

Temporary Protective Overcoat™ (TPO™)

This Bulletin applies to the processing of all Solarban® Temperable coated Low-E coated glasses by Vitro Architectural Glass which contains a Temporary Overcoat™ (TPO™) surface protection coating. This includes but is not limited to products such as SB60VT, SB70VT, SB72VT and SBR77VT that contain TPO. This does not include any Solarban Temperable coated Low-E glasses that are protected by film (TPF). The recommended procedures for proper processing of Solarban Temperable coated glass are described including storage, safety, and sound environmental management.

General

Solarban Temperable Low-E coated glass contains a *Temporary Protective Overcoat* for surface protection that is a non-toxic, water-soluble, polymer coating that provides protection from mechanical damage, such as handling scratches.

This coating and its Temporary Protective Overcoat surface protection layer, also referred to as TPO coating, was a significant advance in glass surface protection. The TPO coating will provide surface protection to the surface until it is washed off.

The TPO coating does not alter the performance characteristics of the base substrate or the coating. Prior to heating *Solarban Temperable* coated low-E glass, it is a necessary to remove the TPO coating from each glass lite by washing the glass. Removal of the coating will produce a wash water that requires proper management and recycling and/or disposal.

Storage

Storage of the product must be indoors away from exposure to the elements. 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. The TPO coating, being water soluble, will be partially or completely removed if exposed to direct moisture. Once the TPO surface protection has been exposed to direct moisture it will no longer provide the same level of protection to the underlying MSVD coating.

Unintentional or inadvertent moisture contact with the TPO 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. As stated above, direct moisture contact will partially or completely remove the TPO in the areas contacted. This will not alter or damage the MSVD coating. However, in areas where the TPO coating has been removed, all normal Low-E handling procedures must be followed including the use of Low-E gloves. 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.

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Processing

With the considerations noted below, *Solarban Temperable* coated low-E glass can be processed in a manner consistent with any low-emissivity MSVD coated glass. General 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. Handling - Pre-Washer:

Handling *Solarban Temperable* coated low-E glass, with wet gloves or other wet articles should be avoided. Once the TPO coating has been exposed to direct moisture it will no longer provide the same level of protection to the underlying MSVD coating.

B. Cutting:

The coated low-E glass can be cut using conventional scoring and breakout equipment. It is a requirement that the cutting wheel have a cutting angle of 140° or less. A 134° or 138° cutting wheel can be used to process most 2.5 to 6.0mm thickness glass products.

C. Deletion:

Solarban Temperable coated low-E glass must be edge deleted. The MSVD coating can be edge deleted before or after washing off the TPO coating. If the coated low-E glass is deleted prior to washing, care must be taken to ensure that both the TPO coating and the underlying coating are completely removed in the deleted area.

D. Seaming:

Solarban Temperable coated low-E glass can be edged with conventional seaming equipment. Care needs to be exercised by the operator to not contact any portion of the MSVD coating where the TPO coating has been inadvertently or prematurely removed.

E. Washing:

When the coated low-E glass is to be washed using a flat glass washer it is required that the washing equipment include a pre-wash water spray to assist in removing the TPO coating on the coated side of the glass. Vitro technical service personnel will assist you in the settings required for proper automated washer operation. At a minimum, the designed water flow of the pre-rinse and washer must be maintained. If the TPO coating is to be removed by manual washing, use only water spray; avoid direct surface contact with cloth or other material.

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Some evidence of foaming in the pre-rinse and washer water tanks may occur as the TPO coating is washed off of the glass. The amount of foaming observed will be dependent on the concentration of dissolved TPO coating in your particular pre-rinse and washer water system. The dissolved polymer concentration in the pre-rinse and washer is a function of the amount of make-up water that is used, and the volume of glass processed with TPO coating. **Vitro recommends that the maximum dissolved polymer concentration not exceed one weight percent, (1.0 wt. %).** The majority of the TPO coating will be removed in the pre-rinse section of the washer, which is where we will focus our discussion. Many factors will contribute to the amount of foam in the washer system. In general, increasing the volume of make-up water will reduce foaming. Since there are many different configurations of pre-rinse and washer plumbing, we will limit our discussion in this bulletin to two examples of a properly managed water make-up system. The examples below are based on nominal TPO coating coverage and the following assumptions:

Pre-Wash Tank Volume = 40 Gallons
Water Flow Rate = 10 Gallons/Minute
Washer Width = 84 Inches
Washer Conveyor Speed = 400 Inches/Minute
Load Factor = 100%

Example 1 – Closed Loop System:

In this case the TPO coating is being washed off of the glass and not sent to drain. The polymer concentration in the water increases proportionally with time as glass is processed. In this case, we calculate how much glass (in square feet) can be run through the pre-wash before the concentration of dissolved TPO coating in the pre-wash tank exceeds 1 wt. %. As shown by graph E.1, slightly more than 12,000 sq. ft. of glass can be run before the recommended 1.0% limit is reached.

Thus, if a customer does not want to continuously add make-up water to the pre-rinse, Vitro recommends they run up to 12,000 sq. ft. of glass with TPO coating in batch quantities. It is then recommended that the pre-wash tank be flushed and re-filled with fresh water.

The TPO coating must be completely removed from the glass surface prior to heating the product. Incomplete removal of TPO coating will result in subsequent damage to the MSVD coating during the heating process.

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Example 2 – Continuous Make-Up Water:

In this case, pre-wash water will be continuously added to the system to provide a source of clean water and to replace water that will be lost through evaporation, spillage, intentional drainage, and carry over into downstream washer stages. Together these losses constitute an "effective drain rate". Assuming make up water is added to the prewash tank at a rate equal to this effective drain rate, the level in the pre-wash tank will remain constant as desired. The calculations show that a make-up water addition rate of about 1.23 gallons/minute will keep the saturation concentration of dissolved TPO coating in the pre-wash tank at slightly less than the recommended maximum level of 1 wt. %. This effect is illustrated in graph E.2. Operating the washer system in this manner will allow continuous processing of glass with TPO coating.

F. Handling – Post Washer:

After washing *Solarban Temperable* coated low-E glass the TPO coating has been removed. After removal of the TPO coating, all normal MSVD coated glass processing / handling procedures must be followed. This includes avoiding contact with the low-emissivity MSVD coating and wearing compatible low-E gloves. Note that Vitro recommends that the glass be washed immediately prior to the tempering operation and that the glass not be handled between the washer and the tempering operation. Compliance with this recommendation will significantly reduce the likelihood of handling scratches to the MSVD coating.

Health & Safety

Solarban Temperable coated low-E glass with Vitro's TPO 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.

Environmental Practices

Processing of *Solarban Temperable* coated low-E glass will generate wash water that must be managed in a responsible manner. The washwater will contain small amounts of dissolved TPO coating, a nontoxic water-soluble material. There may be sufficient dissolved TPO coating present for the material to increase the total suspended solids of the washwater discharged to the sanitary drain. Vitro's experience has been that this small increase in solids is not harmful to sanitary systems. However, each manufacturer should consult the local sanitary regulations or facility permit to confirm requirements.

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Table 1, to the right, provides estimated amounts of the mass of dissolved TPO coating sent to drain on an annual basis dependent on the number of square feet processed at your facility.

These estimates are suitable for discussions with the local sanitary authority.

| Table 1 Estimated TPO Discharge | |
|---|---|
| Annual Solarban 60VTII Glass Volume to be Washed (sq. ft.) | Annual Estimated TPO Coating Discharged to Waste Stream (lbs.) |
| 25,000 | 7 |
| 50,000 | 13 |
| 100,000 | 26 |
| 300,000 | 79 |
| 500,000 | 132 |
| 750,000 | 198 |
| 1,000,000 | 264 |

Recycling:

The 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:

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:

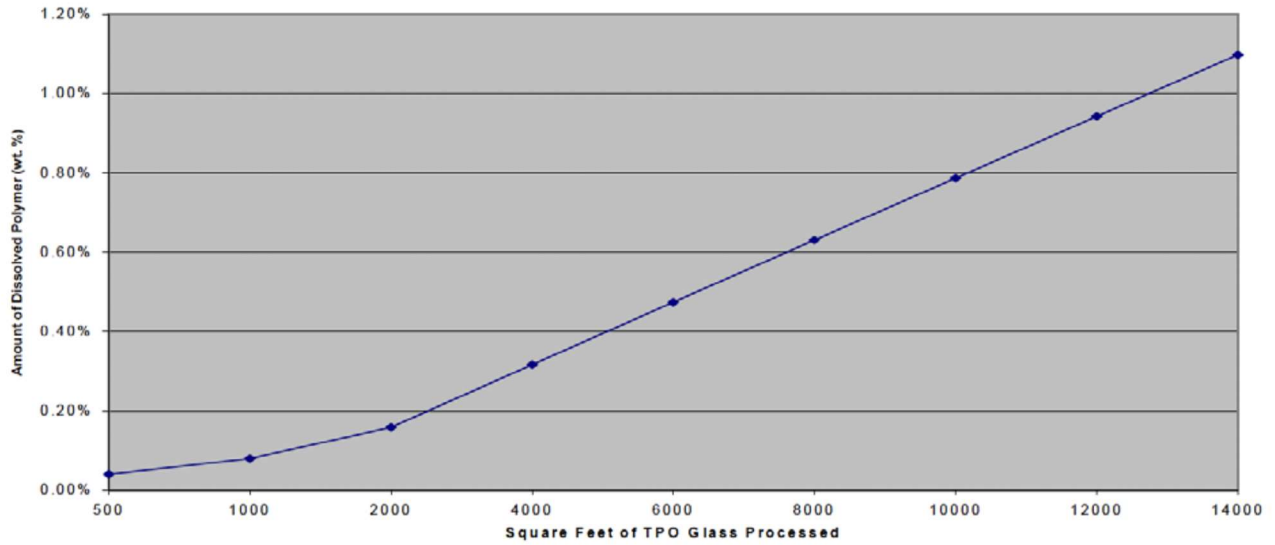
Edge deletion dust may contain sufficient amounts of metals to be “hazardous” as defined by federal or state waste regulations. If the silver containing dust is recycled in a manner to recover the precious metals, it is exempt from portions of the RCRA regulations. Large amounts of silver containing 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 TPO coating does not present any significant health or safety hazard. The TPO coating will provide protection to the coated surface until it is washed off. The dissolved TPO coating should be managed in a responsible manner.

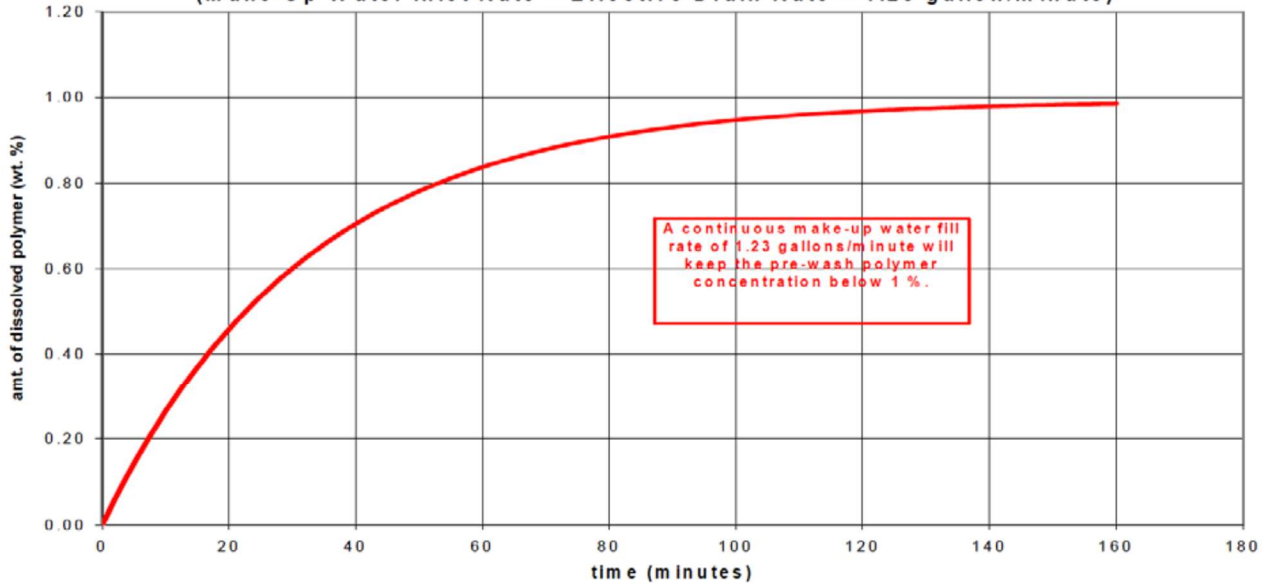
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Weight Percent of Polymer Dissolved In Pre-Rinse Tank vs. Square Feet of TPO Glass Processed



Graph E1

Weight Percent of Polymer Dissolved in Detergent Tank vs. Time
(Make-Up Water Inlet Rate = Effective Drain Rate = 1.23 gallon/m minute)



Graph E2

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| HISTORY TABLE | | |
|-------------------------|------------|---|
| ITEM | DATE | DESCRIPTION |
| Original Publication | 08/25/2000 | Technical Bulletin |
| Transferred to Internet | 11/12/2002 | Added Solarban® 80VT and made minor editorial changes. |
| Revision #1 | 03/29/2019 | Updated Vitro formatting |
| Revision #2 | 03/19/2020 | Referenced all Solarban® Temperable coatings, removed SB80VT and commented that this document doesn't cover TPF |
| Revision #3 | 01/26/2021 | Added SBR77VT to list of Solarban products |
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