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## *ASTM G 180 Analysis of MCI-2005 and Surtreat TPS XV*


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**Background:** The customer would like to determine how Surtreat TPS XV corrosion protection compares MCI-2005.

**Sample Received:** The sample was received on April 29th, 2011.

**Sample(s) labeled:** The sample came is an 8 ounce sample jar labeled Surtreat TPS XV

**Method:** Immersion test  
ASTM G 180

**Materials:**

8 oz. sample jars	Potentiostat
Surtreat TPS XV	Steel working electrode (C 1018)
MCI-2005 Batch number 02651	Type 1 cement
SAE 1010 steel panels	

**Procedure:**

Immersion Test

1. Prepare steel panels by cutting them to 11cm x 3.8 cm rectangles.
2. The panels were then cleaned with methanol by submerging them for 20 minutes. Each panel was dried and then weighed.
3. 220 grams of 3.5% NaCl in water was added to each of the six sample jars. Ca(OH)<sub>2</sub> was added to three of the jars to reach a concentration of 0.25%.
4. MCI-2005 at a concentration of 0.75% was added to two of the jars. Surtreat TPS XV at a concentration of 0.75% was added to two of the sample jars and mixed for 10 minutes with a mixing blade.
5. One of the steel panels was placed into each sample jar.
6. The jars were then stored at room temperature for 216 hours.

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1. Make a mixture of water cement, and admixture as shown in the table below.

	Water (g)	Admixture (g)	Cement (g)
Control	1000	0	200
Surtreat TPS XV	993	7	200
MCI 2005	995.8	4.2	200

2. Mix thoroughly for 60 minutes and filter.
3. Add 4 g/L of calcium hydroxide and stir for 30 min.
4. Setup an electrochemical cell according to ASTM G 5 with the filtered solution.
5. Clean the electrode with hexane by submerging it for 2 minutes and dry before attaching it to the electrode holder.
6. Condition the electrode in the solution while purging the system with carbon dioxide free air for 24 hours at a flow rate of 300 cc/min.
7. Add sodium chloride to make a 0.5 M solution.
8. Purge with carbon dioxide free air for 4 additional hours.
9. Measure the open circuit potential and the polarization resistance.

**Results:**

## Immersion Test Results

Panel	% Ca(OH) <sub>2</sub>	% Surtreat	% MCI-2005	Panel weight (g)	Post weight (g)	Percent protection
1	0.25	0	0	25.0466	23.0234	-
2	0.25	0	0.75	24.7147	24.7144	98.7
3	0.25	0.75	0	25.3524	25.3314	9.4
4	0	0	0	25.9726	25.9472	-
5	0	0	0.75	27.8610	27.8593	93.3
6	0	0.75	0	26.9821	26.9581	5.5

## Polarization Resistance Results

	R <sub>p</sub> (Kohms)	Corrosion Rate (mpy)
Control	4.947	1.206
Surtreat TPS XV	7.078	0.843
MCI 2005	41.04	0.145

**Interpretations:**

1. The immersion test shows that MCI 2005 provides significantly better corrosion protection than Surtreat TPS XV.
2. The polarization resistance results from ASTM G180 show that the corrosion rate with MCI-2005 is 83 percent lower than the rate with Surtreat TPS XV and 88 percent lower than the control.

**Photos:**



Picture 1: Aligned from left to right are panels 1-6 after being submerged for 216 hours