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Engineering the Exceptional

A'18 AIA Conference on Architecture 2018
June 21-23, New York City



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Sustainable Design uses for Large Opening Wall Systems

1 SD/HSW Learning Unit

OBJECTIVES

- Familiarize you with the terminology, capabilities and usage of large operable glass walls
- Provide answers of how large operable glass walls play a vital role in sustainable / GREEN design.
- Demonstrate how the function of operable glass wall systems improve the Health, Safety, and welfare of building occupants
- Illustrate new ideas to take into the design process of schools, hospitality, and other commercial applications, and to help you through that process

COTE Top Ten Measures

I – Sustainable Design Intent and Innovation

- Windows and Openings

II – Regional/Community Design and Connectivity

- Open, Active Day-light Spaces
- Windows and Opening

III – Land Use and Site Ecology

- Day Lighting
- Natural Ventilation
- Windows and Openings



What is a Large Opening?

Starting at around 9'....



Newport Beach Residence - CA

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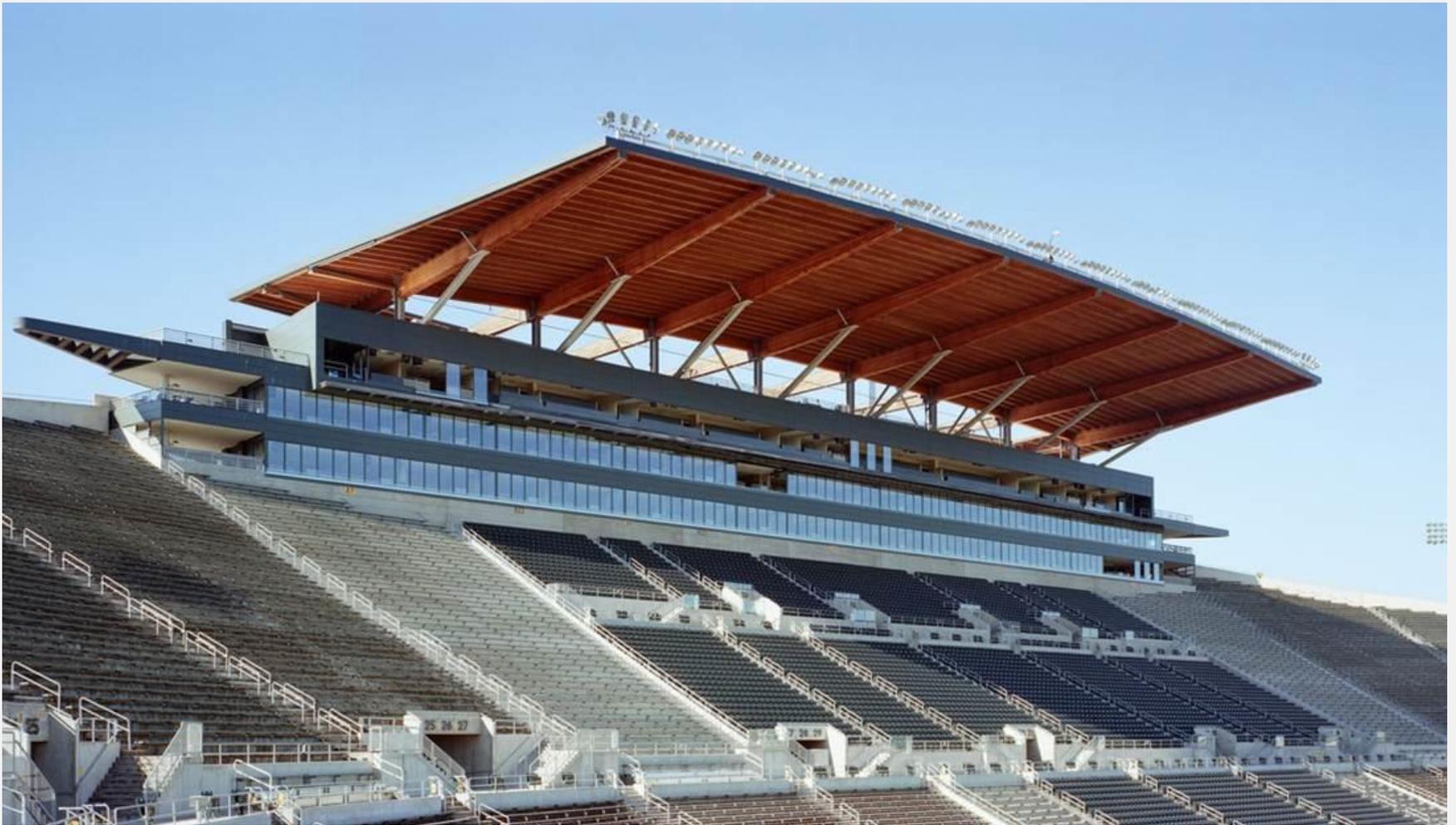
To 300' wide or more!



University of Oregon, Autzen Stadium

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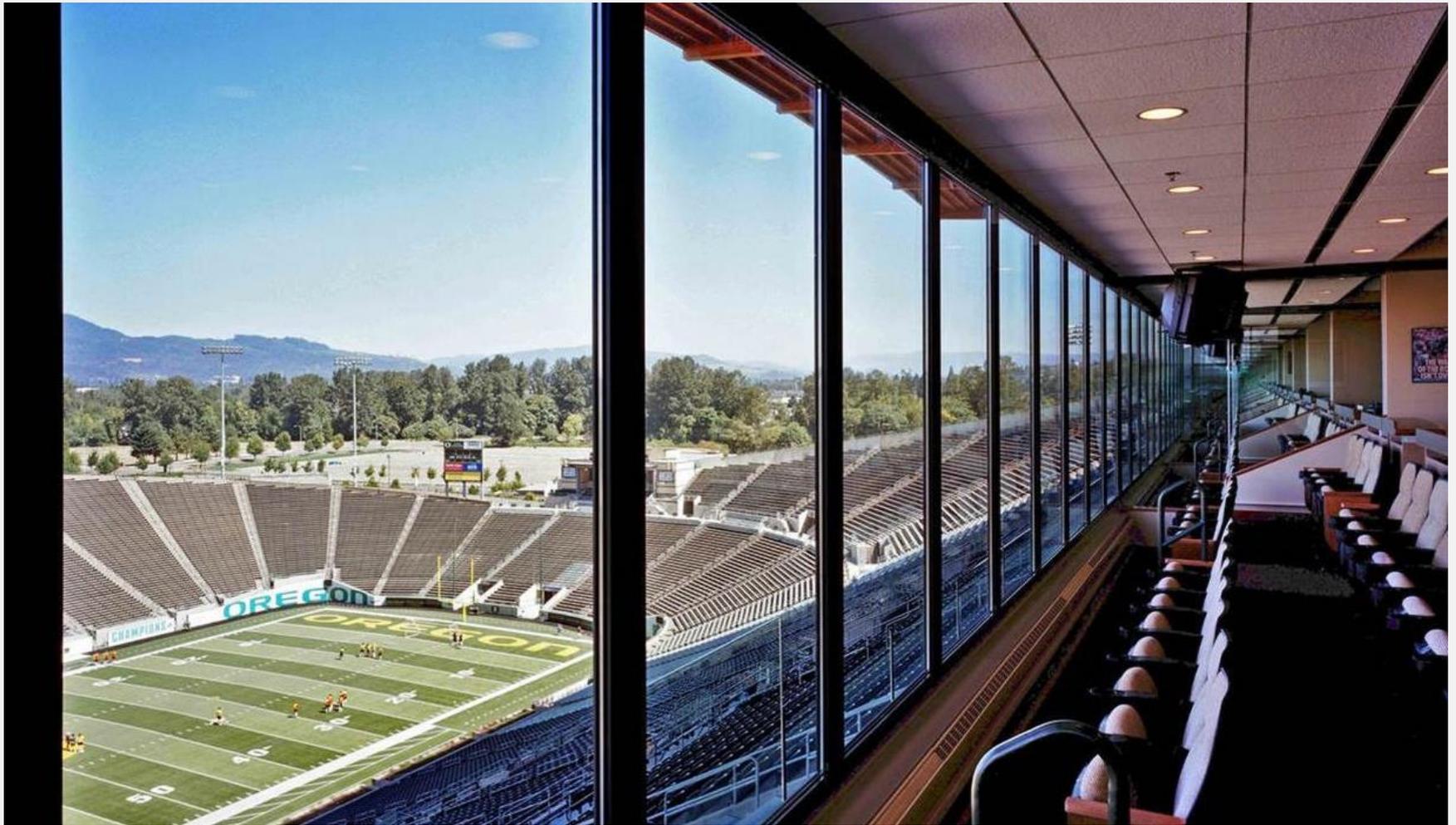
40 Panels Slide Left – 40 Panels Slide Right



University of Oregon, Autzen Stadium

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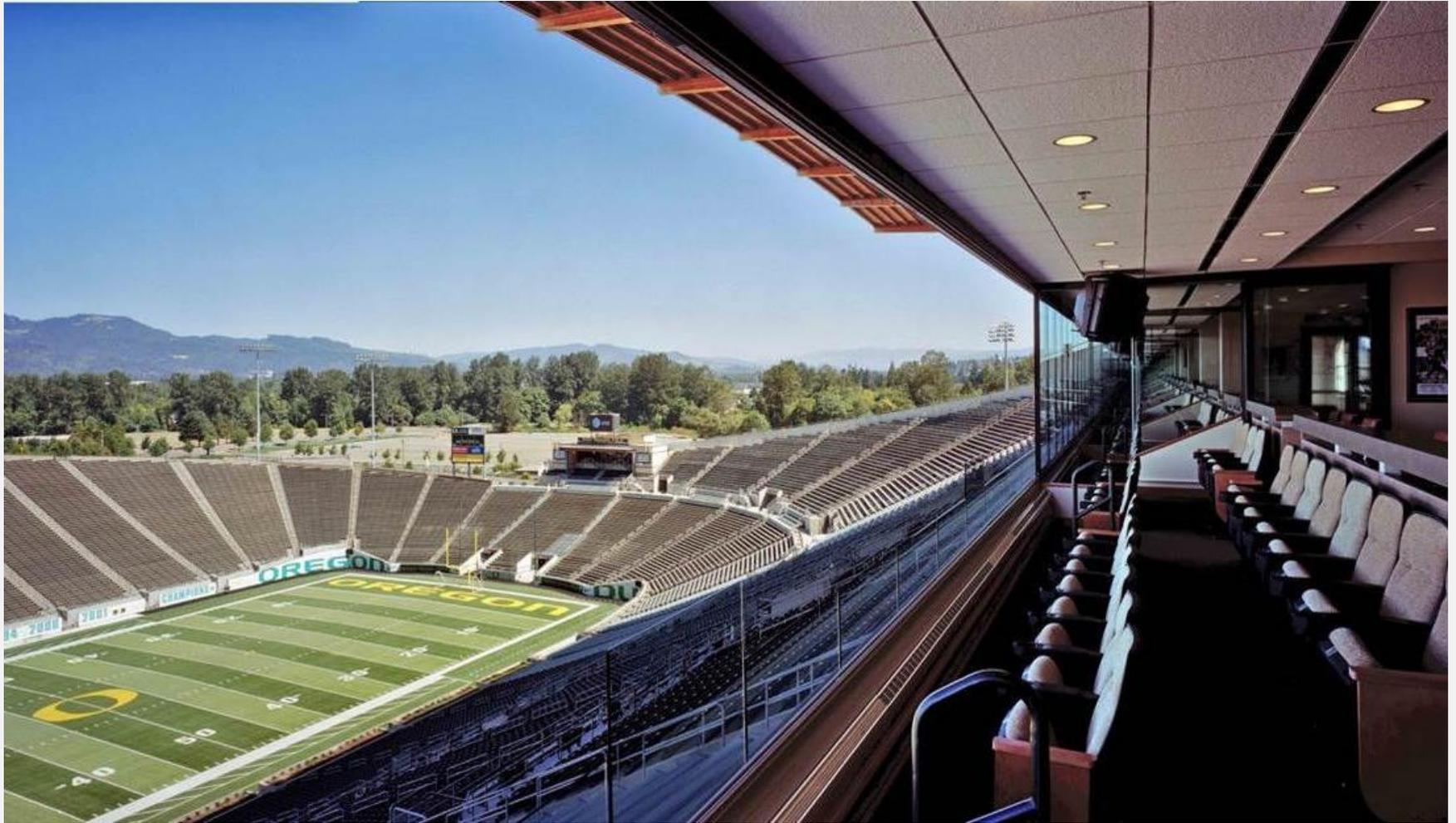
Closed – Sheltered from the Elements



University of Oregon, Autzen Stadium

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Open – Clear Unobstructed View



University of Oregon, Autzen Stadium

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Folding or Sliding?

That is the Question!!

Folding Systems – Up to 43' Wide



Srygley Office Building - AR

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Folding Systems can be Segmented



Folding Systems can be Corner-less



Private residence - CA

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NYIT Solar Decathlon – Open House



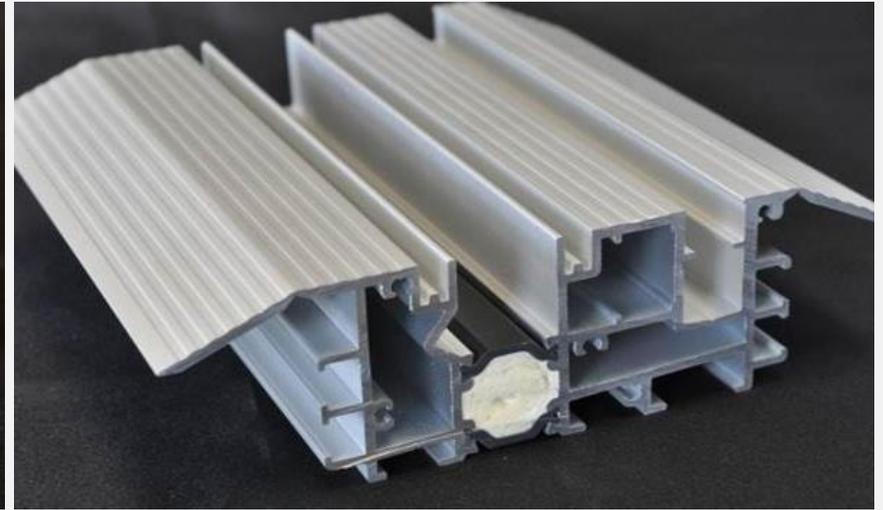


Sill Options for Folding Systems – Exterior Applications



Raised Sill

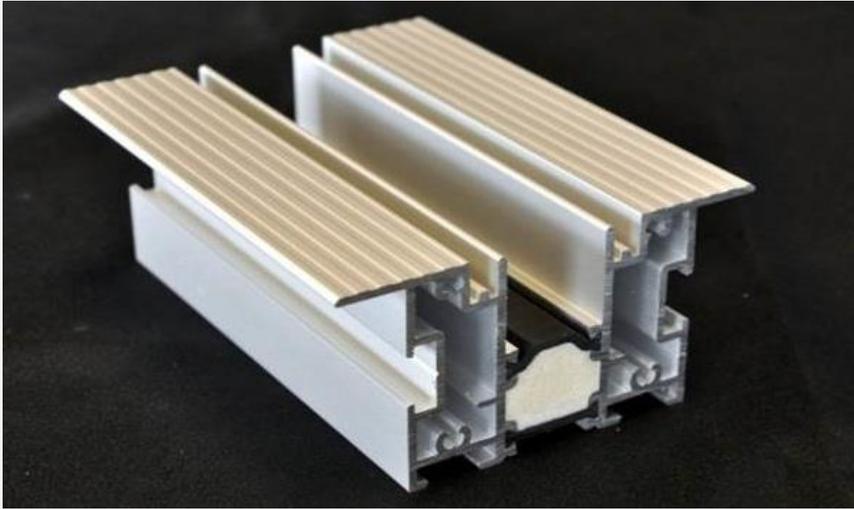
Raised threshold tested for up to 12 PSF



Low Profile Saddle Sill

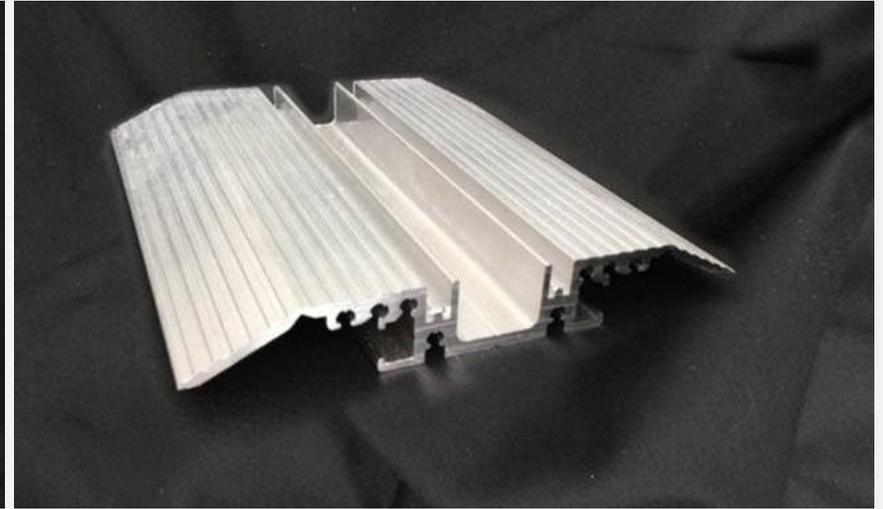
Low profile saddle sill for ADA compliance

Sill Options for Folding Systems



Flush Sill

Flush with finished floor



Surface Mounted Interior Sill

No cutting of subfloor and ADA compliant

Folding Doors can be:

- Aluminum Clad over Solid Wood
- Solid Wood
- Thermally Broken Aluminum
- Non-Thermally Broken Aluminum
- Structurally Glazed
- All Glass

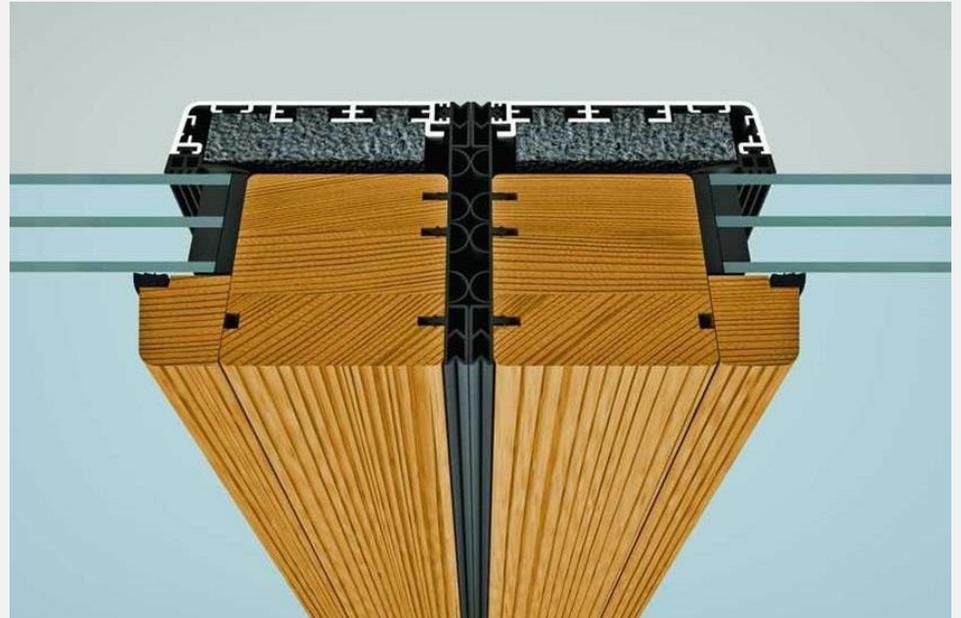
Aluminum Clad over Wood

- Low maintenance
- Tested to 12 PSF
- U-values to .17
- Energy Star Rated
- Up to 9'10" high
- Pine, Douglas Fir, or Red Meranti are standard – FSC woods available



Aluminum Clad over Wood

- 3 ¾" (97 mm) Panel depth—
U-value .17
- Meets Passive House
Standards



Wood Folding Systems

- Tested at 12 PSF
- Wood is Nature's best Insulator!
- U-values as low as .19 (R-5)
- Energy Star Rated
- Up to 9'10" high
- Pine, Douglas Fir, or Red Meranti are standard – FSC woods available



Thermally Broken Aluminum

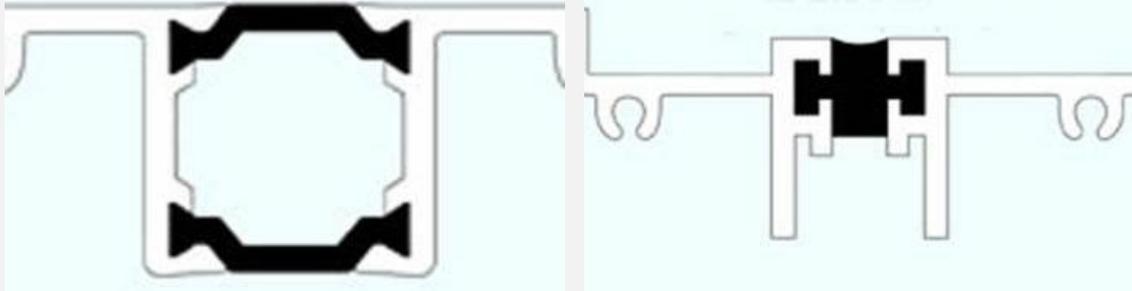


Elevation 8,500 Feet

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Thermally Broken Aluminum

Structural thermal strut vs. Pour and de-bridged



- Glass-reinforced polyamide
- Up to 50% better thermal performance
- Strongest structural thermal barrier
- PVC or Polyurethane
- Minimal separation
- Weaker structurally

Commercial Grade Aluminum Folding Doors – Up to 10' High

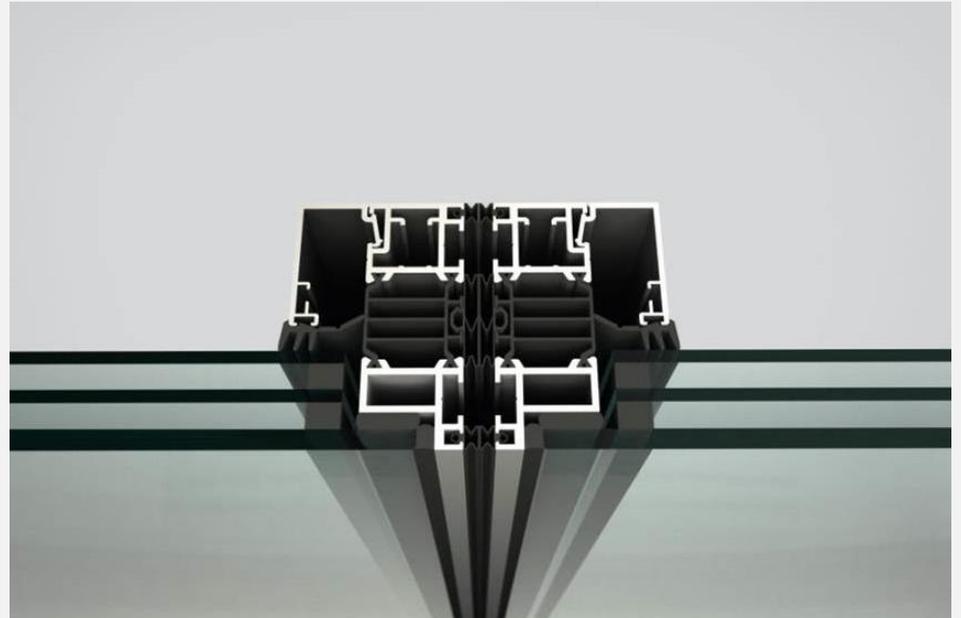


Thor Restaurant - NY

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Folding – Structurally Glazed

- Dual or Triple glazed
- 24 inswing stacking configurations
- U Values to .29



Structurally Glazed Systems



Burnaby Residence

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All Glass Folding



Union Bank

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Folding Wall Technology

- **Cardanic Engineering**

Enables four points of equal weight distribution along the entire extrusion.

- **Hinge adjustment**

Vertically. Yes.

Horizontally. Yes.

Multiple times. Yes.

- **Pressure Equalization**

Double Siliconized Gaskets with airspace.



Door Lite Infill can be...



ESPN Zone Live - LA

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Panic Hardware



Honua Kai

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Concealed Hinges and Two Point Locking System Provide for a Clean Appearance.



Maritime Parc - NJ

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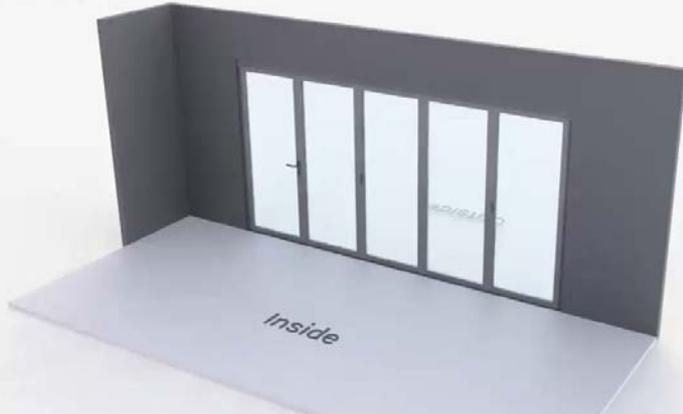
Screens



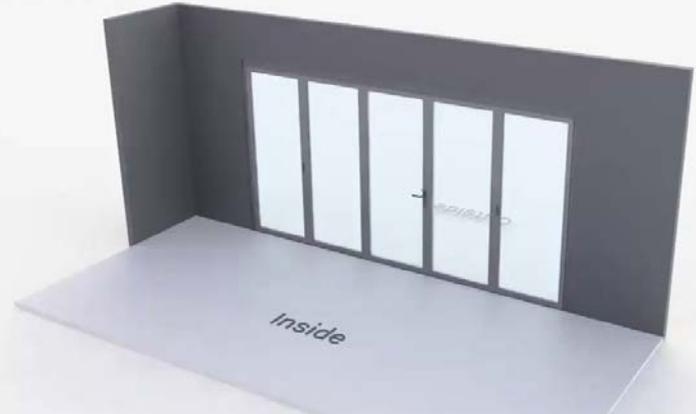
Northbrook Residence

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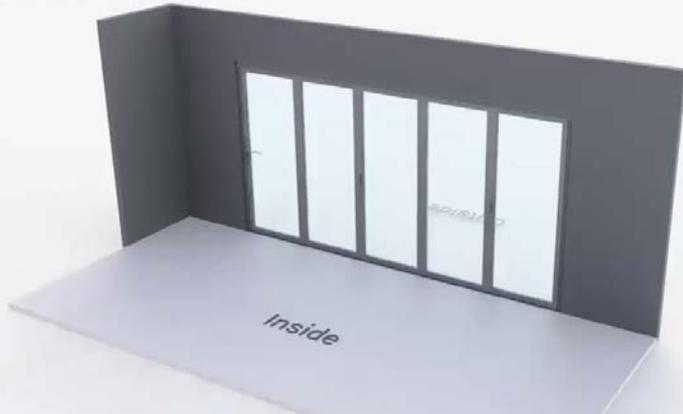
Outward o1L4R



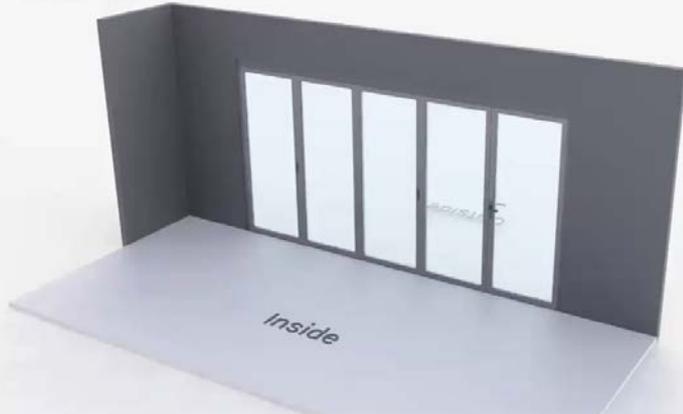
Outward o3L2R



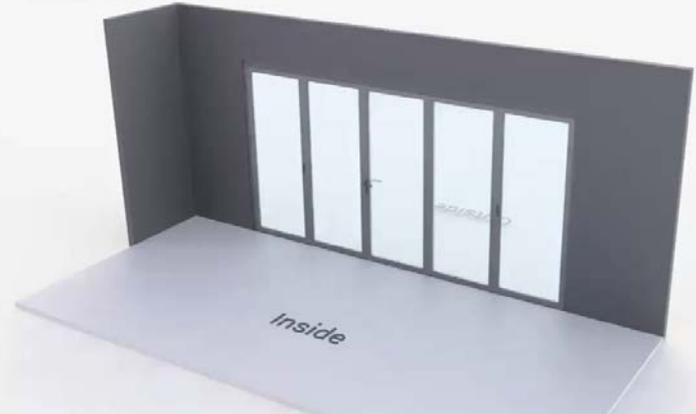
Outward o5R



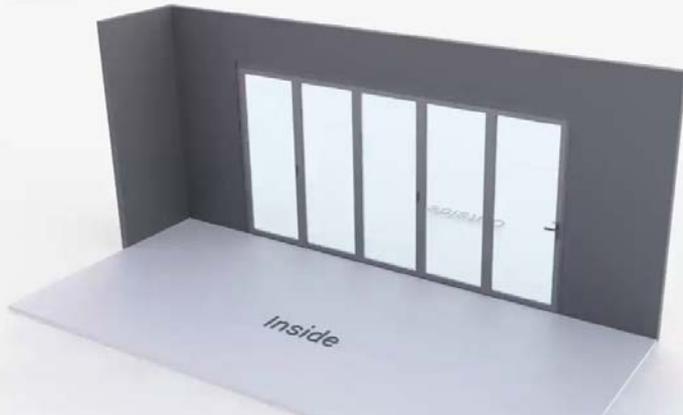
Inward i4L1R



Inward i2L3R



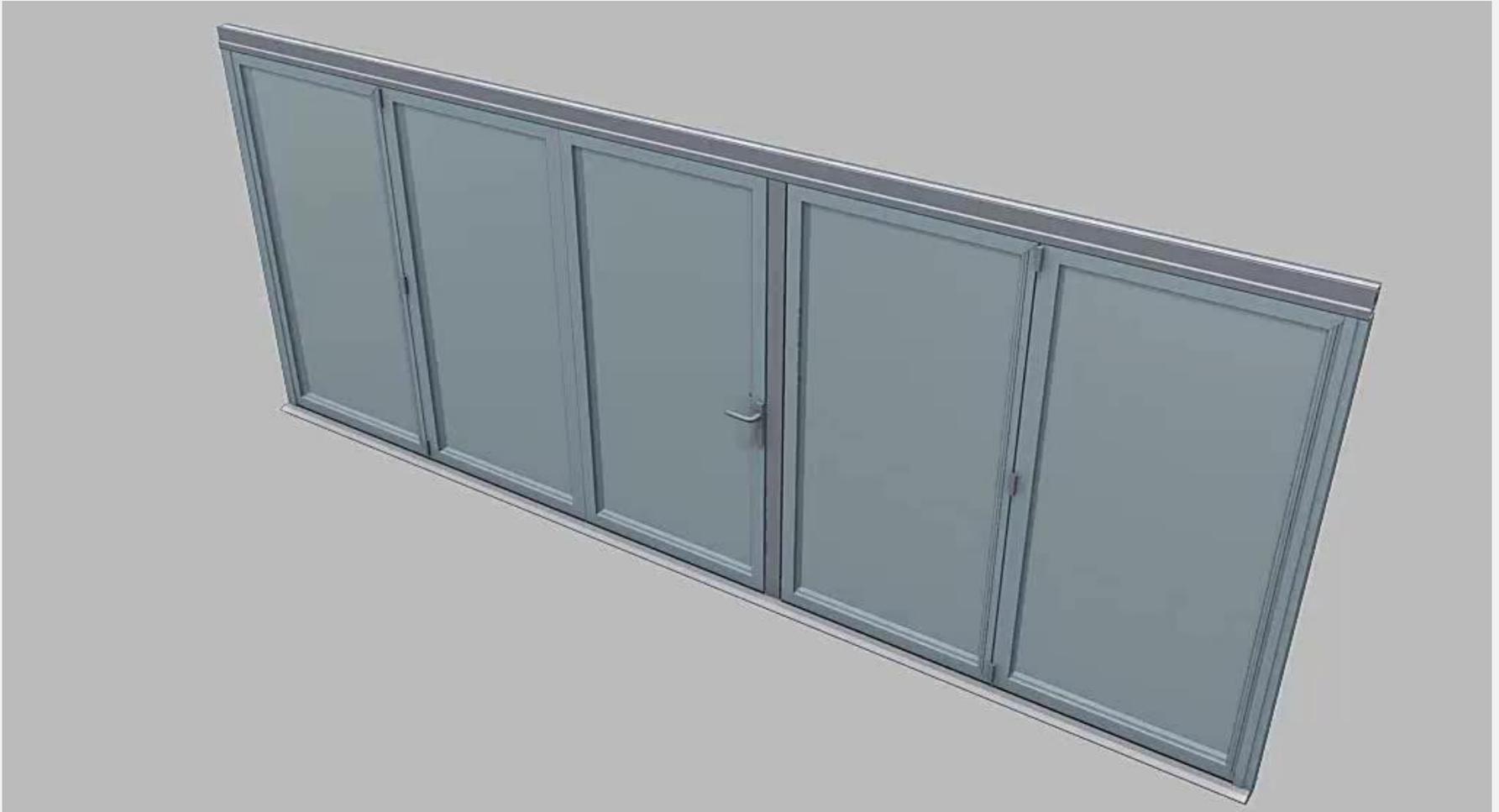
Inward i5L



Folding Doors:

- 80% of single track large glass openings sold in the North America are folding doors
- Easier to operate than sliding
- Better air & water performers than sliding
- Structural load is within the plane of the opening
- Can be top supported or floor mounted

Floor Supported Animation



Paired Panels



The number of panels and width of the opening is virtually unlimited with paired panels

Paired Panels



FoldFlat



FoldFlat

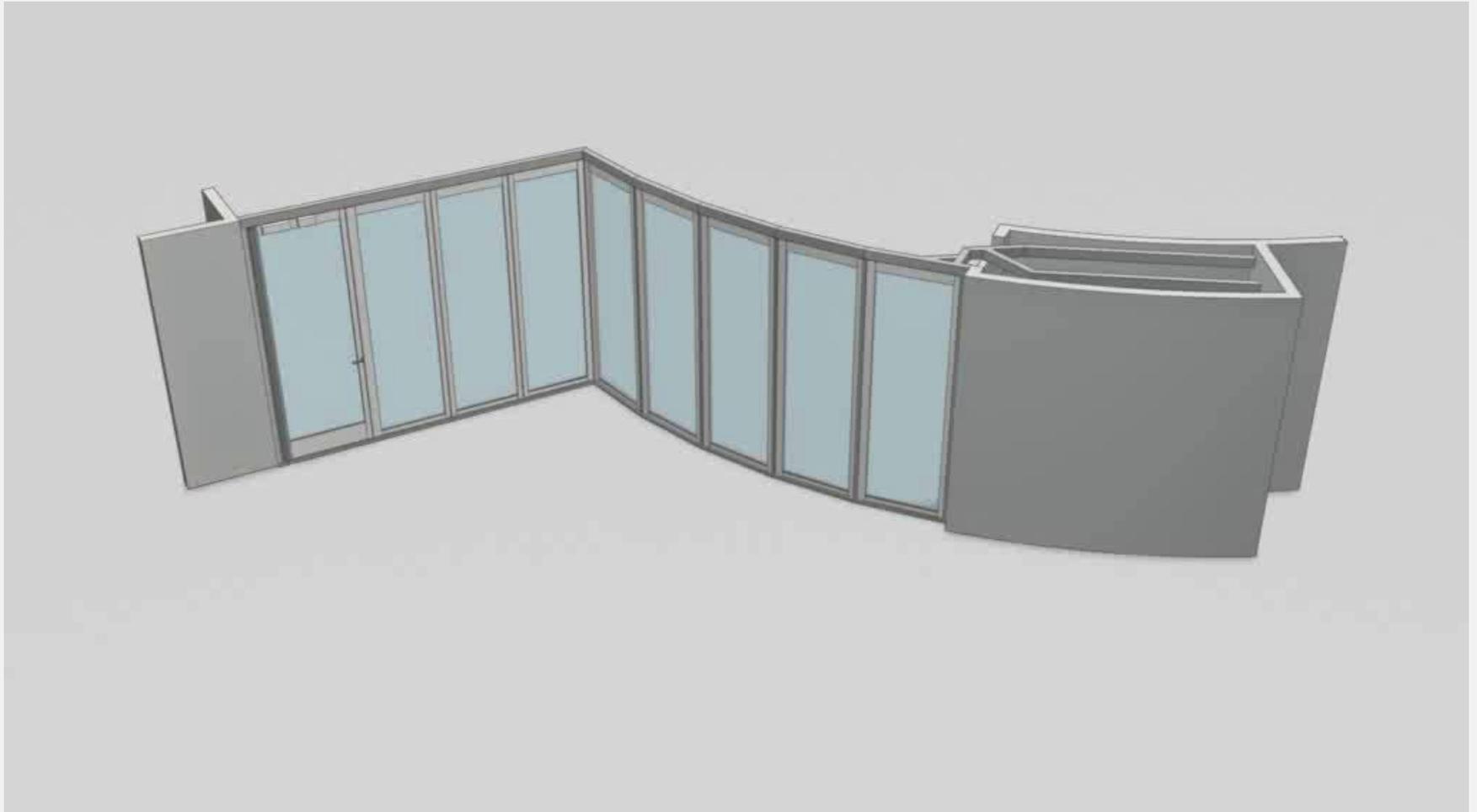


Sanders Elementary

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When Are Sliding Systems Your Best Choice?

Multiple Angle Changes with Flexible Storage



A Virtually Unlimited Number of Panels is Possible!



Cal Memorial Stadium

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Used when the Stacking Bay is Beyond the Plane of the Opening.



United Nations International School

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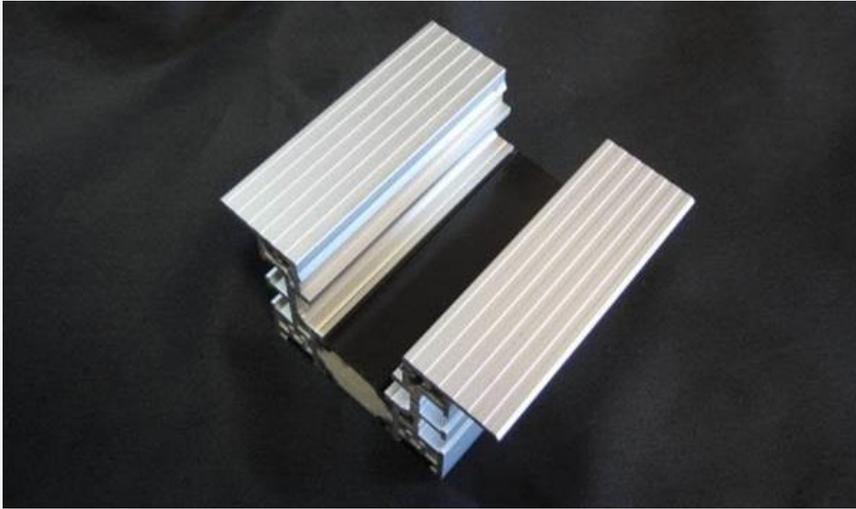
All the Weight is Carried by the Top Track



La Jolla Residence

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Sill Options for Sliding Glass Walls



Flush

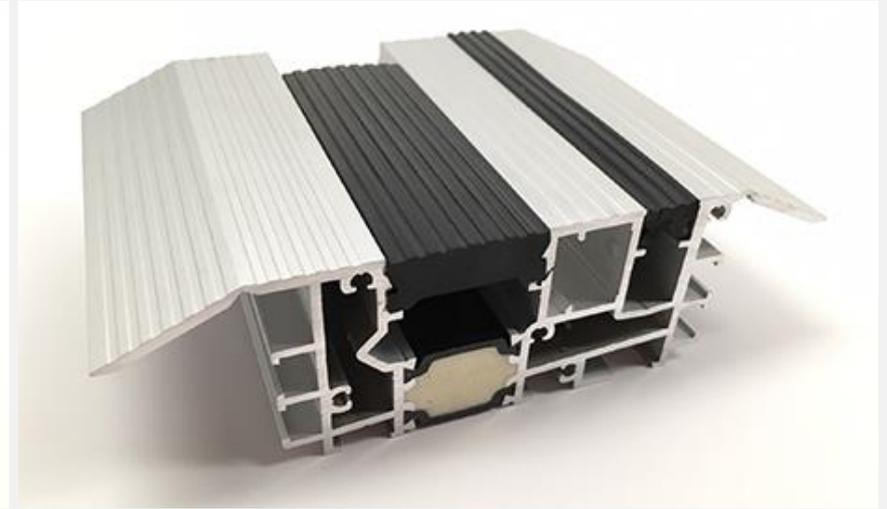


Floor Socket

Sill Options for Sliding Glass Walls

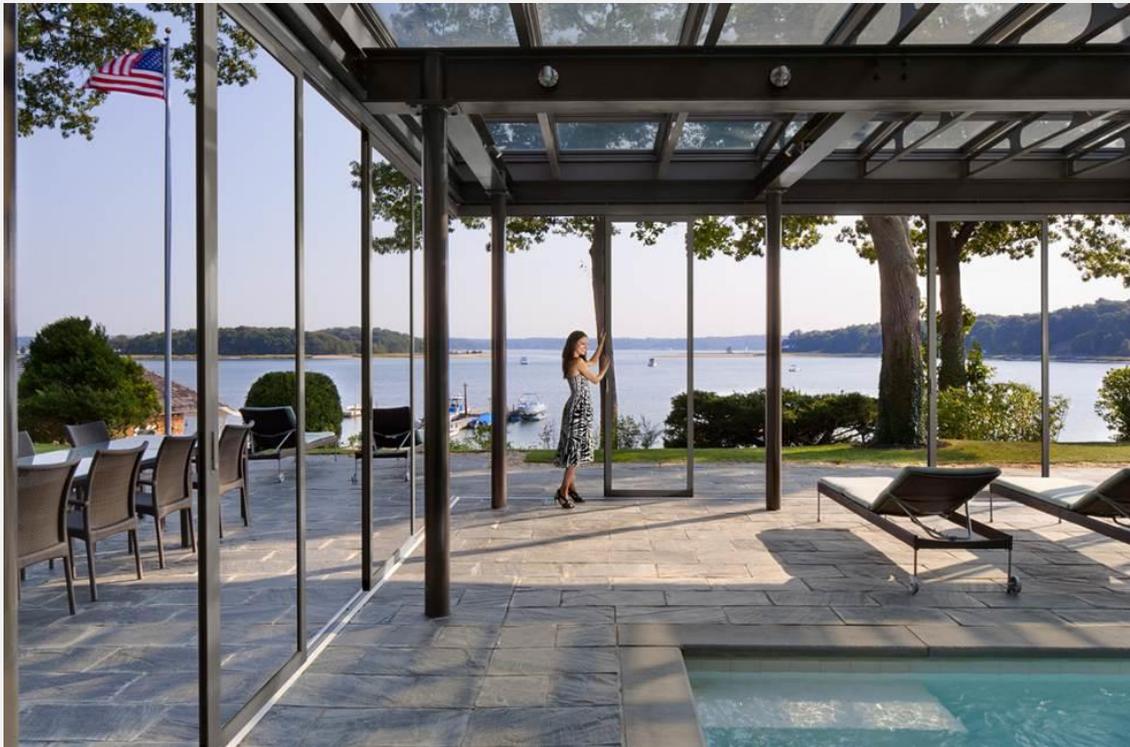


Surface Mounted



Low Profile Saddle - Exterior

Sliding Panels Can Be:



Thermally Broken Aluminum

Wood

All Glass

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Wood Framed - Single Track Sliding with Center Swing Doors



All Glass - Storefront



Gina Laura

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All Glass – Acoustically Rated



Cornerless



Segmented Curves



Chicago White Sox

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Luxury Box Space Management Options



Sliding Glass Walls have been tested to:

- U-Values as low as .26 with triple glazing
- Energy Star Rated
- Structurally tested up to 60 PSF
- Forced entry resistance per AAMA 1202.5 and CAWM 300-96
- Incorporated Swing Door tested to 500,000 open/close cycles per AAMA 920

Single Track Sliding Glass Walls:

- Offer more flexible configurations than folding
- May have Incorporated Swing Doors
- Floor track not necessary
- Restricted only by the structure for unlimited widths

Minimal Framed Sliding Glass Walls

When Are Minimal Framed Systems Your Best Choice?

- Complete connectivity between inside and outside
- Allow more freedom
- Panels slide out of the way for completely open spaces

Visual Profile: Minimal Frames Maximize Connection—Even When the Panels are Closed



Minimal Framed Sliding Glass Walls

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Integration: Elements Integrate Cleanly with Walls and Floors for an Elegant Appearance

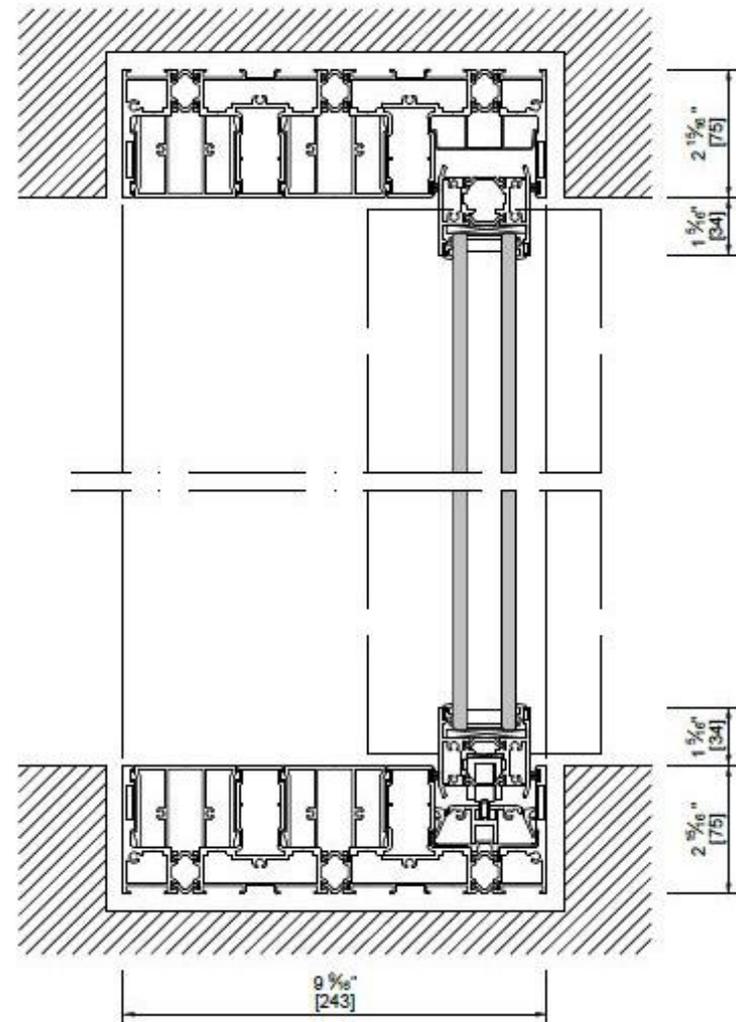


Minimal Framed Sliding Glass Walls

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Construction Coordination:

Minimal frames integrate easily into floors, walls, and ceilings.



vertical section

Visual Continuity: German Engineered and Designed with Built-in Flexibility



Minimal Framed Sliding Glass Walls

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Why Design Large Openings for your Project?





ATLAS
Garages
ACCEPTÉES
ICI

LINCOLN JEFFERSON
FILLER STATION

Blue Diamond

GOODYEAR
EAGLE ST

GOODYEAR
EAGLE ST

To Enhance the Learning Process:



Burleson Elementary

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To Expand the Available Space:



Shore Hotel

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To Create Large Inviting Entrances:



Casino Arizona

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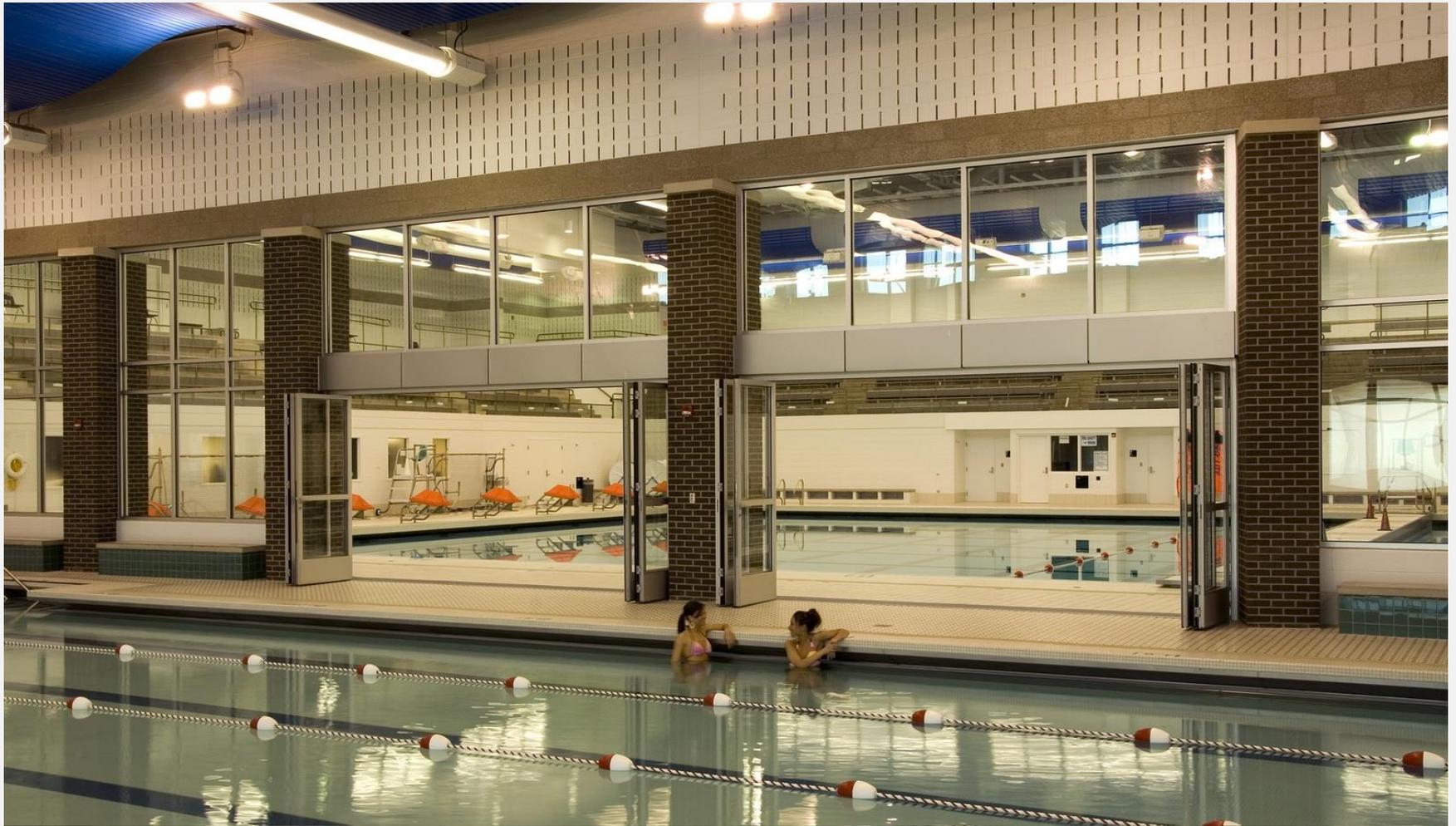
To Maximize Natural Lighting:



University of Hawaii Cancer Center

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Multi-Function Usage:



East Kentwood High School

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For Interior Space Management:



Edmonton North Clinic

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For Security:



Park City Residence

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To Provide a Physical Barrier:



Amway Center – Orlando Magic

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To Connect with the Environment:



Hotel Indigo

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Where are Large Openings Used?

Comfort Office



Double Skin Façade enables individuals to regulate their own balance of heat and fresh air supply with out the use of a mechanical system.

Schools - Flex Space



Carrie Busy Elementary

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Libraries



Palo Alto Children's Library

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Restaurants



Gloria's Restaurant

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More Restaurants



Melt Restaurant

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ROI 600 Square Foot Patio



40 Seats
@ 75% Occupancy

= 30
seats



Average Check
per Seat x 30

= \$900



Turns per Day
x \$900

= \$2,700
Daily Gross Revenue



40% Contribution
Margin x \$2,700

= \$1,080



Operating Days
= \$129,600



Operating Days
= \$388,800

Libart USA - How to Calculate ROI of Operable Glass Architecture

Stadiums



Boise State University

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Stadiums



Training Facility



Arizona Diamondbacks and Colorado Rockies Training Facility

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Gymnasiums and Leisure Facilities



US Ski Team Facility

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Car Dealerships



Mercedes Benz Dealership

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Cultural Centers



Skirball Cultural Center

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Residential



Loblolly House

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Residential



Belvedere Kitchen

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Balconies



Wrigley Field Rooftops

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How Well Does a Large Operable Glass Wall Perform?

Performance

- *This is NOT a Simulation*

- Extreme Weather, No overhangs
- NFRC certified, rated, and labeled.
- Entire system, NOT center of glass values.



Elevation 8,500 Feet

Performance

- Not all Operable Glass Walls are Created Equal



- Air and Water Resistance
- Design Pressure
- Thermal
- Acoustical
- Forced Entry

Look for certified, independent, lab results. Size, Configuration, and Sill matters. One test does not fit all.

Performance

- Not all Operable Glass Walls are Created Equal

- Impact/Hurricane
- Operating Cycles
- Aluminum Finish
- Quality Assurance



Look for certified, independent, lab results. Size, Configuration, and Sill matters. One test does not fit all.

How to Install a Large Opening Glass Wall?

Deflection:

$L/720$ or $1/4''$ whichever is less

Weight:

5.5 lbs / sq. ft. with standard insulated glass

Installation

Certified Installers:

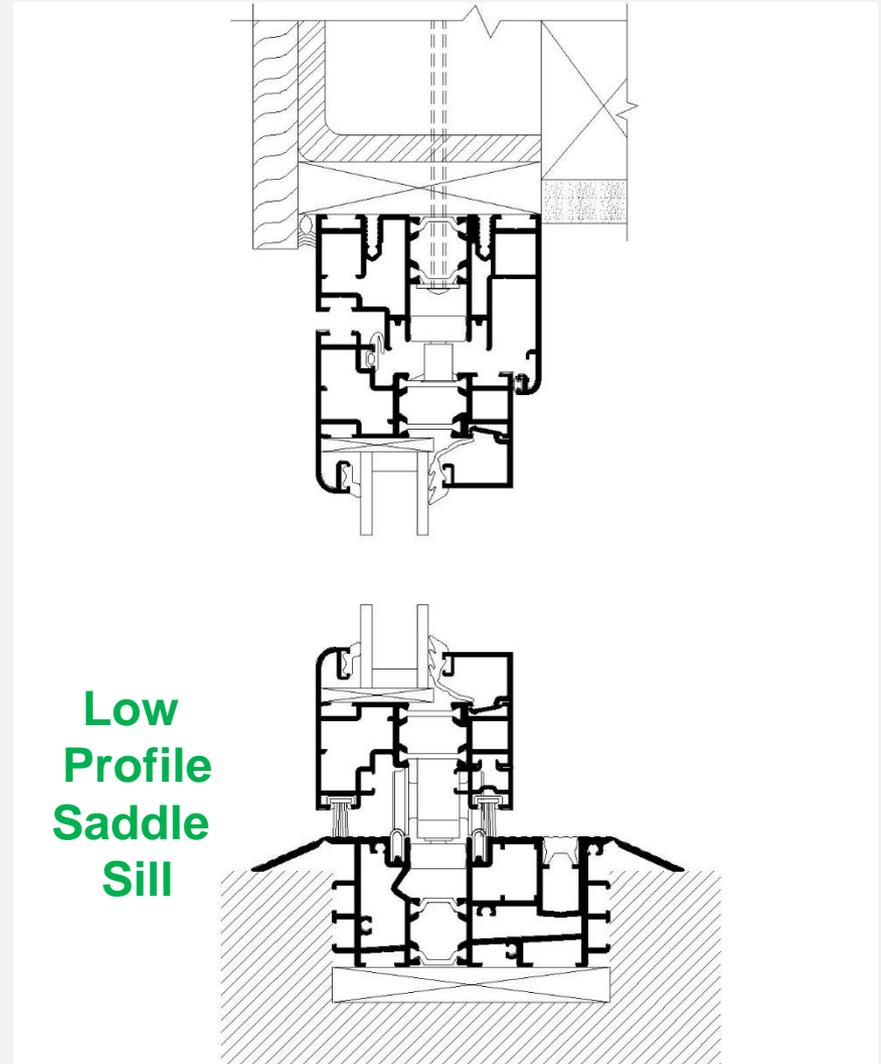
- Factory trained
- Specialized in large openings
- Service and warranty
- Pre-install site review

One King West, Toronto, Ontario, Canada



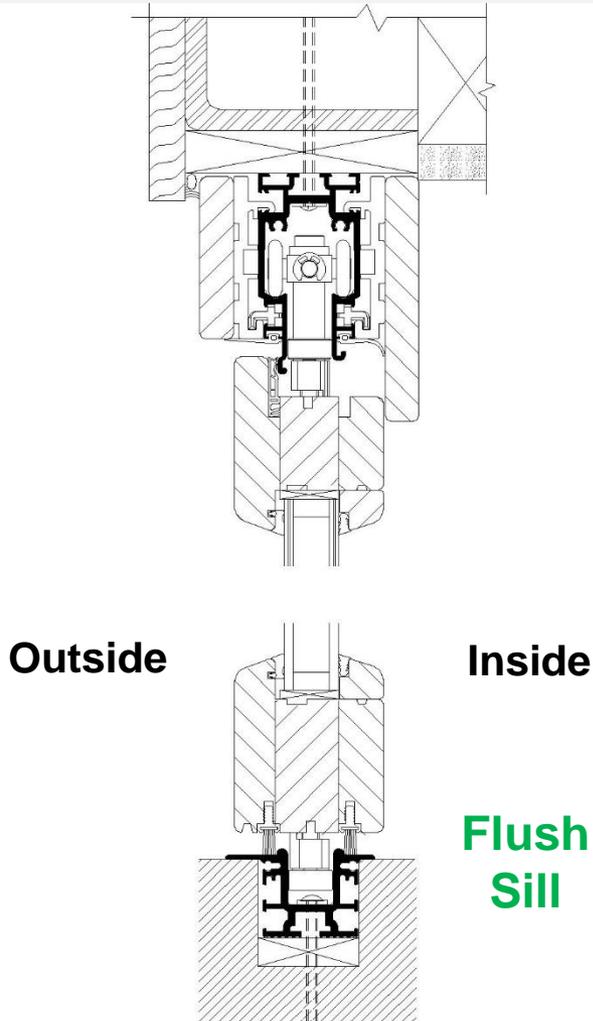
Thermally Broken Aluminum Folding System

Floor Mounted –
Outswing



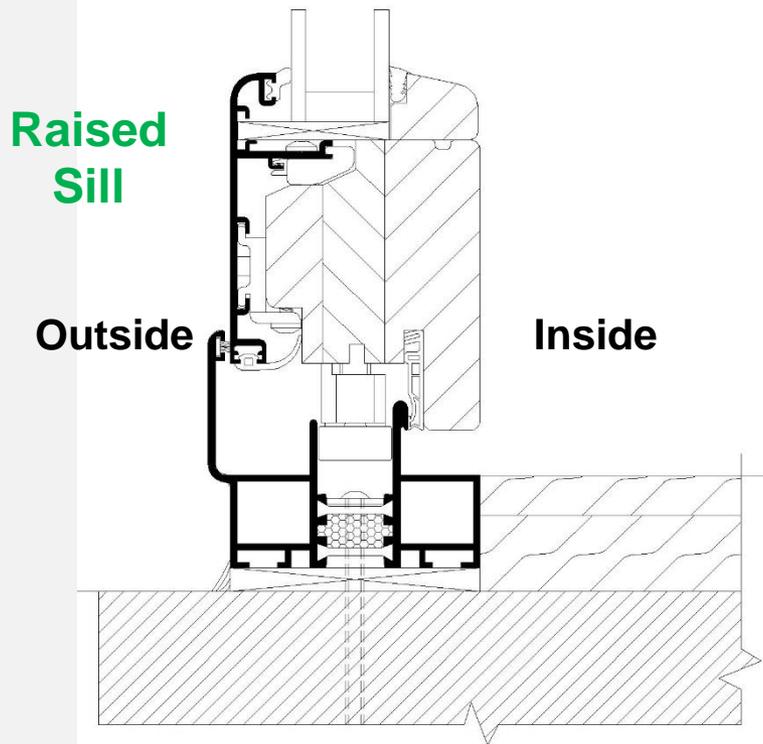
All Wood Folding System

Top Hung – Outswing

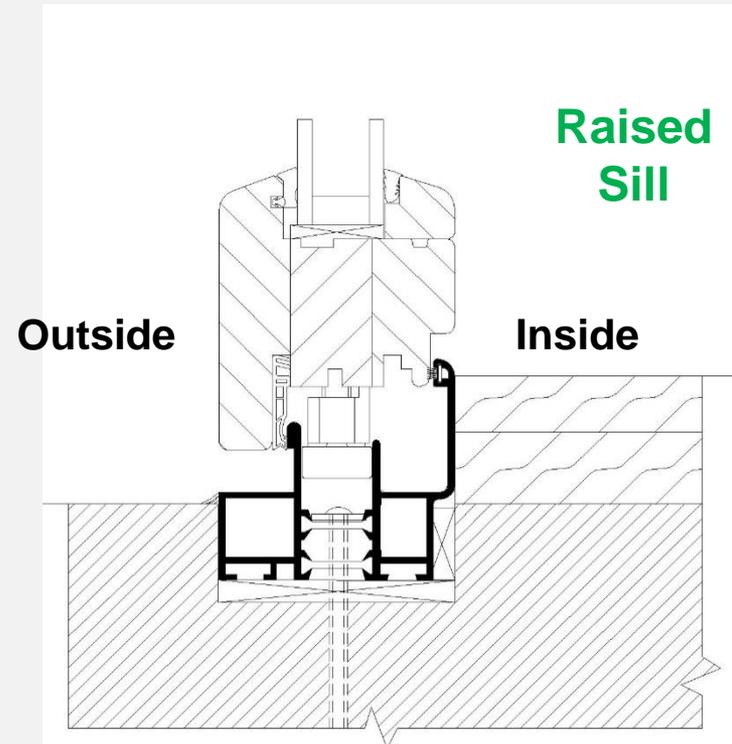


The Raised Sill

- *For very high weather resistance requirements*



Aluminum Clad over Wood -
Inswing



All Wood - Outswing



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