CORTEC Laboratories
4119 White Bear Parkway, St. Paul, MN 55110 USA
Phone: (651) 429-1100, Fax: (651) 429-1122
Toll Free: (800) 4-CORTEC, E-mail: info@cortecvci.com
cortecvci.com • corteclaboratories.com

LABORATORY ACCREDITATION BUREAU
ACCREDITED ISO/IEC 17025
Certificate # L2267 Testing

Evaluation of Armor and Crusader Films

From: Cortec Corporation Laboratories
4119 White Bear Parkway
St.Paul, MN 55110

cc: Boris Miksic
Anna Vignetti
Mike Morin
Bob Boyle
Kristy Gillette

Project #:11-197-1125(supplemental)(bis)

Test conducted by: Liz Austin

Liz Austin
Sr. Lab Technician

Approved by: M. Kharshan

Margarita Kharshan
Laboratory Director

Date: October 6, 2011

Background: Customer submitted Armor and Crusader films and requested that the corrosion inhibiting properties be tested.

Sample Received:

1. Armor Film, good condition, submitted 09-26-11
2. Crusader film, good condition, submitted 09-26-11

Method:

1) VIA Test CC-027
2) Razor Blade Test CC-004
3) FTIR Test CC-006

Materials:

1) VIA test kit
2) Razor Blade test kit
3) Perkin Elmer Paragon 1000 Spectrophotometer
4) VpCI-126 Lot# 30688

Procedure: The tests were conducted according to standard procedures for each test.

Results:

Razor Blade Test-Carbon Steel Panels

Sample	Panel 1	Panel 2	Panel 3
Crusader	Pass	Pass	Pass
Armor	Pass	Pass	Pass
VpCI-126	Pass	Pass	Pass
Control	Fail	-	-

VIA Test

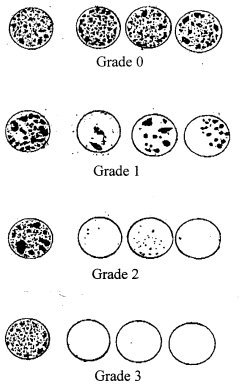
Sample	Plug #1	Plug #2	Plug #3
Crusader	Grade 0	Grade 0	Grade 1
Armor	Grade 0	Grade 0	Grade 2
VpCI-126	Grade 3	Grade 3	Grade 2
Control	Grade 0	-	-

Note: The VIA grading system is attached to the end of the report.

Interpretations:

1. Based on the razor blade test results, the submitted Armor and Crusader films were able to provide sufficient contact-phase corrosion protection for carbon steel.
2. The Armor and Crusader films did not provide vapor-phase corrosion inhibition. Both the films failed the VIA test.
3. The VpCI-126 film provided good contact and vapor-phase corrosion inhibition.
4. Analysis of the FTIR determined that the Armor and Crusader films contain carboxylates. Based on analytical evaluations, both films have similar composition which is most likely sodium benzoate and nitrite.

VIA Test Grades (Grade 2 or 3 are passing)



Grade 0:	Blind test No corrosion inhibiting effect
Grade 1:	Blind test Minute corrosion inhibiting effect
Grade 2:	Blind test Medium corrosion inhibiting effect
Grade 3:	Blind test Good corrosion inhibiting effect