ThermoTek
Heating & Ventilation Systems

To Whom It May Concern

As a norm, the industry standard calculation for obtaining BTU output is as follows:

BTU Output = Temperature Rise (∆ T) x CFM x 1.08

It is critical to understand that the **1.08** multiplier is not simply a constant that we can use with every calculation; it has just become convenient to assume such over time.

This number includes the specific heat (Cp) of air (0.24 BTU per pound per degree Fahrenheit). It takes 0.24 BTU of heat to change the temperature of one pound of air by one degree F. The **1.08** factor also contains the specific density of air (0.075 pounds per cubic foot). The air is measured in CFM, yet the specific heat is per pound of air. The weight per cubic foot of air (0.075 lbs) is needed to convert between the air volume and weight. Also contained in the **1.08** factor is the number of minutes in an hour (60 minutes per hour). This is required to convert between BTU per *hour* and cubic feet per *minute*.

In simple terms the factor of **1.08** is the product of the specific heat (0.24 BTU) times the density (0.075 lbs cubic foot) times the number of minutes per hour (60 min/hour).

M = Cp x ρ x 60 min/hr

The factor **1.08** assumes standard conditions at the blower (70 degrees F and sea level). For practical purposes, the specific heat of 0.24 will remain a good useable constant. Since there will always be 60 minutes in each hour, this is a fixed constant as well. Should the temperature or altitude at the blower vary from 70 degrees F or zero feet sea level however, the density of the air may change enough to significantly affect the accuracy of our BTU formula. At temperatures above 70 degrees F, air density is less (lighter air) and at temperatures below 70 degrees F, air density is greater (heavier air). Similarly with altitude, air density becomes lower at higher altitudes.

Although it is common industry practice to utilize the factor of **1.08** when determining BTU output, it is important to account for true air densities at the blower when determining the actual BTU output to ensure that your system is designed properly.

Actual BTU Output = Temperature Rise (∆ T) x CFM x (0.24 x Blower Air Density x 60)

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