

Guidelines for the Installation of Natural Gas Piping Systems, Appliances & Related Accessories

2025 Edition

Natural Gas Equipment Installation Guidelines

METROPOLITAN UTILITIES DISTRICT

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1. Scope

This manual contains the Metropolitan Utilities District recommendations for design and installation of natural gas piping systems and combustion air and venting requirements for natural gas appliances. Please consult NFPA 54 (The National Fuel Gas Code) and the M.U.D. Gas Rules & Regulations manual for more information.

The designer, installer, or service technician who uses this manual shall understand installation codes and practices to correctly complete each installation safely and effectively. This manual does not supersede local, state or national codes and standards. These codes must always be followed. In applying this manual, reference shall also be made to the manufacturers' installation and operating instructions.

The Metropolitan Utilities District assumes no responsibility for mistakes or misinterpretation of any of the material in this manual.

2. Design & Installation of Piping Systems

2.1 Fuel Line Installation & Operation

2.1.1 Allowable Pressure Drop. Piping shall be sized and installed to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the point of delivery and the appliance as follows:

2.1.1.1 Piping Systems Operating at Low-Pressure (less than 2-PSIG). Low-pressure fuel lines shall be sized based upon the M.U.D. gas main supply pressure as follows:

(a) **Low-Pressure Gas Main.** Piping systems shall be sized for a maximum pressure drop of 0.3-inch W.C.

(b) **High-Pressure Gas Main.** Piping systems shall be sized for a maximum pressure drop of 0.5-inch W.C.

2.1.1.2 Piping Systems Operating at 2-PSIG. 2-PSIG fuel lines shall be sized for a maximum pressure drop of 1-PSIG.

2.1.1.3 Piping Systems Operating at 2-PSIG and Zoned to Low-Pressure. Zoned systems shall operate with a minimum pressure of 5-inch W.C. at the appliance.

2.1.2 Bending of Metallic Pipe. Bending of metallic pipe in place of fittings is prohibited.

2.1.3 Piping In Floors. Gas Piping shall not be embedded in concrete floor slabs.

2.1.4 Piping Joints. All fittings and joints of piping larger than 2 inches in diameter shall be welded, flanged or press-connect fittings listed to the ANSI LC4 standard.

2.1.4.1 Welded Joints. Any piping system operating with a pressure of 5-psig or greater shall be welded. No threaded piping shall be allowed other than final equipment connections.

2.1.5 Metallic Tubing. Steel tubing, except for corrugated stainless-steel tubing, is prohibited. Aluminum tubing shall be used only where the operating pressure is less than 14-inch W.C. Copper tubing installed outdoors above ground shall be securely supported and located where it will be protected from physical damage.

2.1.6 Brazed Joints. Brazed joints shall be made of material having a melting point in excess of 1000°F and shall contain no more than 0.05% phosphorous. Phosphorous content in brazing rods is listed under the product name with the chemical symbol 'P'.

2.1.7 Plastic Pipe, Tubing and Fittings. Plastic pipe, tubing and fittings shall be approved by M.U.D. prior to installation and shall conform to the following:

2.1.7.1 Prohibited Locations. Plastic tubing shall not be used above ground, inside buildings or installed through building walls.

2.1.7.2 Tubing. Plastic tubing shall be Polyethylene PE 2406 conforming to ASTM D2513-96A and ASTM D2513-87 for marking.

2.1.7.3 Fittings. Fittings shall conform to ASTM D2683 or ASTM D3261, as applicable, in addition to the requirements of ASTM D2513-96A. Fittings shall be the same SDR as the pipe or tubing with a tolerance of +20 percent of minimum wall thickness. Underground fittings must be of the slip or fused type and the installer must be trained and certified for the type of fitting being installed.

2.1.8 Fuel Lines Installed Through Walls. Where passing through an aboveground, exterior wall, the piping shall be protected from corrosion by coating or wrapping an inert material approved for such applications. The piping shall be sealed around its circumference at the point of the exterior penetration to prevent the entry of water and insects. Where piping is encased in a protective sleeve, the annular spaces between the gas piping and the sleeve and between the sleeve and the wall opening shall be sealed.

The intent of this section is to require gas piping be protected from corrosion when in contact with building materials that may corrode due to chemical reactions with those materials or due to galvanic corrosion from contact with metallic siding. Piping through masonry walls shall always be sleeved. Piping through wood shall not be wrapped but shall be sealed at the wall.

2.1.9 Underground Fuel Lines. Underground fuel lines shall comply with the following:

2.1.9.1 Burial. Depth of burial shall be a minimum of 18 inches below established grade. Back fill shall be free of rocks or other materials that could cause damage to the pipe.

2.1.9.2 Other Utilities. No electrical service, water piping, sewer piping, telephone, TV cable, electrical conductor, utility service or any other conduit shall be installed in the same trench or within 12 inches of the underground gas fuel line.

2.1.9.3 Wall Penetration. Any fuel line penetrating a masonry wall shall be sleeved. The space between the gas piping and the building shall be sealed to prevent entry of gas or water.

2.1.9.4 Location. Underground fuel lines shall not be installed under existing buildings or remain under newly constructed buildings unless installed in accordance with Section 7.1.6 of the 2024 National Fuel Gas Code.

2.1.9.5 As-built Drawing. The installer shall submit an as-built drawing of the fuel line to M.U.D. so that it may be recorded for safety reasons.

2.1.9.6 Metallic Underground Fuel Lines. Metallic underground fuel lines shall comply with the following:

2.1.9.6.1 Acceptable Materials. Acceptable metallic piping materials that can be installed below grade are Type K and L copper tubing, steel pipe and CSST installed in accordance with 2.1.9.6.6.

2.1.9.6.2 Mechanical Joints. Metallic joints on metallic piping including flared fittings underground are not allowed.

2.1.9.6.3 Insulating. Piping shall be installed with dielectric or insulating fittings a minimum of 8 inches above established grade at each point where the pipe enters and exits the ground.

2.1.9.6.4 Copper Tubing. Fittings on type K and L copper tubing shall be brazed.

2.1.9.6.5 Steel Pipe. Steel pipe shall be cathodically protected in accordance with Section 7.1.3 of the National Fuel Gas Code, coated and wrapped. Below grade joints shall be welded. Cathodic protection shall be inspected annually by the property owner.

In the 2015 Edition of NFPA 54, a new section addressing cathodic protection of underground steel pipe was added. This section address coating of pipe and monitoring of cathodic protection and anodes.

2.1.9.6.6 Corrugated Stainless Steel Tubing. CSST installed below grade shall be installed using one of the following methods:

2.1.9.6.6.1 Conduit. CSST shall be sleeved in a PVC conduit that is 2 pipe diameters larger than the fuel line being encased. The PVC conduit shall be sealed at both ends and vented above grade. The vent line shall extend a minimum of 18 inches above grade.

2.1.9.6.6.2 Encasement System. CSST shall be installed in an encasement system listed for underground use and approved by the CSST manufacturer.

2.1.9.6.7 Inspection. All underground fuel lines require a visual inspection. Fuel lines shall not be buried prior to inspection.

2.1.9.7 Plastic Underground Fuel Lines.

Plastic underground fuel lines shall comply with the following:

2.1.9.7.1 Tracer Wire. A tracer wire shall be buried along the entire length of the pipe. Tracer wire shall be coiled around the anodeless riser and secured with a wire or cable tie. 12 inches of the tracer wire shall be stripped of insulation, coiled and buried in the ground to provide a ground. Acceptable tracer wire is #10 AWG for augured lines and #14 AWG for trenched lines Type SW solid copper wire.

2.1.10 Air Testing.

2.1.10.1 General. Fuel gas piping in commercial, industrial, and multi-family residential buildings where three or more units reside under a common roof shall be air tested. Any fuel gas piping system exposed to heat from a fire shall be air tested. The test must be witnessed by a representative from M.U.D.

2.1.10.2 Test Pressure. Fuel gas piping systems shall be air tested at 40-PSIG for a period of 15 minutes with no loss in pressure. The test gauge shall measure in maximum increments of 2-psig.

2.1.10.3 Increase in Operating Pressure. When increasing the fuel line pressure in commercial or residential buildings more than 1-PSIG above the existing pressure provided by M.U.D., the piping shall be air tested in accordance with 2.1.10.2.

2.1.11 Electrical Bonding and Grounding. Electrical bonding and grounding shall be in accordance with Section 7.12 of the 2024 National Fuel Gas Code and the manufacturer's installation instructions.

2.1.11.1 Gas Piping Other Than CSST. Gas piping other than CSST shall be considered to be bonded when it is connected to one or more appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance(s).

2.1.11.2 CSST. CSST gas piping shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe, pipe fitting or CSST fitting. The bonding jumper shall not be smaller than #6 AWG copper wire or equivalent and shall not exceed 75-feet in length. Gas piping systems that contain one or more segments of CSST shall be bonded in accordance with this section.

The 2018 edition of NFPA 54 removed the requirement that the bonding jumper be located between the outlet side of the gas meter and the first downstream CSST fitting. The bonding clamp can now be located anywhere on the piping system (other than the stainless-steel portion of CSST).

2.1.11.3 Arc-Resistant Jacketed CSST. CSST listed with an arc-resistant jacket or coating system in accordance with ANSI LC1/CSA 6.26, *Fuel Gas Piping Systems Using Corrugated Stainless-Steel Tubing*, shall be electrically continuous and bonded to an effective ground fault current path. Where any CSST component of a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of 2.1.11.2 shall apply. Arc-resistant jacketed CSST shall be considered bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance.

Beginning with the 2018 edition of NFPA 54, CSST products manufactured with an arc-resistant jacket (black jacket material) were recognized as an approved product. With the revised version of the ANSI LC1 standard in 2016, these products were separated out from the yellow jacketed CSST products. Testing of these products has shown a high level of protection associated with indirect lightning strikes.

2.1.11.3 Bonding Connection. Devices used for the bonding connection shall be listed in accordance with UL 467, *Grounding and Bonding Equipment*.

2.1.11.4 Prohibited Use. Gas piping shall not be used as a grounding conductor or electrode.

2.1.11.5 M.U.D. Gas Meter Sets. Do not install a bonding clamp for grounding of gas piping downstream of the M.U.D. gas meter on the gas meter, meter bracket or gas service riser.

2.2 Pressure Regulators

Regulator Operation: Regulator pressure recovery rates are affected by load versus inlet pressure to the regulator. When a maximum load condition is cut off by an appliance solenoid valve, the regulator must move from an open position to a closed position. This is achieved by expelling the volume of air above the diaphragm in the regulator through the vent. This action takes time during which the set gas pressure downstream from the regulator increases, known as "lockup" pressure.

Higher inlet pressures to the regulator tend to give lower “lockup” pressures because the valve movement is small.

Change in pressure between the regulator pressure set point and lockup set point is dependent on inlet pressure. Lower outlet set points give lower lockup pressures. Therefore, do not try to compensate for undersized fuel line piping by raising the outlet pressure setting of the regulator.

2.2.1 Standards.

2.2.1.1 Line Pressure Regulators. Line pressure regulators shall be listed in accordance with ANSI Z21.80/CSA 6.22 where the outlet pressure is set to 2 psi or less.

2.2.1.1 Gas Appliance Pressure Regulators. Appliance regulators shall be listed in accordance with ANSI Z21.18/CSA 6.3. Appliance regulators shall not be used as line pressure regulators.

2.2.2 Size. Regulators shall be sized to supply the full load of all appliances it is serving while meeting the requirements of 2.1.1 where applicable.

2.2.2.1 Single Appliance Maximum Load. Regulators shall be sized so as not to exceed the single appliance maximum load as designated by the regulator manufacturer.

2.2.3 Venting. Regulators shall be vented as follows:

2.2.3.1 Vent Location. Regulators shall be vented to the outdoors except as provided for in 2.2.3.7.

2.2.3.2 Length. Vent lines shall be increased one pipe diameter for each 30-feet installed. Vent lines installed at lengths greater than 90-feet require approval from the regulator manufacturer.

2.2.3.3 Trap. Do not create a trap in the vent line. This may cause the regulator to operate improperly.

2.2.3.4 Vent Outlet. Vent lines shall have a diameter greater than or equal to the NPT threads on the vent opening of the regulator.

2.2.3.5 Vent Termination. The vent termination shall be a minimum of 18-inches above finished grade or the roof to prevent vent blockage due to snow fall. The termination shall include a screened cap to prevent the entry of water and insects.

2.2.3.6 Regulator Vent Piping. Plastic pipe, tubing and fittings used for regulator vents shall be PVC conforming to UL 651, *Schedule 40 and Schedule 80 rigid PVC conduit*. PVC vent piping shall not be installed indoors.

2.2.3.7 Vent Limiting Device. A vent limiting device may be installed on regulators as follows:

2.2.3.7.1 Vent limiters can only be installed in regulators for which they are certified. Any vent limiter installed shall be supplied by the regulator manufacturer in which regulator it is being installed.

2.2.3.7.2 Location Vent limiting devices are designed for use indoors and shall not be installed outdoors if exposed to the environment.

2.2.3.7.3 Installation. A vent limiter must be installed in the upright position and directly into the vent connection of the regulator without intermediate pipe or fittings.

2.2.3.8 Venting Multiple Regulators. When there is more than one regulator at a location, each regulator shall have a separate vent to the outside.

Exception: Vent lines may be manifolded in accordance with the regulator manufacturer's instructions.

3. Combustion Air

3.1 General. Combustion air shall be obtained in accordance with Sections 3.2 through 3.5.

3.1.1 Make up air requirements for the operation of exhaust fans, clothes dryers, kitchen ventilation systems, and fireplaces shall be considered in determining the adequate amount of combustion air needed.

3.2. Appliances Other Than Category I. Appliances other than Category I vented appliances shall obtain combustion air in accordance with the manufacturer's installation instructions.

3.3 Indoor Combustion Air. Indoor combustion air shall be determined in accordance with 3.3.1 and 3.3.2.

3.3.1 Standard Method. The minimum required volume shall be 50 cubic feet per 1,000 Btu/hour.

3.3.2 Indoor Opening Size and Location. When obtaining combustion air from inside, openings and locations shall be installed as follows:

3.3.2.1 Combining Spaces on the Same Story. Opening shall be sized to have a minimum free area of 1 square inch per 1,000 Btu/hour of total input rating of all appliances, but not less than 100 square inches. Openings shall be located within 12 inches of the bottom and top of the room.

3.3.2.2 Combining Spaces on Different Stories. Opening shall be sized to have a minimum free area of 2 square inches per 1,000 Btu/hour of total input rating of all appliances.

Note: When using combustion air as described in section 3.3.2.2, the code does not require two openings as described in section 3.3.2.1. One or more openings may be utilized if the total area requirement is satisfied.

3.3.2.3 Combustion Air Grille in Supply Duct. M.U.D. does not allow combustion air to be supplied to the mechanical room by installing a grille in a forced air supply duct.

3.3.2.4 Furnace Plenums and Air Ducts. Where a furnace is installed so supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall

also be handled by a duct sealed to the furnace casing and terminating outside the space containing the furnace.

Incorporating a grille into the return air ducting either at the drop directly to the furnace or inside the same room as the furnace can cause the mechanical room to be subjected to negative air pressure. This can have a detrimental effect by overwhelming the drafting of nearby gas appliances, pulling products of combustion back into the mechanical room and potentially recirculating those throughout the structure.

3.4 Outside Combustion Air. Outside combustion air shall be determined in accordance with 3.4.1 through 3.4.3.

3.4.1 One Permanent Opening. Opening shall be sized to have a minimum free area of 1 square inch per 3,000 Btu/hour of total input rating of all appliances. Opening shall be located within 12 inches of the top of the room. The minimum opening shall not be less than 3 inches in diameter.

3.4.2 Combination Outdoor and Indoor Method. The use of supplying combustion air from indoor and outdoor shall be in accordance with the following:

3.4.2.1 Indoor Openings. Indoor openings shall be installed in accordance with 3.3.2.

3.4.2.2 Outdoor Opening. Outdoor openings shall be installed in accordance with 3.4.1. The size of the outdoor opening can be reduced by subtracting the amount of combustion air supplied from indoors. The minimum opening shall not be less than 3 inches in diameter.

3.4.3 Two Permanent Openings. Two permanent openings, one located within 12 inches of the top of the room and one located within 12 inches of the bottom of the room shall communicate directly with the outdoors as follows:

3.4.3.1 Vertical Ducts. Where communicating with the outside through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/hour of total input rating of all appliances.

3.4.3.2 Horizontal Ducts. Where communicating with the outside through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu/hour of total input rating of all appliances.

3.5 Gas Vents Serving Appliances on More Than One Floor (Common Venting). All gas utilization equipment in existing multi-level buildings connected to a common vent may take air for combustion and ventilation from habitable space, subject to the habitable space having adequate volume as defined in the National Fuel Gas Code.

Prior to revisions of the Gas Rules in May 2011, M.U.D. allowed for appliances installed on multistory, common vent flue stacks to utilize indoor space to meet combustion air requirements. In agreement with the City of Omaha, M.U.D. will still allow this practice to continue for replacement equipment only. Common venting of natural gas appliances in new multistory installations shall follow Section 12.7.5 of the 2024 National Fuel Gas Code.

3.6 Mechanical Combustion Air Supply. Combustion air shall be supplied from the outdoors at a minimum rate of 0.35 cubic feet per minute per 1,000 Btu/hour of total input rating of all appliances.

3.7 Combustion Air Grilles and Louvers. Where the free area of a grille or louver is unknown it shall be assumed as follows:

3.7.1 Wood Grille or Louver. Free area shall be assumed to be 25 percent.

3.7.2 Metal Louver or Grille. Free area shall be assumed to be 75 percent.

3.8 Screen Mesh. Screens covering combustion air ducts shall have a mesh size of no less than ¼ inch.

4. Venting

4.1 Single Appliance Vent Tables. Single appliance venting configurations shall be used as follows:

4.1.1 Elbows. Single appliance venting configurations with zero lateral lengths as shown in Tables D1.1, D1.2 and D1.5 in Appendix E shall not have elbows. Single appliance venting tables with lateral lengths include two 90° elbows. Deductions for additional elbows shall be as follows:

4.1.1.1 Elbows Up To and Including 45°. For each additional elbow up to and including 45°, the maximum capacity listed in the venting tables shall be reduced by 5 percent.

4.1.1.2 Elbows Greater Than 45° Up To and Including 90°. For each additional elbow greater than 45° up to and including 90°, the maximum capacity listed in the venting tables shall be reduced by 10 percent.

4.1.2 Maximum Offset Length. Where multiple offsets occur in a vent, the total lateral length of all offsets combined shall not exceed that specified in Tables 5.1 through 5.5, for Single Appliance Venting.

4.1.3 Vent Connector Length. Vent connector maximum lengths shall be as follows:

4.1.3.1 Single Wall Connectors. The maximum horizontal length of a single wall metal connector shall be 75 percent of the height of the chimney or vent.

4.1.3.2 Double Wall Connectors. The maximum horizontal length of a double wall metal connector shall be 100 percent of the height of the chimney or vent.

4.2 Multiple Appliance Vent Tables. Multiple appliance venting configurations shall have deductions as follows:

4.2.1 Vent Offset Length. Where the common vertical vent is offset, the maximum capacity of the common vent shall be reduced in accordance with 4.2.2 and horizontal length of the common offset shall not exceed 18 inches per inch of the common vent diameter. Where multiple offsets occur in a common vent, the total horizontal length of all offsets combined shall not exceed 18 inches per inch of the common vent diameter.

4.2.2 Elbows in Vents. Deductions for elbows shall be as follows:

4.2.2.1 Elbows Up To and Including 45°. For each additional elbow up to and including 45°, the maximum capacity listed in the venting tables shall be reduced by 5 percent.

4.2.2.2 Elbows Greater Than 45° Up To and Including 90°. For each additional elbow greater than 45° up to and including 90°, the maximum capacity listed in the venting tables shall be reduced by 10 percent.

4.2.3 Elbows in Connectors. The multiple appliance venting tables listed in Appendix D include allowance for two 90° elbows. Deductions for additional elbows in vent connectors shall be as follows:

4.2.3.1 Elbows Up to and Including 45°. For each additional elbow up to and including 45°, the maximum capacity listed in the venting tables shall be reduced by 5 percent.

4.2.3.2 Elbows Greater Than 45° Up to and Including 90°. For each additional elbow greater than 45° up to and including 90°, the maximum capacity listed in the venting tables shall be reduced by 10 percent.

4.2.4 Vent Connector Length. Vent connector length shall comply with the following:

4.2.4.1 Vent Connector Maximum Length. The maximum vent connector horizontal length shall be 18 inches per inch of connector diameter as shown in the following Table:

Table 4.2.4.1 Vent Connector Maximum Length

Connector Diameter (inches)	Connector Horizontal Length (feet)
3	4.5
4	6
5	7.5
6	9
7	10.5
8	12
9	13.5
10	15

4.2.4.2 Vent Connector Exceeding Maximum Length. Connectors with longer horizontal lengths than those permitted in Table 4.2.4.1 are permitted under the following conditions:

(1) The maximum capacity of the connector shall be reduced 10 percent for each additional multiple of length listed Table 4.2.3.1. For example, a 4-inch connector has a maximum listed horizontal length of 6 feet. If the connector length is between 6 feet and 12 feet, a 10 percent reduction would be required. From 12 feet to 18 feet, a 20 percent reduction would be required.

(2) For a connector serving a fan-assisted appliance, the minimum capacity (FAN Min) of the connector shall be determined by referring to the corresponding single appliance table. For double-wall connectors, Table D1.1 shall be used and for single-wall connectors, Table D1.2 shall be used.

4.2.5 Vent Connector Manifold. Where the connectors are combined prior to entering the vertical portion of the common vent, this shall be known as the common vent manifold.

4.2.5.1 Manifold & Common Vent Size. The size of the common vent manifold and the common vent shall be determined by applying a 10 percent reduction to the common vent capacity listed in the multiple appliance venting tables in Annex D.

4.2.5.1 Length. The length of the common vent connector manifold shall not exceed 18 inches per inch of common vent connector manifold diameter.

4.3 Multistory Venting. Multistory venting shall comply with the following:

4.3.1 Offsets. Offsets shall be limited to one offset in each system and comply with all of the following:

4.3.1.1 Offset Angle. The offset shall not exceed 45°

4.3.1.2 Capacity. The segment of common vent containing the offset shall be reduced in capacity by 20 percent.

4.3.1.3 Length. The horizontal length of the offset shall not exceed 18 inches per inch of the common vent diameter.

4.4 Seven Times Rule. The flow area of the vertical vent shall not exceed seven times the flow area of the listed appliance flue collar area, vent area or draft hood outlet area.

4.5 Corrugated Chimney Liners. Corrugated chimney liners shall be listed and be sized by the venting tables with the maximum capacity reduced by 20 percent. The 20 percent reduction includes an allowance for one 90° turn at the bottom of the liner.

4.6 Connection to Chimney Liners. Connections between chimney liners and double wall connectors shall be made with a listed adapter.

4.7 Two or More Appliances Connected to a Single Vent.

4.7.1 Where two or more vent connectors enter a common gas vent, the smaller connector shall enter at the highest level. Connectors shall not oppose each other when entering a common vent.

4.7.2 Where two or more openings are provided into one chimney flue or vent, either the openings shall be at different levels, or the connectors shall be attached to the vertical portion of the chimney or vent at an angle of 45 degrees or less to the vertical.

4.8 Through the Wall Vent Termination. Mechanical draft through the wall vent terminations shall comply with the following:

4.8.1 A mechanical draft venting system shall terminate at least 3-feet above any forced air inlet located within 10-feet.

4.8.2 A mechanical draft venting system, other than direct-vent, shall terminate at least 4-feet below, 4-feet horizontally or 1-foot above any operable window, door or gravity air inlet to the building. The bottom of the vent shall be located a minimum of 12-inches above established grade.

5. Installation of Gas Equipment and Appliances

5.1 General. All work in conjunction with the installation, operation and maintenance of natural gas appliances and equipment, new or used, shall be performed in accordance with the National Fuel Gas Code except as noted in this section.

5.2 Application, Permit, Inspection.

5.2.1 Applications. An application for a permit shall be submitted to M.U.D. by the installer for all equipment to be permitted and inspected.

5.2.2 Equipment to be Permitted and Inspected. The following equipment shall be permitted by the installer and inspected by M.U.D.

5.2.2.1 Space Heating Equipment. All gas space heating, including combination water and space heaters known as combo-heaters, and gas cooling equipment, except unvented room heaters. Residential furnaces older than five years old will not be inspected by M.U.D.

5.2.2.2 Water Heating Equipment. Water heating equipment with an input rating more than 100,000 Btu/hour and pool heaters with an input rating more than 400,000 Btu/hour or installed in an enclosed structure.

M.U.D. Gas Rules were amended in 2017 to require inspection of any pool heater that is located inside a structure regardless of the BTU input.

5.2.2.3 Conversions. All gas space heating equipment and water heating equipment with an input rating more than 100,000 Btu/hour that is converted from another fuel and that is less than five years old.

5.2.2.4 Generators. Natural gas-fired generators.

M.U.D. Gas Rules were amended in 2022 to require inspection of any natural gas-fired generator.

5.2.2.5 Manufactured Homes. Replacement of gas space heating equipment or water heating equipment more than 100,000 Btu/hour. Manufactured homes with preinstalled equipment will not be inspected but shall instead be installed in accordance with NFPA 501A.

M.U.D. Gas Rules were amended in 2022 to require inspection when some gas-fired appliances are replaced in a manufactured housing unit.

5.2.3 Inspection Fees. Inspection of natural gas appliances and equipment shall be billed in accordance with the District's Billing Price Book. Where a permit request is prepaid and denied, canceled, or withdrawn, the fee will be refunded unless an inspection has been made.

5.2.4 Permits. Permits shall be valid for one year from the date of issuance and may be denied if the gas supply is inadequate or if the equipment is not properly sized to be operated safely. No refunds will be given after the term has expired.

5.2.5 Equipment Relocation. When equipment requiring a permit is relocated, the owner shall obtain a new permit for such installation.

5.2.6 Inspection. Upon completion of the installation of equipment requiring permits, the installer shall notify the property owner to notify M.U.D. to conduct an inspection of the installation and the equipment. When deficiencies are found, M.U.D. will notify the installer of all deficiencies found. Such deficiencies must be corrected within the time limit specified at the time of inspection and be subject to reinspection and reinspection fees as applicable. Where the installation passes the M.U.D. inspection, notice of approval of the installation will be affixed to the equipment by the inspector.

In 2013, the M.U.D. Gas Rules were modified to include language that places responsibility for notifying M.U.D. on the property owner.

5.2.6.1 Appliance Inspection Access.

Inspection access to appliances shall comply with the following:

5.2.6.1.1 Access to Appliances on Roofs.

Buildings of more than 15-feet in height shall have an inside means of access to the roof which shall comply with the following:

5.2.6.1.1.1 Access. The inside means of access shall be a permanent or fold-away inside stairway or ladder, terminating in an enclosure, scuttle, or trap door.

5.2.6.1.1.2 Scuttle or Trap Door Size.

Scuttles or trap doors shall be at least 22-inches x 24-inches in size and shall open easily and safely under all conditions.

5.2.6.1.1.3 Access Location on Roof.

At least 6-feet of clearance shall be available between the access opening and the edge of the roof or rigidly fixed rails or guards a minimum of 42-inches in height shall be provided on the exposed side.

5.2.6.1.1.4 Lighting. Permanent lighting shall be provided at the roof access. The switch shall be located inside the building near the access means leading to the roof.

5.2.6.1.2 Access to Appliances in Attics.

Access to appliances in attics shall comply with the following:

5.2.6.1.2.1 Access. An attic in which an appliance is installed shall be accessible through an opening and passageway at least as large as the largest component of the appliance and not less than 22-inches x 30-inches.

5.2.6.1.2.2 Passageway. Where height of the passageway is less than 6-feet, the distance from the passageway access to the appliance shall not exceed 20-feet. The passageway shall be unobstructed and shall have solid flooring not less than 24-inches wide.

5.2.6.1.2.3 Work Platform. A working platform not less than 30-inches x 30-inches shall be

provided in front of the service side of the appliance.

5.2.6.1.2.4 Lighting. Permanent lighting shall be provided at the appliance. The switch shall be located at the entrance to the passageway.

5.2.6.2 Fused Electrical Switch. All appliances requiring an external source of electrical power for its operation shall be provided with a readily accessible electrical disconnecting means (within sight of the appliance) that will completely deenergize the appliance.

In 2013, the M.U.D. Gas Rules were modified by removing the requirement for a fused electrical switch.

325-L SERIES

Lever Acting Design for 2 psi Piping Systems

Maxitrol's 325-L series line pressure regulators are for 2 psi piping systems. 325 series regulators are for use on residential, commercial, and industrial applications.

The 325 series features a high leverage linkage assembly to deliver dead-end lockup (see page 63). The regulators are capable of precise regulating control from full flow down to pilot flow.



325-3L

Specifications

Pipe Sizes 3/8" to 3" threaded connections with NPT or ISO 7-1 threads.
Optional 1/8" NPT outlet pressure taps on 325-7, 325-9, and 325-11.

Housing Material 325-3L, 325-5L, 325-7AL, 325-9L, 325-11L: aluminum.

Mounting All models with the exception of the 325-11L are suitable for multi-positional mounting. The 325-11L is to be mounted in a horizontal upright position only. If a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_CSA_2PSI_MI_EN.FR).

Certifications 325-3L, 325-5L, 325-7AL, 325-9L, 325-11L: ANSI Z21.80/CSA 6.22 Line Pressure Regulators.

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Rated Inlet Pressure CSA Certified: 2 psi (13.8 kPa)

Maxitrol Tested 10 psi (69 kPa)

Emergency Exposure Limits 65 psi (450 kPa) (inlet side only)

Maximum Individual Load Largest single appliance served by the regulator
325-3L: 140,000 Btu/h;
325-5L: 425,000 Btu/h;
325-7AL: 1,250,000 Btu/h;
325-9L: 2,250,000 Btu/h;
325-11: 4,450,000 Btu/h

Capacity Total load of multiple appliances combined
325-3L (3/8", 1/2"): 250,000 Btu/h;
325-5L (1/2"): 500,000 Btu/h; 325-5L (3/4", 1"): 600,000 Btu/h;
325-7AL (1 1/4", 1 1/2"): 1,250,000 Btu/h;
325-9L (1 1/2", 2"): 2,250,000 Btu/h;
325-11L (2", 2 1/2", 3"): 4,500,000 Btu/h

NOTE: Capacities are used to determine the maximum multiple appliance load. The largest single appliance served by the regulator should not exceed the maximum individual load specified above.

Ambient Temperature Ranges -40 to 205°F (-40 to 96°C)

Minimum Regulation Suitable for pilot flow applications. **(P)** (Circle P) (0.15 CFH NG).

325-L SERIES

Lever Acting Design for 2 psi Piping Systems



Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Outlet Pressure Set Point	Operating Inlet Pressure				
			.5 psi (3.4 kPa)	.75 psi (5.2 kPa)	1 psi (6.9 kPa)	1.5 psi (10.3 kPa)	2 psi (13.8 kPa)
325-3L	3/8" x 3/8" 1/2" x 1/2"	7.0" w.c. (1.7 kPa)	145 (4.1)	200 (5.7)	250 (7.1)	250 (7.1)	250 (7.1)
		10.0" w.c. (2.5 kPa)	110 (3.1)	180 (5.1)	230 (6.5)	250 (7.1)	250 (7.1)
325-5L	1/2" x 1/2"	7.0" w.c. (1.7 kPa)	360 (10.2)	485 (13.7)	500 (14.2)	500 (14.2)	500 (14.2)
		10.0" w.c. (2.5 kPa)	275 (7.8)	475 (13.5)	500 (14.2)	500 (14.2)	500 (14.2)
325-5L	3/4" x 3/4" 1" x 1"	7.0" w.c. (1.7 kPa)	370 (10.5)	520 (14.7)	600 (17.0)	600 (17.0)	600 (17.0)
		10.0" w.c. (2.5 kPa)	275 (7.8)	450 (12.7)	570 (16.1)	600 (17.0)	600 (17.0)
325-7AL	1 1/4" x 1 1/4" 1 1/2" x 1 1/2"	7.0" w.c. (1.7 kPa)	750 (21.2)	1000 (28.3)	1250 (35.4)	1250 (35.4)	1250 (35.4)
		10.0" w.c. (2.5 kPa)	525 (14.9)	900 (25.5)	1125 (31.9)	1250 (35.4)	1250 (35.4)
325-9L	1 1/2" x 1 1/2" 2" x 2"	7.0" w.c. (1.7 kPa)	1390 (39.4)	2080 (58.9)	2250 (63.7)	2250 (63.7)	2250 (63.7)
		10.0" w.c. (2.5 kPa)	1050 (29.7)	1660 (47.0)	2090 (59.2)	2250 (63.7)	2250 (63.7)
325-11L	2" x 2" 2 1/2" x 2 1/2" 3" x 3"	7.0" w.c. (1.7 kPa)	3000 (85.0)	3900 (110.4)	4500 (127.4)	4500 (127.4)	4500 (127.4)
		10.0" w.c. (2.5 kPa)	1890 (53.5)	2770 (78.4)	3600 (101.9)	4500 (127.4)	4500 (127.4)

NOTE: See pages 72-73 for Regulator Sizing Requirements and Examples.

Pressure Drop: expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	7.0" w.c. (1.7 kPa)	.5 psi (3.4 kPa)	.75 psi (5 kPa)
325-3L	145 (4.0)	204 (5.8)	250 (7.0)
325-5L	400 (11.3)	550 (15.6)	670 (19.0)
325-7AL	815 (23.1)	1149 (32.5)	1405 (39.8)
325-9L	1360 (38.5)	2113 (59.8)	2557 (72.4)
325-11L	3000 (85.0)	4220 (119.5)	5170 (146.4)

Spring Selection

Outlet Pressure Range (all models)

Certified Spring 7" to 11" w.c. (1.7 to 2.7 kPa)

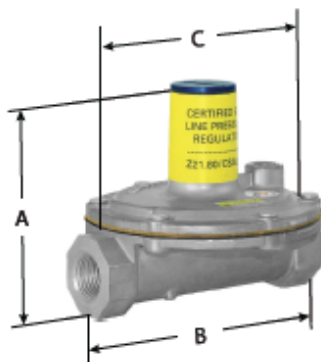
325-L SERIES

Lever Acting Design for 2 psi Piping Systems

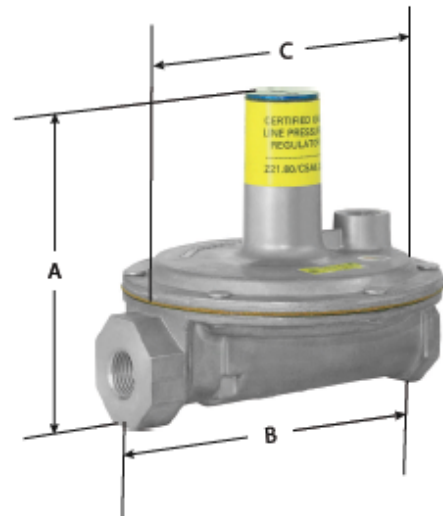
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions		
				A	B	C
325-3L	3/8", 1/2"	1/8" NPT	3" (76 mm)	3.5" (89 mm)	4.2" (108 mm)	3.9" (98 mm)
325-5L	1/2", 3/4", 1"	3/8" NPT	4.9" (124 mm)	5.3" (133 mm)	5.9" (149 mm)	5.4" (138 mm)
325-7AL	1 1/4", 1 1/2"	1/2" NPT	6.1" (156 mm)	7.3" (184 mm)	8" (203 mm)	7" (178 mm)
325-9L	1 1/2", 2"	1/2" NPT	7.8" (198 mm)	9.4" (239 mm)	10.8" (274 mm)	9.1" (231 mm)
325-11L	2", 2 1/2", 3"	3/4" NPT	11.0" (279 mm)	13.1" (333 mm)	16.1" (409 mm)	13.5" (343 mm)

NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



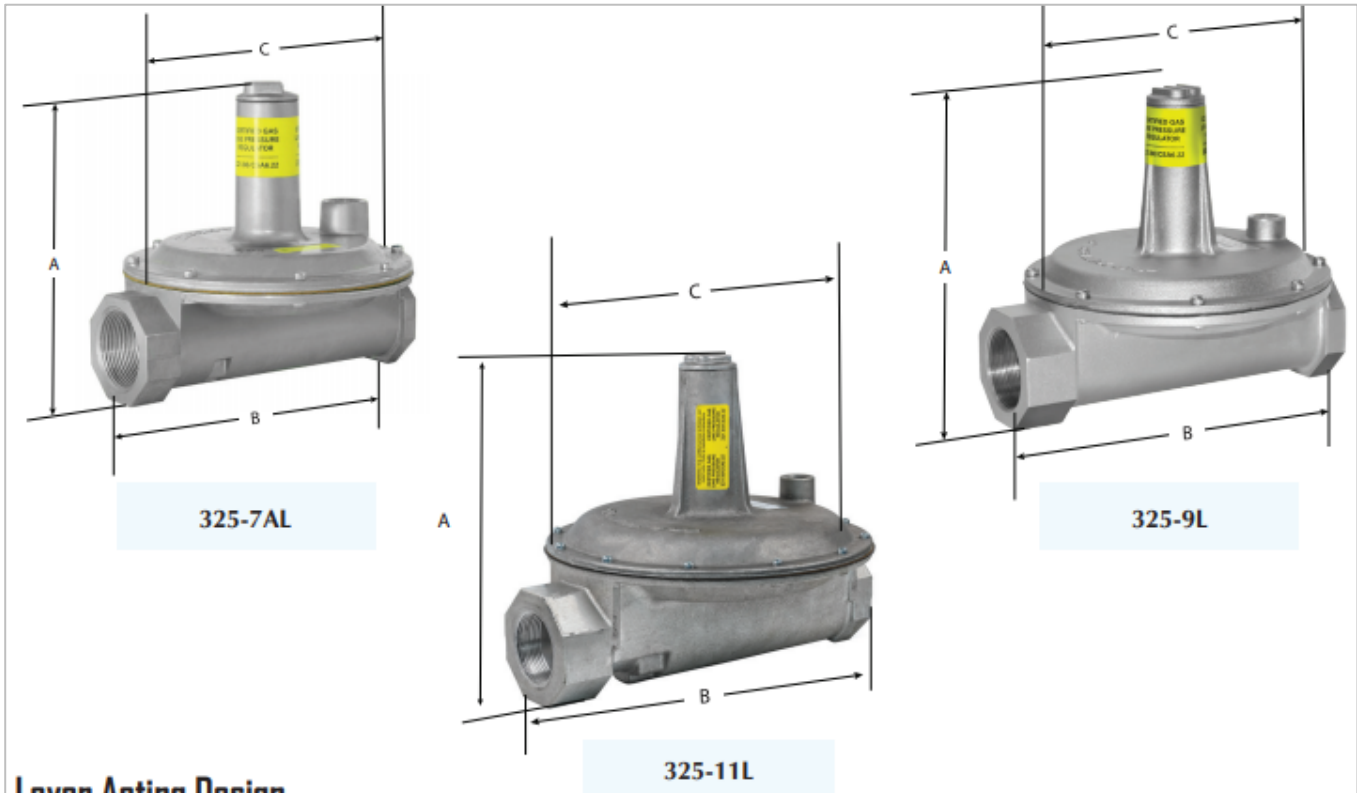
325-3L



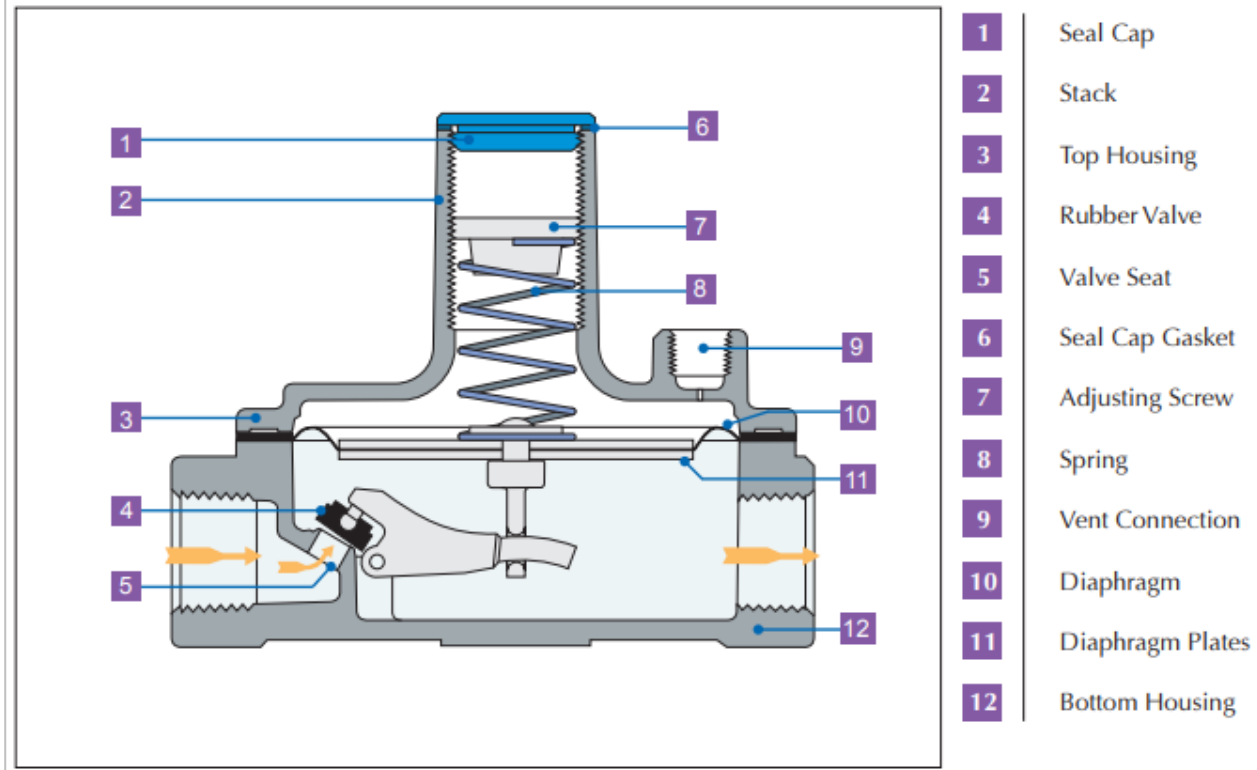
325-5L

325-L SERIES

Lever Acting Design for 2 psi Piping Systems



Lever Acting Design



325-L SERIES

Lever Acting Design with OPDs for 5 psi Piping Systems

Maxitrol's 325-L series line pressure regulators with OPDs are for use on 5 psi piping systems. The regulator reduces pounds pressure to a level within the appliance or equipment's operating supply range. The line regulator is located upstream of equipment already fitted with an appliance regulator. The 325 series features a high leverage linkage assembly to deliver dead-end lockup.



Specifications

Pipe Sizes 3/8" thru 2" threaded connections with NPT or ISO 7-1 threads.

Housing Material All models: aluminum.

Mounting All models with the exception of 325-7AL210D, 325-9L210E, and 325-11L210G are suitable for multi-positional mounting. 325-7AL210D, 325-9L210E, and 325-11L210G are to be mounted in an upright horizontal position only. If a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only.

NOTE: Line pressure regulators with separate overpressure protection devices are factory preassembled and supplied to the field as a unit. All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see LPROPD_MI_EN.FR).

Certifications All models: ANSI Z21.80/CSA 6.22 Line Pressure Regulators

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Rated Inlet Pressure CSA Certified: 5 psi (34.5 kPa)

Maxitrol Tested 10 psi (69 kPa)

With 12A09, 12A39, or 12A49 vLimiter® Installed

Natural: 5 psi (34.5 kPa); LP: 2 psi (13.8 kPa)

Emergency Exposure Limits 65 psi (450 kPa) (inlet side only)

Maximum Individual Load and Capacity

325-3L47 (3/8", 1/2") (w/OPD 47 attached).....	125,000 Btu/h
325-3L48 (1/2") (w/OPD 48 attached).....	200,000 Btu/h
325-5L48 (1/2") (w/OPD 48 attached).....	235,000 Btu/h
325-5L48 (3/4") (w/OPD 48 attached).....	320,000 Btu/h
325-5L600 (3/4") (w/OPD 600 attached).....	425,000 Btu/h
325-5L600 (1") (w/OPD 600 attached).....	465,000 Btu/h
325-7AL210D (1 1/4", 1 1/2") (w/OPD 210D attached).....	1,250,000 Btu/h
325-9L210E (1 1/2", 2") (w/OPD 210E attached).....	2,250,000 Btu/h
325-11L210G (2", 2 1/2", 3") (w/OPD 210G attached).....	4,500,000 Btu/h

Ambient Temperature Ranges -40 to 205°F (-40 to 96°C)

Minimum Regulation Suitable for pilot flow applications. **(P)** (Circle P) (0.15 CFH NG).

MAXITROL®

325-L SERIES

Lever Acting Design with OPDs
for 5 psi Piping Systems



Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model Number	Pipe Size	Outlet Pressure Set Point	Operating Inlet Pressure			
			1/2 psi (3.4 kPa)	3/4 psi (5.2 kPa)	1 psi (6.9 kPa)	5 psi (34.5 kPa)
325-3L47	3/8" x 3/8"	7" w.c.	125 (3.5)	125 (3.5)	125 (3.5)	125 (3.5)
		10" w.c.	100 (2.8)	125 (3.5)	125 (3.5)	125 (3.5)
325-3L47	1/2" x 1/2"	7" w.c.	125 (3.5)	125 (3.5)	125 (3.5)	125 (3.5)
		10" w.c.	105 (2.9)	125 (3.5)	125 (3.5)	125 (3.5)
325-3L48	1/2" x 1/2"	7" w.c.	160 (4.5)	200 (5.6)	200 (5.6)	200 (5.6)
		10" w.c.	120 (3.4)	200 (5.6)	200 (5.6)	200 (5.6)
325-5L48	1/2" x 1/2"	7" w.c.	235 (6.6)	235 (6.6)	235 (6.6)	235 (6.6)
		10" w.c.	235 (6.6)	235 (6.6)	235 (6.6)	235 (6.6)
325-5L48	3/4" x 3/4"	7" w.c.	320 (9.0)	320 (9.0)	320 (9.0)	320 (9.0)
		10" w.c.	245 (6.9)	320 (9.0)	320 (9.0)	320 (9.0)
325-5L600	3/4" x 3/4"	7" w.c.	345 (9.6)	425 (11.9)	425 (11.9)	425 (11.9)
		10" w.c.	260 (7.3)	425 (11.9)	425 (11.9)	425 (11.9)
325-5L600	1" x 1"	7" w.c.	375 (10.5)	465 (13.0)	465 (13.0)	465 (13.0)
		10" w.c.	285 (8.0)	465 (13.0)	465 (13.0)	465 (13.0)
325-7AL210D	1 1/4" x 1 1/4"	7" w.c.	815 (22.8)	1120 (31.4)	1250 (35.4)	1250 (35.4)
		10" w.c.	580 (16.2)	900 (25.2)	1100 (30.8)	1250 (35.4)
325-7AL210D	1 1/2" x 1 1/2"	7" w.c.	815 (22.8)	1120 (31.4)	1250 (35.4)	1250 (35.4)
		10" w.c.	580 (16.2)	900 (25.2)	1100 (30.8)	1250 (35.4)
325-9L210E	1 1/2" x 1 1/2"	7" w.c.	1380 (38.6)	2000 (56.0)	2250 (63.0)	2250 (63.0)
		10" w.c.	890 (24.9)	1750 (49.0)	2100 (58.8)	2250 (63.0)
325-9L210E	2" x 2"	7" w.c.	1380 (38.6)	2000 (56.0)	2250 (63.0)	2250 (63.0)
		10" w.c.	890 (24.9)	1750 (49.0)	2100 (58.8)	2250 (63.0)
325-11L210G	2" x 2" 2 1/2" x 2 1/2" 3" x 3"	7" w.c.	3000 (85.0)	3900 (110.4)	4500 (127.4)	4500 (127.4)
		10" w.c.	1890 (53.5)	2770 (78.4)	3600 (101.9)	4500 (127.4)

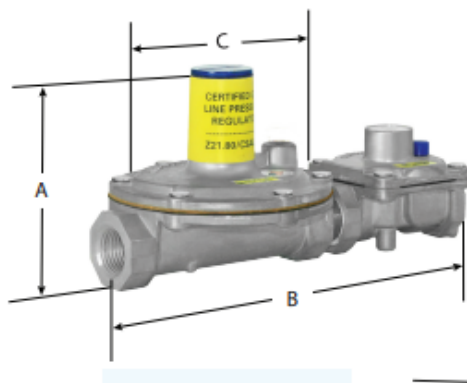
325-L SERIES

Lever Acting Design with OPDs
for 5 psi Piping Systems

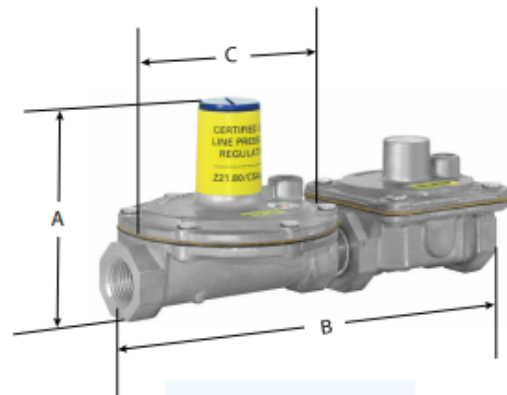
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions		
				A	B	C
325-3L47	3/8", 1/2"	325-3L: 1/8" OPD47: Integral	3" (76 mm)	3.5" (89 mm)	8" (203 mm)	3.9" (99 mm)
325-3L48	1/2"	325-3L: 1/8" OPD48: 1/8"	3" (76 mm)	3.5" (89 mm)	8.5" (216 mm)	3.9" (99 mm)
325-5L48	1/2", 3/4"	325-5L: 3/8" OPD48: 1/8"	4.4" (112 mm)	5.3" (135 mm)	10" (254 mm)	5.4" (137 mm)
325-5L600	3/4", 1"	325-5L: 3/8" OPD600: 1/8"	4.4" (112 mm)	5.5" (140 mm)	11" (279 mm)	5.4" (137 mm)
325-7AL210D	1 1/4", 1 1/2"	325-7AL: 1/2" OPD210D: 3/8"	6.75" (171 mm)	7" (178 mm)	15.4" (391 mm)	9" (229 mm)
325-9L210E	1 1/2", 2"	325-9L: 1/2" OPD210E: 1/2"	8.3" (211 mm)	9.4" (239 mm)	20.6" (523 mm)	9.1" (231 mm)
325-11L210G	2", 2 1/2", 3"	325-11L: 3/4" OPD210E: 3/4"	11.9" (302 mm)	16.5" (419 mm)	29" (737 mm)	13.5" (343 mm)

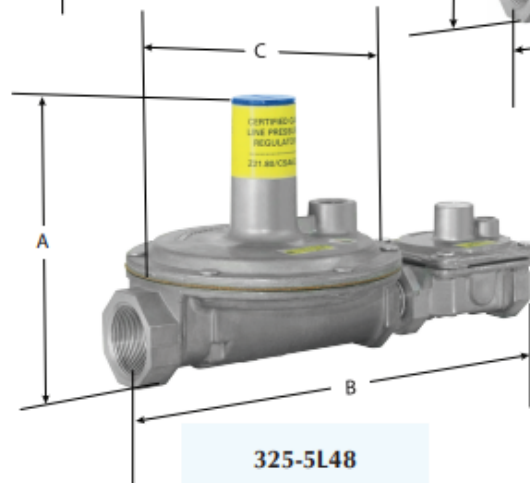
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



325-3L47



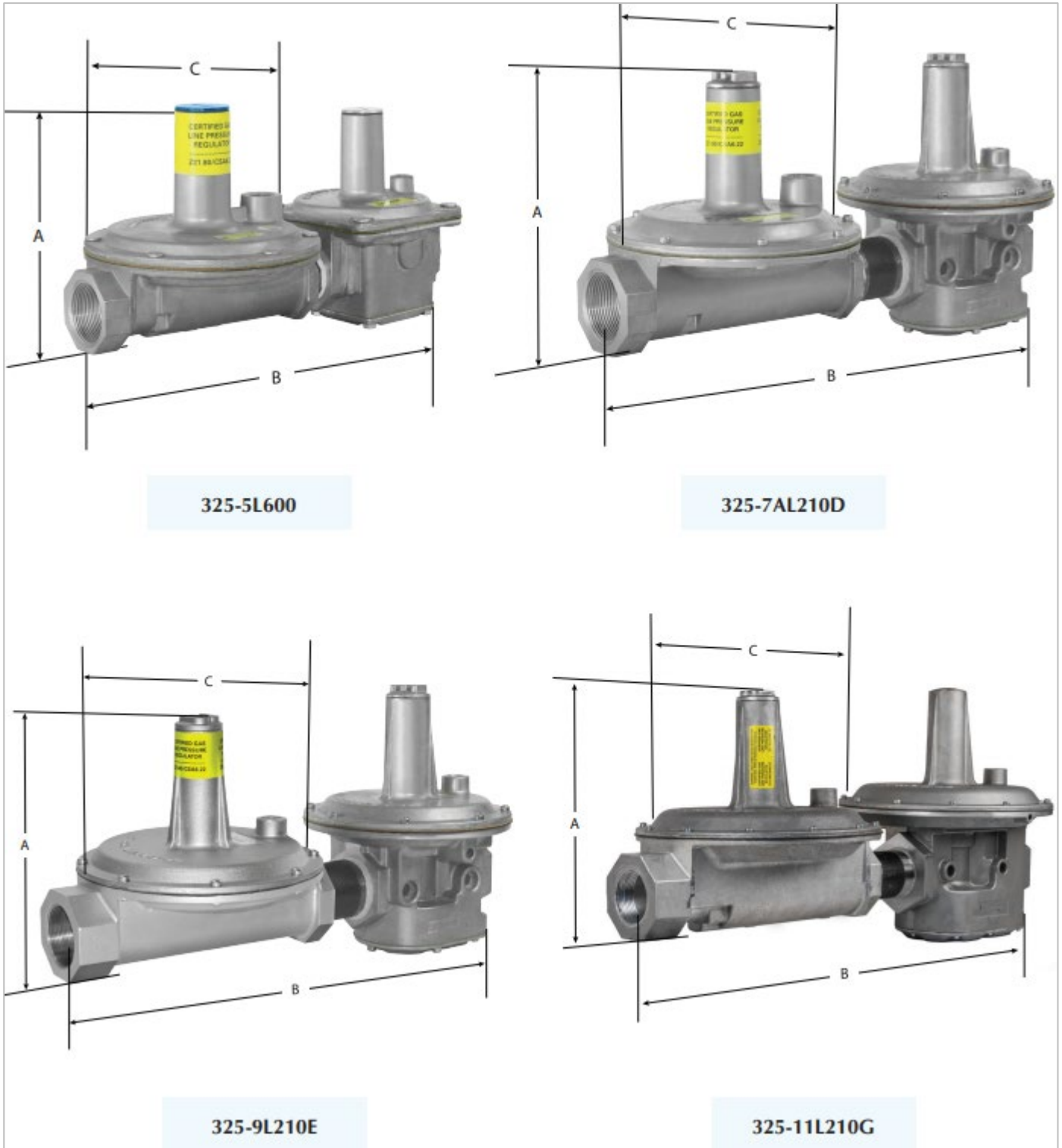
325-3L48



325-5L48

325-L SERIES

Lever Acting Design with OPDs
for 5 psi Piping Systems



325 SERIES

Lever Acting Design

Maxitrol's 325 series pounds to inches regulators are for use on residential, commercial, and industrial applications.

The 325 series features a high leverage valve linkage assembly to deliver positive dead-end lockup. The regulators are capable of precise control from full flow down to pilot flow.



325-3

Specifications

Pipe Sizes 3/8" to 3" threaded connections with NPT or ISO 7-1 threads.

Housing Material 325-3, 325-5, 325-7A, 325-9, 325-11: aluminum.

Mounting Suitable for multi-positional mounting. If a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications 325-3, 325-5: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Rated Inlet Pressure CSA Certified: 325-3, 325-5: 2 psi (13.8 kPa), 5 psi (34.5 kPa)

Maxitrol Tested 325-3, 325-5, 325-7A, 325-9, 325-11: 10 psi (69 kPa)

With Vent Limiter 12A09, 12A39, or 12A49 Installed:

325-3, 325-5, 325-7A, 325-9: 5 psi (34.5 kPa) - Natural, 2 psi (13.8 kPa) - LP

Emergency Exposure Limits 65 psi (450 kPa) (inlet side only)

Maximum Individual Load Largest single appliance served by the regulator: 325-3: 100,000 Btu/h; 325-5: 325,000 Btu/h; (325-3 & 325-5 with 4" to 12" springs: 40,000 Btu/h); 325-7A: 1,250,000 Btu/h; 325-9: 2,250,000 Btu/h; 325-11: 4,500,000 Btu/h

Capacity Total load of multiple appliances combined: 325-3: 150,000 Btu/h; 325-5: 325,000 Btu/h; 325-7A: 1,250,000 Btu/h; 325-9: 2,250,000 Btu/h; 325-11: 4,500,000 Btu/h

NOTE: Capacities are used to determine the maximum multiple appliance load. The largest single appliance served by the regulator should not exceed the maximum individual load specified above.

Ambient Temperature Ranges -40 to 205°F (-40 to 96°C)

Minimum Regulation Suitable for pilot flow applications. (P) (Circle P) (0.15 CFH NG), None (1.5 CFH NG).

MAXITROL®

325 SERIES

Lever Acting Design



Capacities: based on 1" w.c. pressure drop, from set point*

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Outlet Pressure Set Point	CSA MAX CFH	Operating Inlet Pressure					
				0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)	5 psi (34.5 kPa)	10 psi (69.0 kPa)
325-3	3/8" x 3/8" 1/2" x 1/2"	4.0" w.c. (1.0 kPa)	150 (4.2)	160 (4.5)	190 (5.4)	220 (6.2)	220 (6.2)	300 (8.5)	320 (9.1)
		7.0" w.c. (1.7 kPa)	150 (4.2)	120 (3.4)	150 (4.2)	180 (5.1)	220 (6.2)	290 (8.2)	320 (9.1)
		10.0" w.c. (2.5 kPa)	150 (4.2)	100 (2.8)	120 (3.4)	150 (4.2)	220 (6.2)	280 (7.9)	320 (9.1)
325-5	1/2" x 1/2" 3/4" x 3/4" 1" x 1"	4.0" w.c. (1.0 kPa)	325 (9.2)	340 (9.6)	390 (11.0)	450 (12.7)	560 (15.9)	680 (19.3)	750 (21.2)
		7.0" w.c. (1.7 kPa)	325 (9.2)	260 (7.4)	360 (10.2)	410 (11.6)	530 (15.0)	680 (19.3)	750 (21.2)
		10.0" w.c. (2.5 kPa)	325 (9.2)	240 (6.8)	320 (9.1)	360 (10.2)	500 (8.5)	650 (18.4)	750 (21.2)
325-7A	1 1/4" x 1 1/4" 1 1/2" x 1 1/2"	4.0" w.c. (1.0 kPa)	—	850 (24.0)	1060 (30.0)	1190 (33.7)	1600 (45.3)	2090 (59.2)	2190 (62.0)
		7.0" w.c. (1.7 kPa)	—	780 (22.0)	950 (26.9)	1060 (30.0)	1500 (42.5)	1860 (52.7)	2060 (58.3)
		10.0" w.c. (2.5 kPa)	—	650 (18.4)	860 (24.4)	990 (28.0)	1300 (36.8)	1620 (45.9)	2060 (58.3)
325-9	1 1/2" x 1 1/2" 2" x 2"	4.0" w.c. (1.0 kPa)	—	1815 (51.4)	2075 (58.8)	2250 (63.7)	2660 (75.3)	3550 (100.5)	3750 (106.2)
		7.0" w.c. (1.7 kPa)	—	1430 (40.5)	1660 (47.0)	1960 (55.5)	2570 (72.8)	3420 (96.8)	3750 (106.2)
		10.0" w.c. (2.5 kPa)	—	1275 (36.1)	1450 (41.1)	1720 (48.7)	2160 (61.2)	3150 (89.2)	3750 (106.2)
325-11	2" x 2" 2 1/2" x 2 1/2" 3" x 3"	4.0" w.c.	—	2800 (79.3)	3850 (109.0)	4550 (128.8)	5530 (156.6)	6120 (173.3)	9150 (259.1)
		7.0" w.c.	—	1940 (54.9)	3000 (85.0)	3700 (104.8)	4750 (134.5)	5650 (160.0)	9150 (259.1)
		10.0" w.c.	—	1440 (40.8)	2320 (65.7)	2800 (79.3)	4420 (125.2)	5400 (152.9)	9150 (259.1)

NOTE: Maximum Individual Load: 325-3(B) is 100 CFH (2.8 m³/h); 325-5(B) is 325 CFH (9.2 m³/h); 325-7A(B) is 1250 CFH (35.4 m³/h); 325-9(B) is 2250 CFH (63.7).

Approval based on use as an appliance regulator.

*Set points (in CFH): 325-3(B) = 50; 325-5(B) = 150; 325-7A(B) = 500; 325-9(B) = 1000; 325-11(B) = 2000.

See pages 72-73 for Regulator Sizing Requirements and Examples.

Spring Selection Chart: inches w.c. (kPa) unless noted

Model	CSA Certified				Standard Spring	Other Springs Available			
	2 psi (13.8 kPa)		5 psi (34.5 kPa)						
325-3	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12** (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-5	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12** (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-7A	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black
325-9	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black
325-11	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black

325 SERIES

Lever Acting Design

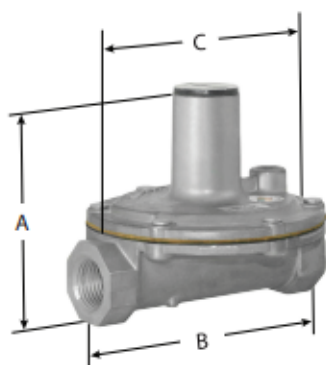
Pressure Drop: 0.64 sp gr gas expressed in CFH (m³/h) (for system pressure drop calculations)

Model	7.0" w.c. (1.7 kPa)	0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)
325-3	145 (4.0)	204 (5.8)	250 (7.0)	289 (8.2)	—
325-5	400 (11.3)	550 (15.6)	670 (19.0)	770 (21.8)	—
325-7A	815 (23.1)	1149 (32.5)	1405 (39.8)	1624 (46.0)	2305 (65.3)
325-9	1360 (38.5)	2113 (59.8)	2557 (72.4)	2949 (83.5)	4059 (114.8)
325-11	3000 (85.0)	4220 (119.5)	5170 (146.4)	6000 (169.9)	8485 (240.3)

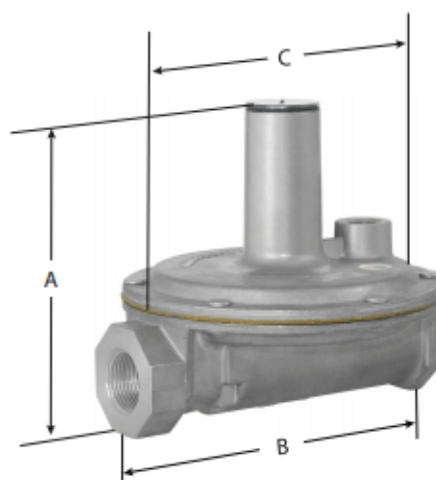
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions		
				v	B	C
325-3	3/8", 1/2"	1/8" NPT	3" (76 mm)	3.5" (89 mm)	4.2" (108 mm)	3.9" (98 mm)
325-5	1/2", 3/4", 1"	3/8" NPT	4.9" (124 mm)	5.3" (133 mm)	5.9" (149 mm)	5.4" (138 mm)
325-7A	1 1/4", 1 1/2"	1/2" NPT	6.1" (156 mm)	7.3" (184 mm)	8" (203 mm)	7" (178 mm)
325-9	1 1/2", 2"	1/2" NPT	7.8" (198 mm)	9.4" (239 mm)	10.8" (274 mm)	9.1" (231 mm)
325-11	2", 2 1/2"	3/4" NPT	11.0" (279 mm)	13.1" (333 mm)	16.1" (409 mm)	13.5" (343 mm)

NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



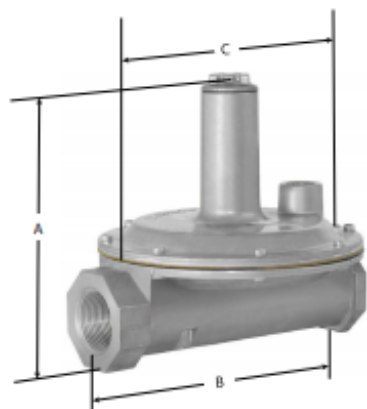
325-3



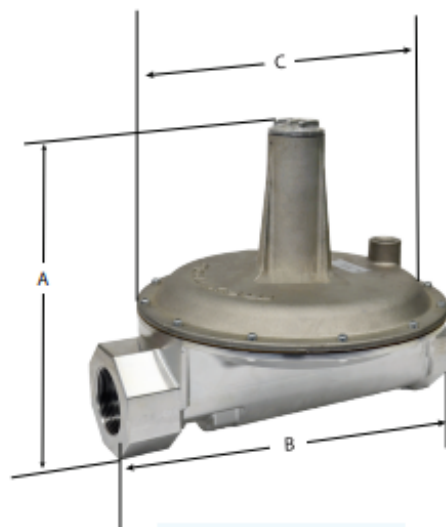
325-5

325 SERIES

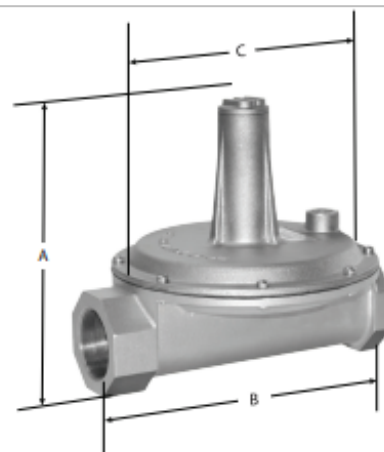
Lever Acting Design



325-7A

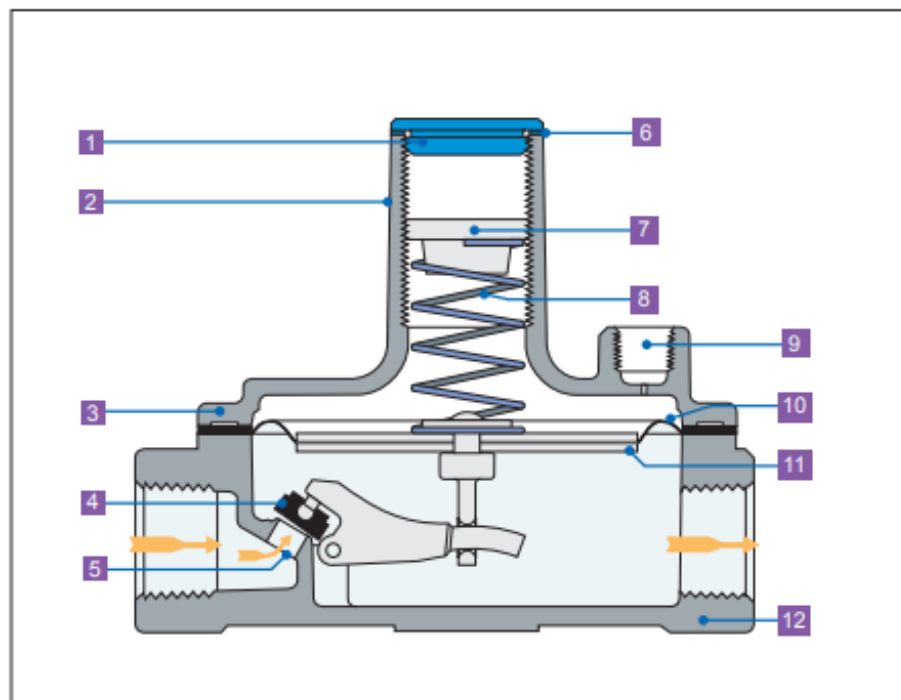


325-11



325-9

Lever Acting Design



- | | |
|----|------------------|
| 1 | Seal Cap |
| 2 | Stack |
| 3 | Top Housing |
| 4 | Rubber Valve |
| 5 | Valve Seat |
| 6 | Seal Cap Gasket |
| 7 | Adjusting Screw |
| 8 | Spring |
| 9 | Vent Connection |
| 10 | Diaphragm |
| 11 | Diaphragm Plates |
| 12 | Bottom Housing |

NOTE: Diagrams are graphical representations only and may differ from actual product.

RV SERIES

Rubber Seat Poppet Design

The compact RV poppet regulators are designed primarily for main burner and pilot load applications. Typical applications include residential and commercial cooking appliances, barbecues, hearth products, and pilot lines. Maxitrol rubber seat poppet models offer the ultimate in design features and performance capabilities to meet your specific appliance or utility requirements.



RV47

Specifications

Pipe Sizes 1/8" thru 3/4" threaded connections with NPT or ISO 7-1 threads.
(Other connections available, please consult Maxitrol Company.)

Housing Material RV12, RV20, RV47, RV48, CV47, CV48: aluminum.

Mounting All models, with the exception of "D" suffix models, are suitable for multi-positional mounting. Other than upright position will result in a slight difference in outlet pressure. "D" suffix models are to be mounted upright only. For the RV48, if a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only. The **vLimiter®** 12A06 is multi-positional.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications RV Series: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.
CV47 and CV48 Series: ANSI Z21.78/CSA 6.20 Combination Gas Controls for Gas Appliances.

Fuel Gases (RV Series) Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Fuel Gases (CV47 Series) Suitable for natural or liquefied petroleum gases.

Rated Inlet Pressure 1/2 psi (3.4 kPa)

Emergency Exposure Limits 2.5 psi (17.2 kPa)

Ambient Temperature Ranges... RV20, RV47, RV48, CV47, CV48: 0° to 225°F (-18° to 107°C)
RV12: -40 to 225°F (-40 to 107°C)
RV12T: -40 to 275°F (-40 to 135°C)
RV20T: -40 to 300°F (-40 to 148°C)
RV48T: 0 to 275°F (-18 to 135°C)
RV47T2, RV48T2: -40 to 225°F (-40 to 107°C)

MAXITROL®

RV SERIES

Rubber Seat Poppet Design

Capacities and Pressure Drop

Capacities expressed in Btu/h (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Pressure Drop @ 0.3" w.c. or (0.07 kPa)	Range of Regulation		Individual Load	
			Main Burner	Main Burner & Pilot	Fixed Orifice	Ball Check Device
RV12	1/8" x 1/8"*	14,800 (0.42)	30,000 (0.85)	25,000 (0.71)	20,000 (0.56)	---
	3/16" x 3/16" Loxit	8,800 (0.25)		15,000 (0.43)		
RV20	1/4" x 1/4" 3/8" x 3/8"*	30,000 (0.85)	65,000 (1.84)	50,000 (1.4)	30,000 (0.85)	---
RV20C	1/4" x 1/4" 3/8" x 3/8"	30,000 (0.85)	75,000 (2.11)	50,000 (1.4)	15,000 (0.42)	---
CV47 RV47	3/8" x 3/8"	55,000 (1.5)	125,000 (3.5)	90,000 (2.5)	40,000 (1.1)	125,000 (3.5)
	1/2" x 1/2"*	60,000 (1.7)				
CV47A or C RV47A or C	3/8" x 3/8"	55,000 (1.5)	125,000 (3.5)	125,000 (3.5)	40,000 (1.1)	125,000 (3.5)
	1/2" x 1/2"	60,000 (1.7)				
CV48 RV48	1/2" x 1/2"	130,000 (3.7)	230,000 (6.5)	230,000 (6.5)	40,000 (1.1)	160,000 (4.5)
	3/4" x 3/4"	150,000 (4.2)	250,000 (7.1)	250,000 (7.1)		
CV48C RV48C	1/2" x 1/2"	130,000 (3.7)	400,000 (11.3)	275,000 (7.8) Nat 275,000 (3.1) LP	40,000 (1.1)	160,000 (4.5)
	3/4" x 3/4"	150,000 (4.2)				

RV SERIES

Rubber Seat Poppet Design

Spring Selection Chart: inches w.c. (kPa)

Model	Available Springs										
RV12	1.0 to 3.5* (0.37 to 0.75) Brown	2.8 to 5.2 (0.69 to 1.3) Plated	---	4 to 8 (1 to 2) Orange	---	---	---	---	6 to 10 (1.5 to 2.5) Red	8 to 12 (2 to 3) Blue	---
RV20	1 to 3.5* (0.25 to 0.9) Brown	2.8 to 5.2 (0.69 to 1.3) Plated	---	4 to 8 (1 to 2) Orange	---	---	---	---	6 to 10 (1.5 to 2.5) Red	8 to 12 (2 to 3) Blue	9 to 12** (2.25 to 3) Plated
CV47 RV47	1 to 3.5* (0.25 to 0.9) Brown	2.8 to 5.2 (0.69 to 1.3) Plated	3.8 to 4.3 (0.95 to 1.08) Black	4 to 8 (1 to 2) Orange	4 to 12* (1 to 3) Violet	4.7 to 5.3 (1.18 to 1.33) Green	---	5.6 to 6.4 (1.4 to 1.6) Red	6 to 10 (1.5 to 2.5) Red	8 to 12 (2 to 3) Blue	9.7 to 11.3 (2.42 to 2.83) Plated
CV48 RV48	1 to 3.5* (0.25 to 0.9) Brown	3.0 to 6.0 (0.75 to 1.5) Plated	---	4 to 8 (1 to 2) Orange	---	---	5 to 12 (1.25 to 3) Blue	---	6 to 10 (1.5 to 2.5) Red	---	---

*Uncertified Spring

**Certified at inlet pressure of 2 psi

Model	Available Springs					
RV20CL	4 / 10 (1 / 2.5)	---	---	---	---	---
CV47CL*** RV47CL***	4 / 10 (1 / 2.5)	4 / 11 (1 / 2.75)	5 / 10 (1.25 / 2.5)	5 / 11 (1.25 / 2.75)	6 / 10 (1.5 / 2.5)	6 / 11 (1.5 / 2.75)
CV48C RV48C(L)***	4 / 10 (1 / 2.5)	4 / 11 (1 / 2.75)	5 / 10 (1.25 / 2.5)	5 / 11 (1.25 / 2.75)	6 / 10 (1.5 / 2.5)	6 / 11 (1.5 / 2.75)

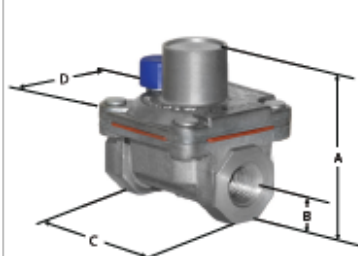
RV SERIES

Rubber Seat Poppet Design

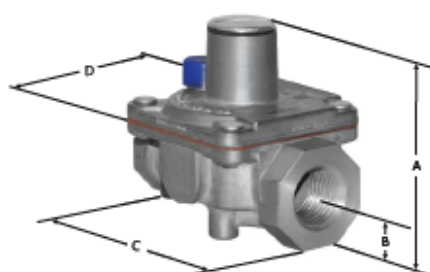
Dimensions

Model	Pipe Size	Vent	Swing Radius	Dimensions			
				A	B	C	D
RV12	1/8" 3/16" Loxit	Integral Vent Limiting Orifice "L"	1.4" (35 mm)	1.7" (43 mm)	0.4" (10 mm)	1.7" (43 mm)	1.4" (35 mm)
RV20	1/4", 3/8"	Integral Vent Limiting Orifice "L" or 5/16-24 "V"	1.6" (41 mm)	2.1" (54 mm)	0.5" (13 mm)	2.4" (61 mm)	1.8" (45 mm)
CV47 RV47	3/8", 1/2"	Integral Vent Limiting Orifice "D" or "L" suffix	1.9" (48 mm)	2.5" (64 mm)	0.6" (16 mm)	2.9" (75 mm)	2.3" (57 mm)
CV47A RV47A			1.6" (41 mm)	2.3" (57 mm)			
CV48 RV48	1/2", 3/4"	Integral "L" or 1/8" NPT, 12A04 or 12A06 vent limiting device	2" (51 mm)	2.8" (70 mm)	0.8" (19 mm)	3.4" (86 mm)	3" (76 mm)

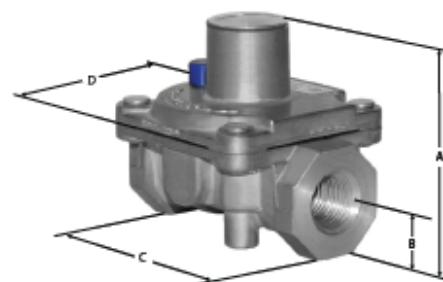
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



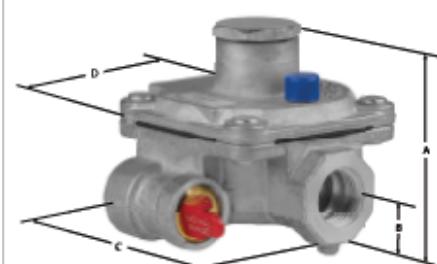
RV12



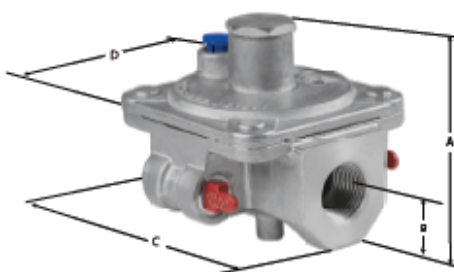
RV20



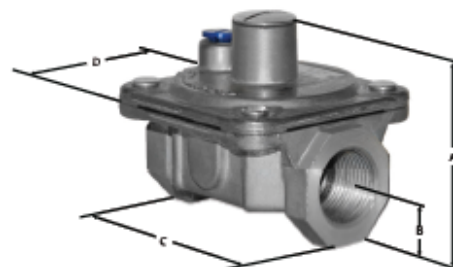
RV47, RV47A



CV47, CV47A



CV48



RV48

RV SERIES

Straight-Thru-Flow Design

MAXITROL®

Maxitrol's original straight-thru-flow (STF) design regulators are non-lockup type regulators for high capacities at low inlet pressures. The difference between STF design and other type regulators is the conical valve. The cone principal permits gas to flow straight through the regulator without changing direction. Frictional flow resistance is reduced, resulting in greater capacity. An improved flow pattern provides accurate, sensitive regulation at extremely low pressure differentials. Typical applications include residential, commercial, and industrial gas-fired appliances and equipment used on low or medium pressure gas supplies.



RV81

Specifications

Pipe Sizes 1/2" to 3" threaded connections with NPT or ISO 7-1 threads. 4" 150lb.

Housing Material RV52, RV53, RV61, RV81, RV91, RV111: aluminum

Mounting RV52, RV53, RV61 are suitable for multi-positional mounting. RV81, RV91, RV111, mount in an upright position only. If a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only. The **vLimiter®** 12A06 is multi-positional.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications RV52, RV53, RV61, RV81, RV91, RV111: ANSI Z21.18/CSA6.3 Gas Appliance Pressure Regulators.

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Rated Inlet Pressure CSA Certified: RV52, RV53, RV61, RV81, RV91, RV111: 1/2 psi (3.4 kPa)

Maxitrol Tested* RV52, RV53: 1/2 psi (3.4 kPa)

RV61, RV81, RV91, RV111: 1 psi (6.9 kPa)

*Do not use if inlet pressure is more than 10 times desired outlet pressure.

Emergency Exposure Limits..... RV52, RV53: 3 psi (21 kPa)
RV61, RV81, RV91, RV111: 5 psi (34 kPa)

Gas Containment Limits..... RV52, RV53: 15 psi (103 kPa)
RV61, RV81, RV91, RV111: 25 psi (172 kPa)

NOTE: Internal damage may occur when exposed to these pressures.

Ambient Temperature Ranges... RV52, RV53, RV61, RV81, RV91, RV111: -40 to 205°F (-40 to 96°C)
RV131: -40 to 125°F (-40 to 52°C)

Minimum Regulation..... RV52, RV53: 20 CFH; RV61: 25 CFH; RV81, RV91: 50 CFH; RV111: 250 CFH.
Expressed in CFH @ 0.64 sp gr gas.

Model Designations (F) Factory-set; fixed non-adjustable regulator.
(M) B.S.P. - PL parallel thread - conforms to ISO 7-1, where pressure tight joints are made on the threads.

RV SERIES

Straight-Thru-Flow Design

Capacities and Pressure Drop

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	CSA MAX	Pressure Drop - inches w.c. (kPa)												
			0.1 (0.02)	0.2 (0.04)	0.3 (0.07)	0.4 (0.10)	0.5 (0.12)	0.6 (0.15)	0.7 (0.17)	0.8 (0.20)	0.9 (0.22)	1.0 (0.25)	2.0 (0.5)	3.0 (0.75)	4.0 (1.0)
RV52	1/2" x 1/2" 3/4" x 3/4"	450 (12.7)	151 (4.2)	214 (6.1)	262 (7.4)	302 (8.5)	338 (9.5)	370 (10.5)	400 (11.3)	427 (12.1)	453 (12.8)	478 (13.5)	676 (19.1)	828 (23.4)	956 (27.1)
RV53	3/4" x 3/4" 1" x 1"	690 (19.5)	217 (6.1)	306 (8.6)	375 (10.6)	433 (12.2)	484 (13.7)	530 (15)	573 (16.2)	612 (17.3)	650 (18.4)	684 (19.3)	968 (27.4)	1185 (33.5)	1369 (38.7)
RV61	1" x 1" 1 1/4" x 1 1/4"	900 (24.5)	379 (10.7)	536 (15.1)	675 (19.1)	759 (21.5)	848 (24.0)	929 (26.3)	1004 (28.4)	1073 (30.4)	1138 (32.2)	1200 (34.0)	1742 (49.3)	2134 (60.4)	2464 (69.8)
RV81	1 1/4" x 1 1/4" 1 1/2" x 1 1/2"	2500 (70.8)	780 (22.1)	1102 (31.2)	1350 (38.2)	1559 (44.1)	1743 (49.5)	1909 (54.0)	2062 (58.4)	2204 (62.4)	2339 (66.2)	2465 (69.8)	3485 (98.7)	4269 (120)	4929 (139)
RV91	2" x 2" 2 1/2" x 2 1/2"	3275 (92.7)	1212 (34.3)	1714 (48.5)	2100 (59.4)	2424 (68.6)	2711 (76.7)	2969 (84.1)	3208 (90.8)	3429 (97.1)	3637 (103)	3834 (108)	5422 (153)	6640 (188)	7668 (217)
RV111	2 1/2" x 2 1/2" 3" x 3"	7500 (212)	2742 (78.0)	3878 (110)	4750 (134)	5485 (155)	6132 (175)	6718 (190)	7256 (205)	7757 (219)	8227 (233)	8572 (243)	12134 (343)	14862 (420)	17161 (486)

NOTE: See pages 72-73 for Regulator Sizing Requirements and Examples.

Spring Selection Chart: inches w.c. (kPa)

Model	CSA Certified Springs			Other Springs Available							
RV52	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	---	---	---	---
RV53	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	---	---	---	---
RV61	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5* (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	---	---	10 to 22 (2.5 to 5.5) Red	---	---
RV81	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	---	---
RV91	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	---	---
RV111	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	---	---

NOTE: The area within the heavy line indicates CSA certified springs. See pages 70-71 for complete Spring Selection Chart.

* The 2 to 5 inches w.c. (0.5 to 1.25 kPa) spring is also CSA certified for the RV61

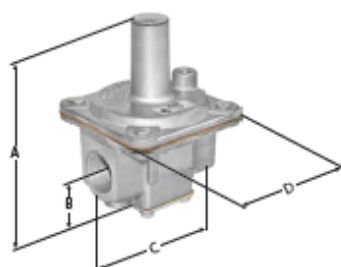
RV SERIES

Straight-Thru-Flow Design

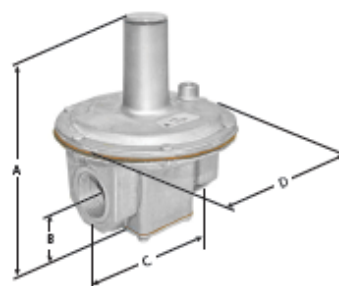
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions			
				A	B	C	D
RV52	1/2", 3/4"	1/8" NPT	3.6" (91 mm)	4.9" (124 mm)	1.3" (33 mm)	3.2" (81 mm)	3.3" (83 mm)
RV53	3/4", 1"	1/8" NPT	3.9" (99 mm)	5.2" (132 mm)	1.3" (33 mm)	3.8" (95 mm)	3.9" (99 mm)
RV61	1", 1 1/4"	1/8" NPT	4.8" (122 mm)	6.4" (164 mm)	1.6" (41 mm)	4.4" (111 mm)	5.4" (138 mm)
RV81	1 1/4", 1 1/2"	3/8" NPT	6.4" (162 mm)	8.4" (213 mm)	2" (51 mm)	6" (153 mm)	7" (178 mm)
RV91	2"	1/2" NPT	8.5" (216 mm)	10.8" (275 mm)	2.3" (60 mm)	6.5" (165 mm)	9.1" (232 mm)
	2 1/2"	1/4" NPT	8.3" (212 mm)	10.5" (267 mm)	2.4" (62 mm)	7.1" (181 mm)	9.1" (232 mm)
RV111	2 1/2", 3"	3/4" NPT	11.5" (284 mm)	15.1" (373 mm)	3.5" (89 mm)	9" (229 mm)	13.4" (324 mm)

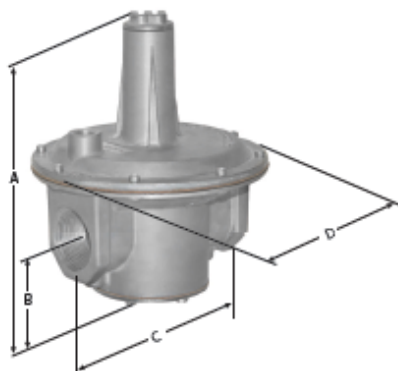
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



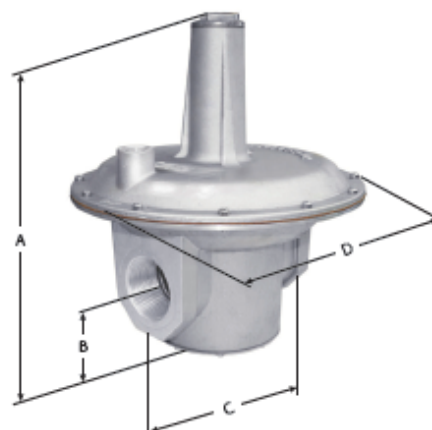
RV52, RV53



RV61



RV81, RV91



RV111

R SERIES

Balanced Valve Design

MAXITROL®

The R series' double diaphragm balanced valve design makes it possible to maintain steady outlet pressure control with widely varying inlet pressures. The regulator is physically small yet has exceptional capacity characteristics. R series regulators are intended for use with both main burner and pilot load applications. They are ideally suited for use with infrared heaters and pilot lines on large industrial heaters and boilers.



R400

Specifications

Pipe Sizes 3/8" to 1 1/4" threaded connections with NPT or ISO 7-1 threads.

Housing Material R400(S), R500(S), R600(S), R700: aluminum.

Mounting Suitable for multi-positional mounting. If a **vLimiter®** or **vProtector®** is installed, mount in an upright horizontal position only. The **vLimiter®** 12A06 is multi-positional.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications R400(S), R500(S), R600(S), R700: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Rated Inlet Pressure CSA Certified: R400(S), R500(S), R600(S): 1/2 psi (3.4 kPa), R700: 5 psi (34.5 kPa)

Maxitrol Tested: R400, R500, R600: 1 psi (6.9 kPa);
R400S, R500S, R600S: 5 psi (34.5 kPa)

Emergency Exposure Limits R400, R500, R600: 2 psi (13.8 kPa)
R400S, R500S, R600S, R700: 12.5 psi (86.2 kPa)

Ambient Temperature Ranges R400(S), R500(S), R600(S), R700: -40 to 205°F (-40 to 96°C)

Zero Governor Models Please refer to pages 22-25 for RZ model information.

Minimum Regulation R400(S), R500(S), R600(S): Suitable for pilot flow applications. (P) (Circle P) (0.15 CFH NG),
None (1.5 CFH NG). R700: 10 CFH

Model Designations (F) Factory-set; fixed non-adjustable regulator.
(M) B.S.P. - PL parallel thread - conforms to ISO 7-1, where pressure tight joints are made on the threads.
(S) S denotes models with a nitrile rubber bonded to aluminum valve.

NOTE: The R regulators are not suitable for dead-end lockup service. They are capable of controlling pressure at very low flows such as standing pilots, but should not be used as a line pressure regulator for appliances equipped with electronic ignition unless the automatic control valve can open against line pressure.

R SERIES

Balanced Valve Design

Capacities and Pressure Drop

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Pressure Drop - inches w.c. (kPa)										
		0.2 (0.05)	0.4 (0.10)	0.6 (0.15)	0.8 (0.20)	1.0 (0.25)	1.5 (0.37)	2.0 (0.50)	2.5 (0.62)	3.0 (0.75)	3.5 (0.87)	4.0 (1.0)
R400(S)	3/8" x 3/8"	77 (2.3)	110 (3.1)	134 (3.8)	155 (4.3)	174 (4.9)	212 (5.9)	245 (6.9)	274 (7.7)	---	---	---
	1/2" x 1/2"	86 (2.4)	121 (3.4)	148 (4.1)	172 (4.82)	192 (5.4)	235 (6.6)	271 (7.6)	303 (8.5)	---	---	---
R500(S)	1/2" x 1/2"	163 (4.6)	231 (6.5)	283 (7.9)	327 (9.2)	366 (10.3)	447 (12.5)	516 (14.6)	577 (16.2)	635 (17.9)	685 (19.2)	730 (20.44)
	3/4" x 3/4"	196 (5.5)	277 (7.8)	340 (9.5)	392 (11.0)	438 (12.3)	537 (15.0)	620 (17.4)	693 (19.4)	760 (21.3)	820 (23.0)	876 (24.53)
R600(S)	3/4" x 3/4"	298 (8.3)	421 (11.8)	516 (14.5)	595 (16.7)	666 (18.7)	816 (22.9)	942 (26.4)	1054 (29.5)	1150 (32.2)	1245 (34.86)	1335 (37.38)
	1" x 1"	330 (9.2)	468 (13.1)	572 (16.2)	661 (18.2)	739 (20.7)	906 (25.4)	1046 (29.3)	1169 (32.7)	1280 (35.8)	1380 (38.64)	1480 (41.44)
R700	1" x 1"	360 (10.2)	510 (14.4)	620 (17.6)	720 (20.4)	800 (22.7)	980 (27.8)	1130 (32.0)	1270 (36.0)	1390 (39.4)	1500 (42.5)	1600 (45.3)
	1 1/4" x 1 1/4"	670 (19.0)	800 (22.7)	880 (24.9)	950 (26.9)	1000 (28.3)	1230 (34.8)	1410 (39.9)	1580 (44.7)	1730 (49.0)	1870 (53.0)	2000 (56.6)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.
See pages 72-73 for Regulator Sizing Requirements and Examples.

Spring Selection Chart: inches w.c. (kPa)

Model	CSA Certified Springs			Other Springs Available					
R400(S)	3 to 6 (0.75 to 1.5) Plated	---	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	10 to 22 (2.5 to 5.5) Red	---
R500(S)	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	10 to 22 (2.5 to 5.5) Red	---
R600(S)	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow
R700	3 to 6 (0.75 to 1.5) Plated	4 to 8 (1 to 2) Orange	5 to 12 (1.25 to 3) Blue	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 8 (0.75 to 2) Pink	4 to 12 (1 to 3) Violet	10 to 22 (2.5 to 5.5) Red	---

R SERIES

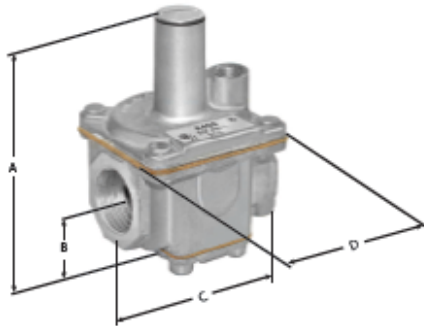
Balanced Valve Design

MAXITROL®

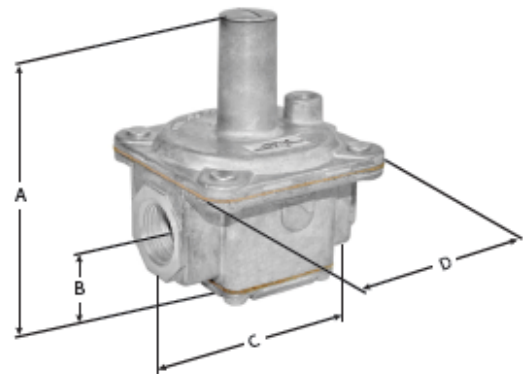
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions			
				A	B	C	D
R400(S)	3/8", 1/2"	1/8" NPT	2.4" (60 mm)	3.3" (83 mm)	0.9" (24 mm)	2" (51 mm)	2" (51 mm)
R500(S)	1/2", 3/4"	1/8" NPT	3.6" (90 mm)	4.7" (119 mm)	1.2" (30 mm)	3" (76 mm)	3.1" (79 mm)
R600(S)	3/4", 1"	1/8" NPT	4.3" (110 mm)	5.7" (145 mm)	1.5" (38 mm)	4" (103 mm)	3.9" (99 mm)
R700	1", 1 1/4"	3/8" NPT	5.0" (128 mm)	6.9" (176 mm)	1.9" (48 mm)	4.4" (113 mm)	5.4" (139 mm)

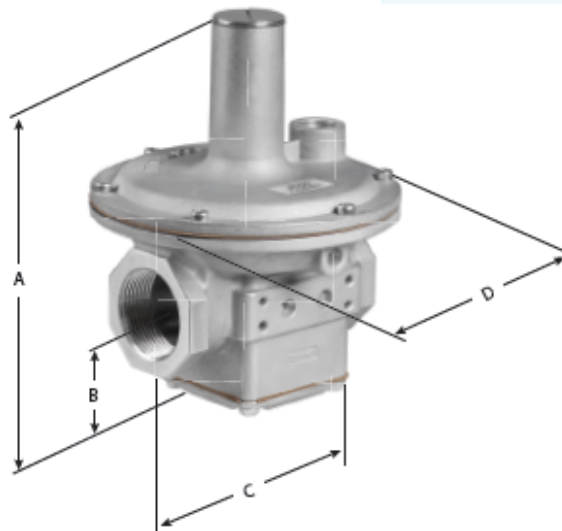
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



R400(S)



R500(S), R600(S)



R700

210 SERIES

Balanced Valve Design

The 210 series is a lockup type regulator. The balanced valve design makes it possible to maintain steady outlet pressure control with widely varying inlet pressures. The regulator has an integrated dampening mechanism in the breather outlet and the sensing tube to improve regulating stability and reduce hunting tendencies. The 210 series provides precise regulation over a wide range of pressures and flow rates. Applications include gas-fired boilers, steam generators, industrial furnaces, and ovens.



Specifications

Pipe Sizes 1" to 3" threaded connections with NPT or ISO 7-1 threads. 4" 125 lb. flange (210J only).

Housing Material 210D, 210E, 210G, 210J: aluminum.

Mounting Mount in an upright position only.

NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications 210D, 210E, 210G: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.

Fuel Gases Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Maximum Inlet Pressure CSA Certified: 210D, 210E, 210G: 10 psi (69 kPa)

Maxitrol Tested 210J: 10 psi (69 kPa)

Emergency Exposure Limits 210D, 210E, 210G, 210J: 25 psi (172 kPa)

Ambient Temperature Ranges -40 to 200°F (-40 to 93°C)

Sensing Taps Convenient tap locations are available for downstream sensing, cross connections, and differential control. Four locations can be tapped and plugged for measuring pressure.

Remote Sensing 210D, 210E, 210G models may be ordered with remote sensing. The internal sensing tube is omitted and external sensing taps are provided. Add suffix letter "R" to model number when ordering.

Zero Governor Models Please refer to pages 36-39 for 210Z model information.

Minimum Regulation 210D: 25 CFH; 210E, 210G: 50 CFH; 210J: 100 CFH.

Model Designations (F) Factory-set; fixed non-adjustable regulator.

(M) B.S.P. - PL parallel thread - conforms to ISO 7-1, where pressure tight joints are made on the threads.

210 SERIES

Balanced Valve Design

Spring Selection Chart: inches w.c. (kPa)

Model	CSA Certified Springs										Other Springs
210D	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 6 (0.75 to 1.5) Plated	3 to 8 (0.75 to 2) Pink	4 to 8 (1 to 2) Orange	4 to 12 (1 to 3) Violet	5 to 12 (1.25 to 3) Blue	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5 to 10.5) Black
210E	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 6 (0.75 to 1.5) Plated	3 to 8 (0.75 to 2) Pink	4 to 8 (1 to 2) Orange	4 to 12 (1 to 3) Violet	5 to 12 (1.25 to 3) Blue	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5 to 10.5) Black
210G	1 to 3.5 (0.25 to 0.9) Brown	2 to 5 (0.5 to 1.25) Plated	3 to 6 (0.75 to 1.5) Plated	3 to 8 (0.75 to 2) Pink	4 to 8 (1 to 2) Orange	4 to 12 (1 to 3) Violet	5 to 12 (1.25 to 3) Blue	5 to 15 (1.25 to 3.7) Green	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5 to 10.5) Black
210J	---	2 to 5 (0.5 to 1.25) Plated	3 to 6 (0.75 to 1.5) Plated	3 to 8 (0.75 to 2) Pink	---	4 to 12 (1 to 3) Violet	5 to 12 (1.25 to 3) Blue	---	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5 to 10.5) Black

Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210D	1" x 1"	8.0" w.c.	2400 (68.0)	1900 (53.8)	1300 (36.8)	---	---	---	---	---	---
		0.5 psi	3400 (96.3)	3100 (87.8)	2700 (76.5)	2200 (62.3)	---	---	---	---	---
		0.75 psi	3500 (99.1)	4000 (113)	3800 (108)	3400 (96.3)	2900 (82.1)	2200 (62.3)	---	---	---
		1 psi	3500 (99.1)	4000 (113)	4500 (127)	4300 (122)	3900 (110)	3400 (96.3)	2700 (76.5)	1900 (53.8)	---
		1.5 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	4600 (130)	4100 (116)	3600 (102)
		2 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	5000 (142)	5000 (142)	5000 (142)
		3 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	5000 (142)	5000 (142)	5000 (142)
		5 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	5000 (142)	5000 (142)	5000 (142)
		7.5 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	5000 (142)	5000 (142)	5000 (142)
		10 psi	3500 (99.1)	4000 (113)	4500 (127)	4800 (136)	4800 (136)	5000 (142)	5000 (142)	5000 (142)	5000 (142)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.

210 SERIES

Balanced Valve Design

Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210D	1 1/4" x 1 1/4"	8.0" w.c.	3000 (84.9)	2400 (68.0)	1700 (48.1)	---	---	---	---	---	---
		0.5 psi	4000 (113)	3905 (111)	3400 (96.3)	2700 (76.5)	---	---	---	---	---
		0.75 psi	4000 (113)	5000 (142)	4700 (133)	4200 (119)	3700 (105)	2700 (76.5)	---	---	---
		1 psi	4000 (113)	5000 (142)	5000 (142)	5300 (150)	4900 (139)	4200 (119)	3400 (96.3)	2400 (68.0)	---
		1.5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	5700 (161)	5200 (147)	4600 (130)
		2 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)
		3 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)
		5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)
		7.5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)
		10 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210D	1 1/2" x 1 1/2"	8.0" w.c.	3100 (87.8)	2500 (70.8)	1800 (51.0)	---	---	---	---	---	---
		0.5 psi	4000 (113)	4000 (113)	3600 (102)	2800 (79.3)	---	---	---	---	---
		0.75 psi	4000 (113)	5000 (142)	5000 (142)	4400 (125)	3800 (108)	2800 (79.3)	---	---	---
		1 psi	4000 (113)	5000 (142)	5000 (142)	5600 (159)	5100 (144)	4400 (125)	3600 (102)	2500 (70.8)	---
		1.5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6000 (170)	5400 (153)	4800 (136)
		2 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)	6500 (184)
		3 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)	6500 (184)
		5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)	6500 (184)
		7.5 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)	6500 (184)
		10 psi	4000 (113)	5000 (142)	5000 (142)	6000 (170)	6000 (170)	6500 (184)	6500 (184)	6500 (184)	6500 (184)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.

210 SERIES

Balanced Valve Design

Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210E	1 1/2" x 1 1/2"	8.0" w.c.	4450 (126)	3650 (103)	2550 (72.2)	---	---	---	---	---	---
		0.5 psi	6300 (178)	5750 (163)	5150 (146)	4050 (115)	---	---	---	---	---
		0.75 psi	7000 (198)	7500 (212)	7050 (200)	6300 (178)	5450 (154)	4050 (115)	---	---	---
		1 psi	7000 (198)	8800 (249)	8500 (241)	7950 (225)	7250 (205)	6300 (178)	5150 (146)	3650 (103)	---
		1.5 psi	7000 (198)	8800 (249)	8800 (249)	10450 (296)	9950 (282)	9250 (262)	8550 (242)	7700 (218)	6800 (193)
		2 psi	7000 (198)	8800 (249)	8800 (249)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10250 (290)	9600 (272)
		3 psi	7000 (198)	8800 (249)	8800 (249)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10500 (297)
		5 psi	7000 (198)	8800 (249)	8800 (249)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10250 (290)	10500 (297)
		7.5 psi	7000 (198)	8800 (249)	8800 (249)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10250 (290)	10500 (297)
		10 psi	7000 (198)	8800 (249)	8800 (249)	10500 (297)	10500 (297)	10500 (297)	10500 (297)	10250 (290)	10500 (297)

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210E	2" x 2"	8.0" w.c.	5150 (146)	4200 (119)	2950 (83.5)	---	---	---	---	---	---
		0.5 psi	7250 (205)	6650 (188)	5950 (168)	4700 (133)	---	---	---	---	---
		0.75 psi	8000 (226)	8650 (245)	8150 (231)	7250 (205)	6300 (178)	4700 (133)	---	---	---
		1 psi	8000 (226)	10000 (283)	9850 (279)	9150 (259)	8400 (238)	7250 (205)	5950 (168)	4200 (119)	---
		1.5 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	11500 (326)	10700 (303)	9850 (279)	8900 (252)	7850 (222)
		2 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	11850 (335)	11000 (311)
		3 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)
		5 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)
		7.5 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)
		10 psi	8000 (226)	10000 (283)	10000 (283)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)	12000 (340)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.

210 SERIES

Balanced Valve Design

Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210G	2 1/2" x 2 1/2"	8.0" w.c.	10400 (294)	8500 (241)	6000 (170)	---	---	---	---	---	---
		0.5 psi	14700 (416)	13410 (380)	12000 (340)	9500 (269)	---	---	---	---	---
		0.75 psi	16000 (453)	17500 (495)	16400 (464)	14700 (416)	12750 (361)	9500 (269)	---	---	---
		1 psi	16000 (453)	20000 (566)	19900 (563)	18500 (524)	16950 (480)	14700 (416)	12000 (340)	8500 (241)	---
		1.5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	23250 (658)	21600 (612)	19900 (563)	18000 (510)	15850 (449)
		2 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	22450 (636)
		3 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)
		5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)
		7.5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)
		10 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)	24000 (680)

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210G	3" x 3"	8.0" w.c.	11500 (325)	9400 (266)	6600 (187)	---	---	---	---	---	---
		0.5 psi	16000 (453)	14800 (416)	13200 (374)	10450 (296)	---	---	---	---	---
		0.75 psi	16000 (453)	19300 (546)	18100 (516)	16200 (459)	14000 (396)	10450 (296)	---	---	---
		1 psi	16000 (453)	20000 (566)	20000 (566)	20350 (576)	18700 (529)	16200 (459)	13200 (374)	9350 (265)	---
		1.5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	23800 (674)	21900 (620)	19800 (561)	17450 (494)
		2 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	27000 (765)	27000 (765)	26400 (748)	24700 (699)
		3 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	27000 (765)	27000 (765)	27000 (765)	27000 (765)
		5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	27000 (765)	27000 (765)	27000 (765)	27000 (765)
		7.5 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	27000 (765)	27000 (765)	27000 (765)	27000 (765)
		10 psi	16000 (453)	20000 (566)	20000 (566)	24000 (680)	24000 (680)	27000 (765)	27000 (765)	27000 (765)	27000 (765)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.

210 SERIES

Balanced Valve Design

Capacities

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Inlet Pressure	Outlet Pressure - inches w.c. (kPa)								
			2.0 (0.5)	4.0 (1.0)	6.0 (1.5)	9.0 (2.25)	12 (3.0)	16 (4.0)	20 (5.0)	24 (6.0)	28 (7.0)
210J	4" x 4"	8.0" w.c.	20800 (589)	17000 (481)	12000 (339)	---	---	---	---	---	---
		0.5 psi	29500 (835)	27000 (764)	24000 (680)	19000 (538)	---	---	---	---	---
		0.75 psi	32000 (906)	35000 (991)	33000 (934)	29420 (833)	25500 (722)	19000 (538)	---	---	---
		1 psi	32000 (906)	40000 (1132)	40000 (1132)	37000 (1048)	34000 (963)	29420 (833)	24000 (680)	17000 (481)	---
		1.5 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	47000 (1331)	43350 (1227)	39700 (1124)	36000 (1019)	31800 (900)
		2 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	48000 (1359)	50000 (1416)	50000 (1416)	48000 (1359)	45000 (1274)
		3 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	48000 (1359)	50000 (1416)	50000 (1416)	50000 (1416)	50000 (1416)
		5 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	48000 (1359)	50000 (1416)	50000 (1416)	50000 (1416)	50000 (1416)
		7.5 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	48000 (1359)	50000 (1416)	50000 (1416)	50000 (1416)	50000 (1416)
		10 psi	32000 (906)	40000 (1132)	40000 (1132)	48000 (1359)	48000 (1359)	50000 (1416)	50000 (1416)	50000 (1416)	50000 (1416)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.

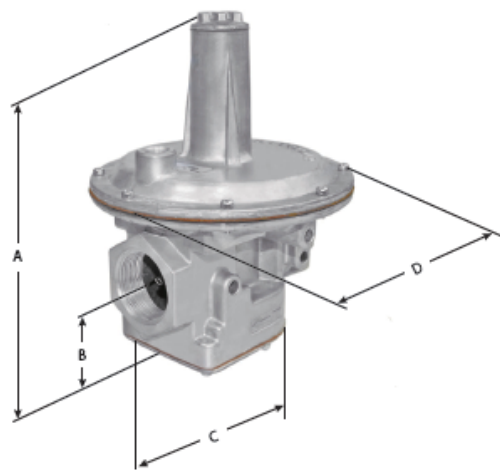
210 SERIES

Balanced Valve Design

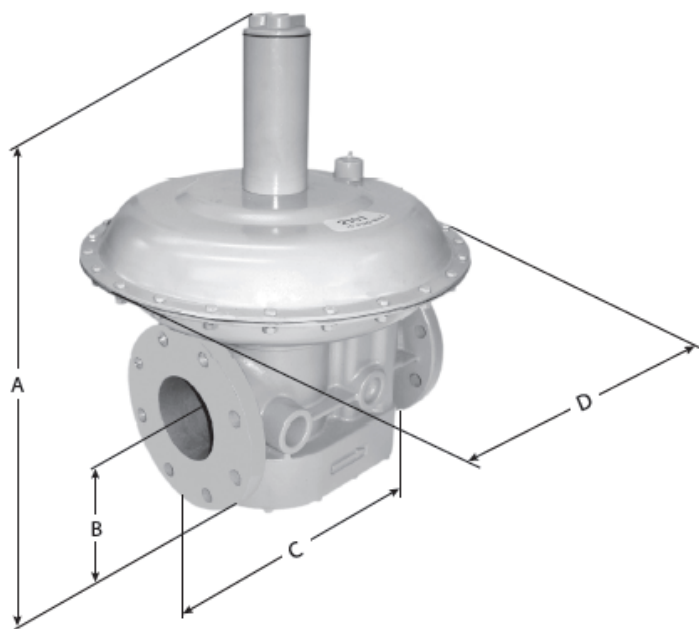
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions			
				A	B	C	D
210D	1", 1 1/4", 1 1/2"	3/8" NPT	5.4" (138 mm)	9" (228 mm)	2.4" (60 mm)	6" (152 mm)	7" (178 mm)
210E	1 1/2", 2"	1/2" NPT	8.3" (211 mm)	11.3" (286 mm)	2.9" (75 mm)	8" (203 mm)	9.1" (232 mm)
210G	2 1/2", 3"	3/4" NPT	11.9" (302 mm)	16.5" (419 mm)	4.6" (116 mm)	11.8" (300 mm)	13.5" (343 mm)
210J	4"	3/4" NPT	18.4" (467 mm)	24.3" (616 mm)	5.4" (138 mm)	13.8" (349 mm)	18" (457 mm)

NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



210D, 210E, 210G



210J

SPRING SELECTION CHART

MAXITROL®

Model	Part Number	Color Code	Outlet Pressure (In. w.c.)	Approx Inner Diameter	Approx Length
Adjustable Models:					
RV12L	R1210T-13	Brown	1.0 to 3.5	3/8"	9/16"
	R1210T-35*	Plated	2.8 to 5.2		3/4"
	R1210T-48	Orange	4.0 to 8.0		3/4"
	R1210T-610	Red	6.0 to 10		7/8"
	R1210T-812	Blue	8.0 to 12		1"
RV20L	R2010T-13	Brown	1.0 to 3.5	7/16"	13/16"
	R2010T-35*	Plated	2.8 to 5.2		1 1/16"
	R2010T-48	Orange	4.0 to 8.0		1 1/16"
	R2010T-610	Red	6.0 to 10		1"
	R2010T-812	Blue	8.0 to 12		1 1/8"
	R2010T-912	Plated	9.0 to 12		1 9/16"
RV47AD RV47AL	R4710-4	Black	3.8 to 4.3	9/16"	1 3/4"
	R4710-5	Green	4.7 to 5.3		1 13/16"
	R4710-6	Red	5.6 to 6.4		1 13/16"
	R4710-10	Blue	9.7 to 11.3		1 11/16"
CV47 RV47D RV47L	R4710-13	Brown	1.0 to 3.5	9/16"	7/8"
	R4710-35*	Plated	2.8 to 5.2		1 1/4"
	R4710-48	Orange	4.0 to 8.0		1 5/16"
	R4710-412	Violet	4.0 to 12		1 1/16"
	R4710-610	Red	6.0 to 10		1 7/16"
	R4710-812	Blue	8.0 to 12		1 1/2"
CV48 RV48	R4810-13	Brown	1.0 to 3.5	9/16"	15/16"
	R4810-36*	Plated	3.0 to 6.0		1 3/16"
	R4810-48	Orange	4.0 to 8.0		1 1/8"
	R4810-512	Blue	5.0 to 12		1 3/16"
CV48T RV48T	R4810-610	Red	6.0 to 10	9/16"	1 1/2"
	R4810T-36*	S Steel	3.0 to 6.0		1 3/16"
	R4810T-48	Orange	4.0 to 8.0		1 1/8"
	R4810T-512	Blue	5.0 to 12		1 3/16"
R400 R400S	R4810T-610	Red	6.0 to 10	9/16"	1 1/2"
	R400B10-13	Brown	1.0 to 3.5		1 1/4"
	R400B10-25	Plated	2.0 to 5.0		1 9/16"
	R400B10-36*	Plated	3.0 to 6.0		2"
	R400B10-38	Pink	3.0 to 8.0		2 9/16"
	R400B10-412	Violet	4.0 to 12		1 1/2"
	R400B10-512	Blue	5.0 to 12		1 7/8"
RV52 R500 R500S	R400B10-1022	Red	10 to 22		1 3/4"
	R5210-13	Brown	1.0 to 3.5	9/16"	2"
	R5210-25	Plated	2.0 to 5.0		2 9/16"
	R5210-36*	Plated	3.0 to 6.0		2 7/8"
	R5210-38	Pink	3.0 to 8.0		2 7/8"
	R5210-48	Orange	4.0 to 8.0		2 9/16"
	R5210-412	Violet	4.0 to 12		3 1/8"
R500 R500S	R5210-512	Blue	5.0 to 12		2 1/2"
					2 15/16"
RV53 R600 R600S	R5210-1022	Red	10 to 22	9/16"	2 13/16"
	R5310-13	Brown	1.0 to 3.5		2 5/8"
	R5310-25	Plated	2.0 to 5.0		2 15/16"
	R5310-36*	Plated	3.0 to 6.0		3 3/8"
	R5310-38	Pink	3.0 to 8.0		3 1/8"
	R5310-48	Orange	4.0 to 8.0		3 5/8"
	R5310-412	Violet	4.0 to 12		3 1/6"
RV53 R600 R600S	R5310-512	Blue	5.0 to 12		3 7/16"
					3 7/16"

* Standard Spring

Model #	Part Number	Color Code	Outlet Pressure (In. w.c.)	Approx Inner Diameter	Approx Length
Adjustable Models:					
R600 R600S	R5310-1022 R5310-1530	Red Yellow	10 to 22 15 to 30	5/8"	3 1/4" 3 1/2"
RV61 R700	R6110-13	Brown	1.0 to 3.5	3/4"	2 5/8"
	R6110-25	Plated	2.0 to 5.0		3 1/4"
	R6110-36*	Plated	3.0 to 6.0		3 1/2"
	R6110-38	Pink	3.0 to 8.0		3 1/8"
	R6110-48	Orange	4.0 to 8.0		3 9/16"
	R6110-512	Blue	5.0 to 12		3 9/16"
	R6110-1022	Red	10 to 22		3 1/2"
RV81 210D	R8110-13	Brown	1.0 to 3.5	7/8"	3 1/8"
	R8110-25	Plated	2.0 to 5.0		3 13/16"
	R8110-36*	Plated	3.0 to 6.0		4 5/16"
	R8110-38	Pink	3.0 to 8.0		3 7/8"
	R8110-48	Orange	4.0 to 8.0		4 1/2"
	R8110-412	Violet	4.0 to 12		3 3/4"
	R8110-512	Blue	5.0 to 12		4 1/16"
210D	R8110-515	Green	5.0 to 15		3 3/4"
	R8110-1022	Red	10 to 22		4 5/16"
	R8110-1530 R8110-2042	Yellow Black	15 to 30 20 to 42	7/8"	4 1/2" 4 5/16"
RV91 210E	R9110-13	Brown	1.0 to 3.5	1 1/8"	4"
	R9110-25	Plated	2.0 to 5.0		4 15/16"
	R9110-36*	Plated	3.0 to 6.0		5 3/4"
	R9110-38	Pink	3.0 to 8.0		5 1/16"
	R9110-48	Orange	4.0 to 8.0		5 15/16"
	R9110-412	Violet	4.0 to 12		5 1/16"
	R9110-512	Blue	5.0 to 12		5 1/2"
210E	R9110-515	Green	5.0 to 15		5 1/8"
	R9110-1022	Red	10 to 22		5 5/8"
	R9110-1530 R9110-2042	Yellow Black	15 to 30 20 to 42	1 7/8"	5 7/8" 5 3/4"
RV111 210G	R11110-13	Brown	1.0 to 3.5	1 1/2"	6 1/8"
	R11110-25	Plated	2.0 to 5.0		7 1/6"
	R11110-36*	Plated	3.0 to 6.0		8 5/16"
	R11110-38	Pink	3.0 to 8.0		7 3/8"
	R11110-48	Orange	4.0 to 8.0		8 3/8"
	R11110-412	Violet	4.0 to 12		7 3/8"
	R11110-512	Blue	5.0 to 12		8 1/8"
210G	R11110-515	Green	5.0 to 15		7 1/16"
	R11110-1022	Red	10 to 22		8 1/8"
	R11110-1530 R11110-2042	Yellow Black	15 to 30 20 to 42	1 1/2"	8 7/16" 8 1/4"
210J	R210J10-13	Plated	2.0 to 5.0	2 1/8"	9 1/6"
	R210J10-36*	Plated	3.0 to 6.0		11 3/4"
	R210J10-38	Pink	3.0 to 8.0		10 3/8"
	R210J10-412	Violet	4.0 to 12		9 7/8"
	R210J10-512	Blue	5.0 to 12		11 5/8"
	R210J10-1022	Red	10 to 22		11 1/2"
	R210J10-1530 R210J10-2042	Yellow Black	15 to 30 20 to 42		11 11/16" 11 1/4"
220D, E,G,& J	R325C10-1022 R325C10-1530	Tagged Tagged	1 psi-3 psi 2 psi-5 psi	5/8"	2 1/8" 2 5/16"

SPRING SELECTION CHART

MAXITROL®

Model	Part Number	Min / Max	Color Code	Outlet Pressure (In. w.c.)	Approx Inner Diameter	Approx Length
Adjustable Models:						
SR400	SR400B10H MR410B10L	Max Min	S Steel Plated	3.0 to 5.0 0.3 to 1.2	$\frac{5}{16}$ " 1 $\frac{1}{16}$ "	1 $\frac{5}{16}$ " $\frac{7}{8}$ "
	SR400B10H-1 MR410B10L	Max Min	White Plated	2.5 to 3.5 0.3 to 1.2		1" $\frac{7}{8}$ "
	SR400B10H MR410B10L-1	Max Min	S Steel Blue	4.0 to 6.0 1.0 to 2.8		1 $\frac{5}{16}$ " 1 $\frac{1}{16}$ "
	SR400B10H-1 MR410B10L-1	Max Min	White Blue	3.0 to 5.0 1.0 to 2.8		1" 1 $\frac{1}{16}$ "
	SR400B10L-4	Min	Black	2.5 to 4.0		1 $\frac{3}{16}$ "
SR400-2**	MR410B102-2	Max	Blue	7.5 to 12.0	$\frac{5}{16}$ "	1 $\frac{1}{2}$ "
SR500	SR500B10H MR510B10L	Max Min	S Steel Plated	3.0 to 5.0 0.3 to 1.2	$\frac{7}{16}$ " 1 $\frac{5}{8}$ "	1 $\frac{9}{16}$ " 1 $\frac{1}{16}$ "
	SR500B10H-1 MR510B10L	Max Min	White Plated	1.5 to 3.5 0.3 to 1.2		1 $\frac{1}{16}$ " 1 $\frac{1}{16}$ "
	SR500B10H MR510B10L-1	Max Min	S Steel Plated	3.5 to 6.0 1.0 to 2.8		1 $\frac{9}{16}$ " 1 $\frac{1}{4}$ "
	SR500B10H-1 MR510B10L-1	Max Min	White Blue	2.0 to 4.5 1.0 to 2.8		1 $\frac{1}{16}$ " 1 $\frac{1}{4}$ "
SR500-2**	SR500B10H\L-2*	Max	Black	7.5 to 12.0	$\frac{7}{16}$ "	2 $\frac{1}{4}$ "
SR600	SR600B10H MR610B10L	Max Min	S Steel Plated	3.0 to 5.0 0.3 to 1.2	$\frac{5}{8}$ " 2 $\frac{1}{8}$ "	2" 1 $\frac{9}{16}$ "
	SR600B10H-1 MR610B10L	Max Min	White Plated	2.5 to 4.0 0.3 to 1.2		1 $\frac{1}{2}$ " 1 $\frac{9}{16}$ "
	SR600B10H MR610B10L-1	Max Min	S Steel Plated	4.0 to 6.0 1.0 to 2.8		2" 1 $\frac{13}{16}$ "
	SR600B10H-1 MR610B10L-1	Max Min	White Blue	3.0 to 5.5 1.0 to 2.8		1 $\frac{1}{2}$ " 1 $\frac{13}{16}$ "

Model #	Part Number	Color Code	Outlet Pressure (In. w.c.)	Approx Inner Diameter	Approx Length
Adjustable Models:					
325-3	R325C10-26 R325C10-59 R325C10-412* R325C10-711 R325C10-1022 R325C10-1530 R325C10-P12	Plated Plated Violet White Red Yellow Tagged	2.0 to 6.0 5.0 to 9.0 # 4.0 to 12 7.0 to 11 10 to 22 15 to 30 1 psi-2 psi	$\frac{5}{8}$ "	1 $\frac{3}{4}$ " 2 $\frac{5}{16}$ " 1 $\frac{3}{4}$ " 2 $\frac{5}{8}$ " 2 $\frac{1}{8}$ " 2 $\frac{5}{16}$ " 2 $\frac{5}{16}$ "
	R325E10-26A R325E10-59A R325E10-412A* R325E10-711A R325E10-1022A R325E10-1530A R325E10-P12A	Plated Plated Violet White Red Yellow Tagged	2.0 to 6.0 5.0 to 9.0 # 4.0 to 12 7.0 to 11 10 to 22 15 to 30 1 psi-2 psi		2 $\frac{7}{8}$ " 4 $\frac{3}{16}$ " 3 $\frac{1}{8}$ " 4" 3 $\frac{9}{16}$ " 3 $\frac{5}{8}$ " 3 $\frac{3}{4}$ "
325-5	R8110-25 R8110-412* R8110-1022 R8110-1530 R8110-2042 R325G10-711	Plated Violet Red Yellow Black White	2.0 to 5.0 4.0 to 12 10 to 22 15 to 30 20 to 42 7.0 to 11	$\frac{7}{8}$ "	3 $\frac{13}{16}$ " 3 $\frac{3}{4}$ " 4 $\frac{5}{16}$ " 4 $\frac{1}{2}$ " 4 $\frac{5}{16}$ " 4 $\frac{5}{8}$ "
	R9110-25 R9110-412* R9110-1022 R9110-1530 R9110-2042 R325J10-711	Plated Violet Red Yellow Black White	2.0 to 5.0 4.0 to 12 10 to 22 15 to 30 20 to 42 7.0 to 11		4 $\frac{15}{16}$ " 5 $\frac{1}{16}$ " 5 $\frac{5}{8}$ " 5 $\frac{7}{8}$ " 5 $\frac{3}{4}$ " 6 $\frac{1}{2}$ "
325-7A	R11110-25 R11110-412* R11110-1022 R11110-1530 R11110-2042 R325K10-711	Plated Violet Red Yellow Black White	2.0 to 5.0 4.0 to 12 10 to 22 15 to 30 20 to 42 7.0 to 11	1 $\frac{1}{8}$ "	7 $\frac{1}{16}$ " 7 $\frac{3}{8}$ " 8 $\frac{1}{8}$ " 8 $\frac{7}{16}$ " 8 $\frac{1}{4}$ " 8 $\frac{1}{2}$ "
	R11110-25 R11110-412* R11110-1022 R11110-1530 R11110-2042 R325K10-711	Plated Violet Red Yellow Black White	2.0 to 5.0 4.0 to 12 10 to 22 15 to 30 20 to 42 7.0 to 11		7 $\frac{1}{16}$ " 7 $\frac{3}{8}$ " 8 $\frac{1}{8}$ " 8 $\frac{7}{16}$ " 8 $\frac{1}{4}$ " 8 $\frac{1}{2}$ "

Model #	Part Number	How Used	Color Code	Approx Inner Diameter	Approx Length
Zero Governor Models:					
R400Z	R400B10-13 R400B10Z	Regulate Counter	Brown Plated	$\frac{3}{8}$ " $\frac{1}{2}$ "	1 $\frac{1}{4}$ " $\frac{3}{4}$ "
R500Z	R5210-13 R500B10Z	Regulate Counter	Brown Plated	$\frac{9}{16}$ " $\frac{7}{16}$ "	2"
R600Z	R5310-13 R600B10Z	Regulate Counter	Brown Plated	$\frac{5}{8}$ "	2 $\frac{5}{8}$ "
R700Z	R6110-25 R700B10Z	Regulate Counter	Plated Plated	$\frac{3}{4}$ " $\frac{7}{8}$ "	3 $\frac{1}{4}$ " 3 $\frac{1}{2}$ "
210DZ	R8110-13 R210D10Z	Regulate Counter	Brown Plated	$\frac{7}{8}$ " 1"	3 $\frac{1}{8}$ " 3 $\frac{3}{8}$ "
210EZ	R9110-13 R210E10Z	Regulate Counter	Brown Plated	1 $\frac{1}{8}$ " 1 $\frac{7}{16}$ "	4" 4 $\frac{3}{4}$ "
210GZ	R11110-13 R210G10Z	Regulate Counter	Brown Plated	1 $\frac{1}{2}$ " 2 $\frac{1}{16}$ "	6 $\frac{1}{8}$ " 6 $\frac{3}{4}$ "
210JZ	R210J10-25 R210J10Z	Regulate Counter	Plated Plated	2 $\frac{1}{8}$ " 2 $\frac{7}{8}$ "	9 $\frac{1}{16}$ " 9 $\frac{1}{4}$ "

* Standard Spring

**L.P. - May be used with any minimum spring.

- or 6.0 to 10.0 for 5 psi

NOTE: Spring free length is given as an aid for the purpose of identification only. Variations of $\pm \frac{1}{2}$ ", although unlikely, can occur. This variation will not affect the spring range.

Vent Tube Connector

Threaded sleeve - two piece assembly where the nut is tightened inside male connector.

- **11A03:** connects 1/8" female pipe thread to 1/8" O.D. tubing.
- **11A04:** connects 1/8" female pipe thread to 1/4" O.D. tubing.

Threaded sleeve nut - for RV20V.

- **11A08:** 5/16-24 threaded sleeve nut for 1/8" O.D. tubing.

Compression fitting - where nut and sleeve are slipped over tubing and tightened into fitting body.

- **11A05-42:** connects 1/4" female pipe thread to 1/4" O.D. tubing.
- **11A05-61:** connects 1/8" female pipe thread to 3/8" O.D. tubing.
- **11A05-63:** connects 3/8" female pipe thread to 3/8" O.D. tubing.
- **11A05-64:** connects 1/2" female pipe thread to 3/8" O.D. tubing.

Vent Limiting Device: Limiter®

Optional automatic vent limiting device - ball check permits unobstructed inhalation for fast regulator diaphragm response on opening cycle, but limits gas escapement to within ANSI standards should a diaphragm rupture.

NOTE: When using the vent limiting device, regulator must be mounted in an upright horizontal position. A Maxitrol vent limiting device should only be installed in the Maxitrol regulator that it is certified with.

- **12A04:** CSA certified for up to 1/2 psi (14" w.c.) inlet pressure. Use on RV48, RV52, RV53, RV61, R400(S), R500(S), R600(S) regulators. Color - brass. 1/8" NPT.
- **12A09:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-3 and 325-3L regulators; OPD48, OPD600. Color - green. 1/8" NPT.
- **12A34:** CSA certified for up to 1/2 psi (14" w.c.) inlet pressure with RV81. Color - brass. 3/8" NPT.
- **12A39:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-5 and 325-5L regulators; OPD210D, R700. Color - brass. 3/8" NPT.
- **12A49:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-7A, 325-7AL, 325-9, and 325-9L regulators; OPD210E. Color - brass. 1/2" NPT.

Satisfies ANSI Standards for both Natural and LP gas.

NOTE: Vent limiters are not recommended for use in models RV91, RV111 and 210 Series.

Vent Limiting Orifice

- **12A06:** Orifice hole is on side of body, under head. Fixed orifice equally limits inhalation and escapement. Use on RV48, RV52, RV53, RV61, R400(S), R500(S), R600(S) regulators. Color - brown. 1/8" NPT.

Satisfies ANSI Standards for both Natural and LP gas.



Vent Protector: vProtector®

Designed for outdoor applications. Use on vent opening to protect breather hole from rain, snow, dust, insects and other foreign particles.

NOTE: Vent protector MUST be mounted in an upright position.

- **13A30-50:** for 1/8" NPT vent. For outdoor use in 325-3, 325-3L, 325-3BL, RV48, RV52, RV53, RV61, R500(S)(Z), R600(S)(Z).
- **13A31-50:** for 3/8" NPT vent. For outdoor use in 325-5, 325-5L, R700(Z), RV81, and 210D.
- **13A32-50:** for 1/2" NPT vent. For outdoor use in 325-7A, 325-7AL, 325-9, 325-9L, RV91, 210E.
- **13A33-10:** for 3/4" NPT vent. For outdoor use in 325-11, 210G, RV111.

NOTE: NOT a vent limiting device. Consult Maxitrol regarding other configurations.

Vent Dampener

- **KVOP-3:** Used on 325-5, 325-5L.
- **KVOP-4:** Used on 325-7A, 325-7AL, 325-9L.

NOTE: Should not be used with vent limiter.

Vent Screen

Brass, 40 mesh screen flame arrestor for insertion in vent outlet. Prevents ignition of gas-air mixture which might be present in upper diaphragm chamber.

- **13A03-1:** for 1/8" NPT vent.
- **13A03-2:** for 1/4" NPT vent.
- **13A03-3:** for 3/8" NPT vent.
- **13A03-4:** for 1/2" NPT vent.
- **13A03-6:** for 3/4" NPT vent.

Pressure Tap Connector

- **PF10:** Pressure tap connector can be installed as part of the control. It is a hose fitting incorporating a captured sealing means for testing inlet and outlet pressures. This eliminates the need for a special barb fitting. Optional per work order.

Dust Cap

Use on vent opening to prevent blockage of breather hole from dust or other foreign particles. Standard on all "L" models with 1/8" threaded vent.

- **13A09:** for 1/8" NPT vent. Press-in plastic cap.

Tamper Proof Seals

Permanent pressure sensitive backed paper. Attempted removal of these seals will destroy the face stock, leaving adhesive residue on surface beneath. Therefore, tampering can be easily detected. Available for all threaded models. Outlet pressure printed on seal.

- **101310:** for RV12, RV20L, RV47, RV48, RV52, RV53, RV61, R400(S)(Z), RV500(S)(Z), R600(S)(Z), R700(Z), 325-3, and 325-5.
- **101311:** for RV81, RV91, RV111, 210D, 210E, 210G, 325-7A, 325-9, and 325-11.



KVOP-3

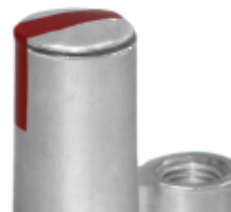
13A03



PF10



13A09



101310

CHOOSING A VENT ACCESSORY

NOTE: If vent limiting device is not used, regulator vent must be piped in accordance with government and local codes and regulations.

RV12L, RV20L	Integral vent limiting orifice with dust cap standard.
RV20VL	Integral vent limiting orifice with dust cap standard or use 11A08 threaded sleeve nut and run vent line as per code.
RV47	Must order: "L" suffix - Integral vent limiting orifice, includes dust cap; or "D" suffix - integral ball-check limiting device, includes dust cap.
RV48	1/8" NPT vent tap. Optional 12A04 or 12A06 vent limiter. Optional 13A09 dust cap. Optional 10A16-2 or 10A16-3 plastic thread protector.
RV48L	Integral vent limiting orifice.
RV52, RV53, RV61	1/8" NPT vent tap. Optional 12A04 or 12A06 vent limiter or 13A30 vent protector.
RV81	3/8" NPT vent tap. Optional 12A34 vent limiter or 13A31 vent protector.
RV91 (2 1/2" pipe size)	1/4" NPT vent tap. Optional 13A30 vent protector. <i>Vent limiter not approved for this model.</i>
RV91 (2" pipe size)	1/2" NPT vent tap. 2" pipe size. Optional 13A32 vent protector. <i>Vent limiter not approved for this model.</i>
RV111	3/4" NPT vent tap. <i>Vent limiter not approved for these models.</i> Optional 13A33 vent protector.
210D	3/8" NPT vent tap. Optional 13A31 vent protector. <i>Vent limiter not approved for this model.</i>
210E	1/2" NPT vent tap. Optional 13A32 vent protector. <i>Vent limiter not approved for this model.</i>
210G, 210J	3/4" NPT vent tap. <i>Vent limiter not approved for these models.</i> Optional 13A33 vent protector.
220D, 220E, 220G, 220J	Pilot regulator is equipped with 12A06 vent limiting orifice, separate vent line is not required.
325-3, 325-3L	1/8" NPT vent tap. Optional 12A09 vent limiting device or 13A30 vent protector.
325-5, 325-5L, R700	3/8" NPT vent tap. Optional 12A39 vent limiting device or 13A31 vent protector.
325-7A, 325-7AL	1/2" NPT vent tap. Optional 12A49 vent limiting device or 13A32 vent protector.
325-9, 325-9L	1/2" NPT vent tap. Optional 12A49 vent limiting device or 13A32 vent protector.
325-11, 325-11L	3/4" NPT vent tap. <i>Contact Maxitrol Customer Service for optional vent protector.</i> Optional 13A33 vent protector.
R400(S), R500(S), R600(S)	1/8" NPT vent tap. Optional 12A04 vent limiting device.
OPD47	Integral vent limiting orifice, includes dust cap.
OPD48, OPD600	1/8" NPT vent tap. Optional 12A09 vent limiting device or 13A30 vent protector.
OPD210D	3/8" NPT vent tap. Optional 12A39 vent limiting device or 13A31 vent protector.
OPD210G	3/4" NPT vent tap. <i>Contact Maxitrol Customer Service for optional vent protector.</i> Optional 13A33 vent protector.
OPD210E	1/2" NPT vent tap. Optional 12A49 vent limiting device or 13A32 vent protector.



GOVERNOR STANDARD MODEL



2^{PSIG}

STANDARD MODEL

Inlet Pressure Range: 3" W.C. to 2 PSIG

MAIN FEATURES

ANSI Z21.80A-2012 / CSA 6.22A-2012(R2016) Class I for outlet pressures up to 14" W.C. Certified
Integral Vent Limiter
External Vent Limiter – no vent line required**
Positive 100% bubble tight lockup
Inlet and Outlet test ports 500 to 1 Turndown
Filter included in all models

SPECIFICATIONS

Suitable for use with Natural Gas, LPG, and other non-corrosive, clean gas
Inlet Pressure: 3" W.C. to 2 PSIG CSA approved
Max. Inlet 7.25 PSIG for non-CSA applications
Outlet pressure: 2" W.C. to 14" W.C. and up to 4.25 PSIG for non-CSA applications
Temperature range: -40°F to 150°F
Connections: ½" thru 4"
Maximum Emergency Inlet Exposure Pressure: 80 PSIG
Suitable for Indoor or Outdoor Installation***

VENT SIZE

1/4" NPT 1/2" – 1"
1/2" NPT 1 1/4" – 4"

OUTLET SPRING RANGE

Green 2" W.C. to 5.1" W.C.*
Red 2.75" W.C. to 7.87" W.C.*
White 4" W.C. to 11.8" W.C.*
Black 6" W.C. to 14" W.C.*
Yellow 9.8" W.C. to 27.5" W.C.*
Violet 23.6" W.C. to 59" W.C. or 0.85 to 2.13 PSIG * Orange 55" W.C. to 118" W.C. or 2 to 4.26 PSIG

* Spring is CSA outlet pressure certified

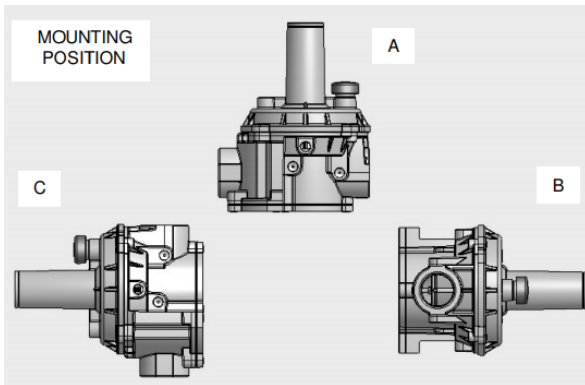
** As Approved by Local Codes and Standards

*** Brass vent limiter must be removed for outdoor installation

US GOVERNOR GAS REGULATOR

The ½" - 4" Governor gas regulators comply with and are certified to CSA 6.22a-2005 and ANSI Z21.80a-2005 for 2 PSIG inlet applications. The Governor design incorporates an integral vent limiter in the regulator. To ensure the installation complies with CSA 6.22a-2005 and ANSI Z21.80a-2005, the vent cap should be left in place and at no time should any restriction or plug be installed in the vent cap of the regulator. When using an external vent limiter, the flat top of the vent limiter must always be facing up, with the threads facing down, so it operates properly. If mounting the regulator in position (B) or (C), you must use the 90 degree external vent limiter adapter to ensure the vent limiter faces up (Fig. 2).

Inlet pressure range: 4" w.c. to 7 PSIG
 Maximum Emergency Inlet Exposure Pressure: 80 PSIG
 CSA Certified Maximum inlet pressure: 2 PSIG
 Outlet pressure range: 2" w.c. to 0.5 PSIG for CSA Class I
 Minimum operating differential pressure: ΔP : 1" w.c.
 CSA Outlet pressures to 0.5 PSIG for Compliance
 Temperature class: -40° F to + 150° F (-40° C to +65.5° C)
 Suitable for use with Natural Gas, LPG, Propane-air and any non-corrosive gas
 Designed for Indoor and Outdoor Installations.

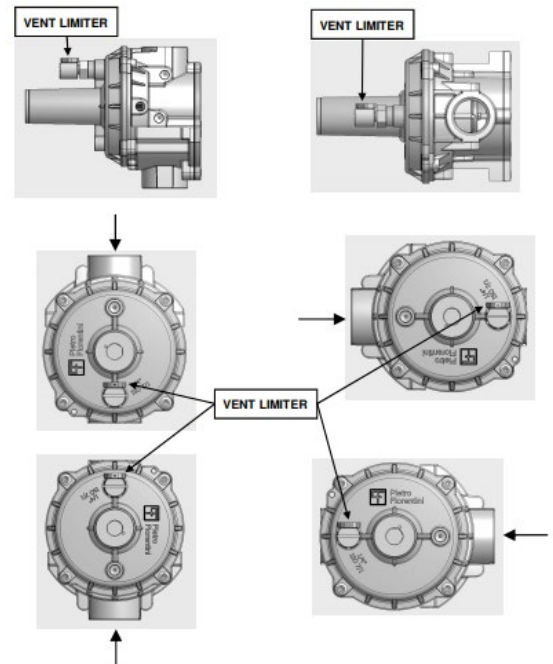


US The single unit Governor regulator is designed and CSA certified for 2 PSIG maximum inlet pressure. Inlet pressures above 2 PSIG require an over pressure protection device.

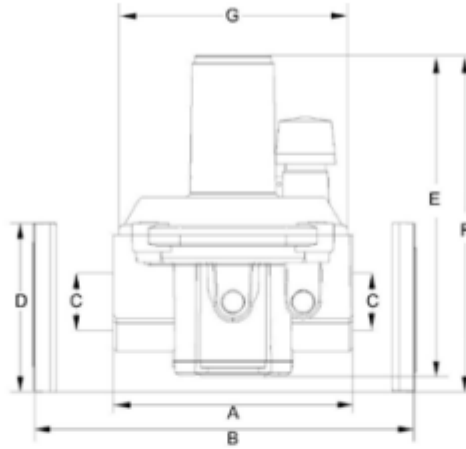
The Governor design incorporates an integral vent limiter in the regulator. To ensure that installation of the Governor regulator complies with CSA 6.22a-2005 and ANSI Z21.80a-2005, the vent cap, or external vent limiter (if installed), should be left in place and at no time should any restriction or plug be installed in the vent connection of the regulator. If venting is required, use a union at the vent connection and install a vent line to the atmosphere, in accordance with all local codes, standards and requirements.

15 feet is the maximum vent line distance that can be run before affecting the performance of the regulator.

Fig. 2



STANDARD MODEL DIMENSIONS



Model	Size	A	B	C	D	E	F	G*	Weight (Lbs)
PF400S	3/8 NPT	3.90	-	3/8	-	3.42	-	3.10	0.56
PF400S	1/2" NPT	3.90	-	1/2	-	3.42	-	3.10	0.56
31051	1/2" NPT	4.09	-	1/2	-	5.59	-	3.78	1.54
31052	3/4" NPT	4.09	-	3/4	-	5.59	-	3.78	1.54
31053	1" NPT	4.09	-	1	-	5.59	-	3.78	1.54
31150	1/2" NPT	4.72	-	1/2	-	6.89	-	4.49	2.75
31151	3/4" NPT	4.72	-	3/4	-	6.89	-	4.49	2.75
31152	1" NPT	4.72	-	1	-	6.89	-	4.49	2.75
31153	1 1/4" NPT	7.68	-	1 1/4	-	10	-	7.56	7.5
31154	1 1/2" NPT	7.68	-	1 1/2	-	10	-	7.56	7.5
31155	2" NPT	9.29	-	2	-	12.44	13.74	7.56	12.34
31156/F	2 1/2" FLANGED	-	16.9	3	ANSI 150	-	17.09	12.52	27.56
31157/F	3" FLANGED	-	16.9	3	ANSI 150	-	17.09	12.52	27.56
31158/F	4" FLANGED	-	16.9	4	ANSI 150	-	19.76	12.52	27.56

Tab.6

* (G) Dimensions is the width of the regulator

TECHNICAL DATA

Capacity in cfm for .60 Specific gravity gas with filter (capacity without filter in brackets)

	Outlet Pessue Set Point	Operating Inlet Pressure		
		14" W.C.	1 PSIG	2 PSIG
31051 ½"	8" W.C.	386 (360)	552 (649)	785 (923)
	11" W.C.	218 (256)	511 (601)	785 (923)
31052 ¾"	8" W.C.	369 (450)	665 (812)	946 (1154)
	11" W.C.	363 (321)	616 (751)	946 (1154)
31053 1"	8" W.C.	495 (585)	893 (1,055)	1270 (1154)
	11" W.C.	353 (417)	825 (977)	1270 (1154)
31150 ½" High Capacity	8" W.C.	610 (855)	1097 (1,543)	1558 (2193)
	11" W.C.	433 (609)	10,14 (1,428)	1558 (2193)
31151 ¾" High Capacity	8" W.C.	714 (1,080)	1284 (1,949)	1824 (2771)
	11" W.C.	507 (770)	1187 (1,803)	1824 (2771)
31152 1" High Capacity	8" W.C.	903 (1,283)	1625 (2,314)	2309 (3290)
	11" W.C.	642 (914)	1503 (2,142)	2309 (3290)
31153 1¼"	8" W.C.	2,071 (3,062)	3,735 (5,522)	5311 (7851)
	11" W.C.	1,476 (2,183)	3,457 (5,110)	5311 (7851)
31154 1½"	8" W.C.	2,567 (3,197)	4,629 (5,766)	6581 (8197)
	11" W.C.	1,829 (2,279)	4,284 (5,336)	6581 (8197)
31155 2"	8" W.C.	5,179 (5,854)	9,339 (10,557)	13278 (15009)
	11" W.C.	3,691 (4,173)	8,643 (9,336)	13278 (15009)
31156/F 2½"	8" W.C.	6,530 (7,431)	11,775 (13,999)	16741 (19051)
	11" W.C.	4,655 (5,297)	10,898 (12,401)	16741 (19051)
31157/F 3"	8" W.C.	7,205 (9,007)	12,993 (16,242)	18473 (23092)
	11" W.C.	12,025 (6,240)	12,025 (15,032)	18473 (23092)
31158/F 4"	8" W.C.	12,835 (15,762)	23,245 (28,424)	32906 (40411)
	11" W.C.	9,149 (11,236)	21,420 (26,306)	32906 (40411)

Tab.3

For additional sizing, visit www.gasinside.com www.GasInside.com • 888.618.8787





ANSI Z21.80
ANSI Z21.18

LINE PRESSURE REGULATORS GAS APPLIANCE PRESSURE REGULATORS

SPECIFICATIONS:

Gases

For use with natural or LP gas

CSA Certified Inlet Pressure

Types 300, 600 2-PSI

Types 300P, 600P 5-PSI

Outlet Pressure Adjustment

Type 300 7" – 9" w.c.

Type 300P 9" – 12" w.c.

Type 600 7" – 11" w.c.

Manufacturer's Adjustment (set point)

Type 300 8" w.c.

Type 300P 11" w.c.

Type 600 8" w.c.

Pipe Size NPT

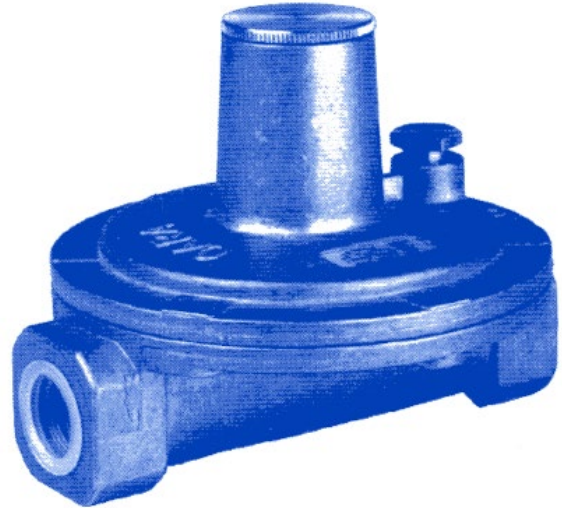
Type 300 1/2" x 1/2"

Type 600 3/4" x 3/4"

Venting

Type 300 Vent Limiter "O" 3-18 1/8 NPT

Type 600 Vent Limiter "O" 6-36 3/8 NPT



NOTES FOR THE INSTALLER:

- The regulators have been manufactured with high quality materials, carefully selected for corrosion and all combustible gas resistant. In case of outside installation, however, the regulators should be properly protected from inclement weather.
- The regulators must be horizontally installed with the cover upwards in order to allow the correct working of the vent limiter; in case of alternative position installation, it is necessary to remove the vent limiter and connect a NPT threaded pipe to send any gas outwards.
- If the regulator is installed in supply lines with a pressure over 2-PSIG, it is necessary to supply independent means to limit the downstream pressure to a maximum of 2-PSIG.
- Be sure gas flow is the same direction as the gas arrow indicated on the body of the regulator.
- The installation must be performed in accordance with local codes or, if absent, with the National Fuel Gas Code ANSI Z223.1.



PRESSURE DROP – 0.64 SP. GR. GAS EXPRESSED IN CFH

Model	Pressure Drop			
	7" w.c.	1/2 PSI	3/4 PSI	1 PSI
Type 300	155	220	280	310
Type 600	359	504	627	719

CAPACITIES – Based on 1" w.c. pressure droop from set point

Model	Outlet Pressure	Inlet Pressure			
		1/2 PSI	3/4 PSI	1 PSI	2 PSI
Type 300	7" w.c.	155	200	230	280
	8" w.c.	155	195	230	270
	9" w.c.	145	190	215	260
Type 600	7" w.c.	364	403	447	517
	8" w.c.	359	394	447	509
	9" w.c.	342	381	430	500
	10" w.c.	329	377	403	495
	11" w.c.	302	360	372	473

SINGLE APPLIANCE RATING FOR O.A.R.A. REGULATORS

Per Gastite technical bulletin TB2006-01 published on March 16, 2006, the following single appliance load limits were established for O.A.R.A. pressure regulators:

Type 300 140 CFH
 Type 600 300 CFH

LIST OF APPROVED LINE PRESSURE REGULATORS

Updated 04-07-2025

List obtained from CSA website for products listed to product class 3331-85 – Regulators (Gas)-Line Pressure Certified to U.S. Standards.

Coverage: Line Pressure Regulators in this section are designed either individual or in combination with over pressure protection devices intended for application in natural, manufactured, and mixed gases, liquefied petroleum gases and LP gas-air mixtures gas piping systems between the service regulator and the gas appliances.

Requirements: ANSI Z21.80/CSA 6.22 – Line Pressure Regulators

1) Maxitrol

2-PSIG				
Model Number	Inlet Size	Outlet Size	Total Capacity (BTUH)	Largest Individual (BTUH)
325-3L	3/8"	3/8"	250,000	140,000
325-3L	1/2"	1/2"	250,000	140,000
325-5L, 325-5AL	1/2"	1/2"	500,000	425,000
325-5L, 325-5AL	3/4"	3/4"	600,000	425,000
325-5L, 325-5AL	1"	1"	600,000	425,000
325-7L, 325-7AL	1-1/4"	1-1/4"	1,250,000	1,250,000
325-7L, 325-7AL	1-1/2"	1-1/2"	1,250,000	1,250,000
325-9L	1-1/2"	1-1/2"	2,250,000	2,250,000
325-9L	2"	2"	2,250,000	2,250,000
325-11(B)L	2"	2"	4,500,000	4,500,000
325-11(B)L	2-1/2"	2-1/2"	4,500,000	4,500,000
325-11(B)L	3"	3"	4,500,000	4,500,000
Capacity shown is based on a 2-psig inlet with 7" wc outlet pressure				

5-PSIG			
Model Number	Inlet Size	Outlet Size	Max Individual Load/Capacity (BTUH)
325-3L47	3/8"	3/8"	125,000
325-3L47	1/2"	1/2"	125,000
325-3L48	1/2"	1/2"	200,000
325-5L48	1/2"	1/2"	235,000
325-5L48	3/4"	3/4"	320,000
325-5L600	3/4"	3/4"	425,000
325-5L600	1"	1"	465,000
325-7L210D	1-1/4"	1-1/4"	1,250,000
325-7L210D	1-1/2"	1-1/2"	1,250,000
325-7AL210D	1-1/4"	1-1/4"	1,250,000
325-7AL210D	1-1/2"	1-1/2"	1,250,000
325-9L210E	1-1/2"	1-1/2"	2,250,000
325-9L210E	2"	2"	2,250,000
325-11(B)L	2"	2"	
325-11(B)L	2-1/2"	2-1/2"	
325-11(B)L	3"	3"	
Capacity shown is based on a 5-psig inlet with 7" wc outlet pressure			

2) Pietro Fiorentini

2-PSIG		
Model Number	Body Size	Capacity (BTUH)
30051	1/2"	928,000
30052	3/4"	1,155,000
30053	1"	1,501,000
30150 – High Capacity	1/2"	2,205,000
30151 – High Capacity	3/4"	2,785,000
30152 – High Capacity	1"	3,308,000
30153	1-1/4"	7,891,000
30154	1-1/2"	8,240,000
30155	2"	15,087,000
30156/F	2-1/2"	19,166,000
30157/F	3"	23,202,000
30158/F	4"	40,612,000

Capacity shown is for 2-PSIG inlet and 8" w.c. outlet

5-PSIG		
Model Number	Body Size	Capacity (BTUH)
30051OPD	1/2"	928,000
30052OPD	3/4"	1,155,000
30053OPD	1"	1,501,000
30150OPD – High Capacity	1/2"	2,205,000
30151OPD – High Capacity	3/4"	2,785,000
30152OPD – High Capacity	1"	3,308,000
30153OPD	1-1/4"	7,891,000
30154OPD	1-1/2"	8,240,000
30155OPD	2"	15,087,000
30156OPD	2-1/2"	19,166,000
30157OPD	3"	23,202,000
30158OPD	4"	40,612,000

Capacity shown is for 5-PSIG inlet and 8" w.c. outlet

3) Cavagna Group – Commonly referred to as O.A.R.A

2-PSIG				
Model Number	Inlet Size	Outlet Size	Total Capacity (BTUH)	Largest Individual (BTUH)
Type 300	1/2"	1/2"	280,000	140,000
Type 600	3/4"	3/4"	517,000	300,000
Type 600	1"	1"	517,000	300,000

Capacity shown is based on a 2-psig inlet with 7" wc outlet pressure

5-PSIG		
Model Number	Inlet Size	Outlet Size
Type 300P	1/2"	1/2"
Type 600P	3/4"	3/4"

Over Pressure Protection Device		
Model Number	Inlet Size	Outlet Size
Type 274	1/2"	1/2"
Type 275	3/8"	3/8"
Type 300, 300P	1/2"	1/2"
Type 600, 600P	3/4"	3/4"

4) Itron (Parent Company is Natural Gas Solutions North America, LLC)

2-PSIG or 5-PSIG. Outlet Pressure of 7" or 14" w.c.			
Model	Version	Approved Orifice Sizes	Body Size (In x Out)
B31	R, IMR	1/8" 3/16" 1/4" 5/16" 3/8"	3/4" x 3/4" 3/4" x 1" 3/4" x 1-1/4" 1" x 1" 1" x 1-1/4" 1-1/4" x 1-1/4"
B34	R, IMR	1/4", 1/4" x 3/8" 3/8", 3/8" x 1/2" 1/2", 1/2" x 5/8" 5/8", 5/8" x 3/4" 3/4"	1-1/4" x 1-1/4" 1-1/4" x 1-1/2" 1-1/4" x 2" 1-1/2" x 1-1/2" 1-1/2" x 2" 2" x 2"
B34S	R	1/4" x 3/8" 3/8" x 1/2" 1/2" x 5/8" 5/8" x 3/4"	1-1/4" x 1-1/4" 1-1/4" x 1-1/2" 1-1/4" x 2" 1-1/2" x 1-1/2" 1-1/2" x 2" 2" x 2"
B42	R	1/8" 1/8" x 3/16" 3/16" 1/4" 5/16"	1/2" x 1/2", 1/2" x 3/4", 1/2" x 1" 3/4" x 3/4", 3/4" x 1" 3/4" x 1-1/4" 1" x 1", 1" x 1-1/4" 1-1/4" x 1-1/4"

5) Fisher (Emerson Process Management Regulator Technologies, LLC)

2-PSIG			
Model Number	Inlet Size	Outlet Size	Outlet Pressure Range
133L	2"	2"	5" – 9" w.c.
133L	2"	2"	8.5" – 14" w.c.

6) Fairview Fittings & Manufacturing Limited

2-PSIG			
Model Number	Outlet Size	Outlet Pressure	Capacity (BTUH)
GR-207	3/8"	7" wc	75,000
GR-211	3/8"	11" wc	110,000
A "VL" suffix to the above model number includes an approved vent limiting device			

7) Honeywell (formerly Bryan Donkin USA)

2-PSIG		
Model Number	Inlet/Outlet	Capacity (BTUH)
Series 240	1/2"x3/4", 3/4"x1", 1"x1"	250,000
Series 241	1/2"x1", 3/4"x3/4", 3/4"x1"	250,000
Series 260	1/2"x1", 3/4"x3/4", 3/4"x1"	250,000

8) Dormont Manufacturing Co.

2-PSIG			
Model Number	Inlet Size	Outlet Size	Capacity (BTUH)
R325N32-0711	1/2"	1/2"	150,000
R625N42-0711	3/4"	3/4"	150,000
Regulator looks identical to Maxitrol 325 model			

9) Elster American Meter Company

2-PSIG			
Model Number	Inlet Size	Outlet Size	Capacity/Notes (BTUH)
1813C	3/4"	3/4"	325,000
1813C	1-1/4"	1-1/4"	425,000
SR113	3/4"x3/4", 3/4"x1", 1"x1"		90°, 180° or Offset Body

10) Karl Dungs Inc.

Up To 2-PSIG		
Model Number	Inlet Size	Outlet Size
FRS 205/6	1/2"	1/2"
FRS 207/6	3/4"	3/4"
FRS 210/6	1"	1"
FRS 212/6	1-1/4"	1-1/4"
FRS 215/6	1-1/2"	1-1/2"
FRS 220/6	2"	2"
FRS 225/6	2-1/2"	2-1/2"
FRS 230/6	3"	3"
FRS series many use VL 502/60 and VL 502/61 Vent Limiter		

Up To 5-PSIG		
Model Number	Inlet Size	Outlet Size
FRS 705/6	1/2"	1/2"
FRS 707/6	3/4"	3/4"
FRS 710/6	1"	1"
FRS 712/6	1-1/4"	1-1/4"
FRS 715/6	1-1/2"	1-1/2"
FRS 720/6	2"	2"
FRS 725/6	2-1/2"	2-1/2"
FRS 730/6	3"	3"
FRS series many use VL 502/60 and VL 502/61 Vent Limiter		

11) **NMT (Norgas Metering Technologies)**

Inlet Pressure to 2-PSIG	
Model	Body Size
N5A	3/8", 1/2"
N5B	1/2", 3/4", 1"
N5C	1-1/4", 1-1/2"
N5D	1-1/2", 2"

Inlet Pressure to 2, 5 or 10-PSIG	
Model	Body Size
NGR02	1/2", 3/4", 1", 1-1/4"
NGR04, NGR08, NGR08	1-1/4", 1-1/2", 2", 2" & 3" Flangede

METROPOLITAN UTILITIES DISTRICT

GUIDELINES FOR METALLIC NATURAL GAS UNDERGROUND FUEL LINES

1. Depth of burial shall be 18 inches below grade. Backfill material shall be free of rocks or other materials that could cause damage to the piping.
2. No other pipe, electrical service, water piping, sewer piping, telephone, TV cable, electrical conductor, utility service or any other conduit shall be laid in the same trench or within 12 inches of the gas piping.
3. All fuel lines penetrating masonry walls must be sleeved and the sleeve must be sealed. See the figure below.
4. Underground fuel lines installed from a Commercial Building must be air tested, and the test must be witnessed by a representative of the District.
5. All residential and commercial underground fuel lines must be inspected in their entirety, and approved by the District, prior to backfill.
6. Underground fuel lines shall not be placed under existing buildings or remain under newly constructed buildings.

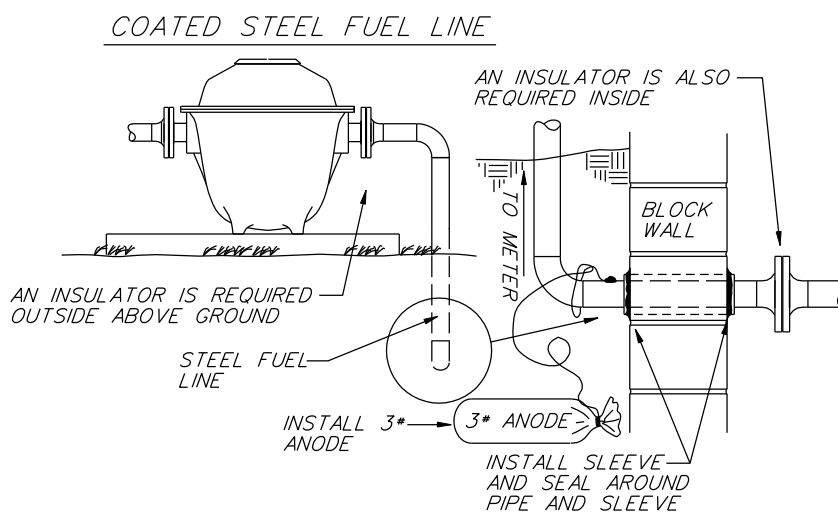
ACCEPTABLE MATERIALS

Metallic Piping

1. Mechanical Joints on metallic piping including flared fittings underground are NOT ALLOWED.
2. Piping must be provided with dielectric or insulating fittings a minimum of 8" above the ground at all points where it enters and exits the ground. See the figure for an example of an insulator.
3. The following types of metallic piping are allowed:
 - a) Type L or Type K copper tubing – Below grade fittings must be brazed or press-connected complying with NFPA 54.
 - b) Steel piping – Pipe must be cathodically protected, coated, and wrapped. Below grade joints must be welded. Cathodic protection must be inspected annually for effectiveness.

Corrugated Stainless Steel Tubing (CSST)

1. CSST shall not be installed below grade without corrosion protection. The colored coating on CSST is for color identification of gas piping and not for corrosion protection.
2. Only OmegaFlex Trac Pipe provided with the manufacturer-supplied casing sleeve, which is sealed at both ends, is allowed to be installed directly underground.
3. All other types of CSST installed underground must be sleeved with a PVC conduit that is 2 pipe sizes larger than the fuel line. The casing shall be vented to the outside and sealed at both ends.



Revised 02/05/2014

METROPOLITAN UTILITIES DISTRICT

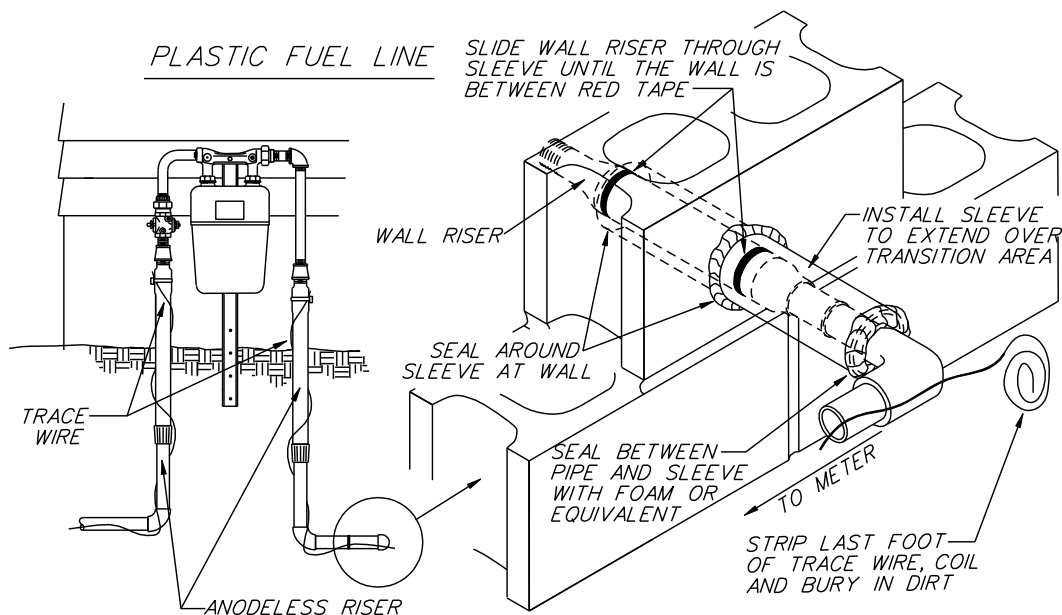
GUIDELINES FOR PLASTIC NATURAL GAS UNDERGROUND FUEL LINES

1. Depth of burial shall be 18 inches below grade. Backfill material shall be free of rocks or other materials that could cause damage to the piping.
2. No other pipe, electrical service, water piping, sewer piping, telephone, TV cable, electrical conductor, utility service or any other conduit shall be laid in the same trench or within 12 inches of the gas piping.
3. All fuel lines penetrating masonry walls must be sleeved and the sleeve must be sealed. See the figure below.
4. Underground fuel lines installed on commercial property must be air tested, and the test must be witnessed by a representative of the District.
5. All residential and commercial underground fuel lines must be inspected in their entirety, and approved by the District, prior to backfill.
6. Underground fuel lines shall not be placed under existing buildings or remain under newly constructed buildings.
7. Underground fuel lines must be buried with a trace wire for the full length of the pipe. Trace wire shall be coiled around the anodeless riser and secured with a wire or cable tie. The last foot of the trace wire shall be stripped of insulation, coiled, and buried in the dirt to provide a ground. Acceptable trace wire is a #10 (for augured lines) or #14 (for trenched lines) Solid Copper or Copper-Clad Steel Wire with polyethylene jacketing.

ACCEPTABLE MATERIALS

Plastic Tubing and Fittings

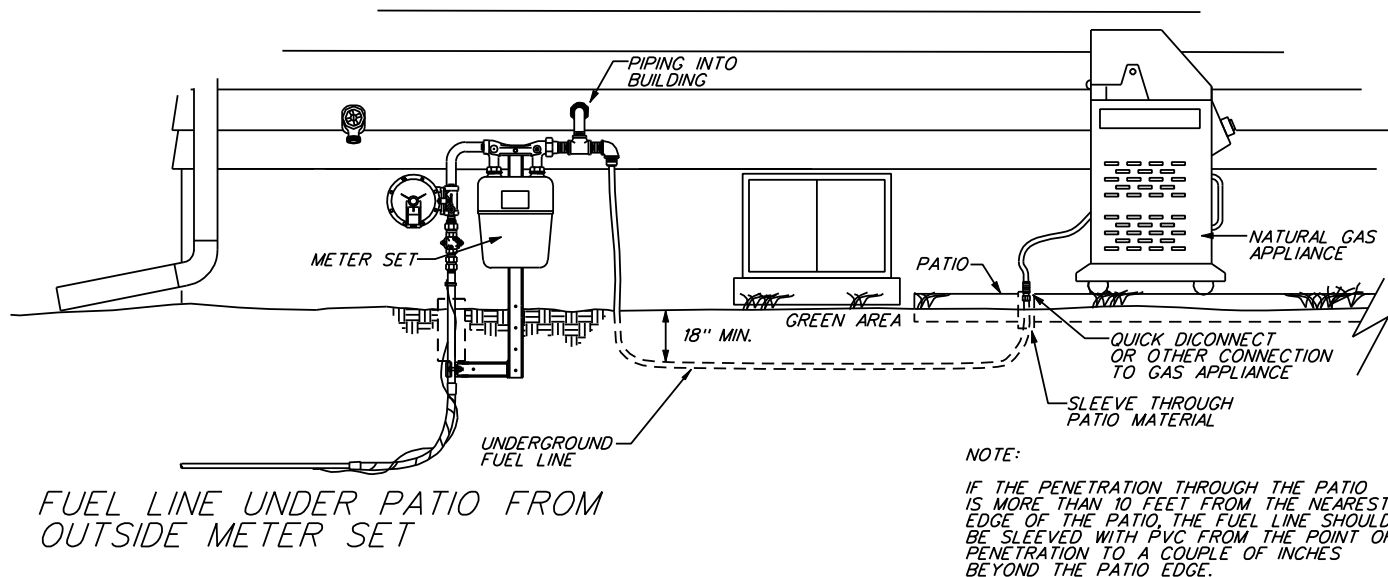
1. Plastic tubing must be Polyethylene PE 2406/PE 2708 conforming to the current edition of ASTM D2513.
2. Fittings shall conform to ASTM D2683 or ASTM D3261, as applicable, in addition to the requirements of ASTM D2513. Fittings shall be the same SDR as the pipe or tubing with a tolerance of +20% of minimum wall thickness. Underground fittings must be of the stab or fused type and the installer must be trained and certified for the particular type of fitting being used.
3. Materials must be approved by the District prior to installation.



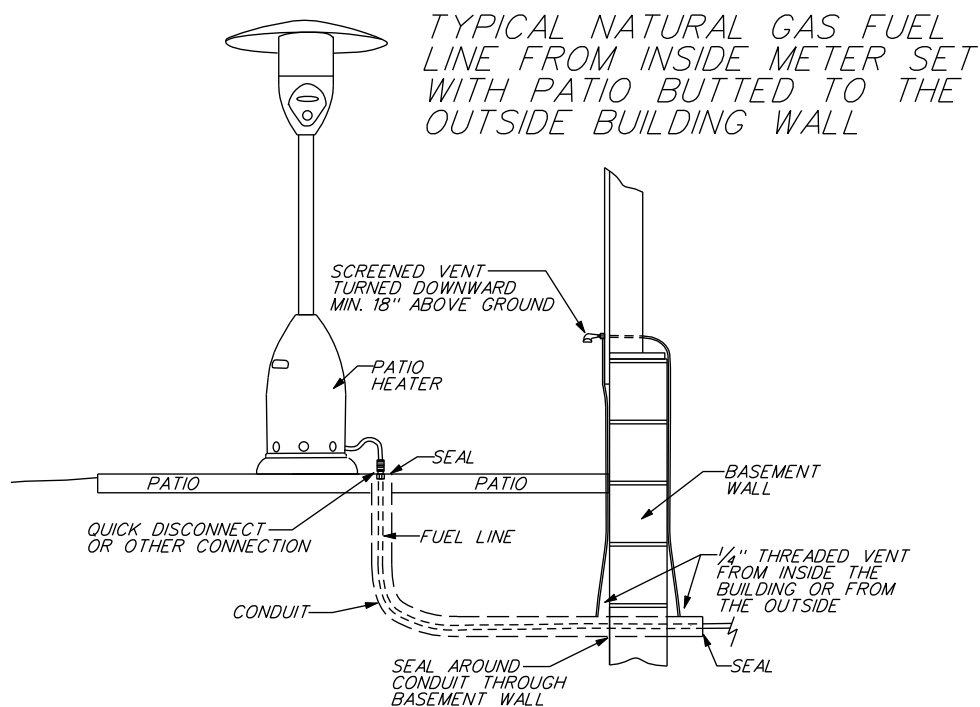
Revised 02/05/2014

UNDERGROUND FUEL LINE INSTALLATIONS

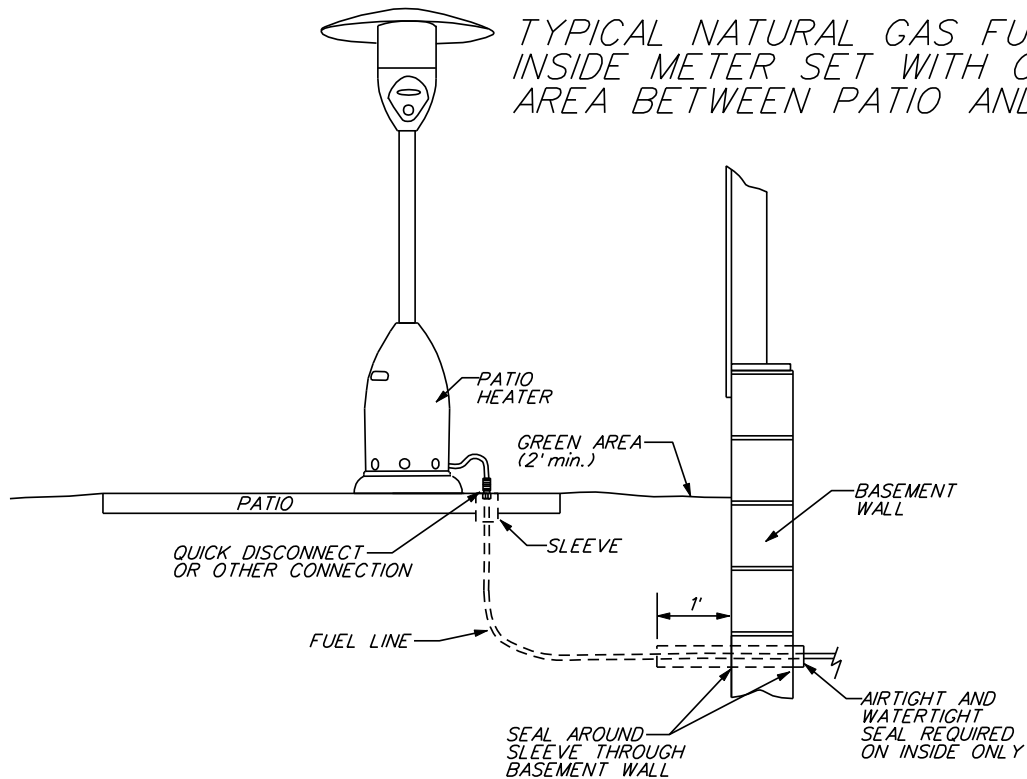
Scenario #1 – Underground fuel line from meter set to an outdoor appliance



Scenario #2 – Fuel line from inside house installed under patio to an outdoor appliance

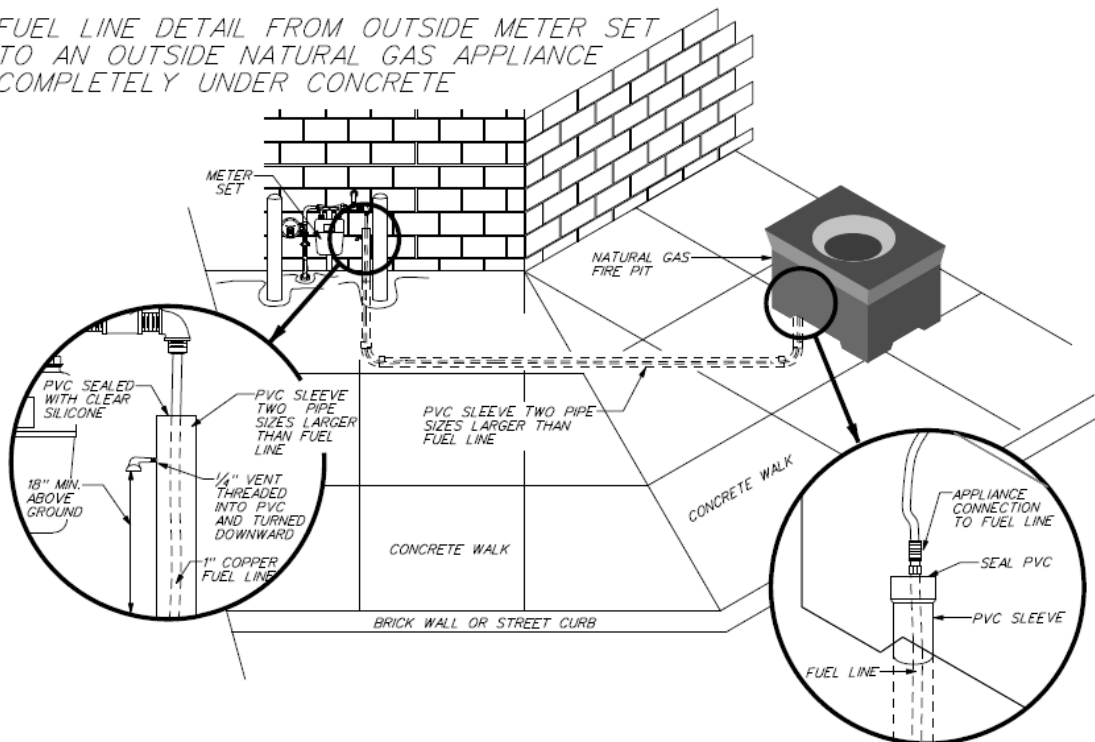


Scenario #3 – Fuel line from inside house installed under grass to an outdoor appliance

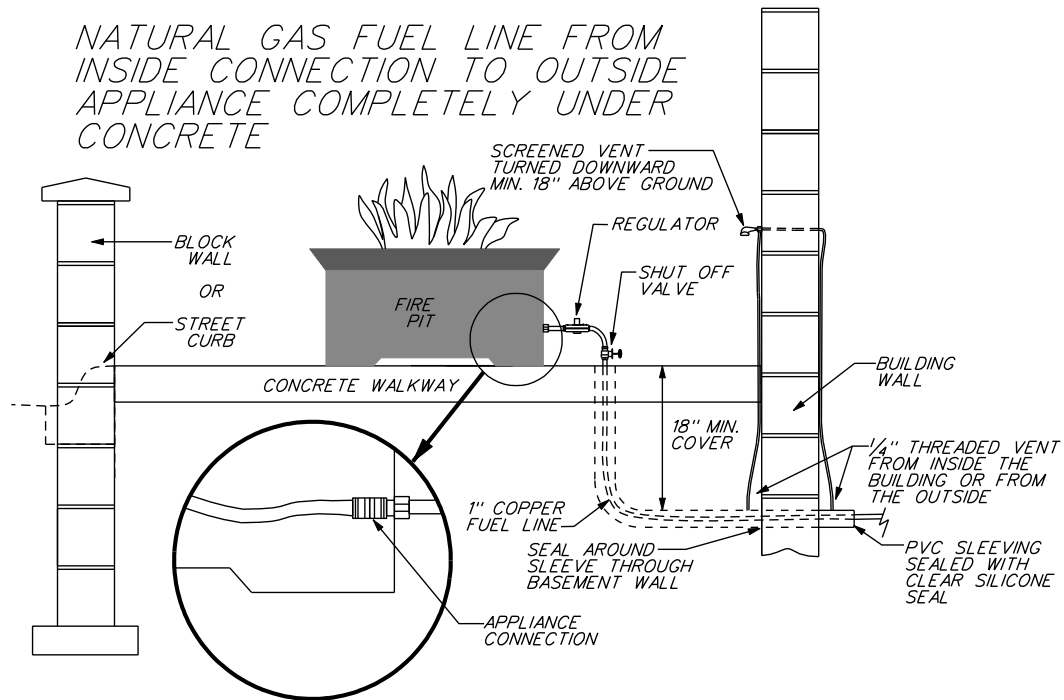


Scenario #4 – Fuel line from meter set installed under patio to an outdoor appliance

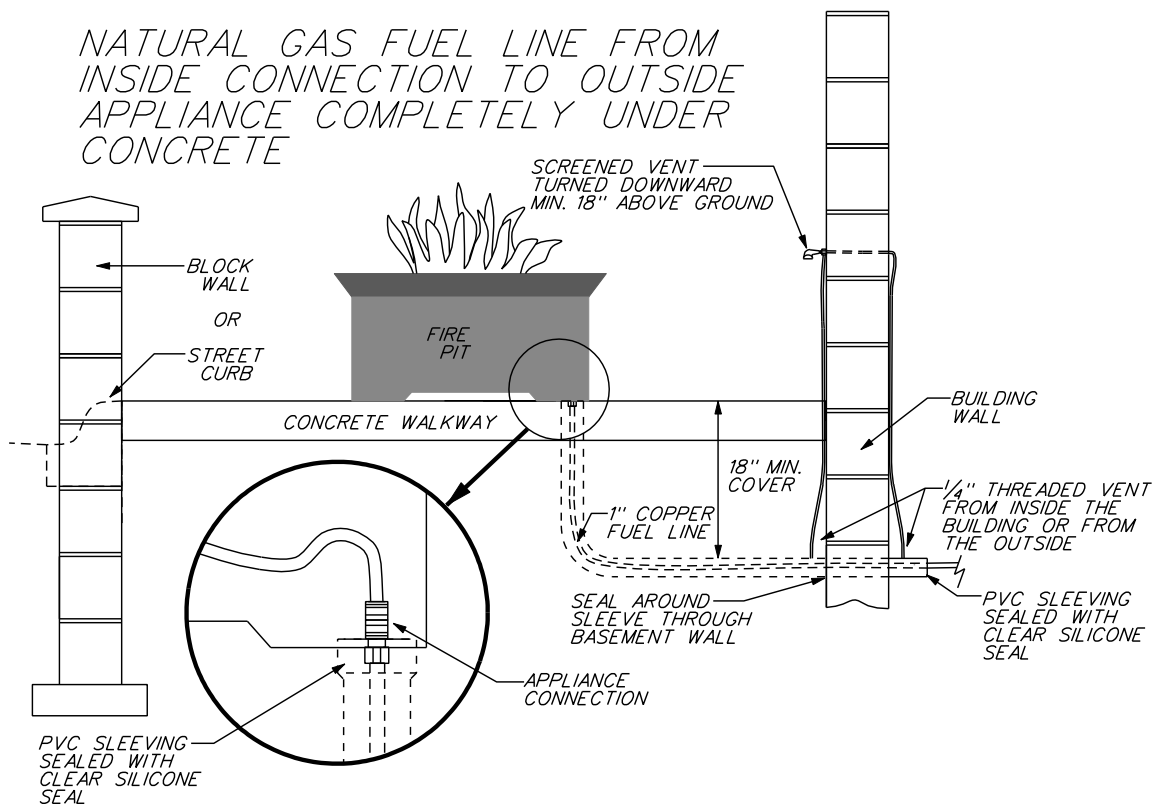
FUEL LINE DETAIL FROM OUTSIDE METER SET TO AN OUTSIDE NATURAL GAS APPLIANCE COMPLETELY UNDER CONCRETE



Scenario #5 – Fuel line installed underground to an outdoor appliance (Regulator above grade)



Scenario #6 – Fuel line installed underground to an outdoor appliance



Schedule 40 Black Pipe

Table 1.1

						Inlet Pressure:		2.0 psi	
						Pressure Drop:		1.0 psi	
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.38	1.61	2.067	2.469	3.068	4.026
Length (ft)	Capacity of Fuel Line (CFH)								
10	1,510	3,040	5,560	11,400	17,100	32,900	52,500	92,800	189,000
20	1,070	2,150	3,930	8,070	12,100	23,300	37,100	65,600	134,000
30	869	1,760	3,210	6,590	9,880	19,000	30,300	53,600	109,000
40	753	1,520	2,780	5,710	8,550	16,500	26,300	46,400	94,700
50	673	1,360	2,490	5,110	7,650	14,700	23,500	41,500	84,700
60	615	1,240	2,270	4,660	6,980	13,500	21,400	37,900	77,300
70	569	1,150	2,100	4,320	6,470	12,500	19,900	35,100	71,600
80	532	1,080	1,970	4,040	6,050	11,700	18,600	32,800	67,000
90	502	1,010	1,850	3,810	5,700	11,000	17,500	30,900	63,100
100	462	934	1,710	3,510	5,260	10,100	16,100	28,500	58,200
125	414	836	1,530	3,140	4,700	9,060	14,400	25,500	52,100
150	372	751	1,370	2,820	4,220	8,130	13,000	22,900	46,700
175	344	695	1,270	2,601	3,910	7,530	12,000	21,200	43,300
200	318	642	1,170	2,410	3,610	6,960	11,100	19,600	40,000
250	279	583	1,040	2,140	3,210	6,180	9,850	17,400	35,500
300	253	528	945	1,940	2,910	5,600	8,920	15,800	32,200
350	232	486	869	1,790	2,670	5,150	8,210	14,500	29,600
400	216	452	809	1,660	2,490	4,790	7,640	13,500	27,500
500	192	401	717	1,470	2,210	4,250	6,770	12,000	24,400

Table 1.2

						Inlet Pressure:		5.0 psi	
						Pressure Drop:		3.5 psi	
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.38	1.61	2.067	2.469	3.068	4.026
Length (ft)	Capacity of Fuel Line (CFH)								
10	3,190	6,430	11,800	24,200	36,200	69,700	111,000	196,000	401,000
20	2,250	4,550	8,320	17,100	25,600	49,300	78,600	139,000	283,000
30	1,840	3,720	6,790	14,000	20,900	40,300	64,200	113,000	231,000
40	1,590	3,220	5,880	12,100	18,100	34,900	55,600	98,200	200,000
50	1,430	2,880	5,260	10,800	16,200	31,200	49,700	87,900	179,000
60	1,300	2,630	4,800	9,860	14,800	28,500	45,400	80,200	164,000
70	1,200	2,430	4,450	9,130	13,700	26,400	42,000	74,300	151,000
80	1,150	2,330	4,260	8,540	12,800	24,700	39,300	69,500	142,000
90	1,060	2,150	3,920	8,050	12,100	23,200	37,000	65,500	134,000
100	979	1,980	3,620	7,430	11,100	21,400	34,200	60,400	123,000
125	876	1,770	3,240	6,640	9,950	19,200	30,600	54,000	110,000
150	786	1,590	2,910	5,960	8,940	17,200	27,400	48,500	98,900
175	728	1,470	2,690	5,520	8,270	15,900	25,400	44,900	91,600
200	673	1,360	2,490	5,100	7,650	14,700	23,500	41,500	84,700
250	558	1,170	2,200	4,510	6,760	13,000	20,800	36,700	74,900
300	506	1,060	1,990	4,090	6,130	11,800	18,800	33,300	67,800
350	465	973	1,830	3,760	5,640	10,900	17,300	30,600	62,400
400	433	905	1,710	3,500	5,250	10,100	16,100	28,500	58,100
500	384	802	1,510	3,100	4,650	8,950	14,300	25,200	51,500

Schedule 40 Black Pipe

Table 1.3

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		0.5" W.C.	
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.38	1.61	2.067	2.469	3.068	4.026
Length (ft)	Capacity of Fuel Line (CFH)								
10	172	360	678	1,390	2,090	4,020	6,400	11,300	23,100
20	118	247	466	957	1,430	2,760	4,400	7,780	15,900
30	95	199	374	768	1,150	2,220	3,530	6,250	12,700
40	81	170	320	657	985	1,900	3,020	5,350	10,900
50	72	151	284	583	873	1,680	2,680	4,740	9,660
60	65	137	257	528	791	1,520	2,430	4,290	8,760
70	60	126	237	486	728	1,400	2,230	3,950	8,050
80	56	117	220	452	677	1,300	2,080	3,670	7,490
90	52	110	207	424	635	1,220	1,950	3,450	7,030
100	50	104	195	400	600	1,160	1,840	3,260	6,640
125	44	92	173	355	532	1,020	1,630	2,890	5,890
150	40	83	157	322	482	928	1,480	2,610	5,330
175	37	77	144	296	443	854	1,360	2,410	4,910
200	34	71	134	275	413	794	1,270	2,240	4,560
250	30	63	119	244	366	704	1,120	1,980	4,050
300	27	57	108	221	331	638	1,020	1,800	3,670
350	25	53	99	203	305	587	935	1,650	3,370
400	23	49	92	189	283	546	870	1,540	3,140
500	21	43	82	168	251	484	771	1,360	2,780

Table 1.4

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		0.3" W.C.	
Nominal:	½	¾	1	1¼	1½	2	2½	3	4
Actual ID:	0.622	0.824	1.049	1.38	1.61	2.067	2.469	3.068	4.026
Length (ft)	Capacity of Fuel Line (CFH)								
10	131	273	514	1,060	1,580	3,050	4,860	8,580	17,500
20	90	188	353	726	1,090	2,090	3,340	5,900	12,000
30	72	151	284	583	873	1,680	2,680	4,740	9,660
40	62	129	243	499	747	1,440	2,290	4,050	8,270
50	55	114	215	442	662	1,280	2,030	3,590	7,330
60	50	104	195	400	600	1,160	1,840	3,260	6,640
70	46	95	179	368	552	1,060	1,690	3,000	6,110
80	42	89	167	343	514	989	1,580	2,790	5,680
90	40	83	157	322	482	928	1,480	2,610	5,330
100	38	79	148	304	455	877	1,400	2,470	5,040
125	33	70	131	269	403	777	1,240	2,190	4,460
150	30	63	119	244	366	704	1,120	1,980	4,050
175	28	58	109	224	336	648	1,030	1,820	3,820
200	26	54	102	209	313	602	960	1,700	3,460
250	23	48	90	185	277	534	851	1,500	3,070
300	21	43	82	168	251	484	771	1,360	2,780
350	19	40	75	154	231	445	709	1,250	2,560
400	18	37	70	143	215	414	660	1,170	2,380
500	16	33	62	127	191	367	585	1,030	2,110

Semi-Rigid Copper Tubing

Table 2.1

						Inlet Pressure:		2.0 psi	
						Pressure Drop:		1.0 psi	
Nominal:	¼	⅜	½	⅝	¾	1	1¼	1½	2
Outside Dia.:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside Dia.	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity of Fuel Line (CFH)								
10	245	506	1,030	1,800	2,550	5,450	9,820	15,500	32,200
20	169	348	708	1,240	1,760	3,750	6,750	10,600	22,200
30	135	279	568	993	1,410	3,010	5,420	8,550	17,800
40	116	239	486	850	1,210	2,580	4,640	7,310	15,200
50	103	212	431	754	1,070	2,280	4,110	6,480	13,500
60	93	192	391	683	969	2,070	3,730	5,870	12,200
70	86	177	359	628	891	1,900	3,430	5,400	11,300
80	80	164	334	584	829	1,770	3,190	5,030	10,500
90	75	154	314	548	778	1,660	2,990	4,720	9,820
100	71	146	296	518	735	1,570	2,830	4,450	9,280
125	63	129	263	459	651	1,390	2,500	3,950	8,220
150	57	117	238	416	590	1,260	2,270	3,580	7,450
175	52	108	219	383	543	1,160	2,090	3,290	6,850
200	49	100	204	356	505	1,080	1,940	3,060	6,380
250	43	89	181	315	448	956	1,720	2,710	5,650
300	39	80	164	286	406	866	1,560	2,460	5,120
350	36	74	150	263	373	797	1,430	2,260	4,710
400	33	69	140	245	347	741	1,330	2,100	4,380
500	30	61	124	217	308	657	1,180	1,870	3,880

Table 2.2

						Inlet Pressure:		5.0 psi	
						Pressure Drop:		3.5 psi	
Nominal:	¼	⅜	½	⅝	¾	1	1¼	1½	2
Outside Dia.:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside Dia.	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity of Fuel Line (CFH)								
10	511	1,050	2,140	3,750	5,320	11,400	20,400	32,200	67,100
20	351	724	1,470	2,580	3,650	7,800	14,000	22,200	46,100
30	282	582	1,180	2,070	2,930	6,270	11,300	17,800	37,000
40	241	498	1,010	1,770	2,510	5,360	9,660	15,200	31,700
50	214	441	898	1,570	2,230	4,750	8,560	13,500	28,100
60	194	400	813	1,420	2,020	4,310	7,750	12,200	25,500
70	178	368	748	1,310	1,860	3,960	7,130	11,200	23,400
80	166	342	696	1,220	1,730	3,690	6,640	10,500	21,800
90	156	321	653	1,140	1,620	3,460	6,230	9,820	20,400
100	147	303	617	1,080	1,530	3,270	5,880	9,270	19,300
125	130	269	547	955	1,360	2,900	5,210	8,220	17,100
150	118	243	495	866	1,230	2,620	4,720	7,450	15,500
175	109	224	456	796	1,130	2,410	4,350	6,850	14,300
200	101	208	424	741	1,050	2,250	4,040	6,370	13,300
250	90	185	376	657	932	1,990	3,580	5,650	11,800
300	81	167	340	595	844	1,800	3,250	5,120	10,700
350	75	154	313	547	777	1,660	2,990	4,710	9,810
400	69	143	291	509	722	1,540	2,780	4,380	9,120
500	62	127	258	451	640	1,370	2,460	3,880	8,090

Semi-Rigid Copper Tubing

Table 2.3

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		0.5" W.C.	
Nominal:	¼	⅜	½	⅝	¾	1	1¼	1½	2
Outside Dia.:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside Dia.	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity of Fuel Line (CFH)								
10	27	55	111	195	276	590	1,060	1,680	3,490
20	18	38	77	134	190	406	730	1,150	2,400
30	15	30	61	107	152	326	586	925	1,930
40	13	26	53	92	131	279	502	791	1,650
50	11	23	47	82	116	247	445	701	1,460
60	10	21	42	74	105	224	403	635	1,320
70	-	19	39	68	96	206	371	585	1,220
80	-	18	36	63	90	192	345	544	1,130
90	-	17	34	59	84	180	324	510	1,060
100	-	16	32	56	79	170	306	482	1,000
125	-	14	28	50	70	151	271	427	890
150	-	13	26	45	64	136	245	387	806
175	-	12	24	41	59	125	226	356	742
200	-	11	22	39	55	117	210	331	690
250	-	-	20	34	48	103	186	294	612
300	-	-	18	31	44	94	169	266	554
350	-	-	16	28	40	86	155	245	510
400	-	-	15	26	38	80	144	228	474
500	-	-	13	23	33	71	128	202	420

Table 2.4

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		0.3" W.C.	
Nominal:	¼	⅜	½	⅝	¾	1	1¼	1½	2
Outside Dia.:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
Inside Dia.	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
Length (ft)	Capacity of Fuel Line (CFH)								
10	20	42	85	148	210	448	806	1,270	2,650
20	14	29	58	102	144	308	554	873	1,820
30	11	23	47	82	116	247	445	701	1,460
40	10	20	40	70	99	211	381	600	1,250
50	-	17	35	62	88	187	337	532	1,110
60	-	16	32	56	79	170	306	482	1,000
70	-	14	29	52	73	156	281	443	924
80	-	13	27	48	68	145	262	413	859
90	-	13	26	45	64	136	245	387	806
100	-	12	24	43	60	129	232	366	761
125	-	11	22	38	53	114	206	324	675
150	-	10	20	34	48	103	186	294	612
175	-	-	18	31	45	95	171	270	563
200	-	-	17	29	41	89	159	251	523
250	-	-	15	26	37	78	141	223	464
300	-	-	13	23	33	71	128	202	420
350	-	-	12	22	31	65	118	186	387
400	-	-	11	20	28	61	110	173	360
500	-	-	10	18	25	54	97	153	319

Corrugated Stainless Steel Tubing (CSST)

Table 3.1

						Inlet Pressure:		2.0 psi	
						Pressure Drop:		1.0 psi	
Nominal:	3/8	1/2		3/4		1	1 1/4	1 1/2	2
EHD	15	18	19	23	25	31	37	46	62
Length (ft)	Capacity of Fuel Line (CFH)								
10	353	587	700	1,098	1,444	2,986	5,683	9,599	21,637
25	220	374	444	712	926	1,869	3,420	6,041	13,715
30	200	342	405	650	847	1,703	3,092	5,509	12,526
40	172	297	351	567	737	1,470	2,636	4,763	10,855
50	154	266	314	510	661	1,311	2,329	4,255	9,715
75	124	218	257	420	512	1,070	1,690	3,470	7,940
80	120	211	249	407	527	1,031	1,795	3,355	7,689
100	107	189	222	366	473	920	1,586	2,997	6,881
150	87	155	182	302	388	748	1,267	2,442	5,624
200	75	135	157	263	338	645	1,080	2,111	4,874
250	67	121	141	236	303	576	955	1,886	4,362
300	61	110	129	217	277	525	863	1,720	3,983
400	52	96	111	189	241	453	736	1,487	3,452
500	46	86	100	170	216	404	650	1,329	3,089

Table 3.2

						Inlet Pressure:		5.0 psi	
						Pressure Drop:		3.5 psi	
Nominal:	3/8	1/2		3/4		1	1 1/4	1 1/2	2
EHD	15	18	19	23	25	31	37	46	62
Length (ft)	Capacity of Fuel Line (CFH)								
10	674	1,080	1,300	2,000	2,530	5,660	8,300	18,100	40,400
25	420	691	827	1,290	1,620	3,540	5,310	11,400	25,600
30	382	632	755	1,180	1,480	3,230	4,860	10,400	23,400
40	329	549	654	1,030	1,280	2,790	4,230	8,970	20,200
50	293	492	586	926	1,150	2,490	3,790	8,020	18,100
75	238	403	479	763	944	2,020	3,110	6,530	14,800
80	230	391	463	740	915	1,960	3,020	6,320	14,300
100	205	350	415	665	820	1,740	2,710	5,650	12,800
150	166	287	339	548	672	1,420	2,220	4,600	10,500
200	143	249	294	478	584	1,220	1,930	3,980	9,090
250	128	223	263	430	524	1,090	1,730	3,550	8,140
300	116	204	240	394	479	995	1,590	3,240	7,430
400	100	177	208	343	416	858	1,380	2,800	6,440
500	89	159	186	309	373	766	1,040	2,500	5,760

Note: Tracpipe 1/2" EHD is 19 and 3/4" EHD is 25. Gastite 1/2" EHD is 18 and 3/4" EHD is 23

Corrugated Stainless Steel Tubing (CSST)

Table 3.3

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		0.5" W.C.	
Nominal:	3/8	1/2		3/4		1	1 1/4	1 1/2	2
EHD	15	18	19	23	25	31	37	46	62
Length (ft)	Capacity of Fuel Line (CFH)								
5	63	115	134	225	270	546	895	1,790	4,140
10	44	82	95	161	192	383	639	1,260	2,930
15	35	66	77	132	157	310	524	1,030	2,400
20	31	58	67	116	137	269	456	888	2,080
25	27	52	60	104	122	240	409	793	1,860
30	25	47	55	96	112	218	374	723	1,700
40	21	41	47	83	97	188	325	625	1,470
50	19	37	42	75	87	168	292	559	1,320
60	17	34	38	68	80	153	267	509	1,200
70	16	31	36	63	74	141	248	471	1,110
80	15	29	33	60	69	132	232	440	1,040
90	14	28	32	57	65	125	219	415	983
100	13	26	30	54	62	118	208	393	933
150	10	20	23	42	48	91	171	320	762
200	9	18	21	38	44	82	148	277	661
250	8	16	19	34	39	74	133	247	591
300	7	15	17	32	36	67	95	226	540

Table 3.4

						Inlet Pressure:		less than 2.0 psi	
						Pressure Drop:		3.0" W.C.	
Nominal:	3/8	1/2		3/4		1	1 1/4	1 1/2	2
EHD	15	18	19	23	25	31	37	46	62
Length (ft)	Capacity of Fuel Line (CFH)								
5	160	277	327	529	649	1,370	2,140	4,430	10,100
10	112	197	231	380	462	958	1,530	3,200	7,160
15	90	161	189	313	379	778	1,250	2,540	5,850
20	78	140	164	273	329	672	1,090	2,200	5,070
25	69	125	147	246	295	599	978	1,960	4,540
30	63	115	134	225	270	546	895	1,790	4,140
40	54	100	116	196	234	471	778	1,550	3,590
50	48	89	104	176	210	421	698	1,380	3,210
60	44	82	95	161	192	383	639	1,260	2,930
70	41	76	88	150	178	355	593	1,170	2,720
80	38	71	82	141	167	331	555	1,090	2,540
90	36	67	77	133	157	311	524	1,030	2,400
100	34	63	73	126	149	295	498	974	2,280
150	27	52	60	104	122	240	409	793	1,860
200	23	45	52	91	106	207	355	686	1,610
250	21	40	46	82	95	184	319	613	1,440
300	19	37	42	75	87	168	234	559	1,320

Note: Tracpipe 1/2" EHD is 19 and 3/4" EHD is 25. Gastite 1/2" EHD is 18 and 3/4" EHD is 23

Polyethylene Plastic Pipe (Underground Installation Only)

Table 4.1

			Inlet Pressure:		2.0 psi	
			Pressure Drop:		1.0 psi	
Nominal OD:	½	¾	1	1¼	1½	2
SDR:	7.00	11.00	11.50	10.00	11.00	11.00
Actual ID:	0.436	0.860	0.915	1.308	1.554	1.917
Length (ft)	Capacity of Fuel Line (CFH)					
5	930	5,500	6,500	16,500	26,000	44,300
10	640	3,720	4,500	11,400	17,600	30,450
15	510	3,050	3,580	9,150	14,400	24,450
20	440	2,560	3,050	7,850	12,100	20,930
25	390	2,310	2,720	6,950	10,950	18,550
30	350	2,050	2,465	6,300	9,690	16,805
40	300	1,760	2,110	5,400	8,300	14,380
50	265	1,560	1,870	4,775	7,350	12,750
60	240	1,410	1,700	4,325	6,660	11,550
70	223	1,300	1,550	3,980	6,130	10,625
80	208	1,210	1,450	3,700	5,700	9,885
90	195	1,130	1,360	3,475	5,350	9,275
100	184	1,070	1,290	3,280	5,050	8,760
125	163	949	1,140	2,915	4,480	7,765
150	148	860	1,035	2,635	4,060	7,035
175	136	791	950	2,425	3,730	6,470
200	126	736	885	2,260	3,470	6,020

Table 4.2

			Inlet Pressure:		less than 2.0 psi	
			Pressure Drop:		0.5" W.C.	
Nominal OD:	½	¾	1	1¼	1½	2
SDR:	7.00	11.00	11.50	10.00	11.00	11.00
Actual ID:	0.436	0.860	0.915	1.308	1.554	1.917
Length (ft)	Capacity of Fuel Line (CFH)					
5	99	586	689	1,760	2,765	4,796
10	68	403	474	1,209	1,900	3,296
15	54	323	380	971	1,526	2,647
20	47	277	326	831	1,306	2,265
25	41	245	289	737	1,158	2,008
30	37	222	261	667	1,049	1,819
40	32	190	224	571	898	1,557
50	28	169	198	506	796	1,380
60	26	153	180	459	721	1,250
70	24	141	165	422	663	1,150
80	22	131	154	393	617	1,070
90	21	123	144	368	579	1,004
100	20	116	136	348	547	948
125	17	103	121	308	485	841
150	16	93	109	279	439	762
175	14	86	101	257	404	701
200	13	80	94	239	376	652

Polyethylene Plastic Pipe (Underground Installation Only)

Table 4.3

			Inlet Pressure:		less than 2.0 psi	
			Pressure Drop:		3.0" W.C.	
Nominal OD:	½	¾	1	1¼	1½	2
SDR:	7.00	11.00	11.50	10.00	11.00	11.00
Actual ID:	0.436	0.860	0.915	1.308	1.554	1.917
Length (ft)	Capacity of Fuel Line (CFH)					
5	260	1,540	1,815	4,640	7,290	12,640
10	180	1,060	1,250	3,190	5,010	8,690
15	143	850	1,000	2,560	4,020	6,980
20	123	730	860	2,190	3,440	5,970
25	109	650	760	1,940	3,050	5,290
30	99	586	690	1,760	2,765	4,800
40	84	501	590	1,505	2,365	4,105
50	75	444	523	1,335	2,100	3,640
60	68	403	474	1,210	1,900	3,300
70	62	370	436	1,113	1,748	3,032
80	58	345	405	1,035	1,627	2,821
90	54	323	380	971	1,526	2,647
100	51	305	359	917	1,442	2,500
125	46	271	318	813	1,278	2,216
150	41	245	289	737	1,158	2,008
175	38	226	265	678	1,065	1,847

**Table 5.1 - Single Appliance, Type B
Double-Wall Gas Vent**

Number of Appliances:	Single
Appliance Vent Connection:	Connected Directly to Vent
Appliance Type:	Category I

Vent Height (ft)	Lateral (ft)	Vent Diameter																				
		3"			4"			5"			6"			7"			8"			9"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	0	0	78	46	0	152	86	0	251	141	0	375	205	0	524	285	0	698	370	0	897	470
	2	13	51	36	18	97	67	27	157	105	32	232	157	44	321	217	53	425	285	63	543	370
	4	21	49	34	30	94	64	39	153	103	50	227	153	66	316	211	79	419	279	93	536	362
	6	25	46	32	36	91	61	47	149	100	59	223	149	78	310	205	93	413	273	110	530	354
8	0	0	84	50	0	165	94	0	276	155	0	415	235	0	583	320	0	780	415	0	1006	537
	2	12	57	40	16	109	75	25	178	120	28	263	180	42	365	247	50	483	322	60	619	418
	5	23	53	38	32	103	71	42	171	115	53	255	173	70	356	237	83	473	313	99	607	407
	8	28	49	35	39	98	66	51	164	109	64	247	165	84	347	227	99	463	303	117	596	396
10	0	0	88	53	0	175	100	0	295	166	0	447	255	0	631	345	0	847	450	0	1096	585
	2	12	61	42	17	118	81	23	194	129	26	289	195	40	402	273	48	533	355	57	684	457
	5	23	57	40	32	113	77	41	187	124	52	280	188	68	392	263	81	522	346	95	671	446
	10	30	51	36	41	104	70	54	176	115	67	267	175	88	376	245	104	504	330	122	651	427
15	0	0	94	58	0	191	112	0	327	187	0	502	285	0	716	390	0	970	525	0	1263	682
	2	11	69	48	15	136	93	20	226	150	22	339	225	38	475	316	45	633	414	53	815	544
	5	22	65	45	30	130	87	39	219	142	49	330	217	64	463	300	76	620	403	90	800	529
	10	29	59	41	40	121	82	51	206	135	64	315	208	84	445	288	99	600	386	116	777	507
	15	35	53	37	48	112	76	61	195	128	76	301	198	98	429	275	115	580	373	134	755	491
20	0	0	97	61	0	202	119	0	349	202	0	540	307	0	776	430	0	1057	575	0	1384	752
	2	10	75	51	14	149	100	18	250	166	20	377	249	33	531	346	41	711	470	50	917	612
	5	21	71	48	29	143	96	38	242	160	47	367	241	62	519	337	73	697	460	86	902	599
	10	28	64	44	38	133	89	50	229	150	62	351	228	81	499	321	95	675	443	112	877	576
	15	34	58	40	46	124	84	59	217	142	73	337	217	94	481	308	111	654	427	129	853	557
	20	48	52	35	55	116	78	69	206	134	84	322	206	107	464	295	125	634	410	145	830	537
30	0	0	100	64	0	213	128	0	374	220	0	587	336	0	853	475	0	1173	650	0	1548	855
	2	9	81	56	13	166	112	14	283	185	18	432	280	27	613	394	33	826	535	42	1072	700
	5	21	77	54	28	160	108	36	275	176	45	421	273	58	600	385	69	811	524	82	1055	688
	10	27	70	50	37	150	102	48	262	171	59	405	261	77	580	371	91	788	507	107	1028	668
	15	33	64	-	44	141	96	57	249	163	70	389	249	90	560	357	105	765	490	124	1002	648
	20	56	58	-	53	132	90	66	237	154	80	374	237	102	542	343	119	743	473	139	977	628
	30	-	-	-	73	113	-	88	214	-	104	346	219	131	507	321	149	702	444	171	929	594
50	0	0	101	67	0	216	134	0	397	232	0	633	363	0	932	518	0	1297	708	0	1730	952
	2	8	86	61	11	183	122	14	320	206	15	497	314	22	715	445	26	975	615	33	1276	813
	5	20	82	-	27	177	119	35	312	200	43	487	308	55	702	438	65	960	605	77	1259	798
	10	26	79	-	35	168	114	45	299	190	56	471	298	73	681	426	86	935	589	101	1230	773
	15	59	70	-	42	158	-	54	287	180	66	455	288	85	662	413	100	911	572	117	1203	747
	20	-	-	-	50	149	-	63	275	169	76	440	279	97	642	401	113	888	556	131	1176	722
	30	-	-	-	69	131	-	84	250	-	99	410	259	123	605	376	141	844	522	161	1125	670
100	0	-	-	-	0	218	-	0	407	-	0	665	400	0	997	560	0	1411	770	0	1908	1040
	2	-	-	-	10	194	-	12	354	-	13	566	375	18	831	510	21	1155	700	25	1536	935
	5	-	-	-	26	189	-	33	347	-	40	557	369	52	820	504	60	1141	692	71	1519	926
	10	-	-	-	33	182	-	43	335	-	53	542	361	68	801	493	80	1118	679	94	1492	910
	15	-	-	-	40	174	-	50	321	-	62	528	353	80	782	482	93	1095	666	109	1465	895
	20	-	-	-	47	166	-	59	311	-	71	513	344	90	763	471	105	1073	653	122	1438	880
	30	-	-	-	-	-	-	78	290	-	92	483	-	115	726	449	131	1029	627	149	1387	849
	50	-	-	-	-	-	-	-	-	-	147	428	-	180	651	405	197	944	575	217	1288	787

**Table 5.1 - Single Appliance, Type B
Double-Wall Gas Vent (continued)**

Number of Appliances:	Single
Appliance Vent Connection:	Connected Directly to Vent
Appliance Type:	Category I

Vent Height (ft)	Lateral (ft)	Vent Diameter																				
		10"			12"			14"			16"			18"			20"			24"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	0	0	1121	570	0	1645	850	0	2267	1170	0	2983	1530	0	3802	1960	0	4721	2430	0	6853	3520
	2	75	675	455	103	982	650	138	1346	890	178	1769	1170	225	2250	1480	296	2782	1850	426	4030	2670
	4	110	668	445	147	975	640	191	1338	880	242	1761	1160	300	2242	1475	390	2774	1835	555	4023	2660
	6	128	661	435	171	967	630	219	1330	870	276	1753	1150	341	2235	1470	437	2767	1820	618	4017	2650
8	0	0	1261	660	0	1858	970	0	2571	1320	0	3399	1740	0	4333	2220	0	5387	2750	0	7838	4010
	2	71	770	515	98	1124	745	130	1543	1020	168	2030	1340	212	2584	1700	278	3196	2110	401	4634	3050
	5	115	758	503	154	1110	733	199	1528	1010	251	2013	1330	311	2563	1685	398	3180	2090	562	4613	3040
	8	137	746	490	180	1097	720	231	1514	1000	289	2000	1320	354	2552	1670	450	3163	2070	630	4602	3030
10	0	0	1377	720	0	2036	1060	0	2825	1450	0	3742	1925	0	4782	2450	0	5955	3050	0	8682	4450
	2	68	852	560	93	1244	850	124	1713	1130	161	2256	1480	202	2868	1890	264	3556	2340	378	5153	3390
	5	112	839	547	149	1229	829	192	1696	1105	243	2238	1461	300	2849	1871	382	3536	2318	540	5132	3371
	10	142	817	525	187	1204	795	238	1669	1080	298	2209	1430	364	2818	1840	459	3504	2280	641	5099	3340
15	0	0	1596	840	0	2380	1240	0	3323	1720	0	4423	2270	0	5678	2900	0	7099	3620	0	10393	5300
	2	63	1019	675	86	1495	985	114	2062	1350	147	2719	1770	186	3467	2260	239	4304	2800	346	6251	4080
	5	105	1003	660	140	1476	967	182	2041	1327	229	2696	1748	283	3442	2235	355	4278	2777	501	5222	4057
	10	135	977	635	177	1446	936	227	2009	1289	283	2659	1712	346	3402	2193	432	4234	2739	599	5175	4019
	15	155	953	610	202	1418	905	257	1976	1250	318	2623	1675	385	3363	2150	479	4192	2700	665	5129	3980
20	0	0	1756	930	0	2637	1350	0	3701	1900	0	4948	2520	0	6376	3250	0	7988	4060	0	11753	6000
	2	59	1150	755	81	1694	1100	107	2343	1520	139	3097	2000	175	3955	2570	220	4916	3200	321	7154	4700
	5	101	1133	738	135	1674	1079	174	2320	1498	219	3071	1978	270	3926	2544	337	4885	3174	475	7119	4662
	10	130	1105	710	173	1641	1045	220	2282	1460	273	3029	1940	334	3880	2500	413	4835	3130	573	7063	4600
	15	150	1078	688	195	1609	1018	248	2245	1425	306	2988	1910	372	3835	2465	459	4786	3090	631	7007	4575
	20	167	1052	665	217	1578	990	273	2210	1390	335	2948	1880	404	3791	2430	495	4737	3050	689	6953	4550
30	0	0	1977	1060	0	3004	1550	0	4252	2170	0	5725	2920	0	7420	3770	0	9341	4750	0	13848	7060
	2	54	1351	865	74	2004	1310	98	2786	1800	127	3696	2380	159	4734	3050	199	5900	3810	285	8617	5600
	5	96	1332	851	127	1981	1289	164	2759	1775	206	3666	2350	252	4701	3020	312	5863	3783	439	8574	5552
	10	125	1301	829	164	1944	1254	209	2716	1733	259	3617	2300	316	4647	2970	386	5803	3739	535	8505	5471
	15	143	1272	807	187	1908	1220	237	2674	1692	292	3570	2250	354	4594	2920	431	5744	3695	590	8437	5391
	20	160	1243	784	207	1873	1185	260	2633	1650	319	3523	2200	384	4542	2870	467	5686	3650	639	8370	5310
	30	195	1189	745	246	1807	1130	305	2555	1585	269	2433	2130	440	4442	2785	540	5574	3565	739	8239	5225
50	0	0	2231	1195	0	3441	1825	0	4934	2550	0	6711	3440	0	8774	4460	0	11129	5635	0	16694	8430
	2	41	1620	1010	66	2431	1513	86	3409	2125	113	4554	2840	141	5864	3670	171	7339	4630	251	10788	6860
	5	90	1600	996	118	2406	1495	151	3380	2102	191	4520	2813	234	5826	3639	283	7295	4597	394	10737	6818
	10	118	1567	972	154	2366	1466	196	3332	2064	243	4464	2767	295	5763	3585	355	7224	4542	491	10652	6749
	15	136	1536	948	177	2327	1437	222	3285	2026	274	4409	2721	330	5701	3534	396	7155	4511	542	10570	6710
	20	151	1505	924	195	2288	1408	244	3239	1987	300	4356	2675	361	5641	3481	433	7086	4479	586	10488	6670
	30	183	1446	876	232	2214	1349	287	3150	1910	247	4253	2631	412	5523	3431	494	6953	4421	672	10328	6603
100	0	0	2491	1310	0	3925	2050	0	5729	2950	0	7914	4050	0	10485	5300	0	13454	6700	0	20578	10300
	2	30	1975	1170	44	3027	1820	72	4313	2550	95	5834	3500	120	7591	4600	138	9577	5800	204	14264	8800
	5	82	1955	1159	107	3002	1803	136	4282	2531	172	5797	3475	208	7548	4566	246	9528	5769	341	14204	8756
	10	108	1923	1142	142	2961	1775	180	4231	2500	223	5737	3434	268	7478	4509	318	9447	517	436	14105	8683
	15	126	1892	1124	163	2920	1747	206	4182	2469	252	5678	3392	304	7409	4451	358	9367	5665	487	14007	8610
	20	141	1861	1107	181	2880	1719	226	4133	2438	277	5619	3351	330	7341	4394	387	9289	5613	523	13910	8537
	30	170	1802	1071	215	2803	1663	265	4037	2384	319	550	3267	378	7209	4279	446	9136	5509	592	13720	8391
50	241	1688	1000	292	2657	1550	350	3856	2250	415	5289	3100	486	6956	4050	572	8841	5300	752	13354	8100	

**Table 5.2 - Single Appliance, Type B
Double-Wall Gas Vent**

Number of Appliances:	Single
Appliance Vent Connection:	Single Wall Metal Connector
Appliance Type:	Category I

Vent Height (ft)	Lateral (ft)	Vent Diameter																				
		3"			4"			5"			6"			8"			10"			12"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	0	38	77	45	59	151	85	85	249	140	126	373	204	211	695	369	371	1118	569	537	1639	849
	2	39	51	36	60	96	66	85	156	104	123	231	156	201	423	284	347	673	453	498	979	648
	4	-	-	33	74	92	63	102	152	102	146	225	152	237	416	277	409	664	443	584	971	638
	6	-	-	31	83	89+	60	114	147	99	163	220	148	263	409	271	449	656	433	638	962	627
8	0	37	83	50	58	164	93	83	273	154	123	412	234	206	777	414	360	1257	658	521	1852	967
	2	39	56	39	59	108	75	83	176	119	121	261	179	197	482	321	339	768	513	486	1120	743
	5	-	-	37	77	102	69	107	168	114	151	252	171	245	470	311	418	754	500	598	1104	730
	8	-	-	33	90	95	64	122	161	107	175	243	163	280	458	300	470	740	486	665	1089	715
10	0	37	87	53	57	174	99	82	293	165	120	444	254	202	844	449	351	1373	718	507	2031	1057
	2	39	61	41	59	117	80	82	193	128	119	287	194	193	531	354	332	849	559	475	1242	848
	5	52	56	39	76	111	76	105	185	122	148	277	186	241	518	344	409	834	544	584	1224	825
	10	-	-	34	97	100	68	132	171	112	188	261	171	296	497	325	492	808	520	688	1194	788
15	0	36	93	57	56	190	111	80	325	186	116	499	283	195	966	523	336	1591	838	488	2374	1237
	2	38	69	47	57	136	93	80	225	149	115	337	224	187	631	413	319	1015	673	457	1491	983
	5	51	63	44	75	128	86	102	216	140	144	326	217	231	616	400	392	997	657	562	1469	963
	10	-	-	39	95	116	79	128	201	131	182	308	203	284	592	381	470	966	628	664	1433	928
20	15	-	-	-	-	-	72	158	186	124	220	290	192	334	568	367	540	937	601	750	1399	894
	0	35	96	60	54	200	118	78	346	201	114	537	306	190	1053	573	326	1751	927	473	2631	1346
	2	37	74	50	56	148	99	78	248	165	113	375	248	182	708	468	309	1146	754	443	1689	1098
	5	50	68	47	73	140	94	100	239	158	141	363	239	224	692	457	381	1126	734	547	1665	1074
30	10	-	-	41	93	129	86	125	223	146	177	344	224	277	666	437	457	1092	702	646	1626	1037
	15	-	-	-	-	-	80	155	208	136	216	325	210	325	640	419	526	1060	677	730	1587	1005
	20	-	-	-	-	-	-	186	192	126	254	306	196	374	616	400	592	1028	651	808	1550	973
	30	-	-	-	-	-	-	-	-	-	-	-	-	461	670	426	704	1147	720	937	1759	1101
50	0	34	99	63	53	211	127	76	372	219	110	584	334	184	1168	647	312	1971	1056	454	2996	1545
	2	37	80	56	55	164	111	76	281	183	109	429	279	175	823	533	296	1346	863	424	1999	1308
	5	49	74	52	72	157	106	98	271	173	136	417	271	215	806	521	366	1324	846	524	1971	1283
	10	-	-	-	941	144	98	122	255	168	171	397	257	265	777	501	440	1287	821	620	1927	1243
100	15	-	-	-	115	131	-	151	239	157	208	377	242	312	750	481	507	1251	764	702	1884	1205
	20	-	-	-	-	-	-	181	223	-	246	357	228	360	723	461	570	1216	768	780	1841	1166
	30	-	-	-	-	-	-	-	-	-	-	-	-	461	670	426	704	1147	720	937	1759	1101
	50	-	-	-	-	-	-	-	-	-	-	-	-	442	809	502	674	1399	848	892	2159	1318
200	0	33	99	66	51	213	133	73	394	230	105	629	361	176	1292	704	295	2223	1189	428	3432	1818
	2	36	84	61	53	181	121	73	318	205	104	495	312	168	971	613	280	1615	1007	401	2426	1509
	5	48	80	-	70	174	117	94	308	198	131	482	305	204	953	602	347	1591	991	496	2396	1490
	10	-	-	-	89	160	-	118	292	186	162	461	292	253	923	583	418	1551	963	589	2347	1455
	15	-	-	-	112	148	-	145	275	174	199	441	280	299	894	562	481	1512	934	668	2299	1421
	20	-	-	-	-	-	-	176	257	-	236	420	267	345	866	543	544	1473	906	741	2251	1387
	30	-	-	-	-	-	-	-	-	-	315	376	-	442	809	502	674	1399	848	892	2159	1318
	50	-	-	-	-	-	-	-	-	-	-	-	-	617	866	-	895	1591	-	1138	2547	1489

Table 5.3 - Single Appliance, Masonry Chimney

Number of Appliances:	Single
Appliance Vent Connection:	Type B Double Wall Connector
Appliance Type:	Category I

Vent Height (ft)	Lateral (ft)	Vent Diameter																				
		3"			4"			5"			6"			8"			10"			12"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	2	-	-	28	-	-	52	-	-	86	-	-	130	-	-	247	-	-	401	-	-	581
	5	-	-	25	-	-	49	-	-	82	-	-	117	-	-	231	-	-	376	-	-	561
8	2	-	-	29	-	-	55	-	-	93	-	-	145	-	-	266	100	728	446	139	1024	651
	5	-	-	26	-	-	52	-	-	88	-	-	134	-	-	247	149	711	423	201	1007	640
	8	-	-	24	-	-	48	-	-	83	-	-	127	-	-	239	173	695	410	231	990	623
10	2	-	-	31	-	-	61	-	-	103	-	-	162	68	519	298	98	810	491	136	1144	724
	5	-	-	28	-	-	57	-	-	96	-	-	148	-	-	277	146	791	466	196	1124	712
	10	-	-	25	-	-	50	-	-	87	-	-	139	-	-	263	182	762	444	240	1093	668
15	2	-	-	35	-	-	67	-	-	114	-	-	179	64	613	336	92	968	562	127	1376	841
	5	-	-	35	-	-	62	-	-	107	-	-	164	99	594	313	139	946	522	186	1352	828
	10	-	-	28	-	-	55	-	-	97	-	-	153	126	565	296	173	912	567	229	1315	777
	15	-	-	-	-	-	48	-	-	89	-	-	141	-	-	281	198	880	485	259	1280	742
20	2	-	-	38	-	-	74	-	-	124	-	-	201	61	678	375	87	1083	627	121	1548	953
	5	-	-	36	-	-	68	-	-	116	-	-	184	95	658	350	133	1059	597	179	1523	933
	10	-	-	-	-	-	60	-	-	107	-	-	172	122	627	332	167	1022	566	221	1482	879
	15	-	-	-	-	-	-	-	-	97	-	-	159	-	-	314	191	987	541	251	1443	840
	20	-	-	-	-	-	-	-	-	83	-	-	148	-	-	296	214	955	513	277	1406	807
30	2	-	-	41	-	-	82	-	-	137	-	-	216	57	762	421	81	1240	717	111	1793	1112
	5	-	-	-	-	-	76	-	-	128	-	-	198	90	741	393	125	1216	683	169	1766	1094
	10	-	-	-	-	-	67	-	-	115	-	-	184	115	709	373	158	1176	648	210	1721	1025
	15	-	-	-	-	-	-	-	-	107	-	-	171	-	-	353	181	1139	621	239	1679	981
	20	-	-	-	-	-	-	-	-	91	-	-	159	-	-	332	203	1103	592	264	1638	940
	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	288	249	1035	555	318	1560	877
50	2	-	-	-	-	-	92	-	-	161	-	-	251	51	840	477	72	1413	812	99	2080	1243
	5	-	-	-	-	-	-	-	-	151	-	-	230	83	819	445	116	1387	774	155	2052	1225
	10	-	-	-	-	-	-	-	-	138	-	-	215	-	-	424	147	1347	733	195	2006	1147
	15	-	-	-	-	-	-	-	-	127	-	-	199	-	-	400	170	1307	702	222	1961	1099
	20	-	-	-	-	-	-	-	-	-	-	-	185	-	-	376	190	1269	669	246	1916	1050
	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	327	233	1196	623	295	1832	984
Minimum Internal Area of Chimney, in²	12			19			28			38			63			95			132			
Maximum Internal Area of Chimney, in²	49			88			137			198			352			550			792			

Table 5.4 - Single Appliance, Masonry Chimney

Number of Appliances:	Single
Appliance Vent Connection:	Single Wall Metal Connector
Appliance Type:	Category I

Vent Height (ft)	Lateral (ft)	Vent Diameter																				
		3"		4"		5"		6"		8"		10"		12"								
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.			
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	2	-	-	28	-	-	52	-	-	86	-	-	130	-	-	247	-	-	400	-	-	580
	5	-	-	25	-	-	48	-	-	81	-	-	116	-	-	230	-	-	375	-	-	560
8	2	-	-	29	-	-	55	-	-	93	-	-	145	-	-	265	382	725	445	549	1021	650
	5	-	-	26	-	-	51	-	-	87	-	-	133	-	-	246	-	-	422	673	1003	638
	8	-	-	23	-	-	47	-	-	82	-	-	126	-	-	237	-	-	408	747	985	621
10	2	-	-	31	-	-	61	-	-	102	-	-	161	216	518	297	373	808	490	536	1142	722
	5	-	-	28	-	-	56	-	-	95	-	-	147	-	-	276	459	789	465	657	1121	710
	10	-	-	24	-	-	49	-	-	86	-	-	137	-	-	261	547	758	441	771	1088	665
15	2	-	-	35	-	-	67	-	-	113	-	-	178	211	611	335	362	965	560	520	1373	840
	5	-	-	32	-	-	61	-	-	106	-	-	163	261	591	312	444	942	531	637	1348	825
	10	-	-	27	-	-	54	-	-	96	-	-	151	-	-	294	531	907	504	749	1309	774
	15	-	-	-	-	-	46	-	-	87	-	-	138	-	-	278	606	873	481	841	1272	738
20	2	-	-	38	-	-	73	-	-	123	-	-	200	206	675	374	252	1079	625	508	1544	950
	5	-	-	35	-	-	67	-	-	115	-	-	183	255	655	348	433	1055	594	623	1518	930
	10	-	-	-	-	-	59	-	-	105	-	-	170	312	622	330	517	1016	562	733	1475	875
	15	-	-	-	-	-	-	-	-	95	-	-	156	-	-	311	591	979	539	823	1434	835
	20	-	-	-	-	-	-	-	-	80	-	-	144	-	-	292	663	944	510	911	1394	800
30	2	-	-	41	-	-	81	-	-	136	-	-	215	200	759	420	340	1237	715	489	1789	1110
	5	-	-	-	-	-	75	-	-	127	-	-	196	245	737	391	417	1210	680	600	1760	1090
	10	-	-	-	-	-	66	-	-	113	-	-	182	300	703	370	500	1168	644	708	1713	1020
	15	-	-	-	-	-	-	-	-	105	-	-	168	-	-	349	572	1128	615	798	1668	975
	20	-	-	-	-	-	-	-	-	88	-	-	155	-	-	327	643	1089	585	883	1624	932
	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	281	-	-	544	1055	1539	865
50	2	-	-	-	-	-	91	-	-	160	-	-	250	191	837	475	323	1408	810	463	2076	1240
	5	-	-	-	-	-	-	-	-	149	-	-	228	-	-	442	398	1381	770	571	2044	1220
	10	-	-	-	-	-	-	-	-	136	-	-	212	-	-	420	447	1337	728	674	1994	1140
	15	-	-	-	-	-	-	-	-	124	-	-	195	-	-	395	546	1294	695	761	1945	1090
	20	-	-	-	-	-	-	-	-	-	-	-	180	-	-	370	616	1251	660	844	1898	1040
	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	318	-	-	610	1009	1805	970
Minimum Internal Area of Chimney, in²	12			19			28			38			63			95			132			
Maximum Internal Area of Chimney, in²	49			88			137			198			352			550			792			

Table 5.5 - Single Appliance, Single Wall Metal Vent or Type B Asbestos Cement Vent

Number of Appliances:	Single
Appliance Vent Connection:	Connected Directly to Pipe or Vent
Appliance Type:	Draft-Hood Equipped

Vent Height (ft)	Lateral (ft)	Vent Diameter								
		3"	4"	5"	6"	7"	8"	10"	12"	
		Appliance Input Rating (CFH)								
6	0	39	70	116	170	232	312	500	750	
	2	31	55	94	141	194	260	415	620	
	5	28	51	88	128	177	242	390	600	
8	0	42	76	126	185	252	340	542	815	
	2	32	61	102	154	210	284	451	680	
	5	29	56	95	141	194	264	430	648	
	10	24	49	86	131	180	250	406	625	
10	0	45	84	138	202	279	372	606	912	
	2	35	67	111	168	233	311	505	760	
	5	32	61	104	153	215	289	480	724	
	10	27	54	94	143	200	274	455	700	
	15	-	46	84	130	186	258	432	666	
15	0	49	91	151	223	312	420	684	1040	
	2	39	72	122	186	260	350	570	865	
	5	35	67	110	170	240	325	540	825	
	10	30	58	103	158	223	308	514	795	
	15	-	50	93	144	207	291	488	760	
	20	-	-	82	132	195	273	466	726	
20	0	53	101	163	252	342	470	770	1190	
	2	42	80	136	210	286	392	641	990	
	5	38	74	123	192	264	364	610	945	
	10	32	65	115	178	246	345	571	910	
	15	-	55	104	163	228	326	550	870	
	20	-	-	91	149	214	306	525	832	
30	0	56	108	183	276	384	529	878	1370	
	2	44	84	148	230	320	441	730	1140	
	5	-	78	137	210	296	410	694	1080	
	10	-	68	125	196	274	388	656	1050	
	15	-	-	113	177	258	366	625	1000	
	20	-	-	99	163	240	344	596	960	
	30	-	-	-	-	192	295	540	890	
50	0	-	120	210	310	443	590	980	1550	
	2	-	95	171	260	370	492	820	1290	
	5	-	-	159	234	342	474	780	1230	
	10	-	-	146	221	318	456	730	1190	
	15	-	-	-	200	292	407	705	1130	
	20	-	-	-	185	276	384	670	1080	
	30	-	-	-	-	222	330	605	1010	

**Table 5.6 - Single Appliance,
Exterior Masonry Chimney**

Minimum Allowable Input Rating of Space Heating Appliance (CFH)									
Number of Appliances:				Single					
Appliance Type:				Natural Draft					
Appliance Vent Connection:				Type B Double Wall Connector					
Vent Height (feet)	Internal Area of Chimney (square inches)								
	12	19	28	38	50	63	78	113	
	Local 99% Winter Design Temp: 37°F or greater								
	6	0	0	0	0	0	0	0	
	8	0	0	0	0	0	0	0	
	10	0	0	0	0	0	0	0	
	15	-	0	0	0	0	0	0	
	20	-	-	123	190	249	184	0	0
	30	-	-	-	-	-	393	334	0
50	-	-	-	-	-	-	-	579	
	Local 99% Winter Design Temp: 27°F - 36°F								
	6	0	0	68	116	156	180	212	266
	8	0	0	82	127	167	187	214	263
	10	0	51	97	141	183	201	225	265
	15	-	-	-	-	233	253	274	305
	20	-	-	-	-	-	307	330	362
	30	-	-	-	-	-	419	445	485
50	-	-	-	-	-	-	-	763	
	Local 99% Winter Design Temp: 17°F - 26°F								
	6	-	-	-	-	-	215	259	349
	8	-	-	-	-	197	226	264	352
	10	-	-	-	-	214	245	278	358
	15	-	-	-	-	-	296	331	398
	20	-	-	-	-	-	352	387	457
	30	-	-	-	-	-	-	507	581
50	-	-	-	-	-	-	-	-	
	Local 99% Winter Design Temp: 5°F - 16°F								
	6	-	-	-	-	-	-	-	416
	8	-	-	-	-	-	-	312	423
	10	-	-	-	-	-	289	331	430
	15	-	-	-	-	-	-	393	485
	20	-	-	-	-	-	-	450	547
	30	-	-	-	-	-	-	-	682
50	-	-	-	-	-	-	-	972	
OMAHA	Local 99% Winter Design Temp: -10°F - 4°F								
6	-	-	-	-	-	-	-	484	
8	-	-	-	-	-	-	-	494	
10	-	-	-	-	-	-	-	513	
15	-	-	-	-	-	-	-	586	
20	-	-	-	-	-	-	-	650	
30	-	-	-	-	-	-	-	805	
50	-	-	-	-	-	-	-	1003	
	Local 99% winter design temperature below -10°F not recommended for any vent configurations								

**Table 5.7 - Masonry Chimney Liner
Dimensions with Circular Equivalents**

Nominal Liner Size (in.)	Inside Dimensions of Liner (in.)	Inside Diameter or Equivalent Diameter (in.)	Equivalent Area (in²)
4 x 8	2½ x 6½	4.0	12.2
		5.0	19.6
		6.0	28.3
		7.0	38.3
8 x 8	6¾ x 6¾	7.4	42.7
		8.0	50.3
8 x 12	6½ x 10½	9.0	63.6
		10.0	78.5
12 x 12	9¾ x 9¾	10.4	83.3
		11.0	95.0
12 x 16	9½ x 13½	11.8	107.5
		12.0	113.0
		14.0	153.9
16 x 16	13¼ x 13¼	14.5	162.9
		15.0	176.7
16 x 20	13 x 17	16.2	206.1
		18.0	254.4
20 x 20	16¾ x 16¾	18.2	260.2
		20.0	314.1
20 x 24	16½ x 20½	20.1	314.2
		22.0	380.1
24 x 24	20¼ x 20¼	22.1	380.1
		24.0	452.3
24 x 28	20¼ x 24¼	24.1	456.2
		26.4	543.3
28 x 28	24¼ x 24¼	27.0	572.5
		27.9	607.0
30 x 30	25½ x 25½	30.0	706.8
30 x 36	25½ x 31½	30.9	749.9
		33.0	855.3
36 x 36	31½ x 31½	34.4	929.4
		36.0	1017.9

Table 6.1 - Multiple Appliances, Type B Double-Wall Gas Vent

Number of Appliances:	Two or More
Appliance Vent Connection:	Type B Double Wall Connector
Appliance Type:	Category I

Connector Capacity

Vent Height (ft)	Rise (ft)	Type B Double-Wall Connector Diameter																				
		3"			4"			5"			6"			7"			8"			10"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max		
6	1	22	37	26	35	66	46	46	106	72	58	164	104	77	225	142	92	296	185	128	466	289
	2	23	41	31	37	75	55	48	121	86	60	183	124	79	253	168	95	333	220	131	526	345
	3	24	44	35	38	81	62	49	132	96	62	199	139	82	275	189	97	363	248	134	575	386
8	1	22	40	27	35	72	48	49	114	76	64	176	109	84	243	148	100	320	194	138	507	303
	2	23	44	32	36	80	57	51	128	90	66	195	129	86	269	175	103	356	230	141	564	358
	3	24	47	36	37	87	64	53	139	101	67	210	145	88	290	198	105	384	258	143	612	402
10	1	22	43	28	34	78	50	49	123	78	65	189	113	89	257	154	106	341	200	146	542	314
	2	23	47	33	36	86	59	51	136	93	67	206	134	91	282	182	109	374	238	149	596	372
	3	24	50	37	37	91	67	52	146	104	69	220	150	94	303	205	111	402	268	152	642	417
15	1	21	50	30	33	89	53	47	142	83	64	220	120	88	298	163	110	389	214	162	609	333
	2	22	53	35	35	96	63	49	153	99	66	235	142	91	320	193	112	419	253	165	658	394
	3	24	55	40	36	102	71	51	163	111	68	248	160	93	339	218	115	445	286	167	700	444
20	1	21	54	31	33	99	56	46	157	87	62	246	125	86	334	171	107	436	224	158	681	347
	2	22	57	37	34	105	66	48	167	104	64	259	149	89	354	202	110	463	265	161	725	414
	3	23	60	42	35	110	74	50	176	116	66	271	168	91	371	228	113	486	300	164	764	466
30	1	20	62	33	31	113	59	45	181	93	60	288	134	83	391	182	103	512	238	151	802	372
	2	21	64	39	33	118	70	47	190	110	62	299	158	85	408	215	105	535	282	155	840	439
	3	22	66	44	34	123	79	48	198	124	64	309	178	88	423	242	108	555	317	158	874	494
50	1	19	71	36	30	133	64	43	216	101	57	349	145	78	477	197	97	627	257	144	984	403
	2	21	73	43	32	137	76	45	223	119	59	358	172	81	490	234	100	645	306	148	1014	478
	3	22	75	48	33	141	86	46	229	134	61	366	194	83	502	263	103	661	343	151	1043	538
100	1	18	82	37	28	158	66	40	262	104	53	442	150	73	611	204	91	810	266	135	1285	417
	2	19	83	44	30	161	79	42	267	123	55	447	178	75	619	242	94	822	316	139	1306	494
	3	20	84	50	31	163	89	44	272	138	57	452	200	78	627	272	97	834	355	142	1327	555

Common Vent Capacity

Vent Height (ft)	Type B Double-Wall Common Vent Diameter																				
	4"			5"			6"			7"			8"			9"			10"		
	Appliance Input Rating (CFH)																				
	Fan + Fan + Nat +			Fan + Fan + Nat +			Fan + Fan + Nat +			Fan + Fan + Nat +			Fan + Fan + Nat +			Fan + Fan + Nat +			Fan + Fan + Nat +		
	Fan	Fan	Nat	Fan	Fan	Nat	Fan	Fan	Nat	Fan	Fan	Nat	Fan	Fan	Nat	Fan	Fan	Nat	Fan	Fan	Nat
6	92	81	65	140	116	103	204	161	147	309	248	200	404	314	260	547	434	335	672	520	410
8	101	90	73	155	129	114	224	178	163	339	275	223	444	348	290	602	480	378	740	577	465
10	110	97	79	169	141	124	243	194	178	367	299	242	477	377	315	649	522	405	800	627	495
15	125	112	91	195	164	144	283	228	206	427	352	280	556	444	365	753	612	465	924	733	565
20	136	123	102	215	183	160	314	255	229	475	394	310	621	499	405	842	688	523	1035	826	640
30	152	138	118	244	210	185	361	297	266	547	459	360	720	585	470	979	808	605	1209	975	740
50	167	153	134	279	244	214	421	353	310	641	547	423	854	706	550	1164	977	705	1451	1188	860
100	175	163	-	311	277	-	489	421	-	751	658	479	1025	873	625	1408	1215	800	1784	1502	975

Table 6.1 - Multiple Appliances, Type B Double-Wall Gas Vent (continued)

Number of Appliances:	Two or More
Appliance Vent Connection:	Type B Double Wall Connector
Appliance Type:	Category I

Connector Capacity

Vent Height (ft)	Rise (ft)	Type B Double-Wall Connector Diameter																				
		12"			14"			16"			18"			20"			22"			24"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	2	174	764	496	223	1046	653	281	1371	853	346	1772	1080	-	-	-	-	-	-	-	-	
	4	180	897	616	230	1231	827	287	1617	1081	352	2069	1370	-	-	-	-	-	-	-	-	
	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8	2	186	822	516	238	1126	696	298	1478	910	365	1920	1150	-	-	-	-	-	-	-	-	
	4	192	952	644	244	1307	884	305	1719	1150	372	2211	1460	471	2737	1800	560	3319	2180	662	3957	2590
	6	198	1050	772	252	1445	1072	313	1902	1390	380	2434	1770	478	3018	2180	568	3665	2640	669	4373	3130
10	2	196	870	536	249	1195	730	311	1570	955	379	2049	1205	-	-	-	-	-	-	-	-	
	4	201	997	664	256	1371	924	318	1804	1205	387	2332	1535	486	2887	1890	581	3502	2280	686	4175	2710
	6	207	1095	792	263	1509	1118	325	1989	1455	395	2556	1865	494	3169	2290	589	3849	2760	694	4593	3270
15	2	214	967	568	272	1334	790	336	1760	1030	408	2317	1305	-	-	-	-	-	-	-	-	
	4	221	1085	712	279	1499	1006	344	1978	1320	416	2579	1665	523	3197	2060	624	3881	2490	734	4631	2960
	6	228	1181	856	286	1632	1222	351	2157	1610	424	2796	2025	533	3470	2510	634	4216	3030	743	5035	3600
20	2	223	1051	596	291	1443	840	357	1911	1095	430	2533	1385	-	-	-	-	-	-	-	-	
	4	230	1162	748	298	1597	1064	365	2116	1395	438	2778	1765	554	3447	2180	661	4190	2630	772	5005	3130
	6	237	1253	900	307	1726	1288	373	2287	1695	450	2984	2145	567	3708	2650	671	4511	3190	785	5392	3790
30	2	216	1217	632	286	1664	910	367	2183	1190	461	2891	1540	-	-	-	-	-	-	-	-	
	4	223	1316	792	294	1802	1160	376	2366	1510	474	3110	1920	619	3840	2365	728	4861	2860	847	5606	3410
	6	231	1400	952	303	1920	1410	384	2524	1830	485	3299	2340	632	4080	2875	741	4979	3480	860	5961	4150
50	2	206	1479	689	273	2023	1007	350	2659	1315	435	3548	1665	-	-	-	-	-	-	-	-	
	4	213	1561	860	281	2139	1291	359	2814	1685	447	3730	2135	580	4601	2633	709	5569	3185	851	6633	3790
	6	221	1631	1031	290	2242	1575	369	2951	2055	461	3893	2605	594	4808	3208	724	5826	3885	867	6943	4620
100	2	192	1923	712	254	2644	1050	326	3490	1370	402	4707	1740	-	-	-	-	-	-	-	-	
	4	200	1984	888	263	2731	1346	336	3606	1760	414	4842	2220	523	5982	2750	639	7254	3330	769	8650	3950
	6	208	2035	1064	272	2811	1642	346	3714	2150	426	4968	2700	539	6143	3350	654	7453	4070	786	8892	4810

Common Vent Capacity

Vent Height (ft)	Type B Double-Wall Common Vent Diameter																				
	12"			14"			16"			18"			20"			22"			24"		
	Appliance Input Rating (CFH)																				
	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +
	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat
6	900	696	588	1284	990	815	1735	1336	1065	2253	1732	1345	2838	2180	1660	3488	2677	1970	4206	3226	2390
8	994	773	652	1423	1103	912	1927	1491	1190	2507	1936	1510	3162	2439	1860	3890	2998	2200	4695	3616	2680
10	1076	841	712	1542	1200	995	2093	1625	1300	2727	2113	1645	3444	2665	2030	4241	3278	2400	5123	3957	2920
15	1247	986	825	1794	1410	1158	2440	1910	1510	3184	2484	1910	4026	3133	2360	4971	3862	2790	6016	4670	3400
20	1405	1116	916	2006	1588	1290	2722	2147	1690	3561	2798	2140	4548	3552	2640	5573	4352	3120	6749	5261	3800
30	1658	1327	1025	2373	1892	1525	3220	2558	1990	4197	3326	2520	5303	4193	3110	6539	5157	3680	7940	6247	4480
50	2024	1640	1280	2911	2347	1863	3965	3183	2430	5184	4149	3075	6567	5240	3800	8116	6458	4500	9837	7813	5475
100	2569	2131	1670	3732	3076	2450	5125	4202	3200	6749	5509	4050	8597	6989	5000	10681	8648	5920	13004	10499	7200

Table 6.2 - Multiple Appliances, Type B Double-Wall Gas Vent

Number of Appliances:	Two or More
Appliance Vent Connection:	Single Wall Metal Connector
Appliance Type:	Category I

Connector Capacity

Vent Height (ft)	Rise (ft)	Single Wall Connector Diameter																				
		3"			4"			5"			6"			7"			8"			10"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	1	-	-	26	-	-	46	-	-	71	-	-	102	207	223	140	262	293	183	447	463	286
	2	-	-	31	-	-	55	-	-	85	168	182	123	215	241	167	271	331	219	458	524	344
	3	-	-	34	-	-	62	121	131	95	175	198	138	222	273	188	279	361	247	468	574	385
8	1	-	-	27	-	-	48	-	-	75	-	-	106	226	240	145	285	316	191	481	502	299
	2	-	-	32	-	-	57	125	126	89	184	193	127	234	266	173	293	353	228	492	560	355
	3	-	-	35	-	-	64	130	138	100	191	208	144	241	287	197	302	381	256	501	609	400
10	1	-	-	28	-	-	50	119	121	77	182	186	110	240	253	150	302	335	196	506	534	308
	2	-	-	33	84	85	59	124	134	91	189	203	132	248	278	183	311	369	235	517	589	368
	3	-	-	36	89	91	67	129	144	102	197	217	148	257	299	203	320	398	265	528	637	413
15	1	-	-	29	79	87	52	116	138	81	177	214	116	238	291	158	312	380	208	556	596	324
	2	-	-	34	83	94	62	121	150	97	185	230	138	246	314	189	321	411	248	568	646	387
	3	-	-	39	87	100	70	127	160	109	193	243	157	255	333	215	331	438	281	579	690	437
20	1	49	56	30	78	97	54	115	152	84	175	238	120	233	325	165	306	425	217	546	664	336
	2	52	59	36	82	103	64	120	163	101	182	252	144	243	346	197	317	453	259	558	709	403
	3	55	62	40	87	107	72	125	172	113	190	264	164	252	363	223	326	476	294	570	750	457
30	1	47	60	31	77	110	57	112	175	89	169	278	129	226	380	175	296	497	230	528	779	358
	2	51	62	37	81	115	67	117	185	106	177	290	152	236	397	208	307	521	274	541	819	425
	3	54	64	42	85	119	76	122	193	120	185	300	172	244	412	235	316	542	309	555	855	482
50	1	46	69	34	75	128	60	109	207	96	162	336	137	217	460	188	284	604	245	507	951	384
	2	49	71	40	79	132	72	114	215	113	170	345	164	226	473	223	294	623	293	520	983	458
	3	52	72	45	83	136	82	119	221	123	178	353	186	235	486	252	304	640	331	535	1013	518
100	1	45	79	34	71	150	61	104	249	98	153	424	140	205	585	192	269	774	249	476	1236	393
	2	48	80	41	75	153	73	110	255	115	160	428	167	212	593	228	279	788	299	490	1259	469
	3	51	81	46	79	157	85	114	260	129	168	433	190	222	603	256	289	801	339	506	1280	527

Common Vent Capacity

Vent Height (ft)	Type B Double-Wall Common Vent Diameter																				
	4"			5"			6"			7"			8"			9"			10"		
	Appliance Input Rating (CFH)																				
	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +
	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat
6	-	78	64	-	113	99	200	158	144	304	244	196	398	310	257	541	429	332	665	515	407
8	-	87	71	-	126	111	218	173	159	331	269	218	436	342	285	592	473	373	730	569	460
10	-	94	76	163	137	120	237	189	174	357	292	236	467	369	309	638	512	398	787	617	487
15	121	108	88	189	159	140	275	221	200	416	343	274	544	434	357	738	599	456	905	718	553
20	131	118	98	208	177	156	305	247	223	463	383	302	606	487	395	824	673	512	1013	808	626
30	145	132	113	236	202	180	350	286	257	533	446	349	703	570	459	958	790	593	1183	952	723
50	159	145	128	268	233	208	406	337	296	622	529	410	833	686	535	1139	954	689	1418	1157	838
100	166	153	-	297	263	-	469	398	-	726	633	464	999	846	606	1378	1185	780	1741	1459	948

Table 6.3 - Multiple Appliances, Masonry Chimney

Number of Appliances:	Two or More
Appliance Vent Connection:	Type B Double Wall Connector
Appliance Type:	Category I

Connector Capacity

Vent Height (ft) Rise (ft)		Type B Double-Wall Connector Diameter																				
		3"			4"			5"			6"			7"			8"			10"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
Min Max		Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max	Min Max	Max		
6	1	24	33	21	39	62	40	52	106	67	65	194	101	87	274	141	104	370	201	145	599	319
	2	26	43	28	41	79	52	53	133	85	67	230	124	89	324	173	107	436	232	148	694	378
	3	27	49	34	42	92	61	55	155	97	69	262	143	91	369	203	109	491	270	151	795	439
8	1	24	39	22	39	72	41	55	117	69	71	213	105	94	304	148	113	414	210	156	682	335
	2	26	47	29	40	87	53	57	140	89	73	246	127	97	350	179	116	473	240	160	776	394
	3	27	52	34	42	97	62	59	159	98	75	269	145	99	383	206	119	517	276	163	848	452
10	1	24	42	22	38	80	42	55	130	71	74	232	108	101	324	153	120	444	216	165	739	348
	2	26	50	29	40	93	54	57	153	87	76	261	129	103	366	184	123	498	247	168	825	407
	3	27	55	35	41	105	63	58	170	100	78	284	148	106	397	209	126	540	281	171	893	463
15	1	24	48	23	38	93	44	54	154	74	72	277	114	100	384	164	125	511	229	184	824	375
	2	25	55	31	39	105	55	56	174	89	74	299	134	103	419	192	128	558	260	187	900	432
	3	26	59	35	41	115	64	57	189	102	76	319	153	105	448	215	131	597	292	190	960	486
20	1	24	52	24	37	102	46	53	172	77	71	313	119	98	437	173	123	584	239	180	943	397
	2	25	58	31	39	114	56	55	190	91	73	335	138	101	467	199	126	625	270	184	1011	452
	3	26	63	35	40	123	65	57	204	104	75	353	157	104	493	222	129	661	301	187	1067	505
30	1	24	54	25	37	111	48	52	192	82	69	357	127	96	504	187	119	680	255	175	1115	432
	2	25	60	32	38	122	58	54	208	95	72	376	145	99	531	209	122	715	287	179	1171	484
	3	26	64	36	40	131	66	56	221	107	74	392	163	101	554	233	125	476	317	182	1220	535
50	1	23	51	25	36	116	51	51	209	89	67	405	143	92	582	213	115	798	294	168	1334	506
	2	24	59	32	37	127	61	53	225	102	70	421	161	95	604	235	118	827	326	172	1379	558
	3	26	64	36	39	135	69	55	237	115	72	435	180	98	624	260	121	854	357	176	1421	611
100	1	23	46	24	35	108	50	49	208	92	65	428	155	88	640	237	109	907	334	161	1589	596
	2	24	53	31	37	120	60	51	224	105	67	444	174	92	660	260	113	933	368	165	1626	651
	3	25	59	35	38	130	68	53	237	118	69	458	193	94	679	285	116	956	399	169	1661	705

Common Vent Capacity

Vent Height (ft)	Minimum Internal Area of Masonry Chimney Flue, square inches																				
	12			19			28			38			50			63			78		
	Appliance Input Rating (CFH)																				
	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +
	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat
6	-	74	25	-	119	46	-	178	71	-	257	103	-	351	143	-	458	188	-	582	246
8	-	80	28	-	130	53	-	193	82	-	279	119	-	384	163	-	501	218	724	636	278
10	-	84	31	-	138	56	-	207	90	-	299	131	-	409	177	606	538	236	776	686	302
15	-	-	36	-	152	67	-	233	106	-	334	152	523	467	212	682	611	283	874	781	365
20	-	-	41	-	-	75	-	250	122	-	368	172	565	508	243	742	668	325	955	858	419
30	-	-	-	-	-	-	-	270	137	-	404	198	615	564	278	816	747	381	1062	969	496
50	-	-	-	-	-	-	-	-	-	-	-	-	-	620	328	879	831	461	1165	1089	606
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	348	-	-	499	-	-	669

Table 6.4 - Multiple Appliances, Masonry Chimney

Number of Appliances:	Two or More
Appliance Vent Connection:	Single Wall Metal Connector
Appliance Type:	Category I

Connector Capacity

Vent Height (ft)	Rise (ft)	Single Wall Connector Diameter																				
		3"			4"			5"			6"			7"			8"			10"		
		Appliance Input Rating (CFH)																				
		Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.	Fan		Nat.
		Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max	Min	Max	Max
6	1	-	-	21	-	-	39	-	-	66	179	191	100	231	271	140	292	366	200	499	594	316
	2	-	-	28	-	-	52	-	-	84	186	227	123	239	321	172	301	432	231	509	696	376
	3	-	-	34	-	-	61	134	153	97	193	258	142	247	365	202	309	491	269	519	793	437
8	1	-	-	21	-	-	40	-	-	68	195	208	103	250	298	146	313	407	207	529	672	331
	2	-	-	28	-	-	52	137	139	85	202	240	125	258	343	177	323	465	238	540	766	391
	3	-	-	34	-	-	62	143	156	98	210	264	145	266	376	205	332	509	274	551	838	450
10	1	-	-	22	-	-	41	130	151	70	202	225	106	267	316	151	333	434	213	558	727	343
	2	-	-	29	-	-	53	136	150	86	210	255	128	276	358	181	343	489	244	569	813	403
	3	-	-	34	97	102	62	143	166	99	217	277	147	284	389	207	352	530	279	580	880	459
15	1	-	-	23	-	-	43	129	151	73	199	271	112	268	376	161	349	502	225	623	808	366
	2	-	-	30	92	103	54	135	170	88	207	295	132	277	411	189	359	548	256	634	884	424
	3	-	-	34	96	112	63	141	175	101	215	315	151	286	439	213	368	586	289	646	945	479
20	1	-	-	23	87	99	45	128	167	76	197	303	117	265	425	169	345	569	235	614	921	387
	2	-	-	30	91	111	55	134	185	90	205	325	136	274	455	195	355	610	266	627	986	443
	3	-	-	35	96	119	64	140	199	103	213	343	154	282	481	219	365	644	298	639	1042	496
30	1	-	-	24	86	108	47	126	187	80	193	347	124	259	492	183	338	665	250	600	1089	421
	2	-	-	31	91	119	57	132	203	93	201	366	142	269	518	205	348	699	282	613	1145	473
	3	-	-	35	95	127	65	138	216	105	209	381	160	277	540	229	358	729	312	626	1193	524
50	1	-	-	24	85	113	50	124	204	87	188	392	139	252	567	208	328	778	287	582	1302	492
	2	-	-	31	89	123	60	130	218	100	196	408	158	262	588	230	339	806	320	596	1346	545
	3	-	-	35	94	131	68	136	231	112	205	422	176	271	607	255	349	831	351	610	1386	597
100	1	-	-	23	84	104	49	122	200	89	182	410	151	243	617	232	315	875	328	560	1537	580
	2	-	-	30	88	115	59	127	215	102	190	425	169	253	636	254	326	899	361	575	1570	634
	3	-	-	34	93	124	67	133	228	115	199	438	188	262	654	279	337	921	392	589	1604	687

Common Vent Capacity

Vent Height (ft)	Minimum Internal Area of Masonry Chimney Flue, square inches																				
	12			19			28			38			50			63			78		
	Appliance Input Rating (CFH)																				
	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +	Fan +	Fan +	Nat +
	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat	Fan	Nat	Nat
6	-	-	25	-	118	45	-	176	71	-	255	102	-	348	142	-	455	187	-	579	245
8	-	-	28	-	128	52	-	190	81	-	276	118	-	380	162	-	497	217	-	633	277
10	-	-	31	-	136	56	-	205	89	-	295	129	-	405	175	-	532	234	771	680	300
15	-	-	36	-	-	66	-	230	105	-	335	150	-	400	210	677	602	280	866	772	360
20	-	-	-	-	-	74	-	247	120	-	362	170	-	503	240	765	661	321	947	849	415
30	-	-	-	-	-	-	-	-	135	-	398	195	-	558	275	808	739	377	1052	957	490
50	-	-	-	-	-	-	-	-	-	-	-	-	-	612	325	-	821	456	1152	1076	600
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	494	-	-	663

**Table 6.5a - Multiple Appliances,
Exterior Masonry Chimney**

Minimum Allowable Input Rating of Space Heating Appliance (CFH)									
Number of Appliances:				Two or More					
Appliance Type:				Nat + Nat					
Appliance Vent Connection:				Type B Double Wall Connector					
Vent Height (feet)	Internal Area of Chimney (square inches)								
	12	19	28	38	50	63	78	113	
	Local 99% Winter Design Temp: 37°F or greater								
	6	0	0	0	0	0	0	0	
	8	0	0	0	0	0	0	0	
	10	0	0	0	0	0	0	0	
	15	-	0	0	0	0	0	0	
	20	-	-	-	-	-	184	0	0
	30	-	-	-	-	-	393	334	0
50	-	-	-	-	-	-	-	579	
	Local 99% Winter Design Temp: 27°F - 36°F								
	6	0	0	68	-	-	180	212	-
	8	0	0	82	-	-	187	214	263
	10	0	51	-	-	-	201	225	265
	15	-	-	-	-	-	253	274	305
	20	-	-	-	-	-	307	330	362
	30	-	-	-	-	-	-	445	485
50	-	-	-	-	-	-	-	763	
	Local 99% Winter Design Temp: 17°F - 26°F								
	6	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	264	352
	10	-	-	-	-	-	-	278	358
	15	-	-	-	-	-	-	331	398
	20	-	-	-	-	-	-	387	457
	30	-	-	-	-	-	-	-	581
50	-	-	-	-	-	-	-	862	
	Local 99% Winter Design Temp: 5°F - 16°F								
	6	-	-	-	-	-	-	-	-
	8	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	430
	15	-	-	-	-	-	-	-	485
	20	-	-	-	-	-	-	-	547
	30	-	-	-	-	-	-	-	682
50	-	-	-	-	-	-	-	-	
OMAHA	Local 99% Winter Design Temp: -10°F - 4°F								
6	-	-	-	-	-	-	-	-	
8	-	-	-	-	-	-	-	-	
10	-	-	-	-	-	-	-	-	
15	-	-	-	-	-	-	-	-	
20	-	-	-	-	-	-	-	-	
30	-	-	-	-	-	-	-	-	
50	-	-	-	-	-	-	-	-	
	Local 99% winter design temperature below -10°F not recommended for any vent configurations								

**Table 6.5b - Multiple Appliances,
Exterior Masonry Chimney**

Combined Appliance <u>Maximum</u> Input Rating (CFH)								
Number of Appliances:				Two or More				
Appliance Type:				Nat + Nat				
Appliance Vent Connection:				Type B Double Wall Connector				
Vent Height (feet)	Internal Area of Chimney (square inches)							
	12	19	28	38	50	63	78	113
	Local 99% Winter Design Temp: 37°F or greater							
6	25	46	71	103	143	188	246	-
8	28	53	82	119	163	218	278	408
10	31	56	90	131	177	236	302	454
15	-	67	106	152	212	283	365	546
20	-	-	-	-	-	325	419	648
30	-	-	-	-	-	-	496	749
50	-	-	-	-	-	-	-	922

**Table 6.6a - Multiple Appliances,
Exterior Masonry Chimney**

Minimum Allowable Input Rating of Space Heating Appliance (CFH)								
Number of Appliances:			Two or More					
Appliance Type:			Fan + Nat					
Appliance Vent Connection:			Type B Double Wall Connector					
Vent Height (feet)	Internal Area of Chimney (square inches)							
	12	19	28	38	50	63	78	113
	Local 99% Winter Design Temp: 37°F or greater							
6	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
15	-	0	0	0	0	0	0	0
20	-	-	123	190	249	184	0	0
30	-	-	-	334	398	393	334	0
50	-	-	-	-	-	714	707	579
	Local 99% Winter Design Temp: 27°F - 36°F							
6	0	0	68	116	156	180	212	266
8	0	0	82	127	167	187	214	263
10	0	51	97	141	183	210	225	265
15	-	111	142	183	233	253	274	305
20	-	-	187	230	284	307	330	362
30	-	-	-	330	319	419	445	485
50	-	-	-	-	-	672	705	763
	Local 99% Winter Design Temp: 17°F - 26°F							
6	0	55	99	141	182	215	259	349
8	52	74	111	154	197	226	264	352
10	-	90	125	159	214	245	278	358
15	-	-	167	212	263	296	331	398
20	-	-	212	258	316	352	387	457
30	-	-	-	362	429	470	507	581
50	-	-	-	-	-	723	766	862
	Local 99% Winter Design Temp: 5°F - 16°F							
6	-	78	121	166	214	252	301	416
8	-	94	135	182	230	269	312	423
10	-	111	149	198	250	289	331	430
15	-	-	193	247	305	346	393	485
20	-	-	-	293	360	408	450	547
30	-	-	-	377	450	531	580	682
50	-	-	-	-	-	797	853	972
OMAHA	Local 99% Winter Design Temp: -10°F - 4°F							
6	-	-	145	196	249	296	349	484
8	-	-	159	213	269	320	371	494
10	-	-	175	231	292	339	397	513
15	-	-	-	283	351	404	457	586
20	-	-	-	333	408	468	528	650
30	-	-	-	-	-	603	667	805
50	-	-	-	-	-	-	955	1003

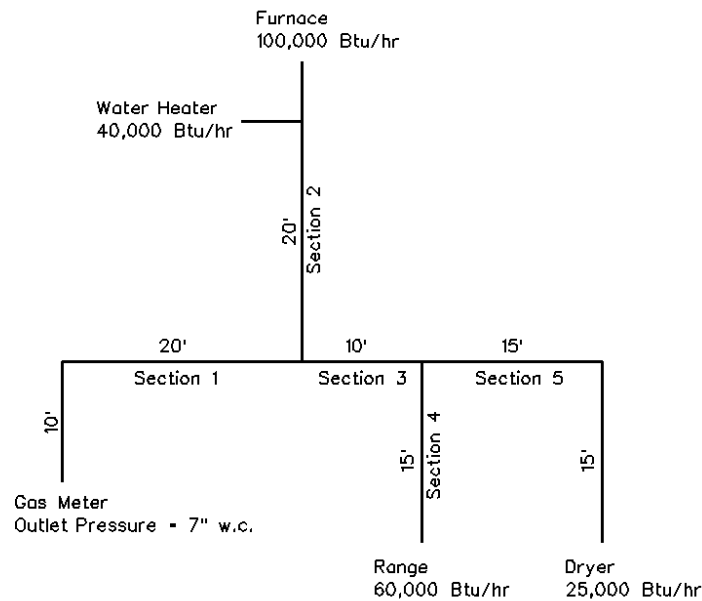
**Table 6.6b - Multiple Appliances,
Exterior Masonry Chimney**

Combined Appliance <u>Maximum</u> Input Rating (CFH)								
Number of Appliances:				Two or More				
Appliance Type:				Fan + Nat				
Appliance Vent Connection:				Type B Double Wall Connector				
Vent Height (feet)	Internal Area of Chimney (square inches)							
	12	19	28	38	50	63	78	113
	Local 99% Winter Design Temp: 37°F or greater							
6	74	119	178	257	351	458	582	853
8	80	130	193	279	384	501	636	937
10	84	138	207	299	409	538	686	1010
15	-	152	233	334	467	611	781	1156
20	-	-	250	368	508	668	858	1286
30	-	-	-	404	564	747	969	1473
50	-	-	-	-	-	831	1089	1692

FUEL LINE SIZING EXAMPLES

EXAMPLE #1 – LONGEST LENGTH METHOD

Determine the required pipe size of each section of the fuel line system as shown. All piping is black iron with an allowable pressure drop of 0.5" w.c.



**** Pipe size for each section of gas piping is determined by using the longest length of piping from the point of delivery (meter set) to the furthest gas appliance ****

1. Determine the longest section of piping from the point of delivery to furthest appliance

The dryer is the furthest appliance at 70 feet away from the meter.

2. Section 1

Total gas load flowing through Section 1 is:	Water Heater =	40,000 Btuh
	Furnace =	100,000 Btuh
	Range =	60,000 Btuh
	<u>Dryer =</u>	<u>25,000 Btuh</u>
	Total =	225,000 Btuh

Using Table 1.3 for schedule 40 black pipe for less than 2.0 psi pressure with a 0.5" w.c. pressure drop, 1" black pipe will pass 237 cfh at 70' of length. **Section 1 requires 1" pipe.**

3. Size the remaining pipe segments

Section 2: 40,000 btuh + 100,000 btuh = 140,000 btuh.

Section 2 requires 1" pipe.

Section 3: 60,000 btuh + 25,000 btuh = 85,000 btuh.

Section 3 requires 3/4" pipe.

Section 4: 60,000 btuh.

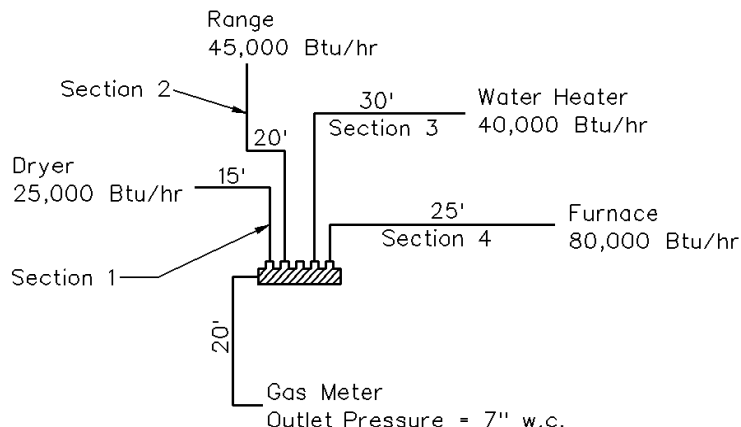
Section 4 requires 1/2" pipe.

Section 5: 25,000 btuh.

Section 5 requires 1/2" pipe.

EXAMPLE #2 – BRANCH LENGTH METHOD

Determine the required pipe size of each section of the fuel line system as shown. All piping is copper tubing with an allowable pressure drop of 0.5" w.c.



**** Pipe sized using the branch length method shall be sized as follows ****

- The pipe size of each section of the longest pipe run from the meter set to the furthest appliance shall be determined using the longest run of the piping and the load of the section.
- The pipe size of each section of branch piping not previously sized shall be determined using the length of piping from the point of delivery to the most remote outlet in each branch and the load of the section.

1. Piping from gas meter to manifold

The furthest appliance from the meter is the water heater so the length from the meter to the furthest appliance is 50'.

Total gas load of connected appliances = 25 cfh + 45 cfh + 40 cfh + 80 cfh = 190 cfh

Using Table 2.3 for semi-rigid copper tubing, determine what diameter is necessary to flow 190 cfh at a distance of 50'. From the table we see 1" will pass 247 cfh so **the section of pipe from the gas meter to the manifold shall be 1" copper tubing.**

2. Section 1 Length of piping from the meter to the Dryer is 35'

Total load of dryer = 25 cfh

Using Table 2.3, **Section 1 will require 3/8" copper tubing.**

3. Size the remaining pipe sections

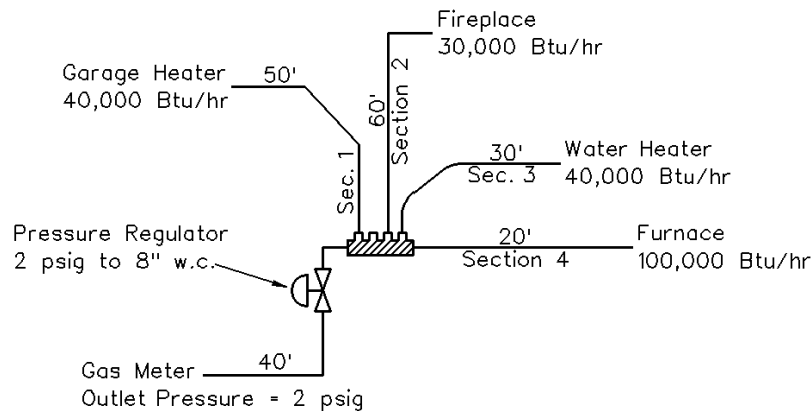
Section 2: 40' of pipe at 45 cfh = **1/2" copper tubing.**

Section 3: 50' of pipe at 40 cfh = **1/2" copper tubing.**

Section 4: 45' of pipe at 80 cfh = **5/8" copper tubing.**

EXAMPLE #3 – HYBRID OR DUAL PRESSURE SYSTEMS

Determine the required pipe size of each section of the fuel line system as shown. All piping is corrugated stainless steel tubing (CSST).



**** Pipe sized using the hybrid method shall be sized as follows ****

- a) The pipe size of each section of high-pressure piping shall be determined using the longest length of piping from the point of delivery to the most remote line pressure regulator.
- b) The pipe size from the line pressure regulator to each outlet shall be determined using the length of piping from the regulator to the most remote outlet served by the regulator.

1. Piping from gas meter to manifold

The length from the meter to the manifold is 40' with a total load as follows.

Total gas load of connected appliances = 40 cfh + 30 cfh + 40 cfh + 100 cfh = 210 cfh

Using Table 3.1 for CSST piping with an allowable pressure drop of 1 psig, 1/2" will pass 297 cfh so **the section of pipe from the gas meter to the manifold shall be 1/2" CSST.**

2. Section 1

The length of pipe in section 1 is 50' with a total connected load of 40 cfh.

Using Table 3.4 with an allowable drop of 3.0" w.c. **Section 1 will require 3/8" CSST**

3. Size the remaining pipe sections

Section 2: 60' of pipe at 30 cfh = **3/8" CSST**

Section 3: 30' of pipe at 40 cfh = **3/8" CSST**

Section 4: 20' of pipe at 100 cfh = **1/2" CSST**

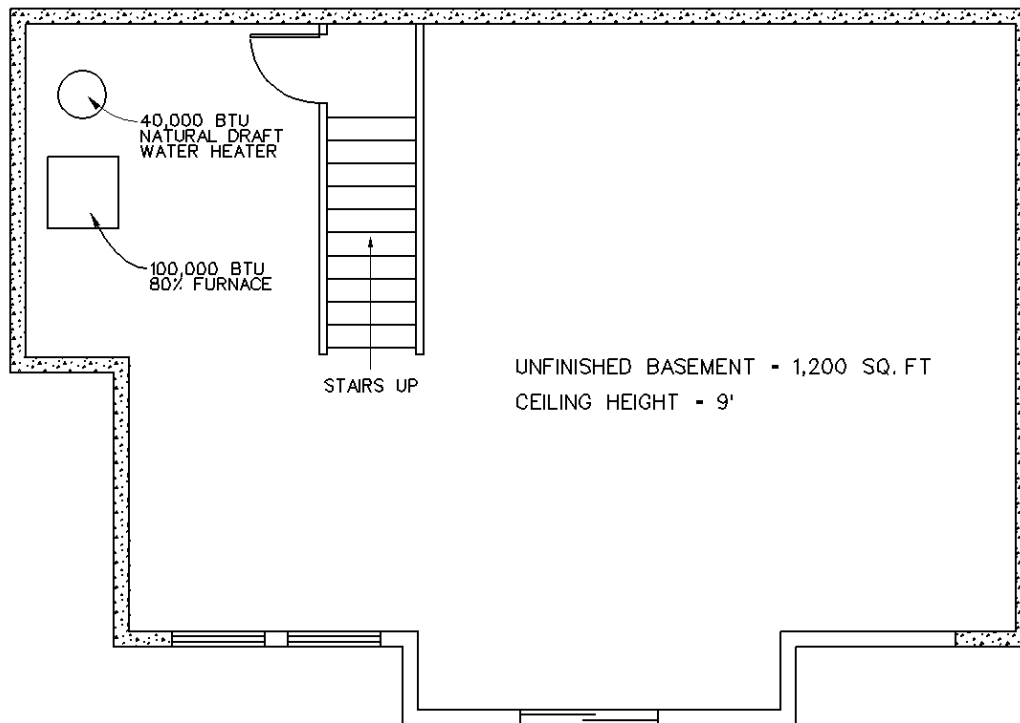
4. Size Regulator

Consult Maxitrol Regulator sizing to properly size the pressure regulator. Remember to check not only the total capacity of the regulator, but also the largest single appliance served by the regulator.

A **Maxitrol 325-3L** can pass a maximum of 250 cfh and supply a single appliance no greater than 140 cfh, so this regulator is adequate.

EXAMPLE #4 – COMBUSTION AIR CALCULATION

Does the following basement provide enough combustion air for the gas appliances shown? If not, what method(s) could be used to provide enough air?



1. CALCULATE REQUIRED VOLUME FOR PROPER COMBUSTION AIR

- National Fuel Gas Code, Section 9.3.2.1 requires 50ft³ per 1,000 BTU/hr

$$\frac{40,000 \text{ Btuh Water Heater} + 100,000 \text{ Btuh Furnace}}{1,000} * 50 \text{ cubic feet} = 7,000 \text{ cubic feet}$$

2. CALCULATE AVAILABLE VOLUME IN BASEMENT

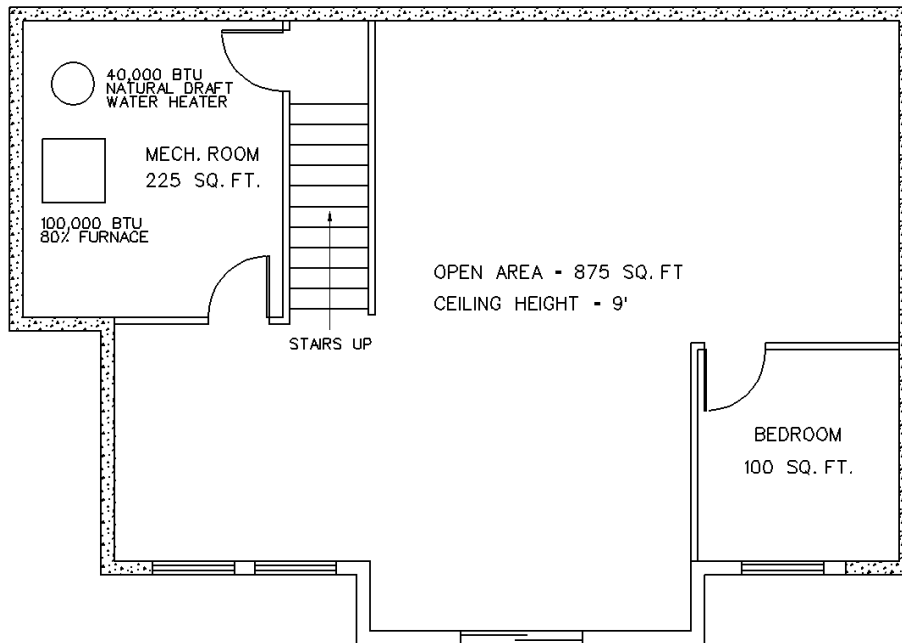
- Multiply the area of the room by the ceiling height.

$$1,200 \text{ sq. feet} * 9 \text{ foot high ceiling} = 10,800 \text{ cubic feet}$$

Basement area satisfies requirements for combustion air

EXAMPLE #5 – PROVIDING SUPPLEMENTARY COMBUSTION AIR

Does the following basement provide enough combustion air for the gas appliances shown? If not, what method(s) could be used to provide enough air to the mechanical room?



From example problem #1, we know the required volume for adequate combustion air is 7,000 cubic feet

1. CALCULATE AVAILABLE VOLUME IN MECHANICAL ROOM

225 sq. feet * 9 foot ceiling height = 2,025 cubic feet

**** Mechanical Room alone does not provide enough combustion air ****

2. USING INDOOR AIR TO PROVIDE THE REQUIRED AMOUNT OF COMBUSTION AIR

a) Two Openings

- Calculate available volume in basement minus the finished off bedroom

(875 sq. feet + 225 sq. feet) * 9 foot ceiling height = 9,900 cubic feet

**** Basement provides enough combustion air ****

- Calculate size of openings

Code requires a High and Low opening sized with a **free area** of 1 sq. inch per 1,000 btuh, but not less than 100 sq. inches (Roughly a 14" x 10" Minimum sized grille). For indoor air, we need to size openings based on the full load.

1 sq. inch * (100,000 btuh + 40,000 btuh) / 1,000 btuh = 140 sq. inches

- Metal Grilles are assumed to have a free area of 75%

Metal Grill Size = 140 sq. inches / 0.75 = 186 sq. inches

This equates to a 10" x 20" grill installed high & low

b) **One Opening (combing spaces on different floors)**

- **Calculate size of opening**

Code requires a single opening to be sized with a free area of 2 sq. inches per 1,000 btuh, connected by one or more openings in doors or floors.

$$2 \text{ sq. inches} * (100,000 \text{ btuh} + 40,000 \text{ btuh}) / 1,000 \text{ btuh} = 280 \text{ sq. inches}$$

- **Wood louvers are assumed to have a free area of 25%**

$$\text{Louvered Door Opening} = 280 \text{ sq. inches} / 0.25 = 1120 \text{ sq. inches}$$

A Standard 80" x 32" will provide roughly 1700 sq. inches of louvered area

3. **USING OUTDOOR AIR TO PROVIDE THE REQUIRED AMOUNT OF COMBUSTION AIR**

a) **Outdoor Air Only**

- **Calculate size of opening**

Code requires a single, high opening to be sized with a free area of 1 sq. inch per 3,000 btuh

$$1 \text{ sq. inch} * (100,000 \text{ btuh} + 40,000 \text{ btuh}) / 3,000 \text{ btuh} = 46.7 \text{ sq. inches}$$

This equates to a 8" round opening

b) **Combination Indoor & Outdoor Air**

Code allows the volume of the indoor mechanical room to be used, which may help reduce the size of the outdoor opening.

- **Contribution of mechanical room volume**

The mechanical room provides 2,025 cubic feet, which equates to 28.9% of the required volume as calculated.

$$2,025 \text{ cubic feet} / 7,000 \text{ cubic feet} = 28.9\%$$

- **Calculate size of opening**

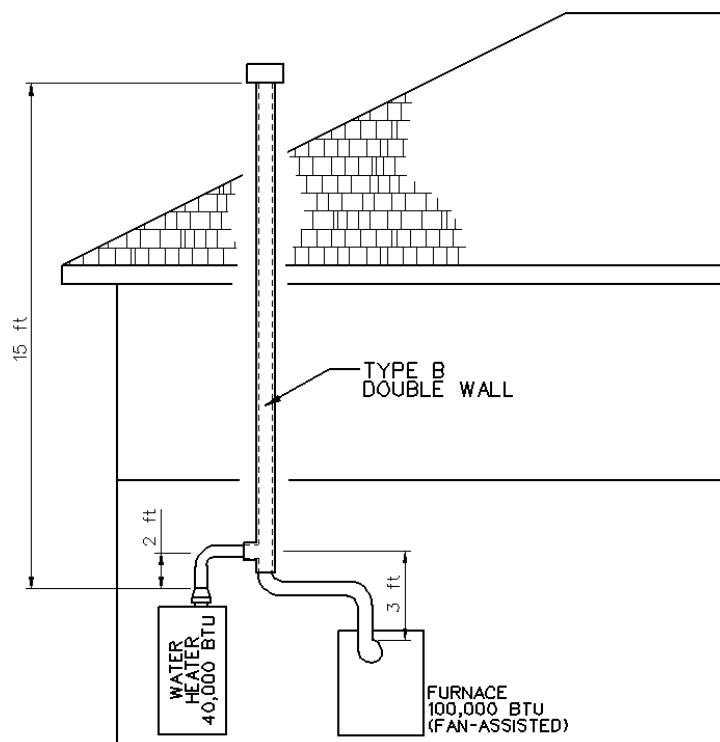
Inside volume provides 28.9% of the necessary combustion air, so the outside duct can be reduced by this percentage.

$$46.7 \text{ sq. inches} * (1.00 - 0.289) = 33.2 \text{ sq. inches}$$

This equates to a 7" round opening

EXAMPLE #6 – TYPICAL RESIDENTIAL VENTING CONFIGURATION

Size the vent connectors and common vent for the following vent system.



1. VENT CONNECTOR FOR WATER HEATER & FURNACE

a) **Water Heater:** Check single wall connector first using Table 6.2.

- 4" single wall connector Nat. Max. with 2 foot of rise will pass 62,000 btuh

A 4" single wall connector is required

b) **Furnace:** Check single wall connector first using Table 6.2

- 4" Single wall has a Fan Min. of 87,000 btuh and Fan Max. of 100,000 btuh

A 4" single wall connector is required

2. COMMON VENT

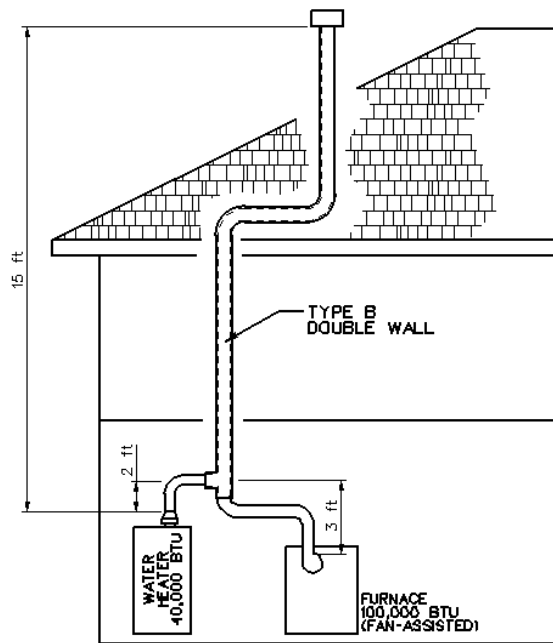
Use Table 6.2 for Multiple Appliances with a single wall connector.

- 5" common vent Fan + Nat will pass a maximum of 159,000 Btuh.

A 5" double wall common vent is required.

EXAMPLE #7 – COMMON STACK OFFSETS

Size the vent connectors and common vent for the following vent system.



1. VENT CONNECTOR FOR WATER HEATER & FURNACE

a) **Water Heater:** Check single wall connector first using Table 6.2.

- 4" single wall connector Nat. Max. with 2 foot of rise will pass 62,000 btuh

A 4" single wall connector is required

b) **Furnace:** Check single wall connector first using Table 6.2

- 4" Single wall has a Fan Min. of 87,000 btuh and Fan Max. of 100,000 btuh

A 4" single wall connector is required

2. COMMON VENT

Use Table 6.2 for Multiple Appliances with a single wall connector.

- 5" common vent Fan + Nat will pass a maximum of 159,000 btuh.
- Account for two 90° elbows in common stack (10% reduction for each elbow)

$$159,000 \text{ btuh} * 0.80 = 127,200 \text{ btuh}$$

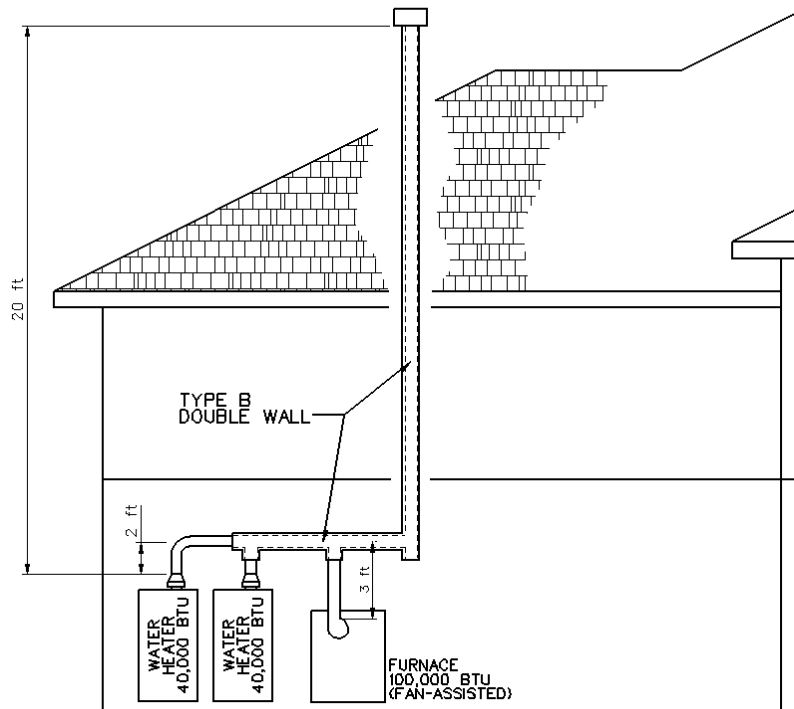
- 6" common vent Fan + Nat will pass a maximum of 221,000 btuh

$$221,000 \text{ btuh} * 0.80 = 176,800 \text{ btuh}$$

A 6" double wall common vent is required

EXAMPLE #8 – VENTING WITH A MANIFOLD

Size the vent connectors and common vent for the following vent system.



1. VENT CONNECTORS FOR WATER HEATERS & FURNACE

a) **Water Heaters:** Check single wall connectors first using Table 6.2.

- 4" single wall connector Nat. Max. with 2 feet of rise will pass 64,000 btuh.

A 4" single wall connector is required for both water heaters

b) **Furnace:** Check single wall connector first using Table 6.2.

- 4" Single wall has a Fan Min. of 87,000 btuh and Fan Max. of 107,000 btuh

A 4" single wall connector is required

2. COMMON VENT

a) **Manifold:** The manifold begins at the tee where the water heaters tie into the stack. Use Table 6.2 for Multiple Appliances with a double wall common vent.

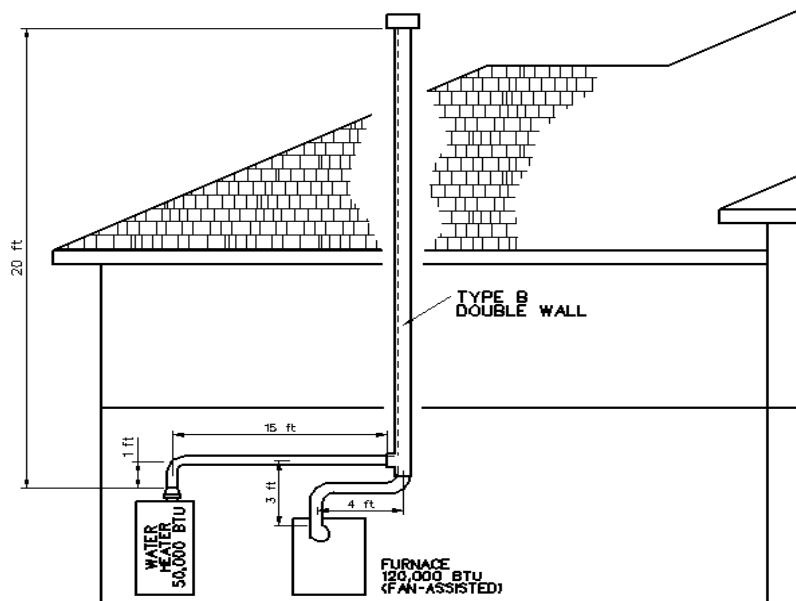
- 6" common vent that is 20' high will pass 247,000 Btu/hour under the Nat + Fan column.
- For manifolds, take a 10% reduction off the common capacity.

$$247,000 \text{ btuh} \times 0.90 = 222,300 \text{ btuh}$$

A 6" double wall common vent is required.

EXAMPLE #9 – VENTING WITH EXCESSIVE CONNECTOR LENGTH

Size the vent connectors and common vent for the following vent system.



1. VENT CONNECTORS FOR WATER HEATER & FURNACE

a) Water Heater: Check single wall connector first using Table 6.2.

- 4" single wall connector Nat. Max. with 1 foot of rise will pass 54,000 btuh
- Connector length at 15 feet would require a 20% reduction.
 $54,000 * 0.80 = 43,200 \text{ btuh.}$
- Increase connector size to 5" which will pass 84,000 btuh and recheck length deduction.
 $84,000 * 0.80 = 67,200 \text{ btuh}$

A 5" single wall connector is required

Options: Increase rise on stack or investigate a double wall connector to reduce diameter.

b) Furnace: Check single wall connector first using Table 6.2

- 4" Single wall has a Fan Min. of 87,000 btuh and Fan Max. of 107,000 btuh – Try a 5" single wall
- 5" Single wall has a Fan Min. of 125,000 btuh and a Fan Max. of 172,000 btuh

A single wall connector will not work for the furnace – go to a double wall connector

Use Table 6.1 for Multiple Appliances with double wall connectors:

- 5" double wall has a Fan Min. of 50,000 btuh and a Fan Max. of 176,000 btuh.

A 5" double wall connector is required

2. COMMON VENT

Use Table 6.2 for Multiple Appliances with a single wall connector.

- 5" common vent Fan + Nat will pass a maximum of 177,000 Btuh.

A 5" double wall common vent is required

FACT SHEET

Natural Gas Appliance Connectors

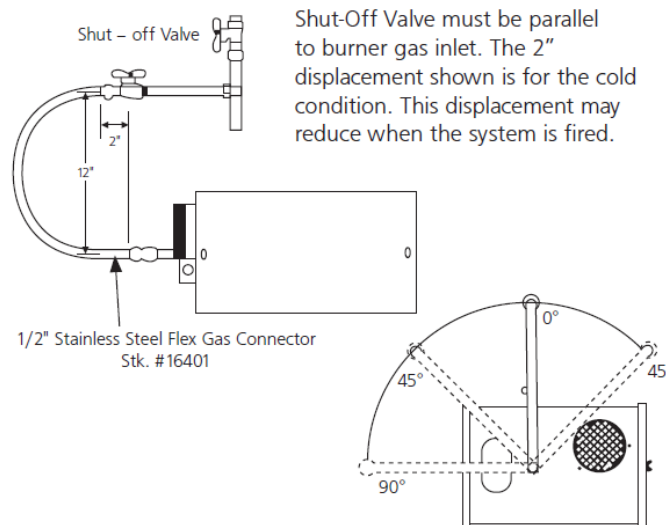
When using natural gas appliance connectors, the following rules & regulations from the 2018 National Fuel Gas Code shall apply:

1. **Commercial Cooking Appliances:** Commercial cooking appliances that are moved for cleaning purposes shall be connected in accordance with the manufacturer's installation instructions using a listed appliance connector complying with *ANSI Z21.69, Connectors for Moveable Gas Appliances*.
2. **Commercial Cooking Appliances with Casters:** Movement of appliances with casters shall be limited by a restraining device.
3. **Suspended Low-Intensity Infrared Tube Heaters:** Shall be connected to the building piping system with a connector listed for the application in accordance with ANSI Z21.24, Connectors for Gas Appliances. When using this connector, the following applies:
 - a. Maximum inlet pressure of **0.5 psig** – **DO NOT INSTALL ON THE 2-PSIG SIDE OF PIPING!**
 - b. Do not reuse a connector.
 - c. Only one connector shall be used per appliance.
 - d. These connectors are not to be used on appliances with casters.
 - e. Cannot be concealed or installed through walls.
 - f. Connector must reach from the gas supply to the appliance without stretching, kinking or twisting.
 - g. Avoid sharp bends smaller than 1-1/2" internal diameter (golf ball size).
 - h. Always follow manufacturer instructions and appliance manufacturer installation instructions.

See examples below for correct installation practices with connectors listed to ANSI Z21.24

Heat Star Low-Intensity Tube Heater by Enerco

- Support all gas piping with suitable pipe hanging materials
- Use wrought iron or wrought steel pipe and malleable iron fittings. All pipe fittings shall be new and free from defects.
- Install the flex gas connector as shown. The flex gas connector accommodates expansion of the heating system and allows for easy installation and service of the burner.

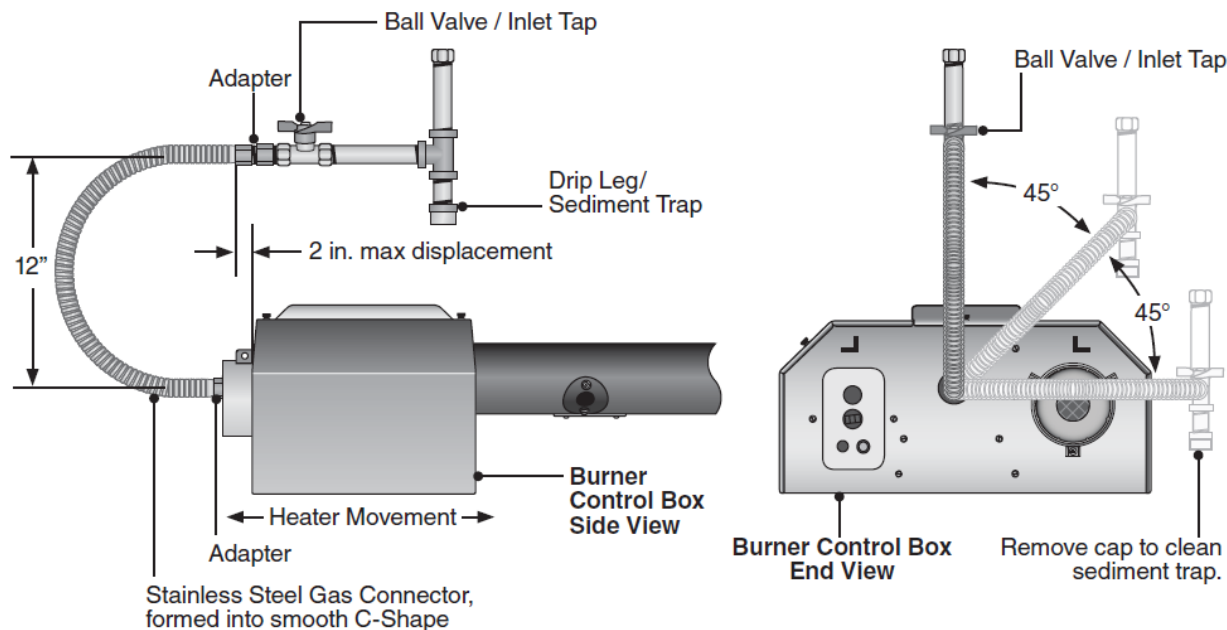


FACT SHEET

Natural Gas Appliance Connectors (continued)

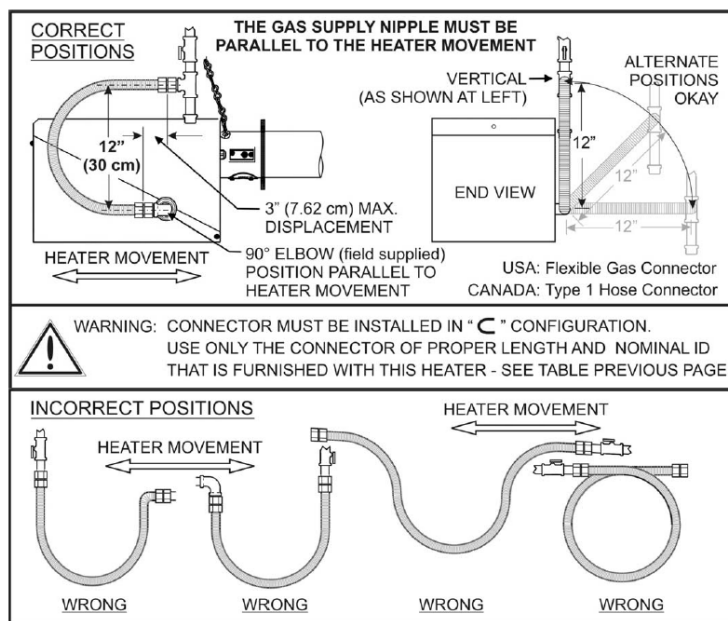
Re-Verber-Ray Low-Intensity Tube Heater

- Form the stainless-steel flexible connector into a smooth C-shape allowing 12 in. between the flexible connector's end nuts.
- When using a stainless-steel flexible connector, do not attach the connector nuts directly to the gas pipe supply. Connector nuts must be installed to an approved adapter.



InfraSave Low-Intensity Tube Heater

- The flexible gas connector MUST be installed in the orientation shown below as required by national installation codes and by the certification standard of this heater. This orientation protects the flexible gas connector from damage due to movement during heater expansion.
- It is the responsibility of the installer to ensure correct installation of the flexible gas supply.



FACT SHEET

Vent Termination Guidelines

2018 National Fuel Gas Code Requirements

(underlined text indicates a revision to the code from the previous version)

12.9.1 A mechanical draft venting system shall terminate at least 3 ft above any forced air inlet located within 10 ft.

Exception No. 1: This provision shall not apply to the combustion air intake of a direct-vent appliance.

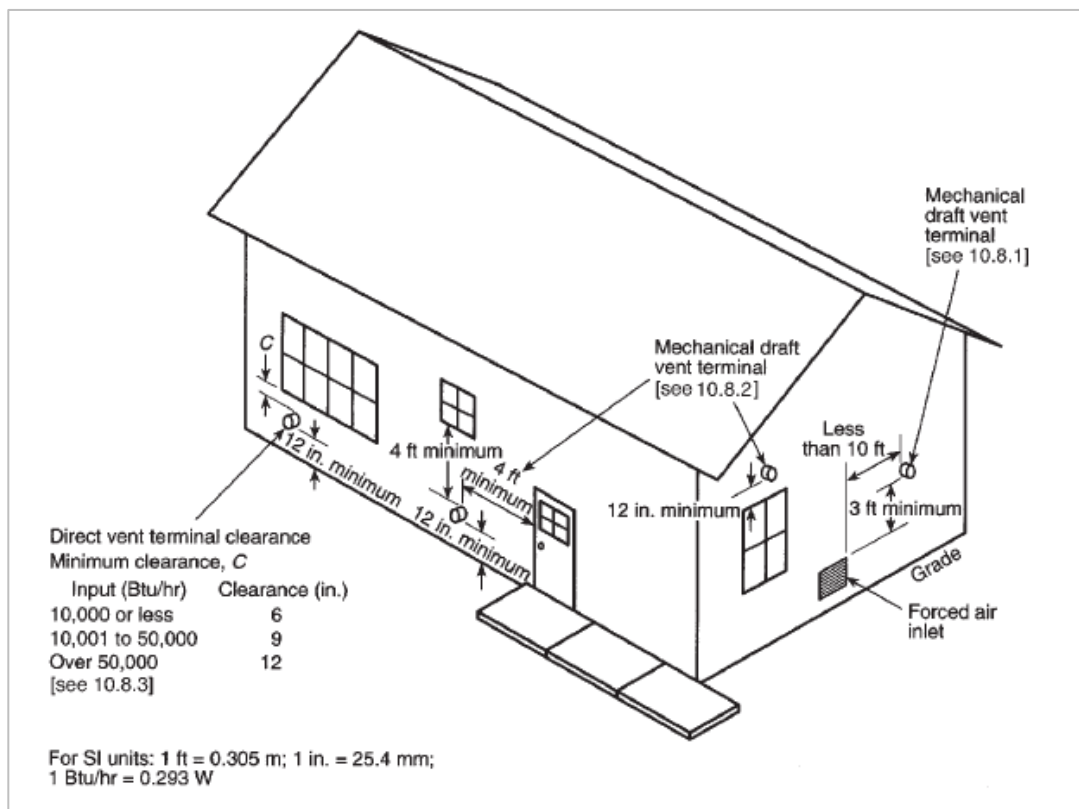
Exception No. 2: This provision shall not apply to the separation of the integral outdoor air inlet and flue gas discharge of listed outdoor appliances.

12.9.2 A mechanical draft venting system of other than direct-vent type shall terminate at least 4 ft below, 4 ft horizontally from, or 1 ft above any door, operable windows, or gravity air inlet into any building. The bottom of the vent terminal shall be located at least 12 in. above finished ground level.

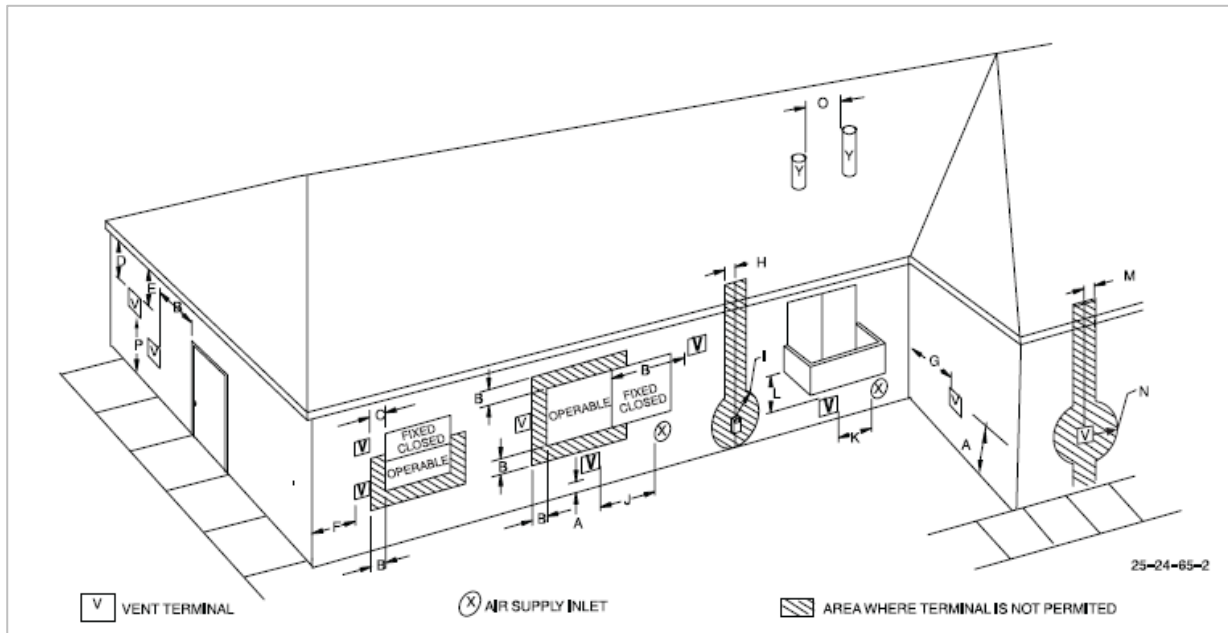
12.9.4 Through-the-wall vents for Category II and Category IV appliances and noncategorized condensing appliances shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves or other equipment.

12.9.6 Vent systems for Category IV appliances that terminate through an outside wall of a building and discharge flue gases perpendicular to the adjacent wall shall be located not less than 10 ft horizontally from an operable opening in an adjacent building.

Exception: This shall not apply to vent terminals that are 2 ft or more above or 25 ft or more below operable openings.



! THE FOLLOWING TABLE GIVES TYPICAL INDUSTRY STANDARDS FOR VENT TERMINAL CLEARANCES. ALWAYS CONSULT THE APPLIANCE INSTALLATION MANUAL FOR EXACT VENTING & CLEARANCE REQUIREMENTS.



Item	Clearance Description	Direct Vent	Other Than Direct Vent
A	Clearance above grade, veranda, porch, deck, balcony or anticipated snow level	12 inches	12 inches
B	Clearance to a window or door that may be opened	9 inches for appliances > 10,000 Btuh and < 50,000 Btuh. 12 inches for appliances > 50,000 Btuh	4 feet below or to the side of the opening. 1 foot above the opening
C	Clearance to permanently closed window	12 inches	12 inches
D	Vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2 feet from the centerline of the terminal	Equal to or greater than soffit depth	Equal to or greater than soffit depth
E	Clearance to unventilated soffit	Equal to or greater than soffit depth	Equal to or greater than soffit depth
F	Clearance to an outside corner	No Minimum	No Minimum
G	Clearance to an inside corner	3 feet	3 feet
H	Clearance to each side of the centerline extended above electrical meter or gas service regulator assembly	3 feet	3 feet within 15 feet above the meter / regulator assembly
I	Clearance to service regulator vent outlet	3 feet	*
J	Clearance to a non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	9 inches for appliances > 10,000 Btuh and < 50,000 Btuh. 12 inches for appliances > 50,000 Btuh	4 feet below or to the side of the opening. 1 foot above the opening
K	Clearance to a mechanical air supply inlet	3 feet above inlet if terminal is located within 10 feet horizontally of inlet.	3 feet above inlet if terminal is located within 10 feet horizontally of inlet.
L	Clearance under a veranda, porch, deck or balcony	12 inches	12 inches
M	Clearance to each side of the centerline extended above or below vent terminal of the furnace to a dryer or water heater vent, or other appliance's direct vent intake or exhaust	12 inches	12 inches
N	Clearance to the vent terminal of a dryer vent, water heater vent, or other appliances direct vent intake or exhaust	3 feet	*
O	Clearance from a plumbing vent stack	3 feet	*
P	Clearance above a paved sidewalk or paved driveway located on public property	7 feet	7 feet

* For clearances not specified in ANSI Z223.1/NFPA 54, clearances shall be in accordance with the local installation codes and the requirements of the gas supplier and the manufacturer's installation instructions.

FACT SHEET

Asbestos-Cement Chimneys (Transite Pipe)

Transite originated as a brand that Johns Manville, an American company, created in 1929 for a line of asbestos-cement products, including boards and pipes. Over time it became a generic term for other companies' similar asbestos-cement products. Originally, transite had between 12-50% of asbestos fiber added to a cement base to provide tensile strength (similar to the rebar in reinforced concrete), and other materials. Frequent uses included:

- Furnace flues
- Roof shingles
- Siding, soffit and fascia panels, and wallboard for areas where fire retardancy is particularly important.
- Roof drain piping
- Water piping
- Sanitary sewer drain piping
- HVAC ducts

Because cutting, breaking, and machining asbestos-containing transite releases carcinogenic asbestos fibers into the air, its use has fallen out of favor. Despite asbestos-containing transite being phased out by 1980, it is still not banned in the United States.

In use as a gas-fired appliance chimney/vent, transite pipe may have been classed as a type "B" flue vent which required 1" clearance from combustibles. However, the fire clearance required for transite pipe or cement-asbestos pipe flues and chimneys varied from 1" to 3" and limited temperatures to 330° to 550°F depending on the clearance. Transite pipe chimneys may become soft with age and exposure to weather, leading to swollen chimney sides and even chimney internal collapse.

Examples of Transite Pipe



FACT SHEET

Selection of Plastic Vent Materials

This fact sheet provides an overview of the requirements for the selection of plastic vent materials based on ANSI Z223.1/NFPA 54, National Fuel Gas Code – 2021 (NFGC). The vent requirements in previous code editions, in local jurisdictions, or in specific situations, may differ.

NFGC REQUIREMENTS

The NFGC allows the use of plastic vent materials for specific appliance types. The relevant requirements in the 2021 NFGC are contained in Section 12.5 as follows:

12.5 Type of Venting System to Be Used. Category II, Category III, and Category IV appliances shall be as specified or furnished by manufacturers of listed appliances

12.5.2 Plastic Piping. Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer or shall be listed and labeled in accordance with ANSI/UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*.

12.5.3 Plastic Vent Joints. Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions. Plastic pipe venting materials listed and labeled in accordance with ANSI/UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*, shall be installed in accordance with the vent manufacturer's installation instructions. Where primer is required, it shall be of a contrasting color.

12.5.4 Special Gas Vent. Special gas vent shall be listed and labeled in accordance with ANSI/UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*, and installed in accordance with the special gas vent manufacturer's installation instructions.

USE OF PLASTIC VENTS

Plastic venting systems are commonly used with condensing boilers, furnaces, tankless water heaters, and mechanically vented tanked water heaters. These appliances are listed as Category II, III, and IV appliances. The NFGC allows the use of plastic piping and special vent as the vent where the appliance is listed for use with the plastic piping or special vent and it is installed in accordance with the listed appliance manufacturer installation instructions. Some listed special vents can also be made of plastic materials. The appliance instructions will include the allowed type of plastic pipe material or special vent and will specify the specific standards for that pipe or special vent. The instructions will also contain sizing criteria and provide vent system construction requirements for plastic pipe. Where a plastic special vent is specified by the appliance manufacturer, the vent manufacturers installation instructions must be followed.

The NFGC requires that the selected plastic pipe and fittings be either labeled in accordance with the appropriate ASTM standard, or where the manufacturer specifies a UL 1738 plastic venting system, the venting system must be listed and labeled in accordance with UL 1738. The labeling requirement is designed for inspection purposes to help ensure that the correct plastic pipe material or plastic venting system has been installed.

The plastic pipe or special vent are specified by the appliance manufacturer to ensure that the pipe or vent can perform under the appliance's vent temperature and pressure conditions. To pass the appliance certifying standard the appliance manufacture is required to have the appliance and the pipe or vent tested together. The listed appliance's installation instructions are required to provide a list of the vent materials that have been certified for use with the appliance.

THE USE OF PVC, CPVC, and ABS

Many appliance manufacturers permit the use of PVC (Poly-Vinyl Chloride), CPVC (Chlorinated Poly-Vinyl Chloride) and ABS (Acrylonitrile-Butadiene-Styrene) plastic pipe, depending on the appliance's designed exhaust gas temperature. The appropriate service temperatures for these plastics are: PVC – 150° F; CPVC – 190° F; and ABS – 180° F.

Selection of Plastic Vent Materials (continued)

While PVC, CPVC, and ABS are not listed as vent materials, their use in vent systems has been proven to be acceptable and durable. All plastics that are to be specified for use with the appliance being certified are tested with the appliance in accordance with the appropriate ANSI appliance standards.

Common pipe standards specified for these plastics include:

PVC:

- ASTM D2241 – SDR Series
- ASTM D1785 – Schedule 40
- ASTM D2665 – DWV

CPVC:

- ASTM F441 – Schedule 40
- ASTM F442 – SDR Series

ABS:

- ASTM D1527 – Schedule 40
- ASTM D2661 – Schedule 40 DWV

The pipe material standards specify the fittings and the pipe cement to be used. Vent systems are constructed using one of the specified pipe, matching fittings, and the appropriate cement.

UL 1738 PLASTIC VENTS

UL 1738 is a complete venting system standard containing requirements that cover venting systems intended for venting Category II, III, or IV gas-burning appliances. UL 1738 specifically addresses the construction requirements, test performance criteria, marking requirements, and installation and maintenance instructions of the vent system. Vent systems listed to UL 1738 can be plastic or metallic, flexible or rigid, and can be single wall or concentric vent systems.

For use in U.S. installations, a UL 1738 vent system may be used only where the appliance manufacturer's installation instructions allow the use of such a vent system. The appliance instructions will specify the type of system (plastic, metal, flexible, rigid, etc.)

Polypropylene is a common plastic material used in plastic vent systems listed to UL 1738. The maximum heat service temperature of polypropylene is appropriately 230° F for gas-fired appliances. The listed vent system includes all pipe, fittings, and connecting means. The NFGC requires that where UL 1738 vent systems are installed that they be labeled and installed in accordance with the vent manufacturer's installation instructions.

FACT SHEET

3-Foot Distance to Ignition Source

This fact sheet chronicles the origin of the National Fuel Gas Code (NFGC) requirements for the 3-ft distance between a source of ignition to either a gas meter (pre 2009 edition) or a line gas pressure regulator vent outlet (2009 to current edition).

The 3-ft requirement in the NFGC applies to customer owned line gas pressure regulators. The location of gas meters and service regulators owned by the Metropolitan Utilities District are covered by their operating procedures in accordance with federal regulations.

This fact sheet also includes the results of a recent GTI project that evaluates the 3-ft distance to sources of ignition and building openings.

National Fuel Gas Code Requirements

Since 2009, the NFGC has required a 3-ft distance between a source of ignition and the outlet of a vent connected to a line gas pressure regulator. The relevant requirements in the 2024 NFGC are contained in Section 5.8.5 as follows:

5.8.5 Venting.

5.8.5.1 Line Gas Pressure Regulators.

- (3) The regulator vent shall terminate at least 3 ft (0.9 m) from a source of ignition.

The code in prior editions applied the 3-ft requirement to the gas meter. The code was revised since the gas regulator is more likely than a meter to develop small internal leaks or were normal regulator operation will release gas from the vent outlet.

3-foot Distance Origin & History

The NFGC was first published in 1974. Predecessor NFGC documents have been traced back to 1927. The requirements that protect a gas meter from heat sources or sources of ignition exist from the earliest document. However, no actual distance was specified.

A possible reason why meters were of concern was due to the types in use at that time and their construction. Residential meters typically had sheet metal housing, and their bellows were made of materials that likely degraded quicker. Both construction elements likely resulted in a higher potential for leakage at the meter location.

The 3-ft requirement was not specified until the NFGC was published in 1974. The 1974 edition was created from two existing installation standards, Z21.30/NFPA 54 for residential and commercial, and Z83.1 for industrial, with editorial additions to join the two. The 3-ft requirement was applied to industrial gas meter installations since it came from Z83.1. The 1974 NFGC had no specific residential and commercial gas meter distances nor any requirement for a meter installation to be protected from heat or ignition sources. The lack of residential/commercial requirements is traced to Z21.30/NFPA 54, which assumed the gas serving utility will properly locate the meter and that utility meter is outside of the NFGC scope.

The 1980 NFGC was a complete reorganization and rewrite, integrating its residential, commercial and industrial requirements, with updates for contemporary installation practices and standards. It was with the 1980 edition that the 3-ft requirement was applied to all meters. There is no written record explaining why the 3-ft requirement was applied to residential and commercial meters.

The next big change occurred in 2009 when the 3-ft requirement was applied to the line gas pressure regulator outlet and removed from the gas meter.

Technical Origins

The NFGC basis of the 3-ft distance came from the Z83.1-1968, Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises. However, an explanation for selecting 3-ft was not found in the written records reviewed.

Federal Regulations

Federal regulations require that a gas meter is installed inside a building be located in a ventilated place, have a 3-ft distance from any source of ignition, and also that it be placed away from any heat source that might damage the meter. There is no federal requirement that the utility meter installed outside have a 3-ft distance. All vents from the service regulator must terminate in a location where the gas can escape freely into the atmosphere and be placed away from any building opening⁴. No minimum distance is specified.

Serving gas utilities are required to maintain operating procedures that meet the federal regulations. Utilities often review other pertinent industry codes and standards including the NFGC in evaluating minimums for their procedures. Many utilities have set a 3-ft minimum distance to a source of ignition for both indoor and outdoor meters and regulators based on the NFGC's 3-ft requirement.

Recent 3-ft Technical Evaluation

The technical basis for establishing a 3-ft distance was either not recorded or the written source not uncovered. GTI undertook a project⁵ with "The objective to provide the utilities with knowledge and supported options regarding the placement of meter sets⁶. Clearance distances from various sources of ignition and house openings have been in place for many years. However, no data or other information exist on why and how these clearance distances were determined."

While the project was intended for utility owned meter sets, the results appropriate to the anticipated conditions addressed by the 3-ft requirement in the NFGC can be applied to customer owned regulator vent outlets.

The research looked at three leakage rates to simulate likely leakage scenarios at a utility meter set:

- Low: 0.25 psig and 1/16 diameter pinhole, resulting in a leak rate of about 3 SCFH. Also, a test of a small continuous leak in a regulator at a leak rate of 1 SCFH to simulate a rate associated with a small periodic venting of a vent-limited regulator.
- Medium: 0.25 psig and 1/8 diameter pinhole, resulting in a leak rate of about 11 SCFH. Also, a test of gas readings around a continuously leaking regulator with an upstream pressure of 55 psig.
- High: Simulate leaks in the upstream line at 55 psig.

The low and medium leakage rates that simulate regulator leakage fit the anticipated operating conditions at the regulator outlet that the NFGC's 3-ft requirement is meant to address. The high leakage rate simulates a large leakage event that may occur when significant meter set damage occurs. The NFGC and federal regulations contains requirements for the prevention of such damage.