

Pinholing

Defined

Pinholes as defined for this bulletin as very small holes that form in a waterproofing membrane or coating under certain conditions. The substrate most often associated with this phenomenon is concrete but it has also been observed in other porous substrate materials as well.

Causes

There are many factors that can contribute to pinholing.

Three of the most common scenarios are as follows:

- Many times in concrete placements there are voids in the surface layer which are termed, “bug holes.” (Figures 1 and 2) These very small imperfections in the concrete can not be easily filled in with membrane or coating and air is typically trapped inside of them just below the membrane. As the concrete begins to heat up, the air/vapor molecules become excited, which in turn drives them upward seeking a less agitated state. As the molecules escape during this process, they penetrate through the wet uncured membrane or coating creating very small pinholes. (Figures 3 and 4)
- The aggregate used within the mix design may also lead to pinholes. Certain aggregates retain moisture at higher concentrations thus leading to outgassing as the concrete increases in temperature due to daytime heating.
- The concrete mix design and the general porosity of the finished product might also lead to pinholing. The general construction of the deck assembly may also be a factor. For example, non-vented metal pan decking with concrete and/or hollow-core precast planks, (among other types) are very susceptible to this phenomenon because the moisture becomes trapped between the coating or membrane, and the nonvented metal pans (or within the hollow-cores). In these situations, the moisture only has one path of egress upward through the uncured membrane or coating, resulting in pinholing.

Control

There are numerous methods that might help too reduce or eliminate pinholing.

The following control methods are suggestions only and may or may not prevent pinholing. Please refer to the figures on pages 2 and 3 of this bulletin. Multiple methods may be required on any given job site due to multiple structural and/or environmental factors.

PLEASE NOTE: these are suggestions only and this guide is not an exhaustive or prescriptive document:

- One of the simplest and most effective ways to minimize pinholing in membranes and coatings is to do the application when the substrate is cooling instead of heating. The work should commence during the late evening and overnight hours prior to sunrise.
- Use the membrane in a thin film application to create what’s known as a scratch coat, by forcibly applying the product so that the membrane enters the small bug holes and capillaries of the concrete (figure 5). This filling action displaces the air/vapor trapped inside. Once the air/vapor present has been displaced the pinholing should be eliminated or greatly reduced.
- Use of a primer prior to the application of the membrane or coating. If moisture is present use of a moisture/vapor mitigating primer to lock down the substrate may be required. If the substrate is known to be dry or in a very low moisture state (Which should be confirmed via ASTM F 2170 Institu testing), other primers that are not considered to be moisture/vapor mitigating might be employed. (Figure 6)

- High pressure water blast, shot blast, or sand blast to remove laitance and to open up bug holes to be properly addressed with an approved sealant or patching/repair mortar. If the substrate to be waterproofed is a wall and is in particularly poor condition a parge coat may be required.

Figure 1 - Bug holes



Figure 2 - Bug holes



Figure 3 - Pinholing in a membrane during cure



Figure 4 - Pinholing in a membrane during cure



Figure 5 - Creating a membrane “scratch coat” with membrane



Figure 6 – Priming prior to membrane application to reduce or eliminate pinholing



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