All About Acid-etched Glass

By Marc Deschamps

Acid-etched glass is becoming trendy in design and construction. The consistency and durability of the finish can reduce glare and reflection, add privacy, increase light transmission, and provide texture. It is important to select the right acid-etched glass for an application, and avoid marking issues during its storage and fabrication.

Although the glass-etching process is generally consistent, variations in chemistry and other parameters create different surfaces with distinct visual and performance characteristics. Glass is etched with an aqueous solution of hydrofluoric acid, which attacks the silica and roughens the glass surface. Generally, the more ‘white’ or opaque the finish, the more rough and porous the surface is.

When choosing distinctive and unique types of glass, architects and designers often have specific objectives in mind. With acid-etched glass, these goals can relate to:
- light diffusion;
- light transmission;
- privacy;
- visual appearance;
- integration with surrounding objects; and
- energy efficiency through increased daylighting.

An etched surface with rugged peaks and deep valleys absorbs and diffuses light, rather than transmitting or reflecting it—the result is a rich, white, opaque appearance. In contrast, an etched surface with smooth, rounded bumps enhances light transmission and creates a more transparent glass, characterized by reduced reflective glare and a soft translucent appearance.

**Acid-etched surface finish**

Acid-etch finishes vary by manufacturer. The type selected for a glass substrate renders a different level of opacity and smoothness and creates varied visual effects. It also impacts performance ratios such as:
- gloss;
- visible light transmission (VLT);
- visible light reflectance;
- shading coefficient;
- solar direct transmission;
- solar direct reflectance; and
- U-value.

The visual effect of the acid-etch finish on mirror varies depending on the extent of etching performed. A lighter-etched mirror has more reflection whereas a deeper etch creates a matte finish and more depth in the glass.

**Glass substrate**

The substrate also influences the colour appearance, level of opacity, and performance ratios of acid-etched glass. Many falsely believe
pieces of ultra-clear glass look the same, irrespective of their origin; similarly, glass with a blue tint from manufacturer ABC is often incorrectly perceived to match the one produced by manufacturer XYZ. Generally, the glass business markets different shades of glass in ultra-clear, green, blue, or black. In addition, some glass floaters can make varying shades of one colour.

For example, acid-etched products manufactured from low-iron glass have a translucent satin appearance without the ‘greening effect’ of ordinary clear glass. Similarly, a piece of acid-etched glass made with a dark blue hue from one supplier creates a different visual effect than one made with light blue from the same manufacturer.

Consequently, the shade of the acid-etched glass or mirror likely varies among manufacturers, depending on the substrate used. It is important to remember that the acid-etch finish itself creates a different colour appearance, with different tints having varying performance ratios.

**Etching on both sides**

Etching glass on both sides can enhance its characteristics. This approach is suitable for applications requiring a higher level of opacity or a similar finish and visual effect on both sides of the glass panel (e.g. partitions).

Most glass is produced by the float process. The raw materials—mainly silica sand, soda ash, and limestone—are melted in a furnace and then flowed onto a bath of molten tin. The glass then takes form and gradually cools as it moves from the tin bath to a controlled cooling chamber.

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It is no surprise acid-etched glass is becoming trendy in design. Acid-etch finishes can create varied visual effects to impart a unique style and elegance to a space.

Float glass is best etched on the ‘air’ or ‘atmosphere’ side of the sheet, due to the greater likelihood of impurities and surface imperfections on the ‘tin’ side. Production of acid-etched mirrors and two-sided etched glass requires etching of the tin side, posing an increased risk of defects in the surface if inappropriately done.

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When considering double-sided acid-etched glass or acid-etched mirror, the type of finish specified impacts quality. The manufacturer of the acid-etched product can recommend the finish (if any) suitable for the application.

**Exterior applications**

Acid-etched glass may be appropriate for exterior applications, such as insulated glazing (IG) units, skylights, and balustrades. As acid-etching is not a coating, its resistance properties in outside conditions are essentially equivalent to non-etched glass. However, it is important to note an etched surface with rugged peaks and deep valleys could lead to higher maintenance costs because dirt particles may be harder to remove (Figure 1). Therefore, the use of an etched surface with a lighter finish (i.e. smooth, rounded bumps) is recommended in exterior applications. In these situations, the level and type of maintenance required is similar to that of non-etched glass.

**Storage and fabrication**

If proper care is taken during storage and fabrication, acid-etched glass or mirror can be kept clean as easily as non-etched products. Whether the glass is tempered, laminated, insulated, painted, or even bent, fabricators can preserve the quality of the final product.

However, the general suggestions for keeping acid-etched glass or mirror stain-free during storage and fabrication may not be suitable in all situations. Fabricators should follow guidelines issued by the manufacturer of a particular product to prevent or fix any marks or stains that occur.

**Storage**

Proper storage practices can help avoid marking on acid-etched glass and mirror. Storage spaces must be dry and adequately ventilated. Sheets should not be stored in areas of high humidity or heat (e.g. places near steam or water pipes). Spaces exposed to chemical fumes should also be avoided. All these conditions promote staining. Conversely, sheets should not be stored outdoors or in unheated areas.

**Fabrication**

Due to the particular characteristics of more rugged glass surfaces, extra care should be taken during their fabrication to minimize the likelihood of embedding grease or dirt into the surface.

Gloves must always be used when working with sheets. When handling sheets using equipment with suction cups, the clean and dust-free cups should be applied to the flat, untreated side. If this is impossible, care should be taken to ensure proper vacuum is achieved (i.e. testing must be done to be certain the cups ‘stick’ to the glass to handle the weight).

When edging glass, these practices should be followed:

1. The edging machine conveyors should be clean and free of grease and buildup of glass grindings or cerium oxide.
2. The conveyor must be regularly opened and the machine interior washed (particularly the brushes) using soapy water.
3. The front and back conveyor pads should be routinely brushed, until all traces of cerium oxide and glass grindings are removed.
4. The front and back conveyors must be synchronized at identical speeds.
5. Only coolants specifically recommended for glass grinding and that adhere closely to the manufacturer’s recommended dilution ratio should be used.
With acid-etched glass, a white, opaque appearance derives from a more rough and porous surface. This visual effect is often chosen for goals of privacy and esthetics.

6. Manufacturer guidelines for concentration levels must be followed when using cerium oxide, with care taken to never add more than the minimal amount necessary for good polishing.

7. Glass should be washed immediately after polishing. Washer brushes with 0.36-mm (0.014-in.) diameter nylon bristles offer the best results. The glass washer should be equipped with one pair of upper and lower brushes for every 0.6 m (2 ft) per minute of travel—for example, a machine operating at a speed of 1.8 m (6 ft) per minute should have three pairs of brushes. (This guideline is only applicable to regular float glass and not to coated products such as low-emissivity [low-e] glass.)

8. As an extra precaution, wetting the glass surface immediately before polishing greatly reduces the risk of marking.

Writing the right specifications
Architects and designers constantly look for new ways to use glass in exterior and interior applications. Writing proper specifications, especially when distinctive and unique types of glass are chosen, is critical to ensure the desired design is achieved. Acid-etched glass is no exception. If care is not taken, the glass ordered and installed on the jobsite may be nothing like the product selected based on samples submitted.

To ensure the acid-etched glass products selected are actually used by the general contractor, glass fabricator, and glazier, the following information should be included in the specifications:
• name of manufacturer;
• product brand name;
• glass thickness;
• substrate (glass or mirror);
• tint (e.g. clear, ultra-clear, blue, green, black, bronze, grey);

• type of finish (name); and
• whether to etch on one or two glass faces.

Warranties and standards are often overlooked when writing specifications. Inherent in the float glass process are small gaseous inclusions and minor abrasions. Consequently, occasional, small 'bubbles' and hairlines are normal and acceptable under recognized standards; from a normal viewing distance, they are barely noticeable.

To ensure acid-etched products are made from float glass that conforms to industry standards, the manufacturer should be consulted. In Canada, glass should comply with Canadian General Standards Board (CAN/CGSB) 12.3-M91, Flat, Clear Float Glass (Quality: Glazing). In the United States, ASTM International C 1036-01, Standard Specification for Flat Glass (Quality: Q3—Sheet) should be followed. The manufacturer’s product warranty should refer to these standards.

Clearly, it is important to be specific about the nature of the acid-etched glass product required. Communicating specifications in detail to a glass professional can help ensure the chosen product meets desired goals and objectives.

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