Cost-effective Cooling

Achieving Energy Efficiency in Warmer Climates

By Meghan Richards

Energy costs continue to rise across the country, and building owners, architects and contractors are looking for cost-effective ways to improve the energy efficiency of buildings. In past years when consumers thought of insulation, they automatically thought of cold-weather climates and heating bills. It is no longer just the Northern climates that are realizing the benefits of insulation. Adding insulation to buildings that utilize air conditioning will not only help the system run more efficiently, it will lower operating costs.

Reflective insulations (1/4-inch [6-mm] to 1-inch [25-mm] bubble pack, foam core or fiberglass core) have become extremely popular in the last five to 10 years in warmer climates and certainly alleviate a lot of the heat gain that occurs in a structure. However, reflective insulations do not have enough thermal value to be used in air-conditioned spaces. In a conditioned space, mass blanket insulation is needed to help economically maintain certain temperature levels inside a building, as well as keep the warm, moist, humid air outside in the summer.

Vapor Retarders

A vapor retarder is a key element in any metal building, but the placement of the vapor retarder becomes very important in warmer climates, especially when a building is air conditioned. Warm, moist outside air can infiltrate around metal panels and seep into cracks and condense in the insulation. In this case, the vapor retarder may be placed on the outside, closest to the roof panel itself. This can help in the prevention of condensation issues.

As most people are aware, the placement of a vapor retarder is normally on the warm (heated) side of the building, and in Northern climates, that is on the interior of the building. To avoid creating a double vapor retarder in an air-conditioned environment, a perforated vapor retarder is usually laminated to the other side of the fiberglass so a white facing is exposed in the interior of the building. Because this interior vapor retarder is perforated, it allows the HVAC system to remove any condensation that may have penetrated the outside vapor retarder and keep the insulation system and the interior of the building dry.

Thermal Bridging

Another element that needs to be discussed is thermal bridging. A thermal bridge is a component or several components connected together in a building envelope through which heat is transferred at a higher rate than through the rest of the building envelope. The obvious thermal bridge in a metal building is the connection of the roof sheet and purlins/bar joists. Unfortunately, the most common method of installing insulation in a metal building is over the purlins. Because the insulation is compressed above the purlin, the thermal value of the insulation is compromised and the heat gain in a building through these areas is very significant.

Certainly there are other insulation systems available that are a vast improvement compared to the over-the-purlin method. However, the insulation systems that fill the cavity between the purlins still do not completely isolate and stop the flow of heat and cold through the roof sheet and purlins into the building.

Achieving Energy Efficiency

Many of the buildings that are in warmer climates (and colder climates) were not insulated well enough or just met minimum standards 10 to 15 years ago. Energy efficiency today equates to a good retrofit insulation system. It is truly one of the most cost-effective ways to lower energy costs.

With that in mind, there are very few insulation systems specifically designed for retrofit applications and certainly few that take thermal bridging into consideration. A retrofit insulation system that has a lower layer of fiberglass blanket insulation that is installed underneath the purlins and/or structural steel actually encapsulates the bottom of the purlins and eliminates the effect of thermal bridging in a structure.

Thermal imaging has been done comparing different retrofit insulation systems. The thermal images were taken with a FLIR ThermaCAM, an infrared camera that instantly measures the temperature of the area within the lens. The portion of the building that had insulation installed under the purlins was 20 F (-7 C) cooler than the portion of the building that had the cavity in between the purlins filled with insulation.

Another key element to a good retrofit insulation system is a system that can accommodate the use of the building. If, for example, a business takes over an existing building and does not utilize the full height of the building, the insulation system should be dropped to create less conditioned space. This creates immediate savings in utility costs. Another item to look for in a retrofit insulation system, especially in warmer climates, is the ability to ventilate the cavity above the insulation system, so if there are existing condensation issues in a building, moisture will not be trapped and condense in the insulation.

The addition of insulation is a cost-effective and easy way to lower the operating costs of a building. Further incentive to make improvements to an existing structure can be found in the Energy Policy Act of 2005, which allows for tax deductions for improving the energy efficiency of an existing building through the building envelope, HVAC and lighting systems. Utility companies across the country are also offering utility rebates and distribution funds to building owners looking to improve the energy efficiency of their structure. Web sites, such as dsireusa.org and icasbs.com/articles/utility.aspx are excellent resources. MCN

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