

CNCGLASS

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TECHNICAL NOTE

Laminated Glass vs Conventional Toughened (Tempered) Glass — With EVA Interlayer

By Peter Lin

Architectural and interior projects often specify “safety glass,” yet toughened (tempered) glass and laminated glass protect people in fundamentally different ways. This technical note compares conventional monolithic toughened glass with laminated glass that uses an ethylene-vinyl acetate (EVA) interlayer: how each product fails under impact, why the interlayer continues to hold fragments after breakage, how EVA laminates are typically processed in a vacuum bag and heat cycle, and where EVA’s moisture behaviour supports wet-area use. Security-related wording is kept qualitative; unverified marketing multipliers from trade copy are not restated as facts.

CNCGLASS · 1. Two Safety-Glass Families — Failure Modes

Both toughened glass and laminated glass can be classified as safety glazing when they meet the applicable impact standards (for example EN 12600 in Europe, or CPSC 16 CFR 1201 / ANSI Z97.1 in North America). The decisive difference is what remains after the glass breaks.

Toughened (tempered) glass. Thermal tempering raises the glass strength relative to annealed glass and produces a characteristic dice-like fracture into small, relatively blunt particles. Once the pane fails, those particles tend to fall out of the framing, leaving an open hole in the building envelope. That opening can allow fall-through, wind-driven rain, or rapid access after a deliberate strike.

Laminated glass with an interlayer. Two or more glass plies are permanently bonded with an interlayer such as EVA. When the glass cracks, fragments typically remain adhered to the interlayer and often stay within the frame, forming the familiar “spider-web” pattern when the impact does not fully pierce the laminate. The interlayer therefore provides both personal-safety containment and a continuing physical barrier after breakage—an attribute that matters for overhead glazing, façades, shopfronts, walk-on floors, security screens, canopies, and similar applications.

In short: toughened glass mainly reduces cutting injury at the moment of breakage; laminated glass mainly keeps the opening closed and the shards bound after breakage. Project codes and risk assessments determine which behaviour—or a combination of tempered plies within a laminate—is required.

CNCGLASS · 2. EVA Interlayer and Vacuum-Bag Heat Process

Ethylene-vinyl acetate (EVA) for architectural laminated glass is supplied as a sheet film. In a typical vacuum-bag (oven) route used with EVA:

1. Clean glass plies are assembled with one or more EVA sheets between them.
2. The stack is sealed in a silicone vacuum bag; vacuum is applied so that atmospheric pressure consolidates the package and entrapped air is removed, reducing the risk of residual bubbles.
3. Heat is applied so that the film softens, wets the glass, and—depending on the EVA grade—cross-links into a stable interlayer bond.
4. The laminate is cooled under controlled conditions before further processing (edge cleaning, inspection, framing).

The source notes that EVA sheet film is available to a maximum width of 2.5 metres for this process context. Actual roll widths vary by product grade and order; confirm the current CNCGLASS / supplier datasheet before quoting project glass sizes.

CNCGLASS · 3. EVA Properties and Wet-Area Suitability

When correctly formulated and laminated, architectural EVA interlayers are valued for a practical combination of mechanical and environmental behaviour:

- 1. Bond and cohesion.** Strong adhesion to glass and good interlayer cohesion help the laminate retain integrity after impact.
- 2. Optical clarity.** Clear EVA grades are selected for high transparency in architectural safety glazing.
- 3. Temperature and durability.** Cross-linked EVA systems are generally resilient across service temperature cycles and intended for long-term reliability when processed to the film maker's schedule.
- 4. Moisture behaviour.** Relative to conventional plasticised PVB, EVA is widely regarded as less hygroscopic and better suited to open-edge or humid conditions—hence its frequent use in shower screens, wet rooms, and other moisture-exposed interior applications. Compatible edge detailing and sealants remain essential; moisture resistance is not a licence for standing water on unprotected edges.
- 5. Broader performance roles.** Beyond personal safety, EVA laminated builds are commonly specified where projects also seek improved security delay and acoustic comfort for indoor or outdoor glazing—subject to the tested build-up and framing system. Always distinguish architectural glass EVA interlayer film from solar photovoltaic encapsulant EVA: formulations, curing schedules, and qualification standards differ.

CNCGLASS · 4. Impact Containment and Intrusion Resistance

Laminated safety glass is generally more resistant to penetration after breakage than monolithic conventional glass, because the interlayer continues to hold fragments and to oppose a cutting or thrusting attack. Monolithic toughened glass, by contrast, can be strong until the first critical strike, yet once it dices it commonly collapses and leaves a clear opening within a very short time.

For deliberate manual attack, industry practice is to specify a tested security-glazing class—commonly EN 356 (hard-body drop classes P1A–P5A and axe classes P6B–P8B)—together with compatible framing, rather than to rely on informal time-to-breach slogans. Resistance depends on glass thickness, number of plies, interlayer type and thickness, edge support, and the attacker's tools; a single universal multiplier is not engineering guidance.

Accordingly, this note does not repeat absolute “times more resistant” or “seconds of resistance” figures as verified performance data. Where customers need quantified forced-entry delay, request the manufacturer's EN 356 (or equivalent) test report for the exact laminated build-up.

CNCGLASS · 5. Illustrations — Post-Breakage Containment

The following archive demonstration photographs show laminated panes after severe impact. Fragments remain bound to the interlayer. Old on-image promotional captions and logo marks were softened before the tiled watermark cnc@cncglass.com was applied.



Figure 1. Laminated safety glass after heavy impact — fragments retained by the EVA interlayer (spider-web fracture pattern).



Figure 2. Densely fractured laminated pane remaining intact as one sheet after impact (interlayer containment).



Figure 3. Concentric impact zone with radial cracks; shards adhere to the interlayer rather than falling free.



Figure 4. Close view of crushed impact centre with radial cracks — post-breakage barrier still present.

CNCGLASS · 6. Practical Selection Notes

1. Choose toughened glass when the primary goal is high strength until failure and dice-like fracture with reduced cutting hazard—and when an open hole after breakage is acceptable for that location.
2. Choose laminated (EVA or other qualified interlayer) when residual barrier, shard retention, overhead fallout control, wet-area open-edge behaviour, or forced-entry delay after cracking are design drivers.
3. Combine tempered plies inside a laminate only when engineering and framing details support the intended post-breakage behaviour; mixed systems can lose integrity differently than annealed-laminate builds.
4. Qualify every security or safety claim with the applicable standard class and a build-up-specific test certificate—not with recycled marketing seconds or multipliers.

This document is a technical comparison for fabricators, glaziers, and project teams. It is not a product catalogue and does not list film SKUs, accessories, or commercial offers.

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