

Residue on Glass

The glass cleaning recommendations in this document are offered by Vitro (formerly PPG Industries) for specific projects with severe residue and dirt build-up and should not be used as standard cleaning procedures.

Glass

For over two thousand years, the lustrous, hard and inert characteristics of glass, coupled with its transparency, have made it one of the world's most desirable and used building materials.

Glass has been successfully used in the construction industry for many years on thousands of projects involving billions of square feet of glass.

NO VITRO GLASS, BY ITSELF, EXUDES, LEACHES OR BLEEDS ANY RESIDUE OR STAIN CAUSING MATERIALS.

Runoff and Glass Damage

When water reaches a building, it is reflected, absorbed into the building materials, or allowed to run down the façade. When this water is permitted to run down over masonry, sealants, and other building materials, and onto the glass, the water can carry with it contaminants that may react with and adhere to the glass surface. These contaminants could lead to a residue that is difficult to remove, a stain that cannot be removed, or the chemical attachment of certain minerals to the glass surface.

The following paragraph was excerpted from Metal Curtain Wall, Window, Store Front and Entrance, Guide Specifications Manual published in 1976 by Architectural Aluminum Manufacturers Association.

"Glass may be damaged, etched or stained by a number of materials typically used at a job site. Surface damage may be caused by weld splatter and wind-blown debris. Alkaline materials such as concrete wash off and certain cleaning agents

may chemically attack the glass surfaces. Rust (iron oxide) will not usually deteriorate the glass surface, but may be very difficult to remove. Silicone concrete sealing materials can discolor glass surfaces; it is a good practice to protect glass surfaces whenever practical during construction of the building. Special attention should be paid to single-glazed reflecting glasses. These are not any more susceptible to damage than uncoated glasses. However, scratches and other damage to the coating are more noticeable."

Silicates

While the above paragraph is generally true, it contains some information that deserves clarification. It states that alkaline materials such as concrete wash off may chemically attack the glass surfaces. What actually happens is this: When rainwater makes contact with a concrete surface, small amounts of silicate material dissolve into the water. If these dissolved silicate solutions are allowed to dry on glass in the building, the result is a tenacious, water-insoluble deposit that is chemically bonded to the glass and resists conventional cleaning agents. The chemical bond occurs as quickly as evaporation to dryness occurs, and is as likely to occur in mid-winter as other seasons. With repeated run down and evaporation of silicate solutions the permanent deposits can build up and become quite unsightly.

Masonry

Staining, and, etching of glass can result from substances released from concrete facades and concrete window frames. Rainfall can permeate concrete, then leach alkaline materials from it, and deposit them on the glass. In some instances, this may cause surface staining and etching.

Concrete frames at window heads should be designed so that any runoff is directed away from the glass. Edge drips and a second drip, as another line of defense, should be provided. Pre-

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cast panels and all other concrete for outdoor walls should be processed for thorough mixing, full hydration, and complete curing. Concrete surface treatments (with acid, sandblasting, bush-hammering, grouting, waterproofing, etc.) must be completed before glazing begins; any loose particles resulting from these operations should be removed by normal wash, rinse, and dry cleaning.

It is essential that these surface treatments be completed prior to glazing. Vitro's experience verifies that if these surface treatments are performed while glass is in place, the risk of permanent damage to the glass is great, and complete replacement is usually the only practical remedy for damaged glass.

Glass should be examined at least monthly during construction when it is installed adjacent to or below concrete or other masonry surfaces that are exposed to weather. When inspection reveals dirt, scum, and other deposits or staining, glass should be immediately washed.

Sealants

Organic sealants used in today's glazing systems may exude, bleed, or leach solvents, oils and/or plasticizers, etc. under normal weathering conditions.

Depending on the type of sealant used and the weathering conditions encountered, residue from sealants can vary dramatically in content, degree, and the time period over which the residue continues to exude from the sealant. Generally, the degree of residue from sealants will diminish asymptotically over time.

In the great majority of projects, frequent cleaning of glass will remove deposits or residue using normal wash and rinse glass cleaning methods.

When residue from sealants is allowed to remain in contact with glass surfaces over a long period of time without frequent washing of the glass,

the residue may become tenaciously bonded to the surface of the glass due to normal weathering. If the residue is permitted to have a long residence time, very costly cleaning techniques may be required to remove the residue from glass surfaces.

Due to exuding, leaching or bleeding, sealants need not necessarily be in direct contact with glass to produce a residue on glass. Residues from metal expansion joint sealants, parapet sealants, and metal and masonry weather-sealants, may still run down and deposit on the glass surfaces, either by gravity or through the action of rain.

On projects where residue build-up from sealants has occurred, it cannot be Vitro's responsibility to analyze these residues to determine their source, nature or composition. Because there are so many sealants available in the construction industry, Vitro cannot effectively analyze them all, or comment on their performance or recommend their use.

Metals

Weathering steels, for example, release oxides while "aging". These oxide deposits should be removed from glass by regular cleaning methods initiated early during construction. If the metal oxides are permitted to wash over glass and are permitted to accumulate, they can leave a deposit that is tenaciously adhered, requiring costly cleaning techniques to remove the residue from the glass surface.

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Glass Fabrication Processing Marks

Window fabrication and installation practices utilize many means to process, store, and install the glass. These means are generally used to prevent glass to glass contact or glass damage from occurring, and to safely handle the glass either manually or automatically. These means may include but are not limited to the use of separator pads, conveyor belts, conveyor rollers, brushes, the use of suction cups, etc. While the use of these devices during the fabrication and installation process does not leave a visible residue on the glass surface, they do change the surface condition of the glass which could provide for a visual appearance under certain conditions. For example when water would bead up on the glass surface from either condensation, cleaning or rain, the outline of the processing contact may become visible. The different water beading patterns can create an outline with distinct lines of demarcation which can take the shape of the device that had previously contacted the glass surface in this area.

While this appearance would be noticeable under certain conditions, it does not affect the functionality, performance, or longevity of the glass. It is possible that this condition could dissipate over time with normal exposure to the elements and regular glass cleaning. It may be possible to immediately minimize or remove the surface differences present by following the cleaning procedure in Attachment C. Use caution with this cleaning method, test a small area first, as glass scratching may occur if light pressure is not used.



Photo Above shows an installed window with heavy condensation on Glass. Different patterns are visible within the condensation including the outline of a Vacuum Cup mark which may have been used to handle the glass during fabrication or installation. There are no visible marks present on this glass in the absence of condensation.



Photo Above shows an installed window with heavy condensation on Glass. Different patterns are visible within the condensation including the outline of separator pad marks on glass. As above there are no visible marks present on this glass in the absence of condensation.

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Cleaning Recommendations

In situations where residue build-up or processing marks may have occurred, building owners and building maintenance supervisors may wish to consider cleaning procedures as indicated in Attachments A, B, and C. Cleaning procedures in Attachments B and C are intended for evaluation by building owners and maintenance supervisors and should be conducted on a selected sample (5 to 10 lites) of glass to determine: (1) their effectiveness and (2) estimated costs.

The cleaning procedures shown on Attachments A, B, and C can be recommended, evaluated, and used on Vitro products with non-low-e coated surfaces. This would include all Vitro clear and tinted products, monolithic *Solarcool*[®] or *Vistacool*[®], and any IG units with Vitro *Solarban*[®], *Sungate*[®], *Solarcool*[®], *Vistacool*[®] coatings facing the airspace of the IG unit.

The indicated glass cleaning procedures have been successfully demonstrated on projects having a rundown residue. However, if the cause of the residue deposit on glass is not corrected, it is likely that recontamination and residue build-up will recur.

After evaluation of these cleaning methods, their costs and effectiveness, it may be found that the only practical remedy for tenaciously bonded residue on glass surfaces is replacement of glass and modification of the glazing system to avoid recontamination.

Design Recommendations

Early in the design stage, architects should consider glazing details designed to avoid water run-off onto glass surfaces. The use of reveals, splays, flashing, drips, etc. from sealants, masonry or metals can minimize run-off and avoid the deposition of residue onto the glass.

Location of water sprinklers in relation to glass surfaces should also be considered early in design. Direct or windblown hard water spray from water sprinklers can produce tenaciously bonded inorganic residues on glass surfaces. If spraying is repeated and/or wet, dry spray cycles are permitted to remain in contact with glass surfaces, for even short periods of time, costly cleaning procedures such as those recommended in Attachment C may be required.

Extended periods of cyclic water spray without frequent cleaning of glass may allow residue build-up to develop which cannot be removed by cleaning procedure in Attachment C. Glass replacement may be the only practical remedy.

Well-designed glazing surrounds that minimize run-off, combined with a review and recommendations from responsible material suppliers, will help eliminate residue build-up. Long-term beauty and performance of glass surfaces that architects and owners have reasonably come to expect over the centuries will thereby be assured.

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**For detailed cleaning procedures
See the following ATTACHMENTS A, B, and C**

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ATTACHMENT A

Recommended Standard Glass Cleaning Procedure

1. Apply mild soap, mild detergent, LEPTYNE®* solvent, xylene, toluene, mineral spirits or naphtha solvents to glass either by spraying or using a clean, grit-free cloth or sponge saturated with cleaning solution. Complete coverage of area to be cleaned is a necessity. For ease in cleaning, an area not exceeding 10 to 15 square feet is recommended. When using solvents, be careful not to damage glazing or insulating unit seals by overgenerous application of solvent. In addition, comply with solvent manufacturer's directions on label for toxicity, handling and flammability warnings.
2. Wipe the above cleaning solutions on the glass in a circular motion, applying light to moderate pressure; Approximately 3 to 5 passes of the affected area may be required to remove the residue. Fewer or more passes may be required, depending on the adhesion and severity of the residue.
3. Rinse the glass surface immediately with generous amounts of clean water, removing the cleaning solution from the glass surface.
4. Using a squeegee or clean, lint-free dry cloth, remove water from the glass surface.
5. If glass residue is still evident, repeat steps 1, 2, 3, and 4.

Important Notes:

1. Do not clean glass when glass is exposed to direct sunlight.
2. Glass should be cleaned by starting at the top of the building, systematically working down to glass installed on lower levels. This technique reduces the possibility of residue and cleaning solution rundown on glass previously cleaned.

*LEPTYNE® is a registered trademark of PPG Industries, Inc.

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ATTACHMENT B

Recommended Glass Cleaning Procedure with RD-10 Detergent

For Evaluation by Building owner or Maintenance Supervisor

1. Make a solution of RD-10 detergent and water, 1 part by volume RD-10 to 5 parts tap water.
2. Apply RD-10 solution on glass by spraying, or using a hand pump spray bottle. Using a soft damp cloth lightly spread the RD-10 water solution over an area of 10 to 15 square feet. Complete coverage of area to be cleaned is a necessity. For ease in cleaning, an area not exceeding 10 to 15 square feet is recommended.
3. Leave RD-10 solution on glass for 30 seconds to 1 minute.
4. With a damp, clean lint-free cloth, wipe the RD-10 solution on the glass-in a circular motion, applying light to moderate pressure. Approximately 3 to 5 passes of the affected area may be required to remove the residue. Fewer or more passes may be required, depending on the adhesion and severity of the residue.
5. Rinse the glass surface immediately with generous amounts of water, cleaning off all RD-10 solution from the glass.
6. Using a squeegee or clean lint-free dry cloth, remove water from the glass surface,
7. If glass residue is still evident, repeat steps 2, 3, 4, 5, and 6.

Important Notes:

1. Do not clean glass when glass is exposed to direct sunlight.
2. Glass should be cleaned by starting at the top of the building, systematically working down to glass installed on lower levels. This technique reduces the possibility of residue and cleaning solution rundown on glass previously cleaned.

RD-10 detergent can be obtained from:

The Rockland Corporation
12215 E. Skelly Drive
Tulsa, Oklahoma, 74128
(918) 437-RD10

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ATTACHMENT C

Recommended Glass Cleaning Procedure with Cerium Oxide

For Evaluation by Building Owner or Maintenance Supervisor

1. If using Cerium Oxide powder, make a paste with the Cerium Oxide and water approximately 3 parts Cerium Oxide to 1 part water.
2. If using the Cerium Oxide paste, use the paste directly from the container.
3. Using a clean, lint-free cloth, wipe the Cerium Oxide paste on the glass in a circular motion with light pressure (two to four pounds). Cerium Oxide is an abrasive and, therefore, scratching could result if light pressure is not used. For ease in cleaning, an area not exceeding five square feet is recommended. Approximately three to five passes of the affected area may be required, depending on the adhesion and severity of the residue.
4. Rinse the glass surface immediately after Cerium Oxide cleaning with generous amounts of clean water, removing the Cerium Oxide paste from the glass
5. Using a squeegee or clean, lint-free dry cloth, remove water from the glass surface
6. If glass residue is still evident, repeat steps 3, 4, and 5
7. For evaluation of fabrication processing marks, lightly mist the surface with clean water. If marking is still evident, repeat steps 3, 4, and 5.

Only optical grade Cerium Oxide should be used, which can be obtained from chemical supply companies. A source for Cerium Oxide is:

1. Universal Photonics, Inc.
85 Jetson Lane
Central Islip, NY 11722
(516) 935-4000
Powder Part Number BA2018NS - Unicer 18, (1pound package - Powder)
Paste Part Number BA2018PASTE – Unicer 18, (1pound container – Paste)

Important Notes:

1. Do not clean glass when glass is exposed to direct sunlight
2. Recommended to clean glass by starting at the top of the building, systematically working down to glass installed on lower levels. This technique reduces the possibility of residue and cleaning solution rundown on glass previously cleaned.

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HISTORY TABLE		
ITEM	DATE	DESCRIPTION
Original Publication	11/30/1981	
Revision #1	1/10/2002	Revised & transferred to TD-107
Revision #2	11/6/2006	Added Glass Fabrication Processing Marks section and pictures.
Revision #3	10/4/2016	Updated to Vitro Logo and format
Revision #4	1/4/2018	Updated Cerium Oxide source in Attachment C, removed reference to SG300 and SG500 on page 4.

This document is intended to inform and assist the reader in the application, use, and maintenance of Vitro Flat Glass products. Actual performance and results can vary depending on the circumstances. **Vitro makes no warranty or guarantee as to the results to be obtained from the use of all or any portion of the information provided herein, and hereby disclaims any liability for personal injury, property damage, product insufficiency, or any other damages of any kind or nature arising from the reader's use of the information contained herein.**