Passive Solar Heating (2 hrs) 2021

for southern Ohio and Indiana, middle & northern Kentucky
by John F Robbins CEM / CSDP

2.0 contact hrs for engineers, contractors, designers and certified energy professionals

Course Description

Passive Solar Heating is an overview of passive solar design principles and features intended to reduce conventional heating and cooling energies. It was popular 1970-2000 during the U.S. Energy Crisis and qualified for solar energy tax credits during the late 1970s and early 1980s. Whether done intentionally and correctly or unintentionally and incorrectly, there are benefits and consequences that modern HVAC contractors should recognize and understand when encountered. So this course starts with many photos of residential and commercial passive solar projects to familiarize students with typical appearances and features.

The most recognizable feature in a proper passive solar design is a large area of south-facing windows protected by large roof overhangs or other shading methods during the cooling season. Ideal passive solar design admits a large amount of sunbeams into the conditioned space during the heating season, but prevents most incoming sunbeams during the cooling season. Higher solar heat-transmitting glass is sometimes used for south-facing windows than for east or west windows. East and west windows are usually smaller and fewer than south-facing windows. The reason for all this is explained by comparing hourly solar heat gain (in BTUs per hour) for sunbeams from south, east and west in December, March/September and June. Since ideal roof overhang design is based on sun angles, seasonal and hourly sun altitudes and azimuths are also presented. Calculations are demonstrated to show how much solar heating is possible with different levels of insulation and airtightness around the conditioned space. And since passive solar heat distribution inside a conditioned space is often passive (involving no fans or blowers), more open floorplans are also more typical than many wall-divided rooms. Indoor thermal storage is also typical with passive solar, like masonry or concrete which is exposed to sunbeams.

Modern HVAC contractors will sometimes encounter incorrectly done passive solar with negative consequences like huge indoor temperature swings during winter and overheating during summer. But even well done passive solar will cause larger indoor temperature swings than most conventional designs without large concentrations of windows. Passive solar designers and builders in the past usually instructed initial occupants how to deal with these matters without using more conventional energy, but later occupants often don't get this instruction. So this course will include some of this instruction, including advice on using programmable thermostats.

Learning Objectives

- Learn how to estimate how much solar heating energy can be collected by south-facing windows during winter. Also learn how much is collected by south-, east- and west-facing windows in summer.
- Become familiar with the different solar heat gain coefficients (SHGC) available among common window choices. Understand when to select higher or lower SHGC.
- Understand hourly sun positions throughout the year for north latitudes 38 to 40 and how to use them to achieve more perfect overhangs and other summer shading strategies.
- Learn about the impact of thermal storage in a passive solar indoor space, but also appreciate the potential problem of a large amount of overly warm or cool thermal mass in a conditioned space.
- Understand why passive solar performance is best with more insulation, airtightness and storage.

J O H N F. R O B B I N S CEM / CSDP
3519 Moffett Road, Morning View, KY 41063-8748
(859) 363-0376 john@johnfrobbins.com www.johnfrobbins.com