Procedure

The gas input to a burner should be determined by "clocking" the gas meter. Failure to apply meter correction factors can lead to over-firing which could result in boiler damage or unsafe operating condition.

When determining gas flows using a gas meter, several factors must be considered to obtain an accurate measurement. The inlet gas pressure and temperature to the meter must be determined and the inlet gas pressure and temperature that was used to calibrate the gas meter must be known.

The calibration pressure (commonly referred to as base pressure) and temperature may be marked on the meter dial or nameplate. If this information is not on the meter, then use 4 oz. (7" water column [w.c.]) as base pressure and 60 degrees F as the calibration pressure and temperature.

The formula for calculating the gas flow is as follows:

$$\text{CFH} = \frac{\text{Cubic Feet X 3,600 X Pressure Correction X Temperature Correction}}{\text{Time}}$$

- CFH = Cubic feet of gas per hour
- Cubic Feet = cubic feet of gas clocked
- 3,600 = Number of seconds in one hour
- Pressure Correction = Correction factor for inlet gas pressure different than base pressure (see pressure correction table, next page)
- Temperature Correction = Correction factor for inlet gas temperature different than calibration temperature (see temperature correction table, next page)
- Time = Time in seconds required to measure "Cubic Feet"

Example

Assume the meter is calibrated with a base pressure of 4 oz. and temperature of 60 degrees F and you measure the inlet pressure to the meter as 5 psi with a gas temperature of 70 degrees F. You determine is takes 42 seconds for 50 cubic feet of gas to flow through the meter. For 5 psi the pressure correction factor is 1.324 and for 70 degrees F the temperature correction factor is .981. The calculation is:

$$\text{CFH} = \frac{50 \times 3{,}600 \times 1.324 \times .981}{42} = 5{,}566 \text{ cubic feet per hour of gas flow}$$

Determining the BTU Input (Heat Input)

To calculate the heat input to the boiler the CFH gas flow must be multiplied by the BTU content of the gas. Typically the BTU content for natural gas is 1,050 BTU's per cubic foot of gas and this number can be used if the actual is not known. In the above example, if the BTU content of the gas is 1,050 BTU's per cubic foot, then the input would be:

Heat Input = CFH X BTU per Cubic Foot = 5,566 x 1,050 = 5,844,300 BTUs per hour

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Gas Pressure Correction Factor

Meter Pressure (psi.)	Meter Base Pressure				
	4 oz. (7" w.c.)	8 oz. (14" w.c.)	10 oz. (17.5" w.c.)	1 psi. (28" w.c.)	2 psi. (56" w.c.)
0	0.983	0.966	0.958	0.935	0.878
1/4	1.000	0.983	0.975	0.951	0.893
1/2	1.017	1.000	0.992	0.968	0.909
5/8	1.026	1.008	1.000	0.976	0.916
1	1.051	1.034	1.025	1.000	0.929
2	1.119	1.101	1.092	1.065	1.000
3	1.188	1.168	1.158	1.130	1.061
4	1.256	1.235	1.225	1.195	1.122
5	1.324	1.302	1.291	1.260	1.183
6	1.392	1.369	1.358	1.325	1.244
7	1.461	1.436	1.424	1.390	1.305
8	1.529	1.503	1.491	1.455	1.366
9	1.597	1.570	1.557	1.520	1.427
10	1.666	1.638	1.624	1.584	1.488

Gas Temperature Correction Factor

Gas Temperature Degrees F	Meter Calibration Temperature				
	60 degrees F	65 degrees F	68 degrees F	70 degrees F	72 degrees F
0	1.130	1.141	1.148	1.152	1.157
5	1.118	1.129	1.135	1.140	1.144
10	1.106	1.117	1.123	1.128	1.132
15	1.095	1.105	1.112	1.116	1.120
20	1.083	1.094	1.100	1.104	1.108
25	1.072	1.082	1.089	1.093	1.097
30	1.061	1.071	1.078	1.082	1.086
35	1.051	1.061	1.067	1.071	1.075
40	1.040	1.050	1.056	1.060	1.064
45	1.030	1.040	1.046	1.050	1.053
50	1.020	1.029	1.035	1.039	1.043
55	1.010	1.019	1.025	1.029	1.033
60	1.000	1.010	1.015	1.019	1.023
65	0.990	1.000	1.006	1.010	1.013
70	0.981	0.991	0.996	1.000	1.004
75	0.972	0.981	0.987	0.991	0.994
80	0.963	0.972	0.978	0.981	0.985
85	0.954	0.963	0.969	0.972	0.976
90	0.945	0.955	0.960	0.964	0.967
95	0.937	0.946	09.51	0.955	0.959
100	0.929	0.938	0.943	0.946	0.950

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