JONES STEPHENS
We Got It

PEXALGAS®

INSTALLATION GUIDE

Jones Stephens PEXALGAS® Installation Instructions

ATTENTION!

The installation of Jones Stephens PEXALGAS piping must be performed by an installer that meets applicable qualifications as required by the state and local administrative authority administering the provisions of the code where the gas piping is installed.

All systems using Jones Stephens PEXALGAS piping shall be designed and installed according to the requirements of this guide.

The Authority Having Jurisdiction or Code Official is always required to review and approve any new PEXALGAS installation.

Installation shall be in accordance with local codes, or in their absence, in accordance with the National Fuel Gas Code ANSI Z223.1 in the USA, and CAN/CGA - B149.1 & B149.2 in Canada. In cases where the requirements of this guide conflict with the local code, the local code must take precedence, unless the local authority having jurisdiction approves a variance, or change.

Inspection, testing, and purging shall be performed according to the procedures in Part 4 of the National Fuel Gas Code, ANSI Z223.1, and CAN/CGA - B149 installation codes or in accordance with local codes.

For LP gas (propane), installation shall be in accordance with the fuel gas code adopted by the local jurisdiction, or in their absence, in accordance with NFPA 58.

This system and related components (pipes, fittings, and tools included in the Jones Stephens PEXALGAS catalog) shall be used only in gas piping systems where the operating gas pressure does not exceed 72.5 PSI (5 bar).

Piping may be buried underground, but appropriate bedding is required as per instructions provided in the Underground Installation section.

The installation of Jones Stephens PEXALGAS in solid flooring should be in accordance with IRC section G2415.8 and IFGC section 404.8.

The PEXALGAS pipe is typically routed:

- Beneath, through, and alongside floor joists
- Inside interior wall cavities
- On top of ceiling joists in attic space

The PEXALGAS pipe does not have a fire rating for runs through plenums that is required by most building codes. If your building code requires products to have a certain rating established by the ASTM E84 testing specification, then PEXALGAS shall not be installed through a plenum.

Carefully unwind and route the piping from the reel to the required location, making certain not to kink, tangle, or apply excessive force.

Piping end shall be temporarily capped or tape closed prior to installation to prevent contamination from foreign material from entering.

When installing Jones Stephens gas piping, avoid sharp bends, stretching, kinking, twisting, or contacting sharp objects. The tubing shall be replaced if damage occurs.

Contents

IMPORTANT - READ ENTIRE MANUAL

Introduction

User Warnings

The use of fuel gas can be dangerous. Special attention must be given to the proper design, installation, testing, and application of the gas piping system. Sound engineering practices and principles must be exercised, as well as diligent adherence to the proper installation procedures to ensure the safe operation of the piping system. All installed systems must pass customary installation inspections by the authority having jurisdiction prior to being placed into service. This document is intended to provide the user with general guidance when designing and installing a Jones Stephens piping system; its components are not interchangeable with other gas tubing systems. Interchanging components with gas piping systems from other manufacturers is not allowed and may result in serious bodily injury and property damage. When local gas or building codes impose greater requirements than this document, you should adhere to the local code requirements. Performance of accessory devices, such as pressure regulators and shutoff valves, should be reconfirmed by contacting the accessory device manufacturer and receiving the latest technical data on sizing, installation, and performance.

Improper installation methods or procedures could lead to accidents such as explosions, fires, gas poisoning, asphyxiation, etc. This system shall be installed with strict adherence to this guide as well as local building codes. All installed systems must pass installation inspections by the authority having jurisdiction prior to being placed into service. Jones Stephens shall have no responsibility for any misinterpretation of the information contained in this manual or any improper installation, repair work, or deviation from the procedures recommended in this manual, whether pursuant to local building codes or engineering specifications.

Jones Stephens PEXALGAS piping components shall not be used with other PEX-AL-PEX piping systems from other manufacturers.

Jones Stephens piping shall be used only in gas piping systems where the operation gas pressure does not exceed 72.5 PSI (5 bar). Accessories for systems shall be rated for the operating gas pressure used. Thus, for example, accessories for 25 PSI systems shall be rated for 25 PSI service. Performance of accessory devices, such as pressure regulators and shutoff valves should be reconfirmed by contacting the accessory device manufacturer and receiving the latest technical data on sizing, installation, and performance.

A gas delivery system consisting of Jones Stephens piping offers significant advantages over other gas delivery systems because of its wall dimensions and design. In contrast to copper or rigid steel pipe, Jones Stephens piping does not require intermediate joints in most installations because the piping is capable of being installed in one continuous run, reducing not only the total number of joints, but also the potential for leaks at joints. Jones Stephens piping's flexibility also affords more installation options because an installer can avoid existing obstacles, and it eliminates repetitive measuring, cutting, threading, and joint assembly that are common with rigid piping systems. Jones Stephens piping's flexibility offers further safety advantages in geographic areas that are prone to seismic activity because the tubing provides greater flexibility to withstand certain movement of the ground or structural shifts. Jones Stephens fittings are insulated to eliminate metal to metal contact between pipe and fittings. To maximize protection of the entire structure from lightning damage, installation of a lightning protection system shall be installed per NFPA 780 and other standards, particularly in areas prone to lightning. Note that lightning protections systems set forth in NFPA 780 and other standards go beyond the scope of this manual. Users of Jones Stephens piping systems shall consider all the limitations and benefits of Jones Stephens piping systems for their particular situation.

Limitation of Manual

This document is intended to aid the user in the design, installation, and testing of Jones Stephens piping systems to distribute fuel gas in residential housing units and commercial structures. It would be impossible for this guideline to anticipate and cover every possible variation in housing configuration, appliance loads, and local restrictions. Therefore, there may be applications which are not covered in this manual. For applications beyond the scope of this guide, contact Jones Stephens. The techniques included within this guide are recommend practice for generic applications. These practices must be reviewed for compliance with all applicable local fuel gas and building codes. Accordingly, where local gas or building codes impose greater requirements than this manual, you should adhere to the local code requirements. This system and related components (pipes, fittings, and tools included in the Jones Stephens PEXALGAS catalog) should only be used as fuel gas piping where the operation gas pressure does not exceed 72.5 PSI (5 bar).

Listing of Applicable Codes and Standards

The Jones Stephens Gas Piping System is compliant with the following codes:

- International Fuel Gas Code (IFGC)
- International Residential Code (IRC)
- Uniform Plumbing Code (UPC)
- National Fuel Gas Code (NFPA 54)

The Jones Stephens Gas Piping System is ICC-ES evaluated to the following standards:

- ASTM F1281 Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene
- ISO 17484 Specification for Multilayer pipe systems for indoor gas installations
- AS 4176.8 Metal-Plastic Multilayer Pipes and Brass Fittings for Conveying Combustible Gases in Systems in Pressure up to 5 bar

Description of System and Components

Piping

The Jones Stephens PEXALGAS Gas Piping System has been engineered, tested, and certified to meet the performance requirements of American Fuel Gas systems, and as such, is acceptable for use with all recognized fuel gases, including natural gas and LP gas (propane).

PEXALGAS pipe is an acceptable piping material to use on LP gas (propane) piping systems, both outside aboveground and underground.

When installed outside above ground, PEXALGAS shall be protected if exposed to direct sunlight and/or subjected to physical damage.

The Jones Stephens PEXALGAS system combines the positive features that are typical of cross-linked polyethylene PEX-b and also those of aluminum. Cross-linked polyethylene PEX-b offers excellent mechanical, physical, and chemical properties. Butt-welded aluminum pipe strengthens mechanical resistance introducing excellent characteristics of flexibility and malleability, fundamental features for accelerating and simplifying installation operations.

The result is a product that is composed of different layers of material, connected to each other, that allows excellent properties to be reached that otherwise would not be possible with a pipe made of one single material.

The Jones Stephens Gas Piping system is certified for systems with working pressures up to 72.5 PSI.
ATTENTION: DO NOT STORE OR INSTALL PEXALGAS EXPOSED TO DIRECT SUNLIGHT.

Fittings

Jones Stephens Crimp Fittings is a system of crimp fittings suitable for a variety of applications. By using a portable crimping machine equipped with a suitable jaw, the pipe is shaped around the fitting insert. Even in the presence of temperature fluctuations, the joint remains perfectly gastight and cannot be loosened thanks to the stainless steel sleeve that covers the portion of pipe in contact with the insert. The sleeve has inspection holes to verify the correct insertion of the pipe on the fitting.

The PEXALGAS Crimp Fittings require the use of Jones Stephens approved PEXALGAS crimping jaws or the Jones Stephens PEXALGAS manual crimper, designed specifically for Jones Stephens PEXALGAS systems.

Protection Devices

Protective devices are to be used when piping passes through studs, joists, or other building materials that limit or restrict the movement of the flexible piping, making it susceptible to physical damage from nails, screws, drill bits, and other puncture threats.

- Striker plates (hardened steel Gauge 16) to be attached directly to studs and joists
- Stripwound metallic conduit shall be used in locations where additional protection may be required

Pressure Regulators

Required to be used to reduce elevated pressure, over 14 inches water column (1/2 PSI), to standard low pressure required for most appliances.

Description of System and Components

Manifolds

- Multiport gas distribution manifolds supply multiple gas appliances in parallel arrangement from a main distribution point
- Multiple sizes and configurations ranging in female NPT sizes with 3, 4, and 6 port cross manifold configurations

Shutoff Valves

Used to control the gas flow. Ball valves shut off the gas supply at appliances, manifolds, and regulators. Valves can be utilized at manifold locations, reducing the number of joints due to the integrated fitting connection.

System Overview

Introduction

The following section will be used to assist you while you design and size your Jones Stephens PEXALGAS system. At any point in which you require further assistance with this process, you can visit our webpage (Pexalgas.com) or contact Jones Stephens.

It is required by this standard to provide installation instructions which include proper sizing tables and methods of sizing.

System Design

In order to properly design a fuel gas piping system, you must first recognize all the important criteria. Requirements for a proper system design include:

- Verify your system meets all local codes. When local codes conflict with the manufacturer's guidelines, the local codes must always take precedence.
- Determine the supply pressure coming from the meter by means of a gauge or a rating supplied by the gas company
- Determine your total system demand for all appliances as well as the largest single load
- Prepare a floor plan sketch with the load and length combinations for all appliances
- Determine your allowable pressure drop

NOTE

PLEASE NOTE THAT JONES STEPHENS SIZING TABLES REFER ONLY TO THE PIPE WITHOUT INCLUDING ANY OTHER LOSSES. SIZING MUST BE DONE IN ACCORDANCE WITH NFPA 54 (NATIONAL FUEL GAS CODE), USING THE PRESSURE LOSSES FROM BOTH THE PIPE AND THE FITTINGS SIZING TABLES TO ALLOW A MORE ACCURATE SIZING OF THE SYSTEM FOR YOUR INSTALLATION.

WHEN CHOOSING A PRESSURE DROP TO SIZE A JONES STEPHENS PEXALGAS SYSTEM, THE MINIMUM OPERATING PRESSURE OF THE APPLIANCE MUST BE CONSIDERED. CHOOSING A PRESSURE DROP THAT WILL REDUCE THE SUPPLY PRESSURE BELOW THE MINIMUM OPERATING PRESSURE OF THE APPLIANCE WILL CAUSE THE APPLIANCE TO PERFORM POORLY OR NOT AT ALL.

General Installation Practices

ATTENTION

THE JONES STEPHENS PEXALGAS GAS PIPING SYSTEM IS AN ENGINEERED FUEL GAS PIPING SYSTEM, AND AS SUCH, THE TUBING AND FITTINGS ARE NOT INTERCHANGEABLE WITH OTHER PEX-AL-PEX MANUFACTURER'S PRODUCTS. THE USE OF OTHER PEX-AL-PEX PRODUCTS WITH THE JONES STEPHENS GAS PIPING SYSTEM IS PROHIBITED.

A. All system hardware should be stored in its original package in a clean, dry location prior to installation. Care must be taken to ensure the PEXALGAS piping is not damaged prior to installation.

B. Piping ends shall be temporarily capped or taped closed prior to installation to prevent contamination from foreign material from entering.

C. PEXALGAS piping exposed to extreme low temperatures should be allowed to come up to room temperature prior to installation and other activities such as uncoiling, bending, cutting, chamfering, and/or connecting to fittings. Once installed, PEXALGAS piping is able to withstand low temperature conditions, down to -40°F (-40°C).

D. Care must be taken to not kink, tangle, twist, stretch, or apply excessive force to the piping or fittings. The Jones Stephens Gas Piping is a flexible piping system and can be bent during installation around obstructions. Avoid stressing the tubing with tight bends. Refer to the table for the recommended bend radius.

Pipe Size (mm)	*EQ. Pipe Size (in.)	Minimum Bend Radius (in.)
16	3/8	2
20	1/2	3
26	3/4	3
32	1	5

E. When installing in, through, or around sharp metal structures (i.e. metal studs, sheet metal, I-beams), rubber grommets or protective tubing should be used to prevent any direct contact which could subject the piping to damage.

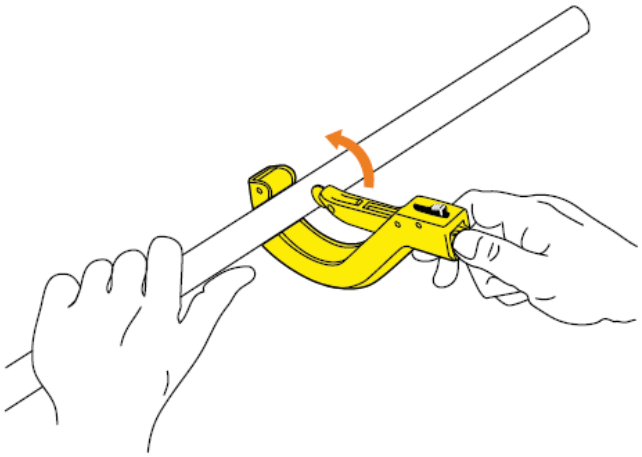
F. Tubing should be supported with metallic pipe straps, bands, brackets, hangers, or building structural components suitable for the size of piping. Support intervals are not to exceed those shown in the table under the Horizontal Run section on page 9. A proper support is one which is designed to be used as a pipe hanger, does not damage the piping during installation, and provides full support of the tubing once installed. Plastic zip ties or cable ties are not to be used as the primary support for PEXALGAS tubing.

G. PEXALGAS MPT/FPT adapter fittings shall be used to transition to Black Iron Pipe or other gas piping systems through NPT threaded pipe connections.

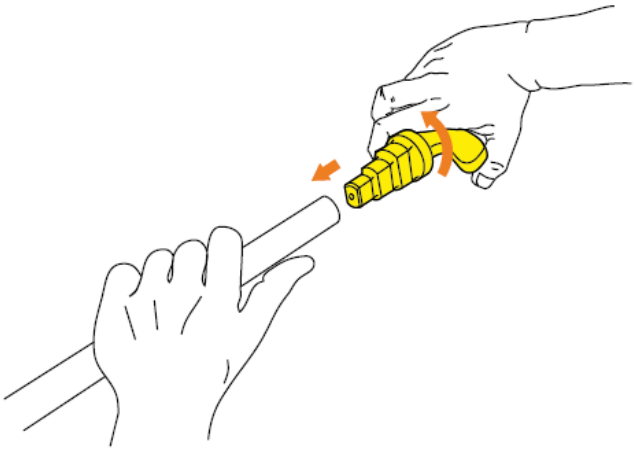
*EQ. = closest U.S. equivalent size

Fitting Assembly

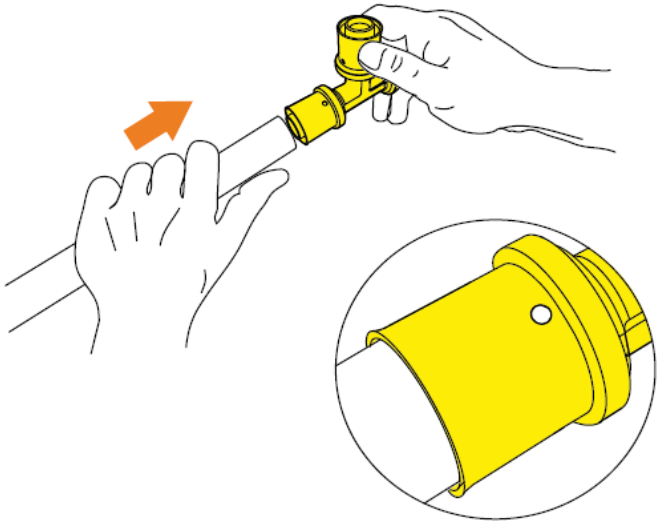
1. Cut the pipe at a right angle using a suitable tubing cutter. Make sure the blade is sharp and in good condition to avoid damage to the pipe. Rotate pipe cutter while applying pressure. To reduce ovalization, do not apply excessive pressure.



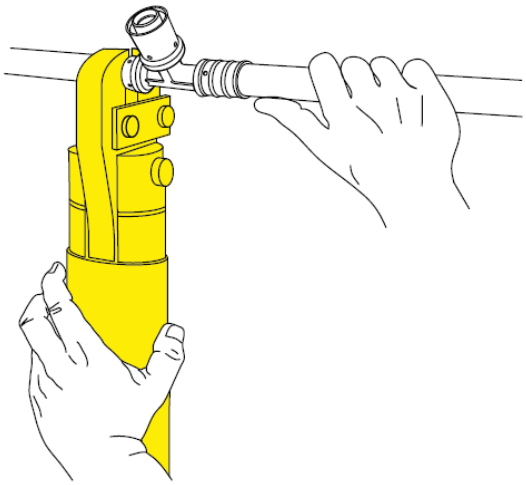
2. Calibrate and chamfer the pipe to obtain a perfectly round inner circumference of the pipe. Always make sure the reamer has no dents or damage, as they would damage the pipe and compromise the seal.



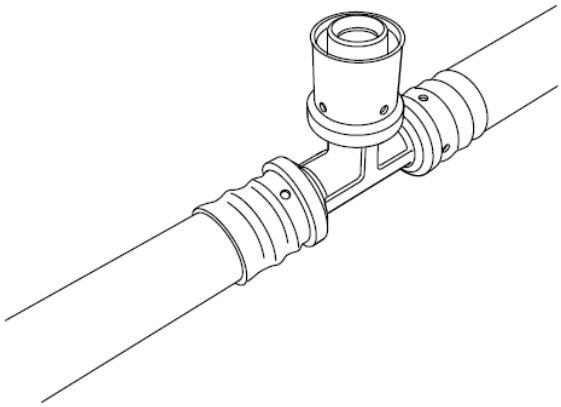
3. Insert the fitting on the pipe, checking through the sleeve inspection holes that the pipe has been properly inserted. Remove any residual material left inside the pipe.



4. For crimp machines: Position the crimping machine so that the crimping jaw is aligned and in position with respect to the body of the fitting, and tighten by pressing the start button on the crimping machine (for more details refer to the instructions supplied with the crimping machine). Use crimping jaws provided by Jones Stephens whose crimping profile (TH) is compatible with the fitting that you are installing.
   For manual crimper: Position the manual crimper so that the crimping jaw is aligned and in position with the respect of the body of the fitting, and close the tool completely until it clicks (for more details refer to the instructions supplied with the tool).



5. Remove the crimping jaw, and verify through the metal sleeve inspection holes that the pipe has remained fully inserted during the connecting process.



NPT Threaded Connections

Use Teflon (PTFE) tape or pipe thread sealants if needed. Wrap PTFE tape clockwise 3-4 times. Apply thread sealant starting at the opening of the fitting that is significantly thick enough to fill the grooves of the first half of the thread only. The proper method of assembling tapered threaded connectors is to assemble them finger tight, and then wrench tighten further to the specified number of turns from finger tight (T.F.F.T.) shown in the table. Tightening torque should not exceed the values listed in the table below.

Connection Size (NPT)	T.F.F.T.	Maximum Torque (ft-lb)
1/2"	2-3	30
3/4"	2-3	37
1"	1.5-2.5	52

Do not use Teflon tape or thread sealant on any Jones Stephens PEXALGAS crimp connections. Ensure thread sealant does not contact pipe or remain inside the fittings.

Fittings should not be rotated after they are crimped to the pipe.

Floor/Wall Mounting Fittings

When using the Jones Stephens Wall/Floor Mounting fittings, it is necessary to drill an adequately sized hole using a hole saw. Please reference the table below to choose the proper hole saw for the fitting being used:

Floor/Wall Mounting Fitting	Hole Saw Size
16 mm x 1/2"	7/8" (22mm)
20 mm x 1/2"	1-1/8" (29mm)
20 mm x 3/4"	1-1/8" (29mm)
26 mm x 1"	1-3/8" (35mm)
26 mm x 3/4"	1-3/8" (35mm)
32 mm x 1"	1-3/4" (44mm)

Tubing Routing

Vertical Runs

Vertical runs inside hollow wall cavities are the preferred location for installation of vertical sections. To avoid damage, tubing should be free to move within the wall cavity without immediate supports between floors, but must be supported at the point of penetration between floors. Vertical run support spacing is not to exceed 10 feet, requiring hangers only where the height of each floor is greater than 10 feet. The run must conform to the Protection Section of this manual.

Horizontal Runs

Areas beneath, alongside, or through floor and ceiling joists or other structural members are typical installation locations for both residential and commercial applications. Structural members may be considered supports for horizontal tubing if they meet the requirements as specified in the table below. The run must conform to the Protection Section of this manual.

Pipe Size (mm)	*Eq. Pipe Size (in.)	Maximum Distance between Supports (in.)
16	3/8	40
20	1/2	50
26	3/4	60
32	1	80

*EQ. = closest U.S. equivalent size

Underground Installation

PEXALGAS requires a minimum burial depth of 12". When connecting to individual appliances, such as gas grills and outdoor lights, in locations not susceptible to physical damage, the minimum burial depth is 8".

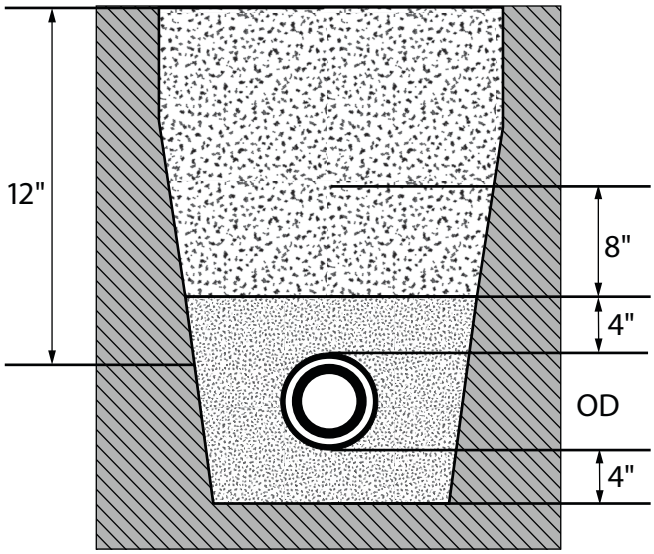
Underground, PEXALGAS may be laid on a layer of sand or inert material (sieved with a particle size no greater than 0.1" - 2.5 mm).

A layer of fine sand at least 4" - 100 mm thick should be laid on the bottom of the trench (leveled and free from stones); it is important that the layer is not too stiff and provides good support for the pipe.

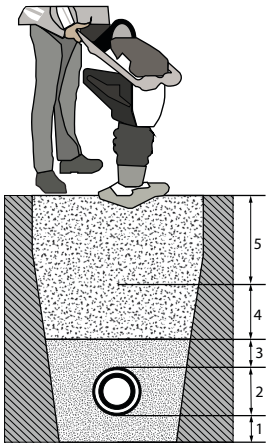
Once PEXALGAS has been laid, it should be covered again with 4" - 100 mm of fine sand.

An 8" - 200 mm final layer of sand or sieved soil should be added and compacted mechanically using a light-duty compactor.

Lastly, up to ground level, compacted debris or soil can be used to backfill the trench.



Where proper bedding material such as fine sand is not available, PEXALGAS can be installed inside a conduit. The conduit may be metallic or polymeric and robust enough to protect piping from physical damage from rocks and other debris.

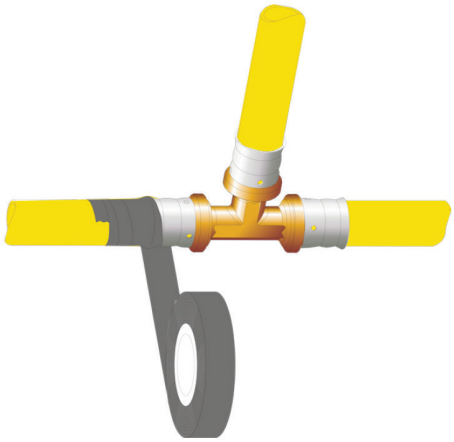


nº	Material	Height	Compaction
1	Fine sand	4"	Manual
2	Fine sand	Pipe diameter	Manual
3	Sand or sieved soil	4"	Manual
4	Sand or sieved soil	8"	Mechanical
5	Debris/soil	Up to ground level	Mechanical

If the fittings are buried underground and installed in particularly moist conditions and embedded in soil, they need to be protected. In such cases, the installer shall cover the fittings with self-joining bituminous tape or silicone tape.

A tracer wire is not required when installing PEXALGAS underground. PEXALGAS is a composite piping material with an aluminum inner pipe, and the requirements of IRC section G2415.17.3, IFGC section 404.17.3 are not applicable.

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. A protective pipe sleeve shall be installed in the foundation wall where PEXALGAS enters the building. The annular space between the pipe sleeve and the PEXALGAS pipe shall be sealed to prevent the entry of gas and water in accordance with IRC section G2415.6, IFGC section 404.6.



Outdoor Appliance Connection Instructions

Outdoor appliances shall be connected in accordance with the manufacturer's instructions using an approved outdoor appliance connector if one is needed, which shall be attached to the PEXALGAS system at a termination fitting.

For LP gas (propane), installation shall be in accordance with the fuel gas code adopted by the local jurisdiction, or in their absence, in accordance with NFPA 58.

Conduit Requirements

The section of PEXALGAS transitioning above ground shall be routed in a section of nonmetallic UV-resistant conduit that is at least 1/2" larger in diameter than the OD of the PEXALGAS pipe.

The conduit shall be strong enough to protect the exposed pipe section from physical damage and shall have a minimum compressive strength of 1,000 lbs (453.6 Kg) and a tensile strength of 300 lbs (136 Kg).

Step-by-Step Installation

Use the Jones Stephens PEXALGAS above ground transition kit for a simplified and faster installation.

Step 1: Route PEXALGAS pipe in conduit. The conduit section shall cover the pipe for a length of a minimum of 12" below grade and continue for at least 4" above ground level.

Step 2: Add a non-metallic UV-resistant end cap drilled to the diameter indicated in the chart below:

Pipe Size (mm)	EQ. Pipe Size (in.)	Hole Size for End Caps (in.)
20	1/2	7/8
26	3/4	1-1/8
32	1	1-3/8

Step 3: Slide the drilled cap down the pipe until it fits onto the conduit section.

Step 4: Crimp the PEXALGAS fittings adapter to the PEXALGAS pipe end, and slide it down until the stainless steel sleeve goes completely inside of the cap's hole and the yellow plastic ring stops on the end cap.

Step 5: Use silicone caulk to join the fitting to the end cap by sealing the area between the outside diameter of the yellow plastic ring and the inside diameter of the cap's hole.

The pipe section above ground can be terminated with PEXALGAS MPT or FPT fitting adapters.

PEXALGAS sections installed outside above ground shall be routed through conduit to protect the pipe when it will be exposed to direct sunlight and/or when it will be subjected to physical damage, unless the pipe terminates directly into a BBQ grill pedestal or gas lamp post (or other similar enclosures).

Expansion/Contraction of Piping

The coefficient of linear expansion of PEX-AL-PEX is 0.00017 in./ft * °F). The hangers use the flexibility of the pipes to accommodate the expansion and contraction of the straight lengths of pipe of the Jones Stephens PEXALGAS system. Use of rigid clamps requires accommodation for linear expansion and contraction of pipe. There are several techniques that can be used.

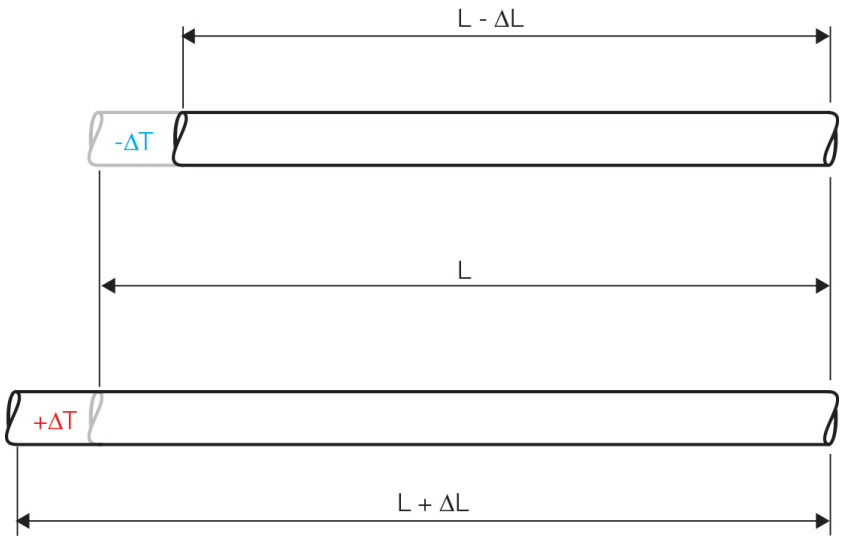
Preliminary Considerations

All materials are subject to expansions or contractions, which are caused by the increase or decrease in temperature. The variation in length ΔL of a pipe of length L caused by a variation in temperature ΔT between the temperature at which the pipe was installed and the current temperature is given by:

$$\Delta L = \alpha \cdot L \cdot \Delta T$$

where α is the coefficient of linear heat expansion of the material.

The following figure can be used to calculate the expansion or contraction of a pipe in relation to the difference in temperature to which it is subjected:



The prevention of such a variation in length in the material would generate a tensile stress (with ΔT<0) or a compression stress (with ΔT>0) given by:

$$\sigma = E \cdot \alpha \cdot \Delta T$$

where E is the modulus of elasticity of the material.

When calculating expansions or contractions, the difference between the temperature at which the pipe was (or will be) installed and the maximum/minimum temperature expected when the system is operating, must always be taken into consideration.

The coefficient of linear expansion of PEX-AL-PEX is 0.00017 in./ft * °F).

The effects of heat expansion and contraction of plastic materials influence the methods of installation of gas supply systems, which require different rules according to the type of installation chosen (refer to the following sections for further details).

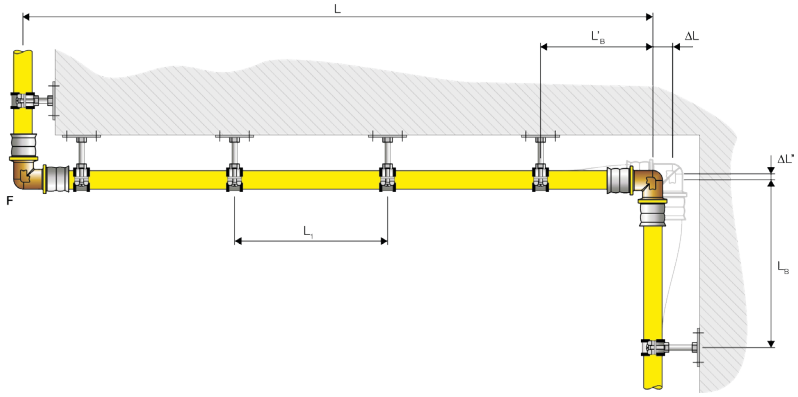
Example:
Calculate the linear heat expansion of a 26-ft PEXALGAS pipe that is installed at a temperature of 50°F and is subject to a maximum temperature of 140°F.

By using the formula previously given and considering the heat expansion coefficient of PEX-AL-PEX, we have:

$$\Delta L = \alpha \cdot L \cdot \Delta T = 0.00017 \cdot 26 \cdot (140\text{-}50) = 0.40 \text{ in}$$

Compensation Using a Flexible Arm (Type L)

This type of compensation utilizes the change of direction of the pipes; the segment of pipe (flexible arm) of length LB accommodates the movement as a result of the thermal expansion of a segment of pipe of length L perpendicular to it. In this case, the correct distance of the pipe from the walls must be guaranteed to allow the movement; it is therefore necessary to install the brackets according to the structure of the flexible arm.



The length of the flexible arm L_B [in] is calculated using the formula:

$$L_B = C \cdot \sqrt{De \cdot \Delta L}$$

where C is the material constant, which for PEXALGAS pipes is 33, De is the diameter of the pipe (in.), and ΔL is the change in length of the segment of pipe to be accommodated.

Example:
Calculate the length of the flexible arm of a PEXALGAS pipe with a diameter of 1" (32 mm) and a length of 160 ft that is installed at a temperature of 70°F and subject to a maximum temperature of 130°F.

The thermal expansion of the section of pipe is:

$$\Delta L = \alpha \cdot L \cdot \Delta T = 0.00017 \cdot 160 \cdot (130 - 70) = 1.63 \text{ in.}$$

and, using the formula, the deflection arm L_B is calculated:

$$L_B = C \cdot \sqrt{De \cdot \Delta L} = 33 \cdot \sqrt{1.26 \cdot 1.63} = 47.29 \text{ in.}$$

$$47.29 \text{ in.} = 3.94 \text{ ft}$$

The same flexible arm (L_B) is subject to a heat expansion of:

$$\Delta L' = \alpha \cdot L_B \cdot \Delta T = 0.00017 \cdot 3.94 \cdot (130 - 70) = 0.04 \text{ in.}$$

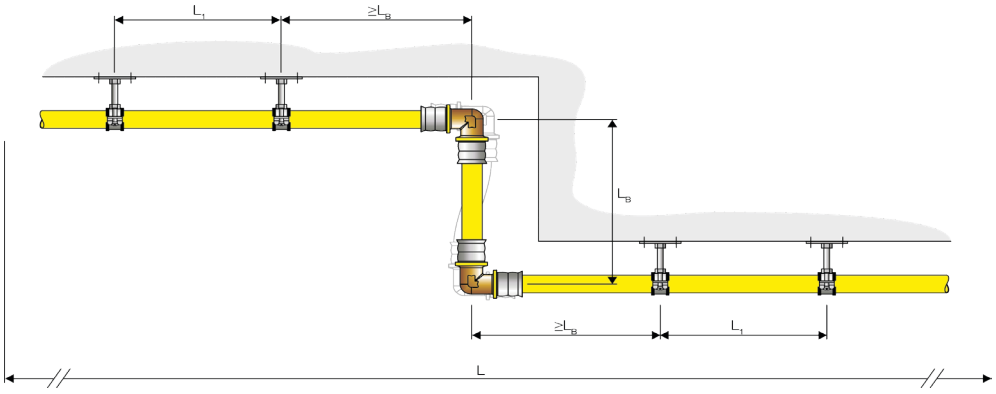
and requires therefore that part of the main pipe section is free to accommodate this expansion, the arm that is free to expand is:

$$L'_B = C \cdot \sqrt{De \cdot \Delta L'} = 33 \cdot \sqrt{1.26 \cdot 0.04} = 7.41 \text{ in.}$$

Compensation Using Flexible Arm Misalignment (Type Z)

This type of compensation utilizes a misalignment of the pipe; the section of pipe (flexible arm) of length L_B accommodates the expansions of the pipe of length L perpendicular to it.

The distance between the flexible arm and the brackets must not be shorter than the length of the flexible arm L.



The length of the flexible arm L_B [mm] is calculated using the formula:

$$L_B = 0.65 \cdot C \cdot \sqrt{De \cdot \Delta L}$$

where C is the material constant, which for PEXALGAS pipes is 33, De is the pipe diameter (in.), and ΔL is the change in length of the segment of pipe to be accommodated.

Example:
Calculate the length of the flexible arm misalignment of a PEXALGAS pipe with a 3/4" (26 mm) diameter and a length of 130 ft installed at a temperature of 50°F and subject to a maximum temperature of 120°F.

The heat expansion of the section of pipe is:

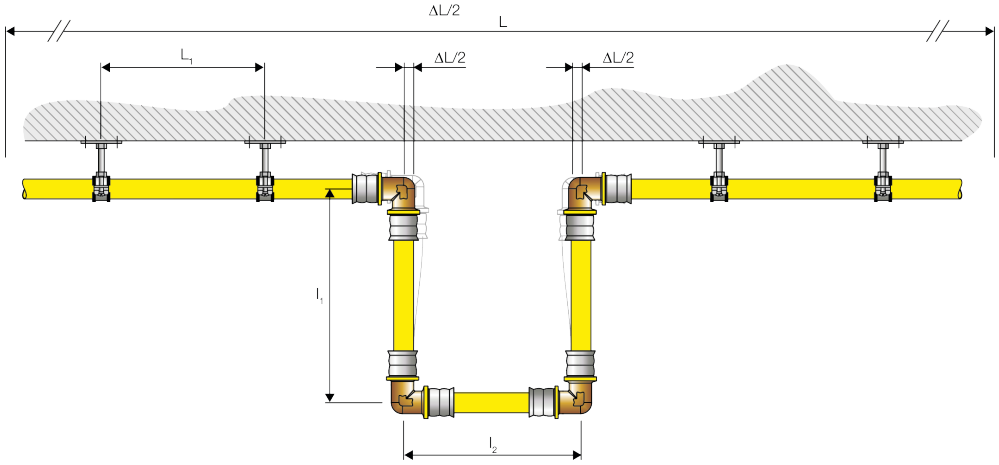
$$\Delta L = \alpha \cdot L \cdot \Delta T = 0.00017 \cdot 130 \cdot (120 - 50) = 1.55 \text{ in.}$$

and, using the formula, the deflection arm L_B is calculated:

$$L_B = 0.65 \cdot C \cdot \sqrt{De \cdot \Delta L} = 0.65 \cdot 33 \cdot \sqrt{1.02 \cdot 1.55} = 26.97 \text{ in.}$$

"Omega" Expansion Bend (Type U)

This type of compensation is generally employed in risers or in basement collectors when the expansions cannot be accommodated by the changes in direction of the pipes. Whereas, in the case of deflection arm compensation, changes in direction of the system are used, in this case, the configuration must be created especially.



The total length of the "omega" expansion bend L_B (mm) is calculated using the formula (also shown in the following diagram):

$$L_B = 2 \cdot l_1 + l_2 = C \cdot \sqrt{De \cdot \Delta L}$$

where C is the material constant, which for PEXALGAS pipes is 33, De is the pipe diameter (in.), ΔL is the change in length of the pipe section to be accommodated, l_1 and l_2 are the sides of the "omega" expansion bend. The "omega" compensation must be configured depending on the available space; however, where possible, it is recommended to maintain the following dimensional ratio:

$$l_1 = 2 \cdot l_2$$

and therefore:

$$l_1 = 0.4 \cdot L_B$$

$$l_2 = 0.2 \cdot L_B$$

Example:
Calculate the "omega" expansion bend for the PEXALGAS pipe section of diameter 1" (32 mm) and 82 ft length, installed at a temperature of 60°F and subject to a maximum temperature of 150°F.

The thermal expansion of the pipe section is:

$$\Delta L = \alpha \cdot L \cdot \Delta T = 0.00017 \cdot 82 \cdot (150 - 60) = 1.25 \text{ in.}$$

and, using the formula, the total length is calculated for the "omega" L_B:

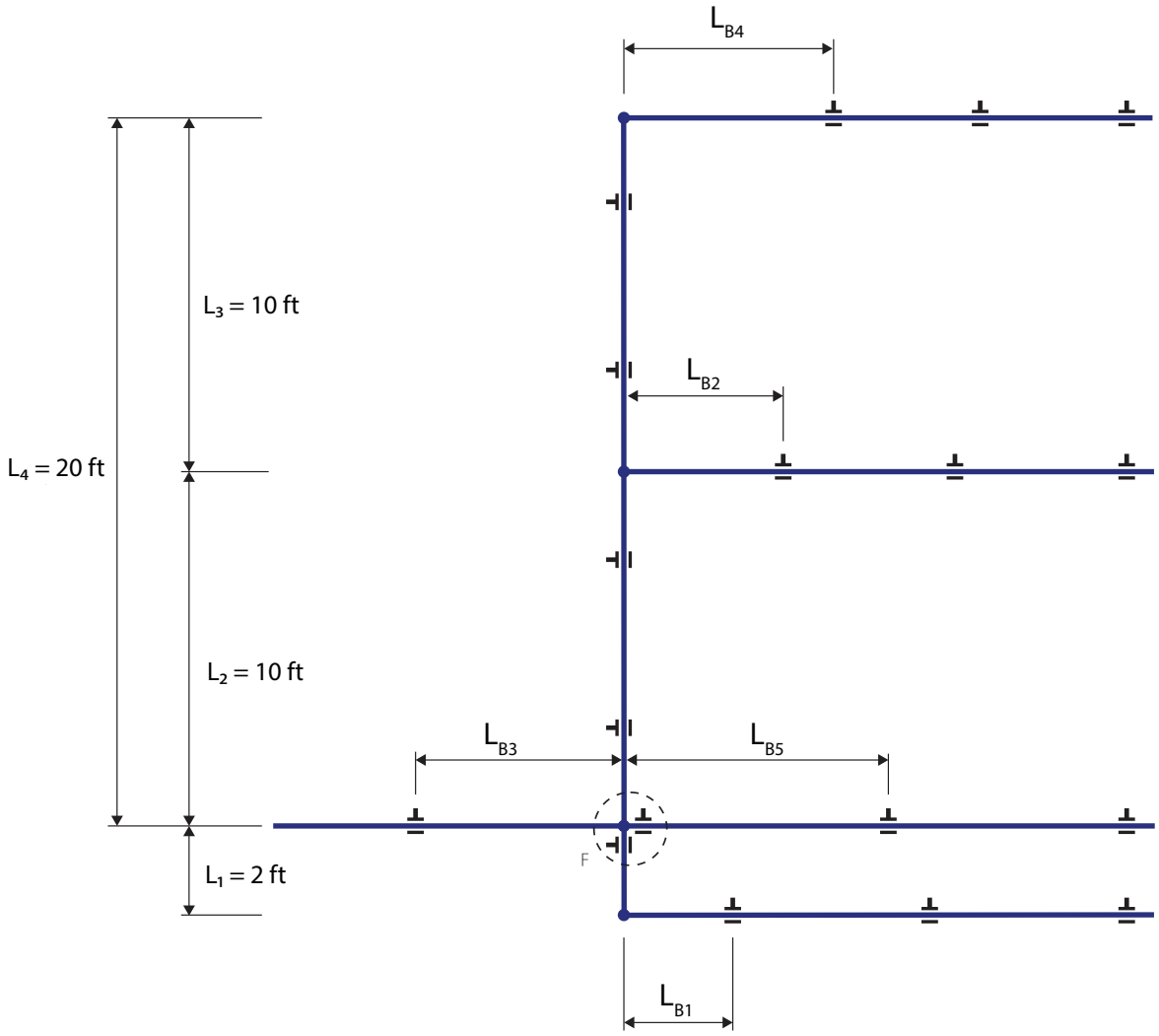
$$L_B = C \cdot \sqrt{De \cdot \Delta L} = 33 \cdot \sqrt{1.26 \cdot 1.25} = 41.49 \text{ in.}$$

and considering the dimensional ratio suggested, the result is:

$$l_1 = 0.4 \cdot L_B = 0.4 \cdot 41.49 = 16.6 \text{ in.}$$

$$l_2 = 0.2 \cdot L_B = 0.2 \cdot 41.49 = 8.3 \text{ in.}$$

Example:
Calculate the flexible arms for the gas supply system indicated in the figure created with PEXALGAS pipe, installed at a temperature of 50°F and subject to a maximum temperature of 140°F.



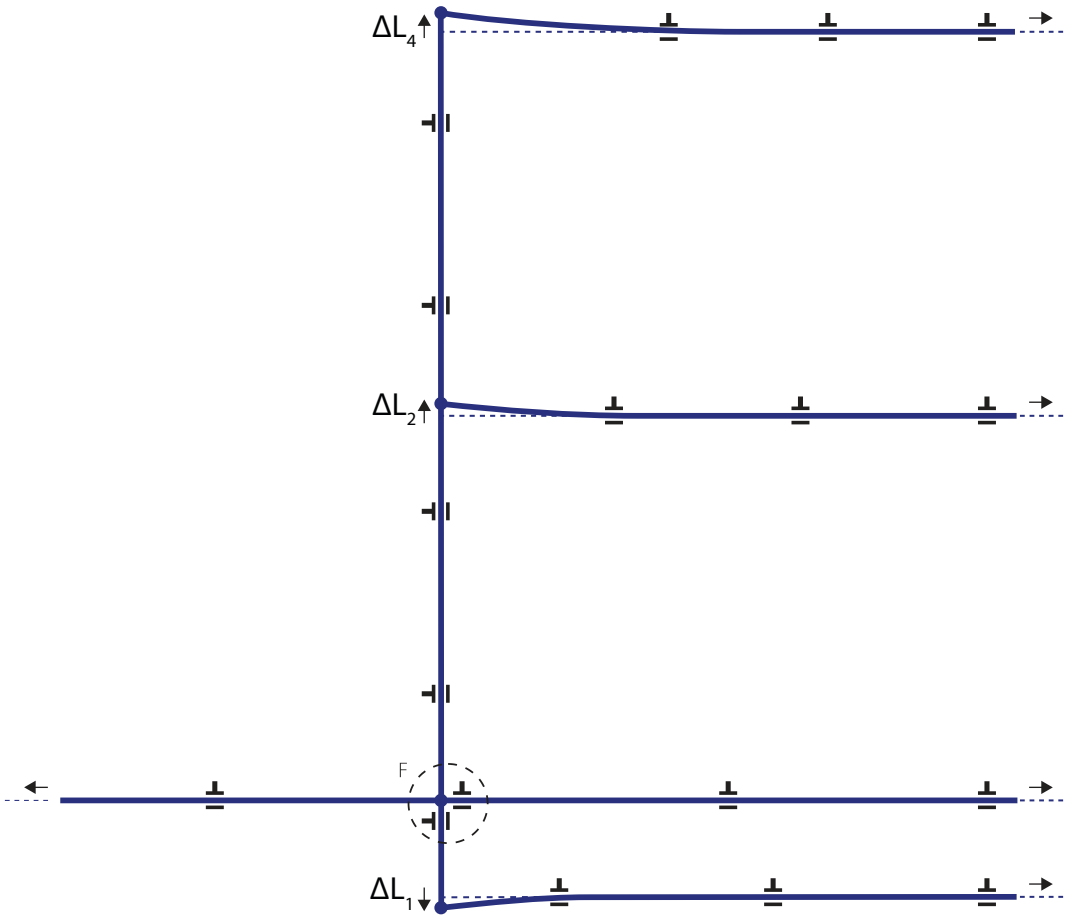
The pipe sections L_{B3} and L_{B5} are not subject to flexure due to the anchor point (F) near the cross branch.

The sections subject to flexure are:

L_{B1} which represents the flexible arm of section L_1,

L_{B2} which represents the flexible arm of L_2,

L_{B4} which represents the flexible arm of $L_4 = L_2 + L_3$.



The extensions of the above mentioned sections are:

$$\Delta L_1 = \alpha \cdot L_1 \cdot \Delta T = 0.00017 \cdot 2 \cdot (140 - 50) = 0.03 \text{ in.}$$

$$\Delta L_2 = \alpha \cdot L_2 \cdot \Delta T = 0.00017 \cdot 10 \cdot (140 - 50) = 0.15 \text{ in.}$$

$$\Delta L_4 = \alpha \cdot L_4 \cdot \Delta T = 0.00017 \cdot 20 \cdot (140 - 50) = 0.31 \text{ in.}$$

which correspond to the following flexible arms:

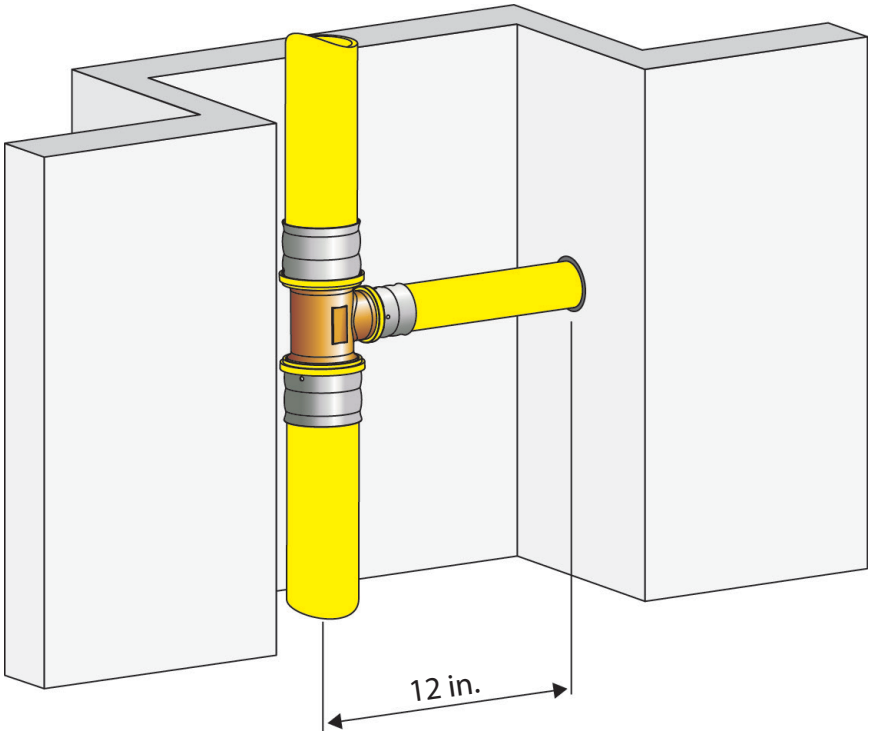
$$L_{B1} = C \cdot \sqrt{(De1 \cdot \Delta L_1)} = 33 \cdot \sqrt{(1.26 \cdot 0.03)} = 6.42 \text{ in.}$$

$$L_{B2} = C \cdot \sqrt{(De2 \cdot \Delta L_2)} = 33 \cdot \sqrt{(1.26 \cdot 0.15)} = 14.35 \text{ in.}$$

$$L_{B4} = C \cdot \sqrt{(De4 \cdot \Delta L_4)} = 33 \cdot \sqrt{(1.02 \cdot 0.31)} = 18.56 \text{ in.}$$

Example:
The figure shows a shaft in which a riser has been installed, subject to a thermal expansion near the branch of 20 ft.

Assess whether the change in direction made with a 1/2" (20 mm) PEXALGAS pipe is sufficient to accommodate such an expansion, keeping the geometries indicated in the figure in consideration.



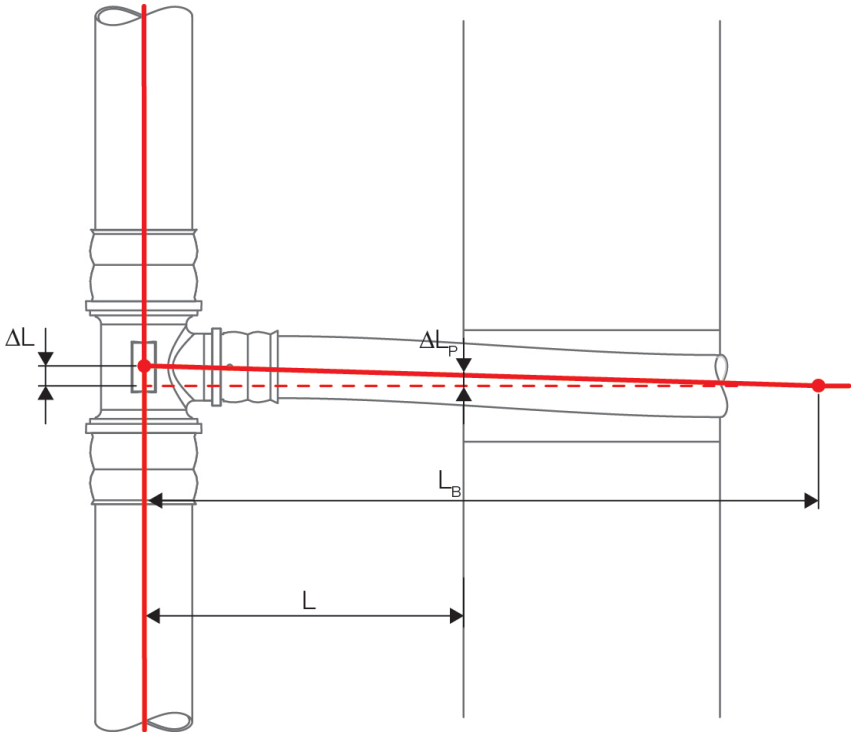
From the figure, we can see that the available space for creating a flexible arm is L=12 in., which is the distance between the wall, through which the change in direction passes, and the riser.

You need to ensure that this distance is sufficient to allow the pipe to flex without it being damaged; it is therefore necessary to calculate the actual length of the flexible arm and assess whether this is less than the available space.

At the point indicated, the expansion ΔL = 0.25 in., the length of the actual flexible arm is therefore:

$$L_B = C \cdot \sqrt{De \cdot \Delta L} = 33 \cdot \sqrt{0.79 \cdot 0.25} = 14.7 \text{ in.} > 12 \text{ in.}$$

Greater space is required to give the pipe sufficient room for movement; however, if the PEXALGAS pipe is installed with insulation where it passes through the wall, this could be capable of absorbing part of the flexure that the pipe exerts inside the wall itself. It is possible to calculate approximately the extent of the movement of the pipe inside the wall to verify whether the insulation can absorb the movement.



$\Delta Lp = \Delta L * (L_B - L)/L_B = 0.25 * 2.7 / 14.7 = 0.046$ in.

Protection

Introduction

Jones Stephens piping should be protected from physical damage caused by screws, nails, drill bits, etc. The piping is most susceptible to puncture at all points of support. The best practice is to install the piping in those areas where the likelihood of physical damage is minimized, and no protection is needed. For example:

A. Where piping is supported to allow for a minimum displacement allowance of 3 inches, or exceeding the length of the fasteners used during construction, whichever is greater.

B. Where any unsupported piping can be displaced in the direction of potential penetration at least 3 inches, or exceeding the length of the fasteners used during construction, whichever is greater.

C. Where piping is supported under the joist in basements or crawl spaces and is not concealed by wall board or ceilings.

When Jones Stephens piping is installed in locations where the potential of physical damage exists, the use of striker plates, listed for gas piping, must be used. The tubing may also be routed inside stripwound conduit or schedule 40 steel pipe when protection is required.

In areas where penetration through studs, joists, plates, and other similar structural members occur, striker protection is required when all of the following criteria apply:

1. When the piping system is installed in a concealed location and is not viewable.
2. When the piping system is installed in a location that does not allow free movement to avoid puncture threats.
3. When the piping system is installed within 3 inches of possible points of penetration, or exceeding the length of the fasteners used during construction, whichever is greater.

Striker Plates

Striker plates are used to prevent piping damage in areas where potential penetration threats exist through studs, joists, plates, and other similar structural members. For installations where all three above criteria apply, PEXALGAS tubing must be adequately protected from risk of puncture or physical damage at all points of penetration through studs, joists, plates, or similar structures using 16-gauge hardened steel striker plates in accordance with the requisite state and/or local fuel gas code.

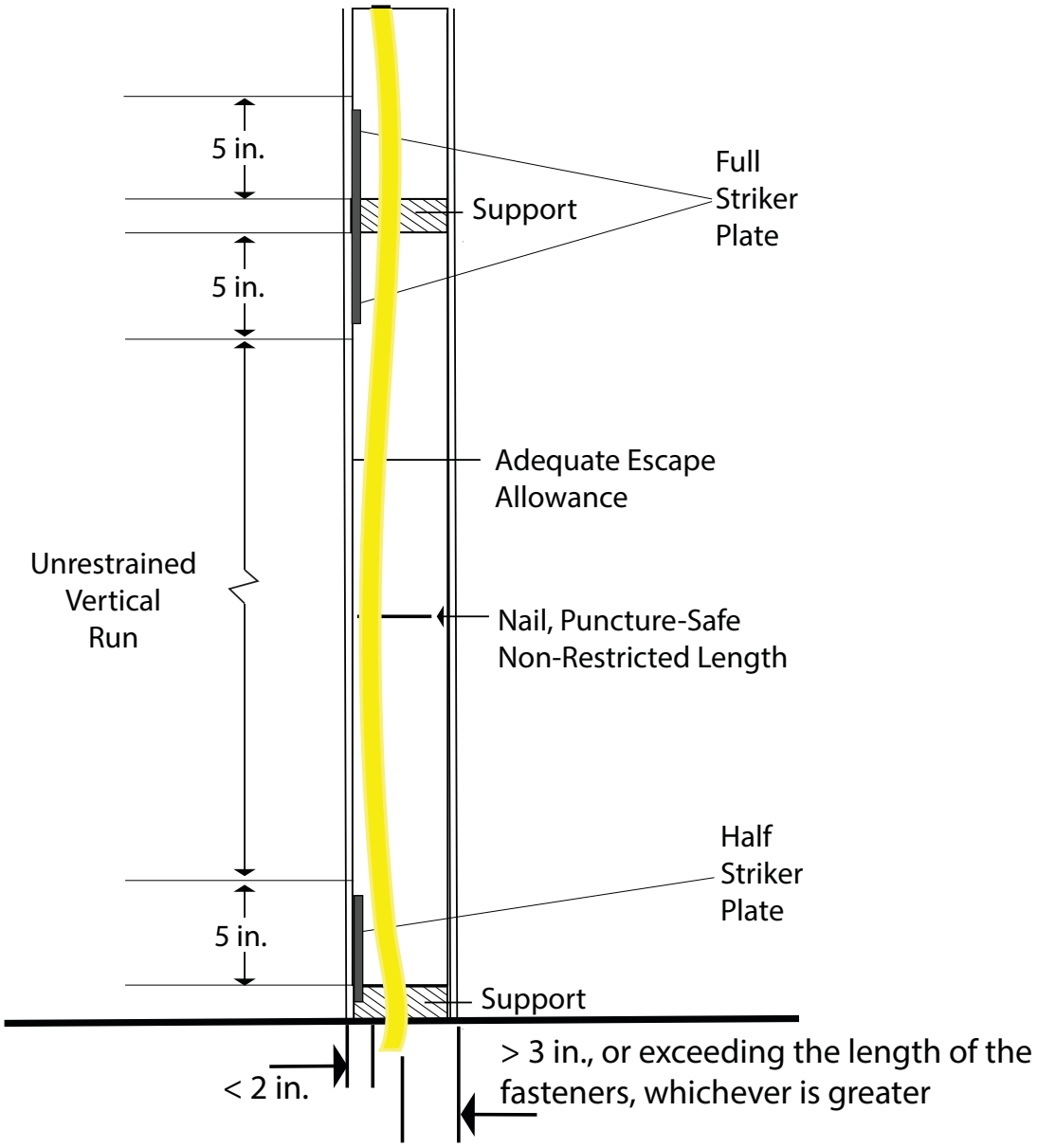
Stripwound Metal Conduit

A. At termination points not covered by ANSI specifications, stripwound metal conduit (heavy wall) shall be installed as additional protection.

B. Stripwound metal conduit shall also be used to shield piping from puncture threats when the piping is installed in a concealed location where it cannot be displaced a minimum 3 inches (or exceeding the length of the fasteners used during construction, whichever is greater) from a potential puncture threat or the pipe run is restricted by constraints or intermediate support points which prevent free movement of the pipe.

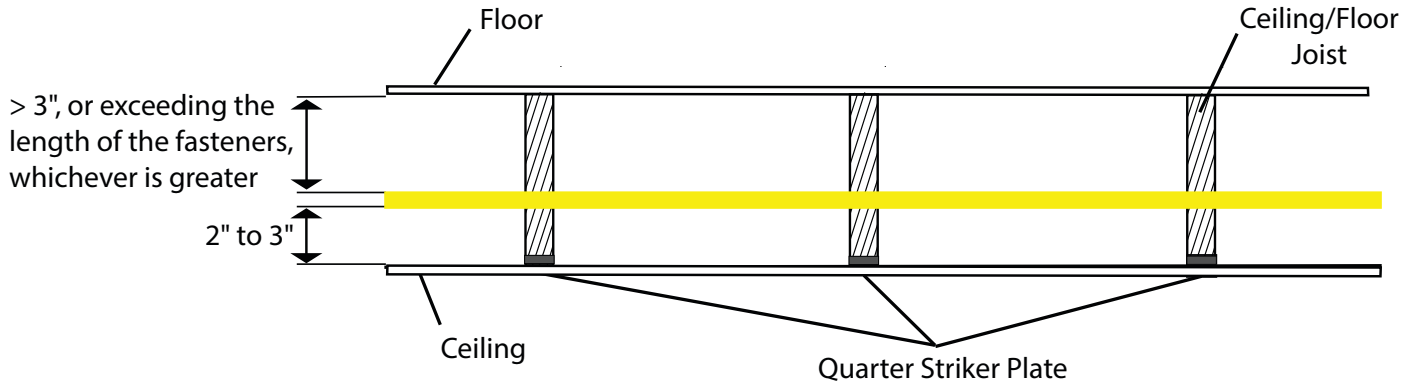
C. Schedule 40 steel pipe is an acceptable alternative for puncture protection. Steel pipe can be used where standard striker plates cannot reasonably be installed.

A. At concealed support points and points of penetration less than 2 inches from any edge of a stud, joist, plate, etc., shielding is required at the area of support and extending 5 inches in one or both directions (if appropriate).

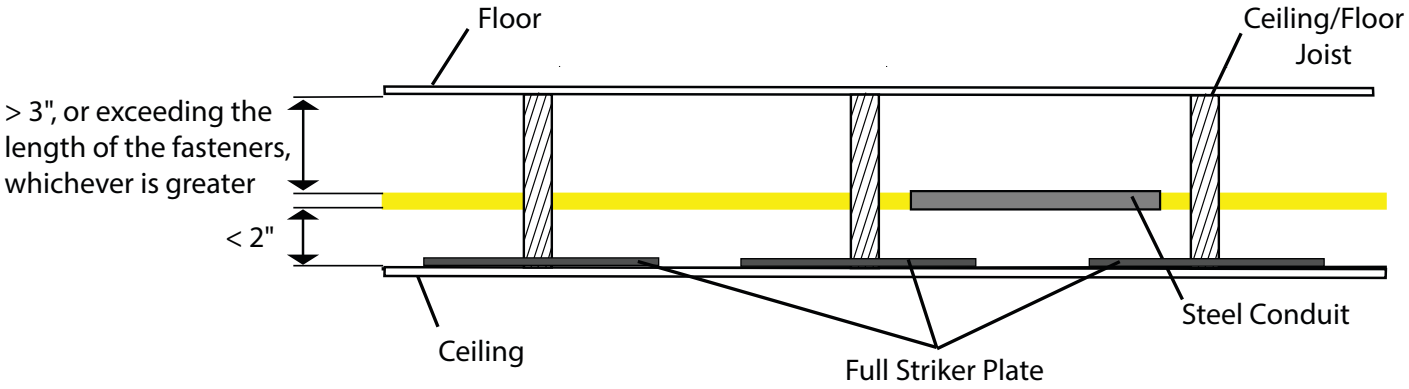


*Drawing is not to scale

B. At concealed support points and points of penetration within 2 to 3 inches from any stud, joist, plate, etc., listed quarter striker plates are required at the area of support.



C. Piping routed horizontally through structural members shall be protected from puncture threats with the appropriate shielding material. At penetration joints, listed stud guards of the appropriate size should be utilized. Piping between constraints that are meeting the criteria requiring full striker plates shall be additionally protected by stripwound metal conduit, or schedule 40 steel pipe along the entire length.



D. Piping greater than 32 mm nominal diameter (26 mm internal diameter) installed within a concealed hollow wall cavity of 2" x 4" construction shall be protected along the entire concealed run length with stripwound metal conduit, or schedule 40 pipe.

E. Should an unfinished ceiling (I.e. basement) be covered at a later date, quarter striker plates should be replaced with appropriate protection devices that provide adequate protection for potential penetration threats.

F. When installed along the side of a structure in an exposed condition, between the ground and a height of 6 feet, PEXALGAS shall be installed in a location which will not subject the piping to mechanical damage or be protected inside a metallic conduit or protective enclosure.

*Drawings are not to scale

Installation in Insulated Walls

Rigid installations present significant puncture threats for Jones Stephens PEXALGAS in concealed spaces.

In concealed spaces (e.g. wall cavities), rigid insulation will prevent Jones Stephens PEXALGAS from being displaced. Piping shall not be installed in a wall cavity with foam insulation without additional protection as described below:

A. Piping shall be routed through a rigid steel pipe or floppy conduit in walls where "foamed in" insulation is to be used (i.e. rigid steel pipe or conduit). This conduit shall be secured according to local building practice.

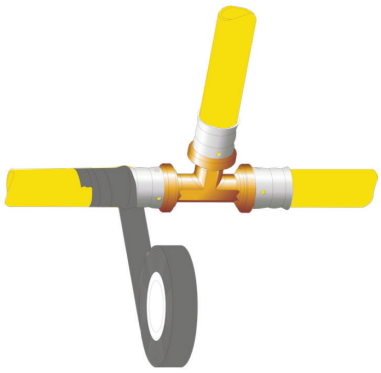
B. When pipe is fastened to the sheathing on exterior walls with cable clamps, the entire length shall be protected with steel pipe or floppy conduit.

C. When piping is installed inside walls with batt insulation, the tubing shall be routed between the face (craft paper/ vapor barrier) and the wall surface. If installed in a concealed location within a minimum 3" from a potential puncture threat, the run shall be protected with stripwound conduit or steel pipe.

D. PEXALGAS piping does not need additional protection where it is more than 3" from any puncture threats, although consideration must be given to the chance that it may migrate toward penetration threats as the insulation is applied and during curing.

Fittings Protection

If the fittings are installed in particularly moist conditions, embedded in soil, or subject to particularly aggressive compounds (such as concrete or cement mortars), they need to be protected. In such cases, the installer should cover the fittings with self-bonding bituminous tape or silicone tape.



Meter Connections

Unsupported Meters

A. Meters which depend on the service and house piping for support shall not be directly connected to the PEXALGAS.

B. The use of an outdoor termination fitting mounted to the exterior of the structure, meter stub out, other rigidly mounted termination fitting, or transitioning to rigid black pipe are acceptable transitional methods.

Self-Supported Meters

A. Meters which are independently supported by a bracket shall not be directly connected to the flexible gas piping.

B. The use of an outdoor termination fitting mounted to the exterior of the structure, meter stub out, other rigidly mounted termination fitting, or transitioning to rigid black pipe are acceptable transitional methods.

Appliance Connections

Movable Appliances

IMPORTANT: JONES STEPHENS PIPING AND FITTINGS ARE NOT RATED AS FLEXIBLE APPLIANCE CONNECTORS AND MUST NOT BE DIRECTLY CONNECTED TO MOVABLE APPLIANCES.

A. When using Jones Stephens Gas piping with movable appliances such as ranges or dryers, the piping must be rigidly terminated before the appliance. Appliance stub outs, termination fittings, or transitioning to rigid black pipe are acceptable means to terminate PEXALGAS prior to the appliance.

B. Final connection from a PEXALGAS termination point to a movable appliance shall be made with a flexible appliance connector or another approved connection device.

Non-Movable Appliance

A. Jones Stephens piping can be directly connected to a non-movable appliance such as a furnace or water heater (be sure to check with local code if this is acceptable prior to installation).

B. In this type of application, no termination fitting is required, and the piping should be terminated at the appliance shutoff valve.

Special Applications

Prolonged exposure to direct sunlight is detrimental to all PEXALGAS. Jones Stephens PEXALGAS shall not be installed exposed in direct sunlight. For outdoor installations, special care must be provided that the PEXALGAS is not left exposed to sunlight, and special care shall be made to protect the piping system from accidental damage.

When installed along the side of a structure in an exposed condition, between the ground and a height of 6 feet, PEXALGAS shall be installed in a location which will not subject the piping to mechanical damage or be protected inside a conduit or protective enclosure.

Infrared Heaters

Infrared heaters mounted from ceilings and walls of structures shall be connected to the Jones Stephens gas piping system ANSI 383.6 "Standard for gas fired infrared heaters."

Pad-Mounted Gas Appliances

Gas appliances mounted on concrete pads or blocks, such as gas furnaces, air conditioners, pool heaters, and NGV refueling systems, shall be connected to the Jones Stephens gas piping system at a termination fitting using either rigid pipe or an approved outdoor appliance connector. Pad-mounted equipment (in most cases) is considered "fixed" if not moved for cleaning, maintenance, etc. (i.e. A/C units).

Gas Fireplaces

ATTENTION: JONES STEPHENS GAS PIPING SHALL NOT BE ROUTED DIRECTLY INTO A METALLIC FIREPLACE ENCLOSURE. THE PIPING CONNECTION SHALL BE MADE OUTSIDE OF THE ENCLOSURE TO A SECTION OF RIGID METALLIC PIPE.

A. When routing Jones Stephens gas piping through masonry construction, for connection to gas fireplaces and gas logs, the piping is required to be sleeved in a nonmetallic conduit through the masonry structure. The annular space between the piping and sleeve should be caulked at both the interior and exterior locations.

B. For any fireplace application where installation of Jones Stephens gas piping is desired, a fireplace stubout shall be used to terminate the piping outside the enclosure. While other listed installation practices are acceptable, this method is preferred to prevent inadvertent damage to the PEXALGAS system.

C. Adherence to local codes and manufacturer's instructions are required; be sure to know and understand all requirements prior to installation that can be caused by the fireplace enclosure.

Pressure Regulators and Vent Line Installation Guidelines

A Jones Stephens gas piping system utilizing gas line pressures above 1/2 PSI are required to use a line pressure regulator upstream of the appliances to reduce the line pressure to less than 1/2 PSI. The regulator shall incorporate construction which will "lock up" under no-flow conditions to limit the downstream pressure to not more than 1/2 PSI. The guidelines below highlight requirements from most fuel gas codes and are for your reference only. The regulator shall comply with a nationally recognized standard for pressure regulators. Installation of the regulator must be done in accordance with the manufacturer's instructions and local fuel gas code requirements.

Regulators used to reduce elevated system pressure for appliance use must also conform to the following:

- Sized to supply the required appliance load
- Equipped with an acceptable vent limiting device, supplied by the manufacturer, or be capable of being vented to the outside atmosphere
- Installed in accordance with manufacturer's printed instructions
- Installed in an accessible location
- A CSA Design Certified shutoff valve must be installed upstream of the pressure regulator

Regulator Venting Requirements

Vent Lines

Venting is required for all regulators to avoid a gas buildup in an enclosed area in the event that the regulator diaphragm ruptures. Vent lines should be properly sized per the manufacturer's instructions and installed to ensure proper operation.

Vent Line Installation Guidelines

The vent line shall not be smaller than the vent connected to the pressure regulator.

The recommended minimum size vent line for the regulator is 1/4" nominal ID copper tubing or other approved material. The maximum length installed for this size vent line should be less than 30 feet. Larger diameter vent lines can be used if necessary. In determining the proper size vent line for a particular installation, a test may be necessary with the vent line and regulator under normal use to ensure proper regulator operation. Consult with the regulator manufacturer for limitations of length and size of the vent line.

The vent shall be designed and installed to prevent the entry of water, insects, or other foreign materials that could cause blockage.

Under no circumstances shall a regulator be vented to the appliance flue or building exhaust system.

Vent Limiter Option

Vent limiters are an alternate venting option available for some regulators. When a vent limiter is desired, all installation guidelines for the vent limiter and regulator must be followed to ensure proper operation of the unit.

Vent Limiter Installation Guidelines

Regulators must be installed in the horizontal upright position and in a well-ventilated area when using a vent limiter. Consult with local code before installation.

Only a vent limiter supplied by the regulator manufacturer may be used; no piping shall be installed between the regulator and vent limiting device.

Leak detection fluids may not be used on vent limiters, as they can cause corrosion and operational failure. Remove the vent limiter and check the vent opening if a leaking diaphragm is suspected. Remember, regulators will "breathe" when regulating, creating a bubble — a leak will blow bubbles constantly. Do not leak test the vent limiter with liquid leak test solution. This action will contaminate the internal ball check mechanism or plug the breathing hole, resulting in erratic regulator operation.

Vent limiters shall not be used outside or anywhere they are subject to damage from the environment. Vent protection devices should/must be used in outdoor installations.

Over Pressurization Protection

Gas systems using pressures above 2 PSI up to 5 PSI must use OPD (Over Pressure Protection Devices).

Pressure Testing and Inspection Procedure

The final installation is to be inspected and tested for leaks at 1.5 times the maximum working pressure, but not less than 3 PSI, using procedures specified in Chapter 7 "Inspection, Testing and Purging" of the National Fuel Gas Code, NFPA 54/ANSI Z223.1. In Canada, refer to the applicable sections of the CAN/CGA - B149 Installation codes.

Maximum test pressures recommended - 40 PSI.

Leak test solutions may cause corrosion to some types of material in the gas piping system. Use only non-corrosive leak check solutions. Water rinse after the test and thoroughly dry all contacted materials.

Do not connect appliances until after pressure test is completed.

Inspect the installed system to ensure:

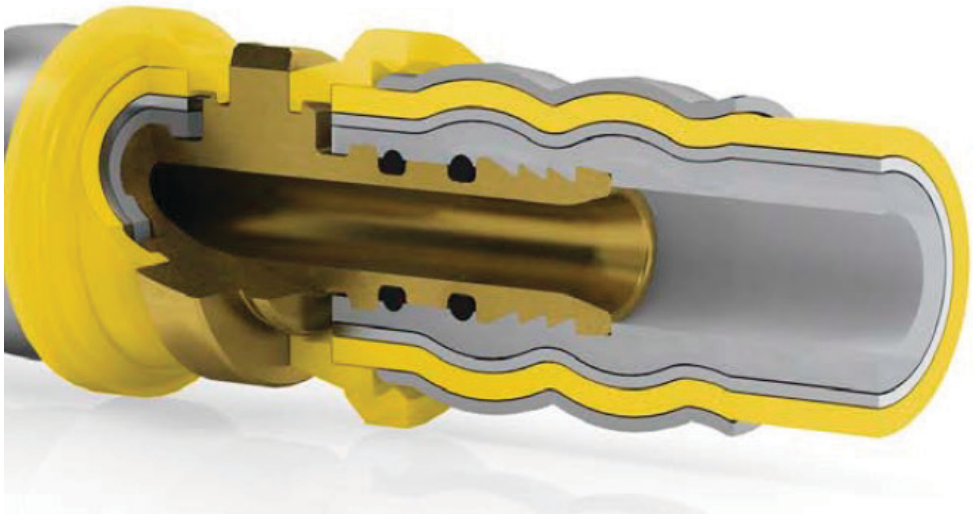
- Presence of listed stud guards and other protective devices at all required locations
- Acceptable physical condition of the tubing
- Presence of fittings (properly pressed)
- Correct regulator and manifold arrangement with proper venting requirements
- Pressure testing should be performed during rough construction of the facility (before interior walls are finished)
- This will permit a more complete inspection of the piping system during the pressure testing. All gas outlets for appliance connections should be capped during pressure testing

The elevated pressure system requires a two-part pressure test.

- The first part is performed on the elevated pressure section, between the meter connection and the pressure regulator.
- The second part is performed on the low-pressure section, between the pressure regulator and the individual gas appliance outlets.

Electrical Bonding

Jones Stephens PEXALGAS system crimp fittings dielectrically isolate the metal fitting from the internal aluminum pipe layer. As such, differently from other metallic gas piping, the PEXALGAS system is not likely to be energized, and there are no additional bonding requirements imposed by the manufacturer's installation instructions for the Jones Stephens PEXALGAS system. However, installers must always adhere to any local requirements that may conflict with these instructions.



ALL OWNERS should consult a lightning safety consultant to determine whether installation of a lightning protection system would be required to achieve sufficient protection for all building components from lightning. Factors to consider include whether the area is prone to lightning.

Lightning protection systems are beyond the scope of this manual and installation guidelines, but are covered by National Fire Protection Association, NFPA 780, the Standard for the Installation of Lightning Protection Systems, and other standards.

Consult local building codes for required separations for piping from continuous metallic systems including metallic chimney liners, metallic appliance vents, metallic ducting and piping, and insulated or jacketed electrical wiring and cables.

Sizing Tables

Jones Stephens sizing tables reflect the real pressure drop of the pipe and fittings. Sizing must be done in accordance with NFPA 54 (National Fuel Gas Code), using both the pipe and the fittings sizing tables. This allows for a more accurate sizing of the system for your installation.

Natural Gas <2 PSI (based on a 0.6 specific gravity gas)

Working Conditions		
Natural Gas	-	-
Inlet Pressure	6" WC	-
Pressure Drop	0.300	WC (in.)

*EQ. Pipe Size (in.)	3/8"	1/2"	3/4"	1"
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	97	206	370	737
10	67	142	254	506
15	54	114	204	407
20	46	97	175	348
25	41	86	155	308
30	37	78	140	279
40	31	67	120	239
50	28	59	107	212
60	25	54	97	192
70	23	49	89	177
80	22	46	83	164
90	20	43	78	154
100	19	41	73	146
150	15	33	59	117
200	13	28	50	100
250	12	25	45	89
300	11	23	40	80
350	10	21	37	74
400	9	19	35	69
450	8	18	32	65
500	8	17	31	61

*EQ. = closest U.S. equivalent size

Sizing Tables

Natural Gas <2 PSI (based on a 0.6 specific gravity gas)				
Working Conditions				
Natural Gas		-	-	
Inlet Pressure		6-7" WC	-	
Pressure Drop		0.500	WC (in)	

*EQ. Pipe Size (in.)	3/8"	1/2"	3/4"	1"
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	128	272	488	971
10	88	187	335	668
15	71	150	269	536
20	60	128	231	459
25	54	114	204	407
30	48	103	185	368
40	41	88	158	315
50	37	78	140	279
60	33	71	127	253
70	31	65	117	233
80	29	61	109	217
90	27	57	102	203
100	25	54	97	192
150	20	43	78	154
200	17	37	66	132
250	15	33	59	117
300	14	30	53	106
350	13	27	49	98
400	12	25	46	91
450	11	24	43	85
500	11	23	40	80

*EQ. = closest U.S. equivalent size

Sizing Tables

Natural Gas <2 PSI (based on a 0.6 specific gravity gas)				
Working Conditions				
Natural Gas		-	-	
Inlet Pressure		8" WC	-	
Pressure Drop		3.000	WC (in)	

*EQ. Pipe Size (in.)	3/8"	1/2"	3/4"	1"
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	337	717	1287	2560
10	232	492	884	1760
15	186	395	710	1413
20	159	338	608	1209
25	141	300	539	1072
30	128	272	488	971
40	109	233	418	831
50	97	206	370	737
60	88	187	335	668
70	81	172	309	614
80	75	160	287	571
90	71	150	269	536
100	67	142	254	506
150	54	114	204	407
200	46	97	175	348
250	41	86	155	308
300	37	78	140	279
350	34	72	129	257
400	31	67	120	239
450	30	63	113	224
500	28	59	107	212

*EQ. = closest U.S. equivalent size

Sizing Tables

Natural Gas <2 PSI (based on a 0.6 specific gravity gas)				
Working Conditions				
Natural Gas		-	-	
Inlet Pressure		12-14" WC	-	
Pressure Drop		6.000	WC (in)	

*EQ. Pipe Size (in.)	3/8"	1/2"	3/4"	1"
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	490	1043	1872	3725
10	337	717	1287	2560
15	271	575	1033	2056
20	232	492	884	1760
25	205	436	784	1560
30	186	395	710	1413
40	159	338	608	1209
50	141	300	539	1072
60	128	272	488	971
70	118	250	449	894
80	109	233	418	831
90	103	218	392	780
100	97	206	370	737
150	78	166	297	592
200	67	142	254	506
250	59	126	226	449
300	54	114	204	407
350	49	105	188	374
400	46	97	175	348
450	43	91	164	327
500	41	86	155	308

*EQ. = closest U.S. equivalent size

Sizing Tables

Natural Gas 2 PSI - 1 PSI (based on a 0.6 specific gravity gas)				
Working Conditions				
Natural Gas		-	-	
Inlet Pressure		2.000	(PSI)	
Pressure Drop		1.000	(PSI)	
***EQ. Pipe Size (in.)**	**3/8"**	**1/2"**	**3/4"**	**1"**
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	1180	2510	4506	8968
10	811	1725	3097	6164
15	651	1385	2487	4950
20	557	1186	2129	4236
25	494	1051	1887	3754
30	448	952	1709	3402
40	383	815	1463	2912
50	340	722	1297	2580
60	308	654	1175	2338
70	283	602	1081	2151
80	263	560	1006	2001
90	247	525	943	1878
100	233	496	891	1774
150	187	399	716	1424
200	160	341	612	1219
250	142	302	543	1080
300	129	274	492	979
350	118	252	453	901
400	110	234	421	838
450	103	220	395	786
500	98	208	373	742

*EQ. = closest U.S. equivalent size

Sizing Tables

Natural Gas 5 PSI - 3.5 PSI (based on a 0.6 specific gravity gas)				
Working Conditions				
Natural Gas		-	-	
Inlet Pressure		5.000	(PSI)	
Pressure Drop		3.500	(PSI)	
***EQ. Pipe Size (in.)**	**3/8"**	**1/2"**	**3/4"**	**1"**
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow Rate Natural Gas (ft3/h)			
5	2457	5225	9381	18670
10	1688	3591	6448	12832
15	1356	2884	5178	10304
20	1160	2468	4431	8819
25	1029	2187	3928	7816
30	932	1982	3559	7082
40	798	1696	3046	6061
50	707	1503	2699	5372
60	640	1362	2446	4867
70	589	1253	2250	4478
80	548	1166	2093	4166
90	514	1094	1964	3909
100	486	1033	1855	3692
150	390	830	1490	2965
200	334	710	1275	2538
250	296	629	1130	2249
300	268	570	1024	2038
350	247	525	942	1875
400	229	488	876	1744
450	215	458	822	1636
500	203	433	777	1546

*EQ. = closest U.S. equivalent size

Sizing Tables

LP gas (propane) <2 PSI (based on a 1.52 specific gravity LP gas)				
Working Conditions				
Propane		-	-	
Inlet Pressure		11	WC (in)	
Pressure Drop		0.500	WC (in)	
***EQ. Pipe Size (in.)**	**3/8"**	**1/2"**	**3/4"**	**1"**
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow rate Propane (kBTU/h)			
5	208	443	795	1583
10	143	304	547	1088
15	115	244	439	874
20	98	209	376	748
25	87	185	333	663
30	79	168	302	600
40	68	144	258	514
50	60	127	229	455
60	54	115	207	413
70	50	106	191	380
80	46	99	177	353
90	44	93	167	331
100	41	88	157	313
150	33	70	126	251
200	28	60	108	215
250	25	53	96	191
300	23	48	87	173
350	21	44	80	159
400	19	41	74	148
450	18	39	70	139
500	17	37	66	131

*EQ. = closest U.S. equivalent size

Sizing Tables

LP gas (propane) 2 PSI -1 PSI (based on a 1.52 specific gravity LP gas)				
Working Conditions				
Propane		-	-	
Inlet Pressure		2.000	(PSI)	
Pressure Drop		1.000	(PSI)	
***EQ. Pipe Size (in.)**	**3/8"**	**1/2"**	**3/4"**	**1"**
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow rate Propane (kBTU/h)			
5	1915	4072	7312	14551
10	1316	2799	5025	10001
15	1057	2247	4035	8031
20	904	1924	3454	6873
25	802	1705	3061	6092
30	726	1545	2774	5520
40	622	1322	2374	4724
50	551	1172	2104	4187
60	499	1062	1906	3794
70	459	977	1754	3490
80	427	909	1631	3247
90	401	853	1531	3046
100	379	805	1446	2878
150	304	647	1161	2311
200	260	553	994	1978
250	231	491	881	1753
300	209	444	798	1588
350	192	409	734	1461
400	179	380	683	1359
450	168	357	641	1275
500	159	337	605	1205

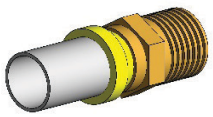
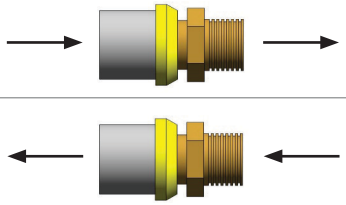
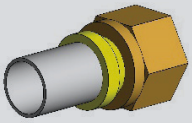
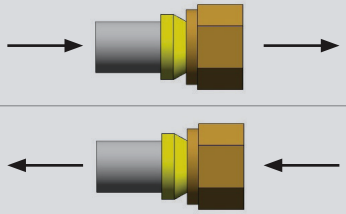
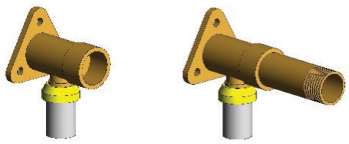
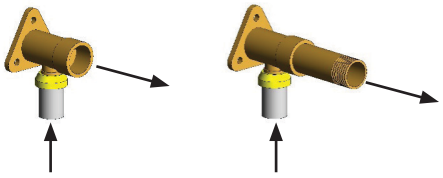
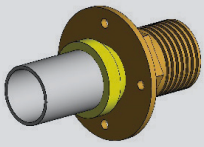
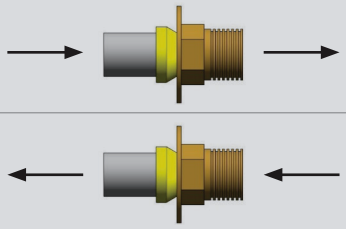
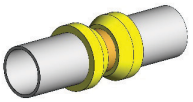
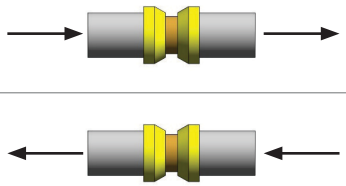
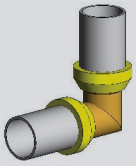
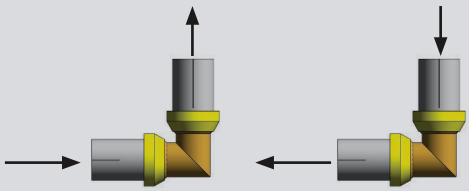
*EQ. = closest U.S. equivalent size

Sizing Tables

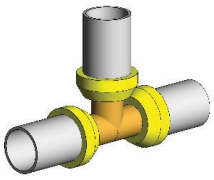
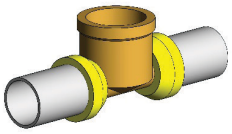
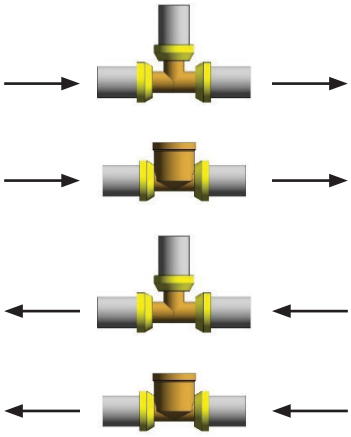
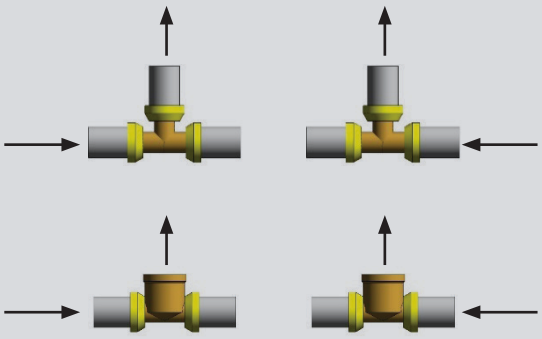
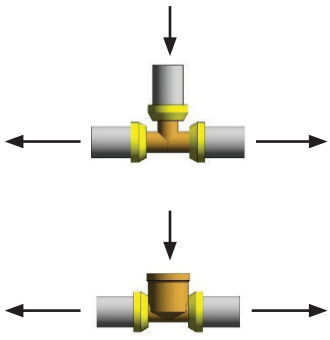
LP gas (propane) 5 PSI -3.5 PSI (based on a 1.52 specific gravity LP gas)				
Working Conditions				
Propane		-	-	
Inlet Pressure		5.000	(PSI)	
Pressure Drop		3.500	(PSI)	
***EQ. Pipe Size (in)**	**3/8"**	**1/2"**	**3/4"**	**1"**
Pipe (mm)	**16**	**20**	**26**	**32**
Length (ft)	Flow rate Propane (kBTU/h)			
5	3986	8477	15221	30292
10	2740	5826	10462	20820
15	2200	4679	8401	16719
20	1883	4004	7190	14309
25	1669	3549	6373	12682
30	1512	3216	5774	11491
40	1294	2752	4942	9835
50	1147	2439	4380	8716
60	1039	2210	3968	7898
70	956	2033	3651	7266
80	889	1892	3396	6759
90	835	1775	3187	6342
100	788	1677	3010	5991
150	633	1346	2417	4811
200	542	1152	2069	4117
250	480	1021	1834	3649
300	435	925	1661	3306
350	400	851	1528	3042
400	372	792	1422	2830
450	349	743	1334	2655
500	330	702	1260	2508

*EQ. = closest U.S. equivalent size

Sizing Tables

Fitting	Flow Rate Direction	Value
NPT Male Couplings 		3.28
NPT Female Couplings 		3.28
Wingback Elbows 		3.28
Floor/Wall Mountings 		3.28
Couplings 		1.03
Crimp & NPT Elbows 		2.26

Sizing Tables

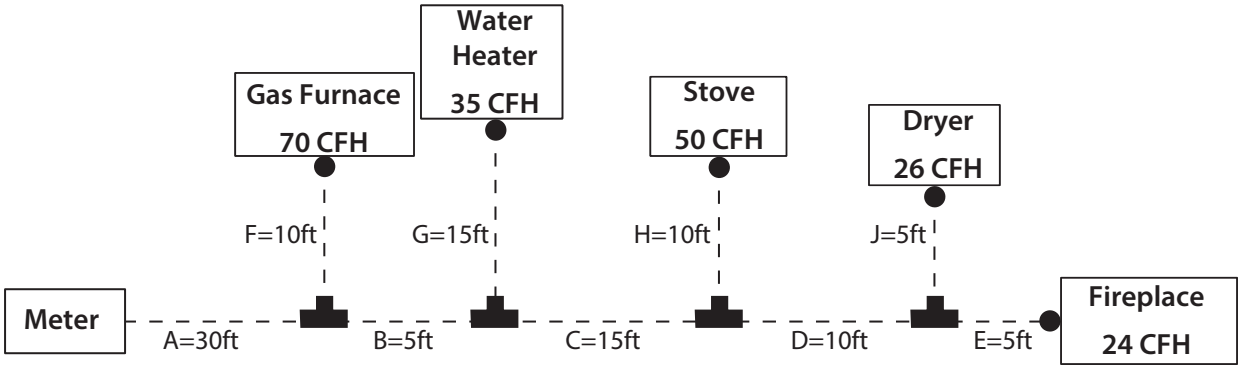
Fittings Pressure Losses in Equivalent Pipe Length (ft)		
Fitting	**Flow Rate Direction**	**Value**
Crimp and NPT Tees  		1.64
		4.51
		4.92

Example No. 1

This is a typical single-family house installation with five appliances, where the design layout of the gas supply piping system is arranged in series with a main run branching at the appliances. The utility company's supply pressure (downstream of the meter) is 8" WC, and the utility company advises that the specific gravity of the gas delivered will be 0.60, and the energy content is 1 CFH = 1,000 BTUH. The allowable pressure drop across the system has been determined to be 3.0" WC.

Appliances list:

- Gas furnace (70,000 BTUH → 70 CFH)
- Water heater (35,000 BTUH → 35 CFH)
- Stove (50,000 BTUH → 50 CFH)
- Dryer (26,000 BTUH → 26 CFH)
- Fireplace (24,000 BTUH → 24 CFH)



Trunks

Trunks Section	Load Delivered by Section	Section Length (ft)	Appliance with the Longest Run
A	205 CFH	30	Dryer: • Run length = 65' • Run fittings: 3 straight tees, 1 tee 90°, and 1 termination wingback elbow
B	135 CFH	5	Dryer: • Run length = 65' • Run fittings: 3 straight tees, 1 tee 90°, and 1 termination wingback elbow
C	100 CFH	15	Dryer: • Run length = 65' • Run fittings: 3 straight tees, 1 tee 90°, and 1 termination wingback elbow
D	50 CFH	10	Dryer: • Run length = 65' • Run fittings: 3 straight tees, 1 tee 90°, and 1 termination wingback elbow

Appliance Sections

Appliance Section	Appliance Load	Total Section Length (ft)	Section Fittings
E	24 CFH	65	4 straight tees and 1 termination wingback elbow
F	70 CFH	40	1 tee 90° and 1 termination wingback elbow
G	35 CFH	50	1 straight tee, 1 tee 90° and 1 termination wingback elbow
H	50 CFH	60	2 straight tees, 1 tee 90° and 1 termination wingback elbow
J	24 CFH	65	3 straight tees, 1 tee 90° and 1 termination wingback elbow

Run Length for Trunk Sections = Distance from meter to appliance with the longest run, depending on the system layout and the total section length (it means not just the farthest one, but the one whose section has the highest value of pressure losses).

Total Section Length for Appliance Sections = Appliance with the longest run

Sizing Run A: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 205 CFH
- Appliance with the longest run: Dryer
  - Run to it = 65'
  - Additional fittings of it: 3 tees straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 65 + 3*1.64 + 4.51 + 3.28 = 77.71 → rounded up to 80
According to sizing table, pipe size = 3/4 in. (26mm) (up to 287 CFH)

Sizing Run B: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 135 CFH
- Appliance with the longest run: Dryer
  - Run to it = 65'
  - Additional fittings of it: 3 tees straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 65 + 3*1.64 + 4.51 + 3.28 = 77.71 → rounded up to 80
According to sizing table, pipe size = 1/2 in. (20mm) (up to 160 CFH)

Sizing Run C: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 100 CFH
- Appliance with the longest run: Dryer
  - Run to it = 65'
  - Additional fittings of it: 3 tees straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 65 + 3*1.64 + 4.51 + 3.28 = 77.71 → rounded up to 80
According to sizing table, pipe size = 1/2in (20mm) (up to 160 CFH)

Sizing Run D: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 50 CFH
- Appliance with the longest run: Dryer
  - Run to it = 65'
  - Additional fittings of it: 3 tees straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 65 + 3*1.64 + 4.51 + 3.28 = 77.71 → rounded up to 80
According to sizing table, pipe size = 3/8 in. (16mm) (up to 75 CFH)

Sizing Run E: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 24 CFH
- Run to relative appliance = 65'
- Additional fittings of the run: 4 tees straight + 1 termination wingback elbow

→ Total run = 65 + 4*1.64 + 3.28 = 74.84 → rounded up to 80
According to sizing table, pipe size = 3/8 in. (16mm) (up to 75 CFH)

Sizing Run F: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 70 CFH
- run to relative appliance = 40'
- additional fittings of the run: 1 tee 90° + 1 termination wingback elbow

→ Total run = 40 + 4.51 + 3.28 = 47.89 → rounded up to 50
According to sizing table, pipe size = 3/8 in. (16mm) (up to 97 CFH)

Sizing Run G: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 35 CFH
- Run to relative appliance = 50'
- Additional fittings of the run: 1 tee straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 50 + 1.64 + 4.51 + 3.28 = 59.43 → rounded up to 60
According to sizing table, pipe size = 3/8 in. (16mm) (up to 88 CFH)

Sizing Run H: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 50 CFH
- Run to relative appliance = 60'
- Additional fittings of the run: 2 tees straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 60 + 2*1.64 + 4.51 + 3.28 = 71.07 → rounded up to 80
According to sizing table, pipe size = 3/8 in. (16mm)m (up to 75 CFH)

Sizing Run J: Utilize sizing table for natural gas at 8" WC + 3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 26 CFH
- Run to relative appliance = 65'
- Additional fittings of the run: 3 tee straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 65 + 3*1.64 + 4.51 + 3.28 = 77.71 → rounded up to 80
According to sizing table, pipe size = 3/8 in. (16mm) (up to 75 CFH)

Below are the sizes of the gas supply system:

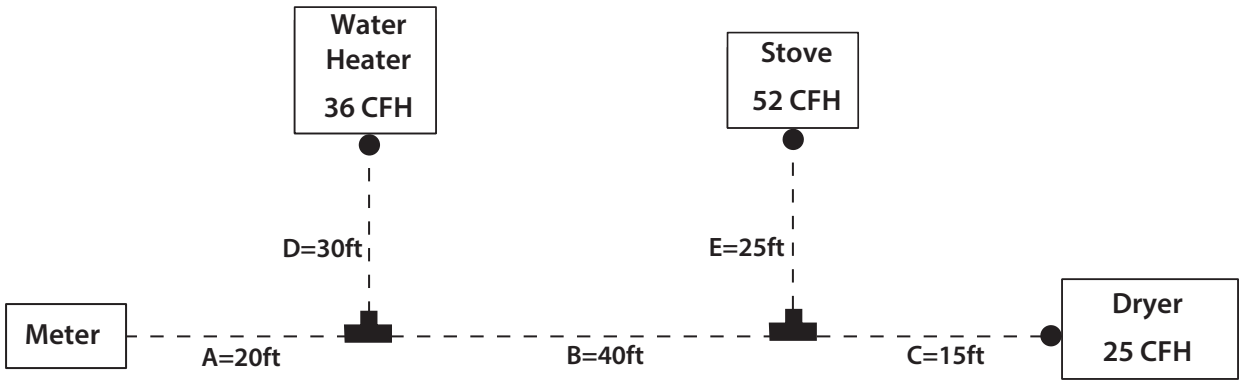
Section	Pipe Size (mm)	Pipe Size (in.)
A	26	3/4
B	20	1/2
C	20	1/2
D	16	3/8
E	16	3/8
F	16	3/8
G	16	3/8
H	16	3/8
J	16	3/8

Example No. 2

This is a typical small single-family house installation with three appliances, where the design layout of the gas supply piping system is arranged in series with a main run branching at the appliances. The utility company's supply pressure (downstream of the meter) is 6" WC, and the utility company advises that the specific gravity of the gas delivered will be 0.60, and the energy content is 1 CFH = 1.000 BTUH. The allowable pressure drop across the system has been determined to be 0.3" WC.

Appliances list:

- Water heater (36,000 BTUH → 36 CFH)
- Stove (52,000 BTUH → 52 CFH)
- Dryer (25,000 BTUH → 25 CFH)



Trunks

Trunks Section	Load Delivered by Section	Section Length (ft)	Appliance With The Longest Run
A	113 CFH	20	Stove: • Run length = 85' • Run fittings: 1 straight tee, 1 tee 90°, and 1 termination wingback elbow
B	77 CFH	40	Stove: • Run length = 85' • Run fittings: 1 straight tee, 1 tee 90°, and 1 termination wingback elbow

Appliance Sections

Appliance Section	Appliance Load	Total Section Length (ft)	Section Fittings
C	25 CFH	75	2 tees and 1 termination wingback elbow
D	36 CFH	50	1 tee and 1 termination wingback elbow
E	52 CFH	85	2 tees and 1 termination wingback elbow

Run Length for Trunk Sections = Distance from meter to appliance with the longest, run depending on the system layout and the total section length (it means not just the farthest one, but the one whose section has the highest value of pressure losses)

Total Section Length for Appliance Sections = Distance from meter to each appliance

Sizing Run A: Utilize sizing table for natural gas at 6" WC + 0.3" WC pressure drop + the table of the fittings' pressure losses.

- Total load = 113 CFH
- Appliance with the longest run: Stove
  - Run to it = 85'
  - Additional fittings of it: 1 tee straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 85 + 1.64 + 4.51 + 3.28 = 94.43 → rounded up to 100
According to sizing table, pipe size = 1in. (32mm) (up to 146 CFH)

Sizing Run B: Utilize sizing table for natural gas at 6" WC + 0.3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 77 CFH
- Appliance with the longest run: Stove
  - Run to it = 85'
  - Additional fittings of it: 1 tee straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 85 + 1.64 + 4.51 + 3.28 = 94.43 → rounded up to 100
According to sizing table, pipe size = 1in. (32mm) (up to 146 CFH)

Sizing Run C: Utilize sizing table for natural gas at 6" WC + 0.3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 25 CFH
- Run to relative appliance = 75'
- Additional fittings of the run: 2 tees straight + 1 termination wingback elbow

→ Total run = 75 + 2*1.64 + 3.28 = 81.56 → rounded up to 90
According to sizing table, pipe size = 1/2 in. (20mm) (up to 43 CFH)

Sizing Run D: Utilize sizing table for natural gas at 6" WC + 0.3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 36 CFH
- Run to relative appliance = 50'
- Additional fittings of the run: 1 tee 90° + 1 termination wingback elbow

→ Total run = 50 + 4.51 + 3.28 = 57.79 → rounded up to 60
According to sizing table, pipe size = 1/2 in. (20mm) (up to 54 CFH)

Sizing Run E: Utilize sizing table for natural gas at 6" WC + 0.3" WC pressure drop + the table of the fittings pressure losses.

- Total load = 52 CFH
- Run to relative appliance = 85'
- Additional fittings of the run: 1 tee straight + 1 tee 90° + 1 termination wingback elbow

→ Total run = 85 + 1.64 + 4.51 + 3.28 = 94.43 → rounded up to 100
According to sizing table, pipe size = 3/4 in. (26mm) (up to 73 CFH)

Below are the sizes of the gas supply system:

Section	Pipe Size (mm)	Pipe Size (in.)
A	32	1
B	32	1
C	20	1/2
D	20	1/2
E	26	3/4

VISIT PEXALGAS.COM FOR MORE TECHNICAL INFORMATION.

Use of the PEXALGAS system is subject to state and local approvals. Confirm approval for use with the governing authorities for your project location before installing this product.
PEXALGAS installation instructions apply and are to be followed when installing PEXALGAS pipe and fittings.

JONES STEPHENS
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