Thermal Design

13

TECHNICAL BULLETIN 13:
REDUCING HEAT GAIN IN METAL BUILDINGS

People readily associate the need for a good thermal insulation system with cold weather. Unfortunately for owners, they tend to ignore the value of a good thermal insulation system in hotter climates. The most dominant and overlooked source of heat gain in metal buildings is conduction. Steel is an extremely good heat conductor and has a definite impact on total energy costs and occupant discomfort.

To visualize what occurs, think about the relationship of the metal building components. A typical metal building has approximately five square feet of metal roof panel per lineal foot of purlin. With over-the-purlin insulation systems, the total exposed surface area of each lineal foot of an 8" deep purlin is slightly over two square feet. The surface areas of these two components represent a “heat collector” (roof panels), and a “radiator” (exposed purlin) in the conductive downward heat flow process.

Metal roof panels often reach temperatures in excess of 150 degrees during sunny days. Heat absorbed by the metal roof is conducted downward through the fasteners and/or roof clips, heating up the purlins to temperatures within 10-20 degrees of the roof panels. It’s obvious when these hot purlins are left exposed, that they will radiate a tremendous amount of heat into the building’s attic or directly into occupied space.

The unique Simple Saver System® from Thermal Design is capable of stopping a very high percentage of all three forms of downward heat flow. The system is designed to encapsulate and isolate the steel purlins. Full depth and full width mass insulation in the purlin cavities further reduces heat gain. Whether the Simple Saver System is used above a suspended ceiling or left exposed, it will dramatically reduce heat gain, lower the mechanical equipment requirements and significantly reduce annual energy costs.

It can make sense to install the Simple Saver System even in buildings that are not air-conditioned. The net result is an energy efficient building that will be cooler in the summer and warmer in the winter while increasing occupant comfort, morale and productivity. When you consider all the benefits and project cost trade-offs, it makes sense to use the Simple Saver System more often than you might think.

Note: No owner would install radiant heaters five feet apart the entire length of their building that would automatically run at temperatures as high as 140 to 150 degrees on the hottest days of the year…leaving the purlins exposed in a metal building is a very close comparison!

Think about this:

- Competitive over-the-purlin insulation systems on the market today can increase average installed R-values, but they all leave the purlins exposed and thus fail to effectively reduce conducted downward heat flow in metal buildings. Today's design objective is too often to use the minimal insulation that just meets code.
- Official hotbox tests are not 100% accurate when analyzing conducted downward heat flow. Only by having a very costly test conducted in a special equipped testing laboratory (where the sun’s radiant heat can be simulated on the roof) can a real life box test measurement of total downward heat flow be obtained.
- Ask us about cooling a 10,000 sq. ft. plant addition in Nebraska with only a 3-1/4 ton air conditioning unit, or cooling a contract packaging company’s 7,500 sq. ft. building in Arkansas with a single 5-ton unit.

601 North Main Street | PO Box 468 | Madison, NE 68748
800.255.0776 | **thermaldesign.com**

 TD_TechBul13_HeatGain_DRAFT.indd MA 03/2014