



MAINTENANCE PRODUCTS BENCHMARK STUDY

TEST RESULTS

VCT-22™ vs. RHOPLEX™ CS-4000

1. Samples were production products of ConSeal International Inc. VCT-22™, and the same formula using a commercial floor finish polymer, RHOPLEX CS-4000 from Rohm & Haas.

2. Testing Protocol:

- Determine Heat Aging Stability by variance of primary viscosity measurement.
- Instron Force-to-Peel Adhesion (wet and dry) to 'green' cement.
- Cross-Hatch Adhesion to Transite.
- Efflorescence of 'green' cement.
- Fog Box Blister Resistance.
- Blush Resistance
- Hydrolysis Resistance
- 'Hot Tire' Pick-up Resistance.
- Dirt Pick-up Resistance.
- QUV over Transite.
- Chemical Resistance Testing
 - Brake Fluid
 - Bleach
 - Gasoline
 - Bearing Grease
 - Transmission Fluid
 - Motor Oil
 - Antifreeze

PHYSICAL PROPERTIES AND TEST RESULTS

	VCT- 22	CS -	4000
Test			
In Can Properties			
ICI Viscosity	0.1		0.2
#2 Zahn Cup Viscosity	16		15
Density	8.62		8.58
pH	9.09		8.33
Heat Aged Stability			
Final ICI Viscosity	0.1		0.1
ICI Variance	0		-0.1
Final #2 Zahn Viscosity	13		13
#2 Zahn Viscosity Variance	-3		-2
Heat Aged Viscosity Variance	10		10
Final pH	8.93		8.14
pH Variance	-0.16		-0.19
Film Properties			
Dirt Pick-Up	94.29		95.6
Adhesion			
Instron			
Wet			
Min	5.75		0.75
Max	9.50		3
Avg.	7.75		1.5
Dry			
Min	4.50		5
Max	15.00		9
Avg.	10.75		7.25
Cross-Hatch to Transite			
Wet	100		100
Dry	95		100
Efflorescence	8		5
Blister Resistance			
Early Blush Resistance			
4 Hour Soak	10		9
Recovery	10		10
24 Hour Soak	10		6
Recovery	10		10
Normal Blush	10		8.75
Hydrolysis Resistance	6		7
Chemical Spot Testing			
Antifreeze	7		8
Gasoline	9		9
Bearing Grease	10		10
Brake Fluid	8		10
Transmission Fluid	10		8
Motor Oil	10		9
Bleach	10		9
Hot Tire Pick-up	9		3

QUV TEST RESULTS

QUV Testing - Initial Readings						
	y-reflectance	yellowing	L	A	B	
Blank	0.2470	14.15	56.78	-0.10	2.36	
VCT – 22	0.2360	14.70	55.68	-0.11	2.59	
CS – 4000	0.2960	13.46	61.30	-0.20	2.16	
QUV Data - 500 hours						
	Δ y-reflectance	Δ y-reflectance	Δ L	Δ A	Δ B	Δ E
Blank	3.20	-0.06	3.46	-0.05	0.08	3.46
VCT – 22	2.50	-1.04	2.45	-0.05	-0.42	2.48
CS – 4000	0.05	-0.35	0.04	-0.07	-0.18	0.19
QUV Data - 1000 hours						
	Δ y-reflectance	Δ y-reflectance	Δ L	Δ A	Δ B	Δ E
Blank	6.08	-0.69	5.54	-0.14	-0.17	5.54
VCT – 22	3.12	-0.84	3.03	-0.07	-0.30	3.04
CS – 4000	1.72	-0.62	1.47	-0.11	-0.28	1.50
QUV Data - 1500 hours						
	Δ y-reflectance	Δ y-reflectance	Δ L	Δ A	Δ B	Δ E
Blank	6.61	1.01	5.99	0.05	0.72	6.03
VCT – 22	3.90	-0.77	3.75	-0.10	-0.25	3.76
CS – 4000	3.15	-0.85	2.65	-0.10	-0.37	2.68
QUV Data - 2000 hours						
	Δ y-reflectance	Δ y-reflectance	Δ L	Δ A	Δ B	Δ E
Blank	9.46	0.57	8.31	-0.04	0.58	8.33
VCT – 22	3.98	-0.99	3.82	-0.16	-0.35	3.84
CS – 4000	4.27	-1.17	3.55	-0.09	-0.52	3.59
QUV Data - 3000 hours						
	Δ y-reflectance	Δ y-reflectance	Δ L	Δ A	Δ B	Δ E
Blank	11.46	0.65	9.86	-0.05	0.67	9.88
VCT – 22	5.24	-0.89	4.95	-0.24	-0.23	4.97
CS – 4000	7.93	-1.38	6.37	-0.12	-0.57	6.40

ADDITIONAL RESULTS

	Initial y-reflectance	Final y-reflectance	% Retention		
VCT – 22	0.3487	0.3288	94.29		
CS – 4000	0.3885	0.3714	95.60		
Fog Box Data					
	2 Hr.	24 Hr.	2 Day	3 Day	4 Day
VCT – 22	None	None	None	None	None
CS – 4000	None	None	None	None	None
Fog Box Data - Continued					
	7 Day	8 Day	9 Day	24 Hr. Recovery	
VCT – 22	None	None	None	None	
CS – 4000	None	None	None	None	

Slip Resistance

Standard is greater than 0.50 to be classified as slip resistant.

Results: 0.83

See chart, page 7

Water Resistance

ASTM – D1793 spot test on pass/fail basis.

Results: Pass

Detergent Resistance

ASTM – D3207 Gardner Linear Wear Tester

Rating: Excellent

Passes 200 cycles with no film deterioration.

Test Procedures

1. Heat Aged Stability – A one half-pint sample is put into a 120°F oven for 30 days and left undisturbed. After removing and cooling overnight, the Stormer viscosity, pH and syneresis are rechecked, and the degree of variance from the initial readings is recorded. After the readings have been taken an aliquot of the sample polish is tinted with 0.5 g of universal colorant per 100 g of polish. A similar sample of un-heat-aged polish is tinted in the same manner. A side-by-side drawdown is then done and allowed to dry for 24 hours, after which a subjective rating of color match is made. A sample receives a 10 if there is no discernable color difference, with a decreasing score for increasing color difference.

2. Instron Adhesion (to green cement) – A concrete panel (6' x 12' x ½') is prepared according to the concrete formulation in the appendix and allowed to cure for 24 hours. Approximately 5.0g. of test polish is applied by brush onto a 3' x 3' square in the center of panel. Immediately lay an 18' x 2' strip of Textilene mesh over the test area (use roughly the center of the strip), then apply another approximately 5.0g of polish over the mesh and allow to dry for 7 days. The original method supplied calls for a 180° pull angle; this has been changed to a 90° (roughly*) pull angle to accommodate the instrument fittings. The test strip is pulled at a rate of 1 inch per minute, using a 50-pound load cell, set at 50%. Data is collected for minimum, maximum and average forces to peel. The average force to peel was used for any discussion of the adhesion in this bulletin. *Please note that the actual angle ranged from approximately 88° to approximately 92°.

3. Cross-Hatch Adhesion – ASTM D-3359 Method B using duroc and hardiboard.

4. Efflorescence – Samples are tinted with 0.5 g per 100 g of polish, and the polish is then applied by brush to a 1 day cured 'green' cement panel (with lime) and allowed to dry for 7 days. The panels are then exposed on a Cleveland humidity cabinet for 25 days and then removed. Finally, the efflorescence is rated by subjectively observing the build up of salts on the surface of the film. The rating scale runs from 1 to 10 with 10 being optimum.

5. Fog Box Blistering – Unglazed bisque tiles are used as the substrate. The polish is applied in 2 coats on 2 successive days and allowed to dry for 4 days at room temperature. The tiles are then placed in a Q-Fog chamber (with only D.I. water, no salt solution) at 35°C for 7 days. The panels are rated for blistering at 2 and 4 hours, as well as 1, 4 and 7 days. The panels are also rated for recovery 24 hours after they were removed.

6. Blush Resistance – Samples are painted with one coat of polish and allowed to dry for 2 hours. They are then soaked in water for 4 and 24 hours. After each interval they are removed and rated, allowed to dry overnight, and then re-rated for recovery.

7. Hydrolysis – Cement is mixed, poured into small loaf baking panes (6' x 3' x 2'), and allowed to dry for 3 days. Two coats UGL Masonry Primer are applied to all four side edges and ½ of the top face of the brick, and allowed to dry for at least 24 hours. Test coatings are prepared by tinting one hundred grams of each coating formulation with 10 grams of Quinacridone Magenta and 10 grams of Exterior Yellow. Each test coating is then applied to the top surface of a brick. Please note that you are painting over a ½-primed surface. The coated bricks are allowed to dry for 7 days, and then placed on the roof of the lab, exposed to sunlight, in a container so that at least half of the thickness is immersed in water. The color of the coating is watched for change from orange to yellowish, and the number of days to failure recorded.

8. "Hot Tire" Pick-up Resistance – The coatings are applied to unglazed bisque tiles and allowed to dry/cure for 7 days. The test apparatus is then placed in an oven and allowed to come to equilibrium at 140 °F. The coated tiles are placed into the heated testing apparatus with a piece of new tire tread facing the coating, and a pressure of 35 psi applied. The combined sample/apparatus assembly is then placed back into the oven for 24 hours at the 140 °F temperature. After 24 hours, each sample is allowed to stand for approximately ½ hour to come to room temperature before the tire is removed and the degree of blocking rated subjectively on a 10-point scale (10 being the best). After all of the samples are tested, tire print is subjectively rated using the same 10-point scale as is used for blocking.

9. Dirt Pickup Resistance – A drawdown of 10 mils is cast onto an aluminum panel and dried for 7 days. The panel is then put into a QUV chamber (B-bulb) for 24 hours. After QUV exposure the panel is checked for reflectance, and a dirt slurry containing brown iron oxide, water, and Tamol 731 is applied over one half of the panel. Following a 1 hour dry, the panel is washed off under running water, using cheesecloth. Finally, the panel is then dried and a reflectance is obtained over the stained area. A percentage of the reflectance retention is then obtained and reported.

10. QUV Over Transite – The formulated coatings are painted over Transite with a brush, allowed to dry, and then placed in the QUV cabinet for 3000 hours. Yellowing is evaluated at 500, 1000, 1500, 2000, and 3000 hours using our ACS/Datacolor SF-300 spherical spectrophotometer.

QUV testing takes place in an accelerated weathering chamber, designed to create a highly flexible mix of UV light, temperature and moisture conditions. The tests are intended to reproduce the damage caused by sunlight, rain and condensed surface moisture or dew. The chamber subjects the test materials to alternating cycles of light and moisture at controlled elevated temperatures.

The QUV test method is a cyclic ultraviolet weathering procedure introduced in 1969 by the Q-Panel Company. The particular test equipment uses a UV energy source that consists of eight 40-W fluorescent lamps with an emission range of 280 to 350 NM (Nanometers), with continuous peak output at 310 NM. The enclosure accommodates 3' x 6' panels in two stationary racks that face two banks of four fluorescent lamps. The fluorescent lamps emit UV radiation that emulates the intensity of mid-day June sunlight in Florida.

During the exposure tests, oxygenated water is applied to the test samples by condensation, rather than by spray. The water supply is heated in a vented tank below the test racks and lamps. To control the cyclic tests, the QUV is equipped with a variable interval timer that alternates the UV and the condensation at 43° C followed by 8 hours UV radiation at 60° C and high humidity.

11. Chemical Spot Resistance – Tests are conducted per ASTM D1308, using antifreeze, gas, bearing grease, brake fluid, transmission fluid, motor oil, and bleach.



STATIC COEFFICIENT OF FRICTION, JAMES MACHINE

Surface Tested Black Vinyl Composition Tire

Finish Tested VT-12 C-227

Official Test Chart

Test No. _____
 Date 2/7/06
 Temp. 76°
 Humidity 55%
 Test by M. Malone

COEFF. OF FRICTION	"A" (INCHES)
0.00	0.000
0.05	0.500
0.10	0.955
0.15	1.480
0.20	1.960
0.25	2.425
0.30	2.875
0.35	3.305
0.40	3.715
0.45	4.105
0.50	4.470
0.55	4.820
0.60	5.145
0.65	5.450
0.70	5.735
0.75	6.000
0.80	6.250
0.85	6.475
0.90	6.680
0.95	6.860
1.00	7.010
1.05	7.240
1.10	7.400
1.15	7.545
1.20	7.680
(Tan "A")	(10 Sin "A")

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