(3) Outlets shall be located far enough from floors, walls, patios, slabs, and ceilings to permit the use of wrenches without straining, bending, or damaging the piping.

(4) The unthreaded portion of gas piping outlets shall extend not less than 1 inch (25.4 mm) through finished ceilings or indoor or outdoor walls.

(5) The unthreaded portion of gas piping outlets shall extend not less than 2 inches (51 mm) above the surface of floors or outdoor patios or slabs.

(6) The provisions of Section 1310.10(4) and Section 1310.10(5) shall not apply to listed quick-disconnect devices of the flush-mounted type or listed gas convenience outlets. Such devices shall be installed in accordance with the manufacturer's installation instructions. [NFPA 54:7.7.1.1 – 7.7.1.6]

» **1310.10.1 Cap Outlets.** Each outlet, including a valve, shall be closed gastight with a threaded plug or cap immediately after installation and shall be left closed until the appliance or equipment is connected thereto. When an appliance or equipment is disconnected from an outlet and the outlet is not to be used again immediately, it shall be capped or plugged gastight.

Exceptions:

(1) Laboratory appliances installed in accordance with Section 1312.3.1 shall be permitted.

(2) The use of a listed quick-disconnect device with integral shutoff or listed gas convenience outlet shall be permitted. [NFPA 54:7.7.2.1]

» **1310.10.1.1 Appliance Shutoff Valves.** Appliance shutoff valves installed in fireplaces shall be removed and the piping capped gastight where the fireplace is used for solid fuel burning. [NFPA 54:7.7.2.2]

→ **1310.11 Manual Gas Shutoff Valves.** An accessible gas shutoff valve shall be provided upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve shall not be required at the second regulator. [NFPA 54:7.8.1]

1310.11.1 Valves Controlling Multiple Systems. Main gas shutoff valves controlling several gas piping systems shall be readily accessible for operation and installed so as to be protected from physical damage. They shall be marked with a metal tag or other permanent means attached by the installing agency so that the gas piping systems supplied through them can be readily identified. [NFPA 54:7.8.2.1]

1310.11.1.1 Shutoff Valves for Multiple House Lines. In multiple-tenant buildings supplied through a master meter, through one service regulator where a meter is not provided, or where meters or service regulators are not readily accessible from the appliance or equipment location, an individual shutoff valve for each apartment or tenant line shall be provided at a convenient point of general accessibility. In a common system serving a number of individual buildings, shutoff valves shall be installed at each building. [NFPA 54:7.8.2.2]

1310.11.2 Emergency Shutoff Valves. An exterior shutoff valve to permit turning off the gas supply to each building in an emergency shall be provided. The emergency shutoff valves shall be plainly marked as such and their locations posted as required by the Authority Having Jurisdiction. [NFPA 54:7.8.2.3]

1310.11.3 Shutoff Valve for Laboratories. Each laboratory space containing two or more gas outlets installed on tables, benches, or in hoods in educational, research, commercial, and industrial occupancies shall have a single shutoff valve through which all such gas outlets are supplied. The shutoff valve shall be accessible, located within the laboratory or adjacent to the laboratory's egress door, and identified. [NFPA 54:7.8.2.4]

1310.12 Prohibited Devices. Devices shall not be placed within the interior of gas piping or fittings where such devices reduce the cross-sectional area or otherwise obstruct the free flow of gas, except where allowance in the piping system design has been made for such devices. [NFPA 54:7.9]

1310.13 Systems Containing Gas-Air Mixtures Outside the Flammable Range. Where gas-air mixing machines are employed to produce mixtures above or below the flammable range, they shall be provided with stops to prevent adjustment of the mixture to within or approaching the flammable range. [NFPA 54:7.10]

1310.14 Systems Containing Flammable Gas-Air Mixtures. Systems containing flammable gas-air mixtures shall be in accordance with Section 1310.14.1 through Section 1310.14.6.

1310.14.1 Required Components. A central premix system with a flammable mixture in the blower or compressor shall consist of the following components:

(1) Gas-mixing machine in the form of an automatic gas-air proportioning device combined with a downstream blower or compressor.

(2) Flammable mixture piping, minimum Schedule 40.

(3) Automatic firecheck(s).

(4) Safety blowout(s) or backfire preventers for systems utilizing flammable mixture lines above 2½ inches (64 mm) nominal pipe size or the equivalent. [NFPA 54:7.11.1]

1310.14.2 Optional Components. The following components shall also be permitted to be utilized in any type of central premix system:

(1) Flowmeter(s)

(2) Flame arrester(s) [NFPA 54:7.11.2]

1310.14.3 Additional Requirements. Gas-mixing machines shall have nonsparking blowers and shall be constructed so that a flashback does not rupture machine casings. [NFPA 54:7.11.3]

1310.14.4 Special Requirements for Mixing Blowers. A mixing blower system shall be limited to applications with minimum practical lengths of mixture piping, limited to a maximum mixture pressure of 10 inches water column (2.5 kPa) and limited to gases containing no more than 10 percent hydrogen. The blower

shall be equipped with a gas control valve at its air entrance arranged so that gas is admitted to the airstream, entering the blower in proper proportions for correct combustion by the type of burners employed, the said gas control valve being of either the zero governor or mechanical ratio valve type that controls the gas and air adjustment simultaneously. No valves or other obstructions shall be installed between the blower discharge and the burner or burners. [NFPA 54:7.11.4]

1310.14.5 Installation of Gas-Mixing Machines. Installation of gas-mixing machines shall comply with the following:

(1) The gas-mixing machine shall be located in a well-ventilated area or in a detached building or cutoff room provided with room construction and explosion vents in accordance with sound engineering principles. Such rooms or below-grade installations shall have adequate positive ventilation.

(2) Where gas-mixing machines are installed in well-ventilated areas, the type of electrical equipment shall be in accordance with NFPA 70 for general service conditions unless other hazards in the area prevail. Where gas-mixing machines are installed in small detached buildings or cutoff rooms, the electrical equipment and wiring shall be installed in accordance with NFPA 70 for hazardous locations (Articles 500 and 501, Class I, Division 2).

(3) Air intakes for gas-mixing machines using compressors or blowers shall be taken from outdoors wherever practical.

(4) Controls for gas-mixing machines shall include interlocks and a safety shutoff valve of the manual reset type in the gas supply connection to each machine arranged to automatically shut off the gas supply in the event of high or low gas pressure. Except for open burner installations only, the controls shall be interlocked so that the blower or compressor stops operating following a gas supply failure. Where a system employs pressurized air, means shall be provided to shut off the gas supply in the event of air failure.

(5) Centrifugal gas-mixing machines in parallel shall be reviewed by the user and equipment manufacturer before installation, and means or plans for minimizing the effects of downstream pulsation and equipment overload shall be prepared and utilized as needed. [NFPA 54:7.11.5.1 – 7.11.5.5]

1310.14.6 Use of Automatic Firechecks, Safety Blowouts, or Backfire Preventers. Automatic firechecks and safety blowouts or backfire preventers shall be provided in piping systems distributing flammable air-gas mixtures from gas-mixing machines to protect the piping and the machines in the event of flashback, in accordance with the following:

(1) Approved automatic firechecks shall be installed upstream as close as practical to the burner inlets following the firecheck manufacturer's instructions.

(2) A separate manually operated gas valve shall be provided at each automatic firecheck for shutting off the flow of the gas-air mixture through the firecheck after a flashback has occurred. The valve shall be located upstream as close as practical to the inlet of the automatic firecheck.

Caution: These valves shall not be reopened after a flashback has occurred until the firecheck has cooled sufficiently to prevent re-ignition of the flammable mixture and has been reset properly.

(3) A safety blowout or backfiring preventer shall be provided in the mixture line near the outlet of each gas-mixing machine where the size of the piping is larger than 2½ inches (65 mm) NPS, or equivalent, to protect the mixing equipment in the event of an explosion passing through an automatic firecheck. The manufacturers' instructions shall be followed when installing these devices, particularly after a disc has burst. The discharge from the safety blowout or backfire preventer shall be located or shielded so that particles from the ruptured disc cannot be directed toward personnel. Wherever there are interconnected installations of gas-mixing machines with safety blowouts or backfire preventers, provision shall be made to keep the mixture from other machines from reaching any ruptured disc opening. Check valves shall not be used for this purpose.

(4) Large-capacity premix systems provided with explosion heads (rupture discs) to relieve excessive pressure in pipelines shall be located at and vented to a safe outdoor location. Provisions shall be provided for automatically shutting off the supply of the gas-air mixture in the event of rupture. [NFPA 54:7.11.6]

1311.0 Electrical Bonding and Grounding.

1311.1 Pipe and Tubing Other than CSST. Each above-ground portion of a gas piping system, other than CSST, that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path. Gas piping, other than CSST, shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance. [NFPA 54:7.12.1]

1311.2 Bonding of CSST Gas Piping. CSST gas piping systems, and gas piping systems containing one or more segments of CSST, shall be electrically continuous and bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system. [NFPA 54:7.12.2]

1311.2.1 Bonding Jumper Connection. The bonding jumper shall connect to a metallic pipe, pipe fitting, or CSST fitting. [NFPA 54:7.12.2.1]

1311.2.2 Bonding Jumper Size. The bonding jumper shall not be smaller than 6 AWG copper wire or equivalent. [NFPA 54:7.12.2.2]

1311.2.3 Bonding Jumper Length. The length of the jumper between the connection to the gas piping system and the grounding electrode system shall not exceed 75 feet

(22 860 mm). Any additional grounding electrodes installed to meet this requirement shall be bonded to the electrical service grounding electrode system or, where provided, lightning protection grounding electrode system. [NFPA 54:7.12.2.3]

1311.2.4 Bonding Connections. Bonding connections shall be in accordance with NFPA 70. [NFPA 54:7.12.2.4]

1311.2.5 Devices Used for Bonding. Devices used for the bonding connection shall be listed for the application in accordance with UL 467. [NFPA 54:7.12.2.5]

1311.3 Arc-Resistant Jacketed CSST. CSST listed with an arc-resistant jacket or coating system in accordance with CSA LC 1 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 Section 1311.2 shall apply. Arc-resistant jacketed CSST shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance. [NFPA 54:7.12.3]

1311.4 Prohibited Use. Gas piping shall not be used as a grounding conductor or electrode. [NFPA 54:7.12.4]

1311.5 Lightning Protection System. Where a lightning protection system is installed, the bonding of the gas piping shall be in accordance with NFPA 780. [NFPA 54:7.12.5]

1311.6 Electrical Circuits. Electrical circuits shall not utilize gas piping or components as conductors.

Exception: Low-voltage (50V or less) control circuits, ignition circuits, and electronic flame detection device circuits shall be permitted to make use of piping or components as a part of an electric circuit. [NFPA 54:7.13]

1311.7 Electrical Connections. All electrical connections between wiring and electrically operated control devices in a piping system shall conform to the requirements of NFPA 70. [NFPA 54:7.14.1]

1311.7.1 Safety Control. Any essential safety control depending on electric current as the operating medium shall be of a type that shuts off (fail safe) the flow of gas in the event of current failure. [NFPA 54:7.14.2]

1312.0 Appliance and Equipment Connections to Building Piping.

1312.1 Connecting Appliances and Equipment. Appliances and equipment shall be connected to the building piping in compliance with Section 1312.6 through Section 1312.8 by one of the following:

(1) Rigid metallic pipe and fittings.

(2) Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations.

(3) A listed connector in compliance with CSA Z21.24. The connector shall be used in accordance with the manufacturer's installation instructions and shall be in the same room as the appliance. Only one connector shall be used per appliance.

(4) A listed connector in compliance with CSA Z21.75. Only one connector shall be used per appliance.

(5) CSST where installed in accordance with the manufacturer's installation instructions. CSST shall connect only to appliances that are fixed in place.

(6) Listed nonmetallic gas hose connectors in accordance with Section 1312.3.

(7) Unlisted gas hose connectors for use in laboratories and educational facilities in accordance with Section 1312.4. [NFPA 54:9.6.1]

1312.1.1 Commercial Cooking Appliances. Connectors used with commercial cooking appliances that are moved for cleaning and sanitation purposes shall be installed in accordance with the connector manufacturer's installation instructions. Such connectors shall be listed in accordance with CSA Z21.69. [NFPA 54:9.6.1.3]

1312.1.2 Restraining Device. Movement of appliances with casters shall be limited by a restraining device installed in accordance with the connector and appliance manufacturer's installation instructions. [NFPA 54:9.6.1.4]

1312.2 Suspended Low-Intensity Infrared Tube Heaters. Suspended low-intensity infrared tube heaters shall be connected to the building piping system with a connector listed for the application in accordance with CSA Z21.24 as follows:

(1) The connector shall be installed in accordance with the tube heater installation instructions, and shall be in the same room as the appliance.

(2) Only one connector shall be used per appliance. [NFPA 54:9.6.1.5]

1312.3 Use of Nonmetalic Gas Hose Connectors. Listed gas hose connectors shall be used in accordance with the manufacturer's installation instructions and in accordance with Section 1312.3.1 or Section 1312.3.2. [NFPA 54:9.6.2]

1312.3.1 Indoor. Indoor gas hose connectors shall be used only to connect laboratory, shop, and ironing appliances requiring mobility during operation and installed in accordance with the following:

(1) An appliance shutoff valve shall be installed where the connector is attached to the building piping.

(2) The connector shall be of minimum length and shall not exceed 6 feet (1829 mm).

(3) The connector shall not be concealed and shall not extend from one room to another or pass through wall partitions, ceilings, or floors. [NFPA 54:9.6.2(1)]

1312.3.2 Outdoor. Where outdoor gas hose connectors are used to connect portable outdoor appliances, the connector shall be listed in accordance with CSA Z21.54 and installed in accordance with the following:

(1) An appliance shutoff valve, a listed quick-disconnect device, or a listed gas convenience outlet shall be installed where the connector is attached to the supply piping and in such a manner so as to prevent the accumulation of water or foreign matter.

(2) This connection shall be made only in the outdoor area where the appliance is to be used. [NFPA 54:9.6.2(2)]

(3) The connector length shall not exceed 15 feet (4572 mm).

1312.4 Injection (Bunsen) Burners. Injection (Bunsen) burners used in laboratories and educational facilities shall be permitted to be connected to the gas supply by an unlisted hose. [NFPA 54:9.6.3]

1312.5 Connection of Portable and Mobile Industrial Appliances. Where portable industrial appliances or appliances requiring mobility or subject to vibration are connected to the building gas piping system by the use of a flexible hose, the hose shall be suitable and safe for the conditions under which it can be used. [NFPA 54:9.6.4.1]

1312.5.1 Swivel Joints or Couplings. Where industrial appliances requiring mobility are connected to the rigid piping by the use of swivel joints or couplings, the swivel joints or couplings shall be suitable for the service required and only the minimum number required shall be installed. [NFPA 54:9.6.4.2]

1312.5.2 Metal Flexible Connectors. Where industrial appliances subject to vibration are connected to the building piping system by the use of all metal flexible connectors, the connectors shall be suitable for the service required. [NFPA 54:9.6.4.3]

1312.5.3 Flexible Connectors. Where flexible connections are used, they shall be of the minimum practical length and shall not extend from one room to another or pass through any walls, partitions, ceilings, or floors. Flexible connections shall not be used in any concealed location. They shall be protected against physical or thermal damage and shall be provided with gas shutoff valves in readily accessible locations in rigid piping upstream from the flexible connections. [NFPA 54:9.6.4.4]

1312.6 Appliance Shutoff Valves and Connections. Each appliance connected to a piping system shall have an accessible, approved manual shutoff valve with a nondisplaceable valve member, or a listed gas convenience outlet. Appliance shutoff valves and convenience outlets shall serve a single appliance only. [NFPA 54:9.6.5] The shutoff valve shall be located within 6 feet (1829 mm) of the appliance it serves. [NFPA 54:9.6.5.1] Where a connector is used, the valve shall be installed upstream of the connector. A union or flanged connection shall be provided downstream from the valve to permit removal of appliance controls. [NFPA 54:9.6.5.1(A)]

Exceptions:

(1) Shutoff valves serving decorative appliances in a fireplace shall not be located within the fireplace firebox except where the valve is listed for such use. [NFPA 54: 9.6.5.1(B)]

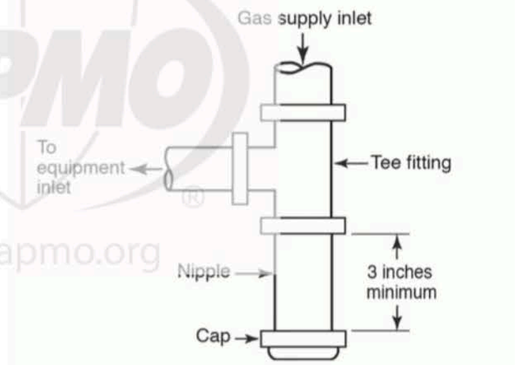
(2) Shutoff valves shall be permitted to be accessibly located inside wall heaters and wall furnaces listed for recessed installation where necessary maintenance is performed without removal of the shutoff valve.

1312.7 Quick-Disconnect Devices. Quick-disconnect devices used to connect appliances to the building piping shall be listed to CSA Z21.41. Where installed indoors, an approved manual shutoff valve with a nondisplaceable valve member shall be installed upstream of the quick-disconnect device. [NFPA 54:9.6.6 – 9.6.6.2]

1312.8 Gas Convenience Outlets. Appliances shall be permitted to be connected to the building piping by means of a listed gas convenience outlet, in conjunction with a listed appliance connector, installed in accordance with the manufacturer's installation instructions.

Gas convenience outlets shall be listed in accordance with CSA Z21.90 and installed in accordance with the manufacturer's installation instructions. [NFPA 54:9.6.7]

1312.9 Sediment Trap. Where a sediment trap is not incorporated as a part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical at the time of appliance installation. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet, as illustrated in Figure 1312.9, or another device recognized as an effective sediment trap. Illuminating appliances, gas ranges, clothes dryers, decorative appliances for installation in vented fireplaces, gas fireplaces, and outdoor cooking appliances shall not be required to be so equipped. [NFPA 54:9.6.8]



For SI units: 1 inch = 25.4 mm

FIGURE 1312.9
METHOD OF INSTALLING A TEE FITTING SEDIMENT TRAP
[NFPA 54: FIGURE 9.6.8]

1312.10 Installation of Piping. Piping shall be installed in a manner not to interfere with inspection, maintenance, or servicing of the appliances. [NFPA 54:9.6.9]

1312.11 Liquefied Petroleum Gas Facilities and Piping. Liquefied petroleum gas facilities shall comply with NFPA 58.

1313.0 Pressure Testing, Inspection, and Purging.

1313.1 Piping Installations. Prior to acceptance and initial operation, all piping installations shall be visually

inspected and pressure tested to determine that the materials, design, fabrication, and installation practices comply with the requirements of this code. [NFPA 54:8.1.1.1]

1313.1.1 Inspection Requirements. Inspection shall consist of visual examination, during or after manufacture, fabrication, assembly, or pressure tests. [NFPA 54:8.1.1.2]

1313.1.2 Repairs and Additions. Where repairs or additions are made following the pressure test, the affected piping shall be tested. Minor repairs and additions are not required to be pressure tested, provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other leak-detecting methods approved by the Authority Having Jurisdiction. [NFPA 54:8.1.1.3]

1313.1.3 New Branches. Where new branches are installed to new appliance(s), only the newly installed branch(es) shall be required to be pressure tested. Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or approved leak-detecting methods. [NFPA 54:8.1.1.4]

1313.1.4 Piping System. A piping system shall be tested as a complete unit or in sections. Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless a double block and bleed valve system is installed. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve-closing mechanism, is designed to safely withstand the pressure. [NFPA 54:8.1.1.5]

1313.1.5 Regulators and Valves. Regulator and valve assemblies fabricated independently of the piping system in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication. [NFPA 54:8.1.1.6]

1313.1.6 Test Medium. The test medium shall be air, nitrogen, carbon dioxide, or an inert gas. Oxygen shall not be used as a test medium. [NFPA 54:8.1.2]

1313.2 Test Preparation. Test preparation shall comply with Section 1313.2.1 through Section 1313.2.6.

1313.2.1 Pipe Joints. Pipe joints, including welds, shall be left exposed for examination during the test.

Exception: Covered or concealed pipe end joints that have been previously tested in accordance with this code. [NFPA 54:8.1.3.1]

1313.2.2 Expansion Joints. Expansion joints shall be provided with temporary restraints, if required, for the additional thrust load under test. [NFPA 54:8.1.3.2]

1313.2.3 Appliances and Equipment. Appliances and equipment that are not to be included in the test shall be either disconnected from the piping or isolated by blanks, blind flanges, or caps. Flanged joints at which blinds are inserted to blank off other equipment during the test shall not be required to be tested. [NFPA 54:8.1.3.3]

1313.2.4 Designed for Operating Pressures Less than Test Pressure. Where the piping system is connected to appliances or equipment designed for operating pressures of less than the test pressure, such appliances or equipment shall be isolated from the piping system by disconnecting them and capping the outlet(s). [NFPA 54:8.1.3.4]

1313.2.5 Designed for Operating Pressures Equal to or Greater than Test Pressure. Where the piping system is connected to appliances or equipment designed for operating pressures equal to or greater than the test pressure, such appliances or equipment shall be isolated from the piping system by closing the individual appliance or equipment shutoff valve(s). [NFPA 54:8.1.3.5]

1313.2.6 Safety. All testing of piping systems shall be performed in a manner that protects the safety of employees and the public during the test. [NFPA 54:8.1.3.6]

1313.3 Test Pressure. This inspection shall include an air, CO_2, or nitrogen pressure test, at which time the gas piping shall stand a pressure of not less than 10 psi (69 kPa) gauge pressure. Test pressures shall be held for a length of time satisfactory to the Authority Having Jurisdiction but in no case less than 15 minutes with no perceptible drop in pressure. For welded piping, and for piping carrying gas at pressures in excess of 14 inches water column (3.5 kPa) pressure, the test pressure shall be not less than 60 psi (414 kPa) and shall be continued for a length of time satisfactory to the Authority Having Jurisdiction, but in no case for less than 30 minutes. For CSST carrying gas at pressures in excess of 14 inches water column (3.5 kPa) pressure, the test pressure shall be 30 psi (207 kPa) for 30 minutes. These tests shall be made using air, CO_2, or nitrogen pressure and shall be made in the presence of the Authority Having Jurisdiction. Necessary apparatus for conducting tests shall be furnished by the permit holder. Test gauges used in conducting test shall be in accordance with Section 1303.3.3.1 through Section 1303.3.3.4.

1313.4 Detection of Leaks and Defects. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction of test pressures as indicated by pressure gauges shall be deemed to indicate the presence of a leak unless such reduction can be readily attributed to some other cause. [NFPA 54:8.1.5.1]

1313.4.1 Detecting Leaks. The leakage shall be located by means of an approved gas detector, a noncorrosive leak detection fluid, or other approved leak detection methods. [NFPA 54:8.1.5.2]

1313.4.2 Repair or Replace. Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested. [NFPA 54:8.1.5.3]

1313.5 Piping System Leak Test. Leak checks using fuel gas shall be permitted in piping systems that have been pressure-tested in accordance with Section 1313.0 through Section 1313.4.2. [NFPA 54:8.2.1]

1313.5.1 Turning Gas On. During the process of turning gas on into a system of new gas piping, the entire system shall be inspected to determine that there are no open fittings or ends and that all valves at unused outlets are closed and plugged or capped. [NFPA 54:8.2.2]

1313.5.2 Leak Check. Immediately after the gas is turned on into a new system or into a system that has been initially restored after an interruption of service, the piping system shall be checked for leakage. Where leakage is indicated, the gas supply shall be shut off until the necessary repairs have been made. [NFPA 54:8.2.3]

1313.5.3 Placing Appliances and Equipment in Operation. Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage in accordance with Section 1313.5.2, the piping system is purged in accordance with Section 1313.6, and connections to the appliance are checked for leakage. [NFPA 54:8.2.4]

1313.6 Purging Requirements. The purging of piping shall be in accordance with Section 1313.6.1 through Section 1313.6.3. [NFPA 54:8.3]

1313.6.1 Piping Systems Required to be Purged Outdoors. The purging of piping systems shall be in accordance with Section 1313.6.1.1 through Section 1313.6.1.4 where the piping system meets either of the following:

(1) The design operating gas pressure is greater than 2 psig (14 kPag).

(2) The piping being purged contains one or more sections of pipe or tubing meeting the size and length criteria of Table 1313.6.1. [NFPA 54:8.3.1]

TABLE 1313.6.1
SIZE AND LENGTH OF PIPING
[NFPA 54: TABLE 8.3.1]*

NOMINAL PIPING SIZE (inches)	LENGTH OF PIPING (feet)
≥ 2½ < 3	> 50
≥ 3 < 4	> 30
≥ 4 < 6	> 15
≥ 6 < 8	> 10
≥ 8	Any length

For SI units: 1 inch = 25 mm; 1 foot = 304.8 mm

* CSST EHD size of 62 is equivalent to nominal 2 inches (50 mm) pipe or tubing size.

1313.6.1.1 Removal from Service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with Section 1313.6.1.3. Where gas piping meeting the criteria of Table 1313.6.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas. [NFPA 54:8.3.1.1]

1313.6.1.2 Placing in Operation. Where gas piping containing air and meeting the criteria of Table 1313.6.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with Section 1313.6.1.3. [NFPA 54:8.3.1.2]

1313.6.1.3 Outdoor Discharge of Purged Gases. The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:

(1) The point of discharge shall be controlled with a shutoff valve.

(2) The point of discharge shall be located at least 10 feet (3048 mm) from sources of ignition, at least 10 feet (3048 mm) from building openings and at least 25 feet (7620 mm) from mechanical air intake openings.

(3) During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with Section 1313.6.1.4.

(4) Purging operations introducing fuel gas shall be stopped when 90 percent fuel gas by volume is detected within the pipe.

(5) Persons not involved in the purging operations shall be evacuated from all areas within 10 feet (3048 mm) of the point of discharge. [NFPA 54:8.3.1.3]

1313.6.1.4 Combustible Gas Indicator. Combustible gas indicators shall be listed and calibrated in accordance with the manufacturer's instructions. Combustible gas indicators shall numerically display a volume scale from 0 percent to 100 percent in 1 percent or smaller increments. [NFPA 54:8.3.1.4]

1313.6.2 Piping Systems Allowed to be Purged Indoors or Outdoors. The purging of piping systems shall be in accordance with the provisions of Section 1313.6.2.1 where the piping system meets both of the following:

(1) The design operating pressure is 2 psig (14 kPag) or less.

(2) The piping being purged is constructed entirely from pipe or tubing not meeting the size and length criteria of Table 1313.6.1. [NFPA 54:8.3.2]

1313.6.2.1 Purging Procedure. The piping system shall be purged in accordance with one or more of the following:

(1) The piping shall be purged with fuel gas and shall discharge to the outdoors.

(2) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.

(3) The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.

(4) The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with Section 1313.6.2.2. Purging shall be stopped when fuel gas is detected.

(5) The piping shall be purged by the gas supplier in accordance with written procedures. [NFPA 54:8.3.2.1]

1313.6.2.2 Combustible Gas Detector. Combustible gas detectors shall be listed and calibrated or tested in accordance with the manufacturer's instructions. Combustible gas detectors shall be capable of indicating the presence of fuel gas. [NFPA 54:8.3.2.2]

1313.6.3 Purging Appliances and Equipment. After the piping system has been placed in operation, appliances and equipment shall be purged before being placed into operation. [NFPA 54:8.3.3]

1314.0 Required Gas Supply.

1314.1 General. The following regulations, shall comply with this section and Section 1315.0, shall be the standard for the installation of gas piping. Natural gas regulations and tables are based on the use of gas having a specific gravity of 0.60 and for undiluted liquefied petroleum gas having a specific gravity of 1.50.

Where gas of a different specific gravity is to be delivered, the serving gas supplier shall be permitted to be contacted for specific gravity conversion factors to use in sizing piping systems from the pipe sizing tables in this chapter.

1314.2 Volume. The hourly volume of gas required at each piping outlet shall be taken as not less than the maximum hourly rating as specified by the manufacturer of the appliance or appliances to be connected to each such outlet.

1314.3 Gas Appliances. Where the gas appliances to be installed have not been definitely specified, Table 1308.4.1 shall be permitted to be used as a reference to estimate requirements of typical appliances. To obtain the cubic feet per hour (m^3/h) of gas required, divide the input of the appliances by the average Btu (kW•h) heating value per cubic foot (m^3) of the gas. The average Btu (kW•h) per cubic foot (m^3) of the gas in the area of the installation shall be permitted to be obtained from the serving gas supplier.

1314.4 Size of Piping Outlets. The size of the supply piping outlet for a gas appliance shall be not less than ½ of an inch (15 mm).

The size of a piping outlet for a mobile home shall be not less than ¾ of an inch (20 mm).

1315.0 Required Gas Piping Size.

1315.1 Pipe Sizing Methods. Where the pipe size is to be determined using any of the methods in Section 1315.1.1 through Section 1315.1.3, the diameter of each pipe segment shall be obtained from the pipe sizing tables in Section 1315.2 or from the sizing equations in Section 1315.3. [NFPA 54:6.1]

1315.1.1 Longest Length Method. The pipe size of each section of gas piping shall be determined using the longest length of piping from the point of delivery to the most remote outlet and the load of the section. [NFPA 54:6.1.1]

1315.1.2 Branch Length Method. Pipe shall be sized as follows:

(1) Pipe size of each section of the longest pipe run from the point of delivery to the most remote outlet shall be determined using the longest run of piping and the load of the section.

(2) 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. [NFPA 54:6.1.2]

1315.1.3 Hybrid Pressure. The pipe size for each section of higher pressure gas piping shall be determined using the longest length of piping from the point of delivery to the most remote line pressure regulator. 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. [NFPA 54:6.1.3]

1315.2 Sizing of Gas Piping Systems. Sizing of piping systems shall be in accordance with Section 1315.2.1 for natural gas piping systems and Section 1315.2.2 for propane piping systems.

1315.2.1 Natural Gas Piping Systems. Table 1315.2(1) through Table 1315.2(23) shall be used in conjunction with one of the methods described in Section 1315.1.1 through Section 1315.1.3 for piping materials other than non-corrugated stainless steel tubing. Section 1315.3 shall be used in conjunction with one of the methods described in Section 1315.1.1 through Section 1315.1.3 for non-corrugated stainless steel tubing. [NFPA 54:6.2.1, 6.2.2]

1315.2.2 Propane Piping Systems. Table 1315.2(24) through Table 1315.2(36) shall be used in conjunction with one of the methods described in Section 1315.1.1 through Section 1315.1.3 for piping materials other than non-corrugated stainless steel tubing. Section 1315.3 shall be used in conjunction with one of the methods described in Section 1315.1.1 through Section 1315.1.3 for non-corrugated stainless steel tubing. [NFPA 54:6.3.1, 6.3.2]

1315.3 Sizing Equations. The inside diameter of smooth wall pipe or tubing shall be determined by Equation 1315.3(1), Equation 1315.3(2) and Table 1315.3 using the equivalent pipe length determined by the methods in Section 1315.1.1 through Section 1315.1.3. [NFPA 54:6.4]

LOW-PRESSURE GAS FORMULA (LESS THAN 1.5 psi) (10.3 kPa) [NFPA 54:6.4.1]

[Equation 1315.3(1)]

$$D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{Cr \times L}\right)^{0.206}}$$

Where:

D = inside diameter of pipe, inches
Q = input rate appliance(s), cubic feet per hour at 60°F and 30 inch mercury column
L = equivalent length of pipe, feet
ΔH = pressure drop, inches of water column
Cro = in accordance with Table 1315.3

HIGH-PRESSURE GAS FORMULA (1.5 psi (10.3 kPa) AND ABOVE) [NFPA 54:6.4.2]

[Equation 1315.3(2)]

$$D = \frac{Q^{0.381}}{18.93\left[\frac{(P_1^2 - P_2^2) \bullet Y}{Cr \times L}\right]^{0.206}}$$

Where:

D = inside diameter of pipe, inches
Q = input rate of appliance(s), cubic feet per hour at 60°F and 30 inch mercury column
P_1 = upstream pressure, psia ($P_1 + 14.7$)
P_2 = downstream pressure, psia ($P_2 + 14.7$)
L = equivalent length of pipe, feet
Cr = in accordance with Table 1315.3
Y = in accordance with Table 1315.3

For SI units: 1 cubic foot = 0.0283 m^3, 1000 British thermal units per hour = 0.293 kW, 1 inch = 25 mm, 1 foot = 304.8 mm, 1 pound-force per square inch = 6.8947 kPa, °C = (°F-32)/1.8, 1 inch mercury column = 3.39 kPa, 1 inch water column = 0.249 kPa

TABLE 1315.3
***Cr* AND Y FOR NATURAL GAS AND UNDILUTED PROPANE AT STANDARD CONDITIONS [NFPA 54: TABLE 6.4.2]**

GAS	FORMULA FACTORS	
	Cr	Y
Natural Gas	0.6094	0.9992
Undiluted Propane	1.2462	0.9910

1315.4 Sizing of Piping Sections. To determine the size of each section of pipe in a system within the range of Table 1315.2(1) through Table 1315.2(36), proceed as follows:

(1) Measure the length of the pipe from the gas meter location to the most remote outlet on the system.

(2) Select the length in feet column and row showing the distance, or the next longer distance where the table does not give the exact length.

(3) Starting at the most remote outlet, find in the just selected the gas demand for that outlet. Where the exact figure of demand is not shown, choose the next larger figure in the row.

(4) At the top of the column in the table will be found the correct size of pipe.

(5) Using this same row, proceed in a similar manner for each section of pipe serving this outlet. For each section of pipe, determine the total gas demand supplied by that section. Where gas piping sections serve both heating and cooling appliances and the installation prevents both units from operating simultaneously, the larger of the two demand loads needs to be used in sizing these sections.

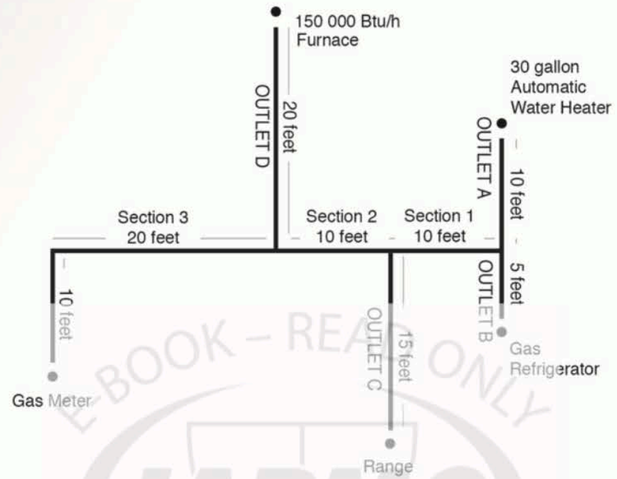
(6) Size each section of branch piping not previously sized by measuring the distance from the gas meter location to the most remote outlet in that branch and follow the procedures of steps 2, 3, 4, and 5 above. Size branch piping in the order of their distance from the meter location, beginning with the most distant outlet not previously sized.

1315.5 Engineering Methods. For conditions other than those covered by Section 1315.1, such as longer runs or greater gas demands, the size of each gas piping system shall be determined by standard engineering methods acceptable to the Authority Having Jurisdiction, and each such system shall be so designed that the total pressure drop between the meter or other point of supply and an outlet where full demand is being supplied to outlets, shall be in accordance with the requirements of Section 1308.4.

1315.6 Variable Gas Pressures. Where the supply gas pressure exceeds 5 psi (34 kPa) for natural gas and 10 psi (69 kPa) for undiluted propane or is less than 6 inches (1.5 kPa) of water column, or where diversity demand factors are used, the design, pipe, sizing, materials, location, and use of such systems first shall be approved by the Authority Having Jurisdiction. Piping systems designed for pressures exceeding the serving gas supplier's standard delivery pressure shall have prior verification from the gas supplier of the availability of the design pressure.

FIGURE 1315.1.1
EXAMPLE ILLUSTRATING USE OF TABLE 1308.4.1 AND TABLE 1315.2(1)

Problem: Determine the required pipe size of each section and outlet of the piping system shown in Figure 1315.1.1. Gas to be used has a specific gravity of 0.60 and 1100 British thermal units (Btu) per cubic foot (0.0114 kW•h/L), delivered at 8 inch water column (1.9 kPa) pressure.



For SI units: 1 foot = 304.8 mm, 1 gallon = 3.785 L, 1000 British thermal units per hour = 0.293 kW, 1 cubic foot per hour = 0.0283 m^3/h

Solution:

(1) Maximum gas demand of Outlet A –
32 cubic feet per hour (0.91 m^3/h) (from Table 1308.4.1).
Maximum gas demand of Outlet B –
3 cubic feet per hour (0.08 m^3/h) (from Table 1308.4.1).
Maximum gas demand of Outlet C –
59 cubic feet per hour (1.67 m^3/h) (from Table 1308.4.1).
Maximum gas demand of Outlet D –
136 cubic feet per hour (3.85 m^3/h) [150 000 Btu/hour (44 kW)] divided by 1100 Btu per cubic foot (0.0114 kW•h/L)

(2) The length of pipe from the gas meter to the most remote outlet (Outlet A) is 60 feet (18 288 mm).

(3) Using the length in feet column row marked 60 feet (18 288 mm) in Table 1315.2(1):
Outlet A, supplying 32 cubic feet per hour (0.91 m^3/h), requires ½ of an inch (15 mm) pipe.
Section 1, supplying Outlets A and B, or 35 cubic feet per hour (0.99 m^3/h) requires ½ of an inch (15 mm) pipe.
Section 2, supplying Outlets A, B, and C, or 94 cubic feet per hour (2.66 m^3/h) requires ¾ of an inch (20 mm) pipe.
Section 3, supplying Outlets A, B, C, and D, or 230 cubic feet per hour (6.51 m^3/h), requires 1 inch (25 mm) pipe.

(4) Using the column marked 60 feet (18 288 mm) in Table 1315.2(1):
Outlet B supplying 3 cubic feet per hour (0.08 m^3/h), requires ½ of an inch (15 mm) pipe.
Outlet C, supplying 59 cubic feet per hour (1.67 m^3/h), requires ½ of an inch (15 mm) pipe.
Using the column marked 60 feet (18 288 mm) in Table 1315.2(1):
Outlet D, supplying 136 cubic feet per hour (3.85 m^3/h), requires ¾ of an inch (20 mm) pipe.

TABLE 1315.2(1)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(b)][1,2]

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	0.5 in. w.c.
SPECIFIC GRAVITY:	0.60

	PIPE SIZE (inch)													
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR													
10	172	360	678	1390	2090	4020	6400	11 300	23 100	41 800	67 600	139 000	252 000	399 000
20	118	247	466	957	1430	2760	4400	7780	15 900	28 700	46 500	95 500	173 000	275 000
30	95	199	374	768	1150	2220	3530	6250	12 700	23 000	37 300	76 700	139 000	220 000
40	81	170	320	657	985	1900	3020	5350	10 900	19 700	31 900	65 600	119 000	189 000
50	72	151	284	583	873	1680	2680	4740	9660	17 500	28 300	58 200	106 000	167 000
60	65	137	257	528	791	1520	2430	4290	8760	15 800	25 600	52 700	95 700	152 000
70	60	126	237	486	728	1400	2230	3950	8050	14 600	23 600	48 500	88 100	139 000
80	56	117	220	452	677	1300	2080	3670	7490	13 600	22 000	45 100	81 900	130 000
90	52	110	207	424	635	1220	1950	3450	7030	12 700	20 600	42 300	76 900	122 000
100	50	104	195	400	600	1160	1840	3260	6640	12 000	19 500	40 000	72 600	115 000
125	44	92	173	355	532	1020	1630	2890	5890	10 600	17 200	35 400	64 300	102 000
150	40	83	157	322	482	928	1480	2610	5330	9650	15 600	32 100	58 300	92 300
175	37	77	144	296	443	854	1360	2410	4910	8880	14 400	29 500	53 600	84 900
200	34	71	134	275	412	794	1270	2240	4560	8260	13 400	27 500	49 900	79 000
250	30	63	119	244	366	704	1120	1980	4050	7320	11 900	24 300	44 200	70 000
300	27	57	108	221	331	638	1020	1800	3670	6630	10 700	22 100	40 100	63 400
350	25	53	99	203	305	587	935	1650	3370	6100	9880	20 300	36 900	58 400
400	23	49	92	189	283	546	870	1540	3140	5680	9190	18 900	34 300	54 300
450	22	46	86	177	266	512	816	1440	2940	5330	8620	17 700	32 200	50 900
500	21	43	82	168	251	484	771	1360	2780	5030	8150	16 700	30 400	48 100
550	20	41	78	159	239	459	732	1290	2640	4780	7740	15 900	28 900	45 700
600	19	39	74	152	228	438	699	1240	2520	4560	7380	15 200	27 500	43 600
650	18	38	71	145	218	420	669	1180	2410	4360	7070	14 500	26 400	41 800
700	17	36	68	140	209	403	643	1140	2320	4190	6790	14 000	25 300	40 100
750	17	35	66	135	202	389	619	1090	2230	4040	6540	13 400	24 400	38 600
800	16	34	63	130	195	375	598	1060	2160	3900	6320	13 000	23 600	37 300
850	16	33	61	126	189	363	579	1020	2090	3780	6110	12 600	22 800	36 100
900	15	32	59	122	183	352	561	992	2020	3660	5930	12 200	22 100	35 000
950	15	31	58	118	178	342	545	963	1960	3550	5760	11 800	21 500	34 000
1000	14	30	56	115	173	333	530	937	1910	3460	5600	11 500	20 900	33 100
1100	14	28	53	109	164	316	503	890	1810	3280	5320	10 900	19 800	31 400
1200	13	27	51	104	156	301	480	849	1730	3130	5070	10 400	18 900	30 000
1300	12	26	49	100	150	289	460	813	1660	3000	4860	9980	18 100	28 700
1400	12	25	47	96	144	277	442	781	1590	2880	4670	9590	17 400	27 600
1500	11	24	45	93	139	267	426	752	1530	2780	4500	9240	16 800	26 600
1600	11	23	44	89	134	258	411	727	1480	2680	4340	8920	16 200	25 600
1700	11	22	42	86	130	250	398	703	1430	2590	4200	8630	15 700	24 800
1800	10	22	41	84	126	242	386	682	1390	2520	4070	8370	15 200	24 100
1900	10	21	40	81	122	235	375	662	1350	2440	3960	8130	14 800	23 400
2000	NA	20	39	79	119	229	364	644	1310	2380	3850	7910	14 400	22 700

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

Notes:

[1] Table entries are rounded to 3 significant digits.

[2] NA means a flow of less than 10 ft^3/h (0.283 m^3/h).

TABLE 1315.2(2)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(c)]*

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	3.0 in. w.c.
SPECIFIC GRAVITY:	0.60

INTENDED USE: INITIAL SUPPLY PRESSURE OF 8.0 IN. W.C. OR GREATER									
	PIPE SIZE (inch)								
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	454	949	1790	3670	5500	10 600	16 900	29 800	60 800
20	312	652	1230	2520	3780	7280	11 600	20 500	41 800
30	250	524	986	2030	3030	5840	9310	16 500	33 600
40	214	448	844	1730	2600	5000	7970	14 100	28 700
50	190	397	748	1540	2300	4430	7060	12 500	25 500
60	172	360	678	1390	2090	4020	6400	11 300	23 100
70	158	331	624	1280	1920	3690	5890	10 400	21 200
80	147	308	580	1190	1790	3440	5480	9690	19 800
90	138	289	544	1120	1670	3230	5140	9090	18 500
100	131	273	514	1060	1580	3050	4860	8580	17 500
125	116	242	456	936	1400	2700	4300	7610	15 500
150	105	219	413	848	1270	2450	3900	6890	14 100
175	96	202	380	780	1170	2250	3590	6340	12 900
200	90	188	353	726	1090	2090	3340	5900	12 000
250	80	166	313	643	964	1860	2960	5230	10 700
300	72	151	284	583	873	1680	2680	4740	9660
350	66	139	261	536	803	1550	2470	4360	8890
400	62	129	243	499	747	1440	2290	4050	8270
450	58	121	228	468	701	1350	2150	3800	7760
500	55	114	215	442	662	1280	2030	3590	7330
550	52	109	204	420	629	1210	1930	3410	6960
600	50	104	195	400	600	1160	1840	3260	6640
650	47	99	187	384	575	1110	1760	3120	6360
700	46	95	179	368	552	1060	1690	3000	6110
750	44	92	173	355	532	1020	1630	2890	5890
800	42	89	167	343	514	989	1580	2790	5680
850	41	86	162	332	497	957	1530	2700	5500
900	40	83	157	322	482	928	1480	2610	5330
950	39	81	152	312	468	901	1440	2540	5180
1000	38	79	148	304	455	877	1400	2470	5040
1100	36	75	141	289	432	833	1330	2350	4780
1200	34	71	134	275	412	794	1270	2240	4560
1300	33	68	128	264	395	761	1210	2140	4370
1400	31	65	123	253	379	731	1160	2060	4200
1500	30	63	119	244	366	704	1120	1980	4050
1600	29	61	115	236	353	680	1080	1920	3910
1700	28	59	111	228	342	658	1050	1850	3780
1800	27	57	108	221	331	638	1020	1800	3670
1900	27	56	105	215	322	619	987	1750	3560
2000	26	54	102	209	313	602	960	1700	3460

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

* Table entries are rounded to 3 significant digits.

TABLE 1315.2(3)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(d)]*

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	6.0 in. w.c.
SPECIFIC GRAVITY:	0.60

INTENDED USE: INITIAL SUPPLY PRESSURE OF 11.0 IN. W.C. OR GREATER									
	PIPE SIZE (inch)								
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 (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	660	1380	2600	5340	8000	15 400	24 600	43 400	88 500
20	454	949	1790	3670	5500	10 600	16 900	29 800	60 800
30	364	762	1440	2950	4410	8500	13 600	24 000	48 900
40	312	652	1230	2520	3780	7280	11 600	20 500	41 800
50	276	578	1090	2240	3350	6450	10 300	18 200	37 100
60	250	524	986	2030	3030	5840	9310	16 500	33 600
70	230	482	907	1860	2790	5380	8570	15 100	30 900
80	214	448	844	1730	2600	5000	7970	14 100	28 700
90	201	420	792	1630	2440	4690	7480	13 200	27 000
100	190	397	748	1540	2300	4430	7060	12 500	25 500
125	168	352	663	1360	2040	3930	6260	11 100	22 600
150	153	319	601	1230	1850	3560	5670	10 000	20 500
175	140	293	553	1140	1700	3270	5220	9230	18 800
200	131	273	514	1056	1580	3050	4860	8580	17 500
250	116	242	456	936	1400	2700	4300	7610	15 500
300	105	219	413	848	1270	2450	3900	6890	14 100
350	96	202	380	780	1170	2250	3590	6340	12 900
400	90	188	353	726	1090	2090	3340	5900	12 000
450	84	176	332	681	1020	1960	3130	5540	11 300
500	80	166	313	643	964	1860	2960	5230	10 700
550	76	158	297	611	915	1760	2810	4970	10 100
600	72	151	284	583	873	1680	2680	4740	9660
650	69	144	272	558	836	1610	2570	4540	9250
700	66	139	261	536	803	1550	2470	4360	8890
750	64	134	252	516	774	1490	2380	4200	8560
800	62	129	243	499	747	1440	2290	4050	8270
850	60	125	235	483	723	1390	2220	3920	8000
900	58	121	228	468	701	1350	2150	3800	7760
950	56	118	221	454	681	1310	2090	3690	7540
1000	55	114	215	442	662	1280	2030	3590	7330
1100	52	109	204	420	629	1210	1930	3410	6960
1200	50	104	195	400	600	1160	1840	3260	6640
1300	47	99	187	384	575	1110	1760	3120	6360
1400	46	95	179	368	552	1060	1690	3000	6110
1500	44	92	173	355	532	1020	1630	2890	5890
1600	42	89	167	343	514	989	1580	2790	5680
1700	41	86	162	332	497	957	1530	2700	5500
1800	40	83	157	322	482	928	1480	2610	5330
1900	39	81	152	312	468	901	1440	2540	5180
2000	38	79	148	304	455	877	1400	2470	5040

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

* Table entries are rounded to 3 significant digits.

TABLE 1315.2(4)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(e)]*

						GAS:	NATURAL		
						INLET PRESSURE:	2.0 psi		
						PRESSURE DROP:	1.0 psi		
						SPECIFIC GRAVITY:	0.60		
	PIPE SIZE (inch)								
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	1510	3040	5560	11 400	17 100	32 900	52 500	92 800	189 000
20	1070	2150	3930	8070	12 100	23 300	37 100	65 600	134 000
30	869	1760	3210	6590	9880	19 000	30 300	53 600	109 000
40	753	1520	2780	5710	8550	16 500	26 300	46 400	94 700
50	673	1360	2490	5110	7650	14 700	23 500	41 500	84 700
60	615	1240	2270	4660	6980	13 500	21 400	37 900	77 300
70	569	1150	2100	4320	6470	12 500	19 900	35 100	71 600
80	532	1080	1970	4040	6050	11 700	18 600	32 800	67 000
90	502	1010	1850	3810	5700	11 000	17 500	30 900	63 100
100	462	934	1710	3510	5260	10 100	16 100	28 500	58 200
125	414	836	1530	3140	4700	9060	14 400	25 500	52 100
150	372	751	1370	2820	4220	8130	13 000	22 900	46 700
175	344	695	1270	2601	3910	7530	12 000	21 200	43 300
200	318	642	1170	2410	3610	6960	11 100	19 600	40 000
250	279	583	1040	2140	3210	6180	9850	17 400	35 500
300	253	528	945	1940	2910	5600	8920	15 800	32 200
350	232	486	869	1790	2670	5150	8210	14 500	29 600
400	216	452	809	1660	2490	4790	7640	13 500	27 500
450	203	424	759	1560	2330	4500	7170	12 700	25 800
500	192	401	717	1470	2210	4250	6770	12 000	24 400
550	182	381	681	1400	2090	4030	6430	11 400	23 200
600	174	363	650	1330	2000	3850	6130	10 800	22 100
650	166	348	622	1280	1910	3680	5870	10 400	21 200
700	160	334	598	1230	1840	3540	5640	9970	20 300
750	154	322	576	1180	1770	3410	5440	9610	19 600
800	149	311	556	1140	1710	3290	5250	9280	18 900
850	144	301	538	1100	1650	3190	5080	8980	18 300
900	139	292	522	1070	1600	3090	4930	8710	17 800
950	135	283	507	1040	1560	3000	4780	8460	17 200
1000	132	275	493	1010	1520	2920	4650	8220	16 800
1100	125	262	468	960	1440	2770	4420	7810	15 900
1200	119	250	446	917	1370	2640	4220	7450	15 200
1300	114	239	427	878	1320	2530	4040	7140	14 600
1400	110	230	411	843	1260	2430	3880	6860	14 000
1500	106	221	396	812	1220	2340	3740	6600	13 500
1600	102	214	382	784	1180	2260	3610	6380	13 000
1700	99	207	370	759	1140	2190	3490	6170	12 600
1800	96	200	358	736	1100	2120	3390	5980	12 200
1900	93	195	348	715	1070	2060	3290	5810	11 900
2000	91	189	339	695	1040	2010	3200	5650	11 500

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

* Table entries are rounded to 3 significant digits.

TABLE 1315.2(5)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(f)]*

						GAS:	NATURAL		
						INLET PRESSURE:	3.0 psi		
						PRESSURE DROP:	2.0 psi		
						SPECIFIC GRAVITY:	0.60		
	PIPE SIZE (inch)								
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	2350	4920	9270	19 000	28 500	54 900	87 500	155 000	316 000
20	1620	3380	6370	13 100	19 600	37 700	60 100	106 000	217 000
30	1300	2720	5110	10 500	15 700	30 300	48 300	85 400	174 000
40	1110	2320	4380	8990	13 500	25 900	41 300	73 100	149 000
50	985	2060	3880	7970	11 900	23 000	36 600	64 800	132 000
60	892	1870	3520	7220	10 800	20 800	33 200	58 700	120 000
70	821	1720	3230	6640	9950	19 200	30 500	54 000	110 000
80	764	1600	3010	6180	9260	17 800	28 400	50 200	102 000
90	717	1500	2820	5800	8680	16 700	26 700	47 100	96 100
100	677	1420	2670	5470	8200	15 800	25 200	44 500	90 800
125	600	1250	2360	4850	7270	14 000	22 300	39 500	80 500
150	544	1140	2140	4400	6590	12 700	20 200	35 700	72 900
175	500	1050	1970	4040	6060	11 700	18 600	32 900	67 100
200	465	973	1830	3760	5640	10 900	17 300	30 600	62 400
250	412	862	1620	3330	5000	9620	15 300	27 100	55 300
300	374	781	1470	3020	4530	8720	13 900	24 600	50 100
350	344	719	1350	2780	4170	8020	12 800	22 600	46 100
400	320	669	1260	2590	3870	7460	11 900	21 000	42 900
450	300	627	1180	2430	3640	7000	11 200	19 700	40 200
500	283	593	1120	2290	3430	6610	10 500	18 600	38 000
550	269	563	1060	2180	3260	6280	10 000	17 700	36 100
600	257	537	1010	2080	3110	5990	9550	16 900	34 400
650	246	514	969	1990	2980	5740	9150	16 200	33 000
700	236	494	931	1910	2860	5510	8790	15 500	31 700
750	228	476	897	1840	2760	5310	8470	15 000	30 500
800	220	460	866	1780	2660	5130	8180	14 500	29 500
850	213	445	838	1720	2580	4960	7910	14 000	28 500
900	206	431	812	1670	2500	4810	7670	13 600	27 700
950	200	419	789	1620	2430	4670	7450	13 200	26 900
1000	195	407	767	1580	2360	4550	7240	12 800	26 100
1100	185	387	729	1500	2240	4320	6890	12 200	24 800
1200	177	369	695	1430	2140	4120	6570	11 600	23 700
1300	169	353	666	1370	2050	3940	6290	11 100	22 700
1400	162	340	640	1310	1970	3790	6040	10 700	21 800
1500	156	327	616	1270	1900	3650	5820	10 300	21 000
1600	151	316	595	1220	1830	3530	5620	10 000	20 300
1700	146	306	576	1180	1770	3410	5440	9610	19 600
1800	142	296	558	1150	1720	3310	5270	9320	19 000
1900	138	288	542	1110	1670	3210	5120	9050	18 400
2000	134	280	527	1080	1620	3120	4980	8800	18 000

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

* Table entries are rounded to 3 significant digits.

TABLE 1315.2(6)
SCHEDULE 40 METALLIC PIPE [NFPA 54: TABLE 6.2.1(g)]*

GAS:	NATURAL
INLET PRESSURE:	5.0 psi
PRESSURE DROP:	3.5 psi
SPECIFIC GRAVITY:	0.60

	PIPE SIZE (inch)								
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	3190	6430	11 800	24 200	36 200	69 700	111 000	196 000	401 000
20	2250	4550	8320	17 100	25 600	49 300	78 600	139 000	283 000
30	1840	3720	6790	14 000	20 900	40 300	64 200	113 000	231 000
40	1590	3220	5880	12 100	18 100	34 900	55 600	98 200	200 000
50	1430	2880	5260	10 800	16 200	31 200	49 700	87 900	179 000
60	1300	2630	4800	9860	14 800	28 500	45 400	80 200	164 000
70	1200	2430	4450	9130	13 700	26 400	42 000	74 300	151 000
80	1150	2330	4260	8540	12 800	24 700	39 300	69 500	142 000
90	1060	2150	3920	8050	12 100	23 200	37 000	65 500	134 000
100	979	1980	3620	7430	11 100	21 400	34 200	60 400	123 000
125	876	1770	3240	6640	9950	19 200	30 600	54 000	110 000
150	786	1590	2910	5960	8940	17 200	27 400	48 500	98 900
175	728	1470	2690	5520	8270	15 900	25 400	44 900	91 600
200	673	1360	2490	5100	7650	14 700	23 500	41 500	84 700
250	558	1170	2200	4510	6760	13 000	20 800	36 700	74 900
300	506	1060	1990	4090	6130	11 800	18 800	33 300	67 800
350	465	973	1830	3760	5640	10 900	17 300	30 600	62 400
400	433	905	1710	3500	5250	10 100	16 100	28 500	58 100
450	406	849	1600	3290	4920	9480	15 100	26 700	54 500
500	384	802	1510	3100	4650	8950	14 300	25 200	51 500
550	364	762	1440	2950	4420	8500	13 600	24 000	48 900
600	348	727	1370	2810	4210	8110	12 900	22 900	46 600
650	333	696	1310	2690	4030	7770	12 400	21 900	44 600
700	320	669	1260	2590	3880	7460	11 900	21 000	42 900
750	308	644	1210	2490	3730	7190	11 500	20 300	41 300
800	298	622	1170	2410	3610	6940	11 100	19 600	39 900
850	288	602	1130	2330	3490	6720	10 700	18 900	38 600
900	279	584	1100	2260	3380	6520	10 400	18 400	37 400
950	271	567	1070	2190	3290	6330	10 100	17 800	36 400
1000	264	551	1040	2130	3200	6150	9810	17 300	35 400
1100	250	524	987	2030	3030	5840	9320	16 500	33 600
1200	239	500	941	1930	2900	5580	8890	15 700	32 000
1300	229	478	901	1850	2770	5340	8510	15 000	30 700
1400	220	460	866	1780	2660	5130	8180	14 500	29 500
1500	212	443	834	1710	2570	4940	7880	13 900	28 400
1600	205	428	806	1650	2480	4770	7610	13 400	27 400
1700	198	414	780	1600	2400	4620	7360	13 000	26 500
1800	192	401	756	1550	2330	4480	7140	12 600	25 700
1900	186	390	734	1510	2260	4350	6930	12 300	25 000
2000	181	379	714	1470	2200	4230	6740	11 900	24 300

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

* Table entries are rounded to 3 significant digits.

TABLE 1315.2(7)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(h)][1, 2]

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	0.3 in. w.c.
SPECIFIC GRAVITY:	0.60

		TUBE SIZE (inch)								
NOMINAL:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[3]		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)		CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10		20	42	85	148	210	448	806	1270	2650
20		14	29	58	102	144	308	554	873	1820
30		11	23	47	82	116	247	445	701	1460
40		10	20	40	70	99	211	381	600	1250
50		NA	17	35	62	88	187	337	532	1110
60		NA	16	32	56	79	170	306	482	1000
70		NA	14	29	52	73	156	281	443	924
80		NA	13	27	48	68	145	262	413	859
90		NA	13	26	45	64	136	245	387	806
100		NA	12	24	43	60	129	232	366	761
125		NA	11	22	38	53	114	206	324	675
150		NA	10	20	34	48	103	186	294	612
175		NA	NA	18	31	45	95	171	270	563
200		NA	NA	17	29	41	89	159	251	523
250		NA	NA	15	26	37	78	141	223	464
300		NA	NA	13	23	33	71	128	202	420
350		NA	NA	12	22	31	65	118	186	387
400		NA	NA	11	20	28	61	110	173	360
450		NA	NA	11	19	27	57	103	162	338
500		NA	NA	10	18	25	54	97	153	319
550		NA	NA	NA	17	24	51	92	145	303
600		NA	NA	NA	16	23	49	88	139	289
650		NA	NA	NA	15	22	47	84	133	277
700		NA	NA	NA	15	21	45	81	128	266
750		NA	NA	NA	14	20	43	78	123	256
800		NA	NA	NA	14	20	42	75	119	247
850		NA	NA	NA	13	19	40	73	115	239
900		NA	NA	NA	13	18	39	71	111	232
950		NA	NA	NA	13	18	38	69	108	225
1000		NA	NA	NA	12	17	37	67	105	219
1100		NA	NA	NA	12	16	35	63	100	208
1200		NA	NA	NA	11	16	34	60	95	199
1300		NA	NA	NA	11	15	32	58	91	190
1400		NA	NA	NA	10	14	31	56	88	183
1500		NA	NA	NA	NA	14	30	54	84	176
1600		NA	NA	NA	NA	13	29	52	82	170
1700		NA	NA	NA	NA	13	28	50	79	164
1800		NA	NA	NA	NA	13	27	49	77	159
1900		NA	NA	NA	NA	12	26	47	74	155
2000		NA	NA	NA	NA	12	25	46	72	151

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

Notes:

1 Table entries are rounded to 3 significant digits.

2 NA means a flow of less than 10 ft^3/h (0.283 m^3/h).

3 Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

TABLE 1315.2(8)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(i)][1, 2]

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	0.5 in. w.c.
SPECIFIC GRAVITY:	0.60

NOMINAL: K & L:	TUBE SIZE (inch)								
NOMINAL: ACR:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[3]	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	27	55	111	195	276	590	1060	1680	3490
20	18	38	77	134	190	406	730	1150	2400
30	15	30	61	107	152	326	586	925	1930
40	13	26	53	92	131	279	502	791	1650
50	11	23	47	82	116	247	445	701	1460
60	10	21	42	74	105	224	403	635	1320
70	NA	19	39	68	96	206	371	585	1220
80	NA	18	36	63	90	192	345	544	1130
90	NA	17	34	59	84	180	324	510	1060
100	NA	16	32	56	79	170	306	482	1000
125	NA	14	28	50	70	151	271	427	890
150	NA	13	26	45	64	136	245	387	806
175	NA	12	24	41	59	125	226	356	742
200	NA	11	22	39	55	117	210	331	690
250	NA	NA	20	34	48	103	186	294	612
300	NA	NA	18	31	44	94	169	266	554
350	NA	NA	16	28	40	86	155	245	510
400	NA	NA	15	26	38	80	144	228	474
450	NA	NA	14	25	35	75	135	214	445
500	NA	NA	13	23	33	71	128	202	420
550	NA	NA	13	22	32	68	122	192	399
600	NA	NA	12	21	30	64	116	183	381
650	NA	NA	12	20	29	62	111	175	365
700	NA	NA	11	20	28	59	107	168	350
750	NA	NA	11	19	27	57	103	162	338
800	NA	NA	10	18	26	55	99	156	326
850	NA	NA	10	18	25	53	96	151	315
900	NA	NA	NA	17	24	52	93	147	306
950	NA	NA	NA	17	24	50	90	143	297
1000	NA	NA	NA	16	23	49	88	139	289
1100	NA	NA	NA	15	22	46	84	132	274
1200	NA	NA	NA	15	21	44	80	126	262
1300	NA	NA	NA	14	20	42	76	120	251
1400	NA	NA	NA	13	19	41	73	116	241
1500	NA	NA	NA	13	18	39	71	111	232
1600	NA	NA	NA	13	18	38	68	108	224
1700	NA	NA	NA	12	17	37	66	104	217
1800	NA	NA	NA	12	17	36	64	101	210
1900	NA	NA	NA	11	16	35	62	98	204
2000	NA	NA	NA	11	16	34	60	95	199

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

Notes:
1 Table entries are rounded to 3 significant digits.
2 NA means a flow of less than 10 ft^3/h (0.283 m^3/h).
3 Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

TABLE 1315.2(9)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(j)][1, 2]

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	1.0 in. w.c.
SPECIFIC GRAVITY:	0.60

INTENDED USE: TUBE SIZING BETWEEN HOUSE LINE REGULATOR AND THE APPLIANCE									
NOMINAL: K & L:	TUBE SIZE (inch)								
NOMINAL: ACR:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[3]	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	39	80	162	283	402	859	1550	2440	5080
20	27	55	111	195	276	590	1060	1680	3490
30	21	44	89	156	222	474	853	1350	2800
40	18	38	77	134	190	406	730	1150	2400
50	16	33	68	119	168	359	647	1020	2130
60	15	30	61	107	152	326	586	925	1930
70	13	28	57	99	140	300	539	851	1770
80	13	26	53	92	131	279	502	791	1650
90	12	24	49	86	122	262	471	742	1550
100	11	23	47	82	116	247	445	701	1460
125	NA	20	41	72	103	219	394	622	1290
150	NA	18	37	65	93	198	357	563	1170
175	NA	17	34	60	85	183	329	518	1080
200	NA	16	32	56	79	170	306	482	1000
250	NA	14	28	50	70	151	271	427	890
300	NA	13	26	45	64	136	245	387	806
350	NA	12	24	41	59	125	226	356	742
400	NA	11	22	39	55	117	210	331	690
450	NA	10	21	36	51	110	197	311	647
500	NA	NA	20	34	48	103	186	294	612
550	NA	NA	19	32	46	98	177	279	581
600	NA	NA	18	31	44	94	169	266	554
650	NA	NA	17	30	42	90	162	255	531
700	NA	NA	16	28	40	86	155	245	510
750	NA	NA	16	27	39	83	150	236	491
800	NA	NA	15	26	38	80	144	228	474
850	NA	NA	15	26	36	78	140	220	459
900	NA	NA	14	25	35	75	135	214	445
950	NA	NA	14	24	34	73	132	207	432
1000	NA	NA	13	23	33	71	128	202	420
1100	NA	NA	13	22	32	68	122	192	399
1200	NA	NA	12	21	30	64	116	183	381
1300	NA	NA	12	20	29	62	111	175	365
1400	NA	NA	11	20	28	59	107	168	350
1500	NA	NA	11	19	27	57	103	162	338
1600	NA	NA	10	18	26	55	99	156	326
1700	NA	NA	10	18	25	53	96	151	315
1800	NA	NA	NA	17	24	52	93	147	306
1900	NA	NA	NA	17	24	50	90	143	297
2000	NA	NA	NA	16	23	49	88	139	289

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

Notes:
1 Table entries are rounded to 3 significant digits.
2 NA means a flow of less than 10 ft^3/h (0.283 m^3/h).
3 Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

TABLE 1315.2(10)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(k)][2]

GAS:	NATURAL
INLET PRESSURE:	LESS THAN 2 psi
PRESSURE DROP:	17.0 in. w.c.
SPECIFIC GRAVITY:	0.60

NOMINAL:	TUBE SIZE (inch)								
K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[1]	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	190	391	796	1390	1970	4220	7590	12 000	24 900
20	130	269	547	956	1360	2900	5220	8230	17 100
30	105	216	439	768	1090	2330	4190	6610	13 800
40	90	185	376	657	932	1990	3590	5650	11 800
50	79	164	333	582	826	1770	3180	5010	10 400
60	72	148	302	528	749	1600	2880	4540	9460
70	66	137	278	486	689	1470	2650	4180	8700
80	62	127	258	452	641	1370	2460	3890	8090
90	58	119	243	424	601	1280	2310	3650	7590
100	55	113	229	400	568	1210	2180	3440	7170
125	48	100	203	355	503	1080	1940	3050	6360
150	44	90	184	321	456	974	1750	2770	5760
175	40	83	169	296	420	896	1610	2540	5300
200	38	77	157	275	390	834	1500	2370	4930
250	33	69	140	244	346	739	1330	2100	4370
300	30	62	126	221	313	670	1210	1900	3960
350	28	57	116	203	288	616	1110	1750	3640
400	26	53	108	189	268	573	1030	1630	3390
450	24	50	102	177	252	538	968	1530	3180
500	23	47	96	168	238	508	914	1440	3000
550	22	45	91	159	226	482	868	1370	2850
600	21	43	87	152	215	460	829	1310	2720
650	20	41	83	145	206	441	793	1250	2610
700	19	39	80	140	198	423	762	1200	2500
750	18	38	77	135	191	408	734	1160	2410
800	18	37	74	130	184	394	709	1120	2330
850	17	35	72	126	178	381	686	1080	2250
900	17	34	70	122	173	370	665	1050	2180
950	16	33	68	118	168	359	646	1020	2120
1000	16	32	66	115	163	349	628	991	2060
1100	15	31	63	109	155	332	597	941	1960
1200	14	29	60	104	148	316	569	898	1870
1300	14	28	57	100	142	303	545	860	1790
1400	13	27	55	96	136	291	524	826	1720
1500	13	26	53	93	131	280	505	796	1660
1600	12	25	51	89	127	271	487	768	1600
1700	12	24	49	86	123	262	472	744	1550
1800	11	24	48	84	119	254	457	721	1500
1900	11	23	47	81	115	247	444	700	1460
2000	11	22	45	79	112	240	432	681	1420

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa, 1 inch water column = 0.249 kPa

Notes:

[1] Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

[2] Table entries are rounded to 3 significant digits.

TABLE 1315.2(11)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(l)][2]

GAS:	NATURAL
INLET PRESSURE:	2.0 psi
PRESSURE DROP:	1.0 psi
SPECIFIC GRAVITY:	0.60

NOMINAL:	TUBE SIZE (inch)								
K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:	0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[1]	0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10	245	506	1030	1800	2550	5450	9820	15 500	32 200
20	169	348	708	1240	1760	3750	6750	10 600	22 200
30	135	279	568	993	1410	3010	5420	8550	17 800
40	116	239	486	850	1210	2580	4640	7310	15 200
50	103	212	431	754	1070	2280	4110	6480	13 500
60	93	192	391	683	969	2070	3730	5870	12 200
70	86	177	359	628	891	1900	3430	5400	11 300
80	80	164	334	584	829	1770	3190	5030	10 500
90	75	154	314	548	778	1660	2990	4720	9820
100	71	146	296	518	735	1570	2830	4450	9280
125	63	129	263	459	651	1390	2500	3950	8220
150	57	117	238	416	590	1260	2270	3580	7450
175	52	108	219	383	543	1160	2090	3290	6850
200	49	100	204	356	505	1080	1940	3060	6380
250	43	89	181	315	448	956	1720	2710	5650
300	39	80	164	286	406	866	1560	2460	5120
350	36	74	150	263	373	797	1430	2260	4710
400	33	69	140	245	347	741	1330	2100	4380
450	31	65	131	230	326	696	1250	1970	4110
500	30	61	124	217	308	657	1180	1870	3880
550	28	58	118	206	292	624	1120	1770	3690
600	27	55	112	196	279	595	1070	1690	3520
650	26	53	108	188	267	570	1030	1620	3370
700	25	51	103	181	256	548	986	1550	3240
750	24	49	100	174	247	528	950	1500	3120
800	23	47	96	168	239	510	917	1450	3010
850	22	46	93	163	231	493	888	1400	2920
900	22	44	90	158	224	478	861	1360	2830
950	21	43	88	153	217	464	836	1320	2740
1000	20	42	85	149	211	452	813	1280	2670
1100	19	40	81	142	201	429	772	1220	2540
1200	18	38	77	135	192	409	737	1160	2420
1300	18	36	74	129	183	392	705	1110	2320
1400	17	35	71	124	176	376	678	1070	2230
1500	16	34	68	120	170	363	653	1030	2140
1600	16	33	66	116	164	350	630	994	2070
1700	15	31	64	112	159	339	610	962	2000
1800	15	30	62	108	154	329	592	933	1940
1900	14	30	60	105	149	319	575	906	1890
2000	14	29	59	102	145	310	559	881	1830

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

Notes:

[1] Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

[2] Table entries are rounded to 3 significant digits.

TABLE 1315.2(12)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(m)][3]

GAS:	NATURAL
INLET PRESSURE:	2.0 psi
PRESSURE DROP:	1.5 psi
SPECIFIC GRAVITY:	0.60

INTENDED USE: PIPE SIZING BETWEEN POINT OF DELIVERY AND THE HOUSE LINE REGULATOR. TOTAL LOAD SUPPLIED BY A SINGLE HOUSE LINE REGULATOR NOT EXCEEDING 150 CUBIC FEET PER HOUR[2].

		TUBE SIZE (inch)								
NOMINAL:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[1]		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)		CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10		303	625	1270	2220	3150	6740	12 100	19 100	39 800
20		208	430	874	1530	2170	4630	8330	13 100	27 400
30		167	345	702	1230	1740	3720	6690	10 600	22 000
40		143	295	601	1050	1490	3180	5730	9030	18 800
50		127	262	532	931	1320	2820	5080	8000	16 700
60		115	237	482	843	1200	2560	4600	7250	15 100
70		106	218	444	776	1100	2350	4230	6670	13 900
80		98	203	413	722	1020	2190	3940	6210	12 900
90		92	190	387	677	961	2050	3690	5820	12 100
100		87	180	366	640	907	1940	3490	5500	11 500
125		77	159	324	567	804	1720	3090	4880	10 200
150		70	144	294	514	729	1560	2800	4420	9200
175		64	133	270	472	670	1430	2580	4060	8460
200		60	124	252	440	624	1330	2400	3780	7870
250		53	110	223	390	553	1180	2130	3350	6980
300		48	99	202	353	501	1070	1930	3040	6320
350		44	91	186	325	461	984	1770	2790	5820
400		41	85	173	302	429	916	1650	2600	5410
450		39	80	162	283	402	859	1550	2440	5080
500		36	75	153	268	380	811	1460	2300	4800
550		35	72	146	254	361	771	1390	2190	4560
600		33	68	139	243	344	735	1320	2090	4350
650		32	65	133	232	330	704	1270	2000	4160
700		30	63	128	223	317	676	1220	1920	4000
750		29	60	123	215	305	652	1170	1850	3850
800		28	58	119	208	295	629	1130	1790	3720
850		27	57	115	201	285	609	1100	1730	3600
900		27	55	111	195	276	590	1060	1680	3490
950		26	53	108	189	268	573	1030	1630	3390
1000		25	52	105	184	261	558	1000	1580	3300
1100		24	49	100	175	248	530	954	1500	3130
1200		23	47	95	167	237	505	910	1430	2990
1300		22	45	91	160	227	484	871	1370	2860
1400		21	43	88	153	218	465	837	1320	2750
1500		20	42	85	148	210	448	806	1270	2650
1600		19	40	82	143	202	432	779	1230	2560
1700		19	39	79	138	196	419	753	1190	2470
1800		18	38	77	134	190	406	731	1150	2400
1900		18	37	74	130	184	394	709	1120	2330
2000		17	36	72	126	179	383	690	1090	2270

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

Notes:

[1] Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

[2] Where this table is used to size the tubing upstream of a line pressure regulator, the pipe or tubing downstream of the line pressure regulator shall be sized using a pressure drop no greater than 1 inch water column (0.249 kPa).

[3] Table entries are rounded to 3 significant digits.

TABLE 1315.2(13)
SEMI-RIGID COPPER TUBING [NFPA 54: TABLE 6.2.1(n)][2]

GAS:	NATURAL
INLET PRESSURE:	5.0 psi
PRESSURE DROP:	3.5 psi
SPECIFIC GRAVITY:	0.60

		TUBE SIZE (inch)								
NOMINAL:	K & L:	¼	⅜	½	⅝	¾	1	1¼	1½	2
	ACR:	⅜	½	⅝	¾	⅞	1⅛	1⅜	–	–
OUTSIDE:		0.375	0.500	0.625	0.750	0.875	1.125	1.375	1.625	2.125
INSIDE:[1]		0.305	0.402	0.527	0.652	0.745	0.995	1.245	1.481	1.959
LENGTH (feet)		CAPACITY IN CUBIC FEET OF GAS PER HOUR								
10		511	1050	2140	3750	5320	11 400	20 400	32 200	67 100
20		351	724	1470	2580	3650	7800	14 000	22 200	46 100
30		282	582	1180	2070	2930	6270	11 300	17 800	37 000
40		241	498	1010	1770	2510	5360	9660	15 200	31 700
50		214	441	898	1570	2230	4750	8560	13 500	28 100
60		194	400	813	1420	2020	4310	7750	12 200	25 500
70		178	368	748	1310	1860	3960	7130	11 200	23 400
80		166	342	696	1220	1730	3690	6640	10 500	21 800
90		156	321	653	1140	1620	3460	6230	9820	20 400
100		147	303	617	1080	1530	3270	5880	9270	19 300
125		130	269	547	955	1360	2900	5210	8220	17 100
150		118	243	495	866	1230	2620	4720	7450	15 500
175		109	224	456	796	1130	2410	4350	6850	14 300
200		101	208	424	741	1050	2250	4040	6370	13 300
250		90	185	376	657	932	1990	3580	5650	11 800
300		81	167	340	595	844	1800	3250	5120	10 700
350		75	154	313	547	777	1660	2990	4710	9810
400		69	143	291	509	722	1540	2780	4380	9120
450		65	134	273	478	678	1450	2610	4110	8560
500		62	127	258	451	640	1370	2460	3880	8090
550		58	121	245	429	608	1300	2340	3690	7680
600		56	115	234	409	580	1240	2230	3520	7330
650		53	110	224	392	556	1190	2140	3370	7020
700		51	106	215	376	534	1140	2050	3240	6740
750		49	102	207	362	514	1100	1980	3120	6490
800		48	98	200	350	497	1060	1910	3010	6270
850		46	95	194	339	481	1030	1850	2910	6070
900		45	92	188	328	466	1000	1790	2820	5880
950		43	90	182	319	452	967	1740	2740	5710
1000		42	87	177	310	440	940	1690	2670	5560
1100		40	83	169	295	418	893	1610	2530	5280
1200		38	79	161	281	399	852	1530	2420	5040
1300		37	76	154	269	382	816	1470	2320	4820
1400		35	73	148	259	367	784	1410	2220	4630
1500		34	70	143	249	353	755	1360	2140	4460
1600		33	68	138	241	341	729	1310	2070	4310
1700		32	65	133	233	330	705	1270	2000	4170
1800		31	63	129	226	320	684	1230	1940	4040
1900		30	62	125	219	311	664	1200	1890	3930
2000		29	60	122	213	302	646	1160	1830	3820

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm, 1 cubic foot per hour = 0.0283 m^3/h, 1 pound-force per square inch = 6.8947 kPa

Notes:

[1] Table capacities are based on Type K copper tubing inside diameter (shown), which has the smallest inside diameter of the copper tubing products.

[2] Table entries are rounded to 3 significant digits.