

B149.1S1-07

***Supplement No. 1 to
CAN/CSA-B149.1-05, Natural gas
and propane installation code
January 2007***

Note: General Instructions for CSA Standards are now called Updates. Please contact CSA Information Products Sales or visit **www.ShopCSA.ca** for information about the **CSA Standards Update Service**.

Title: *Natural gas and propane installation code* — originally published January 2005

The following revisions have been formally approved and are marked by the symbol double delta (ΔΔ) in the margin on the attached replacement pages:

Revised	Contents, Clauses 1.1, 2, 3, 4.3.1, 4.5.5, 4.9.1, 4.14.6, 4.14.7, 4.16.2, 5.2.1.1, 5.2.1.2, 5.2.3, 5.5.7, 5.6.1.3, 6.2.17, 6.16.7, 6.16.8, 6.17.1, 6.17.2, 6.21.1, 6.21.7, 6.22.3, 6.26.1, 7.2, 7.4.4, 7.5.2, 7.26.2, 7.27.3, 8.2.3, 8.4.3, 8.14.8, 8.14.12, 8.16.1, 8.24.2, Tables 5.2 and C.9, and Annex D
New	Clauses 6.16.13, 6.16.14, 7.26.7, 7.26.8, 8.9.5, 8.9.6, and 8.21.6
Deleted	Clause 6.25

CAN/CSA-B149.1-05 originally consisted of **286 pages** (xii preliminary and 274 text), each dated **January 2005**. It now consists of the following pages:

January 2005	vii–xii, 5–8, 11–14, 23, 24, 27, 28, 37–42, 45, 46, 55–66, 69–74, 77–80, 85–88, 91–94, 97–216, 219–232, and 235–274
January 2007	iii–vi, 1–4, 9–10A, 15–22, 25, 26, 29–36A, 43–44A, 47–54E, 67–68A, 75, 76, 81–84, 89, 90, 95–96A, 217, 218, 233, and 234

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.

IMPORTANT NOTICE

Please consult with the appropriate authority having jurisdiction regarding the applicability of this Supplement.

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CAN/CSA-B149.1-05

Natural gas and propane installation code

1 Scope

ΔΔ 1.1

This Code applies to the installation of

- (a) **appliances, equipment, components**, and **accessories** where gas is to be used for fuel purposes;
- (b) piping and tubing systems extending from the termination of the utility installation or from the distributor's propane tank;
- (c) vehicle-refuelling appliances and associated equipment meeting the requirements of a general-purpose appliance to fill a natural-gas-fuelled vehicle; and
- (d) stationary gas engines and turbines.

1.2

This Code does not apply to

- (a) marine or pipeline terminals;
- (b) petroleum refineries;
- (c) gas where used as a feedstock in chemical plants;
- (d) utility pipeline distribution and transmission pipelines;
- (e) storage and handling of liquefied natural gas or underground reservoirs for natural gas;
- (f) the installation of **NGV** fuel systems, **containers**, and refuelling stations;
- (g) the storage and utilization of compressed natural gas on boats;
- (h) the installation of vehicle-refuelling appliances when **NGV** storage **containers** are installed as part of the system;
- (i) refrigerated storage or underground reservoirs for propane;
- (j) propane used on boats;
- (k) propane used as a propellant in aerosol containers;
- (l) butane fuel **cylinders** of 150 g capacity or less; and
- (m) the installation of **containers** and **equipment** to be used for propane in distribution locations and filling plants and on **tank** trucks, **tank** trailers, and cargo liners.

1.3

Where the term "gas" is used, the requirements of this Code include, and apply equally to, any of the following gases or mixtures of them: natural gas, manufactured gas, or mixtures of propane gas and air, propane, propylene, butanes (normal butane or isobutane), and butylenes.

1.4

This Code and any Standards referenced in it do not make or imply any assurance or guarantee with respect to the life expectancy, durability, or operating performance of equipment and materials referenced in the Code.

1.5

The values given in yard/pound units are the standard. This Code contains SI (metric) equivalents to yard/pound units so that the Code can be used in SI (metric) units. SI (metric) equivalents may be approximate.

1.6

In this Code, unless **approved** otherwise by the **authority having jurisdiction**, “shall” indicates a mandatory requirement; “should” indicates a recommendation or that which is advised but not mandatory; “may” indicates an advisory or optional statement. Notes to the text do not include mandatory or alternative requirements. The purpose of a note is to separate from the text explanatory or informative material that is not properly a part of this Code. Notes to figures and tables, however, are considered part of the figure or table and are written as mandatory requirements. Legends to figures are also written as mandatory requirements.

2 Reference publications

This Code refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA (Canadian Standards Association)

Note: CGA Standards, Recommended Practices, and Codes are now published by CSA.

ANSI Z21.24-2001/CSA 6.10-2001

Connectors for Gas Appliances

ANSI Z21.50-2000/CSA 2.22-2000

Vented Gas Fireplaces

ANSI Z21.69-2002/CSA 6.16-2002

Connectors for Movable Gas Appliances

ΔΔ ANSI Z21.75-2001/CSA 6.27-2001

Connectors for Outdoor Gas Appliances and Manufactured Homes

ANSI Z21.80-2003/CSA 6.22-2003

Line Pressure Regulators

ANSI Z21.90-2001/CSA 6.24-2001

Gas Convenience Outlets and Optional Enclosures

ANSI Z83.4-1999/CSA 3.7-M99

Non-Recirculating Direct Gas-Fired Industrial Air Heaters

ANSI Z83.11-2002/CSA 1.8-2002

Gas Food Service Equipment

ANSI/IAS LC1-1997/CSA 6.26-M97 (R2001)

Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)

CGA 2.17-M91 (R1999)

Gas-Fired Appliances for Use at High Altitudes

CAN1-6.2-M81 (R2001)

Draft Hoods

ΔΔ 6.18-02

Service Regulators for Natural Gas

6.19-01

Residential Carbon Monoxide Alarming Devices

CAN/CGA-8.1-M86 (R2001)

Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas

CAN1-8.3-M77 (R2001)

Thermoplastic Hose and Hose Couplings for Conducting Propane and Natural Gas

12.6-04

Vehicle Refuelling Appliances

CGA Certification Laboratory Requirement LAB-009-1989 (revised 1994)

Flexible Gas Tubing for Interior Natural and Propane Gas Piping Systems

B51-03

Boiler, Pressure Vessel, and Pressure Piping Code

B108-05

Natural gas fuelling stations installation code

CAN/CSA-B137 Series-02, *Thermoplastic Pressure Piping Compendium:*

CAN/CSA-B137.4-02

Polyethylene Piping Systems for Gas Services

CAN/CSA-B137.4.1-02

Electrofusion-Type Polyethylene Fittings for Gas Services

CAN/CSA-B149.2-05

Propane storage and handling code

CAN/CSA-B149.3-05

Code for the field approval of fuel-related components on appliances and equipment

CAN/CSA-B365-01

Installation Code for Solid-Fuel-Burning Appliances and Equipment

C22.1-02

Canadian Electrical Code, Part I

CAN/CSA-W117.2-01

Safety in Welding, Cutting, and Allied Processes

CAN/CSA-Z240 MH Series-92 (R2001), *Mobile Homes:*

CAN/CSA-Z240.4.1-92 (R2001)

Installation Requirements for Gas-Burning Appliances in Mobile Homes

Z662-03

Oil and Gas Pipeline Systems

ANSI/ASME (American National Standards Institute/American Society for Mechanical Engineers)

B1.20.1-1983 (R2001)

Pipe Threads, General Purpose (Inch)

B16.3-1998

Malleable-Iron Threaded Fittings, Classes 150 and 300

B36.10-2000

Welded and Seamless Wrought Steel Pipe

ASTM (American Society for Testing and Materials)

A 53/A 53M-02

Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A 106-02a

Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

A 179/A 179M-90a (2001)

Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat Exchanger and Condenser Tubes

B 88-03

Standard Specification for Seamless Copper Water Tube

B 837-01

*Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems***CGSB (Canadian General Standards Board)**

CAN/CGSB-3.13-M88

Liquefied Petroleum Gas (Butanes)

CAN/CGSB-3.14-M88

*Liquefied Petroleum Gas (Propane)***Government of Canada***Transportation of Dangerous Goods Act, S.C. 1992, c. 34, and the Transportation of Dangerous Goods Regulations, as amended from time to time**Weights and Measures Act, R.S.C. 1985, c. W-6***NRCC (National Research Council Canada)***National Building Code of Canada, 1995***UL (Underwriters Laboratories Inc.)**

959-2001

Medium Heat Appliance Factory-Built Chimneys

△△ 144-2001

*LP-Gas Regulators***ULC (Underwriters' Laboratories of Canada)**

C536-1998

Guide for the Investigation of Flexible Metallic Hose

CAN/ULC-S110-M86

Standard Methods of Test for Air Ducts

CAN4-S114-M80 (R1997)

Standard Method of Test for Determination of Non-Combustibility in Building Materials

CAN4-S604-M91

Standard for Factory-Built Type A Chimneys

CAN/ULC-S605-M91

Standard for Gas Vents

S609-M89

Standard for Low Temperature Vents Type L

Direct-vent appliance — an appliance constructed so that all the combustion air is supplied directly from, and the products of combustion are vented directly to, the outdoors by independent enclosed passageways connected directly to the appliance.

Dirt pocket (dust pocket) — a pocket in a piping system designed for the collection of dirt and from which the dirt can be removed.

Draft — the flow of air or combustion products, or both, through an appliance and its venting system.

Chimney draft — the available natural draft of the chimney measured at or near the base of the chimney.

Mechanical draft — a draft produced by a mechanical device, such as a fan, blower, or aspirator, that can supplement natural draft.

Forced draft — a mechanical draft produced by a device upstream from the combustion zone of an appliance.

Induced draft — a mechanical draft produced by a device downstream from the combustion zone of an appliance.

Natural draft — a draft other than a mechanical draft.

Draft-control device — either a draft hood or a draft regulator.

Draft hood — a draft-control device having neither movable nor adjustable parts. A draft hood may be built into an appliance, attached to an appliance, or made part of a vent connector. It is designed to

- (a) ensure the ready escape of flue gases from the combustion chamber in the event of either no draft or stoppage downstream from the draft hood;
- (b) prevent a backdraft from entering the combustion chamber of the appliance; and
- (c) neutralize the effect of stack action of either a chimney or a vent upon the operation of the appliance.

Draft regulator (barometric damper) — a draft-control device intended to stabilize the natural draft in an appliance by admitting room air to the venting system. A double-acting draft regulator is one whose balancing damper is free to move in either direction.

Drip pocket (drip) — a pocket in a piping system designed for the collection of condensate and from which the condensate can be removed.

Dust pocket — see **Dirt pocket**.

Dwelling unit — a housekeeping unit used or intended to be used as a domicile by one or more persons, and usually containing cooking, eating, living, sleeping, and sanitary facilities.

△△ **Emergency use generators (generators)** — engines that operate to provide power to critical operational support such as protection of property, fire fighting activities, and building evacuation.

Enclosure — a secondary structure (room) within or attached to a structure (building) in which an appliance is installed.

△△ **Engine** — a device that performs mechanical work that is used to operate other machinery and equipment.

Reciprocating engine (also known as a piston engine) — an engine that utilizes one or more pistons in order to convert pressure into a rotating motion.

Turbine engine — a rotary engine that extracts energy from a flow of combustion gas. It has an upstream compressor coupled to a downstream turbine and a combustion chamber in between. (Gas turbine may also refer to the turbine element.)

Equipment — a device, other than an appliance, accessory, or component, that is connected to a piping or tubing system.

Excess air — see **Air supply**.

Expanding pilot — see **Pilot**.

Factory-built chimney — see **Chimney**.

False ceiling space — ceiling space that is enclosed with tiles or panels that are removable without the use of a tool. A typical type is the T-bar-constructed suspended ceiling.

Fan-assisted burner — see **Burner**.

Fan-assisted combustion system — an appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber and/or heat exchanger. See Annex C.

FAN Max — the maximum appliance input rating of a Category I appliance with a fan-assisted combustion system that could be attached to the vent. See Annex C.

FAN Min — the minimum appliance input rating of a Category I appliance with a fan-assisted combustion system that could be attached to the vent. See Annex C.

FAN+FAN — the maximum combined input rating of two or more fan-assisted appliances attached to the common vent. See Annex C.

FAN+NAT — the maximum combined input rating of one or more fan-assisted appliances and one or more draft-hood-equipped appliances attached to the common vent. See Annex C.

Fast-closing valve — see **Valve**.

Fireplace — a device for burning solid fuel that has the major portion of one or more essentially vertical sides open or openable for refuelling and for the visual effects of the burning fuel.

Fitting — an item in a piping or tubing system that is used as a means of connection, such as an elbow, return bend, tee, union, bushing, coupling, or cross, but does not include such functioning items as a valve or pressure regulator.

Flame baffle — see **Baffle**.

Flame safeguard — see **Combustion safety control**.

Flame-sensing device — that component of a combustion safety control that senses flame.

Flammable liquid — a liquid that has a flashpoint below 100°F (38 °C) and that has a vapour pressure not exceeding 40 psia (276 kPa absolute) at 100°F (38 °C).

Flashpoint — the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flexible connector — see **Connector**.

Flexible metallic hose — an all-metallic flexible gas conduit.

Floor furnace — a furnace that is suspended from the floor of the space being heated and that supplies warm air to such space through integral floor or wall grilles without the use of ducts.

Flue — an enclosed passageway for conveying flue gases.

Flue baffle — see **Baffle**.

Chassis-mounted camper — an accommodation body that attaches onto a truck chassis and is not intended for removal.

Motorized home — a vehicular portable structure of self-propelled design.

Slide-in camper — an accommodation body that fits into a standard vehicle and is designed to be easily removable.

Tent trailer — a vehicular portable structure built on its own chassis and having a rigid or canvas top and side walls that may be folded or otherwise condensed for transit.

Travel trailer — a vehicular portable structure intended to be towed by a motor vehicle and that does not fold up or reduce in size for transit.

Regulator —

Appliance regulator — a pressure regulator located in the valve train of an appliance.

△△ **Line pressure regulator** — a gas pressure regulator intended for installation in a gas distribution system between the utility service regulator or 2 psi propane regulator and gas utilization equipment.

Lock-up (positive shut-off) regulator — a regulator that is capable of maintaining a reduced outlet pressure when the fuel flow condition is static.

Pressure regulator — a device, either adjustable or nonadjustable, for controlling and maintaining, within acceptable limits, a uniform outlet pressure.

Service regulator — a pressure regulator installed on a service line to control the pressure of the gas delivered to the customer.

Relief device — a device designed to open to prevent a rise of gas pressure in excess of a specified value due to an emergency or abnormal conditions.

Residential appliance — an appliance commonly used in, but not restricted to use in, a dwelling unit.

Residential building — see **Building**.

Safety limit control — a safety control intended to prevent an unsafe condition of temperature, pressure, or liquid level.

Safety shut-off valve — see **Valve**.

Secondary air — see **Air supply**.

Semi-rigid connector — see **Connector**.

Set pressure — the start-to-discharge pressure for which a relief valve is set and marked.

Structure — the entire building in which an appliance is installed.

Tank (with respect to NGV/propane storage) — the class of container for the storage and transportation of gas, designed and fabricated in accordance with CSA B51.

△△ **Two-stage regulation** — a propane gas vapour delivery system that utilizes a first-stage regulator and a second-stage regulator(s), or utilizes an integral two-stage regulator or automatic changeover regulator.

Valve — a device by which the flow of a fluid can be started, stopped, or regulated by a movable part that opens or obstructs passage.

Back check valve — a valve that is normally closed and allows flow in only one direction.

Cylinder valve — a valve fitted to a cylinder.

Emergency shut-off valve — a valve that is part of a system that is designed to limit and shut down the flow of propane in the event that a vehicle moves away from a transfer point with the transfer hose or swivel-type piping connected to it.

Excess-flow valve — a valve designed to close when the liquid or vapour passing through it exceeds a prescribed flow rate as determined by a pressure drop across the valve.

Fast-closing valve — an automatic valve that has a closing time of less than 5 s upon being de-energized.

Hydrostatic relief valve — a pressure relief valve installed in a liquid propane line.

Internal excess-flow valve — an excess-flow valve that remains functional within the tank when any portion of the valve external to the tank's perimeter is sheared off or otherwise damaged. An internal excess-flow valve can be integral to another valve.

Note: *The perimeter of the tank is taken to mean not only the surface of the tank's shell and ends but also the outline of any boss, spigot, or nozzle welded to the tank so as to project outwards from it. The outline of welded brackets, mountings, guards, subcompartments, and the like are not considered part of the perimeter for the purpose of this definition.*

Internal relief valve — a pressure relief valve that is built into the body of the diaphragm assembly of a pressure regulator.

Internal valve — a valve designed and installed so that its seat is within a tank and the arrangement of the parts of the valve is such that damage to the parts outside the tank will not prevent effective seating of the valve.

Line relief valve — a relief valve installed in the piping or tubing system downstream of a final-stage pressure regulator that is not equipped with an internal relief valve.

Lubricated-plug-type valve — a manually operated valve of the plug and barrel type that is

- (a) provided with means for maintaining a lubricant between its bearing surfaces;
- (b) so designed that the lapped bearing surfaces can be lubricated and the lubricant level maintained without removing the valve from service;
- (c) so constructed that the lubricant can be stored in a reservoir so as to be distributed evenly over the entire lapped bearing surfaces of the valve when the plug is rotated; and
- (d) equipped with built-in stops to limit the rotation of the plug to one quarter turn when fully opening or fully closing the valve.

Safety shut-off valve — a valve that automatically shuts off the supply of gas when de-energized by a combustion safety control, safety limit control, or loss of actuating medium.

Stop-fill valve — a device in a container that is intended to automatically shut off the flow of liquid into the container when a predetermined fixed level is achieved.

Test firing valve (firing valve) — a manually operated, lubricated-plug-type, quarter-turn valve that has stops in the open and closed positions and has an attached handle or loose-fitting key or extended handle wrench, and that is located downstream of all safety shut-off valves on the valve train and as close to the burner as is practicable.

Valve train — the combination of valves, controls, and piping and tubing of an appliance upstream from the manifold through which gas is supplied to the appliance and by which gas is controlled.

Vaporizer — an appliance for converting liquid propane to vapour by means other than atmospheric heat transfer through the surface of the container.

Direct-fired vaporizer — a vaporizer in which heat furnished by a flame is directly applied to a heat-exchange surface in contact with the liquid propane to be vaporized.

Indirect vaporizer — a vaporizer in which heat furnished by steam, hot water, or another heating medium is applied to a vaporizing chamber's tubing, pipe coils, or other heat-exchange surface containing the liquid propane to be vaporized. The heating of the medium being used occurs at a point remote from the vaporizer.

Vent — that portion of a venting system designed to convey flue gases directly to the outdoors from either a vent connector or an appliance when a vent connector is not used.

Type B vent — a vent complying with CAN/ULC-S605 and consisting entirely of factory-made parts, each designed to be assembled with the others without requiring field fabrication, and intended for venting gas appliances.

Type BH vent — a vent complying with ULC S636 and consisting entirely of factory-made parts, each designed to be assembled with the others without requiring field fabrication, and intended for venting gas appliances.

Type BW — a vent complying with CAN/ULC-S605 and consisting entirely of factory-made parts, each designed to be assembled with the others without requiring field fabrication, and intended for venting only wall furnaces for use with this type of vent.

Type L — a vent complying with ULC S609 and consisting of factory-made parts, each designed to be assembled with the others without requiring field fabrication.

Vent connector — that part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and that may include a draft-control device.

△△ **Ventilated space** — a space where there is an air change by means of natural ventilation or mechanical means, or where the space communicates with the rest of the structure by means of permanent openings.

Ventilation (with respect to the space in which an appliance is installed) — the removal of inside air, leaked or spilled products of combustion, or flue gases from the space in which an appliance is installed to outside the space, and the replacement of same by air from outside the space.

Ventilation air — see **Air supply**.

Venting system — a system for the removal of flue gases to the outdoors by means of a chimney, vent connector, vent, or a natural or mechanical exhaust system.

Special venting system — a venting system certified with the appliance and either supplied or specified by the appliance manufacturer.

VRA — vehicle refuelling appliance.

Wash-mobile — a mobile outdoor unit that uses propane-heated water, or a solution, for the purpose of cleaning.

Zero governor — a regulating device that is adjusted to deliver gas at atmospheric pressure within its flow rating.

4 General

4.1 Application

4.1.1

For the purpose of this Code, the requirements contained in CAN/CGSB-3.14 for propane or CAN/CGSB-3.13 for butane shall apply.

4.1.2

When a specification or document referenced in Clause 2 contains a requirement that conflicts with a requirement in this Code, the requirement in this Code shall govern.

4.1.3

An **appliance, accessory, component, equipment**, or any other item shall be installed in accordance with the manufacturer's **certified** instructions and this Code.

4.1.4

Where a conflict exists between the manufacturer's **certified** installation instructions and this Code, the requirements of this Code shall prevail unless otherwise **approved**.

4.2 Approval of appliances, accessories, components, equipment, and material

4.2.1

An **appliance, accessory, component, equipment**, or material used in an installation shall be of a type and rating **approved** for the specific purpose for which it is employed.

4.2.2

When deviation from or postponement of these requirements is necessary, permission in writing shall be obtained from the **authority having jurisdiction** before the work proceeds, and this permission shall apply only to the particular installation for which it is given.

4.2.3

The approval of the assembly or construction of an **appliance** is subject to the **authority having jurisdiction**. (CAN/CSA-B149.3 contains provisions for the assembly and construction of **appliances**.)

4.3 Responsibilities of the installer

ΔΔ 4.3.1

Before leaving installations, **installers** shall ensure that the **appliance, accessory, component, equipment**, or piping and tubing they installed complies with the Code requirements, and the person initially activating the **appliance** shall ensure that the **appliance** is in safe working order.

4.3.2

Installers shall instruct the user in the safe and correct operation of all **appliances** or **equipment** that they install.

4.3.3

The **installer** shall ensure that the manufacturer's instructions supplied with the **appliance** are left with the user.

4.3.4

Before installing any replacement part of an **appliance**, the **installer** shall ensure that the replacement part provides operational characteristics at least equivalent to those of the original part.

4.3.5

When the installation or conversion of an **appliance** constitutes a conversion from another form of energy, the **installer** shall advise the user of the **appliance**, at the time of installation or conversion, to have the former form of energy either removed or left safe and secure from accidental activation; for example, the user shall be advised

- (a) in the case of a fuel oil supply tank
 - (i) to remove the fill pipe, and cap or plug the exposed fill pipe opening to an inside tank;
 - (ii) to shut off the tank outlet **valve**, remove the filter, and plug or cap the **valve** outlet; and
 - (iii) where the tank is located outdoors, to disconnect all exposed piping or tubing, and cap or plug the piping or tubing as close as practicable to the tank;
- (b) in the case of a fuel oil central distributing system
 - (i) to shut off the fuel oil supply line **valve** located within the **building**; and
 - (ii) to disconnect the fuel oil supply line immediately downstream of the meter, and cap or plug the outlet of the meter;
- (c) in the case of a propane system
 - (i) to shut off the **cylinder** or tank **valve**; and
 - (ii) to disconnect and cap or plug the propane supply piping or tubing outdoors; and
- (d) in the case of an electrical **appliance**
 - (i) to shut off the power supply to the electrical **appliance** at the switch; and
 - (ii) to ensure that the overcurrent protection, fuse, or circuit breaker has been removed or put in the off position.

4.3.6

The **installer** installing the installation or conversion, as specified in Clause 4.3.5, shall advise the user of the **appliance** in writing of the procedures to be followed in discontinuing the supply of the former form of energy.

4.3.7

It shall be the responsibility of the **installer** of a piping or tubing system to perform pressure tests in accordance with Clause 6.22.2 and to ensure that the piping or tubing system is gas-tight at the completion of the tests.

4.3.8

It shall be the responsibility of the **installer** of an **appliance** to perform tests in accordance with Clause 6.22.3 and to ensure that the system is gas-tight at the completion of the tests.

4.4 Training and quality of labour

4.4.1

All work shall be done in a skillful, thorough manner. Careful attention shall be paid not only to the mechanical execution of the work but also to the arrangement of the installation.

4.4.2

Personnel performing installation, operation, and maintenance work shall be properly trained in such functions.

4.5 Suitability of use

4.5.1

An **appliance** shall not be installed unless it is designed for use with the type of gas to which it is to be connected and is suitable for the pressure supplied.

4.5.2

The use of an **appliance, accessory, component, equipment**, or material shall be prohibited where a hazard is created.

4.5.3

When an **appliance** is converted from the gas or fuel specified on the rating plate, the conversion shall be in accordance with the manufacturer's **certified** instructions. If there are no manufacturer's instructions for conversion of the **appliance**, the converted **appliance** shall be **approved**.

4.5.4

If an **appliance** is converted from one gas to another, the gas to which it is converted shall be marked on the **appliance** rating plate by the fitter making the conversion.

△△ 4.5.5

Appliances, accessories, components, and equipment that have been exposed to fire, explosion, flood, or other damage shall not be offered for sale, installed, reactivated, or reconnected to the supply until the **appliance, accessory, component, or equipment** has been inspected by a person acceptable to the **authority having jurisdiction**.

4.5.6

A used **appliance** shall be inspected and determined to be safe for continued use by the **installer** before reconnection to supply piping or tubing.

4.6 Meter and service regulator installations

4.6.1

Meter and **service regulator** installations shall be in accordance with CSA Z662. (See Annex D.)

4.6.2

No person other than an employee or person authorized by the supplier or distributor shall perform any alterations, repairs, tests, services, removals, changes, installations, connections, or any other type of work on the supplier's or distributor's system.

4.7 Electrical connections and components

4.7.1

Electrical connections between an **appliance** and **building** wiring shall comply with the local electrical code or, in the absence of such, with the *Canadian Electrical Code, Part I*.

4.7.2

An electrical circuit employed for operating an automatic main control valve, automatic **pilot**, room-temperature thermostat, **safety limit control**, or another electrical device used with an **appliance** shall be in accordance with the **appliance** wiring diagram.

4.8 Mobile homes

4.8.1

The installation of gas-burning **appliances** and supply piping in **mobile homes** shall be in accordance with CAN/CSA-Z240.4.1.

4.8.2

When a vehicle ceases to be used as a **mobile home** or **recreational vehicle** and is placed at a location in a permanent fixed manner, the system shall comply with all applicable requirements of this Code.

4.8.3

An **appliance** in the application described in Clause 4.8.2 shall not be required to be **certified** specifically for use within a **mobile home**.

4.9 Hazardous locations

ΔΔ 4.9.1

An **appliance** shall not be installed in a location that has an environment corrosive to an **appliance** or **venting system**.

4.9.2

An **appliance**, unless **certified** for installation in a hazardous location, shall not be installed in any location where a flammable vapour, combustible dust or fibres, or an explosive mixture is present.

4.10 Smoking

Smoking or providing any other source of **ignition** shall not be permitted in the area where work is being done on piping, tubing, or **equipment** that either contains or has contained gas unless the piping, tubing, or **equipment** has been **purged** of all gas as outlined in Clause 6.23.

4.11 Isolation of safety devices

Isolating or rendering inoperative a **safety shut-off valve**, **safety limit control**, or **relief valve** shall be prohibited.

4.12 Leak detection

4.12.1

A match, candle, flame, or other source of **ignition** shall not be used to check for a gas leak.

4.12.2

A light, including a flashlight, used in connection with a search for gas leakage shall be of the Class I, Group D type.

4.12.3

An electric switch either in or adjacent to an area of gas leakage shall not be operated unless it is a Class I, Group D type.

4.13 Appliance clearances to combustible material

4.13.1

The clearances required in Clause 7 between an **appliance** and **combustible** material shall be considered the minimum without protection and shall be measured from the **appliance**, disregarding either the **burner** or any other projecting component.

4.13.2

The clearances to **combustible** material specified in Clause 7 shall not be reduced unless

- (a) such reduced clearance is **certified** as safe by a nationally recognized certification organization acceptable to the **authority having jurisdiction**, and so marked on the **appliance** nameplate; or
- (b) protection is provided for the **combustible** material, and such protection and such reduced clearance are in accordance with Table 4.1.

4.13.3

An **appliance** with an input up to and including 400 000 Btuh (120 kW) and **certified** for installation on **noncombustible** flooring may be installed on a floor constructed of **combustible** material, provided that

- (a) the floor is protected with at least two continuous courses of 4 in (90 mm) thick hollow masonry units covered with sheet metal at least 0.0195 in (0.56 mm) thick;
- (b) the masonry units are arranged so that the hollow cores will permit air circulation through them; and
- (c) the base as specified in Items (a) and (b) extends not less than 6 in (150 mm) beyond the sides of the **appliance**.

4.13.4

A **heater** located in an aircraft storage or servicing area shall be installed so that no portion of an aircraft that can occupy the area is within the clearance to **combustible** material, as marked on the **appliance** rating plate. Clearances specified in Table 4.1 shall not apply.

4.14 Accessibility

4.14.1

An **appliance** shall be installed so that it is accessible for servicing.

4.14.2

An **appliance** shall be installed with a minimum service clearance of 24 in (600 mm) to any side, top, or bottom where service could be necessary, except where

- (a) a greater distance is indicated on the **appliance** rating plate; or
- (b) the distance is not sufficient for the removal, replacement, or repair of a **component**, an **accessory**, or any **equipment** either forming an integral part of the **appliance** or connected to the **appliance**, in which case minimum service clearance that is adequate to effect such removal, replacement, or repair shall be provided.

All measurements shall be taken between the outermost projection of the **appliance** and surrounding **structure** or property line after the **appliance** has been installed.

4.14.3

An access opening with minimum dimensions of 24 × 30 in (600 × 750 mm) shall be provided to the space in which an **appliance** is located.

4.14.4

A clear and unobstructed passageway at least 36 in (900 mm) high and 36 in (900 mm) wide shall be provided to each **appliance**.

4.14.5

An **appliance** shall not be installed on a roof

- (a) exceeding 13 ft (4 m) in height from grade to roof elevation unless fixed access to the roof is provided; and
- (b) exceeding 26 ft (8 m) in height from grade to roof elevation unless permanent fixed access to the roof by means of either a stairway or a stairway leading to a ladder not exceeding 13 ft (4 m) in height is provided.

ΔΔ 4.14.6

When an **appliance** is installed on a roof,

- (a) the **appliance** shall be installed on a well-drained surface. When water stands on the roof, either at the **appliance** or in the passageways to the **appliance**, or when the roof is sloped or has a water seal, a suitable anti-skid walkway shall be provided. Such a walkway shall be located adjacent to the **appliance** and control panels, and when the **appliance** is located on a sloped roof, the walkway shall extend from the **appliance** to the point of access and be equipped with guardrails so that the **appliance** can be safely accessed and serviced;
- (b) the clearance between the **appliance** and the edge of the roof or other hazard shall be at least 6 ft (2 m); and
- (c) if the **appliance** is enclosed, such an **enclosure** shall permit easy entry and movement, be of reasonable height, and have at least 2 ft (600 mm) clearance on either side of the service access panel of each **appliance** in the **enclosure**.

ΔΔ 4.14.7

An **appliance** installed at a distance of 10 ft (3 m) or more from either the floor or finished grade level, as measured from the lowest point of the **appliance**, shall be provided with either

- (a) a permanent accessible service platform that permits access to all parts of the **appliance** requiring service; or
- (b) other **approved** means of service access.

4.15 Outdoor installations

4.15.1

An **appliance** installed outdoors shall be **approved** for outdoor use.

4.15.2

An **appliance** installed outdoors shall be located to prevent circulation of **flue gases** into the **combustion air** inlet or circulating airstream of an adjacent **appliance**.

4.15.3

A space-heating or pool-heating **appliance** installed outdoors at grade level shall be placed on a base consisting of poured-in-place concrete or a reinforced concrete slab of the preformed type, extending at least

- (a) 6 in (150 mm) beyond all sides of the **appliance**; and
- (b) 2 in (50 mm) above grade level.

The ground shall first be prepared and provided with gravel for drainage.

4.16 Appliances in garages

4.16.1

An **appliance** in a **garage** shall be protected against damage.

ΔΔ 4.16.2

In a **storage garage**, except for an **appliance** certified as flammable vapours ignition resistant (FVIR), an **appliance** shall be installed so that a component capable of igniting a flammable vapour is located not less than 18 in (450 mm) above the floor.

4.16.3

In a **repair garage**, an **appliance** shall be installed so that a component capable of igniting a flammable vapour is located not less than 4.5 ft (1400 mm) above the floor.

4.17 Appliance ductwork connections

4.17.1

Ductwork shall not be connected to an **appliance** unless the **appliance** is **approved** for use with ductwork.

Δ 4.17.2

Return air ducts installed in an **enclosure** shall be in accordance with the provisions set out for duct systems in the *National Building Code of Canada*.

4.18 Combined heating systems

4.18.1

Air heated by either an **appliance** or **fireplace** that burns a solid fuel shall not be introduced into any part of the ductwork system of a gas-fired **appliance** except where either

- (a) a **certified** combination gas and solid-fuel-fired **appliance** is installed; or
- (b) a **certified** solid-fuel-fired **appliance** downstream series add-on **furnace** is installed.

4.18.2

The installation of a solid-fuel-fired portion of the **appliance** referred to in Clause 4.18.1(a), and the installation of a solid-fuel-fired add-on **furnace** referred to in Clause 4.18.1(b), shall conform to the applicable provincial or territorial building code or, in its absence, to CAN/CSA-B365.

5.1.2

In a residential application using propane, propane vapour pressure in either a piping or tubing system between the first-stage and second-stage **regulator** shall not be higher than 10 psig (70 kPa). In other applications using propane, means shall be provided to prevent liquefaction of propane.

5.1.3

Propane shall not be piped into or within any **building** in the liquid phase, except when

- (a) the **building** is used exclusively to house **appliances** or **equipment** for vaporization (including grain dryers), pressure reduction, propane/air mixing, or distribution;
- (b) the **building** is a container-filling **building**;
- (c) the fire-separated portion of the **building** is used exclusively for housing an internal combustion engine or industrial process; or
- (d) the fire-separated portion of the **building** is occupied exclusively by research and experimental laboratories.

5.1.4

For applications using propane, a **line pressure regulator** installed within a one- or two-family dwelling or row housing shall not be located more than 3 ft (1 m) from the point where the propane supply enters the dwelling.

5.2 Pressure regulators

5.2.1 General

ΔΔ 5.2.1.1

Every **regulator** shall be **certified** and be of sufficient size to provide the required flow of gas at the extremes of inlet pressures to which the **regulator** can be exposed. Recognized Standards for certifying **regulators** include

- (a) ANSI Z21.80/CSA 6.22;
- (b) UL 144; and
- (c) CSA 6.18.

ΔΔ 5.2.1.2

The minimum clearance specified in Clauses 7.4.4 and 7.5.2 between a **pressure regulator** and the moisture-exhaust duct shall be maintained.

5.2.1.3

A **pressure regulator** shall not be bypassed.

Δ 5.2.1.4

When a **line pressure regulator** is required and the inlet supply pressure to the **regulator** exceeds 0.5 psig (3.5 kPa), it shall be of the positive shut-off type.

Δ 5.2.1.5

A **line pressure regulator** shall have

- (a) a manual shut-off **valve** installed upstream of the **regulator**; and
- (b) either a line **relief device** or an **overpressure protection device**.

The **regulator** vent and **relief device** vent shall terminate outdoors.

5.2.2 Additional requirements for pressure regulators for propane applications

5.2.2.1

A **regulator** shall be firmly secured to the **container valve**, or the **regulator** bracket on the wall or hood, or in some other appropriate manner. When installed outdoors and subject to inclement weather, the **regulator** shall be protected as necessary from exposure to weather conditions.

5.2.2.2

Not less than two-stage regulation shall be utilized on all permanent propane installations.

5.2.2.3

A **regulator** installed outdoors or in an unheated area shall be positioned so that the bonnet vent opening discharges vertically downward, except that

- (a) when installed within a **container** dome, the vent opening shall be positioned downward not less than 15° from the horizontal; and
- (b) a single-stage **regulator** of a capacity not exceeding 150 000 Btuh (45 kW) may be installed in a horizontal position, provided that it is protected from inclement weather.

5.2.2.4

When used on a system operating at 2 psig (14 kPa) or less, a **line pressure regulator** equipped with a leak limiting system orificed for 1 ft³/h (0.0283 m³/h) shall be exempt from the requirement of Clause 5.2.1.5(b).

A **regulator** with vent limiting means shall be installed in a **ventilated** space only.

ΔΔ 5.2.3 Additional requirements for pressure regulators for natural gas applications

5.2.3.1

When used on a system operating at 2 psig (14 kPa) or less, a **line pressure regulator** equipped with a leak limiting system orificed for 2.5 ft³/h (0.0706 m³/h) shall be exempt from the requirement of Clause 5.2.1.5(b).

A **regulator** with vent limiting means shall be installed in a **ventilated** space only.

5.2.3.2

For systems with inlet pressures above 2 psig (14 kPa), a pressure regulator equipped to limit the escape of gas from the vent openings, even in the event of a main diaphragm failure, to less than 2.5 ft³/h (0.0706 m³/h), having an overpressure cut-off (OPCO) device set to a pressure either below 2 psig (14 kPa) or 2 times the delivery pressure on the system and certified to CSA 6.18, is exempt from compliance with Clause 5.2.1.5(b) of this Code.

Δ 5.3 Relief devices

Except as specified in Clauses 5.2.2.4 and 5.2.3, when a **line pressure regulator** is not equipped with an internal **relief device**, it shall have immediately downstream an **overpressure protection device** or a line **relief device** as required in Clause 5.2.1.5(b), with a discharge setting of either

- (a) not less than 2 times and not more than 3 times the delivery pressure on systems operating up to 5 psig (35 kPa); or
- (b) not less than 1.5 times and not more than 2 times the delivery pressure on systems operating at more than 5 psig (35 kPa).

The relieving pressure setting of the line **relief device** shall be not higher than that of the lowest-rated **component** or **accessory** located downstream.

5.4 Hydrostatic relief devices for propane applications

5.4.1

A hydrostatic **relief device** (to relieve at a safe location outdoors) shall be installed between each pair of shut-off **valves** on propane liquid piping. The start-to-discharge pressure setting of such a hydrostatic **relief device** shall be neither less than 375 psig (2500 kPa) nor more than 500 psig (3500 kPa).

5.4.2

Discharge lines from two or more hydrostatic **relief devices** may run into a common discharge header, provided that the cross-sectional area of the header is at least equal to the sum of the cross-sectional areas of the individual discharge lines and that the header is not connected to any vent or bleed line.

5.5 Venting of pressure control devices

5.5.1

Except as specified in Clauses 5.5.2, 5.5.3, and 5.6.2 for natural gas and Clauses 5.5.3, 5.5.10, and 5.6.1.3 for propane, when an automatic **valve**, diaphragm **valve**, combination control, **pressure regulator** without internal relief, or other control device (excluding a gas overpressure relief **valve**) that requires venting is installed, it shall be vented separately to a safe location outdoors by a vent line

- (a) of steel pipe, copper, seamless aluminum, or steel tubing that complies with Clause 6.2; and
- (b) of a size at least equal to the nominal pipe size of the vent outlet of the **valve**, combination control, **pressure regulator**, or control device, but in no case shall the inside diameter be less than 0.25 in (6 mm).

5.5.2

For natural gas applications, when a diaphragm **valve** or combination control is installed on an **appliance** with an inlet supply pressure not in excess of 0.5 psig (3.5 kPa) and using a gas lighter than air, it may be vented into the **appliance** combustion chamber adjacent to the **continuous pilot** provided that the terminus of the **bleed vent** is in a **burner tip** having a melting point in excess of 1450°F (790 °C) that is securely held in a fixed position relative to the **pilot** flame and that will not adversely affect the operation of the thermal element.

5.5.3

When two or more, or any combination of, automatic **valves**, diaphragm **valves**, combination controls, other control devices (excluding gas overpressure relief **valves**), or **pressure regulators** without internal relief that require venting are installed, they may be connected into a single vent, provided that

- (a) there is compliance with
 - (i) Clause 5.5.1(a) and (b) for inlet pressure not in excess of 0.5 psig (3.5 kPa); or
 - (ii) Clause 5.5.4(a) and (b) for inlet pressure in excess of 0.5 psig (3.5 kPa); and
- (b) the single vent line has an area of not less than twice the total area of the connected **bleed vents**.

5.5.4

Except as specified in Clause 5.5.5, when a gas overpressure relief **valve** or a **pressure regulator** with **internal relief** is installed, it shall be vented separately to a safe location outdoors by a vent line

- (a) of steel pipe, copper, or seamless steel tubing that complies with Clause 6.2; and
- (b) of the following size:
 - (i) the nominal pipe size of the vent outlet of the **valve** or **regulator** increased as specified by the manufacturer's instructions; or
 - (ii) in the absence of manufacturer's instructions, the nominal pipe size of the vent outlet of the **valve** or **regulator** increased by one pipe size diameter for every 50 ft (15 m) or part thereof that the vent line extends beyond the initial 50 ft (15 m). This increase shall be made at the connection on the device.

5.5.5

When two or more gas **overpressure relief devices** are installed, they may be connected into a single vent line, provided that

- (a) there is compliance with Clause 5.5.4(a) and (b);
- (b) the single vent line has an area equal to the largest **relief device** opening or **pressure regulator** opening plus 50% of the total area of the other **relief device** openings;
- (c) the variance between the inlet pressures of the overpressure relief **valves** does not exceed 10%; and
- (d) the variance between the outlet pressures of the overpressure relief **valves** does not exceed 10%.

5.5.6

The outdoor vent termination of **regulators** and line **relief devices** shall be equipped with a means to prevent the entry of water, insects, or foreign material.

ΔΔ 5.5.7

A vent line shall be of sufficient size and configuration to prevent impedance upon a **regulator**.

5.5.8

A safety limit or a safety **relief device** shall not be isolated, bypassed, or in any way made ineffective by a **valve** or other device.

5.5.9

The discharge from **relief devices** shall terminate outdoors with the clearances specified in Table 5.2.

ΔΔ

Table 5.2
Clearance from discharge, ft (m)

(See Clauses 5.5.9 and 10.1.7.)

	Natural gas (CSA 6.18 certified OPCO (overpressure cut-off) regulators with limited relief of 50 scf/h (1.5 m ³ /h) or less)	Relief capacity		
		Natural gas up to and including 1900 scf/h (55 m ³ /h)	Natural gas over 1900 scf/h (55 m ³ /h)	Propane
Building opening	1 (0.3)	3 (1)	10 (3)	3 (1)
Appliance vent outlet*	1 (0.3)	3 (1)	3 (1)	3 (1)
Moisture exhaust duct†	3 (1)	3 (1)	3 (1)	3 (1)
Mechanical air intake	3 (1)	10 (3)	10 (3)	10 (3)
Appliance air intake	1 (0.3)	3 (1)	10 (3)	10 (3)
Source of ignition	1 (0.3)	3 (1)	3 (1)	10 (3)

*See also Clause 8.14.8.

†Applies to gas or electric dryer termination.

5.5.10

For propane applications, except as specified in Clause 5.6.1.3, a **pressure regulator**, line **relief device**, or **hydrostatic relief device** on an **appliance** using gas heavier than air shall be equipped with a vent line

- (a) in accordance with Clause 5.5.4(a) and (b); and
- (b) terminating outdoors in accordance with Clause 5.5.9.

5.5.11

For propane applications, a **regulator** vent, line **relief device**, or **hydrostatic relief device** discharging vertically upward shall be provided with a loose-fitting rain cap. When discharging downward, it shall be provided with a protective screen.

5.6 Appliance and pilot pressure regulators

5.6.1 Appliance and pilot pressure regulators in propane applications

5.6.1.1

An **appliance** that can be subjected, through supply pressure, design, creepage, or fluctuation, to propane pressure in excess of that for which it is rated shall be equipped with an **appliance pressure regulator**.

5.6.1.2

When an **appliance pressure regulator** is required by Clause 5.6.1.1, the propane supply to the **pilot** or group of **pilots** shall be regulated by an **approved pressure regulator** independent of the main **burner** propane supply.

ΔΔ 5.6.1.3

When an **appliance pressure regulator** without **internal relief** having an inlet pressure not in excess of 2 psig (14 kPa) is installed on an **appliance**, it shall be vented to the outdoors unless it is constructed or equipped with a device to limit the escape of gas from the vent opening in the event of diaphragm failure, and the opening in the device shall restrict the escape of gas to not more than 1 ft³ (0.0283 m³) per hour of a gas having a specific gravity of 1.53. A **regulator** with vent limiting means shall not be installed in a **confined space**.

Note: For the purposes of installation of pressure regulators with a leak limiting system, a ventilated space should not be considered a confined space.

5.6.2 Appliance and pilot pressure regulators in natural gas applications

When an **appliance pressure regulator** without **internal relief** having an inlet pressure not in excess of 2 psig (14 kPa) is installed on an **appliance**, it shall be vented to the outdoors unless it is constructed or equipped with a device to limit the escape of gas from the vent opening in the event of diaphragm failure, and the opening in the device shall restrict the escape of gas to not more than 2.5 ft³ (0.0706 m³) per hour of a gas having a specific gravity of 0.6. A **regulator** with vent limiting means shall be installed in a **ventilated** space only.

6 Piping and tubing systems, hose, and fittings

6.1 General

6.1.1

A gas piping or tubing system shall be of steel, copper, or plastic.

6.1.2

If removed from a gas installation, piping, tubing, and **fittings** shall not be reused unless thoroughly cleaned, inspected, and ascertained to be equivalent to new material. Piping, tubing, or **fittings** previously used with other gases may be reused with natural gas, provided that

- (a) it is ascertained that the piping, tubing, or **fittings** to be used are equivalent to new material; and
- (b) the piping, tubing, or **fittings** to be used are cleaned, inspected, and tested.

6.2 Material

6.2.1

Piping shall comply with ASTM A 53/A 53M or A 106.

6.2.2

A **fitting** used with steel pipe shall be of either malleable iron or steel and shall comply with ANSI/ASME B16.3.

6.2.3

Natural gas piping or propane vapour phase piping with operating pressures up to and including 125 psig (860 kPa) shall be at least Schedule 40. Natural gas piping or propane vapour phase piping with operating pressures exceeding 125 psig (860 kPa) and all liquid piping shall be at least Schedule 80 if joints are either threaded or threaded and back welded. At least Schedule 40 shall be used if joints are either welded or welded and flanged.

6.2.4

Copper tubing used for gas systems shall be Type G, K, or L, and shall meet the requirements of one of the following Standards, as applicable:

- (a) Type G tube shall meet ASTM B 837; or
- (b) Types K and L tube shall meet ASTM B 88.

Δ 6.2.5

Flared nuts shall be forged.

6.2.6

Tubing **ittings** shall be rated for a working pressure of not less than 125 psig (860 kPa) for operating pressures of 125 psig (860 kPa) or less. For higher operating pressures, tubing and **ittings** shall be rated for a minimum of 250 psig (1725 kPa).

6.2.7

Copper tubing for underground use shall be either Type L or G, externally coated with extruded polyethylene or PVC resin at the time of manufacture, or Type K, and any portion of the copper tubing that extends above ground shall be protected against physical damage.

6.2.8

Tubing shall be one of the following:

- (a) corrugated stainless steel tubing (CSST);
- (b) seamless copper; or
- (c) seamless steel.

6.2.9

Except as permitted in Clause 6.2.10, every **hose** and **hose fitting** shall have a minimum working pressure of 350 psig (2400 kPa) and shall comply with CSA Standard CAN/CGA-8.1 or CSA Standard CAN1-8.3.

6.2.10

Every **hose** and hose connection used in cutting or welding systems shall comply with CAN/CSA-W117.2.

6.2.11

Seamless steel tubing shall comply with ASTM A 179/A 179M.

6.2.12

Materials not specified in Clause 6.2 may be used if they conform to a nationally recognized standard or to a test report of a nationally recognized certification organization.

6.2.13

Plastic piping and tubing shall comply with CAN/CSA-B137.4.

6.2.14

Fittings for plastic piping and tubing systems shall comply with CAN/CSA-B137.4 or CAN/CSA-B137.4.1.

6.2.15

Plastic pipe shall not be used in a liquid propane system.

6.2.16

Except as mentioned in Clause 6.2.19, plastic piping or tubing shall only be used for outdoor underground service.

ΔΔ 6.2.17

Plastic pipe shall not be used for, as a minimum, the first 10 ft (3 m) of piping on the downstream side of a **vaporizer** in a propane application and shall not exceed the temperatures specified in Clause 6.2.18.

6.2.18

Plastic piping or tubing shall not be used at ambient temperatures exceeding 122°F (50 °C) or where the steady-state operating temperature of the materials will exceed 86°F (30 °C).

6.2.19

Plastic piping or tubing may terminate above ground and outside the **building**, provided that

- (a) the aboveground portions are completely encased with a **certified** metallic sheathing or anodeless riser that extends a minimum of 6 in (15 cm) below grade; and
- (b) the plastic piping or tubing is not subject to external loading stresses created by other piping, **appliances**, or **equipment**.

6.2.20

Corrugated stainless steel tubing (CSST) and associated **fittings** shall comply with ANSI/IAS LC1/CSA 6.26 or CSA publication CGA Certification Laboratory Requirement LAB-009.

6.3 Size**6.3.1**

Piping, tubing, and **hose** shall be of sufficient size to provide a supply of gas to meet the requirements of volume and pressure at the point of use.

6.3.2

A piping or tubing system supplied at pressures up to and including 14 in w.c. (3.5 kPa) shall be designed to prevent the loss in pressure between the **appliance** and either the termination of the utility installation or the last-stage **regulator** from exceeding the maximum allowable pressure drop specified in Table 6.1. The minimum size of pipe, tubing, and **fittings** shall be determined in accordance with good engineering practice, such as

- (a) by the use of Tables A.1 and A.8 of Annex A for natural gas, which include allowance for a reasonable number of **fittings**, when the maximum allowable pressure drop is 0.5 in w.c. (0.125 kPa);

- (b) by the use of Tables A.2 and A.9 in Annex A for natural gas or Tables B.1 and B.6 in Annex B for propane, which include allowance for a reasonable number of **fittings**, when the maximum allowable pressure drop is 1 in w.c. (0.25 kPa); or
- (c) by the method of calculation outlined in Annex A for natural gas or Annex B for propane.

Table 6.1
Maximum allowable pressure drop
 (See Clause 6.3.2.)

	Piping and tubing system supply pressure	Maximum allowable pressure drop
Natural gas	Less than 7 in w.c. (1.75 kPa)	0.5 in w.c. (0.125 kPa)
Natural gas/propane	7 in w.c. (1.75 kPa) up to 14 in w.c. (3.5 kPa)	1 in w.c. (0.25 kPa)

6.3.3

A piping or tubing system operating at a pressure exceeding 14 in w.c. (3.5 kPa) shall be designed to ensure an adequate supply of gas to each **appliance** served at the respective designated pressure rating, and to ensure that the **appliance** will not be overpressured under conditions of no flow. The minimum size of pipe, tubing, and **fittings** shall be determined in accordance with Clause 6.3.4 for 2 psig (14 kPa) systems or good engineering practice, such as

- (a) by the use of the applicable tables in Annex A for natural gas or Annex B for propane, making allowance for **fittings** as necessary; or
- (b) by the method of calculation outlined in Annex A for natural gas or Annex B for propane.

6.3.4

The piping or tubing system shall be designed to provide adequate gas pressure to the 2 psig (14 kPa) **pressure regulator** to match downstream load requirements. **Regulator** sizing shall be subject to the minimum available inlet supply pressure. See Tables A.3, A.4, A.10, and A.11 in Annex A for natural gas or Tables B.2 and B.7 in Annex B for propane, which include allowance for a reasonable number of **fittings**.

6.3.5

Plastic piping shall be sized

- (a) by the use of Tables A.1 to A.7 in Annex A for natural gas or Tables B.1 to B.5 in Annex B for propane; or
- (b) by the method of calculation outlined in Annex A for natural gas or Annex B for propane.

Note: See Table A.17 for natural gas and Table B.12 for propane.

6.3.6

Annex A is based on natural gas of 0.60 relative density. For natural gas having a relative density other than 0.60, the multipliers given in Table A.15 in Annex A shall be applied to the capacities listed. Annex B is based on propane of 1.52 relative density.

6.3.7

Annexes A and B give the resistance of bends, **fittings**, and **valves** as equivalent length of straight pipe in ft (m) to be added to the actual length to obtain the total equivalent length on which pressure loss calculations shall be based. See Tables A.16 and B.11.

6.3.8

6.3.8.1

For natural gas, threaded piping less than NPS 1/2 used in a piping system shall be Schedule 80.

6.3.8.2

For propane, piping less than NPS 1/2 shall not be used indoors, except that NPS 3/8 piping may be used as a **branch line** not exceeding 25 ft (7.5 m) in length.

6.3.9

Piping less than NPS 1/2 shall not be used in a concealed location.

6.4 Volume of gas to be used for sizing piping and tubing systems

6.4.1

The total volume of gas required shall

- (a) be determined as the total volume for all **appliances** supplied, except as permitted in Clause 6.4.3; and
- (b) include an allowance for known future extensions.

6.15.9

A watertight seal shall be provided at any point where piping or tubing passes through an outside wall below ground level.

6.15.10

When piping or tubing is laid under pavement and an entry to a **building** is made above ground level, a sleeve shall be inserted to protect the piping or tubing where it comes through the pavement to permit free movement of the soil and covering without placing strain on the piping or tubing.

6.15.11

A vent pipe inspection point shall be installed adjacent to a **building** either when the entire piping or tubing is covered with paving or when paving extends 25 ft (8 m) or more from the **building** unless other **approved** provisions have been made for venting the area surrounding the piping.

6.15.12

An **approved** transition **fitting** shall be used for connecting piping or tubing of either steel or copper to plastic.

6.15.13

The gas supply to underground plastic piping or tubing shall be controlled by a shut-off **valve** situated above ground.

6.15.14

Plastic piping or tubing shall be accompanied by a tracer wire or equivalent tracing media.

6.16 Protection of piping and tubing

6.16.1

Outdoor piping or indoor piping and tubing that is exposed to atmospheres that are corrosive to the piping or tubing shall be protected by either painting or coating.

6.16.2

Piping, tubing, or **fittings** laid underground shall be protected against corrosion in accordance with good engineering practice or in accordance with the manufacturer's instructions.

6.16.3

Piping or tubing shall be mounted, braced, and supported to provide for expansion, contraction, jarring, vibration, and settling, and shall be protected against either damage or breakage due to strain, wear, and mechanical impact.

6.16.4

Tubing run inside hollow walls or partitions within 1.75 in (43 mm) of the surface shall be protected against physical damage and puncture at the joists, studs, and plates by the use of No. 16 GSG (1.59 mm) plates or sleeves. This provision shall not apply to tubing that passes directly through walls or partitions.

6.16.5

Piping or tubing shall be located in a position free from the arc of movement of all **appliance** doors or covers.

6.16.6

When piping or tubing is run in a sleeve, the sleeve shall be of such material and so installed as to protect the piping or tubing from damage and galvanic action.

ΔΔ 6.16.7

When piping or tubing passes through an exterior wall above ground, it shall be sealed watertight and the portion of piping or tubing that runs through the wall shall be sleeved or double wrapped with a waterproof wrap.

ΔΔ 6.16.8

When piping or tubing passes through an interior wall of masonry or concrete, the portion of piping or tubing that runs through the wall shall be sleeved or double wrapped with a waterproof wrap.

6.16.9

Care shall be exercised to protect plastic materials from excessive heat and harmful chemicals.

6.16.10

Plastic pipe and tubing shall be adequately supported during storage.

6.16.11

Plastic pipe and tubing shall be protected from exposure to direct sunlight.

6.16.12

Corrugated stainless steel tubing (CSST) and **fittings** shall be protected against physical damage in accordance with the manufacturer's **certified** installation instructions and with this Code.

ΔΔ 6.16.13

Piping or tubing entering a **building** above grade in locations that do not afford protection from damage from vehicles on any street, highway, avenue, alley, or a parking lot, the piping or tubing shall be protected by posts or guardrails in compliance with Clause 6.16.14 unless otherwise **approved** by the **authority having jurisdiction**.

ΔΔ 6.16.14

The piping or tubing entering a **building** shall be protected from vehicular damage by one of the following means:

(a) Posts shall be

- (i) not less than 12 in (300 mm) from the riser, regulator, or equipment;
- (ii) spaced not more than 42 in (1050 mm) apart;
- (iii) buried not less than 36 in (900 mm) below grade;
- (iv) extend at least 30 in (750 mm) above grade; and
- (v) one of the following:
 - (1) 4 in (100 mm) capped steel pipe;
 - (2) 4 in (100 mm) tubing filled with concrete;
 - (3) 8 in (200 mm) pressure-treated wood, either square or round; or
 - (4) 6 in (150 mm) minimum dimension reinforced concrete.

(b) Guardrails shall be

- (i) not less than 12 in (300 mm) from the riser, regulator, or equipment;
- (ii) of the steel deep beam type, 12 in (300 mm);
- (iii) be supported by 6 in (150 mm) minimum pressure-treated wooden posts located not more than 42 in (1050 mm) apart, centre to centre; and
- (iv) located so that the top of the beam is not less than 24 in (600 mm) nor more than 30 in (750 mm) above grade.

6.17 Identification of piping or tubing

ΔΔ 6.17.1

In every **care** or **detention occupancy, commercial, industrial**, and **assembly building**, piping or tubing shall be identified by one of the following:

- (a) the entire piping or tubing system shall be painted yellow;
- (b) the piping or tubing system shall be provided with yellow banding that has a minimum width of one inch (1"); or
- (c) the piping or tubing system shall be labelled or marked "GAS"* or "PROPANE"†, as applicable, utilizing yellow labels or markings.

When identified in accordance with Item (b) or (c), the identification intervals shall not exceed 20 ft (6 m).

*The equivalent French wording is "GAZ".

†The equivalent French wording is "PROPANE".

ΔΔ 6.17.2

In every **care** or **detention occupancy, commercial, industrial**, and **assembly building**, where the piping or tubing pressure is in excess of 14 in w.c. (3.5 kPa), both the piping or tubing and the pressure shall be identified at the following locations:

- (a) shut-off **valves**; and
- (b) wall, ceiling, and floor penetrations.

6.17.3

Tubing systems for **residential buildings** shall be identified in accordance with Clause 6.17.1, except that identification intervals shall not exceed 6 ft (2 m) along their entire length.

6.17.4

Every piping or tubing system that enters a **building** that has two or more gas meters shall be permanently identified with the room number, apartment number, or the area of the **building** it serves.

6.20.5

Flexible metallic hose

- (a) may be used to connect an **appliance** in commercial, industrial, or process applications where vibration, expansion, contraction, or other circumstances of an **appliance** installation warrant its use;
- (b) shall not be used in a concealed location;
- (c) shall neither extend from one room to another nor pass through any wall, partition, ceiling, or floor; and
- (d) when used to connect an **appliance** to rigid supply piping, shall have a shut-off **valve** in the piping immediately upstream of the **flexible metallic hose**.

Δ 6.20.6

When **tanks** or pieces of **equipment** are interconnected, provision shall be made to compensate for vibration and differential settling of the **tanks, equipment**, and interconnecting piping. Where a **flexible hose** is used for this purpose, it shall be a **flexible metallic hose** complying with ULC C536 or a Type II or Type III **hose connector** complying with CSA Standard CAN/CGA-8.1.

6.20.7

When a **hose** is used for transferring liquid propane from one **container** to another, the **hose** shall be protected by a **hydrostatic relief valve** located between the shut-off **valves** on the **hose**.

6.20.8

In propane applications, a **hose** shall not be run from a **tank** and/or **vaporizer** that is installed outdoors to an **appliance** located within a **building** except where the **hose** connects to an **appliance** used for temporary construction-heating purposes.

6.21 Connectors

ΔΔ 6.21.1

A **connector** shall comply with ANSI Z21.24/CSA 6.10 or ANSI Z21.69/CSA 6.16 or ANSI Z21.75/CSA 6.27.

6.21.2

A **connector** shall

- (a) be protected from damage;
- (b) not pass through a wall, floor, ceiling, or partition;
- (c) be connected to rigid piping or tubing located in the same area as the **appliance**; and
- (d) comply with Clauses 4.5.2 and 4.9.1.

6.21.3

A corrugated **metal connector** may be used to connect

- (a) a range, refrigerator, clothes dryer, or built-in counter **appliance** to piping or tubing, provided that the **connector** length does not exceed 6 ft (2 m);
- (b) a suspended **appliance** to piping or tubing, provided that the **connector** length does not exceed 2 ft (600 mm); or
- (c) a decorative **appliance**, a room heater, or a **direct-vent** wall **furnace** to piping or tubing, except when the **appliance, heater, or furnace** is installed as a free-standing unit, provided that the **connector** length does not exceed 2 ft (600 mm).

6.21.4

Commercial cooking appliances certified for use with casters or otherwise subject to movement for cleaning and other large gas utilization **equipment** that can be moved shall be connected by a **certified connector** in accordance with ANSI Z21.69/CSA 6.16.

6.21.5

When the **connector** described in Clause 6.21.4 is used with a **commercial cooking appliance** installed on wheels or rollers, a **noncombustible** restraining device shall be provided to protect the **connector**, and the installation shall be in accordance with Clause 7.31.4.

6.21.6

A **connector** not exceeding 2 ft (600 mm) may be used on a **vented appliance**, such as a free-standing space heater, provided that the **appliance** is secured to prevent dislodgement of the **vent**.

ΔΔ 6.21.7

Where a **mobile home** is not on a permanent foundation, the **mobile home** may be connected by a **certified connector** in accordance with ANSI Z21.75/CSA 6.27.

6.22 Testing of piping, tubing, hose, and fittings

6.22.1

The source of test pressure shall be isolated while the piping or tubing system is under test, and the system shall retain the test pressure for the minimum duration required in Table 6.3 without showing any drop in pressure.

6.22.2

Before an **appliance** is connected, a piping and tubing system that contains **fittings** or joints shall be pressure tested using either air or an inert gas (carbon dioxide) in the following manner:

- (a) **Appliance** shut-off **valves** not rated for the test pressure being used and meters and **regulators** shall not be connected to the piping or tubing system under test.
- (b) The test pressure shall be measured by either a pressure gauge or equivalent device and, if a gauge is used, the minimum diameter shall be 3 in (75 mm) and the maximum range shall exceed the test pressure by at least 15% but not more than 300%. The pressure gauge or equivalent device shall be calibrated to read in increments of not more than either 2 psig (14 kPa) or 2% of the maximum dial reading of the pressure gauge, whichever is less.
- (c) A pressure recorder when used for this test shall be calibrated to the requirements of Item (b).
- (d) The pressure and duration of the test shall be in accordance with Table 6.3.

Δ

Table 6.3
Pressure test requirements
(See Clauses 6.22.1 and 6.22.2.)

Working pressure, psig (kPa)	Diameter of pipe or tubing	Length of pipe or tubing, ft (m)	Test pressure, psig (kPa)	Test duration, min
Up to and including 2 (14)	All sizes	200 (60) or less	15 (100)	15
Up to and including 2 (14)	All sizes	More than 200 (60)	15 (100)	60
Over 2 (14) but not more than 33 (230)	All sizes	200 (60) or less	50 (340)	60
Over 2 (14) but not more than 33 (230)	All sizes	More than 200 (60)	50 (340)	180
Over 33 (230)*	All sizes	All lengths	1.5 times the maximum operating pressure	180
All welded pipe	All sizes	All lengths	The greater of 50 psig (340 kPa) or 1.5 times the maximum operating pressure	180

*Propane maximum operating pressure is defined as

- (a) 250 psi (1725 kPa) for piping and tubing operating at container pressure;
- (b) 350 psi (2400 kPa) when connected to the outlet of a pump or compressor; or
- (c) 375 psi (2570 kPa) minimum or the setting of the hydrostatic relief valve in piping that can contain liquid propane, that can be isolated by valves, and that requires hydrostatic relief valves as specified in [Clause 5.4.1](#) of this Standard or Clause 5.6.1 of CAN/CSA-B149.2.

Notes:

- (1) These test pressures and test durations are minimum requirements. Circumstances can require test pressures and test durations in excess of those shown in the Table.
- (2) All wrapped and/or factory-coated piping systems of all sizes and lengths shall be tested at a minimum pressure of 100 psig (700 kPa) in accordance with the time duration in the Table.

ΔΔ **6.22.3**

After an **appliance** is connected, the system shall be tested in the following manner:

- (a) Before turning on the gas for the test, a check shall be made to ensure that any opening from which gas can escape is closed.
- (b) Immediately after allowing the gas into the piping or tubing system, a test shall be made to determine that no gas is escaping by carefully watching the test dial of the meter or by using a manometer.
- (c) Where a meter is not provided, the pressure shall be measured with either a pressure gauge or equivalent device calibrated to read in increments not greater than those specified in Clause 6.22.2(b), with the following exceptions:
 - (i) for a system where the working pressure is 0.5 psig (3.5 kPa) or less, the pressure gauge or equivalent device shall be calibrated to read in increments of not greater than 1 in w.c. (250 Pa); and
 - (ii) for a system where the working pressure exceeds 0.5 psig (3.5 kPa) but does not exceed 5 psig (35 kPa), the pressure gauge or equivalent device shall be calibrated to read in increments of not greater than 2 in w.c. of pressure (0.5 kPa).
- (d) The test described in Item (b) shall be of a 10 min duration.

- (e) Each **appliance** connection, **valve**, **valve train**, and system **component** shall be checked while under normal operating pressure with either a liquid solution or a leak-detection device to locate any source of a leak.

6.22.4

An addition to an existing piping or tubing system shall be tested as an individual system in accordance with Clause 6.22, except that

- (a) where the addition is 20 ft (6 m) or less in length and the normal working pressure is less than 0.5 psig (3.5 kPa), the addition shall be leak tested in accordance with Clause 6.22.3(e); and
- (b) where the addition is accomplished using a welded tie-in, and the new system has been tested in compliance with Clause 6.22, the tie-in weld shall be tested in accordance with Clause 6.22.3(e).

6.22.5

When any part of a **piping** or **tubing system** is to be enclosed or concealed, the tests specified in Clause 6.22.2 shall precede the work of closing in.

6.23 Purging of piping and tubing systems and hose after leak testing

6.23.1

A piping system, tubing system, or **hose** containing either air or inert gas shall be **purged** in a safe manner either

- (a) to the outdoors in accordance with Clause 6.23.7; or
- (b) to an **approved purge burner**, except as permitted in Clause 6.23.4.

6.23.2

If the piping is NPS 4 or larger, and air has been used for testing, the piping shall be first **purged** with carbon dioxide or nitrogen, or a mixture of these, and then **purged** with gas in accordance with Clause 6.23.7. The person doing the purging shall be in direct control of the purging gas supply during the purging operation by means of a **valve** having an attached operating handle. The piping for the gas being **purged** shall either be of a size or be reduced to a size not larger than NPS 1/2 for piping up to NPS 4.

6.23.3

If the piping exceeds NPS 4, purging shall follow engineering practices.

6.23.4

A piping or tubing system or a **hose** that supplies an **appliance** having an input up to and including 400 000 Btuh (120 kW) may be **purged** with the gas ignited at a **readily accessible burner**, but not at a **burner** located in a combustion chamber, and a continuously burning flame shall be maintained at the **burner** port(s) until a stable gas flame is established.

6.23.5

In the absence of a **readily accessible burner**

- (a) an **appliance** equipped with a **pilot** shall be **purged** at the outlet of the **pilot valve train** after the **pilot** tubing has been disconnected; or
- (b) an **appliance** not equipped with a **continuous pilot** shall be **purged** in accordance with the procedure described in Annex H.

6.23.6

The person doing the purging shall remain in constant attendance.

6.23.7

When a piping or tubing system is to be **purged** to the outdoors

- (a) the purging line shall not terminate closer than 10 ft (3 m) from either a **building** or air intake;
- (b) the purging point shall be under the constant supervision of a competent person who shall control the **purge** by a quarter-turn lever handle **valve** within 5 ft (1.5 m) of the **purge** point. Such a **valve** shall have an attached operating handle. No other **valve** shall be used to control or terminate the **purge**; and
- (c) smoking shall not be permitted, and maximum precautions shall be taken to either remove or shut off any source or potential source of **ignition** prior to commencing the **purge**.

6.23.8

When flaring is used to **purge** a piping or tubing system, an **approved purge burner** shall be used.

6.23.9

When all piping and tubing systems and **hose** have been **purged**, the **appliance** piping shall be **purged** and the **pilot burner** lighted.

6.24 Purging gas from a piping or tubing system

Carbon dioxide or nitrogen, or a mixture of these, or air shall be used when purging gas from a piping or tubing system for the purpose of repair, alteration, or abandonment. The applicable procedures in Clause 6.23 shall apply.

△△ **6.25** — *Deleted*

6.26 Rooftop gas piping and tubing△△ **6.26.1**

Piping may be supported with treated wood blocks or material having at least equivalent characteristics as wood blocks and protection against outdoor exposure. The support spacing shall comply with Table 6.2 and support shall be provided for every threaded **fitting**. Tubing shall be supported according to Table 6.2 and Clause 6.26.2.

6.26.2

Tubing shall be supported continuously with treated wood and planks when it is laid on the rooftop.

6.26.3

Piping and tubing shall be installed in accordance with Clauses 6.16.1 and 6.16.3, and means for expansion shall be provided. See Annex G.

6.27 Inspection**6.27.1**

Plastic piping and tubing shall be inspected before and after installation for defects such as cuts, scratches, and gouges. Damaged cylindrical pieces shall be cut out and replaced. Inspection shall be adequate to confirm that sound joints have been made.

6.27.2

Joints in plastic piping and tubing shall be visually checked for evidence of poor bonding. Where inspection reveals defective joints, they shall be cut out and replaced.

7 Installation of specific types of appliances

7.1 Boilers

7.1.1

A **boiler** shall conform to the requirements of the provincial boiler and pressure vessel regulations as applicable.

7.1.2

A **boiler** shall be installed on a

- (a) firm and level base; and
- (b) **noncombustible** floor or support, except where the **boiler** is
 - (i) **certified** for installation on a **combustible** floor;
 - (ii) installed using the **boiler** manufacturer's **certified** special base; or
 - (iii) installed as specified in Clause 4.13.3.

7.1.3

Except where permitted by Clause 4.13.2, a **boiler** shall be installed with the following minimum clearances from **combustible** material:

- (a) vertical — 18 in (450 mm);
- (b) sides and rear — 18 in (450 mm); and
- (c) front — 48 in (1200 mm).

See also Clause 4.14.2.

△△ 7.2 Generators, compressors/pressure boosters, stationary engines, and turbines (for natural gas only)

7.2.1 General requirements

7.2.1.1

The installation of **appliances** and associated **equipment** in Clause 7.2 shall comply with this Code, applicable Standards, manufacturer's instructions, and local requirements, including fire regulations, building codes, and zoning requirements.

7.2.1.2

Engines shall be installed such that all service, maintenance, inspection, and repair as required by the manufacturer can be accomplished.

7.2.1.3

Venting and **air supply** requirements, as a minimum, shall be provided in accordance with applicable clauses of Clause 8 or designed in accordance with any special requirements contained in the manufacturer's instructions.

This requirement shall apply to **engines** of all inputs, and the ventilation openings shall be arranged to minimize short circuiting of the exhausted and make up air streams.

7.2.1.4

Engine rooms or **enclosures** shall be constructed in accordance with national or local fire codes.

7.2.1.5

Engine rooms or structures shall have ventilation designed to minimize the possibility of hazardous accumulation of flammable vapours or gases during engine operation or when shut down.

7.2.1.6

Engines shall be installed on a firm level foundation, set on a suitable framework supplied by the manufacturer, or field fabricated in accordance with the manufacturer's instructions.

7.2.1.7

Engines located on rooftops shall comply with Clauses 4.14.5, 4.14.6, and 6.26, and provisions shall be made for oil spill containment.

7.2.1.8

The installation of **appliances** in Clause 7.2 and associated **equipment** shall be protected by **approved** means against impact, ice build-up, flooding, and blockage of **ventilation**.

7.2.1.9

The **ventilation** required by Clause 7.2.1.5 shall be interconnected with a gas detector that

- (a) is installed in accordance with the detector manufacturer's instructions for the type of gas;
- (b) is set to activate at gas detection levels at and above one-fifth of the lower limit of flammability;
- (c) upon activation, produces an audible and visual alarm;
- (d) is interlocked with the mechanical ventilation system; and
- (e) is interlocked to shut off the **appliance**.

7.2.2 Generators

7.2.2.1

Piping or tubing serving a generator that provides power for safety purposes shall be independent of any other gas supply to the **building** and shall be provided with a manual **valve** identified with a permanent sign. This **valve** shall be at the point of entry of the piping system to the **building**.

7.2.2.2

When a gas supply to a generator is required for safety purposes, the supply of gas to the generator shall be arranged such that the gas supply to the piping serving other **appliances** can be shut off without interrupting the gas supply to the generator. The **valve** used for this purpose shall be at the point of entry of the piping system to the **building**.

7.2.3 Compressors/Pressure boosters

7.2.3.1

A compressor/pressure booster shall be approved by the **authority having jurisdiction**.

7.2.3.2

Ventilation air shall be provided to the space occupied by a pressure booster to prevent any accumulation of gas should leakage occur.

7.2.3.3

A compressor/pressure booster or similar **equipment** capable of reducing pressure in the service piping to a point lower than the required service pressure shall be provided with a low-pressure cut-off device of the manual-reset type.

7.2.3.4

The following requirements shall apply to all gas piping, **hose**, compressor/pressure boosters, and components operating at an outlet pressure higher than those permitted by Table 5.1:

- (a) the installation of all components shall be approved by the **authority having jurisdiction** or they shall be tested in accordance with the manufacturer's instructions;

- (b) the service line to the inlet of a compressor shall be tested in accordance with the requirements of Clause 6.22; and
- (c) discharge piping from a remote compressor that is not directly connected by the manufacturer from the outlet of a compressor shall be installed in accordance with the requirements of the applicable clauses of CSA B51 for pressure piping.

7.2.3.5

The compressor shall be installed outdoors unless approved and labelled for indoor installation.

7.2.3.6

A compressor shall be isolated from vibration at the inlet or outlet by a flexible metallic **hose** certified in compliance with ULC C536.

7.2.3.7

The number of **fittings** used in a supply line, discharge line, or **hose** shall be minimized to reduce the possibility of leakage.

7.2.3.8

The discharge piping shall be supported in accordance with the manufacturer's certified instructions or the requirements of CSA B51 for pressure piping.

7.2.3.9

A pressure booster capable of creating an outlet pressure higher than the normal operating pressure shall be equipped with a mechanical bypass around the booster and a high-gas-pressure switch installed in the booster outlet piping set to prevent the system pressure from exceeding the normal operating pressure by 20%.

7.2.3.10

It is not necessary to meet the requirements of Clause 7.2.3.2 where a hermetically sealed pressure booster is installed.

7.2.3.11

Hermetically sealed compressors used for pressure boosting for the purpose of supplying **burners**, torches, or **cylinder**-filling applications shall comply with the requirements of Clause 7.2 and shall not have a capacity greater than 500 scf/h (14.15 m³/h).

7.2.3.12

Cylinder-filling applications are covered in Clause 9.

7.2.4 Stationary gas engines and turbines

7.2.4.1

Supply piping to a gas **engine** shall be sized according to both the maximum rate of gas consumption and the requirements of Clause 6. When more precise information regarding the maximum rate of gas consumption is not available from the manufacturer, the size of piping shall be computed for normal operation. Normal operation shall be considered the provision of 10 000 Btuh (3 kW) per brake horsepower for 4-cycle engines and 13 000 Btuh (4 kW) per brake horsepower for 2-cycle engines. When either overloads or high starting loads are likely to be encountered, the size of piping shall be computed on a basis proportional to the increased input required.

7.2.4.2

A gas **engine** shall be equipped with

- (a) an automatic **safety shut-off valve**;
- (b) an automatic speed governor;
- (c) a vacuum switch or low-oil-pressure switch;
- (d) a **zero-governor**-type **regulator**; and
- (e) a **flexible hose connector**, which shall be of the **approved** heavy-duty type where the **connector** is installed on the upstream side of the **zero-governor**-type **regulator**.

7.2.4.3

Where the input to an **engine** is in excess of 1 000 000 Btuh (300 kW), an additional automatic **safety shut-off valve** shall be provided and shall be piped in series and wired in parallel to the automatic **safety shut-off valve** required in Clause 7.2.4.2.

7.2.4.4

Engine exhaust gases shall be piped

- (a) by the most direct route to an outdoor location where they can neither be trapped nor be drawn into a **building** through a window, door, or other opening;
- (b) to a **chimney** conforming to Clause 7.2.4.6(b); or
- (c) in accordance with the **engine** manufacturer's certified instructions.

7.2.4.5

An exhaust pipe passing directly through a **combustible** roof shall be guarded at the point of passage by a ventilated metal thimble that extends not less than 9 in (225 mm) above and 9 in (225 mm) below the roof construction and that is 12 in (300 mm) larger in diameter than the pipe. If a double ventilation metal thimble is used, the same requirements shall apply, except that the thimble shall be at least 6 in (150 mm) larger in diameter than the pipe.

7.2.4.6

An exhaust pipe that passes directly through a **combustible** wall or partition shall be guarded at the point of passage by

- (a) a metal ventilated thimble not less than 12 in (300 mm) larger in diameter than the exhaust pipe; or
- (b) a metal or burned fire clay thimble built into either the brickwork or another **noncombustible** material. The brickwork or other **noncombustible** material shall provide not less than 8 in (200 mm) of insulation between the thimble and the **combustible** material.

7.2.4.7

An **engine** exhaust pipe shall not be installed in a floor, ceiling, attic, or concealed space but may pass through such spaces, provided that it is installed inside either a **masonry chimney** or a **factory-built chimney** of appropriate temperature rating and provided that the **chimney** does not serve any other type of **appliance**.

7.2.4.8

An **engine** exhaust pipe shall not discharge into

- (a) a gas **vent**;
- (b) a **chimney** that has a temperature rating less than the maximum temperature of the exhaust gas; or
- (c) a **chimney** that serves another **appliance**.

7.2.4.9

Where an **engine** is of an automatic-start type, it shall be equipped with overcrank protection in addition to the requirements of Clauses 7.2.4.2 and 7.2.4.3.

7.2.4.10

Where the gas supply pressure is in excess of 0.5 psig (3.5 kPa), a **pressure regulator** of the lock-up type shall be provided to the entrance to the **valve train**.

7.2.4.11

Where all **components** on the **valve train** are not pressure rated for the inlet supply pressure, a pressure relief **valve** shall be provided immediately downstream of the **pressure regulator** required under Clause 7.2.4.12 and shall be set to prevent pressure build-up exceeding that of the lowest-rated downstream **component**.

7.2.4.12

Each gas engine shall be provided with a clearly legible, permanent rating plate indicating

- (a) the manufacturer's or vendor's name;
- (b) the fuel to be supplied to the **engine**;
- (c) the electrical rating;
- (d) the maximum input rating; and
- (e) the inlet pressure at the point of connection to the supply piping.

7.2.5 Propane-fuelled engines in buildings

7.2.5.1

Hermetically sealed compressors used for pressure boosting for the purpose of supplying **burners**, torches, or **cylinder**-filling applications shall be in accordance with Clause 7.2 and shall not have a capacity greater than 500 scf/h (14.15 m³/h).

7.2.5.2

A room containing a propane-fuelled **engine** shall be ventilated at the floor level and shall take air for combustion directly from outdoors.

7.2.5.3

When a propane-fuelled **engine** is installed within a room that is below grade, mechanical exhaust **ventilation** shall be provided and operated continuously, and approval of the **authority having jurisdiction** shall be obtained. The mechanical **ventilation** shall be electrically interlocked to shut down the **engine** in the event of failure of the exhaust system, or means shall be provided to **purge** the room before the **engine** is started. The mechanical **ventilation** shall be in operation when the **engine** is running, and the room shall be ventilated before and during any repairs to the **engine**.

7.2.5.4

A propane-fuelled **engine** shall be installed in a room that has a minimum 2 h fire separation from the remainder of the **building**, and the room shall have a fire door having a 1.5 h fire protection rating on every opening that communicates with other sections of the **building**. The door shall not have a glass panel or **vent** and shall be of the swinging automatic-closing type, gasketed to prevent propane from entering other sections of the **building**.

7.2.5.5

Exhaust gases shall be discharged from the **building** to the outdoors in a manner that will not create a fire or any other hazard.

7.2.5.6

An **engine** exhaust pipe shall not discharge into

- (a) a gas **vent**;
- (b) a **chimney** having a temperature rating less than the maximum temperature of the exhaust gas; and
- (c) a **chimney** that serves another appliance.

7.2.5.7

A **regulator** and relief **valve** installed in a propane supply system in a **building** or room containing a propane-fuelled **engine** shall relieve to the outdoors, and the discharge shall terminate not less than

- (a) 5 ft (2 m) from any opening in a **building**; and
- (b) 10 ft (3 m) from any air-handling direct-**vent** appliance or source of ignition.

The venting of combination regulating and vaporizing **equipment** shall not be required where a solenoid **valve** is installed upstream of this **equipment**.

7.2.5.8

Two solenoid **valves** installed in series and wired in parallel shall be installed immediately upstream of the **flexible hose connector** required in Clause 7.2.5.9. They shall be controlled by a vacuum switch, oil pressure switch, or an equivalent device to prevent the flow of propane to the carburetor when the **ignition** is off or the **engine** is not running.

7.2.5.9

A **flexible hose connector** not exceeding 3 ft (1 m) in length shall be installed at the **engine** end of the propane piping to eliminate the possibility of damage.

7.2.5.10

An **engine** exhaust pipe passing through a **combustible** roof shall be insulated at the point of passage by a single ventilated metal thimble that shall extend not less than 9 in (225 mm) above and 9 in (225 mm) below the roof construction and that is 12 in (300 mm) larger in diameter than the pipe. A double ventilated metal thimble may be used if the thimble is at least 6 in (150 mm) larger in diameter than the exhaust pipe.

7.2.5.11

An exhaust pipe passing directly through a **combustible** wall or partition shall be guarded at the point of passage by either

- (a) a metal ventilated thimble, not less than 12 in (300 mm) larger in diameter than the exhaust pipe; or
- (b) a metal or burned fire clay thimble built into either the brickwork or another **noncombustible** material. The brickwork or other **noncombustible** material shall provide not less than 8 in (200 mm) of insulation between the thimble and the **combustible** material.

7.2.5.12

An **engine** exhaust pipe shall not be installed in a floor, ceiling, attic, or concealed space but may pass through such a space, provided that it is installed inside a **chimney** that does not serve any other type of **appliance** and meets the requirements of Clause 8.12.1.

7.3 Carbon dioxide generators

7.3.1

A generator used in a greenhouse shall be **certified** for the application.

7.3.2

A generator used in a produce storage area shall take its **combustion air** from outside the storage area.

7.3.3

A generator installed for the production of carbon dioxide in a greenhouse may take its **combustion air** from inside the greenhouse when the rate of combustion does not exceed 20 Btuh/ft³ (0.2 kW/m³) of greenhouse volume, the concentration of carbon dioxide does not exceed 5000 parts per million (ppm), and the concentration of carbon monoxide in the atmosphere does not exceed 35 ppm. The concentration of carbon dioxide and carbon monoxide shall be verified upon initial start-up.

7.4 Commercial-type clothes dryers

7.4.1

A dryer used in a laundromat-type of installation shall be installed such that access to the top of the dryer is screened or otherwise protected to prevent any material coming into contact with the hot surface.

7.4.2

Except where permitted by Clause 4.13.2, a dryer shall have the following minimum clearances from **combustible** material:

- (a) above — 18 in (450 mm);
- (b) front — 18 in (450 mm); and
- (c) back and sides — 18 in (450 mm).

Δ 7.4.3

A **certified** flexible foil **noncombustible**-type duct may be used as a transition connection between the dryer exhaust and a rigid moisture duct.

ΔΔ 7.4.4

A dryer shall be connected to a metal moisture-exhaust duct that terminates outdoors not less than 3 ft (1 m) from any **pressure regulator vent** termination and not less than 10 ft (3 m) from a fresh-air intake.

7.4.5

A moisture-exhaust duct shall not be secured with screws and shall not be connected into any **vent connector, vent, or chimney**.

7.4.6

Provision shall be made for make-up air to the area where the dryer is installed.

7.4.7

A moisture-exhaust duct shall have a clearance of at least 6 in (150 mm) to **combustible** material but may be installed with a reduced clearance, provided that the **combustible** material is protected as specified in Table 4.1.

7.5 Domestic-type clothes dryers

7.5.1

A dryer shall be equipped with a moisture-exhaust duct that terminates outside the **building**, and the duct shall be constructed of a material that is

- (a) **noncombustible**; or
- (b) **certified** as meeting the requirements for Class 1 air ducts contained in CAN/ULC-S110.

ΔΔ 7.5.2

A moisture-exhaust duct shall not terminate within 3 ft (1 m) in any direction of any **pressure regulator vent** termination or fresh-air intake.

7.5.3

A moisture-exhaust duct shall not be secured with screws and shall not be connected into any **vent connector, vent, or chimney**.

7.5.4

Except where permitted by Clause 4.13.2, a dryer shall have the following minimum clearances from combustible material:

- (a) above — 6 in (150 mm);
- (b) front — 24 in (600 mm); and
- (c) back and sides — 6 in (150 mm).

7.6 Conversions

7.6.1

The minimum clearances from **combustible** material for a **boiler** or a **furnace** converted to gas shall be

- (a) for a **boiler**, as specified in Clause 7.1.3;
- (b) for a forced-air **furnace**,
 - (i) from top (casing, bonnet, or plenum) — 1 in (25 mm);
 - (ii) the jacket sides and rear — 6 in (150 mm); and
 - (iii) front — 24 in (600 mm); and
- (c) for a gravity **furnace**,
 - (i) vertical — 6 in (150 mm);
 - (ii) sides and rear — 6 in (150 mm); and
 - (iii) front — 24 in (600 mm), except as specified in Clause 4.13.2.

7.6.2

An **appliance** to be converted shall be thoroughly cleaned, leak tested, and examined for serviceability. Any unserviceable parts shall be repaired or replaced.

7.6.3

When an existing **vented appliance** is to be converted from a solid or liquid fuel, the **chimney** shall be examined and shall meet the requirements of Clauses 8.12.2 to 8.12.11.

7.25.6

A swimming pool heater of the finned-tube type shall be installed outdoors or in an **enclosure** that is not normally occupied and does not directly communicate with occupied areas.

7.25.7

With prior approval of the **authority having jurisdiction**, when an existing indoor swimming pool heater is being replaced with a gas-fired swimming pool heater of the finned-tube type and it is neither possible nor practicable to comply with Clause 7.25.6, a gas-fired swimming pool heater of the finned-tube type may be installed indoors in the same location as the heater that is being replaced, provided that

- (a) there is compliance with Clauses 7.25.1 and 7.25.2;
- (b) any door directly communicating with an area that is normally occupied is equipped with self-closing hardware; and
- (c) **combustion air** is supplied from the outdoors to the space in which the heater is located in accordance with Clauses 8.2.4 and 8.3 or, if applicable, with Clause 8.4.

7.25.8

Where a heater is installed in accordance with Clause 7.25.7, it shall be the responsibility of the owner of the heater to provide maintenance for the heater in accordance with the manufacturer's instructions, but in no case less than once annually.

7.25.9

An outdoor swimming pool heater shall be installed so that the **flue** discharge is in accordance with Clause 8.14.10.

7.26 Water heaters

7.26.1

A water heater, unless of the **direct-vent** type, shall not be installed in a **bathroom, bedroom**, or any **enclosure** where sleeping accommodation is provided.

ΔΔ 7.26.2

The temperature and pressure **relief device** on a tank type water heater or the pressure **relief device** provided for an instantaneous (tankless) water heater shall have a discharge pipe of a size at least equal to the nominal size of the device outlet. The discharge pipe shall terminate not more than 12 in (300 mm) above the floor.

7.26.3

An instantaneous-type (tankless) water heater, unless **certified** for installation on a **combustible** wall, shall be provided with appropriate protection as specified in Table 4.1. Such protection shall extend the full length and width of the heater and its **draft hood**.

7.26.4

Except where permitted by Clause 4.13.2, the minimum clearance from **combustible** material for an underfired storage-type water heater shall be 2 in (50 mm), and the minimum clearance for any other type of water heater shall be 6 in (150 mm). See also Clause 4.14.2.

7.26.5

A **direct-vent** water heater shall have a minimum access clearance of 3 ft (900 mm) on the **burner** side.

7.26.6

Before installing an instantaneous-type (tankless) water heater, the **installer** shall ensure that there is sufficient water supply for proper operation of the heater.

ΔΔ 7.26.7

Except for direct **vent** water heaters, when the water heater is used in a combo heating system, return-air inlets shall not be installed in an enclosure that contains the air handling unit and the water heater and provides combustion air to the water heater.

ΔΔ 7.26.8

When the return air duct(s) of an air handling unit in a combo heating system is installed in an enclosure in which any spillage-susceptible appliances are located, it shall be sealed to the air handling unit casing, and joints in the ducting shall be sealed to prevent infiltration of air from the enclosure into the return-air ducting.

7.27 Unit heaters

7.27.1

A suspended unit heater shall be firmly supported with metal hangers or brackets.

7.27.2

The location of either a suspended unit heater or duct attached thereto shall be such that a negative pressure will not be created in the room in which the unit heater is located.

ΔΔ 7.27.3

When installed in a **garage**, a minimum clearance of 8 ft (2.4 m) shall be maintained between the base of the heater and the **garage** floor. The minimum clearance may be reduced when a substantial guard is provided to prevent vehicles from striking the heater. See also Clause 4.16.

7.27.4

Except where permitted by Clause 4.13.2, all clearances from **combustible** material shall be a minimum of 18 in (450 mm). See also Clause 4.14.2.

7.28 Hotplates

7.28.1

A hotplate shall be connected with rigid piping and secured to prevent movement.

7.28.2

A hotplate shall not be installed in a **bedroom** but may be installed in a **bed-sitting room**, provided that it is not required to be used for space-heating purposes.

7.28.3

Except where permitted by Clause 4.13.2, a hotplate shall have the following minimum clearances from **combustible** material:

- (a) above — 30 in (750 mm);
- (b) front — 6 in (150 mm); and
- (c) back and sides — 6 in (150 mm).

7.29 Incinerators

7.29.1

An incinerator shall be installed as close as practicable to a **chimney**.

7.29.2

An incinerator of the wall type shall be installed in a **noncombustible** wall that communicates directly with a **chimney flue**.

7.29.3

An incinerator shall not be equipped with a **draft hood**. When **draft control** is required, a **draft regulator** of the single-acting type shall be used.

7.29.4

A **vent connector** shall be directly connected to a **chimney** through a separate thimble.

8.2.2

Except as permitted in Clause 8.2.3, the free area of the outdoor **air supply** required by Clause 8.2.1 shall be determined from Table 8.1 for an **appliance** having a **draft-control device** and from Table 8.2 for an **appliance** not having a **draft-control device**, using the total input of all **appliances** in the **structure** or **enclosure**. If an **appliance** with a **draft-control device** and an **appliance** without a **draft-control device** are installed within the same **structure** or **enclosure**, the required free area of the **air-supply** opening shall be the greater of

- (a) that required by Table 8.1, using the total input of only those **appliances** having **draft-control devices**; or
- (b) that required by Table 8.2, using the total input of all **appliances**.

ΔΔ 8.2.3

An outdoor **air supply** shall not be required for a single water heater with an input of 50 000 Btuh (15 kW) or less within an **enclosure** or **structure** where there are no other **appliances** that require an **air supply**. Except for **direct vent** water heaters, when the water heater is contained in an **enclosure**, permanent openings shall be provided as described in Clause 8.2.5.

8.2.4

An outdoor **air supply** sized in accordance with Clause 8.2.5 shall be provided for an **enclosure** or a **structure** in which an **appliance** is installed when the **enclosure** or **structure** is neither constructed as described in Clause 8.2.1(a) nor complies with Clause 8.2.1(b).

8.2.5

The free area of the outdoor **air supply** required by Clause 8.2.4 shall be determined from Table 8.3 for an **appliance** having a **draft-control device** and Table 8.4 for an **appliance** not having a **draft-control device**, using the total input of all **appliances** in the **structure** or **enclosure**. If an **appliance** with a **draft-control device** and an **appliance** without a **draft-control device** are installed within the same **structure** or **enclosure**, the required free area of the **air supply** opening shall be the greater of

- (a) that required by Table 8.3, using the total input of only those **appliances** having **draft-control devices**; or
- (b) that required by Table 8.4, using the total input of all **appliances**.

Table 8.1
Combustion/dilution air requirements for appliances having
draft-control devices when the combined input is up to
and including 400 000 Btuh (120 kW) and the structure
complies with Clause 8.2.1(a) or (b)

(See Clauses 8.1.5, 8.2.2, and 8.21.2 and Tables 8.3 and 8.4.)

Total input of appliances*, thousands of Btuh (kW)	Required free area of air-supply opening or duct, in ² (mm ²)	Acceptable approximate round duct equivalent† diameter, in (mm)
25 (8)	7 (4 500)	3 (75)
50 (15)	7 (4 500)	3 (75)
75 (23)	11 (7 000)	4 (100)
100 (30)	14 (9 000)	4 (100)
125 (37)	18 (12 000)	5 (125)
150 (45)	22 (14 000)	5 (125)
175 (53)	25 (16 000)	6 (150)
200 (60)	29 (19 000)	6 (150)
225 (68)	32 (21 000)	6 (150)
250 (75)	36 (23 000)	7 (175)
275 (83)	40 (26 000)	7 (175)
300 (90)	43 (28 000)	7 (175)
325 (98)	47 (30 000)	8 (200)
350 (105)	50 (32 000)	8 (200)
375 (113)	54 (35 000)	8 (200)
400 (120)	58 (37 000)	9 (225)

*For total inputs falling between listed figures, use next largest listed input.

†These figures are based on a maximum equivalent duct length of 20 ft (6 m). For equivalent duct lengths in excess of 20 ft (6 m) up to and including a maximum of 50 ft (15 m), increase round duct diameter by one size.

8.4 Air-supply requirements for appliances having a total input exceeding 400 000 Btuh (120 kW) (See Clause 8.1.4)

8.4.1

Ventilation of the space occupied by an **appliance** or **equipment** shall be provided by an opening for **ventilation air** at the highest practicable point communicating with outdoors. The total cross-sectional area of such an opening shall be at least 10% of the area required in Clauses 8.4.2 and 8.4.3, but in no case shall the cross-sectional area be less than 10 in² (6500 mm²).

8.4.2

When the **air supply** is provided by natural airflow from the outdoors for **natural-draft**, partial **fan-assisted**, **fan-assisted**, or **power draft-assisted burners**, there shall be a permanent **air-supply** opening having a cross-sectional area of not less than 1 in²/7000 Btuh (310 mm²/kW) up to and including 1 000 000 Btuh, plus 1 in²/14 000 Btuh (155 mm²/kW) in excess of 1 000 000 Btuh. This opening shall be either located at or ducted to a point not more than 18 in (450 mm) or less than 6 in (150 mm) above the floor level. This **air-supply** opening requirement shall be in addition to the opening for **ventilation air** required in Clause 8.4.1. See also Clauses 4.1.3 and 4.1.4.

ΔΔ 8.4.3

When **air supply** is provided by natural airflow from outdoors for a power **burner**, in addition to the opening for **ventilation air** required in Clause 8.4.1, there shall be a permanent **air-supply** opening(s) having a total cross-sectional area of not less than 1 in² for each 30 000 Btuh (70 mm² for each kW) of the total rated input of the power **burner(s)**. The location of the opening(s) shall not interfere with the intended purpose of the opening(s) for the **ventilation air** referred to in Clause 8.4.1. See also Clauses 4.1.3 and 4.1.4.

8.4.4

When air is provided by natural airflow from outdoors into a location containing both types of **equipment** described in Clauses 8.4.2 and 8.4.3, the cross-sectional area of the opening shall not be less than the total required cross-sectional area for both types of **equipment** when calculated in accordance with either Clause 8.4.2 or 8.4.3, as applicable. This **air-supply** opening requirement shall be in addition to the opening for **ventilation air** required in Clause 8.4.1. See also Clauses 4.1.3 and 4.1.4.

8.4.5

When an **air-supply** duct is used to meet the requirements of either Clause 8.4.2 or 8.4.3, its discharge opening shall be located where there is no possibility of cold air affecting steam or water pipes and electrical or mechanical equipment.

8.5 Air-supply dampers, louvres, and grilles

8.5.1

The free area of an **air-supply** opening required in Clauses 8.2 and 8.3 shall be calculated by subtracting the blockage area of all fixed louvres, grilles, or screens from the gross area of the opening.

8.5.2

Apertures in a fixed louver, grille, or screen shall have no dimension smaller than 0.25 in (6 mm).

8.5.3

Neither a manually operated **damper** nor manually adjustable louvres shall be used.

8.5.4

An automatically operated **damper** or automatically adjustable louver shall be interlocked so that the main **burner** cannot operate unless either the **damper** or louver is in the fully open position.

8.5.5

An automatic **combustion air damper** installed in the **air supply** within a **dwelling unit** shall be **certified**.

8.6 Conditions created by exhaust fans, air-supply fans, circulating fans, or fireplaces

When it is determined that the operation of another **appliance** or other **equipment**, including an exhaust fan, **air-supply** fan, or circulating fan, adversely affects the venting, combustion, or burning characteristics of a gas **appliance**, either the condition shall be corrected or the fuel supply to the affected **appliance** shall be discontinued.

8.7 Engineered installations

Subject to the approval of the **authority having jurisdiction**, outdoor **air-supply** provisions other than those described in Clauses 8.2 and 8.3 may be used if designed in accordance with good engineering practice.

8.8 Air supply by mechanical means

8.8.1

When the **air supply** is provided by mechanical means, an airflow-sensing device shall be installed. It shall be wired into the safety limit circuit of the primary safety control to shut off the gas in the event of **air-supply** failure. When an **appliance** is not equipped with a **combustion safety control**, the restoration of the gas supply shall be by a manual-reset device.

8.8.2

When all the **air supply** is provided by a make-up air heater and the **appliance** is interlocked with the heater, the requirements of Clauses 8.1 to 8.6 shall not apply.

8.9 Appliance venting

8.9.1

Every **appliance** shall be connected to either an effective **chimney** or a **vent**, except

- (a) for a **radiant heater** installed in a masonry **fireplace** with a permanently opened **flue**;
- (b) for an **appliance** that is **approved** for use without a **vent**;
- (c) for an **appliance** installed in accordance with Clause 8.24.5 in a **building** (other than a **residential** or **care or detention occupancy building**) where adequate **ventilation** is provided by an exhaust fan, by a **natural-draft** ventilator, or by other means acceptable to the **authority having jurisdiction**;
- (d) for an **appliance** installed for the production of carbon dioxide in a greenhouse where the rate of combustion does not exceed 3 Btuh/ft³ (30 W/m³) of greenhouse volume and the concentration of carbon dioxide in the atmosphere does not exceed 5000 ppm (0.5%); and
- (e) as provided in Clauses 8.14.12, 8.24, and 8.30.

8.9.2

Except for a **direct-vent appliance**, an **appliance** requiring venting shall be located as close as practicable to either a **chimney** or **vent**.

8.9.3

A **venting system** shall be firmly attached to either a **draft-hood** outlet or **flue collar** by sheet metal screws or mechanical fasteners, or in accordance with the manufacturer's **certified** installation instructions.

Note: A moisture-exhaust duct from a clothes dryer is not considered to be a connector. See Clauses 7.4 and 7.5.

8.9.4

A **venting system** shall be securely supported by **noncombustible** hangers suitable for the weight and design of the materials employed. A slip joint in the horizontal section of a **venting system** shall be secured either with sheet metal screws or in accordance with the manufacturer's **certified** installation instructions to prevent sagging.

ΔΔ 8.9.5

Venting systems that employ plastic **vents** shall be installed such that the first 3 ft (900 mm), or total vent run if less than 3 ft (900 mm) from the appliance flue outlet, is readily accessible for visual inspection.

ΔΔ 8.9.6

Vents constructed using plastic piping shall be certified to ULC S636.

8.10 Methods of venting appliances

8.10.1

A **vent** or **chimney** shall provide effective venting and shall be designed and constructed to remove all **flue gases** to the outdoors.

8.10.2

A **chimney** suitable to the application shall be used for venting the following **appliances**:

- (a) an incinerator, except as provided in Clause 8.10.11;
- (b) an **appliance** that may be readily converted to the use of solid or liquid fuels;
- (c) a combination gas- and oil-burning **appliance**; and
- (d) an **appliance approved** for use with a **chimney** only.

8.10.3

The type of **venting system** to be used shall be in accordance with Table 8.5.

8.10.4

A special **venting system** or a **BH venting system** shall be installed in accordance with the terms of its listing and the **appliance** and **vent** manufacturer's **certified** installation instructions.

8.10.5

When used on an **appliance** having a **special venting system**, a **draft-control device** shall be located in a position where positive **vent** pressures will not occur.

8.10.6

An **appliance** that operates at a positive **vent** pressure shall not be connected to a **venting system** serving any other **appliance**.

8.10.7

A **Type B vent** shall only be used with an **appliance** that is

- (a) **certified** with a **draft hood**; or
- (b) **certified** and marked for use with a **Type B vent**.

Table 8.5
Type of venting system to be used
 (See Clause 8.10.3.)

Gas utilization appliance	Type of venting system
Listed Category I appliance	Type B gas vent*
Listed equipment with draft hood	Chimney, special venting system*
Equipment listed for use with Type B gas vent	Listed chimney lining system for gas venting, Type BH or special venting system listed for this appliance*
Listed vented wall furnace	Type BW gas vent (Clauses 7.17.3, 8.10.8, 8.11) if designed for use with a BW vent
Category II appliance	Type BH vent or special venting system or as specified or furnished by manufacturer of the listed appliance (Clause 8.10.4)
Category III appliance	Type BH vent or special venting system or as specified or furnished by manufacturer of the listed appliance (Clause 8.10.4)
Category IV appliance	Type BH vent or special venting system or as specified or furnished by manufacturer of the listed appliance (Clause 8.10.4)
Incinerators, indoors	Chimney (Clauses 8.18.2, 8.18.12)
Incinerators, outdoors	Single-wall metal pipe (Clauses 8.10.11, 8.18.2, 8.18.12)
Appliance that may be converted to use of solid fuel	1202°F (650 °C) chimney (Clauses 8.12.3, 8.12.6)
Listed combination gas- and oil-burning appliance	Type L vent or chimney (Clauses 8.10.2, 8.12.4)
Combination gas- and solid-fuel-burning appliance	1202°F (650 °C) chimney (Clauses 8.10.2, 8.12.2)
Appliance listed for use with chimneys only	Chimney (Clause 8.12)
Decorative appliance in vented fireplace	Chimney (Clauses 7.23.3 to 7.23.5)
Direct-vent appliance	See Clause 8.10.4
Appliance with integral vent	See Clause 8.10.4
Appliance in commercial and industrial installations	Chimney, ventilating hood, and exhaust system (Clause 8.30)

*See Clause 8.

8.10.8

A **Type BW vent** shall only be used with a recessed wall **furnace**.

8.10.9

Except as specified in Clause 8.10.10, a **Type L vent** shall only be used with an **appliance certified** for use with **Type L vents**.

8.10.10

A **Type L vent** may be used in lieu of a **Type B vent**.

ΔΔ 8.14.8

A **vent** shall not terminate

- (a) directly above a paved sidewalk or paved driveway that is located between two single-family dwellings and serves both dwellings;
- (b) less than 7 ft (2.1 m) above a paved sidewalk or a paved driveway that is located on public property;
- (c) within 6 ft (1.8 m) of a mechanical **air-supply** inlet to any **building**;
- (d) above a meter and **regulator** assembly within 3 ft (900 mm) horizontally of the vertical centreline of the **regulator** vent outlet to a maximum vertical distance of 15 ft (4.5 m);
- (e) within 3 ft (900 mm) of any gas **pressure regulator** vent outlet;
- (f) less than 1 ft (300 mm) above grade level;
- (g) within the following distances of a window or door that can be opened in any **building**, of any nonmechanical **air-supply** inlet to any **building**, or of the **combustion air** inlet of any other **appliance**:
 - (i) 6 in (150 mm) for inputs up to and including 10 000 Btuh (3 kW);
 - (ii) 12 in (300 mm) for inputs from 10 000 Btuh (3 kW) up to and including 100 000 Btuh (30 kW); and
 - (iii) 3 ft (900 mm) for inputs exceeding 100 000 Btuh (30 kW); and
- (h) underneath a veranda, porch, or deck unless
 - (i) the veranda, porch, or deck is fully open on a minimum of two sides beneath the floor; and
 - (ii) the distance between the top of the **vent** termination and the underside of the veranda, porch, or deck is greater than 1 ft (300 mm).

8.14.9

When more than one **direct-vent appliance** of the same make and model are installed, the clearances between the air-intake and exhaust **vent** terminals may be reduced from the clearances required by this Code, provided that they have been tested and **certified** for such reduced clearances. The manufacturer's **certified** installation instructions shall specify and illustrate the reduced clearances.

8.14.10

The **flue gas** discharge opening for an outdoor swimming pool heater shall terminate not less than 10 ft (3 m) from any **building opening**.

8.14.11

A terminus of a **vent** shall be fitted with a cap either in accordance with the **vent** manufacturer's installation instructions or in accordance with the installation instructions for a **special venting system**.

ΔΔ 8.14.12

A **vent** from an **appliance** shall not extend through an exterior wall and terminate adjacent to the exterior wall unless

- (a) the **appliance** is a **direct-vent appliance**;
- (b) the **appliance** is intended for connection to a **special venting system**;
- (c) the **appliance** and its complete **vent** assembly are specifically **certified** to be installed in this manner;
- (d) the **venting system** is equipped with a **certified power venter** that complies with Clause 8.29.2; or
- (e) the **venting system** is equipped with a **certified power venter** that complies with Clause 8.24.2.

8.14.13

The **vent** from one or more gas-fired appliances may be installed vertically inside a dormant masonry **flue**, a dormant **certified chimney**, or a dormant **vent**, provided that

- (a) each **appliance** is equipped with its own individual **vent** installed in accordance with the requirements of Clauses 8.12 to 8.14, as applicable; and
- (b) spacers are installed to maintain a minimum clearance of 1 in (25 mm) between an active **vent** and a **combustible vent**.

8.15 Vent and chimney support

8.15.1

A **vent** or **chimney** shall be adequately supported independent of the **appliance** being served.

8.15.2

A **vent** or **factory-built chimney** shall be installed in accordance with the manufacturer's instructions.

8.15.3

A **vent** may be directly connected to the **flue** outlet or **draft-hood** outlet of the **appliance** that it serves, provided that the **vent** is independently supported and the connection is made in accordance with the manufacturer's **certified** instructions.

8.15.4

When the **vent** referred to in Clause 8.15.3 is of double-wall construction, the connection shall be made by the use of a **certified** double-wall to single-wall adapter, and by

- (a) an adjustable telescopic-type fitting, fabricated by the **vent** manufacturer; or
- (b) a single-wall **vent connector** having a maximum length not exceeding 18 in (450 mm) and a minimum length not less than 12 in (300 mm).

8.15.5

When a single-wall **vent connector** connects an **appliance** to a **Type B vent**

- (a) the base fitting shall be accessible for inspection;
- (b) the connection shall be by means of a **certified** double-wall to single-wall adapter; and
- (c) the clearance from **combustibles** as specified in Table 8.6 shall be maintained.

8.16 Vents and chimneys serving two or more appliances

ΔΔ 8.16.1

When two or more **vent connectors** enter either a common **vent** or common **chimney**, they shall not enter at the same horizontal plane. The smallest **vent connector** shall enter at the highest level consistent with the available headroom and clearance from **combustible** material, except that a **vent connector** from an incinerator shall be installed at the lowest level. When the **vent connectors** are of the same diameter, the **vent connector** serving the appliance with the lowest BTU input shall be connected at the highest level.

8.16.2

When two or more **appliances** are vented through a common **vent connector**, the common **vent connector** shall be located at the highest level consistent with the available headroom and clearance from **combustible** material.

8.17 Vents outside buildings

8.17.1

When the installation of a **vent** used in a **natural-draft venting system** is impracticable inside a **building**, it may be done outdoors, provided that the vent is

- (a) **certified** for outside installation;
- (b) installed in accordance with the manufacturer's **certified** installation instructions; and
- (c) adequately insulated.

8.17.2

The portion of an indoor-installed **Type B** or **Type L vent** that extends above the roof line shall be **certified** for exterior use, and each length shall be so identified.

- (b) have **combustion air** supplied to the **enclosure** by means of grilles or ducts that communicate directly with the outdoors, are sized in accordance with the requirements of Table 8.1 or 8.2, and are installed in accordance with Clause 8.3. (See Figure C.13 of Annex C for a practical method of meeting this requirement.) **Combustion air** shall not be taken from inhabited or occupied spaces within the **building**.

8.21.3

The requirements of Clause 8.21.2 shall not apply if all **appliances** served by a common **venting system** are located within one **dwelling unit**.

8.21.4

When a forced-air **furnace** is installed in an **enclosure** in accordance with Clause 8.21.2, no opening shall be located in the **furnace** return-air system within the **enclosure**, and means shall be provided on the return-air system to prevent the infiltration of air from inside the **enclosure**.

8.21.5

When a common gas **vent** is used in accordance with Clause 8.21.1, the common gas **vent** shall be

- (a) of a **Type B** or **Type L vent**;
- (b) sized in accordance with the requirements indicated in Tables C.3 and C.4 and illustrated in Figures C.11 and C.12 of Annex C; and
- (c) installed in accordance with the manufacturer's **certified** installation instructions.

△△ 8.21.6

With approval of the **authority having jurisdiction**, a common **chimney** is permissible in multi-storey installations to vent **appliances** replacing existing **appliances**, if

- (a) new **appliances** are of the same size (input capacity with similar efficiency range) and venting type (fan-assisted or natural draft) as the original;
- (b) the **venting system** does not include significant changes; and
- (c) the **venting system** provides effective venting and shows no signs of condensation or deterioration.

Evidence shall be provided to authenticate the characteristics of the replaced **appliance** to the **authority having jurisdiction**.

8.22 Dampers and attachments

A device or attachment that might in any way impair either the combustion or safe venting of the **combustion products** shall be prohibited.

8.23 Draft hoods

8.23.1

Except for an incinerator, a dual oven-type combination range, and a **direct-vent appliance**, an **appliance** requiring zero over-fire **draft** for operation shall be installed with a **draft hood**.

8.23.2

A **draft hood** shall not be used on an **appliance** with either positive over-fire **draft** or an **induced draft**.

8.23.3

A **draft hood** either supplied with or forming part of an **appliance** shall be installed without alteration.

8.23.4

When a **draft hood** is required and it is not supplied by the **appliance** manufacturer, it shall be supplied by the **installer** and it shall be of an **approved** design. See Annex F.

8.23.5

The **draft-hood** outlet shall be of the same size as the **appliance flue collar** unless otherwise sized in the **appliance** manufacturer's installation instructions.

8.23.6

A **draft hood** shall be in the same room as the **combustion air** opening of the **appliance**. A **draft hood** shall not be installed in a **false ceiling space**, in a room other than the one the **appliance** serves, or in any manner that could permit a difference in pressure between the **draft-hood** relief opening and the **combustion air supply**. The **draft hood** supplied for a conversion **burner** shall be located so that the **burner** is capable of safe and efficient operation.

8.23.7

A **draft hood** shall be installed in the position for which it was designed with reference to the horizontal and vertical planes, and shall be located so that the relief opening is not obstructed by any part of the **appliance** or adjacent construction. The **appliance** and its draft hood shall be located so that the relief opening is accessible for checking **vent** operation.

8.23.8

A **draft regulator** shall not be used as a substitute for a **draft hood**.

8.24 Venting arrangements

8.24.1

The requirements for a **draft-control device** in Clauses 8.8 to 8.24 shall not apply either to a **direct-vent appliance** or to an **appliance** requiring a **special venting system**.

ΔΔ 8.24.2

A **power venter** may be used in place of a **natural-draft vent**, provided that means are provided to prevent the flow of gas to the main **burner** in the event of failure of the **power venter**. Such a venter shall not be used in conjunction with an incinerator.

8.24.3

A **vent connector** that serves an **appliance** designed for **natural-draft** venting shall not be connected to any portion of a **venting system** under positive pressure or serving an **appliance** requiring a **special venting system**.

8.24.4

An exhaust hood or canopy for an **industrial appliance** may be used in place of a direct **flue** connection in certain cases, for instance, when the process itself requires fume disposal. The design of the **venting system** shall conform to the requirements of the **authority having jurisdiction**.

8.24.5

When located in a large and adequately **ventilated** space, an **appliance** may be operated by discharging the **combustion products** directly into the space, subject to the approval of the **authority having jurisdiction** and provided that the maximum input of the **appliance** does not exceed 20 Btuh/ft³ (0.2 kW/m³) of the space in which the **appliance** is located. An **appliance** designed to produce a controlled atmosphere need not be subject to these conditions.

8.24.6

A **venting system** that serves one or more **appliances** shall provide adequate venting and shall be sized in accordance with **approved** engineering design.

8.25 Draft regulators

A **draft regulator**, when used, shall be located so that the relief opening is not obstructed by any part of the **appliance** or adjacent construction. When used with an incinerator, a **draft regulator** shall be of the single-acting type. In all other installations, it shall be of the double-acting type.

Table C.8 (Concluded)

Total vent height, H, ft	Common vent equivalent chimney diameter, D, in																			
	8					9					10					12				
	Combined appliance input rating, thousands of Btuh																			
	FAN	FAN	DP†	NAT*	DP†	FAN	FAN	DP†	NAT*	DP†	FAN	FAN	DP†	NAT*	DP†	FAN	FAN	DP†	NAT*	DP†
	+FAN	+NAT*	(F+N)	+NAT*	(N+N)	+FAN	+NAT*	(F+N)	+NAT*	(N+N)	+FAN	+NAT*	(F+N)	+NAT*	(N+N)	+FAN	+NAT*	(F+N)	+NAT*	(N+N)
6	NR‡	348	209	142	85	NR‡	455	273	187	112	NR‡	579	347	245	147	NR‡	846	508	NR‡	NR‡
8	NR‡	390	285	162	118	NR‡	497	363	217	158	NR‡	633	462	277	202	NR‡	928	677	405	296
10	NR‡	405	324	175	140	NR‡	532	426	234	187	NR‡	680	544	300	240	NR‡	1000	800	450	360
15	NR‡	460	391	210	179	NR‡	602	512	280	238	NR‡	772	656	360	306	NR‡	1139	968	540	459
20	NR‡	503	448	240	214	NR‡	661	588	321	286	NR‡	849	756	415	369	NR‡	1264	1125	640	570
30	NR‡	558	519	275	256	NR‡	739	687	377	351	NR‡	957	890	490	456	NR‡	1447	1346	740	688
50	NR‡	612	581	325	309	NR‡	821	780	456	433	NR‡	1076	1022	600	570	NR‡	1672	1588	910	865

*NAT = natural draft appliance

†DP = depressurization

‡NR = not recommended

Note: See [Clause 8.12.8](#).

△△

Table C.9
Single-wall vent connector total length limits
for multiple appliance installations

Vent connector diameter, in	3	4	5	6	7	8
Maximum vent connector length, ft	5	6	8	10	11	12

Notes:

- (1)** Double-wall vent connectors may exceed these values up to a limit of twice these specified values. However, when these values are exceeded using a Type B vent, the capacity shall be reduced by 10%.
- (2)** For configurations wherein vent connectors are combined prior to entering the common vent, the vent connector length of a vent connector serving a single appliance shall be measured from the appliance draft hood outlet or flue collar to the point where the vent gases meet the vent gases from another appliance.

△△ *Annex D (informative)*

Customer's meter and regulator installations

Notes:

- (1) *This informative Annex is written in normative language to facilitate adoption where users of the Code or regulatory authorities wish to adopt it formally as additional requirements to this Code.*
- (2) *This Annex is an extract from Clause 12.4.10 of CAN/CSA-Z662-03.*

12.4.10 Customers' Meters and Service Regulators

Note: *Meter location and installation requirements of Clause 12.4.10 apply to meters that are designed and tested to ANSI B109.1 or equivalent.*

12.4.10.1

It shall be permissible to locate customers' meters and service regulators either inside or outside buildings, dependent upon local conditions.

12.4.10.2

For service lines requiring series regulation in accordance with the requirements of Clause 12.4.8.1, Item b), the upstream regulator shall be located outside the building.

12.4.10.3

Where installed within buildings, customers' meters and regulators shall be in readily accessible locations that afford reasonable protection from thermal stresses and sources of heat, mechanical stresses, and chemical deterioration. Service regulators shall be located near the piping entrance and, where practical, the meters shall be installed at the same locations. For service lines supplying large industrial customers and installations where gas is used at higher than standard service pressure, it shall be permissible to install the regulators at other readily accessible locations.

12.4.10.4

Where located outside buildings, meters and regulators shall be installed in readily accessible locations. Where outside meters and regulators are installed in locations that do not afford reasonable protection from damage, such protection shall be provided.

12.4.10.5

Regulators requiring vents for proper and effective operation, unless manufactured or equipped to limit the escape of gas from their vent opening, even in the event of diaphragm failure, to less than 0.0283 m³/h, shall be vented to the outside atmosphere and shall terminate in rain- and insect-resistant fittings.

12.4.10.6

Where regulator failure would result in the release of gas, open ends of the vents shall be located where the gas can escape freely into the atmosphere and away from any openings in the buildings. Clearances from building openings shall be commensurate with local conditions and the volume of gas that might be released, but shall not be less than those required by CSA B149.1. Where regulators might be submerged during floods, either a special anti-flood-type breather vent fitting shall be installed or the vent line shall be extended above the height of the expected flood waters.

12.4.10.7

Vaults and pits housing meters and regulators shall be designed and constructed to support the loads that may be imposed upon the meters and regulators.

12.4.10.8

Regulator and relief vent piping shall be

- (a) capable of withstanding the maximum pressures as defined in Clause 12.4.7;
- (b) included in the determination of the relief system capacity described in Clause 4.14.3.2;
- (c) of metallic material where installed within buildings; and
- (d) designed, fabricated, and installed to prevent static build-up and mechanical damage where plastic materials are used.