

CNCGLASS

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TECHNICAL NOTE

Fixing Air Trapping in Five-Sided Irregular Multi-Hole Large SGP Laminated Glass

By Peter Lin · CNC Ucolin Interlayer Technology Co., Ltd.

CNCGLASS · 1. Challenge — five-sided irregular, multi-hole, large SGP

The client needed to laminate large **SGP (ionoplast) interlayer** glass with a **five-sided irregular outline** and **multiple cutouts / holes** (typical of point-fixated structural glazing). Geometry left many edges and hole perimeters where air can be trapped during pre-press.

On the first nip-roll pass, the glass showed severe air trapping (“憋气”). Re-bagging and pulling vacuum again did not save the panels: after autoclave they were still scrap.

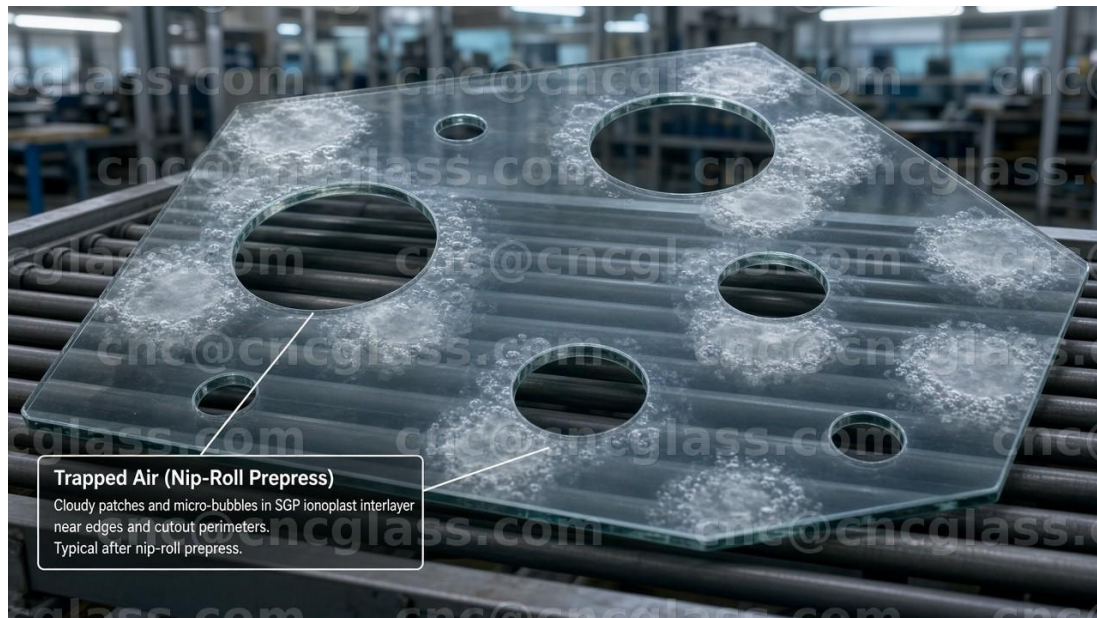


Figure 1 — Problem: trapped air after nip-roll on five-sided irregular multi-hole large SGP laminated glass.

CNCGLASS · 2. Why irregular multi-hole packs trap air

Nip rolls push air toward free edges. On a five-sided irregular outline, corners and short edge segments create dead-end paths; air that does not reach a continuous edge seal stays as trapped pockets. Cutouts add closed or semi-closed perimeters that seal early if the pre-press is too cold, too fast, or uneven.

For large tempered or multi-ply ionoplast laminates, vacuum bag / vacuum-ring prelamination is often preferred over nip roll alone because it de-airs more reliably before autoclave. Porous breather along the full glass–interlayer edge is required so vacuum can pull air out of the stack.

Around holes, the most common post-autoclave yield loss is trapped air adjacent to the hole. That often comes from pressurized autoclave air breaking a weak hole-edge seal (“blow-in”), not only from air left in at pre-press. Uniform haze around a hole usually means the pre-press ran too cold; lowering line speed helps. For vacuum-bagged laminates with holes, leave interlayer in the holes until after autoclave (reduces suck-in), tape porous breather over each hole top and bottom, and maintain continuous edge breather including hole interfaces.

Laminated Glass Vacuum Bag De-Airing

Cross-Section Schematic

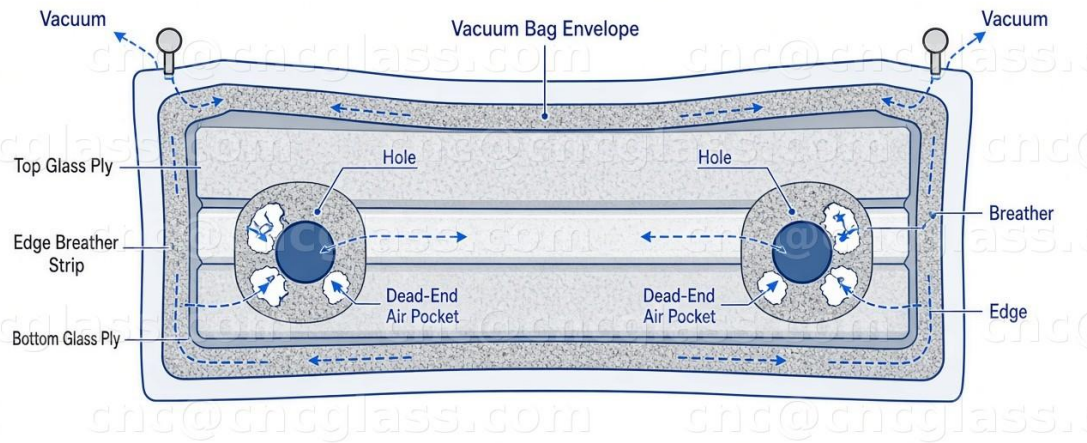


Figure 2 — Principle: vacuum paths, edge breather, and dead-end air pockets at hole perimeters.

CNCGLASS · 3. What failed — re-bag alone after a bad nip

After the first nip-roll, the interlayer and glass had already formed partial edge and hole seals with air locked inside. Putting the same pack into a vacuum bag and pulling vacuum could not reopen those sealed paths. Autoclave heat and pressure then fixed the trapped air as scrap.

Rule for the floor: vacuum bagging is not a rescue for a poorly de-aired nip if seals have already closed around trapped air. Fix pre-press (temperature, speed, pressure) and bagging design for the geometry — do not rely on a second vacuum pull alone.

CNCGLASS · 4. Process levers adjusted — temperature, speed, pressure + bagging

CNC technical service reviewed equipment state and the actual glass structure (outline, hole layout, glass/interlayer thickness), then adjusted temperature, line / nip speed, and pressure in sequence — not as one blind recipe change.

- **Nip / pre-press temperature & speed:** aim for a continuous clear seal around outer edges and every hole; too cold leaves haze and weak seals; too fast leaves air behind on irregular paths. Slow the line when hole perimeters stay hazy.
- **Pressure (nip and autoclave):** match pressure to glass thickness and hole density so seals form without crushing tempered glass or forcing blow-ins at weak hole edges.
- **Vacuum bagging for this geometry:** full-edge porous breather; breather pads taped over each hole (top and bottom); high-temperature-rated bag materials; cold vacuum long enough that most air leaves before heat (industry guides often cite ≥ 10 min cold vacuum; longer for large multi-ply).
- **Autoclave soak (industry reference ranges for ionoplast):** typical published soak about 132–135 °C at roughly 12–14 bar with ≥ 60 min hold (longer for thick / multi-ply). Confirm on your autoclave with a thermocouple in the real stack — do not copy numbers blindly.



Figure 3 — Process levers: adjust temperature, nip-roll / line speed, and pressure to glass structure.

CNCGLASS · 5. Operator coaching points (actionable)

Alongside parameter changes, operators were coached on why each lever matters for this outline and hole layout:

- Read the pre-press: clear continuous seals at outer edges and around every hole before autoclave; haze or cloudy rings mean trapped air risk.
- Do not treat vacuum bag as a cure-all after a bad nip — reopen process: speed, heat, pressure, then bag with hole breathers.
- **Tape breather over holes so it cannot be sucked into the cutout; keep interlayer in holes until after autoclave when using vacuum process.**
- Change one primary lever at a time and record equipment readings against glass structure (size, thickness, hole count).
- For residual hole-area bubbles only, plan a controlled re-autoclave with corrected bagging — not a full re-nip of an already sealed scrap path.

CNCGLASS · 6. Result — autoclave yield and hole-bubble rework

After the adjusted process, autoclave yield reached **98%**. Only two panes still showed bubbles at hole locations. Under guided re-autoclave (corrected bagging / cycle around the hole areas), both pieces met the acceptance standard.



Figure 4 — Hole-area bubble rework: inspect, re-bag with hole breather, guided re-autoclave.

CNCGLASS · 7. Workshop checklist — irregular multi-hole large SGP

- Map every free edge and every hole as a vacuum path; mark dead-end corners on the shop drawing before first nip.
- Prefer vacuum bag / vacuum ring for large irregular multi-hole packs when nip alone leaves haze or trapped air.
- Edge breather continuous; hole breathers taped top and bottom; bag materials rated for autoclave temperature.
- Tune nip temperature and speed until hole perimeters show a clear seal; then set autoclave soak/pressure for the real thickness.
- If only hole-area bubbles remain, rework with guided re-autoclave — document which holes failed and bagging used.
- Train operators to explain seals and blow-ins in their own words before unsupervised production runs.



Figure 5 — Application: structural facade / canopy with irregular panels and point-fixed cutouts.

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