Neat® Coated Glass

Cardinal's Neat® is a smooth titanium dioxide (TiO_2) coating applied onto the #1 outdoor glass surface. It has both photocatalytic and anti-static properties.

Photocatalytic means the coating absorbs ultraviolet (UV) light and uses it in the decomposition of organic residue on the glass surface.

Features and Benefits

When glass coated with Neat® is used on the exterior of a window, the window will stay cleaner longer and be easier to clean when compared to uncoated glass.

Surfaces with high water contact angles are termed "hydrophobic". Surfaces with low water contact angle are termed "hydrophilic". Although to date there are no industry standards on what is considered to be a hydrophobic or a hydrophilic glass surface, at lower contact angles, i.e. 25º and below, water sheets. At high contact angles, water beads up.

Uncoated glass surfaces typically are hydrophobic, causing water to bead up on the glass. The sheeting action of Neat® allows dirt to rinse from the glass surface rather than dry in highly visible ringlets or water marks. The beading up of water on uncoated glass and sheeting action of water on Neat® coated glass is shown in Fig CG04-01 through CG04-04.

Neat® must receive radiation from UV light to become hydrophilic and break down contaminants on the surface. The UV radiation can be from direct or indirect sunlight.

Neat® performs well in all environments, whether dry, humid, cold or warm. The decomposition time will vary with the amount of UV radiation (solar intensity, variations in cloud cover, sun angle, length of daylight) and amount of contaminant.

Additional factors that could affect/delay the benefits of Neat® are:

- Screens
- Elevations/orientations
- Vegetation
- Volatile Organic Compounds (VOC's)
- Inorganic chemicals (like silicones)

Accelerated UV and condensation exposure testing indicate that sheeting and photoactivity of Neat® should continue after 15 years of exposure.

Fig CG04-01 Beading Up of Water (High Contact Angle)

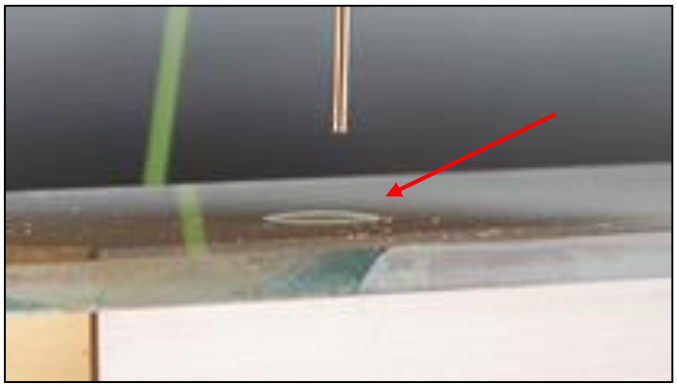

Fig CG04-02 Sheeting of Water (Low Contact Angle)

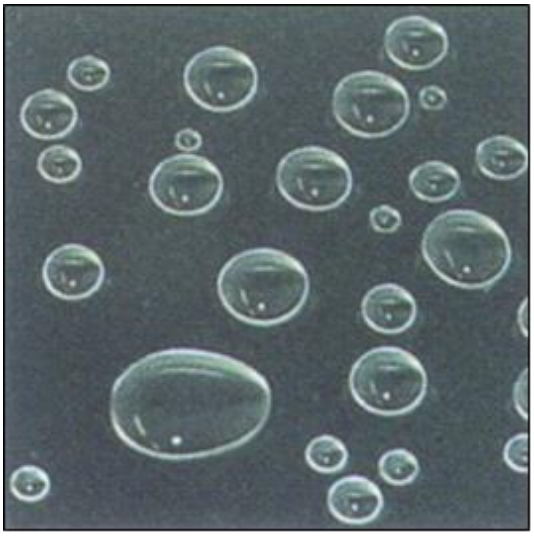

Fig CG04-03 Hydrophobic surface, uncoated glass

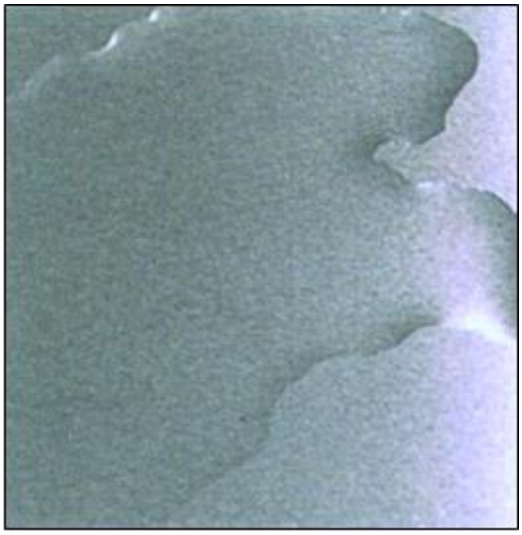

Fig CG04-04 Hydrophilic surface, Neat® coated glass

Fig CG04-06 Silicone glazing residue causing picture framing (beading of the water due to silicone residue)

Neat® decomposes:

- Organic materials (pollens, resins, oily fingerprints and other organic pollutants). Thick layers may be partially decomposed, loosened and then rinsed away with water.
- Vapor contamination from many sealants, i.e. Dow Corning 1199, GE Silglaze, Novagard, Novaflex, Dow Corning 9-1350 and Dow Corning 3-0117.

Neat® does not:

- Decompose thick contaminations, like silicone (cured or glazing residue), paint, stain, etc.
- Stop bleeding around the edge of a window which can cause moisture picture framing around the perimeter (Fig CG 04-06). This isn't unique to Neat® and occurs on uncoated glass as well. Windows with a bed of silicone to adhere the glaze the glass on the outdoor #1 glass surface can result in a narrow residue area of higher contact area around the perimeter of the glass. This perimeter area can extend into the vision area approximately 1" to 3" from the edge of the window

Neat® provides a much smoother glass surface when compared to pyrolytic photoactive coatings as shown by photomicrographs in Fig CG04-05.

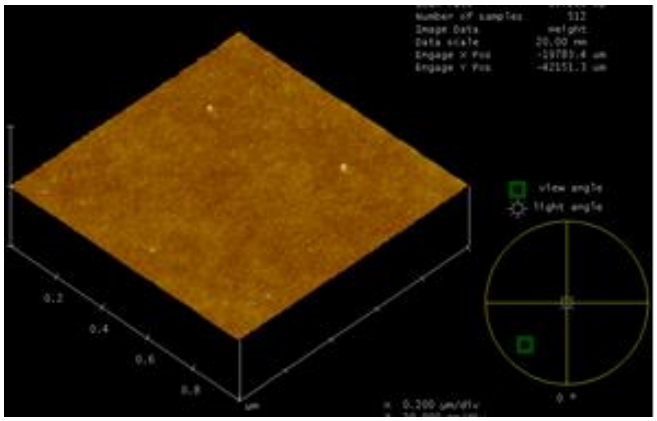

Fig CG04 Roughness of Neat® surface

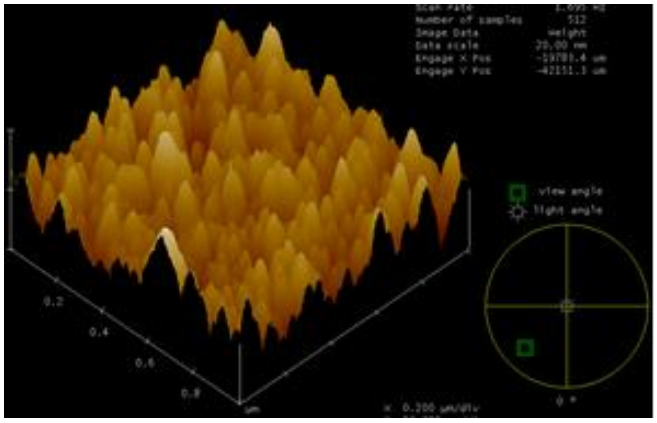

Fig CG05 Roughness of a typical pyrolytic photoactive

Neat® is easier to clean since less force or “elbow grease” is needed. The results of a friction test showed Neat® required 80% less force to wipe compared to uncoated glass.

Neat® is more conductive than uncoated glass. This inhibits the buildup of static electricity that can attract dust and debris to the surface of the glass. This anti-static property does not require UV light, keeping the glass cleaner than uncoated glass regardless of how shaded the windows are. An independent lab test showed a reduction of 34-44% in dust on the window when compared to uncoated glass.

Recertification for NFRC testing of Neat® used in windows is not required because Neat® does not affect the following:

- Outdoor or Indoor reflectance
- Visible transmittance
- Solar Heat Gain Coefficient (SHGC)
- U-Factor
- Color

None of Cardinal’s LoĒ® coatings will have a change in performance with Neat®. LoĒ²-272® for reference.

	LoĒ²-272®	LoĒ²-272® w/Neat®
Visible Trans:	72%	72%
Visible Out:	11%	11%
Solar Out:	35%	35%
SHGC:	0.41	0.41
U-Factor:	0.25	0.25
ISO Damage:	55%	55%
UV Trans:	16%	16%

• Data is for center of glass
• IGU Construction 3mm Coated / 11.5mm 90% Argon / 3mm Clear
• Simulated with LBNL Window program

Neat® has been tested for over 4,000 hours in a carbon arc ISO standardized test. After this test, the contact angle remained at or below 20 degrees. 4,000 hours in this test is predicted to be equivalent to 13 years of field exposure.

Processing Neat® Glass

Neat® can be tempered and heat strengthened.

When fabricating IG units with Neat®, Cardinal recommends that the pH of the wash water be as neutral as possible and not be below 5.5.

Neat® should be placed in the IG unit washer with the Neat® coated surface down and the LoĒ coated glass surface up and away from the rollers in the washer.

When glazing, care should be taken to avoid direct sealant contact to the Neat® surface, except as required in the glazing area.

For grilles that are adhered to the #1 glass surface with a PSA glazing tape (as shown in Fig. CG04-07), the grille tape manufacturer should be contacted for recommendations on adhering grilles to the Neat® surface.

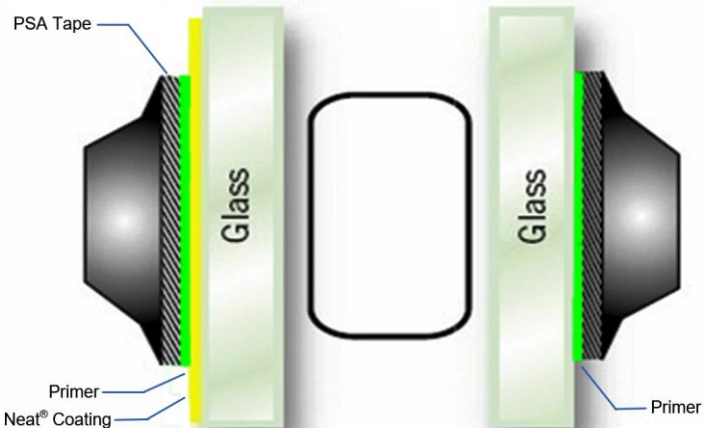

Fig CG04-07 Grilles adhered to Neat® coated glass.

Cleaning Neat® Coated Glass

When Neat® is installed in a window in the field, normal glass protection should occur to reduce the opportunity for building materials (i.e. stucco, paints, stains, etc.) used at the job site from contacting the glass surfaces. Thick deposits or layers of these materials will not be removed by the photocatalytic action of Neat®.

No special cleaning requirements are necessary to clean Neat®. Standard cleaning solutions such as a soap solution with clean water or standard window cleaning products can be used. As with standard glass products, if a squeegee is used to clean the glass, the squeegee should not have exposed metal edges as the metal edges could scratch the coating or glass itself.

As with non-coated glass products, metal blades should not be used as they may scratch Neat® coated glass just as they will scratch any glass product. Clean Neat® glass on a regular schedule as needed. In most applications this will be needed less frequently than without Neat®. However, in areas where rainfall does not reach the surface, Neat® cannot rinse clean.

Hard water deposits can still be visible on Neat® coated glass although less visible than on uncoated glass. These deposits can be reduced after contact with rain or washing. Sprinklers should be adjusted to prevent water contact with the coating.

Neat® and Preserve® Coated Products

Cardinal Preserve® is a protective film used on the exposed glass surfaces of IG units. Cardinal IG Company owns several patents relevant to Preserve® film.

Neat® is compatible with the Preserve® protective film used on Cardinal glass products. The Preserve® film protects the glass surfaces during shipping, window fabrication, handling and installation and from debris to which the glass is exposed on the jobsite.

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