

Architectural & Industrial Maintenance Coatings Technology Assessment

Phase I Report

#P2004-24

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April 8 2005

Executive Summary

Products Listing by Category

	Published VOC	Grouping	
Group 1:	High Gloss Non-flats		
Product A	242 g/L	> 50g/L	H
Product B	149 g/L	> 50g/L	H
Product C	47 g/L	≤ 50g/L	L
Product D	0 g/L	≤ 50g/L	L
Group 2:	Med. Gloss Non-flats		
Product E	150 g/L	> 50g/L	H
Product F	144 g/L	> 50g/L	H
Product G	0 g/L	≤ 50g/L	L
Product H	0 g/L	≤ 50g/L	L
Group 3:	Low Gloss Non-flats		
Product I	150 g/L	> 50g/L	H
Product J	112 g/L	> 50g/L	H
Product K	<50 g/L	≤ 50g/L	L
Product L	49 g/L	≤ 50g/L	L

Number of Products Tested by Published VOC Range

Category	Products >50g/L	Products ≤50g/L
High Gloss Non-flats	2	2
Medium Gloss Non-flats	2	2
Low Gloss Non-flats	2	2

Tests for General Properties Summary

Percent Nonvolatile Summary

	Published VOC	Grouping		Percent Nonvolatile
				Experimental
Group 1:	High Gloss Non-flats			
Product A	242 g/L	> 50g/L	H	42.72
Product B	149 g/L	> 50g/L	H	51.02
Product C	47 g/L	≤ 50g/L	L	49.75
Product D	0 g/L	≤ 50g/L	L	48.49
Group 2:	Med. Gloss Non-flats			
Product E	150 g/L	> 50g/L	H	46.11
Product F	144 g/L	> 50g/L	H	48.55
Product G	0 g/L	≤ 50g/L	L	52.34
Product H	0 g/L	≤ 50g/L	L	42.75
Group 3:	Low Gloss Non-flats			
Product I	150 g/L	> 50g/L	H	52.93
Product J	112 g/L	> 50g/L	H	49.26
Product K	<50 g/L	≤ 50g/L	L	52.23
Product L	49 g/L	≤ 50g/L	L	52.82

Stability Summary

	Grouping	Stormer (original)	Stormer (post-test)	Overall Character
Group 1:	High Gloss Non-flats			
Product A	H	74	Failure*	
Product B	H	103	93	8
Product C	L	109	89	8
Product D	L	104	Failure*	
Group 2:	Med. Gloss Non-flats			
Product E	H	106	99	7
Product F	H	103	94	6
Product G	L	108	103	6
Product H	L	113	105	6
Group 3:	Low Gloss Non-flats			
Product I	H	101	103	10-Good
Product J	H	94	99	7
Product K	L	106	113	7
Product L	L	95	Failure*	

*Mode of Failure – These received a rating of 0 denoting failure because of gellation

Stability Summary - Gloss Measurements

	Grouping	20°Mean	20 SD	60°Mean	60 SD	85°Mean	85 SD
Group 1:	High Gloss Non-flats						
Product A	H	Failure*					
Product B	H	23.9	0.2	63.7	0.2	92.9	0.4
Product C	L	68.3	0.6	85.2	0.2	95.4	1.4
Product D	L	Failure*					
Group 2:	Med. Gloss Non-flats						
Product E	H	8.5	0.2	45.3	0.4	84.3	1.2
Product F	H	2.4	0.1	22.2	0.2	83.5	1.4
Product G	L	2.4	0.1	20.6	0.2	51.7	0.2
Product H	L	4.7	0.2	31.2	0.2	79.5	0.6
Group 3:	Low Gloss Non-flats						
Product I	H	4.2	0.2	29.7	0.6	71.9	0.2
Product J	H	1.3	0.1	4.9	0.1	26.2	0.2
Product K	L	1.4	0.1	4.3	0.1	25.3	0.2
Product L	L	Failure*					

*No draw-downs were done of the failed paints

Stormer and Cone and Plate Viscosities Summary

	Grouping	Stormer (KU)		Cone and Plate (P)	
		Average	Temp. (°C)	Average	Temp (°C)
Group 1:	High Gloss Non-flats				
Product A	H	74	25	0.78	25
Product B	H	103	25	1.69	25
Product C	L	109	25	2.34	25
Product D	L	104	25	1.22	25
Group 2:	Med. Gloss Non-flats				
Product E	H	106	25	1.65	25
Product F	H	103	25	0.81	25
Product G	L	108	25	1.13	25
Product H	L	113	25	1.43	25
Group 3:	Low Gloss Non-flats				
Product I	H	101	25	1.14	25
Product J	H	94	25	1.25	25
Product K	L	106	25	1.1	25
Product L	L	95	25	1.01	25

Spindle = 3, Shear Rate = 12000s⁻¹

Freeze-Thaw Resistance: Pass/Fail Summary

	Grouping	After 1 Cycle	After 3 Cycles	After 5 Cycles	After 8 Cycles
Group 1:	High Gloss Non-flats				
Product A	H	Pass	Fail	Fail	Fail
Product B	H	Pass	Pass	Pass	Pass
Product C	L	Pass	Pass	Pass	Pass
Product D	L	Fail	Fail	Fail	Fail
Group 2:	Med. Gloss Non-flats				
Product E	H	Pass	Pass	Pass	Pass
Product F	H	Pass	Pass	Pass	Pass
Product G	L	Pass	Pass	Pass	Pass
Product H	L	Pass	Fail	Fail	Fail
Group 3:	Low Gloss Non-flats				
Product I	H	Pass	Pass	Pass	Fail
Product J	H	Pass	Pass	Fail	Fail
Product K	L	Pass	Fail	Fail	Fail
Product L	L	Fail	Fail	Fail	Fail

Mechanical Dry Time Summary*

	Grouping	Set-Touch	Tack-Free	Dry-Hard	Dry-Through
Group 1:	High Gloss Non-flats				
Product A	H	4	12	17	176
Product B	H	10	13	63	122
Product C	L	2	22	179	>24 hrs
Product D	L	10	13	22	65
Group 2:	Med. Gloss Non-flats				
Product E	H	10	26	201	296
Product F	H	4	11	88	111
Product G	L	3	7	10	19
Product H	L	13	15	73	>24 hrs
Group 3:	Low Gloss Non-flats				
Product I	H	2	26	129	239
Product J	H	15	20	48	>24 hrs
Product K	L	5	9	88	139
Product L	L	2	6	13	53

*Average values; times in minutes; stylus diameter = 1mm; speed = 6 hours

Ambient Dry Time Summary*

	Grouping	Set-Touch	Dust-Free	Tack-Free	Dry-Hard	Dry-Through
Group 1:	High Gloss Non-flats					
Product A	H	20	24	44	56	61
Product B	H	26	31	35	132	165
Product C	L	43	66	>300	>500	Approx. 24 hours
Product D	L	25	31	35	68	80
Group 2:	Med. Gloss Non-flats					
Product E	H	16	27	83	171	209
Product F	H	21	34	86	157	167
Product G	L	28	32	36	48	60
Product H	L	40	44	46	160	> 5 days
Group 3:	Low Gloss Non-flats					
Product I	H	46	54	59	218	282
Product J	H	41	47	51	62	Approx.24hours
Product K	L	50	59	62	74	103
Product L	L	31	36	39	55	57

*Times are in minutes, and are the average of two samples

Gloss Summary*

	Grouping	20°Mean	20° SD	60°Mean	60° SD	85°Mean	85° SD
Group 1:	High Gloss Non-flats						
Product A	H	44.1	0.7	80.2	0.2	95.6	0.8
Product B	H	42.9	0.6	74.7	0.3	96.2	0.7
Product C	L	71.3	0.7	85.9	0.4	97.1	0.8
Product D	L	21.8	1.0	59	0.6	88.1	0.8
Group 2:	Med. Gloss Non-flats						
Product E	H	13.2	0.4	52.2	0.5	85.9	1.1
Product F	H	22.0	0.2	61.0	0.2	92.7	0.7
Product G	L	3.4	0.1	24.3	0.2	51.4	0.7
Product H	L	4.5	0.2	30.3	0.2	78.8	0.9
Group 3:	Low Gloss Non-flats						
Product I	H	5.1	0.2	32.5	0.4	71.5	0.5
Product J	H	1.4	0.1	6.1	0.1	26.2	0.4
Product K	L	1.4	0.1	5.6	0.1	26.5	0.2
Product L	L	1.4	0.1	4.9	0.1	14.6	0.2

*Average values

Hide Summary – Contrast Ratio*

	Grouping	3 mil #1	3 mil #2	2 mil #1	2 mil #2
Group 1:	High Gloss Non-flats				
Product A	H	0.96	0.96	0.96	0.96
Product B	H	0.98	0.98	0.98	0.98
Product C	L	0.97	0.97	0.97	0.97
Product D	L	0.97	0.97	0.96	0.97
Group 2:	Med. Gloss Non-flats				
Product E	H	0.98	0.98	0.98	0.98
Product F	H	0.98	0.98	0.98	0.98
Product G	L	0.97	0.97	0.97	0.96
Product H	L	0.96	0.96	0.96	0.96
Group 3:	Low Gloss Non-flats				
Product I	H	0.98	0.98	0.97	0.97
Product J	H	0.99	0.99	0.98	0.98
Product K	L	0.98	0.98	0.97	0.97
Product L	L	0.95	0.95	0.92	0.93

*Average values

Tests for Non-Flat Paints Summary

Scrub Resistance Summary*

	Grouping	Sample Average	Standard Average
Group 1:	High Gloss Non-flats		
Product A	H	265	121
Product B	H	368	121
Product C	L	653	120
Product D	L	218	120
Group 2:	Med. Gloss Non-flats		
Product E	H	1750	120
Product F	H	392	121
Product G	L	58	122
Product H	L	408	120
Group 3:	Low Gloss Non-flats		
Product I	H	1685	122
Product J	H	630	120
Product K	L	472	121
Product L	L	1265	120

*The standard is Sherwin Williams' Harmony

Stain Resistance – ΔE Summary*

	Grouping	Ketchup	Mustard	Wine	Carbon
Group 1:	High Gloss Non-flats				
Product A	H	0.60	0.49	0.28	0.58
Product B	H	0.35	0.10	0.18	0.20
Product C	L	0.72	0.98	0.81	1.54
Product D	L	0.46	0.45	0.31	18.13
Group 2:	Med. Gloss Non-flats				
Product E	H	0.38	0.49	4.11	1.32
Product F	H	0.62	0.86	0.62	1.36
Product G	L	0.49	1.77	0.50	0.20
Product H	L	0.59	0.75	3.03	17.18
Group 3:	Low Gloss Non-flats				
Product I	H	0.25	0.86	3.09	1.78
Product J	H	0.11	0.37	1.68	9.29
Product K	L	0.30	0.59	1.13	7.34
Product L	L	0.44	0.46	0.49	4.10

*Average values

Stain Resistance – Gloss Summary*

Washed Area (no stain)/ Washed Area – Ketchup							
	Grouping	20° Mean	20° SD	60° Mean	60° SD	85° Mean	85° SD
Group 1:	High Gloss Non-flats						
Product A	H	27.0/27.3	0.6/2.2	74.5/72.6	2.0/2.6	87.4/86.0	1.2/3.0
Product B	H	34.9/37.0	1.2/3.4	72.2/72.6	1.6/1.4	90.2/89.1	1.0/1.4
Product C	L	48.5/51.7	0.6/2.8	84.2/85.0	0.6/0.6	94.4/93.9	1.0/1.4
Product D	L	17.0/16.8	0.6/2.2	57.7/57.6	0.6/2.6	84.6/85.4	1.0/1.6
Group 2:	Med. Gloss Non-flats						
Product E	H	11.7/12.6	0.1/0.2	51.7/53.0	0.2/0.4	75.5/76.9	0.6/0.8
Product F	H	16.0/18.5	0.2/0.6	59.9/62.7	0.2/0.4	85.5/87.0	0.4/0.8
Product G	L	2.1/2.0	0.1/0.1	13.7/13.3	0.2/0.4	36.2/36.4	0.8/0.8
Product H	L	3.4/3.5	0.1/0.1	24.9/25.8	0.2/0.4	65.8/68.0	0.4/0.8
Group 3:	Low Gloss Non-flats						
Product I	H	3.9/4.2	0.1/0.1	29.6/31.1	0.4/0.4	67.9/70.7	0.8/0.4
Product J	H	1.5/1.5	0.1/0.1	6.5/6.5	0.1/0.2	28.8/31.3	0.2/0.8
Product K	L	1.5/1.6	0.1/0.1	6.5/6.6	0.2/0.1	28.0/29.6	0.4/0.6
Product L	L	1.5/1.5	0.1/0.1	5.5/6.1	0.1/0.1	17.7/20.6	0.2/0.6

*All values written as: left value = washed area (no stain), right value = stained area

Washed Area (no stain) / Washed Area – Mustard							
	Grouping	20° Mean	20° SD	60° Mean	60° SD	85° Mean	85° SD
Group 1:	High Gloss Non-flats						
Product A	H	26.6/25.9	1.0/2.0	75.4/73.1	2.4/2.0	84.0/84.9	1.4/0.6
Product B	H	31.7/31.3	0.8/1.4	70.7/69.6	0.8/0.6	89.6/88.6	1.0/1.6
Product C	L	45.3/47.1	0.4/2.4	83.6/83.2	0.6/1.0	92.8/93.9	0.2/1.4
Product D	L	17.6/20.8	0.2/1.6	57.1/58.9	0.4/2.4	84.6/84.6	0.6/0.6
Group 2:	Med. Gloss Non-flats						
Product E	H	11.5/13.0	0.1/0.4	51.1/53.6	0.2/0.4	75.7/77.6	0.8/0.8
Product F	H	17.1/18.8	0.6/0.6	61.5/61.7	0.6/0.6	86.1/87.7	0.8/0.6
Product G	L	2.4/2.1	0.2/0.2	17.1/14.6	1.0/0.8	44.8/47.2	2.0/4.0
Product H	L	3.4/3.5	0.1/0.1	24.6/25.9	0.1/0.4	65.6/67.5	0.4/0.8
Group 3:	Low Gloss Non-flats						
Product I	H	4.0/4.2	0.2/0.1	30.3/30.8	0.2/0.2	68.2/69.1	0.2/0.4
Product J	H	1.5/1.5	0.1/0.1	6.5/6.6	0.1/0.1	29.0/30.2	0.4/1.2
Product K	L	1.5/1.6	0.1/0.1	6.4/6.9	0.1/0.1	28.3/30.1	0.2/0.2
Product L	L	1.4/1.5	0.1/0.1	5.4/6.1	0.1/0.2	18.3/22.1	0.4/0.4

*All values written as: left value = washed area (no stain), right value = stained area

Washed Area (no stain) / Washed Area – Wine							
	Grouping	20° Mean	20° SD	60° Mean	60° SD	85° Mean	85° SD
Group 1:	High Gloss Non-flats						

Product A	H	27.9/28.1	0.6/2.2	76.8/76.3	0.4/2.6	83.4/82.3	1.8/2.4
Product B	H	31.2/33.1	0.8/1.0	69.7/70.7	0.8/0.4	87.4/88.9	1.6/0.6
Product C	L	46.5/49.9	0.6/1.8	83.6/83.9	0.6/0.8	92.5/94.5	0.2/0.8
Product D	L	18.8/20.4	0.2/1.8	58.9/60.8	0.2/2.0	83.8/85.0	0.6/0.8
Group 2:	Med. Gloss Non-flats						
Product E	H	12.7/12.8	0.2/0.4	53.0/53.1	0.2/0.6	76.8/77.2	0.8/1.0
Product F	H	18.7/20.8	0.2/0.8	62.1/63.7	0.2/0.4	87.6/88.8	0.4/0.8
Product G	L	2.0/2.0	0.2/0.1	14.2/13.1	1.6/1.0	41.3/42.2	0.4/2.8
Product H	L	3.3/3.3	0.1/0.2	24.4/25.1	0.2/0.4	64.9/66.3	0.6/0.4
Group 3:	Low Gloss Non-flats						
Product I	H	3.8/3.9	0.2/0.2	28.9/30.2	0.6/0.6	69.9/70.9	0.4/0.8
Product J	H	1.5/1.4	0.1/0.1	6.4/6.9	0.1/0.1	28.7/34.6	0.4/0.4
Product K	L	1.5/1.5	0.1/0.1	6.5/6.7	0.2/0.1	29.2/32.1	0.2/0.2
Product L	L	1.4/1.5	0.1/0.1	5.3/6.1	0.1/0.1	17.6/22.4	0.4/0.6

*All values written as: left value = washed area (no stain), right value = stained area

Washed Area (no stain) / Washed Area – Carbon Black							
	Group	20° Mean	20° SD	60° Mean	60° SD	85° Mean	85° SD
Group 1:	High Gloss Non-flats						
Product A	H	29.3/27.2	0.8/1.0	78.0/77.9	0.8/1.0	86.1/84.6	0.6/0.6
Product B	H	30.4/32.1	0.2/1.2	70.7/71.7	0.2/0.6	87.8/88.4	0.6/1.2
Product C	L	46.8/49.4	0.8/2.2	82.7/83.2	0.6/1.4	93.6/95.7	1.0/1.4
Product D	L	18.6/29.7	0.6/2.2	58.5/72.0	0.8/4.0	80.9/84.4	0.8/0.8
Group 2:	Med. Gloss Non-flats						
Product E	H	12.9/14.1	0.2/0.4	53.4/55.7	0.4/0.8	76.0/79.7	1.6/1.0
Product F	H	16.7/20.1	0.4/1.2	61.3/65.6	0.4/0.8	86.2/90.6	1.2/1.6
Product G	L	2.4/2.1	0.1/0.2	18.5/15.5	1.0/1.8	51.7/55.1	0.8/2.2
Product H	L	3.3/4.4	0.1/0.4	24.9/32.1	0.2/1.2	65.4/69.4	0.4/2.0
Group 3:	Low Gloss Non-flats						
Product I	H	4.0/4.3	0.1/0.2	29.5/32.1	0.4/1.2	68.0/72.4	0.6/0.6
Product J	H	1.4/1.2	0.1/0.1	6.3/7.1	0.1/0.2	28.0/32.8	0.4/0.4
Product K	L	1.5/1.3	0.1/0.1	6.3/6.5	0.2/0.2	29.1/31.8	0.6/0.4
Product L	L	1.4/1.3	0.1/0.1	5.2/5.4	0.1/0.1	17.2/20.2	0.2/0.6

*All values written as: left value = washed area (no stain), right value = stained area

Blocking Resistance Summary*

	Grouping	Average
Group 1:	High Gloss Non-Flats	
Product A	H	10
Product B	H	2
Product C	L	9
Product D	L	3
Group 2:	Med. Gloss Non-Flats	
Product E	H	5
Product F	H	7

Product G	L	10
Product H	L	6
Group 3:	Low Gloss Non-Flats	
Product I	H	9
Product J	H	9
Product K	L	9
Product L	L	10

*Average Values

Flow/Level and Sag Summary*

	Grouping	Flow/Level	Sag
Group 1:	High Gloss Non-flats		
Product A	H	4.7	10.7
Product B	H	6	7
Product C	L	6	6.3
Product D	L	6	7
Group 2:	Med. Gloss Non-flats		
Product E	H	5	12+
Product F	H	4	12+
Product G	L	5	10
Product H	L	0	12+
Group 3:	Low Gloss Non-flats		
Product I	H	4	12+
Product J	H	4.7	9
Product K	L	4	12+
Product L	L	0	12+

*Average values

QUV Summary – Color Change*

	Grouping	ΔE, 200 Hours	ΔE, 400 Hours	ΔE, 600 Hours	ΔE, 800 Hours	ΔE, 1000 Hours
Group 1:	High Gloss Non-flats					
Product A	H	0.48	0.47	0.40	0.49	0.72
Product B	H	0.67	0.82	0.71	0.88	0.71
Product C	L	0.37	0.39	0.53	0.67	0.68
Product D	L	0.76	0.66	0.73	0.88	0.85
Group 2:	Med. Gloss Non-flats					
Product E	H	0.50	0.55	0.43	0.45	0.37
Product F	H	0.33	0.31	0.30	0.19	0.24
Product G	L	0.58	0.80	0.93	1.15	1.15
Product H	L	0.20	0.25	0.19	0.19	0.28
Group 3:	Low Gloss Non-flats					
Product I	H	0.34	0.30	0.27	0.18	0.15
Product J	H	0.67	0.68	0.97	1.09	1.14

Product K	L	0.28	0.22	0.18	0.23	0.23
Product L	L	0.45	0.43	0.57	0.65	0.83

*Average values

QUV Summary – Gloss: 0 Hours / 1000 Hours*

	Group	20°Mean	20 SD	60°Mean	60 SD	85°Mean	85 SD
Group 1:	High Gloss Non-flats						
Product A	H	46.3/11.9	0.2/3.9	79.1/50.7	0.2/6.7	97.9/91.3	0.5/1.1
Product B	H	34.4/6.2	0.2/0.7	69.4/40.6	0.2/1.5	96.2/88.4	0.5/0.5
Product C	L	70.8/20.7	0.3/1.3	85.8/68.7	0.2/1.3	97.9/95.7	0.7/0.6
Product D	L	21.3/11.7	0.7/0.4	58.5/50.7	0.4/0.7	89.2/85.6	0.6/0.6
Group 2:	Med. Gloss Non-flats						
Product E	H	18.3/2.7	0.3/0.1	57.9/22.8	0.2/0.4	86.8/73.4	0.6/0.3
Product F	H	19.8/3.5	0.4/0.3	59.3/31.6	0.3/1.4	92.8/87.0	1.2/0.7
Product G	L	3.5/1.4	0.1/0.1	24.9/10.1	0.2/0.3	53.6/55.4	0.3/0.5
Product H	L	4.5/2.2	0.1/0.2	30.9/18.2	0.2/1.1	81.8/72.4	1.0/0.7
Group 3:	Low Gloss Non-flats						
Product I	H	3.8/2.2	0.1/0.1	27.6/19.9	0.2/0.6	73.4/72.9	0.6/0.5
Product J	H	1.4/1.2	0.1/0.1	5.5/2.6	0.1/0.1	27.7/15.1	0.3/0.3
Product K	L	1.5/1.3	0.1/0.1	5.7/2.6	0.1/0.1	28.0/20.1	0.5/0.4
Product L	L	1.4/1.3	0.1/0.1	4.5/4.9	0.1/0.3	13.9/28.1	0.2/0.3

*All values written as: left value = 0 Hours value, right value = 1000 Hours value

*All values are averages

Surface Tension Summary

	Grouping	Corrected Surface Tension*
Group 1:	High Gloss Non-flats	
Product A	H	7.72**
Product B	H	8.67**
Product C	L	8.38**
Product D	L	16.92**
Group 2:	Med. Gloss Non-flats	
Product E	H	10.47**
Product F	H	13.85**
Product G	L	16.06
Product H	L	30.97
Group 3:	Low Gloss Non-flats	
Product I	H	23.01
Product J	H	25.85
Product K	L	28.77
Product L	L	26.87

*Surface tension measurements were corrected in accordance with the ASTM procedure using the tables published by Harkins, W.D., and Jordan, H.F., in “A Method for Determination of Surface and Interfacial Tension from the Maximum Pull on a Ring,” Published in *Journal of American Chemical Society* Vol 52, 1930, p. 1751.

**One or more values of the three averaged values were outside of the original published table range. The published table data was plotted using Excel and fitted with a logarithmic fit with equation: $y = -0.0661 \ln(x) + 0.9351$; where y = correction factor, and $x = (R^3)/V$ value. For this line fit, $R^2 = 0.9998$.

Task 1 - Testing Protocol

Tests for General Properties of all paints

Property	Standard	Number of Replicates	Substrate	Film Thickness/ Bar Type
Percent Solids	ASTM D2369-04	3	N/A	N/A
Stability	ASTM D1849-95	1	N/A	3mil/Bird bar
Stormer Viscosity	ASTM D562-01	2	N/A	N/A
Cone and Plate Viscosity	ASTM D4287-00	2	N/A	N/A
Freeze-Thaw Resistance	ASTM D2243-95	3	N/A	3 mil/Bird bar
Dry Time - Mechanical	ASTM D5895-03	2	Glass	3mil Cube Applicator
Dry Time	ASTM D1640-03	2	Glass	3mil/Bird bar
Gloss	ASTM D523-89	2	Leneta Card 1-B	3mil/Bird bar
Hide	Spectrophotometer	4	Leneta Card 1-B	3mil/Bird bar 2mil/Bird bar

Tests for Non-flat Paints

Property	Standard	Number of Replicates	Substrate	Film Thickness/ Bar type
Scrub Resistance	ASTM D2486-00	2	Plastic	7 mil/Dow bar
Stain Resistance	ASTM D4828 mod.	4	Plastic	7 mil/Dow bar
Blocking Resistance	ASTM D4946-89	3	Leneta Card 2-C	3 mil/Bird bar
Flow & Leveling	ASTM D4062-99	3	Leneta Card 1-B	NPCA Bar
Sag	ASTM D4400-99	3	Leneta Card 1-B	Anti-Sag meter
QUV	ASTM D4587-01	3	Aluminum	#44 Wire Wound
Surface Tension	ASTM D1331-89	3	N/A	N/A

Performance of Testing

Tests for General Properties of All Paints

Percent Solids – ASTM D2369 is used.

Stability – ASTM D1849 is used with one sample of each being kept at 125°F for 30 days, followed by evaluation as indicated in the standard. Gloss measurements will also be taken of the samples during evaluation.

Stormer Viscosity – ASTM D562, method B, is used and provides a digital readout in KU.

Cone & Plate Viscosity – ASTM D4287 is used with the Brookfield CAP2000 model viscometer, using a number 3 spindle and a shear rate of 1200s⁻¹.

Freeze-Thaw Resistance – ASTM D2243 is used for the water-borne paints for three samples of each with the paints applied to black and white Leneta charts after one, three, five, and eight cycles. A cycle is defined according to the ASTM method.

Dry Time – Mechanical Recorder – ASTM D5895 is used to determine dry time with a mechanical straight line drying time recorder.

Dry-Time – ASTM D1640 is used to determine dry time at room temperature.

Gloss – ASTM D523 is used with a BYK-Gardner micro-TRI-gloss meter calibrated just prior to use.

Hide – For dry hide and gloss, a three-mil Bird bar was used to apply paint to two black and white Leneta charts. Also, for hide, a two-mil Bird bar was used to apply paint to two black and white Leneta charts. The color was measured using a Minolta CM-2002 spectrophotometer and the CIE XYZ value for Y was recorded. The Y values over the white section and the black section were used to calculate dry hide. Due to Beer's and Lambert's Law, hide increases as film thickness increases. Hide also increases as concentration of hiding pigments increases.

Tests for Non-flat Paints

Scrub Resistance – Test method B of ASTM D2486 is used with a new brush to insure correct data. Sherwin Williams' Harmony is used as the standard.

Stain Resistance – ASTM D4828 is modified for this test. This method is actually a washability test and provides information about the changes which occur as a result of sponge cleaning a stained area rather than the paint's likelihood of resisting a stain. To better determine the paint's resistance to staining, the paint is applied to four plastic panels and allowed to dry for 7 days as described in the ASTM method. Color is measured on each panel using a Minolta CM-2002 spectrophotometer and the CIE XYZ

values are recorded. Four staining materials, ketchup, mustard, wine and carbon black, are applied with each panel having three one-inch stripes that are half an inch apart of one stain resulting in three stripes per stain, and one stain per panel. The materials are left on the panels for 24 hours and then rinsed with de-ionized water and washed for 100 cycles with non-abrasive cleaner and a sponge according to the ASTM method. The panel is patted dry with paper towels to remove standing water, and is then allowed to air dry for one day. Then, color measurements are taken of the stripes with CIE XYZ values and ΔE values recorded. Gloss measurements are also taken of a section of the washed area that is unstained and of the washed area that is stained so that any damage done by the washing itself is accounted for and not contributed to the staining medium.

Blocking Resistance – ASTM D4946 is used. Careful attention can produce reproducible results but this is a somewhat subjective test. It was performed after 7 days as suggested by the ASTM to allow more coalescence.

Flow & Leveling – ASTM D4062 is used. This is an old ASTM method that is analogous to the New York Society for Paint Technology “Official Digest” No. 44 Vol. 32, No. 430, p. 1435. The NYPC Level Blade is used.

Sag – ASTM D4400 is used. A Leneta anti-sag bar is used to apply paint to a black and white Leneta chart. This bar deposits strips of paint from 3 to 12 mils thick approximately ½” wide. The chart is immediately lifted to a vertical position with the 12 mil thick strip at the bottom. Evaluation is based upon how much the strips flow into the strips below.

QUV – ASTM D4587 is used. The aluminum panels are subjected to UV and condensation cycles alternating every four hours. Every 200 hours total time, the panels are evaluated for gloss and color change and are rotated according to the standard used. The total time used is 1000 hours.

Surface Tension – ASTM D1331 is the standard used. The maximum surface tension reached is reported as the length of the lamella, a useful indicator for the stabilization of foam.

Test Results

Tests for General Properties of All Paints

Percent Solids

	Pub. VOC	Grouping		3 Replicates Each						
Group 1:	High Gloss Nonflats			W1	W2	SA	V (%vol)	AVG V	N (%NV)	AVG N
Product A	242 g/L	> 50g/L	H	1.5049	1.7054	0.4704	57.38	57.28	42.62	42.72
	Replicate 2			1.5056	1.721	0.5046	57.31	-----	42.69	-----
	Replicate 3			1.5012	1.7186	0.5072	57.14	-----	42.86	-----
Product B	149 g/L	> 50g/L	H	1.5022	1.7292	0.4467	49.18	48.98	50.82	51.02
	Replicate 2			1.5017	1.7414	0.469	48.89	-----	51.11	-----
	Replicate 3			1.5046	1.7596	0.4987	48.87	-----	51.13	-----
Product C	47 g/L	≤ 50g/L	L	1.5069	1.7288	0.4465	50.30	50.25	49.70	49.75
	Replicate 2			1.512	1.7508	0.4796	50.21	-----	49.79	-----
	Replicate 3			1.4772	1.7031	0.454	50.24	-----	49.76	-----
Product D	0 g/L	≤ 50g/L	L	1.4778	1.7004	0.4599	51.60	51.51	48.40	48.49
	Replicate 2			1.4755	1.7178	0.4989	51.43	-----	48.57	-----
	Replicate 3			1.4739	1.6937	0.4533	51.51	-----	48.49	-----
Group 2:	Med. Gloss Nonflats			-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	1.476	1.7173	0.5223	53.80	53.89	46.20	46.11
	Replicate 2			1.4693	1.6953	0.4915	54.02	-----	45.98	-----
	Replicate 3			1.4743	1.7142	0.5199	53.86	-----	46.14	-----
Product F	144 g/L	> 50g/L	H	1.4812	1.7131	0.4793	51.62	51.45	48.38	48.55
	Replicate 2			1.4792	1.7247	0.5038	51.27	-----	48.73	-----
	Replicate 3			1.4725	1.7311	0.5328	51.46	-----	48.54	-----
Product G	0 g/L	≤ 50g/L	L	1.4878	1.7435	0.4879	47.59	47.66	52.41	52.34
	Replicate 2			1.4886	2.1911	1.3444	47.75	-----	52.25	-----
	Replicate 3			1.484	1.7474	0.503	47.63	-----	52.37	-----
Product H	0 g/L	≤ 50g/L	L	1.481	1.7088	0.5328	57.24	57.25	42.76	42.75
	Replicate 2			1.4833	1.6982	0.5027	57.25	-----	42.75	-----
	Replicate 3			1.4835	1.7058	0.5201	57.26	-----	42.74	-----
Group 3:	Low Gloss Nonflats			-----	-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	1.4849	1.7452	0.4921	47.10	47.07	52.90	52.93
	Replicate 2			1.4821	1.7432	0.4954	47.30	-----	52.70	-----
	Replicate 3			1.4817	1.748	0.5006	46.80	-----	53.20	-----
Product J	112 g/L	> 50g/L	H	1.4792	1.7354	0.521	50.83	50.74	49.17	49.26
	Replicate 2			1.4809	1.7239	0.493	50.71	-----	49.29	-----
	Replicate 3			1.4778	1.7325	0.5164	50.68	-----	49.32	-----
Product K	<50 g/L	≤ 50g/L	L	1.4781	1.7511	0.523	47.80	47.77	52.20	52.23
	Replicate 2			1.4823	1.7403	0.4944	47.82	-----	52.18	-----
	Replicate 3			1.4794	1.7472	0.5119	47.69	---	52.31	-----
Product L	49 g/L	≤ 50g/L	L	1.4838	1.7422	0.4893	47.19	47.18	52.81	52.82
	Replicate 2			1.4837	1.7717	0.5451	47.17	-----	52.83	-----
	Replicate 3			1.4829	1.7747	0.5524	47.18	-----	52.82	-----

Stability

	Pub. VOC		Pre	Storage	Post	Skin/Corr/	Rigidity	Stormer		Overall
Group 1:	HighGloss		Weight	Time	Weight	Press	Low.Layer	Viscosity	Temp	Character
Product A	242 g/L	H	631.2g	30 days	631.2	Failure				
Product B	149 g/L	H	644.4	30 days	644.3	8	10	93	25°C	8
Product C	47 g/L	L	623.1	30 days	623	10	10	89	25°C	8
Product D	0 g/L	L	635.7	30 days	635.6	Failure				
Group 2:	Med.Gloss		-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	H	645	30 days	645	6	6	99	25°C	7
Product F	144 g/L	H	658	30 days	658	8	6	94	25°C	6
Product G	0 g/L	L	709.8	30 days	709.8	8	6	103	25°C	6
Product H	0 g/L	L	643.7	30 days	643.7	8	6	105	25°C	6
Group 3:	LowGloss		-----	-----	-----	-----	-----	-----	-----	-----
Product I	150 g/L	H	685.9	30 days	685.9	10	8	103	25°C	10
Product J	112 g/L	H	683.4	30 days	683.4	8	8	99	25°C	7
Product K	<50 g/L	L	715.1	30 days	715.1	8	6	113	25°C	7
Product L	49 g/L	L	684	30 days	684	Failure				

Stability – Gloss Measurements

	Pub. VOC		Gloss (5 readings per replicate)					
Group 1:	HighGloss		20°Mean	20°SD	60°Mean	60°SD	85°Mean	85°SD
Product A	242 g/L	H	Failure					
Product B	149 g/L	H	23.9	0.2	63.7	0.2	92.9	0.4
Product C	47 g/L	L	68.3	0.6	85.2	0.2	95.4	1.4
Product D	0 g/L	L	Failure					
Group 2:	Med.Gloss		-----	-----	-----	-----	-----	-----
Product E	150 g/L	H	8.5	0.2	45.3	0.4	84.3	1.2
Product F	144 g/L	H	2.4	0.1	22.2	0.2	83.5	1.4
Product G	0 g/L	L	2.4	0.1	20.6	0.2	51.7	0.2
Product H	0 g/L	L	4.7	0.2	31.2	0.2	79.5	0.6
Group 3:	LowGloss		-----	-----	-----	-----	-----	-----
Product I	150 g/L	H	4.2	0.2	29.7	0.6	71.9	0.2
Product J	112 g/L	H	1.3	0.1	4.9	0.1	26.2	0.2
Product K	<50 g/L	L	1.4	0.1	4.3	0.1	25.3	0.2
Product L	49 g/L	L	Failure					

Stormer Viscosity and Cone and Plate Viscosity

	VOC			Grouping			Stormer (KU)				Cone and Plate (P)			
	1	Temp (°C)	2	Temp (°C)	Avg	1	Temp (°C)	2	Temp (°C)	Avg				
Group 1:	HighGloss Non-flats			1	Temp (°C)	2	Temp (°C)	Avg	1	Temp (°C)	2	Temp (°C)	Avg	
Product A	242 g/L	> 50g/L	H	74	25	74	25	74	0.78	25	0.78	25	0.8	
Product B	149 g/L	> 50g/L	H	103	25	103	25	103	1.69	25	1.69	25	1.7	
Product C	47 g/L	≤ 50g/L	L	109	25	109	25	109	2.34	25	2.34	25	2.3	
Product D	0 g/L	≤ 50g/L	L	104	25	104	25	104	1.22	25	1.22	25	1.2	
Group 2:	Med.Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Product E	150 g/L	> 50g/L	H	106	25	106	25	106	1.65	25	1.65	25	1.7	
Product F	144 g/L	> 50g/L	H	103	25	103	25	103	0.81	25	0.81	25	0.8	
Product G	0 g/L	≤ 50g/L	L	108	25	108	25	108	1.13	25	1.13	25	1.1	
Product H	0 g/L	≤ 50g/L	L	113	25	113	25	113	1.43	25	1.43	25	1.4	
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Product I	150 g/L	> 50g/L	H	101	25	101	25	101	1.14	25	1.14	25	1.1	
Product J	112 g/L	> 50g/L	H	94	25	94	25	94	1.25	25	1.25	25	1.3	
Product K	<50 g/L	≤ 50g/L	L	106	25	106	25	106	1.1	25	1.1	25	1.1	
Product L	49 g/L	≤ 50g/L	L	95	25	95	25	95	1.01	25	1.01	25	1	

Freeze-Thaw Resistance

	Pub/VOC	Original	After 1 Cycle				After 3 Cycles				After 5 Cycles				After 8 Cycles			
Group 1:	HighGloss	Stormer	S/G/C	Stormer	Temp	Comp	S/G/C	Stormer	Temp	Comp	S/G/C	Stormer	Temp	Comp	S/G/C	Stormer	Temp	Comp
Product A	242 g/L	74	4	81	25	4	Failure				-----				-----			
Can 2		74	4	81	25	4	Failure				-----				-----			
Can 3		74	4	80	25	4	Failure				-----				-----			
Product B	149 g/L	103	10	106	25	10	10	121	25	10	8	130	25	8	8	138	25	8
Can 2		103	10	106	25	10	10	121	25	10	8	130	25	8	8	138	25	8
Can 3		103	10	106	25	10	10	121	25	10	8	130	25	8	8	138	25	8
Product C	47 g/L	109	10	113	25	10	10	114	25	10	10	117	25	10	10	120	25	10
Can 2		109	10	113	25	10	10	114	25	10	10	117	25	10	10	120	25	10
Can 3		109	10	113	25	10	10	114	25	10	10	117	25	10	10	120	25	10
Product D	0 g/L	104	Failure				-----				-----				-----			
Can 2		104	Failure				-----				-----				-----			
Can 3		104	Failure				-----				-----				-----			
Group 2:	Med.Gloss		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	106	4	127	25	4	8	114	25	8	8	111	25	8	8	106	25	8
Can 2		106	4	127	25	4	8	114	25	8	8	111	25	8	8	106	25	8
Can 3		106	4	127	25	4	8	114	25	8	8	111	25	8	8	106	25	8
Product F	144 g/L	103	10	106	25	10	10	106	25	10	10	112	25	10	10	121	25	10
Can 2		103	10	106	25	10	10	106	25	10	10	112	25	10	10	121	25	10
Can 3		103	10	106	25	10	10	106	25	10	10	112	25	10	10	121	25	10
Product G	0 g/L	108	10	114	25	10	10	113	25	10	10	108	25	10	10	115	25	10
Can 2		108	10	114	25	10	10	113	25	10	10	108	25	10	10	115	25	10
Can 3		108	10	114	25	10	10	113	25	10	10	108	25	10	10	115	25	10
Product H	0 g/L	113	10	112	25	10	Failure				-----				-----			
Can 2		113	10	112	25	10	Failure				-----				-----			
Can 3		113	10	112	25	10	Failure				-----				-----			
Group 3:	LowGloss		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product I	150 g/L	101	10	105	25	10	10	109	25	10	10	111	25	10	Failure			
Can 2		101	10	105	25	10	10	109	25	10	10	111	25	10	Failure			
Can 3		101	10	105	25	10	10	109	25	10	10	111	25	10	Failure			
Product J	112 g/L	94	10	101	25	10	10	102	25	10	Failure				-----			
Can 2		94	10	101	25	10	10	102	25	10	Failure				-----			
Can 3		94	10	101	25	10	10	102	25	10	Failure				-----			
Product K	<50 g/L	106	10	113	25	10	Failure				-----				-----			
Can 2		106	10	113	25	10	Failure				-----				-----			
Can 3		106	10	113	25	10	Failure				-----				-----			
Product L	49 g/L	95	8	122	25	8	Failure				-----				-----			

Can 2	95	8	122	25	8	Failure	-----	-----
Can 3	95	8	122	25	8	Failure	-----	-----

Freeze-Thaw - Gloss

Group 1:	After 1 Cycle						After 3 Cycles						After 5 Cycles					
	20° M	20°S D	60° M	60°S D	85° M	85°S D	20° M	20°S D	60° M	60°S D	85° M	85°S D	20° M	20°S D	60° M	60°S D	85° M	85°S D
Product A	43.2	1	79.2	0.6	89.3	1	Failure						-----					
Can 2	42.5	1.4	78.9	1	91.4	1.2	Failure						-----					
Can 3	31.5	2.6	69.9	2.4	83.5	1.4	Failure						-----					
Product B	39.1	0.4	73.3	0.2	93.5	1	39.9	0.4	73.5	0.2	92.9	0.6	42.3	0.4	74.7	0.2	93.1	0.6
Can 2	37.7	0.2	72.4	0.2	94.2	0.6	40.6	0.2	73.7	0.2	93.6	0.8	43.4	0.4	74.9	0.2	92.6	1.4
Can 3	37.6	0.2	72.4	0.1	93.3	0.2	38.1	0.2	72.7	0.2	92.9	0.6	41.3	0.4	74.2	0.2	92.4	0.8
Product C	67.1	0.6	86.5	0.2	96.4	0.6	68.4	0.6	86.4	0.2	101.7	1.2	66.7	1.2	86.4	0.4	99	1.4
Can 2	67.2	0.2	86.5	0.2	96.2	0.6	66.7	0.8	86.6	0.2	97.1	1	66.9	0.8	86.9	0.2	98	0.4
Can 3	65.9	0.4	86	0.2	96.3	0.4	68.3	1.4	87	0.8	96.5	1.6	65.5	0.6	86.7	0.6	97.8	0.6
Product D	Failure						-----						-----					
Can 2	Failure						-----						-----					
Can 3	Failure						-----						-----					
Group 2:	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----
Product E	16.9	1.4	56.2	0.8	84.9	1	19.4	0.2	58.3	0.6	87.7	2.4	19.4	0.4	59.1	0.4	86.6	0.8
Can 2	17.9	1	56.4	0.6	86.9	2.6	19	0.2	58.5	0.6	85.5	1.2	19.8	0.2	59.4	0.1	86.7	0.6
Can 3	17.4	0.6	56.2	0.4	89.9	0.4	19	0.2	58.1	0.2	86	0.8	20.2	0.2	59.6	0.2	86.5	1.2
Product F	19	0.8	58.1	0.6	91.1	0.6	20.2	0.8	58.8	0.6	94.8	1	19.2	0.4	58.4	0.2	91.4	1
Can 2	19.9	0.4	58.6	0.4	90.3	1.4	19.4	0.4	58.7	0.2	90.4	1	18.9	0.4	58.2	0.6	90.7	1.2
Can 3	20.7	0.4	59.3	0.2	91.5	0.8	20	0.4	58.7	0.2	90.2	1.6	19.3	0.4	58.5	0.2	91.6	1.2
Product G	3.5	0.1	24.8	0.2	52.1	0.4	3.6	0.1	24.9	0.2	51.6	0.4	3.6	0.2	25.5	0.4	52.3	0.2
Can 2	3.3	0.1	23.8	0.2	50.6	0.4	3.5	0.1	24.6	0.2	51.1	0.2	3.8	0.1	26.2	0.2	53.1	0.4
Can 3	3.3	0.1	24.3	0.2	51.3	0.2	3.6	0.1	25.4	0.2	52.9	0.4	3.7	0.2	25.4	0.2	51.5	0.4
Product H	3.8	0.1	25.3	0.6	68	2.2	Failure						-----					
Can 2	4.4		29.6	0.2	77.4	0.6	Failure						-----					
Can 3	4.2		28.4	0.4	76.5	1.2	Failure						-----					
Group 3:	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----
Product I	5.1	0.1	33.1	0.2	70.9	1	5.1	0.2	32.8	0.4	72.3	1.4	5.5	0.2	33.9	0.6	72.7	1
Can 2	5.2	0.1	32.9	0.6	72	0.6	5.2	0.1	32.8	0.6	72.7	0.6	5.3	0.1	33.5	0.2	71.7	0.6
Can 3	5.1	0.1	32.9	0.2	71.6	0.8	5	0.1	32.6	0.4	71.2	0.6	5.2	0.1	33.3	0.2	71.6	0.6
Product J	1.5	0.1	6.6	0.1	27.8	0.2	1.4	0.1	6.1	0.1	32.4	0.4	Failure					
Can 2	1.5	0.1	6.6	0.1	27.2	0.2	1.4	0.1	6.1	0.1	33.7	0.6	Failure					
Can 3	1.5	0.1	6.7	0.1	26.7	0.4	1.4	0.1	6.1	0.1	32	0.4	Failure					
Product K	1.6	0.1	5.8	0.1	26.3	0.2	Failure						-----					
Can 2	1.6	0.1	5.6	0.1	26.2	0.4	Failure						-----					

Can 3	1.6	0.1	5.8	0.1	26.2	0.4	Failure	-----
Product L	1.5	0.1	4.6	0.1	13.4	0.2	Failure	-----
Can 2	1.5	0.1	4.5	0.2	13.3	0.2	Failure	-----
Can 3	1.5	0.1	4.7	0.1	13.4	0.2	Failure	-----

Continued...	After 8 Cycles					
Group 1:	20°M	20°SD	60°M	60°SD	85°M	85°SD
Product A	-----					
Can 2	-----					
Can 3	-----					
Product B	42.4	0.4	74.3	0.2	93.1	0.6
Can 2	43.4	0.6	74.8	0.2	94.2	0.8
Can 3	42.2	0.4	74.3	0.4	96	1.2
Product C	70.6	0.8	87.1	0.4	96.5	1.2
Can 2	62.7	1	84.2	0.4	97.6	0.4
Can 3	69.7	0.6	86.9	0.2	95.7	0.6
Product D	-----					
Can 2	-----					
Can 3	-----					
Group 2:	-----	-----	-----	-----	-----	-----
Product E	20.4	0.8	60.2	0.2	86.2	0.8
Can 2	20.1	0.6	58.3	1.2	87.5	2.6
Can 3	20.6	0.4	59	1.4	89.4	2.4
Product F	20.9	0.1	58.5	0.2	90.1	1.4
Can 2	21.4	0.8	59.2	0.2	90.1	1.2
Can 3	21.3	0.4	58.7	0.2	91.4	1
Product G	3.6	0.1	24.8	0.1	50.9	0.2
Can 2	3.6	0.1	25.3	0.1	52.8	0.6
Can 3	3.4	0.1	24.4	0.2	50.6	1.2
Product H	-----					
Can 2	-----					
Can 3	-----					
Group 3:	-----	-----	-----	-----	-----	-----
Product I	Failure					
Can 2	Failure					
Can 3	Failure					
Product J	-----					
Can 2	-----					
Can 3	-----					
Product K	-----					
Can 2	-----					
Can 3	-----					

Product L	-----
Can 2	-----
Can 3	-----

Freeze-Thaw - Hide

	VOC	After 1 Cycle			After 3 Cycles			After 5 Cycles			After 8 Cycles		
Group 1:	High	Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.
Product A	242 g/L	86.83	88.97	0.98	Failure			-----			-----		
Can 2		86.61	89.04	0.97	Failure			-----			-----		
Can 3		86.94	89.09	0.98	Failure			-----			-----		
Product B	149 g/L	86.09	86.92	0.99	85.17	86.86	0.98	85.17	86.83	0.98	85.45	86.94	0.98
Can 2		86.05	86.95	0.99	86.40	87.10	0.99	86.24	87.13	0.99	86.42	87.18	0.99
Can 3		86.08	86.95	0.99	85.26	86.89	0.98	85.14	86.85	0.98	86.46	87.27	0.99
Product C	47 g/L	83.74	85.26	0.98	83.84	85.20	0.98	83.84	85.27	0.98	83.73	85.23	0.98
Can 2		83.87	85.33	0.98	82.52	84.87	0.97	83.90	85.22	0.98	82.21	85.06	0.97
Can 3		82.55	84.88	0.97	83.94	85.26	0.98	82.67	84.89	0.97	82.82	84.88	0.98
Product D	0 g/L	Failure			-----			-----			-----		
Can 2		Failure			-----			-----			-----		
Can 3		Failure			-----			-----			-----		
Group 2:	Med	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	85.51	86.95	0.98	86.40	87.21	0.99	85.24	86.80	0.98	86.19	87.06	0.99
Can 2		86.56	87.25	0.99	86.53	87.16	0.99	84.94	86.85	0.98	85.11	86.84	0.98
Can 3		86.22	87.20	0.99	85.20	86.92	0.98	86.27	87.20	0.99	86.15	87.08	0.99
Product F	144 g/L	85.65	86.85	0.99	86.43	87.07	0.99	86.40	87.07	0.99	86.25	86.98	0.99
Can 2		85.41	86.80	0.98	85.37	86.90	0.98	85.44	86.81	0.98	85.22	86.78	0.98
Can 3		86.45	87.18	0.99	86.36	87.05	0.99	85.62	86.94	0.98	86.15	87.00	0.99
Product G	0 g/L	88.76	90.55	0.98	86.88	89.94	0.97	87.92	90.54	0.97	86.59	89.84	0.96
Can 2		86.78	90.02	0.96	86.84	89.96	0.97	88.40	90.46	0.98	88.51	90.50	0.98
Can 3		88.69	90.65	0.98	88.52	90.56	0.98	86.96	89.85	0.97	86.57	89.80	0.96
Product H	0 g/L	84.37	87.61	0.96	Failure			-----			-----		
Can 2		86.04	87.96	0.98	Failure			-----			-----		
Can 3		84.42	87.65	0.96	Failure			-----			-----		
Group 3:	Low	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Product I	150 g/L	87.52	90.09	0.97	89.14	90.71	0.98	87.33	89.92	0.97	Failure
Can 2		89.04	90.68	0.98	89.10	90.62	0.98	89.03	90.71	0.98	Failure
Can 3		87.50	90.11	0.97	87.27	89.86	0.97	87.81	90.04	0.98	Failure
Product J	112 g/L	84.07	84.72	0.99	82.89	84.66	0.98	Failure			-----
Can 2		83.10	84.68	0.98	83.87	84.70	0.99	Failure			-----
Can 3		83.37	84.73	0.98	82.99	84.68	0.98	Failure			-----
Product K	<50 g/L	89.83	91.36	0.98	Failure			-----			-----
Can 2		88.27	90.76	0.97	Failure			-----			-----
Can 3		89.95	91.35	0.98	Failure			-----			-----
Product L	49 g/L	85.82	89.65	0.96	Failure			-----			-----
Can 2		82.30	89.03	0.92	Failure			-----			-----
Can 3		85.51	89.76	0.95	Failure			-----			-----

Dry Time – Mechanical Recorder

	PubVOC	Grouping		Replicate 1				Replicate 2			
Group 1:	High Gloss Non-flats			Stage1	Stage2	Stage3	Stage4	Stage1	Stage2	Stage3	Stage4
Product A	242 g/L	> 50g/L	H	3	6	10	108	2	10	13	126
Time (min)				4.5	9	15	162	3	15	19.5	189
Average (min)				4	12	17	176	-----	-----	-----	-----
Product B	149 g/L	> 50g/L	H	7	9	40	82	6	8	44	81
Time				10.5	13.5	60	123	9	12	66	121.5
Average				10	13	63	122	-----	-----	-----	-----
Product C	47 g/L	≤ 50g/L	L	1	15	120	>300	1	14	118	>300
Time				1.5	22.5	180	>24 hrs	1.5	21	177	>24 hrs
Average				2	22	179	>24 hrs	-----	-----	-----	-----
Product D	0 g/L	≤ 50g/L	L	7	9	15	46	6	8	14	40
Time				10.5	13.5	22.5	69	9	12	21	60
Average				10	13	22	65	-----	-----	-----	-----
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	6	16	133	195	7	18	135	199
Time				9	24	199.5	292.5	10.5	27	202.5	298.5
Average				10	26	201	296	-----	-----	-----	-----
Product F	144 g/L	> 50g/L	H	3	8	60	73	2	7	57	75
Time				4.5	12	90	109.5	3	10.5	85.5	112.5
Average				4	11	88	111	-----	-----	-----	-----
Product G	0 g/L	≤ 50g/L	L	1	5	7	12	3	4	6	13
Time				1.5	7.5	10.5	18	4.5	6	9	19.5
Average				3	7	10	19	-----	-----	-----	-----
Product H	0 g/L	≤ 50g/L	L	8	10	50	>300	9	10	47	>300
Time				12	15	75	>24 hrs	13.5	15	70.5	>24 hrs
Average				13	15	73	>24 hrs	-----	-----	-----	-----
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	1	18	87	160	1	16	85	158
Time				1.5	27	130.5	240	1.5	24	127.5	237
Average				2	26	129	239	-----	-----	-----	-----
Product J	112 g/L	> 50g/L	H	10	13	34	>300	10	13	30	>300
Time				15	19.5	51	>24 hrs	15	19.5	45	>24 hrs
Average				15	20	48	>24 hrs	-----	-----	-----	-----
Product K	<50 g/L	≤ 50g/L	L	2	5	62	91	5	7	55	94
Time				3	7.5	93	136.5	7.5	10.5	82.5	141
Average				5	9	88	139	-----	-----	-----	-----
Product L	49 g/L	≤ 50g/L	L	1	4	8	31	1	4	9	39
Time				1.5	6	12	46.5	1.5	6	13.5	58.5
Average				2	6	13	53	-----	-----	-----	-----

Dry-Time – Ambient

	Pub. VOC	Grouping		Times (min)				
Group 1:	High Gloss Non-flats			Set-Touch	Dust-Free	Tack-Free	Dry-Hard	Dry-Through
Product A	242 g/L	> 50g/L	H	20	24	44	56	60
Replicate 2				20	24	44	56	61
Average				20	24	44	56	61
Product B	149 g/L	> 50g/L	H	26	31	35	132	165
Replicate 2				26	31	35	132	165
Average				26	31	35	132	165
Product C	47 g/L	≤ 50g/L	L	46	68	> 300	> 500	approx. 24 hrs
Replicate 2				40	64	> 300	> 500	approx. 24 hrs
Average				43	66	> 300	> 500	approx. 24 hrs
Product D	0 g/L	≤ 50g/L	L	28	34	38	70	85
Replicate 2				22	28	32	65	75
Average				25	31	35	68	80
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	16	27	80	171	189
Replicate 2				16	27	85	170	229
Average				16	27	83	171	209
Product F	144 g/L	> 50g/L	H	21	34	86	154	166
Replicate 2				21	34	85	159	167
Average				21	34	86	157	167
Product G	0 g/L	≤ 50g/L	L	27	31	36	47	59
Replicate 2				28	32	36	49	60
Average				28	32	36	48	60
Product H	0 g/L	≤ 50g/L	L	40	45	47	160	>5 Days
Replicate 2				40	43	45	160	>5 Days
Average				40	44	46	160	>5 Days
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	46	54	59	217	281
Replicate 2				46	54	59	218	282
Average				46	54	59	218	282
Product J	112 g/L	> 50g/L	H	47	50	55	62	approx. 24 hrs
Replicate 2				35	44	46	62	approx. 24 hrs
Average				41	47	51	62	approx. 24 hrs
Product K	<50 g/L	≤ 50g/L	L	50	60	63	74	102
Replicate 2				50	57	60	74	103
Average				50	59	62	74	103
Product L	49 g/L	≤ 50g/L	L	31	36	39	54	57
Replicate 2				31	36	39	55	57
Average				31	36	39	55	57

	Pub. VOC	Grouping		Gloss (5 readings per replicate)					
Group 1:	High Gloss Non-flats			20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Product A	242 g/L	> 50g/L	H	44.1	0.4	80.2	0.2	95.6	0.8
	Replicate 2			44.1	1	80.1	0.2	95.6	0.8
	Average			44.1	0.7	80.2	0.2	95.6	0.8
Product B	149 g/L	> 50g/L	H	43.3	0.6	74.8	0.4	95.8	1
	Replicate 2			42.5	0.6	74.6	0.2	96.5	0.4
	Average			42.9	0.6	74.7	0.3	96.2	0.7
Product C	47 g/L	≤ 50g/L	L	71.3	0.8	86	0.4	96.7	0.6
	Replicate 2			71.2	0.6	85.7	0.4	97.4	1
	Average			71.3	0.7	85.9	0.4	97.1	0.8
Product D	0 g/L	≤ 50g/L	L	22	1.6	59.1	0.8	88.7	0.6
	Replicate 2			21.6	0.4	58.8	0.4	87.4	1
	Average			21.8	1.0	59.0	0.6	88.1	0.8
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	12.5	0.4	51.2	0.4	86.0	1.0
	Replicate 2			13.9	0.4	53.2	0.6	85.8	1.2
	Average			13.2	0.4	52.2	0.5	85.9	1.1
Product F	144 g/L	> 50g/L	H	22.2	0.2	61.3	0.2	92.5	1.0
	Replicate 2			21.8	0.2	60.7	0.2	92.8	0.4
	Average			22.0	0.2	61.0	0.2	92.7	0.7
Product G	0 g/L	≤ 50g/L	L	3.5	0.1	24.6	0.2	51.7	0.8
	Replicate 2			3.3	0.1	24.0	0.2	51.1	0.6
	Average			3.4	0.1	24.3	0.2	51.4	0.7
Product H	0 g/L	≤ 50g/L	L	4.5	0.2	30.5	0.2	78.9	1.0
	Replicate 2			4.4	0.1	30.0	0.2	78.7	0.8
	Average			4.5	0.2	30.3	0.2	78.8	0.9
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	5.2	0.2	32.7	0.4	72.3	0.4
	Replicate 2			5	0.2	32.3	0.4	70.7	0.6
	Average			5.1	0.2	32.5	0.4	71.5	0.5
Product J	112 g/L	> 50g/L	H	1.4	0.1	6.1	0.1	26.4	0.1
	Replicate 2			1.4	0.1	6	0.1	26	0.6
	Average			1.4	0.1	6.1	0.1	26.2	0.4
Product K	<50 g/L	≤ 50g/L	L	1.4	0.1	5.6	0.1	26.6	0.2
	Replicate 2			1.4	0.1	5.6	0.1	26.3	0.2
	Average			1.4	0.1	5.6	0.1	26.5	0.2
Product L	49 g/L	≤ 50g/L	L	1.4	0.1	4.9	0.1	14.7	0.1
	Replicate 2			1.4	0.1	4.9	0.1	14.5	0.2
	Average			1.4	0.1	4.9	0.1	14.6	0.2

Hide

	VOC	Grouping		3mil - 1			3mil - 2			2mil - 1			2mil - 2		
Group 1:	H.G. Non-flats			Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.	Y (Black)	Y (White)	Cont. Rat.
Product A	242 g/L	> 50g/L	H	84.57	88.17	0.96	84.53	88.08	0.96	84.15	87.86	0.96	84.3	87.97	0.96
	Reading 2			84.66	88.13	0.96	84.52	88.16	0.96	84.12	88.04	0.96	84.27	88.16	0.96
	Reading 3			84.92	88.18	0.96	84.86	88.11	0.96	84.37	87.8	0.96	84.5	87.93	0.96
	Average			84.72	88.16	0.96	84.64	88.12	0.96	84.21	87.90	0.96	84.36	88.02	0.96
Product B	149 g/L	> 50g/L	H	84.87	86.65	0.98	84.92	86.67	0.98	84.68	86.62	0.98	84.95	86.68	0.98
	Reading 2			84.78	86.66	0.98	84.81	86.66	0.98	84.79	86.62	0.98	84.85	86.75	0.98
	Reading 3			84.84	86.69	0.98	84.92	86.7	0.98	84.76	86.65	0.98	85.08	86.74	0.98
	Average			84.83	86.67	0.98	84.88	86.68	0.98	84.74	86.63	0.98	84.96	86.72	0.98
Product C	47 g/L	≤ 50g/L	L	82.86	85.17	0.97	83.03	85.31	0.97	82.98	85.16	0.97	82.94	85.23	0.97
	Reading 2			82.84	85.15	0.97	82.97	85.32	0.97	82.82	85.18	0.97	82.93	85.28	0.97
	Reading 3			82.93	85.22	0.97	82.95	85.28	0.97	82.92	85.21	0.97	82.84	85.25	0.97
	Average			82.88	85.18	0.97	82.98	85.30	0.97	82.91	85.18	0.97	82.90	85.25	0.97
Product D	0 g/L	≤ 50g/L	L	86.28	89.21	0.97	86.09	89.31	0.96	85.72	89.06	0.96	86.17	89.15	0.97
	Reading 2			86.18	89.33	0.96	86.12	89.21	0.97	85.85	89.12	0.96	86.11	89.22	0.97
	Reading 3			86.19	89.23	0.97	86.33	89.13	0.97	86.08	89.16	0.97	86.23	89.18	0.97
	Average			86.22	89.26	0.97	86.18	89.22	0.97	85.88	89.11	0.96	86.17	89.18	0.97
Group 2:	M.G. Non-flats			-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	85.98	87.64	0.98	85.64	87.53	0.98	85.66	87.53	0.98	85.27	87.30	0.98
	Reading 2			85.90	87.60	0.98	85.58	87.44	0.98	85.72	87.47	0.98	85.33	87.34	0.98
	Reading 3			85.88	87.62	0.98	85.69	87.49	0.98	85.64	87.53	0.98	85.22	87.30	0.98
	Average			85.92	87.62	0.98	85.64	87.49	0.98	85.67	87.51	0.98	85.27	87.31	0.98
Product F	144 g/L	> 50g/L	H	85.60	87.13	0.98	85.79	87.22	0.98	85.44	87.02	0.98	85.41	87.07	0.98
	Reading 2			85.47	87.10	0.98	85.64	87.18	0.98	85.46	87.11	0.98	85.47	87.10	0.98
	Reading 3			85.59	87.14	0.98	85.66	87.18	0.98	85.55	87.12	0.98	85.52	87.15	0.98
	Average			85.55	87.12	0.98	85.70	87.19	0.98	85.48	87.08	0.98	85.47	87.11	0.98
Product G	0 g/L	≤ 50g/L	L	87.03	90.07	0.97	87.10	90.15	0.97	87.00	89.97	0.97	86.73	90.00	0.96
	Reading 2			87.18	90.06	0.97	86.83	90.10	0.96	86.96	90.10	0.97	86.76	90.07	0.96
	Reading 3			87.08	90.06	0.97	87.17	90.08	0.97	87.09	90.08	0.97	86.74	89.99	0.96
	Average			87.10	90.06	0.97	87.03	90.11	0.97	87.02	90.05	0.97	86.74	90.02	0.96
Product H	0 g/L	≤ 50g/L	L	84.42	87.60	0.96	84.27	87.69	0.96	84.19	87.49	0.96	84.02	87.59	0.96
	Reading 2			84.11	87.62	0.96	84.07	87.56	0.96	84.07	87.60	0.96	84.08	87.55	0.96
	Reading 3			84.23	87.60	0.96	84.27	87.64	0.96	84.18	87.51	0.96	84.02	87.63	0.96
	Average			84.25	87.61	0.96	84.20	87.63	0.96	84.15	87.53	0.96	84.04	87.59	0.96

Group 3: L.G. Non-flats				-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	
Product I	150 g/L	> 50g/L	H	88.92	90.6	0.98	88.88	90.64	0.98	87.07	90.07	0.97	87.34	89.97	0.97
Reading 2				88.96	90.65	0.98	89.04	90.63	0.98	87.08	90	0.97	87.17	90.05	0.97
Reading 3				88.93	90.62	0.98	89.05	90.66	0.98	87.09	90.15	0.97	87.44	90	0.97
Average				88.94	90.62	0.98	88.99	90.64	0.98	87.08	90.07	0.97	87.32	90.01	0.97
Product J	112 g/L	> 50g/L	H	83.96	84.77	0.99	84.05	84.78	0.99	82.82	84.73	0.98	83.05	84.76	0.98
Reading 2				84.02	84.79	0.99	83.96	84.83	0.99	83.1	84.73	0.98	82.96	84.76	0.98
Reading 3				84.02	84.78	0.99	84.03	84.82	0.99	83.07	84.74	0.98	83.08	84.76	0.98
Average				84.00	84.78	0.99	84.01	84.81	0.99	83.00	84.73	0.98	83.03	84.76	0.98
Product K	<50 g/L	≤ 50g/L	L	89.81	91.38	0.98	89.98	91.38	0.98	88.28	90.77	0.97	88.22	90.69	0.97
Reading 2				89.81	91.43	0.98	89.91	91.45	0.98	88.27	90.83	0.97	87.98	90.83	0.97
Reading 3				89.9	91.45	0.98	89.93	91.47	0.98	88.31	90.72	0.97	88.17	90.75	0.97
Average				89.84	91.42	0.98	89.94	91.43	0.98	88.29	90.77	0.97	88.12	90.76	0.97
Product L	49 g/L	≤ 50g/L	L	85.29	89.66	0.95	85.35	89.65	0.95	81.87	88.75	0.92	82.06	88.83	0.92
Reading 2				85.33	89.64	0.95	85.38	89.65	0.95	81.84	88.84	0.92	82.17	88.86	0.92
Reading 3				85.46	89.7	0.95	85.5	89.64	0.95	82.25	88.88	0.93	82.33	88.83	0.93
Average				85.36	89.67	0.95	85.41	89.65	0.95	81.99	88.82	0.92	82.19	88.84	0.93

Tests for Non-flat Paints

Scrub Resistance

	Pub. VOC	Grouping		Panel 1		Panel 2			
Group 1:	High Gloss Non-flats			Sample	Standard	Sample	Standard	Sample Avg	Stand. Avg
Product A	242 g/L	> 50g/L	H	260	121	270	121	265	121
Product B	149 g/L	> 50g/L	H	370	122	365	120	368	121
Product C	47 g/L	≤ 50g/L	L	650	120	656	120	653	120
Product D	0 g/L	≤ 50g/L	L	216	120	220	120	218	120
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	1760	120	1740	120	1750	120
Product F	144 g/L	> 50g/L	H	390	120	394	122	392	121
Product G	0 g/L	≤ 50g/L	L	55	122	60	122	58	122
Product H	0 g/L	≤ 50g/L	L	410	120	406	120	408	120
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	1690	122	1680	122	1685	122
Product J	112 g/L	> 50g/L	H	626	120	634	120	630	120
Product K	<50 g/L	≤ 50g/L	L	474	122	470	120	472	121
Product L	49 g/L	≤ 50g/L	L	1270	120	1260	120	1265	120

Stain Resistance – Gloss

Group 1:	Washed Area						Washed Area - Ketchup						Washed Area - Mustard					
	20° M	20° SD	60° M	60° SD	85° M	85° SD	20° M	20° SD	60° M	60° SD	85° M	85° SD	20° M	20°S D	60° M	60°S D	85°M	85°SD
Product A	27	0.6	74.5	2	87.4	1.2	27.3	2.2	72.6	2.6	86	3	-----	-----	-----	-----	-----	-----
Panel 2	26.6	1	75.4	2.4	84	1.4	-----	----	-----	----	-----	----	25.9	2	73.1	2	84.9	0.6
Panel 3	27.9	0.6	76.8	0.4	83.4	1.8	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	29.3	0.8	78	0.8	86.1	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product B	34.9	1.2	72.2	1.6	90.2	1	37	3.4	72.6	1.4	89.1	1.4	-----	-----	-----	-----	-----	-----
Panel 2	31.7	0.8	70.7	0.8	89.6	1	-----	----	-----	----	-----	----	31.3	1.4	69.6	0.6	88.6	1.6
Panel 3	31.2	0.8	69.7	0.8	87.4	1.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	30.4	0.2	70.7	0.2	87.8	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product C	48.5	0.6	84.2	0.6	94.4	1	51.7	2.8	85	0.6	93.9	1.4	-----	-----	-----	-----	-----	-----
Panel 2	45.3	0.4	83.6	0.6	92.8	0.2	-----	----	-----	----	-----	----	47.1	2.4	83.2	1	93.9	1.4
Panel 3	46.5	0.6	83.6	0.6	92.5	0.2	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	46.8	0.8	82.7	0.6	93.6	1	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product D	17	0.6	57.7	0.6	84.6	1	16.8	2.2	57.6	2.6	85.4	1.6	-----	-----	-----	-----	-----	-----
Panel 2	17.6	0.2	57.1	0.4	84.6	0.6	-----	----	-----	----	-----	----	20.8	1.6	58.9	2.4	84.6	0.6
Panel 3	18.8	0.2	58.9	0.2	83.8	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	18.6	0.6	58.5	0.8	80.9	0.8	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Group 2:	-----	----	-----	----	-----	----	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product E	11.7	0.1	51.7	0.2	75.5	0.6	12.6	0.2	53	0.4	76.9	0.8	-----	-----	-----	-----	-----	-----
Panel 2	11.5	0.1	51.1	0.2	75.7	0.8	-----	----	-----	----	-----	----	13	0.4	53.6	0.4	77.6	0.8
Panel 3	12.7	0.2	53	0.2	76.8	0.8	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	12.9	0.2	53.4	0.4	76	1.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product F	16	0.2	59.9	0.2	85.5	0.4	18.5	0.6	62.7	0.4	87	0.8	-----	-----	-----	-----	-----	-----
Panel 2	17.1	0.6	61.5	0.6	86.1	0.8	-----	----	-----	----	-----	----	18.8	0.6	61.7	0.6	87.7	0.6
Panel 3	18.7	0.2	62.1	0.2	87.6	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	16.7	0.4	61.3	0.4	86.2	1.2	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product G	2.1	0.1	13.7	0.2	36.2	0.8	2	0.1	13.3	0.4	36.4	0.8	-----	-----	-----	-----	-----	-----
Panel 2	2.4	0.2	17.1	1	44.8	2	-----	----	-----	----	-----	----	2.1	0.2	14.6	0.8	47.2	4
Panel 3	2	0.2	14.2	1.6	41.3	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	2.4	0.1	18.5	1	51.7	0.8	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product H	3.4	0.1	24.9	0.2	65.8	0.4	3.5	0.1	25.8	0.4	68	0.8	-----	-----	-----	-----	-----	-----
Panel 2	3.4	0.1	24.6	0.1	65.6	0.4	-----	----	-----	----	-----	----	3.5	0.1	25.9	0.4	67.5	0.8
Panel 3	3.3	0.1	24.4	0.2	64.9	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	3.3	0.1	24.9	0.2	65.4	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Group 3:	-----	----	-----	----	-----	----	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product I	3.9	0.1	29.6	0.4	67.9	0.8	4.2	0.1	31.1	0.4	70.7	0.4	-----	-----	-----	-----	-----	-----
Panel 2	4	0.2	30.3	0.2	68.2	0.2	-----	----	-----	----	-----	----	4.2	0.1	30.8	0.2	69.1	0.4
Panel 3	3.8	0.2	28.9	0.6	69.9	0.4	-----	--	-----	----	-----	----	-----	-----	-----	-----	-----	-----

Panel 4	4	0.1	29.5	0.4	68	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product J	1.5	0.1	6.5	0.1	28.8	0.2	1.5	0.1	6.5	0.2	31.3	0.8	-----	-----	-----	-----	-----	-----
Panel 2	1.5	0.1	6.5	0.1	29	0.4	-----	----	-----	----	-----	----	1.5	0.1	6.6	0.1	30.2	1.2
Panel 3	1.5	0.1	6.4	0.1	28.7	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	1.4	0.1	6.3	0.1	28	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Continued..	Washed Area						Washed Area - Ketchup						Washed Area - Mustard					
	20° M	20° SD	60° M	60° SD	85° M	85° SD	20° M	20° SD	60° M	60° SD	85° M	85° SD	20° M	20°S D	60° M	60°S D	85° M	85°SD
Product K	1.5	0.1	6.5	0.2	28	0.4	1.6	0.1	6.6	0.1	29.6	0.6	-----	-----	-----	-----	-----	-----
Panel 2	1.5	0.1	6.4	0.1	28.3	0.2	-----	----	-----	----	-----	----	1.6	0.1	6.9	0.1	30.1	0.2
Panel 3	1.5	0.1	6.5	0.2	29.2	0.2	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	1.5	0.1	6.3	0.2	29.1	0.6	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Product L	1.5	0.1	5.5	0.1	17.7	0.2	1.5	0.1	6.1	0.1	20.6	0.6	-----	-----	-----	-----	-----	-----
Panel 2	1.4	0.1	5.4	0.1	18.3	0.4	-----	----	-----	----	-----	----	1.5	0.1	6.1	0.2	22.1	0.4
Panel 3	1.4	0.1	5.3	0.1	17.6	0.4	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----
Panel 4	1.4	0.1	5.2	0.1	17.2	0.2	-----	----	-----	----	-----	----	-----	-----	-----	-----	-----	-----

Continued...	Washed Area - Wine						Washed Area - Carbon					
Group 1:	20°M	20°SD	60°M	60°SD	85°M	85°SD	20°M	20°SD	60°M	60°SD	85°M	85°SD
Product A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	28.1	2.2	76.3	2.6	82.3	2.4	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	27.2	1	77.9	1	84.6	0.6
Product B	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	33.1	1	70.7	0.4	88.9	0.6	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	32.1	1.2	71.7	0.6	88.4	1.2
Product C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	49.9	1.8	83.9	0.8	94.5	0.8	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	49.4	2.2	83.2	1.4	95.7	1.4
Product D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	20.4	1.8	60.8	2	85	0.8	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	29.7	2.2	72	4	84.4	0.8
Group 2:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	12.8	0.4	53.1	0.6	77.2	1	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	14.1	0.4	55.7	0.8	79.7	1
Product F	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	20.8	0.8	63.7	0.4	88.8	0.8	-----	-----	-----	-----	-----	-----

Panel 4	-----	-----	-----	-----	-----	-----	20.1	1.2	65.6	0.8	90.6	1.6
Product G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	2	0.1	13.1	1	42.2	2.8	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	2.1	0.2	15.5	1.8	55.1	2.2
Product H	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	3.3	0.2	25.1	0.4	66.3	0.4	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	4.4	0.4	32.1	1.2	69.4	2
Group 3:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product I	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	3.9	0.2	30.2	0.6	70.9	0.8	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	4.3	0.2	32.1	1.2	72.4	0.6
Product J	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	1.4	0.1	6.9	0.1	34.6	0.4	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	1.2	0.1	7.1	0.2	32.8	0.4
Continued...	Washed Area - Wine						Washed Area - Carbon					
Group 1:	20°M	20°SD	60°M	60°SD	85°M	85°SD	20°M	20°SD	60°M	60°SD	85°M	85°SD
Product K	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	1.5	0.1	6.7	0.1	32.1	0.2	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	1.3	0.1	6.5	0.2	31.8	0.4
Product L	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Panel 3	1.5	0.1	6.1	0.1	22.4	0.6	-----	-----	-----	-----	-----	-----
Panel 4	-----	-----	-----	-----	-----	-----	1.3	0.1	5.4	0.1	20.2	0.6

Stain Resistance - Color

	Ketchup				Mustard				Wine				Carbon			
Group 1:	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE
Product A	80.53	85.76	92.18	0.65	80.53	85.76	92.44	0.52	79.91	85.08	91.47	0.28	78.54	83.61	89.91	0.63
Stripe 2	80.37	85.59	91.93	0.63	80.49	85.72	92.31	0.54	80.11	85.3	91.63	0.34	78.76	83.84	89.99	0.63
Stripe 3	80.36	85.59	92.17	0.53	80.37	85.61	92.43	0.42	79.47	84.63	91.2	0.22	78.72	83.82	90.32	0.49
Standard	79.4	84.59	91.54	-----	79.47	84.66	91.58	-----	79.83	85.04	91.81	-----	79.62	84.81	91.69	-----
Average	80.42	85.65	92.09	0.60	80.46	85.70	92.39	0.49	79.83	85.00	91.43	0.28	78.67	83.76	90.07	0.58
Product B	80.53	85.52	91.42	0.46	80.68	85.68	91.96	0.1	80.58	85.59	91.71	0.17	79.89	84.86	91.21	0.3
Stripe 2	80.57	85.57	91.62	0.37	80.73	85.74	91.99	0.12	80.59	85.59	91.68	0.19	80.42	85.41	91.66	0.11
Stripe 3	80.36	85.37	91.61	0.21	80.53	85.54	91.9	0.07	80.33	85.33	91.53	0.19	80.12	85.1	91.48	0.2
Standard	80.26	85.26	91.79	-----	80.66	85.67	92.08	-----	80.7	85.71	92.07	-----	80.56	85.56	91.96	-----
Average	80.49	85.49	91.55	0.347	80.65	85.65	91.95	0.10	80.5	85.50	91.64	0.18	80.14	85.12	91.45	0.20
Product C	78.19	83.24	85.11	0.76	77.7	82.78	84.42	1.2	77.92	82.97	84.97	0.88	74.09	78.8	79.92	2.28
Stripe 2	78.03	83.08	84.9	0.8	77.9	82.97	84.8	1.07	77.9	82.96	84.95	0.88	76.27	81.17	82.7	1.29
Stripe 3	77.66	82.71	84.82	0.6	77.58	82.64	85	0.67	77.6	82.65	84.91	0.68	76.37	81.3	83.23	1.05
Standard	78.06	83.07	85.97	-----	77.65	82.63	85.9	-----	77.82	82.81	85.99	-----	78.16	83.15	86.07	-----
Average	77.96	83.01	84.94	0.72	77.73	82.80	84.74	0.98	77.81	82.86	84.94	0.813	75.58	80.42	81.95	1.54
Product D	82.53	87.78	93.12	0.59	82.19	87.44	92.42	0.59	82.18	87.41	92.7	0.39	51.49	54.32	53.95	16.4
Stripe 2	82.33	87.57	92.92	0.5	82.13	87.36	92.46	0.5	82.05	87.28	92.55	0.36	52.77	55.67	55.38	15.63
Stripe 3	81.9	87.12	92.6	0.29	81.76	86.98	92.34	0.26	81.68	86.89	92.32	0.17	42.54	44.73	43.57	22.36
Standard	81.49	86.63	92.36	-----	81.57	86.72	92.38	-----	81.57	86.73	92.34	-----	81.47	86.62	92.28	-----
Average	82.25	87.49	92.88	0.46	82.03	87.26	92.41	0.45	81.97	87.19	92.52	0.31	48.93	51.57	50.97	18.13
Group 2:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	81.06	85.98	89.37	0.5	80.96	85.87	89.33	0.52	72.9	77.73	79.47	3.82	78.66	83.35	86.69	1.05
Stripe 2	81.02	85.94	89.51	0.37	80.82	85.74	89.23	0.48	72.24	77.06	78.84	4.09	78.6	83.28	86.61	1.08
Stripe 3	80.69	85.62	89.32	0.26	80.54	85.46	88.95	0.46	71.41	76.26	78.16	4.43	76.98	81.55	84.68	1.83
Standard	80.77	85.66	89.73	-----	80.61	85.53	89.68	-----	80.63	85.53	89.61	-----	80.69	85.59	89.57	-----
Average	80.92	85.85	89.4	0.38	80.77	85.69	89.17	0.49	72.18	77.02	78.82	4.11	78.08	82.73	85.99	1.32
Product F	80.71	85.89	89.66	0.74	80.67	85.82	89.27	0.96	80.38	85.47	89.18	0.63	77.46	82.3	85.75	1.63
Stripe 2	80.56	85.71	89.64	0.61	80.54	85.67	89.3	0.82	80.36	85.46	89.13	0.66	77.96	82.85	86.48	1.37
Stripe 3	80.37	85.53	89.65	0.5	80.29	85.42	89.09	0.79	80.17	85.26	89.09	0.58	78.39	83.33	87.31	1.09
Standard	80.59	85.61	90.33	-----	80.53	85.56	90.33	-----	80.81	85.84	90.42	-----	80.68	85.7	90.31	-----
Average	80.55	85.71	89.65	0.617	80.5	85.64	89.22	0.86	80.3	85.40	89.13	0.62	77.94	82.83	86.51	1.36
Product G	82.31	87.59	92.43	0.56	82.04	87.46	90.34	1.97	82.03	87.29	92.15	0.5	82.25	87.48	92.72	0.21
Stripe 2	82.39	87.67	92.57	0.53	81.96	87.38	90.37	1.89	81.88	87.14	91.99	0.5	82.37	87.61	92.83	0.23
Stripe 3	82.01	87.28	92.39	0.37	81.74	87.12	90.72	1.45	81.44	86.69	91.65	0.5	81.96	87.18	92.6	0.16
Standard	82.17	87.39	93.02	-----	82.13	87.36	93.04	-----	82.13	87.36	92.94	-----	82.28	87.51	93.06	-----

Average	82.24	87.51	92.46	0.49	81.91	87.32	90.48	1.77	81.78	87.04	91.93	0.5	82.19	87.42	92.72	0.2
Product H	80.39	85.45	90.47	0.68	80.04	85.13	89.72	0.91	74.45	79.45	82.93	2.89	52.71	55.61	56.22	14.78
Stripe 2	80.42	85.47	90.55	0.65	80.04	85.13	89.82	0.85	73.34	78.25	81.37	3.46	45.81	48.24	48.07	19.23
Stripe 3	80.0	85.05	90.37	0.43	79.83	84.89	90.06	0.5	74.81	79.75	83.26	2.75	48.31	50.92	51.12	17.54
Standard	79.92	84.91	90.81	-----	79.99	84.99	90.86	-----	79.92	84.91	90.78	-----	79.83	84.83	90.75	-----
Average	80.27	85.32	90.46	0.59	79.97	85.05	89.87	0.75	74.2	79.15	82.52	3.03	48.94	51.59	51.80	17.18
Continued..	Ketchup				Mustard				Wine				Carbon			
	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE
Group 3:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product I	83.0	88.15	93.86	0.28	83.25	88.48	93.25	0.96	77.55	82.66	85.99	2.99	78.14	82.88	87.59	2.38
Stripe 2	83.18	88.33	94.06	0.28	83.01	88.24	93.13	0.87	76.53	81.65	84.88	3.4	79.36	84.2	89.39	1.75
Stripe 3	82.88	88.02	93.88	0.19	82.82	88.04	93.11	0.75	77.77	82.85	86.26	2.89	80.44	85.38	90.97	1.2
Standard	83.09	88.21	94.31	-----	83.04	88.16	94.29	-----	83.12	88.25	94.33	-----	83.01	88.13	94.27	-----
Average	83.02	88.17	93.93	0.25	83.03	88.25	93.16	0.86	77.28	82.39	85.71	3.09	79.31	84.15	89.32	1.78
Product J	78.93	83.9	87.62	0.13	78.81	83.81	86.89	0.59	75.21	80.03	82.74	1.83	62.48	66.1	66.94	8.58
Stripe 2	78.91	83.88	87.64	0.1	78.89	83.86	87.33	0.31	75.71	80.55	83.39	1.58	59.49	62.89	63.46	10.24
Stripe 3	78.71	83.67	87.62	0.09	78.84	83.81	87.42	0.21	75.58	80.41	83.3	1.63	61.55	65.1	65.98	9.06
Standard	78.86	83.82	87.71	-----	78.82	83.77	87.66	-----	78.91	83.87	87.7	-----	78.96	83.91	87.79	-----
Average	78.85	83.82	87.63	0.11	78.85	83.83	87.21	0.37	75.5	80.33	83.14	1.68	61.17	64.7	65.46	9.29
Product K	83.81	89.02	94.02	0.32	83.78	89.01	93.6	0.64	81.61	86.72	91.01	1.1	66.05	69.85	71.87	8.77
Stripe 2	83.93	89.15	94.12	0.37	83.49	88.72	93.31	0.62	80.83	85.93	90.23	1.37	68.7	72.7	75.18	7.36
Stripe 3	83.58	88.79	93.93	0.2	83.37	88.6	93.35	0.5	81.82	86.94	91.51	0.92	71.51	75.72	78.78	5.89
Standard	83.57	88.76	94.18	-----	83.44	88.62	94.1	-----	83.59	88.78	94.18	-----	83.59	88.78	94.18	-----
Average	83.77	88.99	94.02	0.30	83.55	88.78	93.42	0.59	81.42	86.53	90.92	1.13	68.75	72.76	75.28	7.34
Product L	78.93	83.9	90.58	0.57	78.81	83.78	90.43	0.62	78.64	83.59	90.24	0.54	73.31	77.81	82.83	2.64
Stripe 2	78.68	83.64	90.38	0.45	78.49	83.45	90.18	0.46	78.62	83.58	90.18	0.56	70.07	74.33	78.71	4.25
Stripe 3	78.36	83.31	90.13	0.29	78.16	83.11	89.91	0.31	78.22	83.17	89.87	0.38	67.75	71.84	75.99	5.4
Standard	78	82.91	90.03	-----	77.8	82.71	89.84	-----	77.78	82.69	89.8	-----	78.18	83.1	90.11	-----
Average	78.66	83.62	90.36	0.44	78.49	83.45	90.17	0.46	78.49	83.45	90.10	0.49	70.38	74.66	79.18	4.10

Blocking Resistance

	Grouping	Pair 1	Pair 2	Pair 3
Group 1:	High Gloss Non-Flats			
Product A	H	10	10	10
Product B	H	2	2	2
Product C	L	9	9	9
Product D	L	3	3	3
Group 2:	Med. Gloss Non-Flats			
Product E	H	3	6	6
Product F	H	7	7	7
Product G	L	10	10	10
Product H	L			
Group 3:	Low Gloss Non-Flats			
Product I	H	9	9	9
Product J	H	9	9	9
Product K	L	9	9	9
Product L	L	10	10	10

Flow & Leveling and Sag

	Pub. VOC	Grouping	Flow/Level				Sag				
Group 1:	High Gloss Non-flats			1	2	3	Avg	1	2	3	Avg
Product A	242 g/L	> 50g/L	H	4	5	5	4.7	11	10	11	10.7
Product B	149 g/L	> 50g/L	H	6	6	6	6	7	7	7	7
Product C	47 g/L	≤ 50g/L	L	6	6	6	6	7	6	6	6.3
Product D	0 g/L	≤ 50g/L	L	6	6	6	6	7	7	7	7
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	5	5	5	5	12+	12+	12+	12+
Product F	144 g/L	> 50g/L	H	4	4	4	4	12+	12+	12+	12+
Product G	0 g/L	≤ 50g/L	L	5	5	5	5	10	10	10	10
Product H	0 g/L	≤ 50g/L	L	0	0	0	0	12+	12+	12+	12+
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	4	4	4	4	12+	12+	12+	12+
Product J	112 g/L	> 50g/L	H	5	4	5	4.7	9	9	9	9
Product K	<50 g/L	≤ 50g/L	L	4	4	4	4	12+	12+	12+	12+
Product L	49 g/L	≤ 50g/L	L	0	0	0	0	12+	12+	12+	12+

	Pub. VOC	Grouping		Gloss (5 readings per replicate) - QUV 0 Hours					
				20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Group 1:	High Gloss Non-flats								
Product A	242 g/L	> 50g/L	H	47.4	0.2	79.4	0.1	98	0.8
	Replicate 2			45.5	0.4	78.8	0.2	98.4	0.6
	Replicate 3			46.1	0.1	79.1	0.2	97.4	0.2
	Average			46.3	0.2	79.1	0.2	97.9	0.5
Product B	149 g/L	> 50g/L	H	34	0.2	69.2	0.2	96.6	0.4
	Replicate 2			34.4	0.2	69.4	0.1	96.4	0.2
	Replicate 3			34.8	0.2	69.5	0.2	95.5	0.8
	Average			34.4	0.2	69.4	0.2	96.2	0.5
Product C	47 g/L	≤ 50g/L	L	70.6	0.2	85.7	0.2	97.9	0.8
	Replicate 2			70.6	0.2	85.7	0.2	98.8	0.2
	Replicate 3			71.3	0.6	86.1	0.2	97.1	1
	Average			70.8	0.3	85.8	0.2	97.9	0.7
Product D	0 g/L	≤ 50g/L	L	21.3	0.6	58.5	0.2	89.3	0.2
	Replicate 2			21.5	0.8	58.6	0.4	89	1.2
	Replicate 3			21	0.8	58.3	0.6	89.3	0.4
	Average			21.3	0.7	58.5	0.4	89.2	0.6
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	18.6	0.2	58.1	0.2	87.8	0.8
	Replicate 2			18.8	0.2	58.3	0.2	87	0.4
	Replicate 3			17.6	0.6	57.3	0.1	85.6	0.6
	Average			18.3	0.3	57.9	0.2	86.8	0.6
Product F	144 g/L	> 50g/L	H	19.6	0.2	58.7	0.2	92	1
	Replicate 2			19.6	0.6	60.4	0.6	92.6	1.4
	Replicate 3			20.1	0.4	58.9	0.2	93.8	1.2
	Average			19.8	0.4	59.3	0.3	92.8	1.2
Product G	0 g/L	≤ 50g/L	L	3.6	0.1	25.3	0.1	53.8	0.2
	Replicate 2			3.5	0.1	24.7	0.2	53.7	0.4
	Replicate 3			3.4	0.1	24.7	0.2	53.2	0.4
	Average			3.5	0.1	24.9	0.2	53.6	0.3
Product H	0 g/L	≤ 50g/L	L	4.4	0.1	30.7	0.1	81.8	0.6
	Replicate 2			4.6	0.1	31.5	0.2	82.7	0.8
	Replicate 3			4.4	0.1	30.6	0.2	80.8	1.6
	Average			4.5	0.1	30.9	0.2	81.8	1.0
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	3.9	0.1	28.1	0.2	73.4	0.2
	Replicate 2			3.7	0.1	27.1	0.1	73.8	0.6
	Replicate 3			3.9	0.1	27.6	0.2	72.9	1
	Average			3.8	0.1	27.6	0.2	73.4	0.6
Product J	112 g/L	> 50g/L	H	1.4	0.1	5.6	0.1	27.8	0.4
	Replicate 2			1.4	0.1	5.6	0.1	28.3	0.2
	Replicate 3			1.4	0.1	5.4	0.2	27	0.2
	Average			1.4	0.1	5.5	0.1	27.7	0.3
Product K	<50 g/L	≤ 50g/L	L	1.5	0.1	5.7	0.1	28.1	0.4
	Replicate 2			1.5	0.1	5.7	0.1	27.9	0.6
	Replicate 3			1.5	0.1	5.7	0.1	28.1	0.6
	Average			1.5	0.1	5.7	0.1	28.0	0.5
Product L	49 g/L	≤ 50g/L	L	1.4	0.1	4.6	0.1	14.3	0.2
	Replicate 2			1.4	0.1	4.6	0.1	14.1	0.2
	Replicate 3			1.3	0.1	4.4	0.1	13.3	0.2
	Average			1.4	0.1	4.5	0.1	13.9	0.2

QUV – Gloss – 200 Hours

		Pub. VOC	Grouping		Gloss (5 readings per replicate) - QUV 200 Hours					
Group 1:	High Gloss Non-flats			20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.	
Product A	242 g/L	> 50g/L	H	37.5	0.6	77.4	0.2	97.4	0.4	
	Replicate 2			32.6	1.4	73.2	1.4	94.1	1.0	
	Replicate 3			33.3	0.6	75.7	0.6	95.9	0.8	
	Average			34.5	0.9	75.4	0.7	95.8	0.7	
Product B	149 g/L	> 50g/L	H	10.6	0.4	50.2	0.4	93.2	0.4	
	Replicate 2			9.2	0.4	47.9	0.8	91.5	0.6	
	Replicate 3			9.1	0.2	47.6	0.2	91.8	0.4	
	Average			9.6	0.3	48.6	0.5	92.2	0.5	
Product C	47 g/L	≤ 50g/L	L	38.8	0.6	79.1	0.6	97.2	0.2	
	Replicate 2			40.8	0.8	79.8	0.2	97.8	0.8	
	Replicate 3			42.2	0.4	79.5	0.4	98.0	0.4	
	Average			40.6	0.6	79.5	0.4	97.7	0.5	
Product D	0 g/L	≤ 50g/L	L	15.8	0.4	53.8	0.4	88.1	0.6	
	Replicate 2			16.0	0.6	54.5	0.6	88.8	0.8	
	Replicate 3			13.1	0.6	50.5	0.6	87.1	0.8	
	Average			15.0	0.5	52.9	0.5	88.0	0.7	
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----	
Product E	150 g/L	> 50g/L	H	5.3	0.1	33.3	0.2	80.7	0.4	
	Replicate 2			4.0	0.2	28.0	0.4	75.3	0.6	
	Replicate 3			3.8	0.1	26.5	0.2	74.1	0.2	
	Average			4.4	0.1	29.3	0.3	76.7	0.4	
Product F	144 g/L	> 50g/L	H	9.1	0.2	47.8	0.2	91.0	0.4	
	Replicate 2			11.0	0.2	50.4	0.2	93.0	1.0	
	Replicate 3			9.8	0.2	48.0	0.2	91.7	0.2	
	Average			10.0	0.2	48.7	0.2	91.9	0.5	
Product G	0 g/L	≤ 50g/L	L	1.8	0.1	18.4	0.2	58.7	0.2	
	Replicate 2			1.8	0.1	17.8	0.4	58.2	0.2	
	Replicate 3			2.0	0.1	19.5	0.1	58.0	0.8	
	Average			1.9	0.1	18.6	0.2	58.3	0.4	
Product H	0 g/L	≤ 50g/L	L	3.5	0.1	25.8	0.2	75.7	0.2	
	Replicate 2			3.6	0.1	26.8	0.6	76.6	0.6	
	Replicate 3			3.3	0.2	25.0	0.6	75.7	0.6	
	Average			3.5	0.1	25.9	0.5	76.0	0.5	
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----	
Product I	150 g/L	> 50g/L	H	3.8	0.1	29.1	0.2	73.1	0.6	
	Replicate 2			3.8	0.1	29.9	0.2	74.5	0.6	
	Replicate 3			3.9	0.1	29.4	0.2	74.2	0.6	
	Average			3.8	0.1	29.5	0.2	73.9	0.6	
Product J	112 g/L	> 50g/L	H	1.3	0.1	4.3	0.1	22.3	0.2	
	Replicate 2			1.3	0.1	4.3	0.1	22.3	0.2	
	Replicate 3			1.3	0.1	4.2	0.1	21.4	0.2	
	Average			1.3	0.1	4.3	0.1	22.0	0.2	
Product K	<50 g/L	≤ 50g/L	L	1.4	0.1	3.7	0.1	23.0	0.2	
	Replicate 2			1.3	0.1	3.8	0.1	22.6	0.2	
	Replicate 3			1.4	0.1	3.6	0.1	22.5	0.2	
	Average			1.4	0.1	3.7	0.1	22.7	0.2	
Product L	49 g/L	≤ 50g/L	L	1.5	0.1	6.2	0.1	23.0	0.2	
	Replicate 2			1.5	0.1	6.3	0.2	22.7	0.6	
	Replicate 3			1.4	0.1	5.6	0.2	17.4	0.2	
	Average			1.5	0.1	6.0	0.2	21.0	0.3	

QUV – Gloss – 400 Hours

	Pub. VOC	Grouping		Gloss (5 readings per replicate) - QUV 400 Hours					
Group 1:	High Gloss Non-flats			20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Product A	242 g/L	> 50g/L	H	36.3	0.4	74.5	0.4	100.8	0.6
	Replicate 2			34.3	0.6	73.9	0.4	100.2	0.4
	Replicate 3			34.7	0.2	74.3	0.2	98.8	0.6
	Average			35.1	0.4	74.2	0.3	99.9	0.5
Product B	149 g/L	> 50g/L	H	10.0	0.6	47.2	1.0	93.9	0.6
	Replicate 2			10.7	0.8	47.7	1.2	94.6	0.4
	Replicate 3			9.1	0.2	45.4	0.6	93.7	1.0
	Average			9.9	0.5	46.8	0.9	94.1	0.7
Product C	47 g/L	≤ 50g/L	L	35.6	0.4	78.1	0.6	99.7	1.6
	Replicate 2			39.3	2.2	79.2	0.8	99.4	0.6
	Replicate 3			41.9	2.0	80.4	0.6	97.1	2.4
	Average			38.9	1.5	79.2	0.7	98.7	1.5
Product D	0 g/L	≤ 50g/L	L	16.3	0.8	54.8	0.4	90.5	1.2
	Replicate 2			16.5	0.6	55.5	0.4	90.6	0.4
	Replicate 3			13.2	0.6	51.0	0.6	87.2	0.4
	Average			15.3	0.7	53.8	0.5	89.4	0.7
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	3.9	0.1	28.5	0.2	79.7	0.8
	Replicate 2			3.6	0.2	27.3	0.4	77.4	0.2
	Replicate 3			3.6	0.1	26.9	0.2	77.1	1.6
	Average			3.7	0.1	27.6	0.3	78.1	0.9
Product F	144 g/L	> 50g/L	H	9.5	0.2	47.6	0.2	89.6	1.0
	Replicate 2			9.4	0.2	47.9	0.4	92.8	1.4
	Replicate 3			9.6	0.2	47.5	0.4	92.7	1.0
	Average			9.5	0.2	47.7	0.3	91.7	1.1
Product G	0 g/L	≤ 50g/L	L	1.5	0.1	14.2	0.2	58.5	0.6
	Replicate 2			1.5	0.1	14.3	0.4	59.2	0.4
	Replicate 3			1.6	0.1	15.1	0.2	58.4	0.6
	Average			1.5	0.1	14.5	0.3	58.7	0.5
Product H	0 g/L	≤ 50g/L	L	3.4	0.1	26.4	0.4	80.6	0.8
	Replicate 2			3.3	0.1	26.2	0.6	81.5	1.0
	Replicate 3			3.2	0.2	25.6	0.6	79.8	0.8
	Average			3.3	0.1	26.1	0.5	80.6	0.9
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	3.7	0.1	29.0	0.2	76.0	0.6
	Replicate 2			3.6	0.1	29.1	0.2	77.3	0.4
	Replicate 3			3.6	0.1	28.8	0.1	75.5	1.4
	Average			3.6	0.1	29.0	0.2	76.3	0.8
Product J	112 g/L	> 50g/L	H	1.3	0.1	3.7	0.1	22.3	0.2
	Replicate 2			1.2	0.1	1.2	0.1	23.8	0.1
	Replicate 3			1.2	0.1	3.7	0.1	21.3	0.2
	Average			1.2	0.1	2.9	0.1	22.5	0.2
Product K	<50 g/L	≤ 50g/L	L	1.3	0.1	3.2	0.1	23.4	0.2
	Replicate 2			1.3	0.1	3.3	0.1	23.4	0.6
	Replicate 3			1.3	0.1	3.2	0.1	23.1	0.4
	Average			1.3	0.1	3.2	0.1	23.3	0.4
Product L	49 g/L	≤ 50g/L	L	1.5	0.1	6.3	0.1	28.5	1.0
	Replicate 2			1.6	0.1	8.4	0.2	31.8	1.2

Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Replicate 6	Replicate 7
Average	1.5	0.1	6.9	0.2	27.6	1.0

QUV – Gloss – 600 Hours

	Pub. VOC	Grouping		Gloss (5 readings per replicate) - QUV 600 Hours					
Group 1:	High Gloss Non-flats			20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Product A	242 g/L	> 50g/L	H	29.2	0.2	71.9	0.4	99.2	0.2
	Replicate 2			26.0	0.4	69.6	0.2	96.7	0.2
	Replicate 3			26.9	0.6	70.9	0.6	97.1	0.4
	Average			27.4	0.4	70.8	0.4	97.7	0.3
Product B	149 g/L	> 50g/L	H	8.5	0.8	46.8	1.0	93.4	0.2
	Replicate 2			7.5	0.4	44.8	0.8	94.4	0.2
	Replicate 3			6.7	0.2	42.5	0.4	93.6	0.2
	Average			7.6	0.5	44.7	0.7	93.8	0.2
Product C	47 g/L	≤ 50g/L	L	28.1	0.2	75.8	0.4	99.3	0.4
	Replicate 2			30.6	1.6	76.0	1.0	98.9	0.8
	Replicate 3			33.7	1.0	77.0	0.6	99.5	0.4
	Average			30.8	0.9	76.3	0.7	99.2	0.5
Product D	0 g/L	≤ 50g/L	L	13.8	0.2	52.9	0.2	90.2	0.4
	Replicate 2			15.5	1.0	54.8	1.2	90.6	0.4
	Replicate 3			13.3	0.6	51.2	0.8	89.0	0.2
	Average			14.2	0.6	53.0	0.7	89.9	0.3
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	3.7	0.1	28.1	0.2	80.1	0.4
	Replicate 2			3.3	0.1	25.9	0.2	76.4	0.6
	Replicate 3			3.0	0.2	23.5	0.4	76.0	0.8
	Average			3.3	0.1	25.8	0.3	77.5	0.6
Product F	144 g/L	> 50g/L	H	7.2	0.1	44.5	0.2	93.6	0.4
	Replicate 2			7.4	0.4	43.8	0.6	94.7	0.8
	Replicate 3			7.6	0.2	44.9	0.2	91.7	0.4
	Average			7.4	0.2	44.4	0.3	93.3	0.5
Product G	0 g/L	≤ 50g/L	L	1.4	0.1	12.4	0.2	58.7	1.0
	Replicate 2			1.4	0.1	12.1	0.2	56.3	0.8
	Replicate 3			1.4	0.1	12.9	0.2	56.7	0.8
	Average			1.4	0.1	12.5	0.2	57.2	0.9
Product H	0 g/L	≤ 50g/L	L	2.8	0.1	22.7	0.4	77.3	0.4
	Replicate 2			2.8	0.2	22.5	0.2	76.5	0.6
	Replicate 3			2.8	0.1	22.2	0.4	76.5	1.0
	Average			2.8	0.1	22.5	0.3	76.8	0.7
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	3.0	0.2	25.4	0.6	75.1	0.2
	Replicate 2			3.1	0.1	26.2	0.2	76.9	0.4
	Replicate 3			3.1	0.1	25.8	0.2	74.9	0.4
	Average			3.1	0.1	25.8	0.3	75.6	0.3
Product J	112 g/L	> 50g/L	H	1.2	0.1	3.0	0.1	18.7	0.2
	Replicate 2			1.2	0.1	3.1	0.1	18.0	0.2
	Replicate 3			1.2	0.1	2.9	0.1	17.0	0.2
	Average			1.2	0.1	3.0	0.1	17.9	0.2
Product K	<50 g/L	≤ 50g/L	L	1.3	0.1	2.9	0.1	22.1	0.1
	Replicate 2			1.3	0.1	2.8	0.1	21.3	0.2
	Replicate 3			1.3	0.1	2.9	0.1	21.5	0.8
	Average			1.3	0.1	2.9	0.1	21.6	0.4

Product L	75 g/L	≤ 50g/L	L	1.4	0.1	5.3	0.1	29.0	0.7
Replicate 2				1.4	0.1	5.5	0.1	29.1	1.0
Replicate 3				1.3	0.1	5.2	0.1	25.0	1.2
Average				1.4	0.1	5.3	0.1	27.7	0.9

QUV – Gloss – 800 Hours

		Pub. VOC	Grouping	Gloss (5 readings per replicate) - QUV 800 Hours					
Group 1:	High Gloss Non-flats			20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Product A	242 g/L	> 50g/L	H	23.5	1.2	66.7	1.8	92.4	1.0
Replicate 2				21.0	1.4	63.9	1.4	91.0	1.0
Replicate 3				22.2	1.8	65.2	2.4	91.4	0.6
Average				22.2	1.5	65.3	1.9	91.6	0.9
Product B	149 g/L	> 50g/L	H	7.6	1.0	44.7	1.6	89.4	0.6
Replicate 2				8.2	0.6	45.6	1.2	89.7	0.2
Replicate 3				6.1	0.2	40.1	1.0	88.2	0.6
Average				7.3	0.6	43.5	1.3	89.1	0.5
Product C	47 g/L	≤ 50g/L	L	26.7	1.8	72.8	0.8	96.4	0.2
Replicate 2				28.6	2.2	74.5	1.2	93.7	1.8
Replicate 3				31.4	1.6	75.6	1.0	95.9	0.6
Average				28.9	1.9	74.3	1.0	95.3	0.9
Product D	0 g/L	≤ 50g/L	L	12.2	0.4	51.0	0.4	85.2	1.0
Replicate 2				13.1	0.2	51.8	0.6	86.9	0.4
Replicate 3				11.6	0.4	49.4	1.0	85.0	0.6
Average				12.3	0.3	50.7	0.7	85.7	0.7
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	3.6	0.2	28.4	0.4	76.9	0.4
Replicate 2				3.1	0.2	25.5	0.4	73.7	0.6
Replicate 3				3.2	0.1	25.3	0.2	72.8	0.6
Average				3.3	0.2	26.4	0.3	74.5	0.5
Product F	144 g/L	> 50g/L	H	6.1	0.4	40.0	0.6	87.9	0.8
Replicate 2				6.0	0.4	40.4	1.0	88.3	1.4
Replicate 3				6.6	0.4	41.8	0.6	85.8	1.0
Average				6.2	0.4	40.7	0.7	87.3	1.1
Product G	0 g/L	≤ 50g/L	L	1.4	0.1	11.1	0.2	56.3	0.6
Replicate 2				1.4	0.1	10.9	0.4	55.0	0.2
Replicate 3				1.3	0.1	11.5	0.2	55.2	1.2
Average				1.4	0.1	11.2	0.3	55.5	0.7
Product H	0 g/L	≤ 50g/L	L	2.6	0.1	21.7	0.8	73.3	0.4
Replicate 2				2.6	0.2	21.4	0.8	73.8	1.0
Replicate 3				2.5	0.2	21.2	1.0	73.8	0.8
Average				2.6	0.2	21.4	0.9	73.6	0.7
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	2.7	0.2	23.6	0.6	73.0	0.2
Replicate 2				2.7	0.1	24.1	0.4	74.5	0.4
Replicate 3				2.8	0.1	24.8	0.2	73.0	0.6
Average				2.7	0.1	24.2	0.4	73.5	0.4
Product J	112 g/L	> 50g/L	H	1.2	0.1	2.8	0.1	15.8	0.2
Replicate 2				1.2	0.1	2.8	0.1	16.2	0.2
Replicate 3				1.2	0.1	2.9	0.1	15.9	0.2
Average				1.2	0.1	2.8	0.1	16.0	0.2
Product K	<50 g/L	≤ 50g/L	L	1.2	0.1	2.7	0.1	20.8	0.2
Replicate 2				1.2	0.1	2.7	0.1	20.2	0.2
Replicate 3				1.3	0.1	2.8	0.1	20.5	0.6
Average				1.2	0.1	2.7	0.1	20.5	0.3
Product L	49 g/L	≤ 50g/L	L	1.3	0.1	5.6	0.2	30.2	0.6

Replicate #
Replicate 3	1.3	0.1	5.5	0.2	26.3	1.2
Average	1.3	0.1	5.8	0.2	29.1	1.0

	Pub. VOC	Grouping		Gloss (5 readings per replicate) - QUV 1000 Hours					
				20° Mean	20° Std. Dev.	60° Mean	60° Std. Dev.	85° Mean	85° Std. Dev.
Group 1:	High Gloss Non-flats								
Product A	242 g/L	> 50g/L	H	13.5	4.0	52.1	6.6	91.8	1.4
	Replicate 2			10.1	3.4	47.9	5.2	91.0	0.8
	Replicate 3			12.1	4.4	52.1	8.2	91.1	1.0
	Average			11.9	3.9	50.7	6.7	91.3	1.1
Product B	149 g/L	> 50g/L	H	6.2	0.4	41.1	1.0	88.7	0.2
	Replicate 2			7.1	1.4	43.0	3.2	88.5	0.6
	Replicate 3			5.4	0.2	37.6	0.2	88.0	0.6
	Average			6.2	0.7	40.6	1.5	88.4	0.5
Product C	47 g/L	≤ 50g/L	L	20.2	1.0	68.8	1.2	96.3	0.4
	Replicate 2			19.5	1.6	67.9	1.6	94.8	1.0
	Replicate 3			22.3	1.2	69.3	1.0	96.0	0.4
	Average			20.7	1.3	68.7	1.3	95.7	0.6
Product D	0 g/L	≤ 50g/L	L	12.0	0.4	51.6	0.8	85.7	0.6
	Replicate 2			12.3	0.4	51.8	0.8	86.3	0.6
	Replicate 3			10.9	0.4	48.8	0.4	84.9	0.6
	Average			11.7	0.4	50.7	0.7	85.6	0.6
Group 2:	Med. Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product E	150 g/L	> 50g/L	H	2.9	0.2	24.4	0.6	75.6	0.4
	Replicate 2			2.8	0.1	23.3	0.4	73.0	0.4
	Replicate 3			2.5	0.1	20.7	0.2	71.6	0.2
	Average			2.7	0.1	22.8	0.4	73.4	0.3
Product F	144 g/L	> 50g/L	H	3.0	0.2	29.1	1.2	86.3	0.4
	Replicate 2			3.8	0.2	32.0	0.8	87.4	1.2
	Replicate 3			3.7	0.4	33.7	2.2	87.2	0.4
	Average			3.5	0.3	31.6	1.4	87.0	0.7
Product G	0 g/L	≤ 50g/L	L	1.4	0.1	10.0	0.2	56.4	0.4
	Replicate 2			1.3	0.1	10.0	0.4	54.8	0.4
	Replicate 3			1.4	0.1	10.2	0.2	55.0	0.8
	Average			1.4	0.1	10.1	0.3	55.4	0.5
Product H	0 g/L	≤ 50g/L	L	2.2	0.2	18.7	1.0	71.7	0.8
	Replicate 2			2.2	0.1	18.4	1.0	72.6	0.6
	Replicate 3			2.1	0.2	17.5	1.2	72.8	0.8
	Average			2.2	0.2	18.2	1.1	72.4	0.7
Group 3:	Low Gloss Non-flats			-----	-----	-----	-----	-----	-----
Product I	150 g/L	> 50g/L	H	2.2	0.2	19.2	0.8	71.7	0.4
	Replicate 2			2.2	0.1	19.8	0.4	74.0	0.6
	Replicate 3			2.3	0.1	20.6	0.6	73.1	0.6
	Average			2.2	0.1	19.9	0.6	72.9	0.5
Product J	112 g/L	> 50g/L	H	1.2	0.1	2.5	0.1	15.0	0.4
	Replicate 2			1.2	0.1	2.6	0.1	15.2	0.2
	Replicate 3			1.2	0.1	2.6	0.1	15.1	0.2
	Average			1.2	0.1	2.6	0.1	15.1	0.3
Product K	<50 g/L	≤ 50g/L	L	1.3	0.1	2.6	0.1	20.2	0.2
	Replicate 2			1.3	0.1	2.6	0.1	19.8	0.2
	Replicate 3			1.3	0.1	2.7	0.1	20.2	0.8
	Average			1.3	0.1	2.6	0.1	20.1	0.4
Product L	49 g/L	≤ 50g/L	L	1.3	0.1	4.9	0.4	29.3	0.4
	Replicate 2			1.4	0.1	5.4	0.2	29.8	0.2
	Replicate 3			1.3	0.1	4.5	0.2	25.3	0.2
	Average			1.3	0.1	4.9	0.3	28.1	0.3

QUV – Color

	0 Hours			200 Hours				400 Hours				600 Hours				800 Hours			
Group 1:	X	Y	Z	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE	X	Y	Z	ΔE
Product A	79.22	84.35	91.11	78.54	83.6	91.09	0.64	78.95	84.04	91.4	0.45	78.77	83.9	91.17	0.42	79.83	85.05	91.47	0.42
Replicate 2	77.36	82.39	89.5	78.62	83.69	91.16	0.6	78.98	84.08	91.41	0.74	78.7	83.83	91.03	0.63	78.82	84	90.91	0.72
Replicate 3	77.24	82.28	89.88	77.34	82.37	90.25	0.2	77.48	82.53	90.41	0.21	77.47	82.55	90.18	0.14	77.62	82.74	90.11	0.21
Average	77.94	83.01	90.16	78.17	83.22	90.83	0.48	78.47	83.55	91.07	0.467	78.313	83.43	90.79	0.40	78.76	83.93	90.83	0.42
Product B	80.47	85.46	91.93	81.48	86.53	93.38	0.5	81.7	86.74	93.74	0.62	81.43	86.47	93.43	0.51	81.61	86.66	93.58	0.51
Replicate 2	80.76	85.76	92.11	81.91	86.97	93.63	0.54	81.84	86.88	93.73	0.56	81.96	87.01	93.76	0.57	82.41	87.5	94.25	0.72
Replicate 3	80.1	85.04	91.02	82.15	87.19	93.76	0.97	82.87	87.92	94.58	1.27	82.34	87.41	94.04	1.06	82.95	88.04	94.6	1.11
Average	80.44	85.42	91.69	81.85	86.90	93.59	0.67	82.14	87.18	94.02	0.82	81.91	86.96	93.74	0.71	82.32	87.4	94.14	0.82
Product C	77.53	82.44	85.31	78.18	83.18	85.84	0.39	78.46	83.47	86.19	0.49	78.79	83.84	86.7	0.63	79.1	84.16	86.91	0.72
Replicate 2	77.89	82.84	86.07	78.11	83.11	85.84	0.39	78.24	83.25	86.17	0.31	78.64	83.68	86.58	0.46	78.7	83.77	86.68	0.42
Replicate 3	79.71	84.65	86.56	79.75	84.69	86.13	0.34	79.93	84.88	86.32	0.36	80.32	85.29	86.63	0.51	80.7	85.69	86.82	0.72
Average	78.38	83.31	85.98	78.68	83.66	85.94	0.37	78.88	83.87	86.23	0.39	79.25	84.27	86.64	0.533	79.5	84.54	86.8	0.62
Product D	80.77	85.85	91.7	82.71	87.85	93.62	0.87	81.13	86.2	92.81	0.54	81.82	86.91	92.72	0.47	80.27	85.33	92.22	0.72
Replicate 2	81.39	86.5	92.1	80.64	85.7	92.22	0.76	81.88	86.98	93.26	0.5	82.5	87.64	93.64	0.54	80.93	86.02	92.73	0.82
Replicate 3	81.35	86.46	92.08	80.94	86.02	92.53	0.66	80.49	85.52	92.31	0.94	79.7	84.72	91.53	1.17	80.44	85.5	92.43	1.02
Average	81.17	86.27	91.96	81.43	86.52	92.79	0.76	81.17	86.23	92.79	0.66	81.34	86.42	92.63	0.73	80.55	85.62	92.46	0.82
Group 2:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product E	79.9	84.76	89.1	80.7	85.59	90.4	0.46	80.89	85.81	90.64	0.54	80.67	85.6	90.3	0.42	80.42	85.35	90.18	0.42
Replicate 2	80.56	85.42	89.43	81.39	86.29	90.77	0.47	81.63	86.54	90.54	0.57	81.35	86.29	90.69	0.44	80.82	85.77	90.44	0.42
Replicate 3	78.89	83.74	88.71	80.09	84.98	90.23	0.56	79.89	84.8	90.21	0.53	79.76	84.69	89.94	0.44	79.72	84.65	89.93	0.42
Average	79.78	84.64	89.08	80.73	85.62	90.47	0.50	80.8	85.72	89.13	0.55	80.59	85.53	90.31	0.433	80.32	85.26	90.18	0.42
Product F	79.58	84.56	89.79	78.83	83.79	89.63	0.58	79.56	84.54	90.2	0.3	79.02	83.99	89.71	0.45	79.77	84.78	90.18	0.12
Replicate 2	81.73	86.72	90.59	81.72	86.73	90.95	0.24	81.71	86.72	91.12	0.37	81.82	86.85	91.07	0.25	81.85	86.9	91.12	0.22
Replicate 3	79.77	84.76	89.88	79.47	84.43	89.61	0.16	80.15	85.16	90.57	0.26	80.18	85.21	90.43	0.2	79.88	84.9	90.21	0.12
Average	80.36	85.35	90.09	80.01	84.98	90.06	0.33	80.47	85.47	90.63	0.31	80.34	85.35	90.40	0.3	80.5	85.53	90.5	0.12
Product G	82.6	87.81	93.14	82.91	88.11	92.45	0.71	82.97	88.2	92.29	0.88	82.78	88.00	91.77	1.08	83.38	88.61	91.78	1.52
Replicate 2	81.72	86.9	92.66	81.81	86.99	91.9	0.59	82.09	87.29	91.83	0.87	81.76	86.96	91.3	0.98	81.59	86.77	91.08	1.02
Replicate 3	81.75	86.93	92.62	81.67	86.85	91.91	0.43	81.59	86.78	91.52	0.65	80.86	86.02	90.78	0.72	81.25	86.43	90.82	0.92
Average	82.02	87.21	92.81	82.13	87.32	92.09	0.58	82.22	87.42	91.88	0.8	81.8	86.99	91.28	0.93	82.07	87.27	91.23	1.12
Product H	79.37	84.3	90.29	79.39	84.33	90.22	0.08	80.05	85.00	90.8	0.35	79.41	84.36	90.4	0.06	79.32	84.26	90.19	0.02
Replicate 2	81.56	86.52	91.45	81.6	86.59	91.42	0.07	81.87	86.85	91.81	0.14	81.9	86.91	91.87	0.17	82.3	87.31	92.1	0.32
Replicate 3	79.58	84.51	90.39	78.71	83.63	89.8	0.46	79.2	84.14	90.3	0.27	80.28	85.25	90.96	0.35	79.58	84.54	90.62	0.12
Average	80.17	85.11	90.71	79.9	84.85	90.48	0.20	80.37	85.33	90.97	0.25	80.53	85.51	91.08	0.19	80.4	85.37	90.97	0.12
Group 3:	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Product I	83.1	88.19	94.18	83.08	88.14	94.23	0.08	83.03	88.08	94.31	0.19	83.5	88.59	94.69	0.18	83.55	88.66	94.72	0.22
Replicate 2	81.92	86.97	93.44	81.56	86.59	93.22	0.21	81.65	86.66	93.37	0.22	81.65	86.69	93.38	0.2	81.77	86.81	93.47	0.12

Replicate 3	83.15	88.23	94.14	81.84	86.87	93.37	0.74	82.43	87.49	93.91	0.5	82.57	87.64	94.02	0.42	83.12	88.22	94.43	0.2
Average	82.72	87.8	93.92	82.16	87.2	93.61	0.34	82.37	87.41	93.86	0.30	82.57	87.64	94.03	0.267	82.81	87.9	94.21	0.11
Product J	78.62	83.54	87.46	77.8	82.67	87.03	0.52	77.74	82.61	87.14	0.63	77.07	81.94	86.49	0.88	76.58	81.44	85.93	1.0
Replicate 2	78.5	83.42	87.39	77.75	82.62	87.05	0.5	77.45	82.31	86.87	0.67	76.9	81.76	86.3	0.88	76.71	81.57	86.02	0.9
Replicate 3	78.09	83	87.2	76.08	80.86	85.38	1.00	76.93	81.78	86.61	0.74	75.99	80.82	85.78	1.16	75.62	80.45	85.37	1.0
Average	78.4	83.32	87.35	77.21	82.05	86.49	0.67	77.37	82.23	86.87	0.68	76.65	81.51	86.19	0.97	76.3	81.15	85.77	1.0
Product K	82.12	87.23	93.19	81.51	86.57	92.38	0.29	81.64	86.7	92.67	0.24	81.96	87.05	92.87	0.12	81.63	86.71	92.67	0.2
Replicate 2	82.09	87.2	93.16	81.7	86.78	92.43	0.27	81.58	86.64	92.52	0.24	81.65	86.74	92.53	0.22	81.46	86.54	92.47	0.2
Replicate 3	83.84	89.00	94.17	83.65	88.78	93.53	0.29	83.6	88.73	93.69	0.17	83.67	88.81	93.71	0.19	83.64	88.78	93.69	0.1
Average	82.68	87.81	93.51	82.29	87.38	92.78	0.28	82.27	87.36	92.96	0.22	82.43	87.53	93.04	0.18	82.24	87.34	92.94	0.2
Product L	78.18	83.01	89.73	78.05	82.82	88.88	0.47	77.4	82.16	88.3	0.52	77.74	82.53	88.36	0.64	78.32	83.14	88.81	0.7
Replicate 2	78.14	82.97	89.68	77.34	82.08	88.27	0.51	77.8	82.56	88.72	0.42	77.59	82.37	88.28	0.59	78.23	83.03	88.82	0.6
Replicate 3	75.57	80.27	87.36	75.84	80.51	87.13	0.38	75.41	80.06	86.69	0.34	75.27	79.93	86.35	0.48	75.63	80.32	86.65	0.5
Average	77.3	82.08	88.92	77.08	81.80	88.09	0.45	76.87	81.59	87.90	0.43	76.87	81.61	87.66	0.57	77.39	82.16	88.09	0.6

Continued...	1000 Hours			
Group 1:	X	Y	Z	ΔE
Product A	79.52	84.74	91.31	0.27
Replicate 2	79.6	84.81	91.35	1.19
Replicate 3	78.33	83.49	90.57	0.7
Average	79.15	84.35	91.077	0.72
Product B	81.47	86.52	93.4	0.51
Replicate 2	81.86	86.9	93.59	0.52
Replicate 3	82.51	87.58	94.13	1.11
Average	81.95	87	93.707	0.7133
Product C	79.24	84.33	87.09	0.85
Replicate 2	78.73	83.82	86.68	0.55
Replicate 3	80.55	85.59	86.86	0.64
Average	79.51	84.58	86.877	0.68
Product D	80.47	85.55	92.42	0.73
Replicate 2	80.61	85.7	92.58	0.99
Replicate 3	80.99	86.09	92.89	0.84
Average	80.69	85.78	92.63	0.8533
Group 2:	-----	-----	-----	-----
Product E	80.43	85.37	90.17	0.4
Replicate 2	81.14	86.09	90.48	0.39
Replicate 3	79.52	84.45	89.62	0.33
Average	80.36	85.3	90.09	0.3733
Product F	79.86	84.88	90.17	0.15

Replicate 2	82.61	87.65	91.29	0.44
Replicate 3	79.99	85.02	90.25	0.14
Average	80.82	85.85	90.57	0.2433
Product G	82.64	87.85	91.31	1.29
Replicate 2	81.29	86.47	90.65	1.09
Replicate 3	81.24	86.41	90.54	1.08
Average	81.72	86.91	90.833	1.1533
Product H	80.17	85.15	90.91	0.42
Replicate 2	81.71	86.72	91.81	0.15
Replicate 3	80.14	85.12	90.95	0.27
Average	80.67	85.66	91.223	0.28
Group 3:	-----	-----	-----	-----
Product I	83.24	88.33	94.48	0.11
Replicate 2	81.86	86.91	93.49	0.08
Replicate 3	82.96	88.05	94.32	0.26
Average	82.69	87.76	94.097	0.15
Product J	76.42	81.27	85.77	1.13
Replicate 2	76.4	81.25	85.71	1.06
Replicate 3	75.65	80.47	85.25	1.24
Average	76.16	81	85.577	1.1433
Product K	81.5	86.57	92.52	0.28
Replicate 2	81.69	86.77	92.56	0.21
Replicate 3	83.57	88.7	93.65	0.19
Average	82.25	87.35	92.91	0.2267
Product L	77.67	82.47	87.93	0.89
Replicate 2	77.5	82.28	87.91	0.79
Replicate 3	75.41	80.1	86.06	0.8
Average	76.86	81.62	87.3	0.8267

Surface Tension

	Pub. VOC	Grouping		Surface Tension											
Group 1:	High Gloss Non-flats			Time	Temp	P	D(lb/gal)	D(g/m ³)	M(g)	V(g/m ³)	V (g/cm ³)	(R ³)/V	F	S	Avg S
Product A	242 g/L	> 50g/L	H	13:24	25	9.4	9.92	1188678.16	0.12	136928.41	0.14	6.16	0.81	7.661	7.72
Replicate 2				14:25	25	9	9.92	1188678.16	0.11	131101.67	0.13	6.43	0.81	7.309	
Replicate 3				14:16	25	10	9.92	1188678.16	0.12	145668.52	0.15	5.79	0.82	8.191	
Product B	149 g/L	> 50g/L	H	12:20	25	11	10.45	1252186.17	0.13	168796.51	0.17	4.99	0.83	9.117	8.67
Replicate 2				12:14	25	10.5	10.45	1252186.17	0.13	161123.94	0.16	5.23	0.83	8.67	
Replicate 3				12:28	25	10	10.45	1252186.17	0.12	153451.37	0.15	5.49	0.82	8.225	
Product C	47 g/L	≤ 50g/L	L	11:42	25	10	10.54	1262970.54	0.12	154772.98	0.15	5.45	0.82	8.231	8.38
Replicate 2				11:54	25	10	10.54	1262970.54	0.12	154772.98	0.15	5.45	0.82	8.231	
Replicate 3				12:28	25	10.5	10.54	1262970.54	0.13	162511.63	0.16	5.19	0.83	8.676	
Product D	0 g/L	≤ 50g/L	L	13:52	25	14	10.12	1212643.44	0.17	208047.63	0.21	4.05	0.84	11.8	16.92
Replicate 2				12:56	25	24	10.12	1212643.44	0.29	356653.07	0.36	2.36	0.88	21.08	
Replicate 3				12:50	25	20.6	10.12	1212643.44	0.25	306127.22	0.31	2.75	0.87	17.88	
Group 2:	Med. Gloss Non-flats														
Product E	150 g/L	> 50g/L	H	11:53	25	10.5	10.41	1247393.11	0.13	160507.18	0.16	5.25	0.83	8.668	10.47
Replicate 2				13:47	25	14	10.41	1247393.11	0.17	214009.58	0.21	3.94	0.84	11.82	
Replicate 3				13:49	25	13	10.41	1247393.11	0.16	198723.18	0.20	4.24	0.84	10.91	
Product F	144 g/L	> 50g/L	H	12:09	25	22.5	10.4	1246194.84	0.28	343613.56	0.34	2.45	0.88	19.71	13.85
Replicate 2				14:04	25	14	10.4	1246194.84	0.17	213803.99	0.21	3.94	0.84	11.82	
Replicate 3				13:46	25	12	10.4	1246194.84	0.15	183260.57	0.18	4.60	0.83	10.01	
Product G	0 g/L	≤ 50g/L	L	13:11	25	18	11.12	1332469.87	0.22	293922.10	0.29	2.87	0.87	15.58	16.06
Replicate 2				13:05	25	22	11.12	1332469.87	0.27	359238.13	0.36	2.35	0.88	19.33	
Replicate 3				13:36	25	15.5	11.12	1332469.87	0.19	253099.59	0.25	3.33	0.86	13.26	
Product H	0 g/L	≤ 50g/L	L	9:03	25	34.5	10.13	1213841.71	0.42	513195.41	0.51	1.64	0.90	31.13	30.97
Replicate 2				8:47	25	35	10.13	1213841.71	0.43	520633.02	0.52	1.62	0.90	31.61	
Replicate 3				8:58	25	33.5	10.13	1213841.71	0.41	498320.18	0.50	1.69	0.90	30.16	
Group 3:	Low Gloss Non-flats														
Product I	150 g/L	> 50g/L	H	12:49	25	24	11.3	1354038.63	0.29	398239.89	0.40	2.12	0.89	21.25	23.01
Replicate 2				13:46	25	25	11.3	1354038.63	0.31	414833.22	0.41	2.03	0.89	22.21	
Replicate 3				10:12	25	28.5	11.3	1354038.63	0.35	472909.87	0.47	1.78	0.90	25.56	
Product J	112 g/L	> 50g/L	H	9:10	25	28	11.1	1330073.34	0.34	456389.82	0.46	1.85	0.89	25.05	25.85
Replicate 2				9:15	25	29.5	11.1	1330073.34	0.36	480839.28	0.48	1.75	0.90	26.49	

Replicate 3				9:43	25	29	11.1	1330073.34	0.36	472689.46	0.47	1.78	0.90	26.01	
Product K	<50 g/L	≤ 50g/L	L	9:45	25	28.5	11.2	1342055.99	0.35	468724.76	0.47	1.80	0.90	25.55	28.77
Replicate 2				8:44	25	32	11.2	1342055.99	0.39	526287.45	0.53	1.60	0.90	28.93	
Replicate 3				8:49	25	35	11.2	1342055.99	0.43	575626.89	0.58	1.46	0.91	31.85	
Product L	49 g/L	≤ 50g/L	L	10:18	25	30.5	10.5	1258177.49	0.37	470266.08	0.47	1.79	0.90	27.34	26.87
Replicate 2				9:33	25	28	10.5	1258177.49	0.34	431719.68	0.43	1.95	0.89	24.94	
Replicate 3				9:17	25	31.5	10.5	1258177.49	0.39	485684.64	0.49	1.74	0.90	28.31	
chart speed: (1in/min) / 1 elevator speed: 4 --> .05in/min equilibrated 5 min (included in time) R/r = 53.1666358 Ring circumference = 5.935cm R = 0.94458458725cm (from C=pi*d) R=0.009445845873m R^3 = 0.842796192246 cm^3					1gram = 81.6 chart divisions d= density of air at 100% rel. humidity =23g/m^3 1 gal = .003785411784 m^3 1lb = 453.59237 g					Note: Values of F for (R^3)/V values above 3.50 were extrapolated by plotting the data points from the given table and fitting with a logarithmic fit of equation: $y=-0.0661\ln(x)+0.9351$ where $y=F$, and $x = (R^3)/V$ For this fit, $R^2 = 0.9998$					