

Cardinal Preserve® Film

Cardinal IG Company has developed a semi-transparent protective film for use on the exposed glass surfaces of IG units. This product is called Preserve® film and Cardinal has patent protection on its use and application. Cardinal's Preserve film protects the glass surfaces during window construction, shipping, handling, and installation. Preserve film is a semi-transparent plastic film with a low tack adhesive and is 0.003" in total thickness. The film is available for application to either or both the indoor or outdoor IG glass surfaces. The film has been tested extensively for durability outdoors and exposure to common building materials.

FEATURES AND BENEFITS OF CARDINAL'S PRESERVE FILM

- Preserve film can eliminate the need for paper or hot melt interleaving during the palletizing and transportation of IG units. This eliminates the cost and time associated with disposing of these materials.
- Since Preserve film protects the glass surfaces during the entire window manufacturing process, it has the ability to dramatically reduce the number of IG units damaged during shipping, handling, window fabrication and installation.
- Preserve film reduces or eliminates marking created by handling equipment during the manufacturing process. This leaves the homeowner with a more pristine glass surface.
- Preserve film has sufficient clarity for window manufacturers to enjoy the curbside exposure they gain through the use of logo stickers.
- Preserve film allows the window manufacturer to apply their labels and stickers to the film, not the glass surface, eliminating complaints about the difficulty in removing these labels.

- Preserve film reduces the need for protecting the glass during the home building process as it protects the glass from common building processes i.e., painting, staining, stucco and dry wall application.
- Semi-transparent Preserve film will allow natural light into the worksite, which would otherwise be lost if conventional cardboard or paper masking was used.
- By protecting the glass during the entire building process, Preserve film will either eliminate or dramatically lower the cost and time associated with cleaning of glass in the final clean-up process.
- Preserve film will reduce the number of windows that need to be replaced due to damage to glass surfaces.
- Preserve film is applied using a patent-pending process. The film is cut back around the periphery of the IG unit to permit the window manufacturer to glaze the IG unit into the sash without affecting the window seal.

TESTING AND EVALUATION

Over 75 commercially available and application designed films were evaluated prior to developing the current Preserve film. This testing included accelerated weathering and field exposure. Accelerated testing included QUV testing which exposes samples to UV radiation, elevated temperature and water condensation.

Outdoor exposure testing included testing in the high temperature low humidity of Arizona, the high temperature and high humidity of Florida, and varied temperatures of the Midwest. To date, over 1,000 IG units with film have been tested using the current Preserve film. Exposures of over one year have now been observed in Florida and the Midwest.



Outdoor exposure of Preserve Masking test units
(Arizona – Top Florida – bottom)

The film has been tested for resistance to common building and window manufacturing chemicals. This included, but was not limited to, resistance to water and oil-based stains, paints and varnishes, adhesives, sealants, cement, stucco and brick wash solution (muriatic acid).

More than a dozen window and door manufacturers have evaluated Preserve film in their window fabrication process. No major incompatibilities have been found with these processes.

HANDLING OF CARDINAL'S PRESERVE FILM

Preserve film, applied to the outdoor surface should be removed within one year of window installation for best results. The film should be removed at ambient temperatures between 30° to 100°F. As the film is exposed to UV, humidity, and heat, the adhesion of the film to glass will increase. In addition, as the temperature at removal decreases the adhesion of the film to the glass will typically increase. Under normal circumstances, removing the film within one year will help ensure easy removal with little to none of the film's adhesive remaining on the glass.

The adhesion of the film will also be affected by:

- Use of high absorption coatings and tints
- Use of LoE² Plus coated glass
- Use of NEAT[®] coated glass

These conditions could cause higher than normal adhesion of the film to the glass and produce residue on the glass after the film has been removed. Outdoor testing near Miami, Florida has shown under certain high humidity, sunlight, and temperature conditions the film will need to be removed from NEAT[®] coated glass within 6 months of exposure. This testing showed that when Preserve was used with NEAT[®] coated glass and exposed to the environmental conditions listed above, adhesive from the film could transfer to the NEAT[®] coated glass. This adhesive required cleaning to remove, though after removal did not affect the functionality of the NEAT[®] coating.

Removal is typically easiest when starting from the edge of one of the overlapping layers of the masking. If the increase in adhesion is large enough to make the starting of film removal difficult, a plastic scraper or plastic putty knife may be used to start film removal. Razor blades should never be used on the glass surface due to the high potential for scratching or scoring the glass. If the Preserve film needs to be cut or trimmed, we recommend the use of a brass bladed hot knife cutter.

Under the few rare conditions when adhesive transfer to the glass occurs, the adhesive can be removed using a Windex-type cleaner or a mild detergent solution and a Delicate Duty Scotch Brite Pad. Occasionally, a faintly visible line could appear in moisture on the glass at the location where the film overlaps. This history or ghosting is not considered a defect (See TSB IG13.)

STATIC DISCHARGE DURING REMOVAL

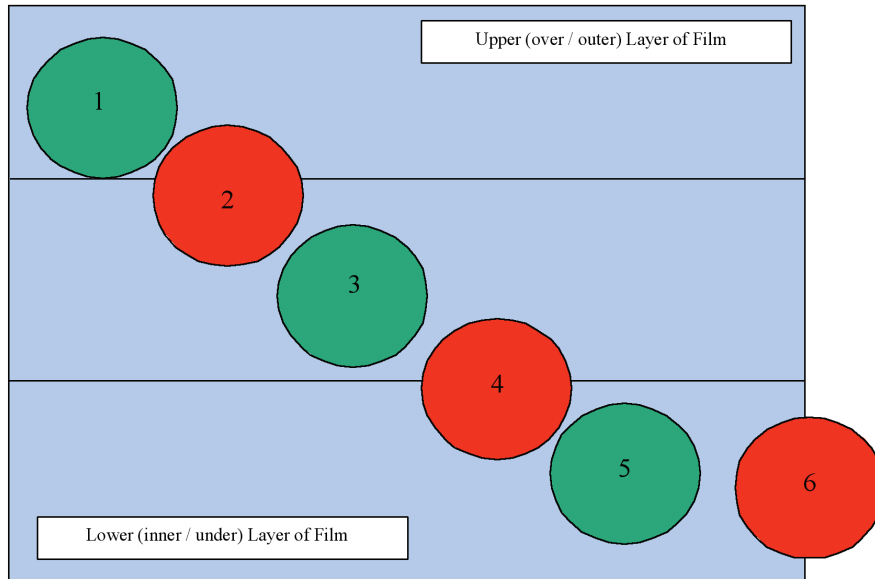
There is potential for an electrical charge to form on the glass surface and Preserve film during removal process. This charge has the potential to create an electrical spark. Because of this potential, it is recommended that flammable or explosive chemicals and gasses not be present during the removal process.

A number of things may reduce the amount of the electrical charge during the removal process:

- Misting the film surface with a light water spray prior to removal
- Removing the film at a slow speed
- Touching the film to the glass surface often during the removal process
- Increasing the humidity in the air prior to removal

USE OF SUCTION AND VACUUM CUPS

IG units with Preserve masking remain process able using suction and vacuum cups. Depending on the size of the units, placement of the cups and system employed, some air may become trapped under the film. This air will typically dissipate with time. It is recommended to avoid placing the cups so that they extend only partially onto the overlapping layers of film, or extend beyond the edge of the film. Placement in these areas may reduce the amount of vacuum and the subsequent lifting power of the cups.



Location Key

- 1 Suction cup completely on upper layer (over / outer layer) --- Recommended Placement
- 2 Suction cup partially on overlap area only on over / outer layer of film --- Not Recommended
- 3 Suction cup completely on overlap --- Recommended Placement
- 4 Suction cup partially on overlap and under layer of film --- Not Recommended
- 5 Suction cup completely on lower layer (under / inner) layer --- Recommended Placement
- 6 Suction cup over edge of protected area --- Not Recommended

CHEMICAL RESISTANCE OF PRESERVE MASKING

Care should be taken not to expose the film to pressure washing or complete submersion in water. This may cause delamination of the film from the glass. Some buckling of the film may be seen at very high temperatures (greater than 140°F). Prolonged exposure to high concentrations of certain solvents may also cause buckling or bubbling of the film.

The Preserve film has been tested for resistance to brick wash solutions (muriatic acid). The Preserve film is resistant to brick wash when used in its typical concentration (20 to

1 dilution). The Preserve film is not intended to and does not provide brick wash protection for the sash and frame or the IG seal system. These systems may be damaged by exposure to brick wash solutions. Additionally, pressure-washing systems should not be used to clean the Preserve film.

Due to the large number of chemicals used in window manufacturing and construction processes, not all could be tested for compatibility to the Preserve film. All chemicals should be tested for compatibility with the Preserve film prior to use.

CLARITY

Due to the unique overlapping application of the film, light may need to pass through as many as 4 layers of the Preserve masking film. The expected clarity of the film when applied to an insulating glass unit is:

Number of Film Layers	Measured Light Transmission	Measured Haze
IG Unit (No Film)	72%	<1%
One	57%	8%
Two	46%	15%
Three	39%	20%
Four	32%	25%

Note: As measured on an IG unit using Cardinal's LoE²-272™ coating

COMPATIBILITY WITH NEAT® HYDROPHILIC COATING

The Preserve® film has been extensively tested with the NEAT® coating. This testing has shown that the film is fully compatible with this coating. No decrease in the function of the coating has been noted from the use of the Preserve® film. Adhesion to this coating may be slightly elevated when compared to clear glass.

PRESERVE® WITH PATTERNED AND OBSCURE GLASS

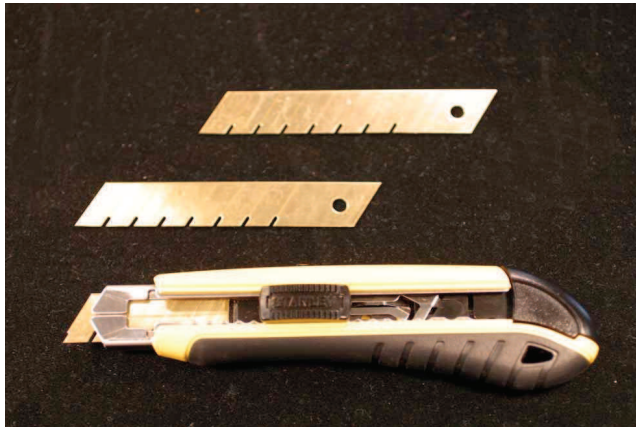
The use of Preserve® film on the rough surface of patterned and obscure glass is not suggested. The rough nature of these surfaces does not facilitate good adhesion of the Preserve film. On obscure and patterned glass the film will only achieve adhesion to the high points of the glass. The decreased adhesion may allow the film to fall off the glass, and the non-adhered areas may allow debris and water to gather under the film.

CARDINAL'S PRESERVE FILM CUTTING PROCEDURE

Insulating glass units with tape applied exterior grilles require the removal of the film below the grilles prior to their permanent installation onto the glass.

Tool Recommendations:

- Brass Break-Off Style Utility Knife Blade
- Generic Break-Off Blade Holder Knife

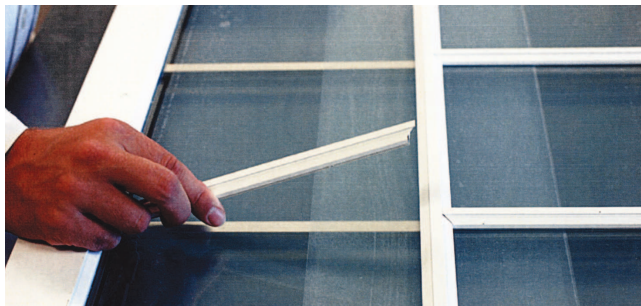


Cutting of Preserve with Break-Off Style Knife

Remove the bars from on top of the film and remove the Preserve film from the desired areas. Care should be taken so that film not intended to be removed stays adhered to the glass.

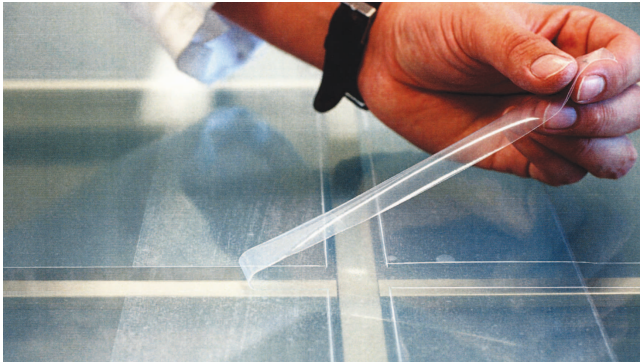
PROCEDURE

Place bars on top of Preserve film in the desired location (do not remove backing from bar adhesive tape). Alternatively, a metal straight edge may be used in place of the bars.



Preliminary Installation of Grilles

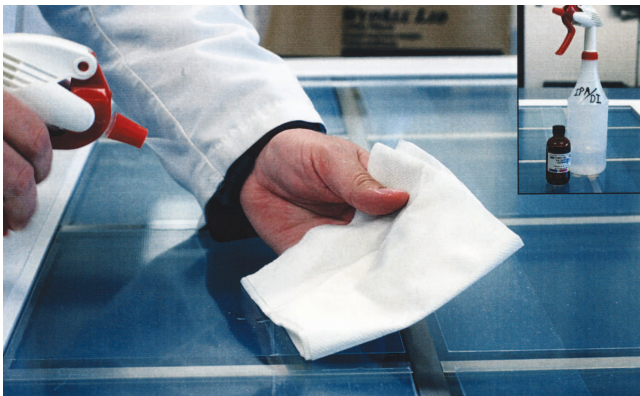
Hold the bar in place and cut along the edge of the bar holding the knife in the opposite hand.



Removal of Grille-Section of Preserve



Removed Sections of Preserve at Grille Locations



Cleaning and Priming Exposed Sections

Proceed with normal procedure for bar placement. Cleaning and priming of the glass should be done according to the tape manufacturer's requirements and specifications. Care should be taken when wiping the surface not to peel back the edges of the Preserve film.

Warnings:

Only brass or similar soft metal blades should be used on the glass surface – alternative blades may scratch or weaken the glass surface. Excessive wiping may cause the edges of the film to lift and permanently lose adhesion. If the film is peeled back and becomes wet, it will not adhere well to the glass surface.

TOOL ORDERING

Brass break off style knives blades can be ordered through your Cardinal sales representative.

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