



Technical Note

Subject: Bugholes

This Technical Note does not address the loss of aggregate at the time of form removal. Rock pockets, form seams and other such discontinuities are beyond the scope of this Technical Note. Simple outgassing of concrete, covered in pinhole resolution, is beyond the scope of this Technical Note.

Problem:

Formed concrete wall surfaces are prone to produce bugholes. Bugholes vary in size and physical configuration. Bugholes are not found on finished slab faces or the underside of elevated decks.

Study of this problem reveals the mechanisms at work. Two types of bughole problems will result.

1. The bughole will be generally exposed to view with or without a circumferential paste crust that hides some portion of the interior of the bughole.
2. The bughole will be partially or fully hidden under the surface paste. In the case of the fully exposed bughole a spray membrane will be able to coat the surface of the bughole without leaving any membrane discontinuities.

In the case of the partially or fully hidden bughole a spray membrane may fully cover the defect, but more often one of two events will occur. Event one occurs on a partially hidden bughole; a small portion of the very deepest part of the bughole (not accessible to the spray) will not be coated. Event two occurs on a fully hidden bughole; an outgassing pinhole will form.

General Phenomenon:

Where vertical formed surfaces are involved air pockets and water bubbles are trapped at the form face. When the concrete hardens these defects remain at the surface of the formed concrete. They may be regular in shape or elongated in any plane, fully or partially exposed or completely hidden. These defects are called bugholes.

Vibration to compact concrete causes portland fines and light aggregate to migrate to the form panel faces creating a laitance-paste at the surface when the forms are removed. During this migration trapped air and encapsulated water migrate with the paste. In many instances the bughole may exist underneath a thin paste.

Polyurea spray will cover many of these defects in a continuous membrane. Some bugholes will not be fully covered without defect in the membrane. Primers will not fill these small cavities or alleviate the resultant defects.

Rubbing the surfaces with special compounds is expensive. The use of general wall paring to cover bugholes is problematic. Bugholes, regardless of size, generally comprise something less than 3% of the total exposed wall surface. Bugholes that are not suitable covered and that cause some defect will result in a membrane that has less than 0.5% discontinuity.

Resolution:

When relatively tight working conditions on the project exist, it might be reasonable to install additional coating material rather than performing surface blasting and additional surface preparation on that surface.

On the more exposed portions, it would be advisable to prepare the surface of hardened concrete with a high-pressure (15,000 to 20,000 psi) hydroblast or such other method as might effectively remove the hardened paste. If the water blast is performed shortly after removal of the forms, while the concrete is still relatively green, the paste can be much more easily removed with lesser pressure.

Our experience is that blasting the surface with high-pressure water, sand or other media will remove the paste and open the cavities so that the coating product can be sprayed uniformly across and into the areas. Certainly not all bugholes will be revealed and a few pinholes will occur even in the most rigorously prepared surface, but a significant reduction of the incidence will be achieved. This preparation coupled with use of additional spot applied coating material to overcome remaining problem areas can result in an optimum waterproofing system installation.

If the laitance/paste is removed bugholes can be fully coated and a continuous membrane will result. This may leave a slightly non-planar surface, but is a fully smoothed surface that critical in below grade waterproofing?