City of Laguna Hills
Community Development: Building Division
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FUEL GAS PIPE SIZING & INSTALLATION with Excerpts from the 2022 CPC

Code and Installation Information

The information provided in this brochure answers a number of commonly asked questions. For additional information please refer to the California Plumbing Code or speak with one of the City's Building Inspectors.

Material

All pipe used for the installation, extension, alteration, or repair of any gas piping shall be standard weight Schedule 40 wrought iron or steel (galvanized or black) or corrugated stainless steel tubing. Approved PE pipe may be used in exterior buried piping systems when installed by certified technicians.

Used Piping

Pipe shall be either new, or shall previously have been used for no other purpose than conveying gas.

Isolation of Underground Pipe

Underground ferrous gas piping shall be electrically isolated from the rest of the gas system with listed or approved isolation fittings installed a minimum of six inches above grade.

Unions

Where unions are necessary, right and left nipples and couplings shall be used. Ground joint unions may only be used at exposed fixtures, appliance, or equipment connections and in exposed exterior locations immediately on the discharge side of a building shutoff valve.

Shutoff Valves

An accessible shutoff valve shall be installed in the fuel supply piping outside of each appliance and ahead of the union connection thereto, in addition to any valve on the appliance. Shutoff valves shall be in the same room as the appliance and no further than 3 feet from the appliance.

Burial Depth

Steel pipe installed outside and underground shall have no less than 18 inches of cover. Plastic pipe shall have no less than 18 inches of cover.

Permits

A plumbing permit must be obtained prior to the installation, alteration or repair of a gas piping system.

Inspections of Underground Exterior Gas Pipe

Underground exterior gas piping requires one inspection which will occur after the pipe has been installed in a trench and pressurized but before it is covered.

Inspections of Above Ground Interior Gas Pipe: All gas piping systems within buildings shall be inspected twice.

First Inspection: (referred to as a rough inspection) occurs after the piping system has been installed but prior to it being covered or concealed, or any fixture or appliance has been attached thereto. This inspection will check for proper pipe size, material, and installation. It is required that the piping system be pressurized.

Second Inspection: (referred to as a final inspection consists of a pressure test and occurs after the building is completely enclosed but prior to connecting any equipment or appliances. For projects in which the gas piping will remain exposed, both inspections would be combined into a single inspection.

Pressure Tests

All gas piping systems will be pressure tested at least once during the inspection process. It is the responsibility of the permit holder to provide and install a temporary pressure gauge and to pressurize the piping system. All gas piping systems shall be pressurized using air, CO2, or nitrogen. For most residential installations the gas piping system shall be pressurized to no less than ten (10) psi and shall hold that pressure for no less than 15 minutes. The gauge used for the pressure test shall have a pressure range not greater than twice the test pressure applied and shall have 1/10 psi incrementation.

CPC Table 1208.4.1

Appliance	Input (btu/h approx.)	CF/H
Space Heating Units		
Warm air furnace		
Single-family	100,000	91
Multi-family, per unit	60,000	55
Hydronic boiler		
Single-family	100,000	91
Multi-family, per unit	60,000	55
Space and Water Heating Units		
Single-family	120,000	109
Multi-family, per unit	75,000	68
Water Heating Appliance		
Water heater, automatic storage		
30-40 gallon tank	35,000	32
50 gallon tank	50,000	45
Water heater, automatic instantaneous		
Capacity at 2 gallons per minute	142,800	130
Capacity at 4 gallons per minute	285,000	259
Capacity at 6 gallons per minute	428,800	389
Water heater, domestic, circulating or side-arm	35,000	32
Cooking Appliances		
Rages, freestanding, domestic	65,000	59
Built-in oven or broiler unit, domestic	25,000	23
Built-in top unit, domestic	40,000	36
Other appliances		
Refrigerator	3,000	3
Clotehs dryer, Type 1 domestic	35,000	32
Gas fireplace direct vent	40,000	36
Gas Log	80,000	73
Barbeque	40,000	36
Gas light	2,500	2

Sizing Gas Pipe

Gas pipe needs to be sized correctly. You can size the gas pipe by following the example in this handout or you may request assistance from a Building Inspector. For the Building Inspector to help, you must provide a piping layout (similar to Figure “C”) with the lengths of all piping and the input demand load of all appliances shown on the drawing. Sizing the pipe will depend on the type of pipe being used.

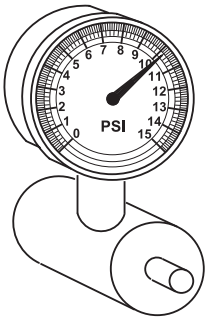

Figure B
For pressure testing gas lines use a 15 lb. gauge with 1/10 lb. increments

Note 1 The demand ratings of the appliances listed in this table are minimums. Demand ratings of the actual installed appliances may be higher. Refer to name plate rating on appliance–use the input Btu/h number. The tables used to size gas piping are based on Cubic Feet per Hour (CFH). To determine the CFH divide the input of the appliances by the average Btu per cubic foot. Contact your local gas supplier to obtain the Btu per cubic foot in your area.

Example exercise for sizing gas pipe

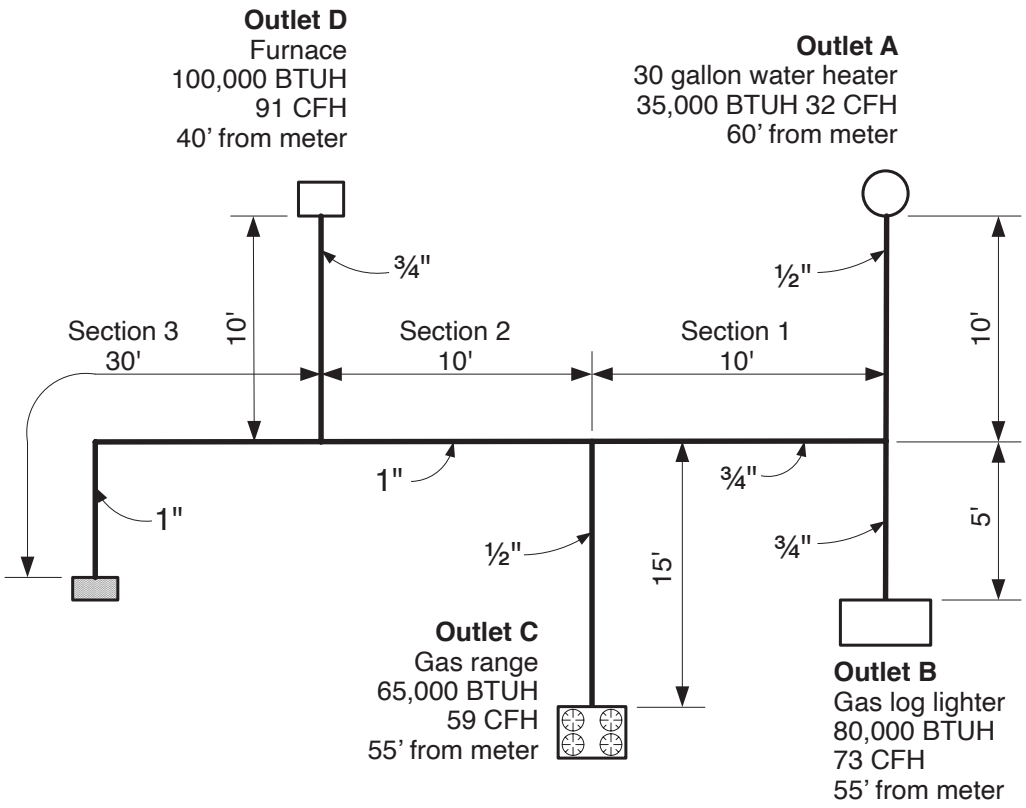

Figure C
Example Piping Layout and Appliance Demand

Example for Determining Pipe Sizes
Problem:

The local utility can deliver 1,100 Btu per cubic feet. Determine the required pipe size of each section and outlet of the piping system shown in Figure "C". To figure the CFH (cubic feet per hour) of natural gas, divide the Btu/h (British thermal units per hour) input rating of an appliance by 1,100. The type of pipe used will be Schedule 40 Metallic (Table 1215.2(1)).

Solution:

1. Determine the maximum input gas demand for each appliance by using Table 1208.4.1 or from the actual name plate of the appliance whichever is higher.
2. Determine the length of pipe from the gas meter to each outlet. If the length falls between those lengths shown on appropriate gas size piping table then go to the next higher column.
3. Figure the lateral pipe sizes feeding the individual appliances
   Outlet A – Use 60' column – with a demand load of 32 CFH the minimum pipe size is ½"
   Outlet B – Use 60' column – with a demand load of 73 CFH the minimum pipe size is ¾"
   Outlet C – Use 60' column – with a demand load of 59 CFH the minimum pipe size is ½"
   Outlet D – Use 40' column – with a demand load of 91 CFH the minimum pipe size is ¾"
4. Figure the size of the main pipe which is feeding more than one appliance. Select the most remote outlet in the system which is Outlet A. It is 60' from the meter so use the 60' column. Then determine the various pipes sizes based upon the demand loads in each section of pipe.
   Section 1 – Serves Outlets A and B with a total demand load of 105 CFH – minimum pipe size is ¾"
   Section 2 – Serves Outlets A, B and C with a total demand load of 164 CFH – minimum pipe size is 1"

Sizing Procedure Summary

1. Add up all appliances BTU.
2. Divide total BTU by 1100, this gives the Cubic feet of gas used (demand).
3. (a) Longest Length Method (easiest): Measure developed length from meter to most remote outlet.
4. (a) Longest Length Method (easiest): Use column (from table below) for the longest develop length, for example, if the longest length is 30 feet used the column for 30 feet.
5. (b) Branch Length Method: Measure developed length to each outlet.
6. (b) Branch Length Method: Select the column (from table below) for load on each branch to each outlet.
7. Select row for pipe size equaling or exceeding the demand for each section or pipe length.

Pipe Size in inches	Length (In Feet)									
	10	20	30	40	50	60	70	80	90	100
	Demand in Cubic Feet									
1/2	172	118	95	81	72	65	60	56	52	50
3/4	360	247	199	170	151	137	126	117	110	104
1	678	266	374	320	284	257	237	220	207	195
1 1/4	1390	957	768	657	583	528	486	452	424	400
1 1/2	2090	1430	1150	985	873	791	728	677	635	600