

NATURAL AND LP-GAS INSTALLATION PROVISIONS



Chapter 24 covers those fuel gas piping systems, fuel-gas appliances and related accessories, venting systems and combustion air configurations most commonly encountered in the construction of one- and two-family dwellings and structures regulated by the IRC.

Coverage of the *piping systems* shall extend from the *point of delivery* to the outlet of the appliance shutoff valves.

This handout is based on RCW 19.27, known as the "Washington State Building Code". The handout includes portions of the International Codes, and may include portions of other codes adopted by statute, publications, as well as Klickitat County Ordinances and policies.

DEFINITIONS

ACCESS (TO). That which enables a device, *appliance* or *equipment* to be reached by ready access or by a means that first requires the removal or movement of a panel, door or similar obstruction (see also "Ready access").

ALTERATION. A change in a system that involves an extension, addition or change to the arrangement, type or purpose of the original installation.

APPLIANCE. Any apparatus or device that utilizes a fuel or a raw material as a fuel to produce light, heat, power, refrigeration or air conditioning. Also, any apparatus that compresses fuel gases.

APPROVED. Acceptable to the *code official*.

CODE. These regulations, subsequent amendments thereto, or any emergency rule or regulation that the administrative authority having jurisdiction has lawfully adopted.

CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

CONCEALED LOCATION. A location that cannot be accessed without damaging permanent parts of the building structure or finish surface. Spaces above, below or behind readily removable panels or doors shall not be considered as concealed.

CONTROL. A manual or automatic device designated to regulate the gas, air, water or electrical supply to, or operation of, a mechanical system.

FLASHBACK ARRESTOR CHECK VALVE. A device that will prevent the backflow of one gas into the supply system of another gas and prevent the passage of flame into the gas supply system.

OUTLET. The point at which a gas-fired *appliance* connects to the *gas piping system*.

PIPING SYSTEM. The fuel *piping*, valves and fittings from the outlet of the *point of delivery* to the outlets of the *appliance* shutoff valves.

READY ACCESS (TO). That which enables a device, *appliance* or *equipment* to be directly reached, without requiring the removal or movement of any panel, door or similar obstruction. (See "Access.")

G2407.6 Outdoor Combustion air. Outdoor combustion air shall be provided through opening(s) to the outdoors.

G2420.1 General. *Piping systems* shall be provided with shutoff valves in accordance with this section.

G2420.1.1 Valve approval. Shutoff valves shall be of an approved type; shall be constructed of materials compatible with the *piping*; and shall comply with the standard that is applicable for the pressure and application.

G2420.1.2 Prohibited locations. Shutoff valves shall be prohibited in *concealed locations* and *furnace plenums*.

G2420.1.3 Access to shutoff valves. Shutoff valves shall be located in places so as to provide access for operation and shall be installed so as to be protected from damage.

G2420.5 Appliance shutoff valve. Each *appliance* shall be provided with a shutoff valve in accordance with G2420.5.1, G2420.5.2 or G2420.5.3.

G2420.5.1 Located within same room. The shutoff valve shall be located in the same room as the *appliance*. The shutoff valve shall be within 6 feet of the *appliance*, and shall be installed upstream of the union, connector or quick disconnect device it serves. Shutoff valves serving movable appliances, such as cooking appliances and clothes dryers, shall be considered to be provided with access where installed behind such appliances. *Appliance shutoff valves* located in the firebox of a *fireplace* shall be installed in accordance with the *appliance* manufacturer's instructions.

G2420.5.2 Vented decorative appliances and room heaters. Shutoff valves for vented decorative *appliances*, room heaters and decorative *appliances* for installation in vented *fireplaces* shall be permitted to be installed in an area remote from the *appliances* where such valves are provided with *ready access*. Such *valves* shall be permanently identified and shall not serve another *appliance*. The piping from the shutoff valve to within 6 feet of the *appliance* shall be designed, sized and installed in accordance with Sections G24212 through G2419.

G2420.5.3 Located in manifold. Where the *appliance* shutoff valve is installed at a manifold, such shutoff valve shall be located within 50 feet of the *appliance* served and shall be readily accessible and permanently identified. The *piping* from the manifold to within 6 feet of the *appliance* shall be designed, sized and installed in accordance with Sections G2412 through G2419.

G2408.1 General. *Equipment and appliances* shall be installed as required by the terms of their approval, in accordance with the conditions of listing, the manufacturer's instructions and this code. **Manufacturer's installation instructions shall be available on the job site at the time of inspection.**

G2413.1 General considerations. *Piping systems* shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum *demand* and supply gas to each *appliance* inlet at not less than the minimum supply pressure required by the *appliance*.

G2414.1 General. Materials used for the piping systems shall comply with the requirements of this chapter or shall be *approved*.

G2414.4.1 Cast iron. Cast-iron *pipe* shall not be used.

G2414.4.2 Steel. Steel, stainless steel and wrought-iron *pipe* shall not be lighter than Schedule 10 and shall comply with the dimensional standards of ASME B36.10, 10M and one of the following standards:

1. ASTM A53/A53M.
2. ASTM A106.
3. ASTM A312.

G2414.5 Metallic tubing. *Tubing* shall not be used with gases corrosive to the tubing material.

G2414.4.5.1 Steel tubing. Steel *tubing* shall comply with ASTM A254.

G2414.5.2 Stainless steel. Stainless steel tubing shall comply with ASTM A268 or ASTM A269.

G2414.5.3 Copper or copper-alloy tubing. Copper *tubing* shall comply with Standard K or L of ASTM B88 or ASTM B280. Copper and copper-alloy *tubing* shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard feet of gas.

G2414.5.4 Corrugated stainless steel tubing. Corrugated stainless steel *tubing* shall be *listed* in accordance with ANSI LC1/CSA 6.26.

G2414.6 Plastic pipe, tubing and fittings. Polyethylene plastic pipe, tubing and fittings used to supply fuel gas shall conform to ASTM D2513. Such pipe shall be marked "Gas" and "ASTM D2513." Polyamide pipe, tubing and fittings shall be identified and conform to ASTM F2945. Such pipe shall be marked "Gas" and "ASTM F2945." Polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) plastic pipe, tubing and fittings shall not be used to supply fuel gas.

G2414.8 Protective coating. Where in contact with material or atmosphere exerting a corrosive action, metallic *piping* and fittings coated with a corrosion-resistant material shall be used. External or internal coatings or linings used on *piping* or components shall not be considered as adding strength.

G2415.1 Installation of materials. Materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved.

G2415.2 CSST. CSST piping systems shall be installed in accordance with the terms of their approval, the conditions of listing, the manufacturer's instructions and this code.

G2415.3 Prohibited locations. *Piping* shall not be installed in or through a ducted supply, return or exhaust, or a clothes chute, *chimney* or gas vent, dumwaiter or elevator shaft. *Piping* installed downstream of the *point of delivery* shall not extend through any townhouse unit other than the unit served by such piping.

G2415.4 Piping in solid partitions and walls. *Concealed piping* shall not be located in solid partitions and solid walls, unless installed in a chase or casing.

G2415.5 Fittings in concealed locations. Fittings installed in concealed locations shall be limited to the following types:

1. Threaded elbows, tees and couplings.
2. Brazed fittings.
3. Welded fittings.
4. Fittings *listed* to ANSI LC1/CSA 6.26 or ANSI LC4/CSA 6.32.

G2415.6 Underground penetrations prohibited. Gas *piping* shall not penetrate building foundation walls at any point below grade. Gas *piping* shall enter and exit a building at a point above grade and the annular space between the *pipe* and the wall shall be sealed.

G2415.12 Minimum burial depth. Underground *pipng systems* shall be installed a minimum depth of 12 inches below grade.

G2415.13 Trenches. The trench shall be graded so that the pipe has a firm, substantially continuous bearing on the bottom of the trench.

G2415.14 Piping underground beneath buildings. *Piping* installed underground beneath buildings is prohibited except where the *pipng* is encased in a conduit of wrought iron, plastic pipe, steel pipe, a piping or encasement system listed for installation beneath buildings, or other *approved* conduit material designed to withstand the superimposed loads. The conduit shall be protected from corrosion in accordance with this code.

G2415.17.3 Tracer. A yellow-insulated copper tracer wire or other *approved* conductor, or a product specifically designed for that purpose, shall be installed adjacent to the underground nonmetallic *pipng*. Access shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic *pipng*. The tracer wire size shall be not less than 18 AWG and the insulation type shall be suitable for direct burial.

G2415.20 Testing of piping. Before any system of *pipng* is put in service or concealed, it shall be tested to ensure that it is gas tight.

G2417.4.1 Test pressure. The test pressure to be used shall not be not less than 1 1/2 times the proposed maximum working pressure, but not less than 3 psig, irrespective of design pressure. Where the test pressure exceeds 125 psig, the test pressure shall not exceed a value that produces a hoop stress in the *pipng* greater than 50 percent of the specified minimum yield strength of the pipe.

G2417.4.2 Test duration. The test duration shall be not less than 10 minutes.

G2418.2 Design and installation. *Piping* shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers or building structural components suitable for the size of *pipng*, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. *Piping* shall be anchored to prevent undue strains on connected *appliances* and shall not be supported by other *pipng*.

G2422.1 Connecting appliances. *Appliances* shall be connected to the *pipng system* by one of the following:

1. Rigid metallic pipe and fittings.
2. Corrugated stainless steel tubing (CSST) where installed in accordance with the manufacturer's instructions.
3. *Listed and labeled appliance connectors* in compliance with ANSI Z21.24/CSA 6.10 and installed in accordance with the manufacturer's instructions and located entirely in the same room as the *appliance*.
4. *Listed and labeled* quick-disconnect devices used in conjunction with *listed and labeled appliance connectors*.
5. *Listed and labeled* convenience outlets used in conjunction with *listed and labeled appliance connectors*.
6. *Listed and labeled outdoor appliance connectors* in compliance with ANSI Z21.75/CSA 6.27 and installed in accordance with the manufacturer's instructions.
7. *Listed* outdoor gas hose connectors in compliance with ANSI Z21.54 used to connect portable outdoor *appliances*. The gas hose connection shall be made only in the outdoor area where the *appliance* is used, and shall be to the gas *pipng* system supply at an *appliance* shutoff valve, a *listed* quick-disconnect device or *listed* gas convenience outlet.

G2422.1.2.1 Maximum length. Connectors shall have an overall length not to exceed 6 feet. Measurement shall be made along the centerline of the connector. Only one connector shall be used for each *appliance*.

Exception: Rigid metallic *pipng* used to connect an *appliance* to the *pipng system* shall be permitted to have a total length greater than 6 feet, provided that the connecting pipe is sized as part of the *pipng system* and the location of the *appliance* shutoff valve comply with this code.

G2422.1.2.3 Prohibited locations and penetrations. Connectors shall not be concealed within, or extended through walls, floors, partitions, ceilings or *appliance* housings.

G2422.1.2.4 Shutoff valve. A shutoff valve not less than the nominal size of the connector shall be installed ahead of the connector in accordance with Section G2420.5.

G2422.1.4 Unions. A union fitting shall be provided for appliances connected by rigid metallic pipe. Such unions shall be accessible and located within 6 feet of the *appliance*.

G2426.1 General. Vents shall be listed, labeled and installed per manufacturer's instructions.

G2426.2 Connectors required. Connectors shall be used to connect *appliances* to the vertical *chimney* or vent, except where the *chimney* or vent is attached directly to the *appliance*.

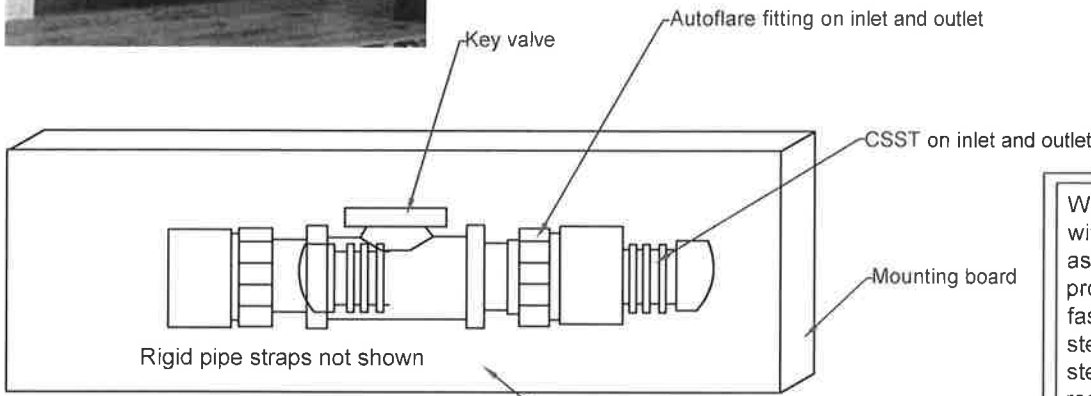
G2426.4 Insulation shield. Where vents pass through insulated assemblies, an insulation shield constructed of steel having a minimum thickness of No. 26 gage shall be installed to provide *clearance* between the vent and the insulation material. The *clearance* shall be not less than the *clearance* to combustibles specified by the vent manufacturer's installation instructions. Where vents pass through attic space, the shield shall terminate not less than 2 inches above the insulation materials and shall be secured in place to prevent displacement. Insulation shields provided as part of a *listed* vent system shall be installed in accordance with the manufacturer's instructions.

G2427.5.3 Chimney termination. *Chimneys* for residential-type or low-heat *appliances* shall extend not less than 3 feet above the highest point where they pass through a roof of a building and not less than 2 feet higher than any portion of a building within a horizontal distance of 10 feet. *Chimneys* for medium-heat *appliances* shall extend not less than 10 feet higher than any portion of any building within 25 feet. *Chimneys* shall extend not less than 5 feet above the highest connected *appliance draft hood* outlet or *flue collar*. Decorative shrouds shall not be installed at the termination of factory-built *chimneys* except where such shrouds are *listed* and *labeled* for use with the specific factory-built *chimney* system and are installed in accordance with the manufacturer's instructions.



G2408.5 Clearances to combustible construction. Heat producing equipment and appliances shall be installed to maintain the required clearances to combustible construction as specified in the listing and manufacturer's instructions. Such clearances shall be reduced only in accordance with Section G2409. Clearances to combustibles shall include such considerations as door swing, drawer pull, overhead projections or shelving and window swing. Devices, such as door stops or limits and closers, shall not be used to provide the required clearances.

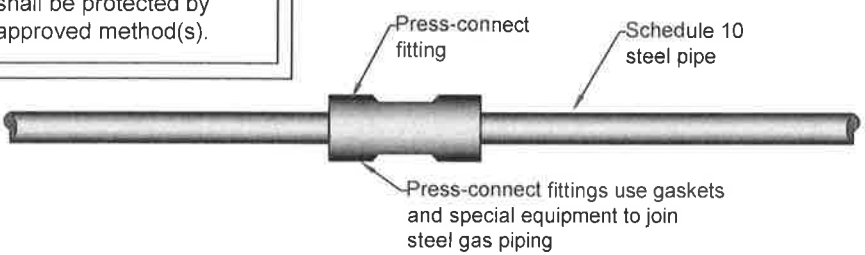
All shut-off valves shall be accessible



Where piping will be concealed within light frame construction assemblies, the piping shall be protected against penetration by fasteners. **Exception:** Black steel piping and galvanized steel piping shall not be required to be protected.

Shutoff valves in gas tubing systems require rigid support separate from the tubing to prevent damage at the valve connection

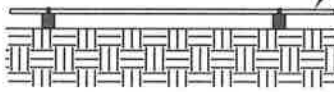
G2415.11 Protection against corrosion. Steel pipe or tubing exposed to corrosive action, such as soil condition or moisture, shall be protected by approved method(s).



CSST that is not listed with an arc-resistant jacking or coating shall be electrically continuous and bonded to the electrical service grounding electrode system, or, where provided, the lightning protection grounding electrode system. The bonding jumper shall connect to a metallic pipe, pipe fitting or CSST fitting, and shall not be smaller than 6 AWG copper wire or equivalent, with a length not to exceed 75'.

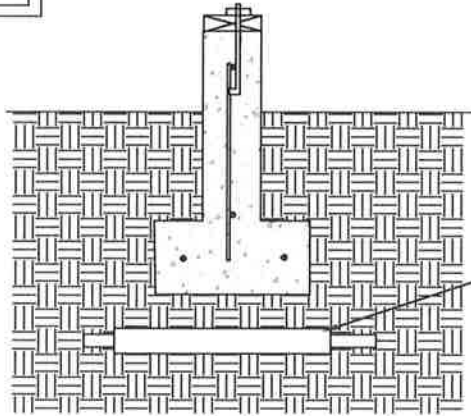
Schedule 10 steel pipe is now allowed to be used for fuel gas piping

G2415.6 Underground penetrations prohibited. Gas piping shall not penetrate building foundation walls at any point below grade. Gas piping shall enter and exit a building at a point above grade and the annular space between the pipe and the wall shall be sealed.

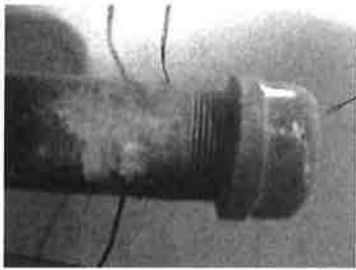


G2415.9 Above-ground piping outdoors. Piping installed outdoors shall be elevated not less than 3 1/2" above ground or roof surface. Piping shall be securely supported and located where it will be protected from physical damage. Where passing through an outside wall, the piping shall be protected against corrosion by coating or wrapping with an inert material. Where piping is encased in a protective pipe sleeve, the annular space between the piping and the sleeve shall be sealed.

DO NOT COVER ANY PORTIONS OF PIPING UNTIL PRESSURE TESTED AND INSPECTED



Piping installed underground beneath buildings is prohibited except where the piping is encased in a conduit of wrought iron, plastic pipe, steel pipe, a piping or encasement system listed for installation beneath buildings, or other approved conduit material designed to withstand the superimposed loads. The conduit shall be protected from corrosion.



Gas outlets that do not connect to appliances shall be capped gas tight. **Exception:** *Listed and labeled flush-mounted-type quick-disconnect devices and listed and labeled gas convenience outlets* shall be installed in accordance with the manufacturer's instructions.

Appliances shall be connected to the piping system by one of the following: Rigid metallic pipe and fittings, CSST, listed and labeled appliance connectors, listed and labeled quick-disconnect devices, listed and labeled convenience outlets, listed and labeled outdoor appliance connectors, listed outdoor gas hose connections to connect portable outdoor appliances.

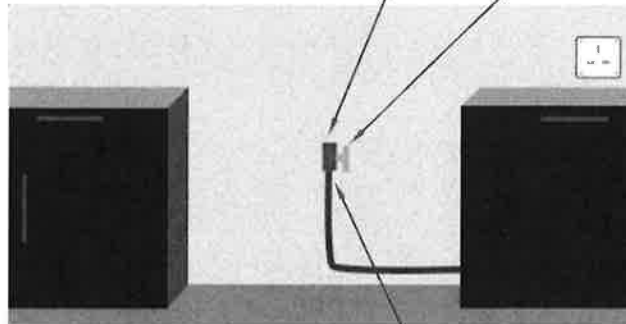
Shutoff valve located behind **movable** appliances.

G2422.1.2.3 Prohibited locations and penetrations. Connectors shall not be concealed within, or extended through, walls, floors, partitions, ceilings or appliance housings.

G2422.1.2.4 Shutoff valve. A shutoff valve not less than the nominal size of the connector shall be installed ahead of the connector.



FAIL



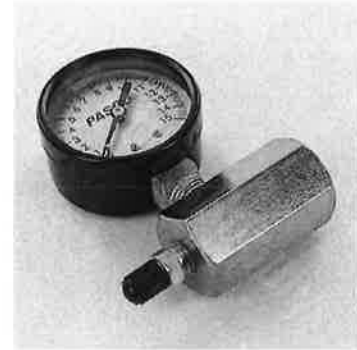
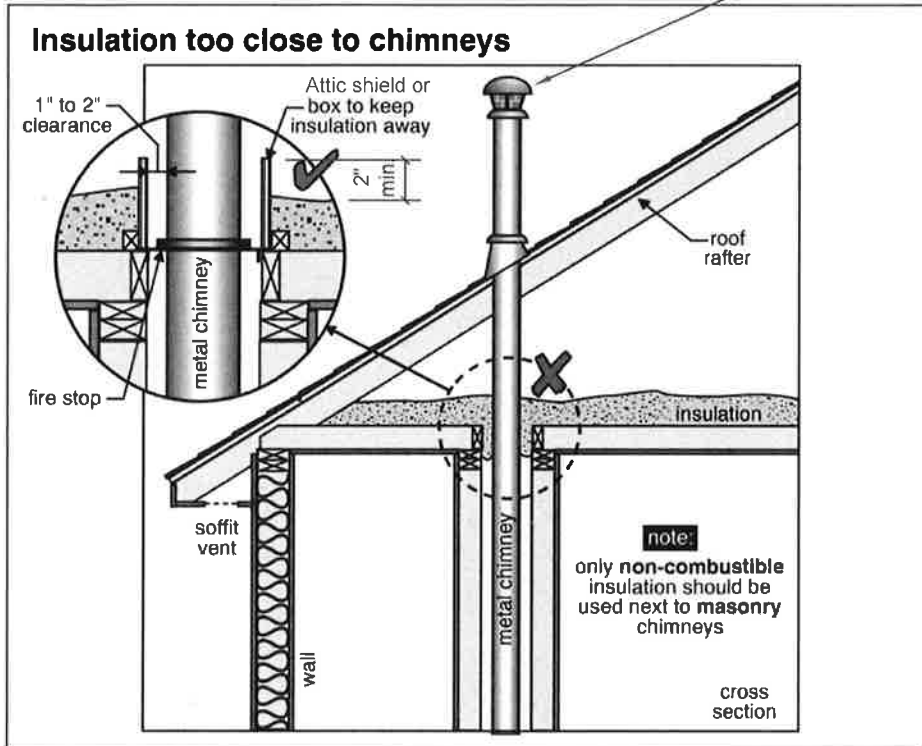
Connectors and tubing shall be installed in accordance with the manufacturer's instructions, and shall be installed so as to be protected against physical damage. Connectors shall have an overall length not to exceed 6' measured along the centerline of the connector. **Only one connector shall be used for each appliance.**

G2416.2 Metallic pipe. Metallic pipe bends shall comply with the following:

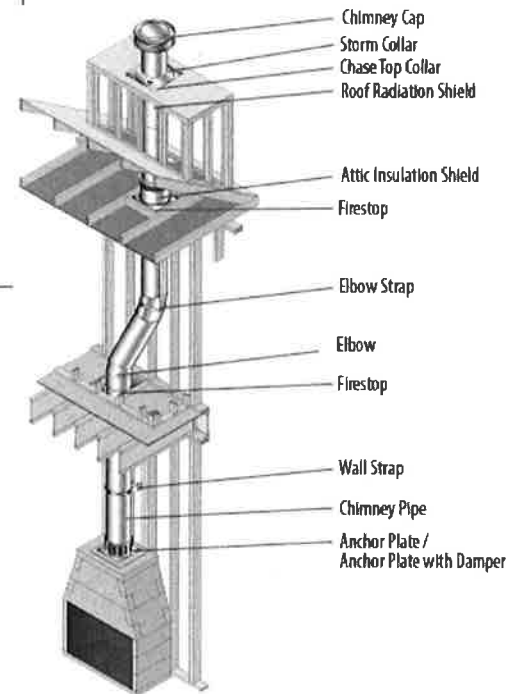
1. Bends shall be made only with bending tools and procedures intended for that purpose.
2. Bends shall be smooth and free from buckling, cracks or other evidence of mechanical damage.
3. The longitudinal weld of the pipe shall be near the neutral axis of the bend.
4. Pipe shall not be bent through an arc of more than 90 degrees.

DO NOT CRIMP THE PIPE

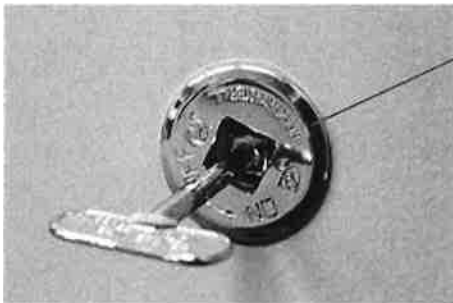
3' above the highest point where passing through roof and not less than 2' higher than any point within 10' horizontally.



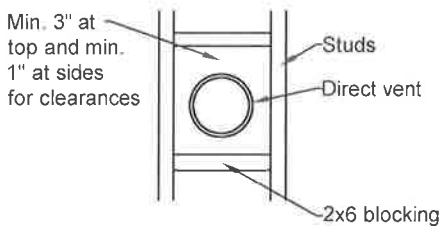
Test at minimum 10 psig for a duration of at least 10 minutes



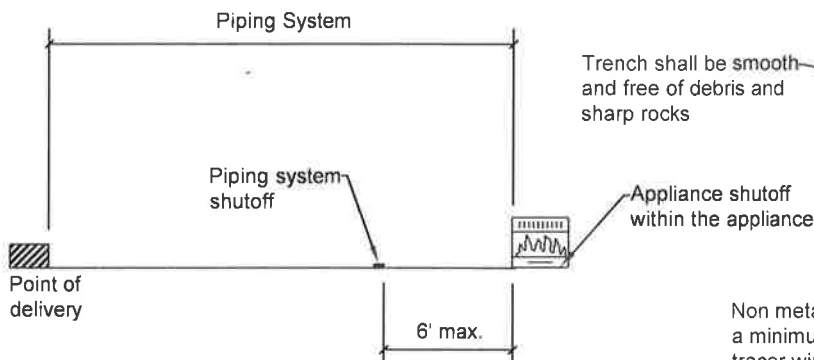
Example of penetrations and blocking at various locations along the installation line.



G2420. Each appliance shall have a shutoff located within 6' of the appliance in the same room. Shutoff valves shall be readily accessible and not located within the appliance. Shutoff valves serving movable appliances, such as cooking appliances and clothes dryers, shall be considered to be provided with access where installed behind such appliances.



Protective coatings/wrappings shall be approved and factory applied. Install approved piping materials per manufacturer's instructions for the location of installation.



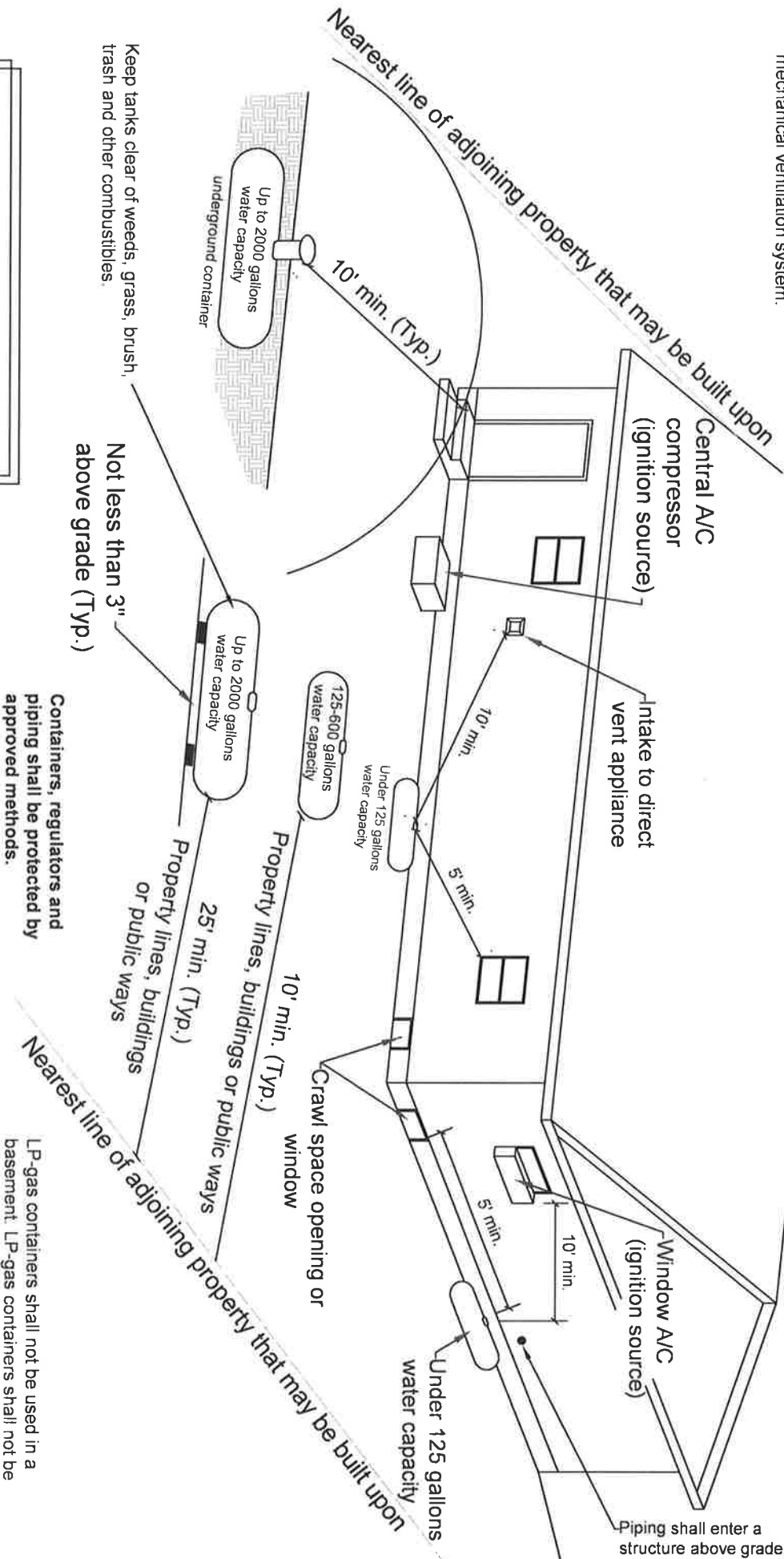
Non metallic pipe requires a minimum 18 gauge yellow tracer wire installed

Pipe shall have a minimum of 12" cover above pipe

DOT SPECIFICATION CONTAINERS

Typical replaceable DOT cylinders 60# or 100#: 5' minimum between relief valve discharge and external source of ignition, direct vent, or mechanical ventilation system.
 Typical DOT cylinder filled from bulk truck (150#, 200#, 300#, or 420#): If the DOT cylinder is filled on site from a bulk truck, the filling connection and vent valve must be at least 10' from any external source of ignition, direct vent, or mechanical ventilation system.

ASME containers filled on-site shall be located so the filling connection and fixed maximum liquid level gauge are a minimum of 10' from any external source of ignition, intake to a direct-vent appliance, or intake to a mechanical ventilation system.



Keep tanks clear of weeds, grass, brush, trash and other combustibles.

Not less than 3" above grade (Typ.)

Containers, regulators and piping shall be protected by approved methods.

Nearest line of adjoining property that may be built upon

NFPA 58 6.2.1
 LP-Gas containers shall be located outside of buildings unless they are specifically allowed to be located inside of buildings.

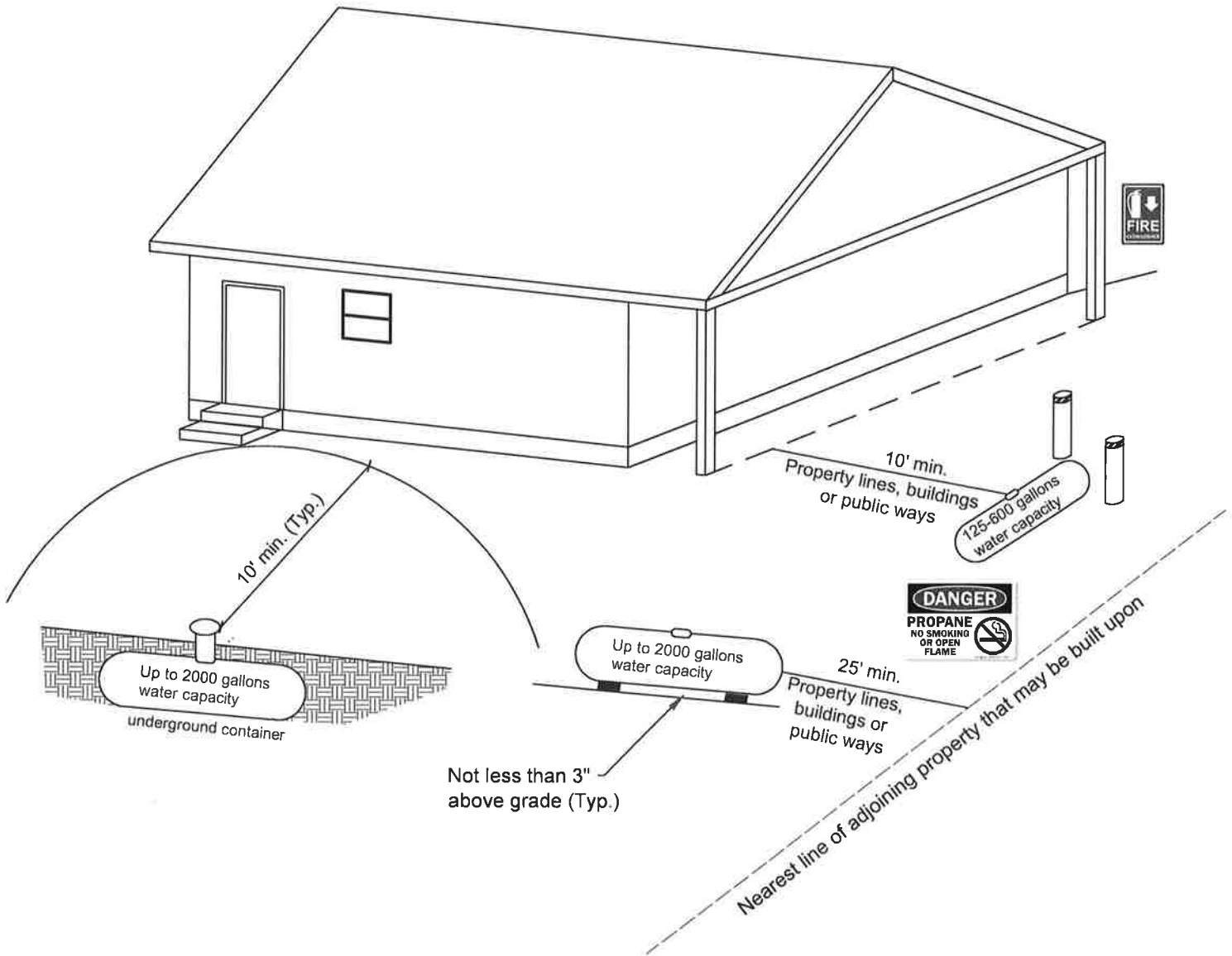
LP-gas containers shall not be used in a basement. LP-gas containers shall not be used in an above-grade under floor space unless provided with an approved means of ventilation. **Gas is heavier than air.**

LOCATION OF LP-GAS CONTAINERS - NON-RESIDENTIAL

This handout is general in nature. For specific requirements, please contact the Building Department. All installations are subject to permitting and inspection requirements.

NFPA 58 6.2.1

LP-Gas containers shall be located outside of buildings unless they are specifically allowed to be located inside of buildings.



- * "No Smoking" signs shall be posted. Smoking within 25 feet shall be prohibited.
- * Weeds, grass, brush, trash and other combustible materials shall be kept not less than 10 feet from LP-Gas tanks and containers.
- * Where exposed to vehicular damage due to proximity to alleys, driveways or parking areas, LP-Gas containers, regulators and piping shall be protected in accordance with NFPA 58.
- * Portable fire extinguishers shall be provided. Class 2-A minimum with a travel distance not to exceed 75 feet.
- * Storage, handling, and transportation of liquefied petroleum gas (LP-Gas) and the installation of LP-Gas equipment shall comply with NFPA 58, and Section 2307 and Chapter 61 of the International Fire Code.

**TABLE 6104.3
LOCATION OF LP-GAS CONTAINERS**

LP-GAS CONTAINER CAPACITY (water gallons)	MINIMUM SEPARATION BETWEEN LP-GAS CONTAINERS AND BUILDINGS, PUBLIC WAYS ^a OR LOT LINES OF ADJOINING PROPERTY THAT CAN BE BUILT UPON		MINIMUM SEPARATION BETWEEN LP-GAS CONTAINERS ^{b, c} (feet)
	Mounded or underground LP-gas containers ^a (feet)	Above-ground LP-gas containers ^a (feet)	
Less than 125 ^{c, d}	10	5 ^e	None
125 to 250	10	10	None
251 to 500	10	10	3
501 to 2,000	10	25 ^{e, f}	3
2,001 to 30,000	50	50	5
30,001 to 70,000	50	75	(0.25 of sum of diameters of adjacent LP-gas containers)
70,001 to 90,000	50	100	
90,001 to 120,000	50	125	

For SI: 1 foot = 304.8 mm, 1 gallon = 3.785 L.

- a. Minimum distance for underground LP-gas containers shall be measured from the pressure relief device and the filling or liquid-level gauge vent connection at the container, except that all parts of an underground LP-gas container shall be not less than 10 feet from a building or lot line of adjoining property that can be built upon.
- b. For other than installations in which the overhanging structure is 50 feet or more above the relief-valve discharge outlet. In applying the distance between buildings and ASME LP-gas containers with a water capacity of 125 gallons or more, not less than 50 percent of this horizontal distance shall also apply to all portions of the building that project more than 5 feet from the building wall and that are higher than the relief valve discharge outlet. This horizontal distance shall be measured from a point determined by projecting the outside edge of such overhanging structure vertically downward to grade or other level on which the LP-gas container is installed. Distances to the building wall shall be not less than those prescribed in this table.
- c. Where underground multicontainer installations are composed of individual LP-gas containers having a water capacity of 125 gallons or more, such containers shall be installed so as to provide access at their ends or sides to facilitate working with cranes or hoists.
- d. At a consumer site, if the aggregate water capacity of a multiple-container installation, comprised of individual LP-gas containers having a water capacity of less than 125 gallons, is 500 gallons or more, the minimum distance shall comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per LP-gas container. If more than one such installation is made, each installation shall be separated from other installations by not less than 25 feet. Minimum distances between LP-gas containers need not be applied.
- e. The following shall apply to above-ground containers installed alongside buildings:
 1. LP-gas containers of less than a 125-gallon water capacity are allowed without a separation distance where in compliance with Items 2, 3 and 4.
 2. Department of Transportation (DOTn) specification LP-gas containers shall be located and installed so that the discharge from the container pressure relief device is not less than 3 feet horizontally from building openings below the level of such discharge and shall not be beneath buildings unless the space is well ventilated to the outside and is not enclosed for more than 50 percent of its perimeter. The discharge from LP-gas container pressure relief devices shall be located not less than 5 feet from exterior sources of ignition, openings into direct-vent (sealed combustion system) appliances or mechanical ventilation air intakes.
 3. ASME LP-gas containers of less than a 125-gallon water capacity shall be located and installed such that the discharge from pressure relief devices shall not terminate in or beneath buildings and shall be located not less than 5 feet horizontally from building openings below the level of such discharge and not less than 5 feet from exterior sources of ignition, openings into direct vent (sealed combustion system) appliances, or mechanical ventilation air intakes.
 4. The filling connection and the vent from liquid-level gauges on either DOTn or ASME LP-gas containers filled at the point of installation shall be not less than 10 feet from exterior sources of ignition, openings into direct vent (sealed combustion system) appliances or mechanical ventilation air intakes.
- f. This distance is allowed to be reduced to not less than 10 feet for a single LP-gas container of 1,200-gallon water capacity or less, provided that such container is not less than 25 feet from other LP-gas containers of more than 125-gallon water capacity.
- g. Above-ground LP-gas containers with a water capacity of 2,000 gallons or less shall be separated from public ways by a distance of not less than 5 feet. Containers with a water capacity greater than 2,000 gallons shall be separated from public ways in accordance with this table.