AGNORA

ARCHITECTS QUICK FACTS

THE WHYS AND HOWS OF BIG GLASS IN ARCHITECTURE

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WHY BIG GLASS

Big Glass has the benefit of being one of the most versatile facade materials in the world. It is the perfect blend of form and function and can yield creative, versatile and timeless results. Big Glass can mean a lot of things, but at AGNORA, we believe it comes down to these core values:

AESTHETICS

Big Glass provides numerous aesthetic benefits:

- In homes, it creates incredible vistas, with unhindered views
- In retail, it creates enhanced, authentic in-store experiences with natural light and openness
- In commercial and institutional spaces, it elevates mood and efficiency

Large glass is used throughout commercial, institutional, retail and residential spaces as a way to improve overall personal well-being to each area. Multiple studies have shown the benefits of natural light in both productivity, consumer purchases and overall happiness.

EFFICIENCY & ENERGY

Performance coatings, lamination, and insulated glass units (IGU's) can all have a tremendous effect on the end product's durability and efficiency. AGNORA uses a blend of all these elements to create glass facades perfectly tailored to the requirements of the building, regional environment, and government regulations.

Energy and efficiency are not the only benefits BIG glass can offer.

Do you need theft protection? Do you need a custom solution (e.g. glass staircase)? Big glass fabrication can be used for these applications.

Also consider:

While Building
Each crane movement and each large panel can lay more area, resulting in fewer parts to the "puzzle," less caulking, and less hardware.

For the Building
Glass is the only cladding material that brings energy into the building, and big glass can do an incredible job at controlling both interior and exterior thermals.

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GLASS TERMS

TEMPERING - The process of strengthening glass

- Full Temper - Up to 4x strength over annealed glass. Shatters in pebbles (safety glass)
- Heat Strengthened - Up to 2x strength over annealed glass. Shatter in larger islands
- Annealed - Native state of the glass. Shatter in large, sharp, shards
- Heat Soak Testing (HST) - Thermal cycles in tempering create compression and tension forces within the glass. HST effectively “weather tests” the glass for impurities and encourages breakage in the test facility as opposed to public

LAMINATING - The process of adding layers to glass

- Interlayer - Laminate that is sandwiched between the glass lites
- PVB - A standard, safety interlayer designed to keep glass fragments together in the event of breakage
- SentryGlas - A high strength laminate used for structural and impact-resistant glass

CNC - Machining glass to size and shape

- CNC Polish - There are many variations of the CNC polish dependent on use case, interlayer, and edge exposure
- Diamond Polish - Incredible clarity and dimensional precision. Used on exposed edges like railings.

INSULATED GLASS UNIT(s) / IGUs - Window and Exterior/Interior glass interfaces

- Spacer Bar - A metal strip situated between two glass lites. Filled with a drying agent to reduce any residual moisture within the sealed unit
- Argon Gas - Noble gas between 2-glass lites and spacer. The inert gas slow resists convection and improves thermal efficiency
- Double Glazed IGU’s - Two pieces of glass with one spacer
- Triple Glazed IGU - Three pieces of glass with two spacers
- Ascent IGU’s - IGU’s that have had internal pressure set to a high altitude to eliminate concavity or convexity when the unit is installed at altitude
- Surface Number - The surface from outside in. For example, the exterior surface is Surface 1, the inner surface of the same glass is Surface 2

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GLASS TYPES

CLEAR

Contains iron and thus has a greenish hue to the glass

LOW IRON

This is a preferred glass that does not contain excessive iron and thus is aesthetically clear

LOW EMISSIVITY COATING

To improve thermal efficiency (insulation properties), thin-film coatings are applied to the raw glass. There are two primary methods in use: pyrolytic and magnetron coating.

EXOTIC

Acid etch coatings, painted glass and other exotics exist and are available at AGNORA.

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DESIGN CONSIDERATIONS

LOADS

Loads placed on glass can be from wind, application of force (i.e. someone hitting it, snow) or from the glass itself if placed at an angle other than 90 degrees vertical.

Glass loads are table-driven and require the glazier or fabricator to help determine the appropriate glass thickness or glass thickness + interlayer for a given size. Be aware and consult with a fabricator and engineer from the onset of the project to ensure loads are properly accounted for.

RAW MATERIAL LIMITATIONS

Glass ribbon from the float plant is manufactured in a 130" (3.3m) wide ribbon, which is then cut into lengths that can be transported. North American fabricated glass can reach sizes of 130" x 300."

Fabricators' stock many of different sizes, often from a variety of glass manufacturers. Keep in mind that manufactured glass sizes can differ, thus design with consideration of cost (i.e. don't make a piece of glass 205" when you could make it 203" and save on overall glass costs because a sheet is 204" vs 300")

INTERLAYER CONSIDERATIONS

Interlayers come in two main flavors and should be specified based on the glass's final application.

- PVB (standard)
- SentryGlas (security, structural, impact-resistant)

The general:

ANNEALED LAMINATE
Breaks in large portions, allowing the form to be maintained by the laminate and least distortion.

HEAT STRENGTHENED LAMINATE
Provide adequate protection in most application, and resists most thermal stresses, and breaks in large islands

TEMPERED LAMINATES
For high-stress lites only, fails in a non-structural manner

INTERLAYER SIZE CONSTRAINTS

Both SentryGlas and PVB laminates can accommodate the overall 130" glass width, common to North American manufactured glass.

Other, exotic laminates can include color stock which range in roll widths from 96"-126". Special considerations regarding size must be made if these laminates are to be used.

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FABRICATION TIPS

HEAT SOAK TESTING

NiS inclusions are extremely small particles that occur in the manufacturing process of glass. Very seldom, these inclusions find their way into the glass ribbon and become part of the product shipped to the fabricator.

Expansion and contraction properties of the NiS inclusions differ from that of glass, and failure can occur to glass that has had thermal stress (ie. heat strengthening or tempering) applied. The failure is not immediate and may result many days, months, or years later as the NiS attempts to expand back to its original state inside the glass.

Failure will result in total breakage of the glass and can cause personal or property damage and be expensive to replace.

Heat Soak Testing accelerates NiS expansion and causes failure in a contained, safe space.

Heat Soak Testing of any tempered glass is your best insurance.

ON-SITE DIGITAL TEMPLATE

Digital templating is a useful step if installing complex glass pieces such as stairways, bridges, etc into any existing space. Glass structures must be highly accurate to maintain their strength and form. Accurate scanning allows for fabricators to provide product at the exact requirement.

LOGISTICS

Oversized architectural glass must have special crates and shipping. It is important to work with a fabricator who has a track record of successful shipments and works with partners such as architects, designers, GC's and glaziers to help pack shipments for:

- Sequenced installation to avoid additional manipulations
- Oriented for minimal manipulations

The more time the glass stays on a manipulator, the more risk it carries for damage.

Another consideration is the final weight and size of the glass. Do the regional glaziers have the equipment and capabilities to install jumbo or oversized glass or will specialty installers or equipment need to be brought on to handle sizes. It is worth consulting with a regional glazier at the design stage to determine these capabilities.

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