RMW Architecture & Interiors

C505

Decorative Glass

RMWT3 DecoraG

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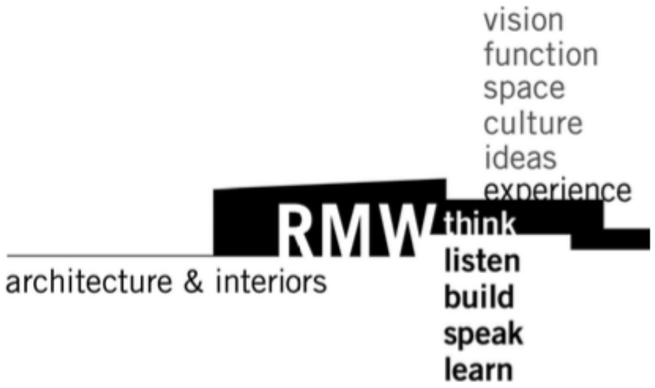


Course Description

The contents of the course are as follows:

- Overview of the glass manufacturing and fabrication processes, glass types, and available treatments.
- Heat treated glass; Heat strengthened, tempered, and fully tempered. Safety glass
- Decorative glass types, description, characteristics, and fabrication process for each type.
- Treatment, installation, and use of each type of decorative glass in exterior and interior applications.

Learning Objectives

At the end of the this course, participants will be able to:

1. Have a general idea of the glass manufacturing and glass fabrication systems and how these affect the performance, uses, and other characteristics of the products.
2. Become familiar with typical glass treatments, including heat treatments, and the effects of these in the properties and uses of the glass. Understand safety glass properties and applications..
3. Recognize the different types of decorative glass, its uses, its costs, installation requirements, maintenance, and other requirements that will influence selection of the right type of decorative glass.
4. Explore the different types of structural glass and possible uses.

DECORATIVE GLASS

CONTENTS

HOW GLASS IS MANUFACTURED

Glass manufacturing starts in an oven. The materials used to fabricate glass are placed in an oven and melted over a layer of melted tin.

This is a typical mix for producing glass:

- 70% silica
- 10% lime
- 15% soda
- 5% magnesia and alumina (to improve resistance) and other ingredients to enhance color and other properties of the glass.

HOW GLASS IS MANUFACTURED

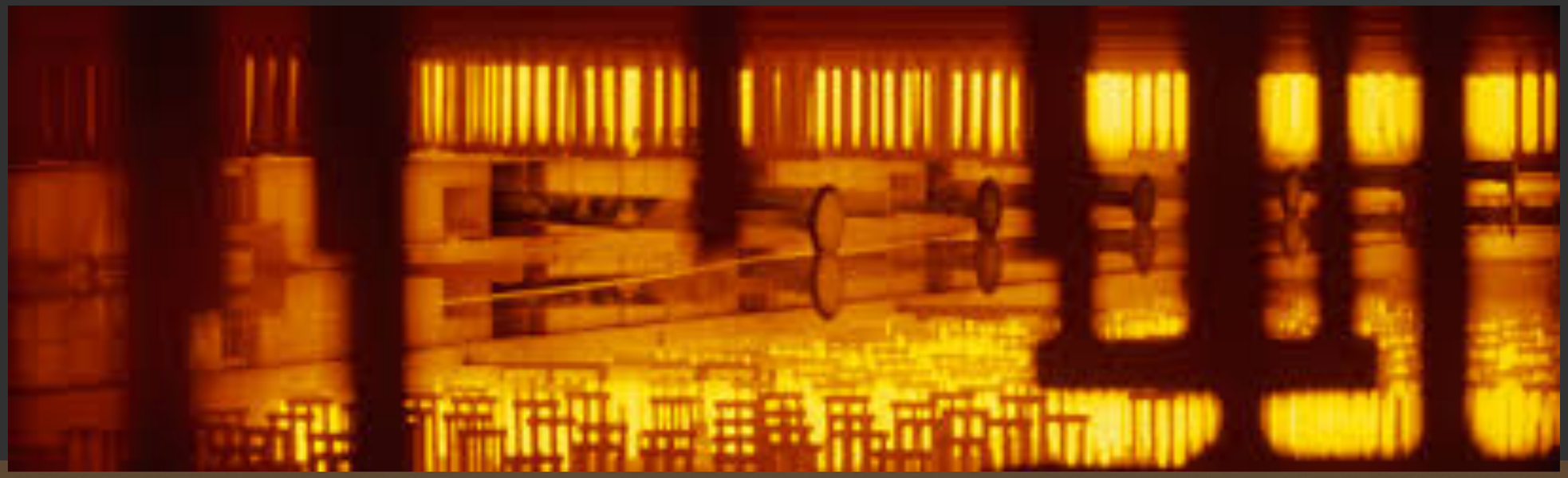
The ingredients used to color tinted glass are added at this stage, so the color of tinted glass is integral. Because the manufacture involves heavy machinery, the production of tinted glass in some cases is accommodated by stopping the production of other types of glass and that makes it expensive.

Glass is never colorless, even when labeled “clear,” so be careful when placing glass of different manufacturers or thicknesses next to each other: the difference in color can be noticeable.

Ultraclear glass is manufactured by reducing the iron in the mix - that is why it is called low-iron. Low-iron glass is more expensive than regular glass.

HOW GLASS IS MANUFACTURED

The glass “ingredients” melt and “float” over the melted tin layer, so the melted glass is perfectly flat. This is why glass produced in this manner is called “float glass”. When the glass cools enough to allow it, it is rolled for further treatment.



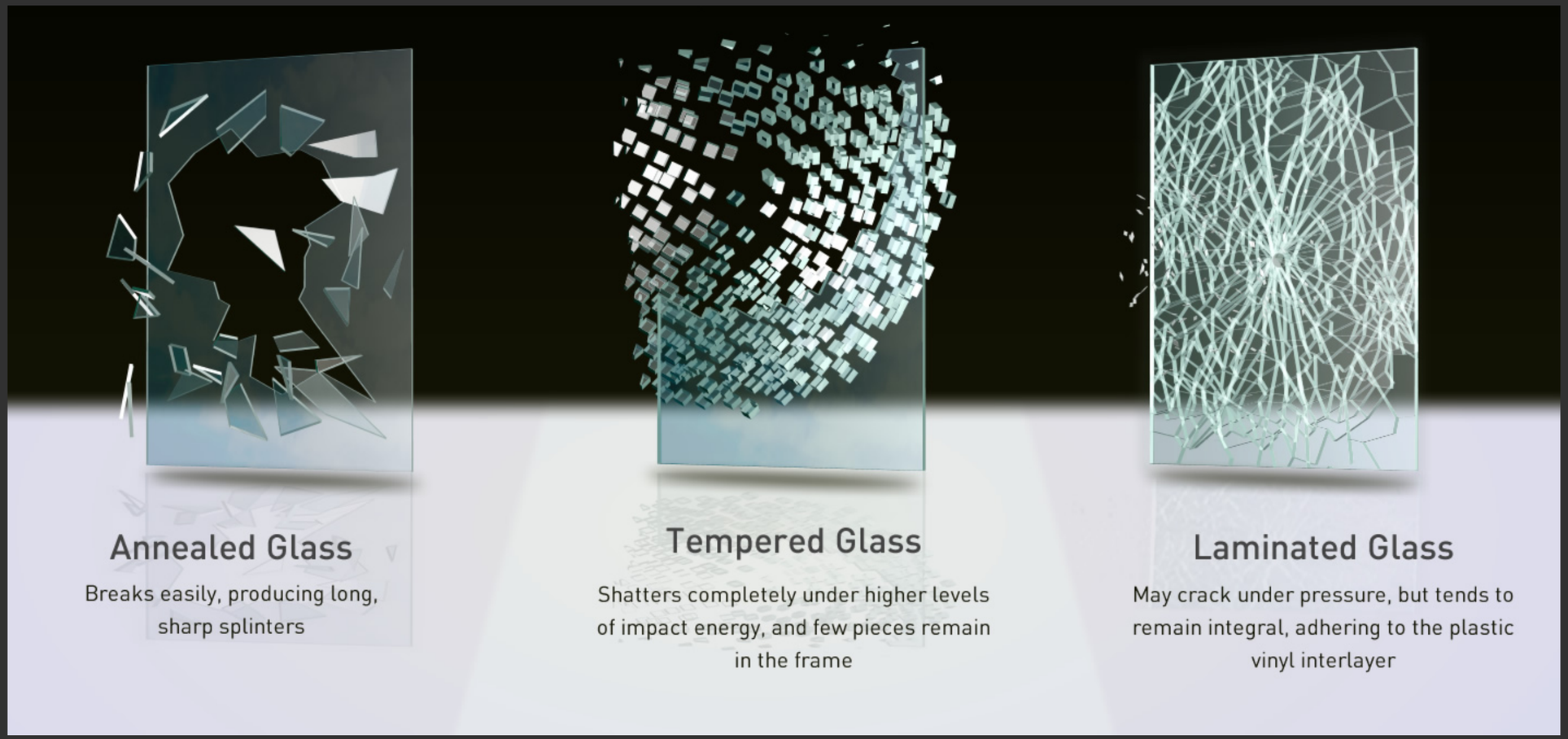
HOW GLASS IS MANUFACTURED

The soft glass is rolled until it reaches the desired thickness and it cools and hardens. The glass at this stage, before it is further treated, is called “annealed” glass.

Glass can be further treated by heating it and then cooling it. This makes it stronger. The higher the temperature at which it is heated, the stronger the glass becomes.

Rolling float glass

USING HEAT TO MAKE GLASS STRONGER



Annealed Glass

Breaks easily, producing long, sharp splinters

Tempered Glass

Shatters completely under higher levels of impact energy, and few pieces remain in the frame

Laminated Glass

May crack under pressure, but tends to remain integral, adhering to the plastic vinyl interlayer

SAFETY GLASS BY CODE

The code accepts two types of glass as “safety glazing”:

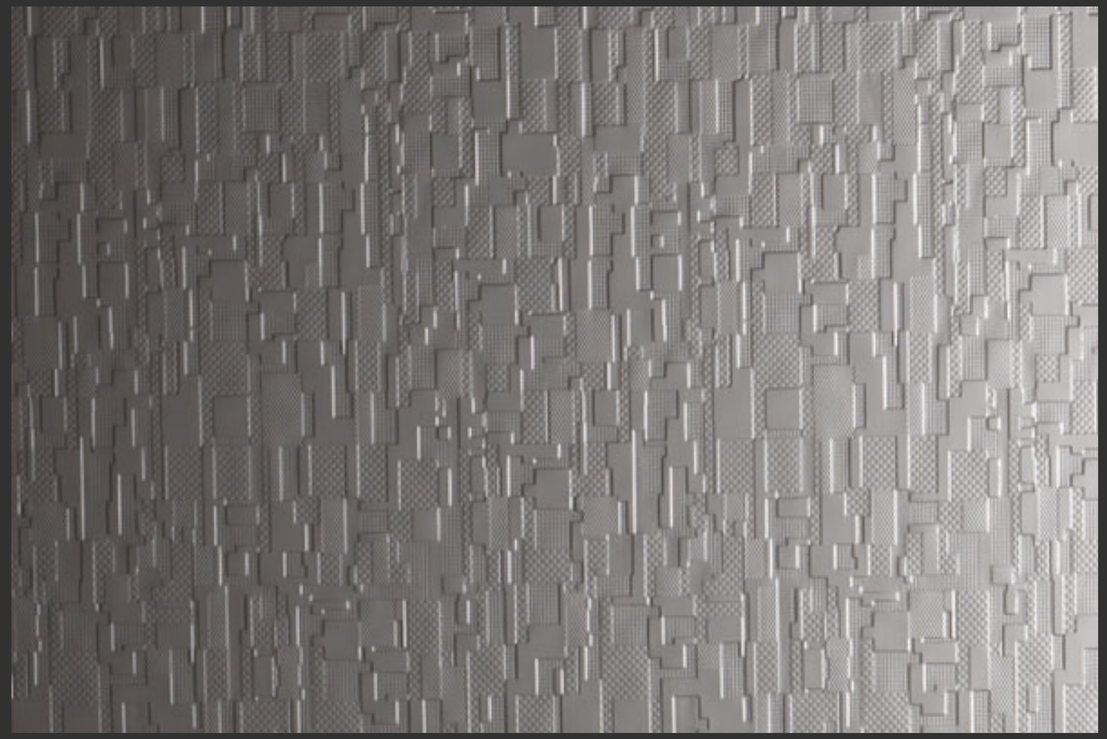
- Laminated glass
- Fully-tempered glass

SAFETY Glazing needs to comply with ANSI Z97.1.

DECORATIVE GLASS

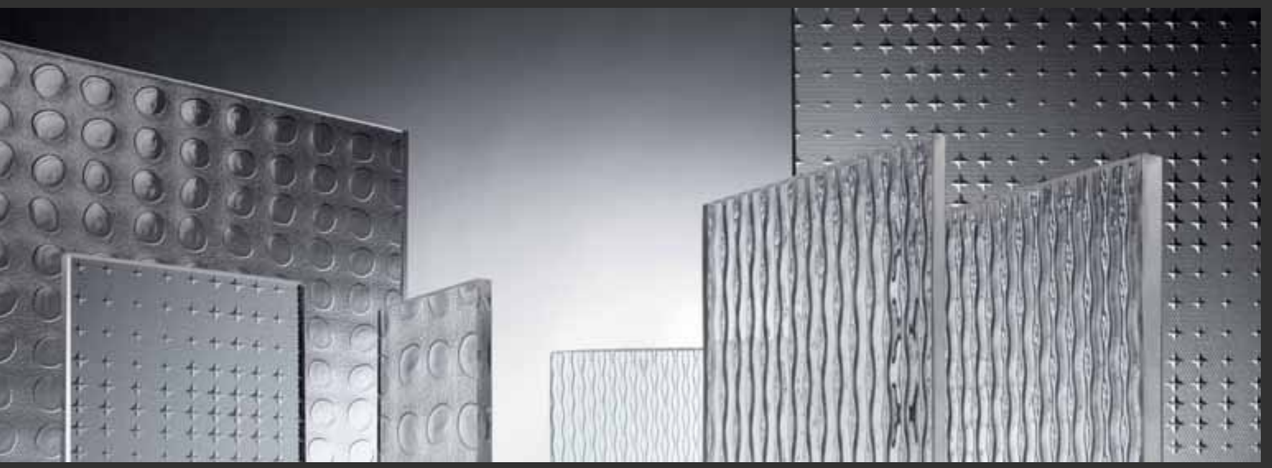
Decorative glass is defined by ASTM C 1172 as:

"Glass with an ornamental appearance created by a textured glass surface (patterned glass), design printed interlayer, application of decal(s) to the glass or interlayer, or other embellishments performed on or to the glass or interlayer material to give the glass an ornamental appearance."



Pilkington, Patterned glass

DECORATIVE GLASS FABRICATION



AGC Glass

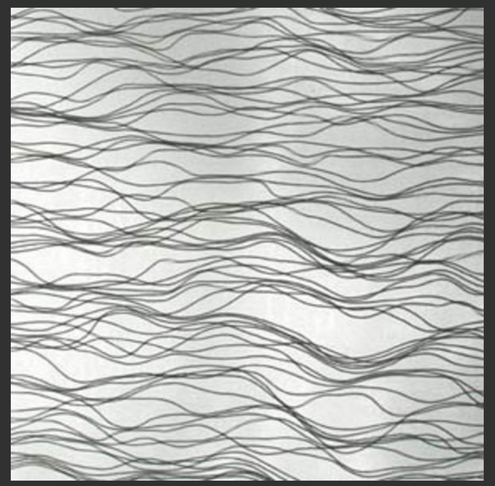
AGC Glass

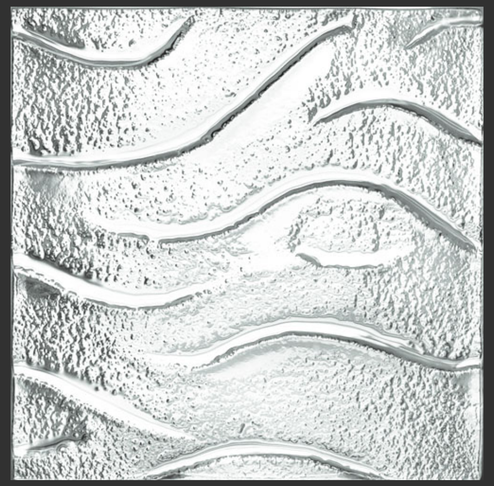
PANEL SIZE

- Minimum and maximum sizes of decorative glass depend on:
- The thickness of the glass specified.
- The limitations imposed by fabrication, handling, and installation.

If working from samples, **always** call the fabricator and verify glass thickness and available sizes!

DECORATIVE GLASS





PANEL SIZE

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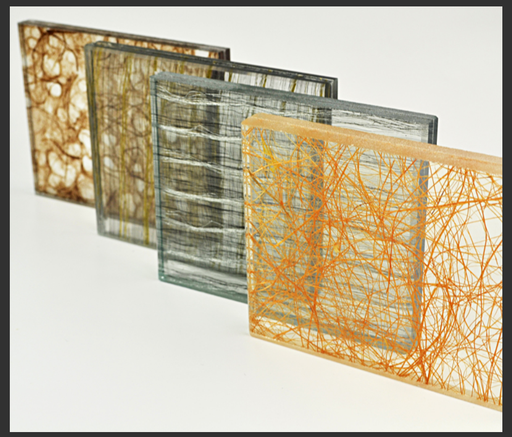
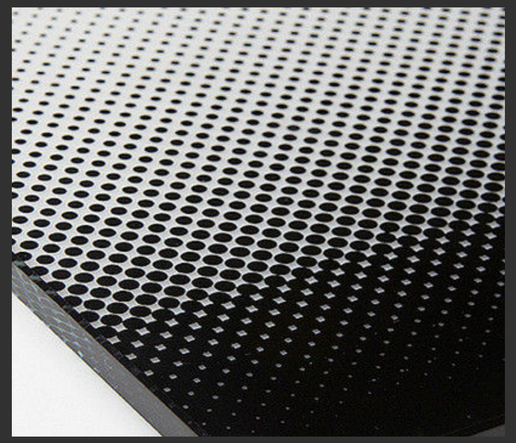
TYPES OF DECORATIVE GLASS



Laminated with decorative interlayer

- Fabricated by heating two layers of glass with a very thin interlayer. This type can be safety glazing - ASK!



Silk-screened

- Fabricated by applying ceramic fit paint to one side of the heat-strengthened or tempered glass so glass does not break when exposed to the sun.

Beveled

- Fabricated by cutting the edges of the glass in an angle. The cut glass can be joined together to create patterns.

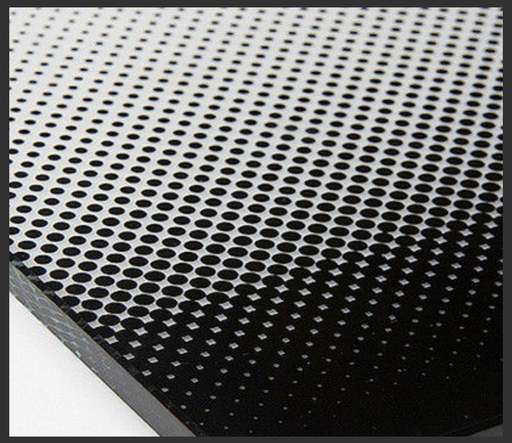
Decorative Film

- Film applied to the glass surface - 1-2-3 or 4.
- Can be strictly decorative or functional,

TYPES OF DECORATIVE GLASS

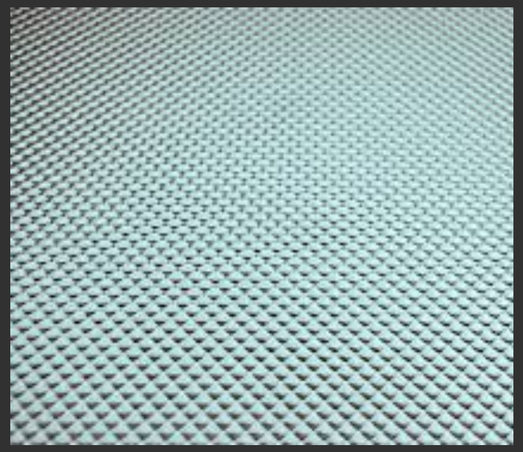
Sandblasted

Fabricated by blasting abrasives onto the glass to create the “frost look”. Requires protection so that dirt does not stick to the glass.



Acid Etched

Fabricated by applying ceramic frit paint to one side. Glass needs to be of the heat-strengthened or tempered glass so it does not break when exposed to the sun.



Patterned Rolled

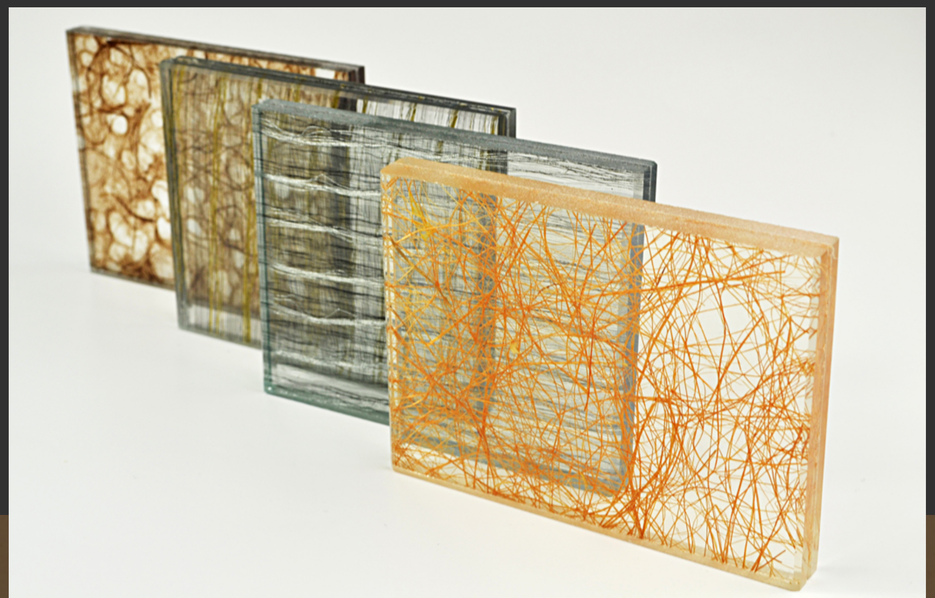
Fabricated by glass manufacturer by rolling “soft” heated glass between a textured roller and a standard roller.

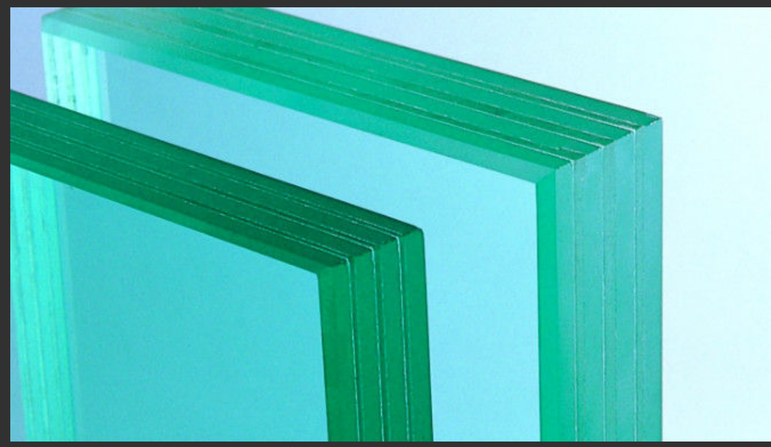
Textured Cast

Fabricated by pouring “soft” hot glass into molds until it cools.

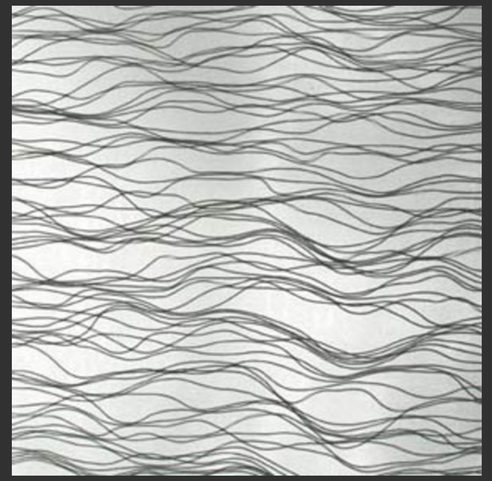
LAMINATED GLASS

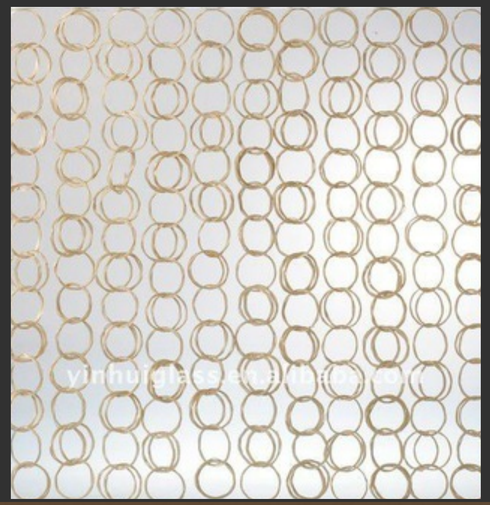
- The most common construction of decorative laminated glass is a decorative plastic interlayer between two lites of glass, though more than two lines can be used.
- Because the surfaces of the laminated glass remain smooth, it is easy to clean and maintain.

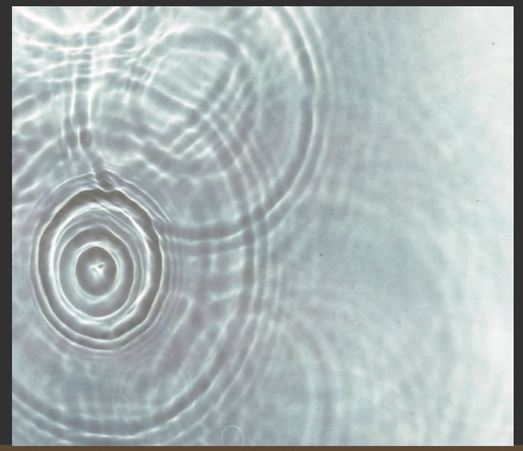




LAMINATED GLASS







- The most common layer is PVB (a plastic sheet) which is a bonded to the glass with heat and pressure to create an homogeneous material. Up to four layers of PVB can be used in this process.
- Glass laminated with PVB protects from fading and damage since the PVB sheets filter out up to 90% of the ultraviolet (UV) light.
- The plastic interlayers can be colored, patterned or simulate all types of materials. Other products, like rice paper or punched metal, can be added to the laminated core.

LAMINATED GLASS

Liquid interlayer

Other interlayer products include:

- Liquid interlayers, installed by pumping the liquid into the space between the glass lites.
- Interlayers applied with adhesive (not “baked”).
- Interlayers for specific functions, such as security, safety, UV protection, fire rating, seismic protection, solar heat control, privacy, etc.

LAMINATED GLASS

SOUND TRANSMISSION

can be effectively reduced by laminated glass.

Montreal's Palais des Congrés

PVB interlayers act as an effective noise-reduction device, dampening vibrations between the glass lites.

- Effective sound control requires a PVB interlayer thickness of 0.030 or 0.060 inch.
- Increasing the thickness above 0.060 inch does little to improve sound transmission.
- Sound Transmission Classes (STCs) from about 35 to 41 are available.

LAMINATED GLASS

SEALANTS

IT is not recommended to leave the edges of laminated glass exposed.

- Either specify framing on all sides or butt-glazing with sealant.

Selecting the sealant for laminated glass is very important, because some sealants may cause progressive damage to the edges, delamination, or the development of cloudiness within the laminated lite.

- Before selecting a sealant, call the glass fabricator and the sealant manufacturer.
- DO NOT ALLOW the Contractor to select the sealant on its own.

PATTERNED GLASS

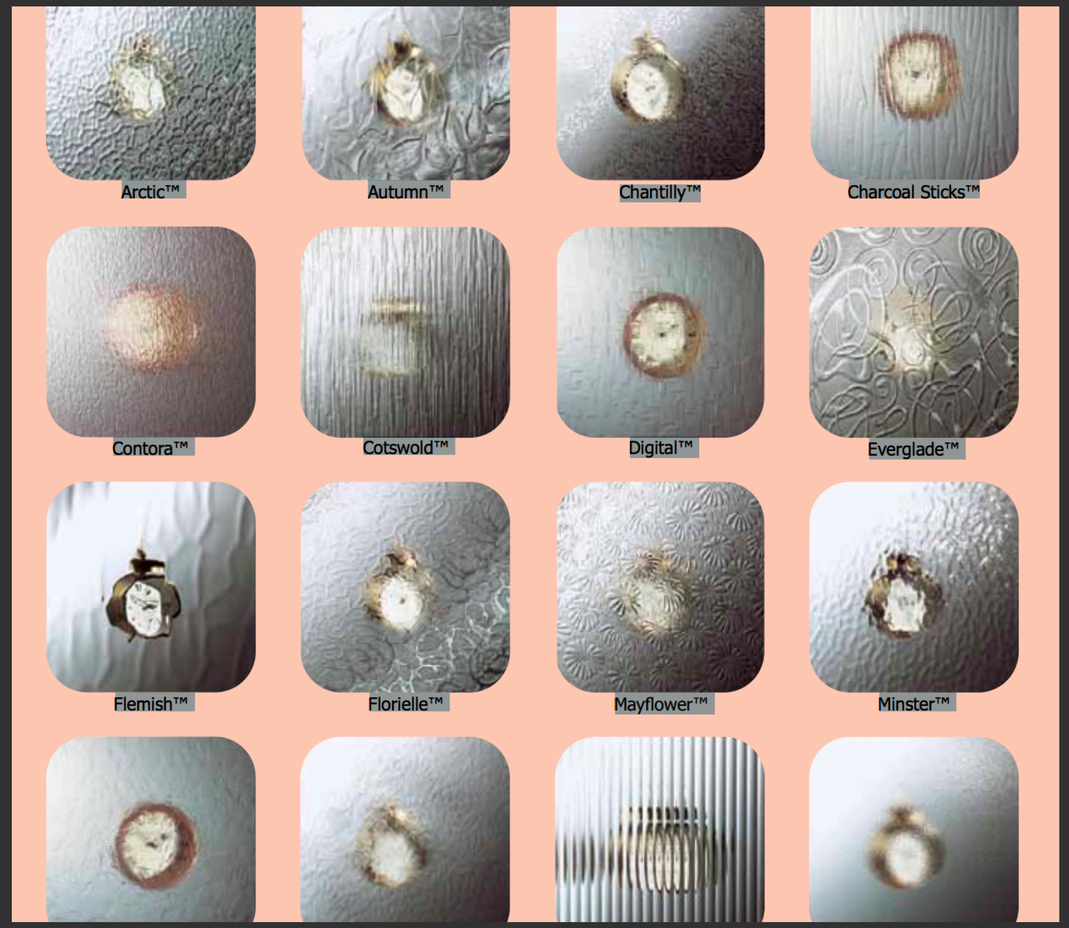
Cardinal, Patterned glass

Patterned glass is defined by ASTM C 1036 as:

"Rolled flat glass having a pattern on one or both surfaces."

- Rolled patterned glass is produced during the glass manufacturing process.
- The pattern (texture) can be applied to one face or both faces of the glass.

PATTERNED GLASS

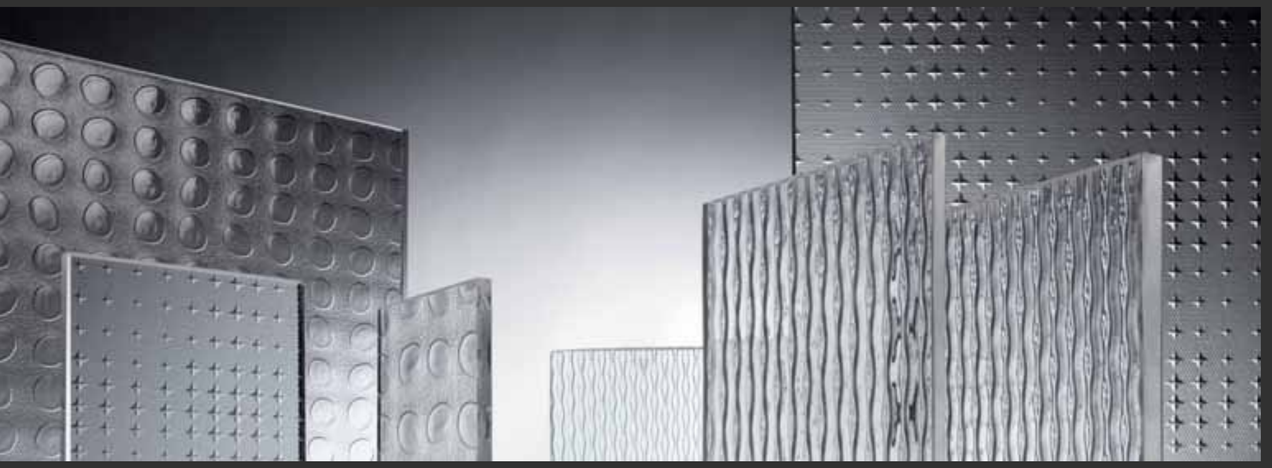


Pilkington, Patterned glass

Pilkington, a glass manufacturer that manufactures glass from “scratch”, makes rolled patterned glass by passing a continuous molten glass ribbon between two steel rollers, one of which has a pattern, creating a permanent impression.

- Pattern glass can be of different types: Tinted, ultra-clear (low iron), wired, or simply clear glass.
- Patterned glass can be tempered and laminated.

PATTERNED GLASS



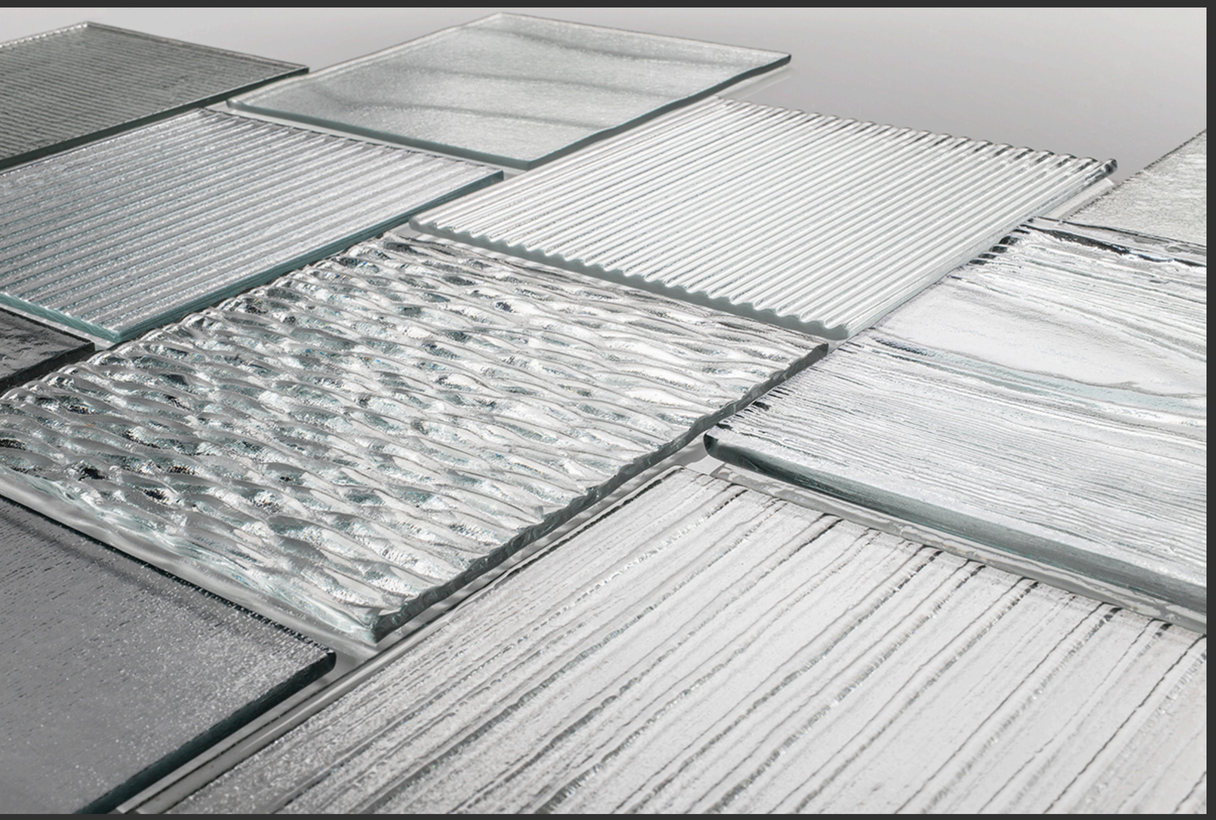
AGC Glass

AGC Glass

PATTERNED GLASS PROPERTIES

- It offers privacy and at the same time it lets light go through and diffuses daylight.
- It can be used as exterior glazing.
- It comes in different thicknesses.
- Fully tempered or laminated, it can be installed where safety glass is required.

PATTERNED GLASS



Forms & Surfaces, Patterned glass, kiln casted.

PATTERNED GLASS cast

- Pattern glass is formed in molds in different ways, including pouring molted glass into a sand mold (sand casting) and melting of glass cullet in a mold placed in a kiln (kiln casting).

SILK-SCREENED GLASS

Silk-screened designs can be applied to glass in one of two permanent ways:

- COLD - Less costly - A cold cured paint or ink process; color adheres to the surface of the glass.
- HOT - A process where a finely ground ceramic frit or inks are applied to the glass surface through a silk-screen and then “baked” to the glass.

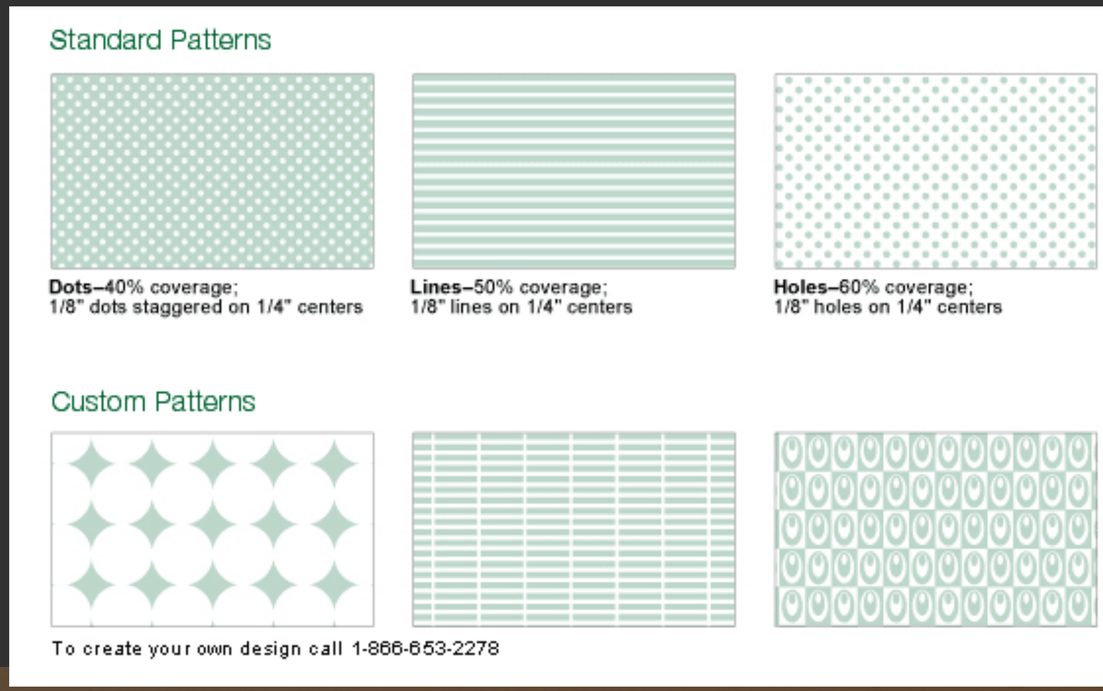
Silk-screened glass fabricated using the hot process is tempered as a result of this procedure.

SILK-SCREENED GLASS

Silk-screened glass properties:

- It can be fully tempered or laminated and used a safety glass.
- It helps with solar control by using darker frit (grey instead of white).
- It controls vision, so glass can be used for privacy or other applications.
- It can be part of an insulating assembly.
- In exterior applications, the glass should be heat-strenghtened or fully tempered to avoid rupture due to thermal stress.

- Because a distortion might be apparent in laminated or insulating silk-screened glass applications , a mock-up is recommended.

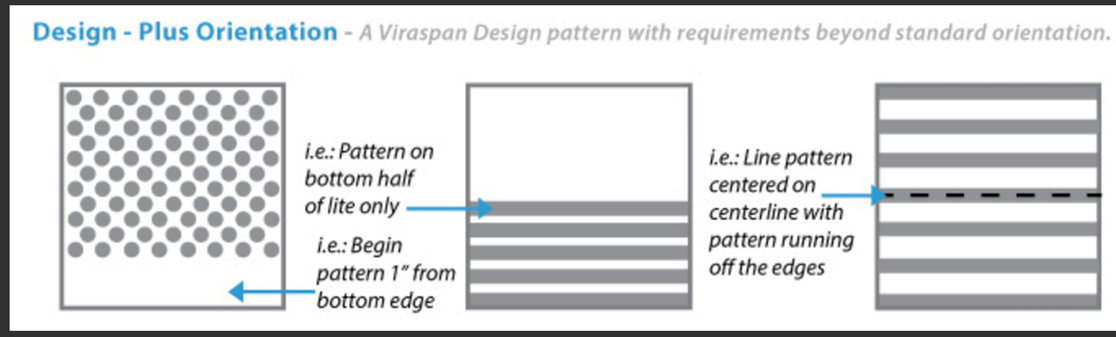


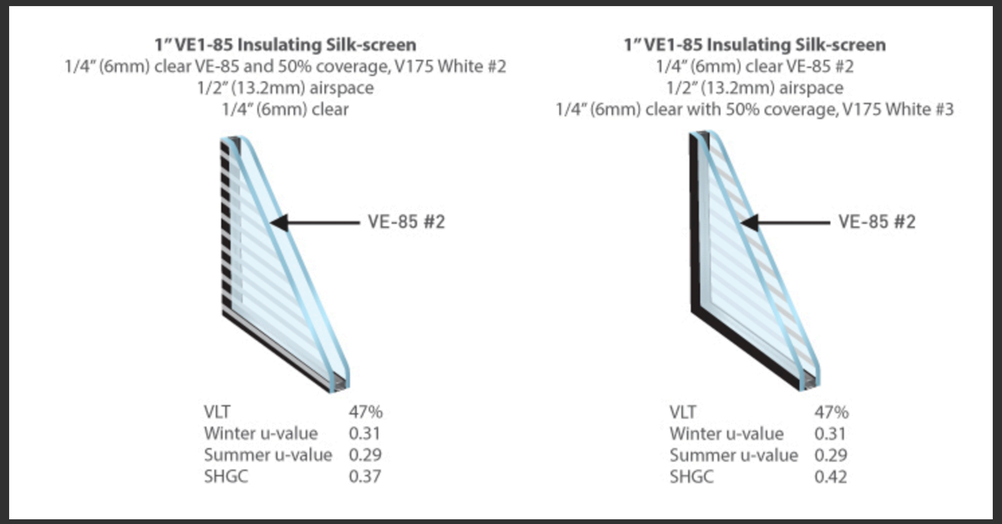
SILK-SCREENED GLASS

If you are using a pattern, document the direction of the pattern and the joints between panels - think fabric.

See the Viracon website.

- Viracon silk-screening process is hot.
- Select this glass type very carefully because they are many variables.
- Always talk to the manufacturers.
- Check the properties of the glass.





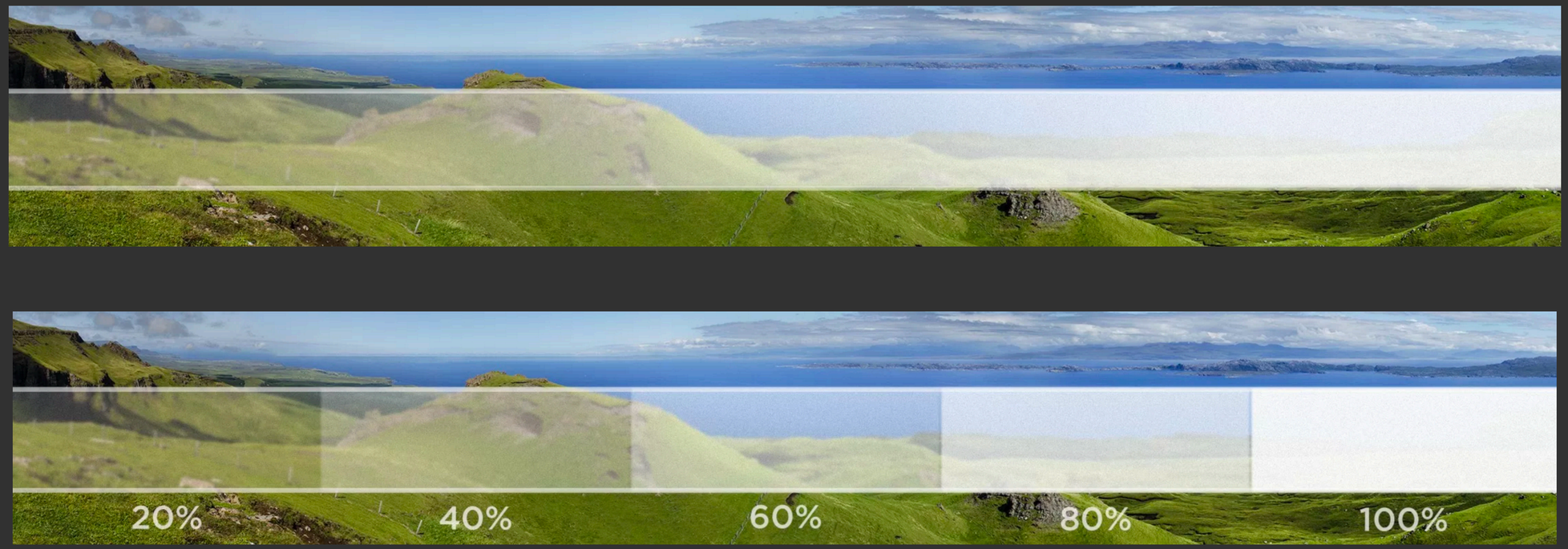
ACID ETCHED GLASS

AIA Dallas

Acid etched glass is fabricated by applying acid to the glass surface. Acid is dangerous, so this process is mostly done overseas.

- It is low-maintenance and less expensive.
- Only one side of the glass panel is etched.
- Acid etching hardens the glass surface and hides the presence of dust and fingerprints, so it is best used in applications where touching is expected.

OTHER TYPES OF DECORATIVE GLASS



ACID ETCHING

- Acid etching gives you choices: different percentages of gradient (above) AND opacity (below).

ACID ETCHED GLASS

Acid-etched glass can be colored by applying colored silicones in the back of the glass. However, mildew can grow between the glass and the silicone back coating.

Since silicone is easily scratched it is appropriate only for applications where the silicone-backed side of the glass will not be exposed. Patterns are available, but they are limited.

LASER ETCHING

Etching can be done using laser technology.

- Glass can be etched on site, so this process should be considered for remodeling projects.

SANDBLASTED GLASS

Sandblasted glass if fabricated by blasting abrasives onto the glass to create the “frost look”. Originally it was done with sand blasted onto the glass surface at high speeds using compressed air, but now other materials are used, such as glass beads, metal pellets, dry ice, and even ground coco nuts shells and corncobs.

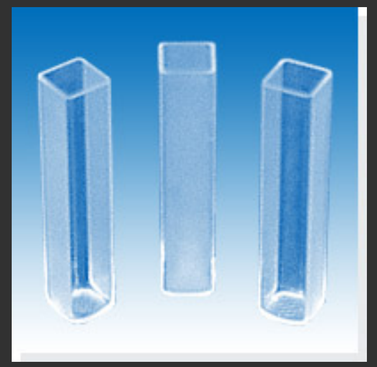
- Each type of blasting material produces a different finish.

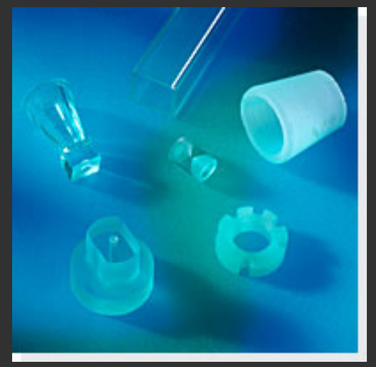
SANDBLASTED GLASS

- Sandblasted glass requires applied protection so that dirt does not stick to the glass surface.
- Sandblasted glass can be more expensive than glass etched glass, but can have better quality.
- Custom designs are easier to order than for acid-etched glass.

DECORATIVE GLASS COMPONENTS

Glass components are available in different shapes and sizes, such as rectangles, rods, tubing (square and round) etc.





Glass stair Apple Store San Francisco

THANK YOU!

GO LOOK AT SOME GLASS SAMPLES

This concludes The American Institute of Architects
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