

# High Performance Façade Should Not Be Left To Chance



# Learning Objectives

- Discuss macro-forces at work emphasizing ventilated rainscreen facades.
- Explain system choices. Why 'systems' thinking is so important. From Simple, to High Performance to Innovative.
- Explain Bespoke System Design, and the system for the exact location on the exact building.
- How early Design Precision and value engineering cuts costs and avoids failure.
- How sloppy specification can lead to failure and what to do about it.
- What to expect in review, shop, and installation drawings.
- Review case studies.

## High Performance Facades Should Not Be Left To Chance

You must get the façade right: performance, quality, and let's face it is the brand of the building.

You need someone who can connect the dots of people, products, systems in such a way that your project's chance to come out the way you intended is true.

*A testimony: "You have always been an experienced voice in the façade materials world, so we look forward to continued discussion on how we realize our design objectives, both from an aesthetic and technical point of view."*



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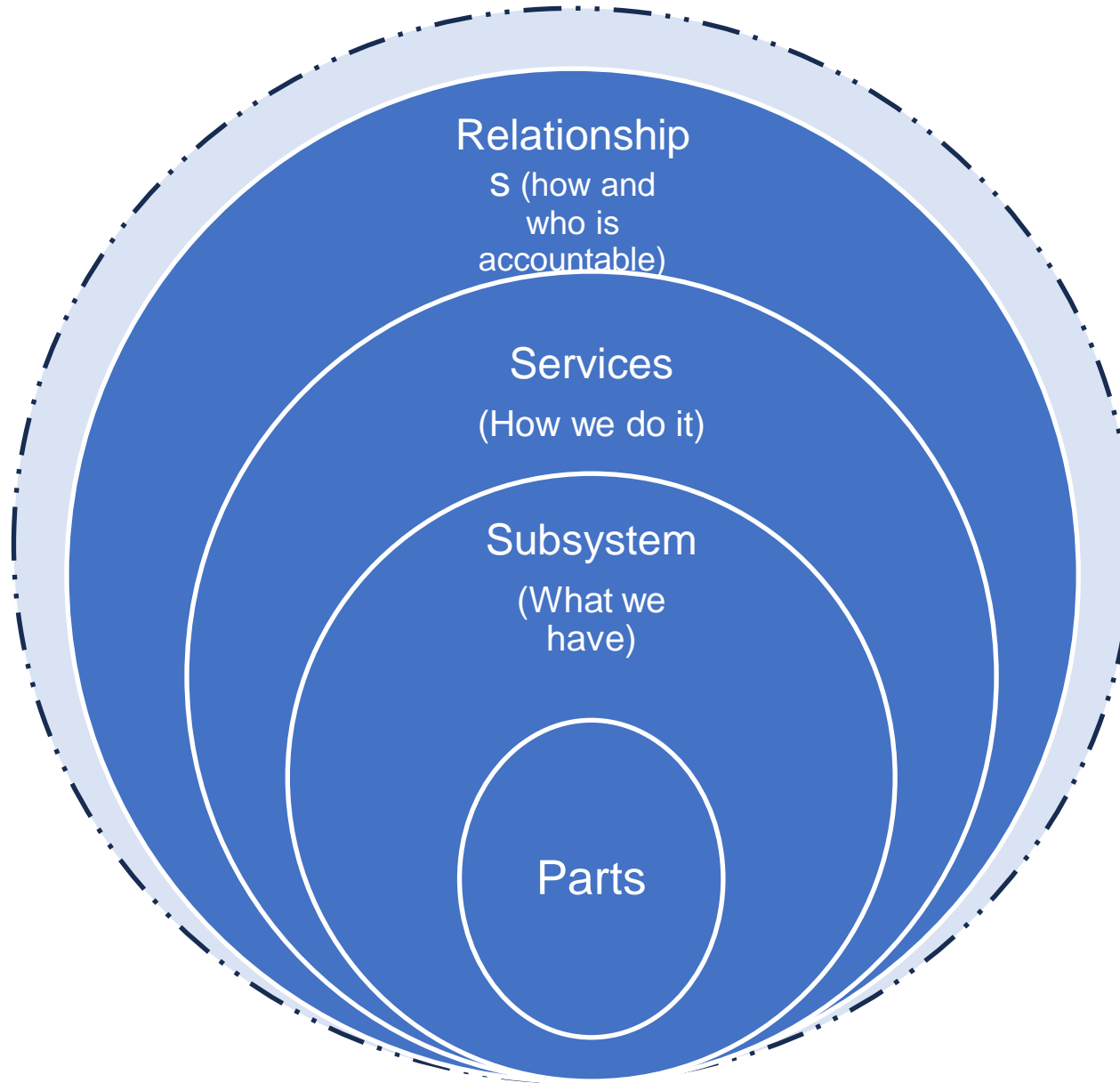




## Welcome to Systems Thinking for Ventilated Facades

- Ventilated facades may have started in Norway in the days of huts.
- Systems Thinking was Socrates wasn't it?
- And Better buildings were built hundreds of years ago.
- And I took Building Science about thermal bridging in the \_\_\_'s





The Division 07 System inside the entire building system, inside the entire property system, inside the entire community system, and so on, and so on...



### The point of it all

By building the Division 7 activities as a system, from sheathing out to cladding, with the most narrowly focused accountability, in a comprehensive and tightly woven collaboration and relationships, we will overcome barriers and reach new goals in façade design and construction.\*

[Same comment true if prefabricated walls, curtain wall with rainscreen elements or volumetric modular]

\*drawing the line at the current Division separations to reflect the norms within which we must work.

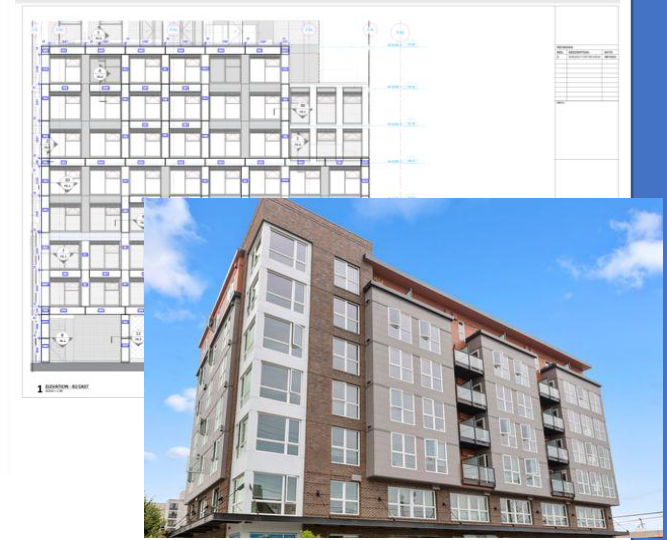
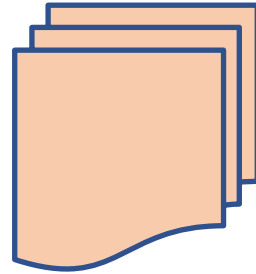
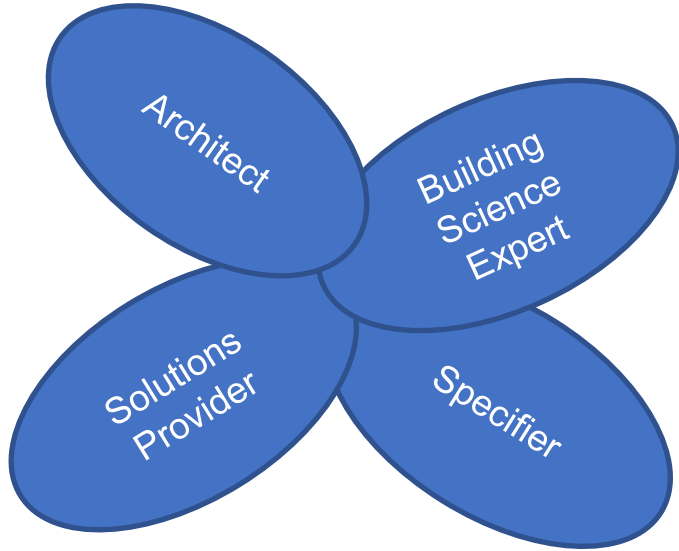
# Plainly put, Systems Thinking Allows Focused Accountability

Design Precision

Excellent Tender Package

Competition

Design and Construction  
Feedback Loops





Systems thinking is a way of making sense of the **complexity** of the world by looking at it in terms of **wholes** and relationships **rather than by splitting it down into its parts**.<sup>[1][2]</sup> It has been used as a way of exploring and developing effective action in complex contexts,<sup>[3]</sup> **enabling systems change**.<sup>[4][5]</sup> Systems thinking draws on and contributes to systems theory and the system sciences.<sup>1</sup>

Tools for the Systems Thinkers: 6 Fundamental Concepts of Systems Thinking.<sup>3</sup>

- Interconnectedness
- Synthesis
- Emergence
- Feedback Loops
- Causality
- Systems Mapping



Systems thinking is a **holistic** way to investigate factors and interactions that could contribute to a possible outcome. A **mindset** more than a prescribed practice, systems thinking provides an understanding of how individuals can work together in different types of **teams** and through that understanding, create the best possible processes to accomplish just about anything.<sup>2</sup>

<sup>1</sup> Wikipedia  
<sup>2</sup> Academic Source  
<sup>3</sup> The Embedding Project



Put competition where it belongs, without compromising collaboration. “Right People on the Bus”\*\*



Cost at the beginning



Inherent Quality



Tight feedback loop Design through to Construction\*



Narrowing accountability



Excellence in Specification: “Say What You Need”



Excellence in Documentation “Say what you are going to do, do what you are going to say”



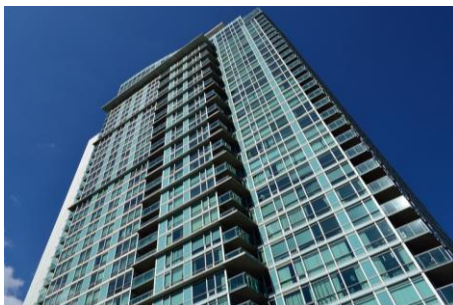
# Macro Directions – moves as fast as you want them to.



- Labour availability and skill
- >6” insulation application

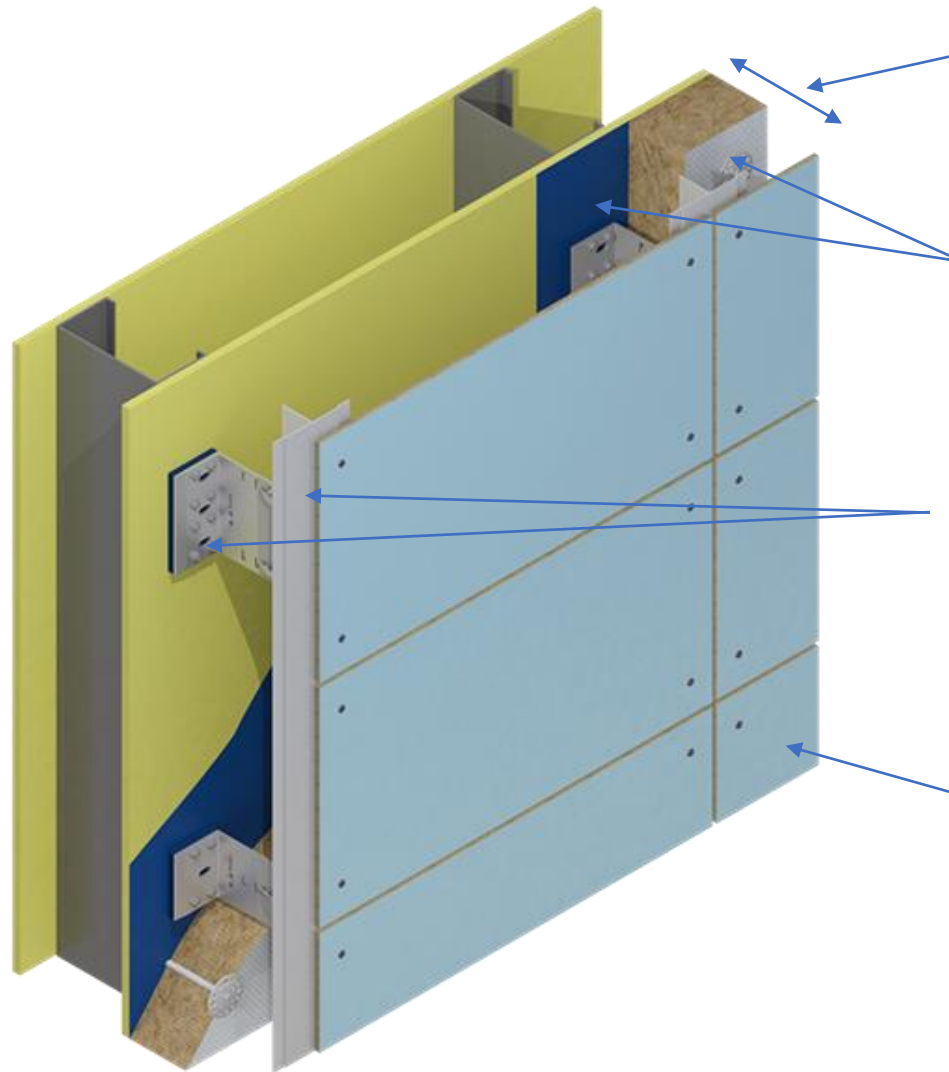


- GHG impact
- >6” insulation application



- Long term resilience – gaskets.
- Thermal performance now
- % fenestration going down.
- Curtain wall exceptions (office, high performance spandrels)





**Façade – everything outside of Sheathing**

**Insulation & AVB**

**Thermally Broken Substructure 'System'**

**Cladding; Skin, Light to Heavy, All types of finishes; Resilient; All budgets; Sustainable; Replaceable.**

# Toughest Challenges – what you are telling us

- **Built ≠ Design**
- Trade-offs; performance vs cost
- Specification pitfalls
- Constructability
- Independence of cladding.
- Best **value engineering** opportunities.
- Initial and Lifecycle costs.
- **Sustainability**

# System Choices\*

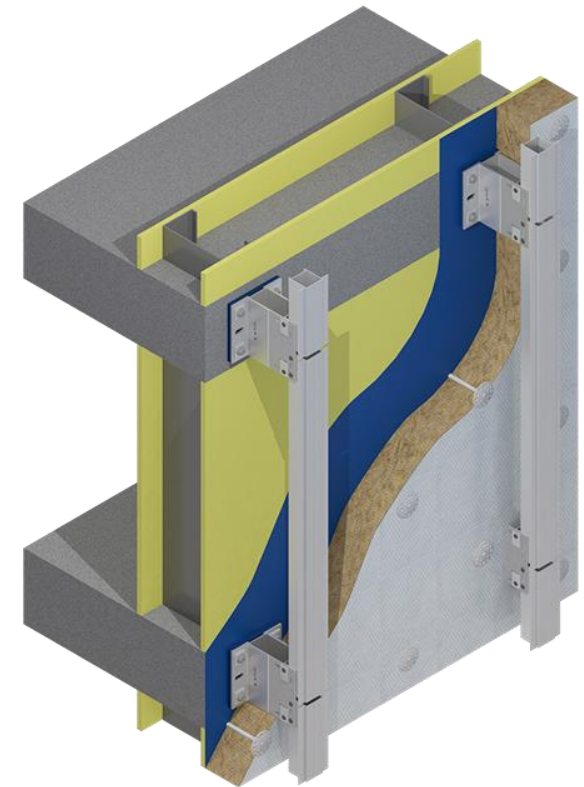
Simple



High Performance



Innovative (slab-to-slab)



\*And Everything Between



# Design Precision

# Build = Design Starts at Beginning

**Best accomplishments are at the beginning;  
Greatest Failures Avoided are too.**

- Design review.
- Cladding layout review.
- Initial system recommendation.
- Initial structural engineering and resulting thermal performance.
- Comprehensive value engineering.
- Cladding fabrication recommendations.
- Document creation; details, specifications.
- Budgeting.



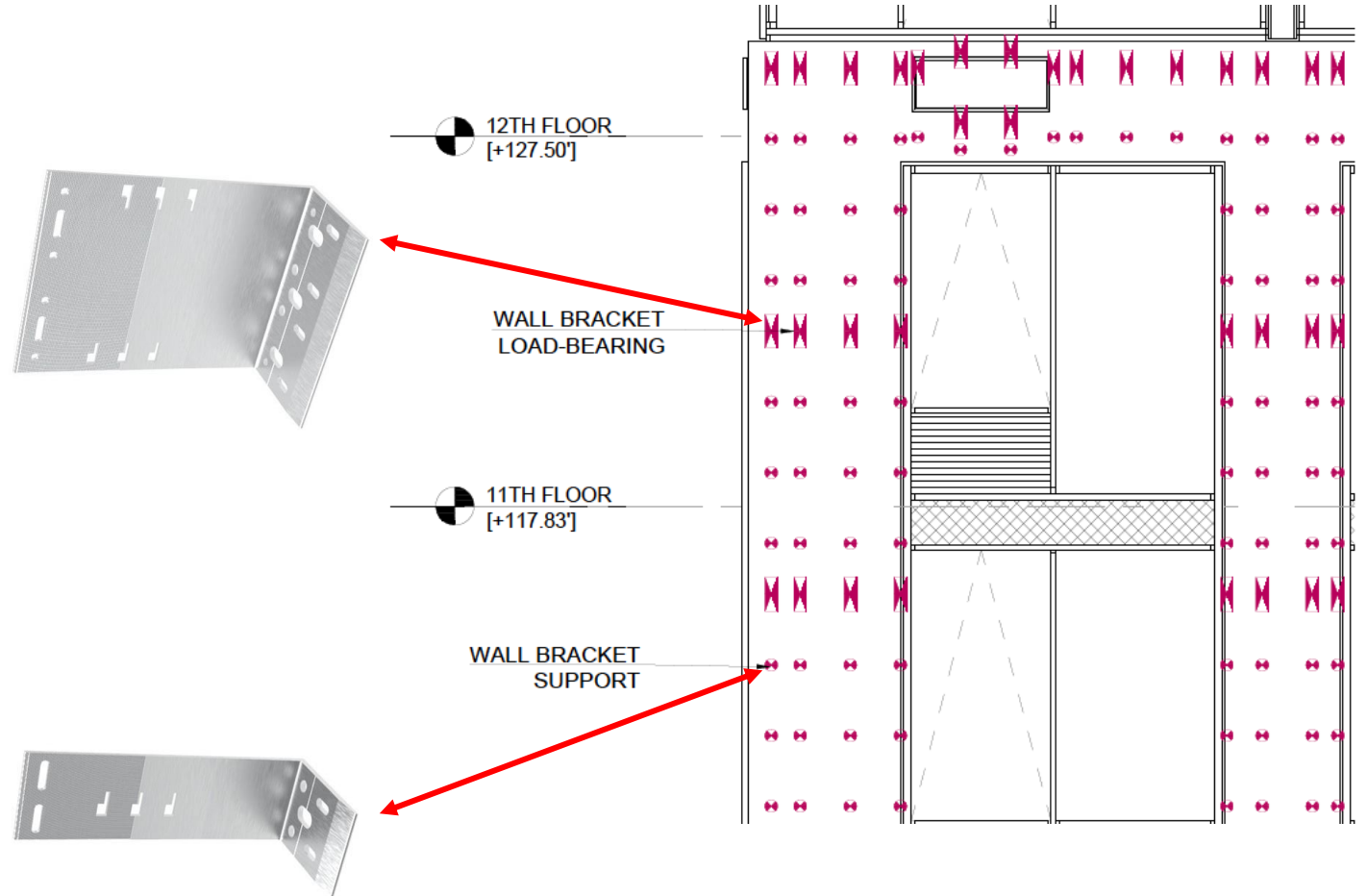
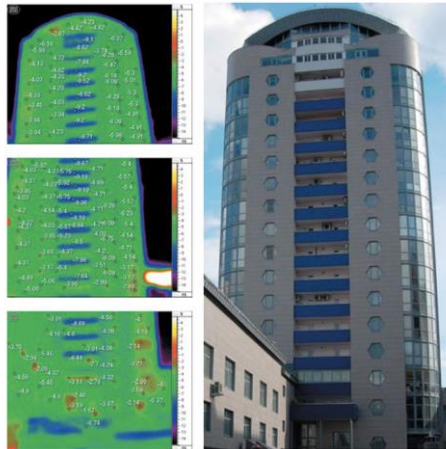
**You Should Ask for This.**

# Structural and Thermal Engineering Together

A façade is modelled for structural requirements and thereby thermal results.

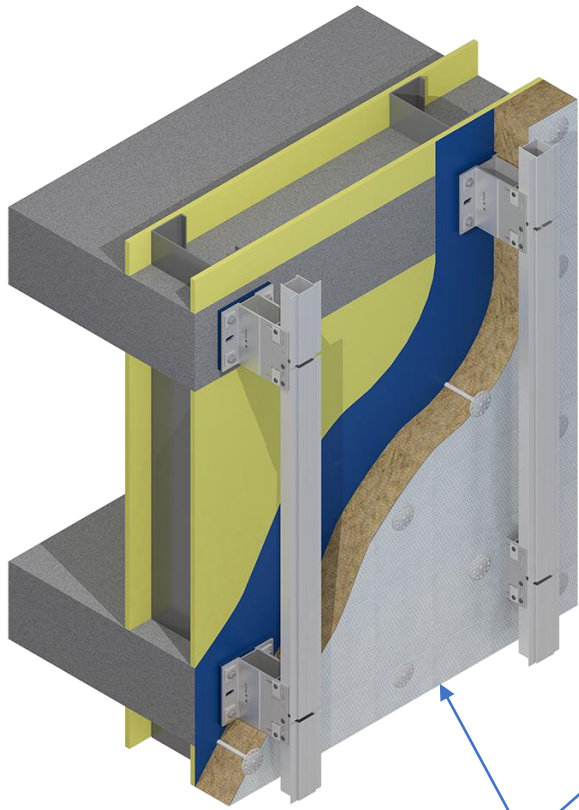
Initial **budgeting** and value engineering opportunities identified.

Problems revealed early.

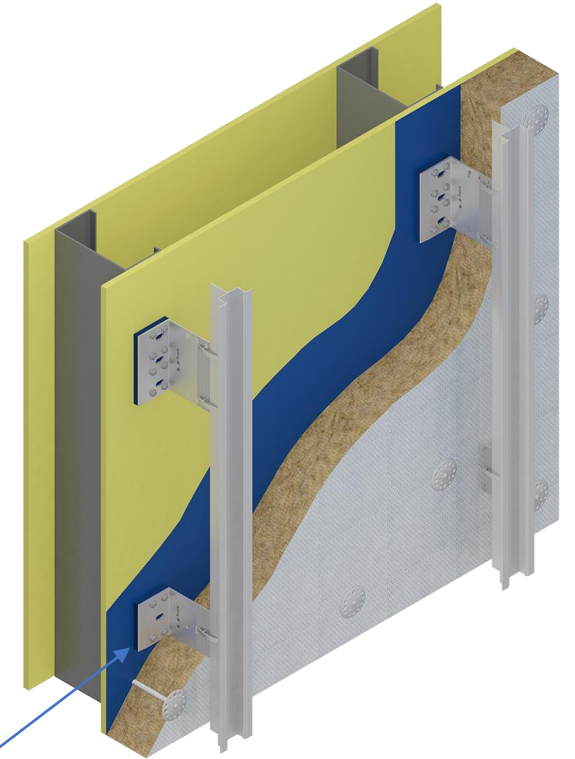
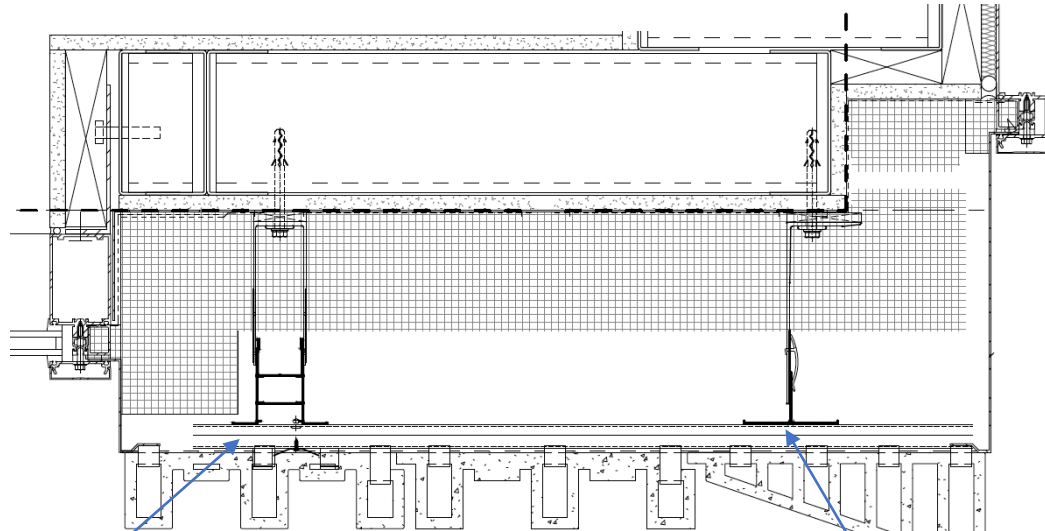


Location of wall brackets; based on structural analysis

# System Selection

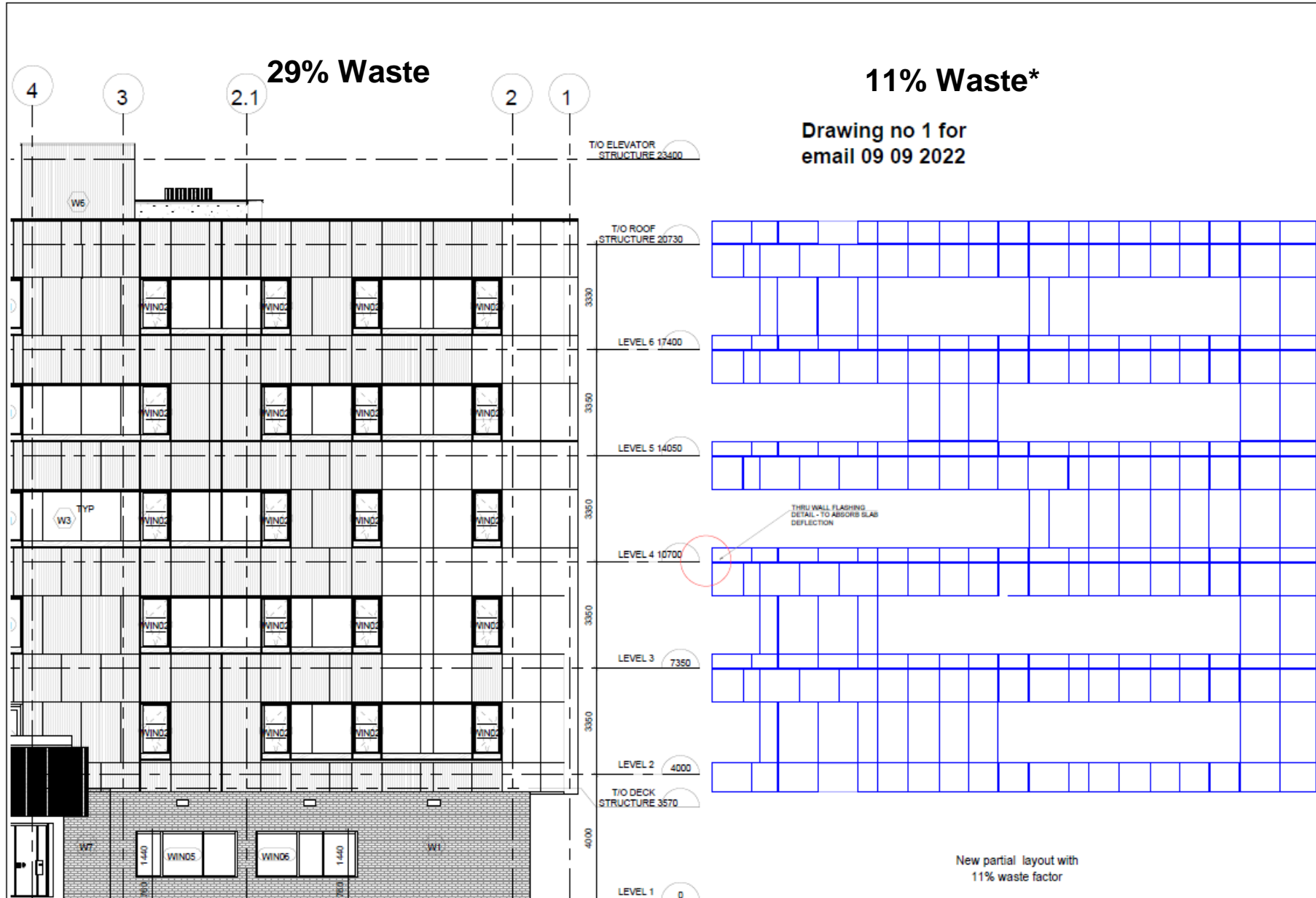


**Slab to Slab**  
Higher loads / Wall Bracket  
Faster Install



**Distributed System**  
Lighter gauge wall brackets  
Slower Install

# Panel Optimization







# Excellent Details Lead to Excellent Review Drawings Post Award

**THE WILDS**  
ARCHITECTURAL DRAWING

**CLADDING LAYOUT**

**LEGEND**

NO.	DESCRIPTION	UNIT
1	ALUMINUM CLADDING PANEL	MM
2	ALUMINUM ANGLE	MM
3	ALUMINUM CHANNEL	MM
4	ALUMINUM STUD	MM
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**VERTICAL & ENLARGED PANEL SECTIONS**

**CLIP LAYOUT**

**TYPES OF CLADDING INSTALLATION**

**GIRT LAYOUT**

**LEGEND**

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# Bespoke Systems

# Bespoke Systems “Building Blocks”

## #1 Wall Brackets



## #2 Profiles



## #3 Cladding Attachments



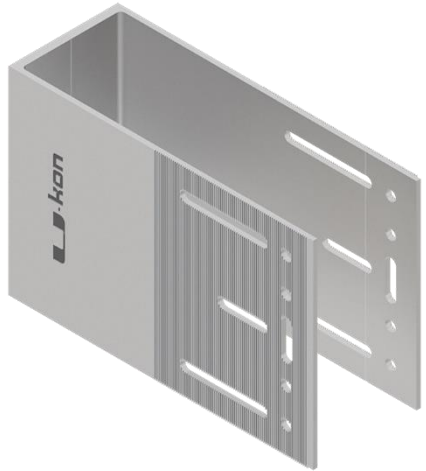
Note: Often different systems are used on the same building, depending on cladding and loads

# Wall Brackets that offer Options – High Performance

Different brackets, extenders, materials provides unique flexibility

**Adjustable in three directions: higher quality, faster install**

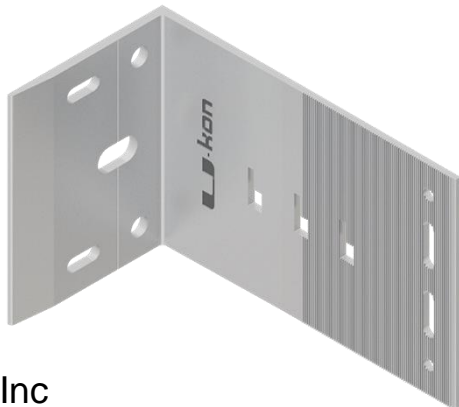
WALL BRACKETS “U” SHAPE



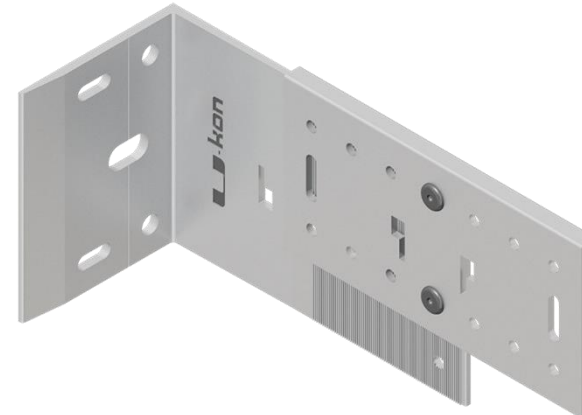
WALL BRACKETS “U” SHAPE WITH EXTENSION



WALL BRACKETS “L” SHAPE

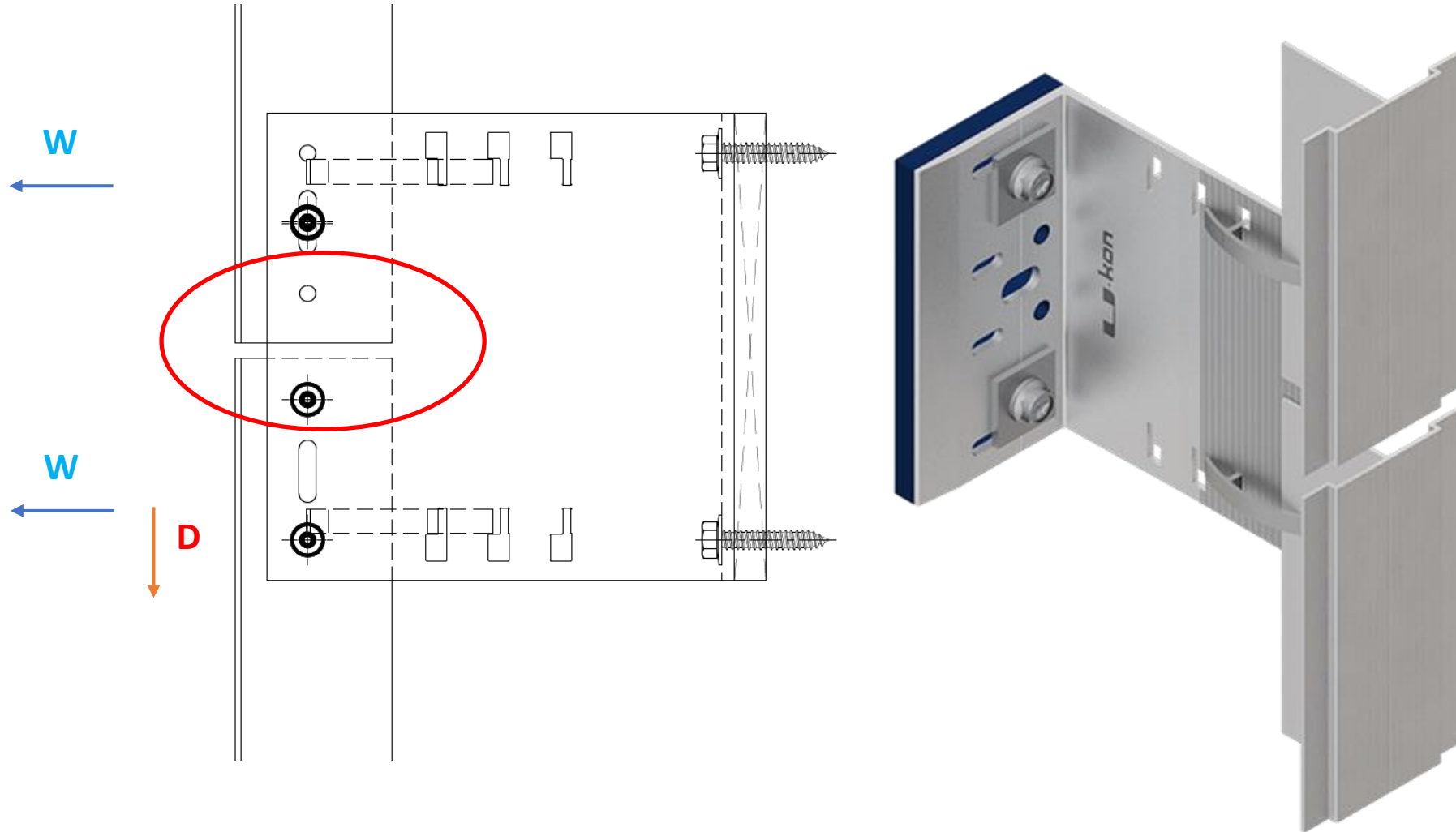


WALL BRACKETS “L” SHAPE WITH EXTENSION





# Innovations Reducing Wall Brackets

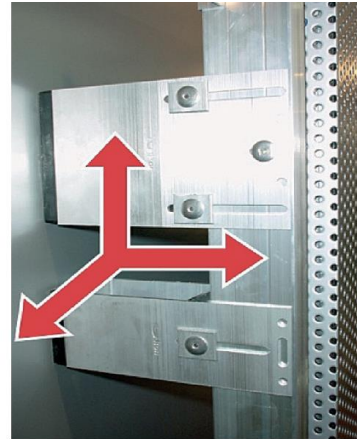
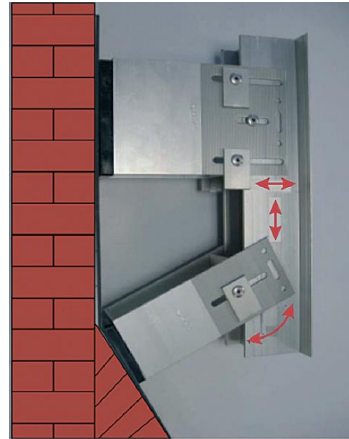


# Wall Brackets Adjustable in Three Directions

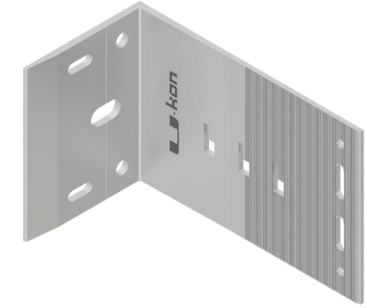
Uneven wall not an issue, e.g. recladding.

Install: attach then adjust, reducing error and rework.

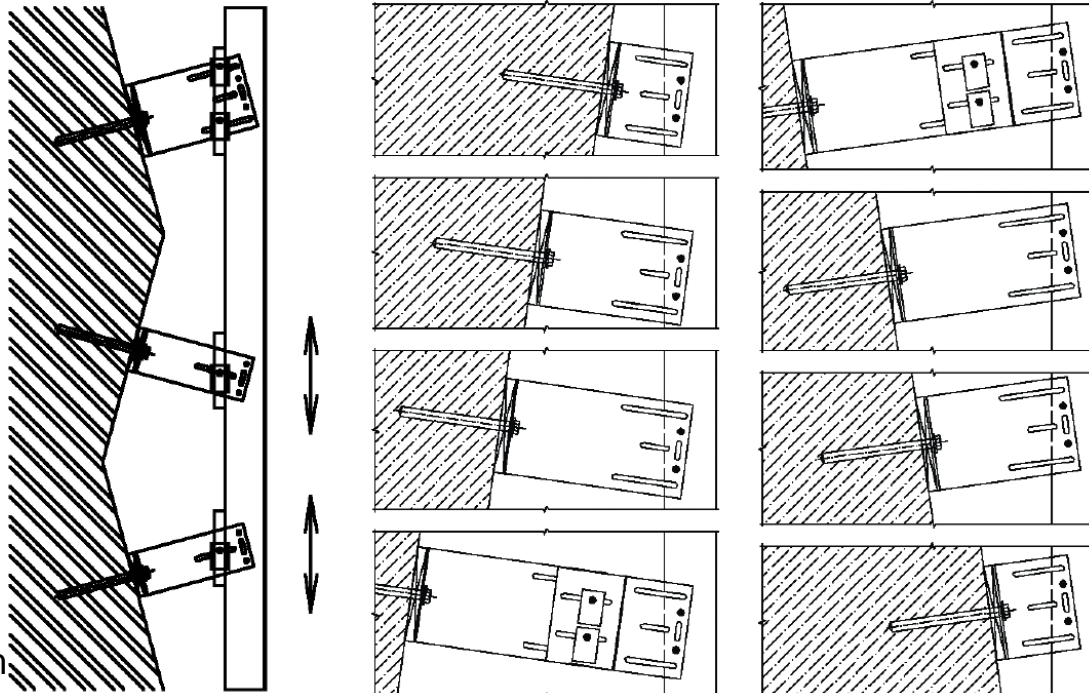
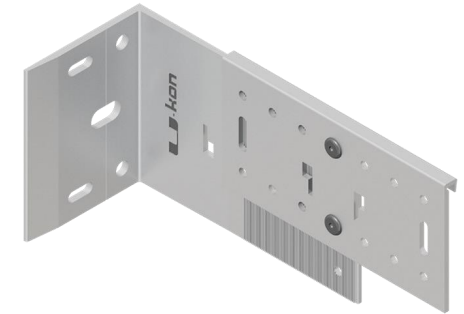
Reduce compromises on site,  
*“Build What Is Designed, Easily”*



WITHOUT EXTENSION



WITH EXTENSION

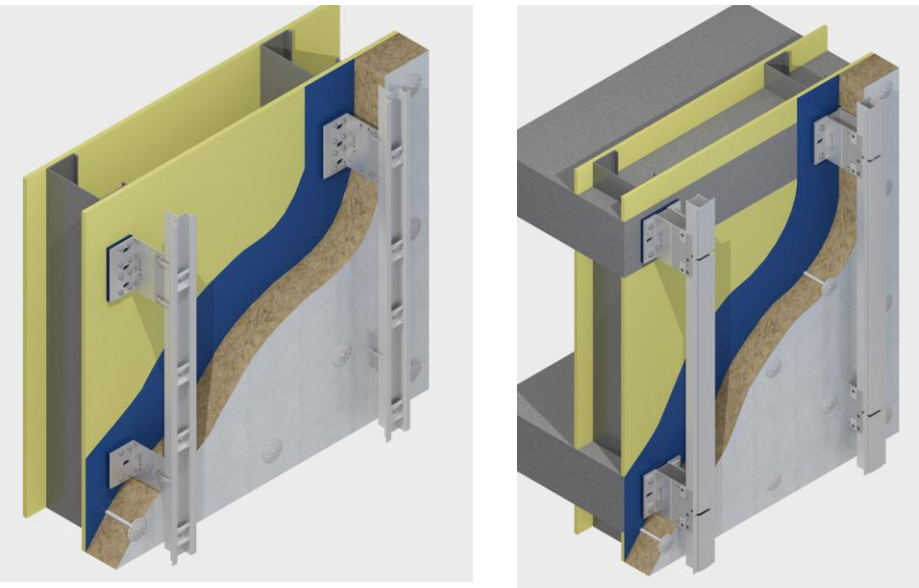


## Victoria BC Stone Install

- 3" out of true ground to roof
- Adjusted with Subsystem.



# Thermal Performance Explained



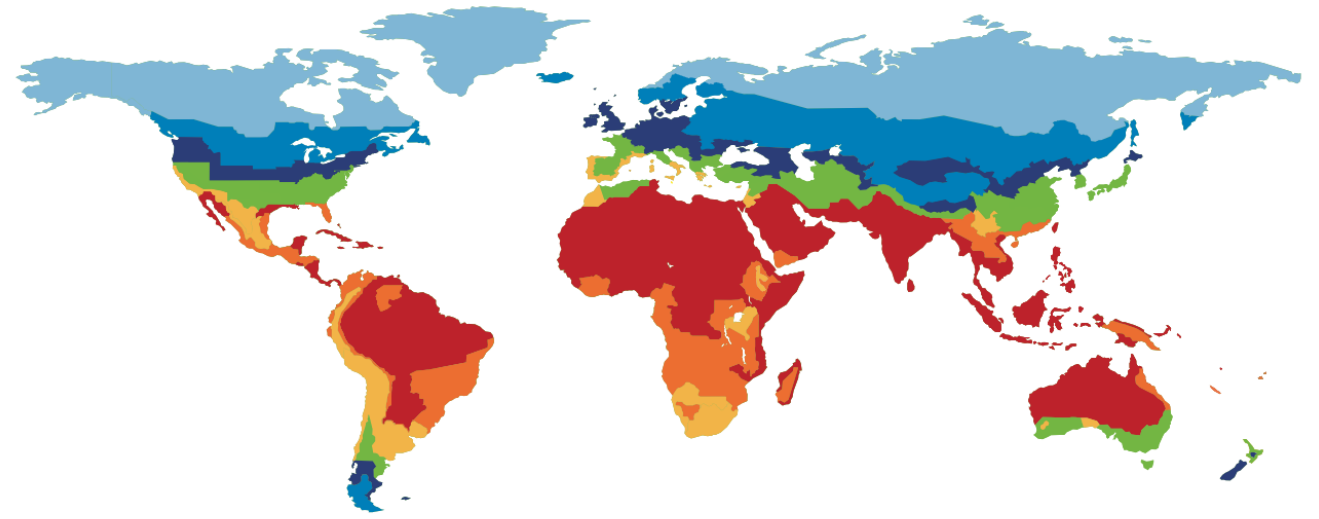
Vertical Spacing in	Exterior Insulation Thickness in	Exterior Insulation Nominal R-Value	Aluminum Bracket	Stainless Steel Bracket	Assembly Effective R-Value (Stainless steel Bracket HIGH)*
			Assembly Effective R-Value	Assembly Effective R-Value	
24	4	R-16.8	R-14.3	R-17.7 (20%)	
24	5	R-21.0	R-16.0	R-21.1 (25%)	
24	6	R-25.2	R-17.7	R-24.8 (29%)	
36	4	R-16.8	R-15.8	R-18.3 (14%)	
36	5	R-21.0	R-18.0	R-21.9 (18%)	
36	6	R-25.2	R-20.2	R-25.8 (22%)	
48	4	R-16.8	R-16.7	R-18.7 (11%)	
48	5	R-21.0	R-19.3	R-22.4 (14%)	
48	6	R-25.2	R-21.8	R-26.3 (18%)	
120	4	R-16.8			18.2*
120	5	R-21.0			21.9*
120	6	R-25.2			25.8*

THERMAL ANALYSIS PERFORMED BY MORRISON & HERSHFIELD

\* - Bracket is mounted to the intermediate floor slab, thermal bridging of the concrete slab must be included in the analysis. As a result, a linear transmittance value,  $\Psi$ , is provided to account for the thermal bridging effect of the intermediate floor.



# Passive House – Façade System



cool, temperate climate



phA

**CERTIFIED COMPONENT**

Passive House Institute

arctic climate



**CERTIFIED COMPONENT**

Passive House Institute

cold climate



**CERTIFIED COMPONENT**

Passive House Institute

cool, temperate climate



**CERTIFIED COMPONENT**

Passive House Institute

warm, temperate climate



**CERTIFIED COMPONENT**

Passive House Institute

warm climate



**CERTIFIED COMPONENT**

Passive House Institute

hot climate



**CERTIFIED COMPONENT**

Passive House Institute

very hot climate



**CERTIFIED COMPONENT**

Passive House Institute



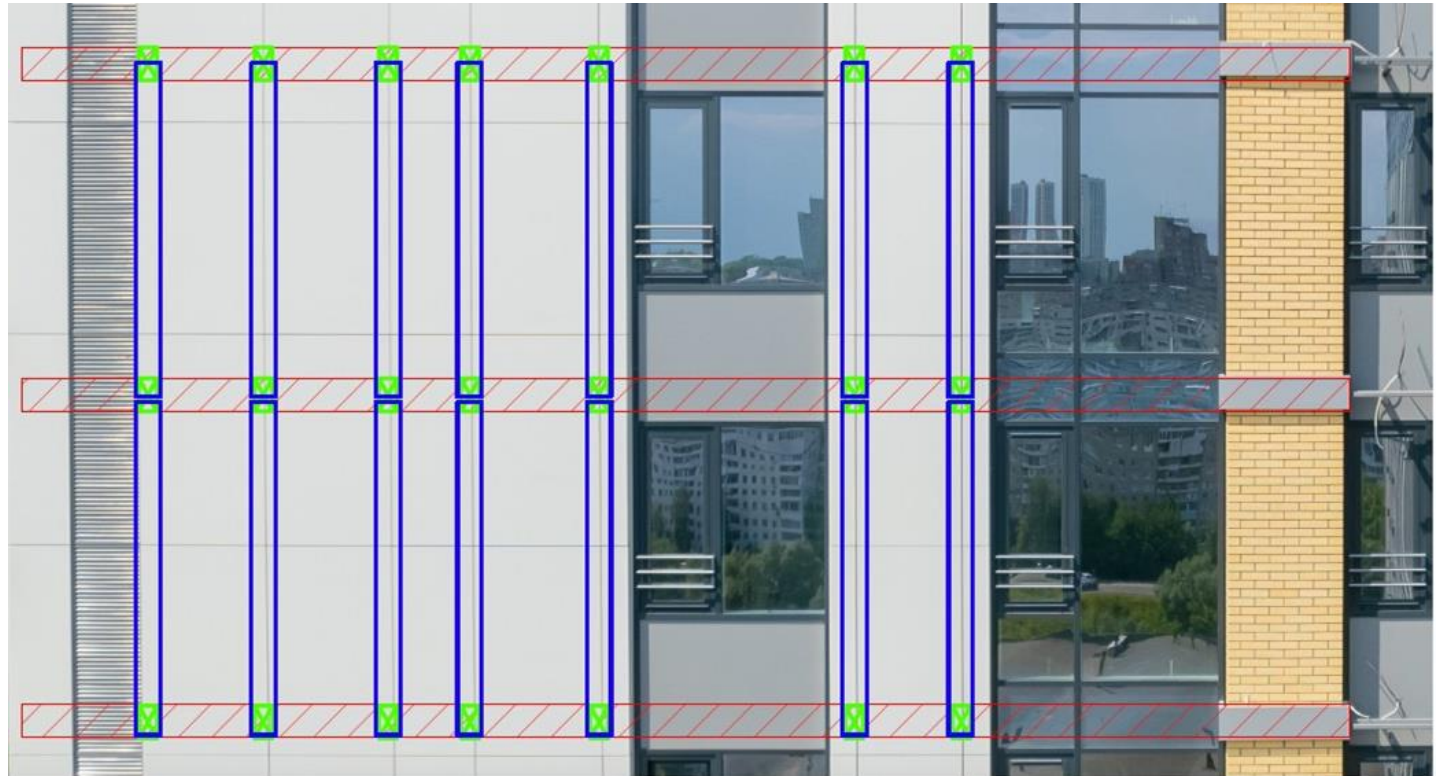
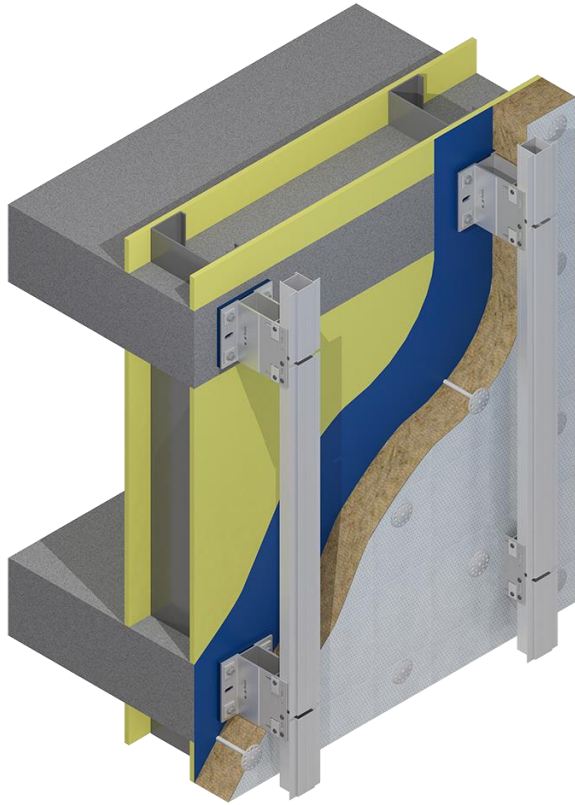
# Innovation





# Innovative System: Slab-To-Slab

Reduce wall brackets, easy alignment, unload studs.



Back wall can be anything: studs, concrete, block or existing wall

# Slab to Slab attachment methods

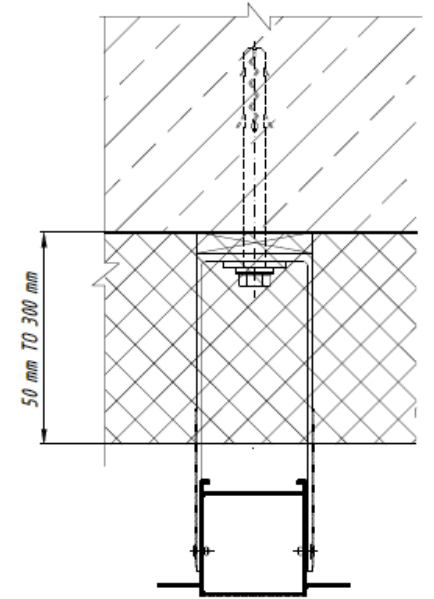
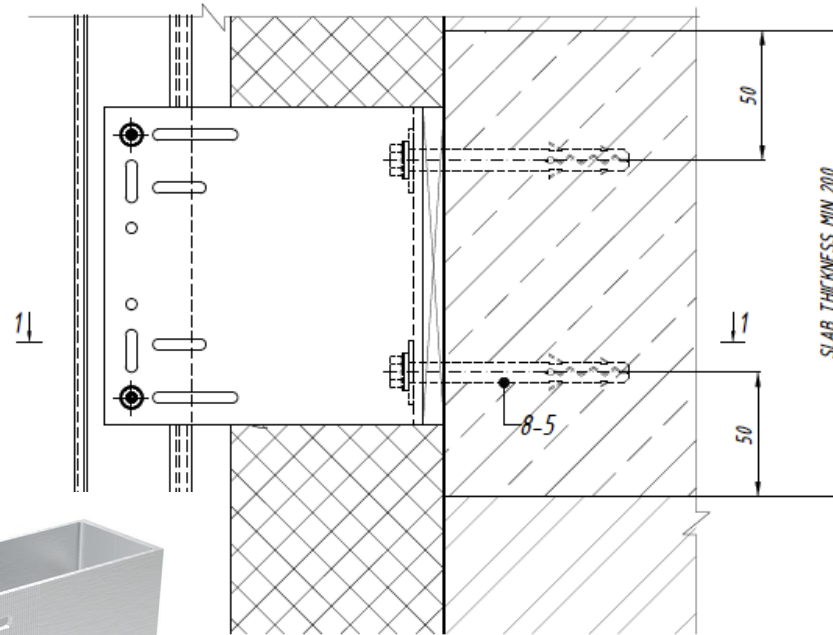
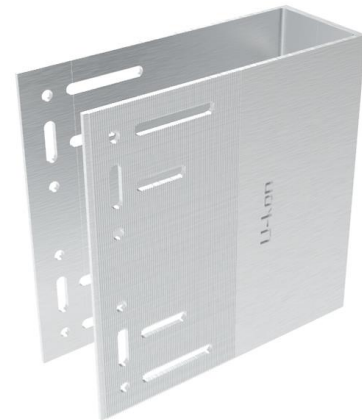
## IDEAL SOLUTION FOR RENOVATION

- WHEN WE DO NOT HAVE GOOD/STRONG BACKUP WALL
- WHEN WE NEED MINIMIZE THERMAL BRIDGING
- WHEN WE NEED TO PROVIDE FAST INSTALLATION



# Slab to Slab attachment methods

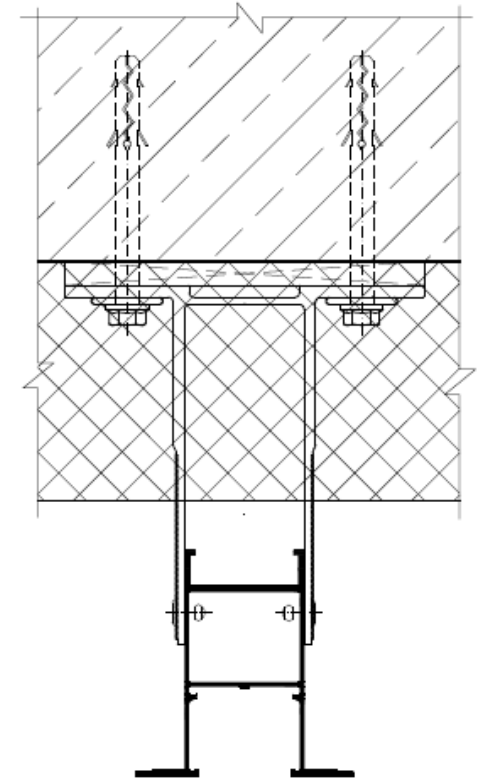
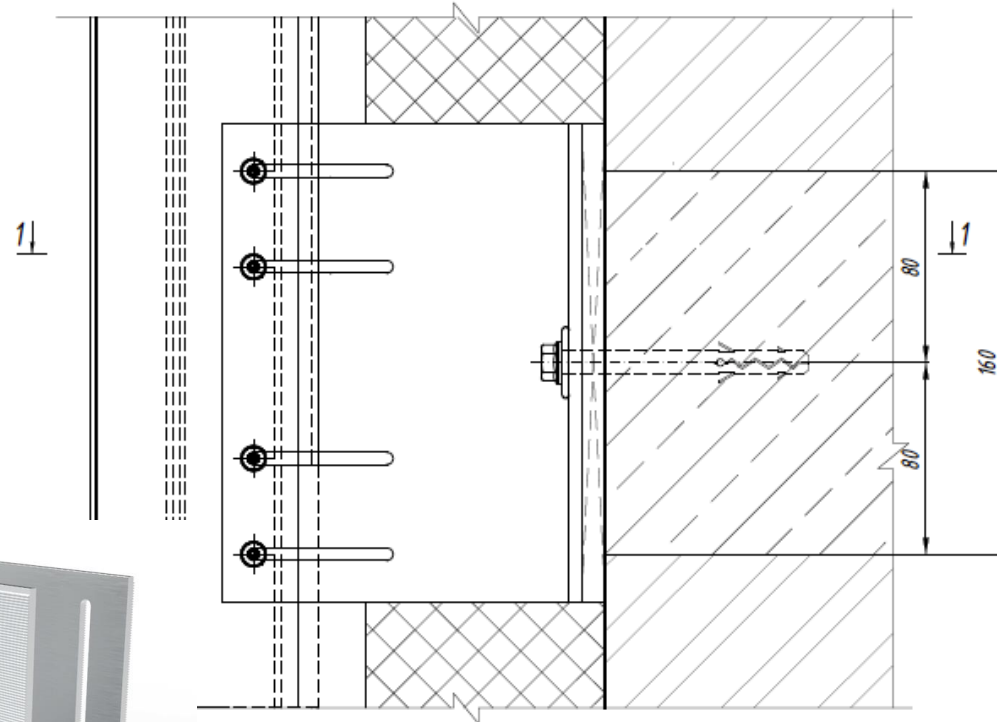
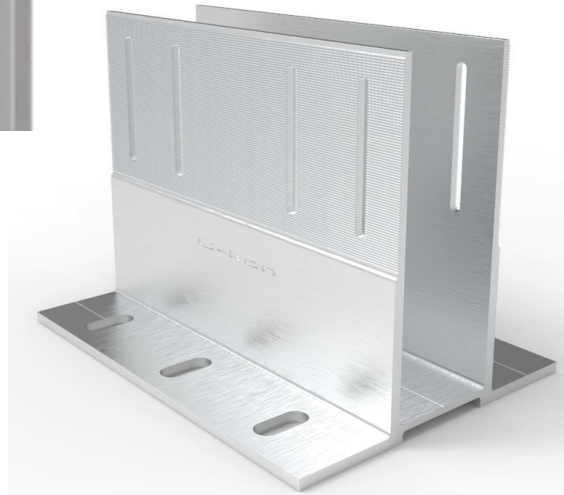
WEAK POINT – EXISTING SLAB CONNECTION  
SLAB THICKNESS MORE THEN 200 mm





# Slab to Slab attachment methods

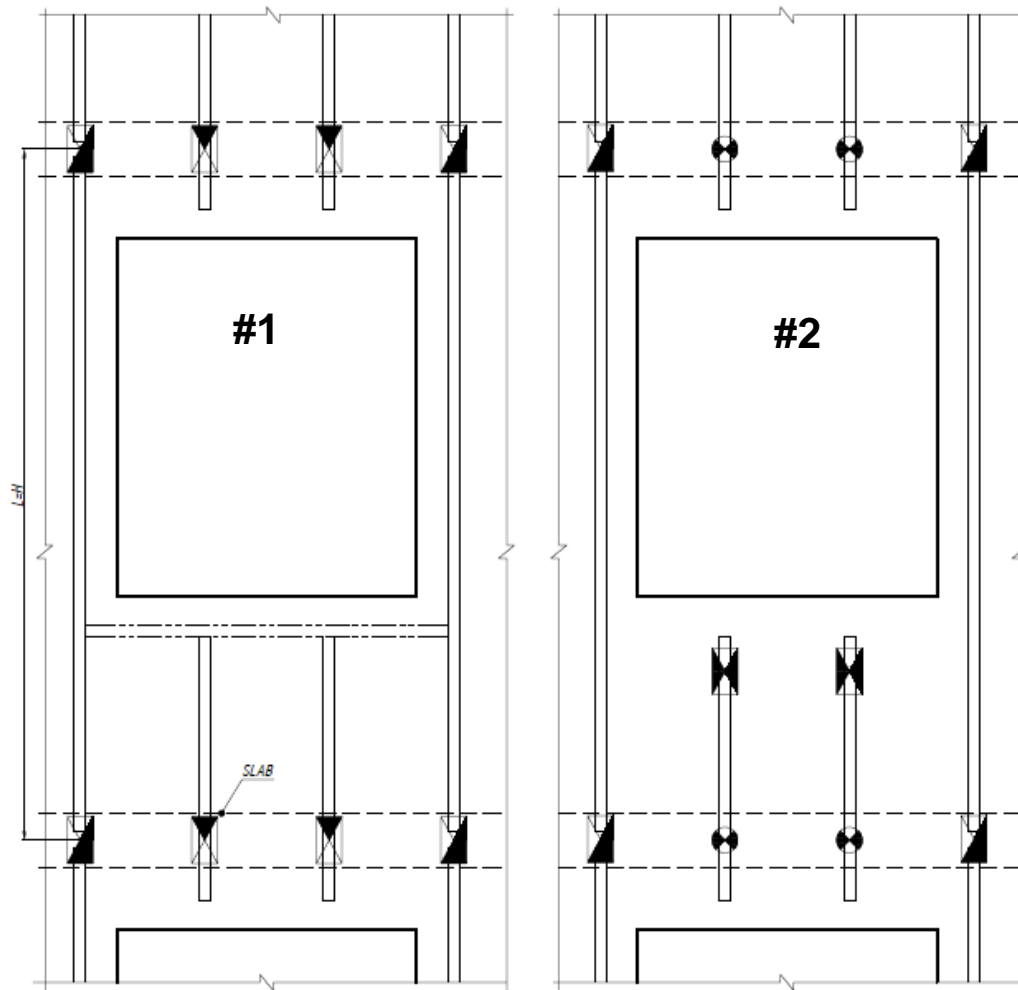
WEAK POINT – EXISTING SLAB CONNECTION  
SLAB THICKNESS LESS THEN 200 mm





# Slab to Slab attachment methods

HOW CAN WE INSTALL SLAB TO SLAB SYSTEM  
WHEN WE HAVE WINDOWS IN A MIDDLE?

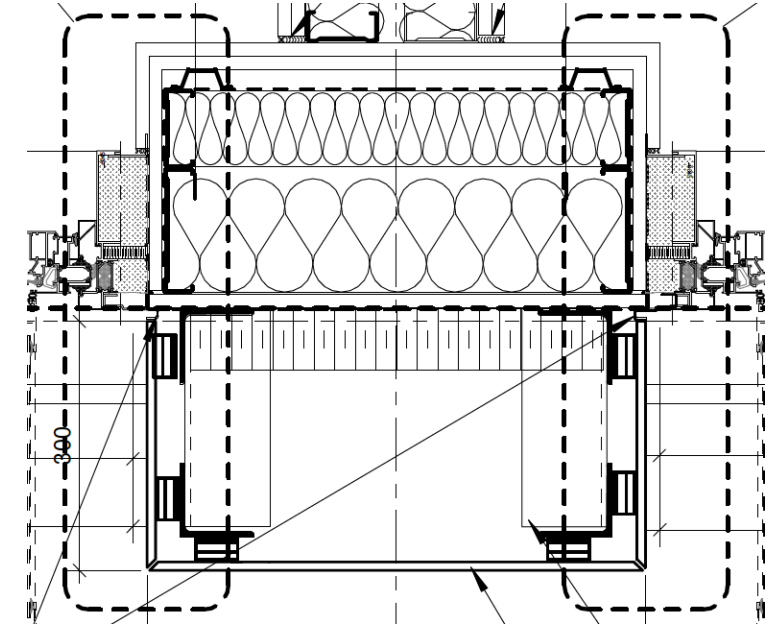
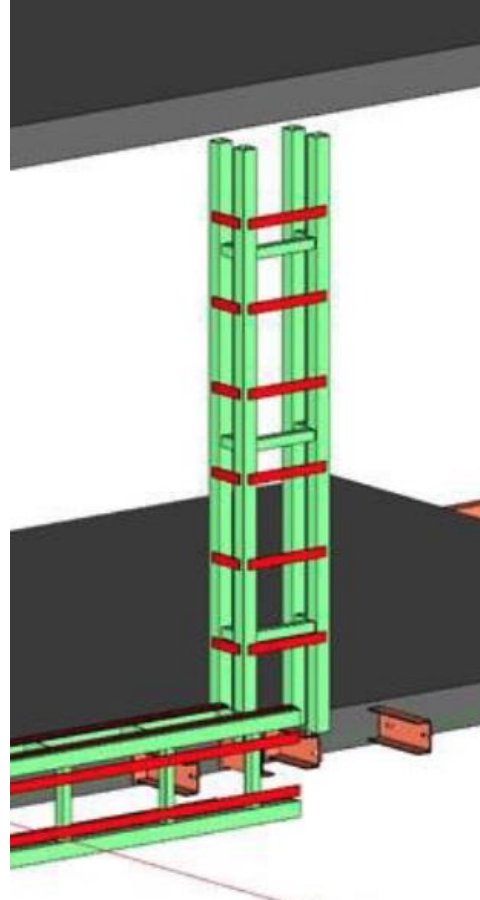


*If you would like to see some projects  
in construction, please contact me*

# One more story – remove HSS

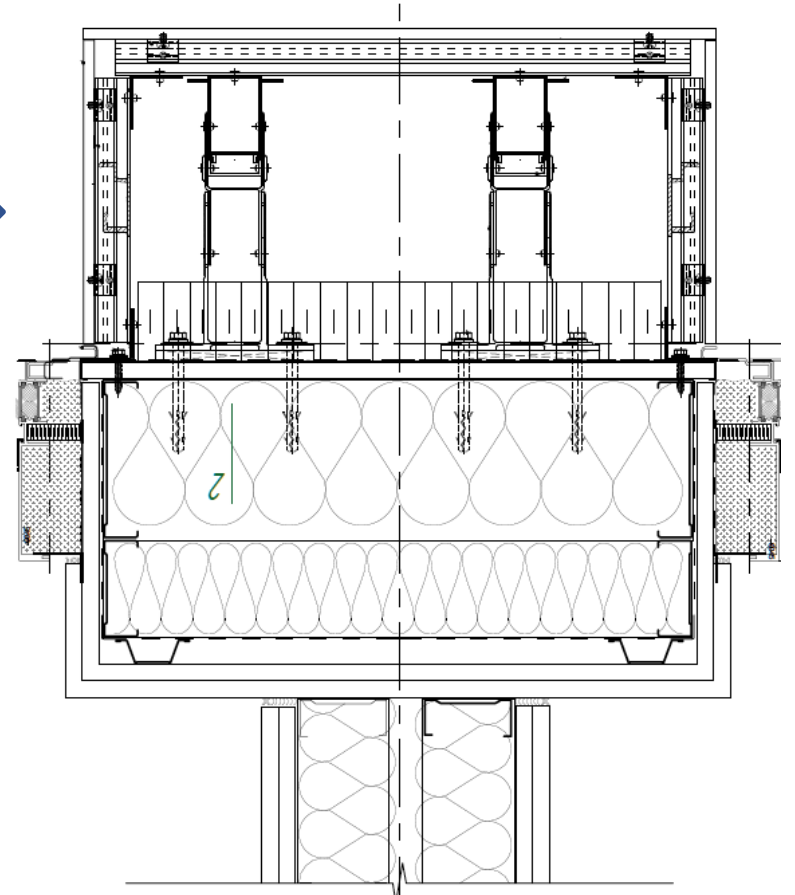
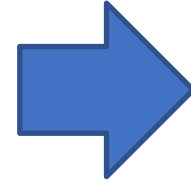
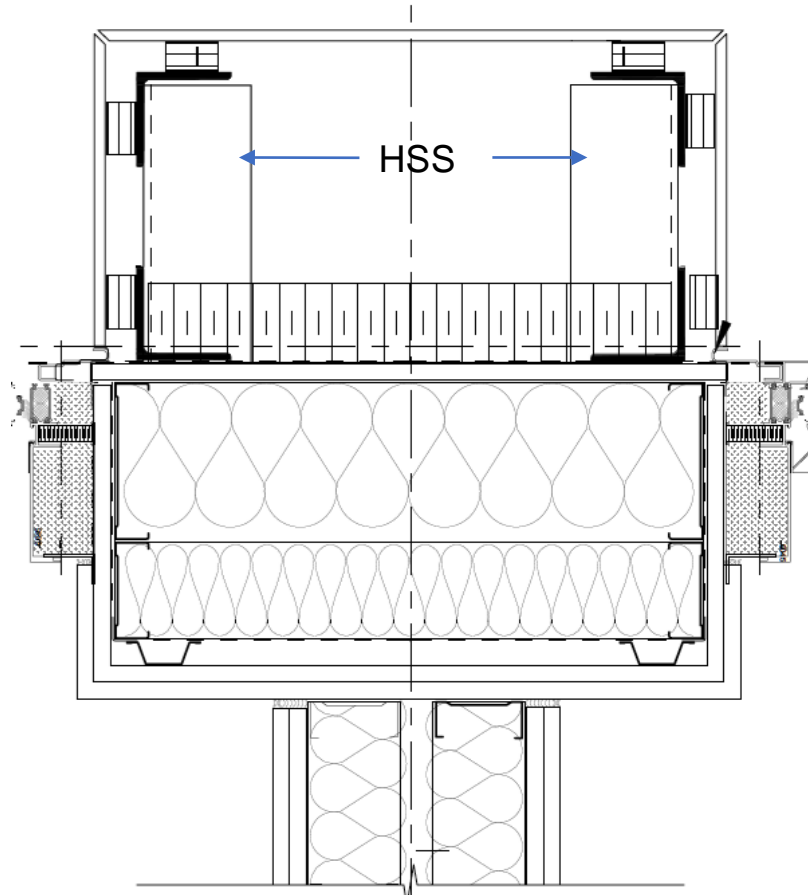


Original design



Column

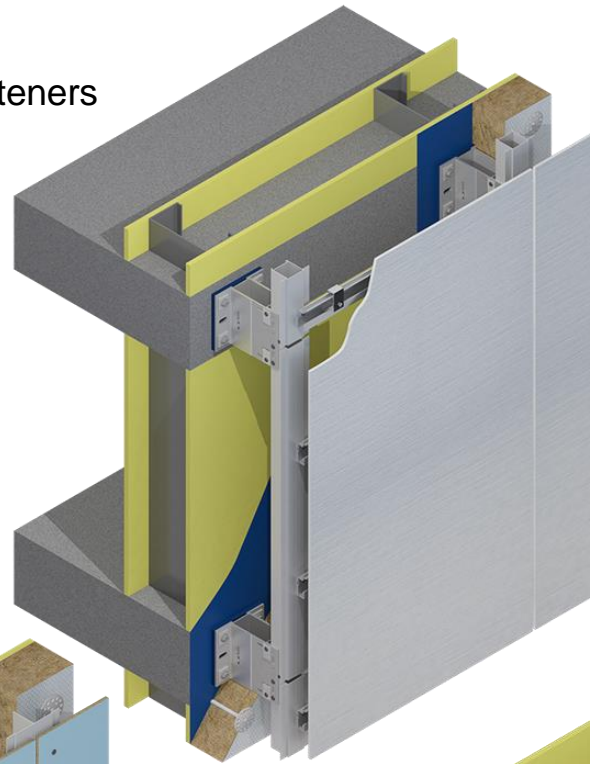
# Value Engineering: Replace HSS



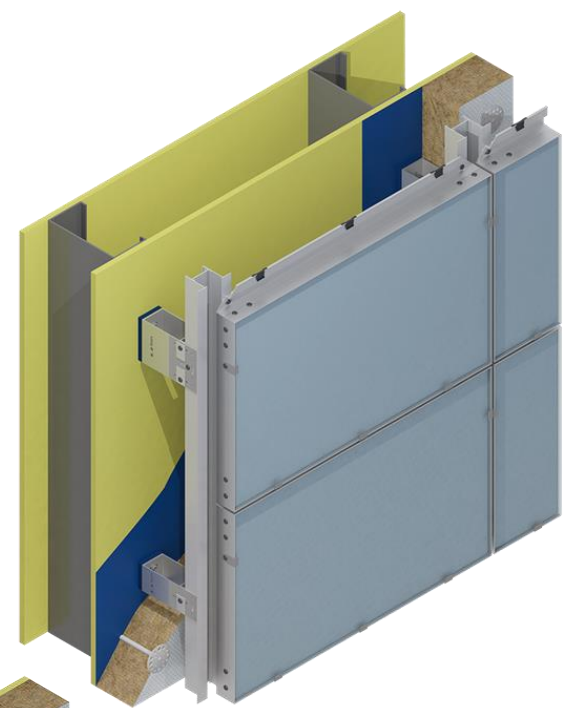
Proposed design  
– (plan view)

# Building Block #3 Cladding Attachments

Concealed Fasteners



BIPV



Simple Front Fastened



Specialized; Kerf for Stone

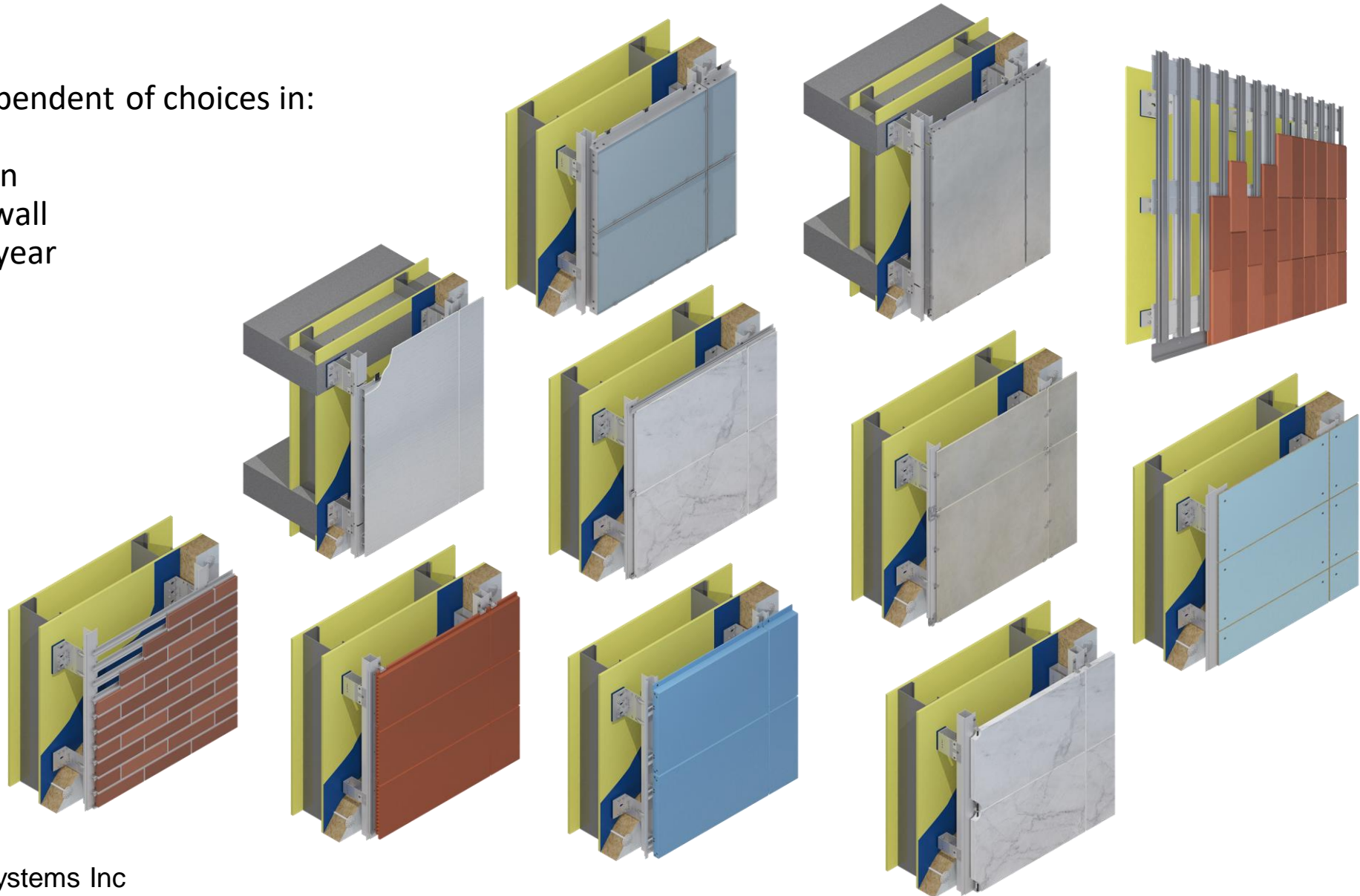




# Subsystem Independence

Systems independent of choices in:

- Cladding
- Insulation
- Backup wall
- Time of year
- Location
- .....









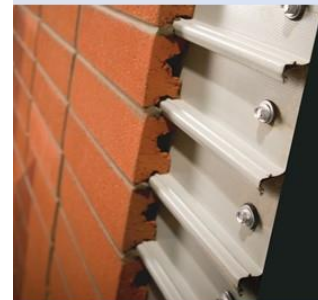
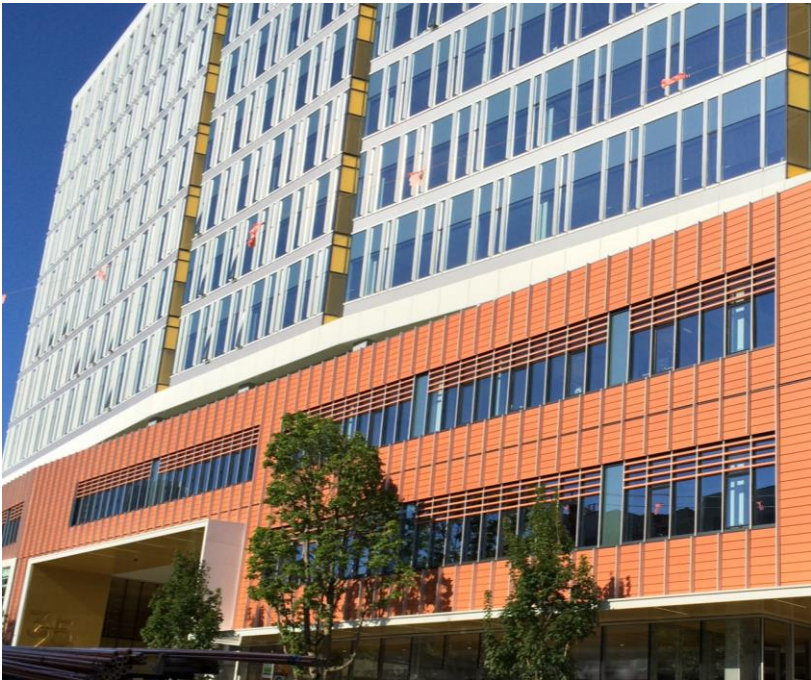
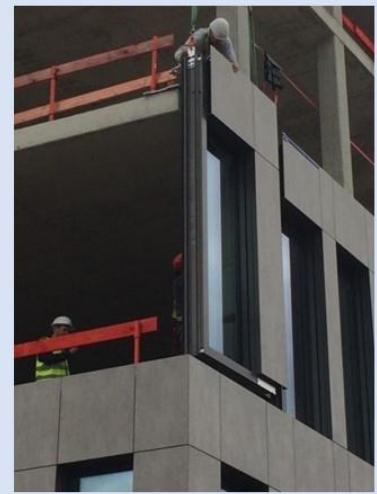
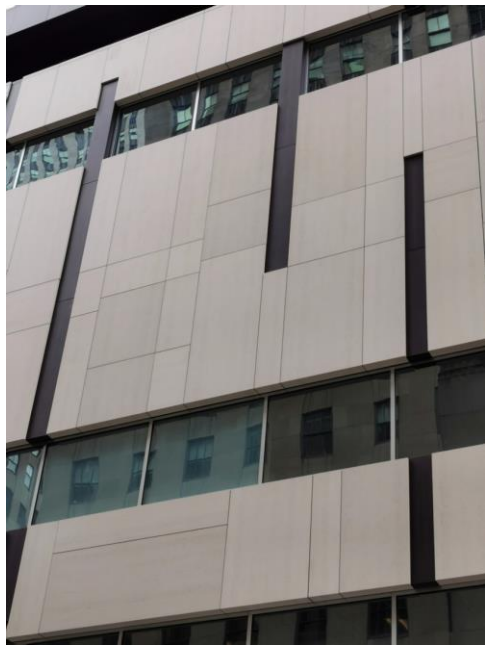






101 Sheppard East  
Toronto, ON







# High Rise Stone







# Simple fibre cement





Unique use of  
standard terracotta



# Simple metal and FRC



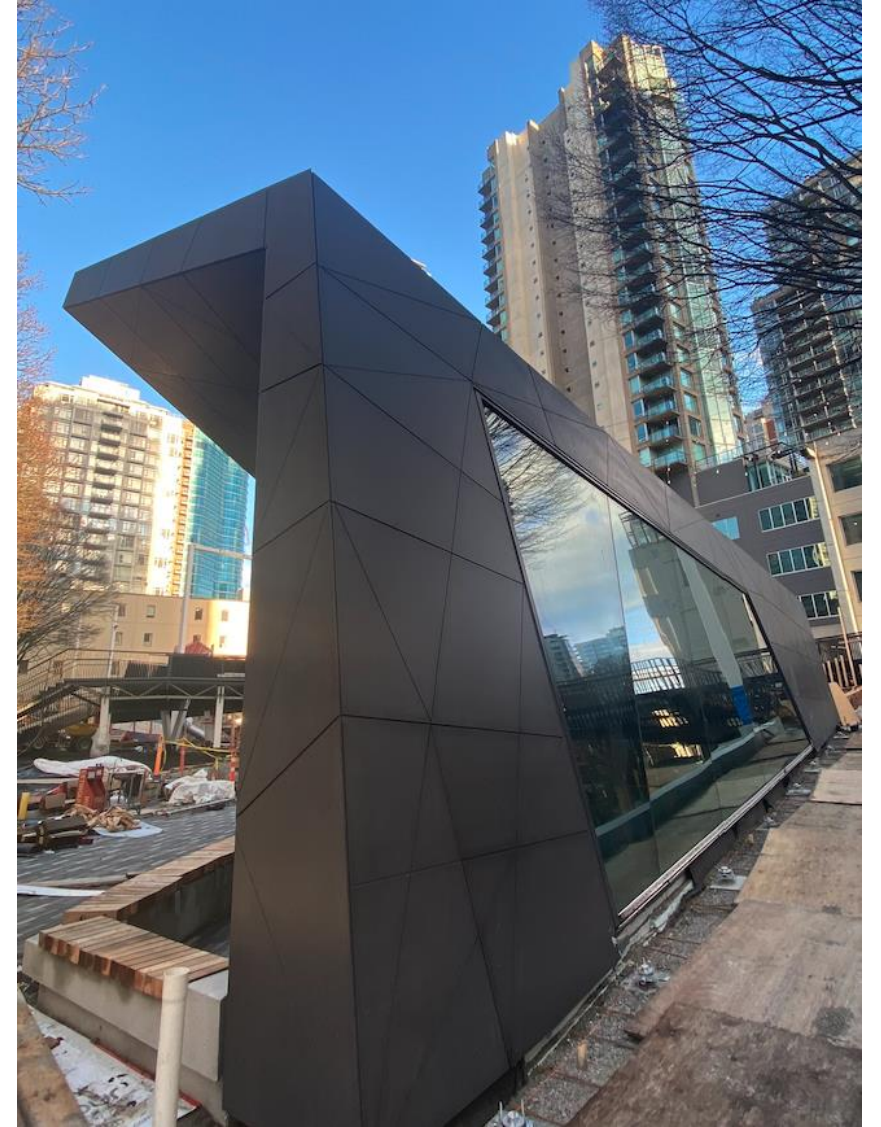


# Under Cut Anchors and FRC





# Undercut Anchors System





# Innovative Configuration: Building Integrated PV (BIPV)





# Mechanically Attached Brick









# Terra Cotta Systems for all Manufacturers



**High Rise Stone**





# Visible Fasteners





## Deep Energy Retrofit – Under construction

55





**Always exploring – cast GFRC in North York**







Put competition where it belongs, without compromising collaboration. "Right People on the Bus"\*\*\*



Cost at the beginning



Inherent Quality



Tight feedback loop Design through to Construction\*



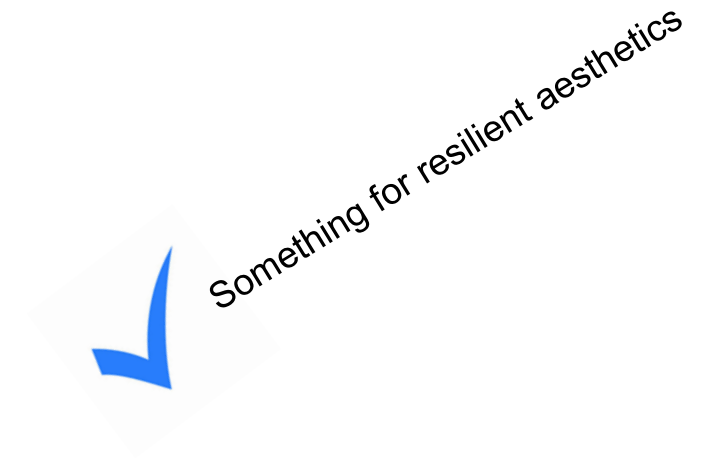
Narrowing accountability



Excellence in Specification: "Say What You Need"



Excellence in Documentation "Say what you are going to do, do what you are going to say"



I walk around Toronto and I see it everywhere.

Concrete on concrete.

Buildings with concrete frames and concrete CLADDING on top.

Concrete foundations are essential. Same with concrete elevator shafts.

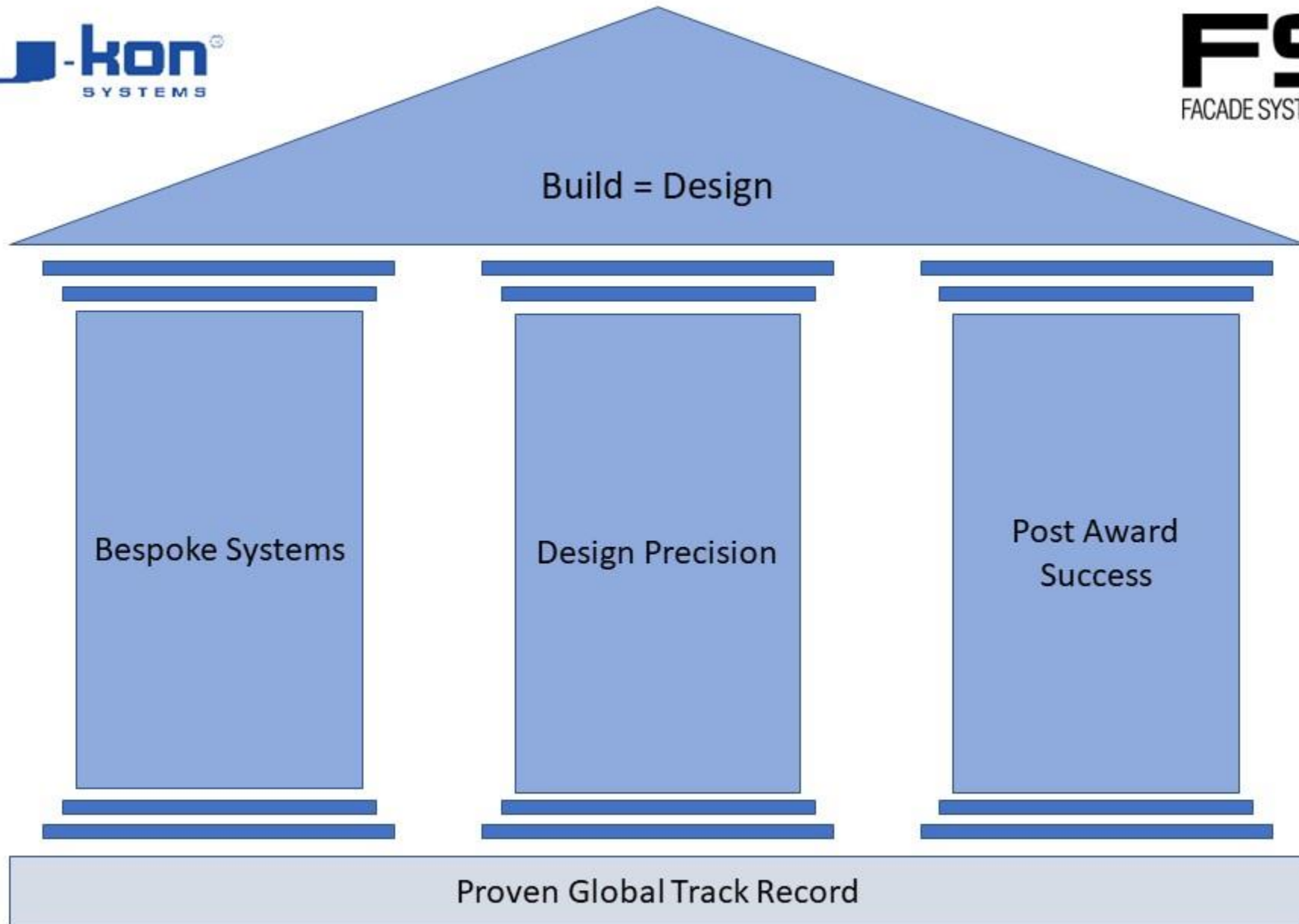
Concrete floors, I get that too. Composite steel makes for a great blend of strength and not hearing your upstairs neighbours.

But concrete walls? Why?

Fall 2023  
5,370 views  
16 comments  
21 Likes

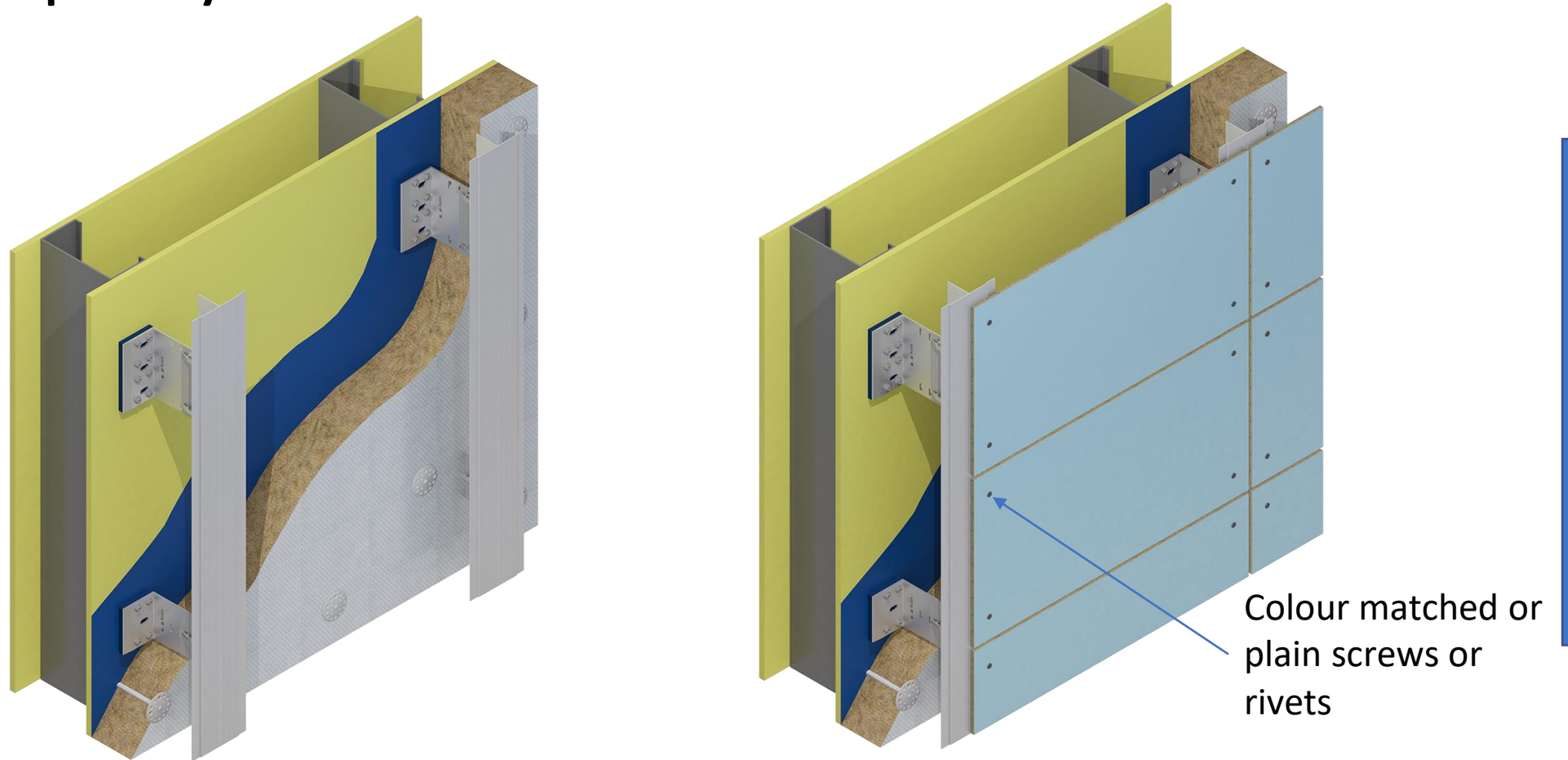


A LinkedIn profile card for Blair Davies, P.Eng. It features a circular profile picture of a man with glasses and a blue shirt. Below the picture, the name 'Blair Davies, P.Eng.' is displayed in bold, followed by the text 'An Expert and Agent for High Performance Facade Systems that are innovative, aesthetic, sustainable, c...'. A large QR code is positioned at the bottom of the card.



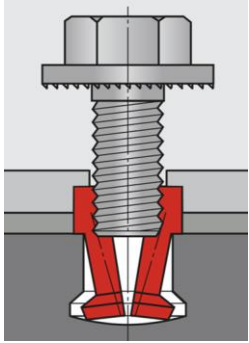


# Simple System: Visible Fasteners

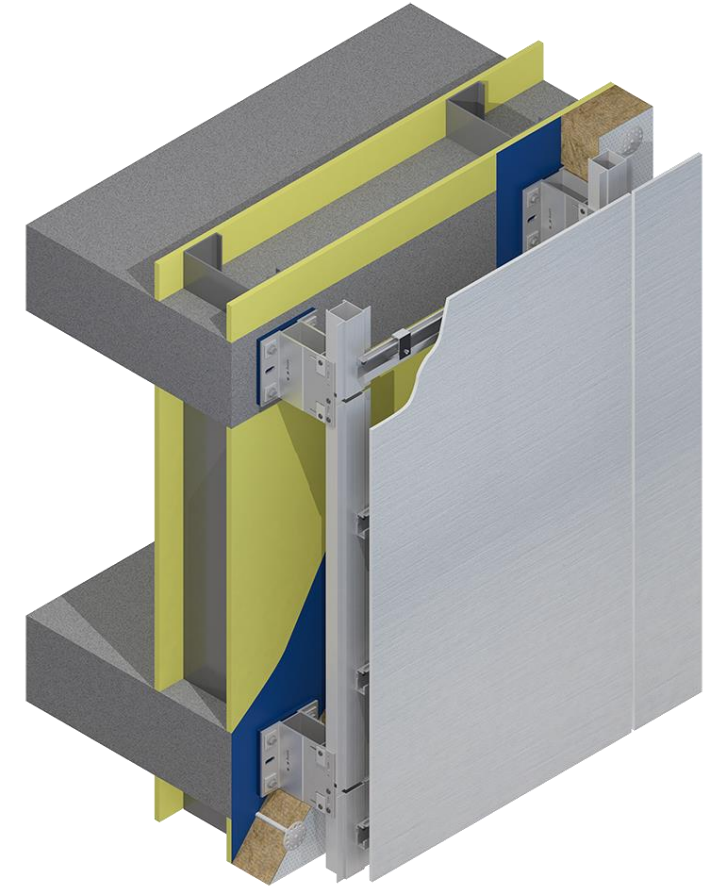
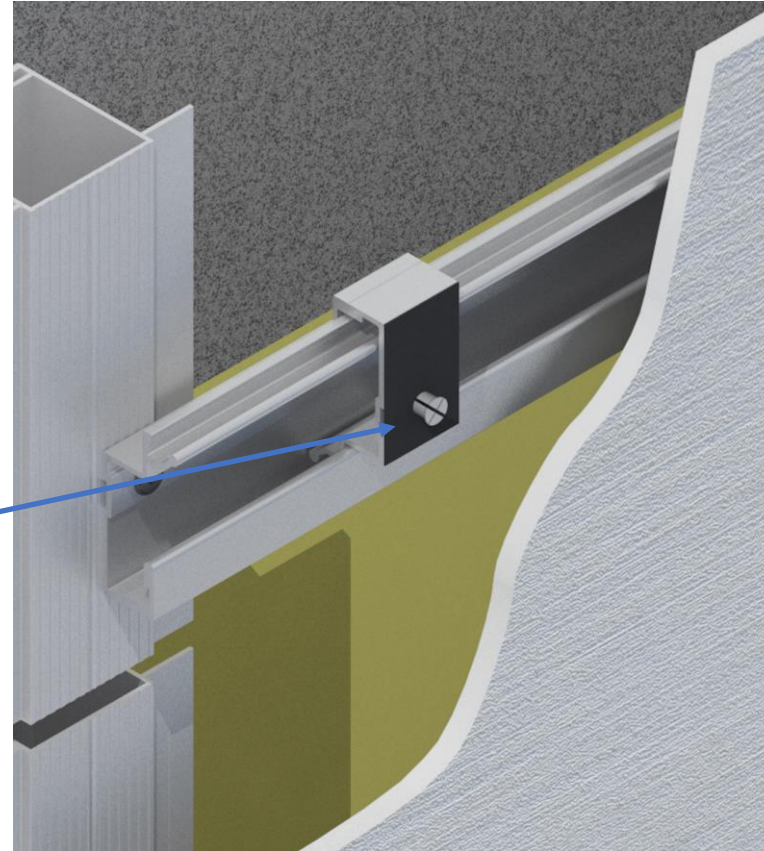


The system is a simple, economical and frequently used system for visible fixing of flat facade material like aluminum composite panels, sheets, HPL, fiber cement corrugated and standing seam metal panels.

# Simple System: Undercut Anchors System



Location of under  
cut anchor, typical  
2' spacing



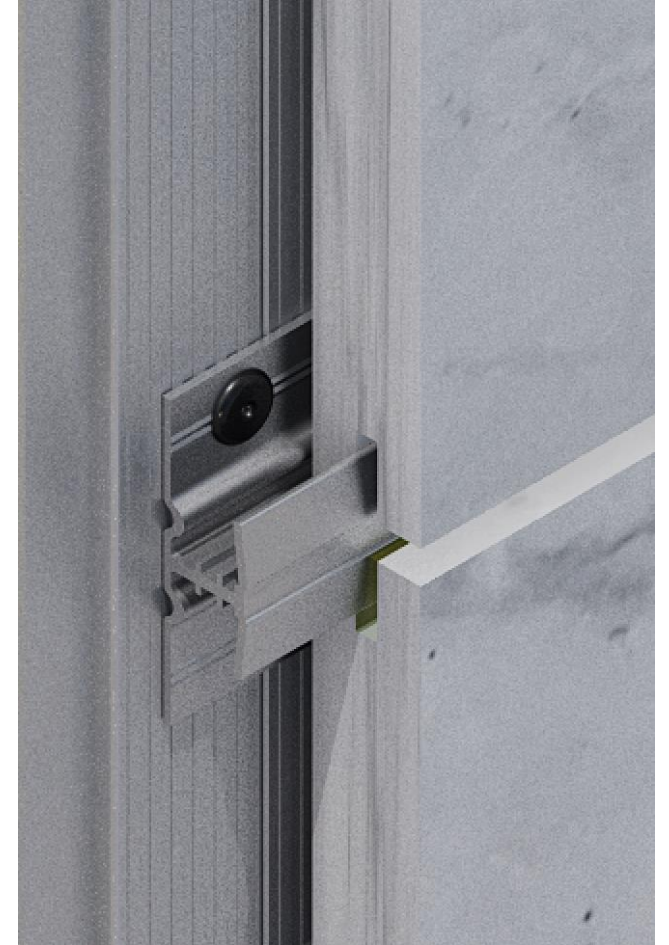
The system is designed for invisible fixing of ceramic, porcelain, HPL and fiber cement panels using special undercut technology.

# Innovative Systems: Kerf System for Heavy Facades

The system is designed for concealed way of fastening the natural stone.

The cladding is fixed to the system of vertical and horizontal profiles.

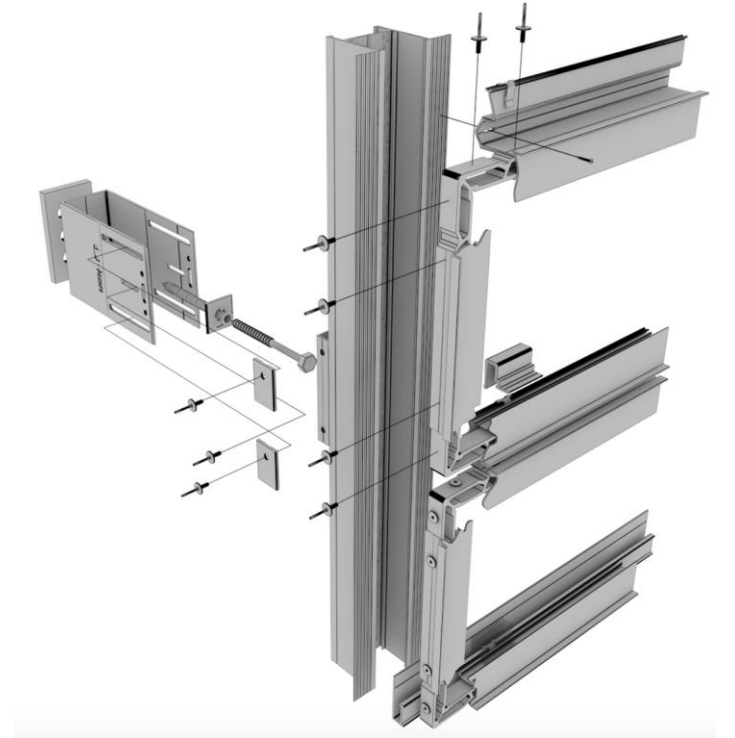
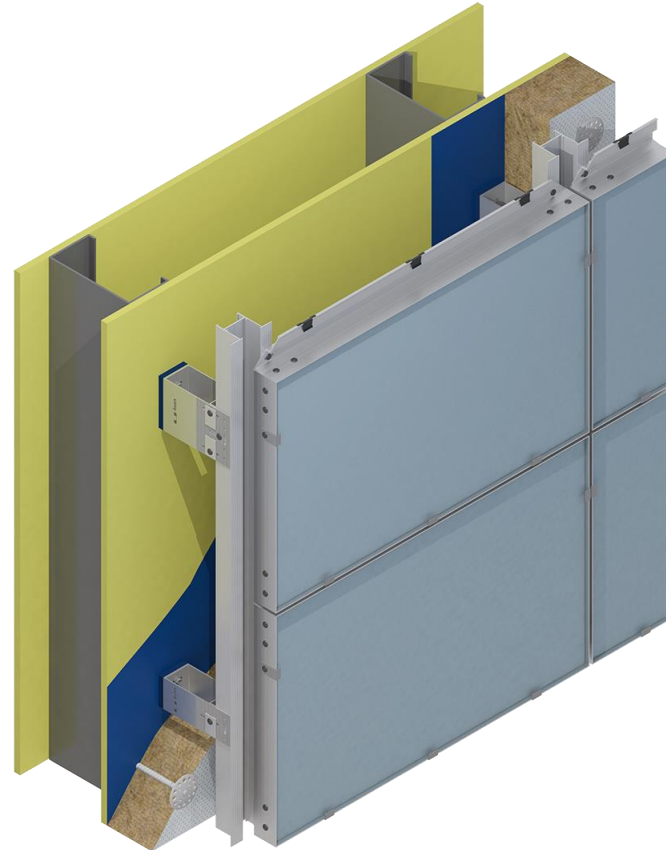
Stone panels are installed on horizontal girts, for which in the lower and upper ends of the panel the cut is made, where installing special horizontal profiles is set.





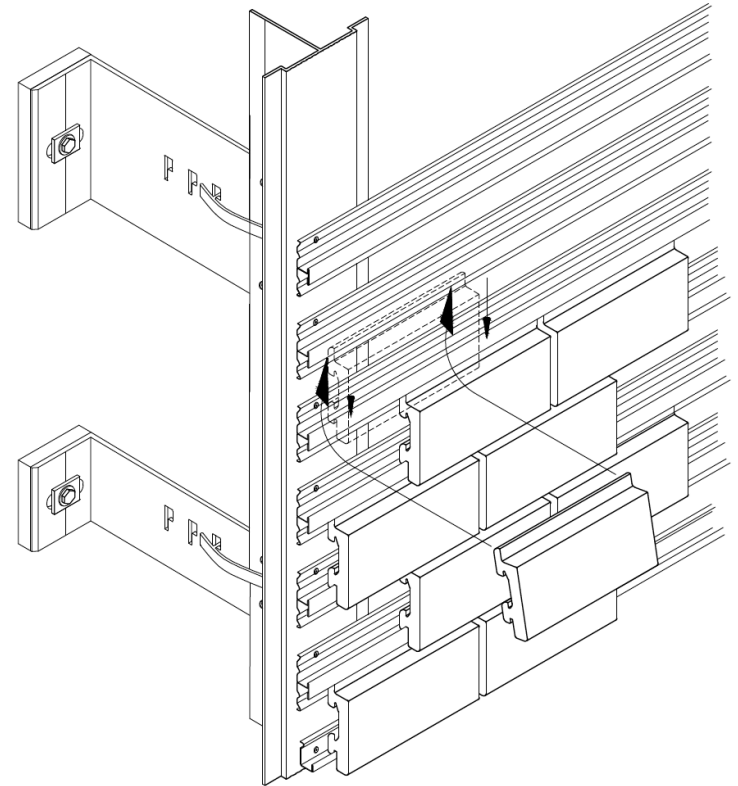
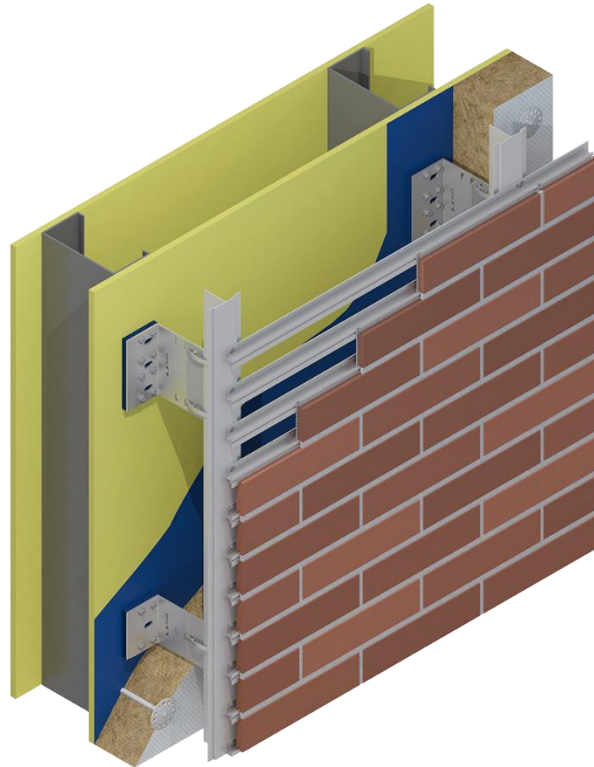
# Innovative Configuration: Glass/ Building Integrated PV (BIPV) Facades

This system is designed for invisible fixing of glass, ceramic, and photovoltaic solar panels. The system can withstand a large format of panels that have a thickness between 3.5 mm to 8 mm. The cladding panel is glued into the frame of aluminum profiles. Special stainless steel safety clips are installed around the perimeter of the cladding panel.

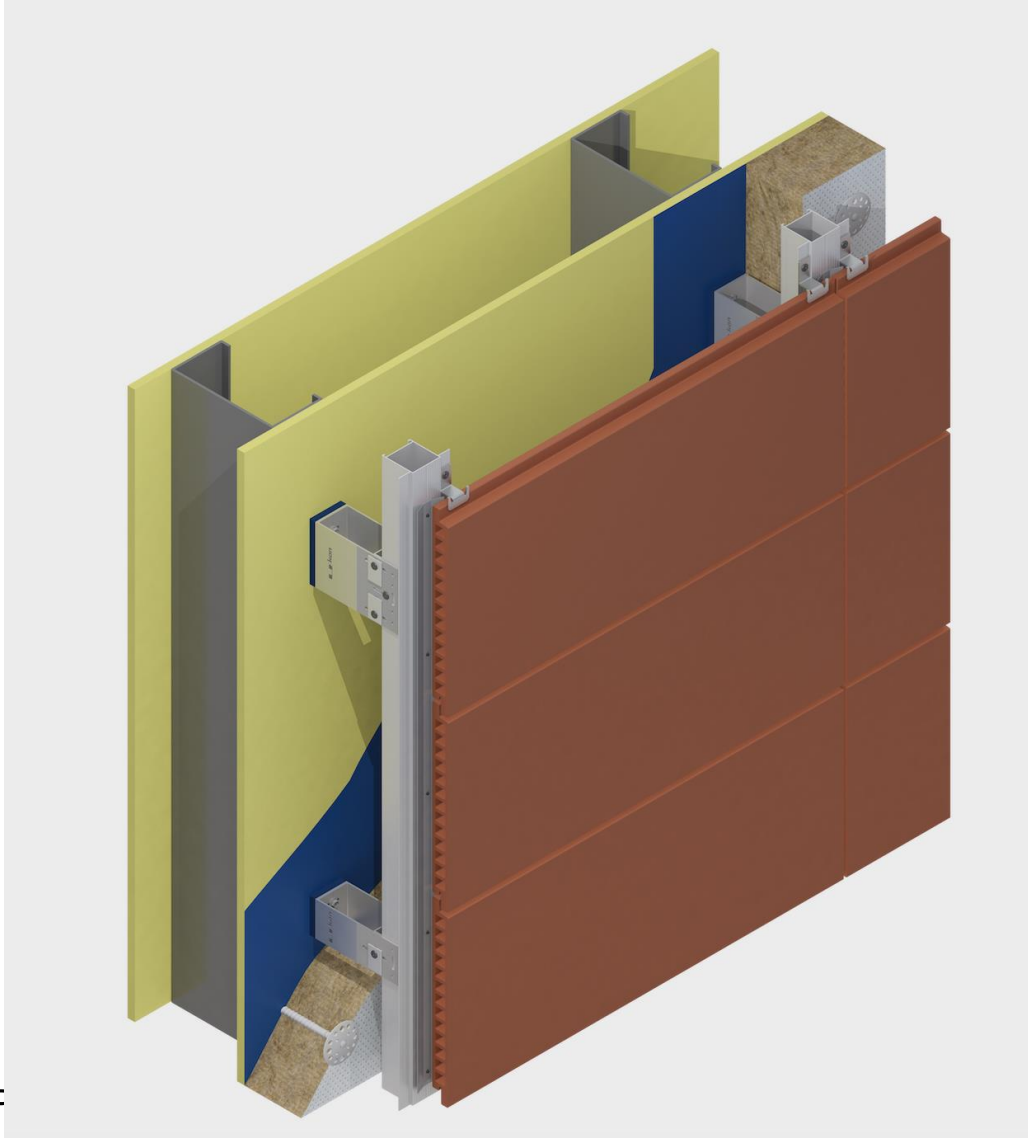


# Mechanically Attached Brick

This system is designed for invisible fixing of thin brick. The brick veneer can be installed with or without grouting. Brick veneer without grouting: Cladding panels are installed on horizontal rails, the shelves of which engage with grooves in the horizontal ends of the panels. Horizontal and vertical seams overlap shelves of plates.



# Terra Cotta Systems for all Manufacturers



Systems are designed for invisible fixing of terracotta panels with different thicknesses from 8,5 mm to 40 mm for vertical and horizontal layout.

We provide a system for following brand of terracotta panels:

- **AgGeTon**
- Agrob Buchtal
- Ceramics Terracotta
- CN-ceramic
- Faveton
- Frontek
- Moeding
- NBK
- Tempio
- Terreal

