

# ARAPAHOE COUNTY

## Adding or Replacing Residential Gas Appliances

### Residential Gas Piping

- Gas piping must comply with Chapter 24 of the 2015 IRC.  
Arapahoe County has made the following amendments to this chapter:  
Outside buried gas pipe must have a minimum depth beneath finished grade of **18** inches.
- When a gas outlet is added, the sizing of the entire system must be reviewed to determine that the additional load will not starve existing outlets.  
An approved gas pipe sizing schematic and sizing calculations that confirm compliance with IRC G2413.1 must be on site for inspections.
- “Future” gas outlets and tees must be documented if location is not obvious (dryer, range, BBQ).
- Plastic pipe is only allowed outside underground. It is not allowed in or under any building or slab. A minimum 18 AWG yellow tracer wire is required.
- If **CSST** or **polyethylene** pipe is installed, a copy of the installer's certification to install the specific brand of pipe is required – enter the information on the back of the inspection card.
- The **CSST** installation instructions must be left on the jobsite for rough inspection.
- **CSST** must be bonded per instructions and an electrical inspection is required.
- Arapahoe County will allow gas piping to be tested for 15 minutes at 20 psi using a 30 psigauge.  
For other pressures or test methods, please contact an Inspector.
- New branches may not connect to existing gas pipe until after they have been tested and approved. A convenience valve at the tie in may be installed and plugged for the rough inspection; and the tie in can be tested using leak detection fluid or an instrument.  
A valve may not be included in the test unless it is listed and labeled ASME B 16.33.
- All gas appliances must be listed and labeled as required by IRC 2404.3 (301.3), IFGC 301.3.

### Residential Combustion Air

- IRC G2407 requires that Combustion air must be supplied to all fuel burning appliances.
- When any appliance is added or replaced, the combustion air provided must comply with the manufacturer’s installation instructions and IRC G2407 (304).
- If the air infiltration rate is known and documented, G2407.5.1 or G2407.5.2 may be used.
- All IRC methods may be accepted, however, IRC G2407.6.2 (304.6.2) contains a good ‘rule of thumb’ method: 1 sq. in. of cross sectional area of combustion air duct or opening per each 3,000 Btu of total rated input.

### Residential Fuel Burning Appliance Venting

- IRC G2425.15 (501.15) requires that when appliances are replaced, removed or added to an existing venting system, that the venting system must comply with current IRC requirements including **manufacturer’s installation instructions**.  
**This may require existing appliance vent components to be changed or upsized when replacing any connected appliance.**
- IRC 2428.3.9.1 (504.3.9.1) requires that a tee or wye fitting on the common vent be double wall if the common vent is double wall.
- Installation instructions for all new appliances must be followed and left on site for inspections.

### FOR MORE INFORMATION:

Inspectors are in the office daily to answer questions between 7:00 to 7:30 AM, and can be reached by calling 720 874-6600.

**Please provide the following information when applying for a permit for gas piping systems or additions to an existing system.**

**Complete information must be provided, missing information will delay approval.**

**Contact Name and Phone Number:** \_\_\_\_\_

**Project address** \_\_\_\_\_ **Permit #** \_\_\_\_\_

Will the final connection of the appliances be performed under this permit? **Yes or no.** \_\_\_\_\_  
**If not shown, sizing cannot be approved.**

**If no, a Future Gas Appliance Documentation affidavit must be provided for final inspection.**

Natural gas supplier, **Write in:** \_\_\_\_\_  
**If not shown, sizing will be reviewed as Xcel @ 813 BTU / Cu. ft.**

Delivery pressure at meter is 6" W. C. or marked at meter. **Delivery pressure:** \_\_\_\_\_  
(Not required for propane.) **If not shown, sizing will be reviewed for 6" W.C.**

Piping material, **circle all to be used**, or write in if not shown, and indicate on drawing the material of each section\* of piping if more than one type of piping is used. For example: CSST and Sch. 40 Steel.

**Schedule 40 metallic**                      **Polyethylene plastic**                      **SDR 9.33**                      **SDR 11.00**

**CSST, provide name of manufacturer:** \_\_\_\_\_

**Other piping system not shown above:** \_\_\_\_\_

Sizing method, **circle one.** **If not circled, sizing will be reviewed as longest length.**

**Longest Length - Branch Length - Friction Loss per Foot - Manufacturer's instructions**

**Write the table number or alternate method used:** \_\_\_\_\_

**Provide a schematic drawing of the complete piping system.**

Indicate on the drawing any existing piping.

\*A **section** of pipe is a combination of pipe and fittings that is of the same material, size and demand.  
**Each section must show:**

The piping type or material **each section.** **If not shown, sizing will be reviewed for sch. 40 steel.**

If all piping is the same material, Note that on the drawing.

The size of **each section.** **If not shown, sizing cannot be approved.**

The total length of **each section.** **If not shown, sizing cannot be approved.**

The total demand in CFH of **each section.** (For propane no conversion from BTUH to CFH required.)

**If not shown, sizing cannot be approved.**

(Xcel - divide Input BTUH by 830 to obtain CFH Demand.)

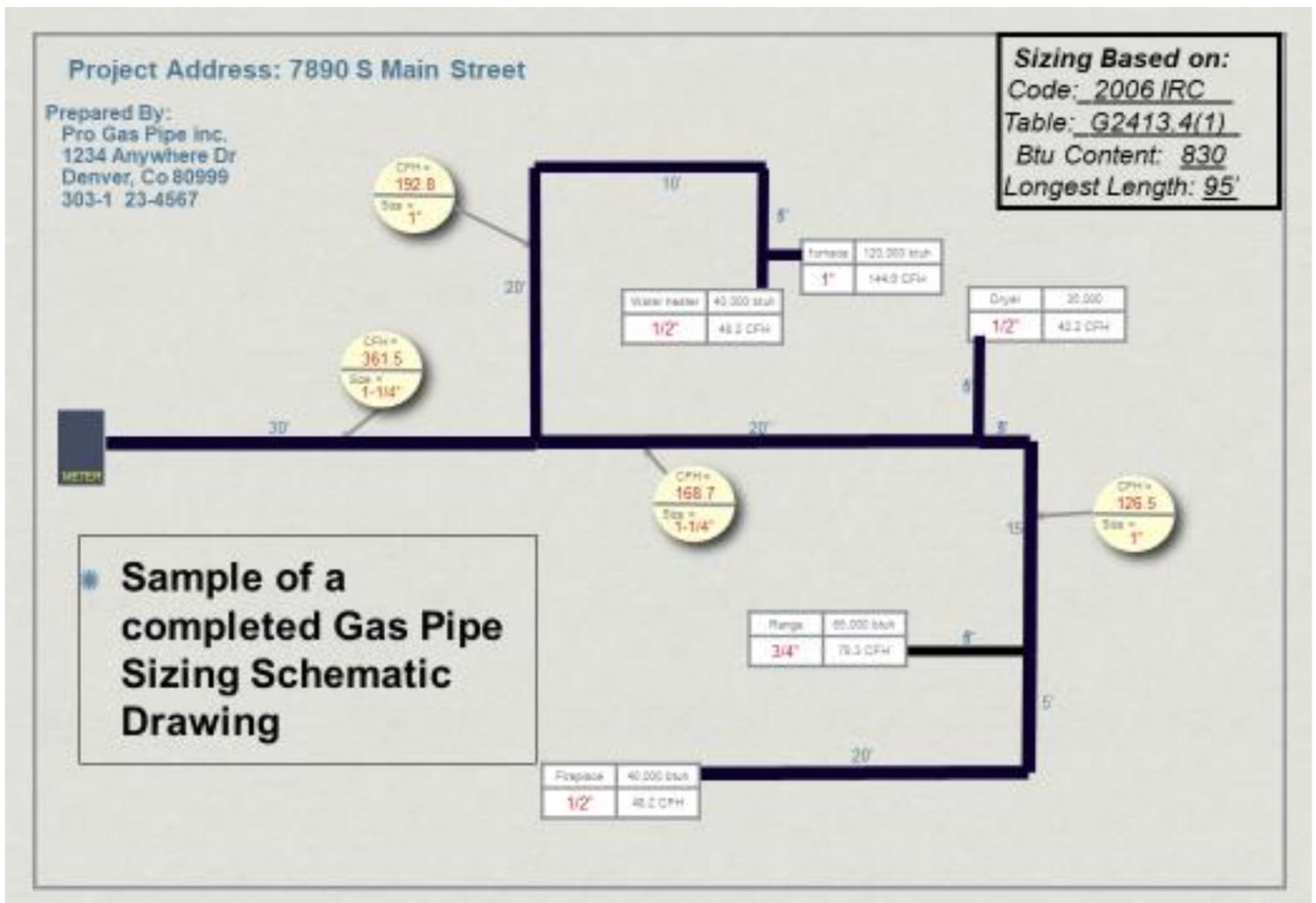
(Colorado Natural Gas - divide Input BTUH by 1050 to obtain CFH Demand.)

**See the International Fuel Gas Code or the International Residential Code Chapter 24 and in either code, Appendix A for additional information.** <http://publicecodes.cyberregs.com/icod/>

For areas served by Colorado Natural Gas, 1422 Monroe Unit C Strasburg, CO 80136 use 1050 BTU per Cu.ft.

**Xcel Energy Gas Standards Manual Gas Meters and Service Regulators 8.2.4 Meter Pressure Factors & Gas Quality Variables (PSCo) 03/31/09** Table 8.2.3 – Elevation, Local Pressure and Appliance Adjustment Data For PSCo Service Territory

Location	Elevation (ft)	Derate Factor	P <sub>a</sub> – Local Atmospheric Pressure (psia)	P <sub>loc</sub> – Local Metering Pressure (psia)	Btu Zone	As Delivered Heating Value (Btu/cf) @ P <sub>loc</sub>	Specific * Gravity
Aurora	5,342	0.79	12.12	12.34	Denver	827	0.67
Centennial	5,841	0.77	11.90	12.12	Denver	813	0.67
Cherry Hills Village	5,381	0.78	12.10	12.32	Denver	826	0.67
Columbine Valley	5,280	0.79	12.14	12.36	Denver	829	0.67
Denver-Metro	5,280	0.79	12.14	12.36	Denver	829	0.67
Englewood	5,306	0.79	12.13	12.35	Denver	828	0.67
Littleton	5,362	0.79	12.11	12.33	Denver	827	0.67



# GAS PIPE SIZING EXAMPLE

**A.3.1 Longest length method.** This sizing method is conservative in its approach by applying the maximum operating conditions in the system as the norm for the system and by setting the length of *pipe* used to size any given part of the *pipng* system to the maximum value. To determine the size of each section of *gas pipng* in a system within the range of the capacity tables, proceed as follows:

(1) Divide the *pipng system* into appropriate segments consistent with the presence of tees, branch lines and main runs. For each segment, determine the gas load (assuming all *appliances* operate simultaneously) and its overall length. An allowance (in equivalent length of *pipe*) as determined from Table A.2.2 shall be considered for *pipng* segments that include four or more fittings.

(2) Determine the gas *demand* of each *appliance* to be attached to the *pipng system*. Where Tables G2413.4 (1) through G2413.4 (21) are to be used to select the *pipng* size, calculate the gas *demand* in terms of cubic feet per hour for each *pipng system outlet*.

To obtain the cubic feet per hour of gas required, divide the total *Btu/h* input of all *appliances* by the average *Btu* heating value per *cubic foot* of the gas. The average *Btu* per *cubic foot* of the gas in the area of the installation can be obtained from the serving gas supplier.

(3) Where the *pipng system* is for use with other than undiluted liquefied petroleum gases, determine the design system pressure, the allowable loss in pressure (*pressure drop*), and *specific gravity* of the gas to be used in the *pipng system*.

(4) Determine the length of *pipng* from the point of delivery to the most remote *outlet* in the building/ *pipng system*.

(5) In the appropriate capacity table, select the row showing the measured length or the next longer length if the table does not give the exact length. This is the only length used in determining the size of any section of *gas pipng*. If the gravity factor is to be applied, the values in the selected row of the table are multiplied by the appropriate multiplier from Table A.2.4. (0.93)

(6) Use this horizontal row to locate ALL gas *demand* figures for this particular system of *pipng*.

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

(8) Opposite this *demand* figure, in the first row at the top, the correct size of *gas pipng* will be found.

(9) Proceed in a similar manner for each *outlet* and each section of *gas pipng*. For each section of *pipng*, determine the total gas *demand* supplied by that section. When a large number of *pipng* components (such as elbows, tees and *valves*) are installed in a *pipe* run, additional pressure loss can be accounted for by the use of equivalent lengths. Pressure loss across any *pipng* component can be equated to the *pressure drop* through a length of *pipe*. The equivalent length of a combination of only four elbows/tees can result in a jump to the next larger length row, resulting in a significant reduction in capacity. The equivalent lengths in feet shown in Table A.2.2 have been computed on a basis that the inside diameter corresponds to that of Schedule 40 (standard-weight) steel *pipe*, which is close enough for most purposes involving other schedules of *pipe*. Where a more specific solution for equivalent length is desired, this may be made by multiplying the actual inside diameter of the *pipe* in inches by  $n/12$ , or the actual inside diameter in feet by  $n$  ( $n$  can be read from the table heading). The equivalent length values can be used with reasonable accuracy for copper or brass fittings and bends although the resistance per foot of copper or brass *pipe* is less than that of steel. For copper or brass *valves*, however, the equivalent length of *pipe* should be taken as 45 percent longer than the values in the table, which are for steel *pipe*.

**Other sizing methods may be approved – contact an Inspector for additional information.**