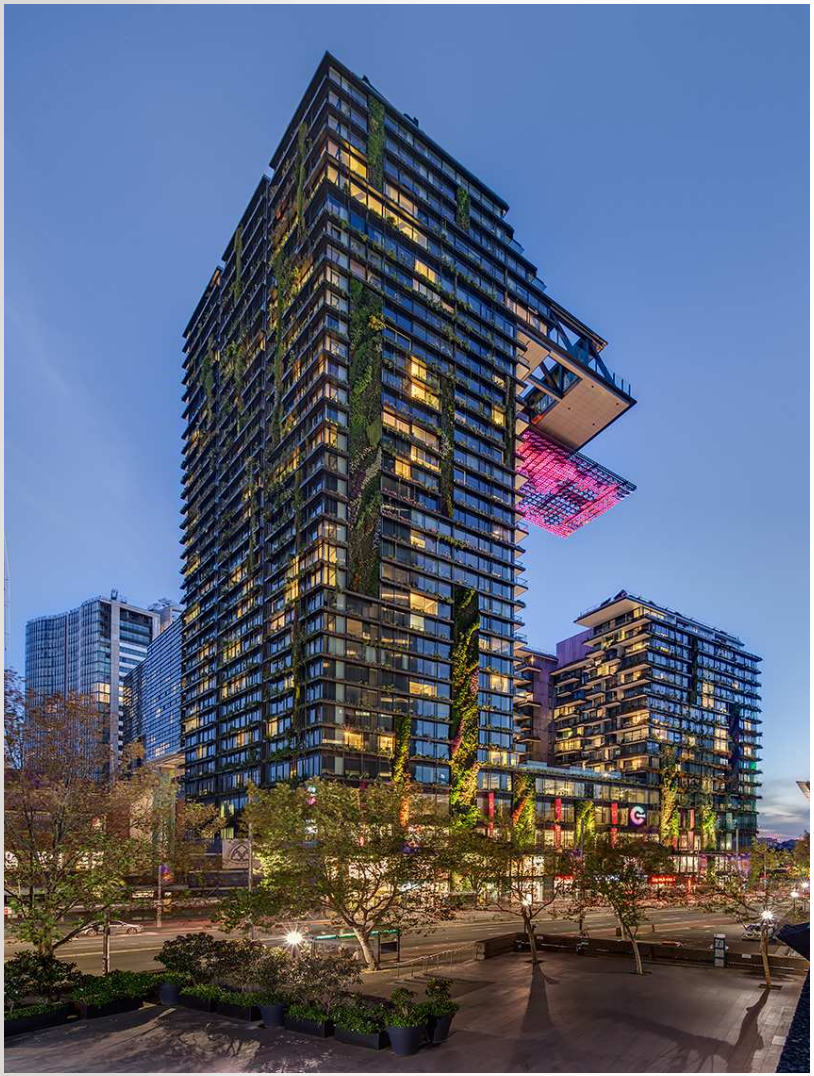
G.James glass & aluminium

When Experience Matters

University of Queensland 2015 3rd year Architecture Presentation

Presenters: Gary Aspden – Glass Marketing & Technical Manager
Jim Stringfellow – Commercial Façade Engineer



One Central Park, Sydney

G.James bring Architect's dreams to reality….

A monumental building is:

an enduring work of art on a grand scale,
viewed by a captive mass audience,
functioning as a habitable structure.

Sir Samuel Griffith Centre, Brisbane

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… but compromise is needed for optimum results.

- Facades have budgets
- Practicalities of performance MUST NOT be compromised
- Flexibility of Architectural detailing can achieve the intent cost effectively

ABC Accommodation, Southbank

Withstand the actions of:
- Wind
- Rain
- Sunlight
- Heat & Cold

Control the passage of:
- Heat
- Air
- Light
- Sound

Consider practicalities of:
- Materials
- Longevity
- Manufacture
- Transport
- Installation

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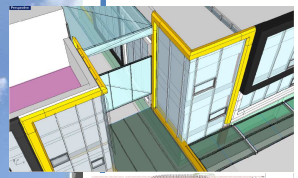
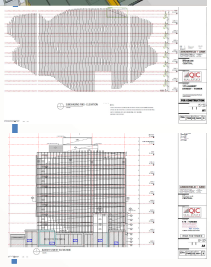
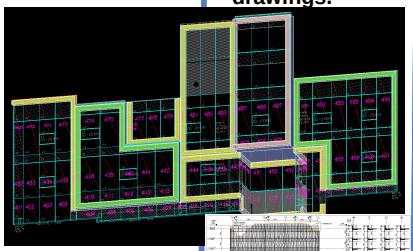
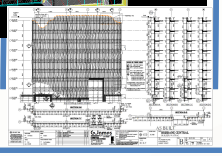
The journey from concept to reality …

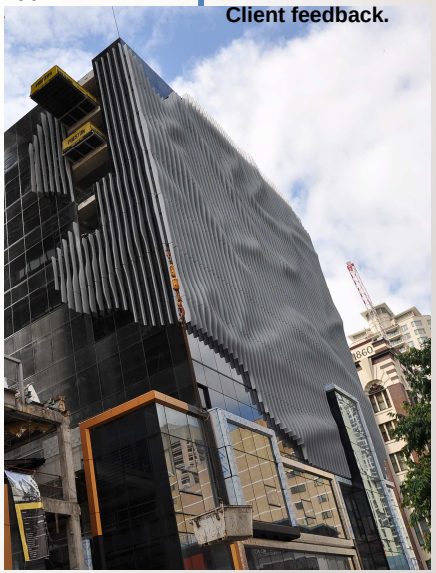
	1. Concept	2. Development Application	3. Tender Documents	4. "Value Engineering"	5. Façade Contractor Design & Construct	6. Procurement Manufacture & Transport	7. Construction	8. Handover & Occupation
Architect's Aims:	The inspired idea and it's presentation.	3D appearance renderings & basic plans showing appearance.	General "massaging" of design into shape.	Design compromise to meet practicalities and budget.	Detailed design compromise to meet REALITIES. Meet program.	Ensure best compromises to achieve intent & confidence in façade contractor.	Minimize costs of "unexpecteds". Balance program vs. quality.	Meet completion date, achieve certification and hope for recognition!
Architect's Duties:	Client engagement.	Client & Council approval.	Consulting team coordination & tender drg/spec.	Builder options appraisals, accounting & contract drg/spec revisions.	Working WITH facade contractor to solve a myriad of problems, approving materials & checking drawings.	Factory QA approvals & variation $ management.	QA site checks & progress claim appraisals	Defect inspection final doc submissions and Client feedback.











Design Development

Architectural Control

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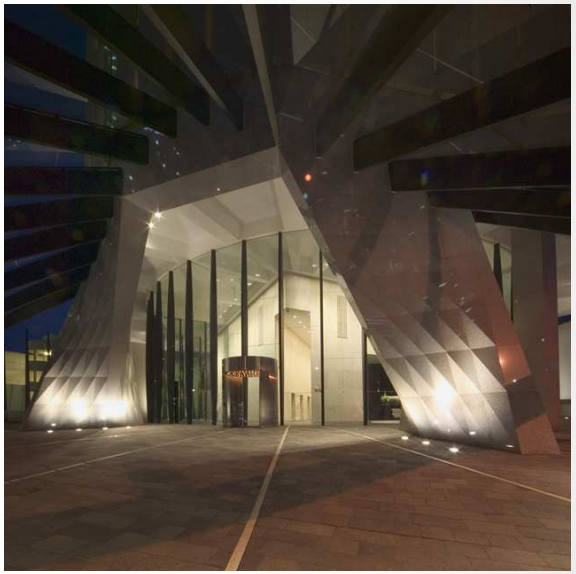
Consider the options…



Riverside Centre vs. Riparian Plaza

"Good design doesn't date" - Harry Siedler

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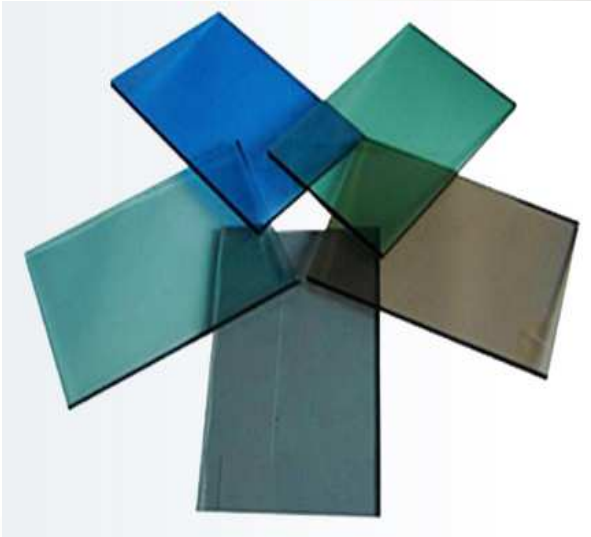
What are the options in Glass?

- Clear
- Low Iron
- Body Tinted (Grey, Green, Blue, Bronze, SuperGreen, SuperBlue, SuperGrey)
- Patterned Glass



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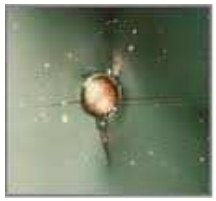
What can we do with this Glass ?

- Annealed (Normal)
- Furnace
  - Toughened
  - Heat Strengthened
- Heat Soaking
- Laminate
- Coated
  - Offline (Reflective, Low E)
  - Online (Reflective, Low E)



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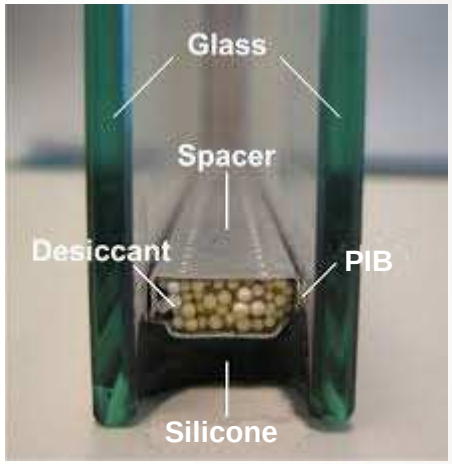
What can we do with this Glass ?

- Double Glaze (IGU)
- Ceramic Paint
  - Ceramic Frit
  - Two Pak
- Curved / Bent



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Low Emissivity (Low E) Coatings

Thin metallic coating is applied to the glass surface

- Online -Float manufacturing process (hard coat)
- Offline – Magnetron sputtering process (soft coat)
- Solect & Optilight Low E Laminates
- TwinGlaze Ultra

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How Low-E Coatings Work

Low-E coatings redirect radiant heat (long wave radiation) back toward the source

Heat moves from HOT ⟶ COLD

In cold climates heat from the inside flows OUT

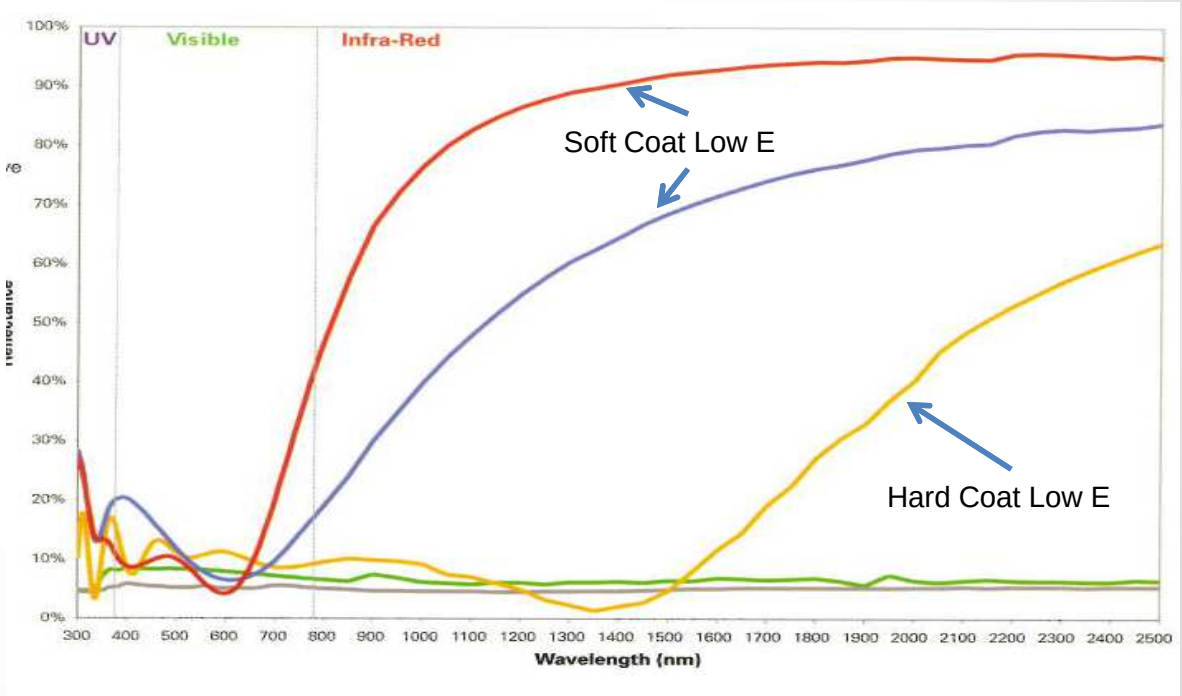
In hot climates heat from the outside flows IN

G.James glass & aluminium

How do Low E Coatings Work?

Coating reflects infra-red energy:

- Outside – Sun's energy
- Inside – Internal Heating



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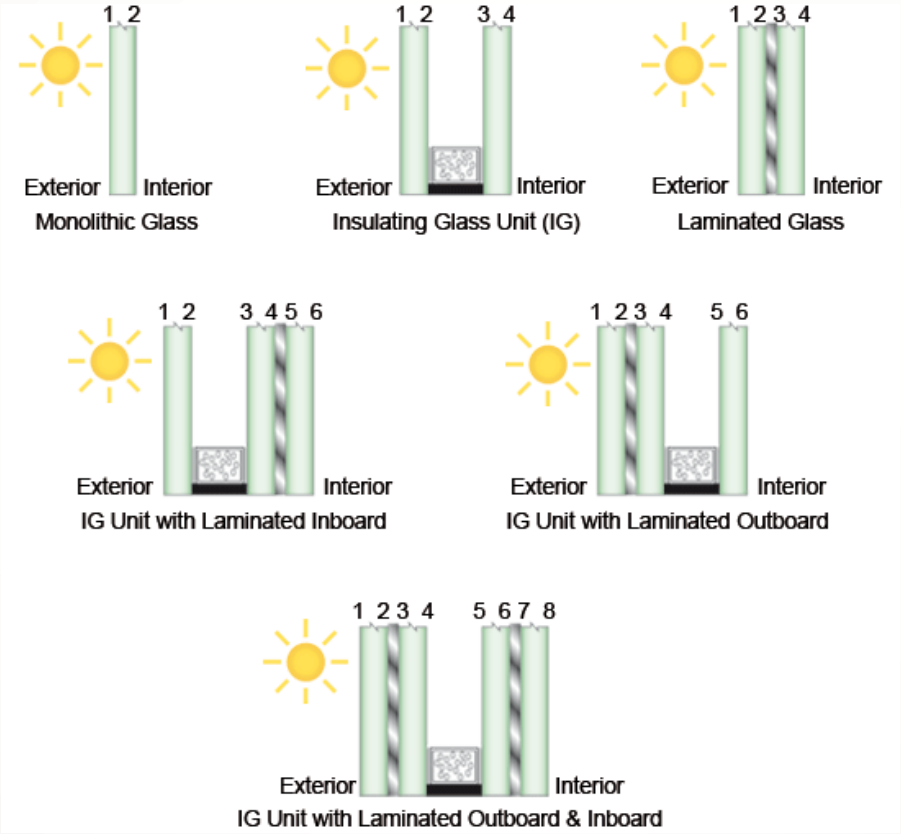
Glass Surface Numbers



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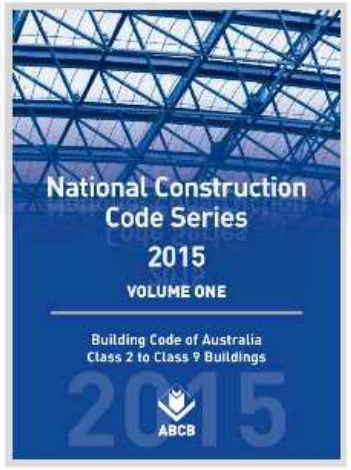
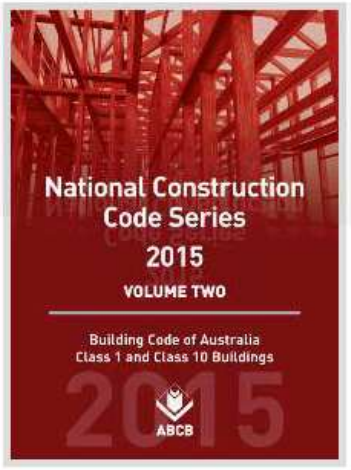
National Construction Code



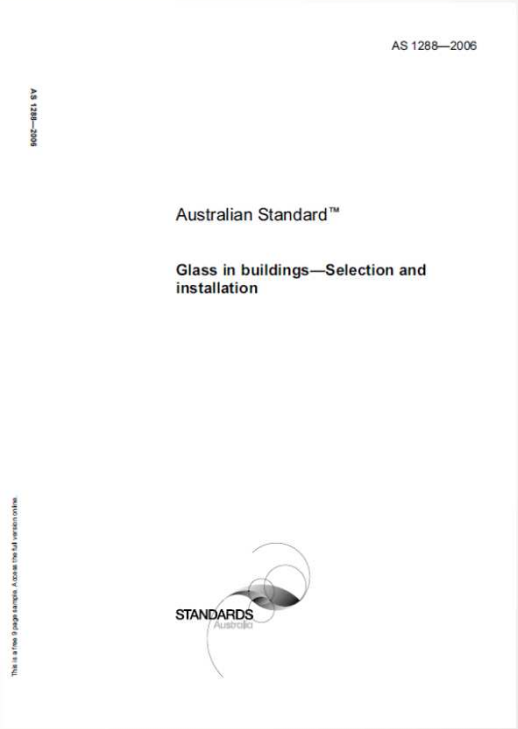
NCC Volume One

Contains the regulations for commercial buildings.



NCC Volume Two

Contains the regulations the residential buildings.


AS 1288—2006

Australian Standard™

Glass in buildings—Selection and installation

STANDARDS Australia

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Is toughened “safety” glass safe?

In applications of:

- Shear walls;
- Overhead;
- Balustrades

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Is toughened “safety” glass safe?

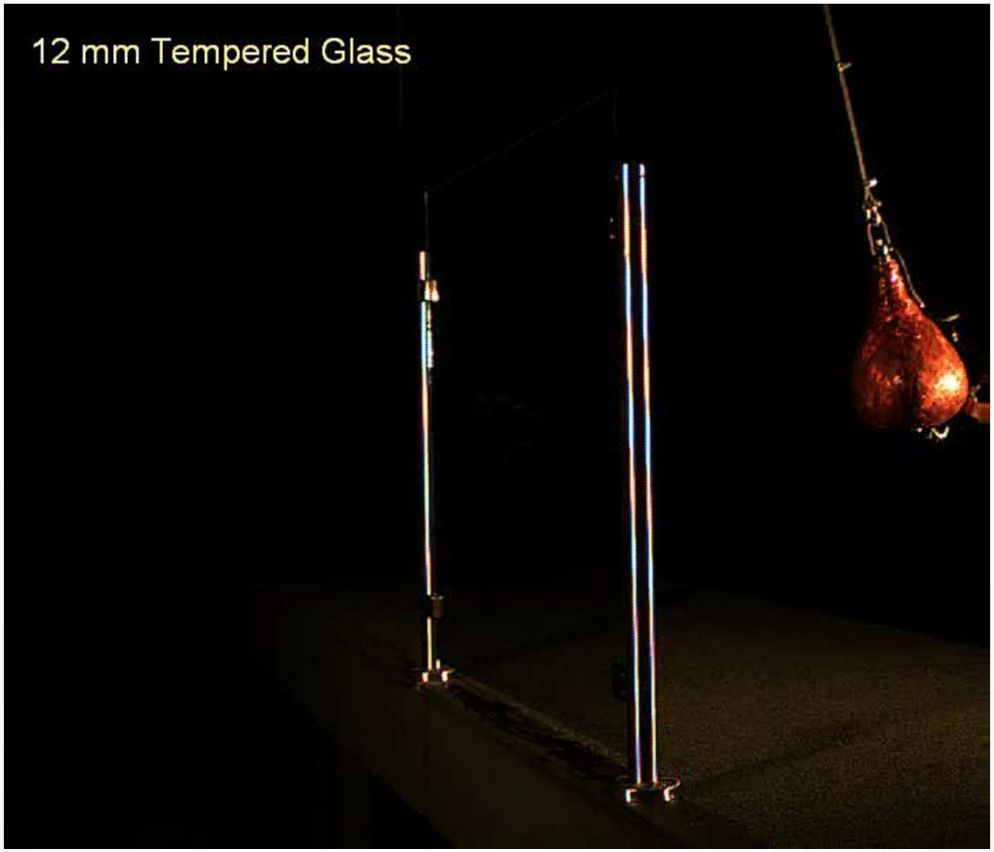
In applications of:

- Shear walls;
- Overhead;
- Balustrades

Beware of the post-breakage risks associated with toughened and toughened laminated glass!

G.James internal policy is decades ahead of legislation around the world, which is only now catching up – Singapore: recently; Canada: soon; USA: debating; Australia- ???

Is the glass appropriate ?



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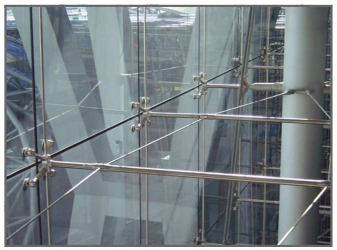
Facade Framing / Support Systems

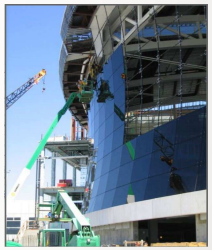
If the glass acts as the “skin”, what forms the “bones”?

Aluminium Framed
- Window Wall
- Curtain Wall
- Captive Glazed
- Structurally Glazed



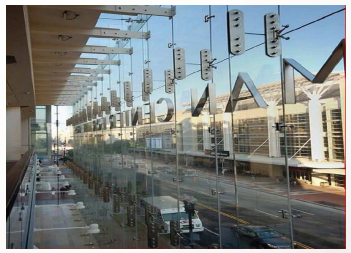
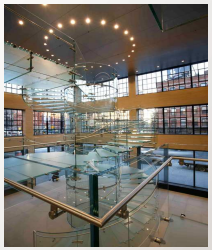

Advanced Structures
- Steel Truss
- Cable Truss
- Grid Shell
- Cable Net



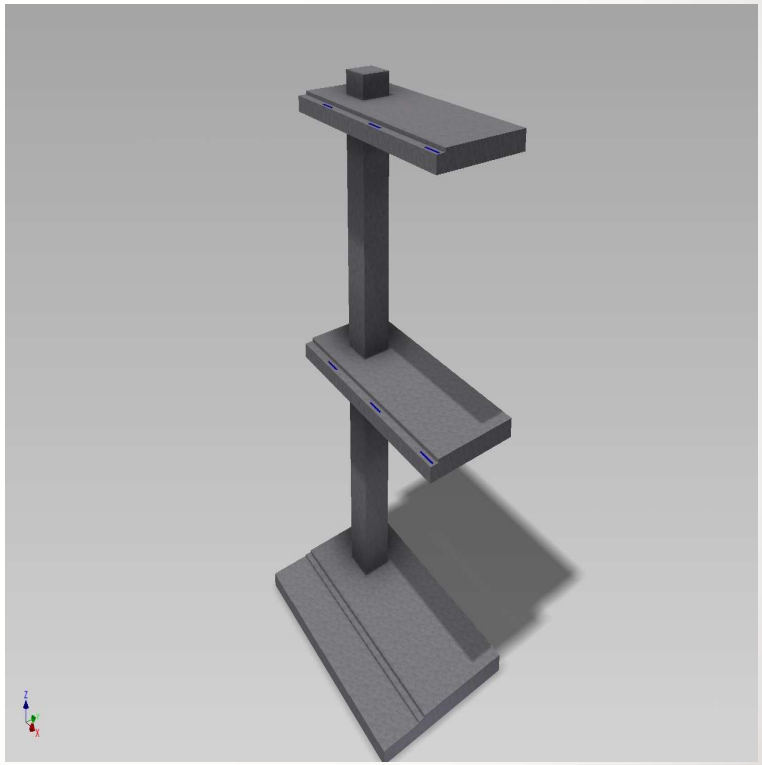
Frameless
- Shopfronts
- Glass Fins
- Structural Glass



G.James glass & aluminium

What is Window Wall & Curtain Wall?



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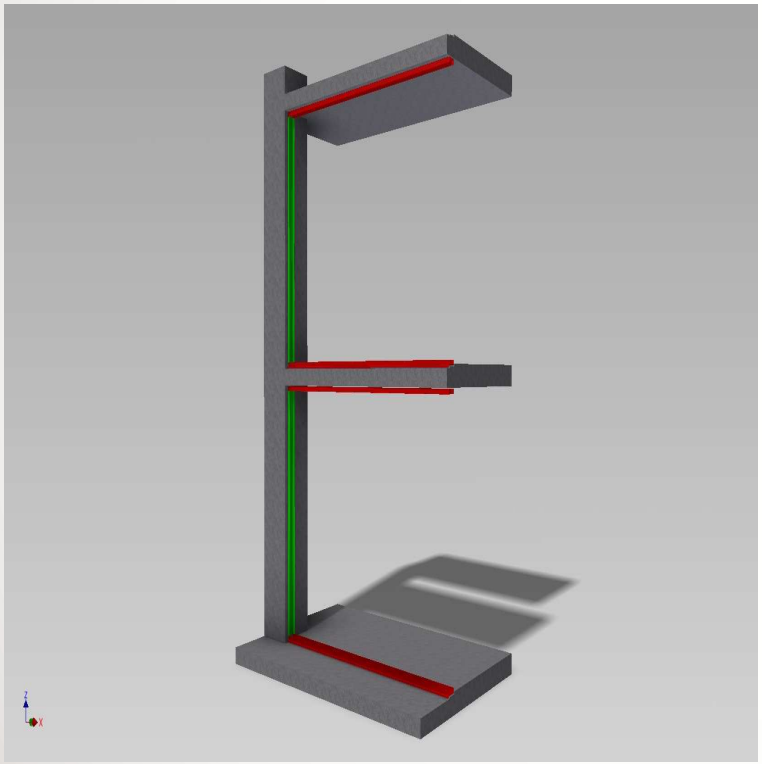

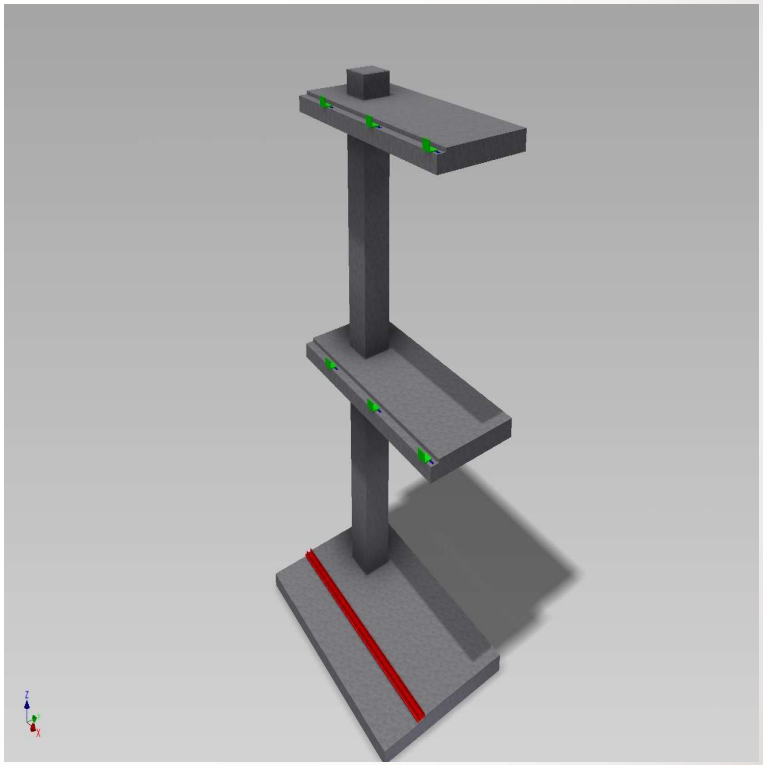

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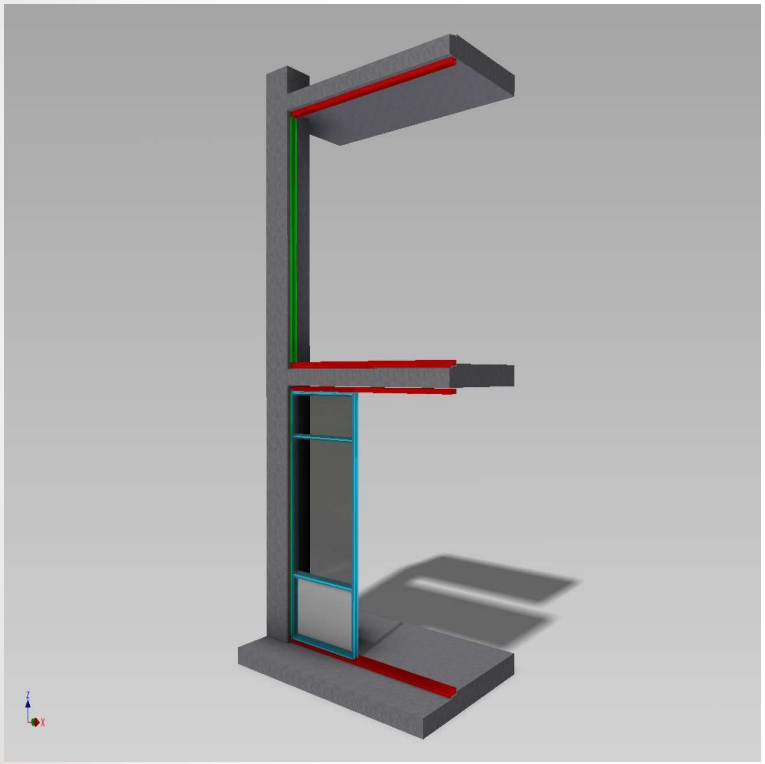

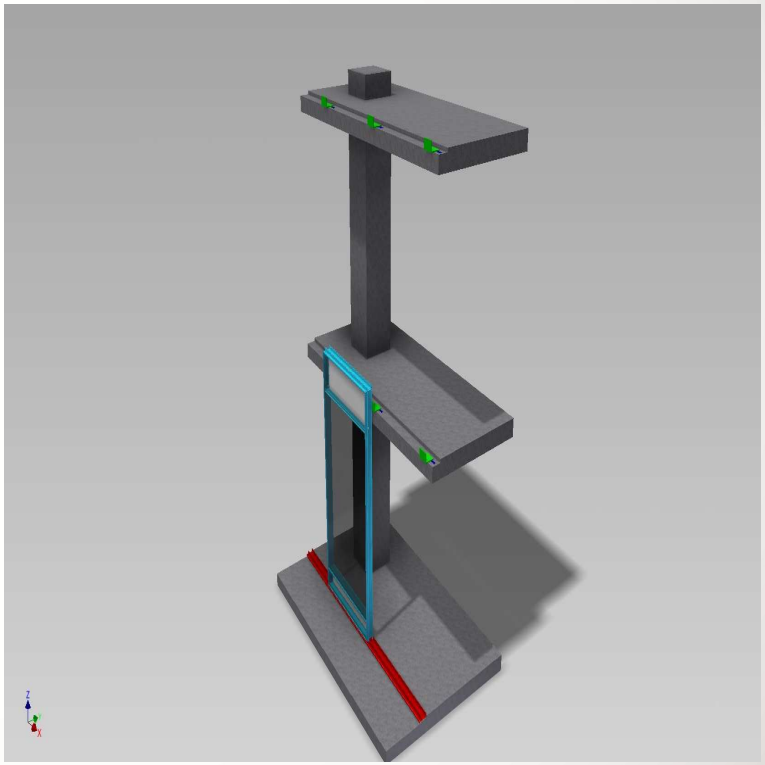

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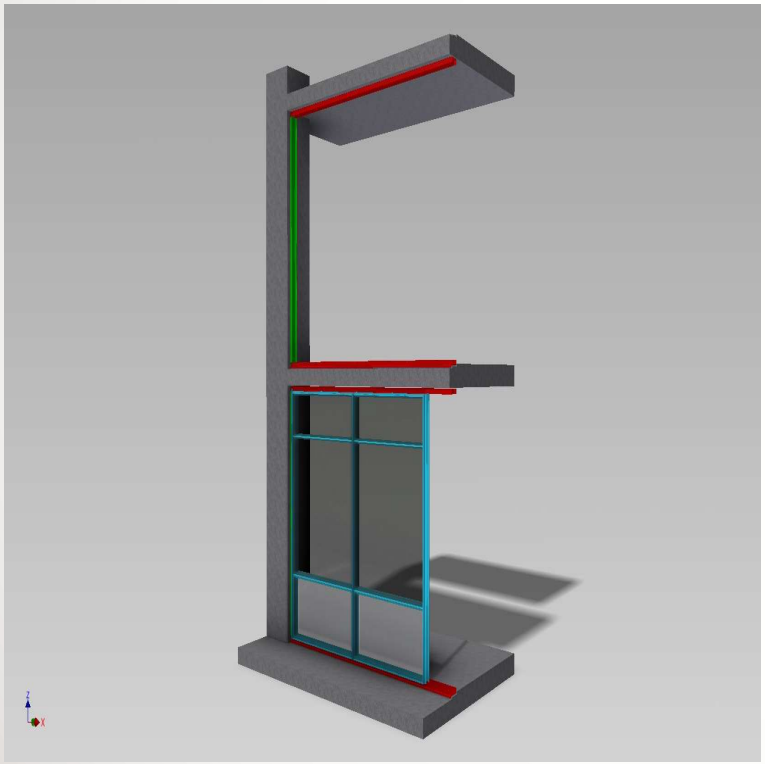

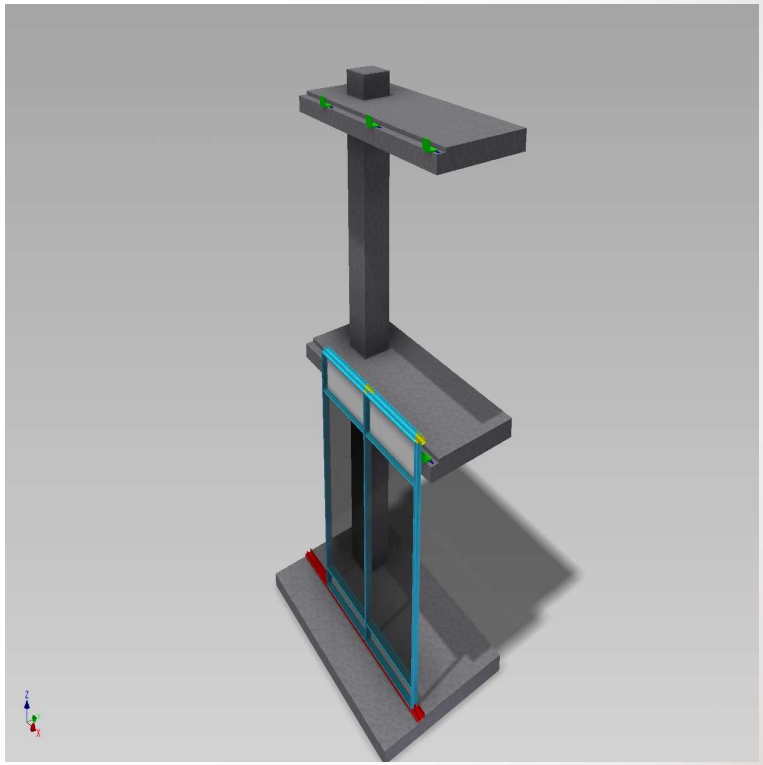

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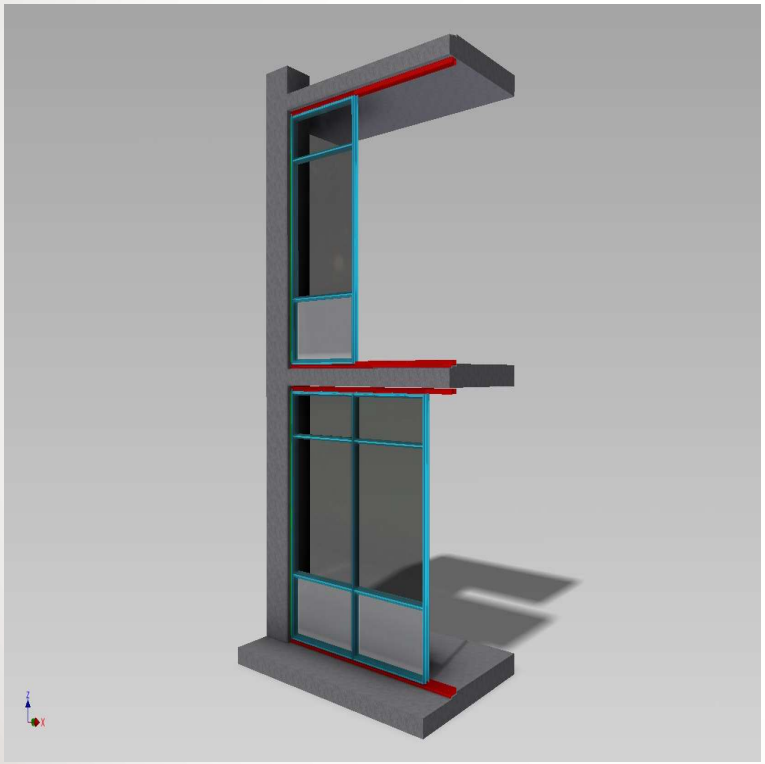

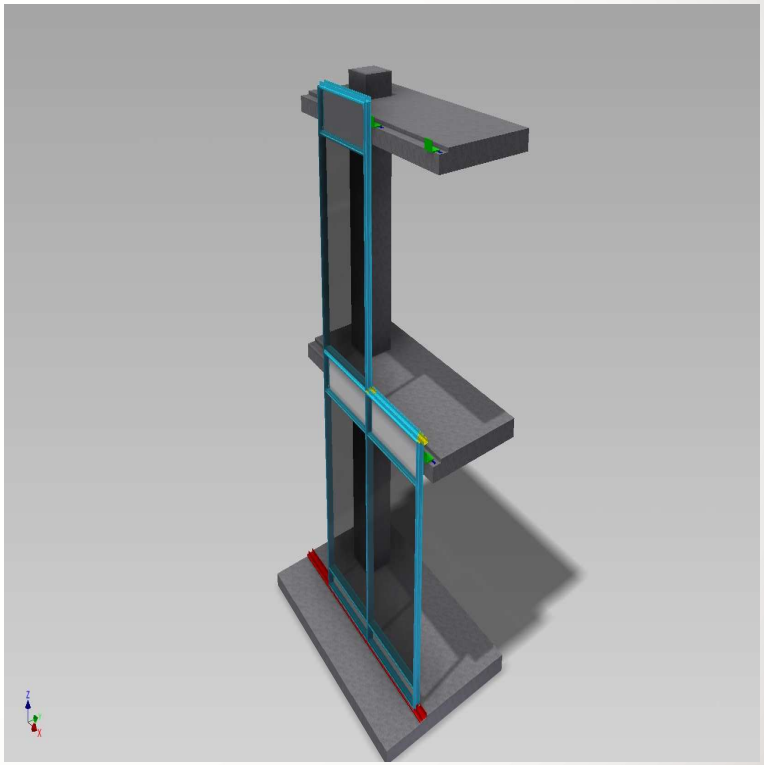

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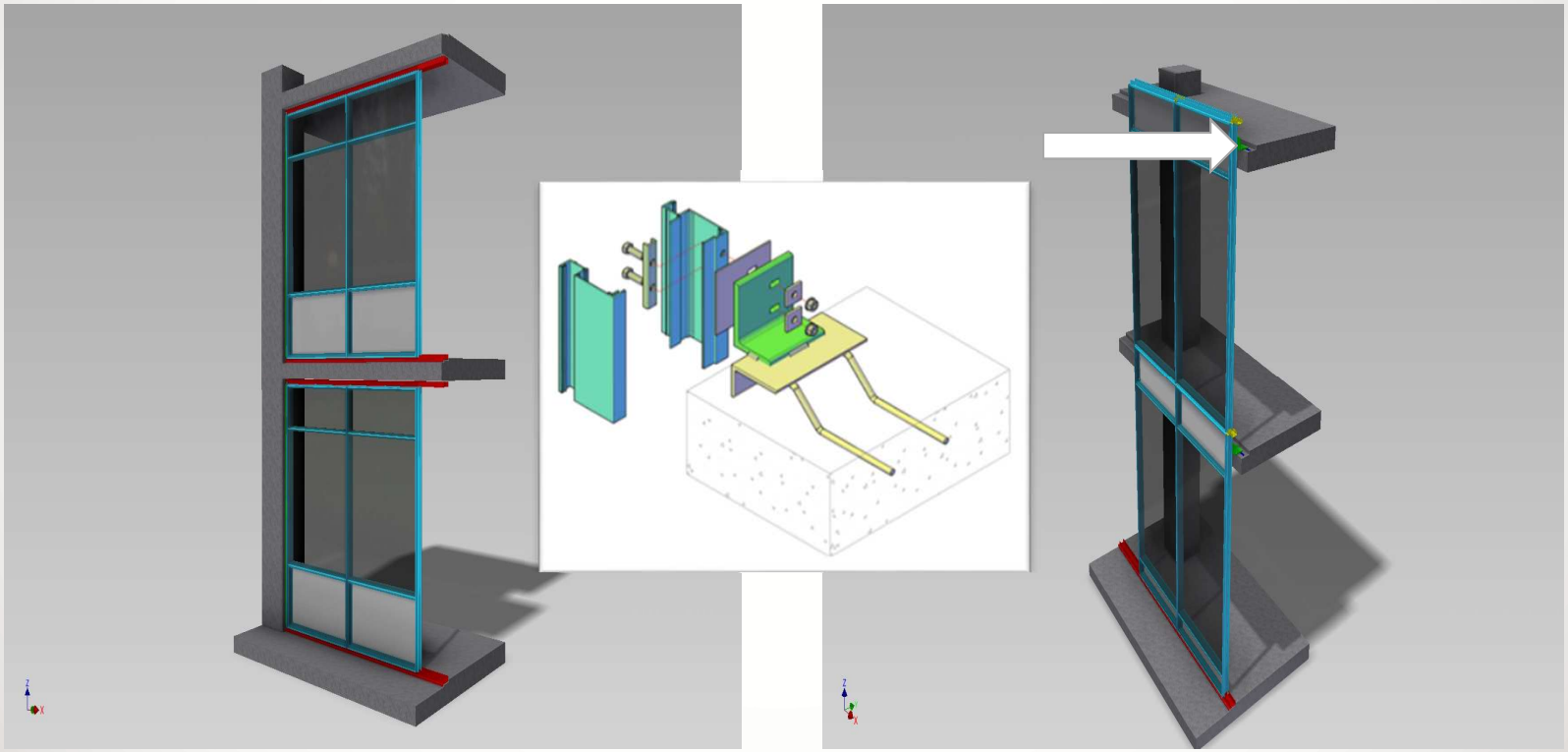


G.James glass & aluminium

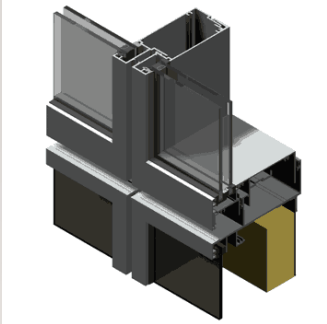
Window Wall vs. Curtain Wall Selection

Not only for appearance…..

- Window wall is more suitable for structural projections through facades (e.g. balconies & concrete ledge sunshades);
- Window wall is more suitable for shorter buildings which are scaffolded during construction;
- There is less area of facade in a window wall so it is more budget oriented;
- Curtain wall is a continuous envelope with no penetrations with subsequent superior weather resistance performance;
- Curtain wall requires no external scaffolding to install, so is more appropriate for tall buildings; there are less items to install, so a curtain wall is erected quicker for tall buildings.

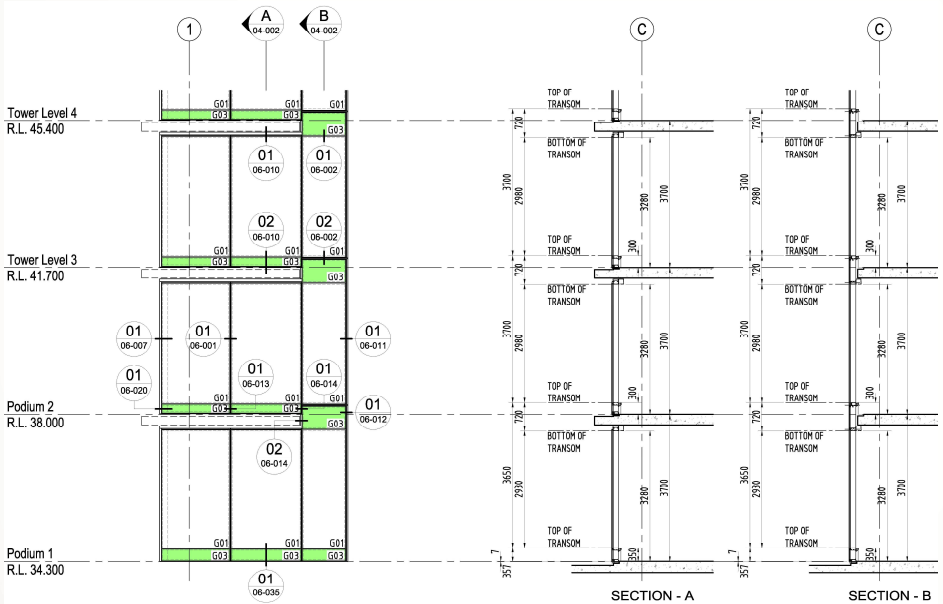
G.James glass & aluminium

Aluminium Framing Systems



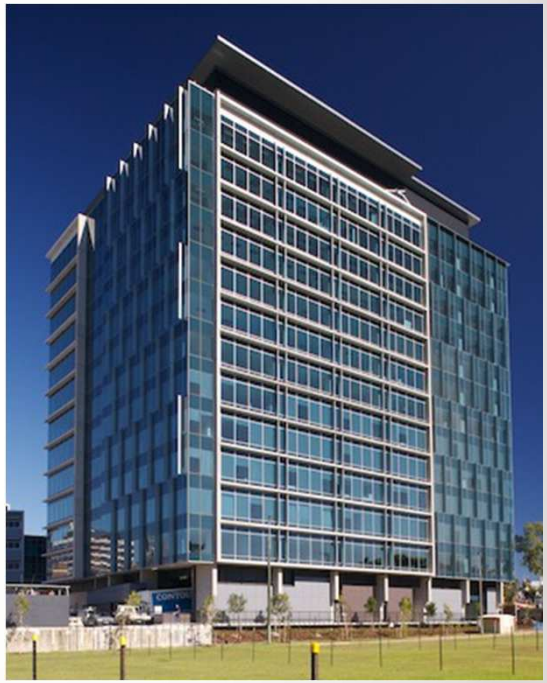
Curtain Wall (refer section – B below)

- Standard G.James systems;
- Bespoke extrusion suites custom designed to meet individual project designs.



Window Wall (refer section – A above)

- Standard G.James systems of varying look (exposed slab ledges & concealed slab edges, face glazed or centrally pocketed, captive or structurally glazed);
- Standard G.James systems of varying structural capacity (eg. 450, 650, 850).



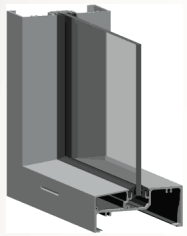
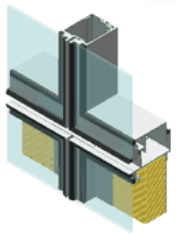
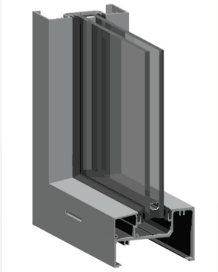
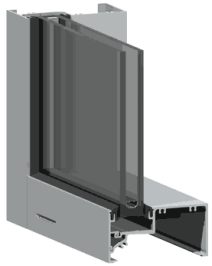
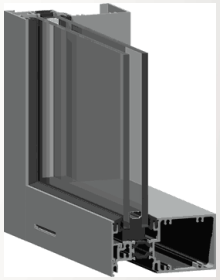
Green Square, Brisbane
Is this window wall or curtain wall?

G.James glass & aluminium

Glass/Frame System Matrix

Thermal Improvement

Thermal &/or Acoustic Improvement

1. Centre Pocket	2. Captive Face Glazed	3. Structurally Glazed	4. Captive Thermally Broken
			
Single Glazed	**Single Glazed**	**Single Glazed**	**Single Glazed**
			
Double Glazed	**Double Glazed**	**Double Glazed**	**Double Glazed**
Deep Cavity IGU	**Deep Cavity IGU**	**Deep Cavity IGU**	**Deep Cavity IGU**
Triple Glazed	**Triple Glazed**	**Triple Glazed**	**Triple Glazed**
IGU with Interstitial Blinds	**IGU with Interstitial Blinds**	**IGU with Interstitial Blinds**	**IGU with Interstitial Blinds**

G.James glass & aluminium

“Can I have a 5.8 high bifold glazed door?”

Indicative Commercial fixed glazing sizes:

Cost effective mullion ctrs

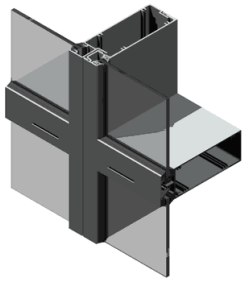
are between 1200 to 1800

- **450 Series**

  max. 3000 high

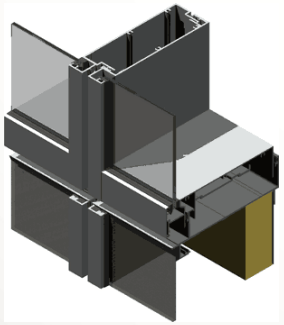
- **650 Series**

  max. 3500 high



- **850 Series**

  max. 4500 high



General Commercial Product Limitations on sizing of Operable Door/Window Sashes

Product/Series/Type	Max. Sizes - Ht & Wd (mm)	Hardware Limitation
• ***150 Series***		
T.H.I.S. - Single and double glazed	1800 x 1500	24 kg @ 90° opening 100 kg @ 20° opening
Awning - Single glazed only	1500 x 1200	24 kg @ 90° opening 100 kg @ 20° opening
Casement - Single glazed only	1500 x 800	52 kg
• ***165 Series Sliding windows***	1600 x 1200	48 kg per sash (4 rollers)
• ***245 Series Commercial Sliding***	2400 x 1200	200 kg per sash
*Upgraded design version	2600 x 1200	200 kg per sash
• ***265-660 Series***		
Awning – Single glazed only	1500 x 1200	24 kg @ 90° opening 100 kg @ 20° opening
Casement – Single glazed only	1500 x 800	52 kg
• ***445 Standard Sliding Door***	2700 x 1500	200 kg per sash
*Custom design version	2800 x 2200	450 kg per sash
• ***475/476 Series Hinged Doors***		
475/476-200	2400 x 1000	Hinged
	2400 x 1200	Pivot
	2400 x 1800	Sliding (Please check auto-door usage)
475-300	2700 x 1000	Hinged
	2700 x 1200	Pivot
	2700 x 1500	Sliding (Please check auto-door usage)
• ***477 Series Bi-Fold***	****477-220 minimum sash width 700 mm and 477-300 minimum sash width 750 mm****	
477-100 (E2) Bottom rolling	1500 x 1200	40 kg per sash (E2)
477-220 (E2) Even Leaves	2400 x 1100	40 kg per sash (E2)
477-220 (E2) 3 Un-Even	2400 x 950	40 kg per sash (E2)
477-300 (E3)	3000 x 1200	80 kg per sash (E3)

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Factors that influence Window & Glass Selection

- Building location & use
- Aesthetics
- Acoustics
- Window Sizes
- Structural Requirements
  - Australian Standards
    - Wind loading
    - Safety
- Energy
  - NCC (BCA) Section J
  - Green Star / NABERS

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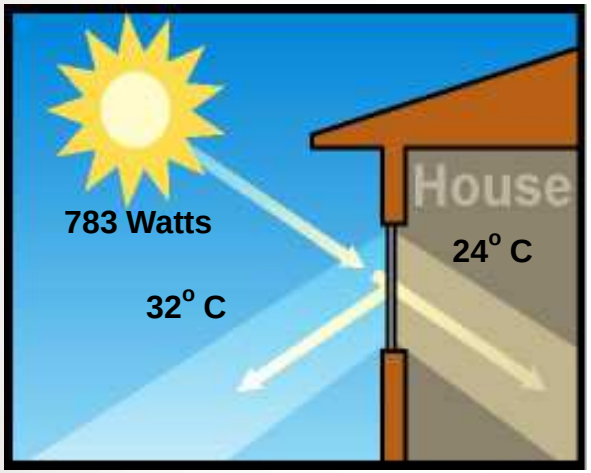
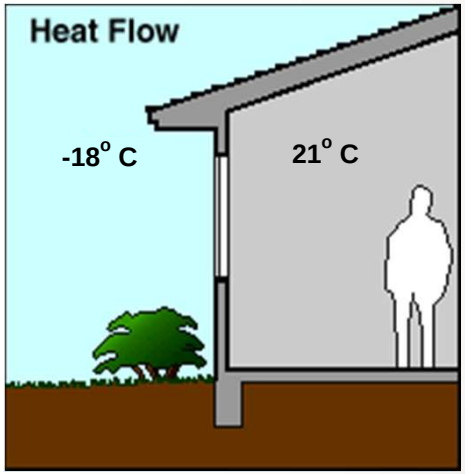
Performance Terms



SHGC – Solar Heat Gain Coefficient



U-Value (W/M^2C)

The lower the number the better the performance

G.James glass & aluminium

Performance Data – Glass Only

	SHGC	U-Value
10.38mm Clear Lam	0.72	5.6
10.38mm HL119	0.68	3.6
6/12/6 Clear IGU	0.70	2.7
DLE70 Grey IGU	0.23	1.7

G.James glass & aluminium

Performance Data – Whole of Window

	Glass Only		Window 650/1		Window 650/1 (Structural Glazed)	
	SHGC	**U-Value**	**SHGCw**	**Uw-Value**	**SHGCw**	**Uw-Value**
10.38mm Clear Lam	0.72	5.6	0.67	6.4	0.70	6.3
10.38mm HL119	0.68	3.6	0.56	4.7	0.59	4.1
6/12/6 Clear IGU	0.70	2.7	0.61	4.0	0.69	3.4
DLE70 Grey IGU	0.23	1.7	0.21	3.2	0.25	2.6

G.James glass & aluminium

Performance Data – Whole of Window

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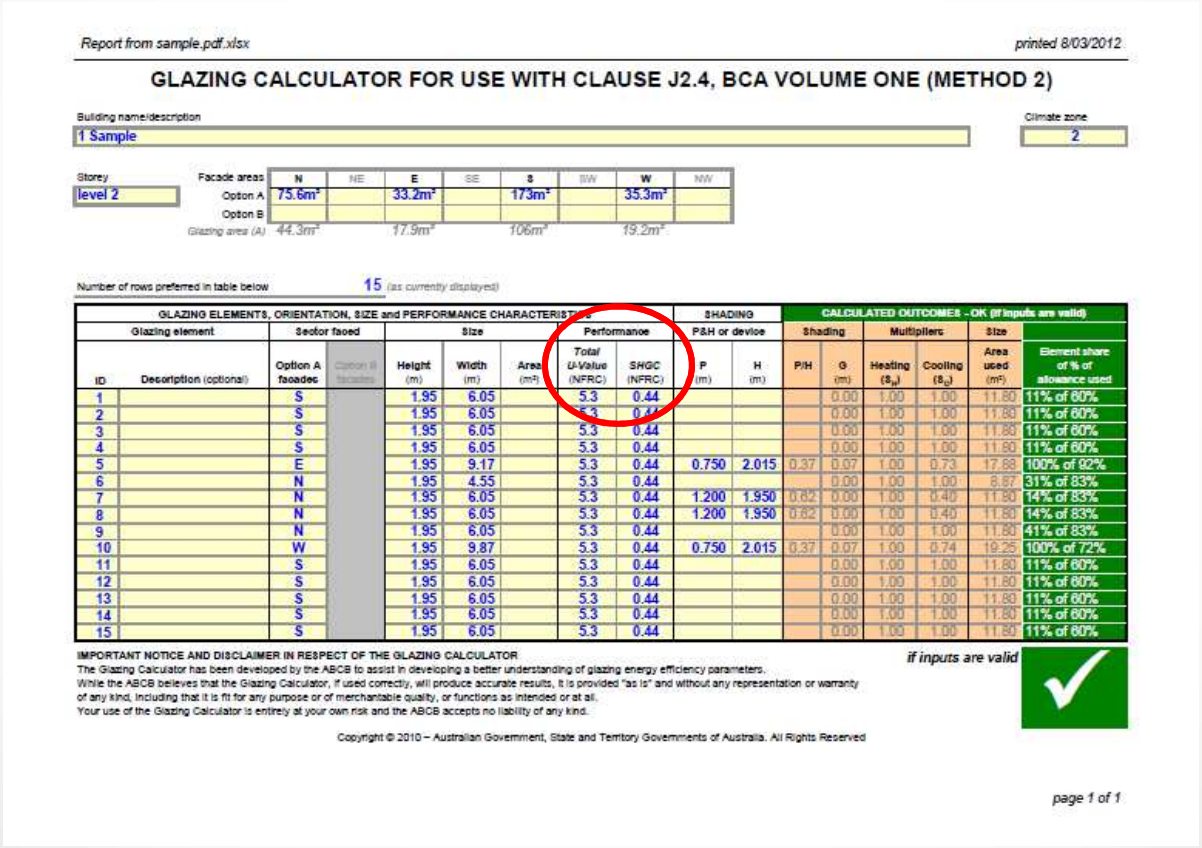
G.James glass & aluminium

NCC (BCA) Section J



Report from sample.pdf.xlsx — *printed 8/03/2012*

GLAZING CALCULATOR FOR USE WITH CLAUSE J2.4, BCA VOLUME ONE (METHOD 2)

Building name/description: 1 Sample — Climate zone: 2

Storey: level 2

Facade areas	N	NE	E	SE	S	SW	W	NW
Option A	75.6m²		33.2m²		173m²		35.3m²	
Option B								
Glazing area (A)	44.3m²		17.9m²		106m²		19.2m²	

Number of rows preferred in table below: 15 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES - OK (if inputs are valid)					
Glazing element		Sector faced		Size			Performance			Shading		Multipliers		Size	
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (NFRC)	SHGC (NFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
2		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
3		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
4		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
5		E		1.95	9.17		5.3	0.44	0.750	2.015	0.37	0.07	1.00	0.73	17.88	100% of 92%
6		N		1.95	4.55		5.3	0.44				0.00	1.00	1.00	8.87	31% of 83%
7		N		1.95	6.05		5.3	0.44	1.200	1.950	0.62	0.00	1.00	0.40	11.80	14% of 83%
8		N		1.95	6.05		5.3	0.44	1.200	1.950	0.62	0.00	1.00	0.40	11.80	14% of 83%
9		N		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	41% of 83%
10		W		1.95	9.87		5.3	0.44	0.750	2.015	0.37	0.07	1.00	0.74	19.26	100% of 72%
11		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
12		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
13		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
14		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%
15		S		1.95	6.05		5.3	0.44				0.00	1.00	1.00	11.80	11% of 60%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters.
While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all.
Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

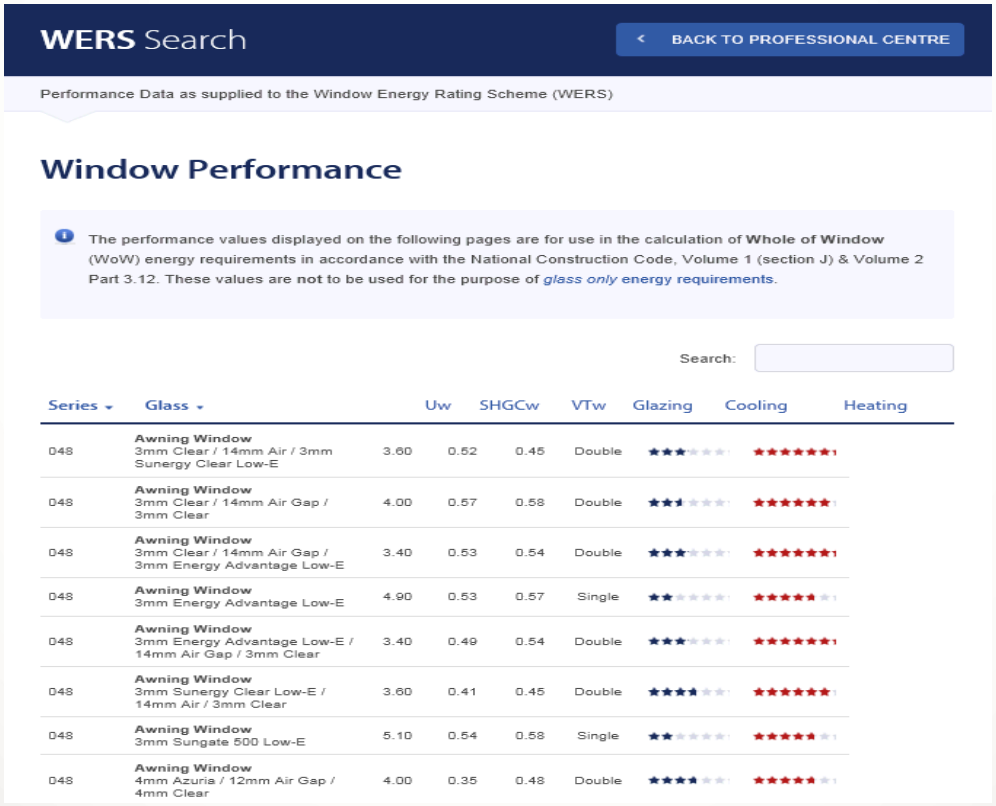
if inputs are valid

page 1 of 1

G.James glass & aluminium

WERS Data Search

http://gjames.com/professional/wers



WERS Search

BACK TO PROFESSIONAL CENTRE

Performance Data as supplied to the Window Energy Rating Scheme (WERS)

Window Performance

The performance values displayed on the following pages are for use in the calculation of **Whole of Window** (WoW) energy requirements in accordance with the National Construction Code, Volume 1 (section J) & Volume 2 Part 3.12. These values are **not** to be used for the purpose of *glass only* energy requirements.

Search:

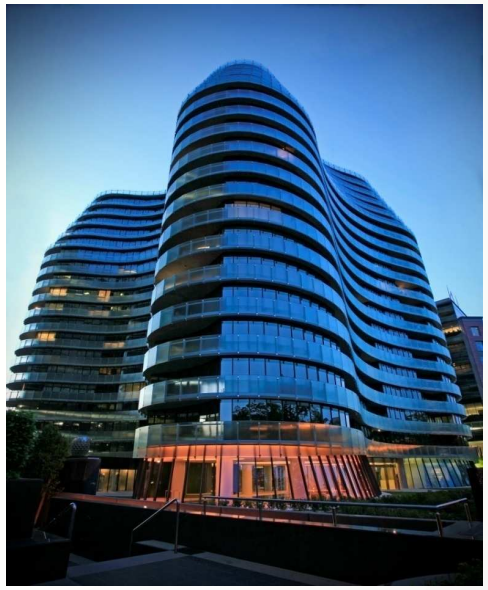
Series	Glass	Uw	SHGCw	VTw	Glazing	Cooling	Heating
048	**Awning Window** 3mm Clear / 14mm Air / 3mm Sunergy Clear Low-E	3.60	0.52	0.45	Double	★★★☆☆☆	★★★★★★
048	**Awning Window** 3mm Clear / 14mm Air Gap / 3mm Clear	4.00	0.57	0.58	Double	★★★½☆☆	★★★★★★
048	**Awning Window** 3mm Clear / 14mm Air Gap / 3mm Energy Advantage Low-E	3.40	0.53	0.54	Double	★★★☆☆☆	★★★★★★
048	**Awning Window** 3mm Energy Advantage Low-E	4.90	0.53	0.57	Single	★★☆☆☆☆	★★★★★☆
048	**Awning Window** 3mm Energy Advantage Low-E / 14mm Air Gap / 3mm Clear	3.40	0.49	0.54	Double	★★★☆☆☆	★★★★★★
048	**Awning Window** 3mm Sunergy Clear Low-E / 14mm Air / 3mm Clear	3.60	0.41	0.45	Double	★★★★☆☆	★★★★★★
048	**Awning Window** 3mm Sungate 500 Low-E	5.10	0.54	0.58	Single	★★☆☆☆☆	★★★★★☆
048	**Awning Window** 4mm Azuria / 12mm Air Gap / 4mm Clear	4.00	0.35	0.48	Double	★★★★☆☆	★★★★★☆

G.James glass & aluminium

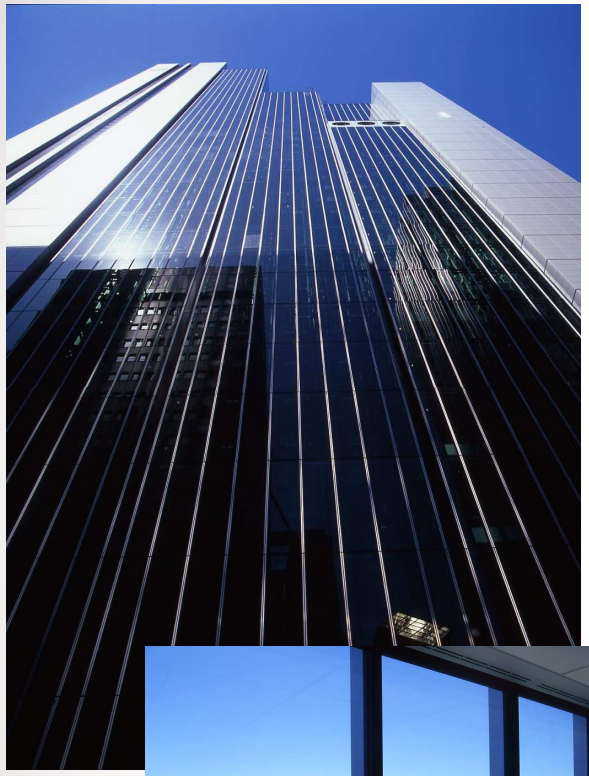
Design Considerations

Consider where we are in the world and…..

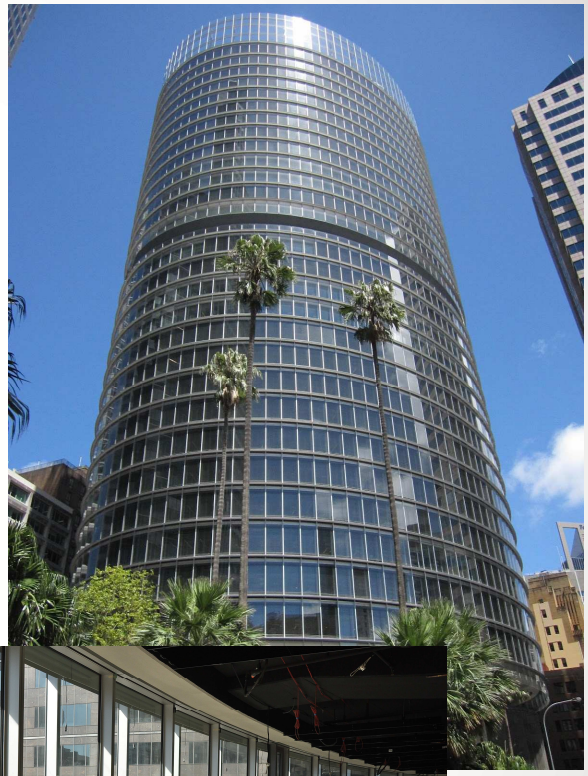
- How the building is to be used
- Building orientation
- Size of windows
- How the glass looks internally
- How to replace damaged glass
- Amount of visible light trans.
- Glare



G.James glass & aluminium



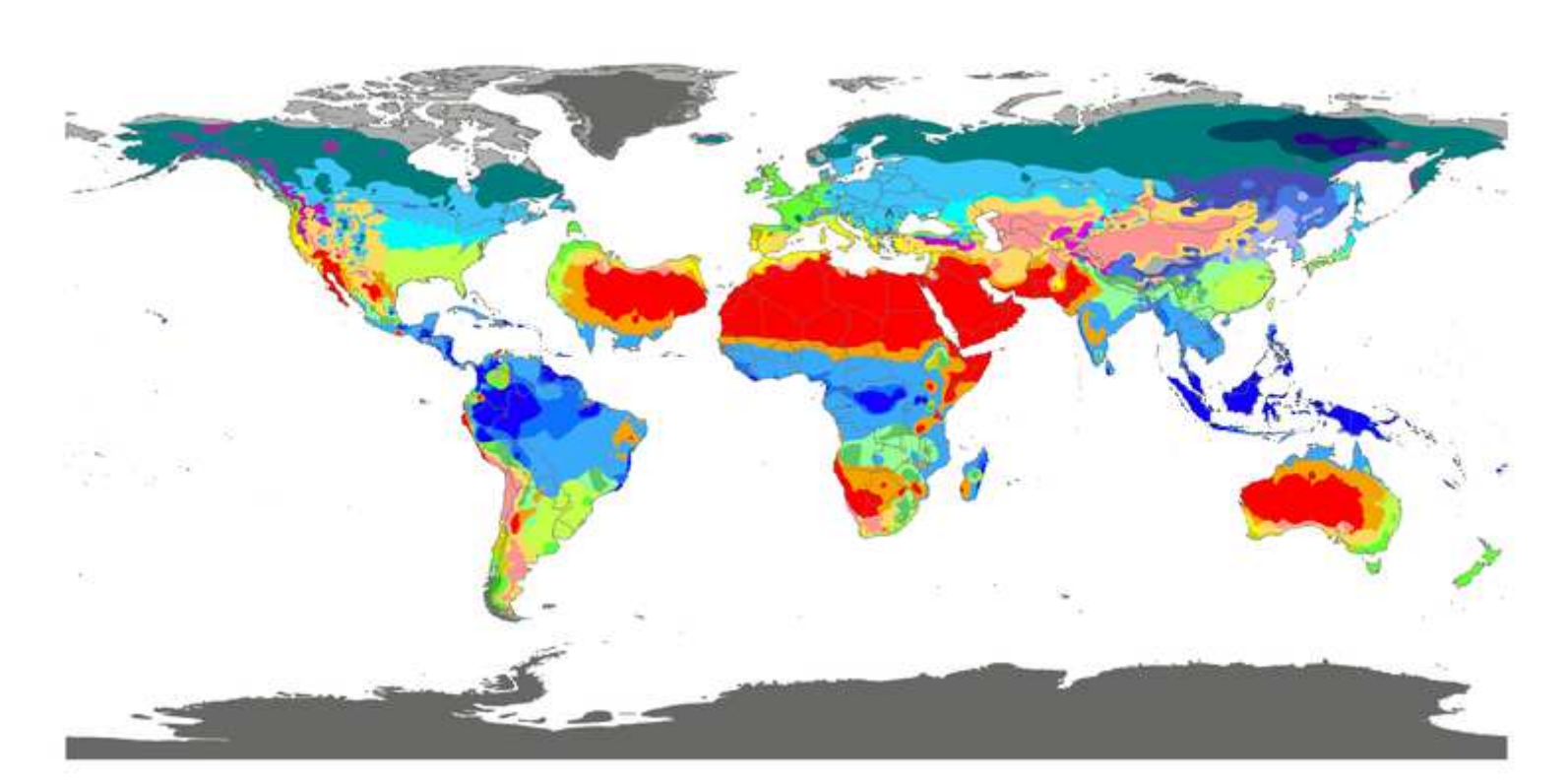
Deutsche Bank,
126 Phillip St,
Sydney



1 Bligh St,
Sydney

G.James
glass & aluminium

Design Considerations



G.James glass & aluminium

Design Considerations

Consider the occupants …….

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Use Glass to create the “LOOK”

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How do we test glass ??

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We even test full scale facades !

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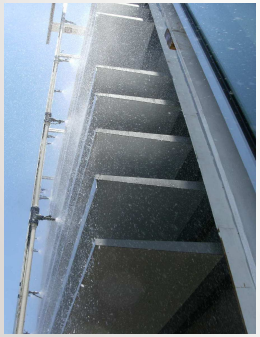
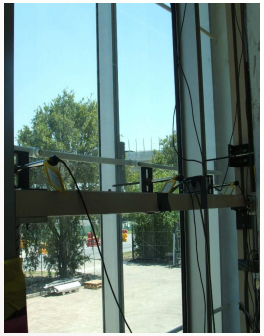
Facade Fenestration Testing

- Water Penetration
- Air Infiltration
- Deflection (1 in 20 year wind load)
- Abseiler loads on sunblades
- Proof Load (Typically 1 in 1000 year wind load)





G.James glass & aluminium

Design Considerations

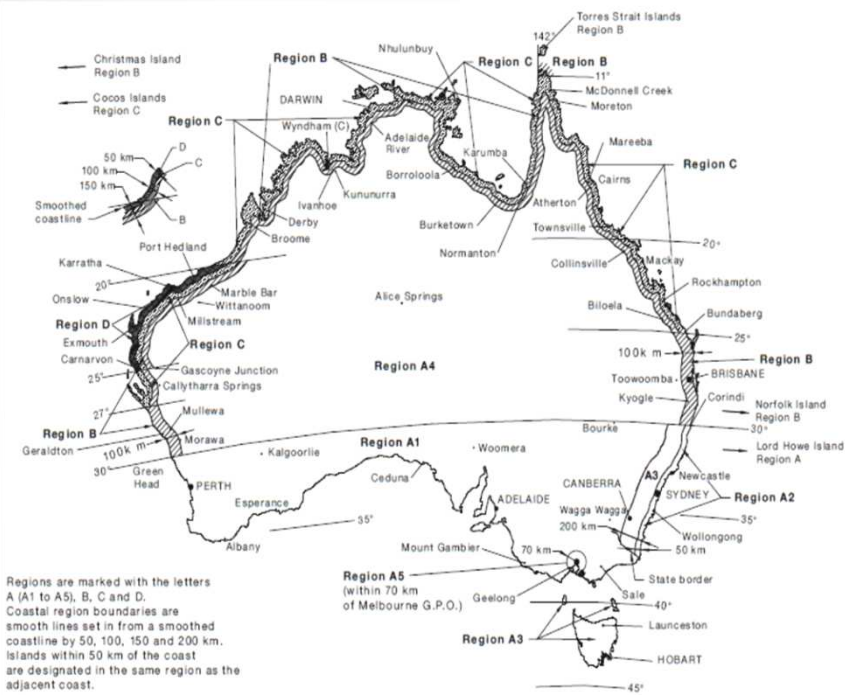


FIGURE 3.1(A) WIND REGIONS

Again… consider the location

- Wind load is typically the critical load that governs facade design for strength.
- Brisbane: approx. 3kPa wind pressure
- Cyclonic Areas: up to 14kPa wind pressure
- In layman's terms; these pressures are equivalent to the weight of how many people standing on the glass?

G.James glass & aluminium

An appreciation of wind pressures

Brisbane:

approx 3kPa wind pressure;

- This equates to the equivalent of how many people standing on a typical 2400x1200 sized lite of glass?

Cyclonic Areas:

up to 14kPa wind pressure;

- This equates to the equivalent of how many people standing on a typical 2400x1200 sized lite of glass?

G.James glass & aluminium

An appreciation of wind pressures

Brisbane:

approx 3kPa wind pressure;

- Equivalent to weight of **4 people/m^2**
- That's a total of **12 people** standing on a typical 2400x1200 sized lite of glass

Cyclonic Areas:

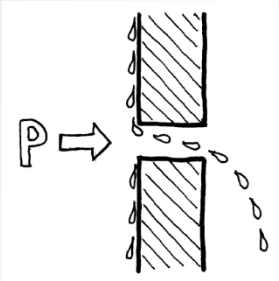
up to 14kPa wind pressure;

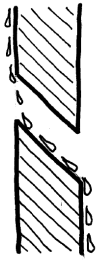
- Equivalent to weight of **19 people/m^2**
- That's a total of **55 people** standing on a typical 2400x1200 sized lite of glass!

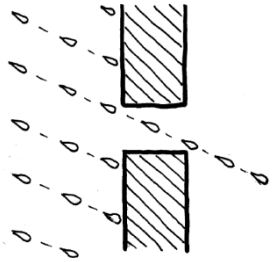
G.James glass & aluminium

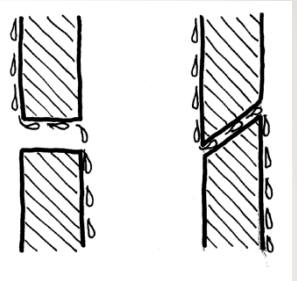
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**

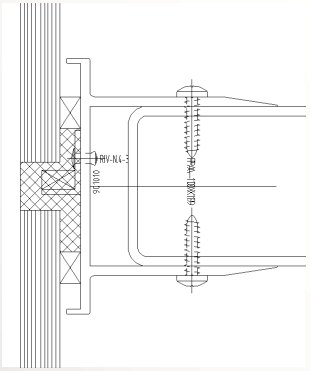


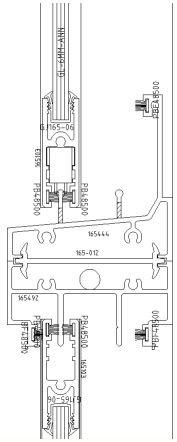


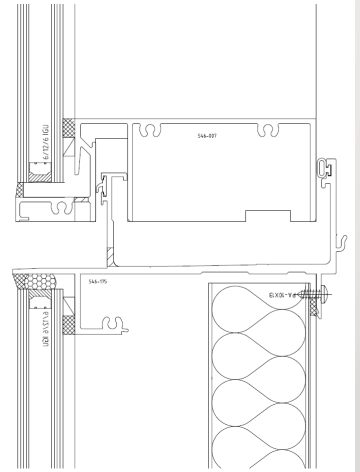




Forces: Pressure or Gravity or Kinetic energy or Surface tension





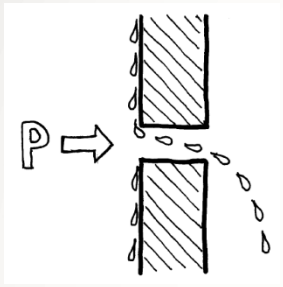


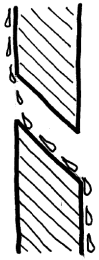
Types: Face Sealed or Water Head or Pressure Equalised

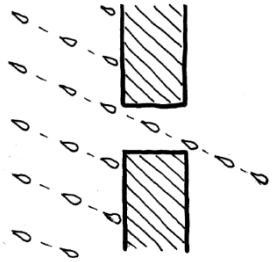
G.James glass & aluminium

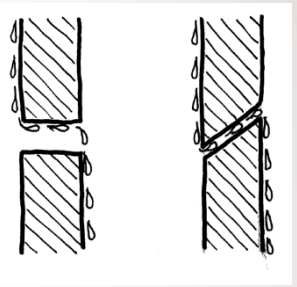
Weatherproofing Principles

For leaks to occur you need: **Water** + ~~**Hole**~~ + **Force to drive water through hole**









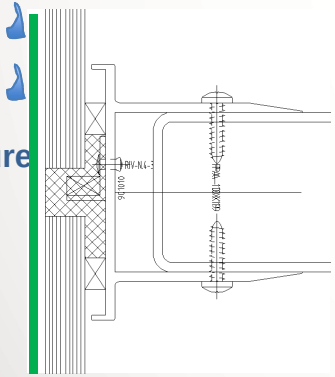
Forces: **Pressure** or **Gravity** or **Kinetic energy** or Surface tension

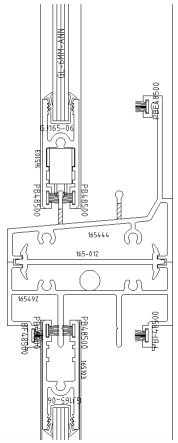
Barrier

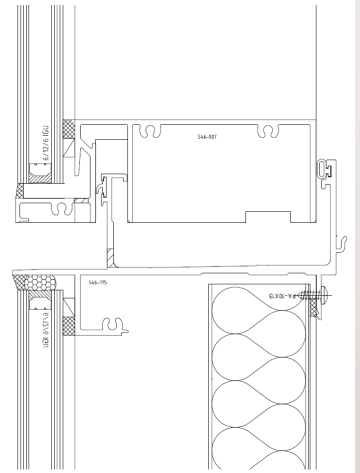
Water

+

Air pressure





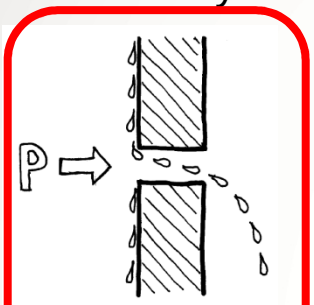


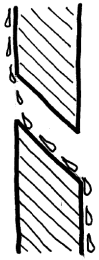
Types: **Face Sealed** or Water Head or Pressure Equalised

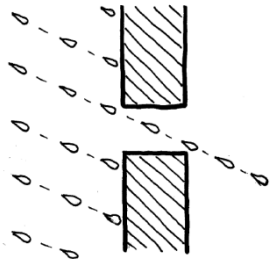
G.James glass & aluminium

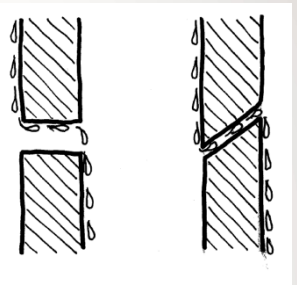
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**



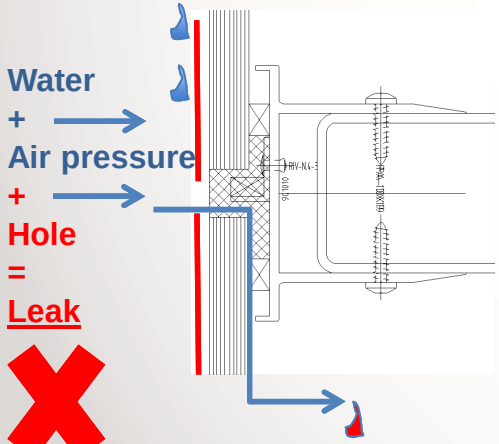


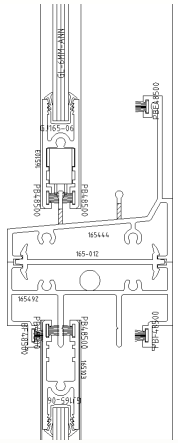


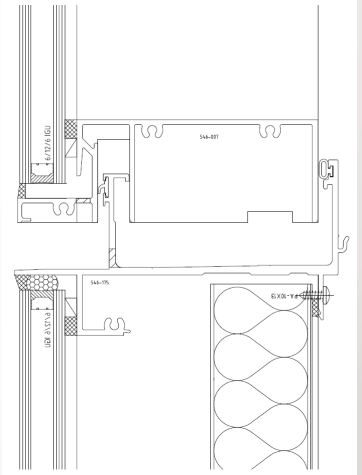


Forces: **Pressure** or Gravity or Kinetic energy or Surface tension

Water
+
Air pressure
+
Hole
=
Leak





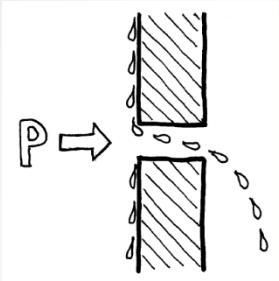


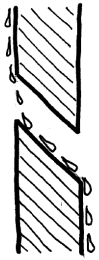
Types: **Face Sealed** or Water Head or Pressure Equalised

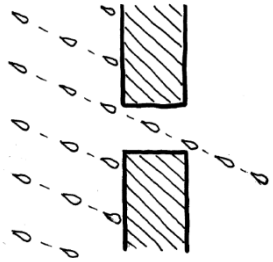
G.James glass & aluminium

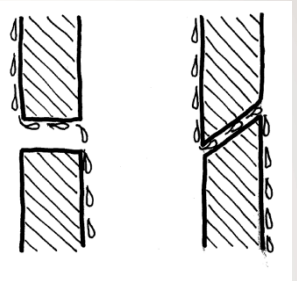
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**

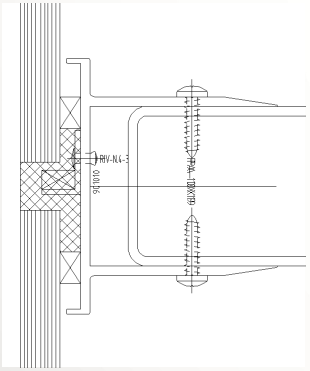


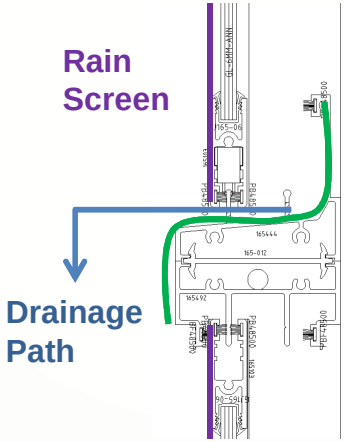


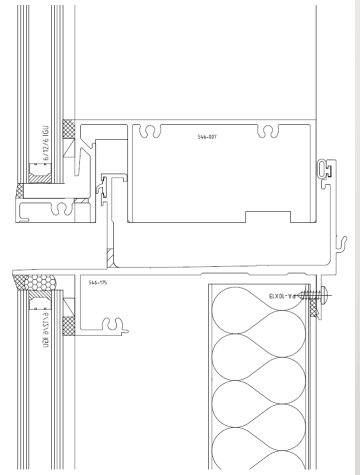




Forces: Pressure or Gravity or Kinetic energy or Surface tension







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G.James glass & aluminium

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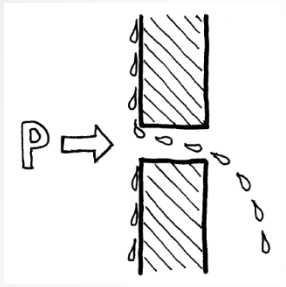
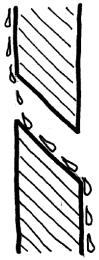
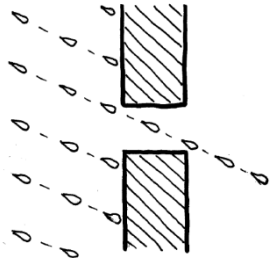
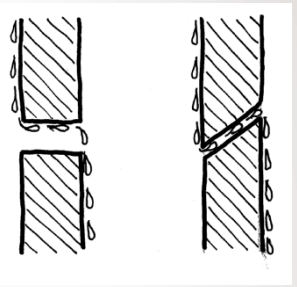
For leaks to occur you need: **Water** + **Hole** + ~~Force to drive water through hole~~

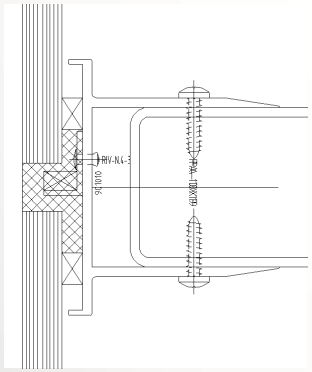






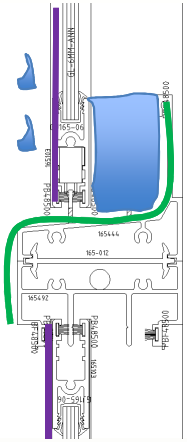


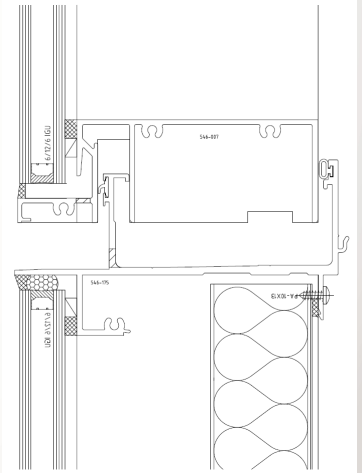
~~Forces: Pressure or Gravity or Kinetic energy or Surface tension~~



Water
+
Air pressure

=
Balancing force of head of water



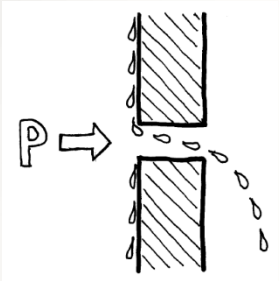


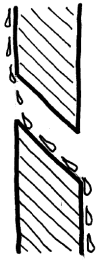
Types: Face Sealed or **Water Head** or Pressure Equalised

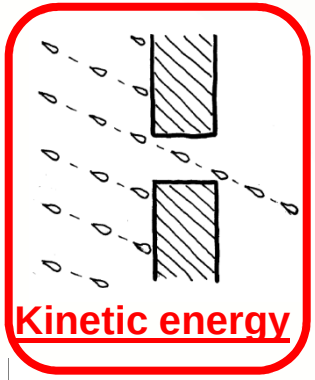
G.James glass & aluminium

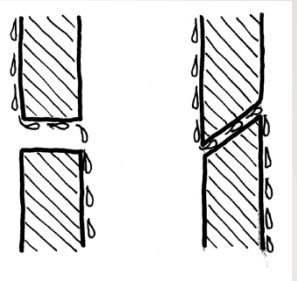
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**

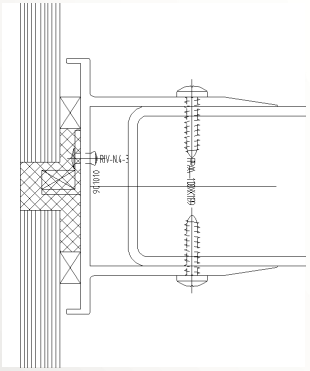






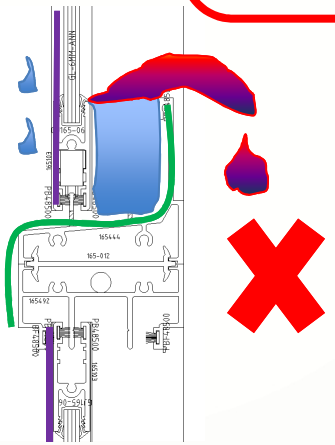


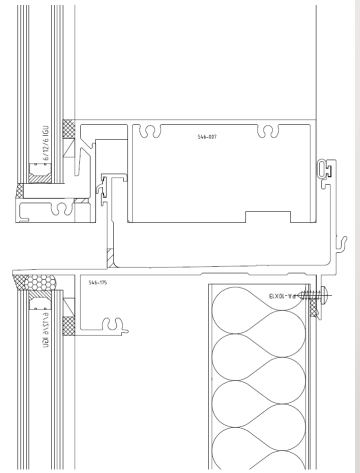
Forces: Pressure or Gravity or **Kinetic energy** or Surface tension



Wind Gusting

= Sloshing of head of water



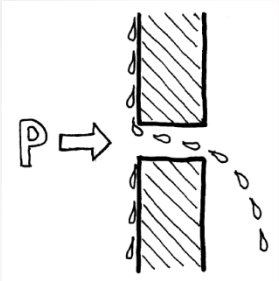


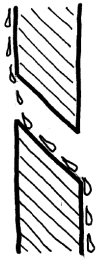
Types: Face Sealed or **Water Head** or Pressure Equalised

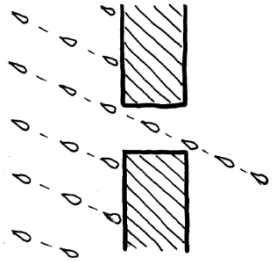
G.James glass & aluminium

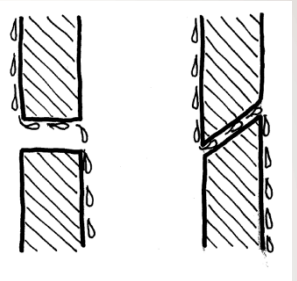
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**

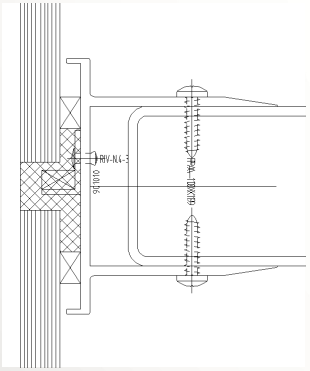


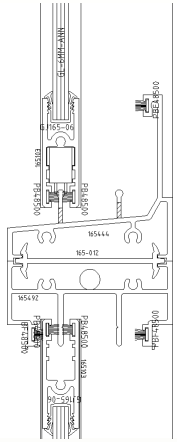


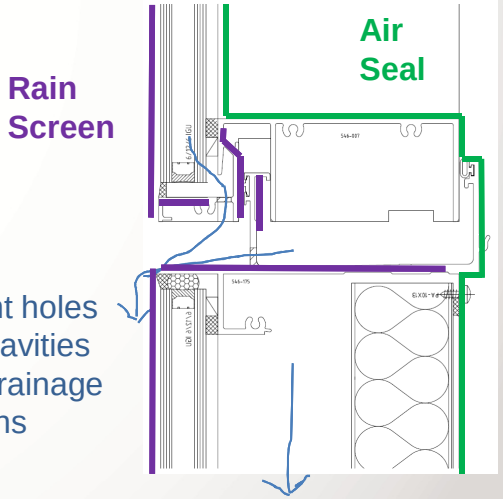




Forces: Pressure or Gravity or Kinetic energy or Surface tension





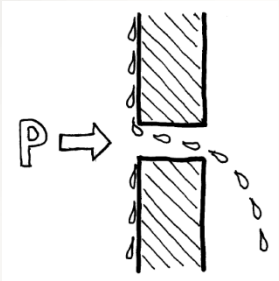


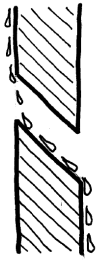
Types: Face Sealed or Water Head or **Pressure Equalised**

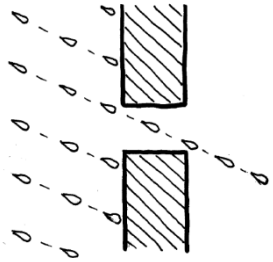
G.James glass & aluminium

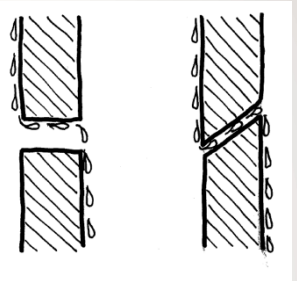
Weatherproofing Principles

For leaks to occur you need: **Water** + **Hole** + **Force to drive water through hole**









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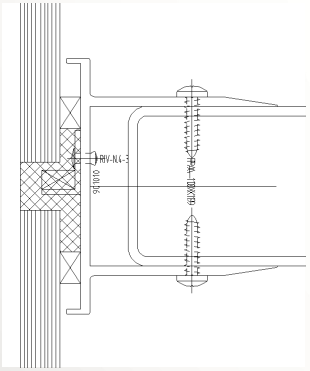
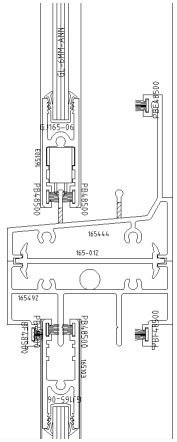
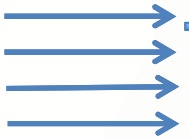


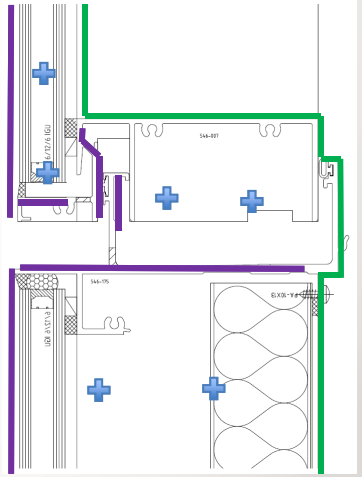


Wind Gusting



=

Cavities pressure equalise to match outside wind pressure

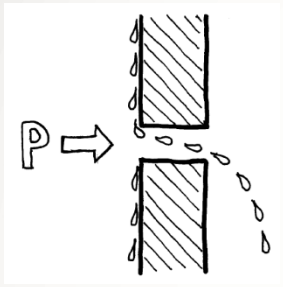


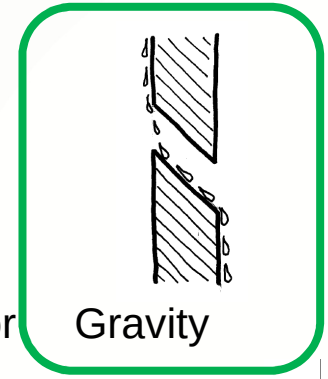
Types: Face Sealed or Water Head or **Pressure Equalised**

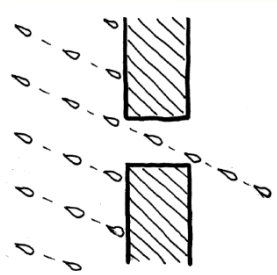
G.James glass & aluminium

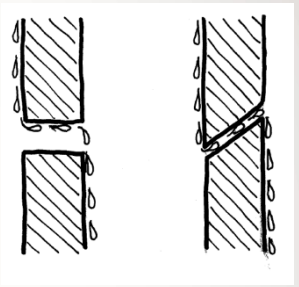
Weatherproofing Principles

For leaks to occur you need: ~~Water~~ + Hole + ~~Force to drive water through hole~~









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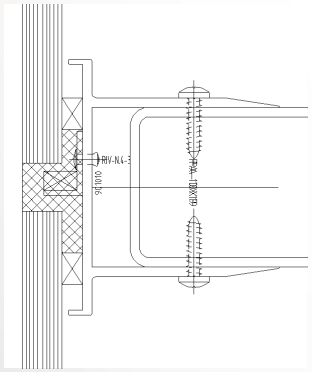
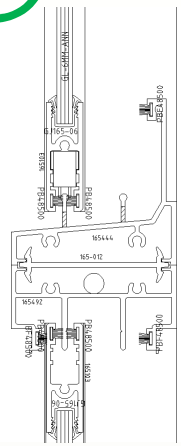
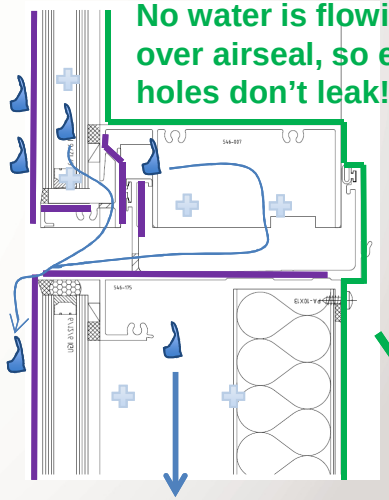




Wind Gusting
+
Water

=

Cavities pressure equalise to outside => **Gravity is only force acting on water entering cavities so it drops to bottom & drains outside.**



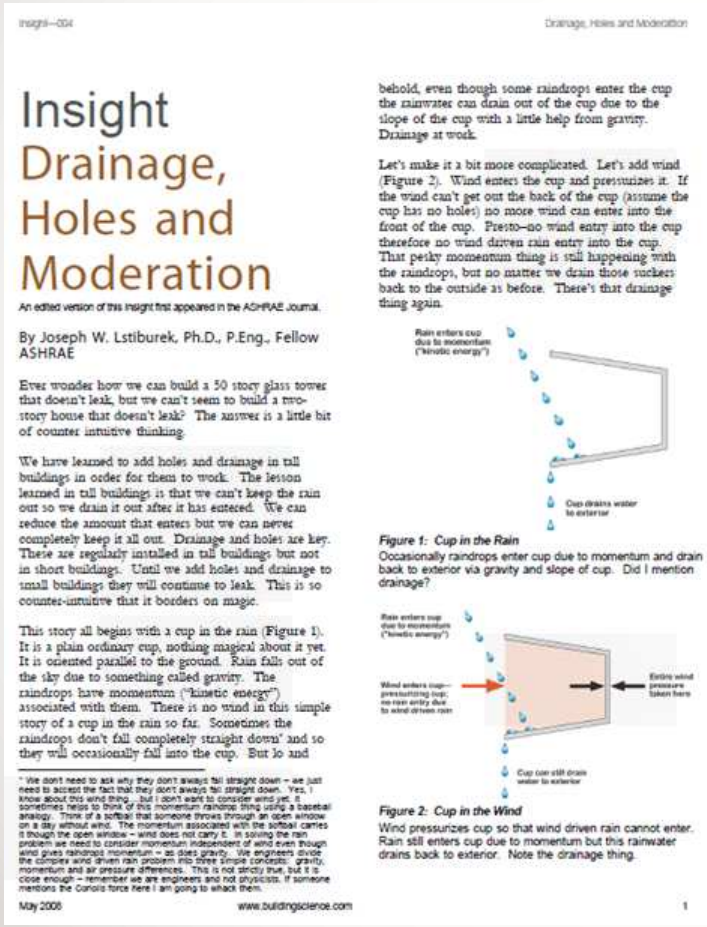
No water is flowing over airseal, so even holes don't leak!

Types: Face Sealed or Water Head or **Pressure Equalised**

G.James glass & aluminium

Quiz – what type of weatherproofing system is a typical brick veneer or cavity brick house?

Pressure equalisation is not new



Insight—004 Drainage, Holes and Moderation

Insight Drainage, Holes and Moderation

An edited version of this insight first appeared in the ASHRAE Journal.

By Joseph W. Lstiburek, Ph.D., P.Eng., Fellow ASHRAE

Ever wonder how we can build a 50 story glass tower that doesn't leak, but we can't seem to build a two-story house that doesn't leak? The answer is a little bit of counter intuitive thinking.

We have learned to add holes and drainage in tall buildings in order for them to work. The lesson learned in tall buildings is that we can't keep the rain out so we drain it out after it has entered. We can reduce the amount that enters but we can never completely keep it all out. Drainage and holes are key. These are regularly installed in tall buildings but not in short buildings. Until we add holes and drainage to small buildings they will continue to leak. This is so counter-intuitive that it borders on magic.

This story all begins with a cup in the rain (Figure 1). It is a plain ordinary cup, nothing magical about it yet. It is oriented parallel to the ground. Rain falls out of the sky due to something called gravity. The raindrops have momentum ("kinetic energy") associated with them. There is no wind in this simple story of a cup in the rain so far. Sometimes the raindrops don't fall completely straight down* and so they will occasionally fall into the cup. But lo and behold, even though some raindrops enter the cup the rainwater can drain out of the cup due to the slope of the cup with a little help from gravity. Drainage at work.

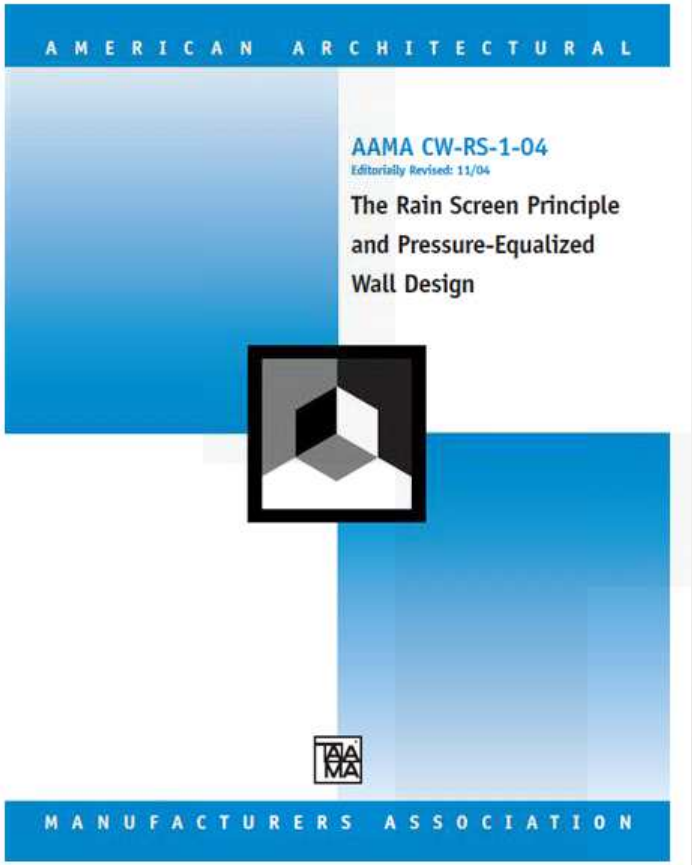
Let's make it a bit more complicated. Let's add wind (Figure 2). Wind enters the cup and pressurizes it. If the wind can't get out the back of the cup (assume the cup has no holes) no more wind can enter into the front of the cup. Presto—no wind entry into the cup therefore no wind driven rain entry into the cup. That pesky momentum thing is still happening with the raindrops, but no matter we drain those suckers back to the outside as before. There's that drainage thing again.

Figure 1: Cup in the Rain
Occasionally raindrops enter cup due to momentum and drain back to exterior via gravity and slope of cup. Did I mention drainage?

Figure 2: Cup in the Wind
Wind pressurizes cup so that wind driven rain cannot enter. Rain still enters cup due to momentum but this rainwater drains back to exterior. Note the drainage thing.

* We don't need to ask why they don't always fall straight down – we just need to accept the fact that they don't always fall straight down. Yes, I know about this wind thing…but I don't want to consider wind yet. It sometimes helps to think of this momentum raindrop thing using a baseball analogy. Think of a softball that someone throws through an open window on a day without wind. The momentum associated with the softball carries it though the open window – wind does not carry it. In solving the rain problem we need to consider momentum independent of wind even though wind gives raindrops momentum – so does gravity. We engineers divide the complex wind driven rain problem into three simple concepts: gravity, momentum and air pressure differences. This is not strictly true, but it is close enough – remember we are engineers and not physicists. If someone mentions the Coriolis force here I am going to whack them.

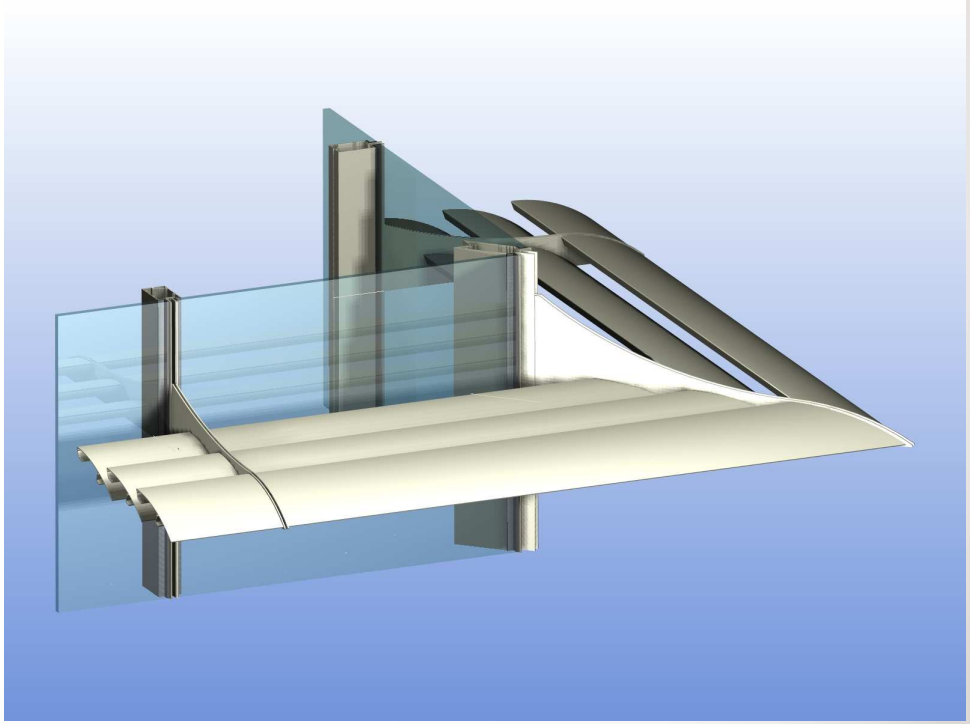
May 2008 www.buildingscience.com 1



G.James glass & aluminium

How to achieve energy efficient facades?

- Sunshade devices
- Motorised external venetian blinds
- Double skin facades
- Natural ventilation



G.James glass & aluminium

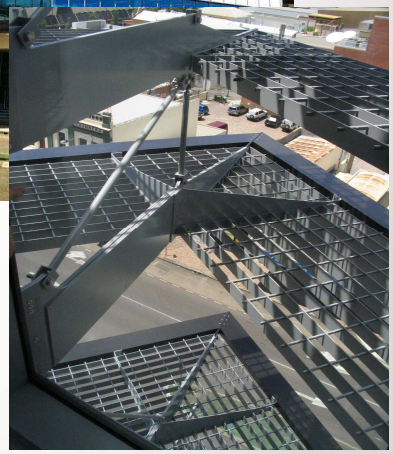
Sunshade Devices

Horizontal Sunblades

Latitude, Sydney

Mossop Building 3, Adelaide

ANZAC Park West, Canberra

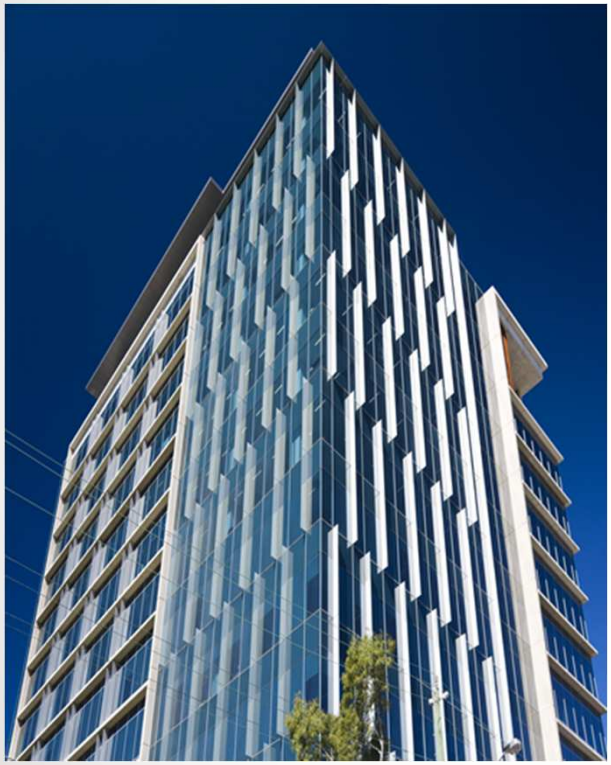


Bankwest,Townsville

G.James glass & aluminium

Sunshade Devices

Vertical Fins



Green Square, Brisbane

BCEC, Brisbane

G.James glass & aluminium

Sunshade Devices

Combined Horizontal Sunblades & Vertical Fins

KSD1 Hamilton Harbour, Brisbane

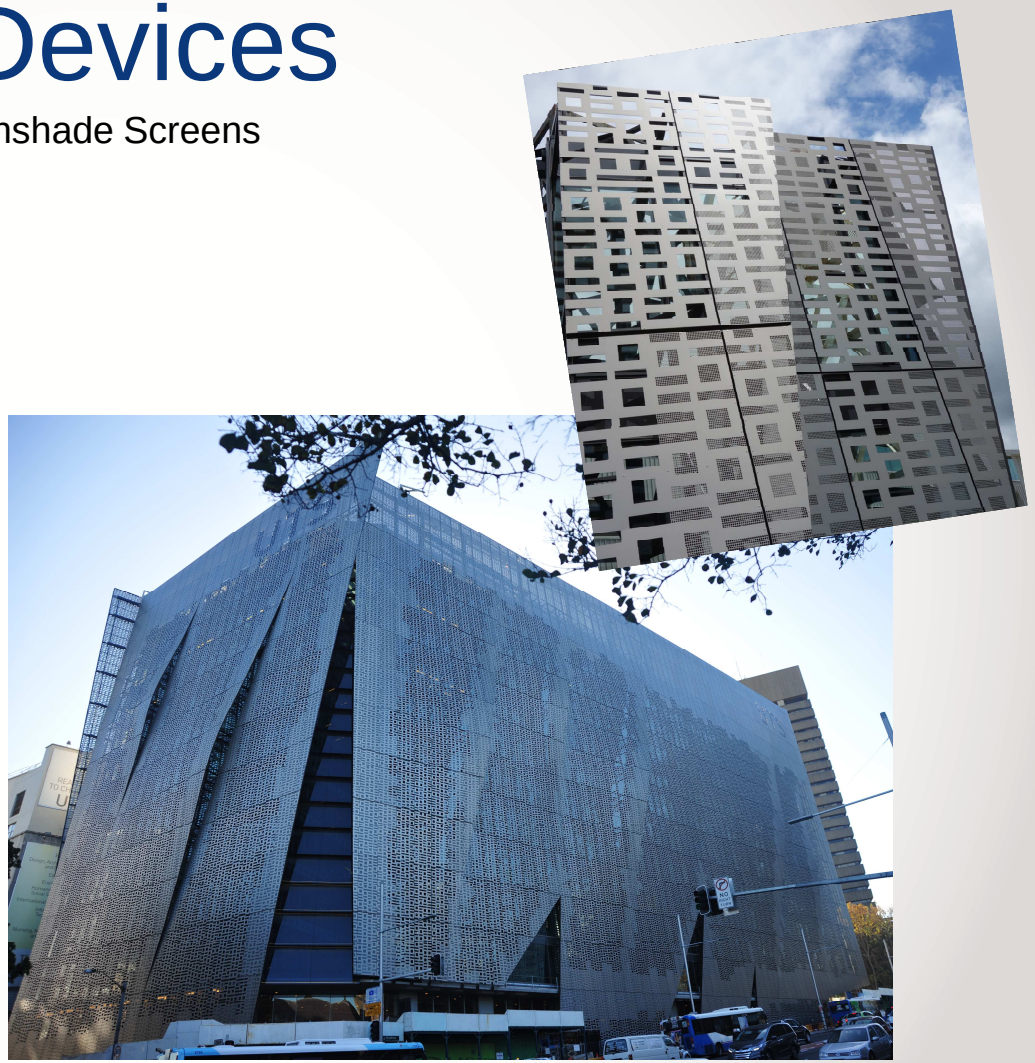
WEHI, Melbourne

G.James glass & aluminium

Sunshade Devices

Perforated Aluminium Sheet Sunshade Screens

WEHI, Melbourne
(DNA pattern to genetic research facility)



UTS Broadway, Sydney (Binary pattern to IT & Engineering building)

G.James glass & aluminium

Sunshades used for stunning visual effect

Brisbane Central

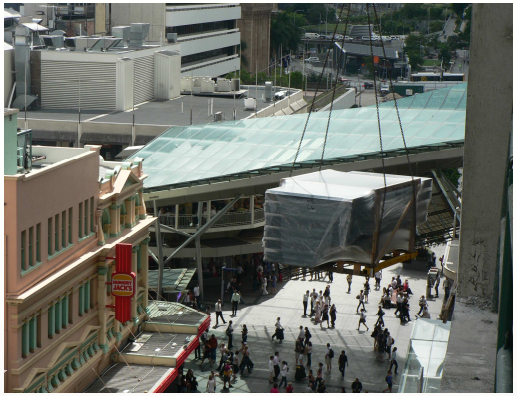
M&A, Cnr MacLauchlan & Ann Sts,
Fortitude Valley

G.James glass & aluminium

Sunshade Devices

Design Considerations

- Mitigate penetrations through façade (potential water leaks)
- Panelised in size for transport
- Factory fabrication
- For safety - site assembly onto panels prior to panel install
- Light weight
- Minimise projections as the sunshades catch wind loads like spinnakers!

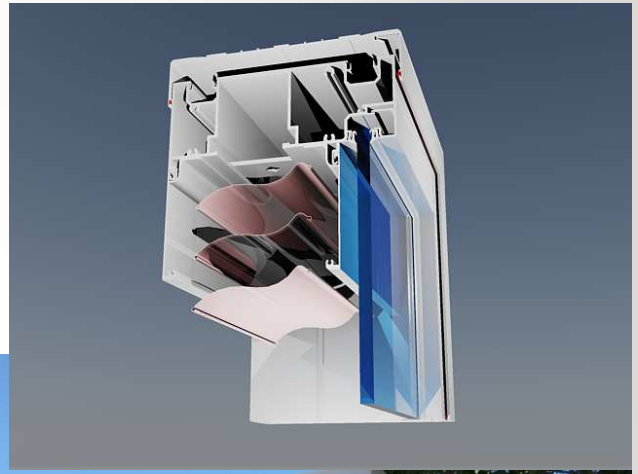


G.James glass & aluminium

Operable External Venetian Blinds

QUT CIP2, Kelvin Grove (rendering)

Horizo motorised external venetian blinds mounted onto G.James custom curtain wall.

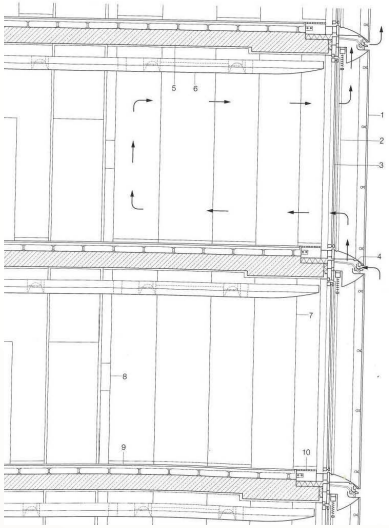


G.James / Liftmaster motorised external venetian blind integrated into window framing system.

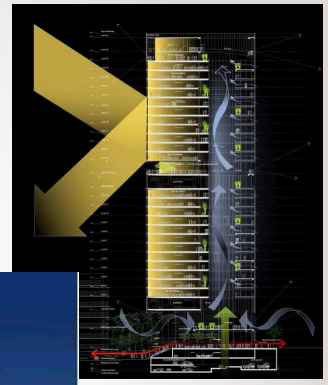
G.James glass & aluminium

Double Skin Facades

Southern Cross, Melbourne

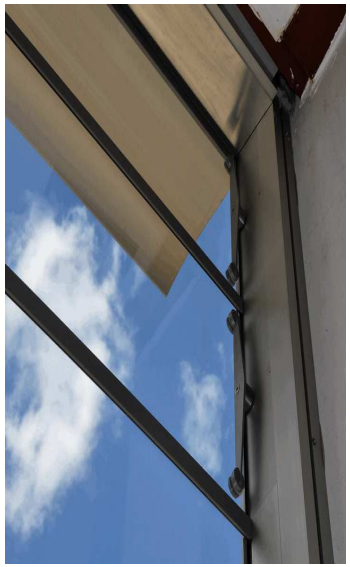


1 Bligh St, Sydney



Operable Facades and Natural Ventilation

Vertical lift doors, No.1 Bligh St, Sydney



Concealed motorised louvres, No.1 Bligh St, Sydney

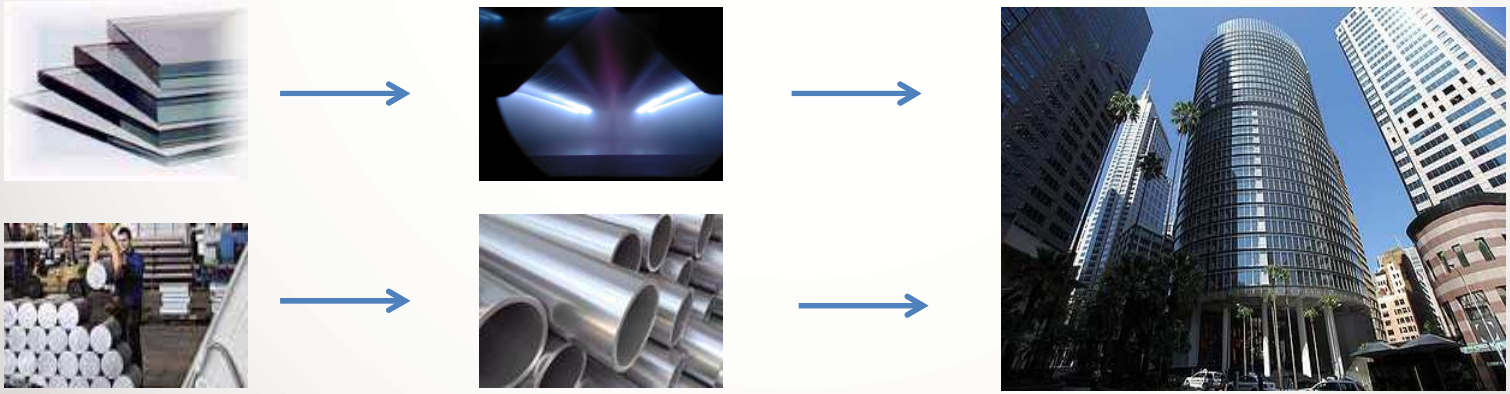
Vertical pivot glass louvres with concealed motor - Sydney residence

G.James glass & aluminium

Forming a successful relationship with G.James.

- 98yrs of operation with impressive project references including working relationships on buildings by:

  Norman Foster, Harry Seidler, Ingenhoven, James Carpenter, etc.
- Wealth of experience with in-house scientists driving an extensive R&D division
- Design office, engineering team & NATA Test Rig
- Manufactured locally
- Fully integrated design, manufacture and installation from float glass & raw aluminium billets to finished facades of monumental skyscrapers.



G.James glass & aluminium

G.James makes the difference…

G.James
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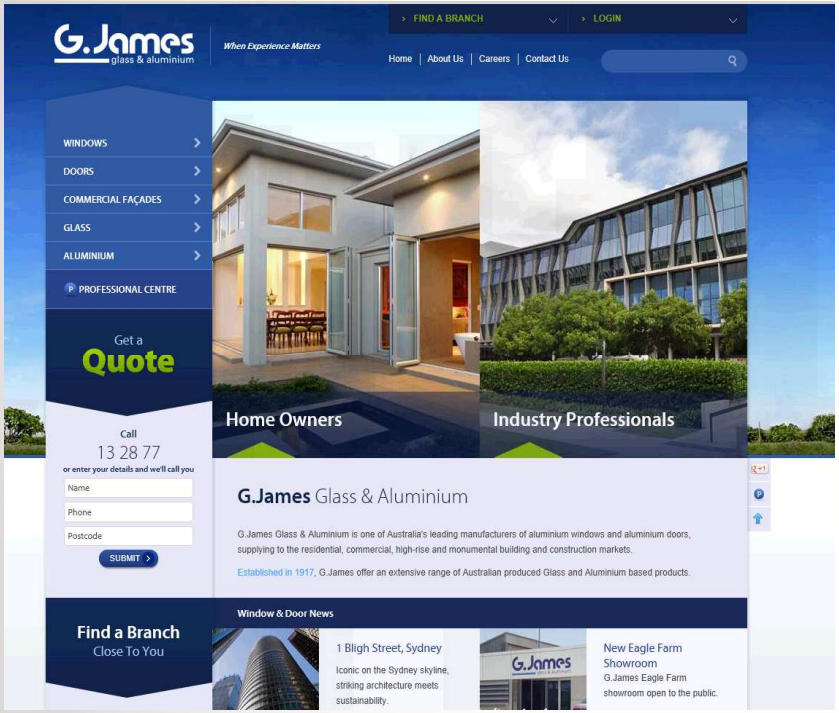
G.James Website & Social Media



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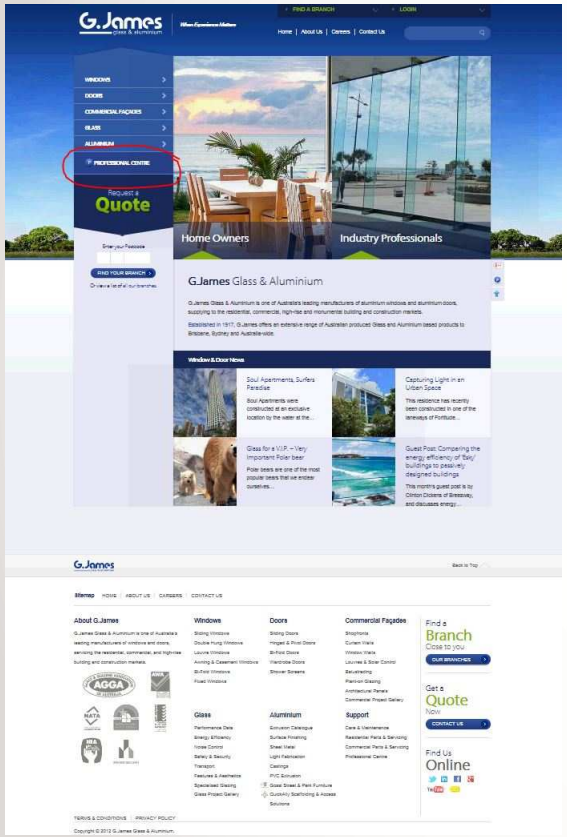

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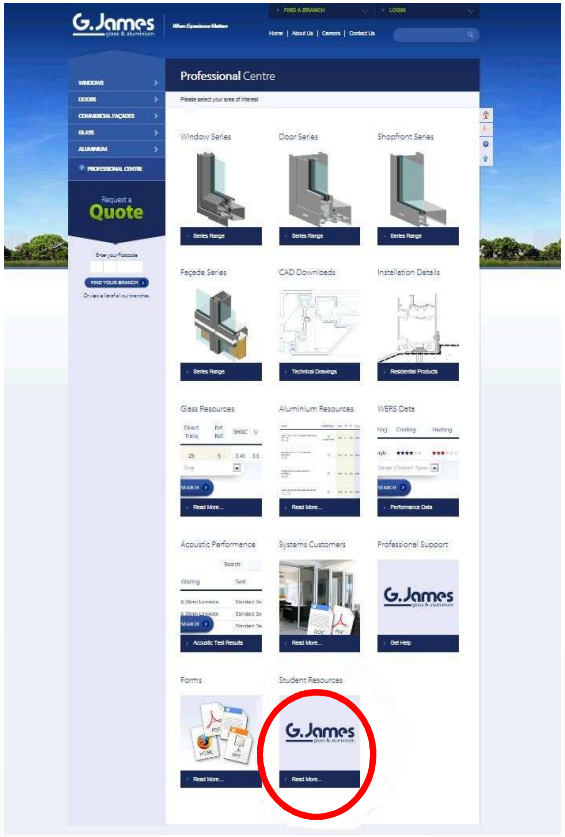

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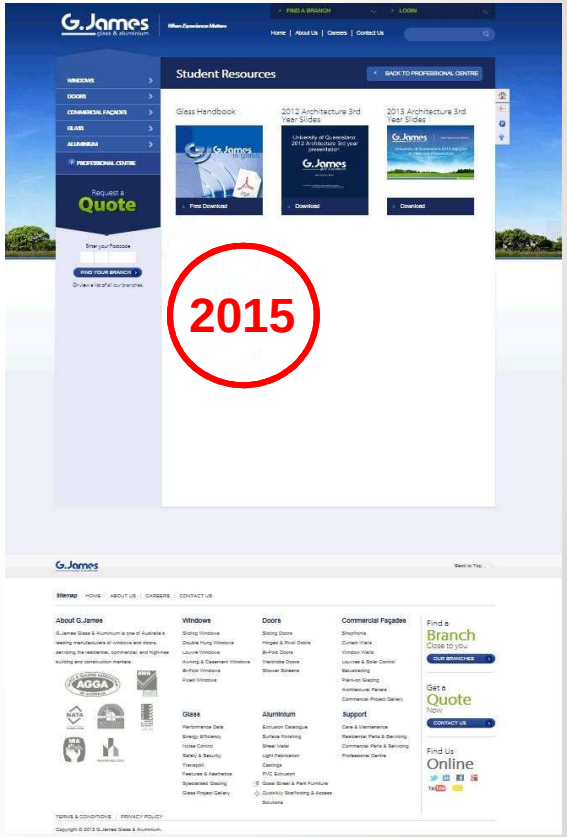

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When Experience Matters

Thank You

Factory Visits

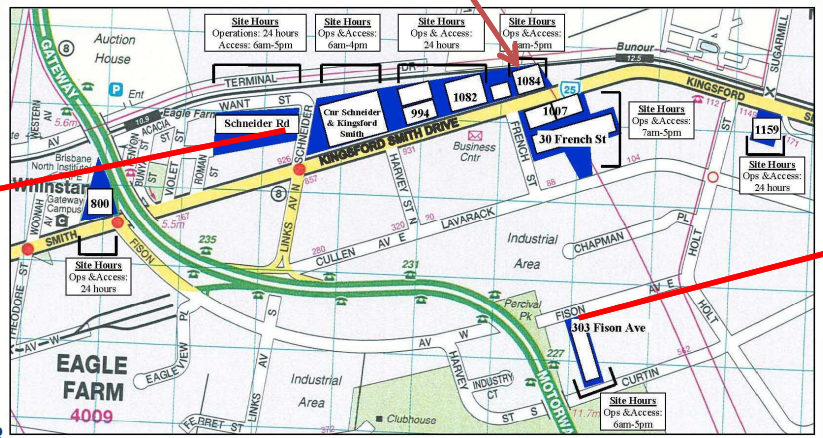
IGU Assembly

Glass Laminating

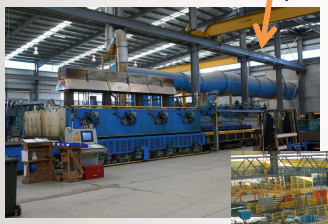
You are here

Façade test rig.

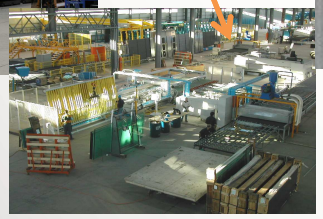
Schneider Rd Glass Operations Shed 23



Curtain Wall Factory, 303 Fison Ave



Glass Toughening

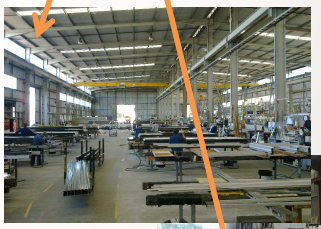


Glass Cutting & Processing

Tour Guide:
Tony Skennerton
(Factory Supervisor)

Tour Guide:
Lucas Coombes
(Factory Supervisor)

Tour Guide:
Bernie Merrylees
Production Manager



Curtain wall panel assembly, glazing & packing.

Aluminium extrusion, handling, cutting & processing

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Slideshow

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