

ADHESION

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The adhesion of sprayed coatings to substrates is a matter of great concern to Engineers. Coatings which become detached during machining must be re-applied whereas those which fail during service will not only cause failure of the coated part but may seriously damage other components and could lead to injuries. However, provided that the basic rules for using sprayed metal coatings are applied and that materials are correctly sprayed on to properly prepared surfaces, bond failures are rare. Many techniques have been used to assess the adhesion of coatings. The most commonly employed involve pulling in tension a known area of coating from a suitably prepared substrate. In order to do so, it is necessary to attach a pulling device to the coating with a suitable adhesive. This method has the advantage of giving a load failure and, knowing the area under test, a failure of bond strength can be calculated. Unfortunately, the test is generally restricted to test pieces which bear little resemblance to engineering components. Although the test is simple, it is subject to many variables: the strength and curing state of the adhesive; the degree of penetration into porous sprayed deposit (depending on porosity, coating thickness, adhesive viscosity, etc.) axiality may not be achieved during testing (which may give rise to sheer and peel stresses as well as tensile stresses at the interface). Complete detachment of the deposit rarely occurs and the fracture is a mixture of bond and cohesive failure. These factors combine to produce considerable scatter and test results and quoted bond strengths should be treated with considerable caution. If adhesion is critical, it is strongly recommended that a practical evaluation of a sprayed component be made before specifying a particular sprayed deposit. The adhesion test may then be used as a quality control tool rather than a design aid.

MATERIAL	SURFACE PREPARATION	BOND Mpa	STRENGTH PSI
75E Nickel Aluminium	Cleaned	28.96	4200
	Blasted	33.09	4800
10E Aluminium Bronze	Cleaned	20.68	3000
	Blasted	24.13	3500
70E Monel	Blasted	17.24	2500
15E Phosphor Bronze	Blasted	10.00	1450
05E Copper	Blasted	10.00	1450
02E Zinc	Blasted	4.82	700
01E Aluminium	Blasted	13.78	2000
30E Low Carbon Steel	Blasted	39.30	5700
55E 18/5 Stainless Steel	Blasted	28.77	4100
60E Chrome Steel	Blasted	20.68	3000
65E Chrome Manganese Steel	Blasted	21.37	3100
80E 18/8 Stainless Steel	Blasted	28.34	4100
08E 80/20 Tin Zinc	Blasted	8.27	1200
99E Molybdenum	Blasted	37.92	5500