

thirsty THURSDAY

Quench your thirst for knowledge!

MARK YOUR CALENDAR FOR THESE OTHER UPCOMING EVENTS!


Annual Conference
Jan. 22-24, 2019
Naples Grande Resort | Naples, FL

Building Envelope Contractors (BEC) Conference
Mar. 3-5, 2019
Caesars Palace | Las Vegas, NV


Glass Processing Automation Days - GPAD (co-sponsored by NGA)
March 26-28, 2019
San Antonio, Texas

Fall Conference
August 12-14, 2019
Toledo, OH

GlassBuild America
September 17 - 19, 2019
Georgia World Congress Center | Atlanta, Georgia



GLASS EMBEDDING



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GLASS EMBEDDING

New Design Considerations for frameless Glass Railings



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BUILDING TRUST





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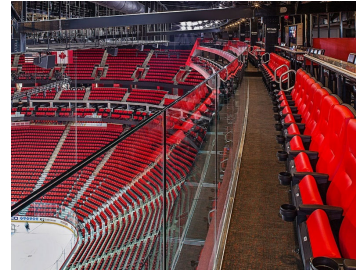
GLASS RAILING

INTRODUCTION

Transparency and safety are essential for every unique stadium or shopping mall experience. All-glass railings and partition walls made of laminated safety glass are important parts of this concept.

Balconies are considered as social connectors in design of modern high-rise buildings. It's important to make the railings neither a fence nor a barrier. Transparent all-glass railings help connecting with the outdoor and the neighborhood.

Daylight Autonomy is an important criteria in the evaluation process of LEED certified buildings. Frameless all-glass railings help improving daylight gains of modern facades as well as safety and comfort of balconies at the same time.



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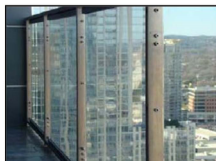
TECHNICAL STANDARDS & GUIDELINES



Glass Informational Bulletin

FB 33-11 (2017)

Use of Laminated Glass in Glass Railing Systems



GUARDRAIL: According to ASTM E2353 Section 3.2.3, a protective railing system around the outer edges of locations of an accessible roof, balcony, landing, platform or ramp designed to minimize the probability of an accidental fall from the walking.

GUARD: According to the 2015 IBC and 2018 IBC, a building component or system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

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GLASS RAILING

TECHNICAL STANDARDS & GUIDELINES

ASTM E2358

Standard Specification for the Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades

ASTM E2353

Standard Test Methods for the Performance of Glass in Permanent Glass Railing Systems, Guards, and Balustrades

ASTM C1172

Standard Specification for Laminated Architectural Flat Glass

ASTM C1048

Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

2015 IBC & 2018 IBC

2015 and 2018 International Building Code represents a major change in the use of glass in railing systems. It makes specific reference to glass railings in Section 2407.



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GLASS RAILING

INCREASED SAFETY DEMANDS

RELEVANT POINTS OF SECTION 2407 OF THE 2015 IBC

- Laminated glass must be used in handrails, guardrails or guards.
- Glass types must be fully tempered laminated or heat-strengthened laminated.
- Laminate must comply with CPSC 16 CFR 1201 Cat II or ANSI Z97.1-2015 Class A
 - (for more information look at *Glass Informational Bulletin –Differences Between Safety Glazing Standards - NGA/GANA FB 08-06 (2009)*)
- Minimum nominal thickness must be 1/4 in.
- The panels and their support systems should be designed to withstand the loads as specified by the code. A design factor of 4 must be used in designing the glass.
- Top rail is not required if the laminated glass is comprised of two or more glass lites having equal thickness and only then if the system receives approval from the building official.
- In windborne debris regions, in-fill glass and glass balusters must be laminated and comply with safety glazing standards.



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GLASS RAILING

COMPATIBILITY WITH LAMINATED GLASS

USE OF LAMINATED GLASS IN GLASS RAILING SYSTEMS GIB NGA/GANA FB 33-11 (2017)

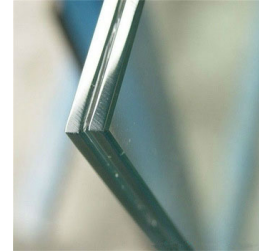
Glazing System Considerations

When a system is wet glazed, it is important to verify compatibility of the caulk, grout, blocks, and sealant used in contact with the laminate interlayer. This is especially important in exterior applications where moisture and expansion rates can impact the system.

Traditional methods of setting monolithic glass in railings such as cement-based grouts may be incompatible with laminated glass.

Bolted or clamped systems must be designed and installed properly to avoid over-stressing the glass around the points of contact.

Consult with the fabricator and component suppliers (i.e. interlayer manufacturers, sealant suppliers, etc.) for questions surrounding compatibility.



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GLASS EMBEDDING

INTRODUCTION

Growing importance of frameless total vision glazing and glass railing.

Postless design - Embedding the bottom edge of glass units into the base shoe fixed to the building structure.

Flat, bent, rectangular, trapezoidal, horizontal, inclined

Common installation methods:

- dry glazing
- wet glazing



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TRADITIONAL SYSTEMS

MECHANICAL FIXATION

- Popular technique
- Customer must use a specific channel system
- Water accumulation → Drainage needed
- Concentrated pressure on glass and interlayer



EMBEDDING WITH CEMENTITIOUS GROUT

- Customer-made channel possible
- Incompatibility with glass interlayers
- Alkaline attack on glass → glass corrosion
- Glass breakage as cementitious grout is too rigid (peak stress, constraint forces)



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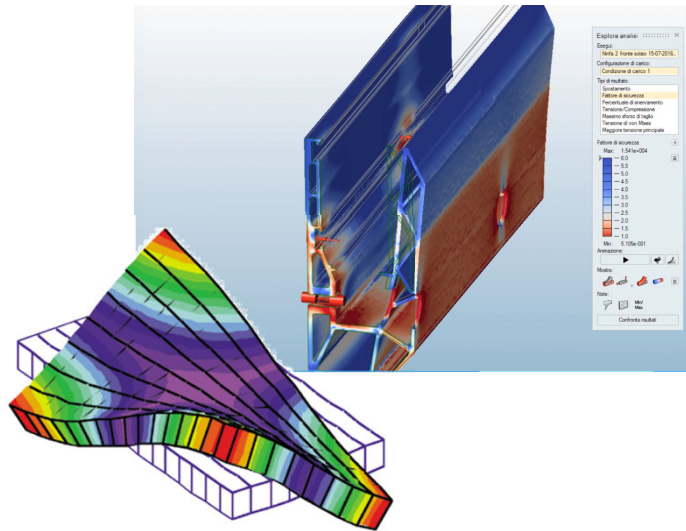
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TRADITIONAL SYSTEMS

INCONSISTENT FIXING

- Mechanical means or rigid materials cause significant stress peaks
- Concentrated stress requires more sophisticated analyses and increase of glass resistance
- Increased risk of glass breakage
- Local relaxation of the interlayer



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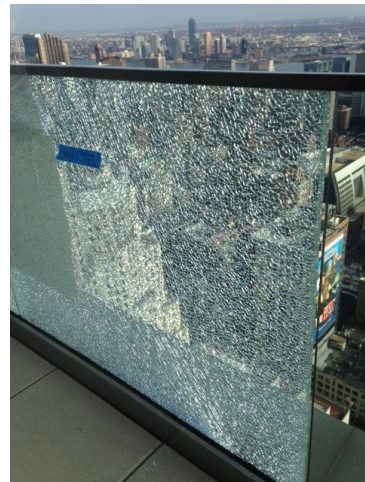
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TRADITIONAL SYSTEMS

RIGID GROUTS

- Installed at outdoor summer conditions with epoxy-based grout
- Glass breakage during first winter
- Range of temperature: -20 to +120 F [-30 to +50°C]
- Thermal expansion of glass vs. aluminum?
- Extreme high hardness of the grout?
- Strong adhesion of the grout?
- Inconsistent filling?
- Collected water → expanding ice?



New York City

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TRADITIONAL SYSTEMS

CEMENTITIOUS GROUTS

- Cementitious grout has been very common in many projects (easy handling, availability)
- BUT: Significant interaction with the interlayer and visible reactions have been observed in most of the outdoor projects!



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PROBLEM SOLVING



CHALLENGES

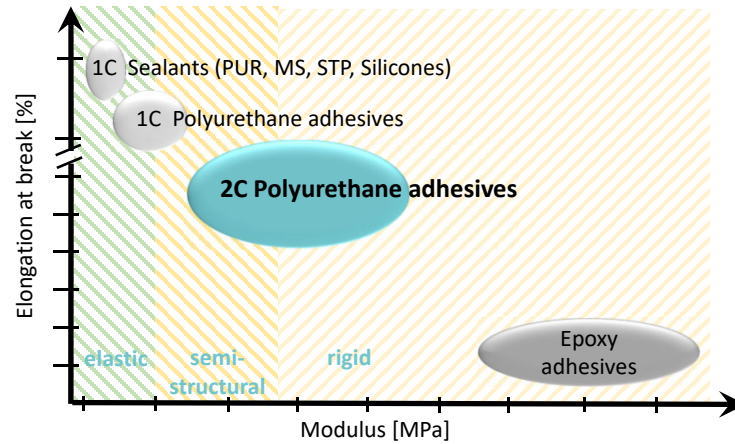
- New standard requirements
- Higher demands on structural and post-breakage performance
- Material compatibility
- Durability under various conditions
- Fast setting and easy repair
- Freedom of design

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STRONG TECHNOLOGY WITH CONTROLLED FLEXIBILITY

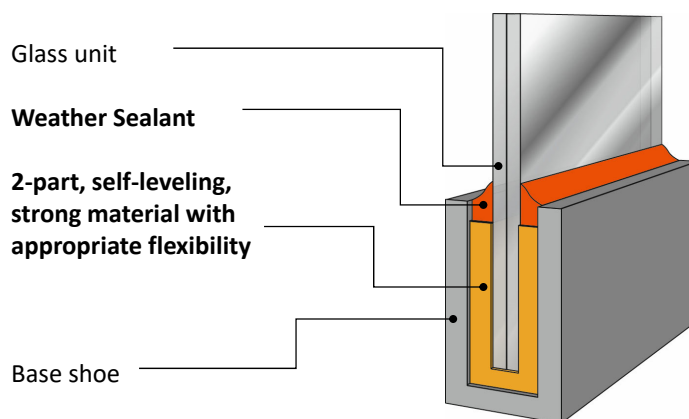


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GLASS EMBEDDING

INNOVATIVE SOLUTION



- Self-leveling, polymer-based technology
- Appropriate hardness and flexibility
- 2-component system: uniform and controlled curing

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GLASS EMBEDDING

COMPATIBLE PRODUCTS

	SikaGlaze® GG-735	SikaForce®-7722 L45	SikaForce®-7780 L05
Base	Two-component Polymer-based grout	Two-component Polymer-based grout	Two component Polymer-based grout
Open time	35 min	45 min	5 min
Shore Hardness	80 (Shore D)	80 (Shore D)	80 (Shore A)
Viscosity mixed	10 Pas for horizontal application	140 Pas for inclined glass railings	for smaller applications, horizontal and inclined, repair
Compatible with laminated glass	Tested	Testing in progress	Testing in progress
Packaging	Component A Pail 25 kg Component B Can 5 kg	Component A Pail 25 kg Component B Can 5 kg	Dual Cartridge 490 ml with static mixer

Tested compatible whether
sealants and for the cap joints:

- Sikasil® WS-305 CN
- Sikasil® WS-295



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GLASS EMBEDDING

APPROPRIATE DESIGN

DESIGN CONSIDERATIONS

- Recommend minimum clearance between base shoe and glass unit: 3/8 in
- Recommend minimum covered glass bite at the bottom edge: h/10 not less than 3 in
- Recommend depth of the silicone top finish: 1/4 - 3/8 in
- **Details can be optimized and customized if verified in a mock-up application and performance testing**

COMPATIBLE PRODUCTS

- **Cycles of 21 weeks in a climatic chamber**
- Temperature range -20 to +140 F [-30 to +60°C]
- High humidity / condensation
- Laminated glass in full contact with grouts and sealants
- **Thermal expansion tests** over 1 year
- Good compatibility with common interlayers
- Waterproof embedding system
- Compatible weather sealing recommended for outdoor applications



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GLASS EMBEDDING

METERING & DISPENSING EQUIPMENT

MIX MASTER GG



APPLICATIONS

- GROUTING OF GLAZING CHANNELS
- LARGE JOINT SEALING

MATERIALS

- DESIGNED FOR SikaGlaze GG-735

AST ADHESIVE SYSTEMS
TECHNOLOGY CORP

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GLASS EMBEDDING

PRODUCTIVITY

CASE STUDY

- Installation of 1600 LF glass railing, incl. glass planting, grouting, cap joints
- 3 man crew

Grouting method	Total completion of 1600 LF	Productivity of 3 man crew	Advantages
Traditional cementitious grouts, manually mixed and applied	20 workdays	80 LF per day	
Polymer-based grout, manually mixed and applied	8 workdays	200 LF per day	Easy to mix Self-leveling Applied from one side Fully cured after 24 hours
Polymer-based grout, machine mixed and dispensed	4 workdays	400 – 500 LF per day + 60% less waste	Pump supported mixing and dispensing Reduced material waste and cleaning effort

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Glass Bonding is our Passion

