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## *Evaluation of RUST-X VCI Film and Paper*

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**Project #:** 10-226-1125(bis)

**Test conducted by:**

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**Approved by:**

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**Background:** Customer submitted a sample of RUST-X VCI paper and film for corrosion inhibition testing. RUST-X is a part of HI-Tech group with manufacturing facilities in India. Representatives from RUST-X have been actively soliciting and trying to establish business in Europe and India.

**Samples Received:**

Rust-X Film  
Rust-X Paper

**Method:**

VIA Test Method  
Razorblade Test Method  
Tensile Strength, ASTM D882  
Tear Resistance, ASTM D1922  
Puncture Resistance, MIL-STD-3010B, Test Method 2065

**Materials:**

VIA Test Kit  
Razorblade Test Kit  
Oakland Tensile Test Stand  
Thwing-Albert Tear Tester

**Procedure:**

All tests were carried out according to standard test procedures.

**Results:**

**Table 1.** VIA Test Results

Sample	Plug 1	Plug 2	Plug 3	Control
RUST-X Paper	Grade 0	Grade 1	Grade 0	Grade 0
VpCI-146	Grade 3	Grade 3	Grade 3	Grade 0
VpCI-126	Grade 3	Grade 3	Grade 2	Grade 0
RUST-X Film	Grade 0	Grade 0	Grade 0	Grade 0

**Table 2.** Carbon Steel Razorblade Test Results

Sample	Panel 1	Panel 2	Panel 3	Control
RUST-X Paper	Pass	Pass	Pass	Fail
VpCI-146	Pass	Pass	Pass	Fail
VpCI-126	Pass	Pass	Pass	Fail
RUST-X Film	Fail	Fail	Fail	Fail

**Table 3.** Copper Razorblade Test Results

Sample	Panel 1	Panel 2	Panel 3	Control
RUST-X Paper	Pass	Pass	Pass	Fail
VpCI-146	Pass	Pass	Pass	Fail
VpCI-126	Pass	Pass	Pass	Fail
RUST-X Film	Fail	Fail	Pass	Fail




**Table 4. Mechanical Properties Comparison of RUST-X Film to VpCI-126**

<u>Property</u>		<u>Test Method</u>	<u>Units</u>	<u>Rust-X</u>	<u>VpCI-126</u>
Caliper		ASTM D6988	mil	3.00	3.00
Breaking Factor	MD	ASTM D882-02	lbs/in	12.14	9.58
	TD			12.43	9.86
Tensile Strength at Break	MD	ASTM D882-02	psi	4217.46	3375.35
	TD			3801.86	3474.67
Elongation at Break	MD	ASTM D882-02	%	606.35	677.77
	TD			913.28	712.55
Yield Strength	MD	ASTM D882-02	psi	1984.22	1355.33
	CD			1503.82	1404.83
Tear Strength	MD	ASTM D1922-06a	mN	957.46	8350.27
	CD			9511.78	9857.09
Puncture Resistance		MIL-STD-3010B, Test Method 2065	lbf	3.99	4.11

**Conclusions:**

1. RUST-X Film and Paper failed to provide vapor-phase corrosion protection as demonstrated by the VIA test.
2. RUST-X Paper provides corrosion protection while in direct contact with both ferrous and non-ferrous metals; however, the submitted RUST-X film did not provide sufficient protection for neither ferrous nor non-ferrous metals.
3. FT-IR spectra doesn't show evidence of any corrosion inhibitors in the film.

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	