

ATB-104 Adhesion Tests

Adhesion Tests

Adhesion is one of the most critical aspects of any coating and provides a key indicator of the long term performance of the coating system. Before using an Acrymax coating system it is recommended, and in some cases required, that an adhesion test be performed on a properly prepared and representative area of the substrate that is to be coated. The term substrate refers to the surface which a coating is being applied to - be it steel, single-ply membrane, or another coating that is to be overcoated. Adhesion tests are especially important if you are planning to coat a metal roof with an existing fluoropolymer finish, a TPO membrane, or other materials that are difficult to adhere to.

Adhesion tests that may be used for coatings include the 180° Peel Test, the Tape Test, and the Knife Test. The 180° Peel Test is the most common test used for elastomeric roof coatings. Procedures for conducting these tests in the field are described below.

In addition to the tape test used to evaluate adhesion, there is also a tape test that is used to evaluate how effectively a substrate has been prepared. Dirt and contaminants interfere with adhesion and will adversely affect coating performance, so it is important to make sure that the cleaning process has been effective. After verifying that the substrate is dry, 2" wide masking tape is pressed on to the surface, and then the tape is peeled off. If the tape is removed easily and the adhesive side of the tape shows an excessive amount of contamination, then further cleaning is necessary.

180° Peel Test

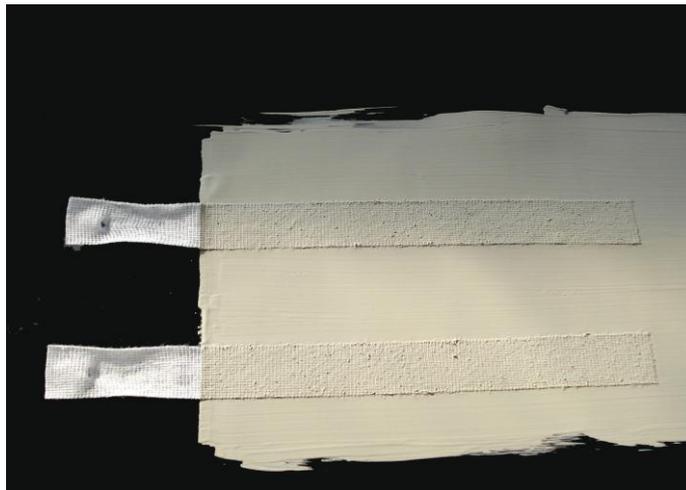


Figure 1 - Polyester Test Strips embedded into coating.

A quantitative measure of adhesion is performed through an 180° peel test. This is the best test to evaluate the adhesion of elastomeric roof coatings, both in the field and in laboratory setting.

In this evaluation, the coating to be tested is applied to the substrate such that the coating adequately coats the surface. Into this wet coating 1" wide strips of fabric are embedded leaving a 3-4 inch "tail" at the end of each strip. The fabric is then saturated with additional coating leaving the tail uncoated. Two or three strips should be used to verify results.

After two weeks of curing, the adhesion test is ready to be conducted. This is done by peeling the fabric sample back at an 180° angle. In the lab this is done with a tension-testing machine that runs at a rate of 2 in/min. Adhesion results are an average of the tests and are typically reported in pounds per linear inch (PLI).



Figure 2 - Digital scale used to evaluate adhesion

In the field the adhesion test can be done using a small fish scale such as the one shown in Figure 2. Attach the scale to the “tail” that was left uncoated and pull slowly on the scale, pulling the 1” wide fabric away from the substrate. Record the weight (force) that is required as the fabric strip is pulled away.



Figure 3 - Cohesive Failure

In a qualitative aspect of this test, the mode of failure, either adhesive or cohesive, is recorded to provide the evaluator additional information. As seen in the Figure 3, the test coating failed by cohesively. This means that the polymer was pulled apart, before it was pulled from the substrate, indicating a high degree of adhesion to substrate.

ASTM C-794 is the standardized test methodology that provides the basis for these adhesion tests.

Tape Test

The basic procedure to perform this test is to use a razor blade to make cuts in the coating down to the substrate. The cuts can be made in either an “X”, generally used on job sites, or a cross hatch, which is generally used in lab settings and on thinner film coatings. Pressure sensitive tape is then applied over the test area, pressed firmly onto the coating, and then the tape is rapidly removed. The test area is then inspected for removal of the coating from the substrate. ASTM D3359 is the standard for this test method.

Knife Test



To perform this test a utility knife is used to make two cuts into the coating to form an “X”. At the vertex, the point of the knife is used to attempt to lift up the coating from the substrate. The evaluation of adhesion is based on both the degree of difficulty to remove the coating from the substrate and the size of removed coating. ASTM D6677 is the standard for this test method.

Results from this test are fairly subjective, and evaluation of adhesion depends not only on the results, but on the ability of the inspector to accurately interpret them as well. As such, this test should be used only as initial screening of adhesion with further evaluation through another method.