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TIPS TO SUCCESSFUL ADHESION TESTING OF COATINGS

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For many years, visual inspection was the standard method to verify that a manhole coating application met project specifications and objectives. More recently, the value of performing adhesion testing has been embraced by engineers, owners and inspectors as a tool to evaluate the integrity of the coating system. Using ASTM D7234-12 Standard Test Method for Pull-off Adhesion Strength of Coatings on Concrete Using Portable Pull-off Adhesion Testers as a guide (and general method for establishing the what, where and how in order to successfully test the adhesion of manhole coating systems) is now being accepted and used throughout the industry.

What is adhesion testing?

In the simplest terms, adhesion testing measures the strength of the bond between the coating system and the substrate to which it has been applied. This happens because the equipment used is capable of applying both the load and counter load to the surface, even though only one side is accessible. Instruments like the DeFelsko PosiTest or the Elcometer include simple-to-follow manufacturer's instructions.

The loading fixtures, usually referred to as dollies or studs, are applied to the surface of the coating using a manufacturer's approved adhesive at prepared locations in the manhole. The prep before attaching the dolly varies between coating manufacturers, but typically consists of using 80-120 grit sandpaper to lightly abrade the coating, and cleaning the abraded surface with either a mild solvent or a clean cloth. The adhesive should be strong enough to exceed the testing range; generally 1,500 psi or more.

Where testing is performed is a decision made between the owner, engineer (or inspector) and the contractor, and should be agreed upon before testing begins. As a rule of thumb, two or three locations are selected for testing at different depths; for example, one in the cone section, one midway down on a barrel section and one on the bench, or lowest barrel section. Keep in mind that adhesion testing is a destructive test and all testing locations will need to be repaired following completion of the test.

Once the locations are selected and the dollies have been attached using the manufacturer's approved adhesive, the dolly should be secured in place (duct tape works great for this) until the adhesive has dried and cured, usually 12-24 hours. Following complete cure of the adhesive, the dolly is inspected to ensure that the bond between the dolly and coating is secure and that there is no separation from the surface. The next step in the process is scoring completely through the coating down to the substrate surface with a diamond tip core bit and drill. By scoring the

coating, we ensure that we are measuring only the bond between the coating system and the substrate. Attach and align the testing apparatus, being careful not to apply stress to the dolly. While supporting the testing apparatus, apply smooth and continuous loading until the dolly is removed from the substrate. Record the force in psi, mark and retain the dolly and document the results.

Adhesion testing results can vary widely and will have a direct relationship to the strength of the substrate; therefore it is important to establish the interpretation criteria in advance between the owner, engineer (or inspector) and the contractor. The mode of failure is usually categorized as:

Substrate Failure:

This is the preferred method, demonstrating that the coating system has an excellent bond and can indicate the strength of the underlying substrate. A value of 400 psi or more is common, but a value of 200 psi with 100% substrate attached is an acceptable test, according to the methodology.

Cohesive Failure:

The coating system separated from the substrate and there is no substrate adhered to the coating. This result can indicate a poor bond between the coating system and the substrate, or it may indicate a very strong substrate. For example, a result of more than 800 psi without substrate should not necessarily be considered a cohesive failure.

Adhesive Failure:

The test dolly separated from the coating. When this happens the test is inconclusive, and another location should be selected for testing.

Pull-off adhesion testing is one of several methods to ensure the quality of your manhole coating system project and can also be a valuable tool in evaluating your project. Refer to your coating manufacturer's website and/or technical information for more on adhesion testing and other testing methods.