

The Pull-Off Adhesion Series

7. Assessing the Result; Glue, Adhesive and Cohesive Failures

When testing coating adhesion using a pull-off adhesion gauge, typically the dolly, or pull stub, is completely pulled off the surface, and you record the resultant tensile pull-off force. You then assess the dolly face and surface, to determine the failure mode.

For a valid pull test, the coating must cover at least half of the area of the dolly face. If the glue fails, and no coating is present on the dolly, or it covers less than half of the dolly face area, the pull test is invalid and should be repeated.

However, if the glue fails at a value that's above the specification, then it can be reported the adhesion exceeded the specification for this individual test, and is a valid result.

When the coating has failed within the layer, leaving the same coating on both the dolly and the test panel, it is known as a cohesive failure.

Adhesive failures occur when either the coating has failed at the interference with another coating, leaving coating on the dolly and another coating on the substrate; or when the coating has failed at the substrate, leaving coating on the dolly and a bare substrate.

It is possible for both adhesive and cohesive failures to occur during one test.

Many National and International Standards require the user to record both the pull-off force and the nature of the failure as an estimated percentage to the nearest 10%.

Codes are used to denote the layer or layers in which the failure occurred.

For example, if the pull-off force was 20 MPa, and upon reviewing the dolly and surface there is a 50% cohesive failure of the bottom coat, and a 50% adhesive failure between the first and second coats, usually identified by the colours on the dolly and the coating system; then the result is recorded as 20MPa, 50% B, 50% B/C.

Once the dolly and substrate have been assessed, the dolly diameter, the pull rate, whether you did or did not cut around the dolly, the pull-off force, and the percentage cover of the failure should all be recorded.

For most gauges you will have to record this manually.

The Elcometer 510 Automatic Pull-Off Adhesion gauge is different. The gauge allows the user to store all of this data against each reading, which you can later transfer via USB or Bluetooth to ElcoMaster, Elcometer's free software application, which allows you to create professional inspection reports, instantly.

When using ElcoMaster on your Android or Apple mobile device, you can instantly add photos to your test results – a quick and easy way to provide evidence of the result.

For more information and training on the pull-off adhesion method, or Elcometer's range of pull-off adhesion testers, please click on one of the links on-screen or visit our website.