

TEST REPORT

InvisiGARD

DATE: January 14, 2003

REPORT NO.: 067682

P.O. NO.: 19537

DESCRIPTION OF SAMPLE

Fifteen (15) samples reported to be “Functional Film” and identified as “InvisiGARD IPP-7510”

WORK REQUESTED

Material Testing in accordance with GM 6254M, Type I for:

1. Appearance Durability after Environmental Exposure per Section 6
2. Abrasion Resistance per SAE J1847 – 1000 Cycles at 500g, CS-17 Wheel
3. Dimensional Stability – 168 Hours at 121°C, 24 Hour Dwell
4. Peel Adhesion per ASTM D1000, Method A
5. Solvent Wipe
6. Fuel Resistance per GM 9501P, Method B
7. Wrap Test after Environmental Exposure per Section 6.3
8. Film Durability per GM 9508P
9. Corrosion Performance per GM 4298P
10. Appearance Color per GM 9220P
11. Appearance Durability after Xenon Weatherometer Exposure per SAE J1960
12. Resistance to Water Spotting & Staining per GM 9133P
13. Acid Spotting and Color/Gloss Evaluation
14. Topcoat Adhesion per GM 9071P

TEST RESULTS

1. Appearance Durability - After Environmental Exposure

<u>Exposure Cycle</u>	<u>Results</u>	<u>Specification</u>
Humid Aging (GM 4465P) 16 Hours at $38 \pm 2^{\circ}\text{C}$, $95 \pm 5\%$ RH	Satisfactory	Prepared samples shall show no surface deterioration, objectionable shrinkage (edge of film shall show no visible line of adhesive), delamination, edge lifting, cracking, pitting, blistering or other degradation after environmental exposure
Heat Aging 168 Hours at $70 \pm 2^{\circ}\text{C}$	Satisfactory	
Cycle Test: 2 Cycles (GM 9505P) Cycle F	Satisfactory	
High Temperature Resistance 1 Hour at $93 \pm 2^{\circ}\text{C}$	Satisfactory	

2. Abrasion Resistance (SAE J1847) – 1000 Cycles, 500g Load, CS-17 Wheel

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	There shall be no removal of graphics or wear through to the substrate after testing

3. Dimensional Stability – 168 Hours at $121 \pm 2^{\circ}\text{C}$

<u>Orientation</u>	<u>Shrinkage</u>	<u>Specification</u>
Lengthwise	<0.1	0.5% Max Shrinkage
Widthwise	<0.1	4.0% Max Shrinkage

TEST RESULTS, Continued

4. Peel Adhesion (ASTM D1000)

<u>Exposure Cycle</u>	<u>Results</u>	<u>Specification</u>
72 Hours at Ambient Conditions		
1	1212	400 N/m
2	856	
3	805	
Humid Aging (GM 4465P) 168 Hours at 38 ± 2°C, 95 ± 5% RH		
1	996	600 N/m
2	1070	
3	1112	
Heat Aging 168 Hours at 70 ± 2°C		
1	855	600 N/m
2	852	
3	874	
Cycle Test: 2 Cycles (GM 9505P) Cycle F		
1	620	600 N/m
2	614	
3	618	
High Temperature Resistance 1 Hour at 93 ± 2°C		
1	870	600 N/m
2	1038	
3	1009	

5. Solvent Wipe Resistance

<u>Solvent</u>	<u>Results</u>	<u>Specification</u>
Isopropyl Alcohol (9881293)	Satisfactory	Prepared samples shall show no loss of adhesion, loss of gloss or change when exposed separately listed solvents
VM & P Naphtha (9981062)	Satisfactory	
Aliphatic HC paint cleaning solvent	Satisfactory	

TEST RESULTS, Continued

6. Fuel Resistance (GM 9501P)

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	Prepared samples shall show no objectionable loss of gloss or color change, no loss of adhesion, surface degradation or tackiness

7. Wrap Test after Thermal Cycle

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	Prepared samples shall show no evidence of delamination, edge lifting, cracking, pitting, or other objectionable degradation

8. Film Durability (GM 9508P)

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory The film was equal or better than painted panel	There shall be no evidence of film wear-through to the base substrate. Acceptable adhesion shall be determined by the appropriate release division. Type I films shall exhibit a rating of 8 or better

9. Corrosion Performance (GM 4298)

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	There shall be no evidence of red or white corrosion following the exposure

10. Appearance Color (GM 9220P)

	<u>Results</u>				
	L	a	b	c	H
Sample	72.33	-0.08	5.62	5.62	90.94

Specification: Appearance, color, pattern and gloss shall be equivalent to approved standard when viewed under simulated north sky daylight.

NOTE: No standard is available.

TEST RESULTS, Continued

11. Appearance Durability (SAE J1960) – After Xenon Weatherometer Exposure

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	Prepared samples shall show no evidence of Surface deterioration, objectionable shrinkage (edge of film shall show no visible line of adhesive), objectionable color or gloss change, delamination, edge lifting, cracking, pitting, blistering or other degradation

NOTE: Xenon Control Chart Attached.

12. Resistance to Water Spotting & Staining (GM 9133P)

	<u>Results</u>	<u>Specification</u>
Water	Satisfactory	Prepared samples shall show no staining or change in color or finish
Salt	Satisfactory	

13. Acid Spotting and Color/Gloss Evaluation

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	Prepared samples shall show no evidence of color change and only minimal gloss change

14. Topcoat Adhesion (GM 9071P) – After Environmental Exposure

	<u>Results</u>	<u>Specification</u>
Sample	Satisfactory	Prepared samples shall show no evidence of film topcoat removal

BODYCOTE MET CHEM, INC.