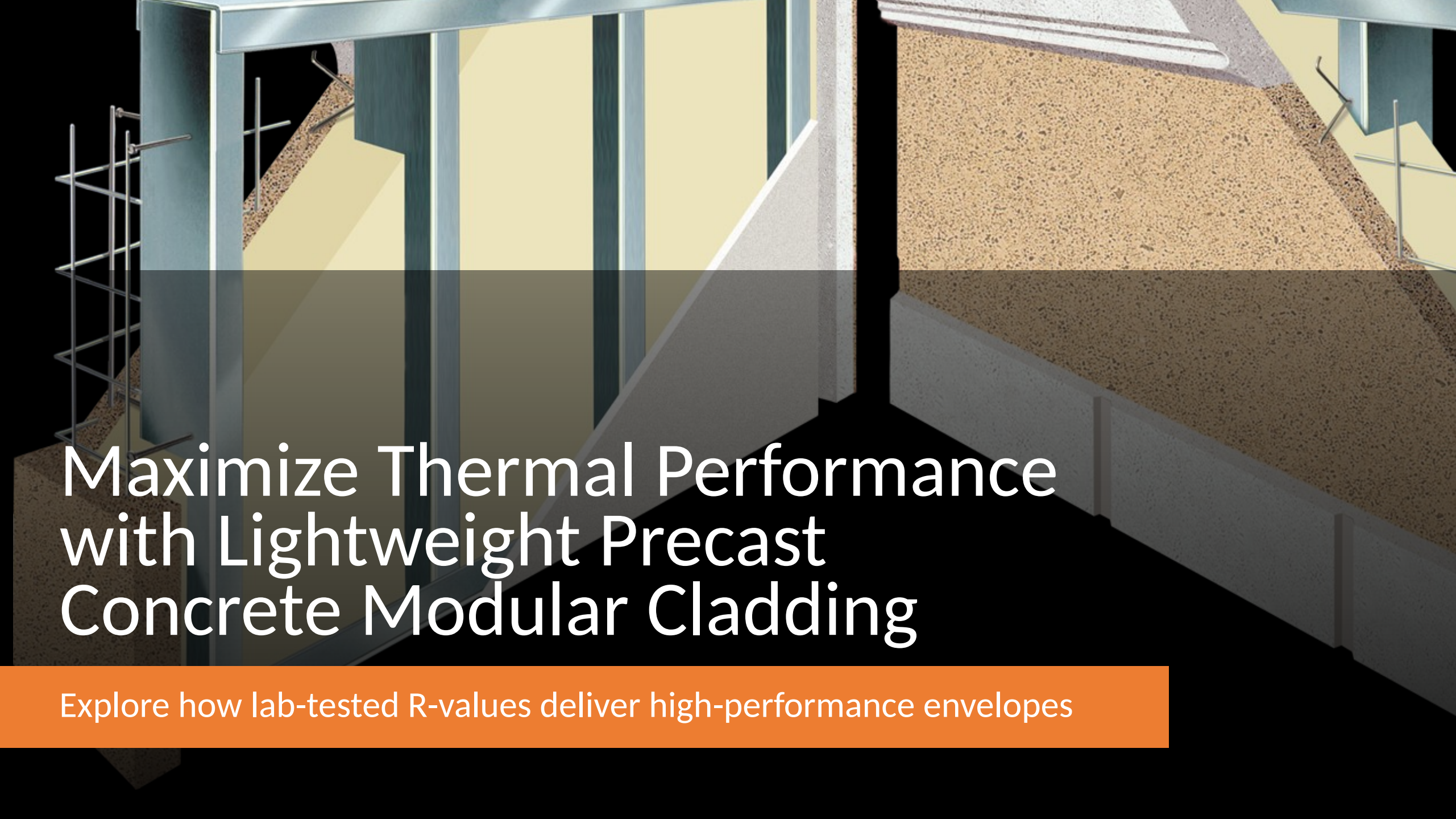


Maximize Thermal Performance with Lightweight Precast Concrete Modular Cladding

Explore how lab-tested R-values deliver high-performance envelopes

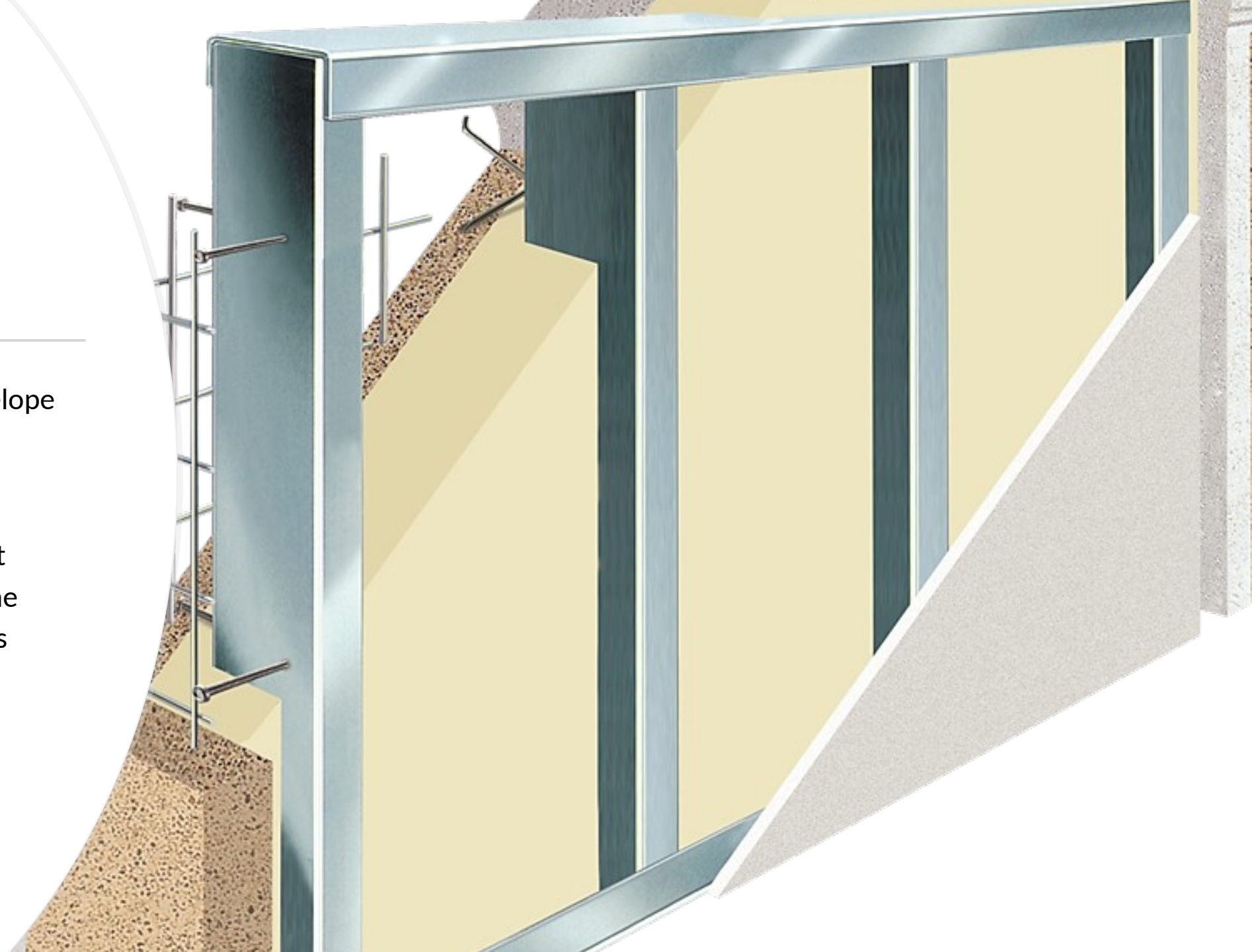
Learning Objective

- Differentiate between a prescriptive and lab-tested R-value and explain why lightweight precast concrete modular cladding provides heightened thermal performance over traditional built-up building envelopes.

Lightweight Precast Concrete Cladding System

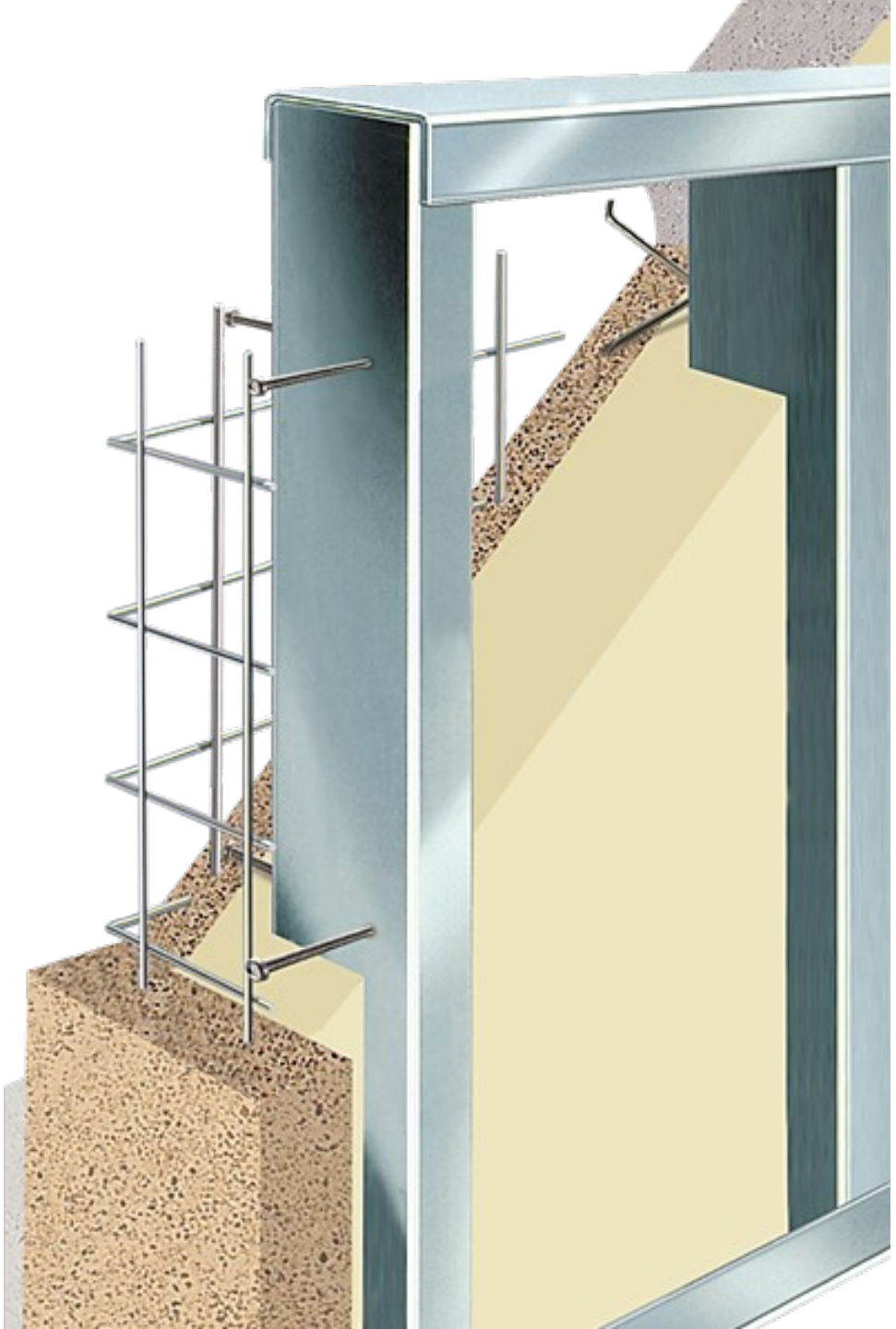
This modularized building envelope solution contains:

- Insulation
- Vapor barriers
- Integral water repellent
- Heavy-gauge steel frame
- Stainless steel fasteners
- Lightweight, 2-in thick precast concrete panel
- Windows, available



Insulation & Vapor Barrier

- Factory-applied polyurethane closed-cell foam insulation is sprayed into the thermal break and stud cavity.
- Minimum depth 1 ½-inches.
- Provides the vapor barrier too.

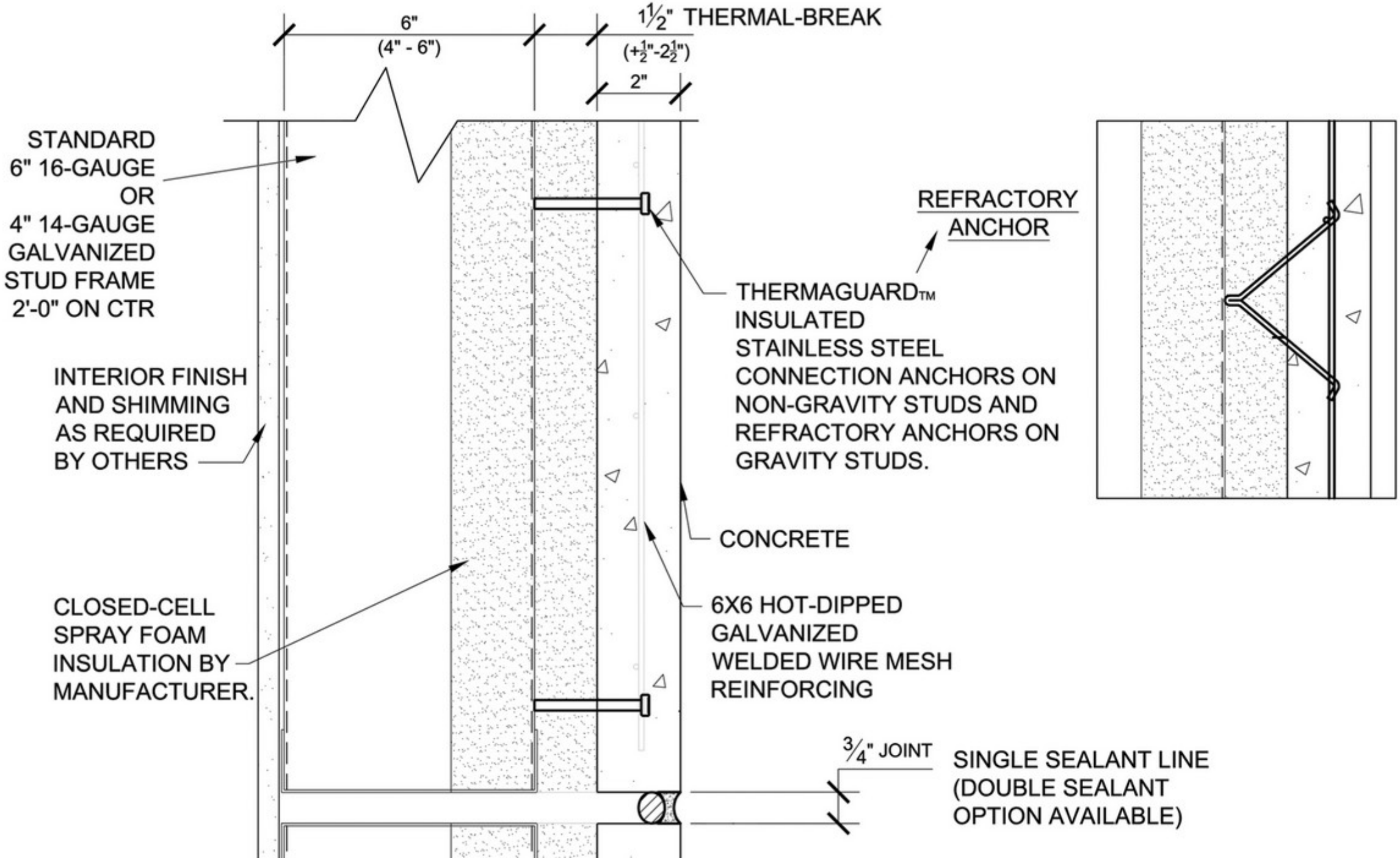


Heavy-Gauge Steel Frame and Fasteners

- The lightweight 2-inch thick precast concrete panel is fixed to a heavy-gauge steel frame with stainless-steel fasteners.

Cladding

- 2-inches of architectural precast cladding
- Maintains ability to introduce reveals, projections, and true brick finishes
- The cladding system is easily installed upon the building frame.
- Can be used to re-clad existing buildings using the as-built foundation and superstructure

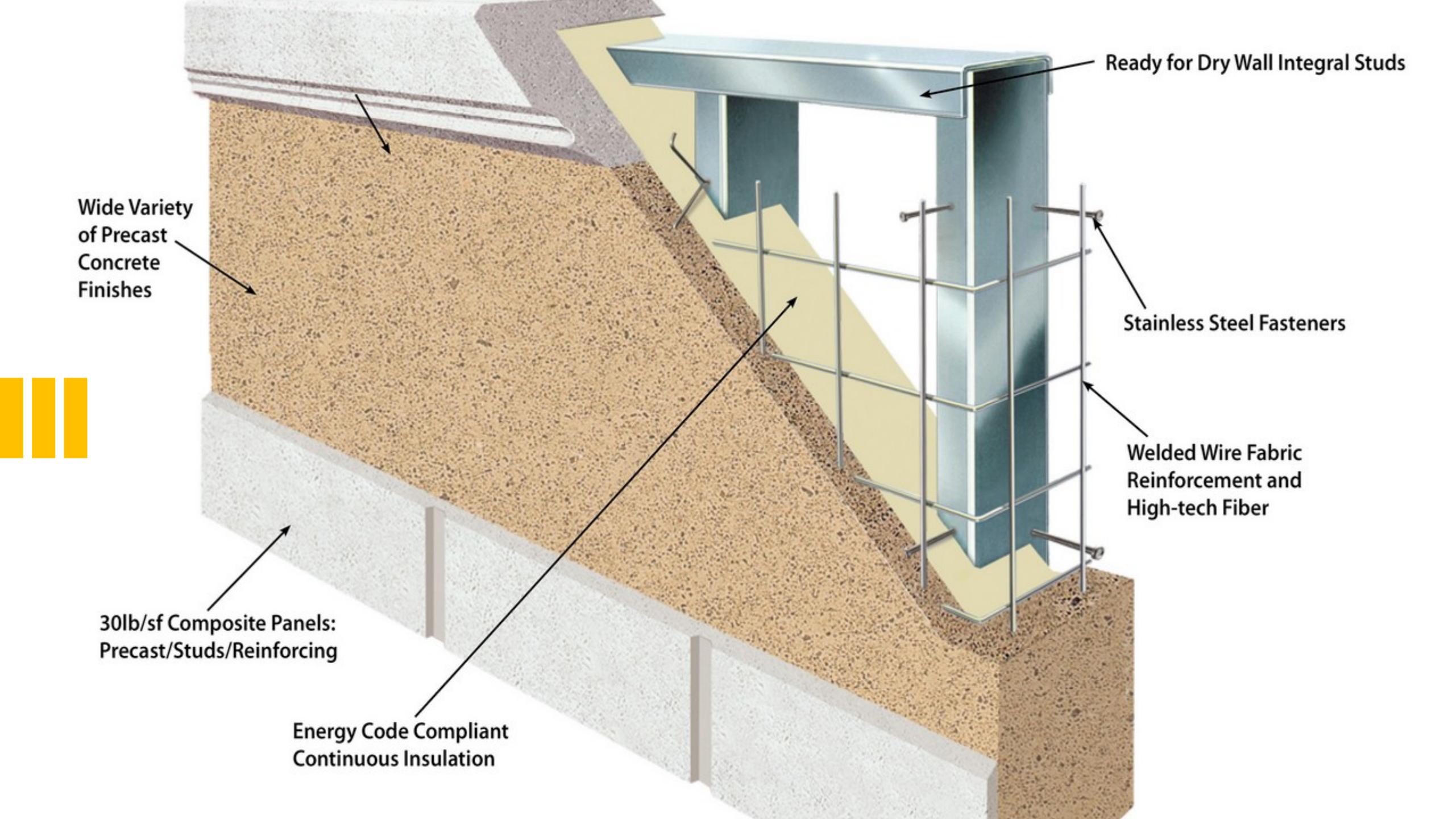

6"
(4" - 6")
1½" THERMAL-BREAK
(+½"-2½")
2"
STANDARD
6" 16-GAUGE
OR
4" 14-GAUGE
GALVANIZED
STUD FRAME
2'-0" ON CTR
INTERIOR FINISH
AND SHIMMING
AS REQUIRED
BY OTHERS
CLOSED-CELL
SPRAY FOAM
INSULATION BY
MANUFACTURER.
REFRACTORY
ANCHOR
THERMAGUARD™
INSULATED
STAINLESS STEEL
CONNECTION ANCHORS ON
NON-GRAVITY STUDS AND
REFRACTORY ANCHORS ON
GRAVITY STUDS.
CONCRETE
6X6 HOT-DIPPED
GALVANIZED
WELDED WIRE MESH
REINFORCING
¾" JOINT
SINGLE SEALANT LINE
(DOUBLE SEALANT
OPTION AVAILABLE)

The Air Gap in Architectural Precast Concrete Cladding

- The way that the exterior concrete face attaches to the frame creates a thermal air gap that is filled with factory-applied, closed-cell foam insulation.
- Provides a thermal break to allow for a layer of continuous insulation.
- Size of available air gap ranges from ½-inch to 2 ½ inches

Air Gap Impact

- The air gap reduces thermal transfer across the assembly by as much as 25 percent, when compared to a traditional architectural precast system.


Ready for Dry Wall Integral Studs
Wide Variety of Precast Concrete Finishes
Stainless Steel Fasteners
Welded Wire Fabric Reinforcement and High-tech Fiber
30lb/sf Composite Panels: Precast/Studs/Reinforcing
Energy Code Compliant Continuous Insulation

Traditional Built-Up

- Onsite Construction
- Each layer added upon the other
  - Frame
  - Vapor/air barriers
  - Insulation
  - Facade
- Multiple interior crews create the envelope
- Improper installation of components often occurs
- Thermal performance is impacted by insulation gaps and quality issues related to the limitations of on-site installation

Lightweight Precast Concrete Modular Cladding

- Factory Assembled
- Factory-Controlled Quality
- Integrated Design Process —early coordination of design aesthetic, performance, and scheduling goals
- Achieve continuous insulation across the entire enclosure
- Higher Energy Performance

Thermal Performance Metric: R-Value

- R-value is a measure of how well insulation, or an assembly, resists the flow of thermal energy.
- Higher R-values indicate better insulators.
- Lower R-values indicate poorer insulators.

Prescriptive R-Value

- Determined by calculations used to arrive at the *expected* thermal performance of the solution

Lab-Tested R-Value

- Determined by the assembly being tested to attain accurate data on the heat transfer that occurs through the insulated structure in representative test conditions.

Importance of Testing R-Values

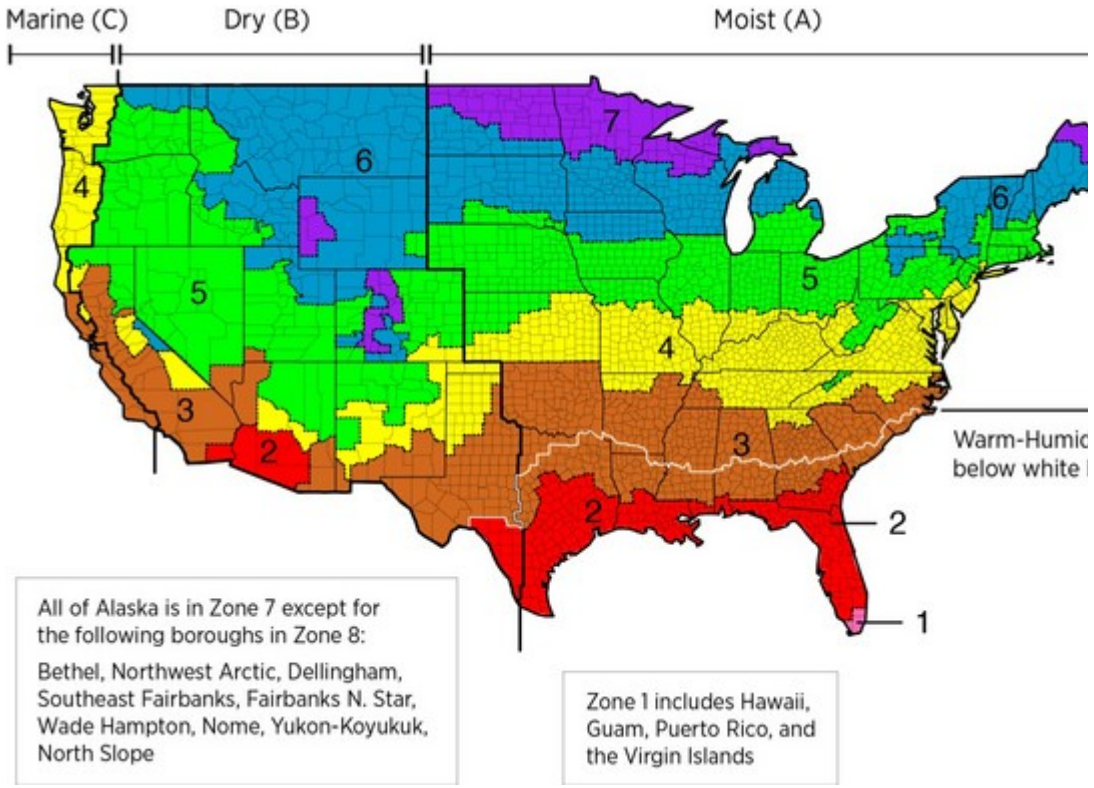
- **Example 1: Panel Configuration**
  - ½-inch air gap
  - 4 inches foam
- **Prescriptive R-Value: 24.8**
- **Lab Tested Value: 12.2**

- **Example 2: Panel Configuration**
  - 2-inch air gap
  - 5.5 inches foam
- **Prescriptive R-Value: 38.5**
- **Lab Tested R-Value: 24**

IE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	A
Roofs											
y :k	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	
	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R
	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	
Walls, above grade											
	R-5.7ci[e]	R-5.7ci[e]	R-5.7ci[e]	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R
	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	
	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	
d	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	or
Walls, below grade											
l[d]	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	
Floors											
	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R
	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	
Slab-on-grade floors											

Energy Codes Use R-Values to Define Requisite Thermal Performance

IECC 2012 Climate Zone Map



- Architectural precast concrete cladding systems can satisfy the thermal requirements for IECC Zone 1-Zone 8.
- Suitable in locations—Miami to the North Slope Borough in Alaska.

Le Griffix, Montreal, Canada

- Key Design Objectives
  - High R-Value—the IECC has designated Montreal as a Zone 7.
  - Easy to assemble
- Lightweight Precast Concrete Cladding
  - R-Value: 21
  - Lightweight: 30 lbs. per square foot

Johns Hopkins Campus Nelson-Harvey Building East Elevation (built circa 1970s)

- Key Design Objectives
  - Increase thermal performance
  - Provide an air and water barrier
  - Maintain cohesive look with rest of campus
  - Limit cladding system weight (5% dead load threshold for steel structural members, 10% building lateral.)
  - Meet aggressive design and construction schedule
  - Comply with current Baltimore City Building Code and ASHRAE standards
  - Achieve Baltimore City Green Building Systems 2 Green Star certification (LEED Silver equivalent)

Nelson Harvey Building East Elevation

"The project required a weathertight exterior that had sufficient insulation. It needed to be a lightweight system that matched the Johns Hopkins signature brick aesthetic on campus."

Dan McKelvey
Associate Principal and Envelope Expert, Ayers Saint Gros

Project Materials—Wall Systems

- **Precast panel**—thin-brick mechanically bonded to lightweight precast concrete panel. System thickness of 2-1/2” brick/concrete on 6” CFMF = 8 1/2” overall thickness.
- **Aluminum curtain wall**—thermally broken curtain wall with fluoropolymer coating, insulating glazing, low-iron glass with ceramic frit and low-E coating.
- **Metal panel system**—aluminum panel with foamed-in-place poly-iso core on CFMF

Completed Nelson Harvey Building Entrance

Increased the insulation value of the building walls by 227%.

Thank You!

Register at The Continuing Architect to receive AIA credits:

https://www.thecontinuingarchitect.com/course/maximize-thermal-performance-with-lightweight-precast-concrete-modular-cladding-explore-how-lab-tested-r-values-deliver-high-performance-envelopes

SLENDERWALL®

Architectural Precast Concrete/Steel Stud Building Panels