

# TL-0002 — Inspection and Repair of Concrete Technical Letter (US Version)

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Before applying the BITUTHENE® or PROCOR® waterproofing membrane system, concrete substrates should be inspected and repaired as necessary to obtain a smooth, uniform, defect free and well-consolidated surface. Decisions regarding repairs, particularly involving structural questions, should be referred to the appropriate engineer. This technical letter describes some common defects in concrete surfaces and some frequently used repair techniques.

## Defects

Some of the most common concrete defects are as follows:

### Bugholes

Bugholes are surface craters of varied size which are frequently quite deep relative to their length and width. They are caused by air trapped during concrete placement and they occur to some extent in nearly all vertically formed concrete. For BITUTHENE® membranes, bugholes greater than 0.5 in. (13 mm) in length or width or 0.25 in. (6 mm) in depth must be repaired. For PROCOR® membranes, bugholes greater than 0.125 in. (3mm) should be pre-treated with PROCOR® membrane or with a concrete mix or grout.

### Unconsolidated Concrete

Unconsolidated concrete manifests itself as surface holes in the concrete, the edges of these holes usually show the outline of large pieces of aggregate. These occur most frequently at the foundation base or at critical wall footing or wall floor junctures. They are caused by the failure of fine aggregate and cement paste to flow around the coarse aggregate. This situation can be prevented by adequate vibration during placement. If it does occur, however, the surface should be repaired.

### Form Tie Rod Holes

When concrete forms are removed and the tie rods are snapped off, round holes in the concrete may result from removal of the metal or plastic tie rod plugs. Holes must be filled flush to the concrete surface. Plugs may remain in place if they are tight, have a flat flush surface, and if it is acceptable to the engineer.

### Fins

Gaps between form panels may allow cement paste and fine aggregate to extrude out into the gap, leaving a fin when the forms are removed. Fins will vary in size and severity. Sharp fins needed to be repaired by grinding. Those fins 30 mils (0.8 mm) or higher must be trimmed off because, as the BITUTHENE® membrane is applied over them, channels will be left between the membrane and the concrete on each side of the fin. This could leave a path for water to migrate behind the membrane.

## Windrows (Float or Trowel Marks)

Windrows or (float and trowel marks) are quite common but only infrequently require repair. Repair those that are sharp or higher than 30 mils (0.8 mm) by grinding.

## Scaling

Scaling manifests itself as thin layers of loose and crumbly concrete on a concrete surface. This phenomenon is the result of poor curing caused by freezing during the cure or by excessively rapid surface drying during the cure. Loose surface concrete must be removed down to the sound, completely cured concrete. The rough area remaining must be repaired flush to the surface.

## Irregular Construction Joints

Sometimes the formwork alignment can cause a step between two concrete placements. This is common when a floor slab or tunnel roof slab is placed over the top of the foundation walls. Such steps must be repaired by feathering the repair material or by grinding to provide a surface smooth enough to ensure full membrane adhesion. Other defects may be found, such as damage from other trades, heavy rain or hail. These can be treated using one of the repair materials or methods discussed below. Dusting or laitance normally does not require repair, but will require extra effort for cleaning prior to waterproofing.

## Repair Materials

Several materials can be used for making repairs. For all non-structural deck surface repairs use BITUTHENE®Deck Prep. BITUTHENE®Deck Prep is self-leveling and cures to the consistency of hard rubber. BITUTHENE®or PROCOR® membranes may be applied directly to freshly installed BITUTHENE®Deck Prep surface treatment. F

**For repairs to vertical or horizontal substrates the following materials may be used:**

- BITUTHENE® Liquid Membrane
- Latex-modified Portland cement, concrete or grout
- Epoxy mortar
- Portland cement, concrete or grout

The choice of material will depend on several factors:

- Nature of the repair
- Material and application cost
- Material availability.

BITUTHENE®Liquid Membrane can be used for a variety of repairs, particularly shallow patches. It is excellent for repairs to unconsolidated concrete at the juncture between horizontal and vertical surfaces.

In that application, BITUTHENE®Liquid Membrane can serve three purposes:

- Repairing the concrete
- Forming a fillet
- Serving as a reinforcing layer under the membrane

It can also be used to smooth irregular construction joints. BITUTHENE®Liquid Membrane cannot restore the structural strength of defects in the original concrete. BITUTHENE®or PROCOR®membranes may be applied directly to freshly installed BITUTHENE®Liquid Membrane.

As a general guide, for relatively deep defects such as some bugholes, tie rod holes and some unconsolidated concrete, portland cement grout mixes with relatively fine aggregate will be first choice because it is inexpensive. The difficulty with plain portland cement mixes is that considerable care must be taken to achieve a good bond. Surfaces to be repaired must be dampened before starting repairs. A common mix is one part of cement and two parts of mason's sand.

For shallow repairs, latex modified portland cement mixes containing DARAWELD®C can be used. DARAWELD®C will increase the bond level. Surfaces to be repaired should be dampened. Large shallow areas should be protected from premature drying.

Some practical guidelines for drying time of patches must be observed. Small repairs, such as filling bugholes or tie rod holes, may be sufficiently dry on the same day. They are small enough for moisture to dissipate laterally into adjacent concrete. Repairs to unconsolidated concrete should dry for a longer period of time, usually overnight. Two days of drying time may be needed for large areas of deeper patches, 0.5 in. (13mm) depth or more.

Epoxy mortar may be used for making some repairs. It is not used frequently because of its cost and inavailability at the job site. Waiting time following application is usually overnight or as recommended by the manufacturer.

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