PROCESSING GUIDE

CNCGLASS Ionoplast Interlayer — Laminating Process Guide

1. Introduction

This guide provides glass fabricators with recommended processing practice for laminating architectural and structural glazing with the **CNCGLASS ionoplast interlayer** — a stiff ionic-type interlayer delivering high structural performance and reliable post-breakage retention. Equipment used for conventional PVB laminating can, in general, be used for CNCGLASS ionoplast processing; because furnace designs, line speeds and glass configurations differ between plants, the parameters below are recommended starting points and should be validated and fine-tuned for each production line.

2. Packaging and Storage

CNCGLASS ionoplast interlayer is supplied in roll form, hermetically sealed in aluminium-foil bags to exclude moisture and contamination, and packed in wooden crates for transport protection. On receipt, verify that the foil bag is intact and still under vacuum.

Unlike PVB, ionoplast film has no blocking tendency and needs no interleaving separator sheet. Unopened packages require no temperature-controlled storage; stored dry, the material retains its properties for many years. Moisture is nevertheless the key ageing factor: once a package is opened, the film slowly absorbs atmospheric water, which reduces adhesion — and, unlike PVB, an ionoplast does not release absorbed water in a dry environment.

- Recommended shelf life: use within two years of production.
- Before laminating with stock older than two years, or from any package that has been open for an extended period, verify the moisture content (Karl Fischer titration). Material above 0.2% moisture should not be used.
- Re-seal part-used rolls immediately: return the film to its foil bag, expel as much air as possible, tape all openings, and re-vacuum-seal where facilities allow.

Recommended lay-up room temperature	22 – 28 °C
Recommended lay-up room humidity	18 – 28% RH

Store and handle rolls horizontally (never standing on end), do not stack them, and lift rolls with a horizontal roll lifter. When opening the outer foil bag, either slit the end of the bag and slide the seal out in one piece, or cut along the inside of the original seal — keep the bag for re-sealing. Inspect opened bags for pinholes and tears before reuse.

3. Cutting and Trimming

The interlayer can be cut by any of the following methods: shear-type paper cutter, automatic cutting table, sharp knife with score-and-tear technique, punching, mechanical scoring followed by breaking, or rotary slitting equipment. Because of the film's excellent dimensional stability it can be cut precisely to the glass size, and post-lamination trimming is normally unnecessary.

The most direct and economical method is a sharp knife:

1. Cut against a template to guarantee size; for curved shapes, a piece of flat glass makes an ideal template.
2. Score the film firmly along the template outline.
3. Cut or snap the film along the score line.
4. Remove any loose particles with a lint-free cloth or a contact (tacky) roller.

> Avoid sawing. Sawing produces debris that adheres to the film edge and can only be removed by machine washing; score-and-cut methods leave no such debris.

4. Cleaning the Interlayer

The film leaves the plant clean but carries static charge that attracts dust. Perform the final cleaning immediately before assembly, especially after cutting or trimming. Suitable methods are:

- Contact (tacky) roller;
- Ionised air blast;
- Lint-free cloth wipe.

Glass-cleaning detergent is not recommended for the interlayer. If saw-cut film must be washed, use only deionised water without detergent, at a temperature below 38 °C — hot water softens the film and can cause jams in the washing machine.

5. Glass Preparation and Cleaning

1. **Tin-side management.** Identify the tin and air sides of the float glass during cutting, and mark the air or tin side so that orientation remains known after edging. The interlayer is laid against the tin side (see Section 6), so orientation must be traceable through cutting, edging and tempering.
2. **Edging.** Keep the glass rotation direction consistent to avoid diagonal overlap, and do not rotate the glass over the edging rack.
3. **Tempering.** Load the furnace with tin faces alternately up and down; where possible, verify orientation with a tin-side detector after tempering.

Wash the glass with a commercial detergent and rinse with demineralised or deionised water — final rinsing with demineralised water gives measurably higher glass-to-interlayer adhesion than tap or softened water. Evaluate each detergent for bond performance before routine use. Where washing with plain water, keep the final wash temperature above 55 °C for best results. Ensure the glass is fully dry before assembly.

6. Assembly

Assemble the laminate with the interlayer directly against the tin sides of the glass, in the **ATTA orientation** (air side – tin side – interlayer – tin side – air side). For constructions in which the interlayer cannot be

placed against a tin surface — non-float glass, multi-ply laminates and similar — an adhesion promoter is mandatory (see Section 10).

7. Pre-Pressing (Nip-Roll Process)

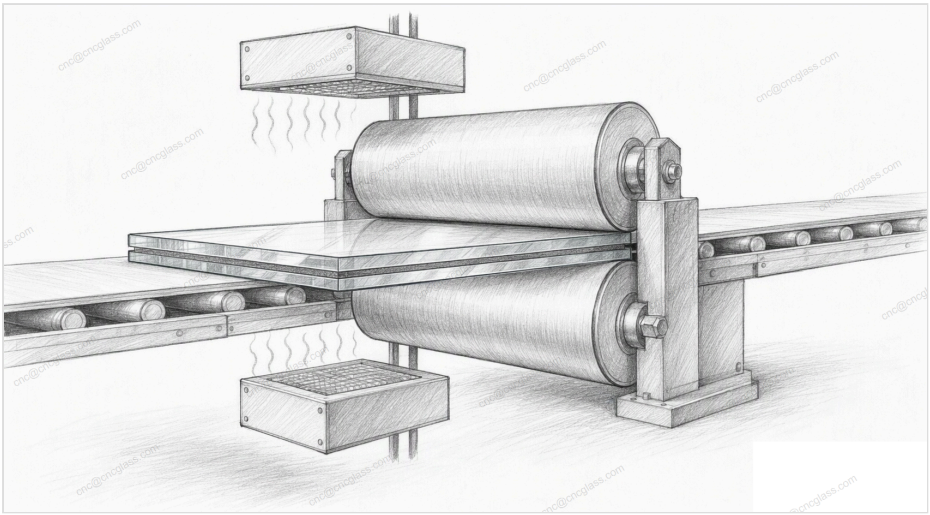


Fig. 1 — Nip-roll pre-pressing: the assembly is heated and passes through rollers that seal the edges and expel air.

Pre-pressing removes air from the glass–interlayer interfaces and seals the panel edges. The embossed surface texture of the interlayer assists venting before the film conforms to the glass. Rolled film may show wavy ripples when laid flat; this is normal and does not harm final quality if the pre-press parameters below are observed.

Glass surface temperature at the nip	63 ± 8 °C
Transparent edge band (all four sides)	At least 20 mm wide, fully sealed
Nip-roll pressure	≥ 75 psi (5.2 bar)
Nip gap	At least 2.5 mm less than total laminate thickness

- Set the line speed from the measured glass surface temperature and the pre-press appearance: the goal is a fully sealed perimeter with the interior still translucent.
- Convection furnaces are adjusted from mid towards higher temperatures; infrared furnaces from mid towards lower temperatures, because the interlayer absorbs infrared more strongly than glass.
- The best pre-press appearance is obtained near the lower end of the recommended temperature range.
- A line of trapped bubbles along the edge indicates premature edge sealing from excessive pre-press temperature.
- For tempered glass with visible roller wave, reducing the nip gap is sometimes necessary; if glass slips, disengage the first (drive) roller.

8. Vacuum-Bag Process

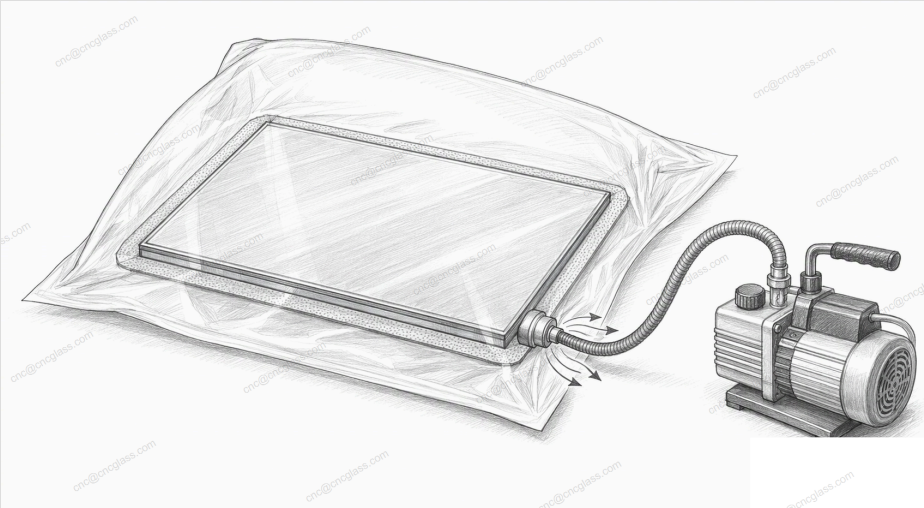


Fig. 2 — Vacuum-bag de-airing: the laminate is sealed in a bag with a perimeter breather strip and evacuated before autoclaving.

Slower and more labour-intensive than nip-rolling, the vacuum-bag process gives higher yields and is strongly recommended for large-area tempered laminates, multi-ply laminates and pierced or structured glass. Disposable bags are made to the panel size; a breather strip must run around the panel perimeter inside the bag so that air is evacuated from the whole edge. All bag materials must be autoclave-temperature rated.

- Cold evacuation (before any heat): at least 10 minutes.
- Target vacuum: better than 71 cmHg (≈ 93% vacuum, 948 mbar absolute).
- For open-edge (pierced) designs, apply breather tape around the perimeter between interlayer and breather strip; if the interlayer sticks to breather materials, insert a breathable release film.
- Hot evacuation temperature and duration are set from the pre-press appearance of the laminate. Panels may alternatively be autoclaved directly under vacuum without pre-pressing, which shortens the cycle.
- Use additional suction connections for large panels to maintain vacuum quality.

9. Autoclave Cycle

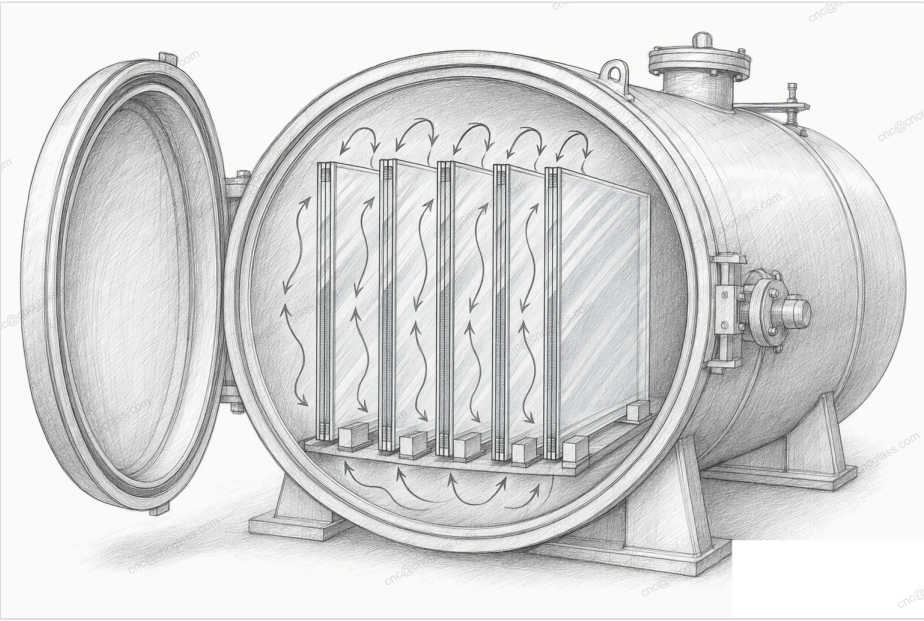


Fig. 3 — Autoclave loading: laminates stand vertically with even spacing so that cooling air flows freely between panels.

Autoclave conditions determine the final optical and mechanical quality of the laminate. Load laminates vertically with at least 19 mm spacing between panels (about two fingers), supported on liners that spread the load. Do not use metal bars or wooden spacers between panels and never rest laminates directly against the rack: blocked airflow causes uneven heating and cooling, uneven interlayer thickness, residual stress and optical distortion (rainbow).

Hold temperature	132 – 135 °C (do not exceed 137.8 °C to limit interlayer flow)
Autoclave pressure	180 – 200 psi (12 – 14 bar)
Hold time	≥ 60 minutes (extend for thick stacks > 16 mm and large loads)
Cooling rate	≥ 3 °C / min — faster cooling gives lower haze

- Lower pressures are acceptable but increase the risk of bubbles.
- Verify hold time against the true core temperature with an embedded thermocouple for thick or large constructions; a good appearance with a short hold usually means reduced adhesion.
- Maximise cooling rate: correctly sized fans, sufficient cooling water, and full-power heat exchangers. Laminates with high haze can be re-autoclaved and rapidly re-cooled to reduce it.
- Stop fans and cooling water as the load approaches ambient temperature.

10. Multi-Ply Laminates

Two or more interlayer plies may be stacked between two glass plies for higher strength or resilience. Clean each ply with a tacky roller before assembly.

- **Nip-roll process:** suitable for up to two plies (0.76 / 0.89 mm). More plies can be pre-pressed provided the total interlayer stack thickness stays below 5 mm; above that, insufficient heat reaches the inner plies and autoclave bubbles result.
- **Vacuum-bag process:** recommended for any thicker or multi-ply stack. Increase cold-evacuation time with stack count, extend autoclave hold time with thickness and panel size, and force-cool with fans off below 38 °C for minimum haze. Cool large multi-ply loads for at least 60 minutes.

11. Adhesion Promoter

An adhesion promoter **must** be used whenever the interlayer contacts a non-tin glass surface (non-float glass, configurations that cannot be laid up ATTA). The active agent is **4-aminopropyltriethoxysilane**, available as commercial aminosilane coupling agents. Two working formulations:

Component	Standard formulation (wt%)	Modified formulation (wt%)
Isopropanol	92.00	89.92
Water	7.90	8.47
Acetic acid / white vinegar	0.01 (acetic acid)	1.50 (vinegar)
4-Aminopropyltriethoxysilane	0.09	0.11

Use high-purity isopropanol and vinegar without additives for the modified formulation. The solution is flammable — store away from ignition sources and consult the relevant safety data sheets. After mixing, let the solution stand 24 hours for full silane hydrolysis; store sealed in glass or plastic for up to four months.

Apply the promoter to the **glass** surface, not to the interlayer: spray and wipe dry with a clean cloth, or apply with a cloth, or use commercial coating equipment. Apply a thin, uniform film in a clean area on pre-cleaned

glass — over-thick application reduces adhesion. Lamination may follow immediately, with any standard pre-press process.

12. Coated and Fritted Glass

The interlayer bonds well to most glazes and metallic coatings. Coatings not on the verified compatibility list should not be used; please request the current list from our technical representative. Wherever possible, apply ceramic frit to the tin side of the glass. If frit or coating must face the air side, or coverage is not complete, use an adhesion promoter — and in every case pre-test adhesion and compatibility on the actual configuration.

13. Quality Control

Recommended daily checks include the hammer-tap (knock) adhesion test, performed at room temperature (about 21 °C), plus haze and light transmittance measured with a haze meter or judged against standard optical samples. Hammer-tap results range from low adhesion (grade 1–2) to excellent (grade 8); production should target the upper grades.

14. Troubleshooting Guide

Problem	Possible cause	Corrective action
Low adhesion	Wrong glass orientation	Re-lay in ATTA orientation
Low adhesion	Interlayer moisture too high	Use low-moisture film; review storage and handling
Low adhesion	Insufficient autoclave time/temperature	Check hold time and temperature; ensure spacing and airflow; extend hold; verify with embedded thermocouple
Low adhesion	Hammer test performed incorrectly	Perform the test at room temperature
Trapped air	Edges sealed too early (too hot)	Increase line speed or lower furnace temperature
Trapped air	Line speed too high — local unswept pockets	Reduce roller speed (and/or furnace temperature)
Trapped air	Nip gap too wide	Set nip gap at least 2.5 mm below total laminate thickness
Trapped air	Insufficient edge seal — air re-enters in autoclave	Lower roller speed or raise furnace temperature
Trapped air	Uneven heating shifts the interlayer to one side	Balance upper and lower heater temperatures
Trapped air	Laterally distributed blisters from roller wave or glass bow	Review tempering; match curvatures to reduce bow
Rainbow (optical distortion)	Local over-pressure in the autoclave	Remove point loading; use correct liners and spacing
High haze	Cooling too slow or uneven	Ensure airflow and a cooling rate of at least 3.3 °C/min

15. Cutting and Finishing After Lamination

Where extra edge allowance was left at assembly (typically 5 mm on the long and short sides), trim it after autoclaving. Trim pierced panels with a hollow drill and a sharp knife or hot knife — do not flame-soften the interlayer.

16. Further Support

This guide cannot cover every plant configuration. For questions on any aspect of CNCGLASS ionoplast laminating, contact our technical representative.

This document is a CNCGLASS technical note and processing guide. It is not a third-party test certificate or a certificate of conformity, and it does not authorise the use of any third-party laboratory mark.

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

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