



GLASSWERKS – TECHNICAL BULLETIN

GUIDANCE ON SILKSCREEN – DECORATIVE GLASS

TECHNICAL DOCUMENT: GW-TB-005

Ceramic enamel applied to architectural glass by silk-screen or digital printing processes exhibits inherent visual characteristics that are dependent upon pattern design, printing method, glass configuration, and service conditions. The appearance of printed and silkscreen glass is influenced by factors including, but not limited to, lighting conditions, viewing angle, glass size, substrate reflectivity, and environmental exposure.

Certain design and application conditions—including high pattern density, printing on multiple glass surfaces, first-surface enamels, and non-standard or unconventional applications—may result in visual effects such as moiré patterns, visible print artifacts, localized variations, or perceived non-uniformity. Such effects are inherent to the silkscreen printing and glass fabrication processes and should not be construed as defects in material or workmanship.

Appearance-related characteristics that comply with the inspection procedures, viewing conditions, and quality criteria defined herein shall be considered acceptable. Compliance with these guidelines does not guarantee the absence of visual phenomena under all conditions of use.

These guidelines apply to decorative silk-screen coatings used on monolithic, laminated, and insulating glass units in architectural applications.

MOIRÉ EFFECT — DESIGN CONSIDERATIONS

The Moiré effect is an optical phenomenon that may manifest as circular, wavy, or repetitive interference patterns on silk-screened glass. It occurs when two or more regularly spaced patterns overlap but are not precisely aligned in spacing or orientation.

While the appearance of moiré cannot always be anticipated, the probability of occurrence increases under the following conditions:

- Use of very fine line graphics or dense patterning
- Dots, perforations, or voids spaced closely together
- Identical or similar silk-screen patterns applied to multiple glass surfaces
- Combination of silk-screen patterns with highly reflective glass substrates or coatings
- Large insulating glass units with a width-to-length ratio of less than 2:1

MOCK-UP RECOMMENDATION

Full-size, project-specific mock-ups are strongly recommended for all silk-screened glass applications. Mock-ups should be evaluated under multiple lighting conditions, viewing distances, and temperature environments to assess potential visual effects, including moiré.



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INSPECTION GUIDELINES (INTERIOR APPLICATION)

Inspection shall be conducted under the following conditions:

- Viewing distance: 1 meter (39 inches)
- Viewing angle: 90 degrees (perpendicular to glass surface)
- Lighting: Incandescent or typical interior ambient lighting

INSPECTION GUIDELINES (EXTERIOR APPLICATION)

Inspection shall be conducted under the following conditions:

- Viewing distance: 3 meters (10 feet)
- Viewing angle: 90 degrees (perpendicular to glass surface)
- Lighting: Indirect daylight
- Background: Uniform, non-distracting background

QUALITY EVALUATION CRITERIA

When viewed in accordance with the inspection guidelines above, silk-screened decorative glass shall meet the following quality criteria:

- Scattered pinholes and/or fisheyes are acceptable
- Screen drag marks, streaking, or misprints are not acceptable
- Minor mottling is acceptable within the normal viewing area
- Opaque foreign particles are not acceptable within the normal viewing area but may be permissible outside of it
- Slight variations in color uniformity are acceptable

The **Normal Viewing Area** is defined as the central 80% of the total visible surface area of an individual glass lite.

BACKLIT APPLICATIONS

Silk-screened decorative glass is not recommended for backlit applications due to increased visibility of inherent print variations and coating characteristics.

MANUFACTURING AND ALIGNMENT TOLERANCES

The following tolerances shall be considered inherent to the silk-screen printing and glass fabrication process:

- Close-range viewing may reveal stepped or "sawtooth" edges consistent with screen-printing methods; this condition is acceptable.
- Dot, line, or perforation placement may vary by $\pm 1/32$ inch (0.8 mm).



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- Printed patterns may deviate up to 1/16 inch (1.6 mm) from parallel relative to the designated locating edge.
 - The locating edge must be clearly identified on the purchase order.
- Due to glass dimensional and squareness tolerances, printed patterns may vary up to 1/8 inch (3 mm) from parallel on non-locating edges.
- Patterns covering the full glass surface shall maintain a perimeter border of 1/8 inch (3 mm) or less.

STRUCTURAL SILICONE GLAZING APPLICATIONS

For use in structural silicone glazing systems:

- Silk-screen patterns may extend to within $\pm 1/32$ inch (0.8 mm) of the glass edge when specifically identified in the order documents.
- A printed image incorporating an indefinite border up to 1/32 inch (0.8 mm) is acceptable.

REFERENCES

- ASTM C1036 Standard Specification for Flat Glass
- ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
- ASTM C1172 Standard Specification for Laminated Architectural Flat Glass
- ASTM C1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
- ASTM C1464 Standard Specification for Bent Glass
- ASTM F1857 Standard Terminology Relating to Ink Jet Printers and Images Made Therefrom