

**ABSORPTANCE** – The fraction of incident radiation that is absorbed.

**ACRYLIC** (Plastic, Plexiglas) – A non-crystalline thermoplastic with good weather resistance, shatter resistance, and optical clarity; sometimes used for glazing.

**ADHESION** – The ability of a coating or sealant to stick or bond to the surface to which it is applied.

**ADHESIVE FAILURE** – Failure of a compound by pulling away from the surface with which it is in contact. (See cohesive failure.)

**ALLOY** – A metal to which another element has been added, generally another metal.

**ANNEALED GLASS** – Standard sheet or plate glass.

**ANNEALING** – To heat above the critical or recrystallization temperature, then controlled cooling of glass or other materials to eliminate the effects of cold-working, relieve internal stresses or improve strength, ductility, or other properties.

**CLOUDINESS INDEX** – The percent of extra-terrestrial radiation that reaches the earth surface when measured on a horizontal

**COHESIVE FAILURE** – Splitting and opening of a compound resulting from over-extension of the compound. (See adhesive failure)

**COMPATIBILITY** – The ability of two or more materials to exist in close and permanent association for an indefinite period with no adverse affect of one on the other.

**CONDENSATION** – When water vapor, which is present in all but the driest air, comes on contact with a surface that is below what is called the “dew point temperature”, the vapor becomes liquid and is called condensation. An example is as follows: Condensation forms on a glass of ice water since the surface of the glass is down to the dew point temperature of the inside air.

**CONDUCTION** – Process of heat transfer through a material from a warm surface to a cool surface.

**CONDUCTION FACTOR** – The difference in the “U-values” before and after -lm application to glass multiplied by 24 hours/day. This factor is used in calculating heating energy savings.

**CONVECTION** – Heat transfer by the movement of fluid or air

**COOLING DAYS** – The number of days in a year that air conditioning equipment is used.

**COOLING DEGREE-DAY** – Cooling and heating engineers have found a way to relate the typical climate conditions of different areas to the amount of energy needed to cool and heat a building. The term they use is “Degree-Day” using a base temperature of 65°F (18°C). A cooling degree-day is counted for each degree above 65°F (18°C) reached by the average (between the highest and lowest) daily outside

temperatures in the summer. For example, if on a given summer day the high is 90°F (32°C) and the low is 70°F (21°C), the daily average temperature is 80°F (26°C). This is 15°F (8°C) above the base temperature of 65°F (18°C difference). So, on that day, you would have gone through 15 (8) cooling degree-days.

**CORROSION** – The deterioration of metal by chemical or electro-chemical reaction resulting from exposure to weathering, moisture, chemicals, or other agents or media.

**CRF** (Condensation Resistance Factor) – Gives an indication of a window's ability to resist condensation. The higher the CRF, the less likely condensation is to occur.

**CURTAIN WALL** – An exterior building wall which carries no roof or -floor loads and consists entirely or principally of metal, or a combination of metal, glass, and other surfacing materials supported by a metal framework. There are two basic types:

**CUSTOM:** Walls designed specifically for one project, and using parts and details specially made for this purpose.

**STANDARDS:** Walls made up of principally of parts and Details standardized by their manufacturer and assembled in accord with either the architect's design or the manufacturer's stock patterns.

**DEGREE-DAY** – A unit that represents a 1°F (1°C) deviation from some fixed reference point (usually 65°F [18°C]) in the mean, daily outdoor temperature. (See heating degree-day and cooling degree-day)

**DESICCANT** – An extremely porous crystalline substance used to absorb moisture from within the sealed air space of an insulating glass unit.

**DEW POINT** – The temperature at which the condensation of water vapor in a space. Used in testing sealed insulated glass. The lower the number, the higher the resistance to forming condensation.

**DOUBLE GLAZING** – In general, any use of two panes of glass, separated by an air space, within an opening, to improve insulation against heat transfer and/or sound transmission. In factory-made double glazing units the air between the glass sheets is thoroughly dried and the space is sealed airtight, eliminating possible condensation and providing superior insulating properties. (See sealed insulating glass.)

**EDGE CLEARANCE** – The distance between the edge of a unit of glass or panel and its surrounding frame, measured normal to the edge in the pane of the glass or panel.

**ELASTICITY** – Pliability, ability to take up expansion and contraction; opposite of brittleness.

**EMI** – An abbreviation of Electromagnetic Interference

**EMISSIVITY** – This is a measure of the ability of a surface to emit room temperature radiant heat energy. It is also a measure of the ability of the surface to reflect room radiant energy since, for window

systems, the emissivity and the reflectivity of room radiant energy add up to unity. A low emissivity means a high reflectivity of room radiant energy

**EXTERIOR GLAZED** – Glass set from the exterior of the building.

**FENESTRATION** – An opening in a building.

**FLOAT GLASS** – Glass which has its bottom surfaces formed by floating on molten metal, the top surface being gravity formed, producing a high optical quality of glass with parallel surfaces and, without polishing and grinding, the refinished brilliance of the best sheet glass. Float glass is replacing plate glass.

**FOGGING** – A deposit of contamination left on the inside surface of the sealed insulating glass unit due to extremes of temperatures. Usually happens with failed sealed insulated glass.

**GLARE REDUCTION** – This is the ratio of the difference in visible transmission of the glass before and after installing lm to the visible transmission of the glass with no film . It is expressed as percentage and is determined by the respective visible transmission values of the glass with and without lm.

**GLASS** – A transparent, brittle substance formed by fusing sand with soda or potash or both; it often has lime, alumina or lead oxide.

**GLASS EDGE STRESS** – An amount of force in pounds per square inch (psi) ( $\text{kg}/\text{cm}^2$ ) experience by the edge of the glass pane

**GLASS THERMAL STRESS** – An applied force, caused by absorbed solar heat, that tends to strain or deform glass.

**GLAZING** – The work of installing glass in a frame.

**GLAZING BEAD** – A molding or stop around the inside of a frame to hold the glass in place.

**GLAZING COMPOUND** – A soft dough-like material used for filling and sealing the space between a pane of glass and its surrounding frame. Dow 995 would be an example.

**HEATING DAYS** – The number of days in a year that the heating equipment is used.

**HEATING DEGREE-DAY** – Heating and cooling engineers have found a way to relate the typical climate conditions of different areas to the amount of energy needed to heat and cool a building. The term they use is “Degree-Days” using a base temperature of 65°F (18°C). A heating degree-day is counted for each degree below 65°F (18°C) reached by the average (between highest and lowest) daily outside temperature in winter. For example, if on a given winter day the high is 40°F (4°C) and the low is 20°F (-6°C), the daily average temperature is 30°F (-1°C). This is 35°F (19°C difference) below the base temperature of 65°F (18°C).

So, on that day, you would have gone through 35 (19) heating degree-days.

**HEAT GAIN** – The transfer of heat from outside to inside. Both heat loss and heat gain are measured in terms of the fuel consumption required to maintain a comfortable indoor temperature.

**HEAT LOSS** – The transfer of heat from inside to outside by means of conduction, convection, and radiation through all surfaces of the building.

**HEAT LOSS REDUCTION** – This is the ratio of the difference in heat loss through the glass after installing Im to the heat loss through the glass with no Im. It is expressed as a percentage and is determined by the respective “U” values of the glass with and no without Im.

**HEAT STRENGTHENED GLASS** – Glass which is reheated, after forming, just below melting point and then cooled. A compressed surface is formed which increases its strength. Often used for spandrel glass.

**HERMETICALLY SEALED UNIT** – An insulated glass unit made up of two lites of glass, separated by a roll formed aluminum spacer tube (at the full perimeter) which is filled with a moisture absorbing material. The unit is then completely sealed, creating a moisture free, clean, dead air space.

**HVAC** – An abbreviation for Heating, Ventilating, and Air Conditioning equipment.

**HUMIDITY, RELATIVE** – The percentage of moisture in the air in relationship to the amount of moisture the air could hold at that given temperature. 100% relative humidity would be rain.

**ICBO** – International Conference of Building Officials.

**IFMA**- International Facility Manager Association

**INFILTRATION (air)** – The movement of outdoor air into the interior of a building through cracks around windows and doors or in walls, roofs, and doors.

**INSULATING GLASS** – Insulating glass refers to two pieces of glass spaced apart and hermetically sealed to form a single-glazed unit with an air space between.

Heat transmission through this type of glass may be as low as half that without such an air space. It is also called Double Glazing.

**INTERIOR GLAZED** – Glass set from the interior of the building.

**INTERIOR STOP** – The removable glazing bead that holds the glass in place, when it is on the interior side of the lite, as contrasted to an exterior stop which is located on the exterior side of a glass or panel.

**IWFA**-International Window Film Association

**JALOUSIES** – the jalousie window is made up of horizontally-mounted louvered glass that abuts each other tightly when closed and extend outward when cranked open.

**KWH** – An abbreviation for kilowatt-hour. A unit of electric power consumption. Equivalent to 3413 Btu's of energy or heat.

(1 kWh = 3.60 MJ)

**LAMINATED GLASS** – Two or more sheets with an inner layer of transparent plastic to which the glass adheres if broken. Used for overhead, safety glazing, and sound reduction.

**LITE** – Another term for a pane of glass used in a window. Frequently spelled “light” in the industry literature, but spelled “lite” in this text to avoid confusion with light as in “visible light”.

**LOW-EMISSIVITY GLASS** – Glass which restricts the passage of radiant heat, in and out; a metal or metal oxide coating applied to the glass to provide low emissivity.

**MAXIMUM HEAT GAIN** – The maximum per hour amount of solar heat coming through one square foot of glass. Measured in units of Btu/hr./sq.ft ( $W/m^2$ ).

**MCF** – An abbreviation of one thousand cubic feet. A unit of natural gas consumption. Equivalent to 1,000,000 BTUs ( $37,300 \text{ KJ}/m^3$ ) of energy or heat.

**MLB** – An abbreviation for one thousand pounds. A unit of steam consumption. Equivalent to 1,000,000 Btu's ( $2330 \text{ KJ}/kg$ ) of energy or heat.

**MOISTURE CONTROL** – The use of humidifiers, air conditioners, or ventilation to keep the humidity of the home at acceptable levels. Also refers to vapor barriers

**MONOLITHIC** – A single piece of glass.

**MULLION** – An intermediate connecting member used to “marry” two or more windows or patio doors together in a single rough opening without sacrificing air or water light performance. A mullion also can give added strength to the connection for structural stability.

**MUNTINS** – A muntin is a strip of wood or metal separating and holding panes of glass in a window. Muntin is also called "muntin bars", "glazing bars", or "sash bar"

**OBSCURE GLASS** – Mainly used for decoration, diffusion, or privacy. The design is pressed into the glass during the rolling process. There are many patterns available.

**ORGANIC COATING** – A coating such as paint, lacquer, enamel, or plastic in which the principal ingredients are derived from animal or vegetable matter or from some compound of carbon (which includes all plastics).

**PASSIVE SOLAR HEAT GAIN** – Solar heat that passes through a material and is captured naturally, not by mechanical means. (ex: Large windows facing south/east/west take advantage of passive solar heat gain in Northern Hemisphere.)

**PAYBACK** – Savings from reducing energy cost and seeing this reflected in your heating/cooling bills.

**PERMEABILITY** – The quality of permitting passage of water through openings without causing rupture or displacement.

**PLATE GLASS** – Polished plate glass is a rolled, ground, and polished product with true at parallel plane surfaces.

**POLYCARBONATE** – Any of a family of thermoplastics characterized by a high softening temperature and high impact strength (Lexan).

**POLYSULFIDE** – Polysulfide liquid polymers are mercaptan terminated, long chain aliphatic polymers containing disulfide linkages. They can be converted to rubbers at room temperature without shrinkage upon addition of a curing agent. Used for exterior sealant and sealed insulating glass sealant.

**PSF** – Pounds per square foot (lbs/ft<sup>2</sup>) (kg/m<sup>2</sup>) as above.

**PSYCHROMETER** – An apparatus used to determine the relative humidity by determining the wet bulb temperature of the air. It is a very accurate means of determining relative humidity.

**RADIATION** – Transmission of heat through space by wave motion; passage of heat from one object to another without warming the space between, such as sunlight.

**REFLECTANCE** – The fraction of the incident light that is reflected.

**REFLECTIVE HEAT GAIN** – The amount of conduction heat gain plus solar heat gain, measured in terms of energy unit per hour per square foot (compare U-Value).

(Btu/hr/sq.ft. or W/m<sup>2</sup>)

**RFI** – An abbreviation for Radio Frequency Interference.

**ROI** – Return on investment.

**“R”-VALUE** – A measure of resistance to heat gain or loss (insulative ability).

**SEALANT** – An elastomeric material with adhesive qualities that joins components of a similar to dissimilar nature to provide an effective barrier against the passage of the elements.

**SHADING COEFFICIENT** – This is ratio of the solar energy entering through a window compared to that which enters through a window of clear 1/8” (3mm) double strength sheet glass. The solar energy which enters includes both that which is transmitted directly through the window and that portion of the energy absorbed in the window that is transferred to the interior.

**SHEET GLASS** – A transparent, flat glass whose surface has a characteristic waviness. There are three basic classifications of sheet glass:

**SHELF LIFE** – The length of time that packaged materials such as adhesives and sealants can be stored under specific temperature conditions and still remain suitable for use.

**SIG** – (Sealed Insulated Glass) – See insulating glass.

**SOLAR ENERGY SPECTRUM** – Solar radiation is typically divided into three categories, namely, the ultraviolet, the visible and the near infrared portions of the spectrum. All three portions results in heat when the solar radiation is absorbed. At the earth's surface, approximately 3% of the solar energy is in the ultraviolet portion, 44% is in the visible portion and 53% is in the near infrared

**SOLAR HEAT GAIN** – The amount per hour of solar heat coming through a square foot of glass. Measured in units of Btu/hr/sq.ft. ( $W/m^2$ ).

**SOLAR HEAT REDCUTION** – This is the ratio of the difference in total solar energy entering before and after installing lm on the glass to that entering through the glass with no lm. It is expressed as a percentage and is determined by the respective shading coefficients of the glass with and without lm.

**SPANDREL GLASS** – Heat-strengthened -oat glass with a colored-ceramic coating adhered to the back by a heat-fusing process. It has double the strength of annealed glass of the same size and thickness; enabling it to withstand greater uniform loads and thermal stresses. Spandrel glass cannot be re-cut after heat strengthening. It is used as fixed opaque colored glass on buildings in front of -floor slabs and columns. It is available in a wide array of colors.

**SPECTROPHOTOMETER** – An instrument for measuring the transmittance and reflectance of surfaces and media as a function of wavelength.

**SUNLIGHT** – The portion of solar energy which is detectable by the human eye; it accounts for about 44% of the total solar energy.

**TEMPERED GLASS** – As with heat strengthened glass, it is re-heated to just below the melting point but suddenly cooled. When shattered, it breaks into small pieces. It is approximately five times stronger than standard annealed glass. It must be used as safety glazing in patio doors, entrance doors, side lites, and other hazardous locations. It can't be re-cut after tempering.

**TENSILE STRENGTH** (Also called ultimate strength) – The breaking strength of a material when subjected to a tensile (stretching) force. Usually measured by placing a standard piece in the jaws of a tensile machine gradually separating the jaws and measuring the stretching force necessary to break the test piece. Tensile strength is commonly expressed as pounds (or tons) per square inch ( $kg/m^2$ ) of original cross sectional area.

**THERM** – 100,000 Btu's (105.5 MJ) of energy or heat.

**TINTED GLASS** – A mineral admixture is incorporated in the glass, resulting in a degree of tinting. Any tinting reduces both visual and radiant transmittance.

**TON-HR** – A unit of air conditioning consumption equivalent to 12,000 Btu's (3024kcal) of energy.

**TOTAL SOLAR ENERGY** – When solar radiant energy strikes the exterior surface of a window, the energy is reflected, absorbed and/or transmitted as defined above.

The total of these three parameters must add up to 100%.

**TOTAL SOLAR ENERGY ABSORBED** – This is a ratio of the solar energy that is absorbed by the window and converted to heat in the window to the total solar energy impinging on the window. It is typically expressed as a percentage.

**TOTAL SOLAR ENERGY REFLECTED** – This is a ratio of the solar energy that is reflected directly away by the window to the total solar energy impinging on the window. It is typically expressed as a percentage.

**TRIPLE GLAZED** – Three panes of glass separated by air spaces.

**UBC** – Uniform Building Code.

**UL** – Underwriters Laboratory.

**“U”-VALUE** – The measurement used in determining the ability of different structural components (such as windows) to conduct heat. The “U”-Value of a window is

measured by the number of Btu’s that will pass through each square foot of area per degree of temperature difference ( $W/m^2\text{-}^\circ C$ ) from one side of the window to

the other. “U”-Values can tell you how well your windows will hold in your heated or cooled air. The lower the number the better.

**VISCOSITY** – The internal resistance to flow exhibited by a fluid. The higher the number, the thicker the fluid.

**VISIBLE LIGHT REFLECTED** – Visible light is defined as that portion of the solar energy spectrum under average daylight conditions that is visible to the human eye and the values given are based on the response of the human eye. The ratio of that which is reflected away from the surface of the window to that impinging on it is called the percent of visible light reflected.

**VISIBLE LIGHT TRANSMITTED** – This is a ratio of the human eye weighted average daylight that is transmitted through the window to that which is incident upon the window.

**VISIBLE RADIATION** – The spectrum containing radiation with wavelength in a narrow band from about 400 nanometers (violet) to 750nm (red). At the earth’s surface about half the solar energy is in the visible range.

**WAVELENGTHS** – Wavelength is the distance between two successive points of a periodic wave in the direction of propagation, in which the oscillation has the same phase. The three common used units are listed in the following table:

Name	Symbol	Value
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Micrometer  $\mu\text{m}$  1  $\mu\text{m}$  =  $10^{-6}$  m

Nanometer nm 1 nm =  $10^{-9}$  m

Angstrom A 1 A =  $10^{-10}$  m

**ULTRAVIOLET** – The invisible rays of the spectrum which are outside of the visible spectrum at its violet end. UV rays are found in everyday sunlight and can cause fading or chalking of dark paint finishes. Extreme UV exposure can cause certain plastic materials to distort.

NOTE: On the basis of practical applications and the effect obtained, the ultraviolet region often is divided into the following wavelengths:

UV-A : 315-400 nanometers

UV-B : 280-315 nanometers

UV-C : 100-280 nanometers

**UV REDUCTION** – This is the ratio of the difference in ultraviolet transmission of the glass before and after installing film to the ultraviolet transmission of the glass with no film. It is expressed as a percentage and is determined by the respective UV transmission values of the glass with and without film.

#### **WINDOW TYPES –**

**AWNING** – A partially movable sash hinged at the top, and opening either outwards or inwards.

**CASEMENT** – A window sash hung by hinges fastened to the jamb of the window frame.

**DOUBLE HUNG** – Consists of a pair of vertical sliding sash, either sash opening independently of the other. Older type double hung sash operate through a system of weights, springs, or pulleys.

**FIXED** – A single sash fastened permanently in a frame so that it cannot be raised, lowered, or swung open.

**HOPPER** – A partially movable sash hinged at bottom and opening inwards.

**PIVOTED** – A sash that swings open or shut by revolving on pivots at either side of the sash or at top and bottom.

**SINGLE HUNG** – A window frame containing a pair of vertical sliding sashes in which only one sash is movable, usually the lower in contrast to a double hung sash.

**SLIDING** – A sash which moves horizontally on a track.

**STORM** – A full length sash, either fixed or movable, fitted to the outside or inside of a window frame to afford protection during cold or stormy weather.

**WIRE GLASS** – Polished or clear glass,  $\frac{1}{4}$ " (6mm) thick. Wire mesh is embedded within the glass such that the glass will not shatter when broken. The wire pattern is available in many types. It is frequently used in skylights, overhead glazing, and locations where a re-retardant glass is required.