STUDIES WITH ZINC SILICATE PRIMER

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The performance characteristics of zinc silicate paint developed in Central Electrochemical Research Institute is described. Both electrochemical and accelerated tests have been used. It is shown that the paint gives the protective potential as well as the current required for protection for about a month in 3% sodium chloride solution. The performance of the paint in accelerated tests and field exposure tests are satisfactory.

Zinc rich silicate primers are covered by several patents abroad[1-3]. Although it is indicated in these patents that high $SiO_2 : Na_2O$ ratio is used and the coating is fixed by employing acid washes, details about the composition of the vehicle and method of preparation are not available. The paper describes the performance characteristics of a new single pack formulation of zinc dust incorporated in silicate medium developed in C.E.C.R.I[4] by electrochemical methods of evaluation, accelerated corrosion tests and field trials.

Experimental

Pickled mild steel panels 15 × 10 cm, 7.5 × 5 cm, 2.5 X 2.5 cm for field trials, accelerated tests and electrochemical methods were used respectively. They were applied with one coat of primer by brush.

Physical properties

The coating gets completely dried in about 2 hours time and the coating thickness is 2 mil. The dried coating adheres well. The consistency of the primer is adjusted by adding few ml of water for subsequent applications and the application should be over in six hours time from the time of addition of water to dry primer.

Electrochemical tests

Potential-time measurements using VTVM and galvanic current measurements by zero resistance ammeter(ZRA) in 3% NaCl at room temperature were made.

Accelerated tests

The painted panels were immersed in 3% NaCl at room temperature and the duration at which rust spots appear were noted.

The salt fog test (3% NaCl) was carried out for one month and the condition of the panels after that period was observed.

The silicate primer coated panels were given one coat each of the finishing paints (1) chlorinated rubber and (2) epoxy coal tar. They were exposed in open racks at shore site (45 metres from sea) at Mandapam camp.

Results

Figure 1 gives the potential-time and current-time measurements made with the primer. It may be seen

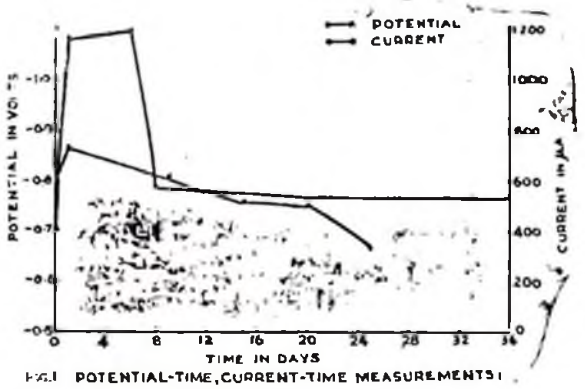


FIG.1 POTENTIAL-TIME, CURRENT-TIME MEASUREMENTS OF ZINC SILICATE COATING

from the figure that the potential goes to —0.94V vs SCE and then gradually falls. Upto 22 days the potential is more negative than the protective potential viz., —0.76V Vs S.C.E. and after that it falls down. It may be seen from the figure that current between the coated panel and pickled steel increases from the initial value of 400 μA to 1200 μA in 6 days, falls to 580 μA and remains more or less constant for a month and then reaches 0 at 40th day.

Table 1 gives the visual observations made with the panels subjected to accelerated and exposure tests. The silicate coating either in immersion in 3% NaCl or salt fog test does not show any sign of rusting at the end of 30 days. Only white corrosion products appear. In the case of immersion studies rust spots appeared only after 90 days. When the coating was removed and surface examined, they were almost free from signs of rusting. At Mandapam Camp, though there was white corrosion product on the primer applied panels, the panels with finishing paints were free from rusting.

Conclusion

It may be concluded that this new inorganic zinc silicate primer can give satisfactory protection to steel surfaces.

Table 1 : Results of Accelerated and Exposure Tests — Visual Observation

System	Immersion in 3% NaCl after 30 days	Salt spray test after 30 days	Exposure test after 6 months
Zinc silicate coating	No red brown rusting at all White product at the bottom Surface free from rust	No rust dots, white corrosion product here and there	No change-white corrosion product here and there
Zinc silicate coating + finishing paint	—	—	No chang at all

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