# Spandrel & Silk-Screened Glass


TRI★STAR

GLASS PRODUCTS

# Introduction to Screen Printing

## Introduction:

Silk-Screening ceramic frit onto glass is an excellent way for architects and designers to create exciting new looks on their building while at the same time helping to improve the overall performance of the glass by reducing the incoming solar energy and reducing glare.

The process of silk-screening uses a patterned screen to transfer ceramic frit onto the surface of the glass. The ceramic frit is then fired onto the surface of the glass during the heat treatment process, creating a permanent bond to the glass surface.

## Heat Treating:

Silk-Screened glass can be heat-strengthened or fully tempered.

Tristar Glass Products supports the industry standards concerning the use of fully tempered glass. In other words, fully tempered glass should only be used when and where necessary. These areas are defined as areas where safety glazing characteristics are required by code and for high wind load areas where both annealed and/or heat-strengthened glass will not meet the appropriate project design wind loads.

## Choosing a surface:

A silkscreen pattern can be applied to any glass surface with the exception of a soft coat Low-E type product. The working metal in all soft coat Low-E coatings is that of silver and/or a fragile metal. The soft Low-E coating would become damaged as a result of the silkscreen process.

However, most soft coat Low-E coatings are of the high transmission type. With that in mind the decorative effect is not sacrificed if the silkscreen pattern is applied to the number three surface and/or the inboard clear lite of an insulating unit.

There are many advantages to the application of the silkscreen pattern to the clear inboard lite of an IGU on the number three surface.

- The decorative effect is not compromised from the project exterior or interior.
- It serves to reduce reflection and glare room side.
- The initial cost is less in comparison to glass that needs to be silkscreened and then coated with a Low-E coating and/or a second surface application.
- Should a replacement unit be required in the future, it would prove much less expensive and more readily available in comparison to a second surface silkscreen application.
- The functionality of the third surface silkscreen pattern is similar to that of a second surface application.

## Applications:

Solar Control

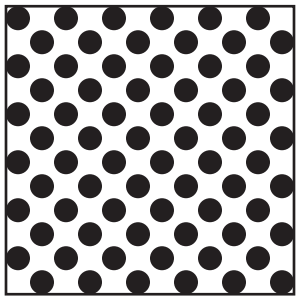
Glare Control

Privacy

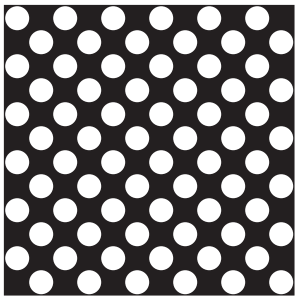
Decorative Design

Signs and Logos

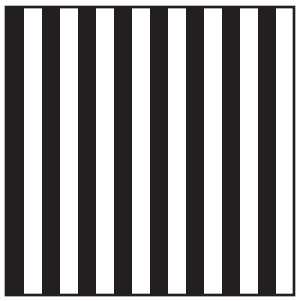
# Standard Patterns and Colors



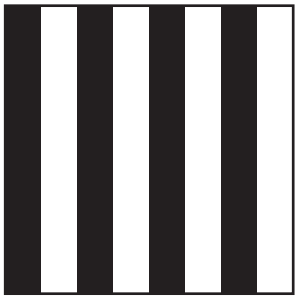
1/8" (3mm) diameter dots 40% coverage, spaced 1/4" (6mm) center-to-center



1/8" (3mm) diameter holes 60% coverage, spaced 1/4" (6mm) center-to-center



1/8" (3mm) wide lines 50% coverage, spaced 1/4" (6mm) center-to-center



1/4" (6mm) wide lines 50% coverage, spaced 1/2" (12mm) center-to-center

Choose from one of our four standard patterns or create your own custom pattern. Tristar stocks the 13 ceramic frit colors, listed in the column to the right, and can match almost any color with the aid of a sample, paint swatch, or PMS color chart number. When silk-screening, only one color can be applied per glass surface.

- **Standard Patterns index from the lower left position of the glass and run of the opposite edges.**
- **Partial dots/holes or lines are acceptable with the standard pattern configuration.**
- **Please indicate pattern orientation for lines and if starting with a line or a space.**
- **Size Limitations:**
  Max: 77"x134"
  Min: 12"x12"

  **Image Limitations**
  1/16" Minimum dot, pixel or space

Black TS2439

Solar Gray TS3522

Warm Gray TS3524

Solar Bronze TS7602

Gun Metal TS3517

Solex Green TS40068

Ford Blue TS10774

Lava Bronze TS7601

Charcoal TS3527

Guardrail Gray TS3762

High Opacity White TS8876

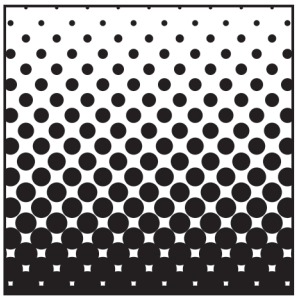
Simulated Etch TS8931

Simulated Sandblast TS80048

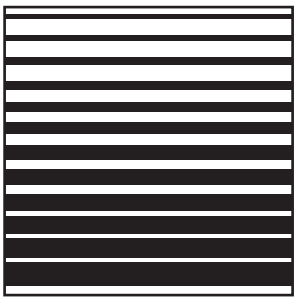
# Custom Pattern Specifications

## Examples of Custom Patterns

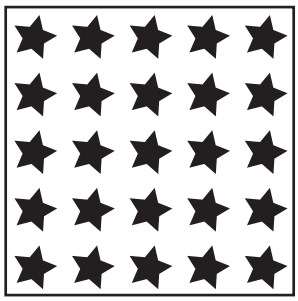
Line Patterns



Graduated Dots



Graduated Lines



Geometrical Patterns or Logos

## Specifying a Custom Pattern:

**Describe the pattern:**
general description (i.e. dots, lines, etc.), location, dimensions, spacing, orientation, %of glass covered by pattern

**Sending a pattern file:**
File must be sent in a vector file format, preferably adobe illustrator (.ai or .eps)

**Area to be silk-screened:**
Full or partial coverage (if partial, where the pattern starts and stops)

**Starting location of the pattern:**
on which edge(s) of the glass does the pattern start, is it centered

**Surface and viewing orientation:**
on which surface will the pattern be placed and from which surface will it be read

**Borders:**
will there be borders (solid or clear) around the silk-screened pattern, are partial elements allowed or not allowed

**Quality:**
See Tristar quality standards for applicable tolerances

**Cutting and Hole Drilling:**
Cutting and hole drilling must be done prior to the application of a coating and the heat treating process.

## Design Considerations:

**Samples:**
All Custom Patterns require the approval of a 12"x12" sample before proceeding with the order.

**Moire pattern and dual surface silk-screen patterns:**
Dual patterns (typically requested on surface #2 and #3) are not recommended due to the potential for optical phenomenon known as a Moire pattern to occur. Moire patterns can occur when two or more repetitive patterns are placed in front of each other creating a wavy, rippled, or circular pattern. Moire patterns are not considered a defect. A full-size mock-up is always recommended before the start of any job

**Translucent frit:**
Full coverage traslucent frit (etchs) are not recommended for interior applications. Characteristics inherent to translucent frit, when used in full coverage applications, make this product unsuitable for vision areas. These characteristics include slight variatiations in color and uniformity, pinholes, and/or streaks. Please take note that certain spandrel applications may be prone to condensation formation on the interior glass surface.Over time this condensation may result in the build up of a visible film. Translucent frits should only be applied to non-exposed surfaces.

**Material compatibility:**
When using sealants and other accessories during installation, particular attention must be given to compatibility. Sealants must be compatible with the coating, glass, and other materials used during the installation. Using incompatible products could result in failure of the unit.

**Installation:**
Please visit www.tristarglass.com resource page for a more detailed list of installation instruction and guidelines

**Protection and maintenance:**
Please refer to the Glass Association of North America (GANA) glass information bulletins: GANA 01-0300 "Proper Procedures for Cleaning Architecural Glass Products" and GANA TD 03-1003 "Construction Sit Protection and Maintenance of Architectural Glass", for information on proper cleaning, storage, and handling of spandrel glass.

# Introduction to Spandrel

## Introduction:

Spandrel glass is glass that has been rendered near opaque by a coating, hiding the utilities and control areas of a building, typically found between occupancy floors or as wall cladding. The process of rendering this glass opaque takes place by passing clean glass through a roller coating machine that transfers a coating onto the surface of the glass. The coating is either a silicone based paint ICD Opaci-Coat 300) or ceramic frit. The ceramic frit must be fired onto the surface of the glass during the heat treatment process, creating a permanent bond to the glass surface, while the silicone based paint must be heat treated before application to the surface of the glass. This production process, while 'state-of-the-art", produces a spandrel area quality product. There are, and will be, inconsistencies. When either of these products are placed in a spandrel area cavity on the number four surface and the back lighting in the cavity is eliminated the inconsistencies inherit to the product wash out. **Neither product is meant to be used in a vision area application.**

## Heat Treating:

Spandrel glass must be heat-strengthened or fully tempered. Tristar Glass Products supports the industry standards concerning the use of fully tempered glass. In other words, fully tempered glass should only be used when and where necessary. These areas are defined as areas where safety glazing characteristics are required by code and for high wind load areas where both annealed and/or heat-strengthened glass will not meet the appropriate project design wind loads.

## Applications:

Ceramic frit or ICD Opaci-Coat 300 should be installed in applications that do not allow viewing of the glass in transmission. A uniform colored insulation or back-pan should be placed at a minimum distance of 1" behind the spandrel glass to eliminate the possibility of read-through. Spandrel glass is never meant to be used in a vision area. Spandrel areas should never be backlit or installed in a manner that allows daylight or artificial light on the opposite side.

Glass types with high visible light transmittance or low visible reflectance tend to show more contrast between vision areas and spandrel areas than do glass types with lower visible light transmittance and high reflectivity. This contrast can be further minimized by maintaining a
consistent construction between the spandrel and vision insulated glass units in regards to the exterior glass color and coating.

## Ceramic Frit vs. ICD Opaci-Coat 300:

Both ceramic frit and Opaci-coat have outstanding records of durability and long-term performance. In most applicaitons, the products are equivalently matched and either would satify project requirements at a comparable cost. However, there are certain applications in which the slight differences between the two products qualify one as a superior choice. Many of these differences are outlined in the "Applications and Limitations" sections found in the next two pages. In all cases, the two products should not be mixed on a project without fully understanding the implications/impact this could have on the exterior appearance of the building.

## Choosing a surface:

Please be advised that the preferred placement of ceramic frit or Opaci-Coat 300 in a spandrel area IGU is on the number four surface versus that of the number three surface.

Due to the high temperatures experienced in spandrel much attention is paid to achieving the best possible primary IGU seal. This is to ensure the longevity of the unit. We know from experience that the best possible seal is achieved with sealant to glass contact. With ceramic frit placed on the third surface you end up with sealant to ceramic frit contact in lieu of sealant to glass contact. When placing Opaci-Coat 300 on the third surface the outer perimiter of the coating must be edge deleted to allow for proper adhesion of the spacer PIB to the surface of the glass. By relocating the ceramic frit or Opaci-Coat 300 coatings to the number four surface the desired sealant to glass contact is achieved, allowing for the best possible performance of the unit over its life time.

In addition, ceramic frit or Opaci-Coat 300 located on the number four surface serves to minimize the difference in appearance between vision and spandrel areas. In a vision area, light is both transmitted and reflected through both an outboard and inboard lite of glass creating an appearance of depth from the project exterior. When you locate a ceramic frit or Opaci-Coat 300 coating on the number three surface you lose this appearance of depth. This is a caused by light transmitting and reflecting through only one lite of glass. When viewed from the project exterior, the result is spandrel area glass appearing more noticeable in comparison to the vision area glass.

# Ceramic Frit Standard Colors

## Choosing a Color:

Tristar stocks the 13 ceramic frit colors, listed in the column to the right, and can match most custom colors with the aid of a sample, paint swatch, or PMS color chart number. There are, however, some color matching limitations with ceramic frit.

## Size Limitations:

Max: 84"x156"*
Min: 12"x12"

## Applications and Limitations:

Ceramic frit is fired onto the surface of the glass to form a permanent bond that prevents removal via ordinary means. Ceramic frit may be laminated, with the painted surface on the exterior or in direct contact with the laminate.

No edge deletion is required when applied to the interior of an IG, though application to the interior of the unit is not recommended (see 'Choosing a Surface" in the next section for a complete explanation as to why).

The colors found in this guide are for comparison purposes only. Final product selection should be based on the viewing of actual samples.

Black TS2439

Solar Gray TS3522

Warm Gray TS3524

Solar Bronze TS7602

Gun Metal TS3517

Solex Green TS40068

Ford Blue TS10774

Lava Bronze TS7601

Charcoal TS3527

Guardrail Gray TS3762

High Opacity White TS8876

Simulated Etch TS8931

Simulated Sandblast TS80048

# ICD Opaci-Coat 300 Standard Colors

## Choosing a Color:

Tristar stocks the 10 ICD Opaci-Coat 300 colors, listed in the column to the right, and can match almost any custom color with the aid of a sample, paint swatch, or PMS color chart number. In General, ICD Opaci-Coat tends to be able to match a broader and more vibrant spectrum of colors than ceramic frit.

## Size Limitations:

Max: 84"x156"*
Min: 12"x12"

*A spray technique may be used to apply Opaci-Coat 300 to the surface of the glass allowing, in some circumstances, for greater widths of glass to be processed.

## Applications and Limitations:

ICD Opaci-Coat 300 is the preferred product for laminated glass applications, Hower, it may **NOT BE APPLIED TO A SURFACE COMING IN DIRECT CONTACT WITH THE LAMINATE.**

**ICD Opaci-Coat 300 may not share the same air space with any soft-coat Low-E coating.**

ICD Opaci-Coat 300 must be edge deleted when applied to the interior of an IG to allow the PIB on the spacer to properly adhear to the surface of the glass, though application to the interior of the unit is not recommended (see 'Choosing a Surface" in the next section for a complete explanation as to why). This edge deletion is also necessary in certain structurally glazed applications that require a direct bond of the adhesive to the surface of the glass.

Black TS1-818

Harmony Gray TS3-820

Warm Gray TS3-0770

Harmony Bronze TS4-822

Harmony Solex TS2-743

Harmony Blue TS6-0025

Lava Bronze TS4-975

Charcoal TS1-0016

Medium Gray TS3-0586

Primary White TS0-1060

The colors found in this guide are for comparison purposes only. Final product selection should be based on the viewing of actual samples.


# TRISTAR

## GLASS PRODUCTS

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