



Blisters in roof coating have many causes

Blisters can frustrate anyone who works with roofs. Their arrival is usually a surprise, their cause is often unknown, and their removal is a lot of work. In this bulletin, we offer some ideas that may be helpful in dealing with blisters.

What causes blisters?

Blisters represent a localized loss of adhesion and the lifting of roof ply or roof coating film from the underlying surface. The most common cause is water or moisture vapor migrating through from below or above the roof surface. If the volume of trapped moisture exceeds the permeability (breathability) of a roof ply or coating film, pressure caused by rising temperatures on a warm day expands the moisture below the ply or coating film, and separates it at its weakest point, forming a blister.

Blisters may occur below or between ply sheets in a built-up roof system, at the roof coating interface with the roof surface, or between coating layers when multiple coats have been applied to the roof. **It is important**

to recognize the difference before proceeding. Blisters may be filled with water or air. Osmotic blisters can occur when moisture permeates the coating film from the outside due to continuous or frequent contact with water (i.e. ponding water). Moisture collects at the interface between roof ply, or the coating film and the ply, eventually causing a loss of adhesion and a blister. Osmotic blisters are not likely in areas where drainage is good.

Moisture can come from below the roof and through the ply system to cause blisters. Some roofing experts maintain it is impossible to build an absolutely moisture tight BUR membrane. The nature of the process always creates tiny voids. If the area beneath the roof can't breathe, then moisture may be drawn to the roof deck. Buildings can be too air tight to breathe adequately.

Surface blisters in coating can sometimes be caused by the actual moisture in the liquid coating at the time of application. Small blisters can form when the coating dries so

rapidly some of the water can't evaporate completely before the coating surface cures.

What to do about blisters

If blistering is evident; try to determine the source of the moisture. Likely possibilities:

- a. Coating blisters confined to standing water areas are osmotic blisters.
- b. Coating blisters over asphalt emulsion or Puddle Plaster™ often mean these were coated before fully cured.
- c. Blisters between layers of coating (as opposed to blisters originating between the coating and the ply) are often caused by:

- Thick roof coating applied over a hot surface (flash-drying that traps moisture)
- Applying a second coat before the first coat is dry
- Poor coating adhesion, either due to coating over a dirty/chalky surface (lack of proper cleaning) or not fully rinsing away cleaning agents such as TSP, causing areas of chemical interference

- d. Blisters originating at the coating/substrate interface, indicating moisture coming up from below:

- Moisture trapped in roofing plys, insulation, or wood decking due to past or current roof leaks
- Moisture trapped in roofing plys, insulation, or wood decking — caused by moisture from the living area being lifted by warm air that ultimately condenses on cold roof and deck surfaces — migrates through tiny passages in the ply layers.
- Moisture trapped in voids during construction of BUR roofs where ply sheets are not fully sealed by hot mop asphalt can cause blisters between ply sheets.
- Moisture trapped in spray-down foam due to deterioration or loss of protective coating.

What to watch for

Roof coating blisters in ponding water areas are due to moisture permeation from above. Roof coating blisters in areas of adequate



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drainage are usually coming from below. Consider venting.

Watch out for roofs with coatings that have blistered before. Try to determine why the blistering occurred before recoating, as the blisters may return.

Roofs over cathedral ceilings often blister because they are likely poorly vented and collect moisture from the interior.

Coatings on older foam roofs that have not been well-maintained will result in blistering (water intrudes into the foam and can't be seen when recoating).

Look for water squishing out of small openings as you walk the roof. Water can permeate foam, asphalt, and decking and is very hard to dry out.

Coating roofs in extremely hot weather results in flash drying. The coating may separate from the substrate even before it dries but not be visible as a blister immediately. By examining the underside of a coating blister, look for numerous tiny tendrils indicating the film pulled away from the surface at application.

Recoating tinted roofs (coated with a dark color) or asphalt emulsion on a hot day also can result in flash drying and blistering.

Coating roofs too soon after heavy rains or washing leaves roofs vulnerable to blistering, as does coating roofs with frost or condensation present.

Coating roofs just before it rains is poor timing. Water in the coating that has not had time to evaporate provides an avenue for rainwater to

penetrate and damage the coating.

“My old coating never blistered until I put on your coating!”

This can happen. If the roof membrane is allowing moisture to enter from below and the original coating was thin and permeable enough to allow moisture to escape, no blisters formed. A new coating reduces permeability by adding to total coating thickness and moisture is now trapped causing blisters.

Our #120 Solar Tek Extreme™ and #121 High-Tek Basecoat™ are unlikely to blister because of their exceptional adhesion.

Special Blister Issues

Tinted Roofs: We have spent an entire day cutting hundreds of small blisters off a desert tan-colored roof with shop knives. What a job! After smoothing them over with Crack & Joint Sealant™, with the owner's permission, we recoated the roof with white. There was never another blister on the roof. We surmised that the excess heat on the roof promotes blistering, and the original coating itself may not have been well-adhered to begin with.

Water Blisters: We have seen cases where larger water-filled blisters form in surfaces that drain well. These blisters form even when there has been no rain for months. Cutting into the blister releases a gush of water. The source is below the coating and inadequate venting may be the cause. Water passing through the roof system can apply pressure over a wide area and not cause a blister until it finds a weak point.