

CNCGLASS

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TECHNICAL NOTE / CASE STUDY

Bubbles Because Of Bad Vacuuming — EVA Laminated Glass Safety Glazing Case Study and Solutions

By Peter Lin

When EVA laminated glass shows large, gathered bubbles near the edges after a full heat–vacuum cycle, the vacuum line—not only the recipe—must be checked. This case study records how Glazier E's high scrap rate on tempered EVA laminates was traced to a completely choked vacuum-pump filter; after cleaning and renewing the pump path, the bubble problem was solved.

CNCGLASS · Summary

Bubbles in laminated glass with EVA interlayer film occurred because of **bad vacuuming**. The bad vacuuming was caused by a vacuum pump that was **completely choked**. The solution was to **clean the vacuum pump and renew it**.

CNCGLASS · Customer Situation

Glazier E reported heavy waste when laminating glass with EVA interlayer film. Every week the shop recycled a large volume of laminated glass because of bubbles.

Glass: mostly **tempered** glass. Some laminates finished well at the end of the cycle; others came out wrinkled with bubbles between the two panes.

Interlayer for tempered glass: **0.76 EVA + 0.38 EVA** (never a single **0.38 EVA** interlayer film).

Symptom: wrinkles and bubbles between the glasses; photos from the last 2–3 cycles were shared for analysis.

CNCGLASS · Heating / Vacuum Cycle (as reported)

Glazier E described the heating process as follows:

- 30 minutes to reach 60 °C
- 15 minutes hold at 60 °C
- 45 minutes to reach 133 °C
- 70 minutes hold at 133 °C
- Then cool under vacuum down to 30 °C

Keep vacuum active through cool-down until the interlayer is firm enough that air cannot rush back into the laminate. Do not invent a fixed vacuum pressure figure when the source does not state one—qualify on your own pump gauge and bag setup.

CNCGLASS · Evidence Photos — Failed Laminated Glass

Photos of the failed EVA laminated glass with bubbles (source archive; each image watermarked cnc@cncglass.com):



Figure 1. Failed tempered EVA laminated glass — scattered bubbles across the pane (Glazier E).



Figure 2. Close-up of gathered / elongated bubbles near the laminated glass edge.



Figure 3. Another failed laminate from the same cycles — wrinkles and bubbles near edges.

CNCGLASS · Diagnosis (Peter Lin)

First analysis: the vacuuming system was **not strong enough**. From the photos, the bubble areas were **large and gathered in one place, close to the edges**, because vacuuming was not strong enough to pull the air out. Peter asked Glazier E to check the vacuum value and whether the vacuum pump was working well.

Edge-gathered, large bubble fields after a long 133 °C hold usually point to insufficient bag vacuum during heat and cool-down, not only to film grade. Confirm gauge reading against a healthy pump before changing the heat recipe.

Follow-up questions to narrow the cause:

1. Heating-pipe position

Were the bubbles close to the position of the heating pipes in the oven?

2. Heat distribution

Was the oven heating uneven / not well distributed?

3. Stacks per silicone vacuum bag

How many combinations of pre-laminated glass were put in each silicone vacuum bag?

CNCGLASS · Customer Reply

Vacuum gauge: indicated the **minimum on the scale**.

Defect pattern: mostly wrinkles, close to the edges—consistent with the vacuum diagnosis.

Action planned: check the rotation / operation of the air (vacuum) pumps.

Bag loading: mostly **two couples stacked per floor** — two levels: **(6+0.76+6)** under **(6+0.76+6)**.

CNCGLASS · Outcome

Soon afterward, Glazier E reported that the vacuum pump **filter was completely choked**. After cleaning it and loading glass again to control the process, **the problem was well solved**.

Peter Lin confirmed the shop was welcome to return with further process questions.

CNCGLASS · Practical Process Note

For similar tempered EVA lines using 0.76 + 0.38 mm film and multi-stack bags (for example two 6 + 0.76 + 6 couples per floor), treat a vacuum gauge stuck at minimum as a hard stop: open and clean or renew the pump filter and confirm rotation before blaming heat time at 60 °C / 133 °C. Re-qualify with a short trial load after service. Large edge-gathered bubbles after a full cycle are a classic weak-vacuum signature; uneven heat or pipe proximity can contribute, but fix them after the pump path is proven clear.

CNCGLASS · Closing

This case shows that high scrap from bubbles and wrinkles in EVA laminated tempered glass can come from a choked vacuum pump even when the heating cycle looks complete. Cleaning and renewing the vacuum pump resolved Glazier E's bubble problem. For further questions on EVA laminated glass vacuuming and safety glazing process, please contact us.

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