

Gas Line Sizing

When sizing Gas piping systems certain factors must be considered. They are:

- Z It shall provide sufficient gas to meet the maximum demand of the gas equipment. ***Piping must be sized to supply enough fuel for all appliances to operate at the same time.***
- Z Maximum gas demand shall be determined by adding all of the equipment Btu ratings from appliances connected on the system.
- Z Gas piping should be sized in accordance with the tables in the Standard Gas Code or by other engineering methods approved by local Authority Having Jurisdiction.

Use of Code Book Sizing Tables

How to size gas piping.

- Z The Gas Code contains sizing tables and information that must be used to size most gas systems. Some large commercial and industrial systems fall outside the scope of this book and must be sized by other engineering practices. There are software programs available that will design and size fuel gas piping systems.
- Z When sizing piping you must first determine the gas pressure at point of delivery. Calling the gas supplier is the quickest way of checking gas pressure at the meter. You must know this information to use the correct sizing table in the Gas Code. The gas pressure delivered to residential buildings systems is 1/2 pounds per square inch (psi) or less. Since most gas appliances operate on 1/4 pounds pressure (psi) this is more than enough. In most cases high pressure (2 psi and up) is reserved for commercial and industrial applications. The supplier marks the meter to alert of high pressure.

Use of Code Book Sizing Tables

Each table in the Gas code has a header that describes the system to which it applies. Always make sure that the information in this header matches the system you are installing. An example of a table header is shown below. All of the information listed in the Header of the Table must be used to size pipe.

Table 402.3.(2)
MAXIMUM CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR FOR GAS PRESSURES OF 0.5 PSI OR LESS AND A PRESSURE DROP OF 0.5-INCH WATER COLUMN
(Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size {Inches}	Total Internal Diameter {Inches}	Length of Pipe {Feet}							
		10	20	30	40	50	60	70	80
1/4	.364	43	29	24	20	18	16	15	14
3/8	.493	95	65	52	45	40	36	33	31
1/2	.622	175	120	97	82	73	66	61	57
3/4	.824	360	250	200	170	151	138	125	118
1	1.049	680	465	375	320	285	260	240	220
1-1/4	1.380	1,400	950	770	660	580	530	490	460
1-1/2	1.610	2,100	1,460	1,180	990	900	810	750	690
2	2.067	3,950	2,750	2,200	1,900	1,680	1,520	1,400	1,300
2-1/2	2.469	6,300	4,350	3,520	3,000	2,650	2,400	2,250	2,050

Use of Code Book Sizing Tables

The sizing tables are based on a number of factors. The main factor is gas pressure of the system. The tables cover pressures up to 50 pounds(psi) for schedule 40 pipe materials and up to 5 pound for semi-rigid tubing and Corrugated Stainless Steel Tubing (CSST) The table on the previous page is for gas pressure of 0.5 pounds(1/2 psi). This is a common pressure for residential systems.

You will notice on the table also that the words Water Column is used in the headers above the tables. One inch of water column is equal to .036 psi. When 1/2 pound pressure is delivered to the meter you have 14 inches of water column. The tables listed in the Gas Code show **pressure drop** of the gas pressure in water column or in pounds per square foot (psi) or a certain percentage of pressure. Pressure drop is the loss of pressure of the gas as it travels through the system. It is caused by friction on the interior surface of the pipe, fittings etc.. For instance the table header shown below has a pressure drop of 0.5 inch water column. Since one inch of water column is equal to .036 psi or less than 4% of a pound of pressure You see that this is a very small loss.

You also see a **Specific Gravity of .60** . Specific Gravity is the weight of a volume of gas compared to the weight of the same amount of air. Natural gas is always 0.60 Specific Gravity.

Use of Code Book Sizing Tables

Z When determining the total load of the systems you need to know the type appliances to be connected. Gas appliance manufacturers always attach a metal plate in a visible location on each appliance. This data plate shows the Btu input rate (the maximum gas demand). *Btu* is the abbreviation for British thermal unit, the quantity of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit. While the appliances are rated in Btu, the gas code tables list the size of piping in cubic feet per hour (cfh). So you'll have to convert each Btu input rating to cubic feet of gas before sizing the distribution piping.

Z You can assume that each cubic foot of natural gas releases 1,000 Btu per hour. Some gas has Btu ratings that vary slightly, but 1,000 Btu per cubic foot is generally a safe assumption. Assume you're sizing pipe for a gas range with a maximum demand of 68,000 Btu per hour. Divide the value in Btu by 1,000 to find the demand in cubic feet per hour:

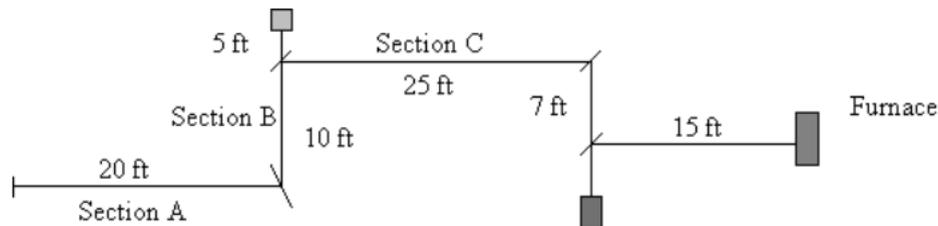
$$\text{Example - } 68,000 \text{ Btu} \div 1,000 = 68 \text{ cfh}$$

Gas Piping Problem

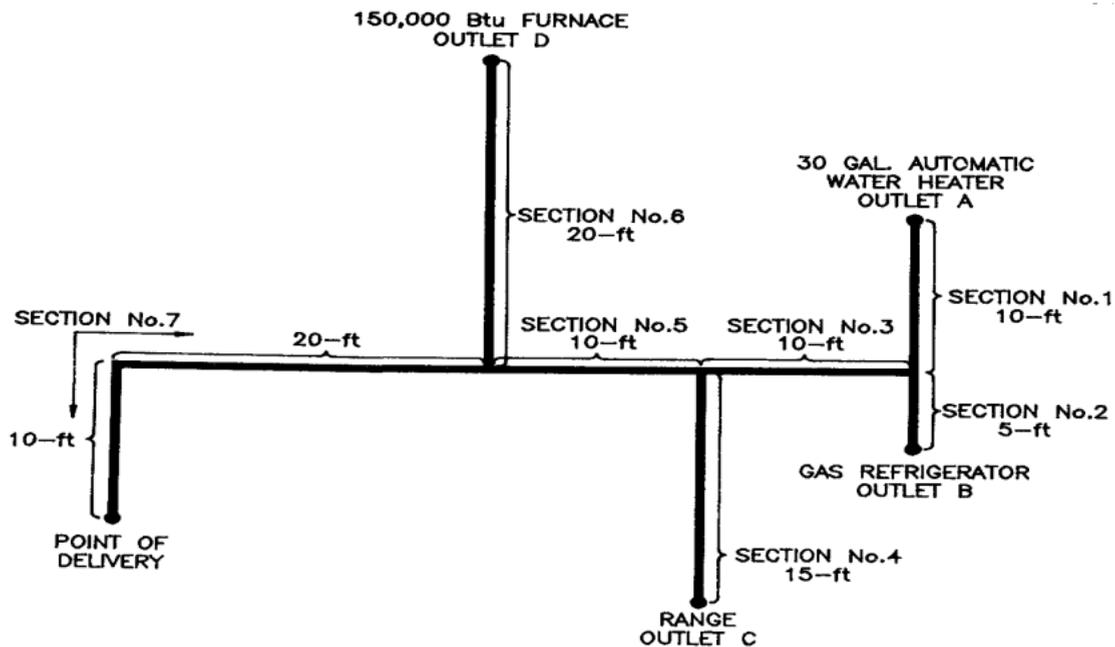
- Z Now lets work through sizing a sample gas piping system. Remember the thing you must know is the pressure of the gas delivered by the supplier to the meter (This will tell you which table to use), Total of the Btuh for all the appliances connected to the system and the distance gas will travel through the pipe to the farthest appliance connected.
- Z For this problem we will use the following factors:
- Z Size pipe in Sections 1-7 on the piping diagram using the specifications listed in the next paragraph.
- Z Gas is delivered at 0.5 (1/2) pound pressure with a pressure drop of 0.5 water column. The gas delivered has a 0.60 Specific Gravity. Use the Typical Piping Plan shown on the next slide to determine the size of all natural gas piping in the system.

Gas Piping Problem

- Z The other factor one must know to properly size a system is the distance the gas must travel (in feet) through the pipe from the point of delivery to the most remote appliance. This is called sizing by the “Longest Length Method”. When the footage is determined, it will be the only distance used to size piping in that system. For instance if a furnace is the most remote appliance and the pipe length is 50 feet then you would use the table column listed under 50 feet to size all pipes. If you distance exceeds the amount of footage listed in a column you must use the next column to size your pipes. For example if you had 44 feet you would go to the next column which is 50 feet and use the values listed under that column.



Sizing 0.5 PSI Gas Piping System



Sizing 1/2 lb or less System



Use of Code Book Sizing Tables

How to size gas piping.

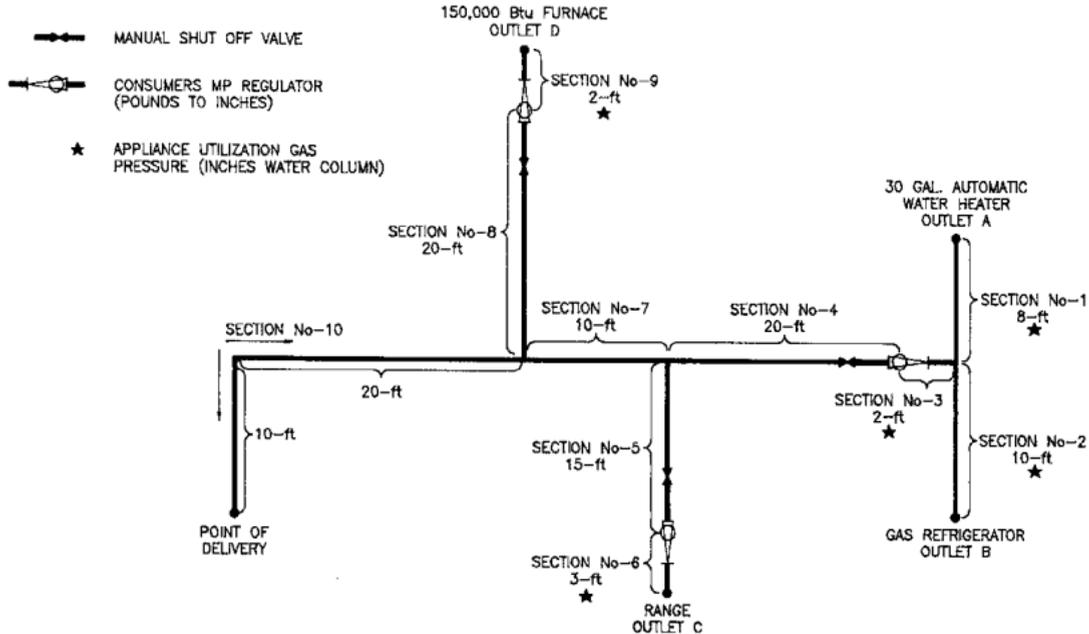
Table 402.3.(2)

**MAXIMUM CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR FOR GAS PRESSURES OF 0.5 PSI OR LESS
AND A PRESSURE DROP OF 0.5-INCH WATER COLUMN**

(Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size (Inches)	Total Internal Diameter (Inches)	Length of Pipe (Feet)							
		10	20	30	40	50	60	70	80
1/4	.364	43	29	24	20	18	16	15	14
3/8	.493	95	65	52	45	40	36	33	31
1/2	.622	175	120	97	82	73	66	61	57
3/4	.824	360	250	200	170	151	138	125	118
1	1.049	680	465	375	320	285	260	240	220
1-1/4	1.380	1,400	950	770	660	580	530	490	460
1-1/2	1.610	2,100	1,460	1,180	990	900	810	750	690
2	2.067	3,950	2,750	2,200	1,900	1,680	1,520	1,400	1,300
2-1/2	2.469	6,300	4,350	3,520	3,000	2,650	2,400	2,250	2,050

Sizing a 2-psi system



Sizing 2 psi System
Figure D1003.3

Sizing table 2 psi system

Table 10-3 Pipe Sizing Table for 2 psi Pressure Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per Initial Pressure of 2.0 psi with a 1.0 psi Pressure Drop and a Gas of 0.6 Specific Gravity

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe (Feet)											
		10	20	30	40	50	60	70	80	90	100	125	150
1/2	.622	1506	1065	869	753	673	615	569	532	502	462	414	372
3/4	.824	3041	2150	1756	1521	1360	1241	1150	1075	1014	934	836	751
1	1.049	5561	3932	3211	2781	2487	2270	2102	1966	1854	1708	1528	1373
1 1/4	1.380	11415	8072	6591	5708	5105	4660	4315	4036	3805	3508	3138	2817
1 1/2	1.610	17106	12096	9876	8553	7650	6983	6465	6048	5702	5257	4702	4222
2	2.067	32944	23295	19020	16472	14733	13449	12452	11647	10981	10125	9056	8130
2 1/2	2.469	52505	37127	30314	26253	23481	21435	19845	18563	17502	16138	14434	12960
3	3.068	92819	65633	53589	46410	41510	37893	35082	32817	30940	28530	25518	22911
4	4.026	189326	133873	109307	94663	84669	77292	71558	66937	63109	58194	52050	46732

Gas Piping Sizing Table 2 psi System

(Tubing size from regulator to appliance cut off)

Table 10-15 Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 psi or Less and a Pressure Drop of 1.0 Inch Water Column

Use this table to size tubing from house line regulator to the appliance.

Length (Feet)	Diameter: Inside (Outside)					
	$\frac{1}{4}$ in. (0.315 in.)	$\frac{3}{8}$ in. (0.430 in.)	$\frac{1}{2}$ in. (0.545 in.)	$\frac{5}{8}$ in. (0.666 in.)	$\frac{3}{4}$ in. (0.785 in.)	1 in. (1.025 in.)
10	42	95	177	300	461	928
15	34	76	142	241	370	745
20	29	65	122	206	317	638
30	23	52	98	165	255	512
40	20	45	84	142	218	439
50	18	40	74	125	193	389
60	16	36	67	114	175	352
70	15	33	62	105	161	324
80	14	31	57	97	150	301
90	13	29	54	91	140	283
100	12	27	51	86	133	267
125	11	24	45	76	118	237
150	10	22	41	69	107	215
175	9	20	38	64	98	197
200	8	19	35	59	91	184
250	7	17	31	53	81	163
300	7	15	28	48	73	147

Gas Piping Sizing Table 5 psi System

Table 10-4 Pipe Sizing Table for 5 psi Pressure Capacity of Pipes of Different Diameters and Lengths in Cubic Feet per 1 Initial Pressure of 5.0 psi with a 3.5 psi Pressure Drop and a Gas of 0.6 Specific Gravity

Pipe Size of Schedule 40 Standard Pipe (Inches)	Internal Diameter (Inches)	Total Equivalent Length of Pipe (Feet)											
		10	20	30	40	50	60	70	80	90	100	125	150
1/2	.622	3185	2252	1839	1593	1425	1301	1204	1153	1062	979	876	786
3/4	.824	6434	4550	3715	3217	2878	2627	2432	2330	2145	1978	1769	1589
1	1.049	11766	8320	6793	5883	5262	4804	4447	4260	3922	3617	3235	2905
1 1/4	1.380	24161	17084	13949	12080	10805	9864	9132	8542	8054	7427	6643	5964
1 1/2	1.610	36206	25602	20904	18103	16192	14781	13685	12801	12069	11128	9953	8937
2	2.067	69727	49305	40257	34864	31183	28466	26354	24652	23242	21433	19170	17211
2 1/2	2.469	111133	78583	64162	55566	49700	45370	42004	39291	37044	34159	30553	27431
3	3.068	196468	138924	113431	98234	87863	80208	74258	69462	65489	60387	54012	48494
4	4.026	400732	283361	231363	200366	179213	163598	151463	141680	133577	123173	110169	98911

Gas Piping Sizing Table 5 psi System

(Tubing size from regulator to appliance cut off)

Table 10-15 Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 psi or Less and a Pressure Drop of 1.0 Inch Water Column

Use this table to size tubing from house line regulator to the appliance.						
Length (Feet)	Diameter: Inside (Outside)					
	$\frac{1}{4}$ in. (0.315 in.)	$\frac{3}{8}$ in. (0.430 in.)	$\frac{1}{2}$ in. (0.545 in.)	$\frac{5}{8}$ in. (0.666 in.)	$\frac{3}{4}$ in. (0.785 in.)	1 in. (1.025 in.)
10	42	95	177	300	461	928
15	34	76	142	241	370	745
20	29	65	122	206	317	638
30	23	52	98	165	255	512
40	20	45	84	142	218	439
50	18	40	74	125	193	389
60	16	36	67	114	175	352
70	15	33	62	105	161	324
80	14	31	57	97	150	301
90	13	29	54	91	140	283
100	12	27	51	86	133	267
125	11	24	45	76	118	237
150	10	22	41	69	107	215
175	9	20	38	64	98	197
200	8	19	35	59	91	184
250	7	17	31	53	81	163
300	7	15	28	48	73	147

Course Complete

***Congratulations, You have completed this course. Make sure you complete the next page. It certifies the completion of this course and one (1) hour of credit.

[Click Here](#)