



# Technical Data Sheet

## MIRROR

AUSTRALIA LANDSON GLASS (QINGDAO) CO., LTD (LQ) hereby provide the following Warranty in respect of Mirror Product and Safety Organic Backed Mirror Product either of monolithic or laminated composition.

<b>1</b>	<b>INTRODUCTION</b>	<b>2</b>
<b>2</b>	<b>NORMATIVE REFERENCES</b>	<b>2</b>
<b>3</b>	<b>COMPOSITION AND PROPERTIES OF THE GLASS</b>	<b>2</b>
3.1	CHEMICAL COMPOSITION	2
3.2	MECHANICAL PROPERTIES	3
3.3	THERMAL PROPERTIES	3
3.4	OPTICAL PROPERTIES	3
3.5	ELECTRICAL PROPERTIES	3
<b>4</b>	<b>DURABILITY OF MIRROR</b>	<b>4</b>
<b>5</b>	<b>LIGHT PROPERTIES</b>	<b>5</b>
<b>6</b>	<b>TOLERANCES ON DIMENSIONS</b>	<b>5</b>
6.1	THICKNESS	5
6.2	LENGTH AND WIDTH	6
<b>7</b>	<b>QUALITY REQUIREMENTS</b>	<b>6</b>
7.1	INTRODUCTION	6
7.2	DEFINITIONS OF DEFECTS	6
7.3	GLASS FAULTS	7
7.4	REFLECTIVE SILVER COATING FAULTS	8
7.5	PROTECTIVE COATING FAULTS	9
7.6	OPTICAL QUALITY	10
7.7	ASPECT OF THE "SAFE/SAFE+" VERSION	12
7.8	EDGE FAULTS	12
<b>8</b>	<b>ENVIRONMENTAL ASPECT</b>	<b>13</b>
<b>9</b>	<b>SAFETY</b>	<b>14</b>
9.1	SAFETY IN USE - PENDULUM BODY IMPACT RESISTANCE	14
9.2	SAFETY IN THE CASE OF FIRE - REACTION TO FIRE	14
<b>10</b>	<b>HEALTH ASPECT</b>	<b>14</b>
<b>11</b>	<b>OTHER RELATED DOCUMENTS</b>	<b>14</b>



## 1 INTRODUCTION

This Technical Datasheet gives information about the range of silver mirror glass, safety backed or not with a safety film. The substrate of silver is a float glass in accordance with Chinese National Standard GB/T 11614-1999.

## 2 NORMATIVE REFERENCES

Silver products are made in accordance with:

European Standard

EN1036-1 Glass in building – Mirrors from silver-coated float glass for internal use – Part 1: Definitions, requirements & test methods;

EN1036-2 Glass in building – Mirrors from silver-coated float glass for internal use – Part 2: Evaluation of conformity/Product standard

Chinese National Standard

GB/T 23148-2008 Civil Ornamental Mirrors;

GB/T 28804-2012 Copper-free Silver Mirror on Flat Glass, in reference to ISO 25537:2008, Glass in Building – Silvered, Flat Glass Mirror, NEQ;

Industry Standard JC/T871-2000 Silver Coated Glass Mirror

All Silver are produced in factories being ISO 9001 certified.

## 3 COMPOSITION AND PROPERTIES OF THE GLASS

The basis glass used for silver production is float glass conform to GB/T 11614-1999. The properties of the float glass are listed hereunder.

### 3.1 CHEMICAL COMPOSITION

GB/T 11614-1999 defines the magnitude of the proportions by mass of the principal constituents of float glass as following:

SiO <sub>2</sub>	69 to 74 %
Na <sub>2</sub> O	10 to 16 %
CaO	5 to 14 %
MgO	0 to 6 %
Al <sub>2</sub> O <sub>3</sub>	0 to 3 %
Others	0 to 5 %

### 3.2 MECHANICAL PROPERTIES

Weight (at 18°C): = 2 500 kg/m<sup>3</sup> Density: 2.5

Young's Modulus (modulus of Elasticity): E = 70 000 N/mm<sup>2</sup> Poisson Ratio: = 0.2

Shear Modulus:  $G = E / 2(1 + \nu)$  = 29 166 N/mm<sup>2</sup> Knoop Hardness: 6 GPa

Mohs Hardness: 6

Characteristic bending strength: 45 N/mm<sup>2</sup>

### 3.3 THERMAL PROPERTIES

Softening point: 600 °C

Fusion temperature: 1500 °C

Linear expansion coefficient: =  $9.10 \cdot 10^{-6} / K$  (between 20° and 300°) Specific heat capacity: C = 720 J/(kg.K)

### 3.4 OPTICAL PROPERTIES

Refractive index N to visible radiation (380 to 780 nm):

- air/glass: 0.67

- glass/air: 1.50

### 3.5 ELECTRICAL PROPERTIES

Specific resistance:  $5.107 \cdot 10^{12} \Omega \cdot m$  at 1 000 Hz and 25°C

Dielectric constant: 7.6 at 1 000 Hz and 25°C

#### 4 DURABILITY OF SILVER

Silver products are tested following the durability method described in GB/T 23148-2008 and GB/T 28804 2012. Silver products resist to more severe requirements than the requirements of GB/T 23148-2008 and GB/T 28804-2012.

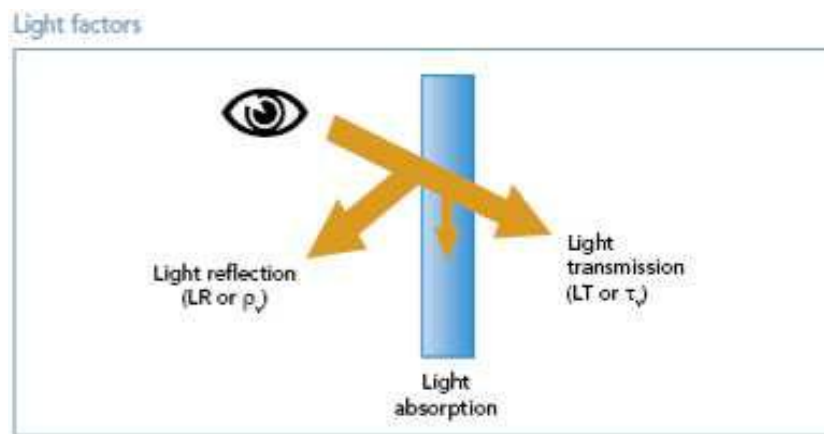
	GB/T 23148-2008	GB/T 28804-2012
Neutral salt spray test: - Maximum corrosion around the edge	1.5 mm, after 480hrs	N/A
Copper accelerated acetic acid salt spray test (CASS): - Maximum corrosion around the edge - Maximum number of spots (diameter between 0.2 and 3 mm)	2.5 mm  2 After 120hrs	1.5mm  2 After 120hrs
Condensation water test - Maximum corrosion around the edge - Maximum number of spots (diameter $\leq$ 0.3 mm)	0.2 mm  1 After 480hrs	0.2mm  1 After 480hrs

## 5 LIGHT PROPERTIES

The light properties are calculated using spectral measurement that conforms with standard GB/T 23148 2008 and GB/T 28804-2012.

The light reflection (LR -pv) measured in accordance with GB/T 23148-2008 and GB/T 28804-2012 shall be at least:

85 % for mirrors made from clear float with a thickness between 2 mm and 6 mm 83 % for mirrors made from clear float with a thickness of 8 mm and 10 mm.



## 6 TOLERANCES ON DIMENSIONS

The same tolerances as for the float used as substrate of the mirrors apply.

### 6.1 THICKNESS

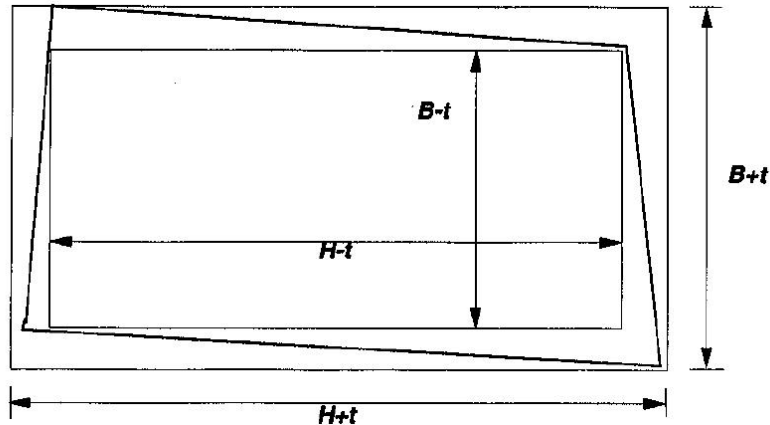
The actual thickness shall be the average of four measurements, taken to the nearest 0.01 mm, one taken at the center of each side.

The actual thickness rounded to the nearest 0.1mm shall not vary from the nominal thickness by more than the tolerances shown in the table and the tolerance for the same glass shall not exceed 0.25mm.

	Minimum (mm)	Maximum (mm)
2	1.75	2.25
3	2.75	3.25
4	3.75	4.25
5	4.7	5.3
6	5.7	6.3
8	7.6	8.4
10	9.6	10.4

## 6.2 LENGTH AND WIDTH

The tolerances on nominal dimensions length H and width B are  $\pm 2$  mm.



The limit of squareness is described by the difference between diagonals. The difference is maximum 4 mm.

## 7 QUALITY REQUIREMENTS

### 7.1 INTRODUCTION

The quality of mirrors can be affected by faults, which alter the appearance of the image of reflected objects. Such alteration of the image can result from optical faults, faults in the glass and faults in the reflective coating.

### 7.2 DEFINITIONS OF DEFECTS

The following definitions apply:

- Optical faults: faults directly associated with the distortion of the reflected image

Glass appearance faults: faults, which alter the visual quality of the mirror from silver-coated float glass. They can be spot and/or linear and/or enlarged area faults

Spot faults: nuclei (solid or gaseous inclusions), deposits, crush marks etc. In certain instances, spot faults are accompanied by a distortion zone called 'halo'. The nucleus of the spot fault is measurable

- Linear defects: scratches extended spot faults etc.

Brush marks: very fine circular scratches that can hardly be seen and are associated with glass cleaning techniques

- Scratches: any kind of scratches that are not brush marks

Reflective silver coating faults: faults in the reflective silver layer, which will alter the appearance of the silvered glass. They consist of scratches, stain, color spots and edge deterioration.



- Stain: alteration of the reflective coating characterized by a more or less brownish, yellowish or greyish coloration of zones, which can sometimes cover the whole reflective surface
- Color spots: alteration of the reflective coating in the form of small, generally colored spots
- Edge deterioration: discoloration of the reflective silver at the edge of the silvered Glass
- Protective coating(s) faults: faults where the metallic layer is exposed. They can be scratches or loss of adhesion of the protective coating(s)
  
- Edge faults: faults that affect the as-cut edge of the silvered glass. They can include Entrant/emergent faults, shelling, corners on/off and vents.

## 7.3 GLASS FAULTS

### 7.3.1 INSPECTION METHOD

The silvered mirror shall be observed in a vertical position, with the naked eye and under normal diffused lighting conditions (natural daylight), from a distance of minimum 1 m. The direction of observation is normal, i.e. at right angles, to the silvered mirror. The use of an additional lighting source, e.g. spotlight, is not allowed.

The dimension and number of brush marks, scratches and spot faults that cause disturbance to vision shall be noted.



### 7.3.2 ACCEPTANCE LEVELS

The tables give the acceptance level for glass faults respectively for standard sizes.

#### Acceptance level for linear defects in standard sizes

	Mirrors with clear and tinted glass substrate	
	Jumbo size (defects/sheets of 3.66m x 2.44m)	Other sizes (defects/m <sup>2</sup> )
Brush marks (≤ 50 mm)	8	0.375
Scratches (≤ 50 mm)	3	0.139

#### Acceptance level for spot faults a in standard sizes

	Mirrors with clear glass substrate			
	Jumbo size (defects/sheets of 3.66m x 2.44 m)		Other sizes (defects/m <sup>2</sup> )	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet <sup>b</sup>
≤ 0.2 mm	Accepted c	Accepted c	Accepted c	Accepted c
> 0.2 mm and ≤ 0.5 mm	26	18	1.35	0.93
> 0.5 mm	3	2	0.16	0.11

	Mirrors with tinted glass substrate			
	Jumbo size (defects/sheets of 3.66mx2.44 m)		Other sizes (defects/m <sup>2</sup> )	
	Max/sheet	Average/sheet	Max/sheet	Average/sheet <sup>b</sup>
≤ 0.2 mm	Accepted c	Accepted c	Accepted c	Accepted c
> 0.2 mm and ≤ 0.5 mm	30	29	1.55	1.50
> 0.5 mm	4	3	0.21	0.16

a The dimensions stated are without the effect of halo and relate to the largest of the fault dimensions  
b The average shall be calculated taking into account the total individual pack area (m<sup>2</sup>) c Accepted, providing they do not form a cluster.

## 7.4 REFLECTIVE SILVER COATING FAULTS

### 7.4.1 INSPECTION METHOD

Same as §7.3.1

### 7.4.2 ACCEPTANCE LEVELS

The reflective silver coating faults are not allowed if they are visible under the condition of § 7.3.1.



## 7.5 PROTECTIVE COATING FAULTS

### 7.5.1 INSPECTION METHOD

Same as §7.3.1.

### 7.5.2 ACCEPTANCE LEVELS

Using the method in §7.3.1, the presence of pinholes, burst bubbles, flaking of the protective coating along the edges or other faults in the protective coating(s) shall not be allowed.

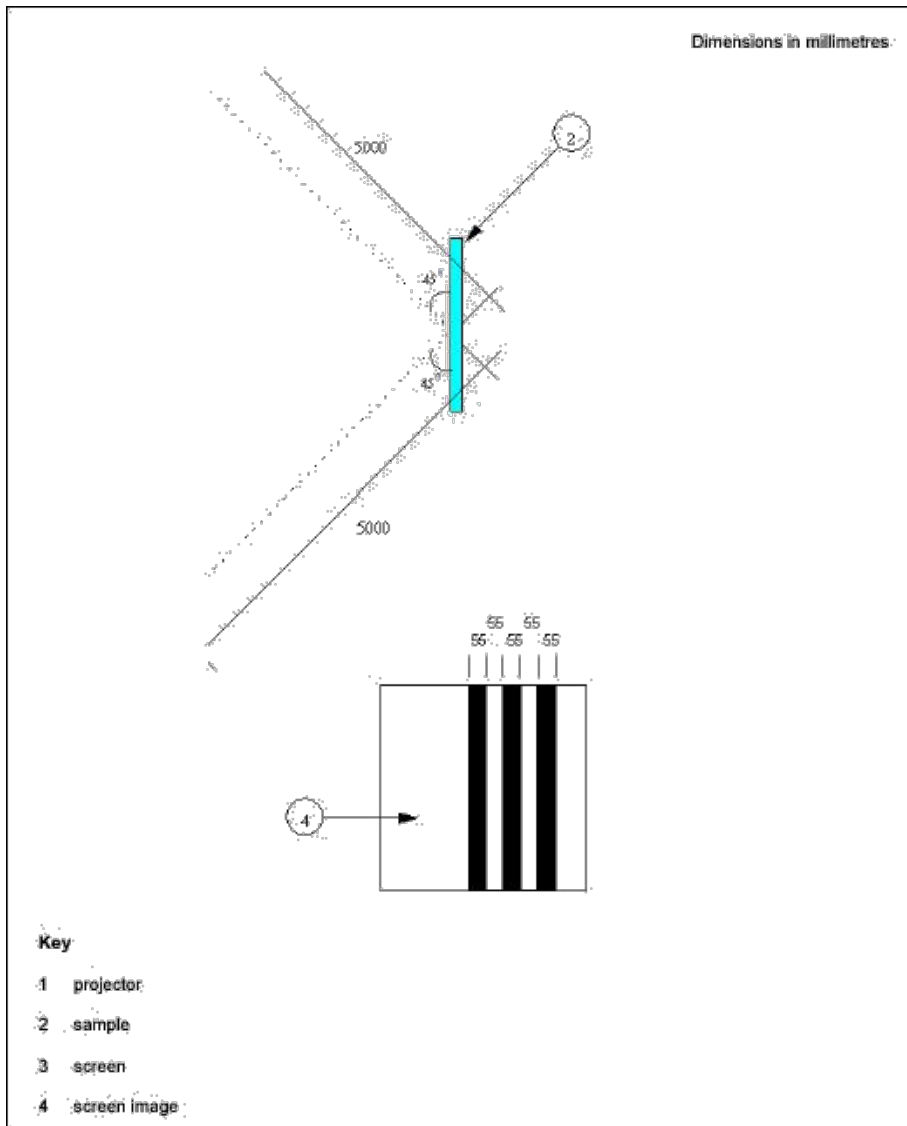
## 7.6 OPTICAL QUALITY

### 7.6.1 QUALITATIVE VISUAL INSPECTION METHOD

A silvered mirror shall be examined in areas of 500 mm × 500 mm at a time. The observer shall be located at a distance of 2 m in front of and normal to the area being examined. Behind the observer shall be an irregular background. The reflected image shall not be optically disturbed, e.g. by another reflective surface, window. The observed distortions can be quantified using the method in §7.6.2.

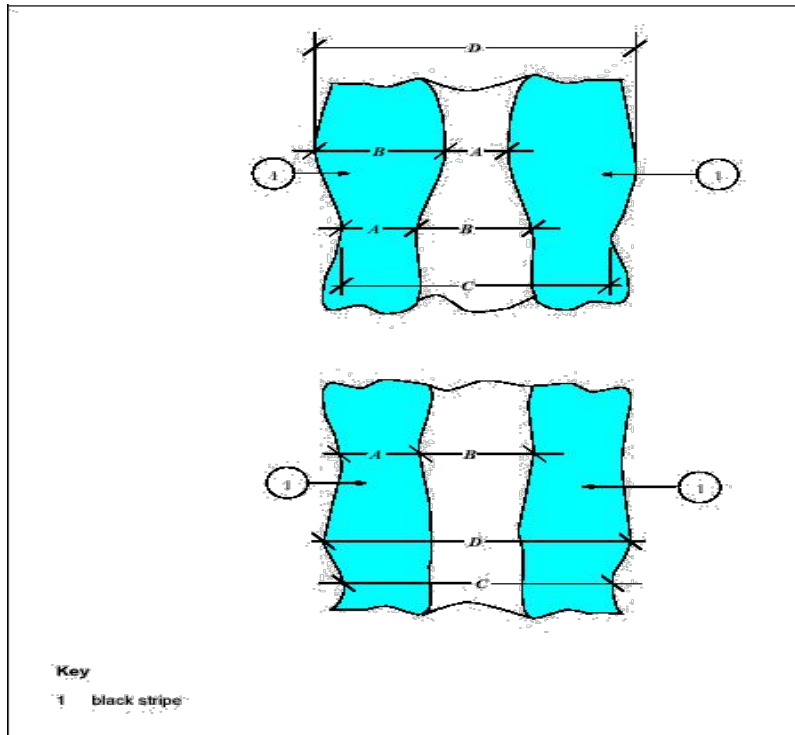
### 7.6.2 OPTIONAL QUANTITATIVE TEST METHOD

A projector having a focus distance between 80 mm and 100 mm and an aperture of 8 mm shall be positioned at a distance of 5 m from the specimen being examined, at an angle of 45° to the specimen, which is positioned vertically. A screen shall be located 5 m from the center of the mirror at right angles to the reflected beam.



A grid pattern slide, when projected onto the screen shall give dark and clear stripes of 55 mm width. Calibration of the stripe width is achieved by using a non-distorted front surfaced mirror in place of the specimen.

The difference in width of each projected stripe, or of three neighboring stripes shall be measured.



### 7.6.3 ACCEPTANCE LEVELS

The mirror meets the requirements if it does not exhibit any disturbing optical variation of the image following the visual inspection described in §7.6.1.

In case of doubt, the method given in §7.6.2 can be used. The measured deviations shall remain within the following limits (see figure above):

$$A = 55 \text{ mm} - a$$

$$B = 55 \text{ mm} + a$$

$$C = 165 \text{ mm} - b$$

$$D = 165 \text{ mm} + b$$

Where  $a = 10 \text{ mm}$  and  $b = 15 \text{ mm}$ .

If the pane includes an original edge of the basic glass production width B, the following values for a and b apply in the corresponding 165 mm wide border band:

Nominal glass thickness  $< 4 \text{ mm}$ :

- o  $a = 30 \text{ mm}$
- o  $b = 40 \text{ mm}$ .

Nominal glass thickness  $\geq 4 \text{ mm}$ :

- o  $a = 20 \text{ mm}$
- o  $b = 30 \text{ mm}$



## 7.7 ASPECT OF THE VINYL BACK VERSION

Silver can be delivered with safety backing film on the painted side. The aspect of this film is not perfect and some bubbles can appear. Visual imperfections in the safety backing film do not have a negative impact on soft body impact resistance according to AS/NZS2208:1996.

## 7.8 EDGE FAULTS

### 7.8.1 INSPECTION METHOD

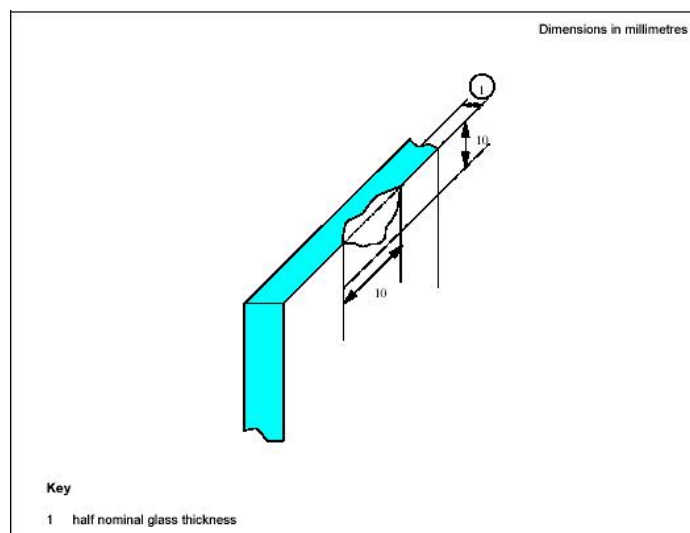
Same as §7.3.1.

### 7.8.2 ACCEPTANCE LEVELS

The edge quality of stock sizes mirrors can be affected by the presence of entrant/emergent faults and shelling. Using the method of §7.3.1, the edges of the mirrors shall be checked for the presence of shells, corners on/off and edge vents.

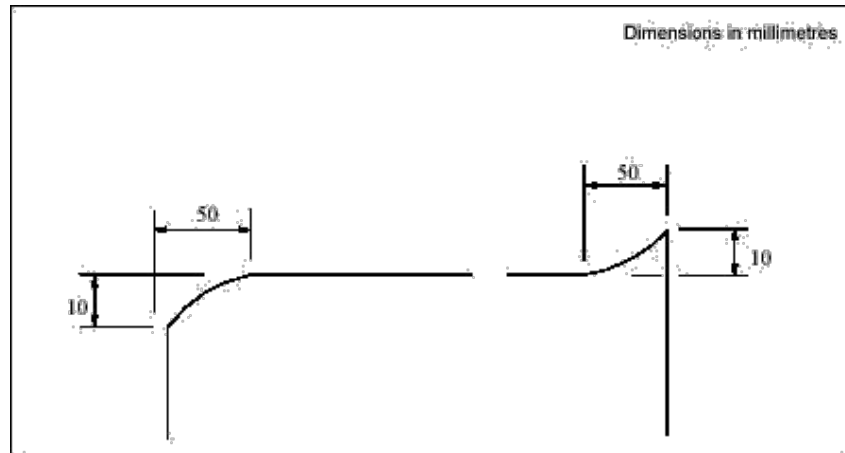
#### 7.8.2.1 CHIPS OR SHELLS

For stock sizes, entrant or emergent chips or shells shall be accepted provided they do not exceed a maximum length and depth of 10 mm and half the nominal glass thickness.



#### 7.8.2.2 CORNERS ON/OFF

For stock sizes occasional corners on/off shall be allowed. No more than 5 % of the sheets on a delivery shall be affected.



### 7.8.2.3 VENTED (CRACKED) EDGES

Vented (cracked) edges shall not be allowed for stock sizes.

## 8 ENVIRONMENTAL ASPECT

Silver have been developed to be environmentally friendly mirrors.

Copper Free Silver is one-step further; its paints contains (compared to Copper Silver):

Zero lead

70% less solvents

0% formaldehydes (colorless gas, very harmful irritant).



LandsonGlass

## 9 SAFETY

### 9.1 SAFETY IN USE - PENDULUM BODY IMPACT RESISTANCE

Shatter properties (safe breakability) and pendulum body impact resistance are determined and classified in accordance with AS/NZS 2208:1996.

Silver mirrors show a mode of breakage typical of annealed glass.

Vinyl Back Silver comprises polymer film applied to the back of the glass. This safety backing film ensures safety in case of soft body impact.

Vinyl Back Silver shows a mode of breakage typical of laminated glass (AS/NZS2208:1996). Numerous cracks appear under soft body impact, but the fragments hold together and do not separate.

## 10 HEALTH ASPECT

LANDSON GLASS puts great effort in developing products that preserve our indoor air quality.

Silver products show very little indoor emissions of Volatile Organic Compounds (VOCs), including very low levels of formaldehyde.

## 11 OTHER RELATED DOCUMENTS

Following documents are also available from [www.landsonglass.com.au](http://www.landsonglass.com.au),

Installation Guide

Processing Guide

Cleaning and Maintenance Guide for Decorative Glazing