Anglo Eastern Glass

Anglo Eastern Glass

Processor of Architectural

Toughened or tempered glass

Anglo Eastern Glass

Toughened or tempered glass

- Toughened or tempered glass is glass that has been processed by controlled thermal or chemical treatments to increase its strength compared with normal glass.

Properties Toughened glass

- 4-5 times physically stronger and thermally stronger (It can sustain 300 degree temperatures) than regular glass.
- It will usually shatter into small fragments instead of sharp shards when broken, making it less likely to cause severe injury and deep lacerations.

How is it made?

- Tempered glass is made by processes which create balanced internal stresses which give the glass strength. Tempered glass is manufactured through a process of extreme heating and rapid cooling, making it harder than normal glass.

Use of TEMPERED GLASS

- Toughened glass is mainly used in buildings for unframed assemblies (such as frameless doors) structurally-loaded applications, and any other application.

Use of TEMPERED GLASS

As a result of its safety and strength, tempered glass is used in a variety of demanding applications, including passenger vehicle windows, glass doors and tables, refrigerator trays as a component of bulletproof glass, for diving masks, and various types of plates and cookware.

Disadvantages

- It must be cut to size or pressed to shape before toughening and cannot be re-worked once toughened. Polishing the edges or drilling holes in the glass is carried out before the toughening process starts.

The glass is most susceptible to breakage due to damage to the edge of the glass where the tensile stress is the greatest, but shattering can also occur in the event of a hard impact in the middle of the glass pane or if the impact is concentrated (for example, striking the glass with a point).

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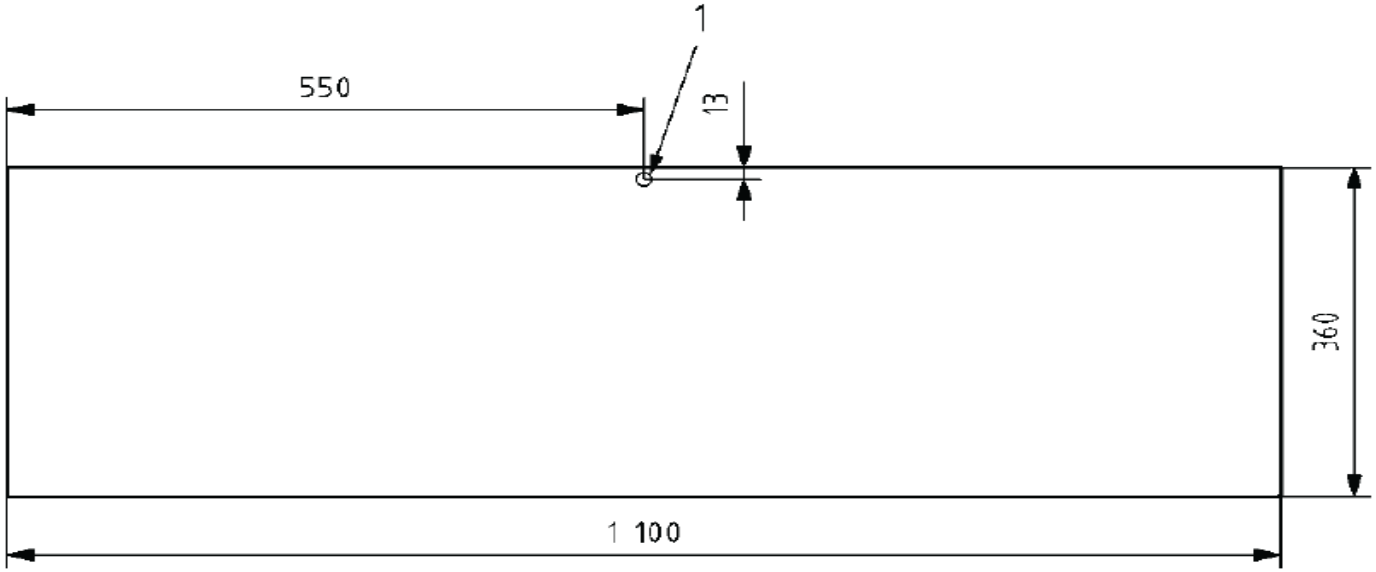
Follows EN12150, EN1863 & EN1279

Processing Standard

EN 12150 (Fully Tempered Glass)

Fragmentation Test(EN 12150)

- Dimension of Test Sample – 360 mm X 1100 mm
- Each test specimen shall be impacted, using a pointed steel tool, at a position 13 mm in from the longest edge of the test specimen, at the mid point of that edge, until breakage occurs.
- The fragments shall be held at the edges, by a small frame or adhesive tape.



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Fragmentation Test(EN 12150)

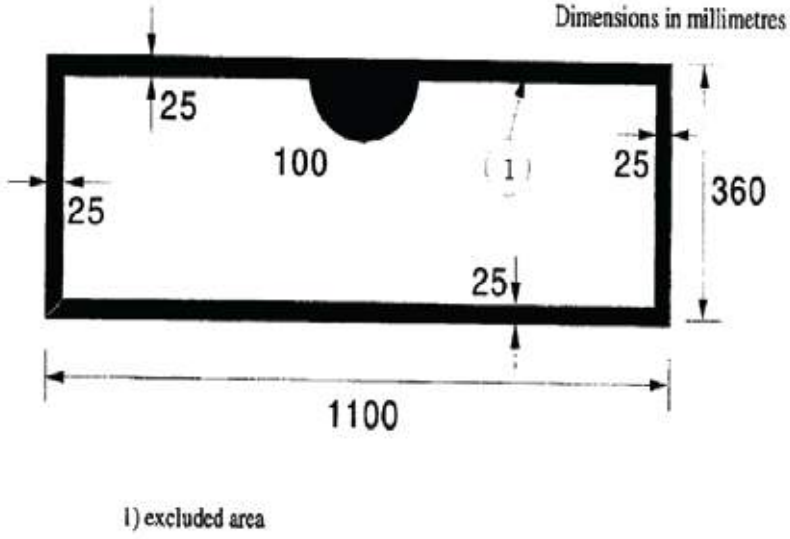
The particle count and measuring of dimensions of the largest particle shall be made between 3 min to 5 min after fracture.

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 0,2 mm.

The particle count shall be made by placing a mask of (50 ± 1) mm x (50 ± 1) mm on the test piece

Table 8 — Minimum particle count values

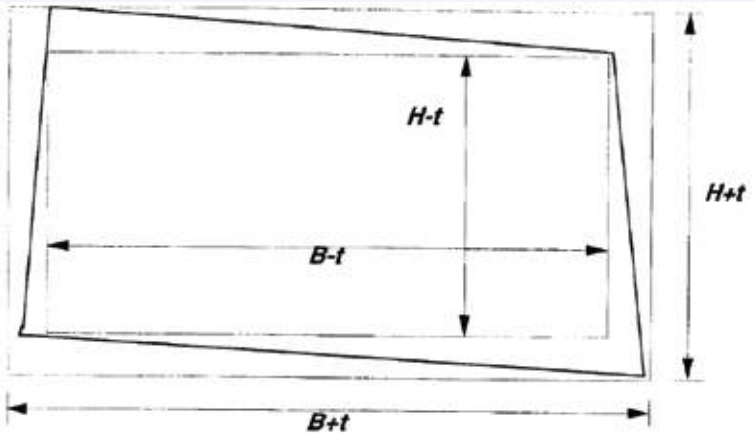
Glass type	Nominal thickness, *d* mm	Minimum particle count number
Patterned glass	3	30
All other glass types	3	40
All glass types	4 to 12	40
All glass types	15 to 25	30



Glass Punching Tools

Dimensional Tolerances(EN12150)

Below are the allowable tolerance



Dimensions in millimetr

Nominal dimension of side, *B* or *H*	Tolerance, *t*	
	nominal glass thickness, $d \leq 8$	nominal glass thickness, $d > 8$
≤ 2000	± 2,0	± 3,0
2000 < *B* or *H* ≤ 3000	± 3,0	± 4,0
> 3000	± 4,0	± 5,0

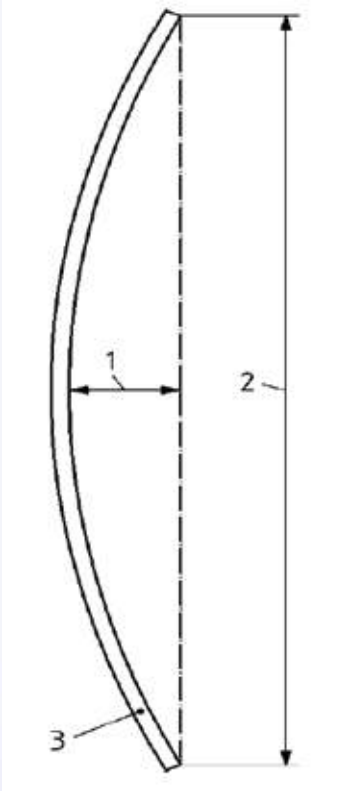
Dimensions in millimetres

Limit deviation v on the difference between diagonals		
Nominal dimension B or H	nominal glass thickness, $d \leq 8$	nominal glass thickness, $d > 8$
≤ 2000	≤ 4	≤ 6
2000 < *B* or *H* ≤ 3000	≤ 6	≤ 8
> 3000	≤ 8	≤ 10

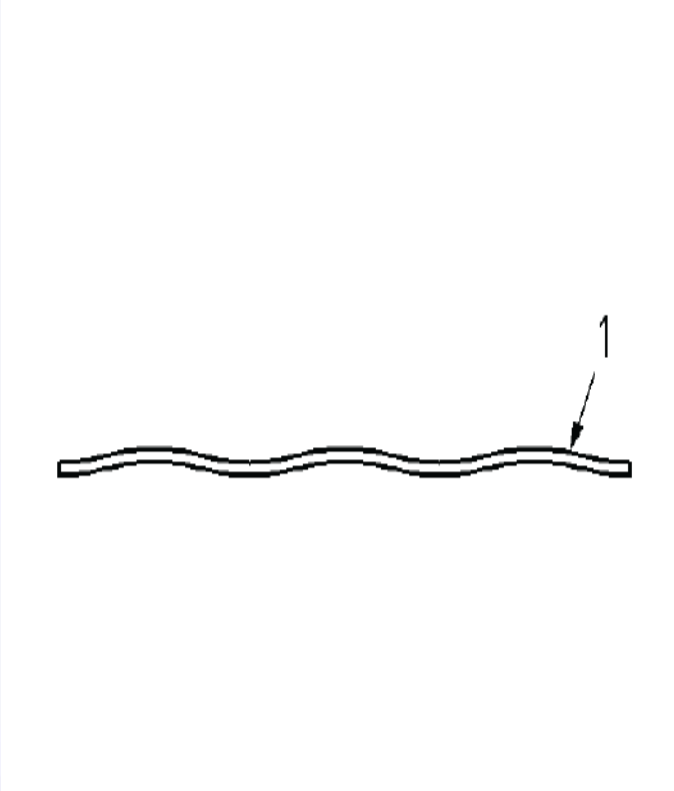
Optical Distortion(EN12150)

- There are 3 types of optical distortions
  - Overall Bow
  - Roller wave distortion
  - Edge Lift

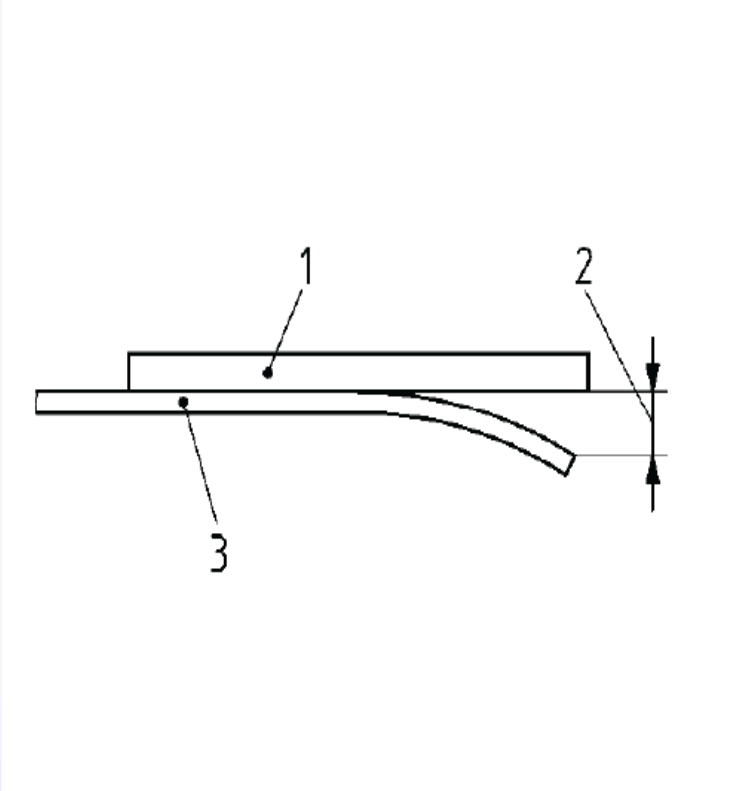
Optical Distortion



OVERALL BOW

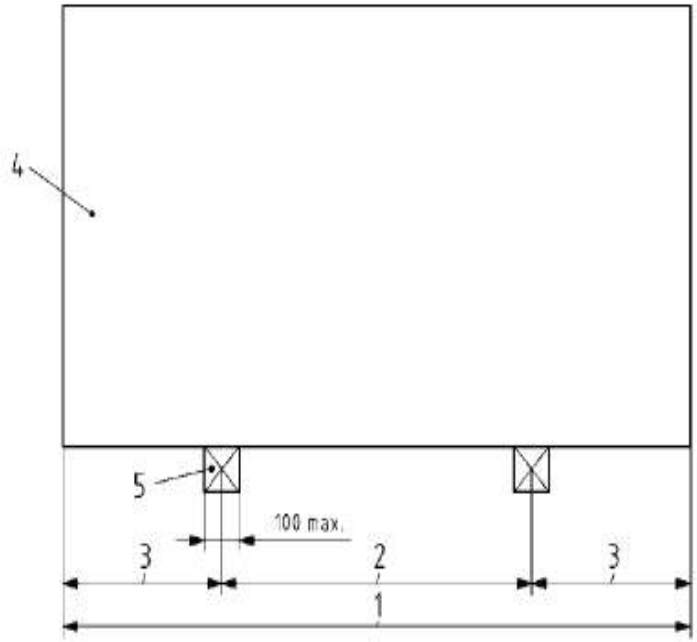


ROLLER WAVE DISTORTION



EDGE LIFT

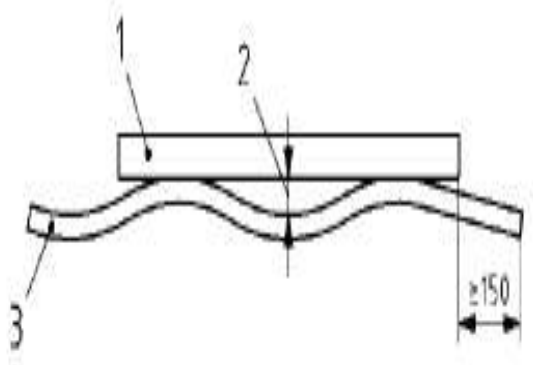
Optical Distortion



Key

1 *B* or *H*
2 (*B* or *H*)/2
3 (*B* or *H*)/4
4 thermally toughened glass
5 support

Figure 7 — Support conditions for the measurement of overall bow



Key

1 – straight edge
2 – roller wave distortion
3 – thermally toughened glass

Figure 8 — Measurement of roller wave distortion

Roller Wave Gauge

Anglo Eastern Glass

What EN 12150 says

The below table summarizes the max. values for overall bow/roller wave in a glass pane :

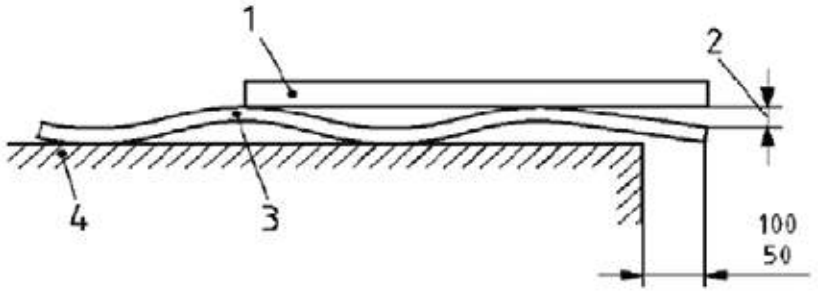
Table 4 — Maximum values of overall bow and roller wave distortion for horizontal toughened glass

Glass Type	Maximum value for distortion	
	Overall bow mm / m	Roller Wave mm
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3,0	0,3
Others [a]	4,0	0,5
a For enamelled glass which is not covered over the whole surface the manufacturer should be consulted.		
Note: Dependant upon the wave length of the roller wave an appropriate length of gauge has to be used		

Edge Lift – How to Measure?

The glass shall be placed on a flat support with the edge lift overhanging the edge of the support by between 50 mm and 100 mm

The gap between the ruler and the glass is measured using a feeler gauge.



Key

1 straight edge
2 edge lift
3 thermally toughened glass
4 flat support

Figure 9 — Measurement of edge lift

Glass Surface Stress Device

Anglo Eastern Glass

What EN 12150 says

- The following are the limiting values for edge lift in accordance with EN 12150 :

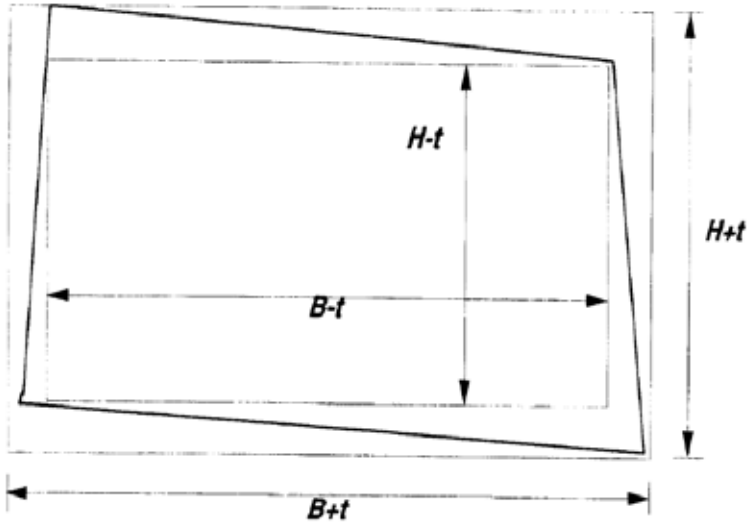
Table 5 — Maximum values for edge lift for horizontal toughening

Type of glass	Thickness of glass mm	Maximum values mm
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3	0,5
	4 to 5	0,4
	6 to 25	0,3
Others [a]	all	0,5
a For enamelled glass which is not covered over the whole surface the manufacturer should be consulted.		
Note: Dependant upon the wave length of the roller wave an appropriate length of gauge has to be used		

EN 1863(Heat Strengthening)

Dimensional Tolerances(EN1863)

Below are the allowable tolerance



Dimensions in millimetr

Nominal dimension of side, *B* or *H*	Tolerance, *t*	
	nominal glass thickness, $d \leq 8$	nominal glass thickness, $d > 8$
≤ 2000	± 2,0	± 3,0
2000 < *B* or *H* ≤ 3000	± 3,0	± 4,0
> 3000	± 4,0	± 5,0

Dimensions in millimetres

Limit deviation v on the difference between diagonals		
Nominal dimension B or H	nominal glass thickness, $d \leq 8$	nominal glass thickness, $d > 8$
≤ 2000	≤ 4	≤ 6
2000 < *B* or *H* ≤ 3000	≤ 6	≤ 8
> 3000	≤ 8	≤ 10

What EN 1863 says

The below table summarizes the max. values for overall bow/roller wave in a glass pane :

Table 4 — Maximum values of overall bow and roller wave distortion for horizontal heat strengthened glass

Glass Type	Maximum value for distortion	
	Overall bow mm/m	Roller Wave mm
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3,0	0,3
Others [a]	4,0	0,5
a For enamelled glass which is not covered over the whole surface the manufacturer should be consulted.		
Note: Dependant upon the wave length of the roller wave an appropriate length of gauge has to be used		

Edge Lift (EN1863)

- The following are the limiting values for edge lift in accordance with EN 1863 :

Table 5 — Maximum values for edge lift for horizontal heat strengthening

Type of glass	Thickness of glass mm	Maximum values mm
Uncoated float glass in accordance with EN 572-1 and EN 572-2	3	0,5
	4 to 5	0,4
	6 to 12	0,3
Others [a]	all	0,5
a For enamelled glass which is not covered over the whole surface the manufacturer should be consulted.		
Note: Dependant upon the wave length of the roller wave an appropriate length of gauge has to be used		

Fragmentation Test(EN 1863)

- Dimension of Test Sample – 360 mm X 1100 mm (5 samples)
- Each test specimen shall be impacted, using a pointed steel tool, at a position 13 mm in from the longest edge, of the test specimen,at the mid point of that edge, until breakage occurs.
- The fragments shall be held at the edges, by a small frame or adhesive tape.

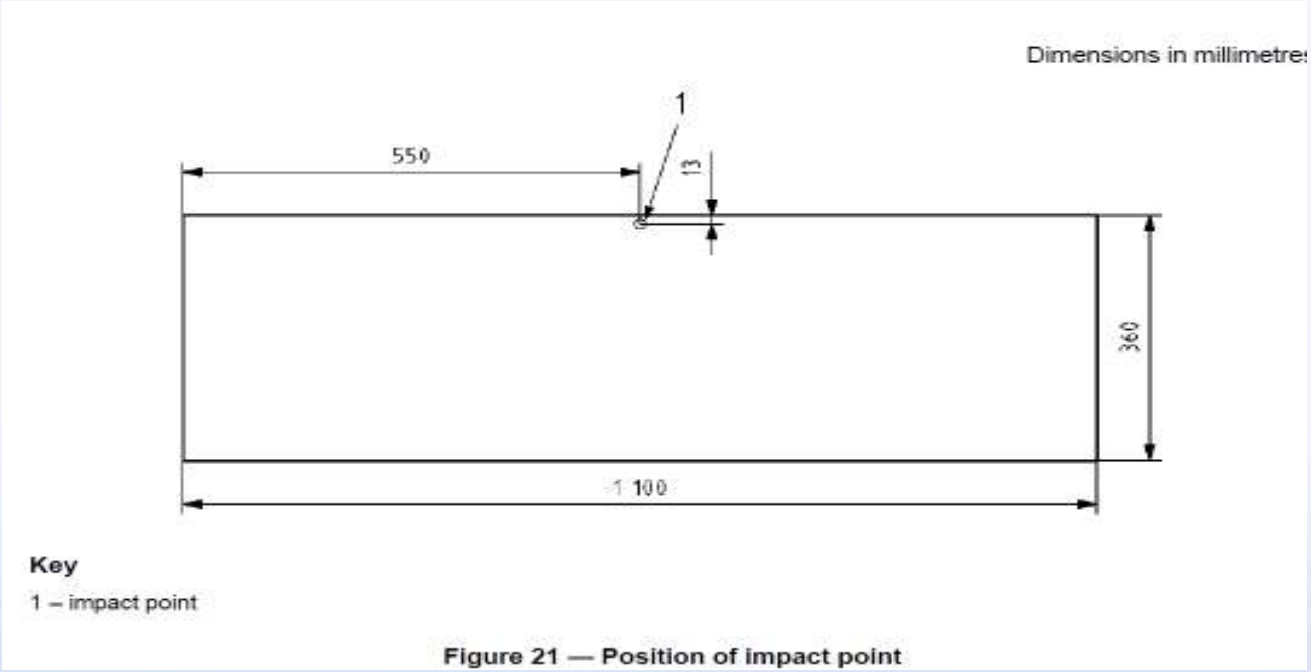


Figure 21 — Position of impact point

Anglo Eastern Glass

What EN 1863 says

Each test specimen shall be inspected for its fragmentation pattern.

An area of radius 100 mm centered on the impact point, and a border of 25 mm, round the edge of the test specimen, shall be excluded from the test. The examination shall be completed within 5 min of fracturing glass.

Each fragment shall be assessed as follows :

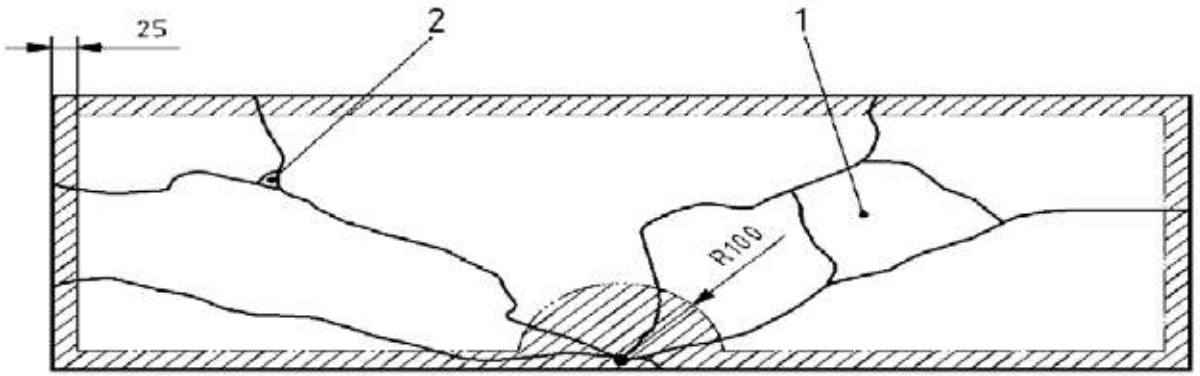
1) At least one edge of the fragment shall reach the excluded area.
2) Where no edge of the fragment reaches the excluded area, either an “island” or “particle” is produced..
3) The number of ‘Island’ fragments shall be counted & each island shall be weighed
4) The ‘Particles’ shall be collected and weighed

What EN 1863 says

1 – Island (size ≥100 mm²)

2 – Particle(size <100 mm²)

Dimensions in millimetres



Key

1 - island

2 - particle

Figure 24 — Representation of 'island' and 'particle'

What EN 1863 says

At least 4 of the 5 specimens tested should meet the following requirements to qualify as Heat Strengthened glass.

Each test specimen :

1) **Shall have no more than 2 “island” fragments.**
2) **Shall not have any “island” fragments with area/mass equivalent exceeding 1000 mm², and**
3) **Shall not have the area/mass equivalent of all particles exceeding 5000 mm².**

If only one of the 5 specimen fails to meet these requirements, then it shall match the below specimen to qualify as Heat Strengthened glass :

1) **It shall have no more than 3 “island” fragments, and**
2) **The area/mass equivalent of all “islands” and “particles”, shall not exceed 50000 mm²**

EN1279 (INSULATED GLASS)

THICKNESS TOLERANCE(EN1279)

Table 4 — Thickness tolerances on the insulating glass units (IGU) when float glasses are used

	First pane (note 1 of this table)	Second pane (note 1 of this table)	IGU thickness tolerance
a	Annealed glass	Annealed glass	± 1,0 mm
b	Annealed glass	Toughened or strengthened glass (note 2 of this table)	± 1,5 mm
c	Annealed glass	Foil laminated glass (note 3 of this table)	
	thickness ≤ 6 mm and total thickness ≤ 12 mm		± 1,0 mm
	in other cases		± 1,5 mm
d	Annealed glass	Patterned glass	± 1,5 mm
e	Toughened or strengthened glass	Toughened or strengthened glass	± 1,5 mm
f	Toughened or strengthened glass	Plastic sheet laminated glass	± 1,5 mm
g	Toughened or strengthened glass	Patterned glass	± 1,5 mm
h	Plastic sheet laminated glass	Plastic sheet laminated glass	± 1,5 mm
i	Plastic sheet laminated glass	Patterned glass	± 1,5 mm

NOTE 1 Pane thicknesses are expressed as nominal values.

NOTE 2 Thermally toughened safety glass, heat strengthened glass or chemically strengthened glass

NOTE 3 Laminated glass or laminated safety glass, consisting of two annealed float glass sheets (maximum thickness 12 mm each) and plastic sheet interlayer. For different assemblies of laminated glass or laminated safety glass, see EN ISO 12543-5, and subsequently the calculation rule as given in 5.4.3 should be applied..

Tests For Insulated Glasses

Dessicent Test.			
S N	**PROCEDURE**	**Figure**	**KEY POINT**
1	Take 50 ml of water in a test tube / beaker	Figure 1 	1] Note down the supplier name, date of receipt of dessicant lot, Diameter of granules before each test
2	Insert a thermometer ranging from 0° to 100° Centrigrade in to the test tube / beaker		
3	Take 50 g of dessicant in a separte Test Tube / Beaker & add this water in to the dessicant .		2] Keep record copy of the test certificate received from supplier for each lot .
4	Check the initail water temperature & note down in deg. centrigrade	 	3] Ensure Secondary sealant is applied after confirming the correctness of Butterfly test only
5	Add the water in dessicant & note the water temperature of water		
6	Measure the temparature difference of intial reading & risen temperature reading , the difference must be not less than 32°c		
7	If the Temparature rise is less , then inform the QA incharge & materials incharge for the abnormality .		Keep a check whether the drum of dessicant is properly sealed all the time during production.

Tests For Insulated Glass

Adhesion Test.			
S NO.	**PROCEDURE**	**FIGURE**	**KEY POINT**
1	Take a piece of **Spacer or Glass** of approx **size 15.0 - 24.0 mm** Width and place the Polytheline sheet on it.		Ensure the GlassEand Spacer surface is Cleaned from Dust and Dirt particles.
2	Apply a minimum 200.0 mm long bead of sealant to the Glass or Spacer **starting from the Polytheline sheet edge.**		Ensure that at least 50.0 mm of the Sealant should be applied over the Polythen sheet.
3	Shape or Tool the Sealant from the strip of **approx 200.0 mm long, 25.0 mm Wide and 3.0 mm Thick paste.** (As shown in Figure.1)		
4	Allow the Sealant to cure for **12 hours** for **Polyeurethin sealant** and **6 hours** for **Silicon sealant.**		Ensure that the curring is done in Normal Room Temperature.
5	After Curing **pull backwards to the Sealant and Perpandicular to the Spacer surface.** (As shown in Figure.1)		
6	**Asses the correctness of the Test as follows :**		
	The cured Sealant must **Tear out** as **Cohesive Failure** (See Figure.1) **Not** in **Adhesive Failure** (See Figure.2) **Cohesive Failure of Sealant** means their is **No Adhesion Loss.** ie. **The Sealant is bonded with Spacer and Glass Firmly.**		This same Test can be done Online on the Insulated Glass at the site or in Factory premises also, But insure that the peeled out area must be Repaired again properlly (ie Resealing the cut part)

Tests For Insulated Glass

Shore - Hardness Test.

S NO.	PROCEDURE	FIGURE	KEY POINT
1	Take the hardness master sample & check the correctness by taking readings of 25 Shore A master block		
2	Take the hardness master sample & check the correctness by taking readings of 50 Shore A master block		
3	Take the hardness master sample & check the correctness by taking readings of 75 Shore A master block		Shore A Hardness Meter
4	Check the correctness & confirm the same		Master Block for Verification of Hardness
5	Next Put the Hardness Meter on the dried sealant area or on the dried sealant of the glass & press it as shown in figure		Ensure the meter edge do not rests on the glass surfaces during inspection ,the pointer must completley touch the rubber part .
6	**Take the reading & Asses the correctness of the Test as follows :**		
	The cured Sealant must **have the hardness between** **(35 to 60 Shore A Hardness - For Silicon)**		This same Test can be done Online on the Insulated Glass at the site or in Factory premises also.

Test For Insulated Glass

Pot Life Test.			
S NO.	**PROCEDURE**	**Figure**	**KEY POINT**
1	**Take a small container and fill it half with the Sealant which is to be Tested.**	 FIGURE 1	
2	Place a **Stick, Pencil in to the Sealant** as shown in Figure.1 and **Note the Time** in Record book.		Ensure that this Test is Performed on Daily basis. It relates to the Base to Catalyst Mixing Ratio to the Cure rate of the Sealant.
3	**Every 5 - 10 minutes, Pull on the Stick** as shown in the Figure.2	 FIGURE 2	Do not Stir the Sealant or Incrporate Air in to the Mixed Sealant.
4	If the Sealant does not tear it self (Cohesively) when the **stick is pulled out,** the Sealant has **Not Snapped.** The Time at which the sealant Tears Cohesively when the **stick is pulled out,** the Sealant is **Snap**		Note down the Time of SNAP in record book.
5	The **Snap Time** will **vary - Depending upon Atmospheric condition, Temperature, Humidity and the Individual doing Test.** **A Snap Time varying more than 45 minutes from what is Expected may Indicate an Equipment or Sealant Problem.**	 FIGURE 3	Such problems include Pluged Hoses, Clogged filters, Bad Check valves or Out of Self Life of the Sealant. In such cases consult the supplier before continuing to use this Material.

Test For Insulated Glass

Butterfly Test.

S NO.	PROCEDURE	Figure	KEY POINT
1	Take a Test format paper fold it as shown in Figure.1	 FIGURE 1	
2	Apply a **minimum 150.0 mm bead** of sealant to the Crease of the folded paper as shown in Figure.2	 FIGURE 2	Ensure that this test is performed every time the pump is started up, Including start ups that occur after extended Breaks.
3	Press the **paper together**, smearing the Sealant bead to a **Thin Film**.		
4	Next pull the paper apart and **Visually inspect the sealant smear formed**. As in Figure.3	 FIGURE 3	
5	Asses the correctness of the Test as follows :	 FIGURE 4	
	Properly mixed sealant should have No White Steaks (Refer Figure.4) of unmixed base. If **steaks** are present then more material must be pumped through the line to **improve the Mixing Quality.**		If Grey or White streaks continue, Equipment maintanance may be needed. Cleaning or Changing the mixing system, Dispensing the hose, Dispensing Gun or Ratio sysytem ball check valve can often correct this Problem.
	& If Sealant smear is a **consistent Black colour** (Refer Figure.3), The Sealant is **Properly mixed and is ready to use.**		

ANGLO EASTERN ART GLASS

Most Advanced Digital Ceramic Glass Printing Technology

Anglo Eastern Glass

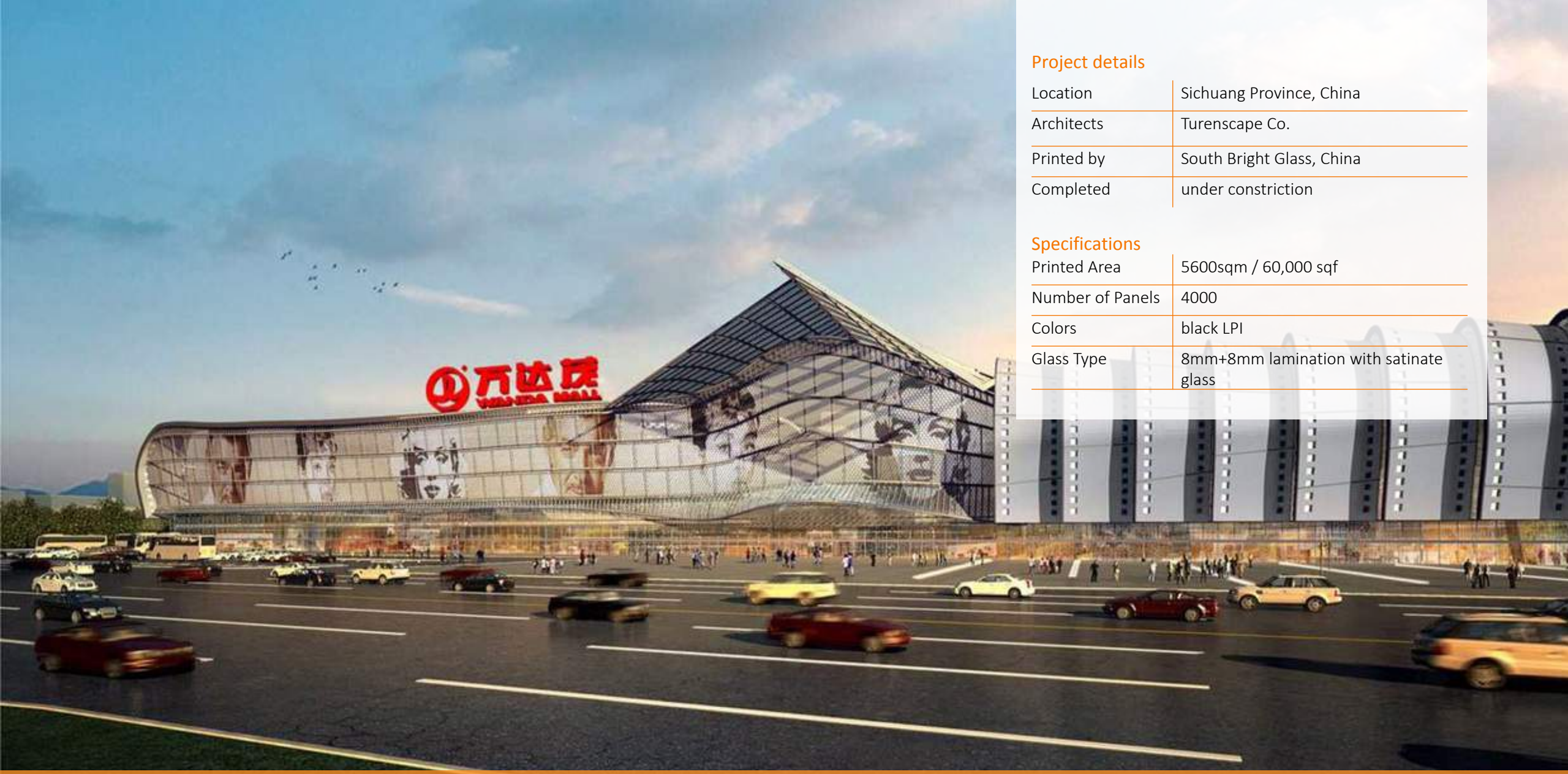
Project details

Location	Sichuang Province, China
Architects	Tengyuan Design Institute Co., Ltd
Printed by	South Bright Glass, China
Completed	2015

Specifications

Printed Area	6,500 sqm / 70,000 sqf
Number of Panels	4000
Colors	Digital mix
Glass Type	8mm+1.52pvb+8mm lamination glass

Chengdu Exhibition Hall, China



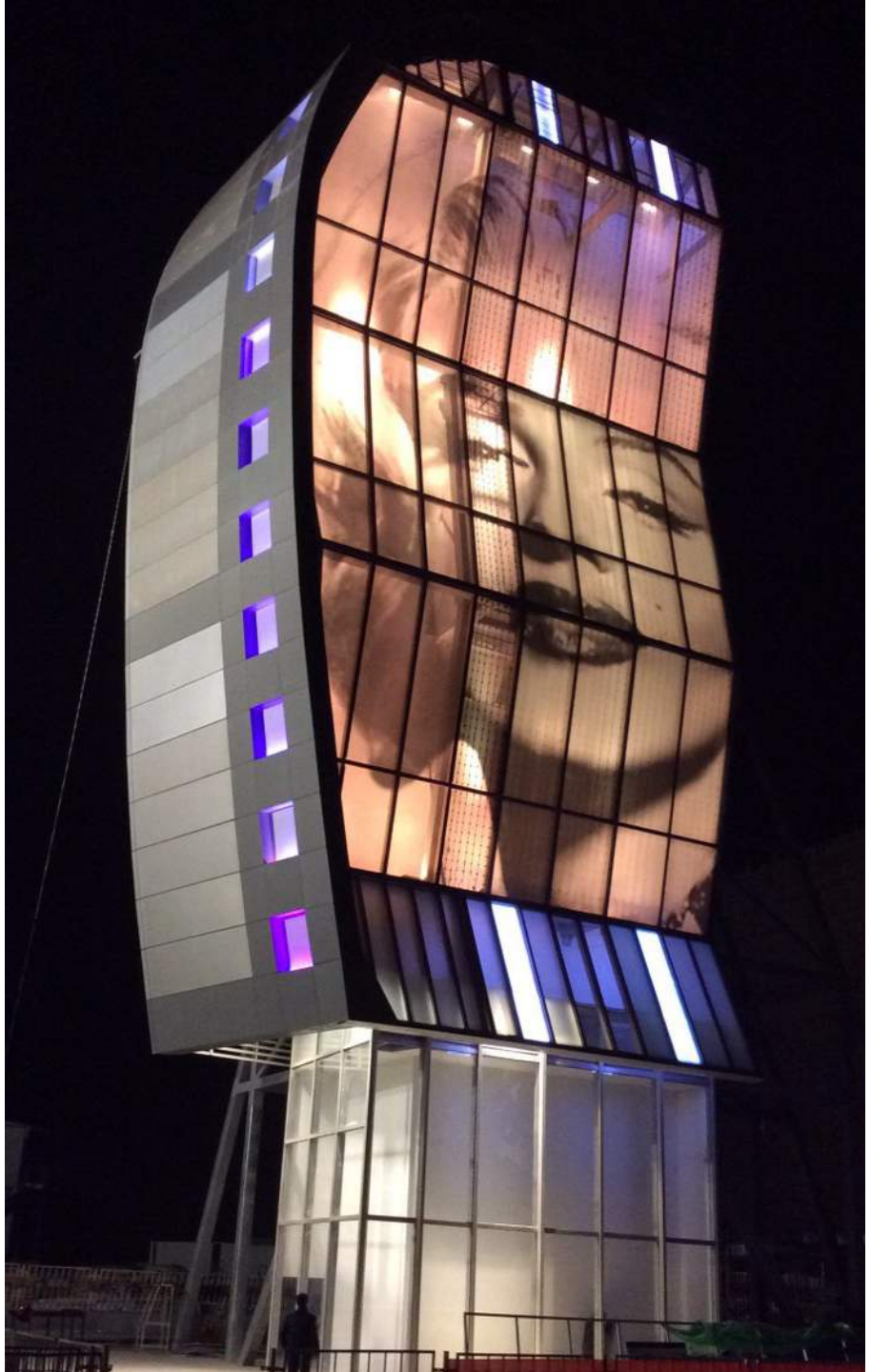
Project details

Location	Sichuang Province, China
Architects	Turenscape Co.
Printed by	South Bright Glass, China
Completed	under constriction

Specifications

Printed Area	5600sqm / 60,000 sqf
Number of Panels	4000
Colors	black LPI
Glass Type	8mm+8mm lamination with satinate glass

Qingdao Wanda, China



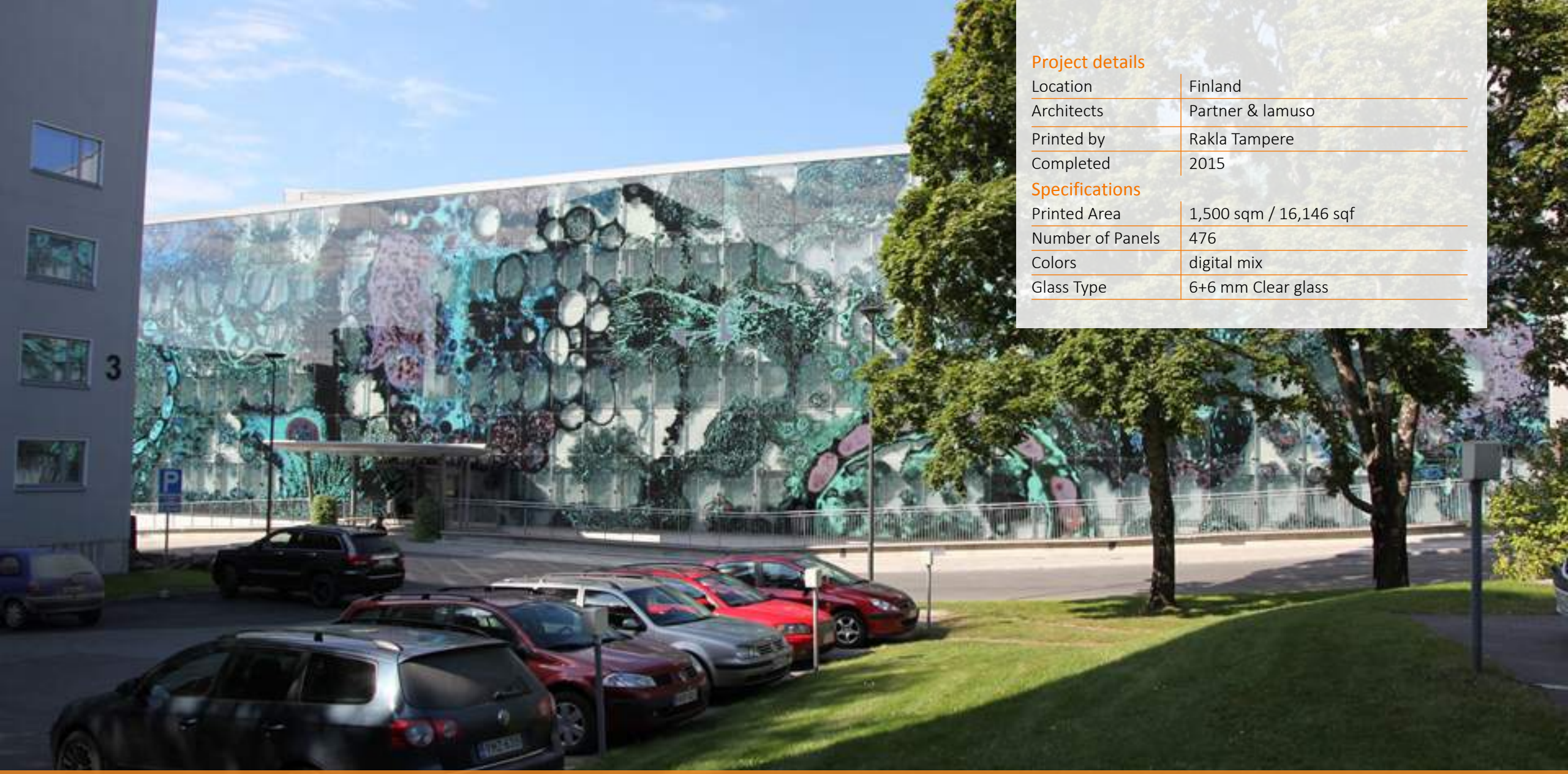
Project details

Location	China
Architects	Xi’an Lanting design
Printed by	Jing Feng glass
Completed	2015

Specifications

Printed Area	1630 sqm / 17,545sqf
Number of Panels	860
Colors	digital mix
Glass Type	6mm Ultra clear

Xi’an Sales Center, China



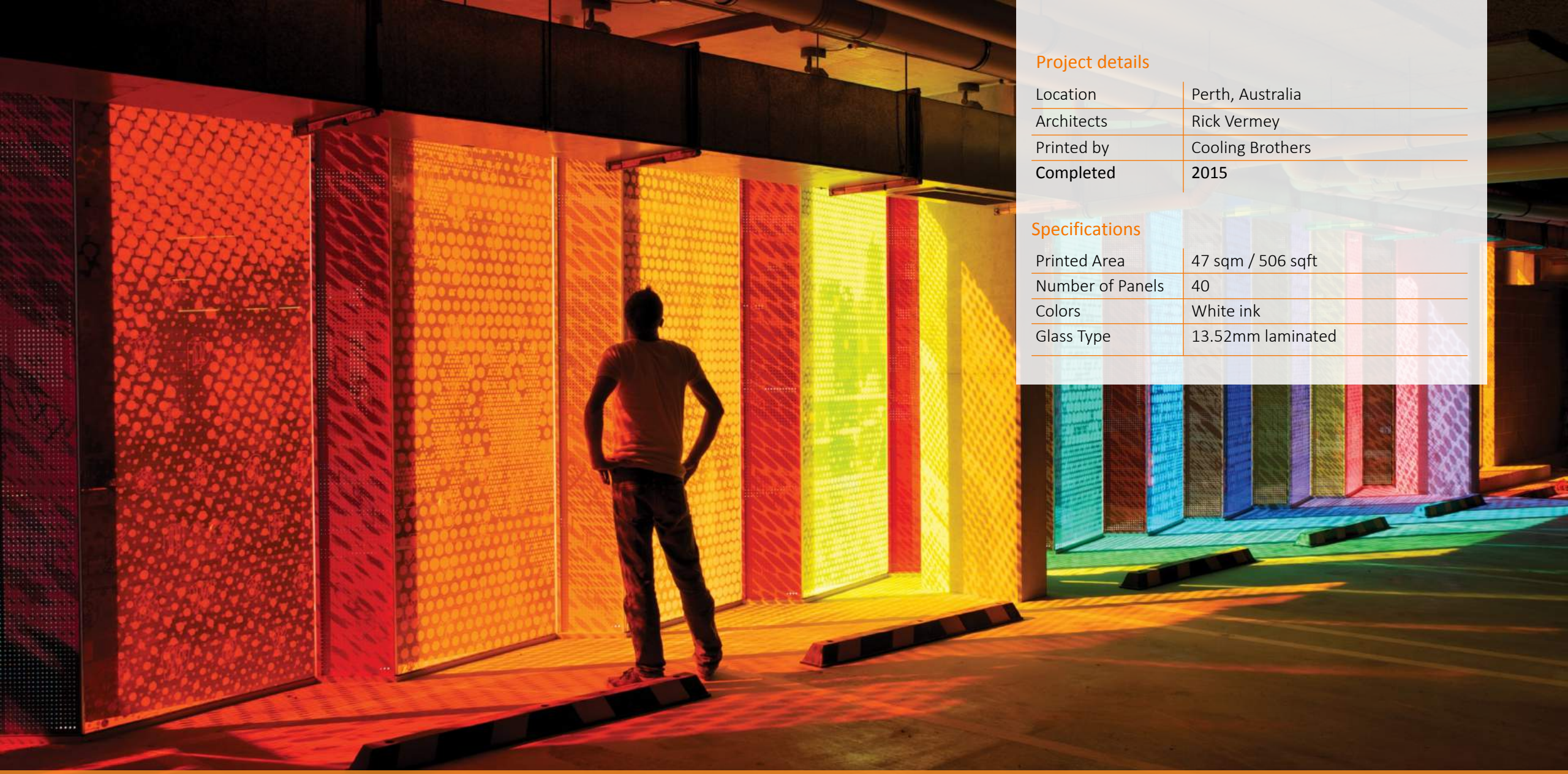
Project details

Location	Finland
Architects	Partner & lamuso
Printed by	Rakla Tampere
Completed	2015

Specifications

Printed Area	1,500 sqm / 16,146 sqf
Number of Panels	476
Colors	digital mix
Glass Type	6+6 mm Clear glass

Kuopio University Hospital, Finland



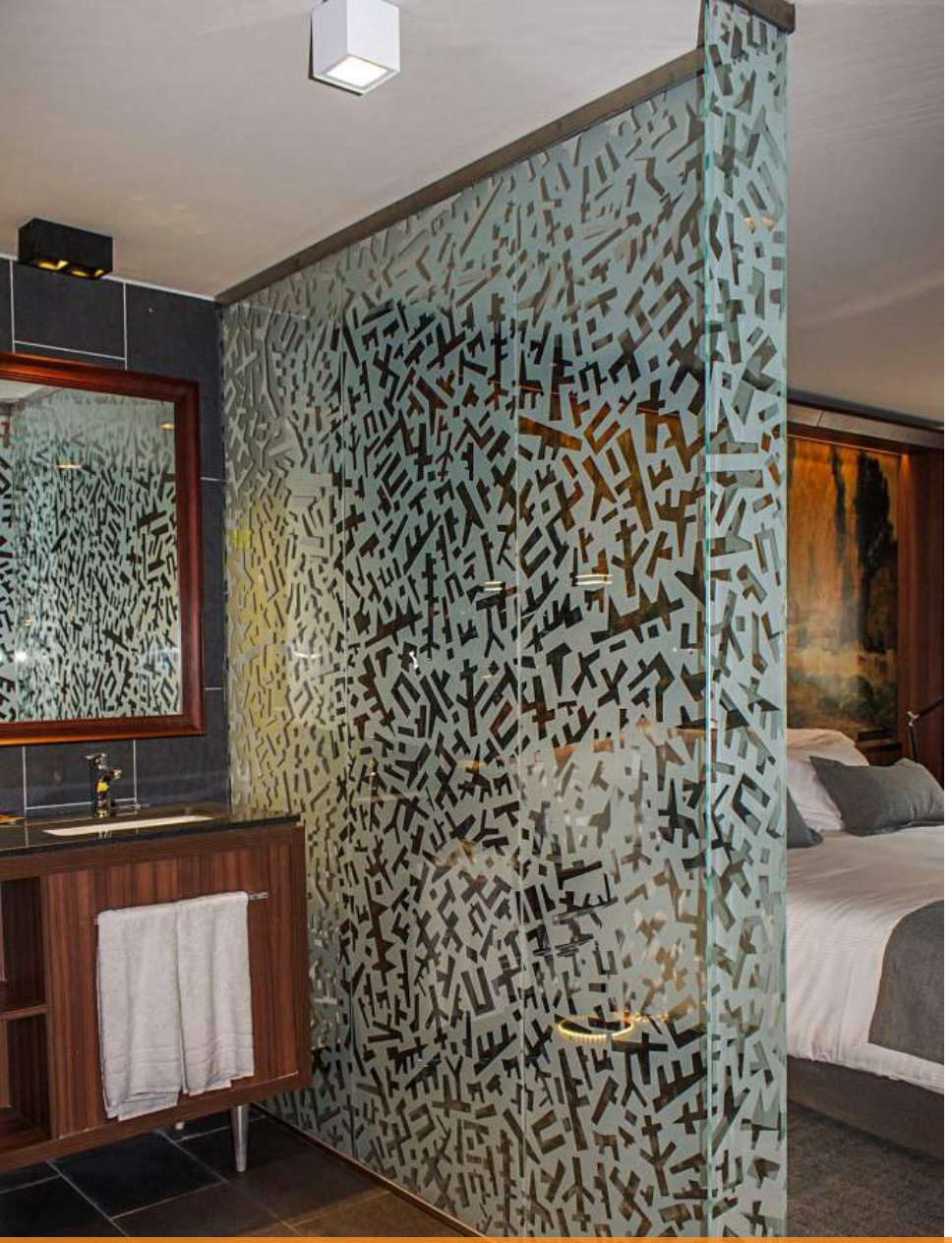
Project details

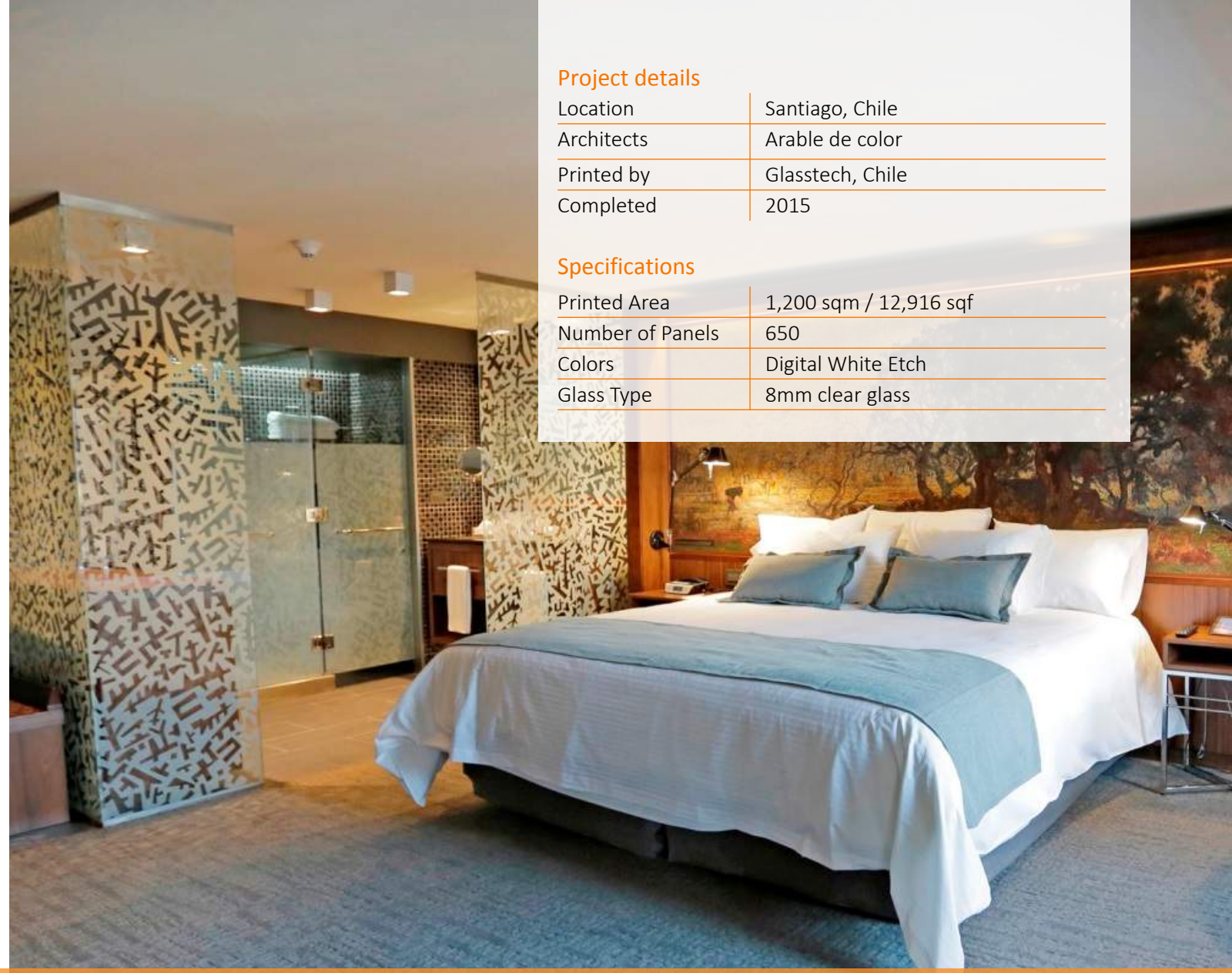
Location	Perth, Australia
Architects	Rick Vermey
Printed by	Cooling Brothers
Completed	**2015**

Specifications

Printed Area	47 sqm / 506 sqft
Number of Panels	40
Colors	White ink
Glass Type	13.52mm laminated

Public Art, Australia





Project details

Location	Santiago, Chile
Architects	Arable de color
Printed by	Glasstech, Chile
Completed	2015

Specifications

Printed Area	1,200 sqm / 12,916 sqf
Number of Panels	650
Colors	Digital White Etch
Glass Type	8mm clear glass

Cumbres – Lastarria, Boutique Hotel, Chile

Project details

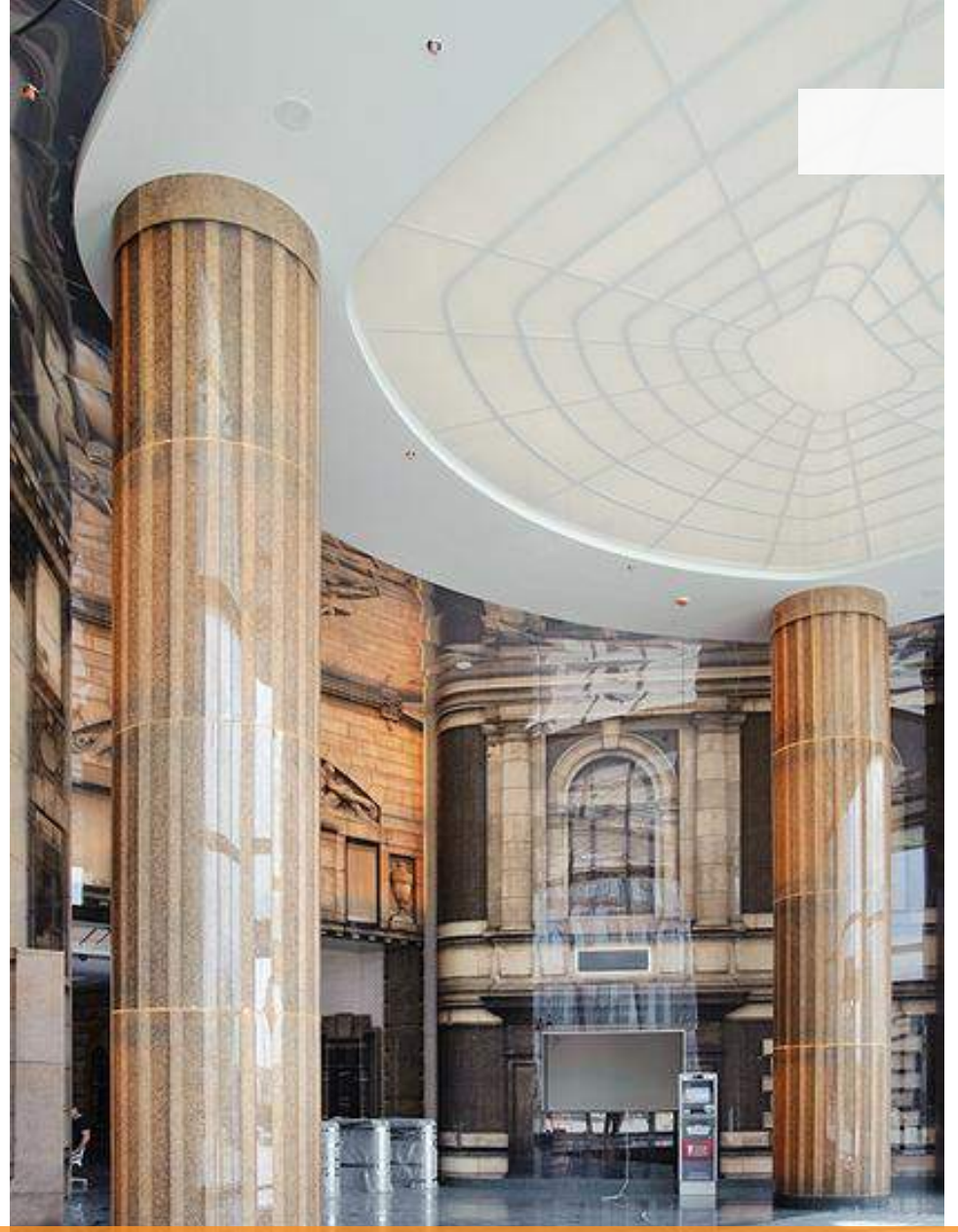
Location	Japan
Architects	\
Printed by	Nishha Japan
Completed	2016

Specifications

Printed Area	4sqm / 12,916 sqf
Number of Panels	3
Colors	Digital White Etch
Glass Type	8mm clear glass

Toilet Room, a video arcade, Japan

3 Impact Projects



AKMA, Russia

St. Petersburg Bank, Russia 2011

AGC, Mirodan, MVRDV

Glass Farm, Netherland, 2013

Interpane, Germany

Origami Building, Paris, 2013

Office Building, USA

Printed by GGI

Harvard Business School, USA

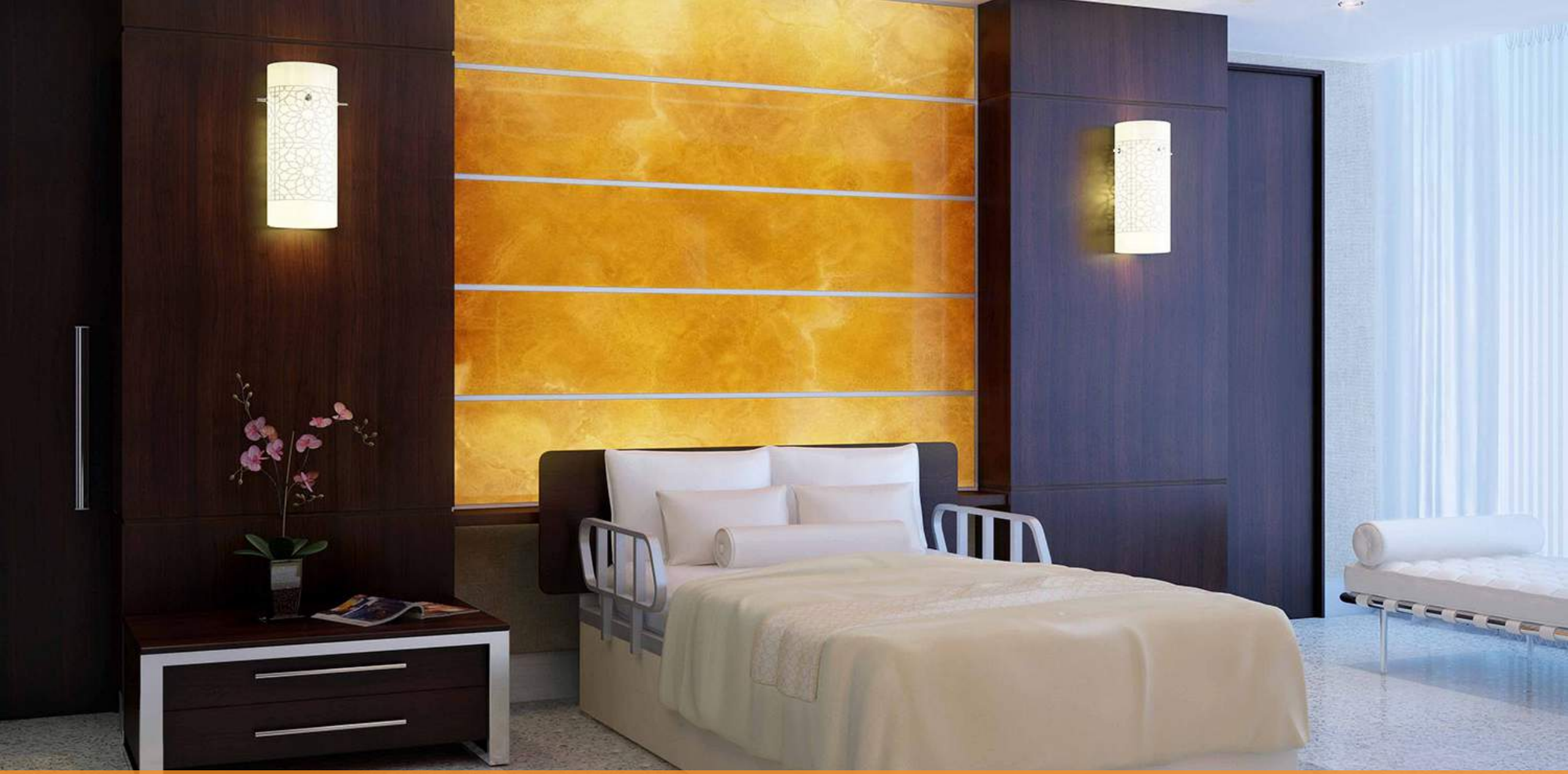
Printed by Jianghua glass, China

Wu'Xi Coastal city, China

Wu'Xi Coastal city, China

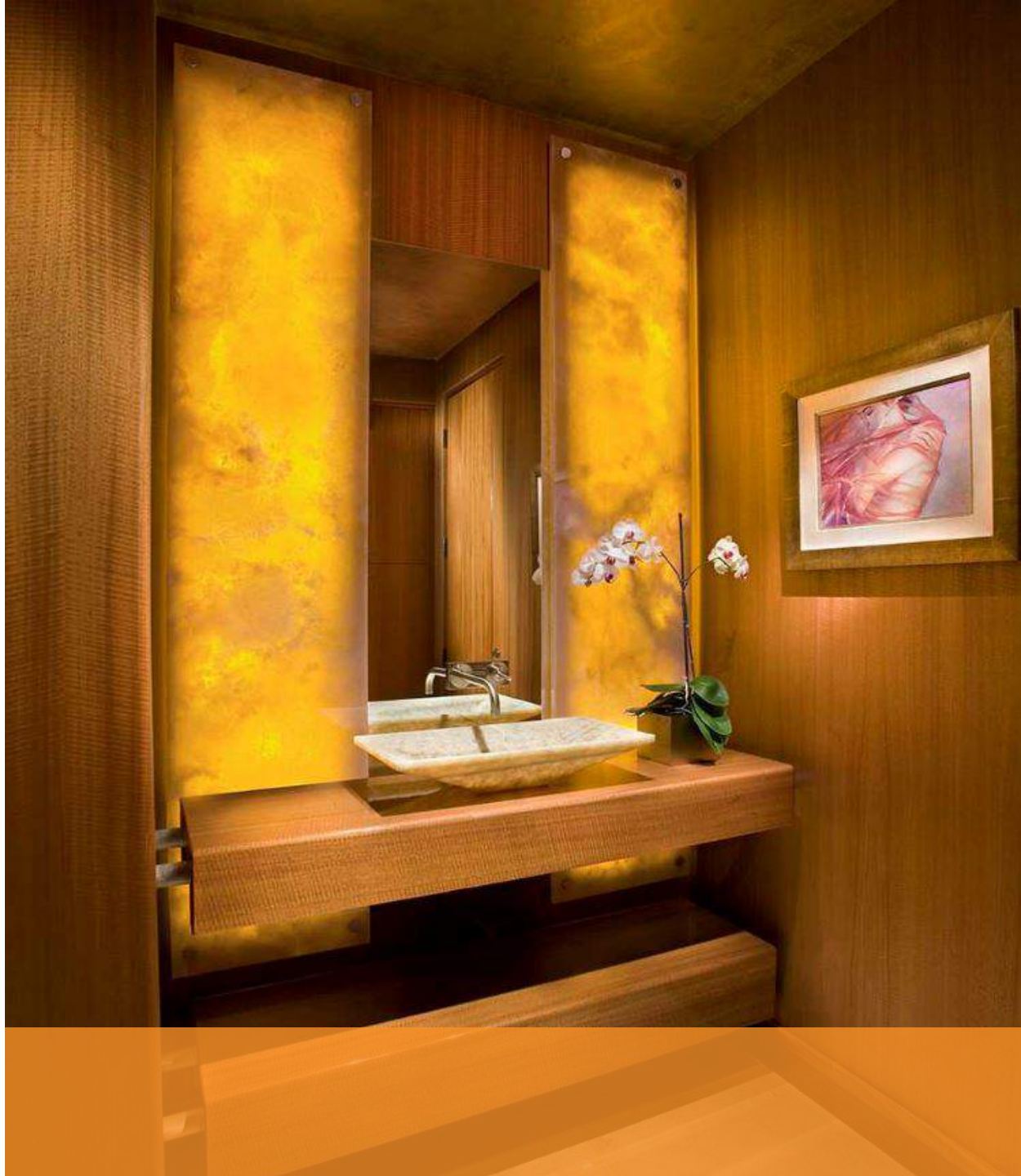
Cleveland Hospital, Abu Dhabi

INTERIOR



Cleveland Hospital, Abu Dhabi

Shower and Bathroom



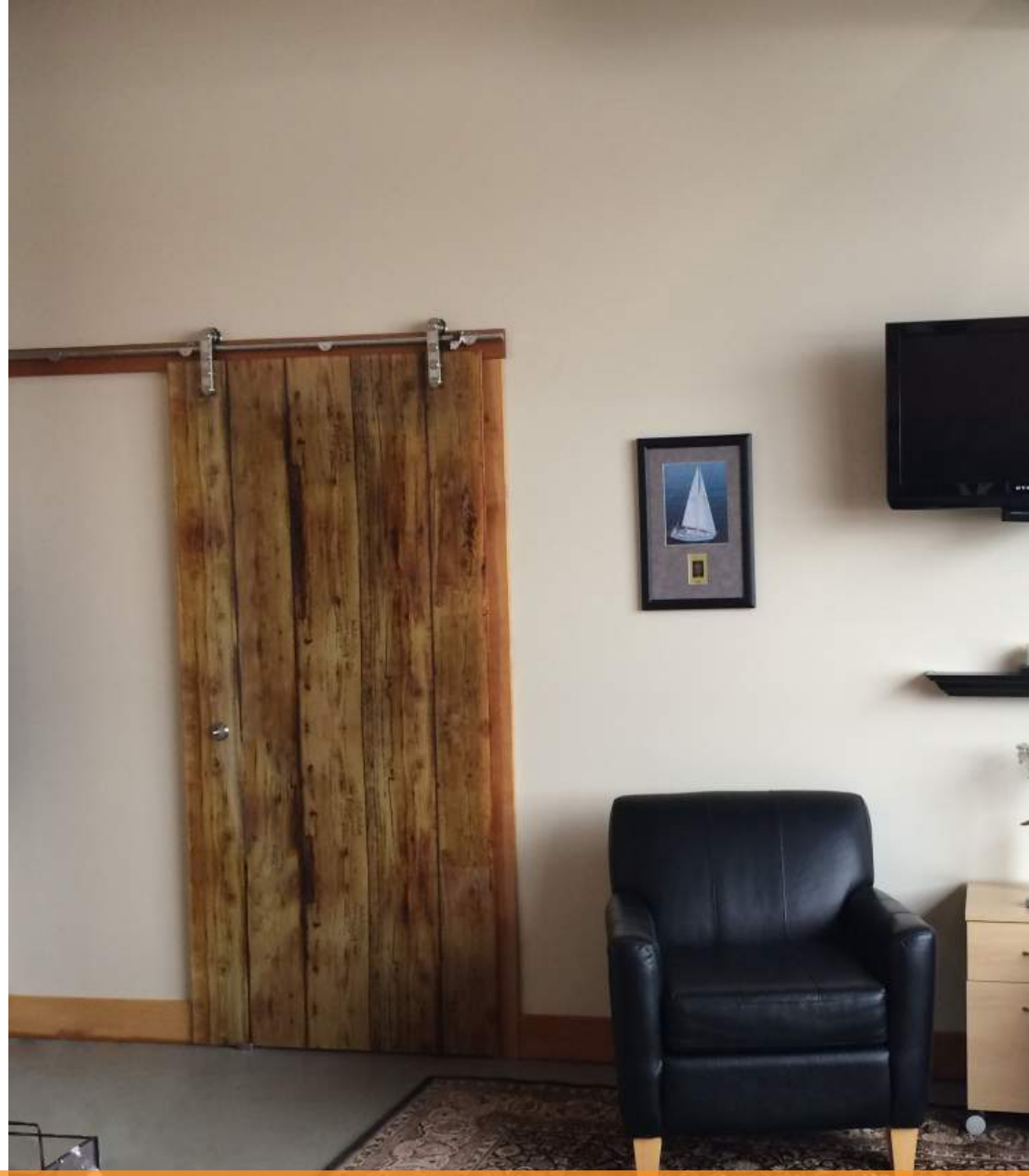
Shower and Bathroom

Wall Panels and Dividers

Wall Panels and Dividers

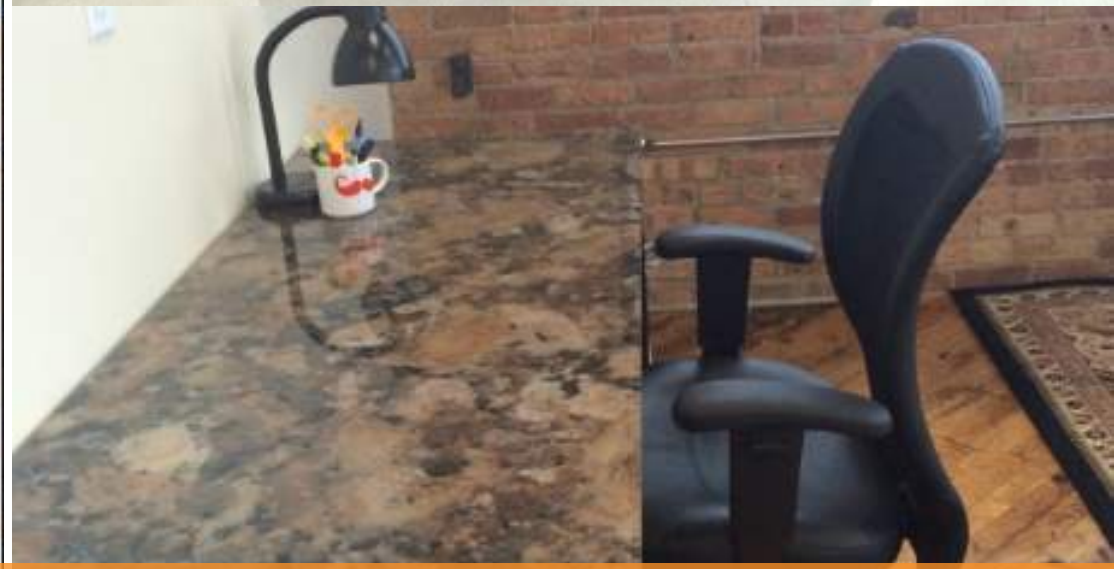
Wall Panels and Dividers

Doors & Cabinets



Sink Top and Doors

Kitchen Backsplash



Furniture

Furniture

Furniture

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