402.3 Sizing. Gas piping shall be sized in accordance with one of the following:

1. Pipe sizing tables or sizing equations in accordance with Section 402.4.
2. The sizing tables included in a listed piping system's manufacturer's installation instructions.
3. Other approved engineering methods.

402.4 Sizing tables and equations. Where Tables 402.4(1) through 402.4(33) are used to size piping or tubing, the pipe length shall be determined in accordance with Section 402.4.1, 402.4.2 or 402.4.3.

Where Equations 4-1 and 4-2 are used to size piping or tubing, the pipe or tubing shall have smooth inside walls and the pipe length shall be determined in accordance with Section 402.4.1, 402.4.2 or 402.4.3.

1. Low-pressure gas equation [Less than 1.5 pounds per square inch (psi) (10.3 kPa)]:

$$D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{C_r \times L}\right)^{0.206}} \qquad \textbf{(Equation 4-1)}$$

2. High-pressure gas equation [1.5 psi (10.3 kPa) and above]:

$$D = \frac{Q^{0.381}}{18.93\left[\frac{\left(P_1^{\,2} - P_2^{\,2}\right) \times Y}{C_r \times L}\right]^{0.206}} \qquad \textbf{(Equation 4-2)}$$

where:

D = Inside diameter of pipe, inches (mm).

Q = Input rate appliance(s), cubic feet per hour at 60°F (16°C) 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

ΔH = Pressure drop, inch water column (27.7 inch water column = 1 psi)

TABLE 402.4
C_r AND Y VALUES FOR NATURAL GAS AND UNDILUTED PROPANE AT STANDARD CONDITIONS

GAS	EQUATION FACTORS	
	C_r	Y
Natural gas	0.6094	0.9992
Undiluted propane	1.2462	0.9910

For SI: 1 cubic foot = 0.028 m^3, 1 foot = 305 mm, 1-inch water column = 0.249 kPa, 1 pound per square inch = 6.895 kPa, 1 British thermal unit per hour = 0.293 W.

402.4.1 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.

402.4.2 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.

402.4.3 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.

402.5 Allowable pressure drop. The design pressure loss in any piping system under maximum probable flow conditions, from the point of delivery to the inlet connection of the equipment, shall be such that the supply pressure at the equipment is greater than the minimum pressure required for proper equipment operation.

402.6 Maximum design operating pressure. The maximum design operating pressure for piping systems located inside buildings shall not exceed 5 pounds per square inch gauge (psig) (34 kPa gauge) except where one or more of the following conditions are met:

1. The piping system is welded.
2. The piping is located in a ventilated chase or otherwise enclosed for protection against accidental gas accumulation.
3. The piping is located inside buildings or separate areas of buildings used exclusively for:
   3.1. Industrial processing or heating;
   3.2. Research;
   3.3. Warehousing; or
   3.4. Boiler or mechanical equipment rooms.
4. The piping is a temporary installation for buildings under construction.

402.6.1 Liquefied petroleum gas systems. The operating pressure for undiluted LP-gas systems shall not exceed 20 psig (140 kPa gauge). Buildings having systems designed to operate below -5°F (-21°C) or with butane or a propane-butane mix shall be designed to either accommodate liquid LP-gas or prevent LP-gas vapor from condensing into a liquid.

Exception: Buildings or separate areas of buildings constructed in accordance with Chapter 7 of NFPA 58, and used exclusively to house industrial processes, research and experimental laboratories, or equipment or processing having similar hazards.

METER RECEIVES 8" HAS .5" PD. 7.5" AVAILABLE ON HOUSE SIDE.

1" SEGMENT G IS 15'. @ 325000 PD IS .013" PER FT. .013" x 15' = .195" PD
7.5" - .195 = 7.305" @ TEE.

1" SEGMENT E IS 10'. @ 225000 PD IS .007" PER FT. .007" x 10' = .07" PD
7.305" - .07" = 7.235" @ ~~EAST~~ TEE.

3/4" SEGMENT C IS 15'. @ 120000 PD IS .007" PER FT. .007" x 15' = .105" PD
7.235" - .105" = 7.13" @ EAST TEE

BRANCHES ALL HAVE APPLIANCES W/ a 5" WC. MIN REQUIREMENT.

1/2" SEGMENT F IS 7'. @ 90000 PD IS .015" PER FT. [redacted] TEE HAS
7.305" WC. 7.305" - 5.1" = 2.205" ALLOWABLE. USING 1/2" I.D WE WILL
HAVE 7.2" @ FIXTURE.

1/2" SEGMENT D IS 7'. @ 110000 pd IS .022" PER FT. 7.235" @ TEE.
7.235" - 5.1" = 2.135" ALLOWABLE. USING 1/2" I.D WE WILL HAVE 7.081" @
FIXTURE.

1/2" SEGMENT B IS 7'. @ 40000 pd IS .003" PER FT. 7.13" @ TEE.
7.13" - [redacted]" = 5.1" = 2.03" ALLOWABLE. USING 1/2" I.D WILL GIVE US
7.109" @ FIXTURE.

1/2" SEGMENT A IS 7', @ ~~80000~~ 75000 pd IS .012" PER FT. 7.~~13~~" @ TEE
7.13 - 5.1 = 2.03" ALLOWABLE. USING 1/2" I.D WILL GIVE US
7.046" @ FIXTURE