Degree-Day Method (Heating)

A "degree-day" is a unit of measure for recording the temperature conditions for a 24-hour period. The number of heating degree-days (HDD) applied to any particular day is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value, which is usually 65°F. (The mean temperature is calculated by adding the high for the day to the low for the day, and then dividing the result by 2.)

If the mean temperature for the day is 60°F and the base temperature is 655°F, then there are 5 heating degree-days for that 24-hour period.

Although 65°F is the most commonly used base temperature, heating degree-days can be calculated for other temperatures, as well. The National Oceanic and Atmospheric Administration (NOAA) publishes "Annual Degree-days To Selected Bases." They are derived from 30-year normal monthly temperatures. The typical heating degree-day base temperatures (°F) are 65°, 60°, 57°, 55°, 50°, 45° and 40°.

Estimating the theoretical seasonal energy requirement of a conventional heating system using the degree-day method assumes the efficiency of the system to be constant regardless of outdoor temperature.

$$\frac{\text{Btu/h Loss x 24 x Annual Degree-Days}}{\text{Temperature difference}} = \text{Annual Btu}$$

The degree-day method equation has undergone several stages of refinement in an attempt to make it agree as closely as possible with the available measured data on an average basis. C_d is an empirical correction factor for heating effect vs. 65°F heating degree-days. Employing the C_d factor attempts to account for "free heat" from internal sources such as lights, equipment, occupants and solar gain.

$$\frac{\text{Btu/h Loss x 24 x Annual Degree-Days x } C_d}{\text{Temperature difference}} = \text{Annual Btu}$$

Reference:
Howell, R. H., and Sauer, H. J., "Environmental Control Principles. A Textbook Supplement to the ASHRAE Handbook 1985 Fundamentals Volume." University of Missouri-Rolla. 1985