



## Glossary of Solar Terms and Definitions

**Altitude:** The angular distance from the horizon to the sun.

**Ambient Temperature:** The temperature of the surrounding air.

**ASHRAE:** Abbreviation for the American Society of Heating and Air-Conditioning Engineers.

**Azimuth:** The angular distance between true south and the point on the horizon directly below the sun.

**British Thermal Unit (BTU):** The quantity of heat needed to raise the temperature of one pound of water one degree Fahrenheit.

**Calorie:** The quantity of heat needed to raise the temperature of one gram of water one degree Celsius.

**Coefficient of Heat Transmission:** The rate of heat loss in BTU per hour through a square foot wall or other building surface when the difference between indoor and outdoor air temperatures is one degree Fahrenheit.

**Conductance:** The rate of heat flow (in BTUs per hour) through an object when a 1° F. temperature difference is maintained between the sides of the object.

**Conduction:** The flow of heat due to temperature variations within a material.

**Conductivity** A measure of the ability of a material to permit conduction of heat flow through it.

**Convection:** The motion of fluid such as gas or liquid by which heat may be transported.

**Daylight Efficacy Value (Ke):** The daylight Efficacy Value is an indication of the amount of light (footcandles) that will enter through a fenestration system as compared to the amount of heat (Btu/hr.ft<sup>2</sup> or W/M<sup>2</sup>).  $Ke = \text{Visible Transmittance} / \text{Shading Coefficient}$ .

**Degree Day:** A unit that represents a 1 degree F. deviation from some fixed reference point (usually 65°F.) in the mean daily outdoor temperature.

**Design Heat Load:** The total heat loss from a house under the most severe winter conditions likely to occur.

**Design Temperature:** The temperature close to the lowest expected for a location, used to determine the design heat load.

**Diffuse Radiation:** Indirect sunlight that is scattered from air molecules, dust and water vapor.

**Direct Radiation:** Solar radiation that comes straight from the sun, casting shadows on a clear day.

**Emittance:** A measure of the propensity of a material to emit thermal radiation.

**Emissivity-** A measure of a surface's ability to emit long-wave infrared radiation or room temperature radiant heat energy. The lower the emissivity, the lower the resultant U-Value.

**Heat Capacity:** A property of a material denoting its ability to absorb heat.

**Heating Season:** The period from early fall to late spring (in the northern hemisphere) during which additional heat is needed to keep a house comfortable for its occupants.

**Infrared Radiation:** Electromagnetic radiation from the sun that has wavelengths slightly longer than visible light.

**Insolation:** The total amount of solar radiation direct, diffused and reflected-striking a surface exposed to the sky.

**Insulation:** A material with high resistance (R-value) to heat flow.

**Langley:** A measure of solar radiation; equal to one calorie per square centimeter.

**Percentage of Possible Sunshine:** The percentage of daytime hours during which there is enough direct solar radiation to cast a shadow.

**Pyranometer:** An instrument for measuring solar radiation.

**R-value:** The R-Value (F/Btu/hr.FT<sup>2</sup>) is the inverse of the U-value. The value represents the resistance to heat flow due to the indoor/outdoor temperature differential.

**Radiation:** The flow of energy through open space via electromagnetic waves, such as visible light.

**Reflected Radiation:** Sunlight that is reflected from surrounding trees, terrain or buildings onto a surface exposed to the sky.

**Relative Heat Gain-** The total amount of heat gain through a glazing system expressed in terms of Btu/hr/ft<sup>2</sup>.

**Resistance, or R Value:** The tendency of a material to retard the flow of heat.

**Shading Coefficient-** The ratio of solar heat gain through a glazing to the solar heat gain through a single lite of 1/8" glass. The smaller the number, the better the glazing is at preventing solar gain. I.E. A value that represents the quantity of solar heat through the product/glazing in question as compared to the solar heat gain through the ASHRAE reference glazing (1/8" clear single glazing; SC = 1.0), under the same conditions.

**Solar Constant:** The average intensity of solar radiation reaching the earth outside the atmosphere; accounting to two Langley's or 1.94 gram-calories per square centimeter, equal to 442.4 BTU/hr/ft.<sup>2</sup>, or 1395 watts/m<sup>2</sup>.

**Solar Energy Transmittance-** In the solar spectrum, the percentage of ultraviolet, visible, and near infrared energy from the sun that is transmitted through the glazing.

**Solar Energy Reflectance-** In the solar spectrum, the percentage of ultraviolet, visible, and near infrared energy that is reflected from the glazing surface(s).

**Solar Radiation (Solar Energy):** Electromagnetic radiation emitted by the sun.

**Solar Rights:** A legal issue concerning the right of access to sunlight.

**Solar Heat Gain Coefficient-** The fraction of solar radiation entering a home through the windows. The lower the number the better the window is at preventing solar gain-critical to reducing summer cooling costs.

**Solar Heat Gain Factor (SHGF):** A solar radiation level (Btu/hr.ft<sup>2</sup> or W/M<sup>2</sup>) for a given geographic location, surface tilt and orientation, time and day that would enter (transmitted and the inward flowing fraction of the absorbed portion of solar

radiation) the space through the ASHRAE reference glazing. This value accounts for the change in transmittance, reflectance and absorbance due to the changing incident angle on the glass.

**Solar Heat Gain Coefficient (SHGC):** This value was developed to replace the Shading Coefficient due to the fact that the Shading Coefficient is not constant. Specifically for products that have strong angular solar optical properties. ie: louvered shade screen.—The ratio of solar heat gain (transmitted and the inward flowing fraction of the absorbed portion of solar radiation) through the product/glazing to the incident solar radiation striking the surface for a given condition.

**Specific Heat:** The quantity of heat, in BTU, needed to raise the temperature of one pound of a material 1°F.

**Solar Optical Properties (TRA Values):** The solar optical properties of a glazing or product are the transmittance, reflectance and absorbance. Generally referred to as the TRA values.

The solar optical properties are further broken down into three categories, total solar, visible and UV.

Total solar properties are used for the analysis of the product/glazing for the entire spectrum related to solar radiation. These values would be used when one is concerned with the solar heat gain (heat) into a space.

The visible properties are the same TRA values but for the visible range of the solar spectrum only. This is the solar spectrum range that the average human eye responds to. These properties would be used for analysis of day lighting, glare, etc.

The UV transmittance is the transmittance of the product/glazing for the UV range of the solar spectrum. This value is used as a rating to determine the product/glazing effectiveness in guarding against UV degradation. The reader should be aware that the UV portion only accounts for approximately 1/3 of the damage. The environmental UV radiation and the heat produced by absorbed solar radiation both impact the degradation to carpet and furnishings.

**Sun Path Diagram:** A circular projection of the sky vault, similar to a map, that can be used to determine solar positions and to calculate shading.

**Thermal Mass or Thermal Inertia:** The tendency of a building with large quantities of heavy materials to remain at the same temperature or to fluctuate only very slowly; also the overall heat storage capacity of the building.

**Thermal Radiation:** Electromagnetic radiation emitted by a warm body.

**Turtle Glass:** Turtle glass is glass with a visible light transmittance of 45% or less in the visible spectrum (380 to 720 nanometers).

**Ultraviolet Radiation:** Electromagnetic radiation with wavelengths slightly shorter than visible light.

**U-Value:** The amount of heat transmitted by the window. The lower the number, the more efficient the window is in reducing winter heating costs. I.E. The U-factor (Btu/hr.ft<sup>2</sup>.F or W/M<sup>2</sup>.C) is the heat transmission value for the product/glazing/window which occurs to the indoor/outdoor temperature differential. this can be a heat gain or loss depending on the indoor/outdoor temperatures.

**Visible Light Reflectance:** In the visible spectrum, the percentage of light that is reflected from the glass surface(s).

**Visible Light Transmittance:** A measure of the amount of visible light that passes through the glazing material of a window. Visible light transmittance, or simply *visible transmittance* (VT), is a fraction of the visible spectrum of sunlight (380 to 720 nanometers), weighted by the sensitivity of the human eye, that is transmitted through a window's, door's, or skylight's glazing. A product with a higher VT transmits more visible light. VT is expressed as a number between 0 and 1. The VT you need for a window, door, or skylight should be determined by your home's daylighting requirements and/or whether you need to reduce interior glare in a space.