

## ENERGY & UTILITIES

### Degree Days - Commercial Real Estate Concepts & Applications

BuildingsOne | September 3, 2015

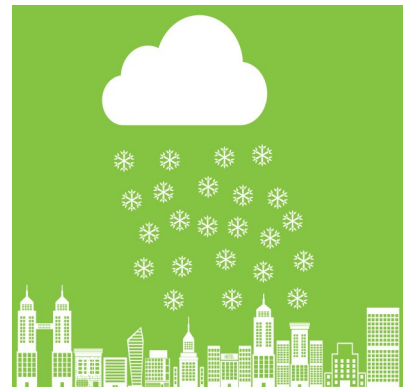


**Degree Days** are a function of outside air temperature, compared to a **'base temperature'**, over a period of time. In commercial real estate applications, the base temperature selected should represent an outside air temperature that would result in no (or minimal) heating or cooling required within the subject building.



By example, a building requiring no heating or cooling system operation at 60 degrees Fahrenheit (60°F) outside air temperature should consider tracking degree days based on an outside air base temperature of 60 F. Degree days are calculated, against the defined base temperature, as either *'heating degree days'* (HDD) or *'cooling degree days'* (CDD).

**Heating degree days** 'accumulate' when outside air temperatures are below the defined base temperature. During these conditions, building heating systems and equipment (and the energy sources for these systems) would generally be operating in order to maintain the desired interior space temperatures for occupant comfort.



**Cooling degree days** 'accumulate' when outside air temperatures are above the defined base temperature. During these conditions, building cooling systems and equipment (and the energy sources for these systems) would generally be operating in order to maintain the desired interior space temperatures for occupant comfort.

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## DEGREE DAYS

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The U.S. *default outside air base temperature* for degree day applications has historically been 65°F. This default outside air base temperature seems to work well when used in residential real estate applications. In theory, when the outside air temperature is below 65°F, some form of heating could be required in a private residence. By comparison, the BuildingsOne September 2015 Newsletter, utilized 50°F as a standard outside air base temperature in the calculation of 2015 winter - (total) heating degree days.

Most commercial real estate buildings tend to have sufficient internal occupancy and equipment heat load, e.g., computers, lighting, etc., such that minimal (or no) heating would be required when outside air temperatures are at or above 50°F. In actuality, most commercial office buildings would require some form of cooling with outside air temperatures between 50°F and 65°F. By using 50°F or 55°F as a standard outside air base temperature, the calculation of heating degree days (and cooling degree days) would provide the commercial real estate owner | operator with a more accurate measure of the impact, of outside air temperatures, to the building's energy consumption required in heating and cooling their building.

Base temperature is defined & recorded as outside ambient - '*dry bulb*'- temperature and does not factor in other thermal energy consumption factors such as wind or humidity. Also, a building's heating and cooling demand varies based on factors including physical structure, occupancy and internal equipment '*heat load*'. Regardless, the concept of tracking and recording heating and cooling degree days, against a standard base temperature, provides the property owner | operator with relevant energy information, in particular the impact of weather temperature conditions to building energy consumption and utilities expenses.



With advancements in *weather monitoring and recording technology*, combined with unrestricted access to data via the internet, building owners, managers and senior operating staff, can quickly and easily calculate and record *heating and cooling degree days* for their respective properties. With thousands of outside weather station centers, strategically positioned around the globe, outside air temperature data is downloaded on a near continuous basis. [www.degreedays.net](http://www.degreedays.net) - the leading 'degree day web-site' for 5,000 + energy professionals - has an interactive program that facilitates the automatic calculation of degree days with several straightforward web-site entries.

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Calculating Cooling and Heating Degree Days - <a href="http://www.degreedays.net">www.degreedays.net</a>	
6 Step Process	Comments
Select Weather Station	Generally, select a weather station situated closest to the subject property. Certain weather stations, e.g., large airports, typically provide more accurate data. <a href="http://www.degreedays.net">www.degreedays.net</a> - rates each station with 'bars & stars' to assist in selecting the most suitable station.
Select Degree Day Type	Select Heating or Cooling Degree Days (in Celsius or Fahrenheit)
Select an Outside Air Base Temperature	Enter the outside air base temperature, e.g., 50°F   55°F   60°F   65°F The program will calculate the number of heating or cooling degree days; comparing actual outside air temperatures to the base temperature selected. Select the same base temperature when comparing degree days for multiple periods.
Select Period Covered	Generally, from 1 month to 36 months. Also, select data breakdown: Monthly   Weekly   Daily   Average
Generate Degree Days	The program will calculate the cooling   heating degree days over the period selected
Export into Excel	There is an 'excel export' function allowing you to record the information to an excel document, 'total sum' degree days and compare data to comparison time periods.

The chart below represents the data that is transferred from the weather station to [www.degreedays.net](http://www.degreedays.net)  
The chart also illustrates the calculation of heating degree days (8 Heating Degree Days) in a 24 hour period.

Outside Air - Base Temperature = 55 Degrees F																							
12am	1am	2am	3am	4am	5am	6am	7am	8am	9am	10am	11am	12pm	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm	9pm	10pm	11pm
Actual Outside Air Temperature - Recorded Hourly																							
45	44	43	40	40	41	42	44	48	49	50	50	52	53	53	54	52	50	49	48	46	44	43	40
Number of Degrees Below the Base Temperature																							
10	11	12	15	15	14	13	11	7	6	5	5	3	2	2	1	3	5	6	7	9	11	12	15
<b>Total Number of Heating Degree Days</b> for 1 Day = Average Number of Degrees Below Base Temperature Measured Each Hour x 24 Hours																						<b>8</b>	

With *Degree Days* information, the commercial real estate manager can record and compare outside air temperature variations on a monthly and annual basis. In doing so, the manager can better determine the impact to the building's energy consumption and if the building's heating | cooling system energy consumption corresponds with these external weather conditions.