CNCGLASS
CNC Ucolin Interlayer Technology Co., Ltd.
SHENZHEN, GD, CHINA
Peter Lin · cnc@cncglass.com · WhatsApp / Mobile +86 15013829504
WeChat wecan365 · www.cncglass.com

How to Laminate PDLC Smart Glass with EVA Film: A Practical Process Guide

Why the interlayer decides whether a PDLC pane will last

Switchable, or PDLC, glass has moved from a curiosity to a regular specification in hotels, clinics, offices, and residences. The active layer is a polymer-dispersed liquid-crystal film that scatters light in the unpowered state and opens to a clearer view when a suitable voltage is applied. That film is delicate. It is not a structural sheet, and it cannot be left exposed to moisture, abrasion, or unrestrained heat. It has to be laminated between glass plies with an encapsulant that bonds, stays clear, and protects the electrodes for the life of the unit.

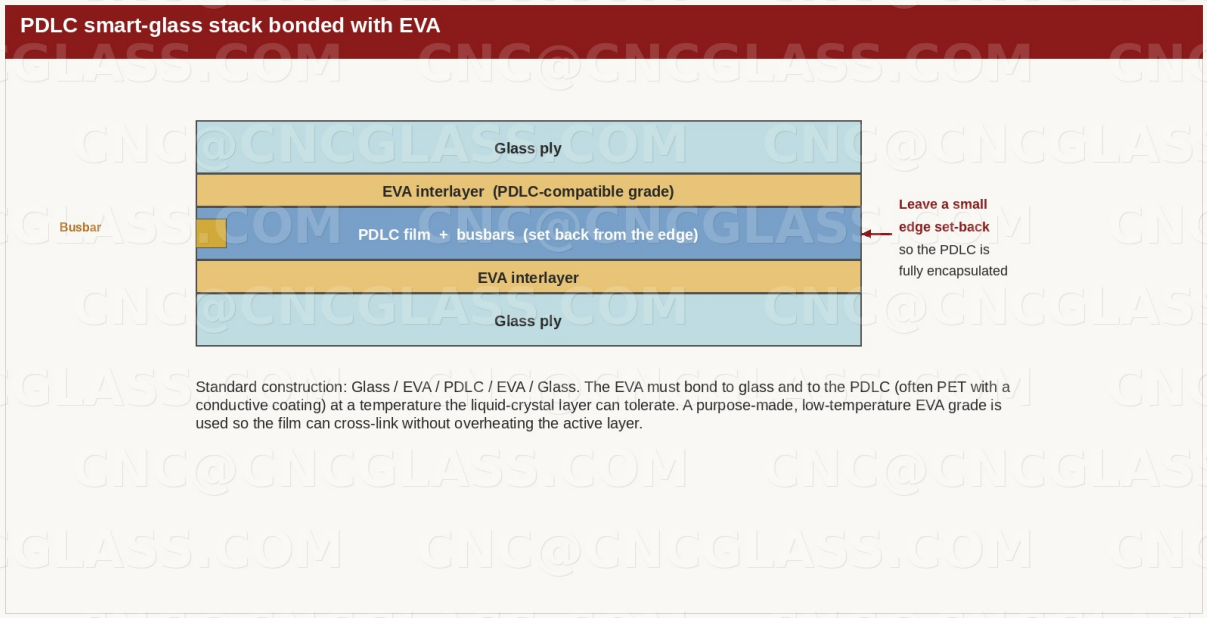

Figure 1. Standard PDLC smart-glass construction: glass / EVA / PDLC with busbars set back from the edge / EVA / glass.

EVA is the usual encapsulant for this work, provided the grade is formulated for PDLC. The interlayer must adhere to glass and to the PDLC construction, often a PET film with a conductive coating. It must remain optically clean so that the switching function is not muddied. And it must seal the active layer against moisture, dust, and ultraviolet exposure. If any of those duties fail, bubbles appear, edges discolor, or switching becomes slow or patchy.

Why EVA is chosen over PVB for most PDLC work

Conventional PVB lamination typically needs a higher temperature and an autoclave. Many PDLC films begin to suffer once the pack is taken much above a modest heat, commonly in the region of 100 to 110 degrees Celsius, depending on the film. PVB is also more sensitive to moisture, which is unwelcome next to an electrical layer, and the autoclave route is less convenient for many smart-glass shops. A PDLC-compatible EVA grade is designed for a lower-temperature cycle, often in a vacuum furnace without an autoclave, with strong adhesion and useful electrical insulation.

The grade matters. A decorative or general-purpose EVA is not automatically safe for PDLC. We look for high clarity, reliable bonding to both glass and the coated film, resistance to yellowing, dimensional stability in the lower-temperature window, and insulation that does not encourage ionic migration or a short at the bus. Those are the traits of a purpose-made encapsulant, not of a generic sheet chosen only for price.

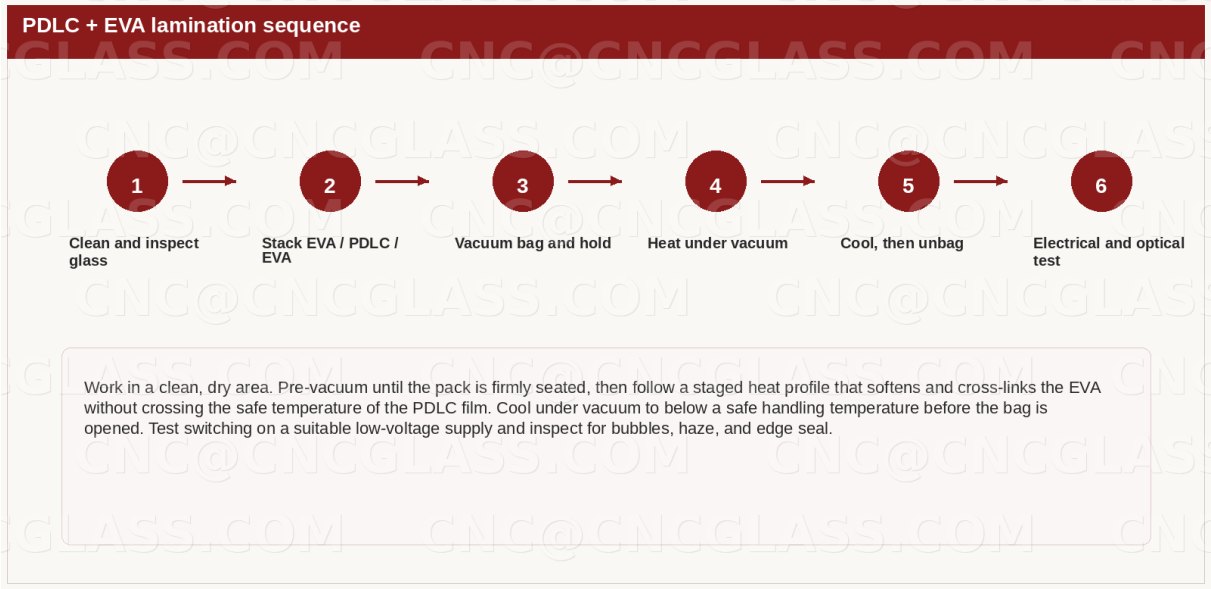

Figure 2. The lamination sequence, from cleaning and stacking through vacuum, heat, cooling, and electrical testing.

Preparation, stacking, and vacuum

Every trapped fiber becomes a permanent defect, so preparation is not a formality. Clean both glass plies with a neutral cleaner or deionized water, dry them completely, and inspect under bright light. Use lint-free gloves, anti-static tools, and a clean, dry room. A class of environment tighter than an ordinary workshop is recommended. Store the EVA dry and sealed until it is laid up.

The standard stack is glass / EVA / PDLC / EVA / glass. Lay the first glass, place the EVA without wrinkles, then align the PDLC so that it is slightly smaller than the glass, leaving a small set-back all around so the active film is fully encapsulated and not exposed at the edge. Busbars or copper tape should be dressed carefully and kept out of the pinch. Add the second EVA ply and the cover glass, check alignment, and tape the edges with heat-resistant tape.

Place the pack in a vacuum bag or a silicone membrane, with gauze or a release layer to help air leave. Seal the bag, pull a deep vacuum, and hold it for several minutes before heat is applied. A typical target is on the order of minus 0.09 MPa or better. Insufficient pre-vacuum is a leading cause of bubbles and cloudy spots later in the cycle.

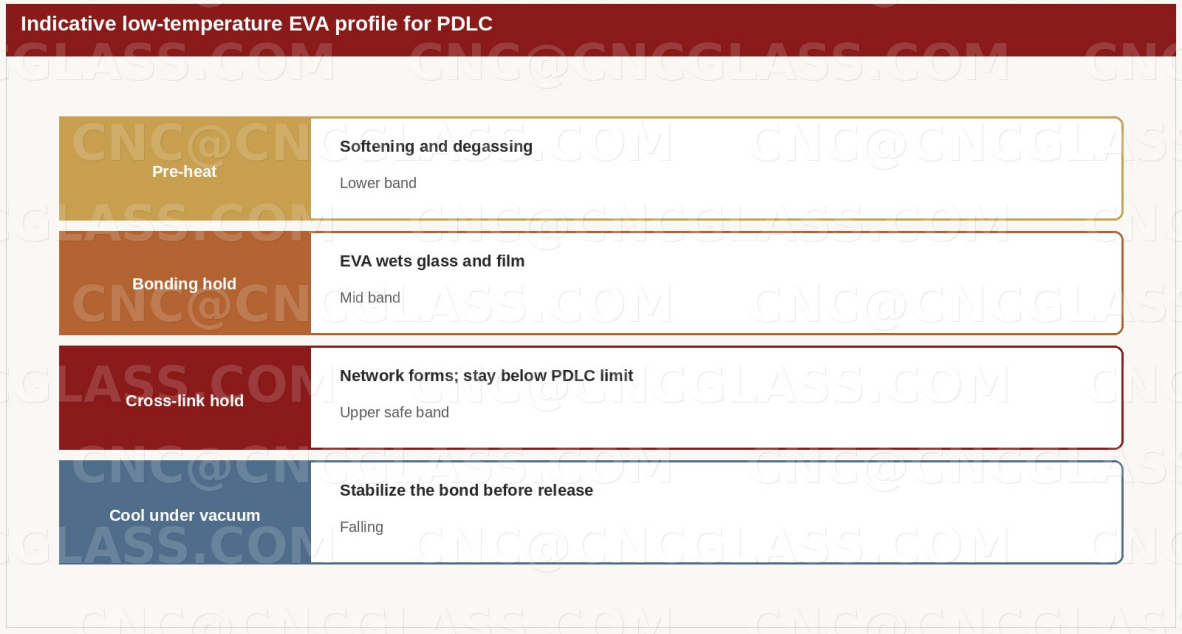

Figure 3. An indicative low-temperature EVA profile: pre-heat, bonding hold, cross-link hold below the PDLC limit, then cool under vacuum.

Heat profile, cooling, and testing

The profile must soften and cross-link the EVA without crossing the safe temperature of the PDLC film. An indicative vacuum-furnace sequence is a pre-heat in a lower band for degassing and softening, a mid-band bonding hold in

which the EVA wets both faces, a cross-link hold in the upper safe band, and a cool under vacuum to a handling temperature, often below about 50 degrees Celsius, before the bag is opened. The upper hold should stay inside the film limit; for many PDLC constructions that means not pushing through roughly 110 degrees Celsius. Exact times depend on glass thickness and the oven.

After unbagging, trim surplus EVA while the edge is still slightly warm, and handle the pane so that the busbars are not stressed. Inspect under strong light for bubbles, dust, and haze, and confirm that the EVA has closed around the PDLC. Then connect the buses to a suitable low-voltage supply, commonly in a range used for this film family, and watch the switch from scatter to clear. Flicker, delay, or dead zones usually point to a damaged bus, a poor joint, or overheating during the hold, not to a mysterious failure of the liquid crystals themselves.

Common PDLC + EVA defects and first checks

Defect	Usual cause	First correction
Bubbles or voids	Short vacuum, fast ramp	Extend the vacuum hold; slow the heat ramp
Edge delamination	Contamination or shrinkage	Improve cleaning; keep the profile in range
Haze or milkiness	Moisture in the EVA	Dry storage; keep the room humidity low
Weak or dead switching	Bus damage or overheat	Protect electrodes; stay below the film limit
Wrinkled PDLC	Uneven vacuum or loose stack	Flat glass, even bag pressure, careful alignment

Figure 4. Common defects, their usual causes, and the first corrections to apply.

Defects, prevention, and where the glass is used

Small voids usually mean a short vacuum or a heat ramp that was too fast; extend the vacuum hold and slow the ramp. Edge delamination often starts with contamination or with shrinkage from a poor profile; clean more carefully and keep the cycle in range. Haze or a milky look is frequently moisture in the EVA; dry storage and a room humidity that stays low, preferably well under a typical workshop level, are the prevention. Yellowing over time points to ultraviolet weakness; specify a UV-stable grade and, where needed, a blocking coating. Wrinkles come from uneven vacuum or a loose stack.

Good practice is consistent: a controlled room, dry film, anti-static handling, a recorded temperature and pressure trace for each batch, a rest period after lamination before installation, and a neutral-cure silicone edge protection where moisture is expected. Laminated PDLC glass built this way is used in partitions, hotel baths, conference rooms, clinics, retail displays, and in some transport interiors. Privacy is the headline function; the same unit also contributes UV control, a measure of acoustic damping, and a calmer thermal environment when the stack is specified for those duties.

Laminating PDLC smart glass with EVA is a process of cleanliness, a vacuum that is actually deep, and a heat profile that respects both the encapsulant and the active film. Choose a PDLC-compatible EVA grade, set the film back from the edge, stay below the film temperature limit, and test switching before the pane leaves the shop. Done with that discipline, the result is a clear, stable, switchable laminate rather than a fragile film trapped in glass.

Contact Us

Brand: CNCGLASS

Company: CNC Ucolin Interlayer Technology Co., Ltd.
Address: SHENZHEN, GD, CHINA
Contact: Peter Lin
Email: cnc@cncglass.com
WhatsApp / Mobile: +86 15013829504
WeChat: wecan365
Website: www.cncglass.com

Ask us about PDLC-compatible EVA grades, vacuum-furnace profiles, and edge and busbar practice for switchable laminated glass.