

Analysis on The Impacts of Ponding water on Roof Coatings

Introduction:

Although a pond of water in itself is indeed quite simple, it is extremely complex when analyzed in the context of a roofing system. Ponding water is defined by the National Roofing Contractors Association (NRCA) as any water still standing on the roof after 48 hours. Although water ponding is just one variable amongst many in the whole “what causes a roof to age” formula it is one of the most important and causes some of the most detrimental effects to the roofing system as a whole. This paper will analyze how ponding water affects specific coating chemistries. We will also offer some solutions to prolong roof coating systems that are susceptible to larger ponds that exist for much longer than the earlier defined NRCA length.

Impact of Ponding water on Roof Coatings:

1. **Accelerated Deterioration:** Ponding water is a formidable adversary to roof coatings. When water accumulates on the roof surface, it can lead to the premature breakdown of the coating material. Water, especially when stagnant, can degrade the coating's composition, causing it to become brittle, crack, or peel.
2. **Algae and Mold Growth:** Stagnant water creates a favorable environment for the growth of algae, mold, and mildew. These organisms not only compromise the integrity of the roof coating but can also lead to health concerns and unpleasant odors within the building.
3. **Reduced Reflectivity:** Ponding water often leaves behind debris, dirt, and contaminants on the roof's surface. This accumulation diminishes the reflective properties of the coating, reducing its ability to reflect sunlight and maintain energy efficiency.
4. **Weight Load:** Water is heavy, and ponding water can add significant weight to a roofing system. This excess load can strain the structural integrity of the roof deck, leading to deflection or even structural damage.
5. **Increased Maintenance Costs:** Roof coatings that are exposed to ponding water may require more frequent maintenance and recoating to ensure their performance. These added maintenance costs can be a burden for building owners.
6. **Failed adhesion:** The presence of water on top of the roof coating can cause it to delaminate from the roof substrate. Roof coatings
7. **Potato Chipping** occurs in climate zones that are susceptible to colder temperatures. When water is absorbed into a coating film over time from sitting under a pond, it can freeze which will then cause the coating to tear/crack.
8. **Water is a solvent.** Yes, it is a very weak solvent, but it is a solvent and over time it can cause things within the coating film to leach out. That means that in these ponding areas the coating is losing some of its physical properties which cause it to prematurely degrade.

How does ponding water affect different chemistries of roof coatings?

The truth is, and let's be honest here, PONDING WATER AFFECTS ALL COATINGS!!! The question shouldn't be; Which coatings are affected? It should be; Which coatings offer the longest potential resistance to failure in a ponding area?

All coatings can potentially fail under a long-term ponding (LTP) scenario however some chemistries will last longer. The highest performing and longest lasting products in (LTP) situations rank:

1. Silicone & SEBS
2. Polyurethane
3. Acrylic

It is impossible to know how long a coating will last in a pond, and if you ask some manufacturers, they will just tell you, "Just use Silicone!". Well, the answer isn't that simple, in fact in many cases it comes down to more than chemistry itself, it often depends on other variables within the matrix as well. For example, a coating under a LTP may last quite a bit longer in a place like Texas than it does in a place like Chicago or Minneapolis.

There are three key variables that affect roof coating performance in LTP situations. Water Swell, Climate Zone of Installation, & Permeability. These are just three variables within a complex matrix, but alone they have the largest impact on success or failure within an LTP. Acrylics and Urethanes tend to fail prematurely due to water swelling which causes the coating film to swell, thus increasing the chances of failure. A Silicone roof coating will fail due to its high permeability coupled with colder climates that have large amounts of freeze thaw. SEBS Coatings can fail under ponding areas because water can pull out components of the film which change its long-term performance. All of these variables affect all roof coating types, but the degree at which they are affected varies based on their chemistry.

What can we do to mitigate and prevent ponding water issues?

1. Proper Drainage: The most effective way to address ponding water is through proper roof design and drainage systems. Ensure that the roof has adequate slope or that roof drains and scuppers are properly installed to facilitate water runoff.
2. Regular Inspection: Routine inspections are essential to identify ponding water issues early. Timely detection allows for corrective measures to be taken before significant damage occurs.
3. Roof Coating Selection: When choosing a roof coating, consider those that are specifically formulated to have longer performance. Some coatings are formulated to offer longer term resistance to ponding water conditions.
4. Roof Coating Maintenance: Regular maintenance, such as cleaning and recoating, can help extend the life of the roof coating and ensure its continued performance.

What kind of solutions are there for those areas that pond water for longer timeframes and would normally cause a premature roof coating failure?

1. Full polyester fabric reinforcement with a highly water resistance coating is the best option to prolong the life of the coating in these areas. Data has shown in the field that fabric can double the life expectancy of a roof coating where long term ponds are present.
 - a. This is because the fabric does two things. It decreases the ability for the water to migrate through the film of the coating to cause delamination while it also increases the tensile strength of the coating significantly to the point where the coatings tensile strength is so strong it helps to prevent the physical forces from causing delamination.

Conclusion

Ponding Water affects all types of roof coatings. To protect your roofing investment and maximize lifespan of the roofing system it is crucial to address ponding water issues promptly through proper design, drainage solutions and regular maintenance. Additionally, selecting the right roof coating that has the best performance in LTP situations can help make a substantial difference in the longevity and performance of your roofing system