

Metal Buildings and Condensation

Frequently Asked Questions

1) What are the conditions that will make condensation occur on the underside of an uninsulated metal roof deck or framing members?

Condensation will occur on any surface when the surface air temperature is at or below the “dew point temperature” for an air-water (vapor) mixture. The dew point temperature depends on the dry bulb temperature (measured with an ordinary thermometer) and the relative humidity in the air space next to the surface. The dew point temperature is less than or equal to the dry bulb temperature. The two temperatures are equal when the relative humidity is 100%. Some examples of dew point temperature conditions:

Temperature (inside surface)	Relative Humidity	Dew Point Temperature
70°F	50%	50.5°F
70°F	75%	64.6°F
70°F	90%	66.9°F

As you can see, condensation can occur when the outside temperature is cold. Insulation below a roof deck will have an inside surface temperature that is above the roof surface temperature. The actual temperature of the inside surface depends on the amount of thermal resistance between the roof and the inside surface. The higher the resistance, the closer the interior surface temperature will be to the inside air temperature. Maintaining a reasonable inside relative humidity (less than 60%) is an important factor in preventing condensation.

2) How will the addition of a reflective insulation with an airspace between the roof deck and the aluminum surface change the conditions that cause condensation?

A reflective insulation below the roof deck results in an interior surface temperature that is greater than the outside temperature (in cold weather). As the inside air surface temperature increases, the conditions for condensation become less likely to occur.

3) Is a vapor retarder required?

A vapor retarder is highly recommended on the underside of metal roof decks. A vapor retarder is a layer of material having a permeance of less than 1 perm and is typically applied to a warm interior surface to prevent condensation. If interior air containing water vapor is allowed to come in contact with a cold roof deck, then condensation will likely occur. The insulation system that does not include a high quality vapor retarder will be of little or no value in controlling condensation in cold weather.

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