



**RESTORE, ENHANCE,
EXTEND & PROTECT**

NANO-CLEAR[®] FOR FLEET VEHICLES

- ❖ 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 Newly Painted Surfaces)



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Nano-Clear[®]

ASSERO Coating Technologies

PROTECTION WITHOUT COMPROMISE



TRANSPORTATION MARKETS

Industrial asset owners commonly apply protective coatings over metal surfaces to mitigate the damaging effects from various environmental factors, to maintain optimal performance, and to extend asset service life thereby increasing profitability. However, conventional industrial coatings "alone" are still very susceptible to:

- Corrosion
- Rain Erosion
- UV Degradation
- Weathering
- Moisture / Water Intrusion
- Acid Rain / Chemical Damage
- Scratch / Abrasion / Chip Damage
- Normal Wear & Tear

What is needed?

- A combined basecoat - clearcoat system with a multifunctional clearcoat that protects surfaces more thoroughly than any existing technology.
- A permanent surface coating that enhances and extends the surface life of freshly painted or highly oxidized paint by 10+ years.

Nano-Clear® NCI

Nano-Clear® NCI dramatically improves surface protection and brand image while significantly reducing surface maintenance expenses.



- **Extreme Corrosion Resistance**
No Rust after 6,360 Hour Salt Spray Testing
- **Extreme Abrasion Resistance**
Only 8.4 mg Loss after 1000 Cycles, 1 kg
- **Low VOC**
1.25 lbs / Gal (150 g / L)
- **Weatherproof Gloss**
99% Gloss Retention after 4000 Hours; Xenon WOM
- **1K Coating, Ambient (Humidity) Cured**
Dry-To-Handle in 4 Hours; Return to Service in 24 Hours
- **Reduce Re-Paint Cycle by 2X - 3X**
As Documented in Production Case Studies
- **Improve Brand Appearance**
Achieve Deeper Colors & Dramatically Higher Gloss
- **Achieve Lower Operating Costs**
By Reducing Maintenance Time & Extending Recoat Cycle by 10+ Years



What Makes Nano-Clear[®] Unique?

Nano-Engineering (not nano-particles) Creates Exceptional Crosslink Density

Nano-Clear[®] NCI is manufactured using proprietary 3D nano-structured polymers (*not* nano-particles) which results in extreme crosslink density.

NCI dramatically improves corrosion, weathering, abrasion, scratching, chipping, marring, chemical & UV resistance and reduces surface maintenance. NCI penetrates deep into the pores of freshly painted or highly oxidized paints to enhance color, improve gloss, and significantly increase surface hardness.

Nano-Clear[®] is a one-component, humidity cured, highly cross-linked, polyurethane/polyurea, hybrid nanocoating.

With this exceptionally high crosslink density, we have the test data to prove that NCI is the world's best all-around clearcoat for resistance to scratches, chips, abrasion, chemicals, weathering, and more. Please see the back cover for test results or visit www.assero.co/tests.



BMW validated Nano-Clear[®] coating to have the highest gloss levels and DOI of any clear coating system they had ever tested.

AMAZING FLEXIBILITY!



Before / After

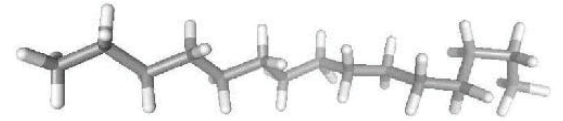
- ✓ Nano-Clear[®] has both remarkably high surface hardness and flexibility.
- ✓ Steel panel coated with Nano-Clear[®], bends in-half without cracking or any other failure to the coating.



Nano-Clear[®]

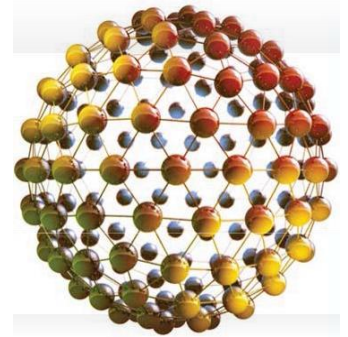
Why is Crosslink Density So Important?

Coatings contain “building blocks” with functional groups. The chemical reaction of these groups during curing forms a network. In most traditional polymers, the network is a linear chain of molecules with low crosslink density.



Linear chain of molecules

Conversely, we “nano-structured” our clearcoat to have a 3D molecular architecture. The 3D polymer network has an exponentially higher number of crosslinked sites. The result is a tightly knit mesh with unprecedented DMA density.



3D molecular architecture

High crosslink density provides highly functional surface properties, including unmatched corrosion resistance, scratch resistance, chemical resistance and UV durability. It also means low surface energy, repelling water (hydrophobic) and aiding in the release of ice, dirt, brake dust, and even concrete dust.



x (8304) Conventional Clearcoat



✓ (8305) Nano-Clear®

After a demanding 3 year field evaluation by Metrolinx, results demonstrated the extreme protective capabilities of Nano-Clear® (NCI):

- **82% Reduction of Damage**
- **33+% Reduction of Product Costs**



10 month field trial *without* Nano-Clear NCI



10 month field trial *with* Nano-Clear NCI

Even sticky concrete dust releases easily from Nano-Clear® NCI.



Unrivalled Performance Enhancement for Newly Painted or Highly Oxidized Coatings

For decades, conventional coating systems have relied on numerous variations of the same linear chain polymers as noted above. As a result, in order to properly protect equipment, it's necessary for industrial customers to perform frequent, costly, labour intensive maintenance cycles every 6 months to 5 years which includes surface preparation & repair, and then repaint & recoat using the same *conventional* technology.

Nano-Clear® Coatings on the other hand, are designed from the bottom up with nano-structuring properties and no matter how badly oxidized your existing coating is, **Nano-Clear® NCI for Fleet Vehicles** will restore its color and provide unmatched surface protection.

Put Simply: NCI restores the color, gloss, surface hardness and extends the surface life of conventional coatings by 10+ years.

Nano-Clear® NCI is also designed to be applied directly over freshly coated surfaces including 2K epoxies, 2K polyurethanes and powder coatings.



Nano-Clear®

How Does NCI Enhance Color & Physical Properties?

NCI has a low (200 cps) viscosity, so it penetrates deep into the smallest pores of newly painted or oxidized coatings, **turning the white, chalked layers transparent**, allowing the original underlying color to show through while fortifying/hardening the surface.

Humidity-cured at ambient temperatures, NCI quickly hardens and fortifies the painted surface, "locking-in" color and preventing future chalking with its long-term UV absorbers.

Please note: NCI must be applied over the existing coating system before the coating has deteriorated into a powdered, peeled and/or eroding state. NCI *is not a rust converter*. Rust or peeling paints must be removed and repainted first (prior to applying NCI) with a coating such as a high-solids, two-component epoxy.

For additional details, please review the Nano-Clear® NCI Technical Data Sheet at: www.assero.co/resources.

Industrial Users of Nano-Clear®



STERLING CRANE



ODEBRECHT
Oil & Gas



Where Can Nano-Clear® Be Used?

On New or Highly Oxidized Coatings:

Nano-Clear® (NCI) has been engineered to be applied over 2K epoxies, 2K polyurethanes, powder coatings, polyesters, gel coats, e-coats, latexes, fibreglass, and anodized aluminum (to prevent filiform corrosion, etc.).

For Fleet Vehicles & Equipment:

NCI is the premiere solution for a diverse range of applications:

- Lifeboats
- Cargo Ships / Ocean Going Vessels
- Chemical, Oil and Gas Storage Tanks
- Pumps & Valves
- Locomotives, Tank & Chemical Railcars
- Oil & Gas Pipelines
- Oil Field Platforms, Pipes and Tubes
- Drinking Water Pipelines
- Epoxy Coated Floors
- Shipping Containers
- Generators
- High & Low Voltage Utility Boxes
- Bridge Structures
- Mass Transit Vehicles & Equipment
- Emergency Response Vehicles & Equipment
- Concrete Warehouse Floors
- Painted & Concrete Building Structures
- Interior and Exterior Concrete / Wood Architectural Structures
- Agriculture, Construction, & Earth Moving Equipment
- Aircraft and Equipment
- Naval and Military Air, Ground & Marine Equipment
- And much more.



Problem: Leading soda pop company owns a global fleet of distribution trucks in need of paint restoration.

Solution: Nano-Clear® is used to dramatically improve the overall image of this leading soda brand, while reducing the re-paint cycle and reducing fleet maintenance. See other Nano-Clear® case studies: www.assero.co/resources



Nano-Clear®

Industry Recognition

Nano-Clear® has been recognized for its innovative engineering by:

- ❖ **NACE MP 2019 / 2020 Corrosion Innovation of the Year Award**
NACE (the National Association of Corrosion Engineers) sets the standards for surface preparation, coating selection, coating application, painting contractor certification, and testing.
- ❖ **Frost & Sullivan Technology Leadership Award 2020**
Frost & Sullivan is the premiere business consulting firm to the Paints and Coatings Industry.
- ❖ **PaintSquare Prestige Award 2020 (Top Product: Coatings for Steel)**
PaintSquare is the premier industry publication to the Paints & Coatings Industry.



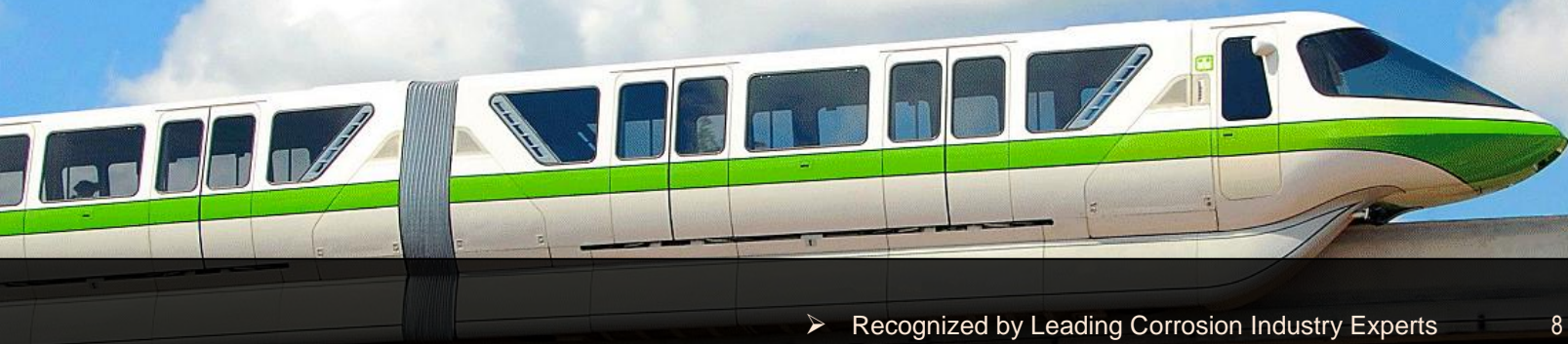
To arrange a Nano-Clear® application demonstration, contact **Assero** at:

info@assero.co



ASSERO COATING TECHNOLOGIES

Assero Coating Technologies delivers **Exceptional Surface Protection™** which extends the useful service life of valuable assets that operate in harsh environments. Assero is built around an ethos of delivering eco-innovative / eco-responsible, sustainable, green chemistry solutions with a line of **Protective Clearcoats™** that reduce damage to the environment.



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 ³ mol/m ³)
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 ² /gal @ 1.0mil
5	Gloss 20°/60°	ASTM D523	86.0/92.2
ABUSE RESISTANCE			
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
ENVIRONMENTAL RESISTANCE			
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
CHEMICAL RESISTANCE			
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
FLAMMABILITY			
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 [®] WITH MATTING ADDITIVE (NCI+MA)		
TEST PROPERTIES		TEST METHOD	CONVENTIONAL COATING RESULTS	NCI +MA RESULTS
OPTICAL PROPERTIES				
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
PHYSICAL PROPERTIES				
42	Adhesion	ASTM D3359	5B	5B
43	Pencil Hardness	ASTM D3363	2B	>6H
RESISTANCE				
44	Acid Spot Resistance	MIL-DTL-53039E Sec 4.6.24	No Effect	No Effect
45	MEK Resistance: Double Rubs to Substrate Double Rubs to Start of Coating Dissolution	ASTM D4752 ASTM D4752	>200 20	>1,500 >1,500
46	Water Immersion Test: 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 (%)	
CONTACT ANGLE RESULTS OF FROZEN DI WATER ICE DROPLETS (%)			
47	Control	43.12	
48	NCI +EC @5%	102.41	
49	NCI +MA @30% +EC @5%	101.07	
SHEDDING TIME RESULTS OF FROZEN DI WATER ICE DROPLETS (Seconds)			
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 ₁₀ REDUCTION) TEST NANO-CLEAR [®] WITH ANTI-MICROBIAL ADDITIVE (NCI+AM)		
TEST PROPERTIES	TEST METHOD	AVERAGE CFU/CARRIER	RESULTS (Log ₁₀ 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)

Available Locally Through:

PROGUARD CANADA
Toronto, ON; Montreal, QC; Halifax, NS

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