GMYQTCF-CPR

CPR TEST REPORT

For

Foshan Gao Ming Ya Qi Toughened Glass Co., Ltd.

Toughened Glass

Model: 3MM,4MM,5MM,6MM,8MM,10MM,12MM

Prepared For : Foshan Gao Ming Ya Qi Toughened Glass Co., Ltd.
Tian Xin Village, The fifth industrial zone, Yanghe Town, Gao Ming district, Foshan city, Guangdong province,China

Prepared By : China Ceprei (Sichuan) Laboratory
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Report Number: GMYQTCF-CPR
Date of Test: Sep.05, 2019
Date of Report: Sep.05, 2019

GMYQTCF-CPR

TEST REPORT DECLARATION

Applicant	:	Foshan Gao Ming Ya Qi Toughened Glass Co., Ltd.
Address	:	Tian Xin Village, The fifth industrial zone, Yanghe Town, Gao Ming district, Foshan city, Guangdong province,China
Manufacturer	:	Foshan Gao Ming Ya Qi Toughened Glass Co., Ltd.
Address	:	Tian Xin Village, The fifth industrial zone, Yanghe Town, Gao Ming district, Foshan city, Guangdong province,China
EUT Description	:	Toughened Glass
Model No.	:	3MM,4MM,5MM,6MM,8MM,10MM,12MM
Remark	:	N/A

Test Procedure Used:
EN 12150-2:2004;EN 12150-1:2015

The test results of this report relate only to the tested sample identified in this report.

Date of Test : Sep.05, 2019

Prepared by : (Jack)

Checked by : (Gina)

Approved by : (Johnson)

Clause	Requirement-Test	Verdict and Result-Remark
1	Mechanical resistance and stability	-
	The construction works must be designed and built in such a way that the loadings that are liable to act on it during their constructions and use will not lead to any of the following: (a) collapse of the whole or part of the work;Pass. These requirements have been complied with. (b) major deformations to an inadmissible degree; (c) damage to other parts of the works or to fittings or installed equipment as a result of major deformation of the load- bearing construction; (d) damage by an event to an extent disproportionate to the original cause.	Pass. These requirements have been complied with.
2	Safety in case of fire	-
	The construction works must be designed and built in such a way that in the event of an outbreak of fire: (a) the load-bearing capacity of the construction can be assumed for a specific period of time; (b) the generation and spread of fire and smoke within the construction works are limited; (c) the spread of fire to neighbouring construction works is limited; (d) occupants can leave the construction works or be rescued by other means; (e) the safety of rescue teams is taken into consideration.	Pass. These requirements have been complied with.
3	Hygiene, health and the environment	-
	The construction works must be designed and built in such a way that they will, throughout their life cycle, not be a threat to the hygiene or health and safety of workers, occupants or neighbours, nor have an exceedingly high impact, over their entire life cycle, on the environmental quality or on the climate during their construction, use and demolition, in particular as a result of any of the following: (a) the giving-off of toxic gas; (b) the emissions of dangerous substances, volatile organic compounds (VOC), greenhouse gases or dangerous particles into indoor or outdoor air; (c) the emission of dangerous radiation; (d) the release of dangerous substances into ground water, marine waters, surface waters or soil; (e) the release of dangerous substances into drinking water or substances which have an otherwise negative impact on drinking water; (f) faulty discharge of waste water, emission of flue gases or faulty disposal of solid or liquid waste; (g) dampness in parts of the construction works or on	Pass. These requirements have been complied with.

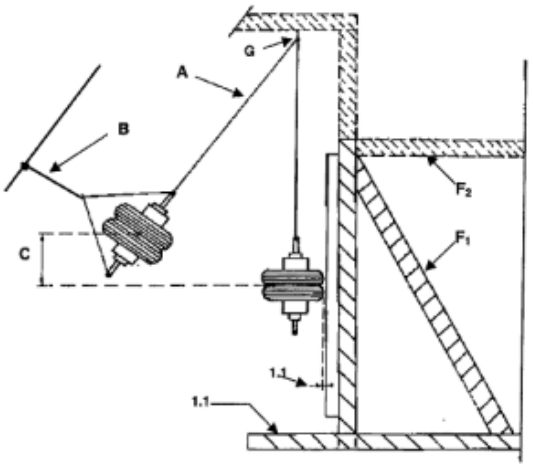
Clause	Requirement-Test	Verdict and Result-Remark
	surfaces within the construction works.	
4	Safety and accessibility in use	-
	The construction works must be designed and built in such a way that they do not present unacceptable risks of accidents or damage in service or in operation such as slipping, falling, collision, burns, electrocution, injury from explosion and burglaries. In particular, construction works must be designed and built taking into consideration accessibility and use for disabled persons.	Pass. These requirements have been complied with.
5	Protection against noise	-
	The construction works must be designed and built in such a way that noise perceived by the occupants or people nearby is kept to a level that will not threaten their health and will allow them to sleep, rest and work in satisfactory conditions.	Pass. These requirements have been complied with.
6	Energy economy and heat retention	-
	The construction works and its heating, cooling and ventilation installations must be designed and built in such a way that the amount of energy required in use shall be low, when account is taken of the occupants and of the climatic conditions of the location. Construction works must also be energy-efficient, using as little energy as possible during their construction and dismantling.	Pass. These requirements have been complied with.
7	Sustainable use of natural resources	-
	The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following: (a) reuse or recyclability of the construction works, their materials and parts after demolition; (b) durability of the construction works; (c) use of environmentally compatible raw and secondary materials in the construction works.	Pass. These requirements have been complied with.

Test Property	Test Method	Test Principle / Requirements	Test Result
Product description	EN 12150-2:2004 Clause 4.1	For conformity purposes the thermally toughened soda lime silicate glass manufacturer is responsible for the preparation and maintenance of the product description. This description shall describe the product and/or product families. The description shall contain at least a normative part. The description may also contain an informative part, when the manufacturer foresees further development of the product. The normative part of the description shall contain the following minimum information: - a reference to EN 12150 parts 1 and 2 and all other standards with which the manufacturer claims compliance. - the radiometric properties and durability of coated glass, i.e. coated glass that conforms with EN 1096-1, EN 1096-2, EN 1096-3, when those properties are changed, intentionally or unintentionally, by the thermal toughening process. The definition of product families shall be consistent with the normative part of the product description.	Pass. A reference to EN 12150 parts 1 and 2.
Characteristics	EN 12150-2:2004 Clause 4.3.1	For the characteristics listed in table 1, for the soda lime silicate glass panes, generally accepted values or calculated values may be used. Since the majority of the characteristics of table 1 are not changed significantly by the thermal toughening process they shall be used for thermally toughened soda lime silicate safety glass. The exceptions shall be the characteristic bending strength ($f_{g,k}$) and the resistance against sudden temperature changes and temperature differentials.	Pass. ρ : 2500kg/m^3 $HK_{0,1/20}$: 6GPa E : 7×10^{10} Pa $f_{g,k}$: 180×10^{6} Pa λ:1 W/(m·K)

<table>
<tr>
<td></td>
<td></td>
<td>Table 1: Information on the characteristics of soda lime silicate glass panes, according to EN 572-1, used for the production of thermally toughened soda lime silicate safety glass
<table>
<tr><th>Characteristic</th><th>Symbol</th><th>Unit</th></tr>
<tr><td>- density</td><td>ρ</td><td>kg/m³</td></tr>
<tr><td>- hardness</td><td>$HK_{0,100}$</td><td>GPa</td></tr>
<tr><td>- Young's modulus</td><td>E</td><td>Pa</td></tr>
<tr><td>- Poisson's ratio</td><td>μ</td><td>Dimensionless</td></tr>
<tr><td>- Characteristic bending strength</td><td>$f_{g,k}$</td><td>Pa</td></tr>
<tr><td>- Resistance against sudden temperature changes and temperature differentials</td><td></td><td>K</td></tr>
<tr><td>- Specific heat capacity</td><td>c</td><td>J/(kg.K)</td></tr>
<tr><td>- Coefficient of linear expansion</td><td>α</td><td>K^{-1}</td></tr>
<tr><td>- Thermal conductivity (for U-value)</td><td>λ</td><td>W/(m.K)</td></tr>
<tr><td>- Mean refractive index to visible radiation</td><td>n</td><td>Dimensionless</td></tr>
<tr><td>- Emissivity</td><td>ε</td><td>Dimensionless</td></tr>
<tr><td>- Light transmittance</td><td>τ_v</td><td>Dimensionless</td></tr>
<tr><td>- Solar direct transmittance</td><td>τ_e</td><td>Dimensionless</td></tr>
<tr><td>- Total energy transmittance</td><td>g</td><td>Dimensionless</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Resistance to fire</td>
<td>EN 12150-2:2004 Clause 4.3.2.1& EN 13501-2</td>
<td>The assessment of integrity shall be made on the basis of the following three aspects:
-cracks or opening in excess of given dimensions;
- ignition of a cotton pad;
-sustained flaming on the unexposed side.
The performance level, used to define insulation, shall be the average temperature rise on the unexposed face, limited to 140 °C above the initial average temperature, with the maximum temperature rise at any point limited to 180°C above the initial average temperature.
The test standards specify how both for uniform and non-uniform elements the mean temperature shall be determined.
For elements which incorporate discrete areas of different thermal insulation, compliance with the insulation criteria shall be determined separately for each area.
The following classes are defined:
<table>
<tr><td>E</td><td>15</td><td></td><td>30</td><td>60</td><td>90</td><td>120</td></tr>
<tr><td>EI</td><td>15</td><td></td><td>30</td><td>60</td><td>90</td><td>120</td></tr>
<tr><td>EW</td><td></td><td>20</td><td>30</td><td>60</td><td></td><td></td></tr>
</table>
</td>
<td>Pass.
Fire resistance: E 15.</td>
</tr>
<tr>
<td>Reaction to fire</td>
<td>EN 12150-2:2004 Clause 4.3.2.2& EN 13501-1</td>
<td>Reaction to fire shall be determined and classified in accordance with EN 13501-1.
Thermally toughened soda lime silicate safety glass products are products/ materials that do not require to be tested for reaction to fire (e.g. Products /materials of Classes A1* according to Commission Decision 96/603/EC, as amended 2000/605/EC)</td>
<td>Pass.
A1.</td>
</tr>
<tr>
<td>External fire behaviour</td>
<td>EN 12150-2:2004 Clause 4.3.2.3& EN 13501-5</td>
<td>Where the manufacturer wishes to declare external fire performance (e.g. when subject to regulatory requirements), the</td>
<td>Not applicable.</td>
</tr>
</table>

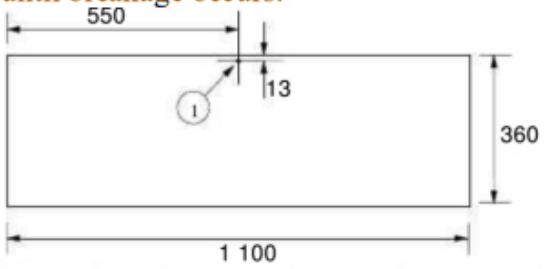
<table>
<tr><td></td><td></td><td>product shall be tested and classified in accordance with prEN 13501-5.</td><td></td></tr>
<tr><td>Bullet resistance: shatter properties and resistance to attack</td><td>EN 12150-2:2004 Clause 4.3.2.4& EN 1063</td><td>The weapon of ammunition is chosen from table1 corresponding to the level of bullet resistance from which the product is to be test.
Mount the first test piece in the frame at the correct distance from the muzzle of the fire arm, according to the table 1, with the attack face facing the weapon.
Table 1: Classification and test requirements for testing the bullet resistance of glazing: hand guns and rifles
<table><tr><th rowspan="2">Class</th><th rowspan="2">Type of weapon</th><th rowspan="2">Calibre</th><th rowspan="2">Type</th><th rowspan="2">Mass g</th><th colspan="4">Test conditions</th></tr><tr><th>test range m</th><th>bullet velocity m/s</th><th>nr. of strikes</th><th>striking distance mm</th></tr><tr><td>BR1</td><td>rifle</td><td>0,22 LR</td><td>L/RN</td><td>2,6 ±0,1</td><td>10,00 ±0,5</td><td>360 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR2</td><td>hand gun</td><td>9 mm Luger</td><td>FJ[1]/RN/SC</td><td>8,0 ±0,1</td><td>5,00 ±0,5</td><td>400 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR3</td><td>hand gun</td><td>0.357 Magnum</td><td>FJ[1]/CB/SC</td><td>10,2 ±0,1</td><td>5,00 ±0,5</td><td>430 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR4</td><td>hand gun</td><td>0,44 Rem. Magnum</td><td>FJ[1]/FN/SC</td><td>15,6 ±0,1</td><td>5,00 ±0,5</td><td>440 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR5</td><td>rifle</td><td>5.56 × 45 *</td><td>FJ[1]/PB/SCP 1</td><td>4,0 ±0,1</td><td>10,00 ±0,5</td><td>950 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR6</td><td>rifle</td><td>7.62 × 51</td><td>FJ[1]/PB/SC</td><td>9,5 ±0,1</td><td>10,00 ±0,5</td><td>830 ±10</td><td>3</td><td>120 ±10</td></tr><tr><td>BR7</td><td>rifle</td><td>7.62 × 51 **</td><td>FJ[1]/PB/HC1</td><td>9,8 ±0,1</td><td>10,00 ±0,5</td><td>820 ±10</td><td>3</td><td>120 ±10</td></tr></table>Draw an equilateral triangle in the centre of the test piece, with the side length equal to the striking distance. Mark the vertices so that they are clearly visible to the marksman.
Subject the test piece to one or three shots, and measure the bullet velocity of each shot.
Measure the centre to centre distances of the three strikes with an instrument with an accuracy to 1mm.
Examine the test piece to determine whether there is an opening between back and front. Examine the gathered fragments in the splinter collecting box for bullet fragments and/or glass splinters released from the rear of the test piece.
Remove the exposed witness foil and examine for perforation against strong light, after lightly brushing to detach any adherent particles.</td><td>Not applicable.</td></tr>
<tr><td>Explosion resistance: impact behaviour and resistance to impact</td><td>EN 12150-2:2004 Clause 4.3.2.5& EN 13541</td><td>For each test the following procedure shall be followed:
-clamp the test piece into the specimen holder;
-ensure that the edges of the test piece fully contact the supporting surface;
-determine the pressure level and load</td><td>Not applicable.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>duration according to the requested class and the corresponding blast load;
-initiate the blast;
-measure the pressure-time parameters of the reflected blast wave;
-determine the positive maximum overpressure and duration of the positive pressure phase;
-inspect the test piece for "through" holes, openings between frame and edges, and fragmentation on the rear side.</td><td></td></tr>
<tr><td>Burglar resistance: shatter properties and resistance to attack</td><td>EN 12150-2:2004 Clause 4.3.2.6& EN 356</td><td>The drop height(measured from the bottom of the impactor to the surface of the test piece) shall be adjusted according to table 1 for the category of resistance to be tested.
<table><tr><th>Category of resistance</th><th>Drop height mm</th></tr><tr><td>P1A
P2A
P3A
P4A
P5A</td><td>1 500 ± 50
3 000 ± 50
6 000 ± 50
9 000 ± 50
9 000 ± 50</td></tr></table>For category P1A, the impactor shall be dropped on to each test piece three times from the same height, in such a way that the impact positions from the pattern of an equilateral triangle with a side length of (130±20）mm around the geometric centre of the test piece, with one side of the triangle parallel to a short side of the specimen. The impact position opposite to this side of the triangle shall be hit first.
Loose fragments shall be removed from the test piece after each impact.
After each impact, the test piece shall be checked for penetration by the impactor. A test piece shall be regards as being penetrated if the impactor has completely passed through the test piece before five seconds has elapsed since the time of impact.</td><td>Pass.
P1A</td></tr>
<tr><td>Pendulum body impact resistance: shatter properties (safe breakability) and resistance to impact</td><td>EN 12150-2:2004 Clause 4.3.2.7& EN 12600</td><td>Testing shall start at the lowest drop height and increase up to the drop height appropriate to the class for which the material is intended.
Place each test piece in the clamping frame so that its edges are encased in the rubber to a minimum depth of 10mm. Inflate both impactor tyres to a pressure of (0.35±0.02)MPa.</td><td>Pass.
Class 3.
Not break.</td></tr>
</table>

		Table 1 — Impact levels Classification / Drop height mm 3 / 190 2 / 450 1 / 1 200 Release the impactor so that it falls with a pendulum movement and without initial velocity. The direction of impact on the centre of the test piece shall be normal to the surface. Inspect the test piece after impact and note whether: it remains unbroken; or it broken in accordance with either the requirements a) or b) of clause 4; or it broke and failed to conform to the requirements of clause 4. 	
Mechanical resistance: Resistance against sudden temperature changes and temperature differentials	EN 12150-2:2004 Clause 4.3.2.8& EN 12150-1	The mechanical properties of thermally toughened soda lime silicate safety glass are unchanged for continuous service up to 250℃ and are unaffected by sub-zero temperatures. Thermally toughened soda lime silicate safety glass is capable of resisting both sudden temperature changes and temperature differentials to 200K.	Pass. Capable of resisting both sudden temperature changes and temperature differentials to 200K.
Mechanical resistance: Resistance against wind, snow, permanent load and/or imposed loads of the glass unit	EN 12150-2:2004 Clause 4.3.2.9& EN 12150-1	The mechanical strength values apply to quasi-static loading over a short time, e.g. Wind loading, and relate to a 5% probability of breakage at the lower of the 95% confidence interval. The values for different types of glass are listed in table 6. **Table 6: Values for the mechanical strength of thermally toughened soda lime silicate safety glass** Type of glass / Values for mechanical strength N/mm² Float: clear, tinted, coated / 120 Enamelled float (based on the enamelled surface in tension) / 75 Patterned glass and drawn sheet / 90	Pass. Mechanical strength values: 123N/mm².

Direct airborne sound reduction	EN 12150-2:2004 Clause 4.3.2.10 & EN 12758	The following separating distances are minimum values and shall be exceeded where possible: 0,7 m between microphone positions; 0,7 m between any microphone position and room boundaries or diffusers; 1,0 m between any microphone position and the sound source; 1,0 m between any microphone position and the test specimen. At each individual microphone position, the averaging time shall be at least 6 s at each frequency band with centre frequencies below 400 Hz. For bands of higher centre frequencies, it is permissible to decrease the time to not less than 4 s. Using a moving microphone, the averaging time shall cover a whole number of traverses and shall be not less than 30 s. ten times the common logarithm of the ratio of the sound power W1 which is incident on a partition under test to the sound power W2 transmitted through the specimen. This quantity is denoted by R and is expressed in decibels. $R = 10 \lg \frac{W_1}{W_2}$ dB	Pass. $R_w(C,C_{tr})$: 29(-2,-3) dB
Thermal properties	EN 12150-2:2004 Clause 4.3.2.11	The thermal transmittance value (U-value) shall be determined by calculation in accordance with EN 673 with: - emissivity ε : the declared value of the glass manufacturer. If the information is not available, the emissivity shall be determined in accordance with EN 12898. - nominal thickness of the glass panes Subject to 5.2.1 the information supplied about the thermal properties of the incoming glass may be used if the thermal toughening process does not alter the values.	Pass. Thermal transmittance value : 5.8 W/(m^2 K)
Radiation properties: Light transmittance and reflectance	EN 12150-2:2004 Clause 4.3.2.12 & EN 410	the light transmittance τ_v and the light reflectance ρ_v for illuminant D65; The light transmittance τ_v of the glazing is calculated using the following formula:	Pass. Light transmittance : 93%. Light reflectance: 2%

		$$\tau_V = \frac{\sum_{\lambda = 380\ nm}^{780\ nm} D_\lambda \tau(\lambda) V(\lambda) \Delta\lambda}{\sum_{\lambda = 380\ nm}^{780\ nm} D_\lambda V(\lambda) \Delta\lambda}$$ D_λ is the relative spectral distribution of illuminant D65 (seeC.2); $\tau(\lambda)$ is the spectral transmittance of the glazing; $V(\lambda)$ is the spectral luminous efficiency for photopic vision defining the standard observer for photometry $\Delta\lambda$is the wavelength interval. The light reflectance of the glazing ρ_V is calculated using the following formula: $$\rho_V = \frac{\sum_{\lambda = 380\ nm}^{780\ nm} D_\lambda \rho(\lambda) V(\lambda) \Delta\lambda}{\sum_{\lambda = 380\ nm}^{780\ nm} D_\lambda V(\lambda) \Delta\lambda}$$ where $\rho(\lambda)$ is the spectral reflectance of the glazing.	
Radiation properties: Solar energy characteristics	EN 12150-2:2004 Clause 4.3.2.13 &EN 410	The solar direct transmittance te of the glazing is calculated using the following formula: $$\tau_e = \frac{\sum_{\lambda = 300\ nm}^{2\,500\ nm} S_\lambda \tau(\lambda) \Delta(\lambda)}{\sum_{\lambda = 300\ nm}^{2\,500\ nm} S_\lambda \Delta\lambda}$$ where: $S\lambda$ is the relative spectral distribution of the solar radiation (seeTable2); $\tau(\lambda)$ is the spectral transmittance of the glazing; $\Delta\lambda$ is the wavelength interval. The solar direct reflectance ρe of the glazing is calculated using the following formula:	Pass. solar direct transmittance: 92%.

		$$\rho_e = \frac{\sum_{\lambda = 300\ nm}^{2\,500\ nm} S_\lambda \rho(\lambda) \Delta\lambda}{\sum_{\lambda = 300\ nm}^{2\,500\ nm} S_\lambda \Delta\lambda}$$ where: $\rho(\lambda)$ is the spectral reflectance of the glazing;	
Durability	EN 12150-2:2004 Clause 4.4	When products conform to the definition of thermally toughened soda lime silicate glass as 4.2 then the characteristics performances in 4.3.2 are ensured during an economically reasonable working life.	Pass.
Dangerous substances	EN 12150-2:2004 Clause 4.5	Materials used in products shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the Member State of destination.	Pass. Not release any dangerous substances.
Fragmentation test	EN 12150-2:2004 Clause5.2.2 &EN 12150-1	Each test specimen shall be impacted, using a pointed steel tool, at a position 12 mm in from the longest edge of the specimen at the mid-point of that edge, until breakage occurs.  Examples of steel tools are a hammer of about 75 g mass, a spring loaded centre punch, or other similar appliance with a hardened point. The radius of curvature of the point should be approximately 0.2mm. The particle count and measuring of the dimensions of the largest particle shall be made between 4min to 5 min after fracture. An area of radius 100mm, centred on the impact point, and a border of 25mm, round the edge of the test specimen, shall be excluded from the assessment.	Pass. The particle count: 80

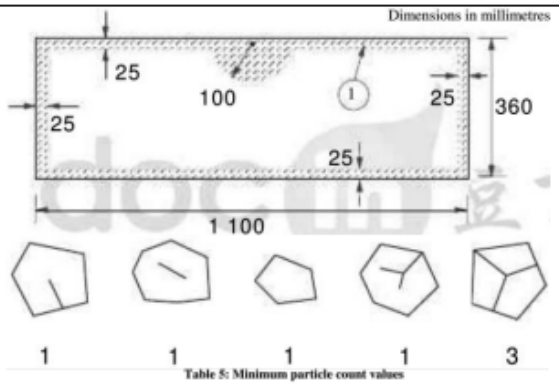


Table 5: Minimum particle count values

Glass type	Nominal thickness (d) in mm	Minimum particle count
Float and drawn sheet	3	15
	4 to 12	40
	15 to 19	30
Patterned	4 to 10	30

Annex：Technical Information

A.1 Photo

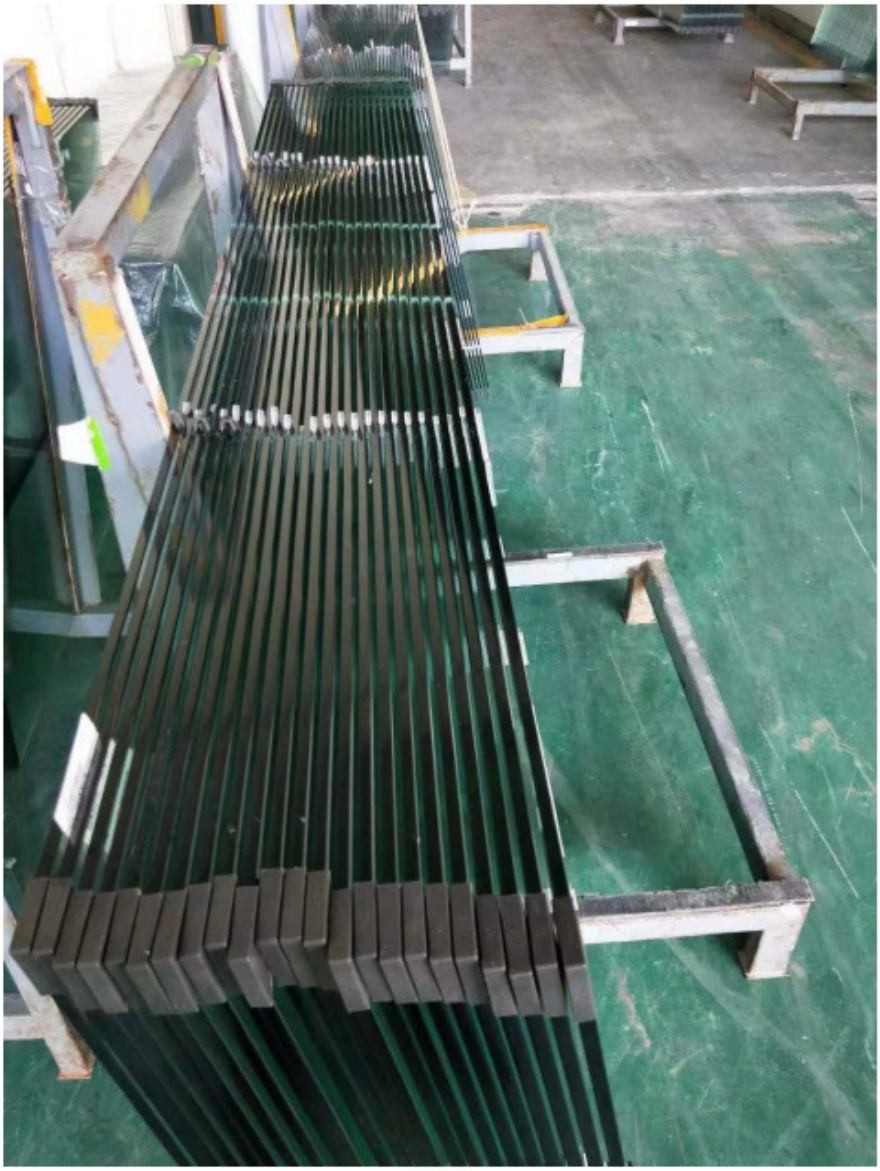


Fig.1