

# Where It Begins

## HVAC Sizing Step 1: Rethink Your Building Envelope

By David Goepfert



The operating efficiency of any HVAC system is directly related to the amount of insulation in the roof and walls and, more importantly, the method in which it is installed in the building. Another important factor is considering the intended building use. What type of equipment and lights will be in operation? How many people will typically occupy the facility? Building components, such as windows, doors and insulation, also have a direct cause/effect relationship on the HVAC equipment. All these factors are important and directly affect the building's heat gain/loss, but it all starts with the insulation.

Heating and cooling relies on the building envelope to repel unwanted heat gain/loss and contain the conditioned or heated air created by the mechanicals. Any short circuit in the thermal conduction in the building will counteract the HVAC and forces the unit(s) to work harder, longer and more frequently.

Building owners should review all areas in which thermal movement is typically placed and ask the designer for better options than what is typically installed. For example, hot box tests confirm compressed insulation—typically installed leaving the purlins exposed—show a reduction in the preinstalled R-value up to 50 percent when installed in metal buildings. Are your HVAC sizing calculations accounting for this disparity? There are methods in the marketplace that allow full R-value insulation while providing proper placement of the vapor retarder, which

drastically reduces the amount of heat transfer in metal buildings. These systems allow HVAC units to be sized properly and make for the most efficient running process and longest life of the heating and cooling equipment. With the additional investment toward the insulation, it allows designers to trade off the costs of additional units, piping, wiring and maintenance. Many times the equipment savings alone will pay for the additional invest-



ment on a superior insulation system.

The HVAC system and insulation system must be designed as a cohesive unit of energy efficiency instead of two separate pieces of a building puzzle. While it is a mindset that is slowly changing, the nation's building codes are requiring architects and design/build contractors to view buildings not as a set of pieces that plug and play but as a series of products that are intertwined throughout the building

construction process and extending through the life of the building.

Owners are becoming more aware of the energy efficiency of their investments, and with the incredible resources and information available on the Internet, they are willing to do research to recommend different products to a building designer. While some old-school designers view this as a meddling owner interfering with the design process, it requires the design-



er to choose products and methods that are not merely "typical" but fit the specific needs of the building owner better than any other option available. The owner will have to pay for the energy usage of the building, not the designer. Integrated systems are how buildings should be designed, and if it's not the standard for designers in today's competitive market, it will be soon.

In short, the sizing of the heating and

cooling equipment (and initial cost to the owner) and lifetime operating efficiency are directly related to the building envelope efficiency (the insulation). The insulation is, therefore, a much larger part of the HVAC equipment than many realize and should be taken into account during the design process. Insulation saves owners money in initial mechanical acquisition costs and, in the lifetime of the building, in operating costs.

Our company has witnessed the difference cohesive HVAC and insulation design makes in metal buildings. Business owners mention that after they increased the insulation levels in their existing building, some of their HVAC units previously installed have not even turned on. This confirms a couple of things for us: First, it confirms that increasing the insulation and making improvements in the building envelope makes an immediate impact on the HVAC equipment. And second, the building owner purchased more heating and cooling equipment than what was needed if their building's insulation would have been installed correctly and the equipment was sized appropriately. **MCM**



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