

HVAC Sizing: Heating & Cooling (2 hrs)

Ohio, Indiana & Kentucky (2016)

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2.0 hrs continuing education for engineers, contractors and certified energy professionals

Course Description

Most HVAC engineers and contractors rely on various softwares to size heating and cooling systems. Energy codes usually refer to software like "Manual J" or calculations methods as described in ASHRAE's "Handbook of Fundamentals." The formulas used in both the softwares and ASHRAE handbook are the same. This course presents, explains and demonstrates those formulas for sizing the required outputs for HVAC equipment to meet local heating and cooling loads. Among the many formulas presented are assessments of heat gains and losses from insulated assemblies, from air leakage, from outside air intake ventilation, from sunbeams which enter the conditioned space through glass, from indoor electricity use and from indoor occupants.

The difference between summing assembly R-values according to installed insulation labels (as required by energy codes) and estimating achieved average R-values is also covered. Tables are presented to show and compare likely or acceptable ranges of R-values for various common insulations and building materials. Discussion is included about lower R-values being possible for certain insulations when used in highest or lowest expected temperatures. R-value calculations for assemblies with busy framing are also demonstrated.

The formula for cooling load from "passive solar heating" is presented, including comparisons by different glass type based on varying solar heat transmittance. The standard window rating which describes this (Solar Heat Gain Coefficient or SHGC) is explained and demonstrated.

Formulas are also presented for quantifying heating and cooling loads from air leaks and intake ventilation, including how to quantify cooling load from summer's high humidity. The potential load reduction achievable by using heat-recovery ventilation is also explained.

The concept of "HVAC capacity index" (BTUs per sf) is introduced for evaluating the overall HVAC efficiency of a home or building, especially its thermal efficiency during the heating season. The normal range of local HVAC capacity index values is presented because such knowledge is also useful for troubleshooting load-sizing calculations whether done manually or by software.

Learning Objectives

- Understand basic manual calculations for sizing heating and cooling loads related to thermal conduction, air leakage and outside air supply with or without heat recovery. Outdoor heating and cooling "design temperatures" are presented for major cities in Ohio, Kentucky & Indiana. Indoor and outdoor design temperatures are presented and compared when ASHRAE's recommendations differ from local codes
- Understand basic manual calculations for sizing cooling loads associated with humidity removal, solar heat gain and heat emitted by indoor electronics and people
- Become familiar with widely varying R-values of common insulations and building materials
- Learn to estimate more accurately the achieved average R-values of insulated assemblies
- Understand solar heat gain coefficient (SHGC) ratings in new windows and how to estimate SHGCs for older glass assemblies. Learn how to use window SHGC ratings and shading factors to estimate solar cooling loads

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