

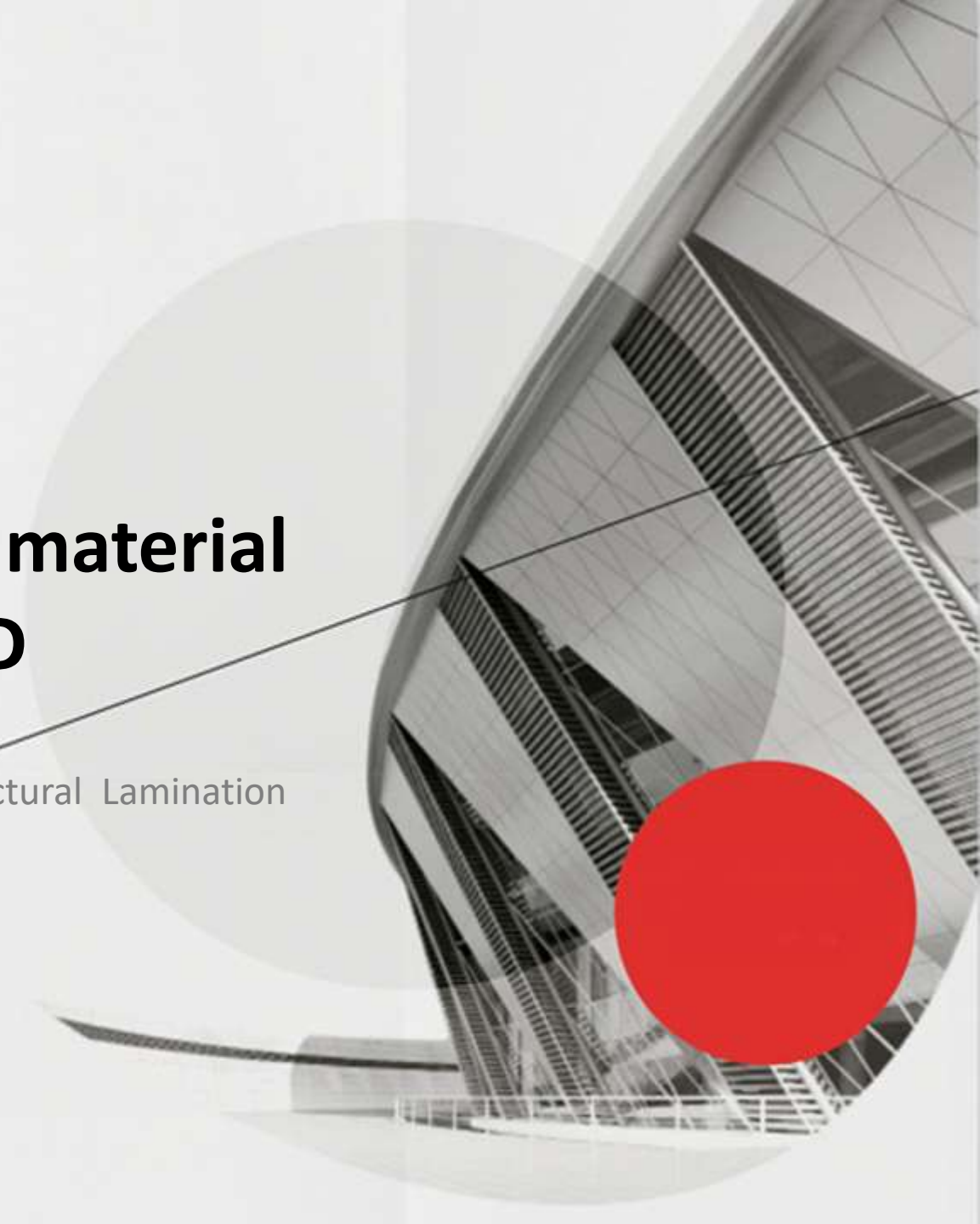


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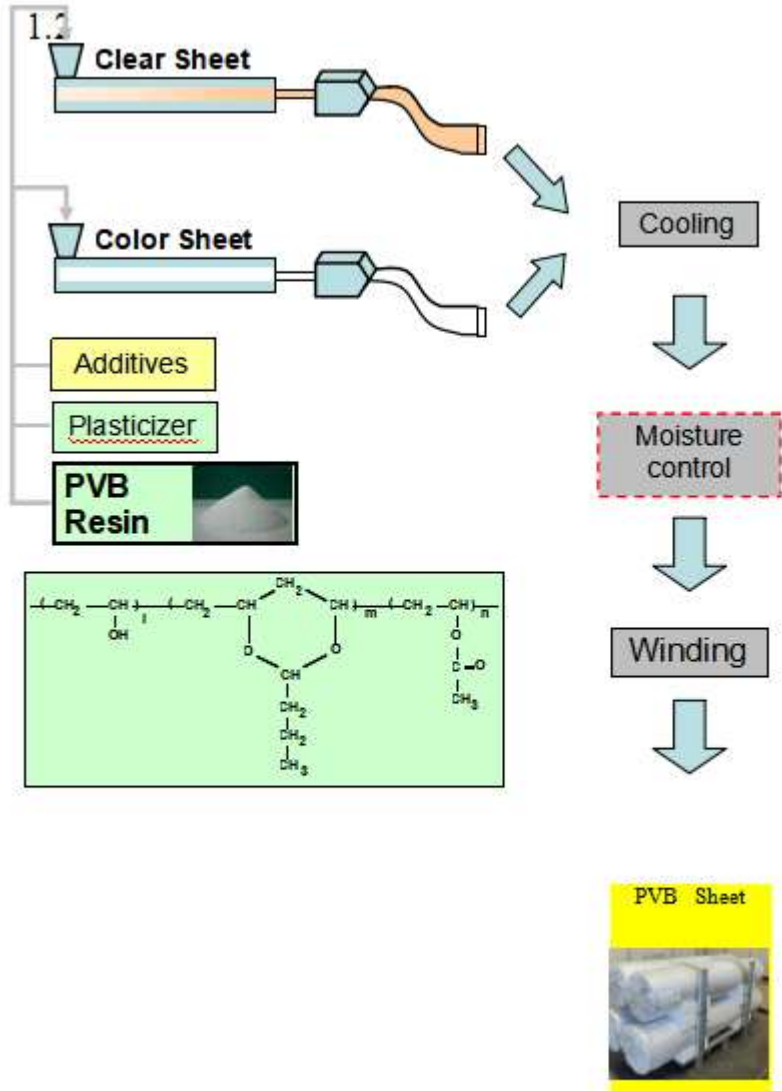
|PVB|

Anhui Yaojing new material Technology Co., LTD

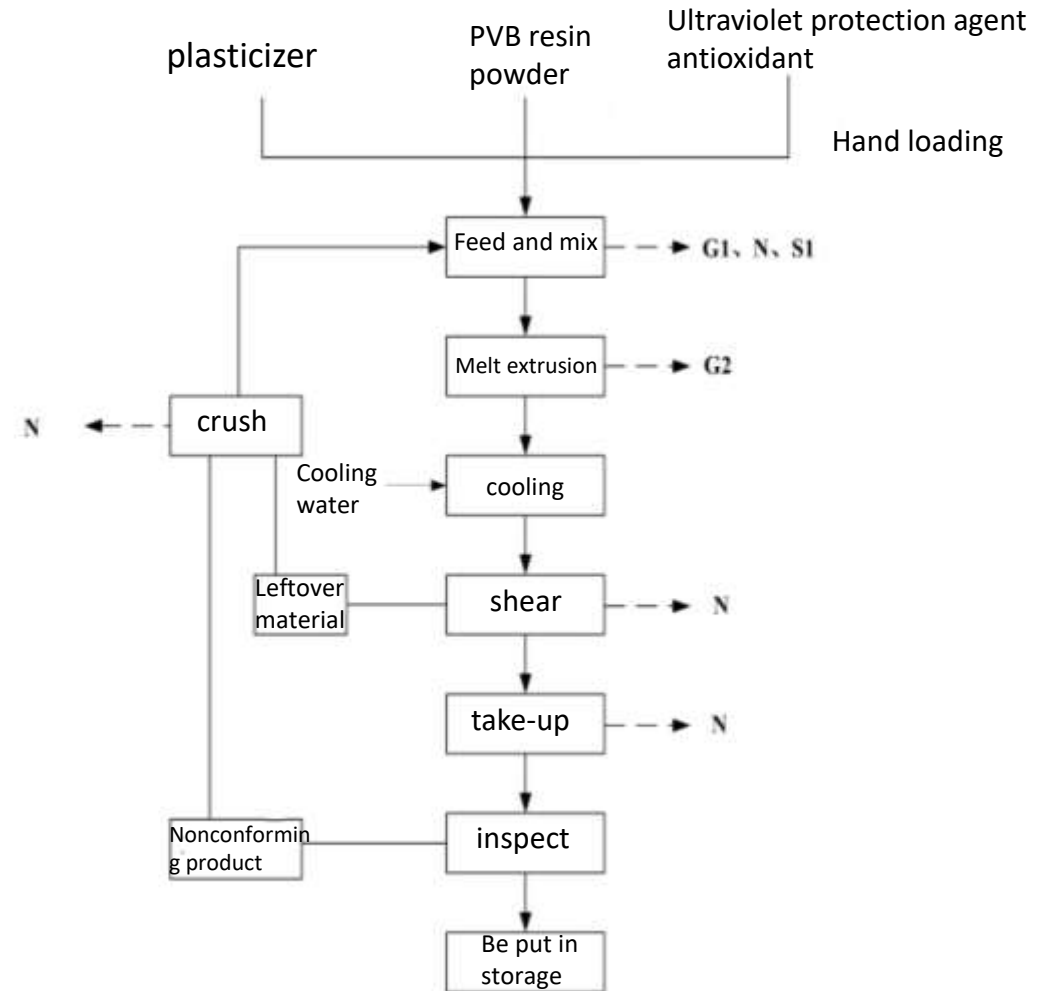
Anhui Yaojing Technical Guide for Architectural Lamination



PVB Sheet Introduction



Production process flow chart



Production process description

1. Resin mixing/metering stirring:

According to the test report of PVB resin powder and its ratio, add other functional additives into plasticizer and heat up to 60°C, let it dissolve fully, and then cool down to 40°C for use.

2. Plasticizing extrusion/Mesh filtration:

The prepared plasticizer, crushing material and PVB resin powder are injected into the extruder through a weight-loss feeder in a certain proportion, and the extrusion temperature is 140-160°C. A twin-screw exhaust extruder with the same mixing function is used to squeeze the material into a continuous and continuous wheel type flame filter with white cleaning function, and the film is formed by the filter core overdirection precision metering pump into the casting film forming machine.

3. Cooling roller shape ---- size cutting:

The film "film" from the film head is cooled and shaped by the sink, and its uniformity is controlled by the thickness gauge. The film can be stretched into a film of the specified thickness by accurately controlling the speed of the roller, and the film is stressed and controlled by moisture, so that the shrinkage rate and moisture after the film is received and formed are controlled within a reasonable range. At the same time, the film is sliced according to customer needs.

4. Finished product winding:

The isolation film and PVB film are combined and wound into a roll by a winding machine with high precision winding tension.

5. Comprehensive performance testing:

The main test thickness, shrinkage, light transmittance, fog, tensile and other values meet the shipping standards.

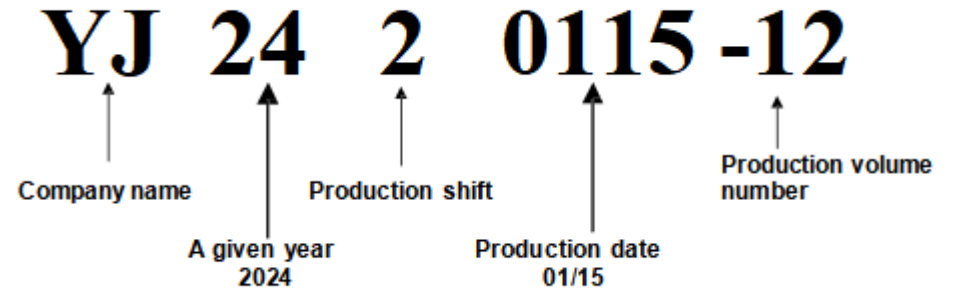
6. Packaging:

Wrap the wound film into a finished product.

PVB Sheet Grades

Grade	Architecture		Photovoltaic
	PFBT PFET PFDT	PFAT PFAS	PFVT
Color	Clear	Clear/Snow White	Clear
Thickness (mm)	0.76 1.14 1.52	0.38	0.76 1.14 1.52
Max.Width (mm)	3,200	2,440	2,440
Length (m/Roll)	200 (0.76) 150 (1.14) 100 (1.52)	400-450	200 (0.76) 150 (1.14) 100 (1.52)

■ Lot No. Description



Architectural PVB Data reference

Thickness	0.38mm	0.76mm	1.52mm
Color	Extra Clear		
Apperance	Achromic or yellowish transparent film with smooth surface		
Length (m)	450	250	120
Width (mm)	500-3300	500-3300	500-3300
Thickness Tolerance(mm)	±0.02	±0.02	±0.02
Haze %	≤0.20	≤0.30	≤0.50
Light Transmittance	≥87%	≥87%	≥87%
Roughness	15 - 30	25 -40	30-50
Moisture %	0.35 - 0.55	0.35 - 0.55	0.35 - 0.55
Yellow Index	≤8	≤8	≤8
Shrinkage(60C/15min)	≤5	≤2	≤1.5
Tensile Strenth	≥20	≥20	≥20
Knock value	7 - 9	7 - 9	7 - 9
Elongation at break	≥200	≥200	≥200

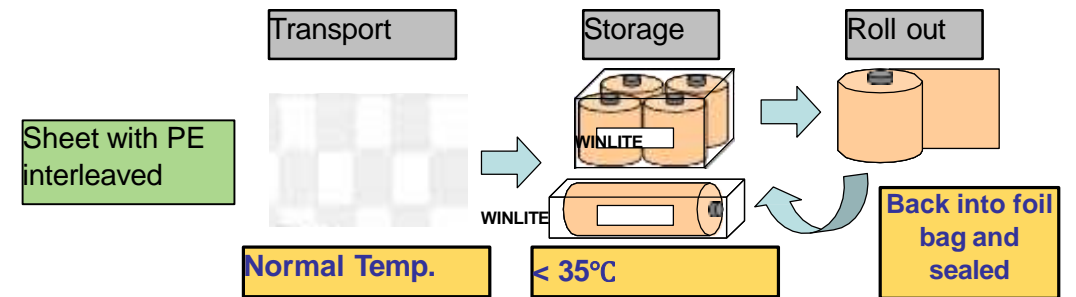
Packaging

- The outer package type depends on the product width.



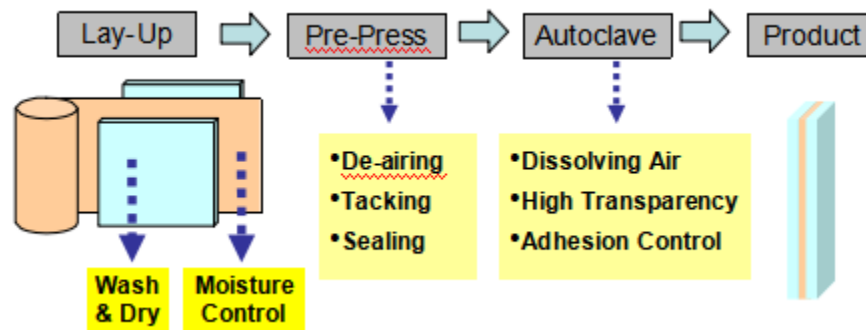
Transport and Storage

1. The sheet will be transported under Normal
2. Temperature and the storage condition below 35°C is recommended.



PVB laminated glass technology and quality control

Laminated Glass Procedure



PVB sheet should be roll out in the appropriate condition to maintain the moisture content.

- The glass should be well cleaned and the water quality should be under controlled.

- **The purpose of Pre-Press process are de-airing, tacking and sealing.**

- Finally the glass is deal with Autoclave to dissolve residual air, perform high transparency and adjust the adhesion.

■ The operating environment of the composite chamber

The operating environment of the film chamber is mainly controlled in four aspects: temperature, humidity, cleanliness and sealing. The temperature is controlled at 18-25°C, the relative degree is controlled at 20%-30%, the cleanliness of the workshop should be clean and dust-free, and the operators entering and leaving the film room should wear dustproof clothing, shoe covers, hats, masks and gloves. In addition, according to the size of the film room, strictly control the number of workers in the film room at the same time to avoid affecting the temperature and humidity in the film room.

■ The cleaning of the glass

- ① cleaning is best to use a wiping cloth specially used to wipe the glass, and the fluorescent light source is installed below the glass wiping table to check the glass.
- ② In order to ensure that the clean glass surface is clean and transparent, the clean glass must be wiped with softening water with a hardness of less than 50ppm, and the hardness of the water is too large, and the surface of the wiped glass will appear fog and white marks after drying, affecting the appearance quality of the product.
- ③ For manufacturers that do not have softening water equipment, drinking pure water can be used instead, wiping with ordinary water for the first time, and then wiping with a glass special wiping cloth that adsorbs pure water for the second time.
- ④ For the ink contamination point on the glass surface, because the glass has been fired at high temperature, it must be wiped with sulfuric acid solution first, and then wiped with water.



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PVB

■ Closing operation

- A. According to the size of the glass specification, choose the appropriate width of the PVB film, the operation should wear clean gloves and do not directly touch the glass with your hands.
- B. When spreading the PVB film, the film should be naturally paved, can not be stretched, the inner and outer pieces of the glass are aligned, the overlap of the inner and outer pieces can not exceed the standard, and then use the blade to cut the excess film around, in the cutting of the blade to maintain a certain inclination, so that the periphery leaves 0.5-2mm width of the excess film, which can avoid the film contraction caused by the film, helping to bond the edge.
- C. Then close the glass of the film, put on the vacuum rubber ring, pay attention to make the tension around the four sealing strip uniform, open the air valve after the sleeve, first cold pumping of the glass, the vacuum degree of the vacuum tank to ensure that 0.09~0.1MPa, and ensure that the cold pumping time of the glass is not less than 5 minutes.

■ Preheat of glass

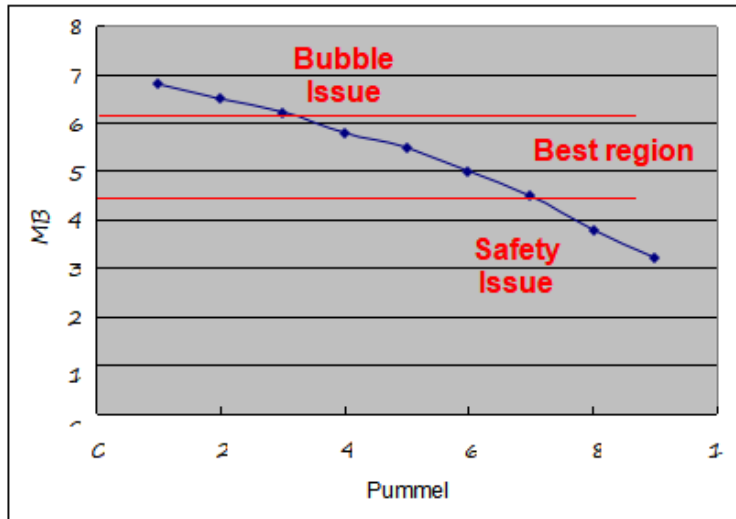
After the inner and outer glass is clamped with PVB film, it is necessary to preheat and prepress the glass of the good film. At present, there are three kinds of preheat and prepress equipment for laminated glass:

- ① preheat and prepress box,
- ② transmission vertical preheat and prepress machine,
- ③ transmission horizontal preheat and prepress machine.

In contrast, the horizontal preheating and prepressing machine is more suitable for the production of large glass specifications. When operating, first put the vacuum silicone sleeve on the side of the glass, first cold pumping the glass, ensure that the cold pumping time is not less than 5 minutes, and then put the glass on the preheating and prepressing machine transmission platform, the glass should be stable and firm, the fulcrum should be suitable, and ensure that the glass is not deformed during preheating and prepressing. The temperature of the preheating and prepressing machine is set between 120 and 150°C. The vacuum pressure is set at 0.09~0.1MPa.

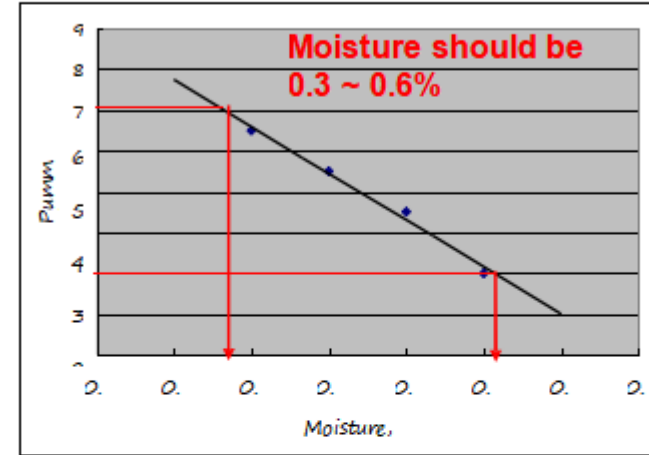
- There is a direct relationship between moisture and Pummel value i.e. higher moisture content leads to lower pummel value. Also, the MBH (Mean Ball-drop Height) can be easily estimated by the pummel value.
- And it should be noticed that if the Pummel value is less than 3, generally causes bubble issue. On the opposite, if the Pummel value is higher than 7, the penetration test will failed.

MBH v.s. Pummel



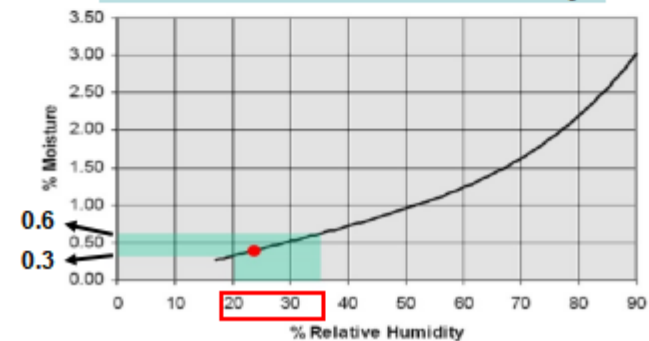
- As the following figure, if PVB sheet Pummel value should be 3 to 7, the moisture content is required to keep from 0.3 to 0.6%.

Pummel(3~7) v.s. Moisture



- According to the following figure, when the relative humidity is around 20 to 35%, the moisture of PVB sheet can be adjusted to 0.3 to 0.6%.

Moisture v.s. Relative Humidity



Temperature Factor

■•PVB Sheet

- a. Refrigerated Sheet : 10~18°C
- b. Interleaved Sheet : 20~25°C

■•Glass Surface: 20~40°C

1. If the glass surface temperature is above 40°C, it will:
 - a. Wrinkle seriously
 - b. PVB sheet becomes soft and stick to glass and affect de-airing efficiency
 - c. Premature sealing
2. If the glass surface temperature is below 20°C, it will:
 - a. Easy to slip
 - b. Easy to appear defect at the edge
 - c. Difficult to de-airing

Cutting

- Do not force to pull the sheet when trimming.
- PVB sheet should be larger than glass about 2mm in each side.

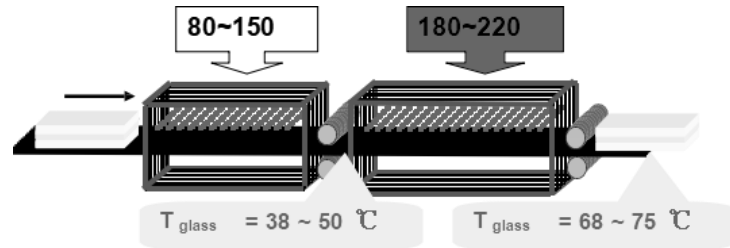
Pre-Press

Purpose

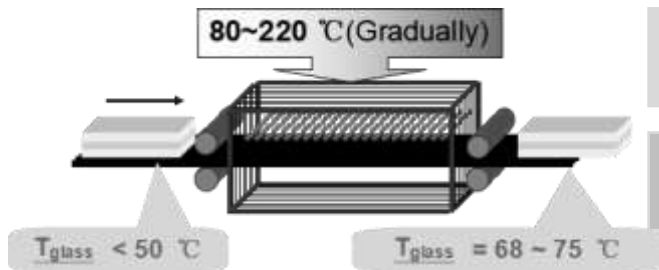
- Pre-combination of PVB Sheet and glasses before autoclave process.
- De-airing between the glasses and PVB sheet as much as possible.
- Accomplish edge sealing to prevent air penetrating into the laminated glass in autoclave process.

Types of Nip-Roll method

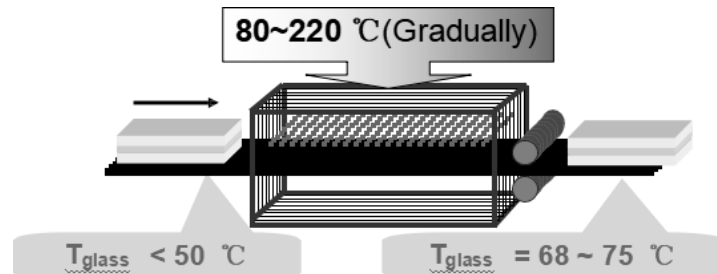
■ Two Rolls; Two Ovens



■ Two Rolls; One Oven



■ One Roll; One Oven



Suggestion of Parameters

- The glass surface temperature after pre-press process should be around 68 to 75°C.
- The value and range of temperature are suggested only as a guide, the optimum temperature is based on the size, thickness of glass, pressure of nip roll, line speed and pre-press appearance.
- The optimum condition depends on the appearance after pre-press, heat resistance and boiling/bake tests results.

Trouble Shooting

3.1 The Route of Bubble Issue

Red color are caused by sheet

- ◆ Blue color are caused by glass
- ◆ Green color are caused by process

1) Bubbles occur directly after autoclave

- PVB sheet pattern
- Glass mismatching
- Improper laminated condition

ii) Air penetration

- PVB sheet adhesion properties
- Glass mismatching
- Improper laminated condition

b) Caused by Moisture

i) High moisture content

- Check moisture content of sheet
- Check water on glass surface or not
- Check R.H. in lay-up room

c) Caused by Visual Defect

i) Concentrated residual air

- Check visual defect on glass or sheet

1) Bubbles occur after nature storage

a) Caused by Air

i) Residual air expanded

- Improper laminated condition

b) Caused by Visual Defect

i) Concentrated residual air

- Check visual defect on glass or sheet

2) Bubbles occur after bake/boiling test

a) Caused by Air

i) Residual air expanded

- Improper laminated condition

b) Caused by Moisture

i) High moisture content

- Check moisture content of sheet
- Check R.H. in lay-up room



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PVB

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