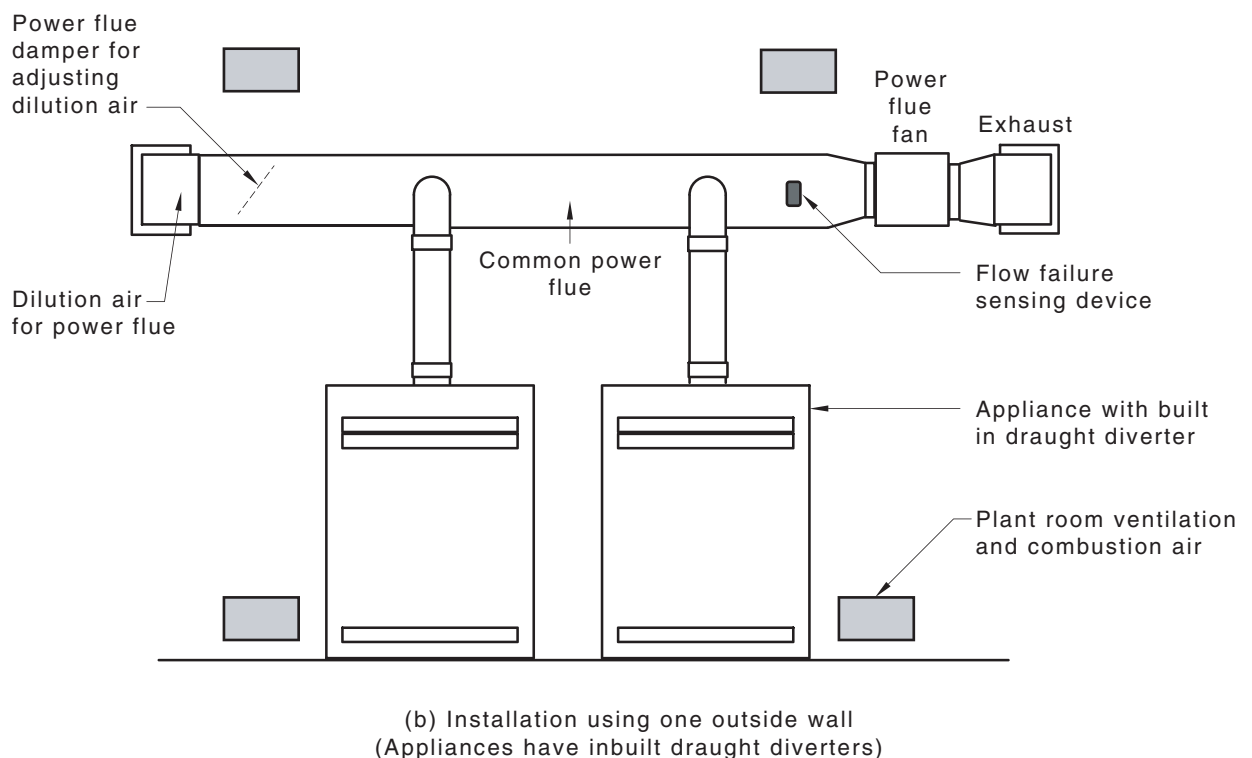
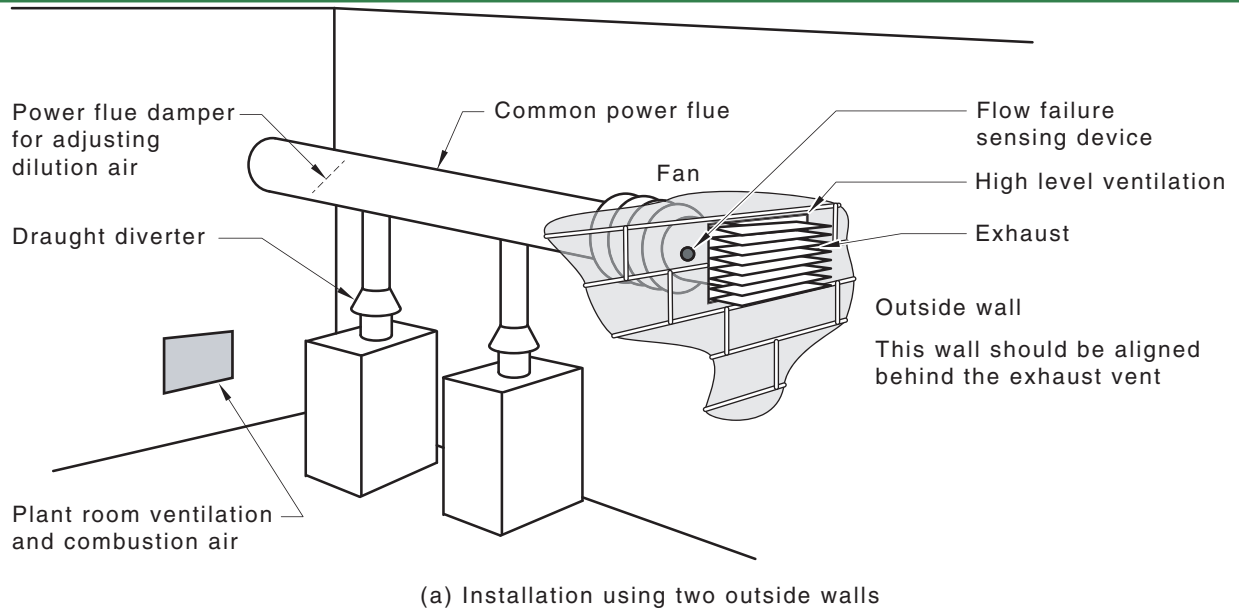


Figure H.6 — Common power flue design — Horizontal discharge

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

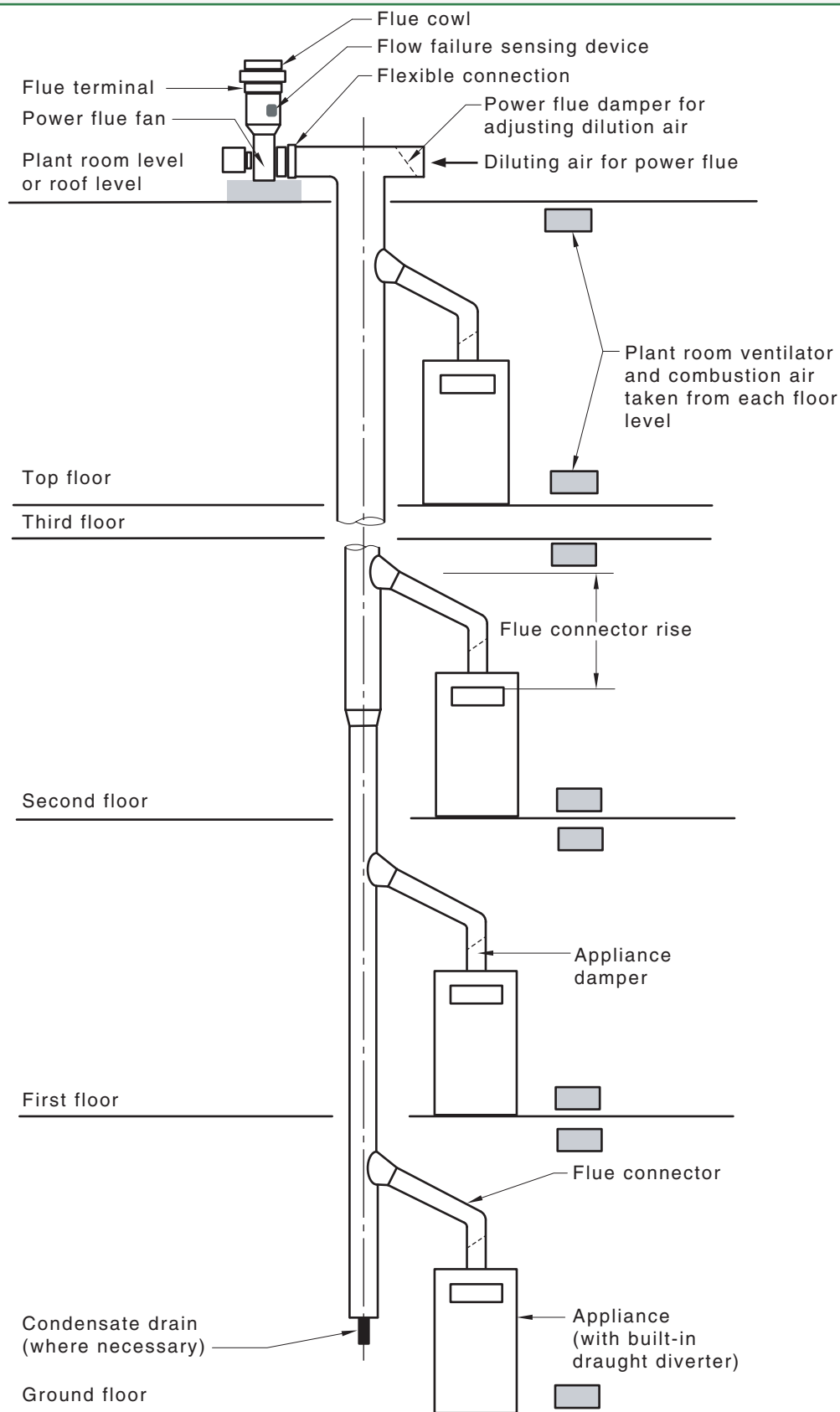


Figure H.7 — Common power flue design with vertical discharge and appliances installed at different levels

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

H.2.2.5 Power flue fan requirements

When selecting a *power flue* fan, allowance shall be made for wind *pressures* at the *flue terminal*.

NOTE 1 A barometric damper is a means of balancing the draught.

The fan shall be rated for continuous operation giving consideration to the maximum design *flue* temperature. A fan located outside shall have a weatherproof motor.

A fan with an indirect drive shall be fitted with a removable steel guard designed and installed so as not to interfere with the pulleys when the motor is moved to take up belt slack. Bearings and shafts shall be protected from the weather by a durable and removable cover.

The fan shall be located in the *common flue* as near as practicable to the *flue terminal*. Factors such as power and control wiring may determine its actual location.

NOTE 2 The fan should preferably be of the backward curved blade type having a non-overloading power characteristic.

H.2.2.6 Flow failure sensing devices

A sensing device shall be installed in the *power flue* to ensure that, in the event of flow failure, the safety shut-off valve will close. Appliances with permanent pilots may shut down the main *burner gas* only and need not have manual reset. Other *appliances* shall go to *lock-out* when there is a flow failure.

NOTE 1 Flow failure can be caused by fan failure, power supply failure, blocked *flue*, or any other cause by which the flow falls to a value at which there would be an unacceptable deterioration of performance (poor combustion, overheating, or spilling of *combustion products*).

NOTE 2 Types of sensing devices which may be considered are:

- (a) Vane or sail switch, which may be fitted on either side of the fan and which has position proving.
- (b) Pressure differential detector, with both of its *pressure* detecting points either upstream or downstream of the fan and with position proving.
- (c) Temperature detector(s) sensing a change in air or *flue gas* temperature associated with flow failure.

A possible disadvantage of sail switches and *pressure* differential detectors in *open flue* systems is that wind gusts can cause rapid on/off cycling of the *gas* valve. This can be overcome by fitting a delayed switching device in the circuit.

H.2.2.7 Noise and vibration reduction requirements

Where an *appliance* with a *power flue* is to be installed in a housing or *plant room*, the construction and the possible effects of high noise levels in neighbouring rooms shall be taken into account.

NOTE 1 *Often flue* wall resonance, grille noise and *burner* noise may necessitate acoustic treatment being carried out after the installation has been completed.

NOTE 2 Methods of minimizing noise levels are as follows:

- (a) *Flue* edging should be smooth and care should be taken that there are no burrs, sharp edges inside or outside, and loose parts in the *flue* system. The *flue* should be sturdily constructed and supported to prevent vibration and drumming.
- (b) The fan should preferably be of the slow running type and the maximum *flue gas* velocity should be kept within the region of 3 m/s.
- (c) Flexible connections between fan and *flue* are desirable, and fans should be separately supported on suitable resilient type mountings.
- (d) Resilient material between a bracket and a wall also assists to reduce noise to a great extent. The material should not be affected by weather or sunlight.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (e) A suitable sound absorbent material may be used to insulate a *flue* that is intended to be boxed in for aesthetic reasons.
- (f) Where fan noise, air rush noise and self-generated noise produced by components of the *flue* are excessive, attenuating devices (sound traps) should be fitted, either directly above the *draught diverter* (wall furnace type space heaters in particular), or in the *flue* downstream and/or upstream of the *power flue* fan.

H.2.2.8 Commissioning the power flue

The correct CO₂ concentration shall be established by adjustment of dampers and checked by *flue gas* analysis. A check that the controls are operating in the manner specified shall be carried out. This check shall include a simulation of flow failure.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

Appendix I (informative)

Appliances in outdoor areas

This Appendix provides diagrammatic representations ([Figure I.1](#), [Figure I.2](#), [Figure I.3](#), [Figure I.4](#) and [Figure I.5](#)) of *outdoor areas*, as defined in [Clause 1.3.84](#). The figures are examples; the same principles apply to any other shaped area.

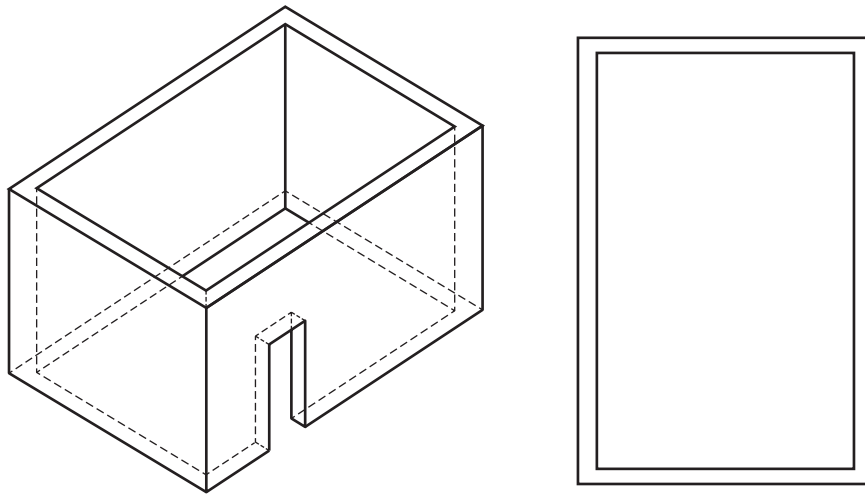


Figure I.1 — Example 1 — Outdoor area — Enclosure with no overhead cover, walls on all sides and with at least one permanent opening at ground level

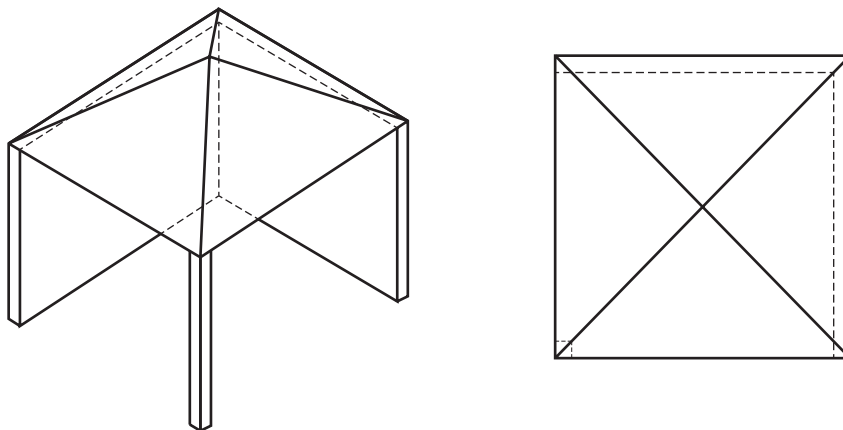


Figure I.2 — Example 2 — Outdoor area — Enclosure with overhead cover and two adjacent sides fully and permanently open

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

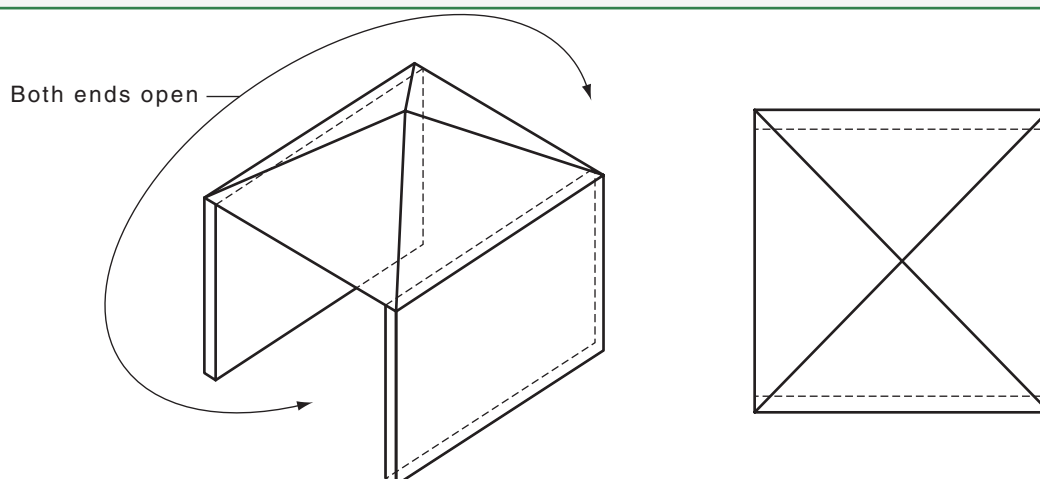


Figure I.3 — Example 3 — Outdoor area — Enclosure with overhead cover and two opposite sides fully and permanently open

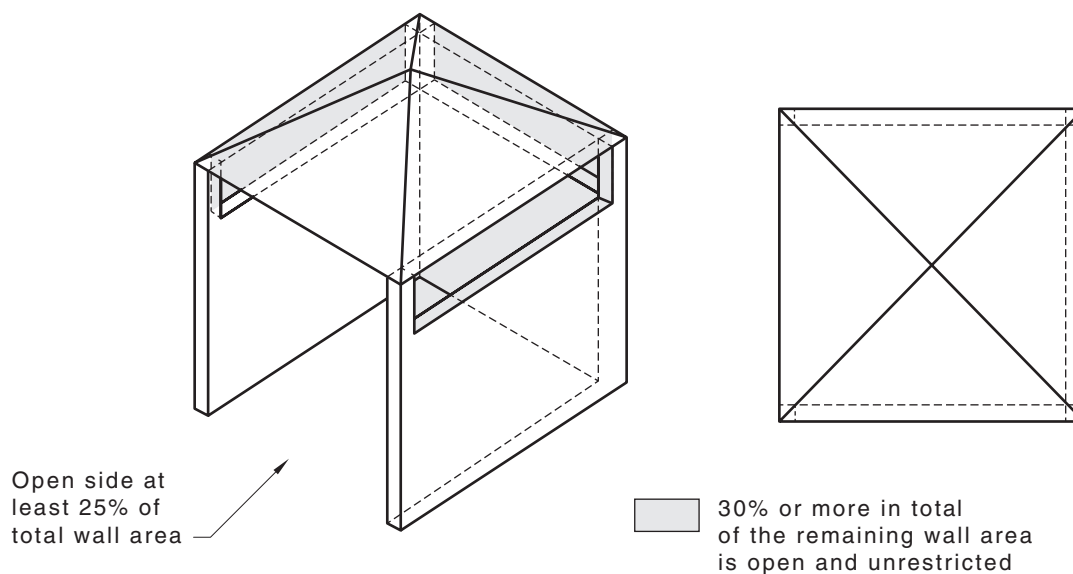


Figure I.4 — Example 4 — Outdoor area — Enclosure with overhead cover, one side fully and permanently open and other sides partially open (minimum opening size requirements as shown)

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

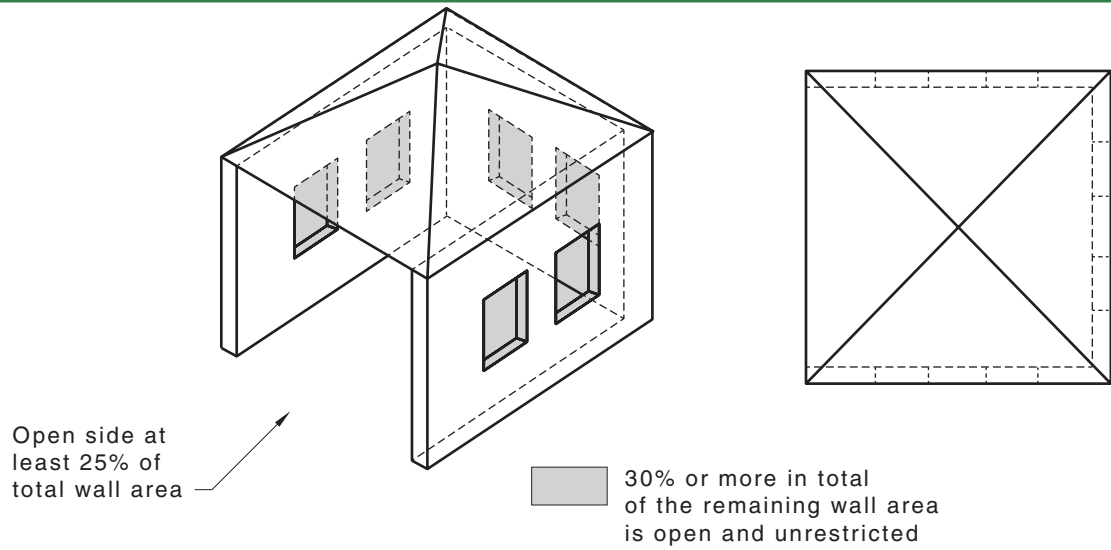


Figure I.5 — Example 5 — Outdoor area — Enclosure with overhead cover, one side fully and permanently open and other sides partially open (minimum opening size requirements as shown)

Appendix J (Informative)

LP Gas cylinder locations

J.1 General

The information in this Appendix is based on clauses of AS/NZS 1596:2014.

The purpose of this Appendix is to provide guidance. For mandatory requirements refer to AS/NZS 1596:2014 and local jurisdictional requirements.

For New Zealand, the controls for the storage and location of LPG are set out in the Health and Safety at Work (Hazardous Substances) Regulations 2017 (in workplaces) or in the EPA Hazardous Substances (Hazardous Property Controls) Notice 2017 (non-workplace or domestic). This informative appendix should be treated as guidance only, especially for quantities exceeding 100 kg.

AS/NZS 1596:2014 applies up to the outlet of the first regulator in the vapor supply system, including any integral two-stage regulator.

J.2 Cylinder requirements

In Australia, requirements for *cylinders* for use in an *LP Gas installation* are specified in AS 2030.1.

In New Zealand, *cylinders* for use in *LP Gas installations* are required to be stamped with a LAB number and a current test date in accordance with the requirements of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

J.3 Location of cylinders

J.3.1 General

Cylinders and associated equipment should not be installed *indoors* unless specifically permitted by AS/NZS 1596:2014 and in such instances should be carried out with all controls specified in AS/NZS 1596:2014 and this Standard relevant to the *appliances* concerned.

J.3.2 Prohibited locations for cylinders

AS/NZS 1596:2014 specifies that any *cylinder* and its associated equipment be not installed in any of the following locations:

- (a) Within a building, except where permitted by AS/NZS 1596:2014.
- (b) Under a stairway.
- (c) In a location with restricted access, where inspection, refilling or exchange of the *cylinder* is restricted, obscured or hazardous to the operator.
- (d) Where nearby constructions, fences, walls or *vapour barriers* could prevent cross-ventilation.
- (e) Under a building, except where permitted by AS/NZS 1596:2014.
- (f) Where the *cylinder*, or an incident involving the *cylinder* and its contents, could obstruct egress from a building.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

(g) Buried in the ground.

NOTE 1 This does not limit innovation design in conjunction with appropriate authority.

NOTE 2 The information in this Clause is based on Clause 4.4.3 of AS/NZS 1596:2014).

J.3.3 Cylinders on a veranda

Where *cylinders* are located on a veranda, AS/NZS 1596:2014 specifies the following:

- (a) The location to be nominally at ground level.
- (b) The veranda to be open on all three sides.
- (c) The wall against which the cylinders are located be free of windows and doors in accordance with [Figure J.5\(B\)](#).
- (d) The veranda floor be free of drains in accordance with [Figure J.5\(B\)](#).
- (e) The hazardous area around the *cylinders* to be free of fixed *ignition sources*, as illustrated in [Figure J.3.3](#).
- (f) The *cylinders* not be subject to physical damage, heat or vibration.
- (g) A maximum of 90 kg be kept on a veranda conforming to this Clause.

The location of such *cylinders* is shown in [Figure J.3.3](#)

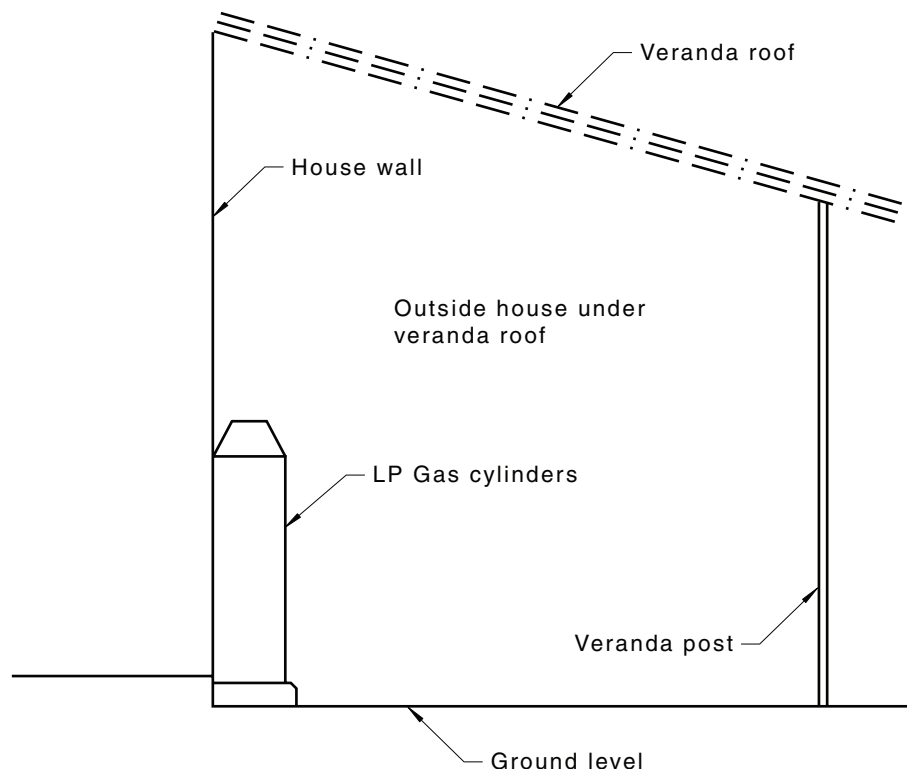


Figure J.3.3 — Location of cylinder on a veranda

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

J.3.4 Cylinders in an enclosure or recess

Where a *cylinder* is to be installed in an *enclosure* or recess, AS/NZS 1596:2014 specifies that the *enclosure* or recess be designed to —

- (a) house *cylinders* and their associated equipment only;
- (b) allow free unimpeded discharge from each *cylinder* safety valve;
- (c) ensure that water will not accumulate on the base; and
- (d) ensure the *cylinder* and its associated equipment are clear of the surrounding soil.

Enclosures of sheet metal or similar impervious construction are required to have ventilation openings at the top and bottom with each opening providing a *free area* of at least 20 000 mm² for every *cylinder* enclosed (see AS/NZS 1596).

NOTE The information in this Clause is based on Clause 4.4.9 of AS/NZS 1596:2014, including Amendment 1 (2017).

J.3.5 Cylinders under a building supported by piers

Where a *cylinder* is located under a building supported by piers, AS/NZS 1596 specifies the following:

- (a) A vertical clearance of at least 800 mm between the top of the neck ring of the *cylinder* and the underside of any overhanging part of the building.
- (b) No part of the *cylinder* be more than 800 mm within the perimeter of the building's walls (see [Figure J.3.5](#), side view).
- (c) The area between the piers be —
 - (i) open on at least three sides; or
 - (ii) enclosed by a construction through which cross-ventilation can occur (e.g. slats or battens) on at least three sides; or
 - (iii) a combination of Items (i) and (ii) above.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

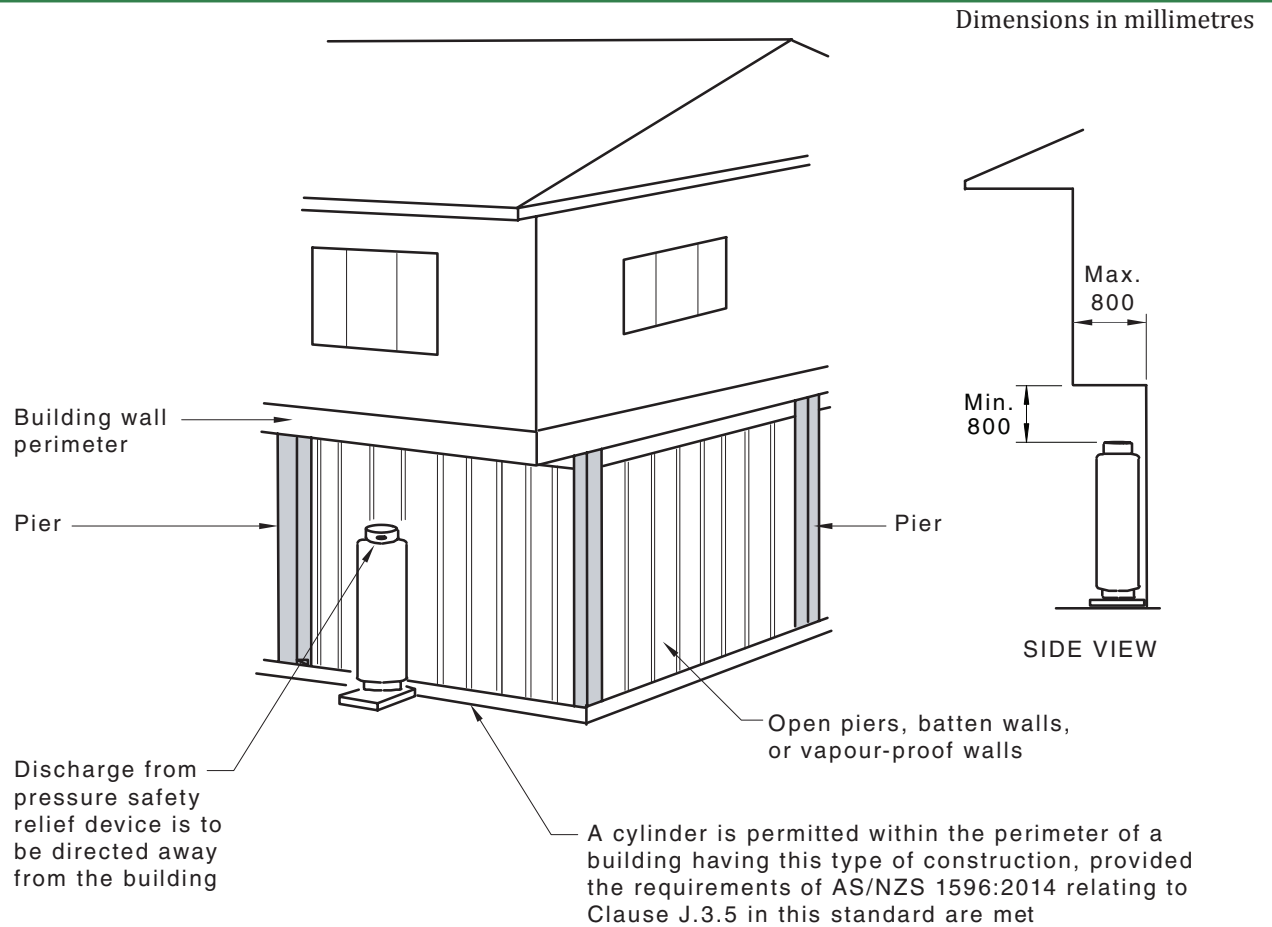


Figure J.3.5 — Location of cylinder under a building

NOTE The information in this Clause is based on Clause 4.4.8 of AS/NZS 1596:2014.

J.3.6 Cylinders in public locations

Where a *cylinder* exceeding 12 L capacity is permanently installed for public use in a location having unrestricted public access, AS/NZS 1596:2014 specifies the following:

- (a) Either —
 - (i) the *cylinder* and any associated *regulator* be enclosed in a lockable cage or cabinet ventilated at the top and bottom; or
 - (ii) the *cylinder* valves and *regulator* be guarded by a covering metal hood and the *cylinder* protected against accidental dislodgment.
- (b) The connecting piping be arranged so that it is not vulnerable to tampering or accidental impact.

Any lockable *enclosure* as described in Items (a)(i) and (a)(ii) to be kept locked when not in use.

These requirements of AS/NZS 1596 do not apply to *cylinders* on *caravans* or mobile homes, or to *cylinders* attached to any cabins for hire or domestic dwelling associated with the site.

NOTE The information in this Clause is based on Clause 4.4.10 of AS/NZS 1596:2014.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

J.3.7 Site upkeep

AS/NZS 1596:2014 specifies that the area around any storage and handling facility and the installation itself shall be maintained in a safe condition. The following would apply:

- (a) Any accumulation of flammable or combustible materials, of a type and quantity sufficient to constitute a significant heat radiation hazard to the installation in the event of fire in those materials, to be removed.
- (b) Specified clearance distances to be maintained.
- (c) Vegetation that could become a fire hazard to be kept short.
- (d) The area to be kept clear of all extraneous material.
- (e) Lighting to be kept operational and effective.
- (f) The surface coating of any tanks to be maintained in good condition.
- (g) Signs and notices to be legible.
- (h) Water levels in drainage system vapour traps to be maintained at the correct level.

J.4 Installation — Installing cylinders

NOTE 1 Authorities in most areas permit only specifically licensed persons to make, repair, alter, or open connections in any installation for *LP Gas cylinders*, except for their actual connection or disconnection.

AS/NZS 1596 specifies that the installation of *cylinders* be as follows:

- (a) *Cylinders* to be installed on a firm, level, non-combustible base, and not resting on soil. The floor or base be constructed so that water cannot accumulate within any *enclosure* or recess.
- (b) *Cylinders* to not be stacked on top of each other.
- (c) Any *cylinder* that is greater than 25 L and less than 200 L water capacity be restrained from falling.

NOTE 2 This includes a *cylinder* located in an area likely to be subject to flooding or seismic activity. Cylinders greater than 200 L or less than 25 L are typically inherently stable.

- (d) In New Zealand, any *cylinder* larger than 25 L to be restrained against seismic activity.
- (e) The selection of the location of cylinder installations to consider minimization of the impact hazard by locating cylinders away from likely vehicle paths. Commercial/industrial cylinder installations to be protected and the impact requirements for the proposed site assessed in accordance with AS/NZS 1596.

NOTE 3 A frame may be used where the *cylinder* is not connected to external pipework.

- (f) *Cylinders* to not be installed below ground level unless there is sufficient ventilation to prevent the accumulation of any leaking *gas*.
- (g) A *cylinder* to be installed so that the *pressure* relief valve is in contact with the vapour space and any discharge from this valve is directed away from any adjacent *cylinders* or combustible structures.
- (h) *Cylinders* to be exchanged or removed are to be connected to a fixed piping system that conforms with AS/NZS 1596:2014 Clause 4.3.3.
- (i) Vapour-service *cylinders* to be installed so that the point of *LP Gas* withdrawal is in contact with the vapour space.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (j) Where two or more *exchange cylinders* are connected for use, a means to be provided to permit the *cylinders* to be isolated from the *gas supply*, to allow the *cylinders* to be disconnected, to be achieved by either of the following:

- (i) A manual or automatic changeover valve to be installed immediately upstream of the *regulator* serving the system.

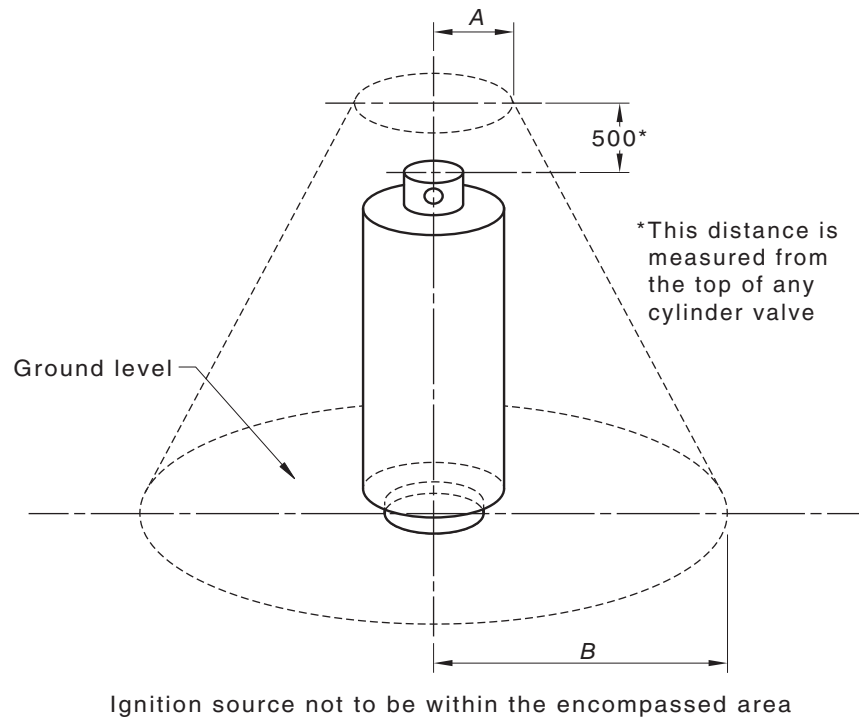
NOTE 4 Such a valve may be an integral part of an *automatic change-over regulator*.

- (ii) *Isolation valves* to be installed on the manifold, to allow each *cylinder* to be individually disconnected from the manifold without depressurizing the manifold.

J.5 Clearances around cylinders

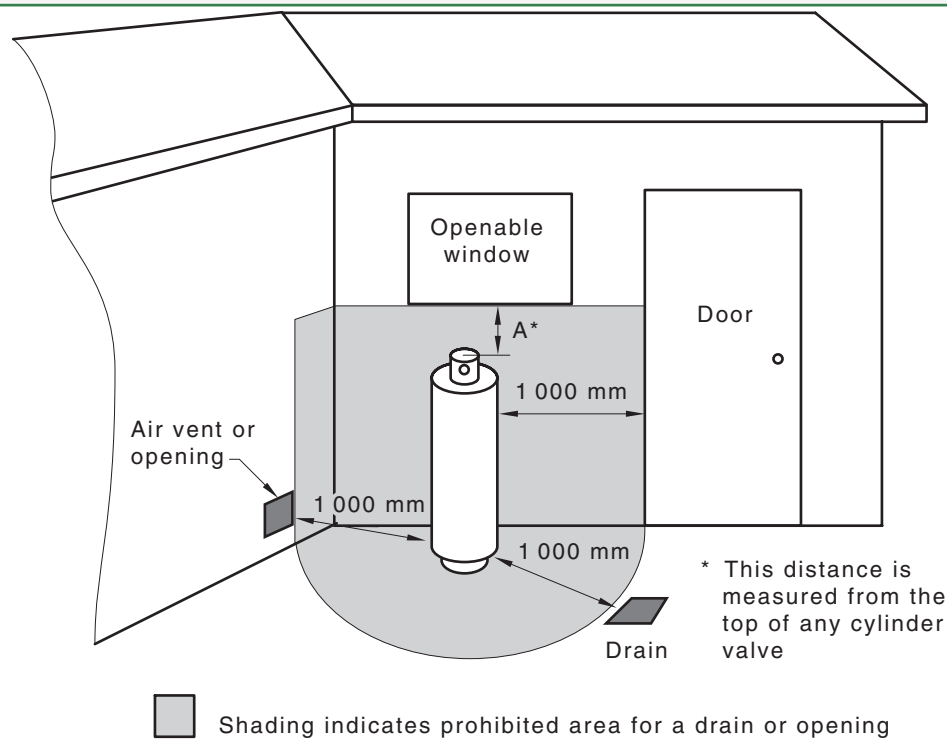
Cylinder clearances are shown in [Figure J.5\(A\)](#) and [Figure J.5\(B\)](#). Cylinders should be kept in a location that does not hinder the escape of people, and is away from any combustible or waste materials.

In New Zealand, the separation distances illustrated in [Figure J.5\(B\)](#) are only applicable to installations having a storage capacity up to 100 kg of *LP Gas*. For above 100 kg storage capacity, a location test certificate issued by a test certifier is required under the hazardous substances legislation.



Radius	Exchange cylinder mm	<i>In situ</i> fill cylinder mm
<i>A</i>	500	1 500
<i>B</i>	1 500	3 500

Figure J.5(A) — Minimum clearance to ignition sources



Distance	Exchange cylinder mm	In situ fill cylinder mm
A	150	500

Figure J.5(B) — Minimum clearance to a drain or openings into a building

J.6 Cylinder regulators

A cylinder regulator is to be certified to AS 4621 or UL 144.

AS/NZS1596 specifies that cylinder regulators be located outside buildings, except where an indoor location is permitted by the Standard.

The regulators are to be either —

- (a) rigidly fixed to an adequate support independent of the cylinder and mounted with the diaphragm vertical and the vent pointing vertically downwards; or
- (b) for cylinders exceeding 400 L and having lockable domes, connected directly to the valve outlet, or as close as the fittings will practically allow.

Pipework connecting the regulator to the cylinder should conform to [Clause J.9](#).

The outdoor discharge from a vent terminal, gas pressure relief device or terminal of a vent line is to be —

- (i) arranged to minimize the risk of vapour collecting in drains, gutters, and downpipes;
- (ii) not less than 0.5 m in any direction from any opening into a building; and
- (iii) located such that there is no fixed source of ignition in the area 0.5 m above and 1 m laterally from the discharge and extending to ground level at a distance of 1 m laterally [see [Figure J.6\(A\)](#)].

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

The vent terminal is to have provision to exclude rain and insects.

Gas pressure regulators are to be located to permit drainage of any liquid back into the *cylinder* [see [Figure J.6\(B\)](#)].

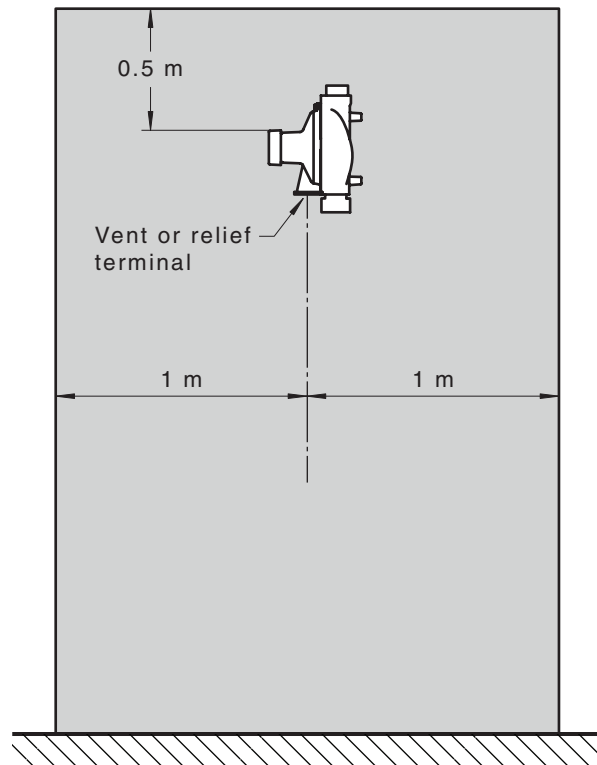


Figure J.6(A) — Regulator vent ignition source exclusion zone

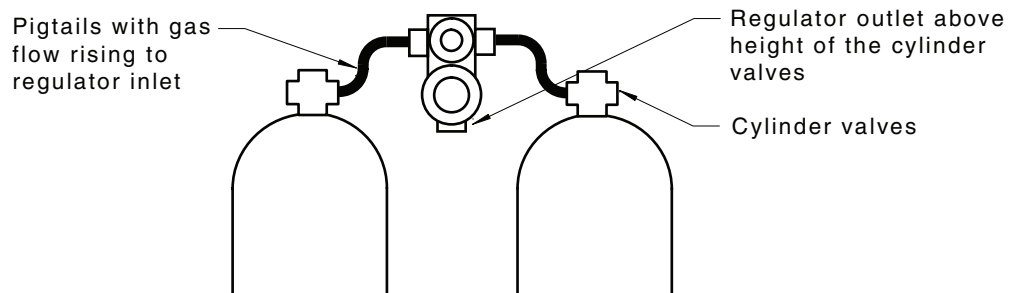


Figure J.6(B) — Location of cylinder regulator

J.7 LP Gas cylinder capacity

[Table J.7](#) provides approximate capacities of *LP Gas cylinders*.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Table J.7 — Approximate capacities of cylinders for LP Gas

Nominal mass of <i>LP Gas</i> in cylinder kg	Approximate volume (water capacity) of cylinder L
3	7
4.5	11
5	13
9	22
10	26
13.5	32
15	36
18	44
45	108
90	200
190	454
210	499

J.8 Vaporization capacity for cylinders and tanks

The vaporization capacity of any *LP Gas* container is dependent on the amount of heat that can be transferred from the external environment through the storage vessel wall into the liquid. This heat may be supplied from either artificial or natural sources. The most common is natural vaporization, that is, heat from the sun (radiant) and wind (conduction).

The surface area of a vessel that is bathed with liquid is called the “wetted surface”. The greater the wetted surface, the greater the vaporization capacity of any storage vessel.

A number of assumptions have been made in calculating the vaporization capacity —

- (a) the *LP Gas* is propane;
- (b) the vessel is 30 % full;
- (c) relative humidity is 70 %; and
- (d) the vessel is under continuous load.

[Table J.8\(A\)](#) and [Table J.8\(B\)](#) show nominal vaporization capacity (in MJ/h) at various temperatures. As a general guide, 4°C represents typical winter conditions and 16°C represents typical summer conditions.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Table J.8(A) — Vaporization capacity of gas cylinder

Vessel size kg	Vaporization capacity, MJ/h				
	–1°C	4°C	10°C	16°C	22°C
45	118	141	164	188	211
90	155	185	216	246	277
190	265	318	372	424	477
Cylinder capacity: 45 kg — 1.115 m height × 0.374 m diameter 90 kg — 1.100 m height × 0.485 m diameter 190 kg — 1.207 m height × 0.776 m diameter					

Table J.8(B) — Vaporization capacity of gas tank

Vessel size kL	Vaporization capacity, MJ/h				
	–1°C	4°C	10°C	16°C	22°C
2.75	1010	1212	1414	1616	1818
4.2	1362	1635	1907	2180	2452
7.5	2300	2760	3220	3680	4140
Tank capacity: 2.75 kL — 3.330 m long × 1.065 m diameter 4.2 kL — 3.920 m long × 1.220 m diameter 7.5 kL — 6.620 m long × 1.220 m diameter					

J.9 Material between LP Gas cylinder valve and inlet to first regulator

Materials for *pipng* between the *LP Gas cylinder* valve and the inlet to the first *regulator* should meet the criteria in [Table J.9](#).

Table J.9 — Materials for piping systems between cylinder valve and inlet to first regulator

Pipe	Fittings
Annealed copper tube conforming to AS 1572 having an alloy designation of 122 in accordance with AS 2738 with a minimum wall thickness of 1.22 mm and a nominal size of 6 mm or 9 mm in industrial and commercial applications.	Copper alloy flared compression fitting conforming to AS 3688 Copper or copper alloy capillary fitting conforming to AS 3688 See Note 3
A flexible pigtail conforming to AS/NZS 1869 Class F with an excess flow valve immediately upstream of the hose assembly; and — (a) having a maximum length of 600 mm; (b) having a nominal size of 6 mm or 9 mm in industrial or commercial applications; and (c) for a non-metallic lined flexible pigtail having a maximum life of 6 years from the date of manufacture.	<i>POL</i> fitting or cylinder quick-connect device and tail piece as determined by the application in accordance with AS/NZS 1596:2014
NOTE 1 The piping should be as short as practicable and not more than 1 m in length.	
NOTE 2 An <i>excess flow</i> valve may be an integral part of the cylinder quick-connect device or <i>POL fitting</i>	
NOTE 3 For joining methods and materials, see Table 4.2 .	

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix K (informative)

Gas in high-rise buildings

K.1 Introduction

This Appendix provides guidance for those associated with the design and installation of *gas* systems in *high-rise buildings*. However, it is not a comprehensive design guide. As these installations are complex in nature and need to resolve issues not normally encountered in low-rise *gas installations*, their design and installation should only be undertaken by persons who can demonstrate competency in this type of work.

Use of heavier-than-air *gases*, e.g. *LP Gas*, in *high-rise buildings* will require special consideration in terms of ventilation.

The information provided relates to [Clause 5.7](#) and the requirements of this Standard or any other relevant standard. It is critical that consideration be given to the *gas installation* requirements as early as practicable in the design and construction of the building.

Ensuring a safe *gas installation* in a multi-storey building is significantly more complex than for single storey residential installations. They generally consist of larger more complex systems that are installed in areas with smaller amounts of adventitious ventilation and more opportunities for escaping *gas* to pool. As a rule, occupants of multi-storey buildings should not be exposed to a risk greater than that for a single level residence. At the design stage of a *gas* system in a *high-rise building*, the risks need to be assessed and measures implemented to eliminate or moderate the risks to the lowest level reasonably possible.

K.2 Gas supply

Arranging for a *gas* supply is by application to an energy retailer or distributor. The meter location/meter room or *LP Gas* storage details are decided in consultation with the applicant and the local *gas* supply company. The applicant should provide details of expected *gas loads* and *pressure* requirements. Contact the *Technical Regulator* for further details and for installation acceptance procedures.

NOTE The use of *LP Gas* in *high-rise buildings* is not recommended.

K.3 Consumer piping

Pipe materials conforming to the requirements of [Clause 4.2](#) may be used in *high-rise buildings*, except where specifically prohibited.

All joints should be welded if the *riser* is constructed from steel or brazed if constructed from copper with the exception of valves which may be screwed or flanged.

K.4 Pipe riser shafts

Riser shafts should be vented to a safe location, external to the building. These will probably need to be fire rated to the requirements of the applicable building code or its equivalent and should be referred to the Building Surveyor.

The use of unventilated *riser* shafts is not recommended and if used needs to be validated by a risk assessment.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

If *regulators* with over-pressure relief are to be installed in a *riser* shaft, there should be a vent pipe that discharges to outside the building in a safe location.

If a *regulator* without over-pressure relief is installed, a vent pipe may be required (see [Clause 5.11.1.2](#)). The volume of the *riser* needs to be calculated to determine if it is acceptable to vent into the shaft or if a *vent line* is required. When a *regulator* is installed without a vent pipe, the *riser* design should take into account the need to dilute to a safe level any *gas* that may escape from the *regulator(s)*.

K.5 Consumer pipe location

[Clause 5.3.1](#) provides for prohibited location of *consumer piping*. Some corridors and passageways are defined as “required exits” or “fire exit ways”. The relevant building codes do not permit *gas* piping in a required exit. If there is doubt about whether a location is to be a required exit, written clarification from the relevant authority should be obtained.

K.6 Components to be accessible

A number of components installed in a high-rise installation need to be *accessible* for servicing or for inspection, including *pressure regulators*, semi-rigid connectors, isolation valves; and pipe anchors and spring clips.

K.7 Pipe support systems

K.7.1 Components to be considered

To allow for the movement of piping within a *high-rise building* the design should consider the four different components highlighted in [Figure K.7.1\(A\)](#) and [Figure K.7.1\(B\)](#).

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

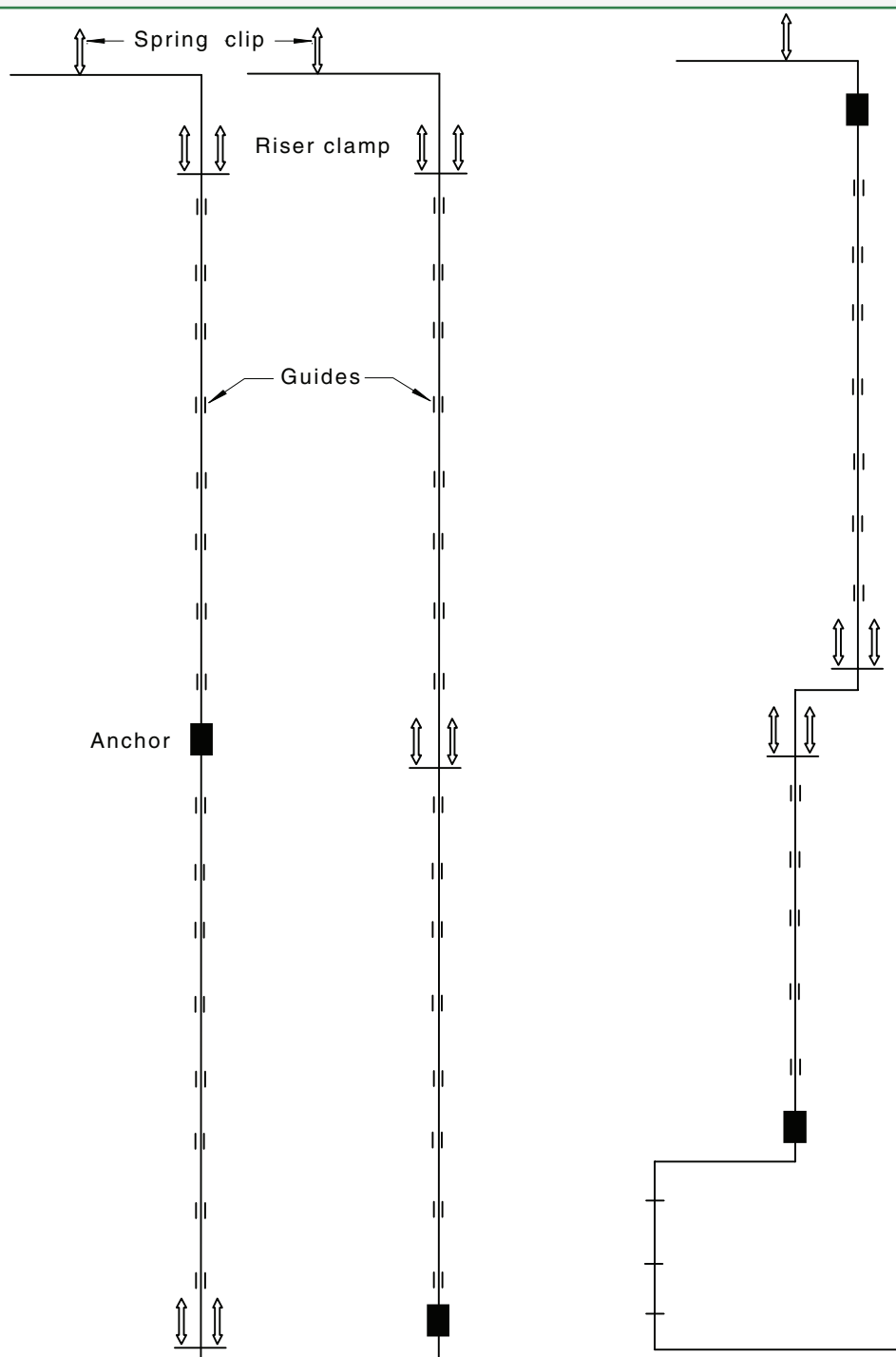


Figure K.7.1(A) — Buildings not exceeding 30 storeys

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

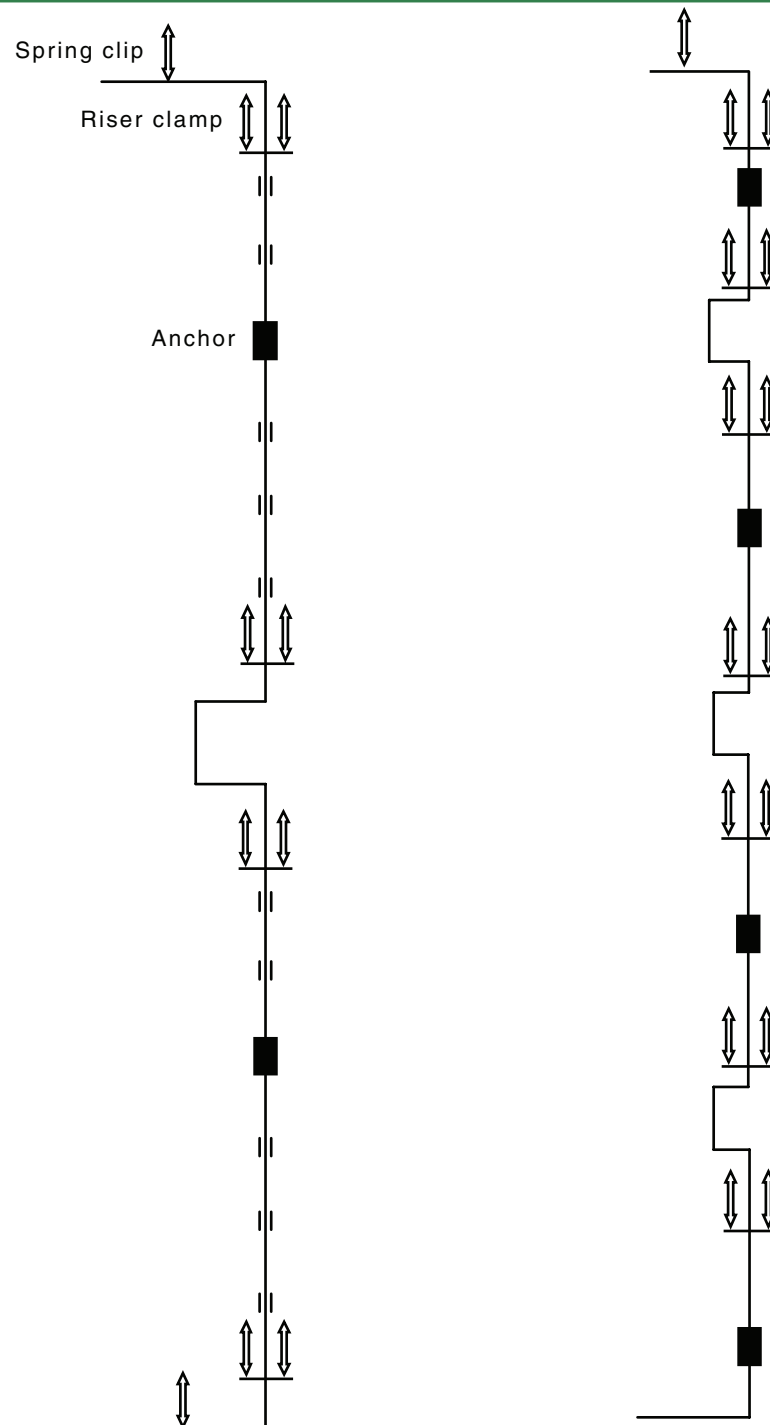


Figure K.7.1(B) — Buildings over 30 storeys

K.7.2 Pipe anchor

Generally, one anchor is provided (provision for anchor failure should be made) to support the pipe, and it should be a friction fit. The anchor should not be brazed to the pipe unless the *riser* has been reinforced, because heating anneals the pipe and the pipe could collapse at this point. Before selecting the location of the anchor, the direction of the expansion needs to be considered. If the anchor is located in the centre of the pipe *riser*, the expansion travel is halved, but allowance for movement is required at both ends. Except where a loop or offset is fitted to absorb movement, there should only be one anchor. If more than one anchor is fitted without a loop being installed between the anchor points, the pipe

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

could buckle due to excessive compressive loading or be subject to tensile forces that could result in permanent deformation of the pipe as the temperature changes.

K.7.3 Pipe riser clamp

Pipe *riser* clamps should be installed at regular intervals (as a general rule, approximately every seven *storeys* from the anchor, or evenly spaced out, and located at the top and bottom of the *riser*). The purpose of the *riser* clamp is to reduce the load imposed on the pipe through its own weight, and may be a friction fit around the pipe. A spring at each side of the clamp is adjustable to take the weight of the pipe off the anchor while still allowing the pipe to travel. The springs are selected taking into consideration the weight of the pipe being supported, and the length of travel. The required spring tension may change as the distance from the anchor increases.

K.7.4 Pipe guides

Pipe guides hold the pipe in position and in line, allowing the pipe clip to move in its bracket as the pipe moves.

Pipe guides are to be installed at spacings as required by [Clause 5.8.2](#).

K.7.5 Spring clip

Spring clips are installed on horizontal sections of the pipe (usually out of the *riser*) to allow for the vertical movement while still being supported. They comprise a bolted clip supported by a single spring adjusted to take the weight of the pipe. The number of spring clips required along a horizontal run will depend on whether pipe has bends or is a straight run. The spacing of the clips is as per [Clause 5.8.2](#).

K.8 Expansion and contraction of consumer piping and buildings

K.8.1 Thermal expansion

K.8.1.1 General

Materials expand or shrink when subjected to changing temperatures; this is known as thermal expansion. The design needs to address the changes in pipe length that can occur as a result of thermal expansion.

K.8.1.2 Selecting a design temperature differential

The design temperature differential should be selected to represent the maximum temperature change that the piping system will experience during its lifetime.

Consideration should be given to the temperatures that the piping will be subjected to through operational and ambient effects, both daily and seasonal. It should start from the time the system is locked into place, usually during construction when it may be exposed to the weather right through to normal operation of the system. If the pipe is installed external to the building, then allowances should be made for solar exposure and shading from adjacent structures.

K.8.1.3 Calculating the thermal expansion

The thermal coefficient of expansion for copper is 0.0000177 per degree Celsius differential temperature. Therefore, the thermal expansion for a 70 m copper pipe rise through 30°C would be:

$$\text{Thermal expansion} = 70000 \times 30 \times 0.0000177 = 37.2 \text{ mm.}$$

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

K.8.2 Building shrinkage

The effect building shrinkage has on *consumer piping* should be considered in all *high-rise building consumer piping* designs. Buildings can shrink significantly for up to 10 years after the initial drying out period. This shrinkage should be allowed for in calculations as it will apply loads to piping systems not designed to cope with support structure shrinkage or disappearing clearances to structural members. The civil design/construction engineer should supply information regarding the expected amount of building shrinkage. For example, buildings of 40 *storeys* are expected to shrink between 150 mm and 200 mm over such a period. Even on 10 *storey* buildings shrinkage should be considered as it may result in significant pipe stresses.

K.8.3 Design for expansion/contraction

The amount a pipe system will expand or contract over its life can be estimated using the above factors. The system should be designed to ensure that it is flexible enough to ensure that it never reaches a condition where it will yield and possibly fail.

[Figures K.7.1\(A\)](#) and [K.7.1\(B\)](#) show some design systems that are used to ensure that the system is flexible and will not fail due to expansion and/or contraction and building shrinkage. Flexibility of the system is increased by incorporating offsets or loops in the design.

Where a system fails to have enough flexibility, loops or offsets should be installed in the *riser*. The number of loops or offsets will depend on the available space in the *riser* shaft, and the amount of travel in the pipe. The amount of travel in the pipe will be controlled by the number of loops/offsets that can be installed, the more loops/offsets installed, the less travel that each loop/offset will be required to deal with. This in turn allows for smaller loops/offsets. (Travel is divided by number of loops.)

An anchor is installed between each loop to support the pipe; the expansion between the two anchors is taken up by the loop. A pipe *riser* clamp is installed as close as possible to each side of the loop, then spaced at approximately every 7 levels or evenly spaced as required. Requirements for the installation of guides are set out in [Clause 5.8.2](#).

The design of loops/offsets needs to ensure that the pipe system is not placed into yield by linear and/or torsional deflexions. Such designs should only be undertaken by persons competent in the field.

K.9 Branches (off-takes)

Where a branch is required to be connected to the *riser* at a point remote from an anchor point, allowance should be made for expansion of the pipe to prevent a fixed branch being broken off as the pipe moves.

Shear and bending loads should be assessed at all off-takes due to the action of shrinkage, expansion and contraction to ensure that the system is never subjected to loads where it will be in yield.

Loads can be accommodated by ensuring correct design to allow for bending of the off-take to cope with pipe movement without yielding, or the installation of *semi-rigid connectors*, certified to AS 4631.

K.10 Valves

K.10.1 General

The positioning of the valves in *high-rise buildings* has to be considered. [Clause 5.3.8](#) requires pipes in unventilated concealed locations to have *permanent joints*. Valves invariably have mechanical joints, and should therefore be installed only in vented spaces. If valves are installed in a ceiling, then the ceiling should be vented to atmosphere at both ends to a safe location [see [Clause 5.3.12\(b\)](#)]. The vent should not terminate into any prohibited location (see [Clause 5.3.1](#)) or into a “required exit”. Valves are usually installed in the *riser* shaft for ease of access and ventilation. Ventilation can be obtained through the *riser* to roof level and atmosphere.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

K.10.2 Pipe riser isolation valves

A manual *isolation valve* is required for a *riser*. Where more than one *riser* is installed, a manual *isolation valve* is required at the base of each *riser*. The valve is to be fitted as close as possible to the *riser* but be *accessible*. A *pressure test point* is recommended to be installed downstream of each valve.

K.10.3 Off-take isolation valves

A manual isolation valve is required at each off-take (branch) from a *riser*. This *isolation valve* should be as close to the main *riser* as possible but be *accessible*. A *pressure test point* is recommended to be installed downstream of each valve.

A *regulator*, if required, depending on the *operating pressure* of the *consumer piping* may also be installed at this point. All these components should be installed in the *riser* shaft and as they comprise mechanical joints the *riser* should be adequately ventilated.

K.10.4 Apartment isolation valves

It is good practice that each apartment or tenancy be isolated by a valve located in an *accessible* and identified location. If the *gas* supply is interrupted, valves can be turned off until access is available for re-supply. A *pressure test point* is recommended to be installed downstream of each valve.

Unlike the roof space of a house, where *gas* can escape to atmosphere if a leak occurs, unvented ceilings of foyers, kitchens, food courts, corridor ceilings, etc., could form a very large area to hold any leaking *gas*.

K.11 Plan of pipe

A durable, permanent plan of the *gas installation* is to be fixed in every *high-rise building*, in a visible location, such as the *gas meter* room.

K.12 Boosters

Requirements for installation of boosters (also referenced to as *gas pressure-raising devices*) and the sequence of components are given in [Clause 5.12](#). Boosters are not permitted within a meter room, unless authorized by the *gas* distribution company. Any take off between the meter and booster should be protected against low *pressure*.

K.13 Effect of altitude on gas supply pressure

Compensation for the effect of altitude on *gas* supply *pressure* should be made in high rise buildings. An increase in altitude will result in an increase in *gas* supply *pressure* for lighter than air *gases* such as natural gas (NG). Conversely, for heavier than air *gases*, such as *LP Gas*, an increase in altitude will result in a decrease in *gas* supply *pressure*.

Consideration should be given to the following:

- (a) Selection of the correct inline and *appliance regulators*;
- (b) Correct adjustment of *operating pressures* for *appliances* on each floor level
- (c) *Over-pressure protection* (see [Clause 5.11.2](#))

A general rule of thumb is that for *Natural gas* (NG) the *pressure* will increase by approximately 0.5 kPa for every 100 m rise in altitude while for Australia where *LP Gas* is mainly propane the *pressure* will decrease approximately by 0.7 kPa for every 100 m rise in altitude and in New Zealand where *LP Gas* is mainly butane the *pressure* will decrease approximately 1.3 kPa for every 100 m rise in altitude.

Appendix L (informative)

Consumer billing meter installations

L.1 For New Zealand

L.1.1 General

The following guidelines apply for locating a *gas measurement system (GMS)* with a meter having a capacity up to 25 m³/h (actual).

- (a) The *GMS* should be located to provide for the shortest, most direct route of *gas* service pipe (that is, on front of a house or on side within 3.0 m of front).
- (b) Where the property is on a corner lot, the *GMS* should be positioned on the side of the property that fronts the street address for that property.
- (c) Where it is not possible to maintain the specified clearance, consideration should be given to installing the *GMS* at the consumer's boundary or other location and the meter outlet piped to the building.
- (d) Where the *GMS* is installed in a recessed meter box, the box should be sealed completely from wall cavities and consumer's *premises*.
- (e) The meter should be installed so that the base of the meter is above finished ground level.
- (f) The service valve should be a maximum height of 300 mm from finished ground level.

L.1.2 Exclusion areas and hazardous zones

L.1.2.1 General

The exclusion areas and hazardous zones around the *GMS* have been determined from the applicable *gas*-related and hazardous area codes, and include the appropriate margins to cover typical variations and layouts.

The determinations assume that the maximum inlet *pressure* to the service *regulator* does not exceed 1000 kPa and that the vent discharges vertically downwards.

L.1.2.2 Electrical equipment

For the purposes of this Standard, all fixed sources of ignition and/or building openings are to be excluded from a Zone 1 or Zone 2 area (see [Figure L.1.2.2](#)).

Where the service valve cannot be installed to [Figure L.1.2.2](#), all vertical measurements should be adjusted accordingly.

The clearances specified should be increased if the *GMS* layout or position is likely to create any additional hazard.

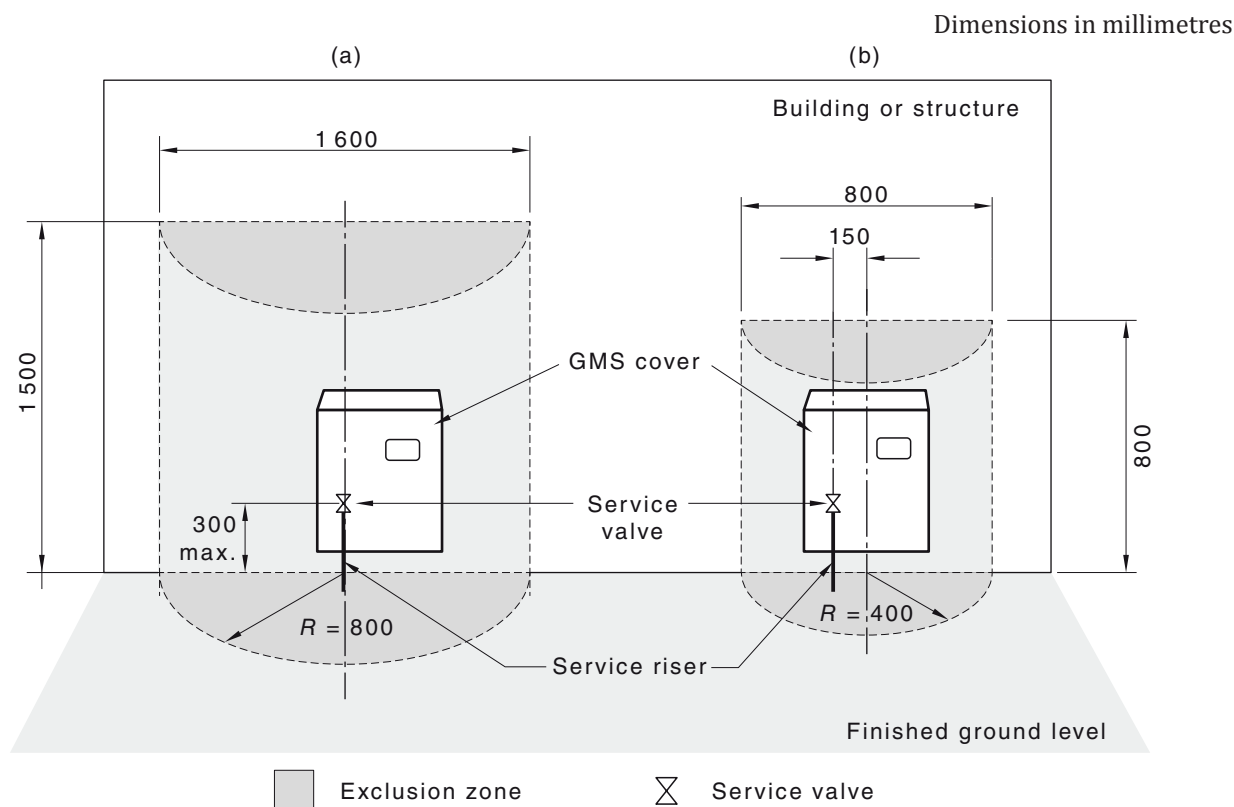
For an *LP Gas GMS* with a venting *regulator* relief valve, a drain or pit should be excluded from an area of at least 1.5 m radius, measured from the service *riser* centre-line.

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

For an *LP Gas GMS* with an automatic shut-off *regulator* device, a drain or pit should be excluded from an area of at least 0.4 m radius measured from the service *riser* centre-line.

NOTE The service *riser* has been used as the point of reference as it is clearly identifiable and unlikely to be moved.

A2



(a) A gas meter fitted with a venting regulator

(b) A gas meter with an OPSO regulator

NOTE 1 Exclusion zone starts at ground level. For venting regulators, the exclusion zone is centred on the service *riser*. For over-pressure shut-off (OPSO) or non-venting regulators, the exclusion zone is centred 150 mm to the right-hand side of the service *riser*, when viewed looking towards the structure.

NOTE 2 The service valve is to be installed between 150 mm and 300 mm maximum above finished ground level.

Figure L.1.2.2 — Exclusion zone for gas regulators A2

L.1.2.3 Natural gas (NG)

In addition to the recommendations of [Clause L.1.1](#), the following should apply for *NG GMS* installations:

- (a) For a *NG GMS* with a venting *regulator* relief valve —
 - (i) the interior of the *GMS enclosure* should be classified as Zone 1; and
 - (ii) an area of at least 0.8 m horizontally from the service *riser* centre-line and at least 1.5 m vertically from finished ground level should be classified as Zone 2.
- (b) For a *NG GMS* with an automatic shut-off device *regulator* —
 - (i) the interior of the *GMS enclosure* should be classified as Zone 1; and

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (ii) an area of at least 0.4 m horizontally from the service *riser* centre-line; and at least 0.8 m vertically from finished ground level should be classified as Zone 2.

L.1.2.4 LP Gas

In addition to the recommendations of [Clause L.1.1](#), the following should apply for *LP Gas GMS* installations:

- (a) For a *LP Gas GMS* with a venting *regulator* relief valve —
 - (i) the interior of the *GMS enclosure* should be classified as Zone 1;
 - (ii) an area of at least 0.8 m horizontally from the service *riser* centre-line, and at least 1.5 m vertically from finished ground level should be classified as Zone 2; and
 - (iii) a drain or pit should be excluded from an area of at least 1.5 m radius measured from the service *riser* centre-line.
- (b) For an *LP Gas GMS* with an automatic shut-off *regulator* device —
 - (i) the interior of the *GMS enclosure* should be classified as Zone 1;
 - (ii) an area of at least 0.4 m horizontally from the service *riser* centre-line, and at least 0.8 m vertically from finished ground level should be classified as Zone 2; and
 - (iii) a drain or pit should be excluded from an area of at least 0.4 m radius, measured from the service *riser* centre-line.

L.2 For Australia

L.2.1 Meter location

The location and the method of installation of a *consumer billing meter* are determined by the *network operator*. Contact should be made with the *network operator* to determine the meter location and relevant installation requirements before any work commences.

NOTE For *sub-meters*, see [Clause 5.11.6](#).

L.2.2 Multiple meters

Where multiple meters are installed, each meter needs to be clearly marked to indicate the portion of the *premises* that is supplied.

NOTE *Consumer piping* should also be appropriately marked prior to meter installation.

L.2.3 Subsequent work

The *network operator's* requirements are to be maintained when subsequent work that involves access to the *consumer billing meter* is carried out. Ensure the following are provided on completion of such work:

- (a) Security.
- (b) Ventilation.
- (c) Corrosion protection.
- (d) Access for reading and maintenance.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix M (informative)

Special requirements in Australian jurisdictions

M.1 Introduction

This Appendix includes information on State and Territory specific requirements set out by the *Technical Regulators*, related to some aspects of this Standard. This is not an exhaustive list. The information below may be subject to change in legislation.

M.2 Technical regulators

The *Technical Regulators* referred to in this Appendix are as follows:

- (a) Office of the *Technical Regulator*, South Australia.
- (b) Energy Safe Victoria.
- (c) Building and Energy Division of the Department of Mines, Industry Regulation and Safety, Western Australia.

M.3 Details of special local requirements

NOTE 1 For legislation relevant to Western Australia in this clause refer to the Western Australia [Gas Standards \(Gasfitting and Consumer Gas Installations\) Regulations 1999](#)

NOTE 2 For legislation relevant to Victoria in this clause refer to the [Victorian Gas Safety \(Gas Installation\) Regulations 2018](#).

NOTE 3 For legislation relevant to South Australia in this clause refer to the [South Australia Gas Regulations 2012](#).

NOTE 4 Legislation is subject to amendment from time to time so consideration should be given to ensuring that current legislation is referenced.

M.3.1 Quick-connect devices

M.3.1.1 Building and Energy Division of the Department of Mines, Industry Regulation and Safety, Western Australia

The following additional requirement applies:

Where a *quick-connect device* socket is installed *indoors*, for the future connection of a flueless space heater, the room is required to have two permanent ventilation openings direct to outside. The openings are required to be provided at high and low levels, with a minimum vertical separation of 1.5 m between the horizontal centre lines of the vents. Each opening is required to have an aggregated minimum *free area* of 25 000 mm².

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

M.3.1.2 Energy Safe Victoria

No person is to install or locate for use a connection device (quick connect, bayonet connection) for a flueless space heater in residential *premises* including a caravan or boat.

No person is to install or locate for use a connection device (quick connect, bayonet connection) in any of the following locations:

- (a) A hospital.
- (b) A registered community health centre, day procedure centre, residential care service or supported residential service within the meaning of the Health Services Act 1988.
- (c) A school, TAFE institute or university within the meaning of the Education and Training Reform Act 2006 (excluding a workshop or assembly hall).
- (d) A children's service within the meaning of the Children's Services Act 1996.

M.3.2 Restriction on installation of a flueless space heater

M.3.2.1 Office of the Technical Regulator, South Australia

For South Australia, in residential *premises*, the maximum *gas consumption* is required to not normally exceed 18 MJ/h and the *appliance* is required to be *certified* to the requirements of AS 4553 or AS/NZS 5263.1.3.

An *appliance* exceeding 18 MJ/h is required to not be installed without additional adequate safety features, or characteristics, that are capable of being demonstrated by the *appliance* manufacturer or supplier.

Two permanent ventilation openings are required to be provided directly to outside, one at a high level and one at a low level, each having a minimum *free area* of 1000 mm² per MJ/h.

M.3.2.2 Building and Energy Division of the Department of Mines, Industry Regulation and Safety, Western Australia

Where a flueless space heater is installed *indoors*, the room is required to have two permanent ventilation openings direct to outside. The openings are required to be provided at high and low levels, with a minimum vertical separation of 1.5 m between the horizontal centrelines of the vents.. Each opening is required to have an aggregated minimum *free area* of 25 000 mm².

M.3.2.3 Energy Safe Victoria

M.3.2.3.1 Flueless space heaters in residential premises

No person is to install any flueless space heater as a new installation in residential *premises* (including a caravan or boat).

A person is permitted to replace an existing flueless space heater in residential premises with a new flueless space heater if the new flueless space heater meets the following requirements:

- (a) The heater being replaced operated on *LP Gas*.
- (b) The new heater operates on *LP Gas*.
- (c) the emission of oxides of nitrogen from the new heater does not exceed 2.5 ng/J
- (d) The carbon monoxide/carbon dioxide ratio of the new heater does not exceed 0.002.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

M.3.2.3.2 Flueless space heaters in premises other than residential

A person is not to install or locate for use a flueless space heater in any of the following locations:

- (a) A hospital.
- (b) A registered community health centre, day procedure centre, residential care service or supported residential service within the meaning of the Health Services Act 1988.
- (c) A school, TAFE institute or university within the meaning of the Education and Training Reform Act 2006 (excluding a workshop or assembly hall).
- (d) A children's service within the meaning of the Children's Services Act 1996.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix N (informative)

Guidelines for commissioning of appliances

N.1 General

The following procedure should be used for the *commissioning* of domestic and small commercial *appliances* in the absence of the relevant *manufacturer's instructions*:

- (a) Operate all *appliances* in the installation while performing the *pressure* check.
- (b) Remove or loosen screw in *burner* test point, connect a manometer and light the *appliance*. (Electronically controlled *appliances* require a digital manometer, as water gauge manometers are not accurate or sensitive enough.)
- (c) If a pilot light is used, check that the pilot impinges on the flame failure device. (Thermocouples should not glow red, as this indicates the pilot flame is set too high and will reduce the life of the thermocouple).
- (d) Check the *pressure* of *gas* at the *burner*, against rating plate. (Remember that some *appliances* have both a cold and hot *pressure*.)
- (e) Adjust *pressure* to specifications. (Remember that some *appliances* have both a low and high *pressure* setting.)
- (f) Lock off the *gas pressure regulator(s)* and A_2 *appliance regulator* A_2 as appropriate
- (g) Remove the manometer and replace the test screw, test for leaks.
- (h) Turn the *appliance* off and on, and up and down (if modulating type) several times, to ensure correct operation and smooth ignition.
- (i) Observe operation of safety and operating devices, such as fan proving, oxygen depletion sensor (ODS) and tilt switch if mobile or portable type.
- (j) Test that spillage of *combustion products* is not occurring.
- (k) Check for the flow of condensate from the drain of a condensing *appliance*.
- (l) Replace panels and covers.
- (m) Instruct householder in correct operation and regular maintenance requirements.

The same commissioning procedures should also be followed after maintenance or repair of *appliances*.

N.2 Stoves, cookers and hot plates

In addition to the procedure in [Clause N.1](#), for stoves, cookers and hot plates —

- (a) check ventilation to the *appliance* (especially if inbuilt);
- (b) check distances from the *burners* to *combustible surfaces* conform to [Figure 6.10.1.1](#);
- (c) check that the *appliance* is level;
- (d) check the restraining device (chain for example) on freestanding cookers;

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

- (e) check the flexible hose for wear and damage, and ensure it is not kinked; and
- (f) check operation of the oven thermostat and adjust low flame by-pass if necessary.

N.3 Instantaneous water heaters

In addition to the procedures in [Clause N.1](#), for instantaneous *water heaters* without electronic controls —

- (a) determine incoming water temperature;
- (b) check and, if necessary, adjust maximum water flow rate, using a flow meter, or a measured receptacle and a stopwatch;
- (c) light the *appliance* and check the outlet temperature against rating plate;
- (d) subtract inlet temperature from outlet temperature, to calculate temperature rise;
- (e) if all is correct, the *water heater* will have raised the temperature of the water by the specified amount, at the flow rate indicated. If not, re-check *pressures* related to *gas*, and then injector sizes; and
- (f) if still not correct, check with the manufacturer.

NOTE Electronically operated and controlled instantaneous *water heaters* have the same information on their rating plate, but the *commissioning* and checking procedures differ, and the relevant *manufacturer's instructions* should be followed.

N.4 Storage water heaters

In addition to the procedures in [Clause N.1](#), for storage *water heaters* —

- (a) check operation of the water valves;
- (b) with the *burner* turned off, check that the temperature-pressure relief valve and/or *pressure* relief valve are not dripping, or the open vent is not overflowing; and
- (c) check operation of the thermostat.

Appendix O (informative)

Symbols used in gas control system diagrams

[Figure O.1](#) lists the symbols used in gas control system diagrams.

1		Manual <i>gas</i> valve	
2		Filter	
3		Pressure point	
4		Pressure <i>regulator</i>	
5		Pressure <i>regulator</i> with <i>over-pressure</i> protection	
6		<i>Over-pressure</i> protection slam shut valve	
7		Slow-opening fast-closing value	Automatic <i>safety shut-off</i> valves
8		Slow-opening fast-closing two stage valve	
9		Fast-opening fast-closing valve	
10		Fast-opening fast-closing two stage valve	
11		Manual reset valve	
12		<i>Vent</i> valve	
13		Closed position indicator (CPI) switch on valve	
14		Proof of closure switch on valve (e.g. mechanical over-travel)	
15		Low <i>gas</i> pressure detector	
16		High <i>gas</i> pressure detector	
17		Flow rate control valve	

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

18		Flow limiting valve
19		Burner
20		3-way valve
21		Non-return valve

Figure 0.1 — Symbols used in gas control system diagrams

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Appendix P (informative)

Gas installation checklist

The checklist given in this Appendix, is provided as guidance for installers to check *gas installation* conformance to the AS/NZS 5601 series.

The checklist is not exhaustive, and both AS/NZS 5601.1 and AS/NZS 5601.2 should be consulted when assessing any *gas installation* to ensure that the essential safety requirements are met.

GAS INSTALLATION CHECKLIST			
Consumer			Date
Address			Certificate No.
			Job No.
Item	C	NA	Notes
General requirements			
Gas supply verified			
Installation tested and gastight			
Gas pipework			
General requirements			
Design			
Location			
Supports and anchoring			
Corrosion protection			
Gas pipework (continued)			
Materials and components			
Isolating valves			
Pressure regulation			
Overpressure protection			
Vent lines			
Test points			
Expansion and contraction			
Pipe protection			
Flexible connections			
Earthing			
Pipeline identification			
Disconnection			
Soundness testing			

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Sizing			
Appliance installation			
Appliance(s) declaration			
Mounting and restraint			
Location			
Clearances			
Disconnection			
Combustible surfaces			
Temperature safety			
Flues			
Design			
Manufacturer's specifications followed			
Installation and location			
Materials			
Structure and supports			
Clearances			
Temperature safety			
Draught diverter			
Terminal and clearances			
Ventilation			
Appliances Input			
Requirements			
Sizing of openings			
Location of openings			
Air not contaminated			
Mechanical ventilation			
LP Gas installations			
Location			
Clearances			
Weather protection			
Ventilation			
Drainage			
Restraint chains			
Hoses and fittings			
Labelling and signage			
Commissioning			
Purging			
Controls tested and set			

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Safety devices tested and set			
Gas rating			
Combustion testing			
Consumer instruction			
Certification			
Certificate issued			
C = Conforming NA = Not Applicable			
Name	Signature		Reg. No.

Appendix Q (normative)

Spillage test for open flued appliances

Q.1 General

The requirements of this Appendix apply only to open-flued appliances. They do not apply to room-sealed appliances.

The test procedures in this Appendix are intended to be performed as part of Appliance Commissioning as specified in [Clause 6.11.4](#). For additional clarity, the steps of the procedures are outlined in flowchart form in [Figure Q.1](#).

This Appendix includes the following:

- (a) A procedure for checking whether operation of mechanical extraction ventilation draws air through the flue system or chimney when conducting a smoke test without the appliances in operation.
- (b) A procedure for testing whether operation of mechanical extraction ventilation results in combustion product spillage from appliances during their operation.
- (c) A method for determining the additional fixed ventilation area required to counteract the effect of mechanical extraction ventilation.

Each space where an open-flued appliance(s) is installed shall be tested one at a time.

Before these procedures are applied, a visual inspection shall be undertaken to confirm that the flues or chimneys are clean, unobstructed and installed correctly and that the appliance to be installed is in good condition, clean and has no obvious defects.

NOTE 1 Obvious defects include obstruction of the flue or chimney, broken radiant tiles, glass defects or cracks and openings in the heat exchangers.

NOTE 2 In this Appendix, mechanical extraction ventilation means ventilation provided for a purpose other than for the operation of A_2 appliances A_2 .

NOTE 3 Mechanical extraction ventilation such as extraction fans (for example, commercial catering canopies, kitchen range hoods, and exhaust fans in toilets and bathrooms) can cause products of combustion to be drawn back down the flue and into the building due to the negative pressure (suction) they generate. This applies particularly to modern buildings, which are more airtight than older buildings and allow less adventitious ventilation.

NOTE 4 Other appliances including non-gas appliances (for example, a wood heater) or air movement systems, such as ducted heating, cooling systems, and warm air distribution systems may create localized positive and negative pressures depending on the installation. Such pressure variations are to be considered and tested for on a case by case basis.

NOTE 5 The effect of mechanical extraction ventilation can be detected with a suitable smoke-producing device (for example, a smoke pen, smoke match or incense stick) and the effect of combustion product spillage can be checked with suitable combustion product detection equipment.

NOTE 6 During testing, consider the welfare of the persons conducting the testing and the occupants of the building regarding their exposure to products of combustion.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NOTE 7 This procedure applies to open-flued appliances without mechanical means to assist flueing. Some power-flued or fan-assisted open-flued appliances may be able to overcome a negative pressure environment and therefore not spill combustion products.

NOTE 8 This procedure should not be carried out under extreme weather conditions, such as high winds, excessive temperatures, and large indoor/outdoor temperature differences, as such conditions may lead to an unreliable result.

Q.2 Equipment

Equipment for the detection of *combustion products* shall be suitable for the intended application, including the temperature of the medium being measured.

The equipment shall be selected for the range and resolution that enables the detection of *combustion products* that may be present in the immediate vicinity of the *appliance draught diverter* and adjacent to the opening for the intake of combustion air.

Equipment shall be calibrated in accordance with equipment testing guidelines or manufacturer's instructions to ensure correct measurement. Documentation shall be maintained to demonstrate the calibration status of the equipment and to justify the calibration interval.

Q.3 Testing the effect of mechanical extraction ventilation with appliances not operating

Q.3.1 Establish baseline conditions

Step 1: Close external windows and doors. Ensure all *open-flued appliances* are not in operation and are at room temperature, and air extraction fans in the space being tested are not in operation.

Step 2: Position a suitable smoke-producing device (for example, a smoke pen, smoke match or incense stick) at the *appliance draught diverter* relief opening, or adjacent to *appliance* openings for combustion air.

Step 3: Generate smoke and observe any flow of smoke towards or away from the *appliance*.

NOTE: Flow of smoke towards or away from the *appliance* is usually caused by weather effects impacting the air flow within the *flue* due to —

- (a) wind, in particular wind gusts; and
- (b) the temperature differential between inside and outside.

Q.3.2 Smoke test

Step 1: Activate all extraction fans on their highest setting.

Step 2: Open or close internal doors to achieve the greatest suction effect on the *flue system(s)* or chimney(s) of the *appliances* in the space being tested.

NOTE 1: In most circumstances the suction effect is greatest when—

- (a) all extraction fans are turned on; and
- (b) all internal doors that allow a flow path of air between the spaces not being tested and the extraction fans are closed.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Step 3: Position a suitable smoke-producing device (for example, a smoke pen, smoke match or incense stick) at the appliance *draught diverter* relief openings or adjacent to *appliance* openings for the intake of combustion air, and generate smoke.

NOTE 2: For the location of the openings, refer to the manufacturer's installation instructions or contact the manufacturer.

NOTE 3: The smoke produced should be non-toxic.

Step 4: Observe if smoke is being drawn away from the *appliance* towards the source(s) of the suction.

Step 5: Repeat Steps 3 and 4 for each *appliance* in the space being tested.

Step 6: Compare the smoke pattern in Steps 4 and 5 with the observed baseline condition in Step 3 of [Clause Q.3.1](#). Proceed to Step 7 if the smoke pattern is drawn away from the appliance or the smoke pattern does not match the baseline, noting that there is insufficient ventilation, which will need to be rectified; otherwise, proceed to [Clause Q.4](#).

NOTE 4: If smoke is being drawn away from any of the appliances or the smoke pattern does not match the baseline condition, the mechanical extract ventilation is causing suction of air through the appliance(s) from the flue system or chimney. This may result in combustion product spillage during appliance operation. It will be necessary to provide an alternative path for this airflow via the addition of permanent ventilation.

Step 7: Incrementally open an external window until smoke is no longer drawn away and record the ventilation area required. Leave the window opened in this position.

NOTE 5: Opening a window is a means of demonstrating to the owner/occupier the approximate area of additional ventilation required.

NOTE 6: If the space where the appliances are located does not have an external window, open a window in the space closest to the space being tested. Make sure air can flow from the space with the open window to the space being tested.

NOTE 7: In cases where it may not be possible or practicable to provide sufficient ventilation to overcome a negative pressure environment, an alternative solution may need to be considered.

Step 8: Leave extraction fans in operation. The testing in this section is now completed. Proceed to [Clause Q.4](#) (Spillage test).

Q.4 Testing appliance and flue operation (Spillage test)

NOTE 1 Any of the following are an indication of combustion product spillage:

- (a) An increase in carbon monoxide (CO) from background levels.
- (b) An increase in carbon dioxide (CO₂) from background levels.
- (c) A decrease in oxygen (O₂) from background levels.

NOTE 2 When testing for combustion product spillage it is recommended to test for either—

- (a) carbon monoxide (CO) and carbon dioxide (CO₂); or
- (b) carbon monoxide (CO) and oxygen (O₂).

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Q.4.1 Prerequisites

Appliances shall be at room temperature and not in operation before proceeding.

Q.4.2 Test conditions

The following shall apply:

- (a) Ensure testing according to [Clause Q.3](#) is carried out before commencing the test procedure of [Clause Q.4.3](#).
- (b) Ensure any windows opened in Step 7 of [Clause Q.3.2](#) are in the same opened position, and ensure that other windows and all doors remain in the position to achieve the greatest suction effect as described in [Clause Q.3.2](#) Step 2.
- (c) Continue the operation of mechanical extraction ventilation.

Q.4.3 Test procedure

- Step 1: Turn on and zero or check the combustion detection equipment reading in accordance with the manufacturer's instructions. This then becomes the background reading for the space to be tested.

NOTE 1: Combustion products may be present prior to conducting spillage testing due to the operation of other fuel burning appliances, e.g. cooking appliance, candles.

NOTE 2: See [Clause Q.2](#) for combustion detection equipment requirements.

- Step 2: Operate all open-flued appliances in the space, at the highest setting for—

- (a) 10 min from cold for Type 1 decorative gas flame effect fires installed in a chimney; and
- (b) 5 min from cold for all other appliances.

During this period, commission the appliance in accordance with the manufacturer's instructions and ensure that the appliance(s) under test is(are) operating at its(their) nominal test point pressure.

Where a space heater is installed in a chimney without a chimney liner and spillage still occurs during testing after 5 min of operation, the appliance may be operated a further 5 min to ensure the chimney draw establishes and spillage ceases.

NOTE 3: The operation time periods are based on the combustion test requirements in Australian gas appliance Standards.

NOTE 4: A Type 1 decorative gas flame effect fire consists of an assembly or kit that comprises a burner, simulated fuel effect logs or coals, grate and decorative surround. It is designed to be installed in a fireplace of indeterminate specifications and in which the chimney is intended to convey flue products to outside air.

- Step 3: Record the measured values of combustion products for the space under test; these are now the new background values.

NOTE 5: This is to account for the fact that any spillage during the start-up period may have increased the level of combustion products in the room since Step 1.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Step 4: After the required time specified in Step 2 above, check for combustion product spillage from each appliance in the space being tested. Sample the air with the combustion detection equipment at locations external to and in the vicinity of the appliance(s) where leakage or spillage of combustion products can occur.

NOTE 6: Combustion products may spill from draught diverter relief openings or leak from heat exchanger joints or cracks, fan discharge points and flue connections. If in doubt, refer to the manufacturer's installation instructions or contact the manufacturer.

NOTE 7: If sampling at the draught diverter opening, ensure that the sampling probe is positioned adjacent to the opening and not inside the draught diverter.

Measured values of combustion products at the *appliance(s)* that are greater than the background values in Step 3 indicate spillage of *combustion products* from the *appliance(s)*.

Q.4.4 Test results

Test results shall be analysed as follows:

- (a) If no spillage was observed at Step 4 of [Clause Q.4.3](#) from any appliance and a window was not opened during the smoke test in Step 7 of [Clause Q.3.2](#), the appliance(s) and flue system(s) shall be deemed to be operating satisfactorily and the extraction fans have no observable effect. All work relating to this Appendix is now completed.
- (b) If no spillage was observed at Step 4 of [Clause Q.4.3](#) from any appliance but a window was opened during the smoke test in Step 7 of [Clause Q.3.2](#), then permanent ventilation equivalent to the area of the window opening shall be installed in accordance with [Clause Q.5](#).
- (c) If spillage was observed at Step 4 of [Clause Q.4.3](#), from any appliance, the installation is unsafe. The spillage shall be immediately rectified or the appliance(s) made safe in accordance with [Clause 3.9](#).

NOTE At this stage of testing, it is likely that a fault within the appliance and/or flue system is causing the spillage rather than a lack of ventilation.

The procedure for identification and rectification of faults shall be in accordance with [Clause Q.4.5](#).

Q.4.5 Identification and rectification of faults

If spillage was observed in Step 4 of [Clause Q.4.3](#) from any appliance, switch off all extraction fans. Ensure any windows opened in Step 7 of [Clause Q.3.2](#) remain in the same opened position. Establish the cause as follows:

- (a) If spillage ceases after 5 min, the operation of extraction fans is having a negative effect on appliance operation. This is most likely due to a lack of ventilation. The appliance shall be switched off to allow it and the flue system to cool. Then take either of the following steps (as applicable):
 - (i) If a window was opened in Step 7 of [Clause Q.3.2](#), open it further to allow for more ventilation. Repeat Steps 1 to 4 of [Clause Q.4.3](#) to confirm whether or not spillage ceases. If spillage ceases, then permanent ventilation equivalent to the new (greater) area of the window opening shall be installed in accordance with [Clause Q.5](#).
 - (ii) If a window was not opened in Step 7 of [Clause Q.3.2](#), open it to allow ventilation. Repeat Steps 1 to 4 of [Clause Q.4.3](#) to confirm whether or not spillage ceases. If spillage ceases, then permanent ventilation shall be equivalent to the area of the window opening, which shall be installed in accordance with [Clause Q.5](#).
- (b) If spillage does not cease, switch off the appliance and allow it and the flue system to cool. Check for faults with the affected appliance and flue system. If faults are found, rectify and

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

repeat Steps 1 to 4 of Clause Q.4.3. If spillage is still observed isolate the affected appliance(s) and contact the appliance manufacturer.

NOTE In cases where no faults are found with the appliance or flue system yet it is not possible or practicable to provide sufficient ventilation to overcome spillage, an alternative solution may be required, such as interlocks to limit simultaneous operation or an appliance other than open-flued.

Q.5 Location and installation for additional and permanent ventilation openings

The following location and installation conditions apply:

- (a) The free area required for any additional and permanent ventilation openings to prevent spillage from appliances during the operation of extraction fans shall be equivalent to the ventilation area determined in Step 7 of [Clause Q.3.2](#) or [Clause Q.4.5](#), Item (a).
- (b) Ventilation opening(s) shall be located in the space(s) where the appliance(s) is(are) installed and directly to outside.

NOTE 1 “Directly to outside” means the ventilation path maintains at least the recorded ventilation area required and is unobstructed by building material or insulation. This may be achieved via ducting from an internal space to outside.

NOTE 2 Due to the effect of exhaust extraction systems into a ceiling space, ventilation cannot be placed simply into that space, and has to be ducted to outside. Similarly, due to the possibility of drawing in products of combustion and other odours, ventilation cannot simply be placed in the floor.

- (c) Ventilation opening(s) shall be located so that building occupants are not subjected to discomfort from cold draughts or noise.
- (d) The minimum dimension of any free ventilation opening shall be 6 mm, to minimize linting.
- (e) After installation of ventilation openings, repeat the spillage testing in [Clause Q.4](#) noting the following before commencing testing:
 - (i) Ensure any windows that were opened previously are closed.
 - (ii) Ensure all extraction fans are activated and internal doors opened or closed to achieve the greatest suction effect.

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

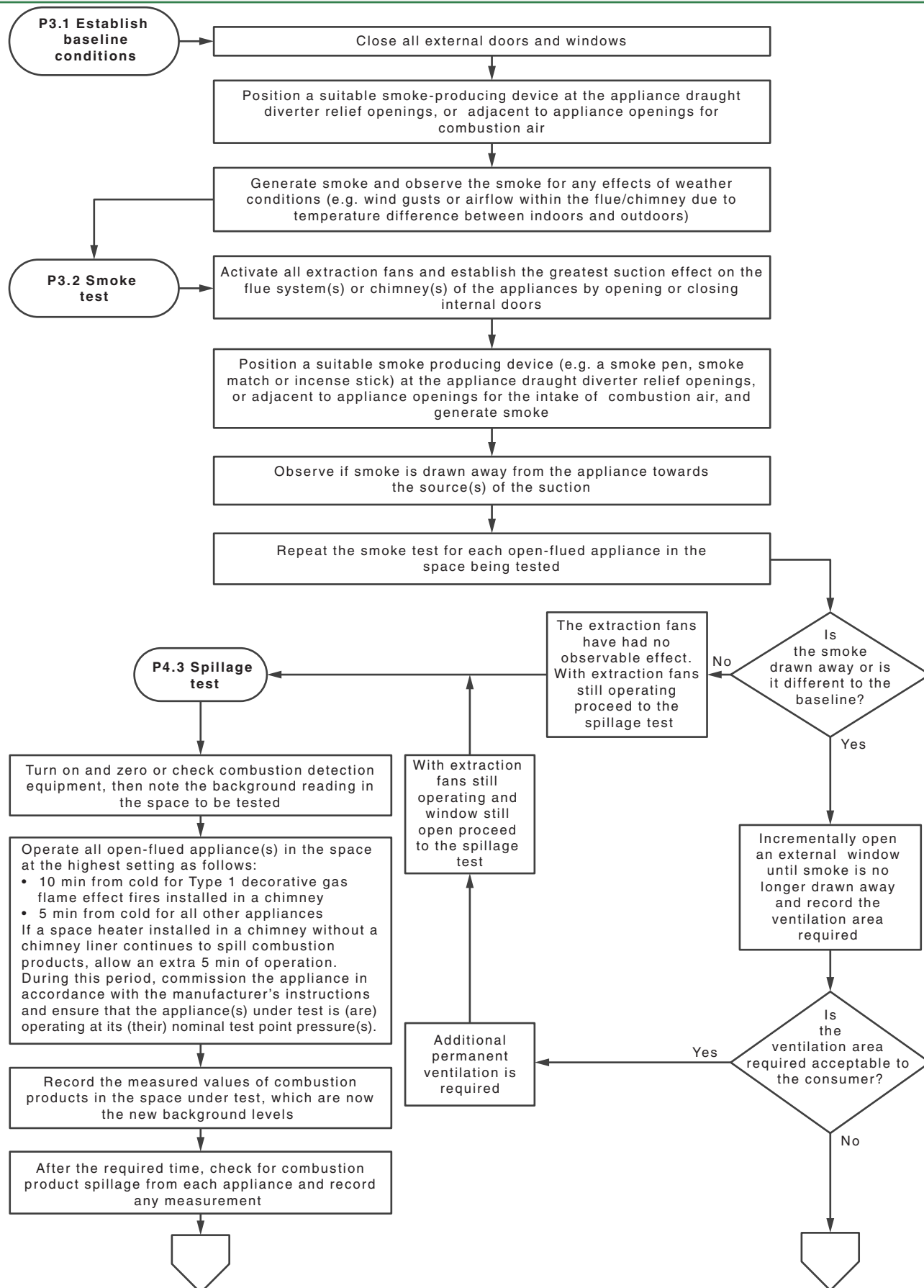


Figure Q.1 — Flowchart — Spillage test for open flued appliances

This is a preview of AS/NZS 5601.1:2022. Click [here](#) to purchase the full version from the ANSI store.

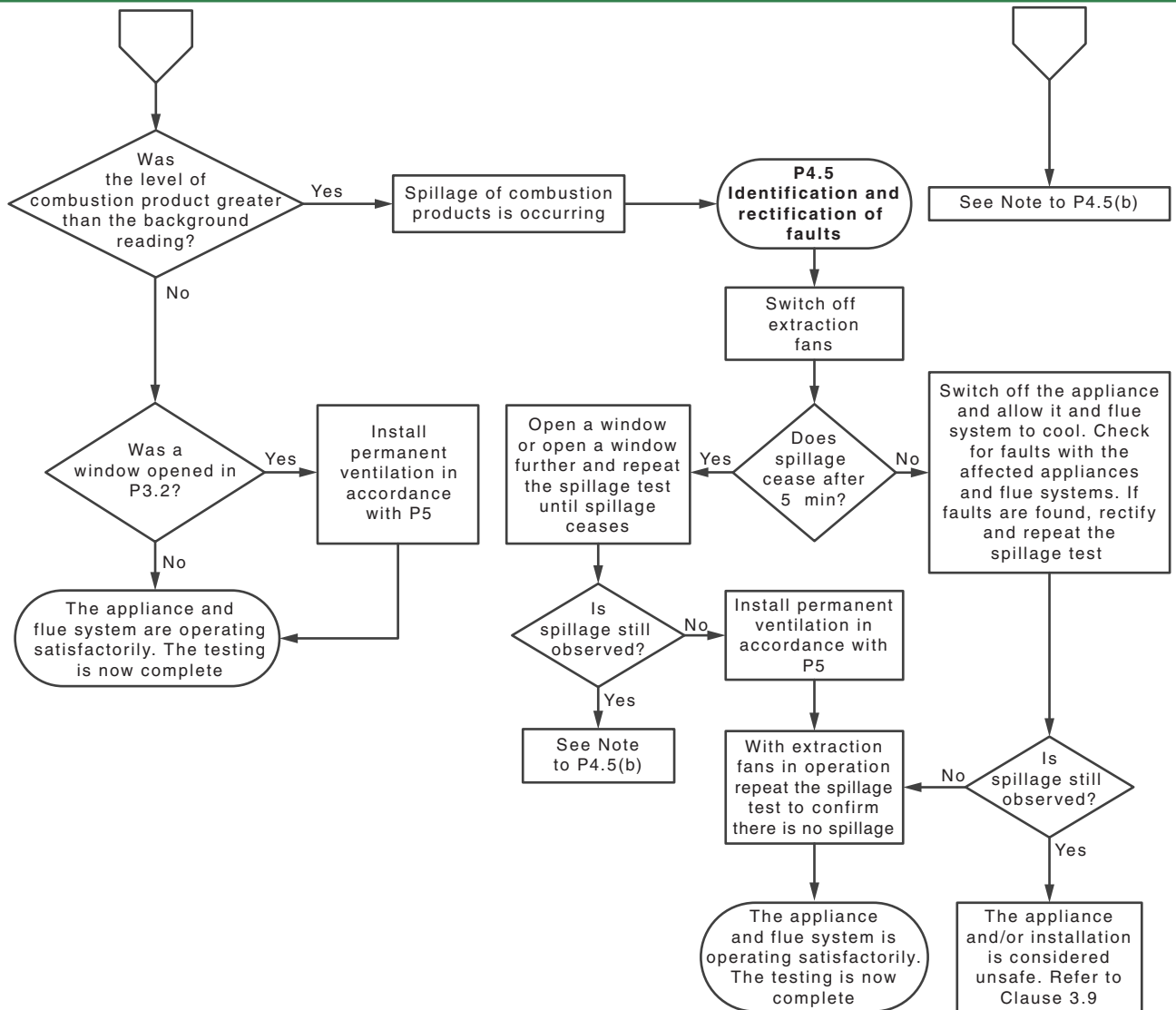


Figure Q.1 — Flowchart — Spillage test for open flued appliances

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Bibliography

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

AS 2030.1, *Gas cylinders, Part 1: General requirements*

AS 2067, *Substations and high voltage installations exceeding 1 kV a.c*

AS 2473.2, *Valves for compressed gas cylinders, Part 2: Outlet connections (threaded) and stem (inlet) thread*

AS 2700, *Colour standards for general purposes*

AS 3959, *Construction of buildings in bushfire-prone areas*

AS 4564, *General-purpose natural gas*

AS 4621, *Regulators for use with liquefied petroleum—Vapour phase*

AS 4670, *Commercial propane and commercial butane for heating purposes*

AS/NZS 5263.1.3, *Gas appliances, Gas space heating appliances*

AS/NZS 5601.2, *Gas installations, Part 2: LP Gas installations in caravans and boats for non-propulsive purposes*

AS/NZS 3000, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*

AS/NZS IEC 60079.10.1, *Explosive atmospheres, Classification of areas—Explosive gas atmospheres*

NZS 3604, *Timber Framed Buildings*

NZS 5435, *Specification for liquefied petroleum gas (LPG)*

NZS 5442, *Specification for reticulated natural gas*

Gas (Safety and Measurement) Regulations 2010 (New Zealand)

Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice

UL 144, *LP Gas regulators*

National Construction Code (Australia) <https://ncc.abcb.gov.au/>

New Zealand Building Code <https://www.building.govt.nz/building-code-compliance/building-code-and-handbooks/>

AS 1670.1, *Fire detection, warning, control and intercom systems — System design, installation and commissioning, Part 1: Fire*

AS 2118, *Automatic fire sprinkler systems*

AS/NZS 5139, *Electrical installations — Safety of battery systems for use with power conversion equipment*

AS/NZS 5263.1.11, *Gas appliances, Part 1.11: Small gas engine driven appliances*

NZS 4512, *Fire detection and alarm systems in buildings*

NZS 4515, *Fire sprinkler systems for life safety in sleeping occupancies (up to 2000 square metres)*

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

NZS 4541, *Automatic fire sprinkler systems* 

Clause D.6, Appendix D— Technical references

NFPA56(PS), Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems

IGE/UP/1, Edition 2, Strength Testing, Tightness Testing and Direct Purging of Industrial and Commercial Installations

IGE/SR/22, Second Impression Purging Operations for Fuel Gases in Transmission, Distribution and Storage

Clause E.2, Appendix E— Technical references

Purging Principles and Practice, Third Edition, American Gas Association, 2001AS 4041, Pressure piping

IGE/UP/1, Edition 2, Strength Testing, Tightness Testing and Direct Purging of Industrial and Commercial Installations

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Index

Accessible

Definition 1.3.1

Appliance

Automatic control 6.2.7
 Balanced flue appliance, definition 1.3.2.3
 Boiler, hot water, definition 1.3.64
 Boiler, steam, definition 1.3.112
 Bunsen burner 2.1.2, 6.2.15
 Commissioning
 Appliance 6.11.4
 Requirements 6.11.2, 6.11.3
 Conversion from
 Another gas 6.1.3
 Another fuel 6.1.3
 Dangerous appliance 3.9
 Decorative flame effect fire
 Definition 1.3.25
 Type 1, definition 1.3.25.1
 Type 2, definition 1.3.25.2
 Definitions 1.3.2
 Direct-fired air heater, definition 1.3.2.4
 Elevated cooking appliance, definition 1.3.2.5
 External appliances, location restriction 6.2.4
 Flueless appliance
 Definition 1.3.2.7
 Freestanding cooking appliance,
 definition 1.3.2.8
 Hob, definition 1.3.61
 Mobile appliance, definition 1.3.2.9
 Pool heater, definition 1.3.90
 Portable appliance, definition 1.3.2.11
 Room-sealed appliance, definition 1.3.2.12
 Salamander, definition 1.3.107
 Second-hand appliance 6.1.2
 Support 6.2.10
 Trivet, definition 1.3.120
 Type A
 Certification 6.1.2(a)
 Definition 1.3.2.1
 Type B
 Acceptance 6.1.2
 Definition 1.3.2.2
 Valve train, definition 1.3.121
 Ventilation 6.3.1
 Water heater, definition 1.3.125

Appliance installation

Air curtain 6.10.11
 Air heater, direct-fired 6.10.12
 Air heating appliance, in confined space 6.4.11
 Additional appliance 6.2.1
 Barbecues
 In residential premises 6.10.1.7
 Outdoor location 6.10.19
 Castors, rollers or wheels
 Gas connection 6.2.13

Requirement where used 6.2.14
 Combustible surface, temperature limitation 6.2.5
 Commercial catering equipment 6.10.2
 Classrooms 6.10.2.9
 Clearance to grease filter 6.10.2.2
 Clearances, general 6.10.2.3
 Combination ranges 6.10.2.1
 Combustible surface, located on 6.10.2.4
 Freestanding, high level hose assembly
 connection 6.10.2.7
 Freestanding, under equipment
 connection 6.10.2.6
 Residential premises 6.10.2.5
 Semi-rigid connectors 6.10.2.8
 Connection pipe size 6.6.2
 Dangerous installation 3.9
 Decorative flame effect fire 6.10.9
 Damper 6.10.9.3
 Fireplace and chimney 6.10.9.2
 Flue cowl 6.10.9.4
 Prohibited installation 6.10.9.1
 Ventilation 6.10.9.5
 Ducted air heater 6.10.10
 Ducting requirement 6.10.10.3
 Fan requirement 6.10.10.2
 Location 6.10.10.1
 Disconnection, means of 6.6.4
 Domestic gas cooking appliances 6.10.1
 Classrooms, multiple appliances 6.10.1.3
 Clearances 6.10.1.1
 Combined living/ sleeping areas 6.10.1.14
 Commercial installations 6.10.1.15
 Connection by hose, high level 6.10.1.9
 Connection by hose, underneath 6.10.1.10
 Elevated cooker, connecting 6.10.1.6
 Elevated cooker, flue clearance 6.10.1.5
 High level griller 6.10.1.4
 LP Gas cooktops, (New Zealand) 6.10.1.8
 Protection of combustible surface 6.10.1.2
 Single burner 6.10.1.13
 Stabilization, freestanding 6.10.1.11
 Electrical bonding 3.13
 Electrical requirements 6.2.8
 Emergency valve, boiler 5.2.10
 Flexible connections, vibration 6.2.12
 Flueless appliances, restriction 6.2.3
 Gas light 6.10.15
 Clearance 6.10.15
 Support of pendant 6.10.15
 Inbuilt oven 6.10.1.12
 Base strength 6.10.1.12(c)
 Connection 6.10.1.12(d)
 Electrical requirements 6.10.1.12(e)
 Location 6.10.1.12(a)
 Recess size 6.10.1.12(b)
 Incinerator 6.10.16
 Clearances 6.10.16.1
 Flue 6.10.16.2

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Incinerator (continued)	
Instructions to be displayed	6.10.16.3
Installation instructions	6.2.2
Instantaneous water heaters	6.10.3
Locations, prohibited	6.10.3.1
Flueless, prohibition of	6.10.3.2
Isolation, means of	6.6.3
Laundry dryer	6.10.14
Community use	6.10.14.6
Exhaust duct required	6.10.14.2
Exhaust duct requirements	6.10.14.3
Exhaust ducts combined	6.10.14.3
Exhaust fans	6.10.14.1
Exhausting into room	6.10.14.5
Ventilation requirements	6.10.14.4
Location	<i>see</i> Appliance location
Pool heater	6.10.5
Base requirements	6.10.5.2
Control systems	6.10.5.3
Locations, prohibited	6.10.5.1
Non-return valve required	6.10.5.5
Plastic piping	6.10.5.4
Valve in water flow line	6.10.5.6
Pottery kiln	6.10.17
Clearances	6.10.17.3
Flame safeguard required	6.10.17.2
Flue dampers	6.10.17.5
Flueing of a pottery kiln	6.10.17.4
Support	6.10.17.1
Radiant heater, overhead	6.10.7
Clearances	6.10.7.2(c)
Support	6.10.7.2(b)
Radiant tube heater, overhead	6.10.13
Clearances	6.10.13.4
Contaminated atmosphere	6.10.13.3
Requirements for installation	6.10.13.2
Refrigerator	6.10.18
Clearances	6.10.18.2
Copper connections	6.10.18.4
Prohibited locations	6.10.18.1
Sealed recesses	6.10.18.3
Restraint, hose assembly	6.2.14
Restrictions on appliance location, indoors and outdoors	6.2.4
Space heater	6.10.6
Institution	6.10.6.4
Limitation on installation	6.10.6.1
Open flued appliance with rear register	6.10.6.2
Restrictions on flueless	6.10.6.3
Storage water heater	6.10.4
Bathroom and toilet	6.10.4
Support of appliance, general	6.2.10
Temperature limitation, combustible surface	6.2.5
Type B appliance	6.1.2
Use of pressurized air or oxygen	6.2.6
Ventilation, air supply	6.4
Vibration	6.2.12

Appliance location

Above cooking vapour, steam or grease	6.3.7
Accessibility	6.3.3
Air heater, direct-fired	6.10.12
Air movement system	6.3.1

Bathroom and toilet	
Instantaneous water heater	6.10.3.1
Space heater	6.10.6.1
Storage water heater	6.10.4
Bedroom	
Installation, general	6.3.9
Instantaneous water heater	6.10.3.1
Space heater	6.10.6.1
Combined living/sleeping room	6.10.3.1
Catering equip, combustible surface	6.10.2.4
Cupboard	6.3.8
Elevated structure	6.3.12
Flammable vapours, materials, chemicals	6.3.5
Garage, residential	6.3.10
Hazardous locations	6.3.4
Instantaneous water heater, prohibited locations	6.10.3.1
Physical damage protection	6.3.2
Pool heater, prohibited locations	6.10.5.1
Radiant tube heater, overhead	6.10.13
Refrigerator, prohibited locations	6.10.18.1
Roof space	6.3.11
Roof, elevated structure	6.3.13
Toilet <i>see</i> Bathroom	
Under floor	6.3.14
Water, contact with	6.3.6

Bathroom

Definition	1.3.5
Space heater	6.10.6.1
Water heater, instantaneous	6.10.3.1
Water heater, storage	6.10.4

Bedroom

Appliance	6.3.9
Definition	1.3.6
Space heater	6.10.6.1
Water heater, instantaneous	6.10.3.1

Breather vent orifice size

Not vented to outside	Appendix G

Breather vent

Definition	1.3.7

Burner

Atmospheric, definition	1.3.8.1
Definition	1.3.8
Forced draught, definition	1.3.8.2
Induced draught, definition	1.3.8.3

Caravan

Definition	1.3.9

Certified/Certification

Definition	1.3.10

Certifying body

Definition	1.3.11

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Combustible material

Definition 1.3.13

Combustible surface

Definition 1.3.14

Combustion products

Definition 1.3.15

Components

See Materials, fittings and components

Compressed natural gas

Definition 1.3.18

Condensate

Definition 1.3.19

Consumer piping

Air ducts, piping within 5.3.2
 Alignment at expansion joint 5.2.6
 Alterations 3.5.2
 Bending 5.1.9
 Blockage 3.14
 Bonding, electrical 3.13
 Building isolation 5.2.8
 Building strength or fire resistance 5.1.11
 Condition of 5.1.1
 Corrosion *see* Corrosion control
 Definition 1.3.21
 Depth of cover 5.4.3
 Design 2.2.3.2
 Emergency valve, boilers 5.2.10
 Earthing, prohibition of 5.1.2
 Extensions 3.5.2
 Flanges
 Gasket material 4.7.1
 Re-making flanged joint 5.1.10
 Flexibility 5.2.5
 Gas leaks, locating 3.10
 Handling and storage 5.1.4
 High-rise buildings 5.7
 Manual shut off required 5.7.4
 Minimizing strain 5.7.6
 Plan required on site 5.7.3
 Riser, support and flexibility 5.7.5
 Hot-tapping 3.7
 Identification 5.1.12
 Installation, entry of foreign matter 5.1.5
 Increasing the operating pressure 3.8
 Location 5.3
 Beneath a building, in ground 5.3.11
 Concealed 5.3.8
 In concrete 5.3.13
 Liquid discharge, avoidance 5.3.6
 Physical damage 5.3.3
 Through an outer wall 5.3.9
 Main run, definition 1.3.73
 Marker tape 5.4.6
 Material, requirements 4.2
 Restriction 4.3
 Operating pressure, increasing 3.8

Pipe sizing *see* Pipe sizing
 Plenum ceiling, piping within 5.3.2
 Pressure-raising device, downstream of 5.12.4
 Pressure rating 5.2.1
 Prohibited locations 5.3.1
 Purging *see* Purging
 Repairs 3.5.2
 Repair restriction 5.1.6
 Riser, definition 1.3.103
 Riser, securing 5.4.8
 Sealing of open ends 2.2.1.3
 Sealing of outlet 3.4.3
 Separation from—
 Above-ground low and extra low voltage electrical equipment 5.3.4
 Ground, above 5.3.7
 Underground communication cable 5.4.11
 Underground services 5.4.12
 Underground services, crossing of 5.4.13
 Underground electrical cable 5.4.9
 Underground earthing electrode 5.4.10
 Static electricity, safe discharge 3.12
 Support
 Electrical conductor, prohibition 5.3.5
 Piping in the ground 5.4.2
 Requirements, support system 5.8.1
 Riser in a high rise building 5.7.5
 Rod hangers 5.8.3
 Spacing 5.8.2
 Tailpipes
 Definition 1.8.115
 Testing 3.5
 Use of pressurized air or oxygen 5.2.3
 Ventilating ducts, piping within 5.3.2
 Ventilation of concealed piping 5.3.12
 Vibration 6.2.12
 Wooden joists, metal frames 5.3.14
 Cavities 5.3.14.5
 General 5.3.14.1
 Metal framework 5.3.14.4
 Timber beams, bearers, joists 5.3.14.3
 Timber wall framework 5.3.14.2

Corrosion control

Corrosive environments 2.2.5.3(a)
 Joining incompatible materials 5.5.3
 Pipe emerging from ground 5.5.4
 Piping with cathodic protection 5.5.5
 Protection of uncoated pipe 5.5.1
 Proving effective protection 5.5.2

Cupboard

Definition 1.3.23

Diametre nominale (DN)

See Nominal size

Electrical

Appliance isolation methods 6.2.8
 Bonding 3.13
 Earthing, prohibition of 5.1.2

This is a preview of AS/NZS 5601.1:2022. Click here to purchase the full version from the ANSI store.

Inbuilt oven, requirements 6.10.1.12
 Restoration of supply 6.2.9
 Static electricity, safe discharge 3.12

Enclosure

Definition 1.3.29

Excess air

Definition 1.3.30

Excess flow valve

Definition 1.3.31

Explosive limit

Lower explosive limit (LEL), definition 1.3.71

Fire damper

Definition 1.3.35
 Interlock with gas supply 6.5.2

Fire safety system

Definition 1.3.39
 Emergency isolation, multilayer pipe 5.2.11

Thermal protection of combustible materials

Introduction C.1
 Methods C.3
 Specification C.2
 Thickness requirement, example C.4

Flame safeguard system

Definition 1.3.40

Flue

Brick and masonry flue to be sealed 6.8.6
 Building strength not to be reduced 6.7.2
 Clearance

Combustible surface 6.8.11
 Single wall metal flue 6.8.11
 Twin wall metal flue 6.8.10
 Wiring and fittings 6.8.14

Common flue

Definition 1.3.41.3
 Flame safeguard required 6.7.6
 Restriction on fuels 6.7.6

Concealed metal flue 6.8.9

Definition 1.3.41

Design 6.7

Common flues H.1.6
 Factors influencing design H.1.4
 Individual flue H.1.5
 Natural draught H.1
 Power flue H.2

Requirements 6.7.4

Draught diverter

Clearance 6.8.7
 Definition 1.3.28
 Flue without 6.7.7.2
 Requirement 6.7.7.1

Existing flue or chimney 6.7.11

Flue cowl

Definition 1.3.42

Required 6.7.9

Flue extending into chimney 6.8.6

Flue gases, definition 1.3.43

Flue not cause a nuisance 6.7.5

Flue to be effective, draught diverter 6.7.7

Flue to be supported independently 6.8.2

Flue with draught diverter 6.7.7.1

Flue without draught diverter 6.7.7.2

Flue design 6.7

Common/ combined flues 6.7.6

Design requirements 6.7.4

Material 6.7.3

Incinerator 6.10.16.2

Installation 6.8

Support independent of appliance. 6.8.2

Joints 6.8.4

Joints, soldered 6.8.3

Lateral run 6.7.4

Lateral run, minimum rise 6.7.4

Locations, prohibited 6.8.8

Material 4.7.4

Natural draught flue, definition 1.3.41.5

Open flue, definition 1.3.41.6

Pottery kilns 6.10.17.4

Power flue 6.7.8

Definition 1.3.41.7

Protection of combustible surface 6.8.12

Protection, flue within a wall 6.8.13

Provision of flue 6.7.1

Removal of appliance, provision 6.8.1

Restriction to flow 6.7.4

Support 6.8.2

Temperature limitation 6.2.5

Terminal, definition 1.3.44

Terminal location

Balanced flue, room-sealed
 6.9.3, Figure 6.2

Fan assisted 6.9.3, Figure 6.2

Open flue 6.9.1

Power-flued appliance 6.9.1

Terminating a flue 6.9.1

From a chimney 6.9.2

Above a roof 6.9.2

Avoiding down draught 6.9.1

In a roof space 6.9.5

Under a covered area 6.9.4

Twin wall flue 6.8.10

Definition 1.3.41.10

Vertical rise required 6.7.4

Weatherproofing 6.8.5

Garage, residential

Definition 1.3.102

Gas

Definition 1.3.47

LP Gas, definition 1.3.47.2

NG, definition 1.3.47.1

SNG, definition 1.3.47.3

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Gas consumption

Definition 1.3.48

Gas installation

Definition 1.3.50

New, testing of piping 3.5.1

Gas load

Definition 1.3.51

Gas supply

Blockage, clearing 3.14

Gas leaks

Methods of location 3.10

Safety requirements 3.11

Interlock with fire damper 6.5.2

Interlock with fire equipment 6.5.1

Safety shut off system, definition 1.3.105

Verification of gas supply 2.2.1.1

High-rise building

Definition 1.3.60

Hose assemblies

Requirements 4.8.3, 5.9.1

Connection point locations

Avoiding traffic across hose 5.9.3

Near a doorway 5.9.3

Prohibited locations 5.9.2

Cooker connections 6.10.1.9

Definition 1.3.62

Installation

Connecting an appliance 5.9.6

Operating conditions 5.9.5

Prohibited methods 5.9.4

Quick connect devices

External sockets 5.10.1

Installation, water and dust 5.10.2

Requirements for use 5.9.1

Restraint, appliance 6.2.14

Use of 5.9

Hot-tapping

Definition 1.3.63

Ignition source

Definition 1.3.65

Interlock

Definition 1.3.68

Local requirements

South Australia

Consumer piping in ground beneath building 5.3.11

Flueless heaters 6.4.4, 6.4.7, 6.10.6.3, M.3.2.1

Instantaneous water heater in roof 6.10.3.3

Quick-connect device 6.10.6.3(g)

Technical Regulator M.2(a)

Victoria

Flueless heaters 6.4.7, 6.10.6.3, M.3.2.3

Quick-connect device 5.10, M.3.1.2

Technical Regulator M.2(b)

Western Australia

Flueless heaters 6.4.4, 6.10.6.3, M.3.2.2

Quick-connect devices 5.10, 6.4, M.3.1.1

Technical Regulator M.2(c)

Lockout

Definition 1.3.72

LP Gas

Bibliography

Regulators, gas pressure

Appliance regulators

Adequate gas supply 6.2.1

Definition 1.3.57

Venting 5.11.5

Automatic change-over regulator, definition 1.3.57.1

Consumer piping regulators 5.11.1

Definition 1.3.57.2

Installation requirements 5.11.1.2

Notice required 5.11.1.6

Pressure rating 5.2.1

Pressure test points 5.11.4

Prohibited locations 5.11.1.3

Requirements 5.11.1.1

Ventilation 5.13

Venting 5.11.5

Where required 5.11.1.4

Cylinder regulator *see* LP Gas

Definition 1.3.57.3

Gas pressure, definition 1.3.57

Zero regulator, definition 1.3.57.5

Cylinders, general J.1

Requirements J.2

Clearances J.5

Connection, maximum length J.9

Connection, piping J.9

Definition 1.3.24

Exchange cylinder 1.3.24.1

In situ fill cylinder 1.3.24.2

Enclosure or recess J.3.4

Installation J.4

Exchange Figures J.5(A), J.6(A)

In situ Figures J.5(B), J.6(B)

Multiple installation-exchange cylinder J.4(j)

Prohibited installation methods J.3.2

Prohibited locations J.3.2

Safety valve discharge J.4(g)

Supporting base J.4

Under a building J.3.5

Cylinder regulators J.6

Materials, fittings and components

Backfill and bedding quality 5.4.4

Brass fittings, where buried 4.3(b)

Consolidation of backfill 5.4.5

Consumer piping, restrictions 4.3

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Cylinder quick-connect device	
Definition	1.3.99
Double block and vent system, definition	1.3.27
Fabricated pipe branches	4.8.1
Fittings containing soft solder	4.4(f)
Flue cowls	4.8.1
Flue material	4.7.4
Gasket material	4.7.1
Insulating joint, definition	1.8.67
Lead meter connections	4.3(d)
Longscrew connectors	4.4(d)
Marker tape	5.4.6
Olive-type fittings	4.4(b), 4.4(c)
Plain nipples	4.4(g)
POL fitting (Prest-O-Lite), definition	1.3.89
Pressure rating	5.2.1
Prohibited fittings	4.4
Push-on connectors	
Bunsen burners	6.2.15
Definition	1.3.96
Restriction	4.3(a)
Quick-connect device	
Definitions	1.3.98
Requirements	4.8.1
Restricted fittings and piping	4.3
Reuse of	4.1.2
Semi-rigid connectors	4.8.1
Substitution of	4.5.3
Suitability of	4.1.1
Swivel joints or couplings	4.8.4
Temperature limit device, definition	1.3.118
Threads, mating	4.1.3
Thread sealant	
Requirements	Table 4.2
Restrictions	5.1.8
PVC-U fittings, internally threaded	4.4(e)
Valve, non-return, definition	1.3.82
Valve, plastic	4.3(c)
Valve, shut off	
Automatic	4.8.1
Manual	4.8.1, 4.8.2
Definition	1.3.74
Safety, definition	1.8.106
Vent line material	4.7.3
Vent valve	4.8.1

Meter (Gas meter)

Consumer billing meter	
Definition	1.3.53
Location, Australia	L.2.1
Multiple meters, Australia	L.2.2
Requirements, Australia	L.2
Subsequent work, Australia	L.2.3
Definition	1.3.52
Exclusion areas, NZ	L.1.2
General, NZ	L.1.1
Hazardous areas, NZ	L.1.2
Sub-meters	5.11.6
Accessibility	5.11.6.3
Connections, strain on	5.11.6.7
Connections, suitability of	5.11.6.7
Definition	1.3.54
Identification	5.11.6.3

Locations, prohibited	5.11.6.2
Meter box	5.11.6.4
Requirements	5.11.6.1
Shut off valve provision	5.11.6.6
Ventilation	5.11.6.5

Multilayer pipe

Appliance connection restriction	6.6.1
Beneath a building	5.3.11
Brazing or annealing adjacent to	5.2.12
Definition	1.3.79
Embedded in concrete	5.3.13(a)
Fire emergency isolation	5.2.11
Jointing	5.1.7
Location	5.3.16
Marker tape	5.4.6
Material	Table 4.2
Reversion fittings	5.2.12
Steel framed buildings	5.13.5
Storage, handling	5.1.4
Support spacing	Table 5.8.2
Termination of	5.4.7

Nominal size

Definition	1.3.81

Outdoor

Definition	1.3.84

Over-pressure 5.11.2

Low pressure protection	5.11.3
Performance	5.11.2.1
Definition	1.3.85
System shuts off supply	5.11.2.3

Permanent joint

Definition	1.8.86

Pipe sizing

Multilayer pipe systems	F.1.4
General requirements	5.2.4
Information required	F.2
Method, suggested	F.3, F.5
Tables	Appendix F
Type A appliances	5.2.4

Plant room

Definition	1.3.88

Premises

Definition	1.3.91

Pressure

Definition	1.3.92
Operating pressure, definition	1.3.83
Rated working pressure, definition	1.3.101

Pressure raising devices

Connection of	5.12.2
Controls	5.12.3
Pipe and equipment downstream	5.12.4

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Pulsation protection 5.12.1

Purging

Commencing work	D.2
Completion of work	3.3.3
Definition	1.3.95
Precautions	D.2
Procedure	
Air to gas, small volume	D.4
Gas to air	D.6
Large volume	D.5
Purpose	D.1
Sub-meter	D.3

Range hood

Clearance	6.10.1.1
Definition	1.3.100

Sub-meter

See Meter

Technical Regulator

Definition	1.8.117

Testing

Alteration, repair, or extension	3.5.2
Connection after testing	E.7
Installations, leakage	E.3
Gastight, definition	1.3.58
Leakage	Appendix E
Limitation	E.2
Test instruments	E.10
Upstream of LP Gas regulator	E.8

Ventilation

Air heater, direct-fired	6.10.12.2
Appliance air supply to be adequate	6.4.1
Appliance air supply quality	6.4.2
Appliance air requirements	
Plant room	6.4.5.3, 6.4.6.2
Residential garage	8
Room or enclosure	6.4.5.2, 6.4.6.2
Combustion and dilution air to be from same space	6.4.12
Concealed piping	5.3.8
Decorative flame effect fires	6.10.9.5
Enclosure, with	
Appliance and gas equipment	5.13.6
Combination, natural and mechanical	5.13.4
Meter or regulator	5.13.2.2
Meter or regulator and pressure raising device	5.13.5
Pressure raising device	5.13.2.3
Gas equipment	5.13
Interlock required	Table 5.13.4
Interlock with fire damper	6.5.2
Interlock with fire alarm	6.5.3
Laundry dryers	6.10.14.4
Location of openings	5.13.7
Radiant tube heaters, overhead	6.10.13.3
Sub-meter	5.11.6.5

Venting

Breather vent	
Definition	1.3.7
Size limitation	5.11.5.7
Restriction	5.11.5.8
Interconnection of	
Breather lines	5.11.5.3
Safety shut off vent lines	5.11.5.6
Vent lines	5.11.5.3
Sizing	
Breather vent lines	5.11.5.5
Common vent lines	5.11.5.4
Relief device vent lines	5.11.5.5
Safety shut off vent lines	5.11.5.6
Vent line	
Definition	1.3.123
Disconnection	5.11.5.11
Material	4.7.3
Performance	5.11.5.1
Where required	5.11.5.2
Vent terminal	
Construction	5.11.5.10
Exclusion zone	5.11.5.9
Location	5.11.5.9
Vent valve	
Definition	1.3.124
Requirement	4.8.1

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Amendment control sheet

AS/NZS 5601.1:2022

Amendment No. 1 (2023)

Correction amendment

Summary: This amendment applies to [the Preface](#), [Clauses 5.2.11](#), [6.4](#), [6.4.1](#) and [6.10.1.1](#) and [Table 6.10.2.3](#).

Published on 24 March 2023.

Amendment No. 2 (2024)

Revised text amendment

Summary: This amendment applies to the [Preface](#), Clauses [1.1.1](#), [1.2](#), [1.3](#), [1.4](#), [2.1.4](#), [2.2.1.1A](#), [2.2.4.8](#), [2.2.5.3](#), [5.2.4](#), [5.2.10](#), [5.2.11](#), [5.3.1](#), [5.9.1](#), [5.11.1.4](#), [5.11.1.5](#), [6.2.2](#), [6.2.4](#), [6.7.6](#), [6.9.3](#), [6.10.1.1](#), [6.10.1.7](#), [6.10.1.9](#), [6.10.2.7](#), [6.10.9.5](#), [6.10.19](#), [C.2](#), [F.2](#), [F.3.1](#), [N.1](#) and [Q.1](#), Figures [5.2.12](#) and [L.1.2.2](#), Tables [4.2](#), [4.8.1](#), [F.54](#), [F.68](#) and [F.69](#), [Appendix A](#) and [Bibliography](#).

Published on 06 September 2024.

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)

Standards Australia

Standards Australia is an independent company, limited by guarantee, which prepares and publishes most of the voluntary technical and commercial standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. Through a Memorandum of Understanding with the Commonwealth government, Standards Australia is recognized as Australia's peak national standards body.

Standards New Zealand

The first national Standards organization was created in New Zealand in 1932. The New Zealand Standards Executive is established under the Standards and Accreditation Act 2015 and is the national body responsible for the production of Standards.

Australian/New Zealand Standards

Under a Memorandum of Understanding between Standards Australia and Standards New Zealand, Australian/New Zealand Standards are prepared by committees of experts from industry, governments, consumers and other sectors. The requirements or recommendations contained in published Standards are a consensus of the views of representative interests and also take account of comments received from other sources. They reflect the latest scientific and industry experience. Australian/New Zealand Standards are kept under continuous review after publication and are updated regularly to take account of changing technology.

International Involvement

Standards Australia and Standards New Zealand are responsible for ensuring that the Australian and New Zealand viewpoints are considered in the formulation of international Standards and that the latest international experience is incorporated in national and Joint Standards. This role is vital in assisting local industry to compete in international markets. Both organizations are the national members of ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission).

Visit our websites

www.standards.org.au www.standards.govt.nz

This is a preview of AS/NZS 5601.1:2022. [Click here to purchase the full version from the ANSI store.](#)



GPO Box 476 Sydney NSW 2001
Phone (02) 9237 6000
mail@standards.org.au
www.standards.org.au



PO Box 1473 Wellington 6140
Free phone 0800 782 632
enquiries@standards.govt.nz
www.standards.govt.nz