

Quantitative testing of corrosion rates of heritage steel coated with Paraloid B72™, Cosmolloid 80H™ and Siliglide 10™

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Within conservation practice a few specific coatings are utilised for a very wide range of applications, based mostly on sketchy evidence of their long term performance, ageing properties, ethical factors such as reversibility and aesthetic considerations that include transparency. Hence the acrylic copolymer Paraloid B72 and the microcrystalline wax Cosmolloid 80H are extensively used as indoor and outdoor coatings across a broad spectrum of metals from archaeological to historical contexts. Evidence of their performance is largely qualitative, based on observations made in environments with uncontrolled and often unmonitored variables. This approach is suited to recording performance in real life storage and display contexts but it lacks reproducibility and does not deliver insight into how specific variables such as relative humidity, application methodology, surface preparation and contaminants impact on coating performance.

This study examines the performance of Paraloid B72, Cosmolloid 80H and a silane polymer Siliglide 10, as protective coatings on modern steel continuously exposed to fixed high humidity. Test samples were cut from the rear door of a Saracen armoured personnel vehicle circa 1950's. Coating procedure was carefully controlled and assessed to offer both standardisation and alignment with commonly used application procedures in the heritage sector. Similarly, surface preparation was uniform and standardised. Both uncontaminated and chloride contaminated surfaces are used as test platforms for the coatings. Long exposure periods of months to years were employed. Quantitative data is collected by measuring the oxygen consumption of individual samples in controlled relative humidity.

The rationale was to deliver evidence of how these coatings may perform in conditions where relative humidity can reach high levels but there is no direct exposure to rain, thus including open shelters and uncontrolled stores used to store historic and industrial objects. The research programme aimed to deliver practical outputs for project partners and end users at the Tank Museum Bovington UK and Historic Scotland. The Arts and Humanities Research Councils sponsored the study.

Results to date indicate that all three coatings perform similarly on surfaces that are cleaned. On surfaces that have undergone chloride contamination post-cleaning the silane was best at preventing corrosion, measured by oxygen consumption followed by Paraloid B72 then Cosmolloid 80H.