

## Bond Strength Concepts

“When the applied thickness of a coating reaches a certain critical point, the primer has less of an effect on the adhesion” or pull off value. At greater thickness the anchor pattern profile assumes a more controlling roll in adhesion. Depending on the coating this critical thickness can be as low as 30-40 mils. The “rule-of-thumb is that the anchor profile should be 10 to 25% of the total film thickness, including the primer, intermediate coats and top coats. If you are in this range the profile will be the determinant of "bond" by the Elcometer or similar instruments. The primer's main function is to improve wet out by increasing the contact angle. The better the wet out, the greater the surface area that can bond. The greater the area, the higher the bond. Some primers also react chemically with the topcoat, which adds to the bond strength.

Part of the problem is definition and misunderstanding of the process. The Elcometer only measures "bond" to the substrate when the thickness is below a certain critical level that is somewhat coating specific, but also lies in the range of 30-40 mils. When you exceed that thickness the "bond" that the Elcometer measures becomes the **cohesive** strength of the material under test. There is also confusion as to what is desired in this test. We do not necessarily want concrete failure. The best result is 100% **glue** failure, assuming one uses glue that meets the requirements of the method, which is one that is stronger than the coating under test. The next best result is substrate failure if you are on concrete. On steel, the substrate is not likely to fail no matter how strong the bond or the cohesive strength, which generally runs about 20 to 30% of the tensile strength for most of our coatings. It has been estimated that if one could do a pull off adhesion test on carbon steel that the value would be between 35,000 to 50,000 psi. There is no coating or glue that exceeds those levels so the substrate will never fail in this case.”