

The Pull-Off Adhesion Series

6. The Pull-Off Test

When testing coating adhesion using a pull-off adhesion gauge; once a properly prepared dolly has been glued to the prepared coating, and the glue has fully cured, you are ready to perform the pull-off test.

Reset or rewind the gauge or actuator head to its start position, and attach to the dolly.

When performing a pull-off test on a coating applied to a thin substrate, it's essential that a thin substrate base ring or thin substrate skirt is used, otherwise the force applied could deform the substrate and cause the coating to fail prematurely.

If testing adhesion on a vertical surface, to ensure that the gauge or actuator doesn't fall when the dolly 'pops' off, attach a lanyard from the test unit; either to your wrist or part of the structure; or use a magnetic anchor clamp.

To begin the adhesion test, apply a uniform increase in force in accordance with your test method or standard - typically a rate of pull of 1MPa/s or 150psi/s is used for a 20mm dolly.

Whilst the rate of pull is controlled manually for most pull off-adhesion testers, the Elcometer 510 Automatic Pull-Off Adhesion tester allows the rate of pull to be selected, and when the start button is pressed, the gauge applies the pre-selected rate of pull automatically.

Typically pull-off adhesion tests require the dolly to be completely pulled off, or pop off the surface. Some gauges, such as the Elcometer 510, allow the user to set a maximum pull value, at which point the gauge automatically returns the pull force to zero, and records the result as "greater than the maximum pull value" – a so-called "non-destructive pull".

[When is the best time to pull?]

A 2015 study investigated the many aspects of the pull-off adhesion test method to improve adhesion testing techniques. The authors found that the higher the ambient temperature at the time of the pull test, the lower the pull-off force achieved.

In fact, research showed that pull-off tests undertaken at an ambient temperature of between 20 - 24°C provide the highest pull-off values, resulting in a 32% increase in values compared to tests undertaken outside this temperature range.

To achieve comparable results when testing on the same structure therefore, it's worth undertaking the pull-off tests at a consistent temperature, and recording the ambient temperature at the time of the pull; as tests on the same structure could yield different pull-off forces depending on the time of day and the location each pull-off test was completed.

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.