

THE SASKATCHEWAN CODES OF PRACTICE

NATURAL GAS AND PROPANE INSTALLATION CODE

CSA-B149.1 – 20



Gas Installation Supplement

Adoption Date: January 1, 2023

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3 DEFINITIONS

Combustible: Materials made of, or surfaced with, wood, compressed paper, plant fibers, or other materials that are capable of being ignited and burned. Such material shall be considered combustible even though flame-proof, fire-retardant treated, plastered, or part of the construction of a fire-rated barrier.

Noncombustible: Material that conforms to CAN/ULC-S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials. To pass this test, the sample cannot flame or cause a temperature rise within an oven at 750°C. Any building material containing even a small proportion of combustibles will be classified as combustible when subjected to this test.

Combination system: An installation that combines both potable hot water and hydronic space heating.

Manufactured or Mobile Home: A transportable, single or multiple section single family dwelling conforming to the CAN/CSA – Z240 MH, Series of Standards, Manufactured Homes, at time of manufacture. It is ready for occupancy upon completion of setup in accordance with required factory recommended installation instructions. These structures are required to have all gas fired appliances installed in accordance with CAN/CSA – Z240 MH, Series of Standards, Manufactured Homes, per clause 4.8.1 of CSA B149.1-20. All appliances must be certified for installation in Canada.

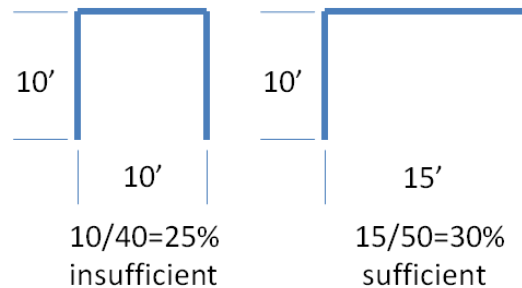
Modular or Ready To Move (RTM) Homes: Are constructed to The National Building Code, and the installation of the gas appliances conforms to the B149.1 Natural Gas and Propane Installation Code. Modular or RTM homes certified through CAN/CSA - A - 277, Procedure for Certification of Prefabricated Buildings, Modules, and Panels, covers the installation of hidden or closed-in gas components (gas piping and venting) and require no additional inspection. If the modular or RTM home is not certified to CAN/CSA - A - 277, the inspection of the hidden or closed-in gas components shall be inspected to conform with the B149.1 Natural Gas and Propane Installation Code. All appliances must be certified for installation in Canada.

Note: Some modular or RTM homes come with furnaces certified for manufactured or mobile homes. These furnaces typically do not have return air ducting. Usually, the central hallway serves as the return air path. Because of this, any other gas appliance installed must have its' combustion process separate from the living space.



Outdoors: For the purpose of this Code of Practice, an appliance that is certified for outdoor use is considered to be outdoors if installed with shelter no more inclusive than:

- a) With walls on all sides, but with no overhead cover; or
- b) Within a partial enclosure that includes an overhead cover and up to three side walls, as long as 30% or more of the total horizontal perimeter of the enclosure is permanently open.



For example, consider a 10'x10' space versus a 10' x 15' space, each open to one side, as shown above.

Permanently Open: for the purpose of this Code of Practice, a sidewall is considered to be permanently open if constructed with shelter no more inclusive than:

- a) For natural gas;
 - I. solid or air-restrictive construction (railings, lattice, etc.) is permitted only within the lowest vertical 4' from floor level to guard rail; and
 - II. the remaining area of the sidewall located vertically above 4' is permanently open or screened, except for roof support columns.
- b) For propane;
 - I. no solid or air-restrictive construction is permitted. Railings must not be air-restrictive in construction.

If any of the space (above 4' from the floor for natural gas) is equipped with glass, panels, shutters, blinds, curtains or draperies, even temporarily, then these walls can no longer be considered permanently open. Outdoor gas-fired appliances may then need to be relocated as appropriate.

4 GENERAL

4.3 Responsibilities of the Installer

4.3.9 Activation Tags - Installers activating any appliance shall fill in all information on an appliance activation tag and hang the tag on the gas line in an accessible location proximal to the appliance. Activation Tags may be those purchased from Gas Inspections or may be of the gas contractor's company design, provided that the same information is provided at minimum. Gas appliances that have supply and return ductwork attached to them shall have the date tested, the tested temperature rise, and the manifold pressure during the test recorded. This data shall be displayed prominently on the supply plenum with a permanent marking device in a legible manner or in the start-up sheet accompanying the installation manual and left on site.

4.3.10 Activations - The contractor shall provide to Gas Inspections 48 hours notice prior to initiating the activation of gas-fired equipment that is rated 1,000,000 btu/hr and over. The gas inspector, upon notification, shall determine if the activation of the equipment requires the presence of a factory-trained technician, the installer, and/or the gas inspector. Activations in high occupancy buildings shall take place when buildings are relatively unoccupied.

Note: For boiler activations in commercial applications or residential applications in more than a three-family dwelling, you must contact Boiler Inspections (TSASK).

4.3.11 Test Firing - For equipment that has been deemed as requiring the presence of a gas inspector to activate, any and all permissions to "test fire" this equipment in our absence (prior to commissioning) must be received from Gas Inspections in written form. The permission must include the location, date, and personnel allowed to test fire the appliance, with an expectation that test firing is limited in scope and that the equipment may not be placed into operation until it is activated in the presence of the gas inspector.

4.3.12 CO readings - Standard action levels in response to carbon monoxide readings are provided in Appendix E. (also reference 4.21)



4.4 Training and Quality of Labour

4.4.3 Permit – No person shall apply for a permit to install any works to which the Gas Inspection Act applies unless they have the requisite license in Saskatchewan from TSASK Gas Licensing to do so. No person shall commence any work to which this Act applies unless the person has been issued a permit from Gas Inspections authorizing the work to commence.

Note: The Gas Licensing Regulations stipulate that the holder of a domestic contractor's license may undertake work only on installations where the total combined gas load (connected to one meter or delivery point) does not exceed 700,000 btu/hr and individual appliance load does not exceed 400,000 btu/hr.

4.4.4 Plan Review - All systems exceeding 2000 feet of piping (in a single run) and all systems having an input rating exceeding 5,000,000 btu/hr (as listed on a New or Addition permit) are subject to a Plan Review by Gas Inspections prior to commencement.

4.5 Suitability of Use

4.5.5.1 Flooding Inspection Qualifications - A Saskatchewan licensed gas fitter is an acceptable person to conduct an inspection pursuant to CSA B149.1-20 clause 4.5.5. For appliances, accessories, components, and equipment exposed to flooding, they shall refer to the Emergency Flood Guidelines in Appendix G.

4.9 Hazardous Locations

4.9.3 Dugouts and Partial Basements - An appliance shall not be installed:

- (a) on an earth floor; or
- (b) in an area having uncribbed earth walls unless a clearance of 4 ft. (1.2 m) can be maintained around the appliance.

4.11 Isolation of Safety Devices

4.11.1 Card Sealed - Where burners are required to operate constantly, then a locked-open, or sealed-open, manual valve to isolate a safety limit control may be installed for servicing, maintenance or testing purposes. This valve may only be unlocked, or unsealed, and closed if the gas-fired equipment under the protection of the safety limit control has continuous manual supervision while the safety limit control is out of service. A documented work procedure submitted and acceptable to Gas Inspections shall be followed during use of each such isolation valve. Under no circumstances are input lines to relief valves to be isolated or have isolation valves installed.

4.11.2 Pressure Relief Path - In a plant environment, where a relief valve terminates into a common flare header, a locked-open, or sealed-open, full port manual valve may only be used to isolate the operational flare header from the relief valve discharge (for maintenance purposes of the equipment under the protection of the relief valve) when the TSASK Pressure Relief Path (PRP) Stop Valve Control Program is utilized. The requirements for application and the PRP Stop Valve Control program manual are available from TSASK Boiler and Pressure Vessels. Copies must be made available to both TSASK Boiler and Pressure Vessel and to TSASK Gas Inspections for approval.



4.14 Accessibility

4.14.6 - 4.14.8 Walkways and Working Platforms

4.14.6.1 Conditions - 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, or the roof surface is metal, a suitable anti-skid walkway shall be provided. The designer must ensure the roof structure has the capability to support the additional load associated by the addition of the walkway and/or working platform structure.

4.14.8 Example - An example of an acceptable method of access design is as follows:

Walkways

- The walkway must be raised and securely affixed to the roof.
- The walkway must be a minimum of 24" (610 mm) and constructed and supported to handle the anticipated loads without appreciable material deflection.
- The surface of the walkway must have anti-skid characteristics such as provided with an expanded metal surface. An adhesive anti-skid material applied directly to the roof does not create an acceptable all-weather walkway.
- When the point of access to the roof is within 6 ft. (1.8 m) of the edge, and the roof slope is 3 in 12 or less pitch, the walkway must be provided with a hand/guard rail starting at the point of access to a distance of 6 ft. (1.8 m) from the roof edge along the walkway.
- When the roof exceeds a 3 in 12 pitch, the hand/guardrail must be continuous along the walkway.
- The hand/guard rail must be constructed in accordance with current OH&S regulations.

Working platforms

- The working platforms must be securely affixed to the roof.
- Level working platforms must be located on all sides of the appliance that requires servicing access.
- The working platforms must be constructed as the walkway, and be a minimum of 30" (762 mm) in width, with a hand/guard rail constructed as required for the walkway.
- The working platform must be installed within 6" (152 mm) horizontally of the unit's edge in a way that does not interfere with any part of the unit that requires removal for servicing purposes.

Access to gas appliances installed on building with multiple level roofs

- A permanent fixed access ladder or suitable step/stairway must be installed on roofs as part of a continuation of the walkway system where passage is obstructed by a pony wall or parapet higher than 3ft (914 mm) in height to allow for safe access to roof top equipment.
- Access ladder design shall be constructed to meet requirements as specified in the Saskatchewan Occupational Health and Safety Regulations.
- Steps/stairs to be designed to the requirements specified in The National Building Code of Canada.



4.23 Protection of Appliances from Physical Damage

- 4.23.1 Conditions** - When appliances are installed in locations that do not afford protection from damage from motor vehicles, they shall be protected by posts or guardrails in compliance with CSA B149.1-20 clause 6.16.15 or other equivalent means of acceptable protection.

5 PRESSURE CONTROLS

5.3 Overpressure Protection Device Setting

- 5.3.4.1 High Pressure Conditions** - An overpressure protection device shall be set to operate at the pressures specified in Table 5.2 when the appliance or equipment maximum rated inlet gas pressure is below 100 psi. When the appliance or equipment maximum rated inlet gas pressure is 100 psi or greater, the maximum allowable downstream pressure shall be 110% of the appliance or equipment maximum rated inlet gas pressure.

6 PIPING AND TUBING SYSTEMS, HOSE AND FITTINGS

6.2 Material

- 6.2.2.1 Press Connect** - "CSA 6.32/ANSI LC-4" is the certification code for "Press-Connect Metallic Fittings For Use In Fuel Gas Distribution Systems" such as ViegaMegaPressG.
- 6.2.12.1 Stainless Steel** - Examples of other permissible materials which meet or exceed the minimum acceptable performance standards for gas piping and fittings listed in CSA B149.1-20 clause 6.2 include ASTM 312 stainless steel piping, and ASTM A182 stainless steel flanges, fittings, and valves commonly used in an aggressively corrosive environment such as potash or salt facilities.
- 6.2.14.1 Qualifications for Heat Fusion of Polyethylene Pipe:**
No person shall join plastic pipe to be used for the transfer of natural gas or propane unless that person has:
(i) in the opinion of the Chief Inspector, had satisfactory experience in similar work, or
(ii) satisfactorily completed a course of training prescribed by or acceptable to the Chief Inspector.
- 6.2.22 CSST**
- 6.2.22.1 Installation** - All CSST shall be installed according to the manufacturer's instructions.
- 6.2.22.2 Prohibited Application** - CSST fittings shall not be used as a union.
- 6.2.22.3 Prohibited Connection to a Swing** - CSST shall not be directly connected to a black iron swing joint. When CSST is directly connected to a black iron swing joint, the swing joint will not perform as intended without causing excessive strain on the CSST.

6.3 Use of Capacity Tables for Sizing of Piping and Tubing

Examples of pipe sizing using the Actual Length/Actual Load method are provided in Appendix A.

- 6.3.6.1 For natural gas installations with a designed delivery pressure of 7 inches** water column, the maximum allowable pressure drop is 0.5 inches water column.



For propane installations with designed delivery pressure of 11 inches water column, the maximum allowable pressure drop is 1 inch water column.

6.3.6.2 Where Schedule 80 pipe is used in natural gas or propane vapour service, Schedule 80 pipe has a lower capacity than that provided in the capacity tables for Schedule 40 pipe.

The capacity tables A.1 through A.7 in CSA B149.1 can be used for Schedule 80 pipe by using the following derating factors:

NPS ¾ sch 40 pipe – take the value from the table and multiply by 0.76

NPS 1 sch 40 pipe – take the value from the table and multiply by 0.78

NPS 1 ¼ sch 40 pipe – take the value from the table and multiply by 0.82

NPS 1 ½ sch 40 pipe – take the value from the table and multiply by 0.83

NPS 2 sch 40 pipe – take the value from the table and multiply by 0.84

NPS 2 ½ sch 40 pipe – take the value from the table and multiply by 0.85

NPS 3 sch 40 pipe – take the value from the table and multiply by 0.86

NPS 4 sch 40 pipe – take the value from the table and multiply by 0.87

These factors are identical for each table (A.1 through A.7). For reference, these derated values for Schedule 80 pipe are provided as Tables A.1 c) to A.7 c) in Appendix A of this SCOP.

6.7 Location

6.7.7 Gas piping systems installed in an aggressive environment including, but not limited to, intensive livestock barns, and potash mines, shall not use materials with low tolerance for these conditions. The use of CSST, schedule 10 steel piping, or brass fittings and components, on gas piping systems in these environments is prohibited. Where the source for corrosion is a component of the gas stream, such as sour oilfield or digester gas, low tolerance materials, such as CSST, schedule 10 steel piping, or brass, shall not be allowed in contact with the gas stream.

6.8 Piping Practice

6.8.8 Job-fabricated welded fittings (for example, branch connections job-fabricated using the stub-in and back-welding method in CSA B149.1-20) are **NOT** allowed in any gas piping system. Branch connections on steel gas piping systems shall use a manufactured fitting, such as a tee, weld-o-let, or thread-o-let, meeting the material selection criteria of CSA B149.1-20 clause 6.2.2.

6.9 Joints and Connections

6.9.3.1 Welding of gas piping within Saskatchewan shall be performed in accordance with a procedure supplied to and approved by the Chief Gas Inspector. Welding procedures, registered with the Technical Safety Authority of Saskatchewan (TSASK), are acceptable. Welding of gas piping shall be performed by an operator qualified under the applicable welding procedure. Documentation of welder registration in the province, territory, state or country shall be provided to and approved by the Chief Gas Inspector.

6.9.4.1 QC Program - All welding projects shall conform to the installer's Quality Control (QC) Program, which has been developed following the principles of an appropriate standard, and shall be documented with a copy submitted to The Chief Gas Inspector. The QC Program shall contain

records of welding procedures, qualification of personnel, weld schedules, repair schedules, and inspection reports.

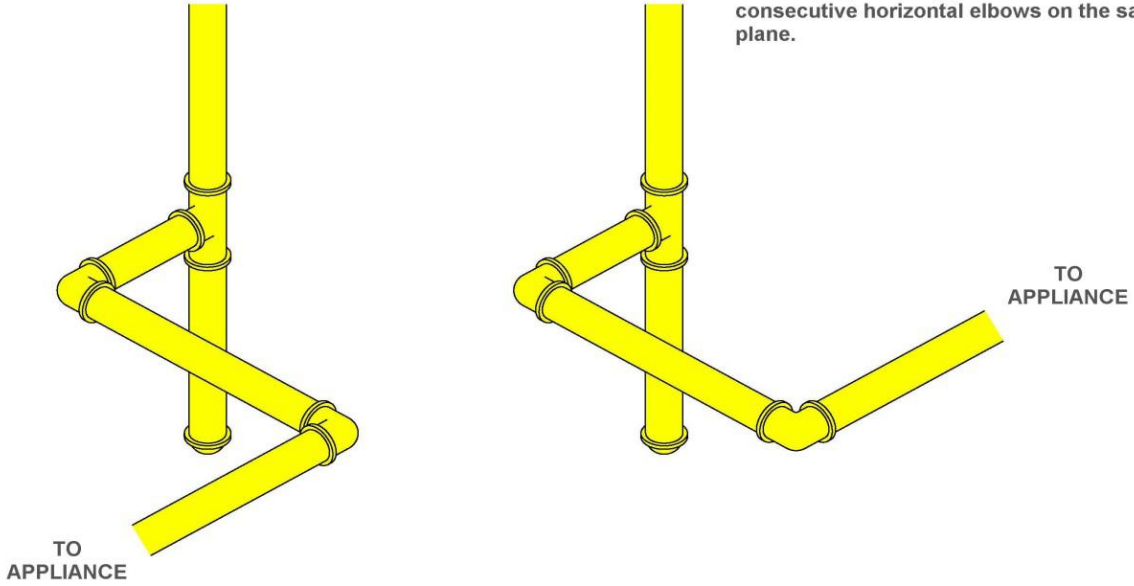
6.11 Appliance Connections

- 6.11.1.1 Rigid Cabinet Penetration** - Except as permitted by S.C.O.P. 6.11.1.2, where an appliance is connected to a flexible piping or tubing system, connection to the appliance shall be outside the cabinet and into a tee fitting containing a drip pocket and rigid piping that extends to the appliance gas valve.
- 6.11.1.2 Flexible Cabinet Penetration** - A flexible piping or tubing system, may be used with a protective sleeve to:
- penetrate the cabinet of a mobile/manufactured home furnace, or
 - penetrate the cabinet of a fireplace.
- 6.11.7 Dryer and Range Connections** - Appliances such as dryers and ranges can be connected directly to a rigid piping system. When a flexible piping or tubing system is used, the piping or tubing system must be securely terminated and the appliance connection must satisfy CSA B149.1-20 clause 6.11.2.
- 6.11.8 Appliance Swings** - Installers shall provide an effective swing joint at all rigid piping manifold connections to meters or appliances installed on earth supported floors, or pad-mounted outdoors. When using threaded pipe, the swing joint shall consist of two consecutive threaded 90° elbows installed on a horizontal plane. When using flexible piping or tubing, the installer shall provide a 5" to 8" free-motion offset connected to a tee fitting containing a drip pocket and rigid piping that extends to the appliance gas valve. The flexible piping or tubing shall not be anchored in a manner in which movement of the appliance due to soil conditions causes stress on the gas piping or tubing.

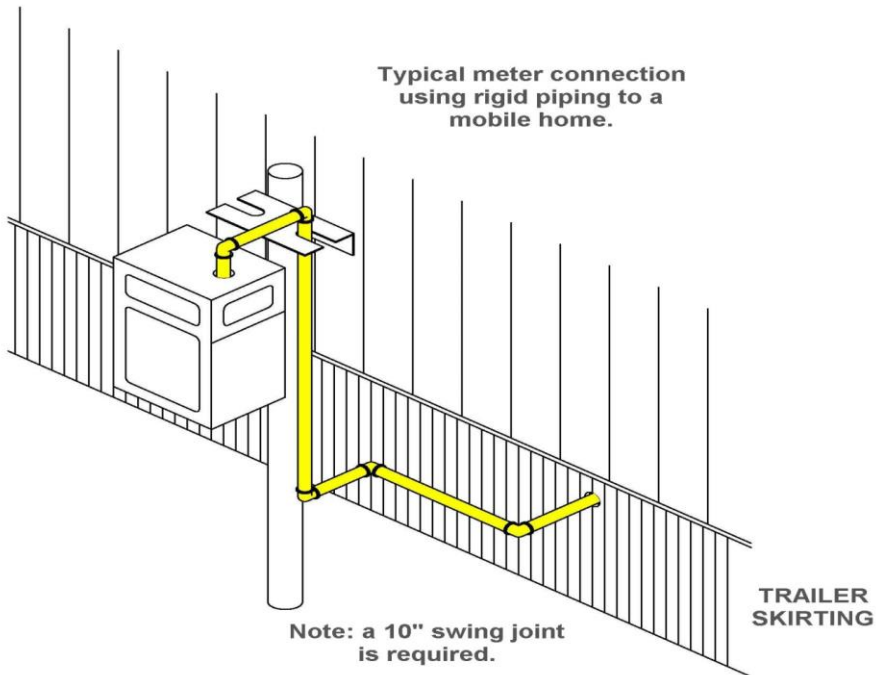
Typical Swing Joint Configurations – threaded pipe

Note: Connection of CSST is not permitted to any portion of the swing joint designed for movement.

Examples of Effective Swing Joint
 Note: a proper swing joint consists of two consecutive horizontal elbows on the same plane.



Meter Stand Connection



6.15 Underground Piping and Tubing

6.15.2 Steel pipe connections - Underground steel piping systems shall only be joined below grade by welding.

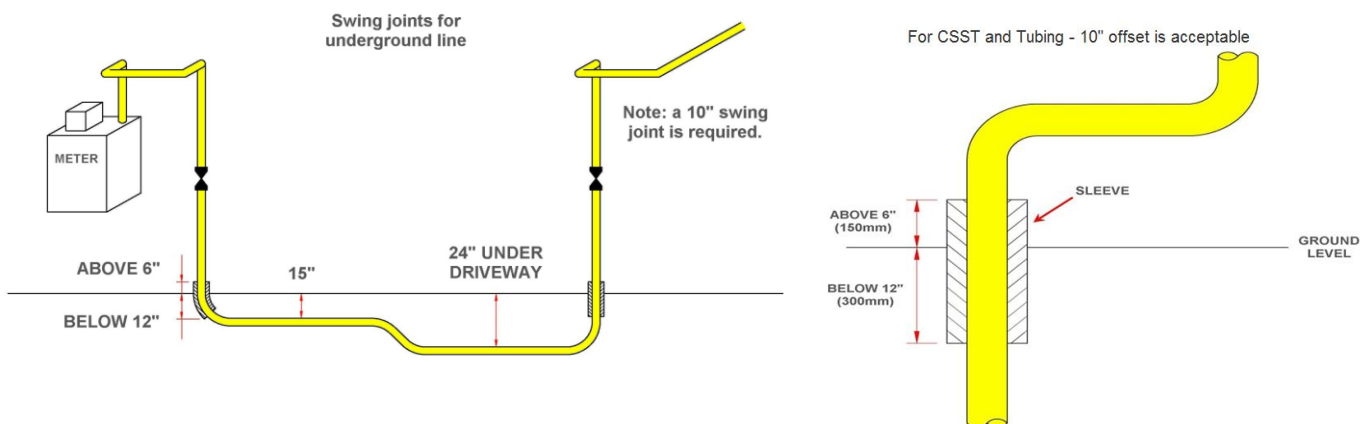
6.15.2.1 PE pipe connections Underground polyethylene piping systems shall only be joined below grade by butt fusion, socket fusion, electrofusion, or mechanical fittings certified to CSA B137.4 (such as "Permasert" or "Con-Stab"), except for underground piping systems in active landslide areas (see Appendix J) in which case all mechanical fittings underground are prohibited.

6.15.3 Copper pipe connections Underground acceptable copper tubing systems shall only be joined below grade by brazing with a material that has a melting point exceeding 1000°F (525°C).

6.15.3.1 Type L pipe connections Type L coated copper liquid propane tubing having an underground tubing connection shall have a polyethylene shrink wrap sleeve installed to cover any exposed section of tubing and fitting. The sleeve shall be positioned to one side of the connection, exposing the connection during the air test, and installed permanently over the connection after the completion of the air test and before burial.

6.15.4.1 Rocky Terrain - Where, due to rocky terrain, it is impractical to comply with section 6.15.4 (a), piping and tubing systems may be installed in accordance with Appendix H.

6.15.10.1 Grade point sleeve - Where piping or tubing penetrates the grade-level, a sleeve shall be installed a minimum of 6" above to 12" below grade-level, to protect the piping or tubing where it penetrates grade-level by permitting free movement of the soil and covering without placing strain on the piping or tubing. Refer to diagrams below.

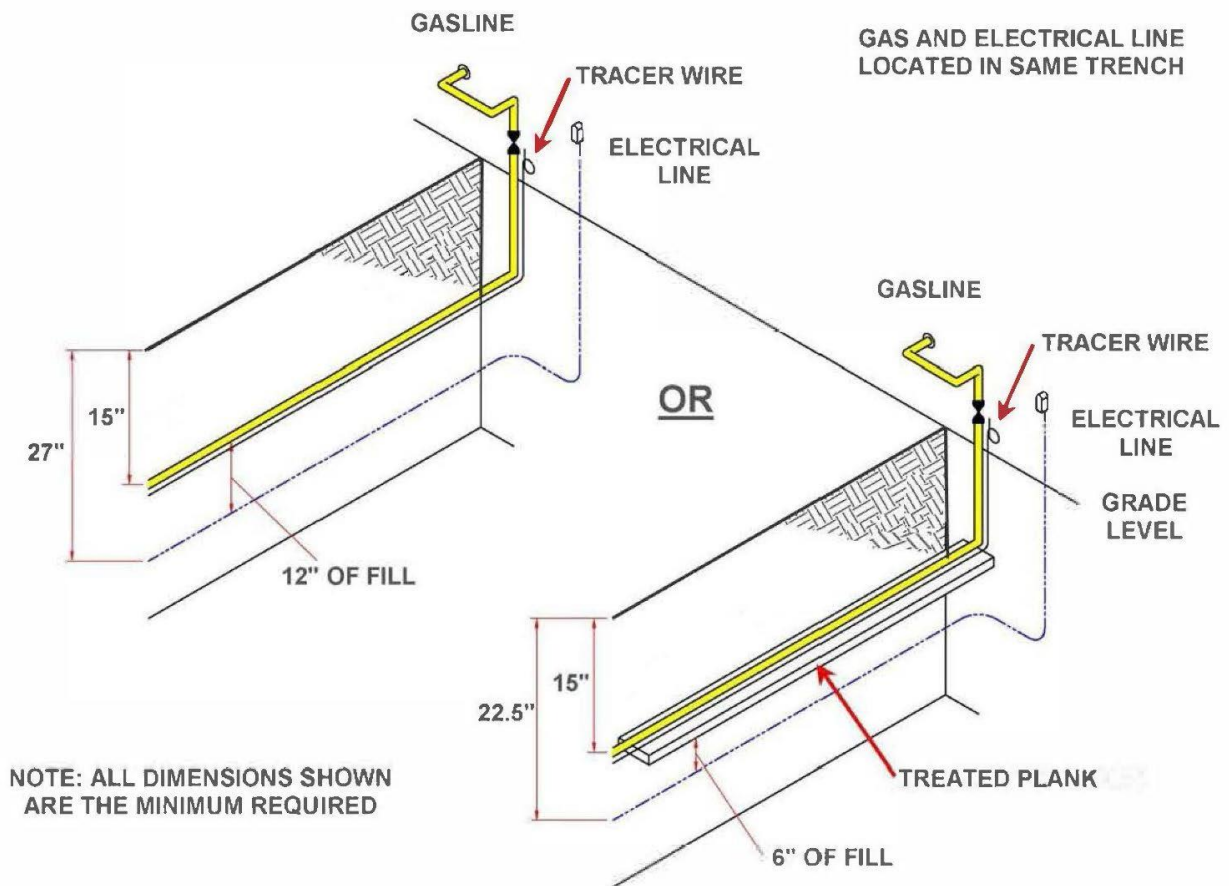
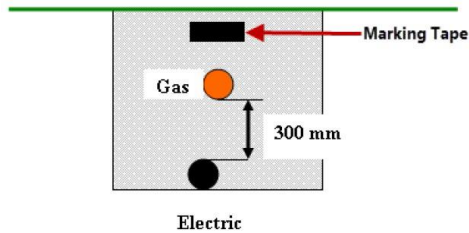


- 6.15.13.1 Shut-off valves** - The gas supply to underground piping or tubing shall be controlled by a shut-off valve located above ground near the point of entry to the ground, and by a shut-off valve located between the point of exit from the ground and the outdoor appliance or building being served. The licensed gas contractor holding the permit, under which the underground piping is installed, is responsible for ensuring that these two valves are installed.
- 6.15.14 Tracer Wire** - Non-metallic piping or tubing shall be accompanied by a minimum 14 AWG TWU copper tracer wire tracing wire. The tracer wire must be taped to the gas line using low conductivity electrician's tape at consistent [max. 16 ft (5 m)] intervals, unless pipe and tracer wire are installed by ploughing. Tracer wire terminations shall be readily accessible by attachment to service risers or equivalent above ground structures.
- 6.15.15 Swing** - A minimum 10" (250 mm) swing joint measured from center to center shall be installed at above ground connections to underground piping systems up to and including 2" in diameter. Swing joints are only effective when constructed from threaded pipe, or installed using a horizontal offset in CSST or tubing. (Welded and press-connected fittings do not provide an approved swing joint.) When using threaded pipe, the swing joint shall consist of two consecutive 90° elbows installed on a horizontal plane. When using tubing or CSST, the installer shall provide a minimum 10" (254 mm) horizontal offset.

6.15.16 Common trench - Electrical wiring may be installed in the same trench as customer-owned propane or natural gas lines provided the electrical wiring is placed at a greater depth with at least 12" (300 mm) earth separation. Clearance can be reduced to 6" (150 mm) of earth separation if a treated plank (2x4 minimum) is installed between the gas line and electrical wiring. All underground electrical installations must still have a suitable marking tape buried halfway between the cable and grade level, and the tape must extend the entire length of the trench containing the electrical cable.

References:

Electrical Inspections 2018 Saskatchewan Interpretation 12-012(11)(12), and 12-012 (13).



6.15.17 Parallel Trench - Electrical wiring may be installed in a parallel trench to customer-owned propane or natural gas lines provided the propane or natural gas lines clearance to electrical wiring is maintained at least 12" (300 mm) separation.

6.15.18 Liquid Propane - Underground piping used to conduct liquid propane is restricted to non-residential purposes and subject to these requirements:

- 1) The installation of underground liquid propane piping shall not commence until approval is granted by the local gas inspector.
- 2) Where a pump is used,
 - i) the liquid supply line shall have an automatic shut off valve (located upstream of buried piping) that will close automatically when the pump is shut off.
 - ii) vapour return piping shall comply with liquid requirements except that listed in 2 (i).
- 3) Piping risers shall be sleeved at least one size larger than the riser and shall extend from the horizontal section of the underground line to 12" (300 mm) above grade to provide for ventilation of the underground line.

6.15.19 Gas Installations in Landslide Areas

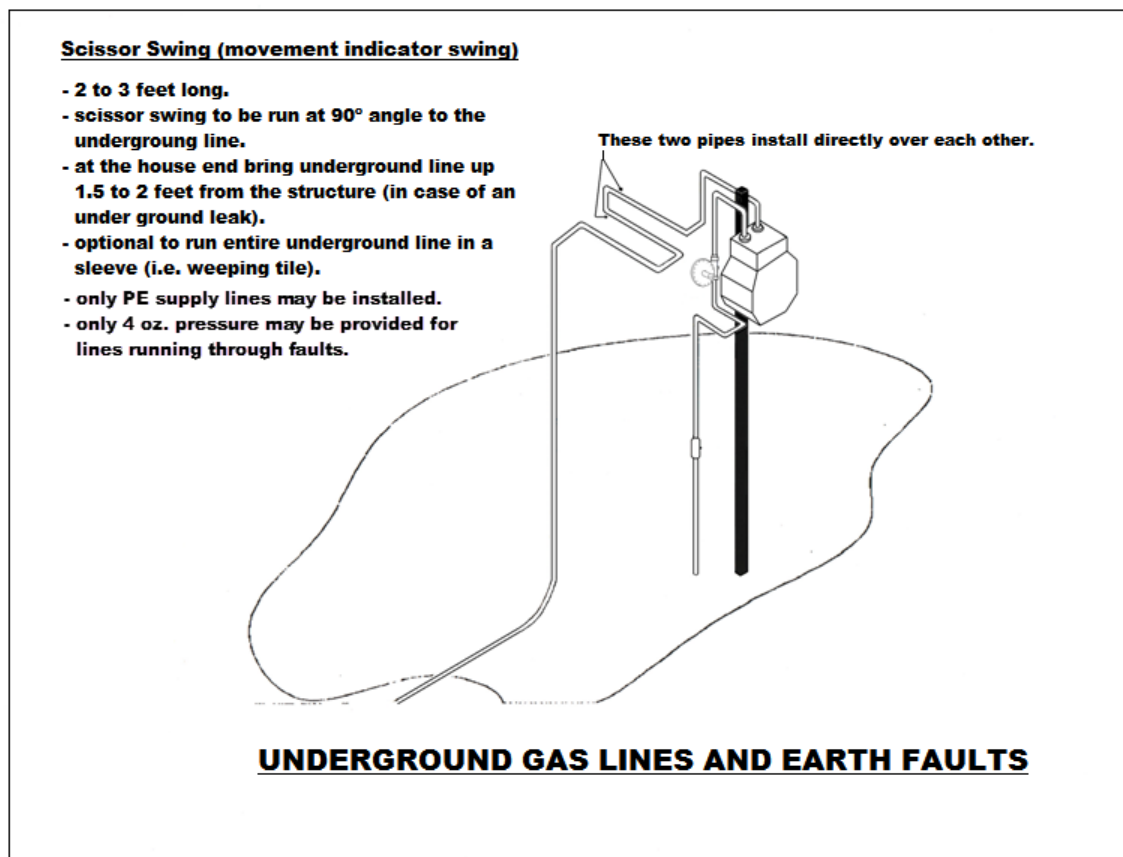
Saskatchewan has several active landslides. These are located along the valley walls of rivers and lakes.

When installing a gas service to one of these areas check with the property owner for a copy of the geotechnical report showing where the structure is placed in relation to the fault lines. The gas utility cannot pass across fault lines with their service line. This means the gas meter may be installed some distance from the building. In this case, consult with the district gas inspector to see how the four ounce pressure supply line can be routed. You will need a copy of the geotechnical report in order to have the consultation with the gas inspector.

In some cases, the gas utility will have a copy of the geotechnical report.

Do not install any underground supply lines that cross fault lines in a landslide area without the district gas inspector's approval.

An example of a swing joint used in a landslide area is shown below: Refer to Appendix J - Specifications for Service Lines through Fault Lines in Active Landslide Areas in Saskatchewan.



6.16 Protection of Piping and Tubing

6.16.1.1 Painting or Coating - All outdoor piping or tubing shall be protected by either painting or coating, except for piping and tubing in oilfield applications which must meet the owner's requirements for painting or coating.

6.16.3.1 Multi-Story Wood Structures

Multi-story wood buildings can shrink or settle as much as 0.75 inches per floor depending on moisture content and the height of the wood framing. The design and installation of gas piping in a new multi-story wood building shall include a means to accommodate for building shrinkage as well as settlement.

6.17 Identification of Piping or Tubing

6.17.1.1 Liquid Propane - At all types of facilities, all exposed or above-ground liquid propane piping and tubing shall be painted yellow or red, and shall be stenciled or marked legibly with the following information: "250 psi Liquid Propane".

6.17.4.1 Acceptable means of permanent identification of the room number, apartment number, or the area of the building served by each piping or tubing system includes:

- i) Embossed Tag - raised lettering on a stainless steel, brass or aluminum tag.
- ii) Engraved Tag - engraved lettering on a stainless steel, plastic or aluminum tag

6.17.4.2 Fastening Tags - All tags shall be fastened using an ultraviolet and corrosion resistant system such as stainless steel wire.

6.17.4.3 Unacceptable means of compliance include:

- i) "Permanent" Marker – whether or not used on a tag, wall, or piping.
- ii) Any type of Printed or Written Tag – there is no existing ink product with sufficient durability to UV degradation to be considered acceptable.
- iii) Illegible Markers or Tags.

6.18.1.1 Manual shut-off valves on liquid propane piping systems shall be certified to UL 125, or approved for use with liquid propane.

6.20 Gas Hose and Fittings

6.20.3 When a gas hose is used

- a) for permanent installation, other than agricultural or oilfield applications, it shall not exceed 10 ft (3 m) in length and shall neither extend from one room to another nor pass through any wall, partition, ceiling, or floor;
- b) to connect to mobile/manufactured homes or Park Model trailers the maximum 10 ft (3 m) in length gas hose connected to the supply utility must terminate to rigid piping at a location outside of where a skirting is currently installed, or where a skirting may be installed in future,
- c) to connect to agricultural or oilfield gas burning equipment, such as a grain dryer or treater, then the hose shall be protected from damage and shall not exceed 30 ft (9.1 m) in length.

6.21 Gas Connectors

6.21.3 Application - Except as specified in CSA B149.1-20 clause 7.23.3, a corrugated metal gas connector certified to ANSI Z21.24/CSA 6.10 may be used to connect rigid piping to a mobile/manufactured home furnace within the furnace cabinet, or to connect a water heater in a mobile/manufactured home.

6.22 Testing of Piping, Tubing, Hose and Fittings

6.22.1.1 Notification - Gas Inspections shall be notified of all underground air tests and all commercial air tests.

6.22.2.1 Low Pressure Testing - All copper and polyethylene piping systems shall be leak tested using air or inert gas (such as nitrogen) as the test medium. All steel piping systems where the test pressure generates a stress below 30% of Specified Minimum Yield Strength (SMYS) of the piping material shall be leak tested using air or inert gas as the test medium. Only under special circumstances will Gas Inspections permit liquid hydrostatic testing of piping systems, (see 6.22.2.2 regarding applications to Gas Inspections for approval to use a liquid as the test medium).

Example test pressures equating to a stress of 30% SMYS for steel piping systems are given in Appendix C.

6.22.2.2 High Pressure Testing - For test pressures exceeding a stress of 30% of SMYS:

- a) both a leak and a strength test are required following the testing requirements and limitations of CSA Z662;
- b) 100% of all welds have successfully passed radiographic inspection; and
- c) air, inert gas or liquids are permissible as the leak and strength test medium on natural gas piping, provided the test and purge procedures have been approved by the Chief Gas Inspector. Liquid freezing temperature must be significantly lower than the potential ambient temperature during the test. Purge procedures must include a liquid removal and disposal plan, and a plan for drying the gas piping system to an acceptable dewpoint of 0°F (-18°C). Liquids are not permissible as a test medium on propane piping systems.

6.22.2.3 Isolation - The pressure test described in CSA B149.1-20 clause 6.22.2 shall be conducted on the entire system isolated from all appliance connections, and isolated from all connections to live gas piping systems, utilizing positive pressure terminations, in the form of blinds, caps or plugs located at each tie-in point. Valves do not provide a positive pressure termination, and all valves in the piping system shall be in their fully open position during this pressure test.

6.22.6 Dormant piping - Where the fuel supply has been shut off to a building or equipment for a period exceeding one year, prior to reactivation the contractor shall:

- a) Air test the entire piping or tubing system downstream of the isolation point;
- b) Ensure that the appliances and venting system are safe for continued use; and
- c) Submit a Gas Permit and the appropriate fee.

6.22.7 For increase in operating pressure - Where the operating pressure of the gas piping system is being increased, the entire gas piping system affected by the change in operating pressure must be retested in compliance with CSA B149.1-20 clause 6.22., including situations where the new pressure test duplicates the parameters of the original pressure test.



6.22.8 Piping Verification - On all installations of a piping or tubing system, the installer shall complete a Piping Verification Tag and hang the tag on the gas line in an accessible location proximal to the work performed. Piping Verification Tags may be those purchased from Gas Inspections, or may be of the gas contractor's company design provided that the same information is provided at minimum.

 AIR SOAP DURATION', 'TEST DATE _____', 'This piping has been tested in accordance with B149.1 and found to be leak free.', 'GAS FITTER LICENSE # _____', 'GAS FITTER NAME _____', and 'Print'." data-bbox="180 191 692 378"/>

PIPING VERIFICATION
ADDRESS _____
CONTRACTOR _____
TEST: AIR SOAP DURATION
TEST DATE _____
This piping has been tested in accordance with B149.1 and found to be leak free.
GAS FITTER LICENSE # _____
GAS FITTER NAME _____
 Print

6.22.9 Liquid Propane Testing - The maximum operating pressure defined in the notes to Table 6.3 for liquid and vapour propane piping and tubing shall be used for material selection purposes. All liquid piping and tubing shall be tested according to the following procedure:

- a) Test Pressure shall be 250 psig.
- b) Testing medium shall be Dry Air, Nitrogen, or other inert gas.
- c) The testing apparatus shall include 2 calibrated test gauges (in accordance with 6.22.2), and shall be protected from overpressure using a certified and calibrated relief valve set at a start-to-discharge pressure of no more than 275 psig.
- d) Test Duration shall be 180 Minutes.
- e) Underground piping and tubing shall be backfilled for restraint before the test is started; with all underground piping or tubing connections left exposed for the duration of the test.
- f) The test shall include all hydrostatic relief valves which are part of the propane piping and tubing system under test.

7 INSTALLATIONS OF SPECIFIC TYPES OF APPLIANCES

7.1 Boilers

7.1.4 Boiler Venting

When a venting system is used on a condensing boiler (Category IV) it shall be ULC - S636 certified gas venting material. ULC-S636 PVC shall not be used as venting material for (Category IV) condensing boilers.

7.1.5 Requirements for Boilers not requiring registration with TSASK

These requirements apply to any boiler installation which is exempt from design registration with the Technical Safety Authority of Saskatchewan (TSASK) under the Boiler and Pressure Vessel Act and Regulations, such as;

- Low pressure boilers with heating surfaces of 32.3 ft² (3 m²) or less; or
- High pressure boilers with heating surfaces of 21.5 ft² (2 m²) or less.

- 7.1.5.1 Boiler safety controls** shall not be located or piped in such a way as to be isolated from the boiler by manual valves, check valves, or automatic valves.
- 7.1.5.2 Boiler limit controls** - All boilers shall have two limit controls. One shall act as an operating control and one shall act as a high limit safety control.
- 7.1.5.3 Pressure relief valves** shall be installed so as to stand in an upright position, with the spindle vertical and;
- discharge outlets shall extend downwards, and shall have the same internal diameter as the relief valve opening, and
 - terminate no more than 12" (300 mm), nor less than twice the internal diameter of the discharge pipe, off the floor. The end of the discharge pipe shall not be threaded or provided with a fitting, which could allow the discharge pipe to be blocked or restricted.

7.1.5.4 Boiler Low Water Cut-off (LWCO) Requirements

- 7.1.5.4.1 LWCO Conditions** – When the boiler is located above the lowest point in the heating system, a safety control to protect against low water conditions must be present as part of the certified appliance, or must otherwise be installed. See 7.1.5.5.2
- 7.1.5.4.2 LWCO Installation** - Where used, low water cut-off safety devices shall be installed and piped in the same manner as required by the Boiler and Pressure Vessels Act to allow for inspection and testing.

7.1.5.5 Boiler Installation and Operation

- 7.1.5.5.1 No flow** - Boilers designed to have burner operation with no flow conditions present shall be installed as per the manufacturer's installation instructions and any other requirements set forth by any national or local codes and jurisdictions.
- 7.1.5.5.2 Requiring flow** - A coil or fin-tube boiler requiring forced circulation to prevent overheating of the coils or tubes shall be equipped with a flow-sensing device installed integral to the unit or within the outlet piping, and the sole function of the device shall be to shut off the fuel supply when the circulating flow drops below the minimum flow rate required to prevent overheating. Where a flow sensing device is used, a separate LWCO device per 7.1.5.4.1 is not required.
- 7.1.5.5.3 Return temperature control** Boilers sensitive to low return water temperatures shall be installed and controlled in such a way as to maintain the minimum return water temperature during normal operation. Owners and/or operators shall be instructed of any requirements regarding minimum return temperature.
- 7.1.5.5.4 Temperature / Pressure monitoring** - Unless internally equipped, boiler installations shall include a minimum of two thermometers or temperature sensors located to accurately sense the water temperature inside (or leaving) the boiler and the return water temperature entering the boiler. Installations shall have a minimum of one pressure gauge located to accurately sense boiler pressure.



7.2 Generators, Compressor/Pressure Boosters, Engines and Turbines

7.2.1 General Requirements

7.2.1.9 Gas Detector - The ventilation required by CSA B149.1-20 clause 7.2.1.5 shall be interconnected with a gas detector that:

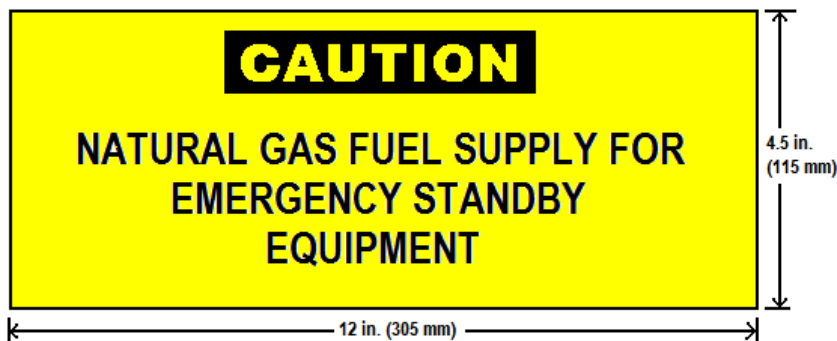
- is installed in accordance with the detector manufacturer's instructions for the type of gas;
- is set to activate at gas detection levels at and above one-fifth of the lower limit of flammability;
- upon activation, produces an audible and visual alarm; and
- is interconnected to engage the mechanical ventilation system upon alarm.

CSA B149.1-20 requirement 7.2.1.9(e) "is interlocked to shut off the appliance" is not mandatory in Saskatchewan. See Appendix F for gas detection concentration unit conversions.

7.2.1.10 Hoses – An engine shall be equipped with a gas hose certified to CAN/CSA-8.1, CAN/CSA-8.3, ULC C536, or CGA CR96, not exceeding 6 ft (2 m) in length. Where the safety shut-off valve or valves are not supplied with and mounted to the engine or engine package by the manufacturer, the gas hose shall be installed downstream of the safety shut-off valve or valves. The valve train upstream of the gas hose shall be mounted, anchored, and supported in such a manner as to minimize damage to the valve train from vibration.

7.2.3 Emergency Use Generators

7.2.3.1.1 Sign - The sign referenced in **7.2.3.1** shall conform to requirements in CSA C282, Emergency Electrical Power Supply for Buildings, or otherwise meet the following specifications:



*NOTE: The **appropriate fuel** must be identified.
Color code: lettering – black, background - yellow*

7.2.3 Additional requirements for gas engines and turbines in buildings

7.2.5.3 Examples of acceptable construction for walls with a 2 hour fire resistance rating includes:

- Brick construction – minimum 4" thick.
- Wood stud framing, 16" on centre, mineral-fibre insulated between studs and covered with gypsum board drywall, minimum 1" thickness on each side (such as two ½" thick gypsum boards, overlaid on each side).
- Minimum 2.5" thickness of gypsum drywall sandwiched between metal cladding on each side.

(Source: Appendix D of The National Building Code 2015)

7.13 Central Furnaces

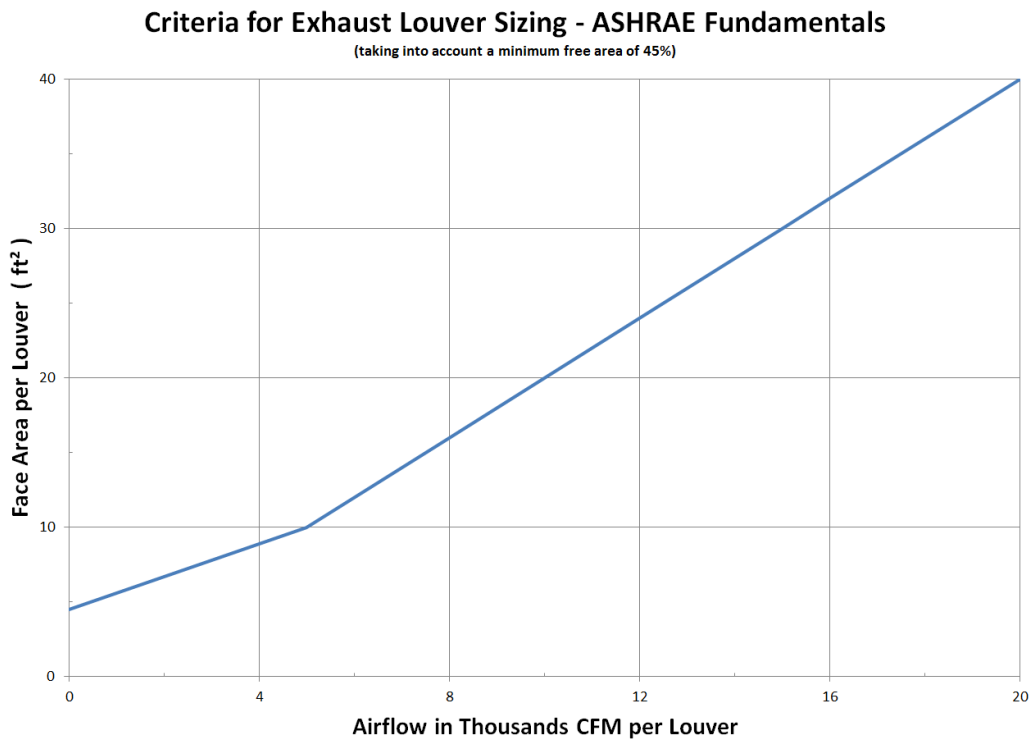
7.13.7 Access - Unless inspection access to the heat exchanger is otherwise provided by the furnace or air conditioning coil manufacturer, all furnace installations shall include a removable access panel in the supply air plenum covering an inspection opening. The opening should be located on the front of the plenum, as close as practical to the furnace cabinet, and must be large enough to permit inspection of the heat exchanger for defects. The opening shall be the full width of the plenum less 2 inches (50 mm) and at least 10 inches (250 mm) high. Where an air conditioning coil is in place, the opening shall be between the coil and the heat exchanger. Where an existing air conditioning coil restricts the clearance necessary for this access panel, the coil should be raised as *practicable to accommodate. The access panel must always be in place when the unit is in operation. When manufacturer's case coils are installed, a plenum access panel is not required.

** (where no alteration of a/c piping is required)*

7.13.8 Plenum Protection - A furnace that is permanently installed where there is only a return air filter, or warm air plenum with take offs, shall have both the return air filter and warm air plenum outlets protected against an influx of waste or discarded material.

7.21 Non-recirculating direct gas-fired industrial air heaters (DFIAH)

7.21.9.1 Relief Openings - Where the installation is dependent upon exfiltration through the building envelope or through relief openings, the structure's designed exfiltration rate and the size of relief openings shall be determined by a professional engineer. Sizing of relief opening(s), at or exceeding the critical area for the maximum airflow rating of the DFIAH, in accordance with the following graph (published in the ASHRAE Fundamentals Handbook) is considered in compliance with this requirement.



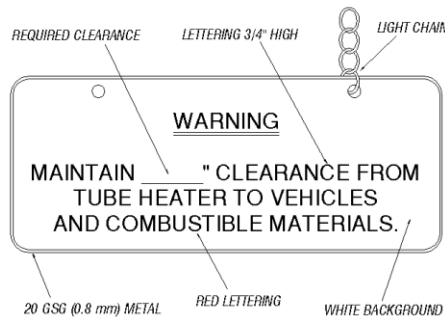
7.23 Infra-Red Heaters (Radiant)

7.23.1 Worksheet - For a worksheet to calculate compliance to code for unvented heaters in livestock and poultry barns, see Appendix K.

7.23.3(e) Clearance Sign Requirements:

A clearance sign shall be installed with all infra-red heater installations. The clearance sign may be as supplied by the heater manufacturer. In the event that a clearance sign is not supplied with the heater, or is missing, a clearance sign shall be installed following these minimum requirements:

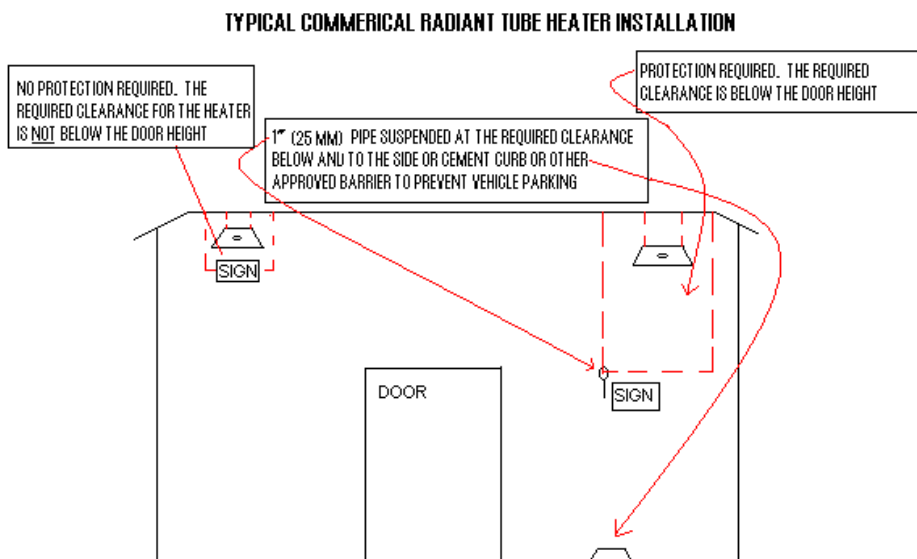
- The sign shall be not less than .020 GSG (0.8 mm) metal.
- Sign shall be prominently displayed and attached with light metal chain to the bottom edge of the reflective shield.
- Sign paint shall be heat resistant. Lettering shall be a minimum 3/4 inch (19 mm) high, red on white background, and shall contain the following information:



7.23.3(f) Acceptable means of maintaining clearance:

- photoelectric sensor which is interlocked to shut off the heater;
- cement barriers to prevent encroachment into clearance area;
- 1" (25 mm) schedule 40 black pipe hung at appropriate level; or
- other effective barriers which must receive prior approval.

Note: A clearance sign shall be installed with all installations.



7.25 Decorative Appliances and Gas Logs

7.25.1.1 Vented Gas Fireplace Heaters Installation

All gas fireplaces and heaters that are certified to CSA 2.33 Vented Gas Fireplace Heaters have special requirements when it comes to clearances to combustibles. The standards under which these fireplaces and heaters are constructed contain the definitions for "Combustible" and "Noncombustible" found in the DEFINITIONS section of this Code of Practice.

Ensure that any material placed within the zone specified by the heater/fireplace manufacturer for noncombustible material has only noncombustible material installed. As an example, cement board and steel sheets are considered noncombustible. Fire-rated drywall or gypsum wallboard is considered combustible and cannot be used in a noncombustible material zone. Any material that does not meet this strict requirement for noncombustibles will have to be replaced.

7.27 Water Heaters

7.27.8 Requirements for Water Heaters Used with Combination Space Heating Systems

(an installation that combines both potable hot water and hydronic space heating)

7.27.8.1 Certification - Only water heaters certified for use in a combination space heating system shall be used. Water heaters shall not be used in a space heating only application.

7.27.8.2 Connection - Side or bottom connections on water heaters shall not be used in combination space heating system applications unless specifically allowed in the manufacturer's instructions.

7.27.8.3 Circulator - A combination space heating system shall have a timed circulator rated for potable water use to fully circulate the water on the space-heating loop back to the water heater every 24 hours.

7.27.8.4 Heat Exchanger - A heat exchanger that is rated for potable water use shall be used to transfer heat between the potable water and the heating fluid when a non-potable heating fluid is used in the space heating system.

7.27.8.5 Requirements - When a heat exchanger is used, the following requirements shall apply:

- a) A device shall be installed to automatically maintain the operating pressure of the hydronic heating (secondary) loop lower than that of the potable water (primary) loop.
- b) The gas contractor shall affix a prominent and permanent label to the pressure relief valve in the hydronic heating loop advising that the heat exchanger shall be examined in the event of a pressure relief valve discharge.
- c) Isolation valves shall be installed on the piping inlets and outlets of the heat exchanger.
- d) A timed circulator rated for potable water use shall be installed to fully circulate the water on the potable water loop back to the water heater every 24 hours.
- e) When temperatures greater than 140°F (60°C) are required in the space heating loop, a thermostatic mixing valve shall be installed to ensure that the potable water does not exceed 140°F (60°C).
- f) The hydronic heating loop shall require the following additional components:
 - i) a pressure relief valve capable of protecting the lowest rated component of the system;
 - ii) an expansion tank
 - I. rated for use in a hydronic system for the maximum system temperature and pressure, and
 - II. set to the system fill pressure.



- iii) a back-flow prevention device if potable feed water piping is attached;
- iv) a pressure gauge;
- v) temperature gauges located on the supply and on the return;
- vi) a circulator; and
- vii) an air eliminator.

7.27.9 Gas Water Heaters in Mobile/Manufactured Homes

All water heaters installed or replaced in these units Mobile/Manufactured Homes shall conform to the following specifications:

- a) Water heaters shall be certified for installation in a mobile/manufactured home per clause 4.8.1, unless the wheels, axels, and towing hitch have been removed per clause 4.8.2, then clause 4.8.3 applies.
- b) When installed, storage water heaters shall be secured to the floor at two legs, and the top of the heater is to be secured with a bracket from a wall. Specified clearances are to be maintained.
- c) For draft hooded or power vented water heaters, the water heater shall be installed in an enclosure which provides complete separation of the heater from the air within the home.
- d) Access to the heater may be either from outside the home or inside the home providing the door is tight fitting.
- e) For draft hooded water heaters, the heater enclosure shall be provided with a minimum of two screened openings to outdoors, each with a minimum area of 7 square inches [3" (75 mm) in diameter].
 - i) The upper opening is to be taken through the ceiling or within 18" (450 mm) of the ceiling, ensuring it is above the relief opening of the draft hood.
 - ii) The lower opening is to be taken through the floor or through an outside wall not exceeding 6" (150 mm) above the floor.
- f) Power vented water heaters require a combustion air opening to the outdoors per e) ii) above.
- g) Direct vented (sealed combustion) water heaters are permissible where clause 4.8.3 applies.



8 VENTING SYSTEMS AND AIR SUPPLY FOR APPLIANCES

8.9.6.1 Installation of Plastic S636 Venting - When installing S636 pipe and fittings from a manufacturer that requires a primer to be used at a specified ambient temperature, the certified primer shall be used, regardless of the ambient temperature.

8.10 Methods of Venting Appliances

8.10.3.1 Sidewall Venting - All unit heaters being installed with sidewall venting in a residential attached garage must use certified Category III venting material (typically stainless steel). Type BH vents are certified for Category III venting. Category III venting is a positive pressure, non-condensing application.

8.10.4.1 Adhesives - ULC S636 PVC and CPVC glues, primers, pipe and fittings must be used only with the compatible companion products in order to be certified as a venting system. Inter-mixing of glues, primers, pipe or fittings from various manufacturers in any combination is prohibited. For compatibility information, refer to the manufacturer's installation instructions.

8.11 Chimney and Vent Clarifications

a) Chimneys

Prefabricated Type A chimneys shall not be installed to vent gas fired appliances with a stack temperature less than 470° F (245°C).

Chimneys - When connected to a gas appliance, masonry, concrete, brick and tile chimneys shall be lined with an approved metal chimney liner. A lined chimney shall be provided with an accessible inspection opening. An inspection opening shall be of such construction that it will remain tightly closed when not in use to prevent entrance of air into the chimney at that point.

b) Type B Vents

To be used for venting any appliances certified for use with Type B gas vent having a flue temperature not less than 275°F (135°C) and not exceeding 470°F (245°C).

c) Existing Tile Lined Masonry Chimneys (Sound Condition)

- i) No change required when used to vent a furnace or boiler and the **water heater only** is replaced.
- ii) Install a metal liner in accordance with section (g) or a Type B gas vent when the **central heating appliance** is replaced (draft hood equipped or fan assisted).
- iii) If oversized (water heater only) - reduce in size in accordance with code requirements and use a metal liner in accordance with section (g) or a Type B gas vent.

d) Masonry Chimneys with Existing Metal Liner SOUND CONDITION

If properly sized, interior located masonry chimneys may be used to vent:

- i) Draft hood equipped appliances; or
- ii) Fan assisted appliances.



e) Exterior Masonry Chimneys

When removing the largest (or major) Category I gas appliance vented into an exterior masonry chimney, the masonry chimney may not continue to be used unless it is lined with a properly sized B vent, L vent or an approved liner.

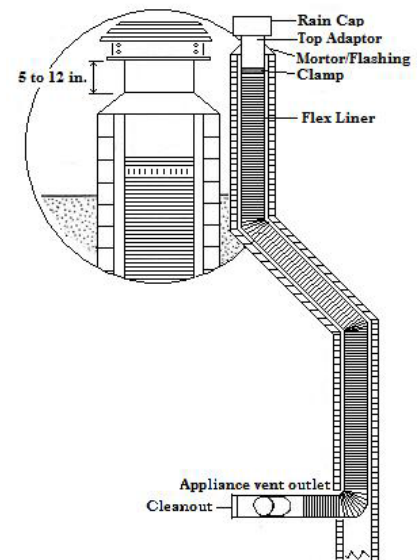
f) Existing Type A Factory Built Metal Chimneys and Other Insulated metal chimneys:

- i) If in **sound condition** may continue to be used to vent a furnace or boiler and the water heater, when the water heater **only** is replaced.
- ii) Replacement of central heating appliances of the draft hood or fan assisted types shall be vented into a Type B gas vent or approved chimney liner.
- iii) When the furnace is replaced with a sidewall vented appliance and the water heater is the only appliance left to vent into the class "A", the chimney shall be down sized as per table C1 or C2.
- iv) If oversized (water heater only), reduce in size in accordance with code requirements and use a certified B vent or approved chimney liner. When the water heater only is in an oversized Type "A" chimney and the water heater is replaced, the chimney shall be replaced as per table C1 or C2.
- v) When an existing Type "A" chimney is found to be unsound or defective (collapsing), it shall be replaced with a Type "B" vent and sized as per the vent tables.

Note: Replacement components of Type A metal chimneys are no longer approved in Saskatchewan. Chimneys with defects must be replaced with a certified Type B gas vent.

g) Chimney Liners and Vent Connectors

- i) Aluminum flexible chimney liners and flexible vent connectors shall be certified for the application of intended use.
- ii) For downsizing an existing Class A chimney in sound condition or a B-Vent in sound condition, a flexible liner certified for use in a factory-built chimney, a solid liner or a B-Vent may be used. The existing Class A chimney does not need to be reduced in height.
- iii) When a solid aluminum vent pipe is used to line or downsize a masonry chimney, a Class A chimney or a type B gas vent or as vent connectors the following wall thicknesses shall be used;
 - a. 3" (75 mm) to 12" (300 mm) must be minimum .025 inches (0.64 mm, or 22 gauge)
 - b. 13" (325 mm) to 20" (500 mm) must be minimum .032 inches (0.81 mm, or 20 gauge)
- iv) Shop fabricated aluminum square liner is permissible where required.
- v) All liners shall be installed with the crimped end down. All joints in liners are to be fastened with stainless steel screws or aluminum or stainless steel rivets.
- vi) Liners that exceed the specifications in the venting tables are subject to good engineering practices.



- vii) Aluminum venting and liners may only be used for gas-fired appliances producing flue gas temperatures of more than 275°F (135°C) but not more than 470°F (245°C).
- viii) Where the manufacturer's appliance installation instruction calls for heavier or thicker vents or vent connectors, the Manufacturer's instructions shall be followed.

h) Chimney Liner Insulation

The use of puffed mica, zonolite, etc. to insulate the space between the liner and the chimney is prohibited. If you encounter it on an existing installation, please advise the owner to remove it.

8.12.10(a) Vent Cap - Where a vent cap is installed as part of a lining system, adequate space must be provided between the flashing and vent cap to prevent a buildup of ice which could block the flow of products of combustion. Clearance between flashing and vent cap shall be between 5" (125 mm) and 12" (300 mm).

8.13.4 DP Column - All residential vents or chimneys shall be sized using the "DP" column in the tables in Annex C of the CSA B149.1.

8.14 Vent and Chimney Termination (see also Appendix B)

8.14.8 A vent shall not terminate:

- h) (iii) The 1 ft (300 mm) min. clearance to the underside of the veranda, porch or deck shall be measured from the top of the vent to the bottom of the joists.
- i) Through a sidewall above a pedestrian doorway.
- j) Less than 4 ft. (1.2 m) beneath a ventilated soffit unless specified as per the manufacturer's instructions. For unvented soffits follow manufacturer's installation instructions.

8.14.14 A vent from a Category IV appliance:

- (a) shall not pass through an exterior wall and terminate adjacent to the exterior wall unless there is a minimum unobstructed distance of 4 ft. (1.2m) or greater from the foundation to the property line.
- (b) that terminates into a side yard which measures not less than 4 ft. (1.2m), and not greater than 8 ft. (2.4m), from the foundation wall to the property, shall have a means of redirecting the vent plume with a certified fitting such as a tee, a 90 degree elbow or a termination acceptable to the Authority Having Jurisdiction, installed in accordance with the manufacturer's installation instructions.
- (c) that terminates into a side yard which measures greater than 8 ft. (2.4m), from the foundation wall to the property will not require redirection.

Note: The above requirements do not apply to locations where adjoining properties are public spaces such as roadways, alleyways, walkways or parks where structures would not normally be erected. All installations are subject to CSA B149.1-20 clause 8.14.8(a) and S.C.O.P clause 8.14.15.

8.14.15 Ice and frost - In all appliance installations the vent shall not be installed so that ice and frost can accumulate and have the potential to cause damage to property.

8.24.5 Unvented heaters - For a worksheet to calculate compliance to code for unvented heaters in livestock and poultry barns, see Appendix K.



8.30 Venting of Appliances into Canopies

8.30.5 Applications - The practice of permitting an exhaust hood to act as the venting of appliances that require venting is now restricted to only those appliances with flue outlets located directly under the exhaust hood per CSA B149.1-20 clause 8.30.1(c). The past practice of locating an appliance adjacently and venting this appliance horizontally by cutting into, or terminating the vent under, an exhaust hood is not permitted.

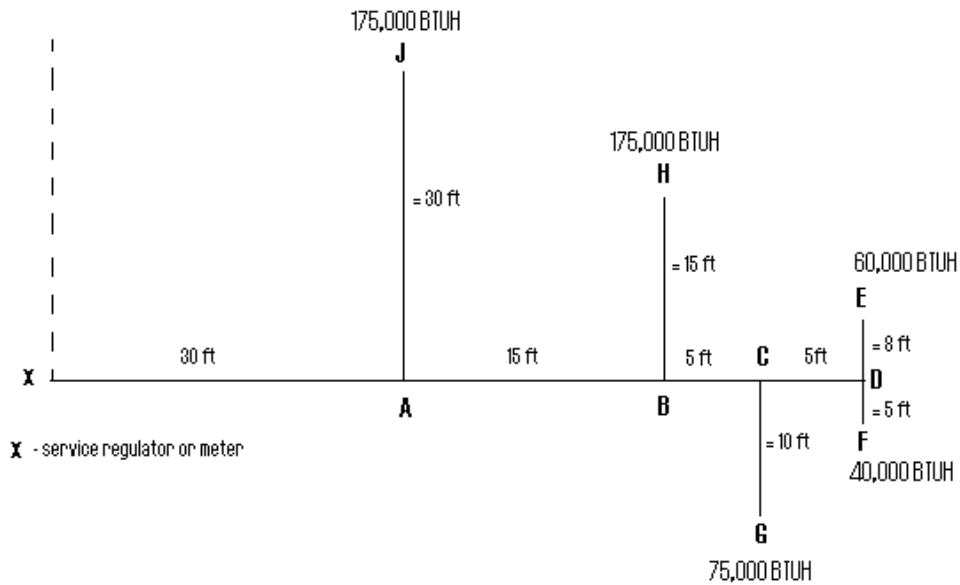
APPENDIX A – SIZING

Actual Length/Actual Load

Pipe Sizing Method Example (Imperial)

Step #	Actual Distance	Actual Load (BTU/H)	<u>Natural Gas:</u> Pressure 7" WC Specific Gravity = 0.6 Pressure Drop = 0.5" WC Table A-1.1 (B149.1-M95) Minimum Pipe Size Required	<u>Propane:</u> Pressure 11" WC Specific Gravity = 1.52 Pressure Drop = 1" WC Table A-1.1 (B149.2 M95) Minimum Pipe Size Required
1	X to F = 60 ft	40,000 at F	½ in. D to F	½ in. D to F
2	X to E = 63 ft	60,000 at E	¾ in. D to E	½ in. D to E
3	X to D = 55 ft	100,000 at D (E + F)	¾ in. C to D	½ in. C to D
4	X to G = 60 ft	75,000 at G	¾ in. C to G	½ in. C to G
5	X to C = 50 ft	175,000 at C (E+F+G)	1 in. B to C	¾ in. B to C
6	X to H = 60 ft	175,000 at H	1 in. B to H	¾ in. B to H
7	X to B = 45 ft	350,000 at B (E+F+G+H)	1 ¼ in. A to B	1 in. A to B
8	X to J = 60 ft	175,000 at J	1 in. A to J	¾ in. A to J
9	X to A = 30 ft	525,000 Total Load	1 ¼ in. X to A	1 in. X to A

**EXAMPLE OF PIPING DESIGN SIZING
(IMPERIAL MEASUREMENTS)**



Actual Length/Actual Load

Pipe Sizing Method Example (Metric)

Step #	Actual Distance (Meter)	Actual Load (Kilowatt)	<u>Natural Gas:</u> Pressure 1.75 KPa Specific Gravity = 0.6 Pressure Drop = 125 Pa Table A-1.1 (B149.1-05) Minimum Pipe Size Required	<u>Propane:</u> Pressure 2.7 KPa Specific Gravity = 1.52 Pressure Drop = 250 Pa Table A-1.1 (B149.1-05) Minimum Pipe Size Required
1	X to F = 17.4 m	12 kW at F	12.5 mm. D to F	12.5 mm. D to F
2	X to E = 17.9 m	18 kW at E	19 mm. D to E	12.5 mm. D to E
3	X to D = 16.5 m	29 kW at D (E+F)	19 mm. C to D	12.5 mm. C to D
4	X to G = 18 m	22 kW at G	19 mm. C to G	12.5 mm. C to G
5	X to C = 15 m	51 kW at C (E+F+G)	25 mm. B to C	19 mm. B to C
6	X to H = 18 m	51 kW at H	25 mm. B to H	19mm. B to H
7	X to B = 13.5 m	103 kW at B (E+F+G+H)	31.75 mm. A to B	25 mm. A to B
8	X to J = 18 m	51 kW at J	25 mm. A to J	19 mm. A to J
9	X to A = 9 m	152 kW -Total Load	31.75 mm. X to A	25 mm. X to A

EXAMPLE OF PIPING DESIGN SIZING (METRIC MEASUREMENTS)

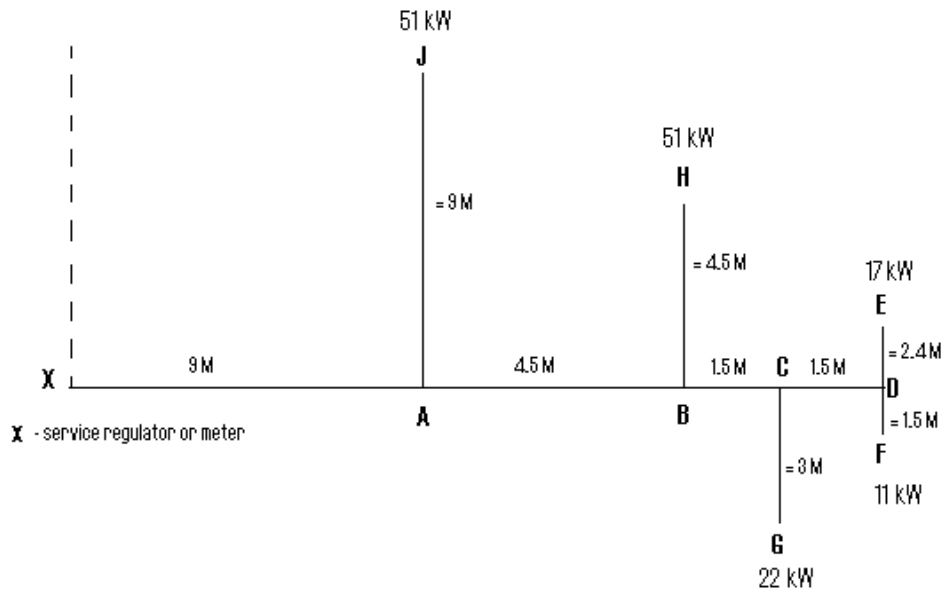


Table A.1 c) [Sch 80]

Table A.1 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for inlet pressure of 7 in w.c. based on a pressure drop of 0.5 in w.c.									
Length of pipe ft	Pipe Size (NPS)								
	"1/2"	"3/4"	1	"1-1/4"	"1-1/2"	2	"2-1/2"	3	4
10	N/A	248	479	1034	1569	3057	4930	8818	18195
20	N/A	170	329	711	1078	2101	3388	6060	12505
30	N/A	137	264	571	866	1687	2721	4867	10042
40	N/A	117	226	489	741	1444	2329	4165	8595
50	N/A	104	200	433	657	1280	2064	3692	7618
60	N/A	94	182	392	595	1159	1870	3345	6902
70	N/A	87	167	361	547	1067	1720	3077	6350
80	N/A	81	155	335	509	992	1601	2863	5907
90	N/A	75	146	315	478	932	1502	2686	5543
100	N/A	71	138	298	452	879	1419	2537	5236
125	N/A	63	122	264	400	780	1257	2249	4640
150	N/A	57	111	239	363	706	1139	2037	4204
175	N/A	52	102	220	334	650	1048	1875	3868
200	N/A	49	94	204	310	605	975	1744	3598
250	N/A	43	84	181	275	536	864	1545	3189
300	N/A	40	76	164	249	486	783	1400	2889
350	N/A	36	70	151	229	447	720	1288	2659
400	N/A	33	65	140	213	416	670	1199	2473
450	N/A	32	61	132	200	390	629	1125	2320
500	N/A	30	58	125	189	368	594	1062	2192
600	N/A	27	52	113	171	333	538	962	1986
700	N/A	25	48	104	158	307	495	886	1827
800	N/A	23	44	97	147	286	461	824	1700
900	N/A	22	42	91	138	268	432	773	1595
1000	N/A	21	40	85	129	253	408	730	1507
1200	N/A	18	36	78	118	229	370	661	1365
1400	N/A	17	33	71	108	211	340	609	1255
1600	N/A	16	30	66	100	197	316	566	1168
1800	N/A	15	29	62	95	184	297	531	1096
2000	N/A	14	27	59	90	174	281	501	1035



Table A.2 c) [Sch 80]

Table A.2 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressures over 7 in w.c. up to 14 in w.c. based on a pressure drop of 1 in w.c.									
Length of pipe ft	Pipe Size (NPS)								
	"1/2"	"3/4"	1	"1-1/4"	"1-1/2"	2	"2-1/2"	3	4
10	N/A	360	697	1505	2282	4448	7173	12830	26473
20	N/A	248	479	1034	1569	3057	4930	8818	18195
30	N/A	199	385	831	1259	2454	3959	7081	14612
40	N/A	170	329	711	1078	2101	3388	6060	12505
50	N/A	151	292	630	955	1862	3003	5372	11083
60	N/A	137	264	571	866	1687	2721	4867	10042
70	N/A	126	243	525	796	1552	2503	4477	9239
80	N/A	117	226	489	741	1444	2329	4165	8595
90	N/A	110	212	458	695	1355	2185	3908	8064
100	N/A	104	200	433	657	1280	2064	3692	7618
125	N/A	92	178	384	582	1134	1829	3272	6751
150	N/A	84	161	348	527	1027	1658	2964	6117
175	N/A	77	148	320	485	946	1525	2727	5628
200	N/A	71	138	298	452	879	1419	2537	5236
250	N/A	63	122	264	400	780	1257	2249	4640
300	N/A	57	111	239	363	706	1139	2037	4204
350	N/A	52	102	220	334	650	1048	1875	3868
400	N/A	49	94	204	310	605	975	1744	3598
450	N/A	46	89	192	291	567	915	1637	3376
500	N/A	43	84	181	275	536	864	1545	3189
600	N/A	40	76	164	249	486	783	1400	2889
700	N/A	36	70	151	229	447	720	1288	2659
800	N/A	33	65	140	213	416	670	1199	2473
900	N/A	32	61	132	200	390	629	1125	2320
1000	N/A	30	58	125	189	368	594	1062	2192
1200	N/A	27	52	113	171	333	538	962	1986
1400	N/A	25	48	104	158	307	495	886	1827
1600	N/A	23	44	97	147	286	461	824	1700
1800	N/A	22	42	91	138	268	432	773	1595
2000	N/A	21	40	85	129	253	408	730	1507



Table A.3 c) [Sch 80]

Table A.3 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressure of 2 psig based on a pressure drop of 1 psig									
Length of pipe ft	Pipe Size (NPS)								
	"1/2"	"3/4"	1	"1-1/4"	"1-1/2"	2	"2-1/2"	3	4
10	N/A	2289	4425	9551	14485	28232	45535	81443	168050
20	N/A	1573	3041	6564	9955	19404	31295	55976	115499
30	N/A	1263	2442	5272	7995	15582	25131	44950	92751
40	N/A	1081	2090	4512	6843	13337	21509	38471	79382
50	N/A	958	1853	3998	6064	11820	19063	34096	70355
60	N/A	868	1679	3623	5495	10709	17273	30894	63747
70	N/A	799	1544	3333	5055	9852	15891	28422	58646
80	N/A	743	1437	3101	4703	9166	14783	26442	54559
90	N/A	697	1348	2909	4412	8600	13870	24809	51191
100	N/A	659	1273	2748	4168	8124	13102	23434	48355
125	N/A	584	1129	2435	3694	7200	11612	20770	42856
150	N/A	529	1023	2207	3347	6523	10521	18819	38831
175	N/A	486	941	2030	3079	6002	9680	17313	35724
200	N/A	453	875	1888	2864	5583	9005	16106	33234
250	N/A	401	775	1674	2539	4948	7981	14275	29455
300	N/A	363	703	1517	2301	4484	7231	12934	26688
350	N/A	334	647	1396	2117	4125	6653	11899	24552
400	N/A	311	601	1298	1969	3837	6189	11070	22842
450	N/A	292	565	1218	1848	3600	5807	10386	21432
500	N/A	276	533	1150	1745	3401	5485	9811	20244
600	N/A	250	483	1042	1581	3082	4970	8890	18342
700	N/A	230	445	959	1454	2835	4572	8179	16875
800	N/A	214	413	892	1353	2638	4253	7608	15699
900	N/A	201	388	837	1270	2475	3991	7139	14730
1000	N/A	189	367	790	1199	2338	3770	6743	13914
1200	N/A	172	332	717	1086	2118	3416	6109	12606
1400	N/A	158	306	659	999	1949	592	5621	11598
1600	N/A	147	284	613	930	1813	2923	5229	10790
1800	N/A	138	267	576	872	1701	2743	4906	10123
2000	N/A	130	252	544	824	1607	2591	4635	9563



Table A.4 c) [Sch 80]

Table A.4 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressure of 2 psig based on a pressure drop of 1.5 psig									
Length of pipe ft	Pipe Size (NPS)								
	"1/2"	"3/4"	1	"1-1/4"	"1-1/2"	2	"2-1/2"	3	4
10	N/A	2826	5465	11794	17887	34863	56228	100569	207514
20	N/A	1943	3756	8106	12293	23961	38644	69121	142623
30	N/A	1560	3015	6509	9872	19242	31033	55506	114532
40	N/A	1335	2581	5571	8449	16468	26560	47506	98025
50	N/A	1183	2288	4938	7488	14596	23540	42104	86877
60	N/A	1072	2072	4474	6785	13225	21329	38150	78717
70	N/A	986	1907	4116	6242	12167	19622	35097	72419
80	N/A	917	1774	3829	5807	11318	18255	32651	67372
90	N/A	861	1665	3592	5449	10620	17128	30635	63212
100	N/A	813	1572	3394	5147	10031	16179	28938	59710
125	N/A	720	1394	3008	4562	8891	14339	25647	52920
150	N/A	653	1263	2725	4133	8056	12992	23238	47949
175	N/A	601	1161	2507	3802	7411	11953	21379	44112
200	N/A	559	1080	2332	3537	6895	11120	19888	41039
250	N/A	496	958	2067	3135	6110	9855	17627	36371
300	N/A	449	868	1873	2840	5536	8929	15971	32956
350	N/A	413	799	1723	2614	5094	8215	14693	30319
400	N/A	384	743	1603	2431	4738	7642	13670	28205
450	N/A	360	697	1504	2281	4446	7171	12825	26465
500	N/A	340	658	1421	2155	4200	6774	12115	24998
600	N/A	309	597	1287	1952	3805	6137	10977	22650
700	N/A	283	548	1184	1796	3501	5646	10099	20837
800	N/A	264	510	1102	1671	3257	5253	9395	19385
900	N/A	248	479	1034	1568	3056	4928	8815	18189
1000	N/A	234	452	977	1481	2886	4655	8327	17181
1200	N/A	212	410	885	1342	2615	4218	7545	15567
1400	N/A	195	377	814	1234	2406	3880	6941	14322
1600	N/A	182	351	757	1149	2239	3610	6457	13323
1800	N/A	170	329	710	1077	2100	3387	6059	12501
2000	N/A	161	311	671	1018	1984	3199	5722	11809



Table A.5 c) [Sch 80]

Table A.5 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressure of 5 psig based on a pressure drop of 2.5 psig									
Length of pipe ft	Pipe Size (NPS)								
	"1/2"	"3/4"	1	"1-1/4"	"1-1/2"	2	"2-1/2"	3	4
10	N/A	4450	8602	18567	28158	54883	88516	158323	326682
20	N/A	3058	5912	12761	19353	37721	60837	108814	224527
30	N/A	2456	4748	10248	15541	30291	48854	87381	180303
40	N/A	2102	4064	8771	13302	25926	41813	74787	154316
50	N/A	1863	3601	7773	11788	22977	37058	66283	136767
60	N/A	1688	3263	7043	10681	20819	33578	60056	123921
70	N/A	1553	3002	6480	9826	19153	30891	55252	114006
80	N/A	1445	2793	6028	9142	17818	28738	51400	106061
90	N/A	1355	2620	5656	8577	16719	26964	48228	99513
100	N/A	1281	2475	5342	8102	15792	25469	45556	93999
125	N/A	1135	2193	4735	7181	13996	22573	40375	83310
150	N/A	1028	1987	4290	6506	12681	20453	36583	75485
175	N/A	946	1828	3947	5986	11667	18816	33656	69445
200	N/A	880	1701	3672	5568	10854	17505	31310	64605
250	N/A	780	1508	3255	4935	9620	15514	27750	57258
300	N/A	707	1366	2949	4472	8716	14057	25143	51881
350	N/A	650	1257	2713	4114	8019	12933	23131	47729
400	N/A	605	1169	2524	3827	7460	12031	21519	44403
450	N/A	568	1097	2368	3591	6999	11289	20191	41662
500	N/A	536	1037	2237	3392	6612	10663	19072	39354
600	N/A	486	939	2026	3073	5990	9661	17281	35657
700	N/A	447	863	1865	2828	5511	8888	15898	32804
800	N/A	416	803	1734	2630	5127	8269	14790	30518
900	N/A	390	754	1628	2468	4811	7759	13877	28633
1000	N/A	369	712	1538	2331	4544	7329	13108	27047
1200	N/A	334	645	1393	2112	4117	6640	11877	24507
1400	N/A	307	594	1282	1943	3788	6109	10926	22546
1600	N/A	286	552	1192	1808	3524	5683	10165	20975
1800	N/A	268	518	1118	1697	3306	5332	9537	19680
2000	N/A	253	490	1056	1602	3123	5037	9009	18589

Table A.6 c) [Sch 80]

Table A.6 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressures of 10 psig based on a pressure drop of 5 psig									
Length of pipe ft	Pipe Size (NPS)								
	1/2	3/4	1	1-1/4	1-1/2	2	"2-1/2"	3	4
10	N/A	7155	13834	29859	45284	88263	142352	254614	525370
20	N/A	4918	9508	20522	31123	60663	97838	174995	361084
30	N/A	3950	7635	16480	24993	48714	78567	140527	289963
40	N/A	3380	6535	14105	21391	41693	67244	120273	248171
50	N/A	2996	5792	12501	18958	36952	59597	106595	219949
60	N/A	2715	5248	11327	17178	33481	53999	96583	199290
70	N/A	2497	4828	10421	15803	30802	49678	88855	183344
80	N/A	2323	4491	9694	14702	28656	46216	82663	170566
90	N/A	2180	4214	9095	13795	26887	43363	77560	160037
100	N/A	2059	3980	8592	13030	25397	40961	73263	151169
125	N/A	1825	3528	7615	11549	22509	36303	64931	133979
150	N/A	1654	3196	6899	10464	20394	32892	58833	121395
175	N/A	1521	2941	6348	9626	18763	30261	54125	111682
200	N/A	1415	2736	5905	8956	17455	28152	50353	103898
250	N/A	1254	2425	5233	7937	15470	24950	44627	92083
300	N/A	1136	2197	4742	7192	14017	22607	40435	83434
350	N/A	1046	2021	4362	6616	12896	20798	37200	76758
400	N/A	973	1881	4058	6155	11997	19349	34607	71409
450	N/A	913	1764	3808	5775	11256	18154	32471	67000
500	N/A	862	1667	3597	5455	10633	17148	30672	63288
600	N/A	781	1510	3260	4943	9634	15538	27791	57343
700	N/A	718	1389	2999	4548	8863	14294	25567	52755
800	N/A	669	1292	2790	4231	8245	13298	23785	49078
900	N/A	627	1213	2617	3969	7736	12477	22317	46049
1000	N/A	593	1145	2472	3749	7308	11786	21080	43497
1200	N/A	537	1038	2240	3397	6621	10679	19101	39412
1400	N/A	494	955	2061	3125	6092	9824	17572	36258
1600	N/A	460	888	1917	2907	5667	9140	16348	33732
1800	N/A	431	833	1799	2728	5317	8576	15338	31649
2000	N/A	407	787	1699	2577	5022	8101	14488	29896



Table A.7 c) [Sch 80]

Table A.7 c) Maximum capacity of natural gas in thousands of Btu/h for Schedule 80 pipe and plastic pipe for pressures of 20 psig based on a pressure drop of 10 psig									
Length of pipe ft	Pipe Size (NPS)								
	1/2	3/4	1	1-1/4	1-1/2	2	"2-1/2"	3	4
10	N/A	12187	23561	50855	77125	150326	242447	433646	894785
20	N/A	8376	16194	34953	53008	103318	166633	298042	614981
30	N/A	6727	13004	28068	42567	82968	133812	239339	493851
40	N/A	5757	11130	24023	36432	71010	114526	204843	422673
50	N/A	5103	9864	21290	32289	62934	101502	181549	374607
60	N/A	4623	8938	19291	29256	57023	91968	164497	339421
70	N/A	4253	8223	17747	26915	52461	84610	151334	312263
80	N/A	3957	7649	16511	25039	48805	78713	140787	290501
90	N/A	3713	7178	15491	23494	45792	73854	132096	272568
100	N/A	3507	6780	14633	22192	43255	69762	124777	257465
125	N/A	3108	6008	12969	19669	38336	61829	110588	228187
150	N/A	2816	5444	11751	17821	34735	56021	100200	206754
175	N/A	2591	5008	10811	16395	31956	51539	92183	190211
200	N/A	2410	4660	10057	15253	29728	47947	85759	176955
250	N/A	2136	4129	8913	13518	26348	42494	76007	156831
300	N/A	1936	3742	8076	12248	23873	38503	68867	142101
350	N/A	1781	3442	7430	11268	21963	35422	63357	130731
400	N/A	1657	3203	6913	10483	20432	32954	58942	121620
450	N/A	1554	3005	6485	9836	19171	30920	55303	114112
500	N/A	1468	2838	6126	9291	18109	29206	52239	107790
600	N/A	1330	2572	5551	8418	16408	26463	47332	97665
700	N/A	1224	2366	5107	7745	15095	24346	43545	89851
800	N/A	1138	2201	4751	7205	14043	22649	40510	83589
900	N/A	1069	2065	4458	6760	13176	21251	38009	78429
1000	N/A	1009	1951	4211	6385	12446	20074	35903	74083
1200	N/A	914	1767	3815	5786	11277	18187	32531	67125
1400	N/A	841	1626	3510	5323	10375	16732	29928	61753
1600	N/A	783	1512	3265	4952	9652	15566	27843	57450
1800	N/A	734	1420	3064	4646	9056	14606	26123	53903
2000	N/A	694	1341	2894	4389	8554	13796	24676	50917



**Table A.18 a) [3 psig]
Table A.18 a)**

Maximum capacity of natural gas in thousands of Btu/h for Schedule 40 pipe and plastic pipe, including fittings, for pressures of 3 psig based on a pressure drop of 2 psig

Length (ft)	Pipe Diameter (NPS)								
	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4
10	2,131	4,455	8,393	17,231	25,817	49,721	79,247	140,095	285,749
20	1,464	3,062	5,768	11,843	17,744	34,173	54,466	96,286	196,394
30	1,176	2,459	4,632	9,510	14,249	27,442	43,738	77,321	157,711
40	1,006	2,105	3,964	8,139	12,195	23,487	37,434	66,177	134,980
50	892	1,865	3,514	7,214	10,808	20,816	33,177	58,652	119,630
60	808	1,690	3,184	6,536	9,793	18,861	30,061	53,143	108,394
70	744	1,555	2,929	6,013	9,010	17,352	27,656	48,890	99,721
80	692	1,446	2,725	5,594	8,382	16,142	25,728	45,483	92,771
90	649	1,357	2,557	5,249	7,864	15,146	24,140	42,675	87,044
100	613	1,282	2,415	4,958	7,429	14,307	22,803	40,311	82,221
125	543	1,136	2,140	4,394	6,584	12,680	20,209	35,727	72,871
150	492	1,029	1,939	3,981	5,965	11,489	18,311	32,371	66,027
175	453	947	1,784	3,663	5,488	10,570	16,846	29,781	60,744
200	421	881	1,660	3,408	5,106	9,833	15,672	27,705	56,510
250	373	781	1,471	3,020	4,525	8,715	13,890	24,555	50,084
300	338	708	1,333	2,736	4,100	7,896	12,585	22,248	45,380
350	311	651	1,226	2,517	3,772	7,264	11,578	20,468	41,749
400	290	606	1,141	2,342	3,509	6,758	10,771	19,042	38,839
450	272	568	1,070	2,197	3,292	6,341	10,106	17,866	36,442
500	257	537	1,011	2,076	3,110	5,990	9,546	16,876	34,422
600	233	486	916	1,881	2,818	5,427	8,650	15,291	31,189
700	214	447	843	1,730	2,592	4,993	7,958	14,068	28,694
800	199	416	784	1,610	2,412	4,645	7,403	13,087	26,694
900	187	391	736	1,510	2,263	4,358	6,946	12,279	25,046
1000	176	369	695	1,427	2,137	4,117	6,561	11,599	23,658
1200	160	334	630	1,293	1,937	3,730	5,945	10,510	21,436
1400	147	307	579	1,189	1,782	3,431	5,469	9,669	19,721
1600	137	286	539	1,106	1,658	3,192	5,088	8,995	18,347
1800	128	268	506	1,038	1,555	2,995	4,774	8,440	17,214
2000	121	254	478	980	1,469	2,829	4,509	7,972	16,260



Table B.13 [Liquid Propane]

Table B.13
Maximum Capacity of Liquid Propane (in thousands of btu/hr) For Copper Tubing or Schedule 80 Piping Gravity Fed from a Propane Tank (No Pump)

Length (ft)	TUBING (ID)						SCH 80 PIPE (NPS)					
	¼	3/8	1/2	5/8	3/4	1	1/2	3/4	1	1 ¼	1 ½	2
10	(7,110)	14,760	29,700	51,210	72,090	142,830	21,060	44,460	86,670	175,590	261,450	503,820
20	(4,950)	(10,440)	20,970	36,180	50,940	107,370	14,940	31,410	60,930	124,200	184,770	356,220
30	(4,050)	(8,550)	17,100	29,520	41,580	87,660	14,220	25,650	49,860	101,610	151,020	290,610
40	(3,510)	(7,380)	14,850	25,560	36,000	75,870	(10,350)	22,230	43,290	87,840	130,770	251,910
50	(3,150)	(6,570)	(13,230)	22,860	32,220	67,860	(9,630)	19,980	38,700	78,570	116,910	225,810
60	(2,880)	(6,030)	(12,060)	20,880	29,430	62,010	(8,460)	18,000	35,280	71,730	106,560	205,920
70	(2,610)	(5,580)	(11,160)	19,350	27,180	57,330	(8,010)	16,830	32,940	66,690	98,910	190,530
80	(2,430)	(5,220)	(10,440)	18,090	25,470	53,640	(7,290)	15,750	30,690	62,100	92,790	178,290
90	(2,340)	(4,860)	(9,900)	17,010	24,030	50,580	(6,930)	14,580	28,800	58,680	87,030	167,940
100	(2,160)	(4,680)	(9,360)	16,200	22,770	47,970	(6,750)	14,220	27,180	55,620	82,800	159,120
125	(1,980)	(4,140)	(8,370)	14,490	20,340	42,930	(6,120)	(12,690)	24,570	49,860	73,980	142,650
150	--	(3,780)	(7,650)	(13,230)	18,540	39,150	--	(11,520)	22,230	45,270	67,500	129,960
175	--	(3,510)	(7,110)	(12,240)	17,190	36,270	--	(10,710)	20,700	42,210	62,460	120,420
200	--	(3,240)	(6,570)	(11,430)	16,110	33,930	--	(9,990)	19,170	39,150	58,680	112,680
225	--	(3,060)	(6,210)	(10,800)	15,120	31,950	--	(9,630)	18,000	37,170	55,170	106,200
250	--	(2,880)	(5,940)	(10,170)	14,400	30,330	--	(8,820)	17,640	35,280	52,560	100,800
275	--	(2,790)	(5,670)	(9,720)	13,680	28,890	--	(8,460)	16,470	33,390	49,860	95,850
300	--	(2,700)	(5,400)	(9,360)	13,140	27,720	--	(8,010)	15,750	32,220	47,970	91,980
350	--	(2,430)	(4,950)	(8,640)	12,150	25,650	--	(7,650)	14,580	29,880	44,100	85,140
400	--	(2,340)	(4,680)	(8,100)	11,340	23,940	--	(6,930)	(13,770)	27,990	41,400	79,740
450	--	(2,160)	(4,410)	(7,560)	10,710	22,590	--	--	(13,050)	26,100	39,150	75,150
500	--	(2,070)	(4,140)	(7,200)	10,170	21,420	--	--	(11,610)	24,930	37,170	71,280
550	--	--	(3,960)	(6,840)	9,720	20,430	--	--	(11,520)	23,760	35,280	68,220
600	--	--	(3,780)	(6,570)	9,270	19,530	--	--	(11,160)	22,590	33,750	65,160
650	--	--	(3,690)	(6,300)	8,910	18,810	--	--	(10,710)	21,870	32,580	62,460
700	--	--	(3,510)	(6,120)	8,550	18,090	--	--	(10,350)	21,060	31,410	60,210
750	--	--	(3,420)	(5,850)	8,280	17,460	--	--	(9,990)	20,340	30,330	58,320
800	--	--	(3,240)	(5,670)	8,010	16,920	--	--	(9,720)	19,530	29,160	56,340
900	--	--	(3,060)	(5,400)	7,560	15,930	--	--	(9,180)	18,360	27,630	52,920
1000	--	--	(2,970)	(5,040)	7,200	15,120	--	--	(8,460)	17,640	26,100	50,220

Flow rates are based on Darcy's equation with 20% reduction due to minor internal flashing of liquid in the piping. Calculation assumes turbulent flow, a pressure drop of 1 psig, and the weight density of propane taken at 0°F.

Flow rates shown in brackets (red italics) are considered too low to be protected by a single 4 USGPM excess flow valve mounted on the tank, per CSA B149.2-20 SCOP 7.4.8.1, and shall not be considered for single line services to a single appliance.

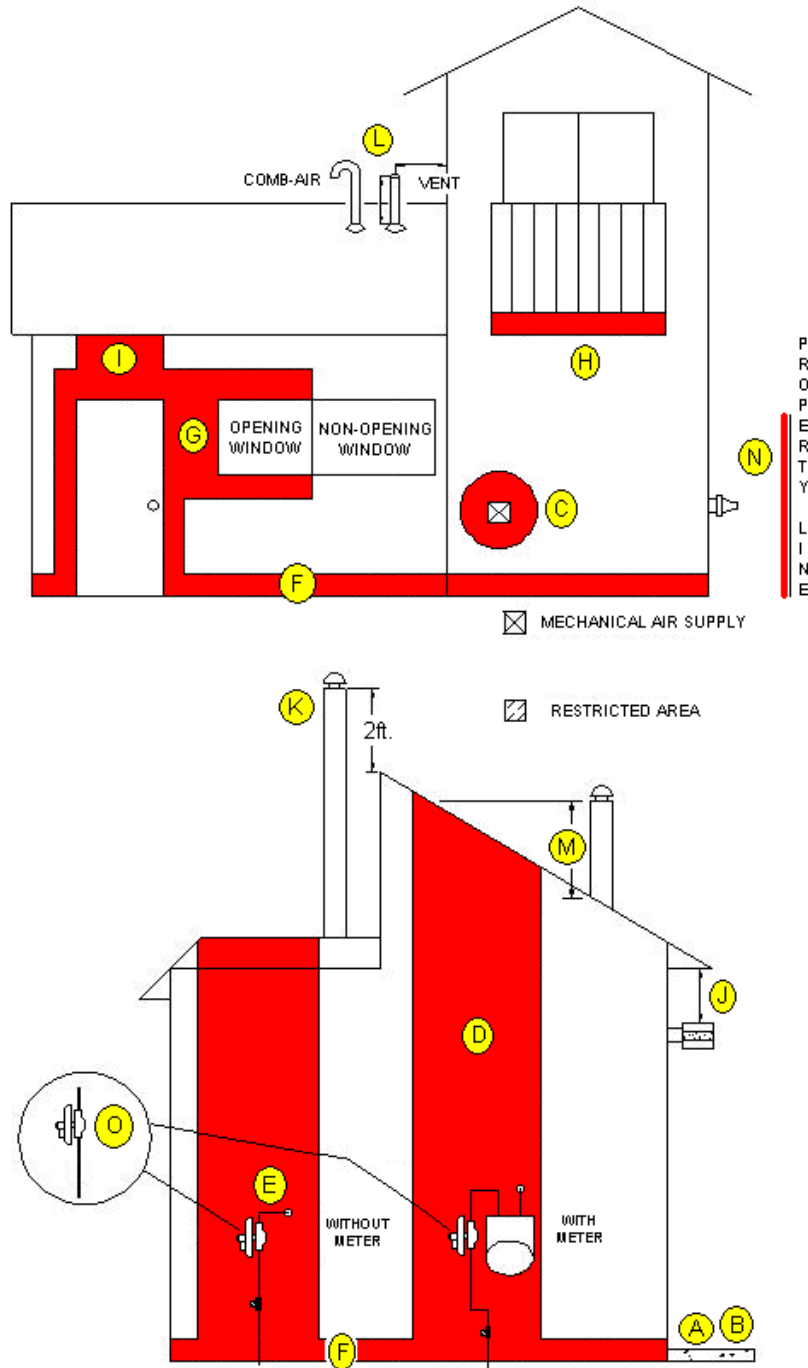
7.4.8.1 Any line utilized for propane flow shall have a flow capacity to atmosphere greater than the design flow rate of the excess-flow valve protecting the line, or have a vapour flow capacity based on Annex B of CSA B149.1, or a liquid flow capacity based on Appendix A of this SCOP, of at least 75% of the rated capacity of the excess flow valve protecting the line.

Rationale: The capacity on this chart is based on a pressure drop of 1 psig, whereas the excess flow valve will experience a flow rate based on a pressure drop to zero psig.



APPENDIX B Appliance Vent Termination and Regulator Discharge Clearances

Quick Reference



Appliance Vent Termination and Regulator Discharge Clearances

8.14.8 – Appliance Vent Termination

A vent shall not terminate:

- (A) 8.14.8(a) where it may cause hazardous frost or ice accumulations on adjacent property surfaces.
- (B) 8.14.8(b) less than 7 ft. (2.1 m) above a paved public sidewalk or driveway that is located on public property.
- (C) 8.14.8(c) less than 6 ft. (1.8 m) of a mechanical air-supply inlet to any building.
- (D) 8.14.8(d) above a regulator within 3 ft (900 mm) horizontally of the vertical centerline of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m);
- (E) 8.14.8(e) except as required in 8.14.8(d), any distance less than detailed in line 2 of Table 5.3 of any gas pressure regulator vent outlet.
- (F) 8.14.8(f) less than 1 ft. (300mm) above grade.
- (G) 8.14.8(g) less than the following distances from an opening door or window, non-mechanical air-supply inlet or combustion air inlet of an appliance;
 - i) 6" (150 mm) - up to including 10,000 btu/hr (3 Kw).
 - ii) 12" (300 mm) - 10,000 btu/hr (3 Kw) to including 100,000 btu/hr (30 Kw).
 - iii) 3 ft. (900 mm) - exceeding 100,000 btu/hr (30 Kw).
- (H) 8.14.8(h) underneath a veranda, porch or deck unless
 - i) the veranda/porch/deck is fully open on two sides below, and
 - ii) * 1 ft. (300 mm) min. clearance from the vent to the bottom of the joists for veranda/porch/deck.
- (I) 8.14.8(i)* through a side-wall above a pedestrian doorway.
- (J) 8.14.8(j)* less than 4 ft (1.2 m) below a soffit, or as listed in the manufacturer's installation instructions.
- (K) 8.14.2♣ less than 2 ft. (600 mm) above a flat roof and 2 ft. (600 mm) above a vertical obstruction within 10 ft. (3 m) horizontally.
- (L) 8.14.3 (Special venting system) - less than 18" (450 mm) above the roof and not less than 18" (450 mm) horizontally from any obstruction. (also refer to manufacturer's instructions).
- (M) 8.14.5♣ less than 2 ft. (600 mm) above a sloped roof to 9/12 pitch (see Figure 8.1 for greater pitches) and 2ft. (600 mm) above a vertical obstruction within 10 ft. (3 m) horizontally.
- (N) 8.14.14* (a cat IV) into area at least 4 ft. from foundation to property line (and redirected if space is 4 ft to 8 ft.)
- (O) 5.6.4 **less than 3 ft. from a regulator or relief valve discharge outlet per clause 5.6.4 and Table 5.3**

* Referring to Saskatchewan Codes of Practice.

♣ Exposed lengths of B Vent shall be installed in an adequately insulated chase.

Note – these references are a summarized form. For an exact wording, refer to the B149.1.and Codes of Practice.

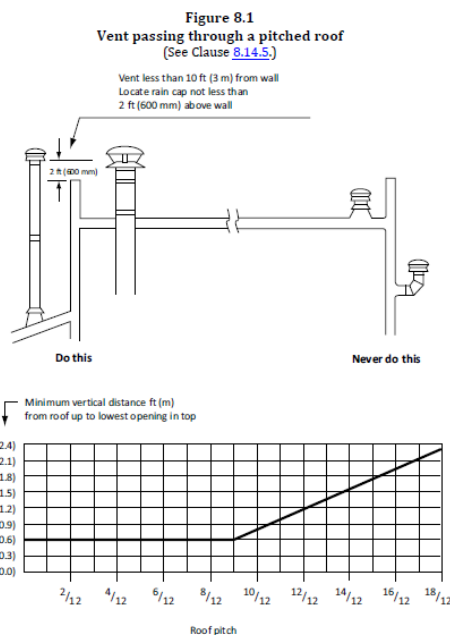


Table 5.3
Clearance from discharge, ft (m)
(See Clause 5.6.4, 8.14.8, and 10.1.9.)

	Reduced clearance for natural gas as permitted in Clause 5.6.4	Natural gas	Propane
Building opening*	1 (0.3)	3 (1)	3 (1)
Appliance vent outlet†	1 (0.3)	3 (1)	3 (1)
Moisture exhaust duct‡	3 (1)	3 (1)	3 (1)
Mechanical air intake	3 (1)	10 (3)	10 (3)
Appliance air intake	1 (0.3)	3 (1)	10 (3)
Source of ignition	1 (0.3)	3 (1)	10 (3)

* Outdoor air intakes that are less than 8 in (200 mm) in diameter or equivalent area shall be considered a building opening in using this Table.

† See also Clause 8.14.8.

‡ Applies to gas or electric dryer termination.

Note: The outdoor air intake referred to in this Table is the ducting that goes from the outside of the structure and terminates into the return air plenum before the appliance, sometimes referred to as a fresh-air intake.



APPENDIX C TEST PRESSURES FOR STEEL PIPE

Test Pressures for Steel Pipe
Maximum Allowable Air or Nitrogen Test Pressures for Steel Pipe (Seamless or ERW) to limit hoop stress to 30% of Specified Minimum Yield Strength (SMYS) per CSA Z662 4.3.5

Nominal Pipe Size	CSA Z245.1 Category 1 Pipe Grade	Schedule	Wall Thickness t_n	Outside Diameter D	Maximum Air Test Pressure Not Exceeding 30% of SMYS <i>below which must be air or nitrogen tested</i>		Operating Pressure Test / 1.5
					(MPa)	(psig)	
			<u>(mm)</u>	<u>(mm)</u>			<u>(psig)</u>
3/4	172	40	2.87	26.7	4.44	644	429
3/4	172	80	3.91	26.7	6.05	877	585
1	172	40	3.38	33.4	4.18	606	404
1	172	80	4.55	33.4	5.62	815	543
1	241	40	3.38	33.4	5.85	848	565
1	241	80	4.55	33.4	7.88	1143	762
1 – 1/4	172	40	3.56	42.2	3.48	505	337
1 – 1/4	172	80	4.85	42.2	4.74	687	458
1 – 1/4	241	40	3.56	42.2	4.88	708	472
1 – 1/4	241	80	4.85	42.2	6.65	964	643
2	241	20	3.18	60.3	3.05	442	295
2	241	40	3.91	60.3	3.75	544	363
2	241	80	5.54	60.3	5.31	770	513
2	290	20	3.18	60.3	3.67	532	355
2	290	40	3.91	60.3	4.51	654	436
2	290	80	5.54	60.3	6.39	927	618
3	241	20	3.96	88.9	2.58	374	249
3	241	40	5.49	88.9	3.57	518	345
3	241	80	7.62	88.9	4.96	719	479
3	290	20	3.96	88.9	3.1	450	300
3	290	40	5.49	88.9	4.3	624	416
3	290	80	7.62	88.9	5.97	866	577
4	241	20	4.78	114.3	2.42	351	234
4	241	40	6.02	114.3	3.05	442	295
4	241	80	8.56	114.3	4.33	628	419
4	290	20	4.78	114.3	2.91	422	281
4	290	40	6.02	114.3	3.67	532	355
4	290	80	8.56	114.3	5.21	755	503



Test Pressures for Steel Pipe

Maximum Allowable Air or Nitrogen Test Pressures for Steel Pipe (Seamless or ERW) to limit hoop stress to 30% of Specified Minimum Yield Strength (SMYS) per CSA Z662 4.3.5

Nominal Pipe Size	CSA Z245.1 Category 1 Pipe Grade	Schedule	Wall Thickness t_n	Outside Diameter D	Maximum Air Test Pressure Not Exceeding 30% of SMYS <small>below which must be air or nitrogen tested</small>		Operating Pressure Test / 1.5
					(MPa)	(psig)	
6	290	20	5.56	168.3	2.3	334	223
6	290	40 STD	7.11	168.3	2.94	426	284
6	290	80 XS	10.97	168.3	4.54	658	439
6	317	20	5.56	168.3	2.51	364	243
6	317	40 STD	7.11	168.3	3.21	465	310
6	317	80 XS	10.97	168.3	4.96	719	479
8	290	20	6.35	219.1	2.02	293	195
8	290	40 STD	8.18	219.1	2.6	377	251
8	290	80 XS	12.7	219.1	4.03	584	389
8	317	20	6.35	219.1	2.2	319	213
8	317	40 STD	8.18	219.1	2.84	412	275
8	317	80 XS	12.7	219.1	4.41	639	426
10	290	20	6.35	273.1	1.62	235	157
10	290	40 STD	9.27	273.1	2.36	342	228
10	290	60 XS	12.7	273.1	3.24	470	313
10	290	80	15.09	273.1	3.85	558	372
10	317	20	6.35	273.1	1.77	257	171
10	317	40	9.27	273.1	2.58	374	249
10	317	60 XS	12.7	273.1	3.54	513	342
10	317	80	15.09	273.1	4.2	609	406
12	290	20	6.35	323.9	1.36	197	131
12	290	STD	9.53	323.9	2.05	297	198
12	290	40	10.31	323.9	2.22	322	215
12	290	80 XS	12.7	323.9	2.73	396	264
12	317	20	6.35	323.9	1.49	216	144
12	317	STD	9.53	323.9	2.24	325	217
12	317	40	10.31	323.9	2.42	351	234
12	317	80 XS	12.7	323.9	2.98	432	288
12	359	20	6.35	323.9	1.69	245	163
12	359	STD	9.53	323.9	2.54	368	245
12	359	40	10.31	323.9	2.74	397	265
12	359	80 XS	12.7	323.9	3.38	490	327

Notes:

% SMYS = (Sh) / SMYS x100 where:

Specified Minimum Yield Strength (SMYS) = CSA Z245.1 Category I Pipe Grade in megapascals (MPa)

Design Hoop Stress (Sh) = (P x D) / (2 x t_n) x F x L x J x T

Test Pressure (P) is calculated in MPa and converted to psig. 1 MPa = 1000 kilopascals (kPa)

Wall Thickness (t_n) and Outside Diameter (D) are measured in millimetres

Design Factor (F) = 0.8 per Z662 clause 4.3.5.1

Location Factor (L) = 0.5 per Z662 clause 4.3.5.1

Joint Factor (J) = 1.0 per Z662 clause 4.3.5.1 since ERW Pipe is limited to 57% of SMYS per 8.2.4.3 and 0.6 times 57% is 34% thus 30% with a joint factor of 1.0 remains conservative for both seamless and ERW.

Temperature Factor (T) = 1.0 per Z662 clause 4.3.5.1

Test pressures exceeding these limits must meet the requirements of Standard Code of Practice 6.22.3



APPENDIX D CERTIFICATION LOGOS

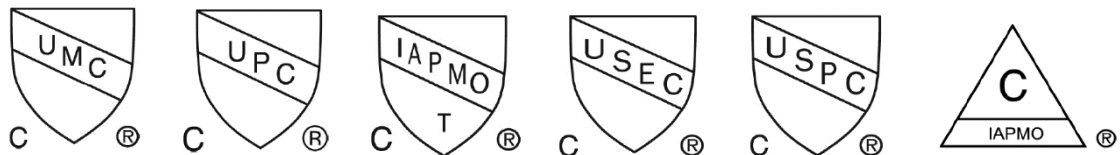
Certification Logos

The following logos indicate **gas-fired equipment** certification for Canada:

CSA Group Testing & Certification Inc.



IAPMO Research and Testing Inc.



UPC®

ICC Evaluation Service



ICC NTA (Z241, A277)

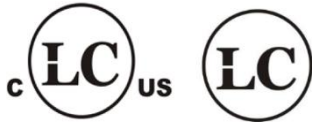


Intertek Testing Services Ltd.



Certification Logos
 The following logos indicate **gas-fired equipment** certification for Canada:

Labtest Certification Inc.



Omni-Test Laboratories Inc.



PFS Corporation



QAI Laboratories Ltd.



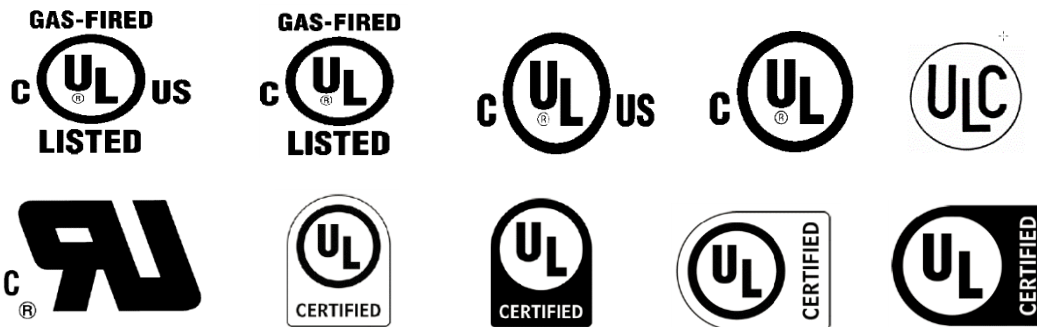
QPS Evaluation Services, Inc.



SGS North America, Inc.

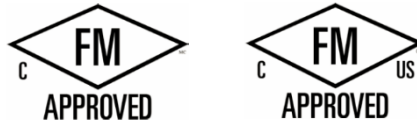


Underwriters' Laboratories (and Underwriters' Laboratories of Canada)



The following logos indicate **other related** certification for Canada:

FM Approvals LLC
(Combustible gas detectors, fire-rating of materials)



NSF International
(CSA B137.4 Polyethylene (PE) piping systems for gas services)



Safety Equipment Institute
(Gas Detection Equipment)



T.R. Arnold & Associates (TRA)
(Z241, A277 Modular Buildings)



The following are examples of logos that **DO NOT** indicate **gas-fired equipment** certification for Canada:

**US Only Certification Logos
(Not Approved for Canada)**



**Other Country Certification Logos
(Not Approved for Canada)**



**Certification Logos
(Approved for Canada, but not Gas Certified)**



APPENDIX E CARBON MONOXIDE (CO) RESPONSE GUIDELINE

Gas Inspections offer these standard action levels for informational purposes. Any increase in parts per million (ppm) from outside to inside warrants further investigation as to the source and should be documented.

Standard for Action Levels

The following action levels have been defined as minimums for an operator trained by the manufacturer of the testing equipment. An operator may adopt more stringent standards than the ones defined in this document. As such, the operator may enforce those higher standards. Under no circumstances shall an operator trained by the manufacturer of the testing equipment recognize less stringent standards or ignore conditions in excess of the defined action levels. The action levels are considered net indoor ambient readings - i.e., indoor ambient minus outdoor ambient readings.

0 to 9 parts per million (ppm) net indoor

Normal: CO levels in this range are acceptable for short periods (8 hr. average concentration).

Action: No Action. Typical from outdoor sources, fumes from attached garages, heavy smoking, burning candles, wood burning fireplace spillage and operation of unvented cooking appliances. If unvented cooking appliances are in operation, recommend additional ventilation in areas of operation. With concentrations in this range, the operator may continue testing sequences.

10 to 35 parts per million (ppm) net indoor

MANDATORY REPORT

Concern: This level could become hazardous in some situations.

Actions: Occupants should be advised of a potential health hazard to small children, elderly people and persons suffering from respiratory or heart problems. If the home has an attached garage, document CO levels in the garage. With concentrations in this range, the operator must continue testing to locate the CO source. Test combustion appliances one at a time to determine the source of CO production. If an appliance is determined to be the source of CO production, it should be shut off and not used until a licensed gas fitter can service it.

36 to 99 parts per million (ppm) net indoor

MANDATORY REPORT

Excessive: Medical Alert. This is a hazardous condition.

Actions: Ask occupants to step outside and query about health symptoms. Advise occupants to seek medical attention. Advise occupants not to drive. Emergency service personnel must be called if occupants exhibit symptoms of CO poisoning. Enter the building, open doors and windows to ventilate the structure. Turn off all combustion appliances until the CO level has been reduced to below 10 ppm. If the home has an attached garage document, CO levels in the garage. Test combustion appliances one at a time to determine the source of CO production. If an appliance is determined to be the source of CO production, it should be shut off and not used until a licensed gas fitter can service it.



100 - 200 parts per million (ppm) net indoor

MANDATORY REPORT

Dangerous: Medical Alert. Emergency conditions exist.

Actions: Evacuate the building immediately and check occupants for health symptoms. Advise all occupants to seek medical attention. Advise occupants not to drive. Emergency service personnel must be called if occupants exhibit symptoms of CO poisoning. Evacuation is important, but operators must not subject themselves to excessive conditions. Maximum exposure time is 15 minutes. Open all doors and windows that can be done quickly. If the home has an attached garage, document CO levels in the garage. Disable combustion appliance operation. This may involve shutting of the service valve. Continually monitor indoor ambient levels while moving through the building. Once the atmosphere within the structure has returned to below 10 ppm, test combustion appliances one at a time to determine the source of CO production. If an appliance is determined to be the source of CO production, it should be shut off and not used until a licensed gas fitter can service it.

Greater than 200 parts per million (ppm) net indoor

MANDATORY REPORT

Dangerous: Medical Alert. Emergency conditions exist. Extremely hazardous.

Actions: Evacuate the building immediately and check occupants for health symptoms. Advise all occupants to seek medical attention. Advise occupants not to drive. Emergency service personnel must be called if occupants exhibit symptoms of CO poisoning. Evacuation is important, but operators must not subject themselves to these conditions. Disable combustion appliance operation. This may involve shutting of the service valve. Do not stay inside or re-enter the building until conditions have dropped below 100 ppm. Open all doors and windows that can be done quickly without entering the structure. Shut off gas supply (if applicable and necessary). If the home has an attached garage, document CO levels in the garage if possible to do so without being subjected to high levels of CO. Once the atmosphere within the structure has returned to below 10 ppm, test combustion appliances one at a time to determine the source of CO production. If an appliance is determined to be the source of CO production, it should be shut off and not used until a licensed gas fitter can service it.

Where a gas appliance is the possible source of the CO or the source cannot be determined, and the net indoor reading is in excess of 9 ppm, a report must be sent to Gas Inspections.



APPENDIX F CARBON MONOXIDE (CO) RESPONSE GUIDELINE

Natural Gas and Propane Concentration Unit Conversion Chart (7.2.1.9)

Concentration Equivalents			
Parts per Million (PPM)	Percent Gas in Air (% Gas)	Percent Lower Explosive Limit (% LEL) for natural gas	Percent Lower Explosive Limit (% LEL) for propane
10	0.001	0.02	0.05
50	0.005	0.1	0.24
100	0.01	0.2	0.48
500	0.05	1	2.38
1,000	0.1	2	4.8
2,500	0.25	5	11.9
4,200	0.42	8.4	20.0
5,000	0.5	10	23.8
10,000	1	20	47.6
21,000	2.1	42	100.0
50,000	5	100	

CSA B149.1-20 Clause 7.2.1.9 reads:

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;

To meet requirement "7.2.1.9 a)" above, the combustible gas detector must be mounted as high as practical for natural gas or as low as practical for propane.

To meet requirement "7.2.1.9 b)" above, the combustible gas detector must alarm at 10,000 ppm for natural gas, or at 4,200 ppm for propane. Lower set points are acceptable.



APPENDIX G EMERGENCY FLOOD GUIDELINES

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For Licensed Gas Contractors

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Flooding in the province of Saskatchewan can occur from the following ways:

1. Waterway spillover.
2. Flash Floods.
3. City, town or village water/sewer system failures
4. Single home flooding (water system failures & sewage backup)

When flooding occurs damage to property can be extensive. The safe operation of gas appliances is a priority for Gas Inspections. To ensure this, Gas Inspections enforces The B149.1 National Gas and Propane Installation Code requirement for gas appliances that are involved in a flood;

4.5 Suitability of Use

4.5.5

Appliances, accessories, components, equipment, piping and tubing 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, equipment, piping or tubing has been inspected by a person acceptable to the authority having jurisdiction. The inspection of piping or tubing exposed to flood shall include a check for water in the piping or tubing system. (Water depth over 7" can backfeed through a gas valve.)

Note: In Saskatchewan, a licensed gas fitter is acceptable to the Authority Having Jurisdiction.

Any gas-fired appliance found to be unsuitable for continued use shall have its rating plate removed by the licensed gas fitter. Gas-fired appliances without a rating plate are no longer certified and cannot be installed or reinstalled.

Procedure for Single Property Flooding:

1. Gas suppliers may isolate area flooded and Red Tag affected appliance(s) or property.
2. Buildings affected by flooding must have their entire gas system inspected by a licensed gas contractor and have affected gas appliances serviced or replaced. Contractors must follow the Red Tag process in cases where necessary corrections are identified but not yet conducted. The local gas inspector will provide advice to contractors and homeowners as required.
3. Listed on the following page are common gas appliances and the corresponding required action depending on the flood condition. For other gas-fired appliances, contact the local gas inspector for advice. For gas inspector and electrical inspector contact information call: **Toll-free 1-866-530-8599 option 2 ("Gas, Electric & Plumbing")**

Procedure for Multiple Property Flooding:

Gas Inspections requires the Red Tag process to followed for reporting and documentation of all flood damaged appliances for all properties affected.

1. Local Gas Inspector in conjunction with local gas utility will coordinate start-up of affected areas to ensure public safety. For properties that have been shut-off but have no required corrections to the gas system or appliances, the local gas inspector will authorize reactivation of the service – no permit or air test is required.
2. Public will be advised through the EMO Centre that, when returning to their homes, they:
 - a) Have a licensed gas contractor inspect gas-fired equipment and have it serviced as necessary, and
 - b) If they smell gas upon returning home, leave immediately and notify appropriate authorities – i.e. for natural gas – SaskEnergy 1-888-700-0427, for propane contact 911 and their propane supplier.
3. Local Gas Inspector will advise local gas contractors to hang an air test verification tag on the meter and to phone-in applicable permit numbers to the utility before the utility turns the gas on to the home or facility.
4. Local Gas Inspector will advise Homeowners to apply to SaskEnergy for a meter activation.

NOTE: Health concerns caused by the release of water or sewage into ductwork or insulation are the responsibility of the Health Authority and must be addressed by the local health inspector.



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Gas Appliance	Condition	Solution	
Furnace	Completely Submerged	Replace Furnace	
	Flooded Above Gas Valve or Burner	Replace Furnace	
	Wet, or in contact with Fan Blade Assembly	Replace Fan Assembly or Replace Furnace	
	Wet, or in contact with Fan Motor	Replace Fan Motor or Replace Furnace	
	Wet, or in contact with Electronic components	Replace Electronic Board or Replace Furnace	
	Floor wetness not in contact with Fan or Electronic Components	Service and Test	
Storage Water Heater	Completely Submerged	Replace Water Heater	
	Flooded Above Gas Valve, or Burner (non FVIR water heaters only)	Replace Affected Components or Replace Water Heater	
	Flooded Above FVIR sensor or Arrestor Screen (FVIR-equipped water heaters)	Replace Water Heater	
	Floor wetness not in contact with Gas Valve, Burner or FVIR Components	Service and Test	
Tankless (Instantaneous) Water Heater	Completely Submerged	Replace Water Heater	
	Flooded Above Gas Valve, Burner or Electronic Components	Replace Affected Components or Replace Water Heater	
Clothes Dryer	Completely Submerged	Replace Clothes Dryer	
	Flooded Above Gas Valve, Burner or Electronic Components	Replace Affected Components or Replace Clothes Dryer	
	Floor wetness not in contact with Gas Valve, Burner or Electronic components	Service and Test	
Fireplace	Completely Submerged	Replace Fireplace	
	Flooded Above Gas Valve, Burner or Electronic Components	Replace Affected Components or Replace Fireplace	
	Floor wetness not in contact with Gas Valve, Burner or Electronic Components	Service and Test	
Boiler	Completely Submerged	Replace Boiler	
	Flooded Above Gas Valve, Burner or Electronic Components	Replace Affected Components or Replace Boiler	
	Floor wetness not in contact with Gas Valve, Burner or Electronic Components	Service and Test	

Note: Appliances that have been removed for replacement due to flooding shall have their rating plates removed, and then the appliances shall be scrapped as a non-certified appliance.

APPENDIX H INSTALLATION OF PIPING OR TUBING IN ROCKY AREAS

Where, due to rocky terrain, it is impractical to comply with section 6.15.4 (a), piping or tubing systems may be installed in accordance with this appendix, the manufacturer's instructions and the **authority having jurisdiction**.

1. When piping or tubing cannot be buried a minimum of 15 inches due to rocky terrain, Type L polyethylene-coated copper tubing, or PE piping, sleeved using high-density polyethylene tubing that contains a minimum 2% UV resistance by weight, may be used in accordance with this document and the Manufacturer's Instructions.
2. Tubing shall be installed without joints unless the required distance is beyond 100 ft. Tubing system shall be joined or connected in accordance with CSA B149.1-20 clause 6.15.3 and the sleeve shall be connected in accordance with the manufacturer's instructions.
3. Measures shall be taken to ensure that the pipe or tubing is protected from damage from vehicles, snow machines etc. (see CSA B149.1-20 clause 6.16.3)
4. Where ground cover is not possible,
 - a. Above ground sections of the tubing sleeve shall be anchored to the contour of a secure rock surface at minimum 10 feet intervals. The sleeve shall be banded every 3 feet with a high visibility yellow Tape
 - b. Piping shall follow the contour of the terrain without unsupported sections of pipe or tubing occurring above grade
5. PVC tubing sleeve to be sealed at each end to prevent the entrance of dirt and moisture.
6. A trench for underground sections of the tubing shall be in compliance with CSA B149.1-20 clause 6.15.5. The backfill, material shall be free of sharp objects, stones larger than 38 mm or any other material that may damage the piping or tubing.
7. Permanent Markers (yellow with black writing) shall be placed along the piping/tubing system every 10 ft. warning that the piping/tubing is part of a natural gas or propane system and when installed on rock, the signs shall be anchored to the rock.
8. Permanent Markers (yellow with black writing) to be placed at the natural gas meter or propane **container**, and **building** or outdoor **appliance** warning of a shallow underground propane/natural gas piping or tubing system.
9. The markers referred to in 7 and 8 shall be of a height above the anticipated snow level for the area.
10. The PE material being used as protective sleeve shall conform the Standard CGSB 41-GP-25M and shall contain a minimum 2% content of carbon black additive, which gives the product essentially a 50 year life cycle for resistance to UV rays from the sun.
11. A Plan Review application to Gas Inspections must be completed and approved prior to installation.



APPENDIX J LANDSLIDE REFERENCE (6.15.19)

Specifications for Service Lines through Fault Lines in Active Landslide Areas in Saskatchewan (as applied to New Services and Existing Service Locations)

1. All Service Line designs through fault lines in active landslide areas in Saskatchewan require consultation with the local gas inspector on-site to review all matters related to a safe design given specific local terrain considerations. **Only after consultation and an approved design is documented shall construction commence.**
2. The permitted operating pressure is 7" w.c. (4 oz/inch²) only.
3. All below ground service line piping shall be PE, minimum diameter 1¼ inch, joining using butt or socket fusion (including electrofusion) means only. No mechanical joining methods are permitted below ground.
4. Use Anodeless risers for all risers. Tracer Wire to be terminated above ground at all risers.
5. A means of leak migration control shall be installed by either:
 - a. lining the bottom of the entire service line trench using a "pea gravel" bedding minimum 6" depth for the width of the trench. ("Pea gravel" shall consist of small rounded stones as used in concrete surfaces), or
 - b. installing the service line in a continuous PE sleeve from riser to riser. Sleeves shall be kept to the smallest diameter practical to permit insertion of the carrier pipe. The allowable joining methods for PE sleeves is the same as those for the carrier pipe, as noted in Item #3 above.
6. Piping risers shall be sleeved using non-metallic piping with a diameter the smallest size practical and shall extend from the horizontal section of the underground line to 12" (300 mm) above grade to provide for ventilation of the underground line.
7. Approved flexible connections shall be installed to connect from meter to riser, or from riser to riser, or from riser to service. These flexible connections may consist of either one of the following two designs:
 - a. The Scissor Swing as detailed in the B149.1-20 Code of Practice 6.15.19, or
 - b. A stainless steel braided reinforced gas hose, certified CSA 8.1 Type II or Type III, minimum diameter 1¼", minimum length 4 ft.



Specifications for Service Lines through Fault Lines in Active Landslide Areas in Saskatchewan (as applied to New Services and Existing Service Locations)

8. At the time of installation, Scissor Swing installations shall be installed such that all sections of the scissor swing are either vertical, or level, as appropriate. At the time of Installation, hose flexible connections shall be installed such that the hose end connections are level with each other, and as close as practicable to each other, with the hose slack (droop) above grade contact. The initial spacing between hose end connections shall be measured and recorded with a permanent (UV resistant) marking or tag fastened to the hose.
9. The minimum number of flexible connections on a service line shall be two.
 - a. The first flexible connection is required at the meter stand prior to the underground riser.
 - b. The second flexible connection shall be as close as practical to the fault line and downstream of the fault line. Consideration shall be given to locating the second flexible connection on the service riser when and where warranted by distance and other local terrain considerations.
10. The service line crossing of the fault line may be buried if the fault line appears passive with little or no signs of recent or impending movement. Consideration shall be given to crossing the fault line above ground where the fault line appears active with recognizable signs of recent or impending movement. The determination of above or below ground crossing of the fault line shall be made **during the design on-site consultation with the gas inspector.**
11. When the second flexible connection (either design as noted in Item #7 above) is installed at a remote riser to riser location adjacent to the fault line and between the meter and the service riser, then the service riser requires termination to a normal (vertical movement only) riser at minimum. In severe cases of active movement, a third flexible connection (Item #7) may be deemed necessary by the gas inspector.
12. Consideration shall be given to removing the operator handle on the dealer valve and/or isolation valves located at the meter due to its public and remote location. In all cases, a ¼ turn shut-off valve is required at the service riser.

APPENDIX K WORKSHEET FOR UNVENTED HEATERS IN LIVESTOCK AND POULTRY BARNs

Worksheet for Unvented Heaters in Livestock and Poultry Barns (Summary)

Livestock ventilation systems with propane and natural gas appliances have to meet the Natural Gas and Propane Installation Code CSA-B149.1. This worksheet is designed to assist in the calculations to meet code specifics of clauses 7.23.1 and 8.24.5 of CSA B149.1. All requirements of CSA B149.1 must be in compliance, including clauses 4.9, 7.23 and 8.24 in their entirety including all sub-clauses. This worksheet is an aid-only for the following two calculations:

- 7.23.1** *Where an infrared heater is of the unvented type, it shall*
(e) be provided with mechanical ventilation that
(ii) has a ventilation volume of at least 300 cfm (142 dm³/s) for each 100,000 btu/hr (30 kW) input or fraction thereof;

NOTE: 300 cfm per 100,000 btu/hr input (or fraction thereof) is the minimum ventilation volume acceptable to Gas Inspections to meet the standard of the term, "adequately ventilated space", used in CSA B149.1, particularly clause 8.24.5.

- 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 btu/hr/ft³ (0.2 kW/m³) of the space in which the appliance is located.*

- A) Barn Owner: _____
- B) Barn Land Location: _____
- C) Barn Occupancy (# of animals, type of animal): _____
- D) Barn Dimensions: _____ ft X _____ ft X _____ ft (high) = Barn volume (E)
- E) Barn Volume (E): _____ cubic feet
- F) Description of Heaters (number/type): _____

- G) Total Heaters Combined Input into Barn (G): _____ btu/hr
- H) Description of Ventilation Equipment (number/type): _____

- I) Minimum Ventilation Rate of All Ventilation Equipment Combined (I): _____ CFM
- J) Ratio of min. ventilation rate to heaters' input = (I) divided by (G) [Must be at least 0.003 CFM per btu/hr]:
 _____ CFM per btu/hr. NOTE: 0.003 CFM per btu/hr = 300 CFM per 100,000 btu/hr
- K) Ratio of heaters input to barn volume = (G) divided by (E) [must not exceed 20 btu/hr per cubic foot]:
 _____ 20 btu/hr per cubic foot
- L) Calculations verified by Licensed Gas Contractor: (please print)
 Gas Fitter License #: _____ Gas Fitter Name: _____
- M) Date of Verification: Month: _____ Day: _____ Year: _____



APPENDIX L GAS INSPECTION LINKS

- [Gas Inspection Districts and Contacts](https://www.tsask.ca/public/pdf/Gas_Inspections_Contact_Listing.pdf)
https://www.tsask.ca/public/pdf/Gas_Inspections_Contact_Listing.pdf
- [Gas Safety Bulletins](https://www.tsask.ca/gas/safety-bulletins)
<https://www.tsask.ca/gas/safety-bulletins>

2020 TO 2025 REVISION HISTORY

Docket	Revision
Editorial	Renamed Venting Appendix as Appendix B, & Sizing Appendix as Appendix A
20-01	Added 3 pound chart to Appendix A as Table A.18 a)
20-03	Added Sch 80 Sizing charts to Appendix A as Tables A.1 c) to A.7 c)
20-06	Added (back) 7.1.5.5.2 Flow Switch requirement for boilers
20-08	Replaced propane testing from Table 6.3 with new clause 6.22.9 prescribing the acceptable procedure for liquid propane testing.
20-09	New clause 6.17.1.1 for marking of liquid propane lines
20-10	New clause 6.15.3.1 for sleeve over all Type L copper joints
20-17	Added (back) 7.2.1.10 for hoses on engines (from Annex N)
20-21	Removed 6.16.1.1 a) and incorporated b) into one statement
20-22/20-28	Removed Infrared Heater SCOP clauses 7.23.1, 7.23.3(c), and 7.23.3 (d) in favour of following manufacturer's instructions
20-32	Removed Residential Ranges SCOP clauses 7.33.4 and 7.33.6 in favour of following manufacturer's instructions
20-34	Removed the requirement in 7.13.7 to raise manufacturer's case coils to accommodate an access panel.