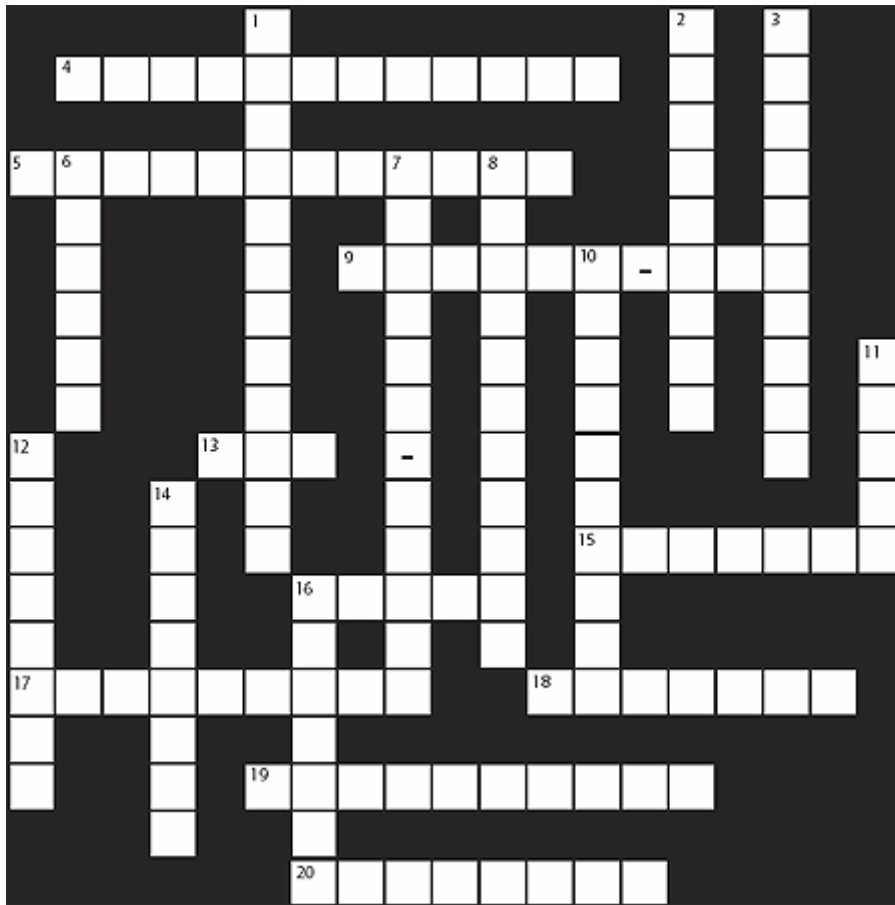


Crossword Puzzle: Energy Calculations



ACROSS

4. This type of energy model is available in two types—standard multiple-liner and Fourier series—and requires more metering than other modeling techniques but is unusable if even one of the metered variables becomes unavailable.
5. This type of data is obtained under normal building operation conditions.
9. These types of energy estimating methods are the simplest methods for energy analysis and are appropriate if the building use and efficiency of the HVAC equipment are constant.
13. These types of energy estimating methods are used when the conditions of analysis vary based on outdoor temperatures and occupancy hours during those varying temperature ranges.
15. This type of energy estimating is used for modeling the energy use of existing building for establishing baselines and calculating retrofit savings.
16. This is a government developed energy simulation code similar to DOE-2 and EnergyPlus, and it is based on forward simulation models.
17. This type of data is gathered under conditions of certain predetermined or planned experiments on the system in order to elicit system response under a wider range of system performance than would have occurred under normal system operation.

18. Determining the fuel and energy required of this equipment is the third step in energy modeling.
19. This type of analysis of manufacturers' published design data has been traditionally used for modeling of primary equipment in lieu of using first-principle models for energy calculations.
20. This efficiency of heating equipment depends on such factors as steady-state efficiency, sizing, cycling effects, and energy conservation devices.

DOWN

1. This part of an HVAC system affects energy consumption both from the direct electrical energy for the fans and pumps and also from the thermal energy transferred through the ducts and pipes.
2. Determining the load on this equipment is the second step in energy modeling.
3. This is a government-developed energy simulation code similar to DOE-2 and BLAST, and it is based on forward simulation models.
6. These variables describe the reaction of the system to the input variables, and energy is often a response variable.
7. This type of energy modeling is based on degree-days or temperature bins, as opposed to dynamic modeling which is based on transfer functions.
8. In choosing an energy analysis method, this criteria is necessary to allow analysis of all options under consideration.
10. During intermediate or cooling seasons, this HVAC system operational mode can be used to postpone the use of mechanical cooling by opening windows or increasing the outside ventilation air quantity.
11. Determining this load is the first step in calculating energy requirements.
12. This type of bin method extends the basic bin method to account for weekday/weekend and partial-day occupancy effects, to calculate net building loads at four temperatures.
14. In choosing an energy analysis method, this criterion should be taken into account, but absolute prediction is not possible.
16. Most of this type of equipment is equipped with combustion control systems that vary fuel input to satisfy changing heating loads.

To brush up on the facts behind this clues, refer to Chapter 31 ("Energy Estimating Methods") in the *2001 ASHRAE Fundamentals Handbook*.

(* Adapted from the journal *Engineered Systems*, March 2004)