

# MAINTENANCE MATTERS



## Glass Balconies: Best Practices & Maintenance

Glass balcony assemblies have become a key feature of modern condominium design and provide the benefits of open views and natural light. But behind the beauty lies a need for precision, care, and ongoing upkeep.

If you own a condo, manage property, or serve on a board, it's key to know how to maintain glass balconies. This helps ensure safety, extend their life, and protect your investment. In this bulletin, we'll answer common questions about glass balcony systems. We'll also share practical maintenance tips to keep balconies safe, secure, and looking great all year.

### Balcony Railing Systems

To help with maintenance planning, it's always a good idea to take pictures and to keep notes of any changes that you may notice with the glass balcony unit. Keeping good records on a yearly basis is very helpful, especially for condo boards that have to keep track of numerous units.

Don't forget to include location tags and dates on the pictures and notes.

There are no official, building code-based names or labels for the type of balcony railing systems used on a building.



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This series of bulletins and companion videos is designed to provide practical information on maintaining residential buildings. Produced by BC Housing, this bulletin was prepared by Capacity Engineering in collaboration with the Condominium Home Owners Association of B.C.

Generally, the railing systems are given names based on the materials and forms used:

- Glass
- Wood
- Metal
- Concrete
- Other

Most of these systems have primary and secondary structural elements. Some also include protective elements, like the armouring reinforcement in load-bearing glass systems.

We will deal broadly with Post and Rail, Post and Infill, and Cantilevered as systems.

For balcony glass systems, the Posts and Top Rails may both be considered hybridizing options. This is because the Glass forms the majority of the aesthetic and function, even when only acting as the secondary (infill) element.

## What Are the Types of Glass Balcony Assemblies?

Glass is one of the most popular materials used for balcony balustrades. It offers:

- A relatively low-cost solution with minimal maintenance needs
- A long lifespan, high impact resistance
- The ability to create clean, open views

Despite its strength, glass remains a fragile material by nature. Safety standards require toughened safety glass for all balconies. This helps prevent serious injuries in case the glass breaks. There are three types of glass used within glass balcony assemblies:

- Tempered
- Heat-soaked tempered
- Laminated glass

### Tempered glass

- Tempered glass is created by heating un-treated glass to a very high temperature and then rapidly cooling it.
  - This process, commonly referred to as quenching, makes the glass much stronger.
- Once quenched, the glass cannot be cut, ground, or drilled.
- Tempered glass shatters into small, blunt pieces.
  - This design lowers the chance of serious injury.
- One potential issue with tempered glass is the presence of Nickel Sulfide (NiS) inclusion, which can cause spontaneous breakage months or even years after installation.

### Heat-soaked Tempered Glass

- To reduce the risk of NiS-related breakage, some tempered glass undergoes an additional process called heat soaking.
- This process heats the glass to accelerate any potential failure caused by NiS inclusions, allowing defective panels to be identified and removed before installation.
- This process is proven to remove approximately 95–98.5% of defective panels. Glass manufacturers that offer heat-soaked products typically provide certification to confirm the testing.
- Heat soaking is energy-intensive and adds to the overall production cost.
- While heat soaking is standard in many parts of Europe (and part of European building codes), North America does not yet have a formal standard.

### Laminated Glass

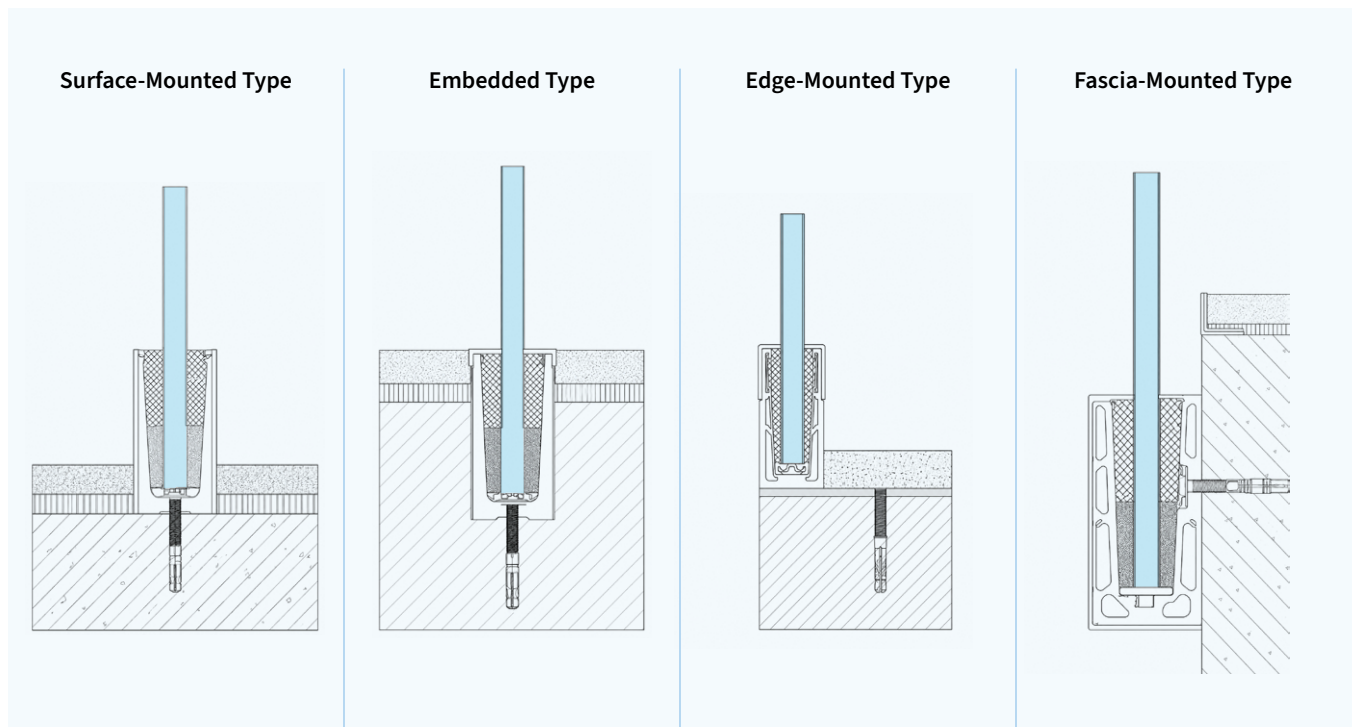
- Laminated glass consists of two or more layers of glass bonded together with a plastic interlayer (typically polyvinyl butyral or PVB) under heat and pressure.
- In case of breakage, the pieces stick to the plastic layer instead of falling out of the frame.
- This makes laminated glass a popular choice for safety-critical applications where retaining the glass in place after breakage is essential.

## What Are the Types of Tracks, Channels, and Railings Used in Glass Balcony Assemblies?

Glass balcony assemblies use tracks, channels, and railings for support. These elements create the framework that holds the glass panels in place. These components are critical for both safety and aesthetics. Their design can vary depending on the building's architecture, desired appearance, and code requirements. Below are the primary systems used:

### Channel Systems

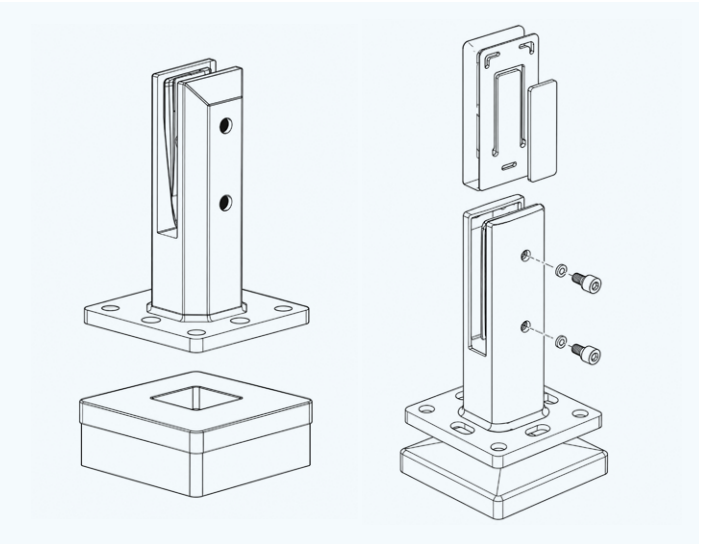
- This system consists of glass panels secured into a continuous metal channel. This system is usually made of aluminum or stainless steel, mounted along the floor or edge of the balcony or in a track.
- The systems can be dry-glazed or wet-glazed.
  - **Dry-glazed:** This uses mechanical gaskets, like rubber or EPDM, to hold the glass in place.
  - **Wet-glazed:** This uses structural silicone sealant to bond the glass to the channel. The sealant offers stronger water resistance but are more difficult to replace.



Additional Information: <https://tinyurl.com/bde5b257>

## Spigot Systems

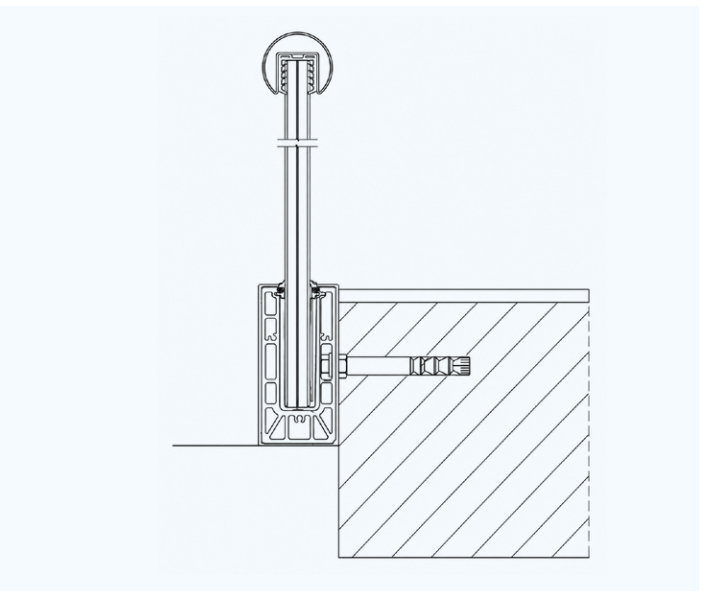
- Spigot systems use individual metal supports (spigots) anchored to the floor or the surface.
- Each spigot clamps the bottom of a glass panel, allowing for a minimalist design without the need for continuous channels.



Additional Information: <https://tinyurl.com/mwybrkws>

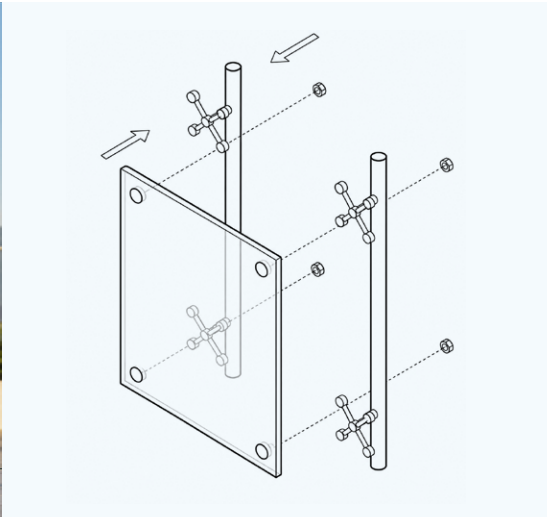
## Top Rail Systems

- Top rail systems incorporate a horizontal rail at the top of the glass panels, providing additional support and safety.
- These systems can be combined with base shoes or spigots and are often chosen for their aesthetic appeal and added structural integrity.



## Bolted Pointed-Fixed Systems

- In structural or “frameless” glass systems, the panels may be held with bolted fittings known as spider fittings or point-fixings. These go through pre-drilled holes in the glass.
- This system required glass to be tempered or laminate and are often use in curtain walls or decorative facades, but occasionally adapted for balconies.



## Types of Fasteners Used in Glass Balcony Assemblies

Fasteners are the backbone of any glass balcony assembly. They anchor the system’s components such as base shoes, brackets, posts, and spigots, etc. into the building structure. Some common type of fasteners used in buildings are:

- **Anchor Bolts (Concrete Anchors):** Used to secure base shoes, posts, or spigots to concrete slabs or balcony decks. These can be wedge anchors, sleeve anchors, or chemical anchors (epoxy-based).
- **Threaded Rod with Epoxy Anchors:** Embedded in concrete using structural adhesives for strong, corrosion-resistant anchoring.
- **Lag Screws / Lag Bolts:** Often used in wood-framed balcony structures.
- **Through Bolts:** Used when access is available to both sides of the mounting surface.

- **Self-Tapping Screws:** Typically used in metal-framed installations where pre-drilled holes aren’t needed.

In outdoor settings like balconies, durability becomes a key factor in choosing fasteners. Rain, UV rays, humidity, and air pollution can quickly corrode standard steel fasteners. This corrosion weakens connections over time. To solve this, galvanized fasteners are often used.

## Why Galvanized Anchors Matter

**Galvanization** is the process of coating steel with a protective layer of zinc.

The zinc layer:

- Acts as a barrier to moisture and oxygen.
- Offers sacrificial protection, meaning the zinc corrodes in place of the steel, preserving the integrity of the fastener beneath.

**Hot-dip galvanized fasteners** are particularly effective for balcony systems, as they receive a thick, uniform coating of zinc during manufacturing.

**Note:** According to the American Galvanizers Association, hot-dip galvanized steel can provide over 50 years of corrosion resistance in moderate environments, and up to 25 years in more aggressive coastal or industrial settings. Their resistance to corrosion significantly reduces long-term maintenance needs and helps ensure the safety and stability of the glass assembly.

Using galvanized or stainless-steel fasteners is not just a best practice, it is often a building code requirement. This is especially the case in guardrail and fall protection systems. The Canadian Building Code requires corrosion-resistant hardware for exposed installations.

Failing to use proper fasteners may lead to:

- Premature rusting,
- Structural failures,
- Costly repairs.

In some high-risk environments, stainless steel fasteners may be preferred over galvanized due to their superior resistance to salt and humidity.



## Why Do Glass Panels Shatter? Understanding Safety Glass and Its Risk.

While glass used in balcony assemblies and curtain walls is typically safety-rated, it can still be damaged. Several factors can cause glass panels to shatter, and often it's a combination of issues rather than a single cause.

Listed below are some of the most common reasons:

- **Environmental Loading**

High wind pressure can stress glass panels beyond their design limits, especially in high-rise buildings or poorly designed systems.

- Axial Shortening
- Over time, the vertical columns in a building can shorten under axial loads (weight from the structure above).
- If this structural movement isn't properly accounted for in the glass structure, it can compress the curtain wall system and lead to glass breakage.

- **Thermal Expansion and Contraction**

- Glass expands and contracts with temperature changes.
- If the system doesn't allow for this movement, through proper expansion joints or gaskets, the resulting stress can cause cracks or shattering.

- **Installation Damage at the Edges**

- Glass edges are particularly vulnerable.
- If they're chipped, cracked, or overly compressed during installation, the risk of future breakage increases significantly.

- **External Impact**

- Sudden impacts, like a bird strike, falling debris, or even strong hail, can cause immediate breakage, especially in exposed balconies or upper levels.

- **NiS Inclusions**

- A known issue with tempered glass, NiS inclusions are microscopic impurities formed during manufacturing.
- These can expand slowly over time, eventually causing spontaneous glass failure, sometimes months or even years after installation.

- **Improper Fastening or Support**

- Glass railing systems rely on precise and secure mounting to perform safely.
- If glass panels are improperly fastened, such as being inadequately clamped, unevenly torqued, or lacking sufficient edge clearance, stress concentrations can develop at contact points.
- Over time, even minor vibrations, thermal cycling, or building movement can cause cracks to initiate and propagate, ultimately leading to sudden shattering.
- In cantilevered or point-supported systems, improper anchorage or hardware misalignment can also compromise the load path, increasing the likelihood of failure under otherwise normal conditions.

## How Often Should Glass Balcony Systems be Inspected?

Regular inspection of glass balcony systems is critical for identifying early signs of wear, defects, or structural issues before they become serious safety risks.

The purpose of inspection is to:

- Assess the current condition of the balcony system
- Identify visible or hidden defects
- Ensure compliance with safety standards and building codes

Inspection activities can range from visual checks to detailed assessments with testing or engineering analysis. The results help with maintenance decisions and catch problems early.

General Inspection Guidelines for Glass Balcony Systems:

- **Visual Inspection**

**Frequency:** Annually

**Responsibility:** Performed by trained building staff or contractors, this should include checks for glass chips, cracks, loose fasteners, corrosion, and damaged or missing components.

- **Fastener Torque Testing**

**Frequency:** Every 5 years, or sooner if concerns arise

**Responsibility:** This should be done by a qualified contractor or structural engineer to ensure anchors and fasteners remain tight and effective.

- **Sealant Inspection & Reapplication**

**Frequency:** Every 5–10 years, or as needed

**Responsibility:** Performed by a glazing professional, this helps prevent water ingress and deterioration of supporting components.

- **Post-Breakage Inspection**

**Frequency:** Immediately after any damage or impact

**Responsibility:** This should be done by a qualified professional or engineer to assess structural safety and recommend corrective action.

**Note:** If you live in a recently constructed condo, inspect all balconies within the first and second year. Early issues may stem from building settlement or shrinkage

## How Frequent Should a Maintenance Program Occur?

A well-planned maintenance program helps ensure the system stays safe and functional over the long term. Without proper maintenance, issues like rust, glass failure, or water intrusion can arise, leading to costly repairs and safety risks. The purpose of maintenance is to:

- Maintain system performance and appearance
- Prevent premature wear or failure
- Reduce long-term repair costs
- Ensure continued safety compliance

Common areas that require maintenance:

- **Guardrails** – Regular use and exposure to elements can cause wear, loosen anchors, or lead to corrosion.
- **Glass edges** – Must remain intact to maintain safety.
- **Base shoes and drainage tracks** – Debris and water buildup can accelerate corrosion and damage hidden parts of the system.

| Task                              | Frequency                      | Performed By                   |
|-----------------------------------|--------------------------------|--------------------------------|
| Visual check for damage and wear  | Annually                       | Trained staff or contractor    |
| Tightening/ checking of fasteners | Every 5 years or if needed     | Qualified contractor/ engineer |
| Sealant inspection/ reapplication | Every 5–10 years or as needed  | Glazing professional           |
| Replacement of worn gaskets       | As needed (often with sealant) | Glazing professional           |
| Drainage cleaning                 | Annually                       | Building maintenance team      |
| Immediate repair after damage     | As needed                      | Qualified contractor/ engineer |

**Table 1:** Types of maintenance for balconies and recommended frequency

## Wood, Metal, Concrete and Other Balcony Assemblies

While this bulletin focuses mainly on glass balcony assemblies, we previously noted that other types of railing systems include wood, metal, concrete, and others. In the following section, we will focus on these railing systems and provide additional information about them.

### What Are the Types of Wooden Balcony Assemblies?

Wooden balcony assemblies are often made with a traditional top rail, bottom rail, posts, and spindle system.

The elements are all lateral load bearing, with the top and bottom rails being structural element supporting both the horizontal and vertical loads. The vertical posts are both gravity and lateral load supporting.

For Maintenance:

- Wooden systems should be inspected annually by owners and maintenance staff for:
  - Evidence of loss of pressure treatment (if applicable)
  - The condition of any coatings (paint, urethane, etc.
  - Signs of softening and/or rot
- Deterioration of posts and the larger elements can progress from the inside out, so often one of the first signs of deterioration in such elements is their increased sagging/curving under loads.
  - Fasteners may also begin to come loose as the materials degrade.
- We recommend that such systems be reviewed by a professional engineer at last every five years.
  - The hidden dangers of timber rot mean that a suitably trained and qualified professional is called for as they age, to minimize the risk of unexpected failure.

## What Are the Types of Metal Balcony Assemblies?

Metal balcony systems tend to be categorized by the type of metal used, with the aluminum and steel systems as the most preferred options.

Aluminum systems are:

- Lightweight,
- Corrosion-resistant,
- Often powder-coated for durability, making them ideal for coastal or high-moisture environments.
- Typically feature post-and-rail or picket designs, where posts provide vertical support and rails/infills handle lateral loads.

Steel systems, including galvanized or stainless steel, offer:

- Greater strength for high-load applications but require protective coatings to prevent rust
- Common forms include ornamental wrought iron styles or cable-infills for a modern look.
- Hybrid metal-glass systems may use metal posts with glass panels.

For Maintenance:

- Metal systems should be inspected annually by owners and maintenance staff for:
  - signs of corrosion (e.g., pitting on aluminum, rust on steel),
  - chipping paint or coatings,
  - loose fasteners, or deformation under load.
- In salted environments (e.g., winter road salt exposure), check for rapid deterioration at base connections.
- We recommend that such systems be reviewed by a professional engineer at least every five years, or sooner in harsh climate zones.
  - Early detection of corrosion can prevent structural weakening, and recoating (e.g., powder or galvanization refresh) may extend lifespan significantly.

## What Are the Types of Concrete Balcony Assemblies?

Concrete may be used as the railing system in a variety of forms. When pre-cast, the connections are a critical area which is both essential, and very difficult, to review in detail.

For Maintenance:

- Owners/Occupants should make note of any signs of rust (steaks on the concrete, rust colour under balconies, visible rust at joints, etc.). They should raise this with property management and maintenance personnel.
  - Check for changes each year.
  - If you notice significant or rapid changes, be sure to consult a professional engineer.
- We strongly recommend concrete balconies be reviewed by a professional engineer at 12 years of age, and then at frequencies set by professional engineering advice, or as outlined in a routine inspection.



## What Other Types of Balcony Assemblies might be encountered?

Other balcony assemblies include less traditional materials like composites (wood-plastic blends), vinyl/PVC, and cable or tension systems.

- Composite systems mimic wood aesthetics but with enhanced weather resistance, often in post-and-rail formats where the composite acts as both structural and infill elements.
- Vinyl/PVC railings are fully synthetic, lightweight, and UV-resistant, commonly used in low-maintenance residential settings with snap-together components.
- Cable systems feature stainless steel cables strung between metal posts, providing minimal visual obstruction while meeting load requirements; these are structural via tension but may include protective sheathing.
  - Hybrids, such as mesh-infills (e.g., nylon or wire nets), are rare but used for child safety in some designs.

For Maintenance:

- These systems should be inspected annually by owners and maintenance staff. Inspections should look for fading, cracking (in composites/vinyl from UV exposure), cable slackening or fraying, or buildup of debris in mesh/cables.
  - Watch for thermal expansion issues (i.e. materials expand when heated and contract when it's cooler) in synthetics during Canadian freeze-thaw cycles.
- We recommend professional engineer reviews every five to seven years, depending on material.
  - Composites and vinyl require minimal upkeep beyond cleaning, but cable systems may need periodic tension adjustments to maintain safety compliance.



## Action Plan Tips

Before you proceed with projects that may affect the balcony structure consider the following:

### System Identification & Design Considerations

- Identify the glass type used in your balconies (tempered, heat-soaked tempered, laminated)
- Confirm support system type: base shoe, spigot, top rail, point-fixing, or cantilever
- Review manufacturer specifications and ensure systems meet local building code (e.g., CSA, NBC)
- Check for potential structural movement (e.g., axial shortening, slab edge deflection)

### Anchoring & Fastening Best Practices

- Use corrosion-resistant fasteners (hot-dip galvanized or stainless steel as required)
- Verify appropriate anchoring method (wedge, sleeve, or epoxy anchors for concrete; lag bolts for wood)
- Ensure all fasteners are torqued properly and reviewed by qualified personnel
- Do not reuse fasteners or hardware during component replacement unless confirmed acceptable by the manufacturer

### Pre-Work Inspection Checklist

- Inspect for chips, cracks, and edge damage on glass panels
- Check for loose fasteners, spigots, or railing elements
- Assess sealant condition and look for signs of degradation or water ingress
- Confirm drainage slots or tracks are clean to avoid corrosion-related failures
- Document all observations before beginning any work affecting balcony assemblies

### Materials & Safety Assurance

- Confirm whether heat soaking was performed for tempered panels (request certification if applicable)
- Use laminated glass in areas where glass retention post-breakage is critical
- Replace any glass panel showing signs of NiS inclusions, spontaneous breakage, or impact damage
- Avoid any grinding, drilling, or cutting of tempered glass on-site—replace panels if modification is needed

### Maintenance and Monitoring Plan

- Schedule annual visual inspections for chips, corrosion, and loose components
- Conduct fastener torque testing every 5 years or sooner if concerns arise
- Plan sealant reapplication every 5–10 years or as needed based on inspection
- Clean drainage tracks annually to prevent water buildup and hidden corrosion
- Inspect all balconies within the first 1–2 years of new construction for settlement-related issues

### Precautions During Nearby Construction or Renovation

- Protect all glass panels from impact, vibration, and debris
- Isolate the work area with temporary barriers if tools or materials are in proximity
- Prohibit any attachment of fixtures to balcony glass unless approved by a qualified engineer

### After Damage or Impact

- Immediately inspect damaged areas with a qualified contractor or structural engineer
- Do not delay replacement or repair—compromised glass or fasteners can pose serious safety risks



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