

Condensation: Why it occurs and how to minimize it.

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What causes condensation and what steps can be taken to help minimize it?

Any glazing or covering product is susceptible to the formation of condensation on the underside of the panel after installation. Single-layer products that are not insulated, such as corrugated metal, fiberglass, glass, polycarbonate, and PVC are all prone to exhibit condensation build-up when certain environmental conditions are present. Suntuf®, Suntop®, Palruf®, Sunlite®, and Sun 'N Rain® fall into this category of single-layer coverings.

If you have installed, or plan to install a patio cover or sun room using one of these covering materials, you may experience water droplets dripping from the underside of the panels, especially at the horizontal supporting members. This is almost certainly due to condensation build up on the underside of the panels. The condensation that forms is not a direct result of the roofing panels but rather the surrounding environment in which the panels are installed. This document briefly explains condensation, why condensation occurs, and a few suggestions to help minimize it.

Definition of Condensation:

Condensation is the process by which moisture vapor becomes a liquid. The air in our atmosphere contains anywhere from 0 % to 4 % moisture vapor. This moisture vapor will remain in the air until either: (1.) so much moisture vapor is added to the air that it becomes saturated and can no longer hold the moisture vapor; or (2.) the temperature of the air drops low enough so that the air can no longer hold the moisture vapor. In either case, the moisture vapor turns into liquid (water) and forms on a surface as condensation.

Cause of Condensation:

Condensation is caused by the air temperature becoming too cool to hold the moisture vapor contained within it. The factors involved in condensation are as follows:

1. The amount of moisture vapor in the air (measured in relative humidity).
2. The circulation of the air.
3. The air temperature, both under the covered roof and outside of it.

The amount of moisture vapor in the air varies and is commonly expressed in terms of relative humidity. Relative humidity is a measure of the amount of moisture vapor in the air, compared to the maximum amount of moisture vapor that the air can hold at a particular temperature and barometric pressure.

The fundamental principle concerning air and relative humidity is: the warmer the air temperature, the greater its capacity for holding moisture vapor. When warm air comes in contact with a cold surface, the air around that surface begins to cool. As it cools, its ability to hold moisture vapor decreases. Eventually, it reaches a temperature at which it can no longer hold the moisture vapor. This is sometimes referred to as the dew point. When the air reaches this point, the moisture vapor begins to condense, forming as tiny droplets of water on the cooler surface.

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To help you visualize this more clearly, we point to an extreme example: a pot of heated water with a glass lid on top. As the water in the pot becomes heated, it turns into moisture vapor, ultimately becoming dense enough to be seen as steam. As the moisture vapor rises, it comes in contact with the lid. The moisture vapor cools and begins to condense and collect on the underside of the lid, ultimately collecting into larger and larger droplets that become too heavy and fall from the lid.

A similar, but less extreme example would be how windows inside of a car become foggy. When someone gets into a cold car, and the temperature outside is also cold, they begin to warm the inside, and also begin to add moisture vapor to the air just by breathing and naturally perspiring. As the moisture-laden air comes into contact with the window, the air is cooled and condenses, forming a fog on the windows.

Moisture vapor within a covered structure is much less visible, but is still present and is susceptible to the same phenomenon. Warm, moisture-laden air will rise and condense as it comes into contact with the underside of the panel, which is cool because its exterior is exposed to the cooler outdoor temperature.

Air Circulation and Condensation:

When air remains still, next to a cool surface, it cools down more rapidly than air that is well-circulated. As the air temperature within a structure decreases, its ability to hold the moisture vapor within it decreases.

Using our example of an automobile interior, when the defroster is turned on, it blows warmed fresh air across the surface of the window, which warms the interior surface of the window, and circulates the air around the car, thereby slowing cooling of the moisture vapor, and preventing it from collecting on the surface of the car's windows. Supplying air circulation to the a covered roof area also slows down the cooling process and can help reduce condensation formation.

Ways of Reducing Condensation on Your Palram Roof:

1. Remove obstacles which inhibit proper air circulation under your Palram roof.
2. The installation of an exterior-grade ceiling or circulation fan can create enough air circulation to reduce the chances of condensation build up.
3. In enclosed structures, the addition of a dehumidifier can assist in removing unwanted moisture it the air.

The implementation of the above suggestions can help minimize unwanted moisture in the air of most applications. Nevertheless, it is impossible to account for all applications and their surrounding environmental conditions.

Applications in high humidity areas such as those in the Pacific Northwest or Southeastern United States are more prone to condensation issues.

If condensation drip is objectionable, it is recommended that these suggestions are put in place to support the removal of excess moisture vapor.

Note: It is possible to build structures with supports that are designed to collect and drain condensation from coverings in order to eliminate dripping. These structures are relatively complex to build and require structural supports that are not typically found through DIY sales channels. For more information, consult with an architect or glazing engineer.