

EcoArmor™ Protective Coating

This document explains the EcoArmor™ protective coating and is intended to provide guidelines for the glass fabricator to successfully process Solarban® Temperable Low-E coated glass with EcoArmor™. Select Solarban products such as Solarban 60VT, Solarban 70VT, Solarban 72VT, Solarban R77VT, Solarban 90VT and Solarban R100VT will now be available with EcoArmor™. The recommended procedures for proper processing of Solarban Temperable coated glass are described including storage, safety, and sound environmental management. This document does not cover any Solarban Temperable coated Low-E glasses that are protected by Temporary Protective Film (TPF) or Temporary Protective Overcoat (TPO™). Those protective products are covered under separate Vitro technical documents.

General

EcoArmor™ is a continuous full surface coating that is applied to select Solarban Solar Control Low-E coated glasses. The EcoArmor™ protective coating is designed to protect the Solarban coating during transportation and subsequent fabrication through heat-treatment at the fabricator. It is applied to the coated surface shortly after the Solarban coating is deposited onto the glass. Glass that is coated with the EcoArmor™ coating will have a hazy or matte appearance prior to heat-treatment.

EcoArmor™ is fabricator friendly. It is easy to process and simply burns off in the heat-treatment furnace resulting in no labor or waste stream. The protective coating accelerates the heating of the coated glass and results in a more efficient heat-treatment process with reduced heating time.

EcoArmor™ is a non-toxic coating that does not contain any harmful ingredients. It will provide surface protection from mechanical damage, protecting against coating scratches due to improper handling and inadvertent contact of the coated glass until the protective coating is burned away in the heat-treatment oven. The EcoArmor™ protective coating burns off cleanly leaving no residue or odor. It is a significant advancement in temperable MSVD coated glass surface protection.

EcoArmor™ does not alter the performance characteristics of the base glass substrate or the high-performance Solarban coating. Glass fabricators should note that Vitro Solarban with EcoArmor™ does process somewhat differently through the fabrication process. These guidelines are intended to be a starting point and specific process parameters may require further optimization depending on the characteristics of a given heat-treating process and equipment.

In general, EcoArmor™ coated low-E glass can be stored and processed in a manner consistent with any Vitro low-emissivity MSVD coated glass. Detailed MSVD processing recommendations are outlined in Vitro's *MSVD Temperable Low-E coated Glass Manual for Vitro Certified™ Network and Vitro Authorized™ Supplier Members* and is available from Vitro's Architectural Glass Technical Services. A copy is also available on the *Vitro Certified™ Network* members only website.

Health & Safety:

Solarban Temperable coated low-E glass with Vitro's EcoArmor™ coating does not present any significant health and safety hazard over other coated products. Proper personal protective equipment including eye protection and cut resistant gloves, cuffs, and apron should be used when handling glass. Vitro field representatives can provide suggestions for types of equipment available. A Vitro Architectural Glass Safety Data Sheet (SDS) on this product is available for your reference.

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Storage

Storage of the product must be indoors away from exposure to the elements and in an area where acid fumes from sources such as de-mineralizers, acid storage, batteries, etc. cannot affect the coating. As with all Magnetron Sputtered Vapor Deposition (MSVD) products, exposure of *Solarban* Temperable coated low-E glass to high humidity or direct water contact during storage should be avoided. There are no special handling or storage requirements that have been identified for this product. Low E slings are recommended for handling all *Solarban* products but are not required for handling *EcoArmor*™ products.

Unintentional or inadvertent moisture contact with the coating may happen in a variety of ways. These include but are not limited to the formation of condensation on the glass surface due to various temperature and humidity levels encountered during glass transportation and storage. *EcoArmor*™ is not water soluble and should not be impacted by minor inadvertent moisture contact; however, the presence of surface moisture may cause multiple glass sheets to adhere and make single lite free fall difficult. When surface moisture is present, Vitro recommends that the container be set aside until the glass surface is dry in order to limit the potential of multiple lites sticking together.

EcoArmor™ may appear to have surface damage (scratches, pitting, etc.) which is not a concern unless the damage extends down through the *Solarban* coated surface. Therefore, close inspection of this glass during processing should be done to identify if there is any coated surface damage.

Handling:

No special handling guidelines have been identified but Vitro suggests avoiding all unnecessary contact with the coated glass surface.

Cutting:

EcoArmor™ coated low-E glass can be cut using conventional scoring and breakout equipment. Cutting is very similar to cutting TPF protected coated glass.

Although cutting fluid is not required when cutting through the coating, cutting fluid SHOULD still be used to lubricate the cutting wheel and achieve the optimal scoring of the glass. Any of the cutting fluids on the approved list can be used with *EcoArmor*™ coated low-E glass. Excessive cutting fluid should be avoided so that it will not run down the glass when it is placed in a vertical position. See TD-149, *Acceptable Cutting Fluids and Detergents for use with Vitro's MSVD Sungate® and Solarban Coated Glass Products* for a list of acceptable cutting fluids.

Results from fabrication trials of *EcoArmor*™ protective coating indicate that a regular grind cutting wheel is optimal for cutting the *EcoArmor*™ and scoring the glass consistently and achieving a high-quality edge. Serrated cutting wheels can be used if desired. See TD-119, *Guidelines for Glass Scoring and Breakout Quality* for additional information and recommendations regarding conventional glass cutting.

The Suggested cutting parameters for glass with *EcoArmor*™ are similar to glass with TPF protection namely a 5-10° sharper wheel (lower angle value) than uncoated or un-filmed glass. Pressure may also have to be increased by 5-10 lbs. especially as the cutting wheel wears. Cutting speed also affects the cut/score and each parameter may need to be altered to achieve the best result for particular cutting equipment and process.

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- A 130°-135° cutting wheel for 6mm glass with *EcoArmor*™ protectant and 5-10 lbs. additional pressure over uncoated or un-filmed glass. (typically, in the range of 12-20lbs)

The cutting speed plays an important role in the amount of pressure that could be necessary to achieve good cut edge quality. Slower cutting speeds will require more pressure than was recommended above and faster speeds could require less pressure depending on the machine and other parameters.

The cutting wheel may need to be changed more frequently to achieve optimal results.

All adjacent score lines should cross so that the coating is completely cut through allowing the glass to breakout and separate properly.

Vitro recommends a minimum 1" trim in order to properly breakout the glass with *EcoArmor*™.

Note: These guidelines are suggested starting points and further adjustments may be needed to optimize the cutting and break-out results for your specific cutting machine and process setup. As always, the cut edge quality should be visually inspected for excessive chips, sharks teeth, and other defects that will affect the glass strength and appearance.

Deletion:

Solarban Temperable coated low-E glass must be edge deleted. *EcoArmor*™ coated low-E glass can be edge deleted using conventional deletion equipment. Deletion is very similar to deletion of TPF protected glass.

Post heat-treatment automated edge deletion on the IG line is recommended for *EcoArmor*™ coated glass, as this approach addresses edge deletion near the final steps in the fabrication process and will result in the least amount of edge kink from tempering.

Manual edge deletion table and hand-style edge deletion may also be performed post-furnace. Consider the following deletion wheels:

- 3M Scotch-Brite™ SST Unitized Wheel
- Norton Bear-Tex Convolute Wheel
- Edgeworks 607-8783-LPX (more aggressive wheel)

Edge deletion performed at the automated cutting system is also achievable and can obtain good results. A more aggressive abrasion wheel such as Edgeworks 607-8783-LPX that is used for TPF protection may also be required when edge deleting through the *EcoArmor*™ protective coating. Increased frequency of dressing the deletion wheel to remove residue buildup may also be required.

Regardless of the approach used, fabricators must assure that the edge deletion process completely removes the conductive silver layer(s) of the coating, that the width of the deletion is sufficient (coating covers no more than 50% of the PIB seal) but doesn't encroach into the vision area (sight line) of the unit, and that the deletion band is aesthetically acceptable for structural glazing units as applicable.

For more specific information regarding edge deletion, see TD-141, *Edge Deletion of Vitro Coated Glass*.

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Seaming:

EcoArmor™ coated low-E glass can have the glass edges seamed using conventional seaming equipment. Seaming will be similar to that of other Vitro Products. Dry seaming is the preferred and recommended method of seaming glass with *EcoArmor™* but Wet seaming is also acceptable. If wet seaming is used, ensure that none of the seaming liquid is allowed to dry on the glass. The optimal seaming belt abrasive is 120 grit.

Washing:

EcoArmor™ coated low-E glass can be washed using standard float glass washer settings and low-e type brushes are still preferred. Good washer practices should be followed including Total Dissolved Solids (TDS) of the final rinse should be maintained below 20ppm.

The *EcoArmor™* coating is not water soluble and will not dissolve in the washer. The coating will still have a hazy or matte appearance after washing and there may be an appearance of minor surface damage (scratches, pitting, etc.) which is not a concern unless the damage extends down through the *Solarban* coated surface. Therefore, close inspection of this glass during processing should be done to identify if there is any coated surface damage.

Wash water detergents on the approved list may be used similar to other *Solarban* products. See TD-149, *Acceptable Cutting Fluids and Detergents for use with Vitro's MSVD Sungate and Solarban Coated Glass Products* for a list of acceptable detergents.

Note: At no time should any portion of the glass be allowed to stop inside the washer.

Even if water, brush rotation, and air-knife blower(s) are programmed to stop, there is a significant risk that some of the *EcoArmor™* coating will peel off of the glass if glass is stopped in the washer. The *EcoArmor™* may begin to bunch up on the surface as it peels off and will eventually break free from the glass. It does not dissolve in water and really doesn't break apart so there will be very thin pieces (like Saranwrap) in the washer. These pieces may get stuck on rolls or brushes and may be there until the washer is cleaned.

When the coating peels it may look similar to an action of a partially peeled sticker where it tears diagonally with a jagged edge pattern towards the center with some exposed areas of the *Solarban* coating and some not exposed areas. Where the *EcoArmor™* has peeled the low-e coating will be exposed and is susceptible to damage. Areas that have peeled and there is no bunching of the *EcoArmor™* coating can still be processed as long as there is no damage to the low-e coating; however, if the *EcoArmor™* has bunched up and there is a buildup of the *EcoArmor™* coating, these lites should be discarded because it will leave a rejectable mark after tempering. Again, no low-e coated glass should be stopped in the washer.

Heat Treating:

Solarban Temperable coated low-E glass with Vitro's *EcoArmor™* coating must be heat strengthened or fully tempered. The heating process will remove the *EcoArmor™* coating which will burn off cleanly in the heat-treatment furnace leaving no residue. There will not be any evidence of the coating burning off such as flames/fire, odors, or fumes.

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The *EcoArmor*™ coating allows for a more efficient heat-treatment process as it allows the low-e coated glass to heat up faster than glass without this coating. Vitro recommends starting with your current recipe and cycle time for similar coated glass products of comparable sizes. Due to the absorbing nature of this coating, more than likely some level of adjustment will be needed to reduce the cycle time to obtain good distortion quality results and prevent overheating. Results from fabrication trials indicate that the cycle time can be reduced by 15-20% for similar coatings.

The picture framing effects of heating glass that has been edge deleted before heat treatment may become more obvious with this product. Vitro recommends that if the option exists, to edge delete after the furnace.

Obviously, refinements will be made by the furnace operator as they gain experience with this product as it processes through the fabricator's specific equipment. The final tempering/heat strengthening recipes will, as always, reflect the setting required to produce a quality product that satisfies the requirements of either heat strengthening or fully tempered as defined in ASTM C1048, as well as the particle size requirements of fully tempered glass approved for safety glazing, while maintaining acceptable distortion characteristics.

The *EcoArmor*™ coating will be completely removed during the heat-treating process. The hazy or matte appearance of the Eco coating will be replaced by the typical Solarban coating appearance. MSVD Low-e coating will now be susceptible to surface damage and all necessary handling precautions must be taken..

Recycling:

Any discarded *Solarban Temperable* coated low-E glass has value as a recycled material. This glass article is not "hazardous" as defined by federal Resource Conservation and Recovery Act (RCRA) or applicable state regulations. It is recommended that the material be recycled through established commercial glass cullet markets. Where markets are available, recycling will offer the most cost-effective method of management. As an alternative to recycling, arrange for proper disposal, complying with applicable Federal, State, and local regulations.

Disposal:

The disposal of glass with the *EcoArmor*™ protective coating does not present any additional health or safety hazard.

A. Cullet:

Solarban Temperable coated low-E glass has a MSVD coating containing silver on one surface. This glass article is not "hazardous" as defined by federal Resource Conservation and Recovery Act (RCRA) or applicable state regulations. If the material is discarded, abraded, or otherwise becomes waste, the resulting waste/recycle stream should be tested for RCRA hazardous characteristics. The test that is required to determine whether there is enough silver for the waste to be "hazardous" is the "Toxic Characteristic Leachate Procedure" or TCLP test. In this test, a small representative sample of the cullet is placed in a mildly corrosive liquid for a specified period and then analysis is performed on the liquid to measure how much of the silver metal has "leached" out. If silver in the leachate exceeds 0.05 mg / liter, then the material should be managed as a "RCRA" hazardous waste for storage and disposal purposes.

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B. Deletion Dust:

Edge deletion dust may contain sufficient amounts of metals to be “hazardous” as defined by federal or state waste regulations. If the silver containing dust is recycled in a manner to recover the precious metals, it is exempt from portions of the RCRA regulations. Large amounts of silver containing dust may be processed to recover its silver content. Precious metal recyclers are listed on the Internet or in the business pages of large metropolitan areas. Smaller amounts of glass deletion dust may be recycled with other broken glass cullet. After exhausting recycling options, it may be necessary to dispose of deletion dust in a landfill. Contact a local landfill that manages industrial, special, or hazardous waste. They will provide guidance, including where to have the material tested, if necessary. Vitro Architectural Glass does not recommend commingling the deletion dust with municipal (household) trash for disposal.

SUMMARY:

When *Solarban Temperable* coated low-E glass is stored, handled, or processed it presents minimal safety, health, or environmental issues. The *EcoArmor™* coating does not present any significant health or safety hazard. The *EcoArmor™* coating will provide protection to the coated surface until it is burned off during heat treatment.

Additional Information:

Every effort has been made to ensure the accuracy of the information in this document. This information is intended to assist in the proper application and use of *Solarban* coated glass with *EcoArmor™* and does not constitute a warranty of this product for any particular purpose.

If you require additional information or technical support with this product or any other flat glass products, please contact your Sales Representative or the Technical Service Group at 412-820-8500.

HISTORY TABLE		
ITEM	DATE	DESCRIPTION
Original Publication	01/21/2022	Initial Release

This document is intended to inform and assist the reader in the application, use, and maintenance of Vitro Architectural 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.