



HIGH GLOSS – POLYURETHANE HYBRID CLEAR COAT



Nano-Clear® Industrial Coating (NCI) is the *only* industrial coating in the global marketplace to enhance, restore, and extend the service life of freshly coated (newly painted) and oxidized (previously painted) surfaces by **10+ years**. **Nano-Clear®** will also dramatically improve corrosion, scratch, abrasion, chemical, and UV resistance.

Engineered using nano-structuring, **Nano-Clear®** penetrates deep into the microscopic pores, holidays, cracks, and defects of painted surfaces to form a chemical bond that will enhance, improve, and recover original color and gloss. **Nano-Clear®** will greatly improve surface hardness, increase the resistance to moisture and water permeation, and provide long-term prevention of coating deterioration, **Nano-Clear®** reduces time & expenses related to maintenance & management, extends service life, increases ROI, and provides a potentially higher resale value for assets.

Nano-Clear® is a one component (1K), humidity cured, densely cross-linked, low VOC, polyurethane / polyurea hybrid nano-coating. **Nano-Clear® (NCI)** is manufactured using proprietary 3D nano-structured polymers producing extreme crosslink density.

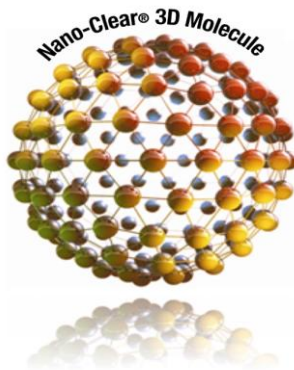
High crosslink density has been proven to generate highly functional surface properties, including unmatched corrosion, scratch, abrasion, weathering, UV, chip, water and chemical resistance. This also yields low surface energy, repelling water (hydrophobic) and aiding in the release of ice, dirt, oil, grease, brake dust, graffiti, soot, and numerous other forms of organic and inorganic surface fouling.

SIDEBAR: "Nanoscience, nanotechnology and nanostructuring refer to things that occur on the nanometer scale (1 to 100 nanometers - nm). In the same manner that 100 yards is the relevant scale for a football game, nanoscale is the playing field for molecules and their interactions.

Nanotechnology is the science of manufacturing things by extracting raw materials from the environment and assembling them an atom or molecule at a time." *Courtesy of the University of Wisconsin – Materials Research and Engineering Center.*

1.0 NANO-CLEAR® INDUSTRIAL COATING'S (NCI) PHYSICAL PROPERTIES

- Polymer Chemistry:** Nano-structured Polyurethane Hybrid
- Mixing Ratio:** No mixing needed
- Recommended Dry Film Thickness:** 1.50 – 2.5 mil (38 - 64µ)
- Pencil Hardness – ASTM D3363:** 4H (7H with NCIM Matte Additive)
- Pendulum Hardness (Persoz) – ASTM D4366:** 220
- Abrasion Resistance – ASTM D4060:** 8.4 mg loss
- Impact Strength – ASTM D2794:** >140
- Chemical Resistance - ASTM D4752:** >1500 MEK rubs



- Water Immersion Test – ISO 2812-2:** Pass
- QUV Resistance – ASTM D4587:** 99%
- Xenon WOM – ASTM G155:** 99%
- Salt Spray – ASTM B177:** 5,000 hrs, no rust, no blisters
- DMA -Crosslink Density – (X103 mo/m3):** 2.17
- Viscosity:** 20 cps
- Withstand Temperatures from:** -40°F to 250°F (-40°C to 121°C)
- VOC (less exempts):** 1.25 lbs./gal. (150 g/L)



2.0 NANO-CLEAR® INDUSTRIAL COATING'S (NCI) APPLICATION POTENTIAL

Oil & Gas Storage Tanks, Oil & Gas Pipelines, Oil Field Pipes and Tubes, Drinking Water Pipelines, Lifeboats, Cargo Ships, Epoxy Coated Floors, Bridge Structures, Painted & Concrete Building Structures, Tank & Chemical Railcars, Agriculture, Construction, and Earth Moving Equipment (ACE), Anodized Aluminum, High & Low Voltage Utility Boxes, Concrete Warehouse Floors, Generators, Interior and Exterior Concrete / Wood Architectural Structures*, Locomotives, Commercial, Industrial, Naval, Military Air, Ground & Marine Equipment, Fleet Vehicles, and much more.



*Please contact **Nanovere** or a **Nano-Clear® Representative** to discuss these and other applications.

- One component (1K) formulation – reduces labor, preparation, and application time & costs
 - High surface area coverage of 333 ft² / 31 m² @ 2 mil DFT per gal / 3.8L (3 wet coats @ 2.0 mils WFT / coat) – reduces material volume requirements
 - Extends in-service life of newly or highly oxidized painted surfaces (minimum 120 months/10 years)
 - Restores original color & gloss, increases surface hardness, provides extreme UV resistance
 - High scratch resistance (> 4H pencil hardness)
 - Extreme chemical resistance (>1,500 MEK rubs)
 - Extreme weathering resistance (98 – 100% gloss retention)
- A. **Nano-Clear**[®] has been engineered to be applied over “**fresh**” (uncured*) 2K epoxies and 2K polyurethane, and sanded powder coatings, fiberglass and anodized aluminum. *Fully cured coatings require sanding pre-application of NCI to allow chemical bonding to take place.
- B. **Nano-Clear**[®] is also engineered to be applied over “**oxidized**” 2K epoxies, 2K polyurethane and powder coatings, fiberglass / gel-coat and anodized aluminum.

Humidity-cured at ambient temperatures, **Nano-Clear**[®] quickly bonds, hardens and fortifies 2K epoxy; 2K polyurethane; 2K basecoats, powder coatings, anodized aluminum, and sanded fiberglass.

3.0 PRE-APPLICATION CONSIDERATIONS

The proper application of **Nano-Clear**[®] is very important in order to achieve the desired outlined physical properties. The substrate type (material composition) and its surface preparation are CRITICALLY important prior to the application of **Nano-Clear**[®]. The application parameters for **Nano-Clear**[®] are just as, or even more important, than achieving the desired physical properties.” **Thomas Choate, CTO and Principal Scientist, Nanovere Technologies, LLC.**



IMPORTANT: **Nano-Clear**[®] + Poor Adhesion = **Failure**
Nano-Clear[®] + Excellent Adhesion = **10 Year Service Life**

All surfaces to be coated must be clean, free of loose debris, stains, rust, vegetative growth, efflorescence, graffiti, oil, grease, moss, mildew, chalked/oxidized paint, and any other unsound or foreign materials which can inhibit the penetration, chemical bond, adhesion and long-term performance of **Nano-Clear**[®].

4.0 NANO-CLEAR[®] APPLICATION ENVIRONMENT

Nano-Clear[®] is engineered to “cure” / “crosslink” in the presence of humidity. As a general rule, higher humidity will result in a faster cure time. Conversely, low humidity results in a slower cure. Low humidity has a positive effect on the flow and leveling of **Nano-Clear**[®].

High humidity outside the design parameters may reduce proper flow and leveling. For large application projects in high humidity regions, **Nano-Clear**[®] **Slow Set** (a special order) is available / recommended as an alternative option.

It's also important to apply **Nano-Clear**[®] in an environment that is as dust-free as possible in order to avoid surface contamination. Appropriate ventilation, approved respirator, personal protective equipment / clothing (PPE) and rubber gloves are required during the application of **Nano-Clear**[®]. Refer to *Section 10.0 Health Precautions* for further details.

Recommended Application Parameters:

(Refer to Section 8.0 for Application Guidelines)

- i. **Ambient temperature:** Min 40°F / 4°C to a Max 90°F / 32°C
- ii. **Relative Humidity:** Min 20% to a Max 90%.
- iii. **Metal Temperature:** Min 40°F / 4°C to a Max 90°F / 32°C.
- iv. **Metal Dew Point Temperature:** At least 5°F / -5°C above the dew point.
- v. **Material Temperature:** Min 40°F / 4°C to a Max 90°F / 32°C

SURFACE PREPARATION

5.1 Glossy and Oxidized Painted Surfaces -



Cleanliness:

Surfaces to be coated must be completely dry and free of grease, oil, soil, biological contaminants, dust, abrasive materials water soluble salts, chlorides, sulfates, scale, rust and/or other forms of contamination prior to the application of **Nano-Clear®**. Remove water soluble salts, chlorides, sulfates, grease, oil and biological contaminants with an appropriate decontamination agent. Please contact **Nanovere** or your **Nano-Clear®** representative for further information.

Standards:

SSPC – SP 1: Chemical Cleaning. For loose scale, rust and deteriorated coatings, employ **SSPC – SP 2 / 31 GP 401*: Hand Tool Cleaning**, or **SSPC - SP3 / 31 GP 402*: Power Tool Cleaning**. Repeat **SP1** post employing **SP2 / 401** or **SP3 / 402**. *[Canadian Government CGSB](#)

We highly recommend testing for surface cleanliness using standard **ISO 8502-9** which is a Field method for the conductive determination of water soluble salts.

NOTE: "Soluble salts have a significant effect on the lifetime, and hence the cost, of coating systems and corrosion protection." [Bernard R. Appleman, Ph.D., KTA-Tator, Inc. Oct. 1987](#)

5.2 Newly Painted Surfaces -



Nano-Clear® is designed to bond with fresh new industrial paints in a wet-on-wet process once the solvent has “flashed off”. **Nano-Clear®** will also bond with paints that have not fully cured. The period to reach full cure for industrial paints/coatings can span from 7 to 30 days post application. Allow these solvents to fully evaporate-out from the underlying paint prior to the application of **Nano-Clear®** (typically 3 - 6 hours). The solvent flash and cure time information will be available in the manufacturer’s product data sheet (PDS). Please qualify application and full cure time before applying **Nano-Clear®**.

If *full cure* has been reached, the coating will require sanding to open up its “pores” for proper chemical bonding to take place with the application of **Nano-Clear®**. It is recommended that 400 grit sanding be implemented followed by solvent cleaning using acetone.



5.3 Special Pretreatment -

New unpainted ferrous and non-ferrous metal surfaces such as stainless steel and aluminum can be coated with **Nano-Clear®** but will require etching followed by the application of **Nano-Clear®’s VV-200**, a Functional Surface Treatment (FST) and Adhesion Promoter (AP). Please review the **Nano-Clear® VV-200** TDS and SDS for complete product information.

Etching can be accomplished with the use of 85% Phosphoric Acid as an etchant agent. Once the etching process is completed, the etched surfaces should be rinsed with a generous amount of distilled or R.O. sourced water and allowed to completely dry before applying **Nano-Clear® VV-200** as an adhesion promoter followed by **Nano-Clear®**.



Standard SSPC - SP 1: As with any cleaning solution, it’s important to review and follow the manufacturer’s instruction for its use and safe disposal according to local, state/provincial, and federal regulations. These recommended methods for surface preparation and pretreatment will greatly reflect in achieving the desired physical properties of **Nano-Clear®** and will also provide a long service life.

Please consult with **Nanovere** or your **Nano-Clear®** representative if you have additional questions regarding surface preparation and pretreatment.

6.0 NANO-CLEAR® APPLICATION EQUIPMENT

Nano-Clear® can be applied using HVLP (high volume low pressure) or Airless paint sprayer equipment. We highly recommend using a dedicated compressed air supply line with an appropriately sized air filtration system and air dryer for best results.

6.1 APPLICATION EQUIPMENT

A. Air Spray Equipment -

Spray type and brands:

HVLP or LVLP (SATA, Devilbiss, Iwata, or Krautzberger)

Fluid Tip:

1.3, 1.4 or 1.5 mm

Fan pattern:

Full

Fluid Control:

2.5 turn out

Spray Pattern:

50% overlap

Inlet Pressure to Spray Gun:

29 to 30 psi / 1.9 to 2.0 Bar

Pressure at Spray Gun Tip:

10 psi / 0.7 Bar. **NOTE** - To meet EPA National Emission Standards for Hazardous Air Pollutants (**NESHAP**) standard of 10 psi / 0.7 Bar at the spray tip, we recommend using a tip gauge for calibration which will also help with atomization.

Compressed Air Quality:

ISO Standard 8573-1:2010 Class 2.2.1

B. Airless Spray Equipment -

Tip Size:

Graco 517 or 617

Pump:

30:1 or 40:1

Pump Pressure:

800 psi / 55 Bar

C. Equipment Clean-Up -

Clean spray equipment **immediately** after use with either Acetone or MEK. **NEVER** attempt to clean spray equipment with Water or Alcohol!



7.0 NANO-CLEAR® APPLICATION SPECIFICATIONS

7.1 RECOMMENDED FILM BUILD

- **Recommended number of spray coats:** Apply a minimum of **3** to **4** wet coats with **2** to **5** minutes between recoats to allow for solvent evaporation / flash off. **NOTE:** Improper flash time can lead to solvent entrapment.
- **Recommended Wet Film Thickness (WFT):** **2.0** to **3.0** mil (50 - 76 µm) per wet coat
- **Recommended Dry Film Thickness (DFT):** **1.5** to **2.5** mil (38 µm to 64 µm) depending on the surface properties desired
- **AVOID** applying additional wet coats after **20 minutes** have passed since the last wet coat application. Flow and leveling will be negatively affected past this period of time.



7.2 CURE TIME (R.H. = Relative Humidity)

	<u>@ 72°F / 22°C, 50% R.H.</u>	<u>@ 90°F / 32°C, 50% R.H.</u>
Dust Free Time (DFT):	~ 20 - 30 minutes	~ 10 - 15 minutes
Tack Free Time (TFT):	~ 30 - 40 minutes	~ 20 - 30 minutes
Dry to Handle Time (DTH):	~ 4 hours	~ 3 hours
Dry Hard:	24 hours	24 hours
Full Cure Time:	48 hours	48 hours

- * Lower temperatures and lower humidity conditions will slow down the curing rate.
- * Higher temperatures and higher humidity conditions will speed up the curing rate.

DFT: refers to the drying stage of a paint/coating film at which airborne dust particles will no longer adhere.

TFT: is the time at which the paint/coating is deemed to be properly adhered and capable of providing maximum protection to a surface without being disrupted or damaged.

DTH: is the time in which a paint/coating does not show any unwanted marks, detachment, loosening, wrinkling or other forms of distortion.

Full Cure Time: is how long it takes a paint/coating to reach maximum durability.



7.3 SURFACE COVERAGE AND SHIPPING WEIGHT PER GALLON

Surface area coverage:	333 ft ² / 31 m ² per gal / 3.8L @ 2.0 mil DFT (3 wet coats @ 2.0 mils WFT / coat)
Weight one (1) gallon container:	8 lbs. / 3.36 kg
Weight five (5) gallon container:	40 lbs. / 18.14 kg
Weight fifty-five (55) gallon drum:	440 lbs. / 220 kg

8.0 NANO-CLEAR® APPLICATION GUIDELINES

8.1 NANO-CLEAR® (NCI) OVER OXIDIZED PAINT



- i. The first wet coat of **NCI** will bond, restore and enhance the underlying oxidized basecoat/paint color.
- ii. **NCI** wet coats 2, 3 and 4 will serve to “Fill & Fortify” the oxidized paint and build a film thickness to the desired level to meet the optimum designed level of 2.0 mil DFT.
- iii. We highly recommend using a WFT gauge (Standard ISO2008-7B, ASTM D4414) to accurately ensure that the recommended coating film build is achieved.
- iv. In the absence of a WFT gauge, overall gloss level can be determined visually after 5 minutes as follows:
High Gloss = Good Film Build
Low Gloss = Low Film Build (The application of additional coats is recommended to meet **NCI**'s optimum DFT level.)

8.2 NANO-CLEAR® (NCI) OVER FRESH PAINT



- i. **NOTE:** Refer to *Section 5.2* to determine the “cure” level of the Fresh Paint, and take appropriate steps where required before the application of **NCI**.
- ii. The first wet coat of **NCI** will bond and fill the still open pores of the basecoat/paint.
- iii. **NCI** wet coats 2, 3 and 4 will serve to “Fill & Fortify” the oxidized paint and build a film thickness to the desired level to meet the optimum designed level of 2.0 mil / 50µm DFT.
- iv. We highly recommend using a WFT gauge (Standard ISO2008-7B, ASTM D4414) to accurately ensure that the recommended coating film build is achieved.
- v. In the absence of a WFT gauge, overall gloss level can be determined visually after 5 minutes as follows:
High Gloss = Good Film Build
Low Gloss = Low Film Build (The application of an additional coat is recommended.)

Third party testing under ASTM, SAE, SASO, ISO, JIS, GM standards for coating specifications has proven that the optimum DFT for **Nano-Clear®** is 2.0 mil. These are recognized test standards which cover physical properties such as physical abuse, environmental and chemical resistance, as well as test standards for adhesion, flexibility, cleaning and crosslink density (DTM). **Nano-Clear®** has met and exceeded the results in 42 test standards used for industrial coatings, and has been tested at a crosslink density that remains unchallenged. **Nano-Clear®** has also gained notoriety by meeting and exceeding 3 additional test standards under military (MIL) specifications for protective coatings. All tests and results were based on a DFT for **Nano-Clear®** at 2.0 mil / 50µm.

Test reports are available on our website. Please consult with **Nanovere** or your authorized **Nano-Clear®** representative if you have additional questions regarding Application Guidelines.

9.0 NANO-CLEAR® STORAGE, SHELF LIFE, AND PACKAGE STABILITY

9.1 TRANSPORTATION, STORAGE AND SHELF LIFE



- a. **Transportation:** Min. 40°F (4°C) to Max. 86 °F (30°C) for short periods.
- b. **Storage & Self Life (Unopened Container):** Higher temperatures will decrease its shelf life.

Min: 40°F (4°C): 12 months	Max: 72°F (22°C): 12 months
	80°F (27°C): 6 months
	90°F (38°C): 2 months
- c. **Storage & Self Life (Opened* Container):**
Max: 80°F (27°C): 2 months

*Opened is defined as cap is opened and closed immediately (tightly recapped) after dispensing the contents in order to avoid solvent evaporation and moisture contamination.

NOTE: DO NOT leave the container uncapped for extended periods of time. Recap it immediately after dispensing to preserve shelf life. Discard the contents if the liquid turns white or takes on a gelatinous consistency.

9.2 PACKAGE STABILITY

As a humidity-cured coating, **Nano-Clear®** is sensitive to moisture contamination. It's very important to quickly recap all containers that house **Nano-Clear®** immediately after dispensing. **DO NOT** leave a container open for extended periods of time. Doing so will shorten the shelf life of the product.

Post manufacturing, all packaging of **Nano-Clear®** is purged with an inert gas (nitrogen) to assure product stability during transport and storage. It is “**NOT**” recommended to repackage **Nano-Clear®** into smaller containers without first engaging **Nanovere** or your **Nano-Clear®** representative regarding the optimum type of packaging material to use (eg. - unlined aluminum bottles or plastic *Baritainer* containers), as well as the proper usage of nitrogen (an inert gas) for product stability.

Note: During a nitrogen (or argon) purge of an opened container, ultra dry nitrogen with a dew point of -70 degrees Celsius is introduced under pressure into the packaging to remove moisture before promptly recapping. This creates a much drier internal environment than standard desiccant can achieve and will extend the product's shelf life.

10.0 HEALTH PRECAUTIONS



Nano-Clear® is safe to use and apply when recommended precautions are followed. Before the application of **NCI**, read and understand the Safety Data Sheet (SDS), which provides information on health, safe handling, cleanup, environmental hazards, first aid recommendations, and the use of personal protective equipment (PPE). Circulate sufficient fresh air to maintain a working environment below NIOSH PEL and LEL exposure levels. Apply according to local, state/provincial, and federal (OSHA) regulations.

11.0 BUFFING AND POLISHING (if required)



BUFFING

STEP 1 - Sand Paper: Start with 800 grit sandpaper, followed by 1,000 and 1,500 grit. Finish with 2,000 or 2,500 grit.
STEP 2 - Cut Compound: Heavy cut compound with wool pad @ 1,200 to 1,400 RPM.



POLISHING

STEP 3 - Polishing: 3M SRC (scratch resistant clears) polishing paste with a wool pad @ 1,200 to 1,400 RPM.
STEP 4 - Final Polishing: Use light to medium cut polish with a wool pad @ 1,200 to 1,400 RPM.

12.0 NCI ADDITIVES: VV-200, NCFP, NCA, and NCIM

Nano-Clear®'s **NCFP** Fluoropolymer, **NCA** Accelerator, and **NCIM** Matting additives have been specifically engineered to increase and enhance the potential of **Nano-Clear®** coating applications. Also developed with this group of additives is a unique, dual-purpose, pre-application, functional surface treatment and adhesion promoter: **Nano-Clear® VV-200**.

12.1 ADDITIVE INFORMATION



- NCFP:** Is a proprietary, low surface energy fluoropolymer which, when admixed into **Nano-Clear®**, will increase and enhance its ability to repel ice, dirt, oil, water, paint, and chemical fouling.
- NCA:** Is a proprietary solution engineered to accelerate the dust & tack free times of **Nano-Clear®** during coating applications with no effect on flexibility.
- NCIM:** Is a proprietary Matting agent engineered to reduce the specular high gloss level of **Nano-Clear®** from semi-gloss up to full matte in a repeatable dial-in manner. **NCIM** also enhances a number of the physical properties of **Nano-Clear®** leading to an increase in asset life cycle management and performance.

12.2 SURFACE TREATMENT

NC® VV200: Is a proprietary, transparent, one component (1K) functional surface treatment and adhesion promoter.

WARRANTY AND LEGAL DISCLAIMER

A current version of this Technical Data Sheet (TDS) is available on our website at www.nanocoatings.com; should there be any discrepancies between this version of the TDS and the one available on our website, then the version on the website will take precedence. The environmental conditions present at the time of application, the proper preparation of the substrate, consideration for the use case of the asset to be coated, and the skill of the applicator, are all significant factors in the performance of this product. No warranty or liability for the performance of the product will be accepted unless specifically agreed to by us in writing.

Please contact **Nanovere Technologies** or your authorized **Nano-Clear®** representative to discuss your application or project.

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