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EIS Comparison Test of MCI-2020 and Ferrogard 903+

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Background: Sika is claiming that Ferrogard 903+ uses the same technology as MCI-2020 and performs better as well. This project is intended to compare MCI-2020 with Ferrogard 903+.

Sample labeled: Sika Ferrogard 903+

Method: EIS analysis, CC-022

Materials: 3/8th inch diameter rebar
VpCI-395 Epoxy
Portland cement
Playground sand
Potentiostat
MCI-2020 batch 03171
Ferrogard 903+ sample
SAE 1010 steel panels
Sodium chloride

Procedure:

Electrochemical Impedance Spectroscopy – EIS testing conducted between 6/22/12 and 7/6/12

1. Prepare steel rebar by removing any rust with a wire wheel. The bars were then cut to 20 centimeters and submerged in methanol for cleaning.
2. A coating of epoxy was applied to the bar leaving 5 cm sections uncoated at the top and in the center of the rebar. The coating was given 5 days to cure before the bars were cast into the samples of concrete.
3. Samples were mixed according to the table below and poured into 400 ml beakers and a piece of rebar was positioned in each. The samples were poured on April 26, 2012.

	Water (g)	Type I Portland Cement (g)	Playground Sand (g)
Control	115	250	750

4. The mortar samples were given 3 days to set up and then they were removed from the beaker molds. They were transferred into 5 gallon buckets with two 200 milliliter beakers of water and sealed for 25 days.
5. After a total of 28 days the samples were removed and coated with epoxy leaving a 5 cm band around the circumference of the block uncoated. The epoxy was allowed to dry for 2 days.
6. After the epoxy cured, the lollipops were coated with MCI-2020 at 150 ft²/gal or Ferrogard at a rate of 100 ft²/gal and allowed to cure for two months.
7. Each of the blocks was placed into a beaker containing 3% sodium chloride for 20 hours after which time period the impedance was measured with the potentiostat to determine the corrosion rate.

Results:

Electrochemical Impedance Spectroscopy –

	After 20 hours			After 1 week			After 2 weeks		
	Rp (kOhms)	icorr (µA/cm²)	Corrosion rate (µm/yr)	Rp (kOhms)	icorr (µA/cm²)	Corrosion rate (µm/yr)	Rp (kOhms)	icorr (µA/cm²)	Corrosion rate (µm/yr)
Control	19.99	0.16	1.81	0.43	7.27	84.30	0.95	3.28	38.00
Control (2)	2.47	1.27	14.68	0.51	6.13	71.08	0.55	5.68	65.91
MCI-2020	76.06	0.04	0.48	4.81	0.65	7.54	2.03	1.54	17.87
MCI-2020 (2)	28.95	0.11	1.25	1.37	2.28	26.46	1.95	1.61	18.64
Ferrogard 903+	1.70	1.83	21.29	0.88	3.55	41.19	0.52	5.99	69.48
Ferrogard 903+ (2)	2.05	1.52	17.68	0.74	4.22	48.99	0.67	4.66	54.10

Interpretations:

The results from this project indicate that MCI-2020 outperformed Ferrogard 903+. After the first day of salt water immersion the rebar of the samples treated with MCI-2020 remained passive while the readings from the Ferrogard treated samples indicated active corrosion. In the subsequent two cycles the corrosion rate of the control and Ferrogard treated rebar increased significantly. The corrosion rate of the MCI-2020 sample did increase but at a significantly slower rate than the control. The impedance measurement over the course of two weeks showed that MCI-2020 performed better than Ferrogard 903+.