Gas Pipe Sizing for Commercial Gas Water Heaters

When troubleshooting commercial gas water heaters, the gas supply or fuel train is essential to the combustion process. To determine if your gas pipe sizing is adequate, measure the inlet gas pressure at the gas control valve. Write down the static pressure (main burner is OFF); then start the water heater and after two minutes note the dynamic pressure (main burner is ON). Typically, there should be no more than 1 to 1 ½ inches w.c. pressure drop. If there is more than a 1 ½-inch pressure drop, the gas pipe size from the gas meter or pressure regulator may be too small. Here is how to check:

1. Note the BTU input of the water heater.
2. Starting at the gas valve, measure the pipe size and distance from the gas valve to the next location in the fuel supply.
3. The next location may be:
   a. Change in pipe size
   b. Pressure regulator
   c. Gas meter
4. Continue this process until you have reached the gas meter.
5. Add up all the straight pipe runs (we are not going to worry about sizing for elbows for now).
   a. Remember, your fittings, elbows and “T” must be the same pipe size as the straight pipe.
6. Then compare to your gas pipe-sizing chart and see if it will support the BTU load from the pressure regulator to the gas water heater.

Example #1:

High-pressure side is no problem. We carry 2 psi the entire 41 feet to the pressure regulator. The pressure regulator reduces the pressure to the rating specified on the rating plate. In this case, it is 10” w.c. natural gas. Then we have 2 feet of pipe from the regulator to the piping “T”; and another 4 feet to each water heater. The water heater system input rating is 400,000 BTU for both heaters. If you check the pipe-sizing chart, the pipe size from the pressure regulator to the water heaters is 1 inch minimum.
Example #2: (pressure regulator has been moved away from the water heaters)

High-pressure side is no problem. We carry 2 psi to the pressure regulator. The pressure regulator reduces the pressure to the rating specified on the rating plate. In this case, it is 10" w.c. natural gas. Then we have 49 feet of pipe from the regulator to the water heaters. The water heater input rating is 400,000 BTU for both heaters. If you check the pipe-sizing chart, the pipe size from the pressure regulator to the water heaters is 1 ¼ inch minimum.

### TABLE 2
For U.S. Installations
Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 psig or Less and a Pressure Drop of 0.3 Inch Water Column.
Based on a 0.60 Specific Gravity Natural Gas; If 1.5 Specific Gravity L.P. Gas is used, multiply capacity by 0.63

<table>
<thead>
<tr>
<th>Nominal Iron Pipe Size, Inches</th>
<th>Internal Diameter Inches</th>
<th>Length of Pipe, Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>0.82</td>
<td>10 20 30 40 50 60 70 80 90 100 125 150 175 200</td>
</tr>
<tr>
<td>1</td>
<td>1.30</td>
<td>1 2 3 4 5 6 7 8 9 10 12 15 18 21 24</td>
</tr>
<tr>
<td>1 1/4</td>
<td>1.67</td>
<td>1 2 3 4 5 6 7 8 9 10 12 15 18 21 24</td>
</tr>
<tr>
<td>1 1/2</td>
<td>1.87</td>
<td>2 3 4 5 6 7 8 9 10 12 15 18 21 24 27</td>
</tr>
</tbody>
</table>

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