

CNCGLASS

Brand: **CNCGLASS**

Company: **CNC Ucolin Interlayer Technology Co., Ltd.**

Address: SHENZHEN, GD, CHINA

Peter Lin | cnc@cncGlass.com | WhatsApp/Mobile +86 15013829504 | WeChat wecan365 | www.cncglass.com

TECHNICAL NOTE

Laminated Glass Overview

Construction, Manufacture, and Practice

《夹层玻璃概述》

By Peter Lin

CNCGLASS · 1. Definition and Safety Behavior

Laminated glass is a bonded glazing sandwich: two or more glass plies (and, where specified, plastic glazing sheet material) permanently joined by one or more adhesive interlayers. When the glass breaks under impact that does not fully pierce the assembly, fragments tend to remain adhered to the interlayer. The visible crack pattern is often a characteristic “spider web,” rather than a shower of large, sharp pieces falling free.

ISO 12543-1 defines laminated glass as an assembly of glass and/or plastic glazing sheet material joined by interlayer(s). Laminated safety glass is further classified under soft-body impact criteria: the interlayer is intended to retain fragments, limit opening size, provide residual resistance, and reduce cutting or piercing injury risk (further requirements in ISO 12543-2 / -3). Automotive safety glazing in many markets is additionally addressed under UNECE Regulation No. 43 (R43) and related national rules.

Definition aligned to ISO 12543-series; automotive safety glazing also references UNECE R43 and local rules. Project acceptance still follows codes and the purchase specification.

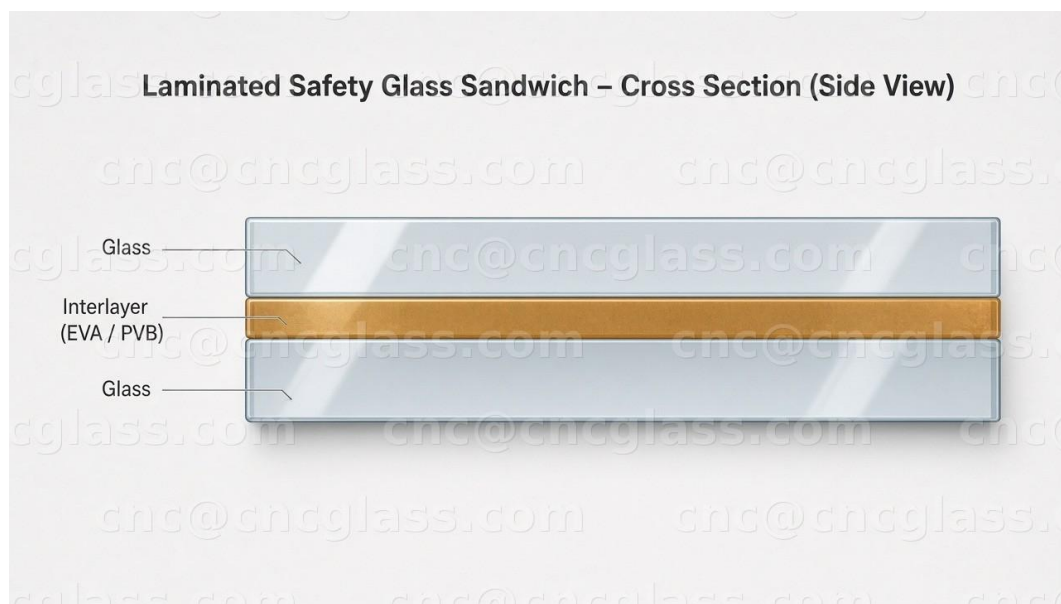


Figure 1 — Laminated glass cross-section: Glass + interlayer (EVA / PVB) + Glass, bonded as a single safety unit.

CNCGLASS · 2. Interlayer Materials (PVB / EVA / TPU)

The interlayer is the functional core of the laminate. Common families include:

- PVB (polyvinyl butyral) — long-established for automotive windshields and many architectural safety laminates; typically processed with heat, rollers or vacuum de-airing, then autoclave bonding. Acoustic-grade PVB grades exist when enhanced sound attenuation is specified.
- Thermoset EVA (ethylene-vinyl acetate) — widely used in architectural and decorative vacuum-oven lamination. Properly cured thermoset EVA crosslinks during the heat cycle, bonding strongly to glass and to many insert materials (PET, fabric, metal mesh, polycarbonate, and similar). Crosslinked EVA is often preferred for frameless edge exposure and multi-material decorative stacks.

- TPU (thermoplastic polyurethane) and related thermoplastics — used where high adhesion to glass and plastics, toughness, or specialized security stacks are required. Glass + polycarbonate hybrids may use aliphatic urethane or EVA under heat and pressure.

CNCGLASS practice note: architectural EVA laminates are commonly built in a vacuum-bag / oven route (layup → vacuum de-air → oven cure), which differs from high-volume automotive PVB autoclave lines. Process windows, edge quality, and insert compatibility must be qualified against the specific EVA grade and glass makeup.

UV filtering: both PVB and EVA interlayers can block a large share of ultraviolet radiation. A source encyclopedia claim states thermoset EVA “could block up to **99.9%** of UV rays.” Practical guidance: treat **99.9%** as a grade-/thickness-dependent marketing-style upper claim — verify with product spectral data for the installed stack (**measure UV blocking for the chosen EVA + glass makeup**).

CNCGLASS · 3. Typical Constructions and Specifications

A widely cited example makeup is **2.5 mm glass / 0.38 mm interlayer / 2.5 mm glass**. The finished product is commonly referred to as **5.38 laminated glass** (nominal glass + interlayer thicknesses summed). Multiple plies and thicker glass or interlayer raise impact and residual resistance when correctly designed and framed.

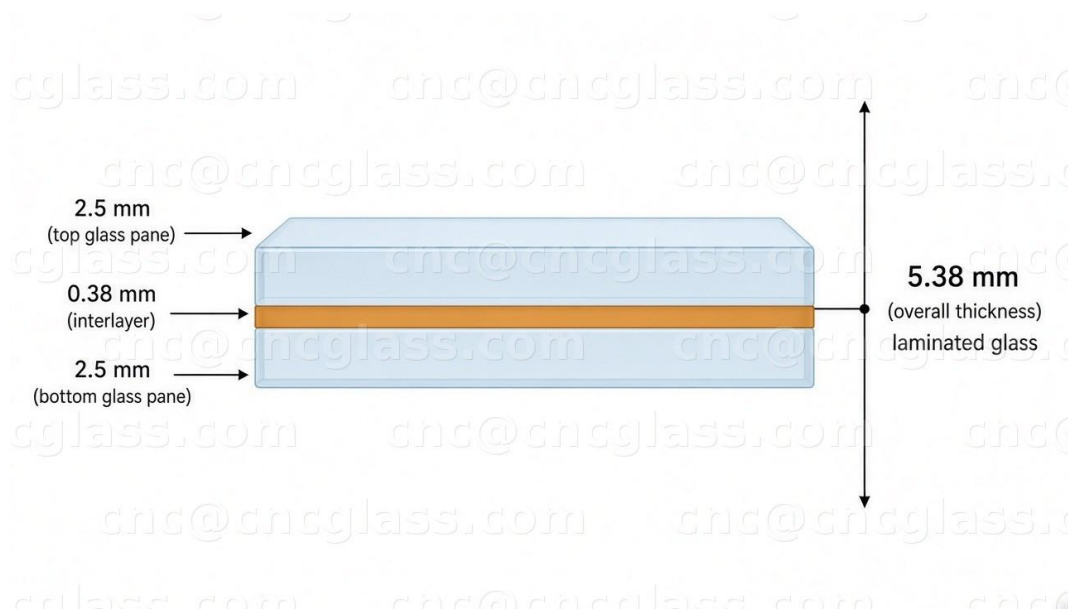


Figure 2 — Typical makeup referred to as 5.38 laminated glass: 2.5 mm glass / 0.38 mm interlayer / 2.5 mm glass.

Security / ballistic multi-layer constructions combine thicker glass, polycarbonate, thermoplastic or thermoset interlayers (including EVA/TPU families), and certified testing. Avoid placing absolute ballistic labels without the applicable ballistic standard, threat level, and test report. Airliner forward glazing historically used multi-ply toughened glass with thick PVB; modern aircraft transparencies follow aerospace-specific constructions and approvals.

Decorative and smart stacks may include colored PET films, metallized or electroconductive PET carriers for LED elements, fabrics, metals, or wood veneers laminated with thermoset EVA between glass plies. Symmetrical vs asymmetrical makeups (ISO 12543 terminology) should be stated clearly on drawings and purchase orders.

CNCGLASS · 4. Brief History Milestones

Early 1900s: French chemist Édouard Bénédictus observed that a cellulose-nitrate-coated flask shattered but held together (accident often dated 1903). He filed a laminated-glass patent in 1909 and later formed Société du Verre Triplex to produce glass–plastic composites aimed at reducing injury in car accidents. Parallel work in England by John Crewe Wood (1905 patent; Safety Motor Screen Co., 1906) used Canada balsam as a bonding medium for windscreens.

World War I saw laminated glass used in gas-mask eyepieces. Licensing spread Triplex technology (e.g., English Triplex Safety Glass; later U.S. production involving Libbey-Owens-Ford / DuPont / Pittsburgh Plate Glass lineages). PVB was invented in 1927 (Matheson & Skirrow). By the mid-1930s, PVB-based “safety glass” gained rapid automotive adoption because it resisted discoloration better than earlier plastics and improved penetration resistance.

The UK Road Traffic Act 1930 required new cars to use windscreens of “safety glass.” By 1939, Ford’s Dagenham works reportedly consumed on the order of **600,000 sq ft (≈ 56,000 m²)** per year of “Indestructo” laminated safety glass, marketed as splinter-resistant, clear, and non-discolouring — language that also hints at the optical and durability barriers that slowed earlier adoption.

CNCGLASS · 5. Manufacture Routes

Industrial laminated-glass manufacture generally follows three families:

- Glass + PVB or EVA film(s) bonded under heat and pressure (rollers / vacuum bagging → oven and/or autoclave).
- Glass + polycarbonate hybrids bonded with aliphatic urethane or EVA under heat and pressure.
- Resin-cast or cured-resin interlayers (including some EVA liquid/resin routes) between glass plies.

Typical process logic: clean glass → layup interlayer (and optional inserts) → de-air (nip rollers or vacuum) → heat to wet-out / melt → final bond under pressure and temperature. For thermoset EVA, the final oven cycle completes crosslinking. Tint bands on some windshields are engineered in the PVB; colored PET can be co-laminated with thermoset EVA for architectural color.

CNCGLASS EVA vacuum-oven context: many architectural fabricators prefer vacuum bags + electric oven (or dedicated EVA ovens) over autoclave capital for decorative and safety laminates. Autoclave PVB lines remain dominant for automotive windshields and some large architectural PVB projects. Route selection must match interlayer chemistry, panel size, edge exposure, and required standards.

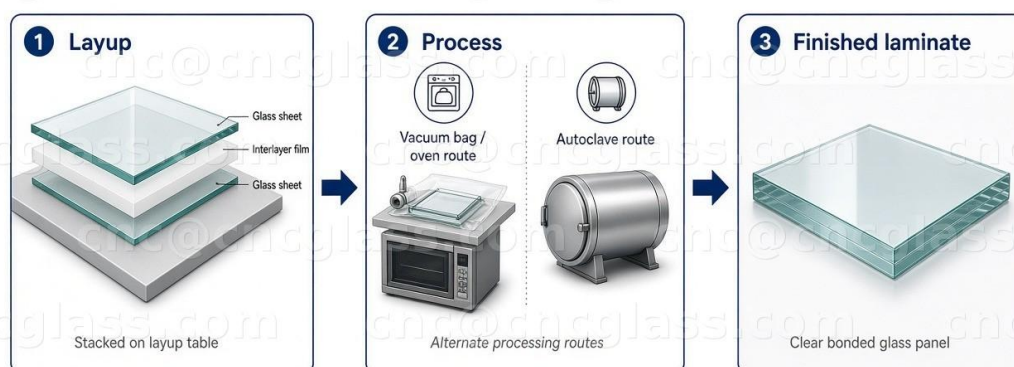


Figure 3 — Manufacture flow: layup → vacuum-oven or autoclave route → finished laminate.

Vacuum-oven EVA and autoclave PVB are different process routes — always state interlayer grade, cure profile, and acceptance standards when comparing.

CNCGLASS · 6. Cutting Laminated Glass Safely

The plastic interlayer makes laminated glass harder to cut than annealed monolithic glass. An unsafe historical practice — scoring both sides, pouring a flammable liquid (e.g., denatured alcohol) into the crack, and igniting it to burn/melt the interlayer — creates fire and burn hazards and must not be used in workshop practice.

Safer methods recommended in UK HSE guidance for laminated cutting include purpose-built laminated cutting tables, vertically inclined saw frames, and controlled heat sources such as a blowlamp or hot-air blower to separate the interlayer after scoring — always under local fire, ventilation, and PPE rules.

Do not ignite flammable liquids to separate the interlayer. Use dedicated laminated cutting tables, saw frames, or controlled heat tools per local HSE rules.

CNCGLASS · 7. Repair and End-of-Life

Repair (windshields): minor impact damage that has not compromised driver vision may be repaired by drilling to the fracture, injecting clear resin under pressure, and UV-curing. When performed correctly to industry repair standards, clarity and residual strength can be restored for many safety-related purposes. Large or vision-zone damage usually requires replacement rather than repair.

Disposal / recycling: landfilling end-of-life laminated vehicle glass is restricted under Europe's End-of-Life Vehicles (ELV) framework. Technical studies (e.g., University of Surrey / Pilkington work summarized in public sources) describe mechanical separation — rolling mills fragment glass so cullet detaches from the film; heat then softens PVB for further recovery trials. PVB recycling remains process-dependent; EVA architectural scrap and failed laminates need site-specific reclaim plans (mechanical, thermal, or solvent routes where legally permitted).

End-of-life laminated glass must follow local ELV / waste rules; solvent degumming or similar reclaim methods only where legally permitted and performed by qualified personnel.

CNCGLASS · 8. Applications

Laminated glass is specified wherever human impact, overhead fall-out, forced-entry delay, acoustic improvement, or UV filtering matter:

- Automotive windshields and selected side/rear glazing meeting safety-glass rules.
- Architectural: skylights, canopies, curtain walls, storefronts, balustrades, partitions; hurricane- or storm-region exterior glazing where codes require laminated retention (verify local windborne-debris criteria).
- Acoustic glazing: special acoustic PVB (or verified EVA stacks) to improve sound attenuation versus monolithic glass of similar thickness.
- Decorative / artistic laminates and glass sculpture using colored or insert-bearing EVA stacks.



Figure 4 — Application: automotive windshield showing characteristic spider-web cracking with fragments retained by the interlayer.

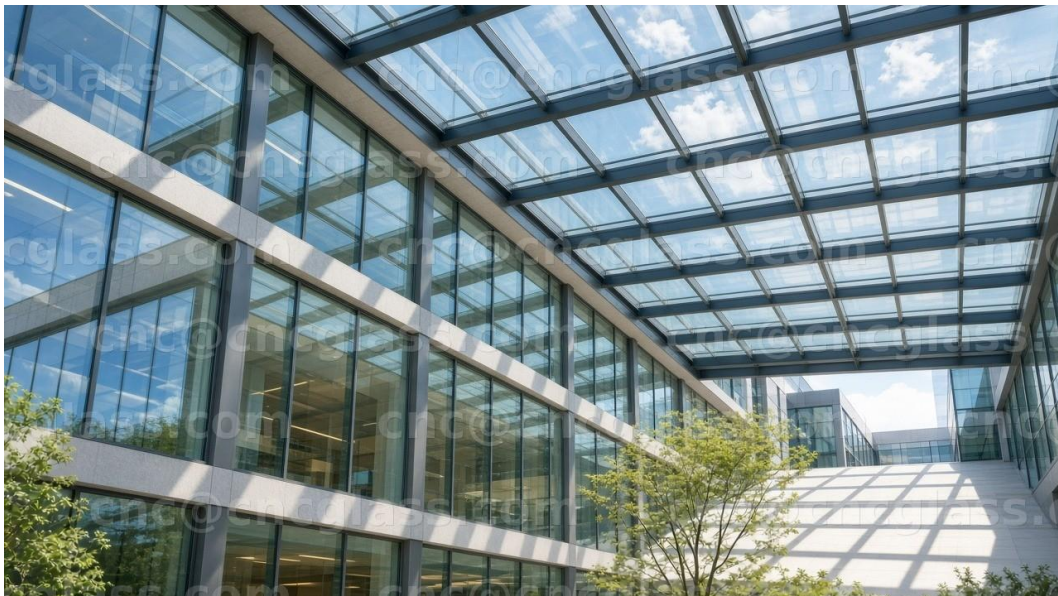


Figure 5 — Application: architectural facade / atrium skylight glazing where laminated glass is specified for overhead and impact safety.

Hurricane-region, security, and acoustic projects require local codes and test reports — this overview does not replace engineering design.

CNCGLASS · Contact

Brand: CNCGLASS

Company: CNC Ucolin Interlayer Technology Co., Ltd.

Address: SHENZHEN, GD, CHINA

Contact: Peter Lin

Email: cnc@cncGlass.com

WhatsApp / WeChat / Mobile: +86 15013829504 · **WeChat:** wecan365

Website: www.cncglass.com

CNC Ucolin Interlayer Technology Co., Ltd. · SHENZHEN, GD, CHINA · Peter Lin