



TECH TIP #51

EVERYDAY HELPFUL FACTS AND FORMULAE

Here's a list of general sizing formulae for everyday HVAC sizing calculations.

Pound of steam

1 pound of steam is equal to 970 BTU (or an easy to remember rule of thumb is 1 pound of steam is equal to 1000 BTU).

Water to steam expansion rate

1 pound of water is equal to a 16 oz tall boy (by volume)...when you heat that tall boy hot enough to make steam it expands almost 1700 times its original volume. That same pound of water becomes 67 CASES of tall boys!

Heating water with steam with a steam to water heat exchanger

$$\frac{\text{GPM}}{2} \times \text{Temperature rise} \times (1.10) = \text{pounds per hour of steam}$$

Heating air with steam coils

$$\frac{\text{CFM}}{800} \times \text{Temperature rise in degrees Fahrenheit} = \text{pounds per hour of steam}$$

Natural gas fired boiler efficiency (typical average, standard eff)

$$80\% \quad \text{Gas input} \times .80 = \text{output}$$

Typical hydronic hot water system design load (most HW systems will use a 20° F temp rise through the boiler or heat exchanger & a 20° F temp drop through hot water coils.)

$$\text{BTU/Hr.} = \text{GPM} \times 500 \times \text{Temp Rise}$$

Typical chilled water system design flow rates

2.4 GPM per ton (assuming 10°F difference between entering and leaving temperatures)

Evaporation rate of cooling tower condenser water

3 GPM per 100 tons

Condenser water flow rate requirement

3 GPM per ton

BTU per ton of cooling

12,000 BTU = 1 ton

Note: For many more helpful formulae, see "Tech Stuff" in the Technical Library on our website www.federalcorp.com.