



Orchards of Orenco
Portland, Oregon
Builder: Walsh Construction

Insulation Installation Methods Annex 61



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AGENDA

1. Exterior Insulation Types
 - Properties and Considerations

2. Attachment Methods
 - Girt Systems
 - Clip & Rail
 - Brick Veneer
 - Screw-through

3. Conclusion

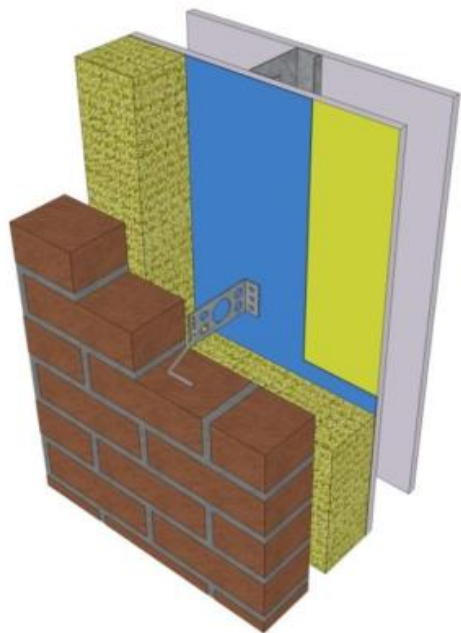
Typical Insulation Types

	Origin	Thermal conductance W/(m K)	Water vapor diffusion resistance factor (μ)	Vapor Permeance (perm-inch)	Fire behavior
Stonewool (mineral wool)	Mineral	0.032 – 0.040	1	30+	Incom-bustible, meltingpoint $\geq 1.000^{\circ}\text{C}$
Glasswool (mineral wool)	Mineral	0.032-0.040	1		Incom-bustible
Ultimate (mineral wool)	Mineral	0.032 – 0.040	1		Incom-bustible, meltingpoint $\geq 1.000^{\circ}\text{C}$
Expanded polystyrene (EPS)	Synthetic	0.035- 0.040	20-70	2.7	Hardly inflammable
Graphit embedded EPS	Synthetic	0.032	30-70		Hardly inflammable
Extruded polystyrene (XPS)	Synthetic	0.030- 0.040	x		normally inflammable
Polyurethane (PUR)	Synthetic	0.022- 0.040	x		Hardly inflammable
Polyisocyan-urat (PIR)	Synthetic	0.023 – 0.028	82 – 10.000		Hardly inflammable
Wood fibre	Vegetable	0.040-0.055			Normally inflammable
Hemp fibre	Vegetable	0.040- 0.045	1-2		Normally infammable
CL Cellulose	Vegetable	0.038-0.069	1-2		Normally inflammable

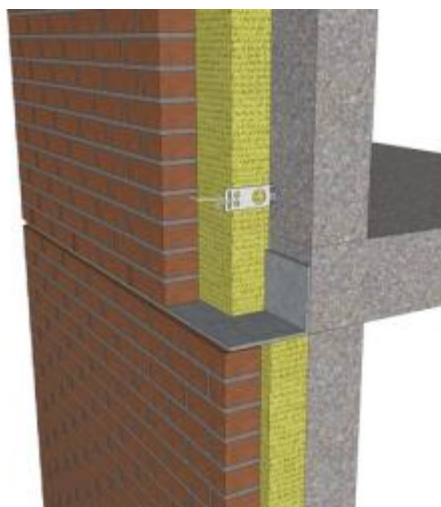
Considerations

- Building code requirements
- Effective thermal performance
- Temperature dependent thermal conductivity
- Moisture dependent thermal conductivity
- Vapour permeance and moisture movement
- Installation method
- Cladding attachments
- Fire performance
- Cost of materials, installation and labour
- Effective cost of assembly

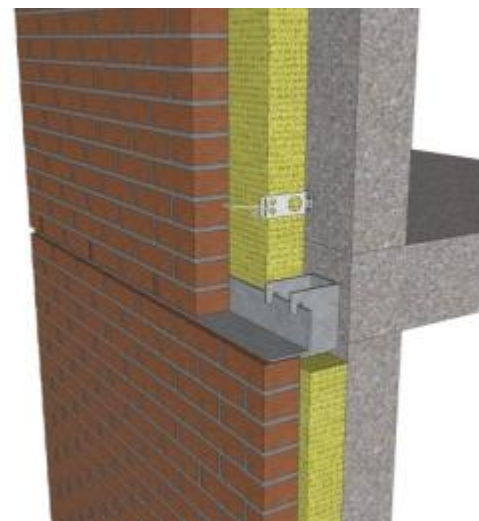
Cladding Attachment: Masonry Ties & Shelf Angles



Brick ties – 10-30% loss for galvanized ties, 5-10% loss for stainless steel

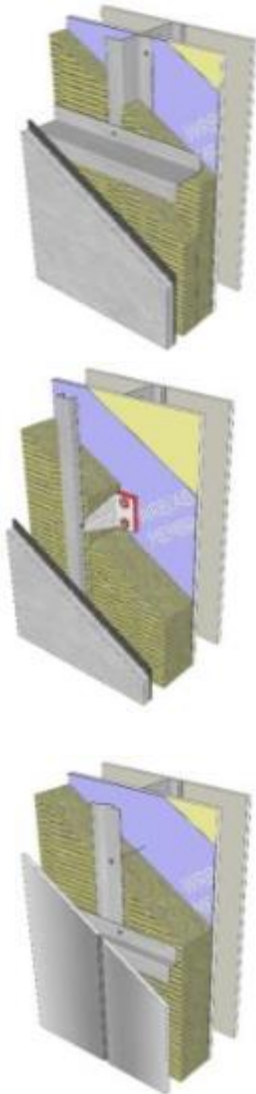


*Continuous shelf angles
~50% R-value loss*



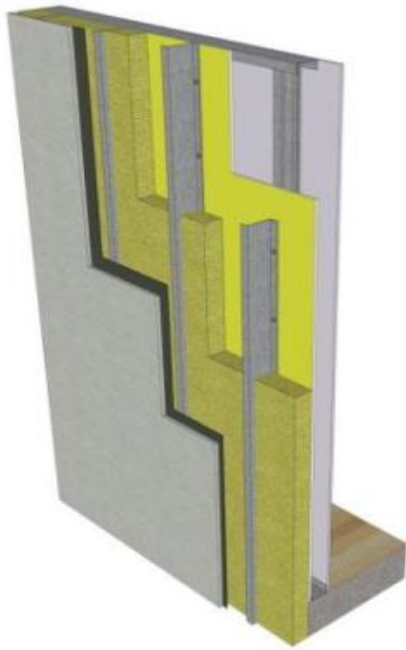
*Shelf angle on stand-offs
only ~15% R-value loss*

Cladding Attachment





- **Continuous Girts** – Rigid or Semi-rigid boards or spray-foam (i.e. almost anything works)
- **Intermittent Clip & Rail Systems** – Semi-rigid boards or spray-foam (i.e. flexibility & ease of installation is key)
- **Screws through Insulation** – rigid insulation boards (i.e. stiff enough to support compression load)

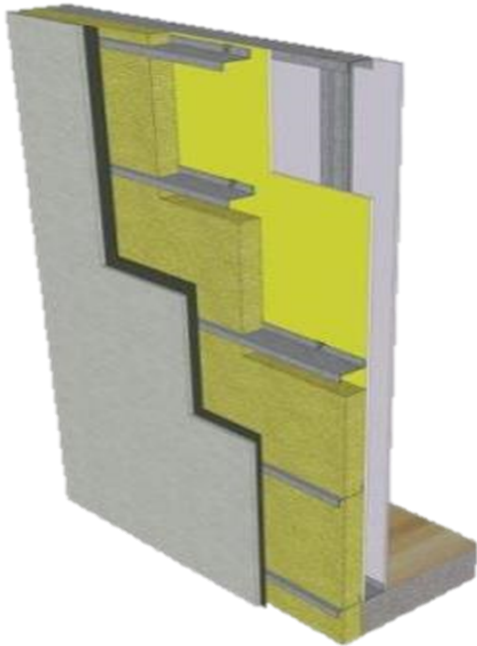
Cladding Attachment: Vertical Steel Z-Girts



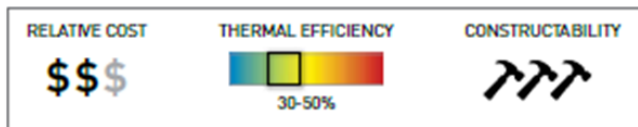
Vertical Z-Girts

RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY
\$\$\$	 20-40%	

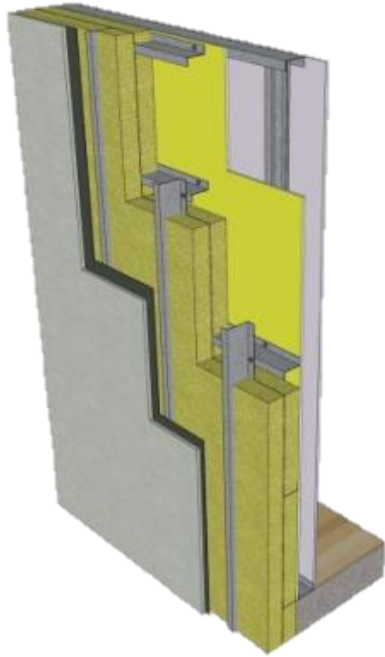
Cladding Attachment: Horizontal Steel Z-Girts





Horizontal Z-Girts



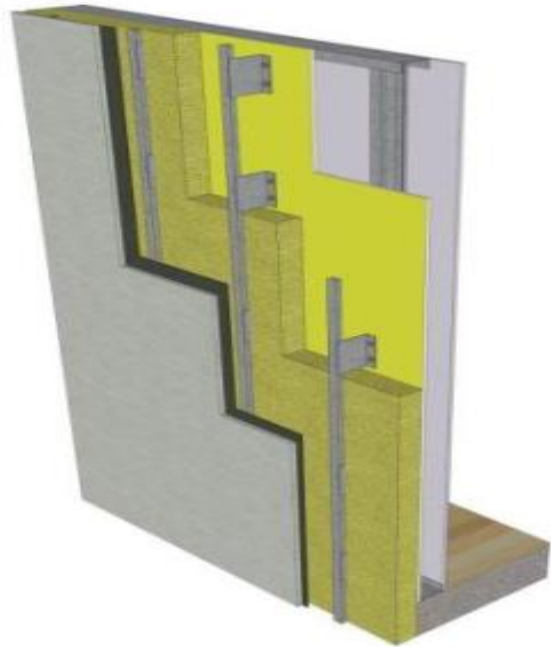
Cladding Attachment: Crossing Steel Z-Girts





Crossing Z-Girts

RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY
\$\$\$	 40-60%	

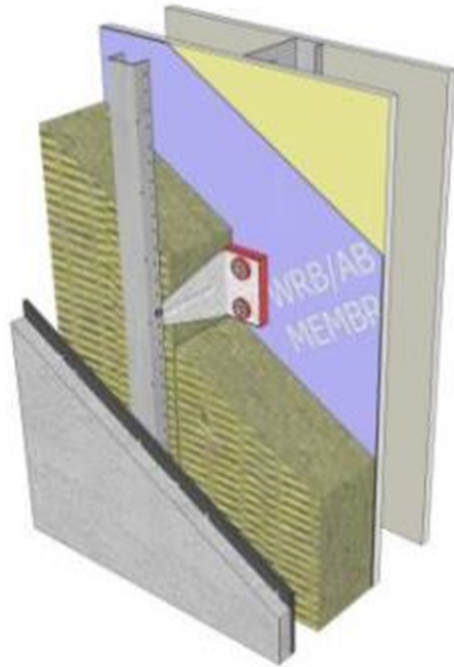
Cladding Attachment: Clip & Rail, Steel





Galvanized Steel Clips

RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY
\$\$\$	 50-75%	

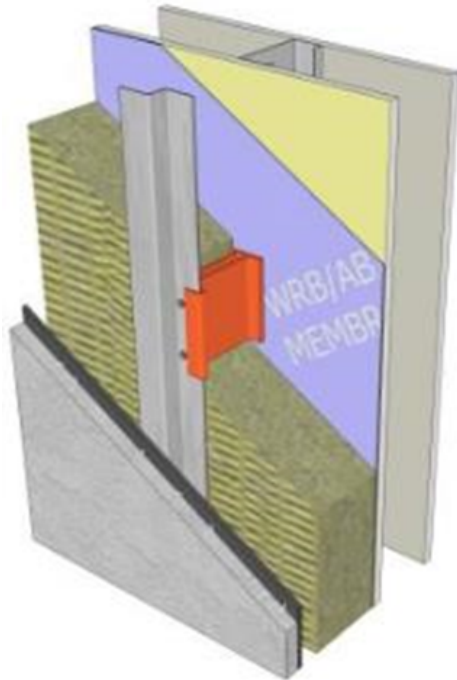
Cladding Attachment: Clip & Rail, Isolated Galvanized



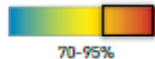

Thermally Isolated Galvanized Clips

RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY
\$\$\$	 60-90%	

Cladding Attachment: Clip & Rail, Fiberglass

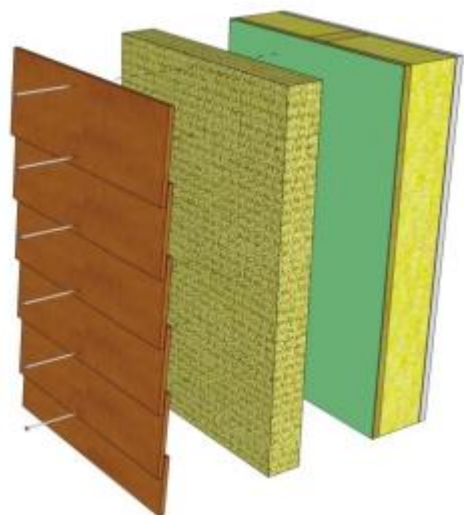


Fiberglass Clips

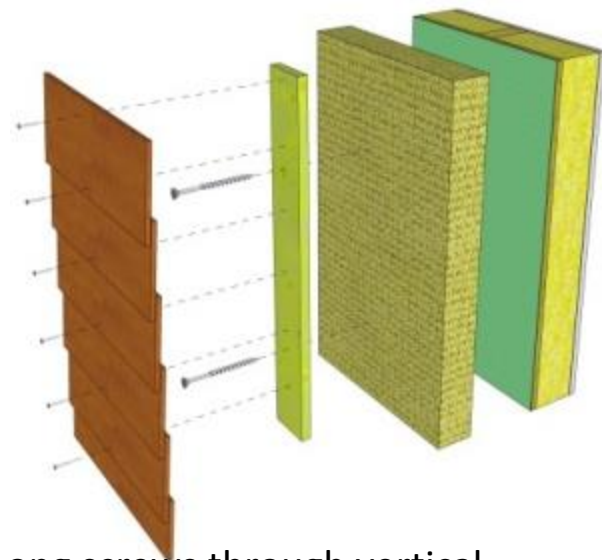
RELATIVE COST	THERMAL EFFICIENCY	CONSTRUCTABILITY
\$\$\$	 70-95%	



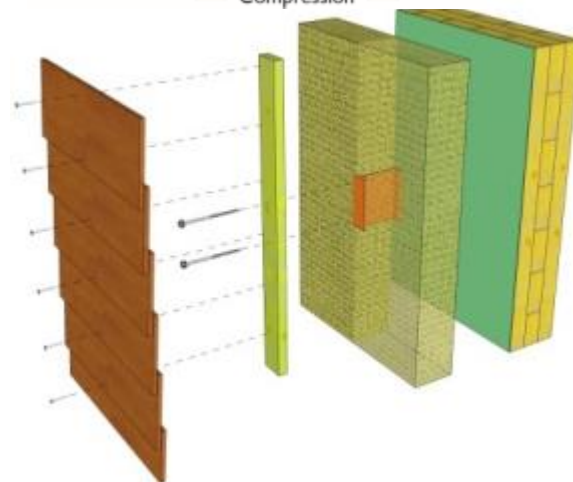
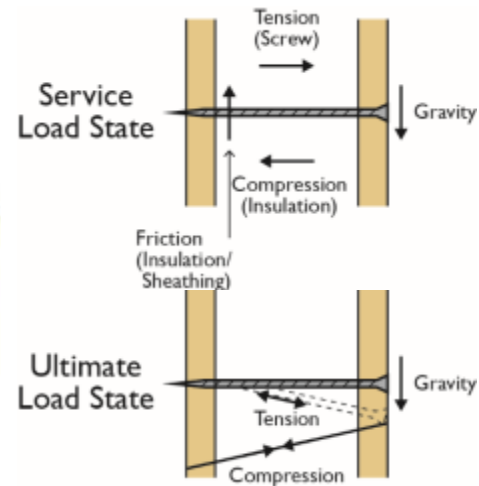
Cladding Attachment: Screw through Insulation



Longer cladding Fasteners directly through rigid insulation (up to 2" for light claddings)



Long screws through vertical strapping and rigid insulation creates truss – short cladding fasteners into vertical strapping



Rigid shear block type connection through insulation, short cladding fasteners into vertical strapping

Cladding Attachment: Screw through Insulation

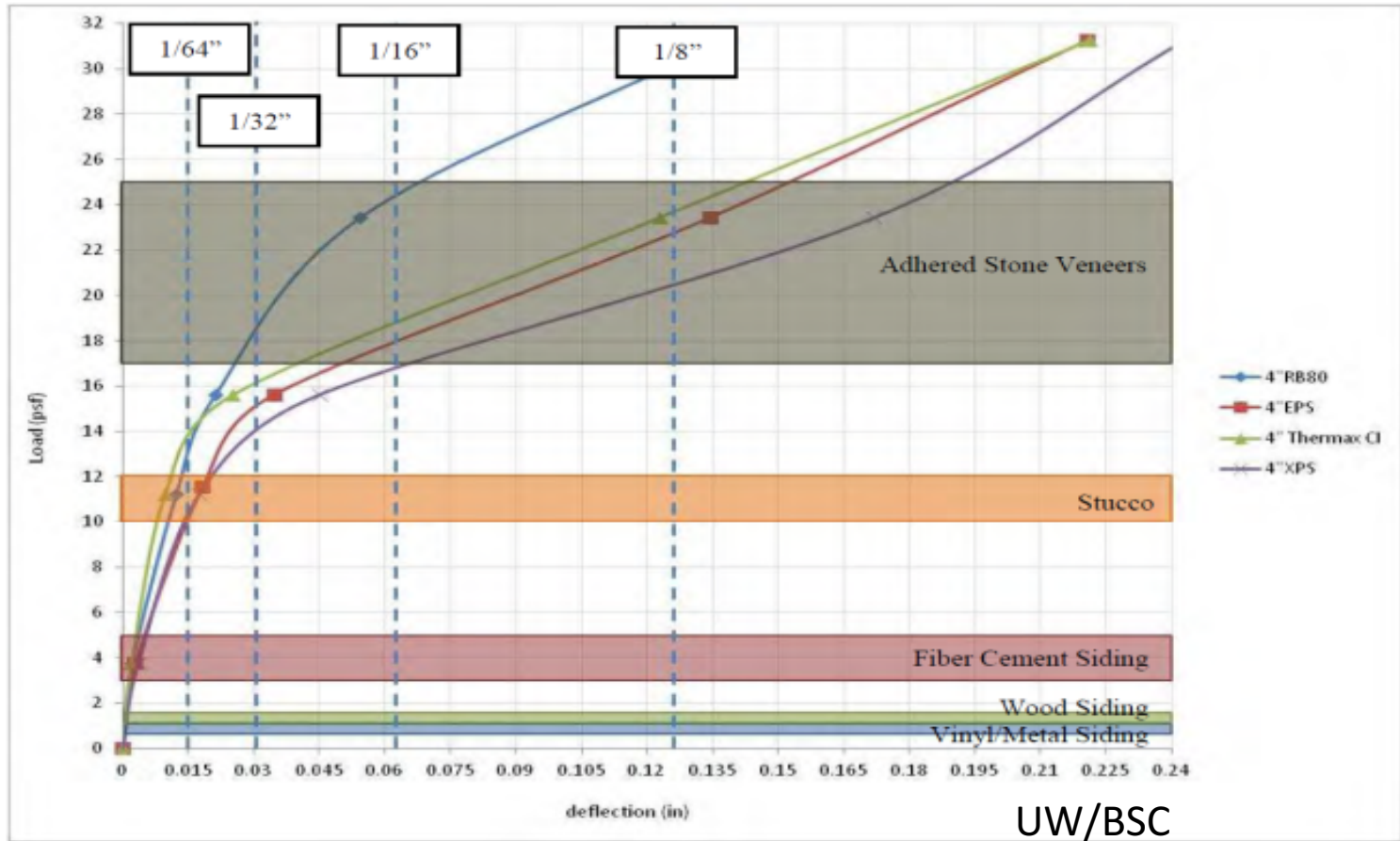
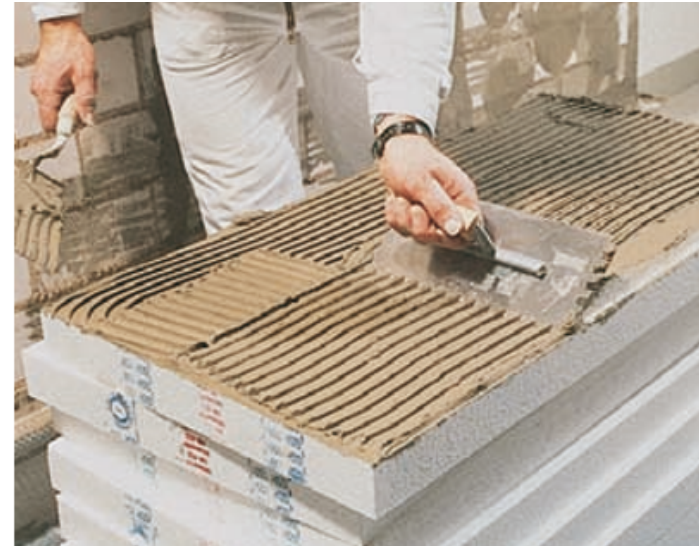
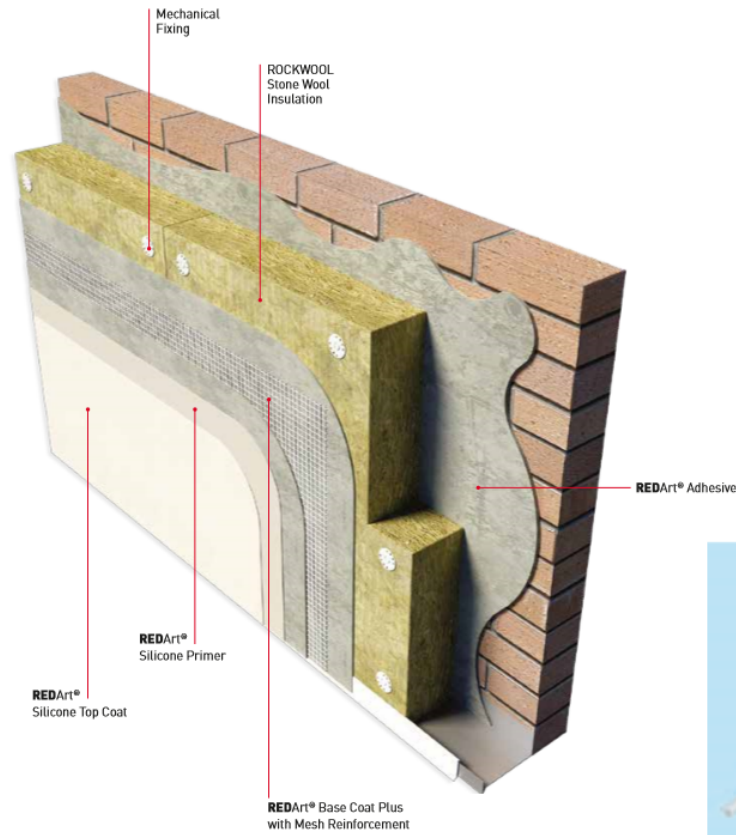


Figure 9: Short term deflection testing results (4" thick insulation)

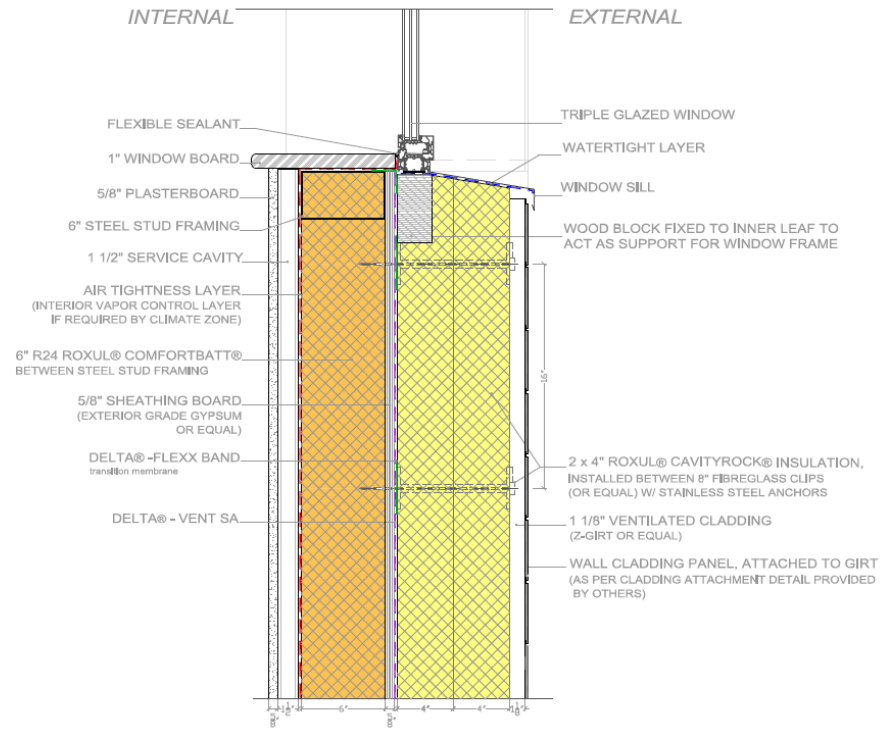
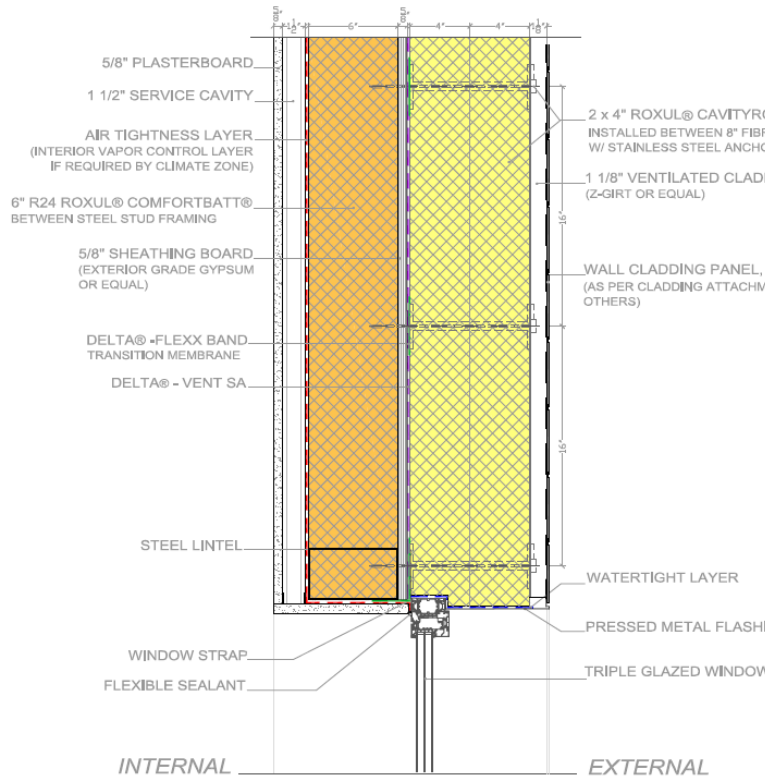
Cladding Attachment: Screws Through Insulation



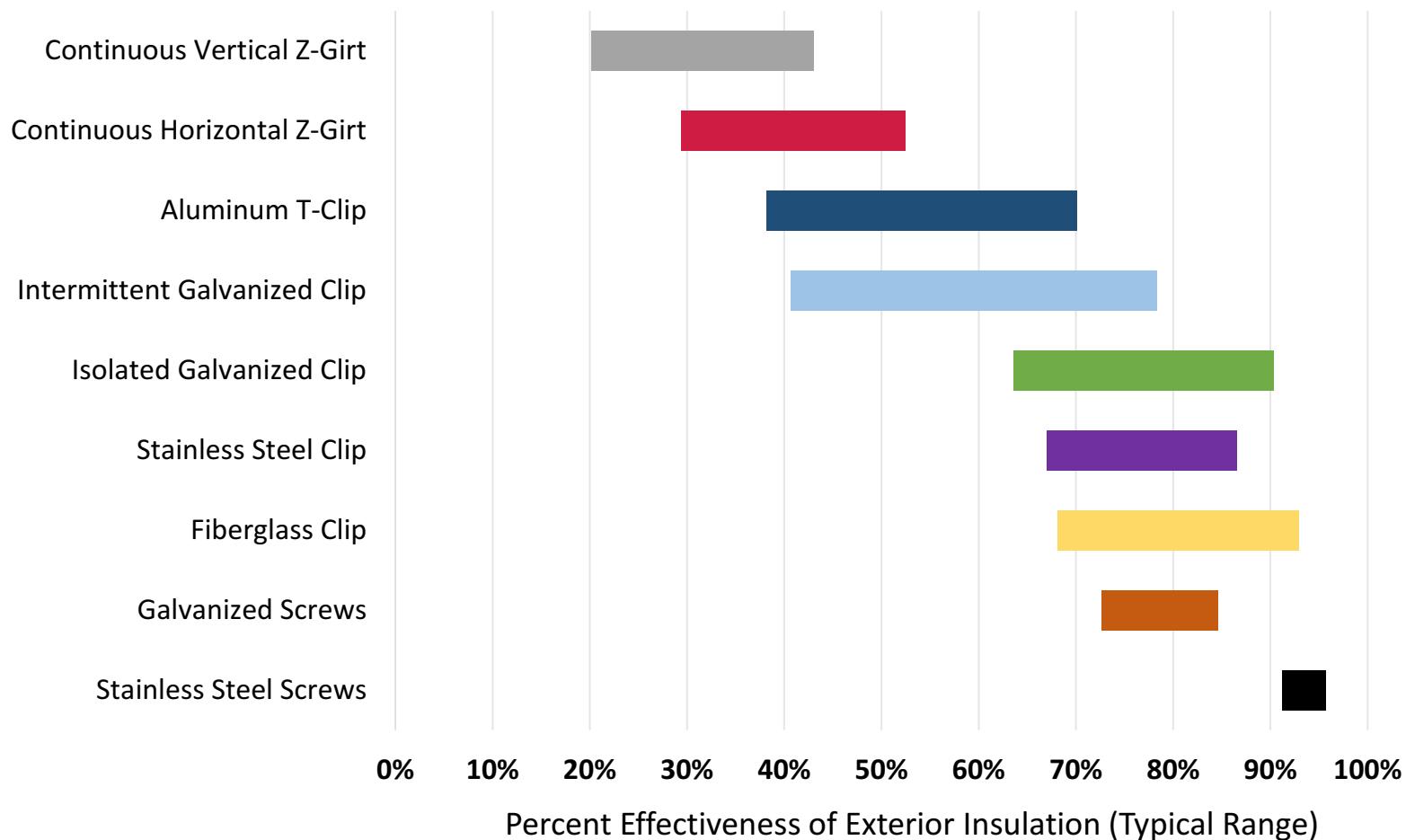
Exterior Insulation Finish Systems




Achieving Passive House



Percent Effectiveness of Exterior Insulation with Various Cladding Support Systems



An aerial photograph of the United States Capitol building in Washington, D.C. The building is a large, white, neoclassical structure with a prominent dome. It is surrounded by other government buildings and greenery. In the foreground, a wide street with multiple lanes and crosswalks is visible, with some vehicles and pedestrians. The sky is clear and blue. A red banner is overlaid on the right side of the image, containing the text "Thank You! Questions?".

Thank You!
Questions?