



**RESTORE, ENHANCE,  
EXTEND & PROTECT**

## **NANO-CLEAR<sup>®</sup>** **THIRD PARTY TEST RESULTS**

- ❖ Industry Award Winning, Eco-Friendly Coatings Guaranteed to Extend the Service Life of Valuable Assets
- ❖ Unmatched Durability, Even in the Harshest Environments

(For Oxidized or Freshly Painted Surfaces)

v-2021.12.03-1

**Nano-Clear<sup>®</sup>**

**ASSERO** Coating Technologies

ECO-INNOVATIVE | ECO-RESPONSIBLE | SUSTAINABLE | PROVEN TECHNOLOGY

**Recommended Uses:** For Oxidized or Freshly Painted Surfaces  
**Chemistry:** 3D Nano-Structured Polyurethane / Polyurea Hybrid

TABLE 1		NANO-CLEAR® WITHOUT PERFORMANCE UPGRADES	
TEST PROPERTIES		TEST METHOD	RESULTS
1	Crosslink Density	DMA (Dynamic Mechanical Analysis)	2.17 (x 10 <sup>3</sup> mol/m <sup>3</sup> )
2	VOC	ASTM D3960	1.25 lb/gal (150 g/l)
3	Recommended Dry Film Thickness	ASTM D5796	1.0 mil to 2.0 mils (25.4µm to 50.8µm)
4	Coverage	Nanovere Inhouse	1,122 ft <sup>2</sup> /gal @ 1.0mil
5	Gloss 20° / 60°	ASTM D523	86.0 / 92.2
<b>ABUSE RESISTANCE</b>			
6	Abrasion Resistance (CS-17, 1 kg, 1000 cycles)	ASTM D4060	8.4 mg loss
7	Pencil Hardness, Scratch	ASTM D3363	4H
8	Scratch Hardness	SASO 2833	2500 gm
9	Pencil Hardness, Gouge	ASTM D3363	5H
10	Pendulum Hardness (Persoz)	ASTM D4366	> 250 oscillations
11	Impact Resistance 18°C Direct in/lbs	ASTM D2794	50 Pass / 60 Fail
12	Impact Resistance 18°C Reverse in/lbs	ASTM D2794	10 Pass / 20 Fail
13	Impact Resistance	SASO ISO 3248	1 kg - 160cm
14	Impact Strength	ASTM D2794	145 kg - cm
15	Chip Resistance 23°C / 73.4°F (2.0 mils)	ASTM D3170	7A
16	Chip Resistance -29°C / -9.4°F (2.0 mils)	ASTM D3170	7B
17	Falling Sand Abrasion 100 liters	ASTM D968	Pass
18	Mar Resistance	ASTM D5178	5.0 kg
<b>ENVIRONMENTAL RESISTANCE</b>			
19	Xenon WOM Resistance 4,000 hrs	SAE J1960 / ASTM G155	100% Gloss Retention 99% Gloss Retention
20	QUV 313, >1,500 hrs	ASTM D4587	100% Gloss Retention
21	Water Immersion Test 240 hrs @ 50°C/122°F	ISO 2812-2	Pass
22	Salt Spray, 6,360 hrs	ASTM B117 / 2018	No corrosion points - Approved
23	Humidity, 100% RH, 100°F / 37.8°C - 240 hrs	ASTM D1735-02	No loss of adhesion - No change
24	CASS 240 hrs @ 50°C / 122°F	JIS H8502	Pass
25	Thermal Shock (Heat: 100°F / 37.8°C: 3 hrs, Freeze: 3 hrs, Steam	GM9525P	No loss of adhesion - No Change
<b>CHEMICAL RESISTANCE</b>			
26	10% Sulfuric Acid	ASTM D 1308	No effect
27	10% Hydrochloric Acid	ASTM D 1308	No effect
28	10% Sodium Hydroxide	ASTM D 1308	No effect
29	10% Ammonium Hydroxide	ASTM D 1308	No effect
30	Isopropyl Alcohol	ASTM D 1308	No effect
31	Xylene	ASTM D 1308	No effect
32	Skvdrol® 500 Fluid	ASTM D6943-A	No effect
33	MEK Resistance - 1,500 Double Rubs	ASTM D4752	No effect
<b>FLAMMABILITY</b>			
34	Flammability: Fire Retardant & Flame Spread	ASTM E84 / BS476	Class 1 (Excellent)

TABLE 2		COMPARISON TEST FOR COMPOSITE MATERIALS (FIBREGLASS WITH GEL-COAT) BASF VS NANO-CLEAR® WITHOUT PERFORMANCE UPGRADES				
TEST PROPERTIES	TEST METHOD	CLEAR TOP COAT (1K or 2K)	DRY FILM THICKNESS (DFT)	ACETONE PRE-CLEAN	RESULTS	
35	Mechanical Scratch Ambient Temperature	ASTM D7027	BASF DC92 (2K)	2.0 - 3.0 mil	43.853 Mean	
36	Mechanical Scratch Ambient Temperature	ASTM D7027	Nano-Clear® (1K)	2.0 mil	38.129 Mean	
37	Mechanical Scratch After 7 Day 8 hr Heat Cycling @ 50°C/122°F, Ambient Cool down Temperature	ASTM D7027	BASF DC92 (2K)	2.0 - 3.0 mil	1.532 Mean	
38	Mechanical Scratch After 7 Day 8 hr Heat Cycling @ 50°C/122°F, Ambient Cool down Temperature	ASTM D7027	Nano-Clear® (1K)	2.0 mil	35.99 Mean	

TABLE 3		TESTING OF CHEMICAL AGENT RESISTANT COATINGS - CARC NANO-CLEAR <sup>®</sup> WITH MATTING ADDITIVE (NCI+MA)		
TEST PROPERTIES		TEST METHOD	CONVENTIONAL COATING RESULTS	NCI +MA RESULTS
<b>OPTICAL PROPERTIES</b>				
39	Gloss 20° 60° 85°	ASTM D234 ASTM D234 ASTM D234	0.7 3.6 7.4	0.6 1.3 7.8
40	Color L a b	ASTM D2244 ASTM D2244 ASTM D2244	66.66 6.02 20.71	66.66 6.02 20.71
41	Infrared Reflectance	ASTM E-903	PASS	PASS
<b>PHYSICAL PROPERTIES</b>				
42	Adhesion	ASTM D3359	5B	5B
43	Pencil Hardness	ASTM D3363	2B	>6H
<b>RESISTANCE</b>				
44	Acid Spot Resistance	MIL-DTL-53039E Sec 4.6.24	No Effect	No Effect
45	<b>MEK Resistance:</b> Double Rubs to Substrate Double Rubs to Start of Coating Dissolution	ASTM D4752 ASTM D4752	>200 20	>1,500 >1,500
46	<b>Water Immersion Test:</b> Visual Observation Pencil Harness Adhesion	MIL-DTL-53039 Sec 4.6.22	No Effect 4B 5B	No Effect >6H 5B

TABLE 4		CONTACT ANGLE AND ICE DE-BONDING (SHEDDING) TEST	
COATING INFORMATION		CONTACT ANGLE RESULTS (%)	
<b>CONTACT ANGLE RESULTS OF FROZEN DI WATER ICE DROPLETS (%)</b>			
47	Control	43.12	
48	NCI +EC @5%	102.41	
49	NCI +MA @30% +EC @5%	101.07	
<b>SHEDDING TIME RESULTS OF FROZEN DI WATER ICE DROPLETS (Seconds)</b>			
50	Control	58.0	
51	NCI +EC @5%	32.0	
52	NCI +MA @30% +EC @5%	40.05	



Sample of Ice De-bonding Test on Aluminum Substrate (NCI +MA +EC: 40 seconds)

TABLE 5		ANTI-MICROBIAL (LOG <sub>10</sub> REDUCTION) TEST NANO-CLEAR <sup>®</sup> WITH ANTI-MICROBIAL ADDITIVE (NCI+AM)		
TEST PROPERTIES	TEST METHOD	AVERAGE CFU/CARRIER	RESULTS (Log <sub>10</sub> Reduction / % Efficacy)	
53	Control	JIS Z 2801	3.97E+05	NA
54	NCI +AM	JIS Z 2801	1.53E+01	6.87 / 99.99998%



Sample Log Reduction Test (Comparing CFU (Colony Forming Units), Before & After)

To arrange a Nano-Clear<sup>®</sup> application demonstration, contact **Assero** at:



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