



CASCADIA

WINDOWS & DOORS

[CASCADIAWINDOWS.COM](https://cascadiawindows.com)

WEBINAR ADMIN

WEBINAR TECHNICAL SUPPORT -

- Technical support is available for any issues during the webinar

CONTINUING EDUCATION CERTIFICATES -

- Will be automatically emailed after the presentation
- AIA & AIBC are automatically submitted (no need to self-report)
- All other association learning credits can be claimed via self-reporting

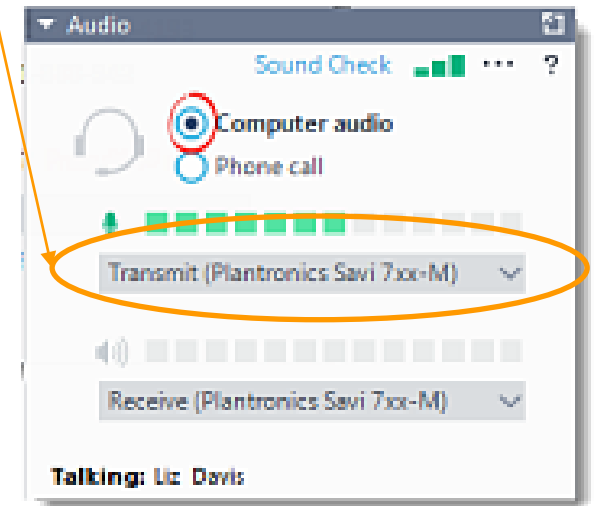
QUESTIONS -

- Feel free to post questions at any point during the presentation

AUDIO -

- We recommend using your computer audio to listen to the presentation. Calling into the presentation may incur long-distance charges from your phone provider.

Remember to select your audio source (headsets vs speakers, etc)





CASCADIA – EDUCATIONAL PRESENTATION

MIND THE GAP

BETTER EXTERIOR WALL PERFORMANCE THROUGH CLADDING ATTACHMENTS



AGENDA: WHAT ARE WE LOOKING AT TODAY?

- INTRO TO CASCADIA WINDOWS & DOORS
 - UNDERSTANDING THE IMPACTS OF THERMAL BRIDGING
 - PRESCRIPTIVE VS U-VALUES / PSI & CHI VALUES
 - INSULATION APPROACHES
 - UNDERSTANDING CLADDING ATTACHMENT OPTIONS
 - DESIGN & PERFORMANCE CHARACTERISTICS OF DIFFERENT CLADDING ATTACHMENTS
 - CASE STUDIES
 - WRAP UP
-

INTRO TO CASCADIA WINDOWS & DOORS



INTRO TO CASCADIA WINDOWS & DOORS



COMMERCIAL & MULTI-FAMILY

Windows & Window Wall
Storefront Glazing
Commercial Doors



RESIDENTIAL

Fixed & Operable Windows
Swing & Sliding Doors
Passive House Windows & Doors



THERMAL SPACER

Exterior Cladding Assemblies
Low-sloped Roofs & Soffits

INTRO TO CASCADIA WINDOWS & DOORS

ABOUT THE COMPANY

- Manufacturing plant & head office located in Langley, BC
- Founded in 2008

PRIMARY MARKETS

- BC, Yukon, Washington, Oregon, California

COMPANY PURPOSE

- To provide simple and cost-effective solutions to stringent energy code requirements



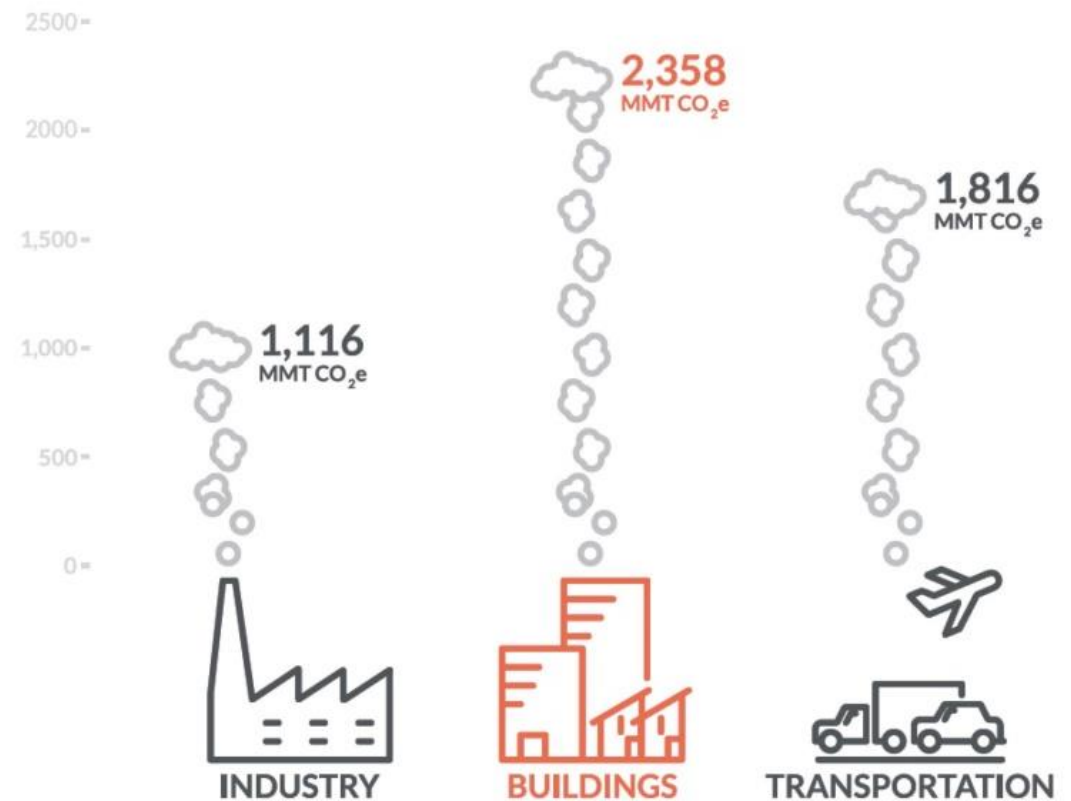
An aerial photograph of the New York City skyline, featuring numerous skyscrapers and a dense urban landscape. The Empire State Building is prominent on the left. A large teal overlay covers the left side of the image, containing the title and subtitle text.

THE PROBLEM WITH BUILDINGS

*Understanding the impact of buildings on our
energy grid and environment*

WHAT'S THE PROBLEM?

**BUILDINGS ARE
RESPONSIBLE FOR 44.5%
OF US CO₂ EMISSIONS.**



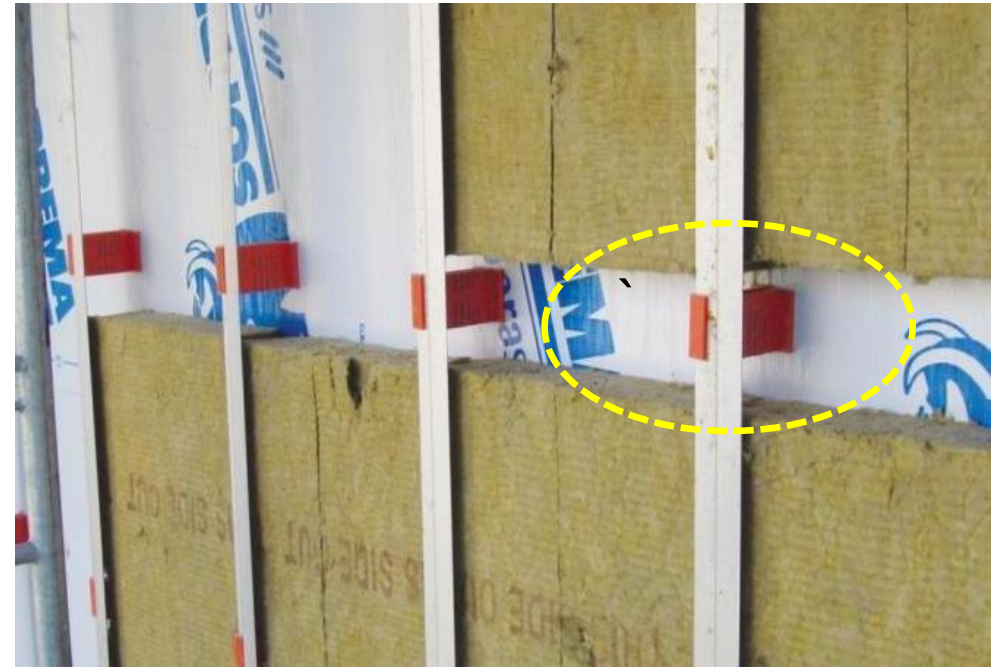
THE IMPORTANCE OF BUILDING SCIENCE



CLADDING ATTACHMENT MATTERS MOST



12" OF INSULATION



3.5" OF INSULATION

THINNER WALL HAS HIGHER EFFECTIVE R-VALUE



POLL QUESTION 1:

**HAVE YOU BEEN ON A TEAM
THAT'S DETAILED / SPECIFIED A THERMALLY
IMPROVED CLADDING SUPPORT SYSTEM?**

HEAT FLOW

Radiation: 



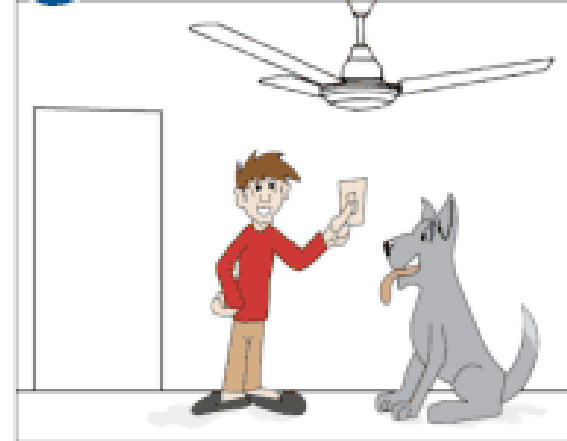
"Hey Duke, doesn't that fire feel good."

Conduction: 



"Ouch! That poker's too hot to hold with my bare hands."

Convection: 



"I'll turn on the fan. All the warmest air is up near the ceiling."

HEAT FLOW – CONDUCTION

CONDUCTION

HEAT FLOW THROUGH
SOLID OBJECTS



CONDUCTIVITY

RATE OF CONDUCTIVE
HEAT FLOW DEPENDS
ON MATERIAL



CONDUCTANCE (U-VALUE)

LAYER OR ASSEMBLY

Aluminum ~160 W/mK
Steel ~60 W/mK
Stainless Steel ~14 W/mK
Fiberglass ~0.15 to 0.30 W/mK
Wood ~0.10 to 0.15 W/mK
Insulation Materials 0.022 to 0.080 W/mK



HEAT FLOW – U-VALUE AND R-VALUE

U-VALUE: CONDUCTANCE

HOW WELL HEAT MOVES
THROUGH AN ASSEMBLY OR MATERIAL

THE LOWER THE U-VALUE,
THE BETTER THE ASSEMBLY

$$\frac{1}{R} = U$$

R-VALUE: RESISTANCE

INVERSE OF U-VALUE

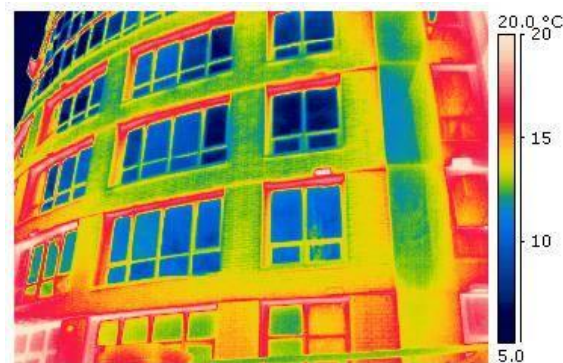
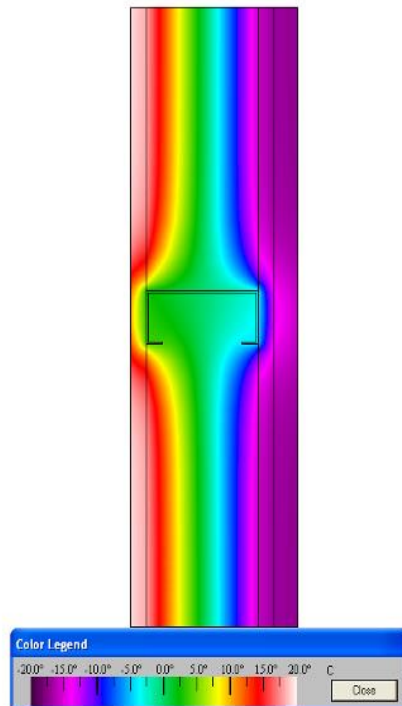
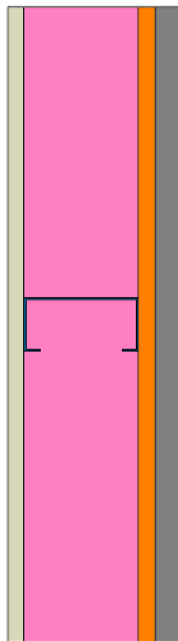
$$\frac{1}{U} = R$$

WHY ADDRESS THERMAL BRIDGING?

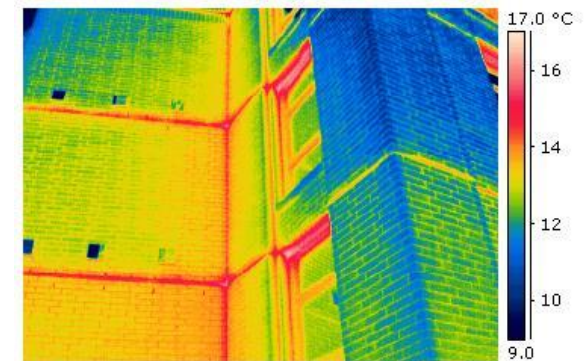
*Understanding the impact of thermal bridging
on a building's overall thermal performance*



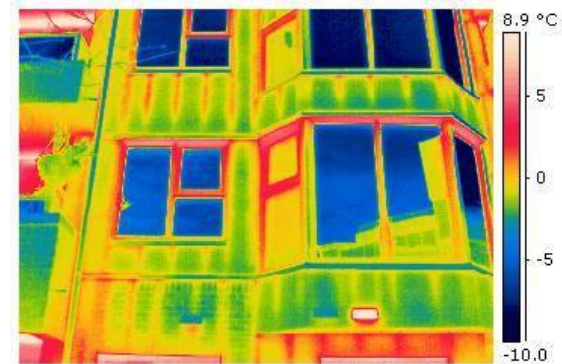
THERMAL BRIDGING



WINDOW FRAME

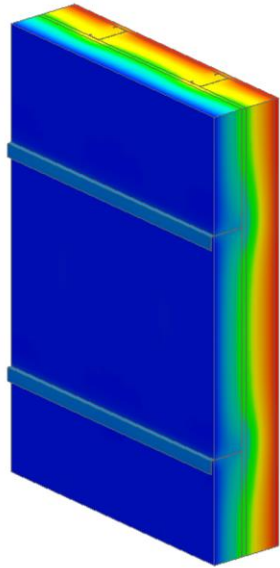


SHELF ANGLES



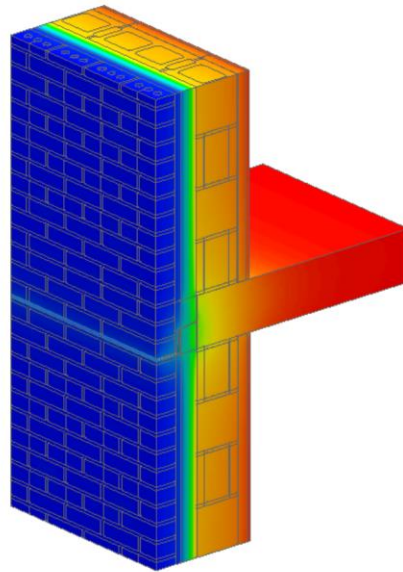
STEEL STUDS

DIFFERENT VALUES FOR DIFFERENT TYPES



Clear Field

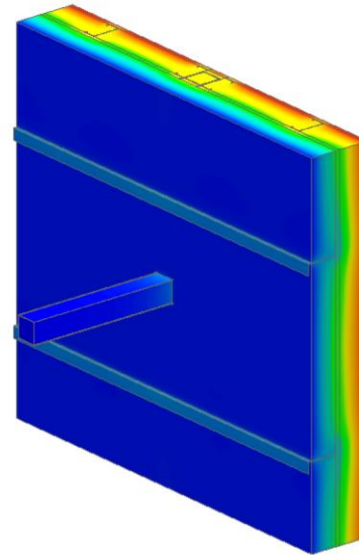
U_o



Linear

Ψ

psi



Point

χ

chi

Graphic credit to Morrison Hershfield
Ripped screaming from the pages of a
2012 report, authored by Neil Norris,
Patrick Ropell, Mark Lawton

DICTATING BETTER PERFORMANCE



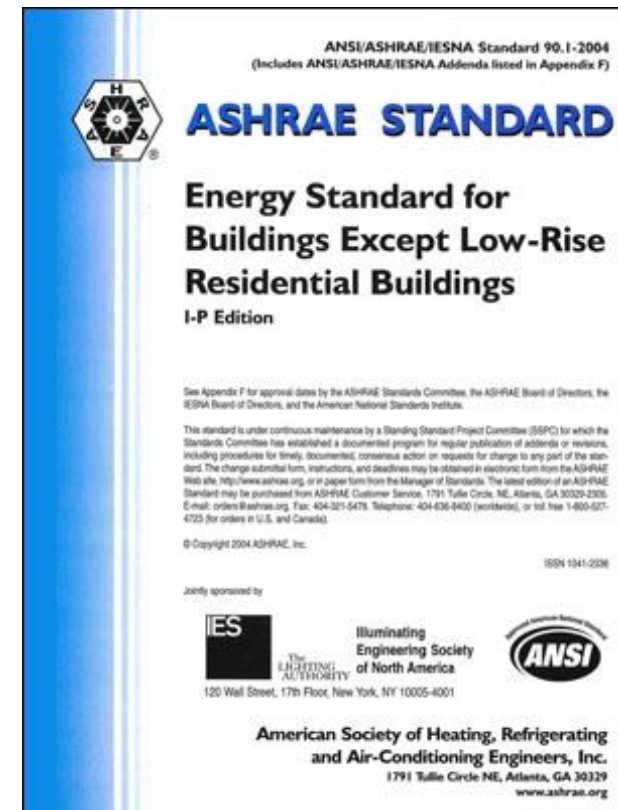
CITY of BOSTON



WHAT IS ASHRAE 90.1?

An energy standard with three ways to achieve compliance:

- Prescriptive path
- Building enclosure trade-off
- Energy cost budget path



ASHRAE 90.1 – Climate Zone 5

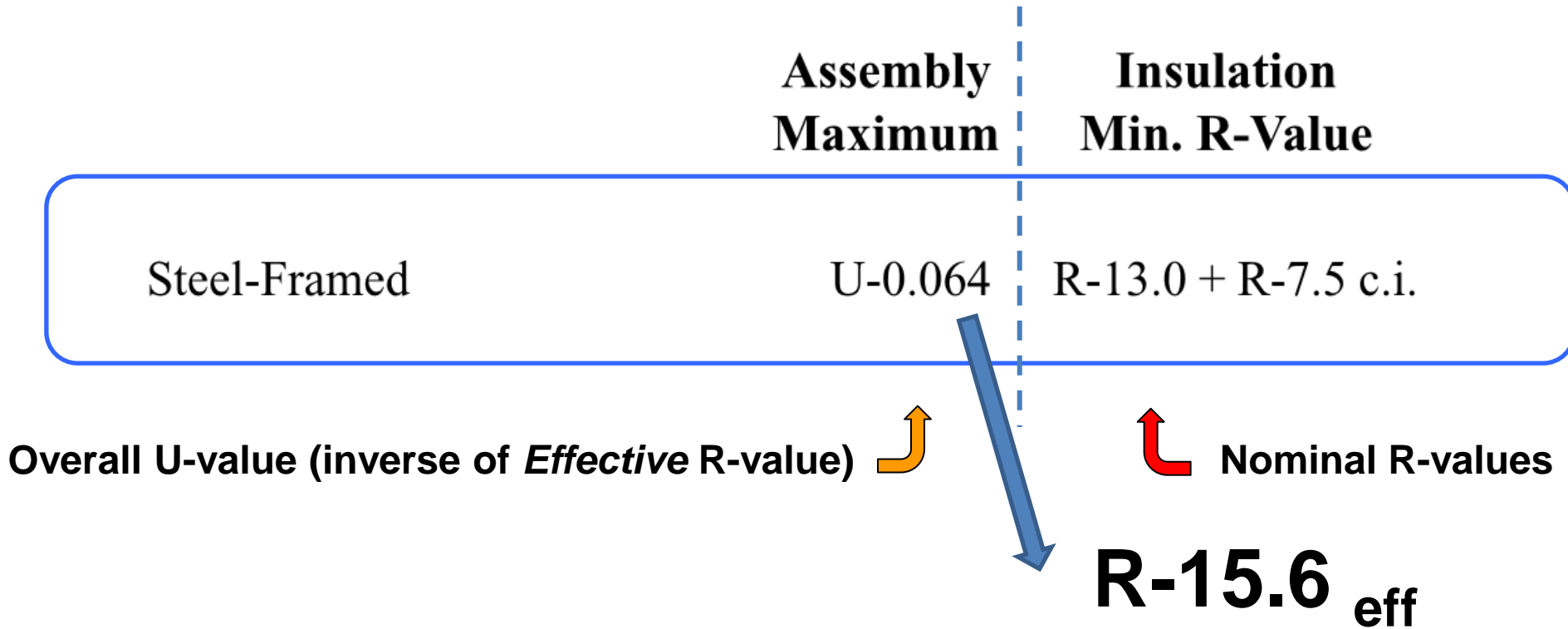
TABLE 5.5-5 Building Envelope Requirements for Climate Zone 5 (A, B, C)*

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
<i>Roofs</i>						
Insulation Entirely above Deck	U-0.048	R-20.0 c.i.	U-0.048	R-20.0 c.i.	U-0.119	R-7.6 c.i.
Metal Building ^a	U-0.055	R-13.0 + R-13.0	U-0.055	R-13.0 + R-13.0	U-0.083	R-13.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
<i>Walls, Above-Grade</i>						
Mass	U-0.090	R-11.4 c.i.	U-0.080	R-13.3 c.i.	U-0.151 ^b	R-5.7 c.i. ^b
Metal Building	U-0.069	R-13.0 + R-5.6 c.i.	U-0.069	R-13.0 + R-5.6 c.i.	U-0.113	R-13.0
Steel-Framed	U-0.064	R-13.0 + R-7.5 c.i.	U-0.064	R-13.0 + R-7.5 c.i.	U-0.124	R-13.0
Wood-Framed and Other	U-0.064	R-13.0 + R-3.8 c.i.	U-0.051	R-13.0 + R-7.5 c.i.	U-0.089	R-13.0
<i>Walls, Below-Grade</i>						
Below-Grade Wall	C-0.119	R-7.5 c.i.	C-0.119	R-7.5 c.i.	C-1.140	NR
<i>Floors</i>						
Mass	U-0.074	R-10.4 c.i.	U-0.064	R-12.5 c.i.	U-0.137	R-4.2 c.i.
Steel-Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.052	R-19.0
Wood-Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.051	R-19.0

Overall U-value (inverse of *Effective* R-value)

Nominal R-values

MOST COMMON WALL TARGET



NEW CODES ARE DIFFERENT

PREVIOUS ENERGY CODES



SEPARATE ASSEMBLY R-VALUES

NOW (BC ENERGY STEP CODE EXAMPLE)



ONE ENERGY USE LIMIT

NEW CODES ARE DIFFERENT

- Where have we already seen a whole-building outcome-based target work?
- Passive House
- It is impossible to develop enough prescriptive detail to account for all influential factors (e.g. thermal bridging), while also being simple enough to actually follow and achieve
- Designing for results
- Flexibility and responsibility

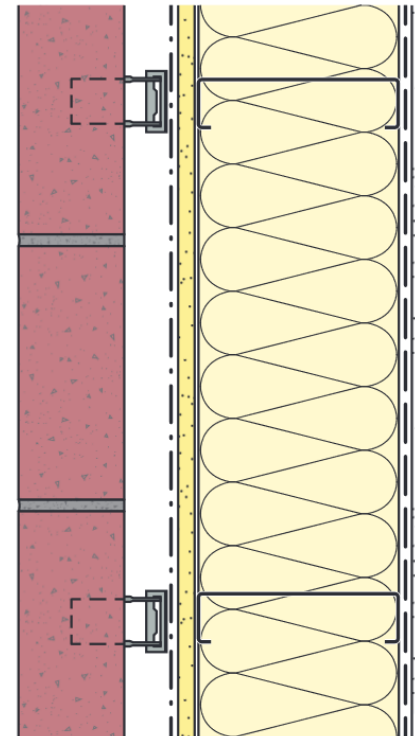


A photograph of a modern building facade with large windows and grey panels. An orange semi-transparent overlay covers the left side of the image, containing text.

WHY EXTERIOR INSULATION?

Gives us a chance to place insulation away from thermal-bridging of stud layer

INTERIOR INSULATION



INSULATION LAYER IN STUD CAVITY

MODERATE THERMAL PERFORMANCE
(EFFICIENT IN WOOD FRAME / INEFFICIENT IN STEEL STUD)

HIGHER RISK OF MOISTURE IN WALLS

SPLIT INSULATION



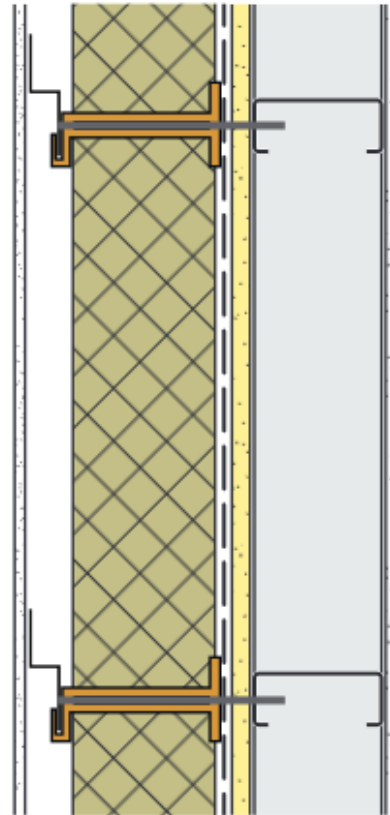
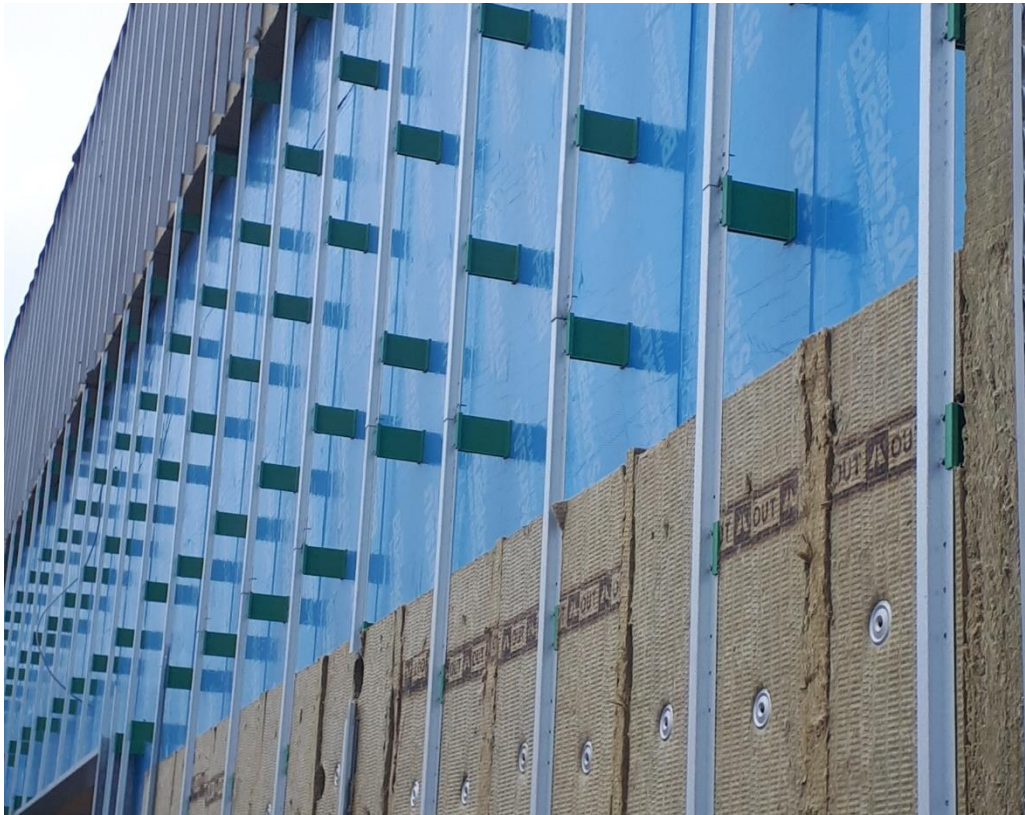
**INSULATION LAYER IN STUD CAVITY +
EXTERIOR OF SHEETING**

THERMAL PERFORMANCE
(BALANCING PERFORMANCE AND WALL THICKNESS)

MODERATE RISK OF MOISTURE IN WALLS
(DEPENDING ON CLIMATE ZONE & VAPOR/AIR BARRIERS)

MORE COMPLEX DESIGN & INSTALL
(MORE COMPONENTS, MORE CONSIDERATION TO
LOCATION, PLACEMENT AND TYPE OF AIR AND VAPOR
BARRIERS)

EXTERIOR INSULATION



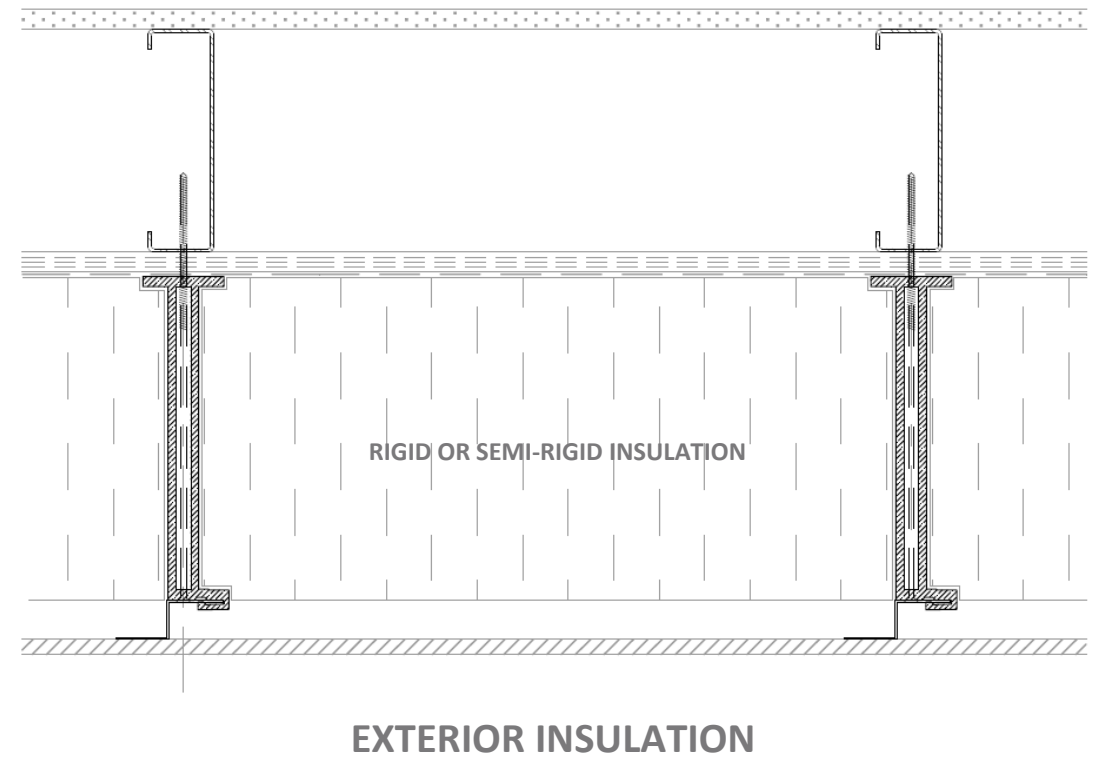
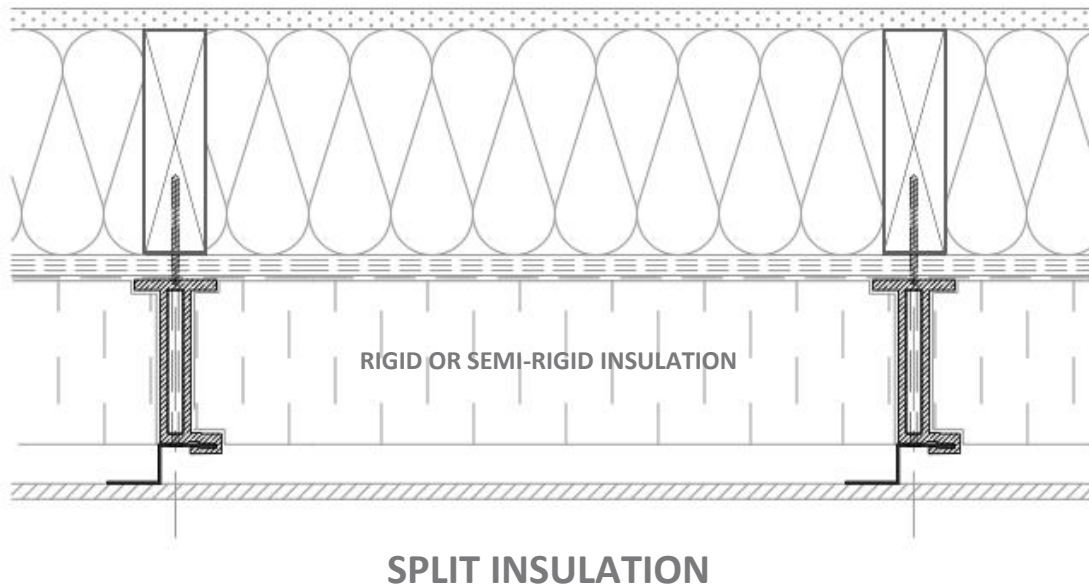
INSULATION EXTERIOR OF SHEETING

HIGH THERMAL PERFORMANCE
(MOST EFFICIENT USE OF INSULATION)

MINIMAL RISK OF MOISTURE IN WALLS

SIMPLE DESIGN & INSTALL
(LESS COMPONENTS, CAN COMBINE AIR AND VAPOR BARRIERS, WORKS IN ALL CLIMATE ZONES, MORE DURABLE)

PASSIVE HOUSE ASSEMBLIES



A low-angle photograph of a modern building with large windows and a grey facade, partially visible at the top of the slide.

POLL QUESTION 2:

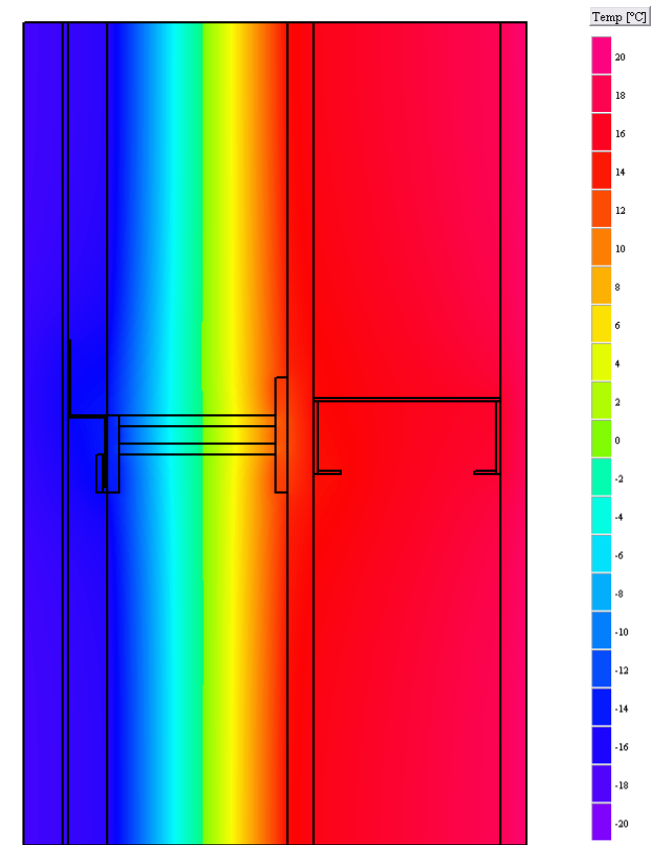
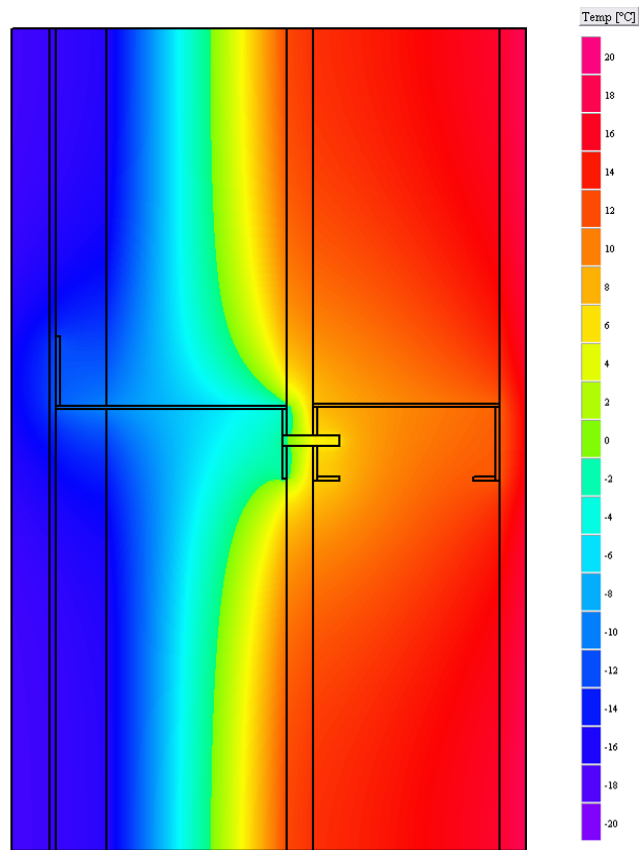
**WHAT INSULATION APPROACH DO
YOU TYPICALLY USE ON PROJECTS?**

HOW CLADDING ATTACHMENT IMPACTS PERFORMANCE

Thermally-improved cladding attachments are more important than insulation type



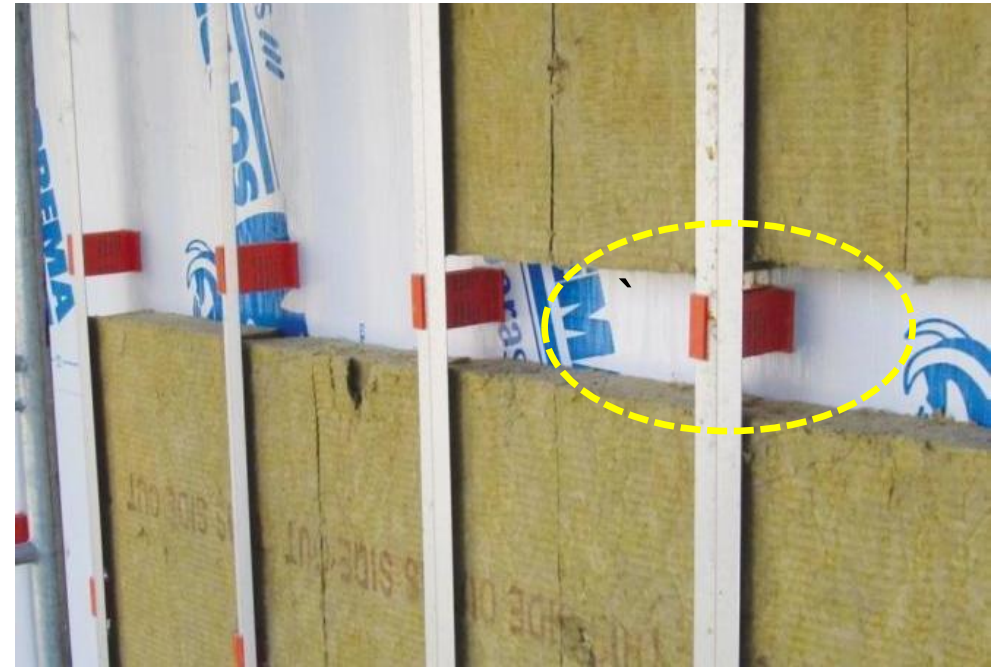
IMPACTS OF HOW YOU ATTACH



CLADDING ATTACHMENT MATTERS MOST



12" OF INSULATION



3.5" OF INSULATION

THINNER WALL HAS HIGHER EFFECTIVE R-VALUE



CLADDING ATTACHMENTS

**METAL GIRTS
VERTICAL &
HORIZONTAL**

**ALUMINUM
T-CLIPS**

**GALVANIZED
STEEL CLIPS**

**STAINLESS
STEEL CLIPS**

**ISOLATED
GALVANIZED CLIPS**

FIBERGLASS CLIPS

DIRECT ATTACHMENT

FIBERGLASS GIRT



CLADDING ATTACHMENTS

**METAL GIRTS
VERTICAL &
HORIZONTAL**

THE “OLD” WAY

ALUMINUM
T-CLIPS

GALVANIZED
STEEL CLIPS

STAINLESS
STEEL CLIPS

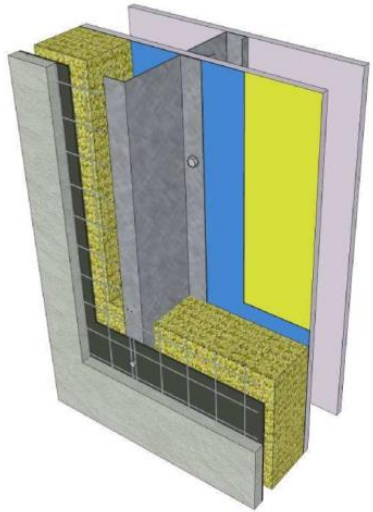
**ISOLATED
GALVANIZED CLIPS**

FIBERGLASS CLIPS

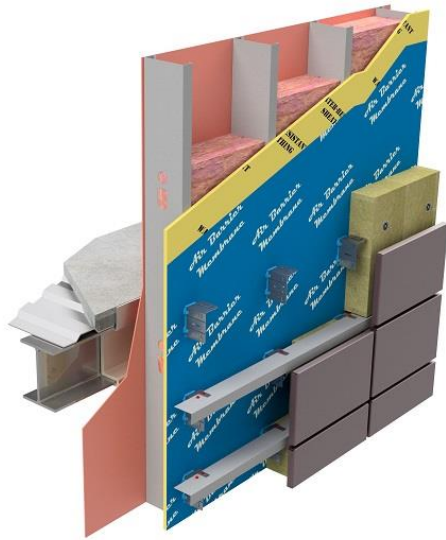
DIRECT ATTACHMENT

FIBERGLASS GIRT

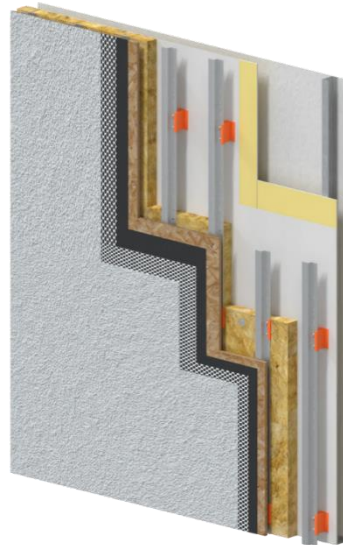
CLADDING ATTACHMENTS



METAL GIRTS
VERTICAL & HORIZONTAL



**ISOLATED
GALVANIZED CLIPS**



FIBERGLASS CLIPS
GALVANIZED SCREWS

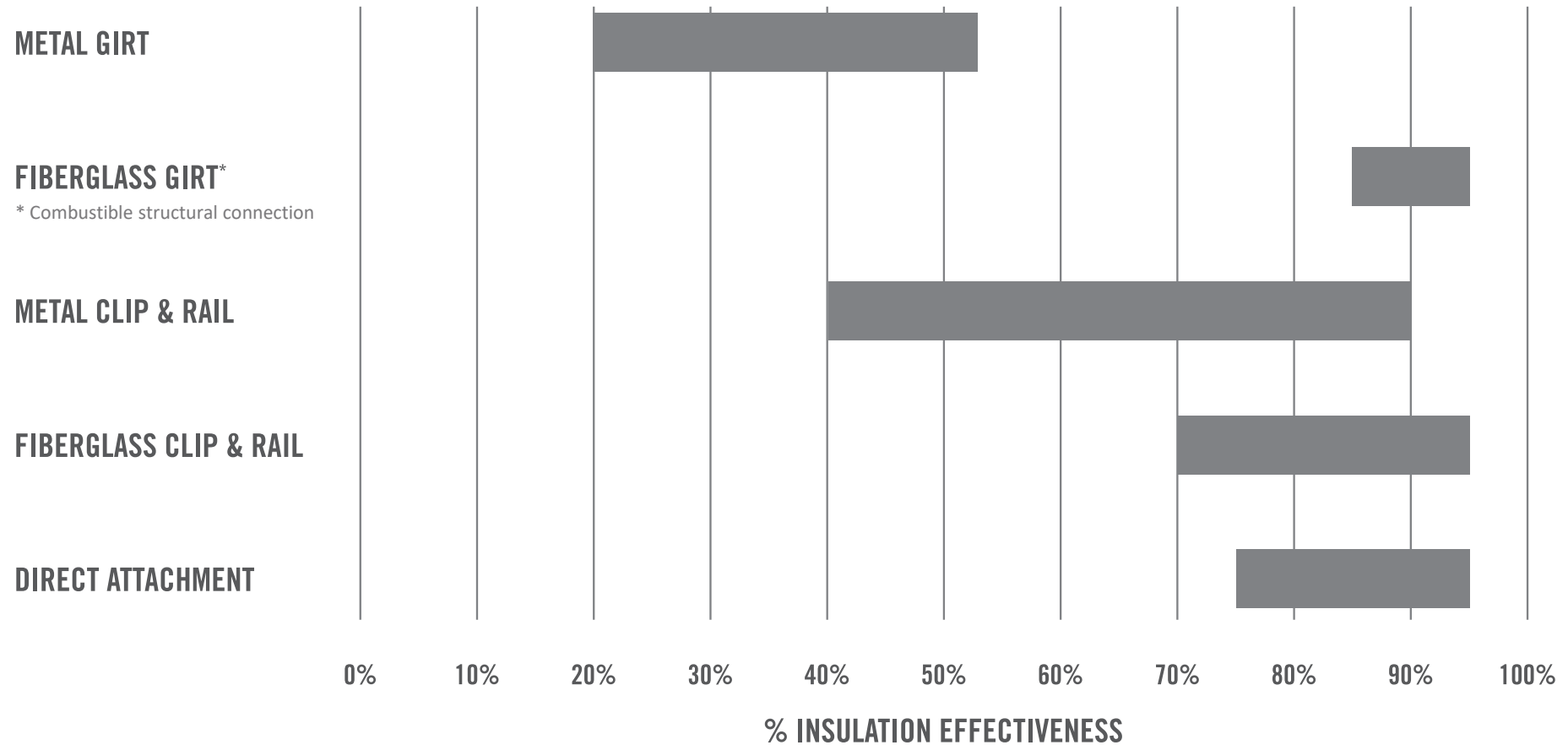


FIBERGLASS GIRT
NO THROUGH SCREWS

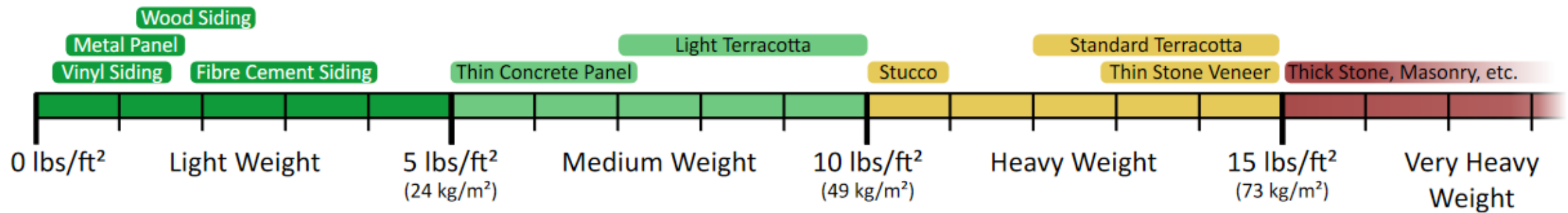


**DIRECT
ATTACHMENT**
GALVANIZED STEEL SCREWS

DEFINING PERFORMANCE – THERMAL



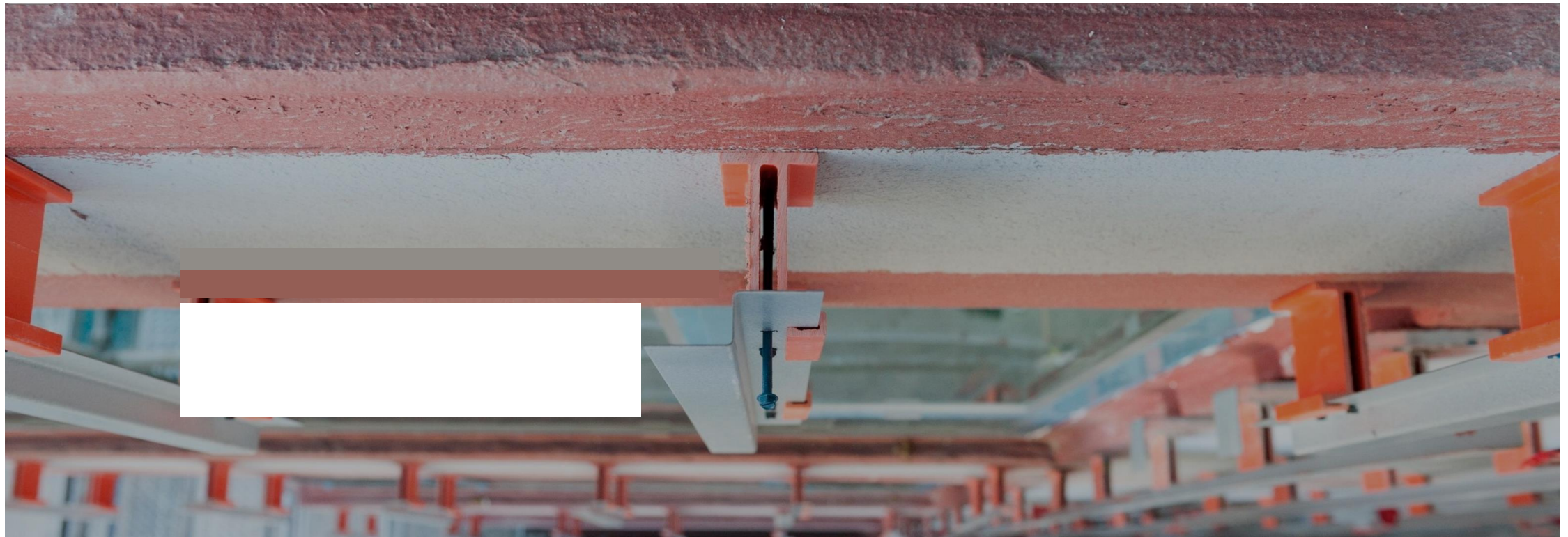
DEFINING PERFORMANCE - STRENGTH


















DEFINING PERFORMANCE - COST



DESIGN TOOLS



PERFORMANCE IS A MATRIX

	RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY	COMBUSTIBILITY	STRENGTH
METAL GIRT	\$\$\$	20-50%			
FIBERGLASS GIRT* <small>* Combustible structural connection</small>	\$\$\$\$	85-95%			
METAL CLIP & RAIL	\$\$\$	40-90%			
FIBERGLASS CLIP & RAIL	\$\$\$	70-95%			
DIRECT ATTACHMENT	\$\$\$	75-95%			

FIRE PROTECTION – CLADDING BIG PICTURE

TO AVOID THIS...





ANALYSIS AND TESTING – FIRE PERFORMANCE

ENGINEERING ANALYSIS – FIRE PERFORMANCE:

Spacer is acceptable for use in:

- A WALL REQUIRED TO BE BUILT OF NON-COMBUSTIBLE CONSTRUCTION
- INCLUDING PERMITTED COMBUSTIBLE CLADDINGS (METAL COMPOSITE MATERIALS)
- ALSO, IN COMBUSTIBLE CONSTRUCTION (OBVIOUSLY)

Maintains the two code (and common sense) objectives, which are:

1. CANNOT ALTER INTENDED FIRE PERFORMANCE OF NON-COMBUSTIBLE WALL
2. CLADDING MUST STAY-IN-PLACE EVEN IF THE COMPONENT IS DAMAGED

No.1 is clear by analysis, and can be further supported by testing

No.2 is clear by observation—direct fastening

CANADIAN CODE EVALUATION



Building Code Consultants Ltd



B.R. Thorson Consulting Ltd.

Consulting Structural Engineer • Building Code Consultant

769 Roslyn Blvd, North Vancouver, B.C. V7G 1P4

Tel. 604-929-8520 Fax 604-929-8530 Cell 604-290-6569

WORKS WITH ANY CLADDING TYPE



MINOR COMBUSTIBLE COMPONENT

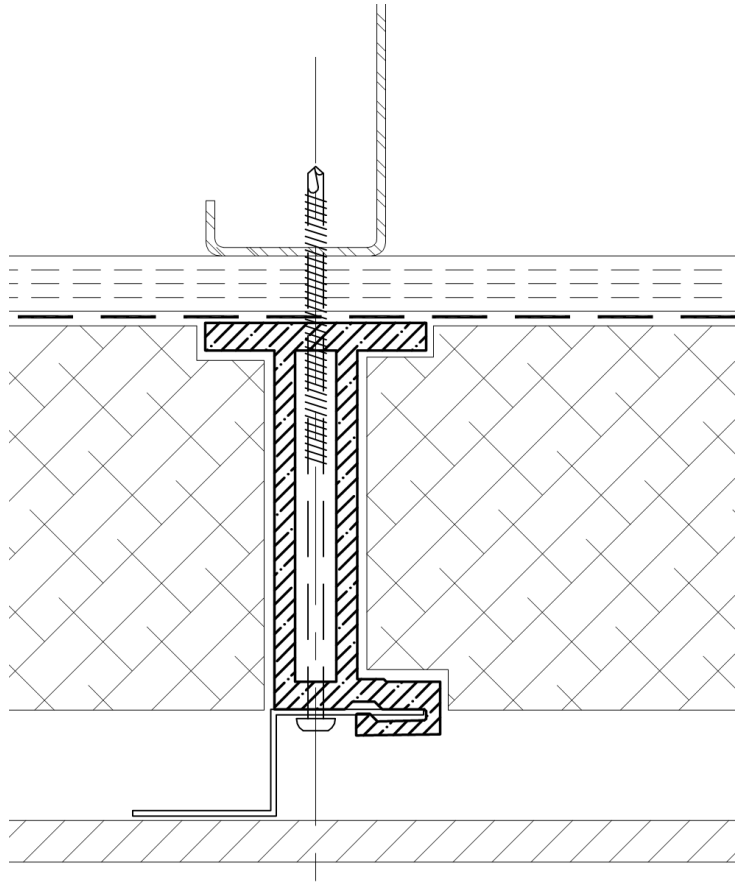
Building Code Appeal Board

c/o Building and Safety Standards Branch

PO Box 9844 Stn Prov Govt

Victoria BC V8W 9T2

NON-COMBUSTIBLE CONNECTION



CODE COMPLIANCE: IAPMO-UES REPORT

THIRD PARTY CERTIFICATION OF THE CASCADIA CLIP

**APPROVES CLIP FOR USE IN IBC TYPES I, II, III, IV, AND V
CONSTRUCTION**

ICC-ES EQUIVALENT

LOOKS AT SEVERAL DIFFERENT ASPECTS OF DESIGN

**ONLY CLIP SYSTEM WITH A NATIONALLY RECOGNIZED THIRD
PARTY CODE COMPLIANCE REPORT**





FIRE PERFORMANCE - TESTING

**NFPA 285 TEST
FIRE PROPAGATION IN EXTERIOR WALL
FULL-ASSEMBLY TEST**

FIRE PERFORMANCE - TESTING



FIRE PERFORMANCE – NFPA 285 RESULTS

SOLID PASS WITH MCM PANELS



FIRE PERFORMANCE – NFPA 285 RESULTS

SOLID PASS WITH MCM PANELS



FOR FIRE PERFORMANCE

**CONCLUSION:
THE CLIP DOES...
NOTHING
AND THEREFORE
CHANGES NOTHING.**



INTERTEK LISTING WITH ROXUL

ROXUL Inc.
Design No. RI/MFF 30-01
Mineral Wool Insulation
CAVITYROCK and COMFORTBOARD 110
NFPA 285 – Meets Conditions of Acceptance

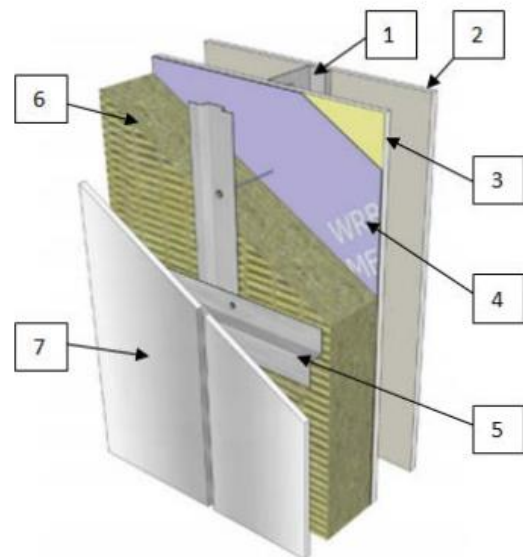


Figure 1: Construction with COMFORTBOARD 110

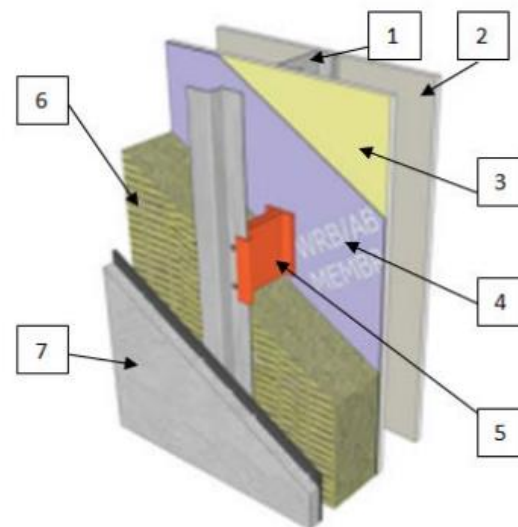
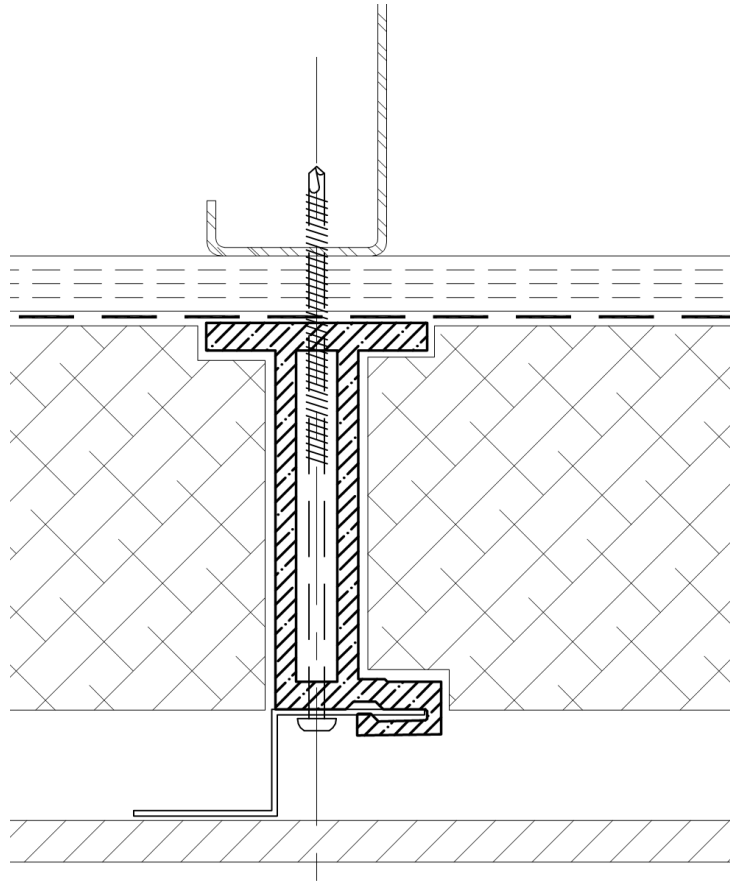


Figure 2: Construction with CAVITYROCK



Valued Quality. Delivered.

A LENS TO JUDGE





POLL QUESTION 3:

**WHEN CHOOSING
AN EXTERIOR CLADDING SUPPORT SYSTEM,
WHICH PERFORMANCE CHARACTERISTICS
ARE MOST IMPORTANT (TOP 3)?**

TYPICAL INSTALLATION PRACTICES

*Maximizing efficiency to
streamline installation*



INSTALLATION STEPS

VERTICAL CLIP & RAIL

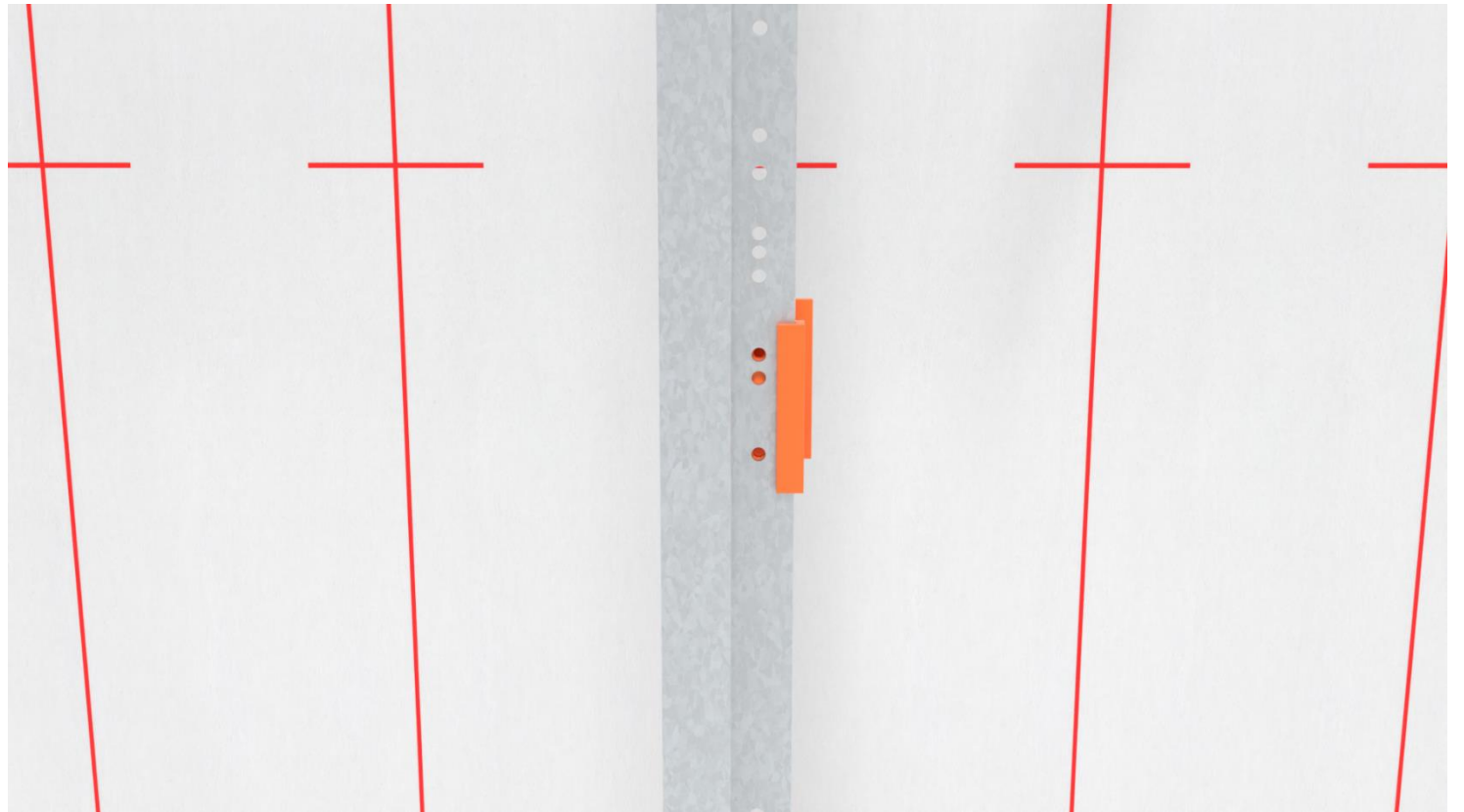
1. Mark spacing on backup wall



INSTALLATION STEPS

VERTICAL CLIP & RAIL

2. Snap clips to pre-punched z-girts



INSTALLATION STEPS

VERTICAL CLIP & RAIL

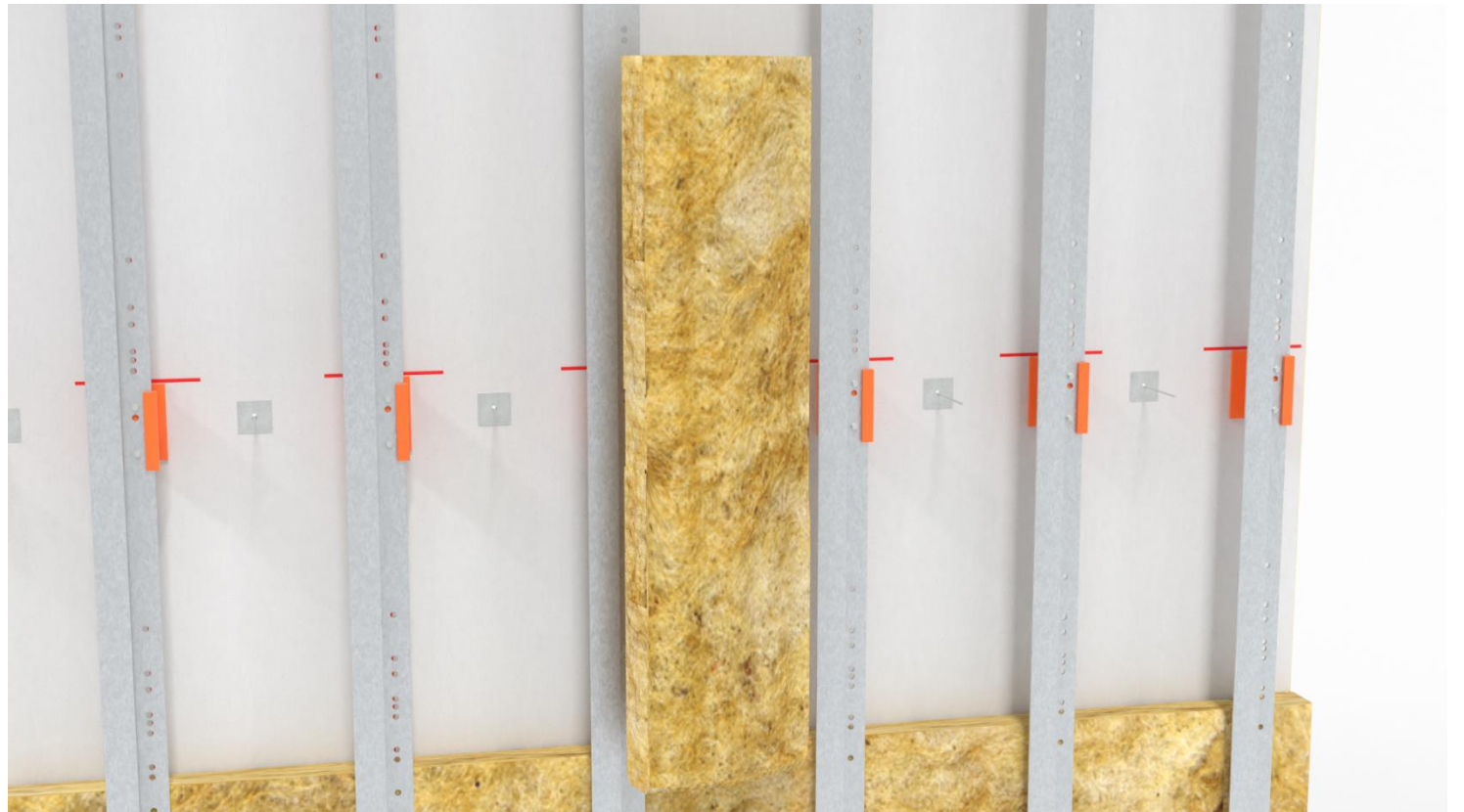
3. Secure clips to backup wall



INSTALLATION STEPS

VERTICAL CLIP & RAIL

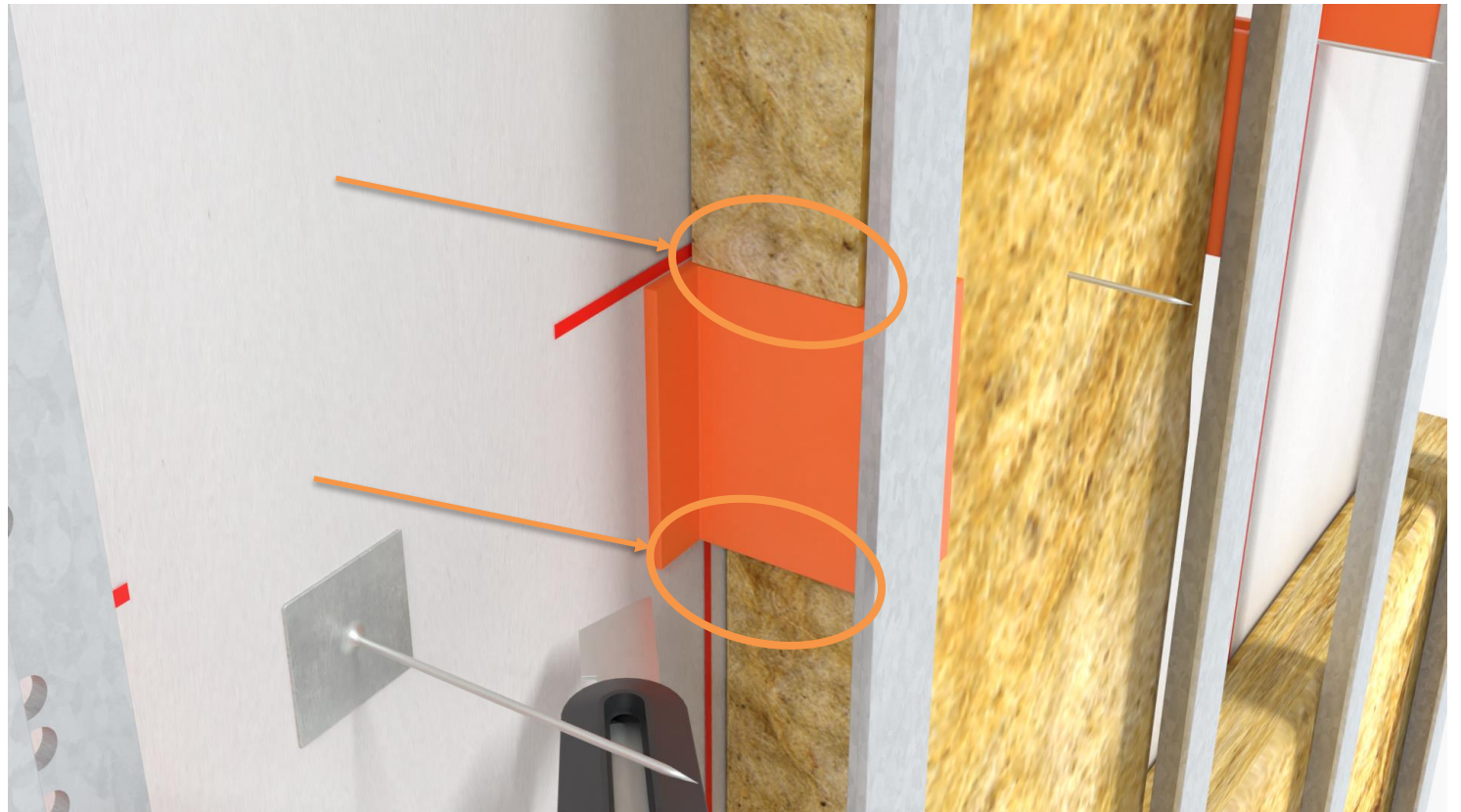
4. Install insulation



INSTALLATION STEPS

VERTICAL CLIP & RAIL

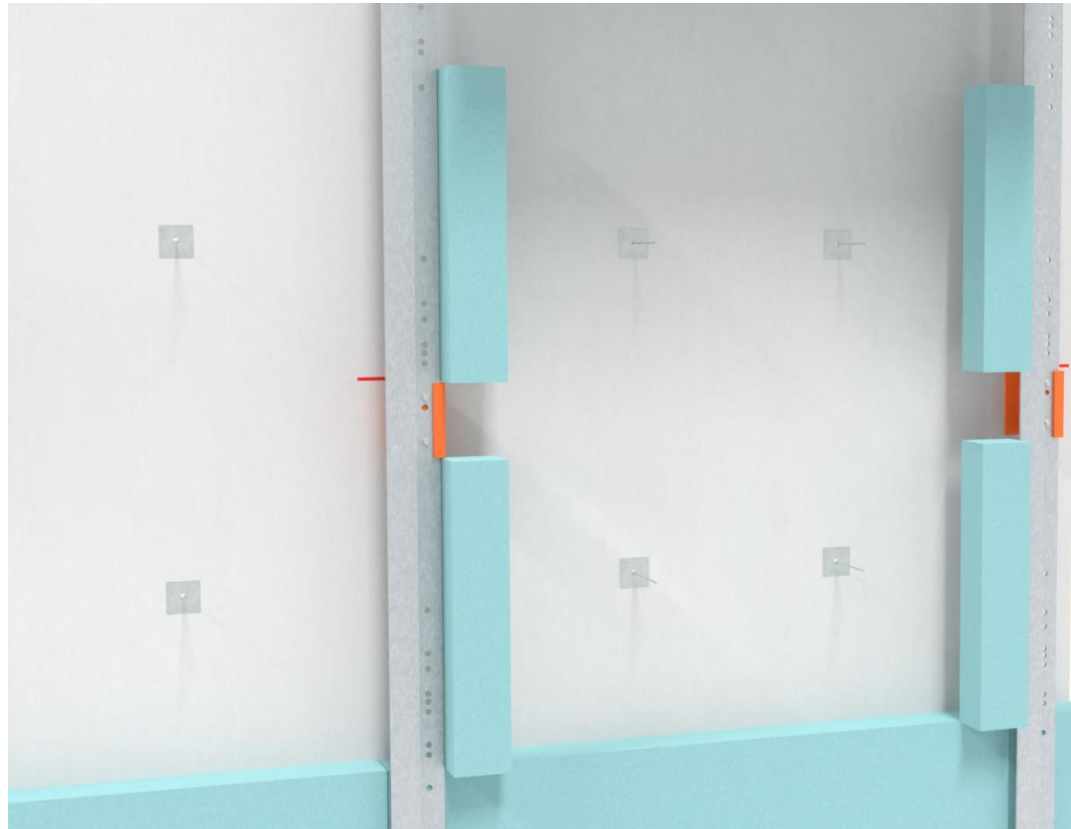
4. Install insulation



INSTALLATION STEPS

VERTICAL CLIP & RAIL

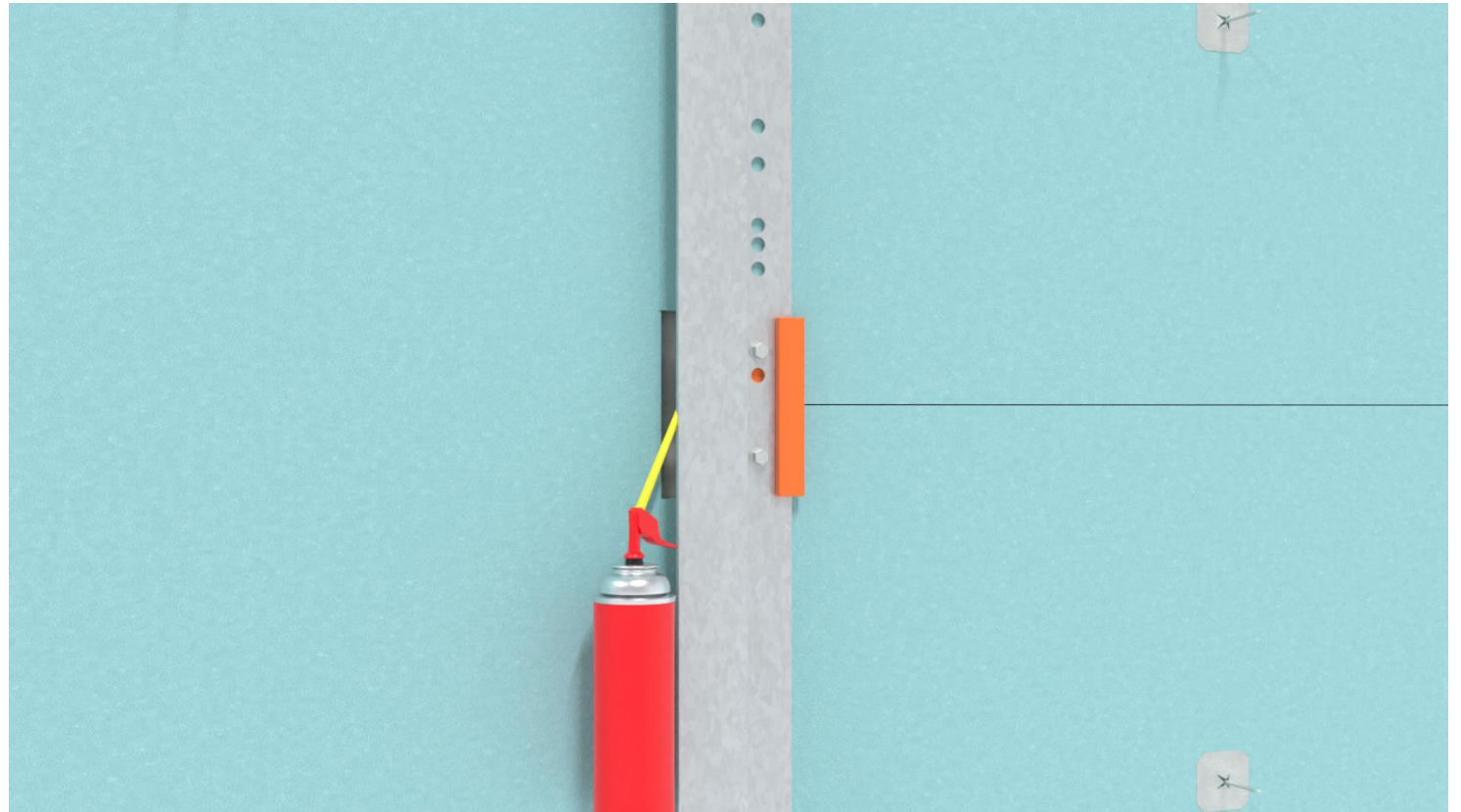
4. Install insulation (Rigid Insulation)



INSTALLATION STEPS

VERTICAL CLIP & RAIL

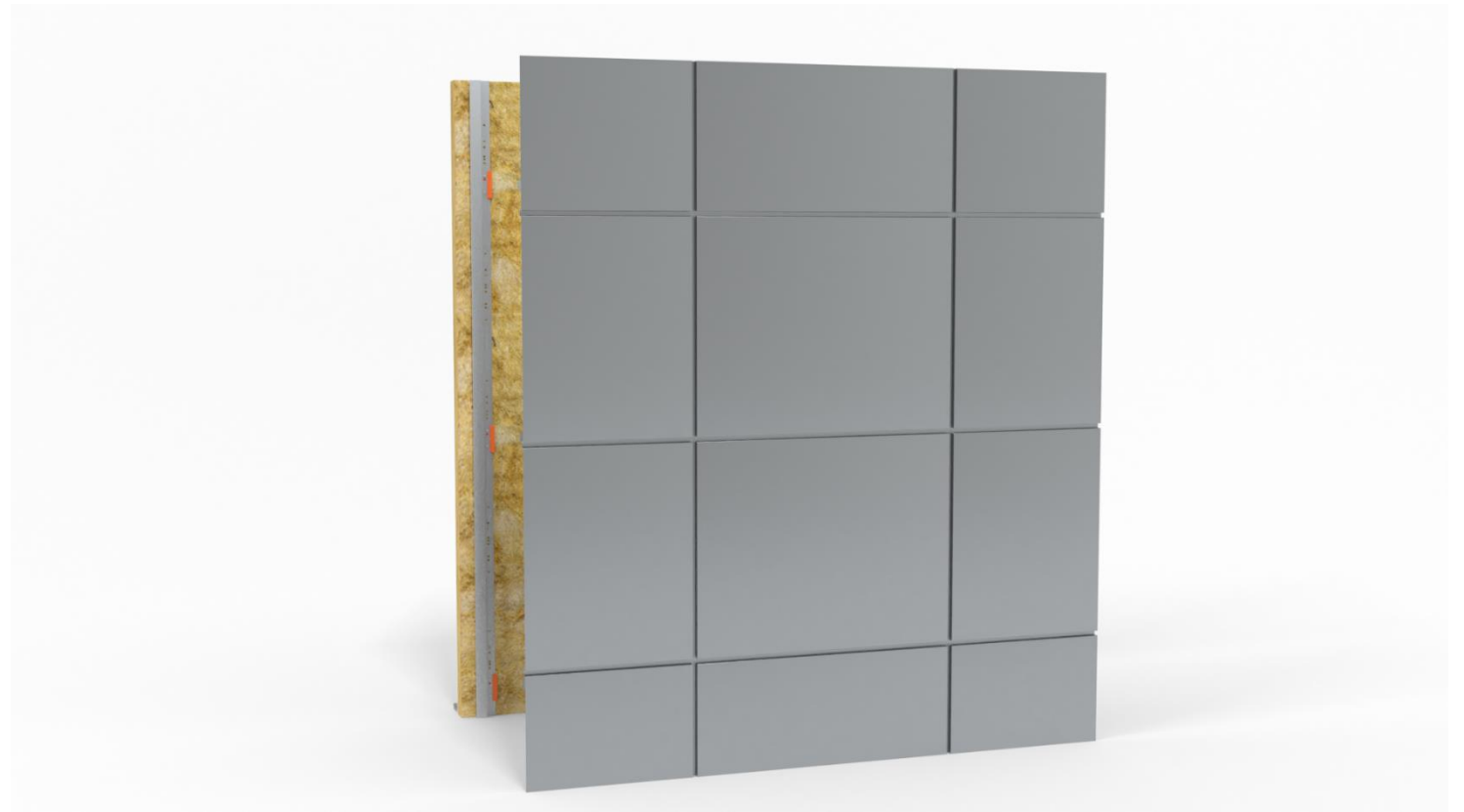
4. Install insulation (Rigid Insulation)



INSTALLATION STEPS

VERTICAL CLIP & RAIL

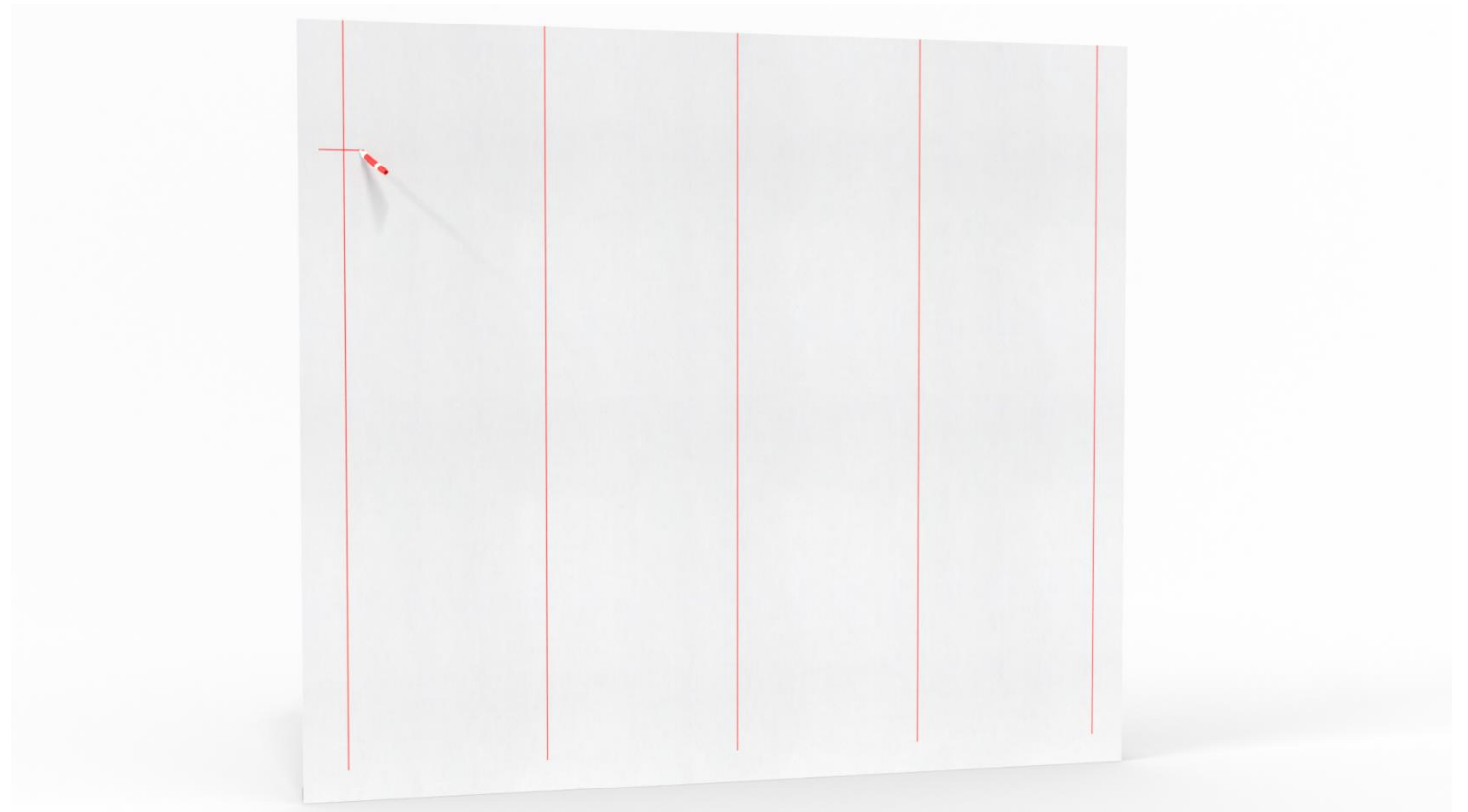
5. Install cladding



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

1. Mark spacing on backup wall



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

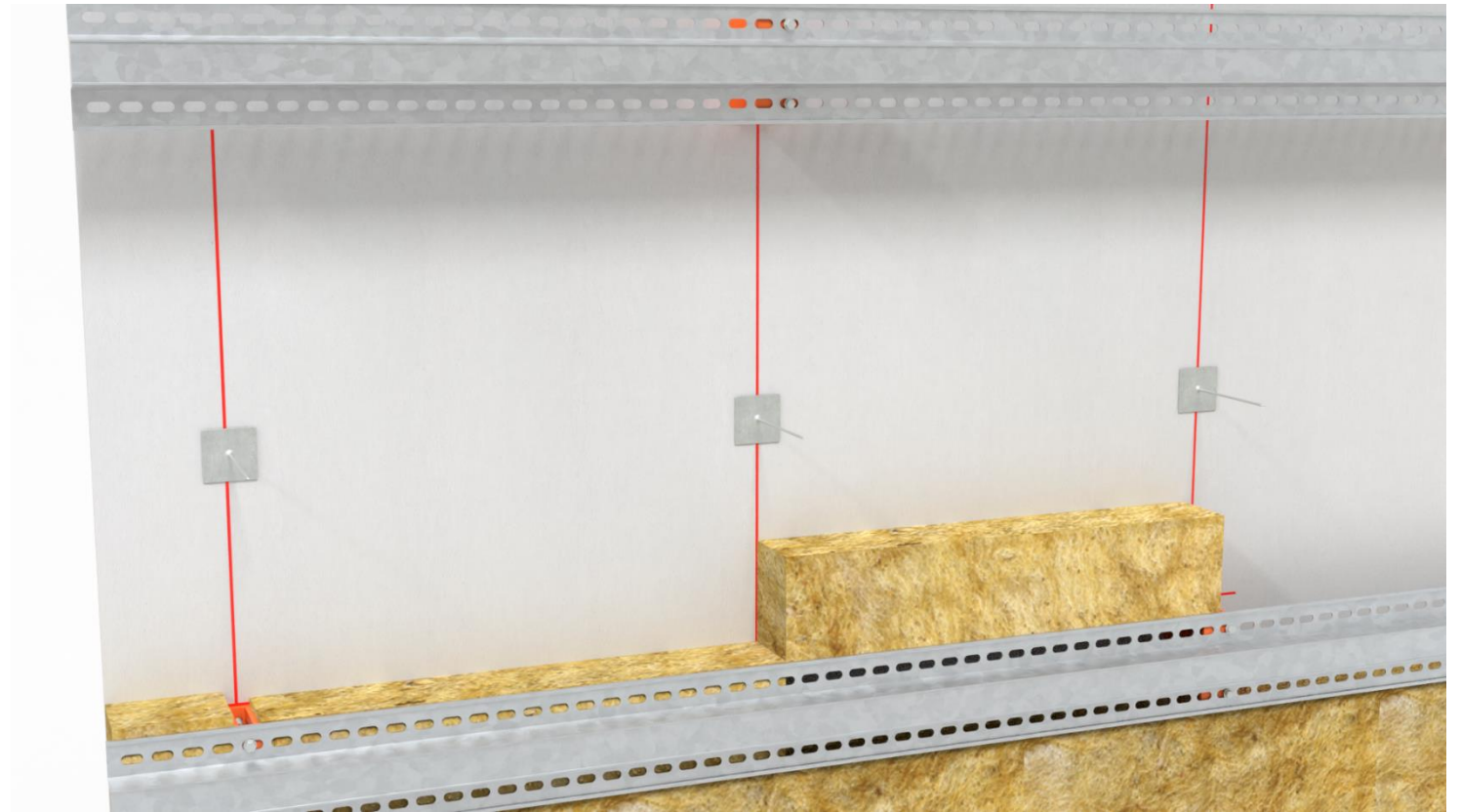
2. Secure clips to backup wall



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

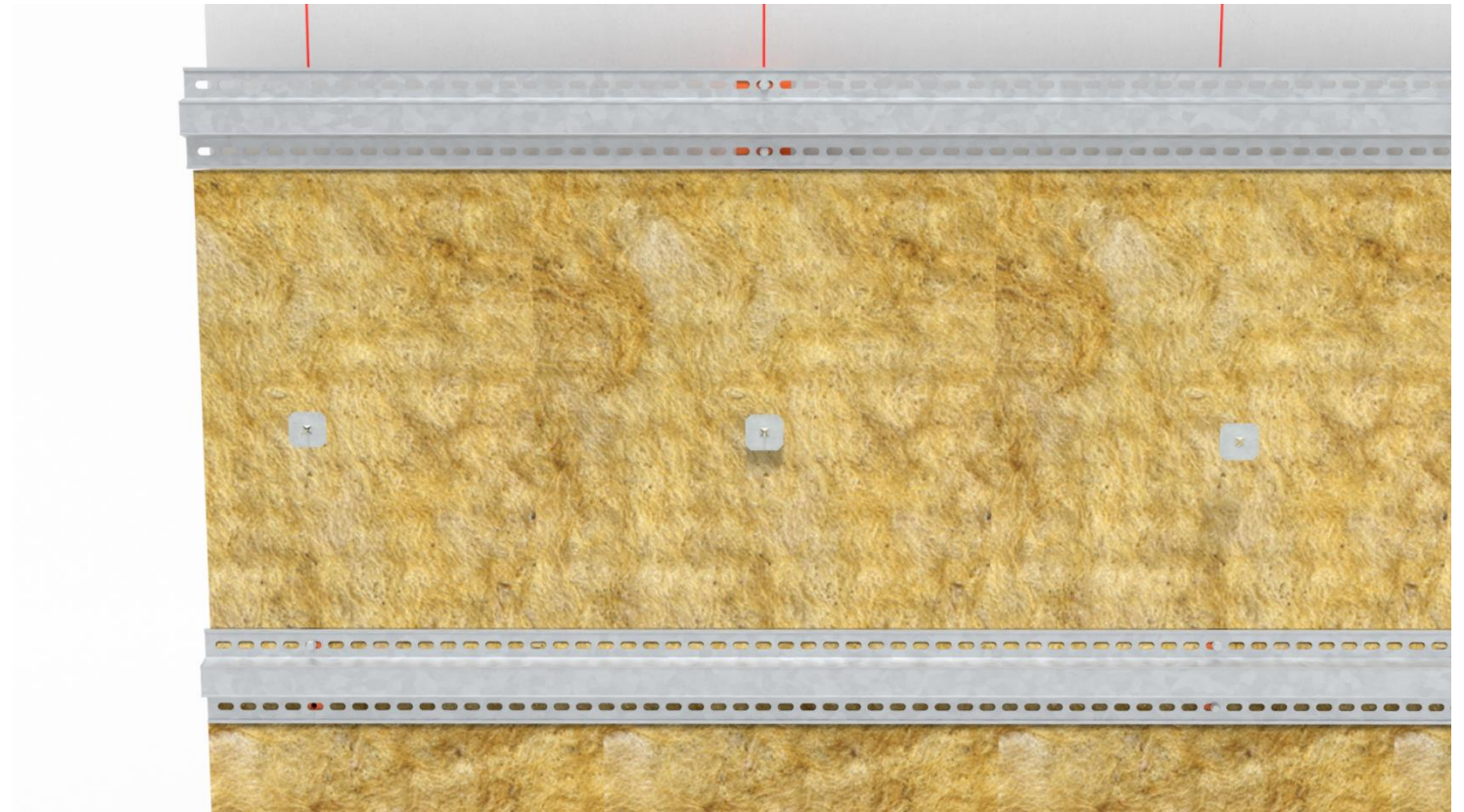
3. Install insulation



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

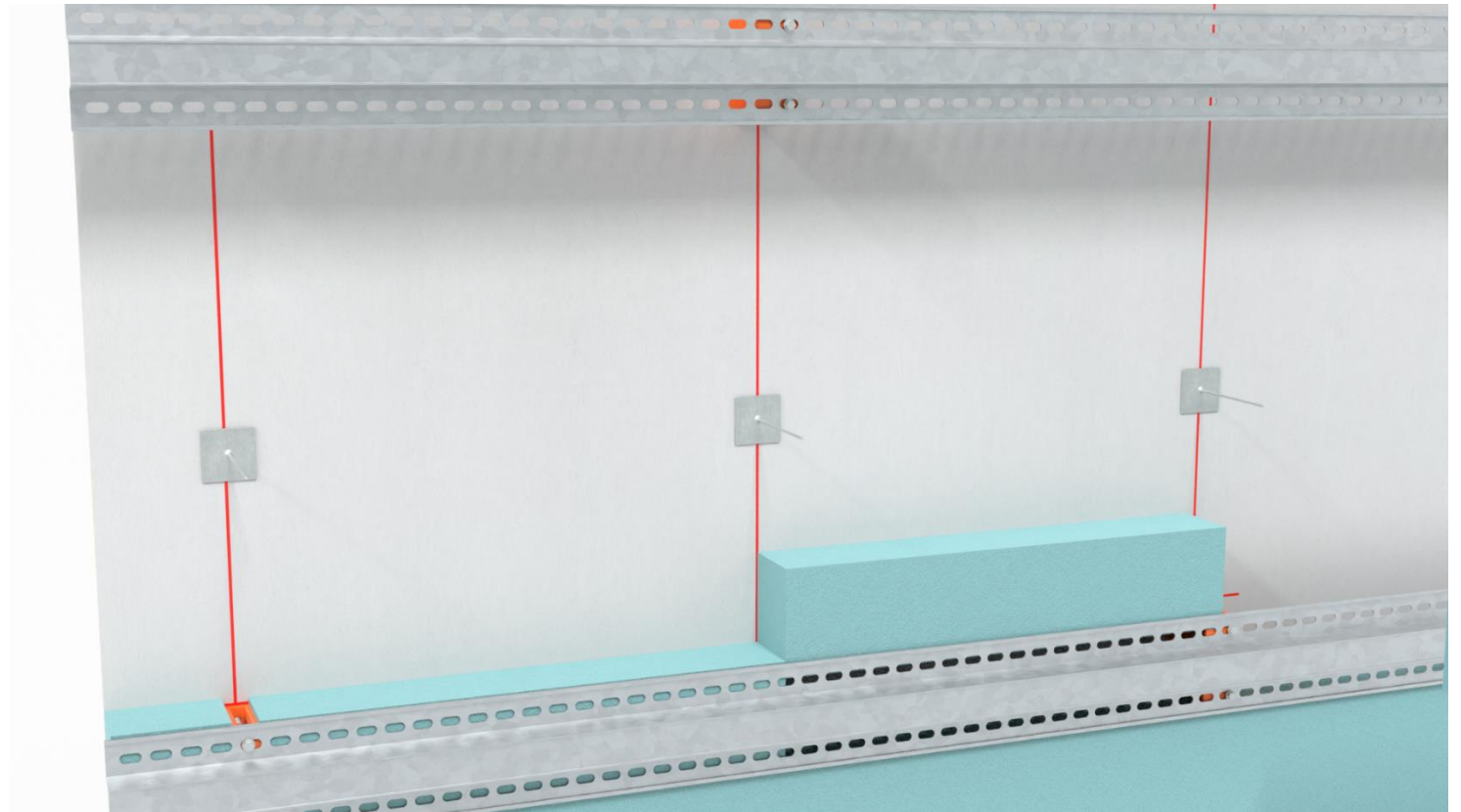
3. Install insulation



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

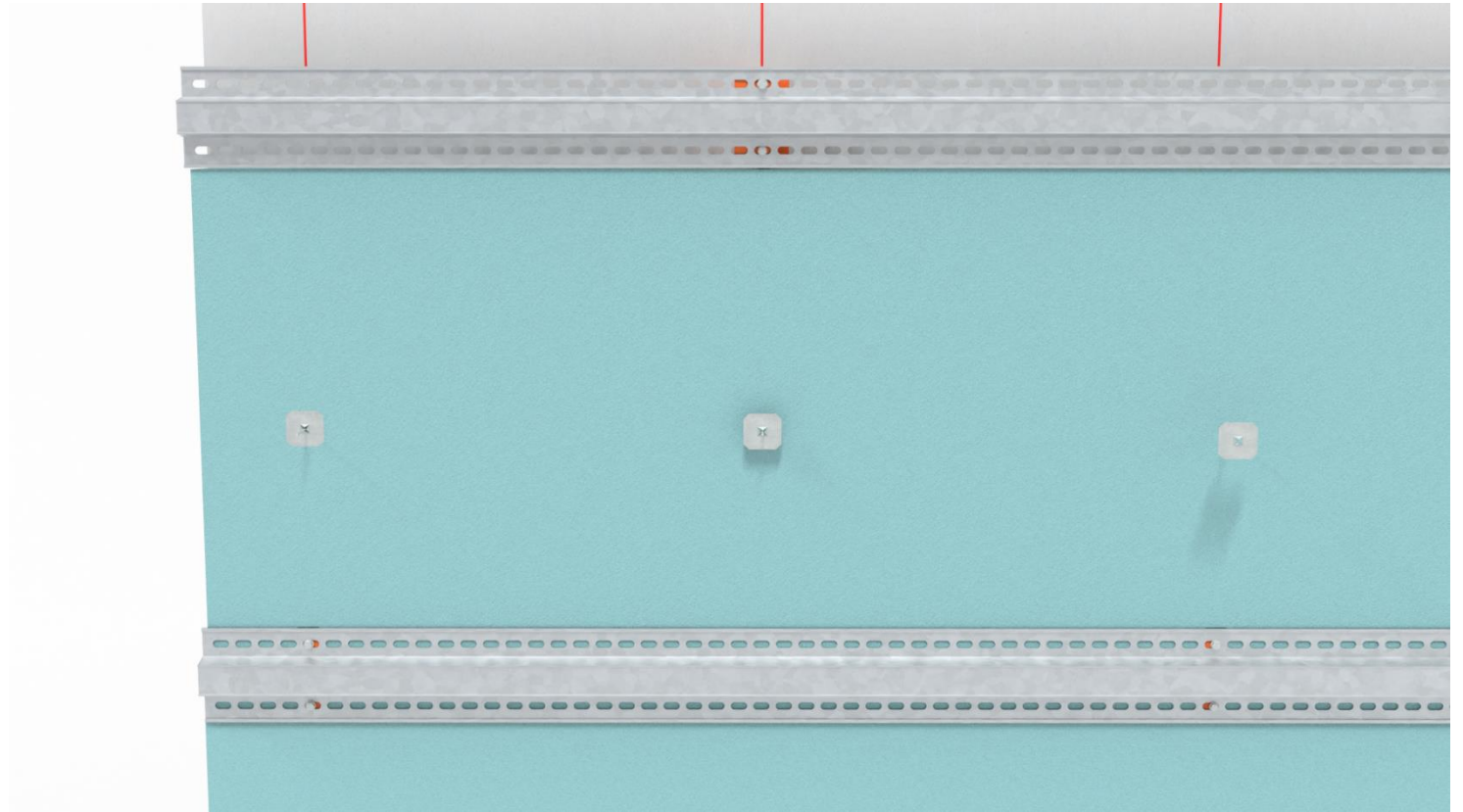
3. Install insulation (Rigid Foam)



INSTALLATION STEPS

HORIZONTAL CLIP & RAIL

3. Install insulation (Rigid Foam)



INSTALLATION STEPS

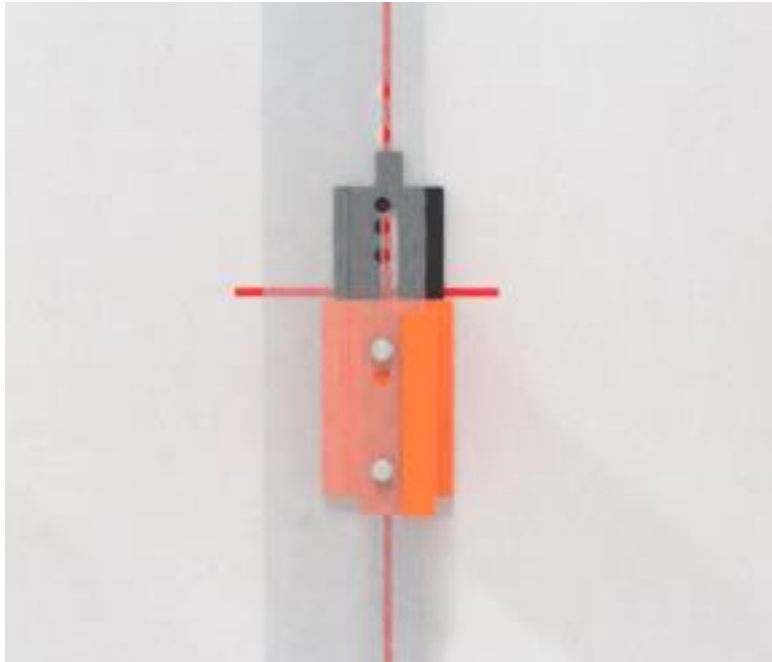
HORIZONTAL CLIP & RAIL

4. Install cladding

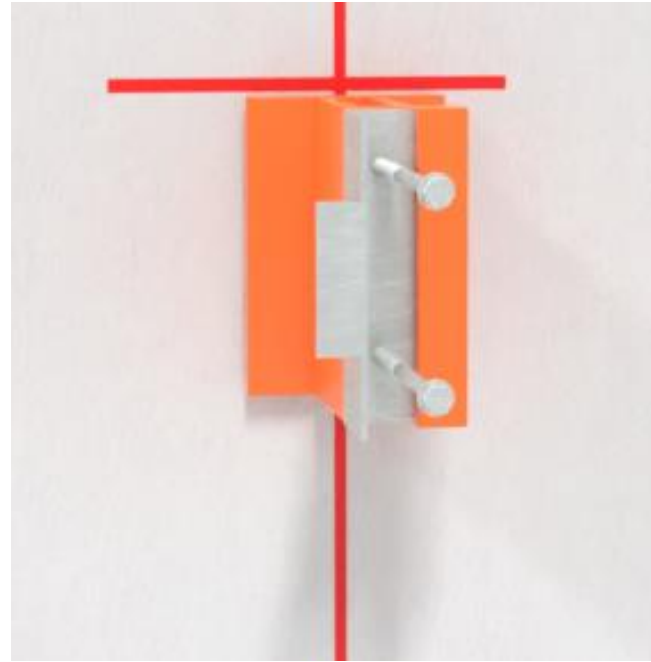


INSTALLATION STEPS - ADJUSTABILITY

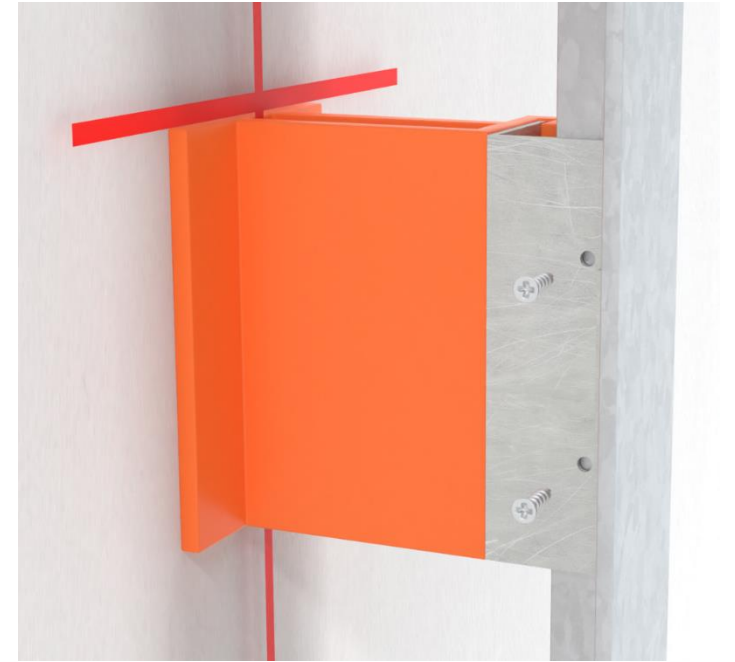
VERTICAL CLIP & RAIL



Shims



Adjustability Bracket



INSTALLATION STEPS - ADJUSTABILITY

HORIZONTAL CLIP & RAIL



Shims

A photograph of a modern building facade with large windows and a greyish-brown exterior, positioned at the top right of the slide.

POLL QUESTION 4:

**WHAT TYPE OF INSULATION
DO YOU TYPICALLY USE IN AN EXTERIOR
CLADDING ASSEMBLY?**

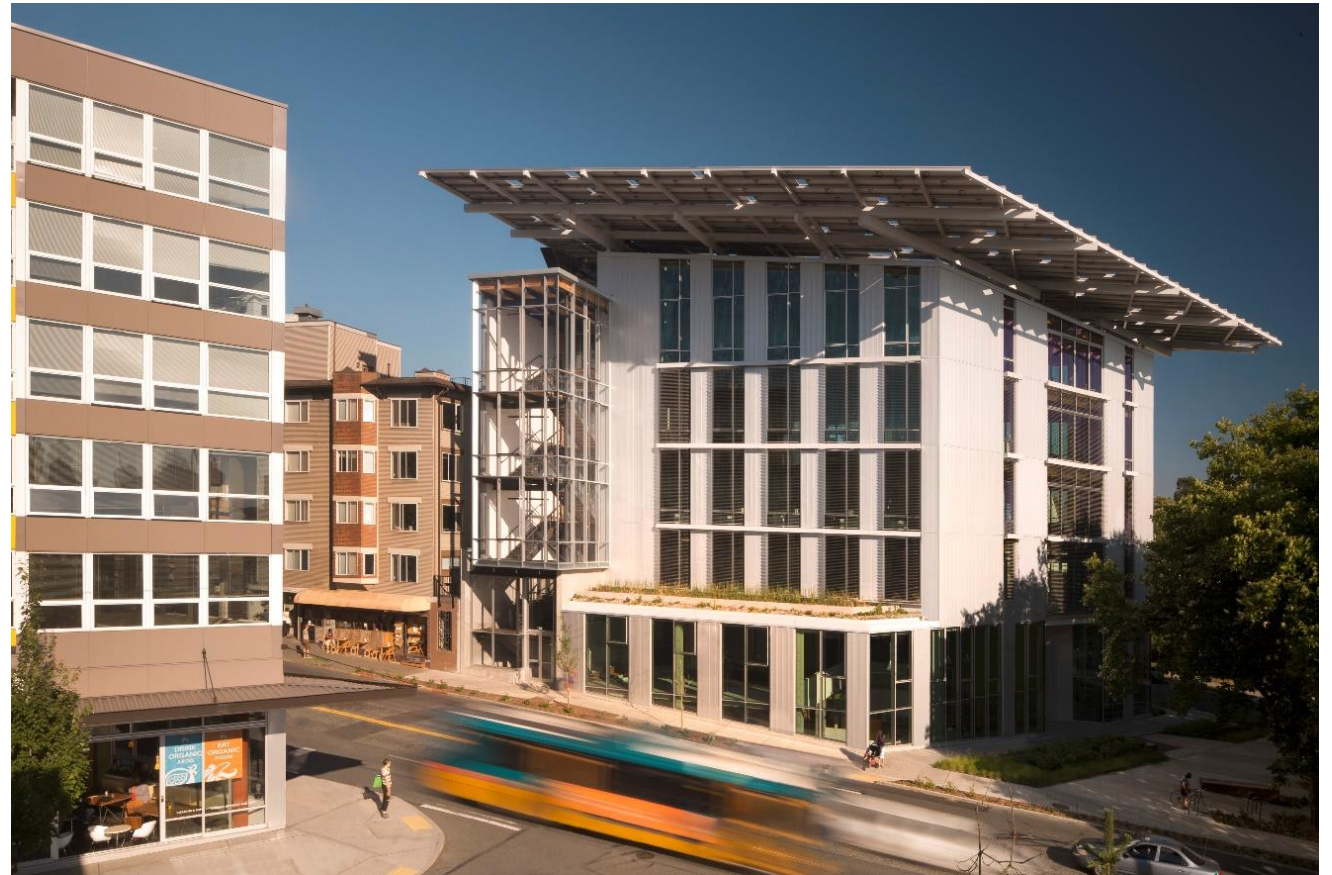
THERMAL BRIDGING IN THE REAL-WORLD

*Project examples of high-performance
thermal bridging*



BULLITT CENTER

- Seattle, WA (2013)
- Living Building Certified
- Project Team
 - Architect - Miller Hull
 - Developer – Point 32
 - Engineer – PAE Engineers
 - Structural Engineer – DCI Engineers
 - Contractor - Schuchart

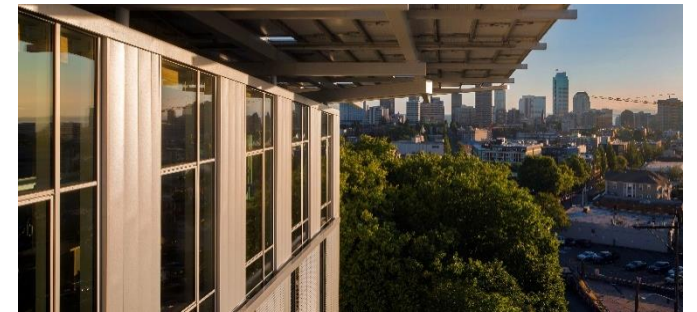


BULLITT CENTER



IMAGE COURTESY OF BULLITT CENTER / BRAD KAHN

BULLITT CENTER

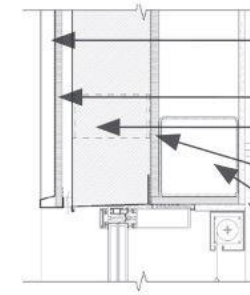


FIRE HALL 17 - VANCOUVER

- Vancouver, BC (est. 2022)
- Passive House Certified (pending)
- Project Team
 - Architect - HCMA
 - Owner – City of Vancouver
 - Structural Engineer – RJC Engineers
 - Construction Management – DGS Construction
 - Energy Modelling – Morrison Hershfield

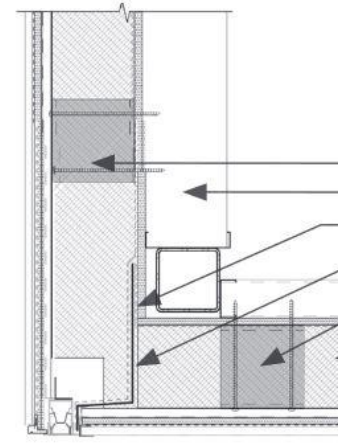


FIRE HALL 17 - VANCOUVER



WALL ASSEMBLY 2

- 38MM DOUBLE LOCK STANDING SEAM METAL
- BREATHER MEMBRANE
- 16MM EXTERIOR GRADE PLYWOOD
- 200MM SEMI-RIGID MINERAL WOOL BOARD INSULATION ON FIBERGLASS THERMAL CLIPS
- 19MM EXTERIOR GRADE PLYWOOD SHEATHING
- AIR/VAPOUR BARRIER MEMBRANE
- 203MM STEEL STUD
- 16MM GYPSUM BOARD



SOFFIT EDGE

- WALL ASSEMBLY 2
- U/S STEEL
- SELF-ADHERED MEMBRANE ABOVE FLASHING
- PRE-FINISHED METAL THROUGH WALL FLASHING
- FIBERGLASS THERMALLY-BROKEN CLIP

PARKDALE LANDING

- Hamilton, ON (2018)
- EnerPHit Passive House Certified
- Project Team
 - Architect – Invizij Architects
 - Owner – Indwell
 - Contractor – Schilthuis Construction



PARKDALE LANDING



IMAGE COURTESY OF CASCADIA WINDOWS & DOORS

PARKDALE LANDING

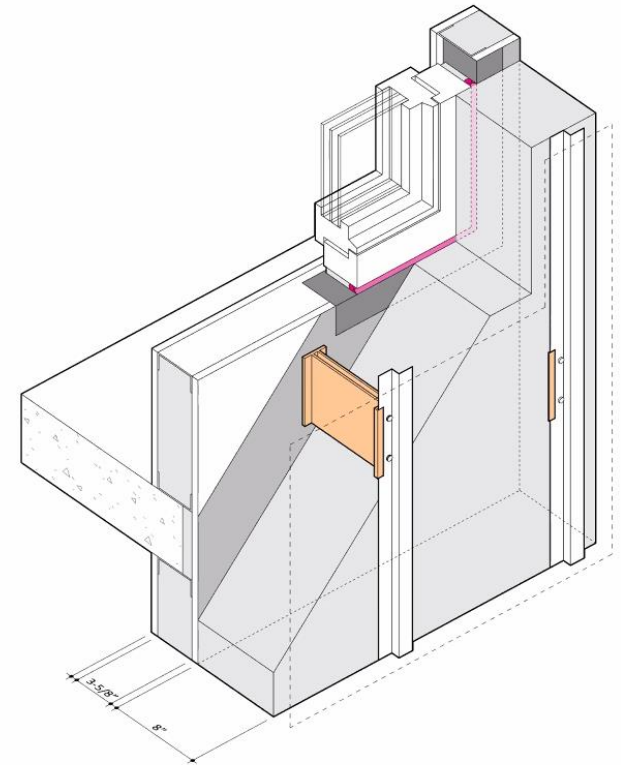
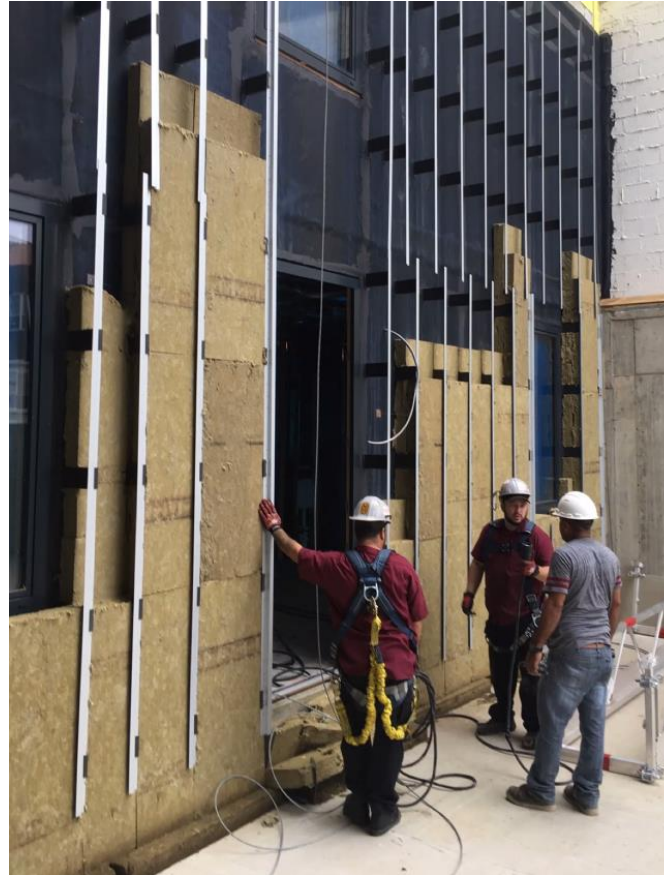


CANDELA LOFTS

- Hoboken, NJ (2019)
- Passive House Certified
- Project Team
 - Architect – Nastasi Architects
 - Contractor – Bijou Design Build
 - Passive House Consultant - bldgtyp



CANDELA LOFTS



CANDELA LOFTS

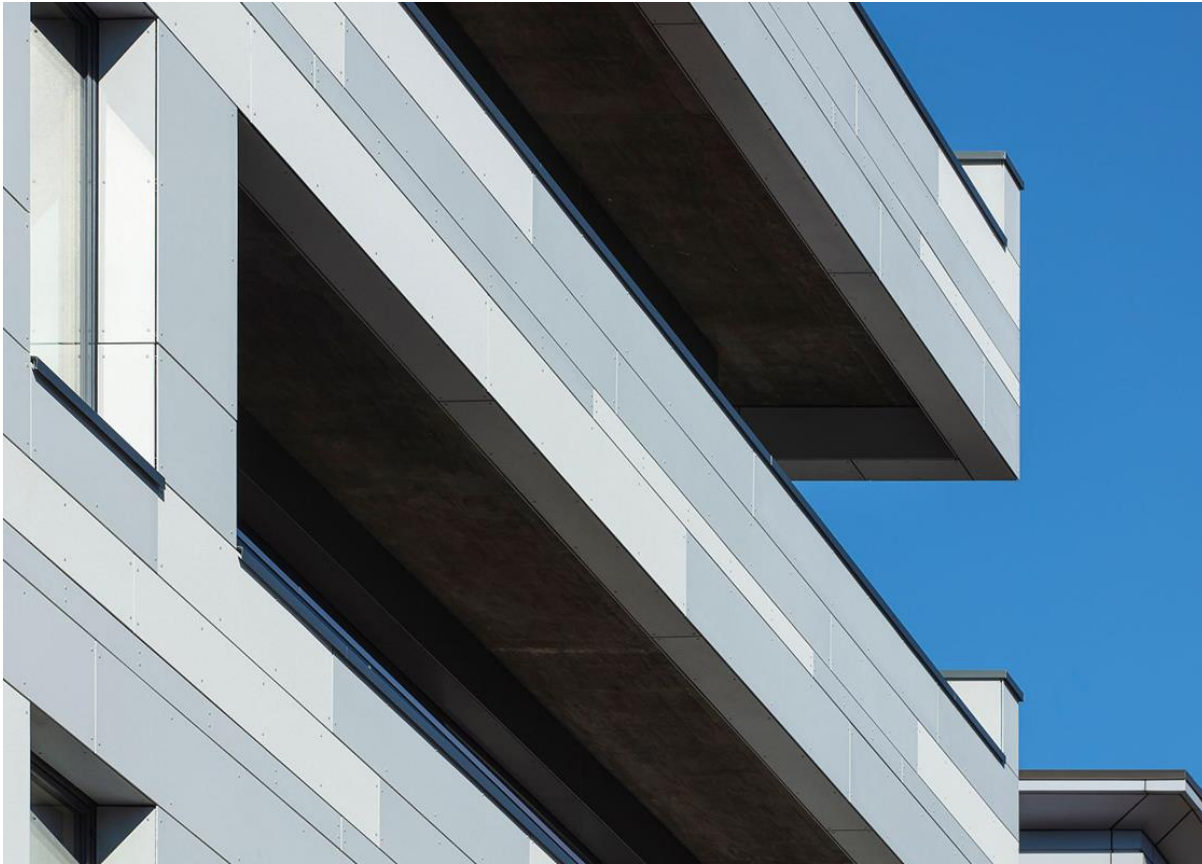


IMAGE COURTESY OF PETRARCH PANELS

FINCH CAMBRIDGE

- Cambridge, MA (2020)
- Passive House Certified
- Project Team
 - Architect – ICON Architecture
 - Developer – Homer's Rehab Inc. (HRI)
 - General Contractor
 - NEI General Contracting
 - Cladding Contractor
 - JKA construction



FINCH CAMBRIDGE



IMAGE COURTESY OF JKA CONSTRUCTION / SIGA

FINCH CAMBRIDGE

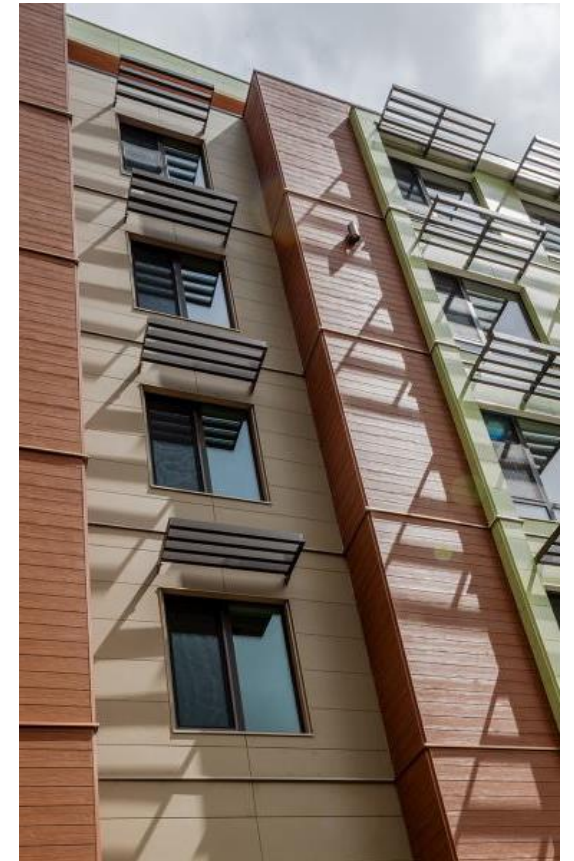


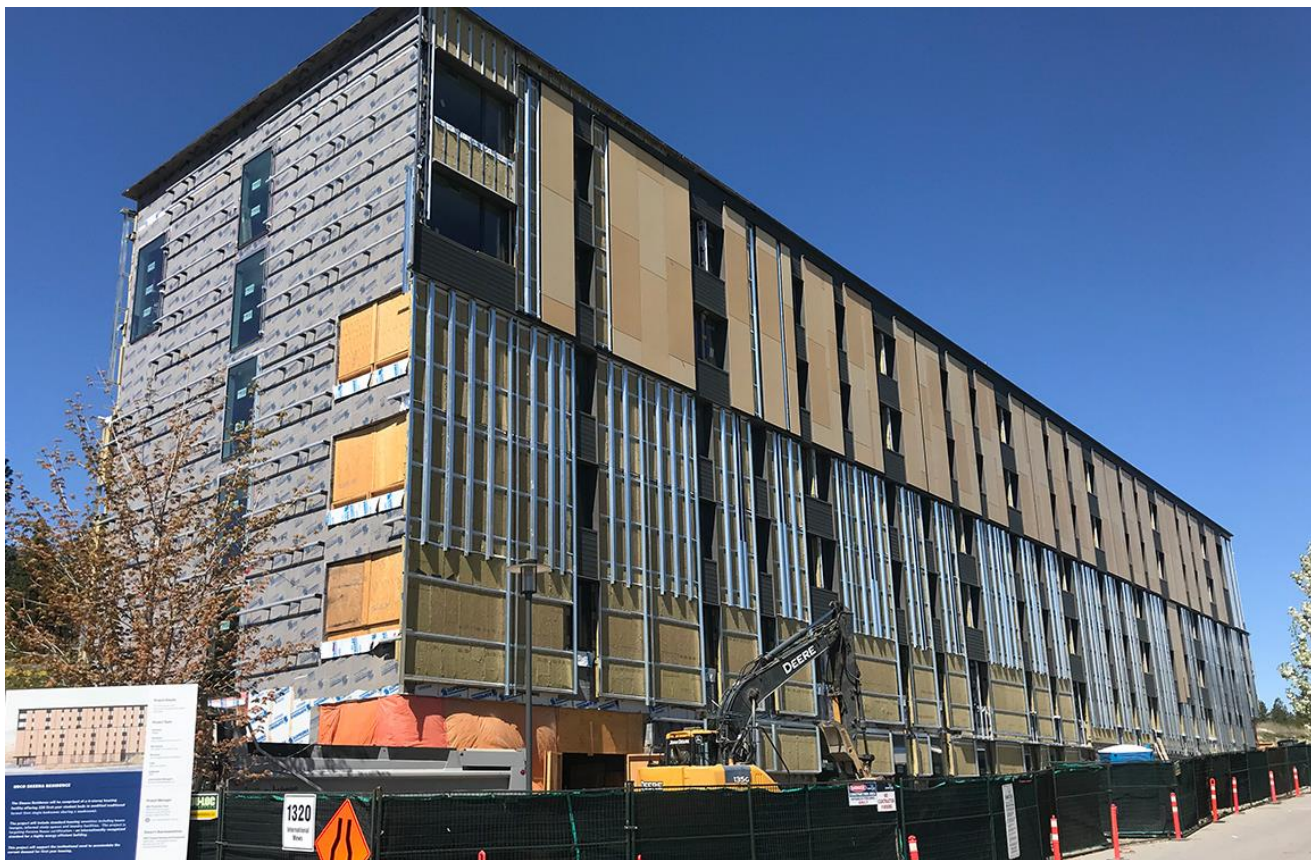
IMAGE COURTESY OF ICON ARCHITECTURE

UBC OKANAGAN - SKEENA HOUSE

- Prince George, BC (2020)
- Passive House Certified
- Project Team
 - Architect – PUBLIC
 - Developer – University of British Columbia
 - Construction Management
 - Sawchuck Developments
 - Consultant – RDH Building Science



UBC OKANAGAN - SKEENA HOUSE



UBC OKANAGAN - SKEENA HOUSE

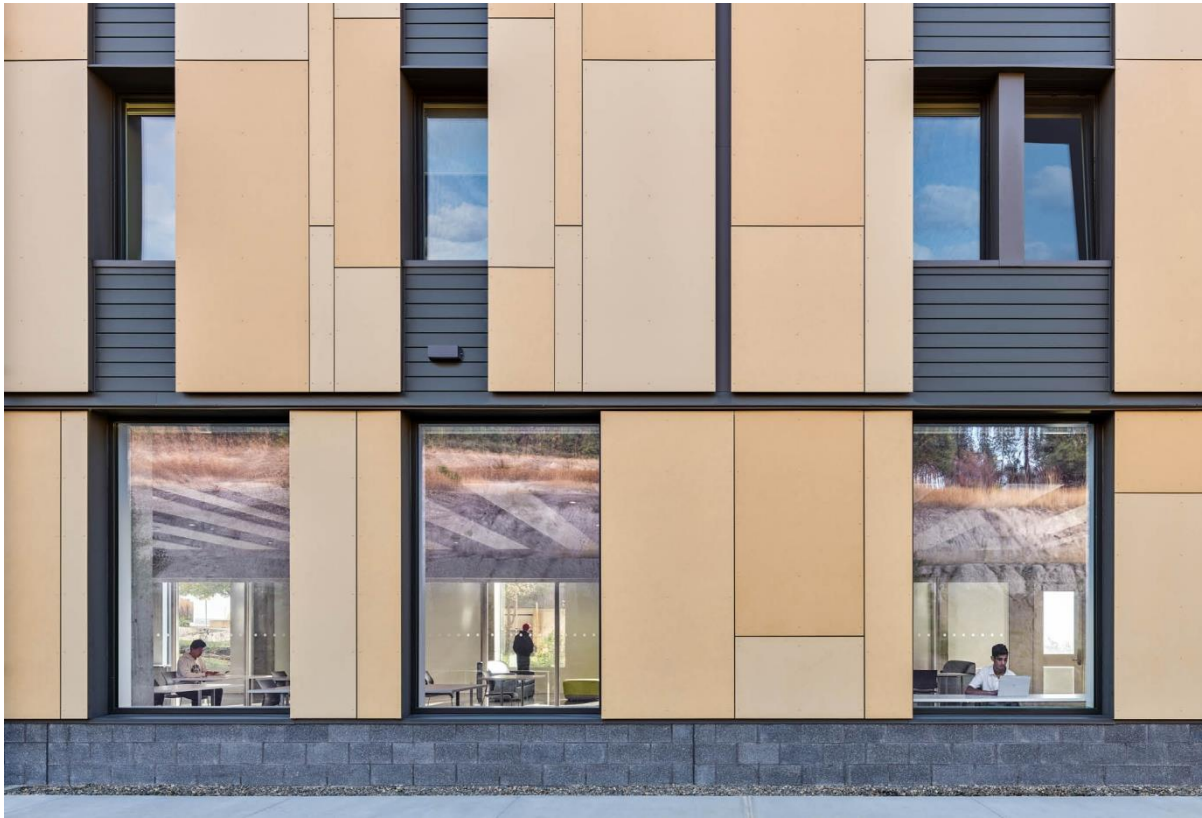


IMAGE COURTESY OF ANDREW LATREILLE / SAWCHUCK DEVELOPMENTS

KEY TAKE AWAYS

Recap of key topics from today's session

GLASS FIBERGLASS
SPACER THERMAL SPACER



KEY TAKE AWAYS

CLADDING ATTACHMENTS HAVE HUGE IMPACT

Design | Material | Installation

Thermal bridging through cladding attachments can reduce insulation efficacy by up to 50%

EMERGING BUILDING CODES OFFER FLEXIBILITY

Prescriptive vs Energy Use

Emerging, more stringent Building Energy Performance Standards (BEPS) allow for design flexibility

PRODUCT PERFORMANCE IS A MATRIX

A Feature vs Overall Performance

Cladding attachment performance must be evaluated holistically and aligned with project goals

**QUESTIONS
& COMMENTS?**





COMMON QUESTIONS

DETAILING SUPPORT:

- Do you have profile drawings and installation details available?
- Available for download (PDF & DWG)?

SPECIFYING SUPPORT:

- Do you have a 3-part spec?
- Do you have engineering reports available?
- Available for download (Word doc & PDFs)

INSTALLATION SUPPORT:

- Do you have installation videos & instructions available?
-



CASCADIA

WINDOWS & DOORS

[CASCADIAWINDOWS.COM](https://cascadiawindows.com)