

Basic Energy Code definitions from the 2009 IECC with short commentary

AIR BARRIER. Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

Many of you are familiar with products like Tyvec or Weathermate (building wrap materials) both are considered an air barrier for the exterior of the building. These products also double as the water resistive barrier required under the exterior cladding. Air barriers on the inside of exterior wall assemblies would be materials like gypsum board, thin structural sheathing (Thermoply), Oriented Strand Board (OSB) and plywood.

AIR CHANGES PER HOUR (ACH). The number of times a defined volume of air is changed each hour.

For example:

A bathroom has a 50 cfm (Cubic Feet per Minute) exhaust fan

The bathroom has a floor area of 50 sq. ft., with a ceiling height of 8'

The volume of this bathroom is $50 \times 8 = 400$ cubic feet

The fan will move 50×60 minutes = 3000 cubic feet of air in one hour

The ACH is $3000/400 = 7.5$ Air Changes per Hour

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floor, roof, and any other building element that enclose conditioned space. This boundary also includes the boundary between conditioned space and any exempt or unconditioned space.

Think to yourself what is inside and what is outside of your building. An example of a 'boundary between conditioned space and unconditioned space' would be the insulated wall between the (conditioned) house and the (unconditioned) attached garage.

BLOWER DOOR. A tool that is used to measure air infiltration through the buildings thermal envelope.

This a large exhaust fan that is typically set up in the front door of the building. The fan is used to depressurize the building to a specific pressure. Sensors located inside and outside the house and on the fan are then used to calculate the amount of air being pulled through the exterior walls and openings. This produces an air changes per hour rate.

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CONDITIONED SPACE. An area or room within a building being heated or cooled, containing un-insulated ducts, or with a fixed opening directly into an adjacent *conditioned space*.

Do not be confused with 'containing un-insulated ducts' The IECC requires that any duct in areas that are not conditioned be insulated. Thus the reasoning that if the duct is insulated it is not in conditioned space. That being said buildings with very low heating and cooling loads often use insulated ducts in conditioned space, so the air temperature loss is minimized.

ECONOMIZER, AIR. A duct and damper arrangement and automatic control system that allows a cooling system to supply outside air to reduce or eliminate the need for mechanical cooling during mild or cold weather.

This type of control is required on commercial HVAC systems. It is essentially a set of louvers that open and allow outside air into the system. So if the buildings thermostat is set at 70° and the outside temperature is 70°, there is no need to run the air conditioner, simply let the outside air in.

ENERGY ANALYSIS. A method for estimating the annual energy use of the *proposed design* and *standard reference design* based on estimates of energy use.

This is the calculation used in the performance path for residential and commercial buildings. The standard reference design is the same building modeled with the prescriptive code requirements and the energy it would use in a year. The proposed design is how the building is actually built and the energy it would use in a year.

ENERGY SIMULATION TOOL. An approved software program or calculation-based methodology that projects the annual energy use of a building.

This would any software approved by the building official used for the energy analysis. An example of software would be:
REMrate by Architectural Energy Corporation

HIGH-EFFICACY LAMPS. Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts,
2. 50 lumens per watt for lamps over 15 watts to 40 watts, and
3. 40 lumens per watt for lamps 15 watts or less.

T-8 means the diameter of the linear fluorescent bulb is $8 \times 1/8'' = 1''$ diameter. Most of the linear fluorescent bulbs we are familiar with are T-12 or $1 \frac{1}{2}''$ in diameter and are not a high-efficacy lamp.

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INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

Air infiltration has a huge impact on the comfort and energy efficiency of a building. This is the outside air coming through the exterior walls. Imagine a typical home that is built without regard to air barriers or sealing penetrations in the exterior walls, many blower door tests have been completed on existing homes and show the average leakage rate of .5 ACH. This means that 50% of the volume of conditioned air inside the building is replaced with unconditioned outside air each hour, so in two hours all of the air has been replaced with unconditioned air. Jurisdictions that have years of blower door test results have found that homes built with proper air barriers and sealing of penetrations, have an average ACH of .1.

R-VALUE (THERMAL RESISTANCE). The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \text{ _ ft}^2 \text{ _ }^\circ\text{F/Btu}$) [$(\text{m}^2 \text{ _ K})/\text{W}$].

OK so maybe not so clear. The higher the R-Value the more resistant to heat loss the insulation product is.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then reradiated, conducted or convected into the space.

So I am certain that clears up what the SHGC is?

OK so in terms most of us can understand: The amount of sun's heat that is reflected back by a window and the amount of the sun's heat that flows through the window. So a window that has a Solar Heat Gain Coefficient of 0.50 means that 50% of the heat is reflected back and 50% flows through the window. The lower the number the more heat that is reflected away. A SHGC of 0.30 reflects 70% and allows only 30% through.

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films ($\text{Btu/h _ ft}^2 \text{ _ }^\circ\text{F}$) [$\text{W}/(\text{m}^2 \text{ _ K})$].

OK so maybe another one that is not exactly crystal clear. U-Factor is how heat flows through a material or assembly (like an exterior wall or window). The lower the U-Factor, the better the material or assembly is at limiting heat loss.

