Webinar: Brick Ventilated Facades

2020

Learning Concepts

- ✓ **Define drained vs ventilated façade.**
- ✓ **"State of the nation" in brick**
- ✓ **World of choices**
- ✓ **Brick + and -**
- ✓ **Precast with Brick + and -**
- ✓ **Corium + and –**
- ✓ **Comparisons**
- ✓ **Projects and applications**

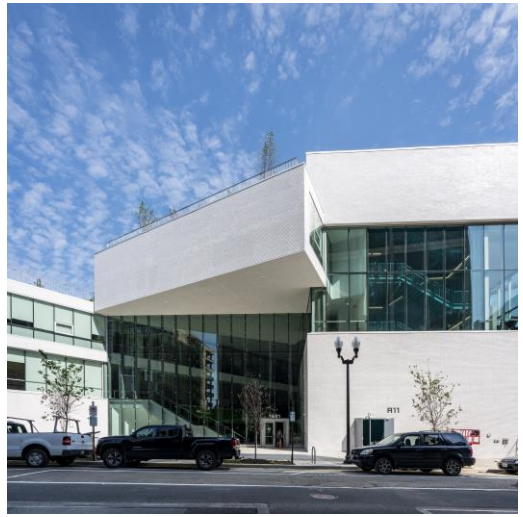
Wienerberger

World’s largest masonry company.

CORIUM

Corium franchise two decades old.
Hundreds of buildings

Architecture



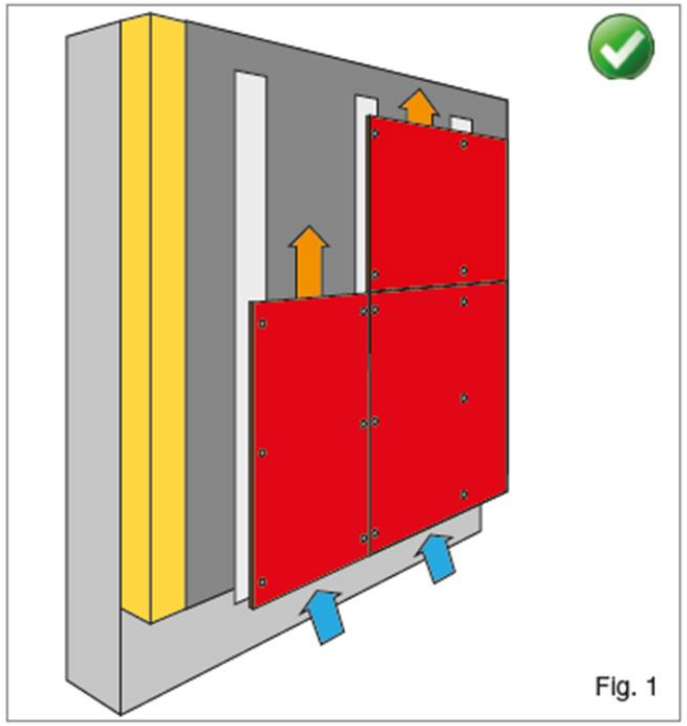
Engineering

Document	Key Points	
AAMA 501.1 Water Penetration	• Wall is approx. 10'x10'. • Real world construction • Thermal cycling +140F > 75F > -40F > +75F	No leakage or visible water: @25 psf (100 MPH)
AAMA 501.5 Thermal Cycling		No permanent damage due to expansion and contraction
ASTM E283-04 Air Leakage		0.01 CFM/ft2 @25psf Passed
ASTM 331-00(2009) Water Penetration		No leakage or visible water penetration @25 psf
ASTM E547 Water Penetration		No leakage or visible water penetration @25 psf
ASTM 330-02(2010) Structural Performance, Air Pressure Differences	• Dead loads applied as per test • Wall is approx. 8'x10'. • Real world construction • L bracket support structure, would need to be translated to other systems • Load cycling from 0 > 60 psf, > -60 psf > +90 psf > -90 psf	No damage of any part of system reported. Tested to negative and positive pressures exceeding 90psf (nearly 200mph)
ASTM C67 Brick Water Absorption, Compressive Strength, Freeze Thaw	See test	ASTM C67 Strength, minimum is 3000 psi, Corium 6700 psi average Water absorption max allowed 17 %, Corium 9.8% after 5 hour boil Saturation coefficient average 67% max allowed 78%
BCRL BM1:1993 standard developed by CERAM Freeze Thaw Testing for Brick	• Procedure based on British standard BS3921:1985 • 100 cycles • Brick and mortar joint tested, installed in rails(slips) • Tested after immersion in water for 7 days • Cycle -15C and +25C • Inspected at 10, 50 and 100 cycles	No damage of brick, mortar or slips appeared
Expectation of Performance of Colorcoat HPS200 Rails in the Corium System Dr Graeme Peacock of Corus UK Ltd. Supplier of Colorcoat HPS200, Confidex and Galvalloy	• Analysis of possible failure mechanisms and evaluation of projected lifespan of coating and rail • Explanation of product's history. • Explanation of the coating structure. • Explanation of galvanization is superior to commodity galv steel.	• HPS 200 used in protecting metal cladding and roofing for 55 years (report written in 2005) • If there was a risk its UV, and coatings and rail don't see UV • Exposed it has 30 year guarantee eg roofing • Expectation of coating, galvanization and steel system is in excess of 60 years. • Does not account for redundancy in structural system.
Technical Bulletin TAS COR 110	LEED points review	See document
Wimlas	A complete review of use of the system based on British standards as of 2001	• As much about explanation as compliance.

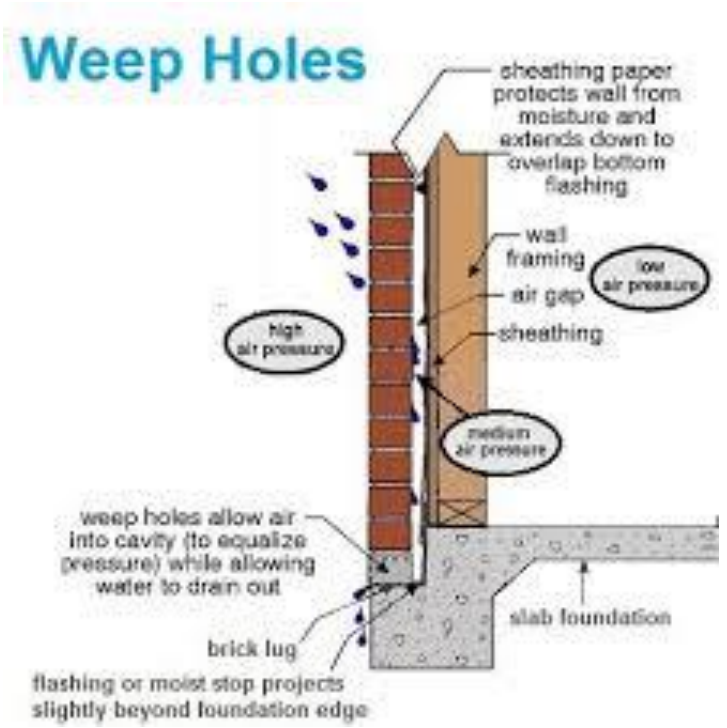
Construction


Click for Video

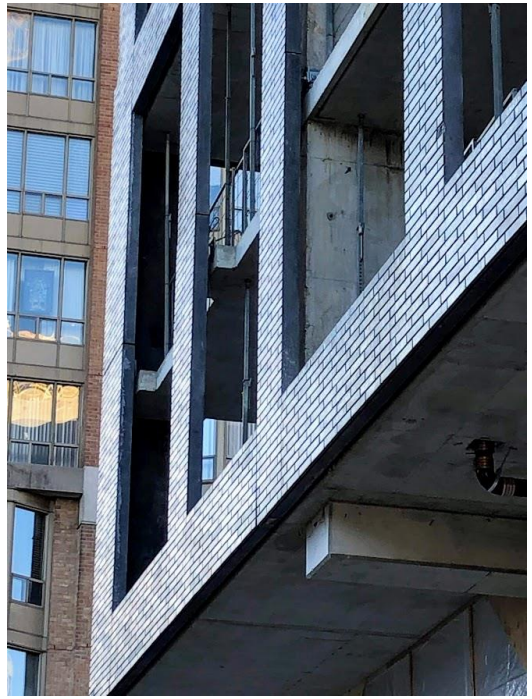
Ventilated Facade



Drained Facade

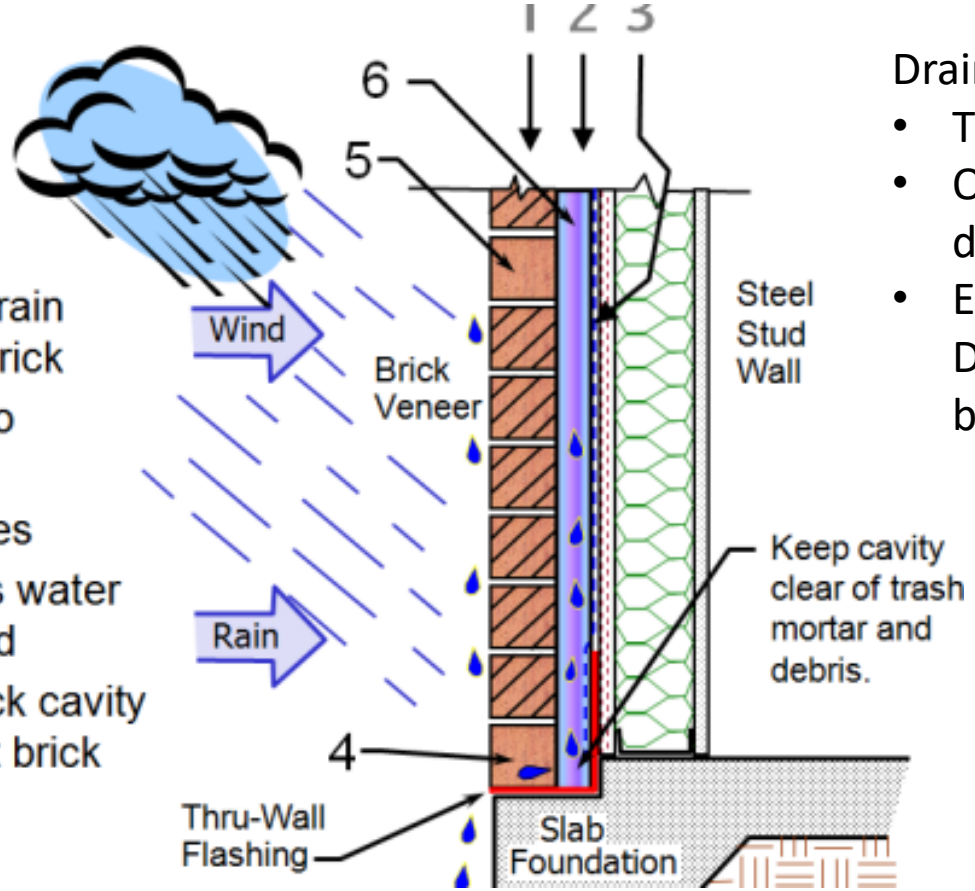


Face Sealed



Define: Brick Rainscreen, isn't all brick rainscreen?

1. Brick veneer is first water barrier
2. Drainage cavity must drain water that penetrates brick
3. WRB must be perfect to prevent water leaks.
4. Flashing and weep holes
5. Air vent near top allows water in, if not properly baffled
6. Vertical air dams in brick cavity must be sealed against brick and WRB.



Drained Cavity System

- Traditional system, allowing for drainage
- Often called 'rainscreen' which is different than ventilated façade.
- Expect water infiltration, and drainage. Does not expect ventilation from top and bottom.

Learning Concepts

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- ✓ **Corium + and –**
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- ✓ **Projects and applications**

State of the nation in Brick

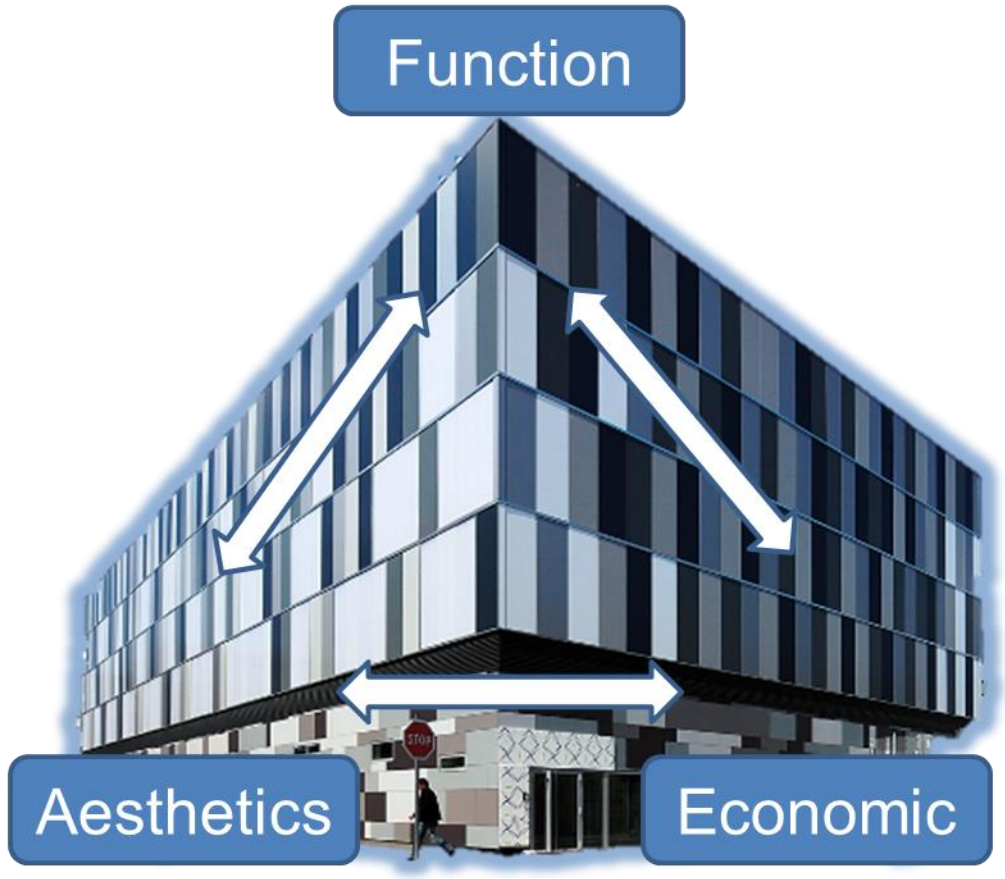
- The Market
  - Commercial, non-combustible, mid to high rise construction.
  - Architecture matters.
  - Public and private buyers
  - Still loved by many and specified by most.
- Threats to Brick
  - Replacement of brick technologies for traditional brick. ie Precast with brick; mechanically attached brick, adhered brick. Mason's share diminishing.
  - Precast, Curtain wall, ACM, Rainscreen facades eat into brick choices.
- Masonry contractors
  - Labour shortages, retiring masons, reducing supply.
  - Price is constrained, creating pressure on Masonry Contractors.
  - Space restrictions on site impacting choice for traditional masonry.

Selection Criteria for Cladding Materials

- **Aesthetics:**
- Image, color, texture, module (grid) size and orientation, joint design and fastening

- **Function:**
- Weight, panel sizes, wind load requirements
- Impact and scratch resistance
- Durability and Life span and the warranty
- Weathering and UV resistant
- Ability to meet code requirements
- Maintenance and Cleaning, chemical resistance
- Sustainability: FSC, LEED, EPD, LC Analysis
- Energy efficiency (both cooling and heating)

- **Economic:**
- Material cost, Optimization and cost of fabrication
  Ease of installation



Poll 5

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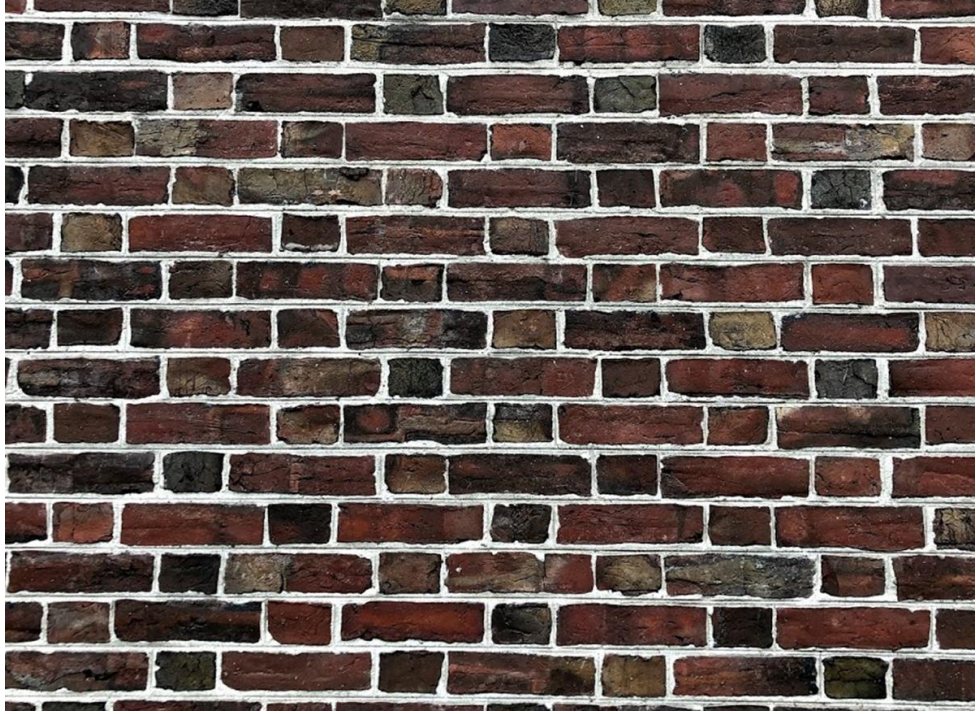
Can be amazing, last forever

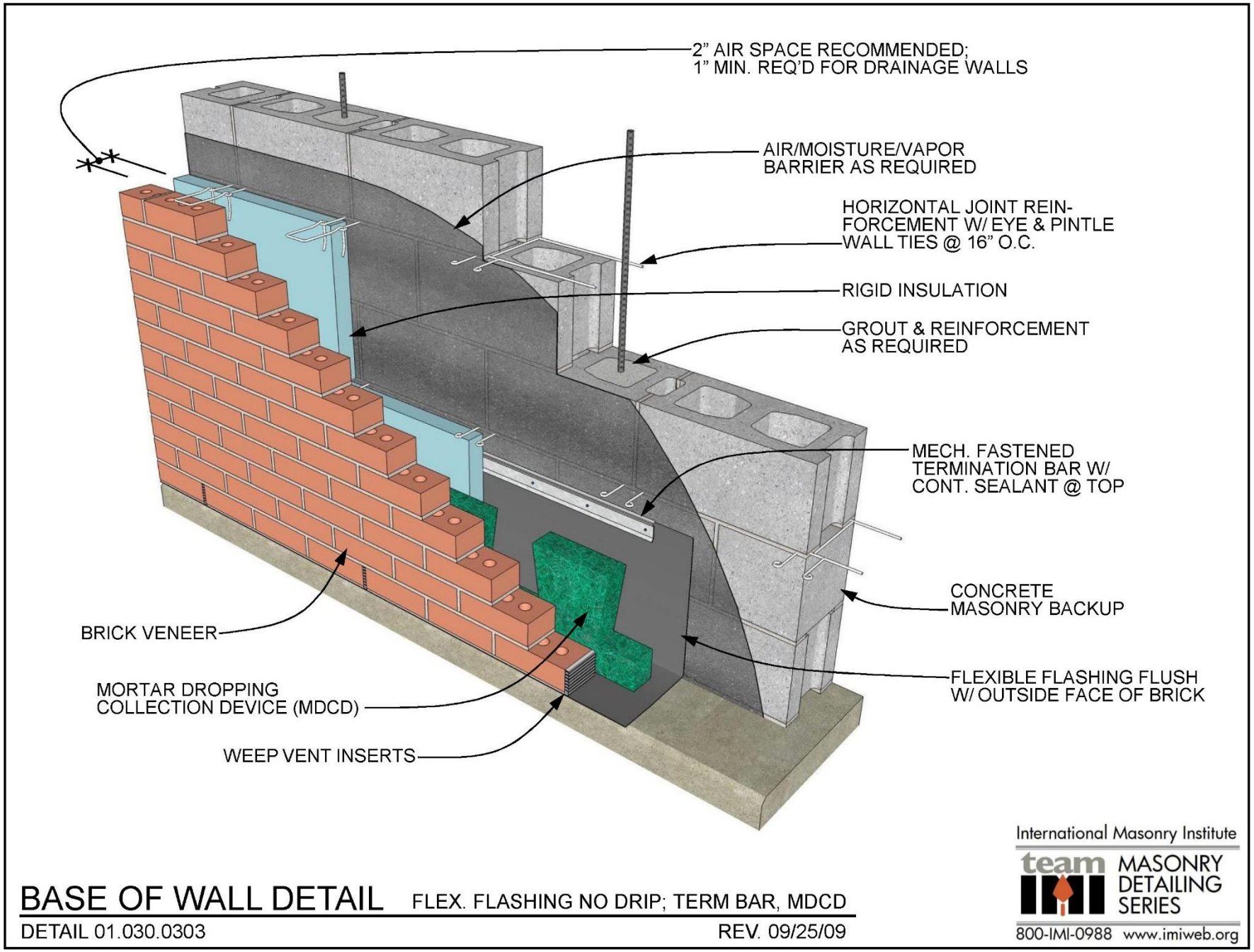


Modern brick economical in simple architecture

Whole industry built up to repair brick

- And how can you make brick veneers easier to install?
  - Labour shortages
  - Restrictions to one role
  - Speed
  - Onsite requirements in space, equipment and labour

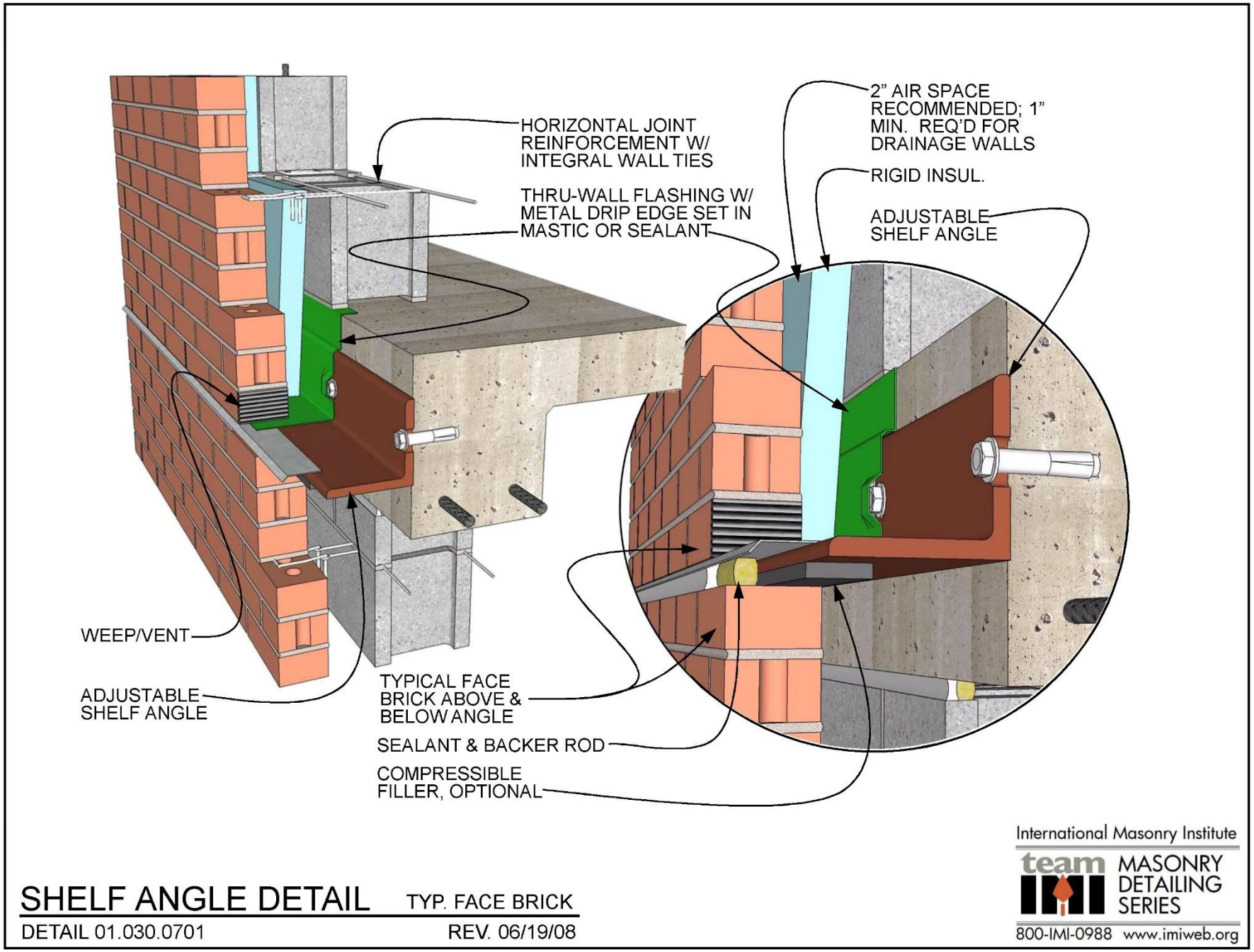
Brick-laying robots have been developed to address the skilled labor shortage in the industry



Brick veneer wall assembly

Traditional Brick

1. Brick
2. Cementous Mortar (much more)
3. Water (much much more)
4. Lintels
5. Tieback to floor slabs
6. Sealants and backing rods
7. Brick ties
8. Vent inserts
9. Reinforced structural wall and assembly
10. Mortar block
11. Labour restricted to bricklayers



What's wrong

- Number of ties
- Penetrations of AVB
- Thermal bridges if not this tie
- Thickness of insulation ie code compliance
- Dependence on excellent installation

Source: OBEC PTE Spring 2019 Blok-Lok Ad

Building envelope concerns conventional systems

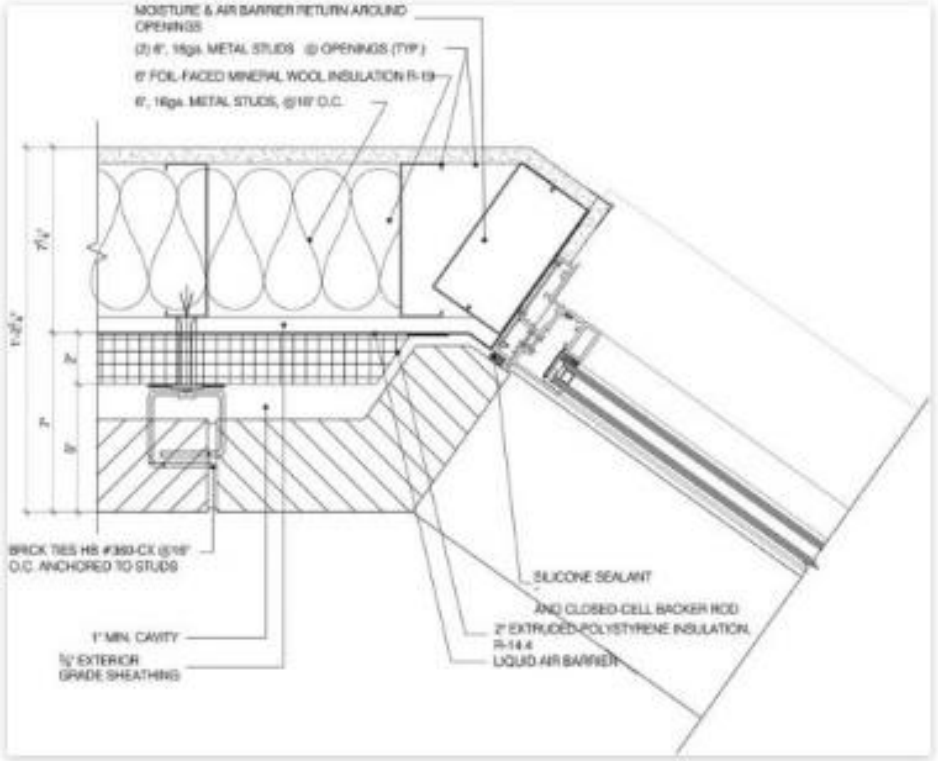
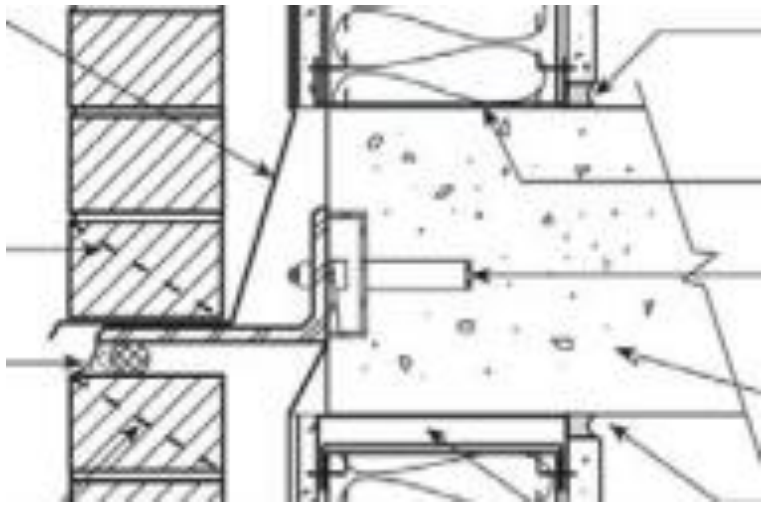


Figure 1: No insulation is provided in front of the steel studs at the window jamb, which creates a thermal bridging, condensation, and all associated problems at these studs. A double vapour barrier could cause condensation within the insulation located between the studs.
Image courtesy Centria



Thermal bridges
- Windows and doors
- Ties
- Ledges

Continuous insulation

Air and water barriers

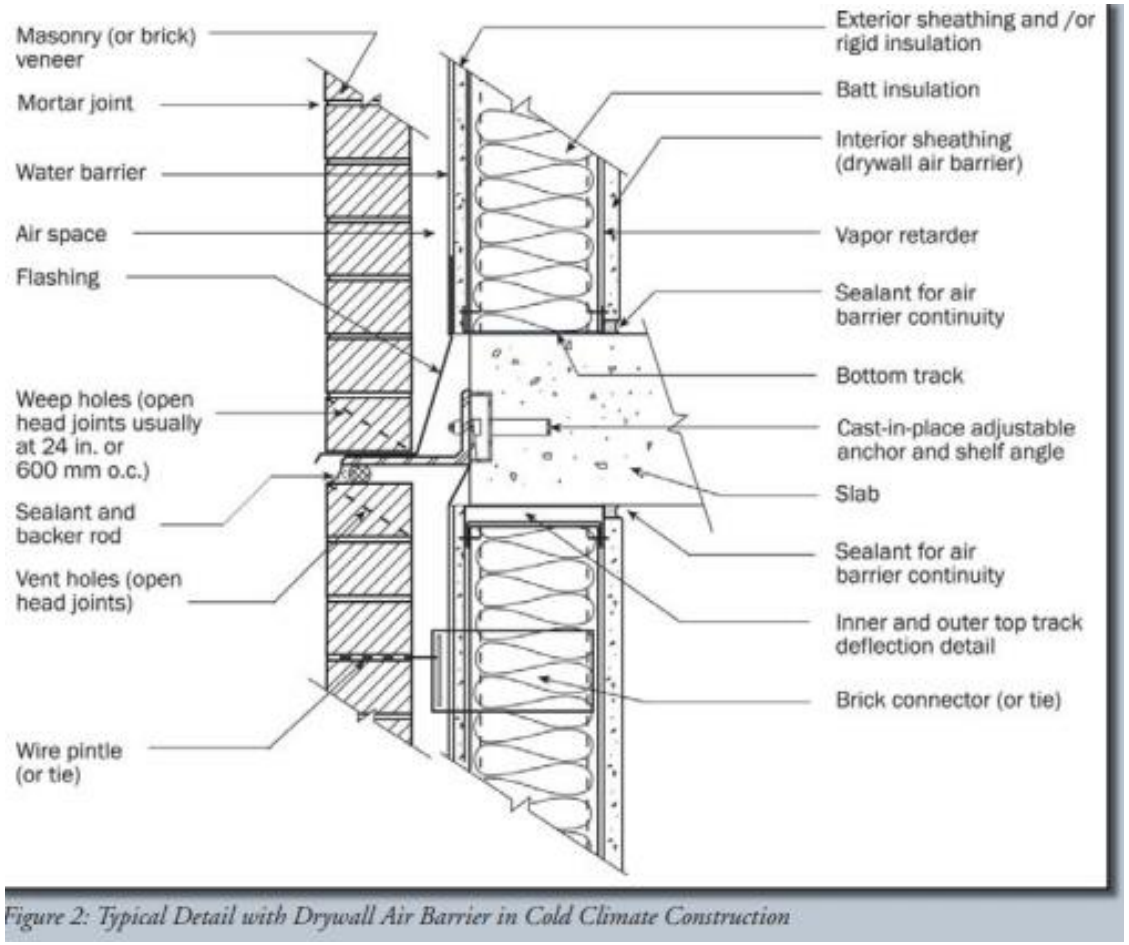
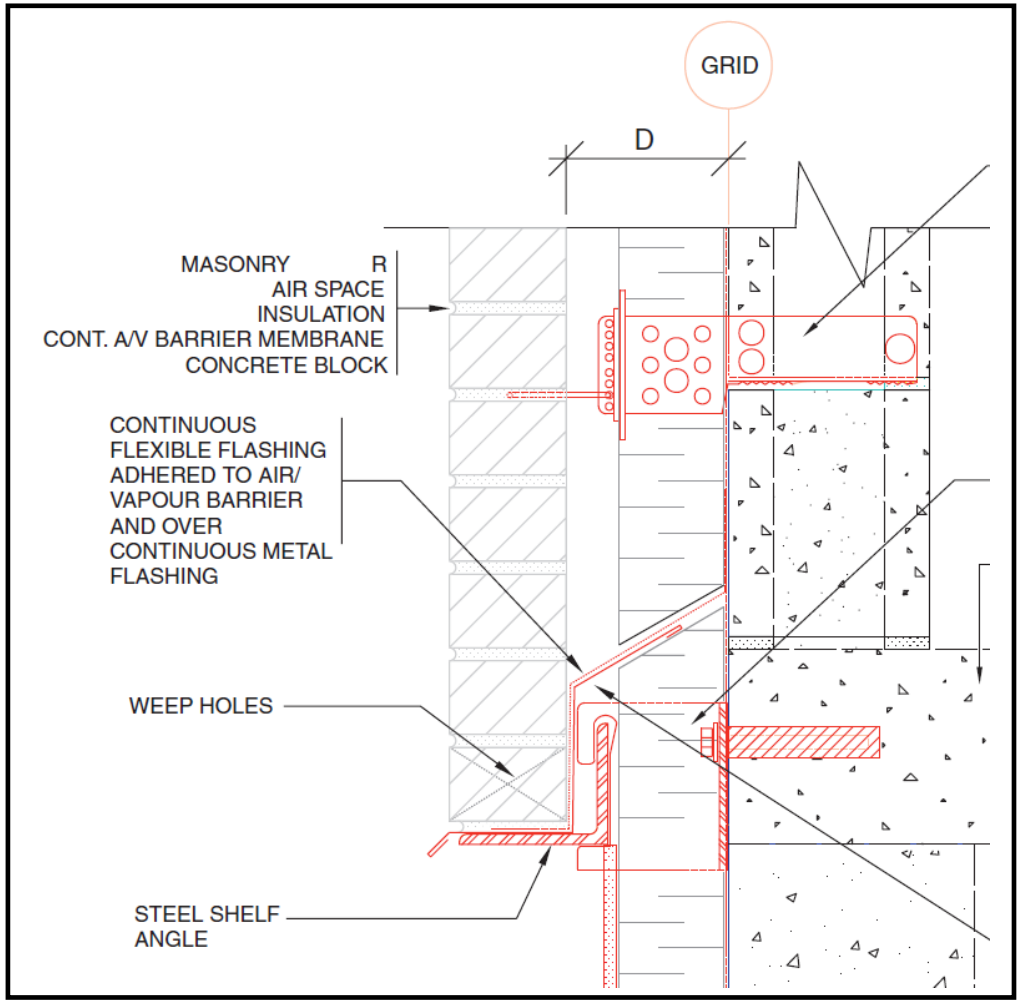


Figure 2: Typical Detail with Drywall Air Barrier in Cold Climate Construction



Continuous Insulation

Thermal Bridges, Very large lintels, or take up Slab Space

Fero Master Catalog
(how do continuous insulation?)

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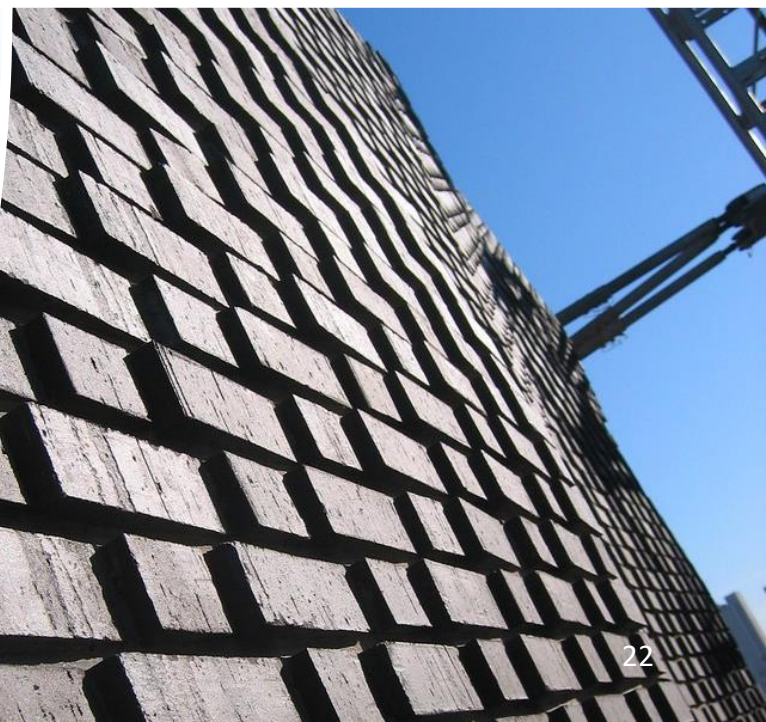
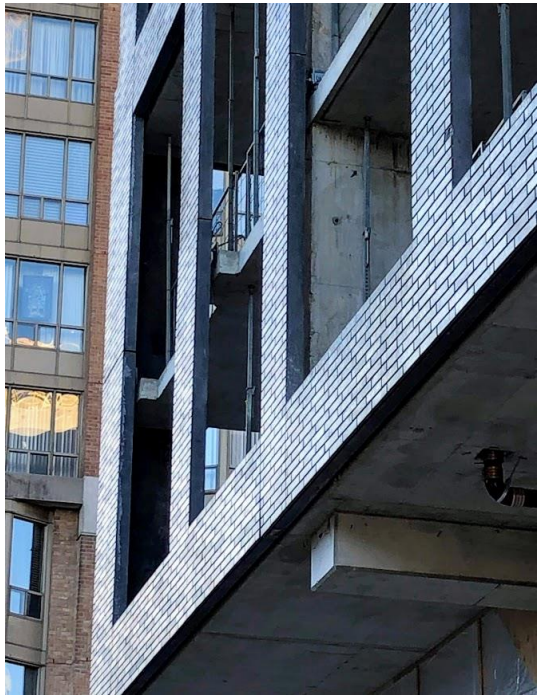
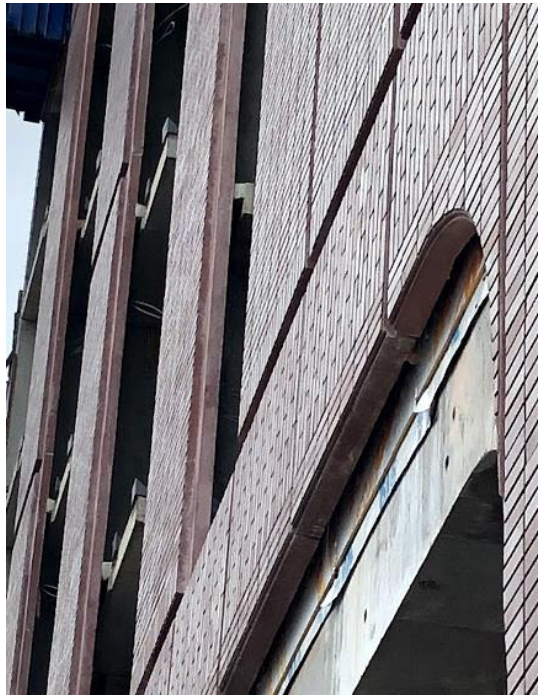
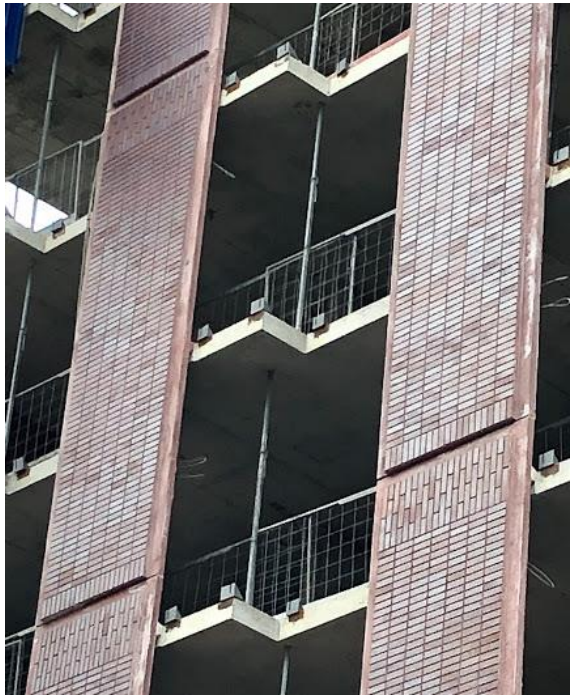
Precast Can be Amazing

(Anyone now how long precast and brick has been done?)



More commonly though

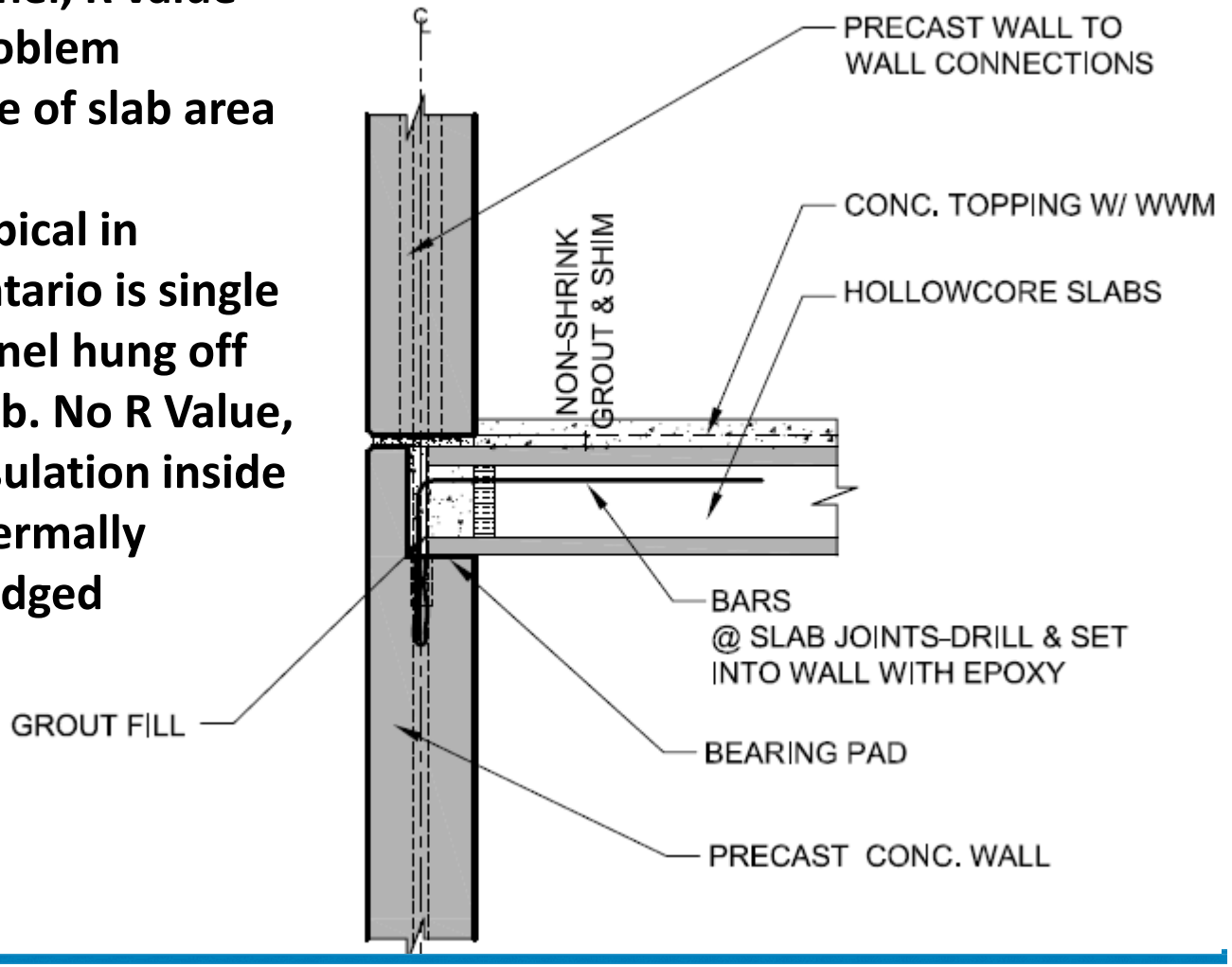
Precast to slab details

Typical uninsulated single panel

Issues:

- **Thermal Bridge**
- **If not sandwich panel, R value problem**
- **Use of slab area**

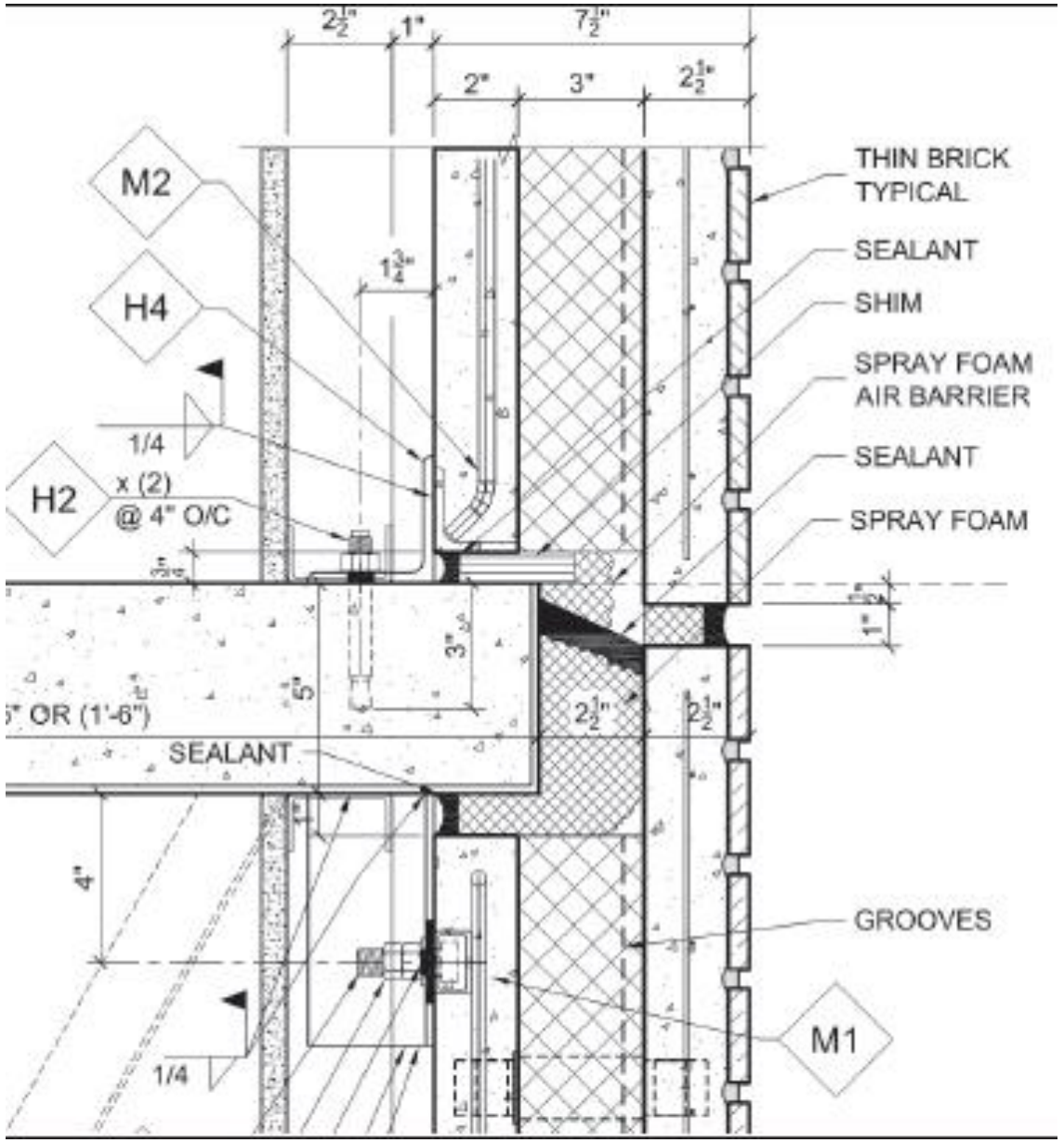
- **Typical in Ontario is single panel hung off slab. No R Value, insulation inside thermally bridged**



Brick on precast_v1.0

- Thickness
- Slab usage
- Slab edge thermal bridge
- No of parts
- All placed with a crane
- Slab thickness for weight
- Caulking joint

But cheap, and average buyer does not know



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CORIUM History

- Wienerberger is the world's largest producer of clay products with 230 plants in 30 countries *www.wienerberger.com*
- Worldwide Patents on the CORIUM system
- Proven performance with 20 years of on the wall experience in a wide range of climate zones.
- CORIUM Brick system and ArGeTon Terracotta

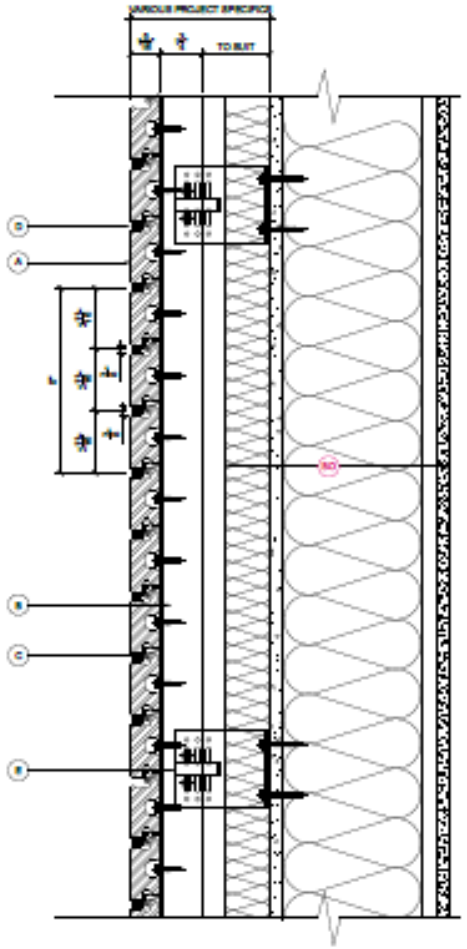
Solution:
CORIUM Brick Cladding System

- Worlds Most Advanced Brick System
- Rainscreen Ventilated System or Drained Cavity Wall
- High-Rise Construction Capable
- Accepts ASHRAE 90.1 Standards
- New Construction, Renovation or Re-Cladding
- High Performance Curtainwall Installation Options
- Easy Field or Factory Installed for Small or Large Projects
- Built in Quality Control

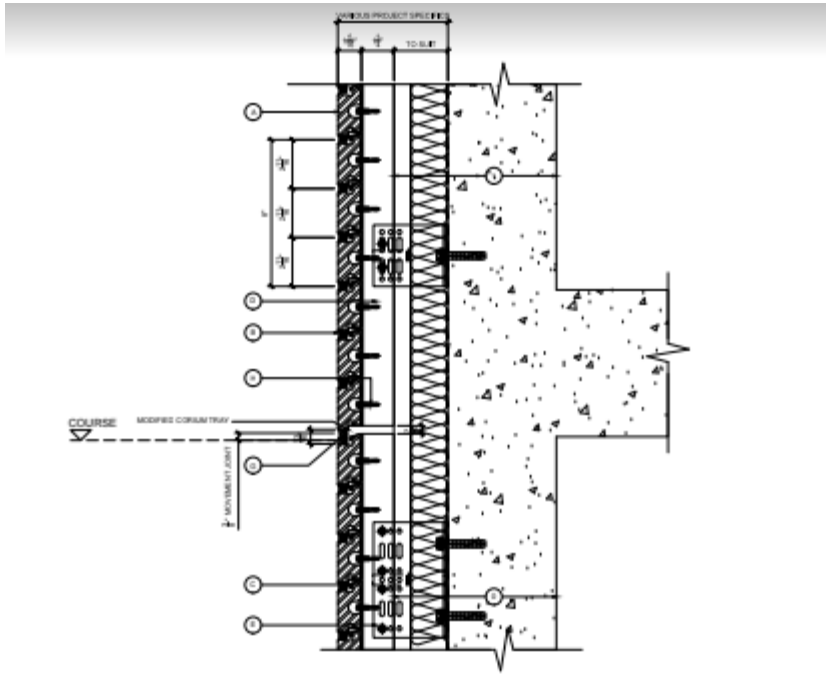
Simple, brick

- Brick.
- No thermal bridges.
- No slab area used.
- Insulation and membranes outside structure.
- No ledges.
- No cranes (if prefab, cranes, but much lighter and faster than precast.

Cross Section

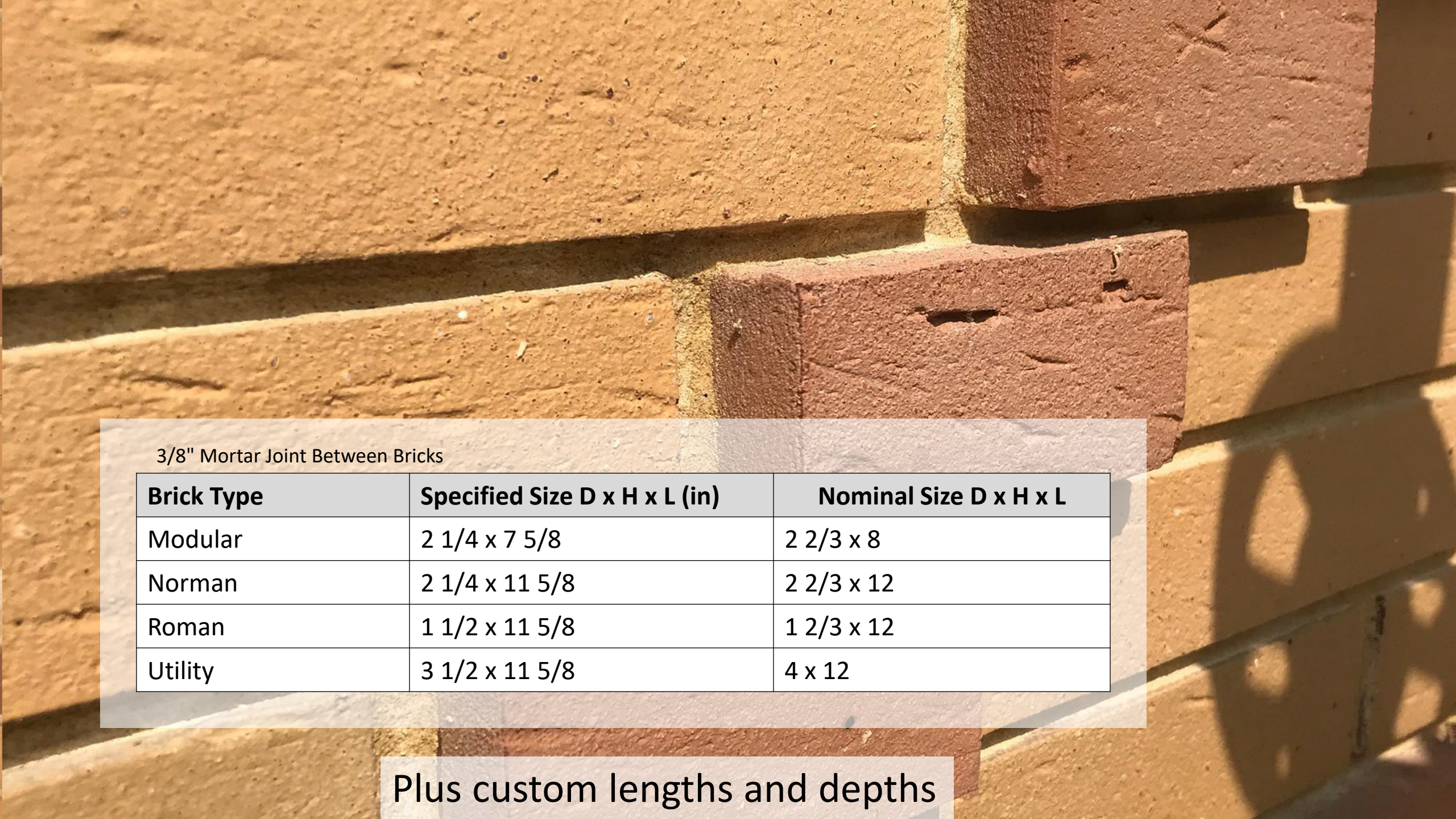


Slab edge



Click for video

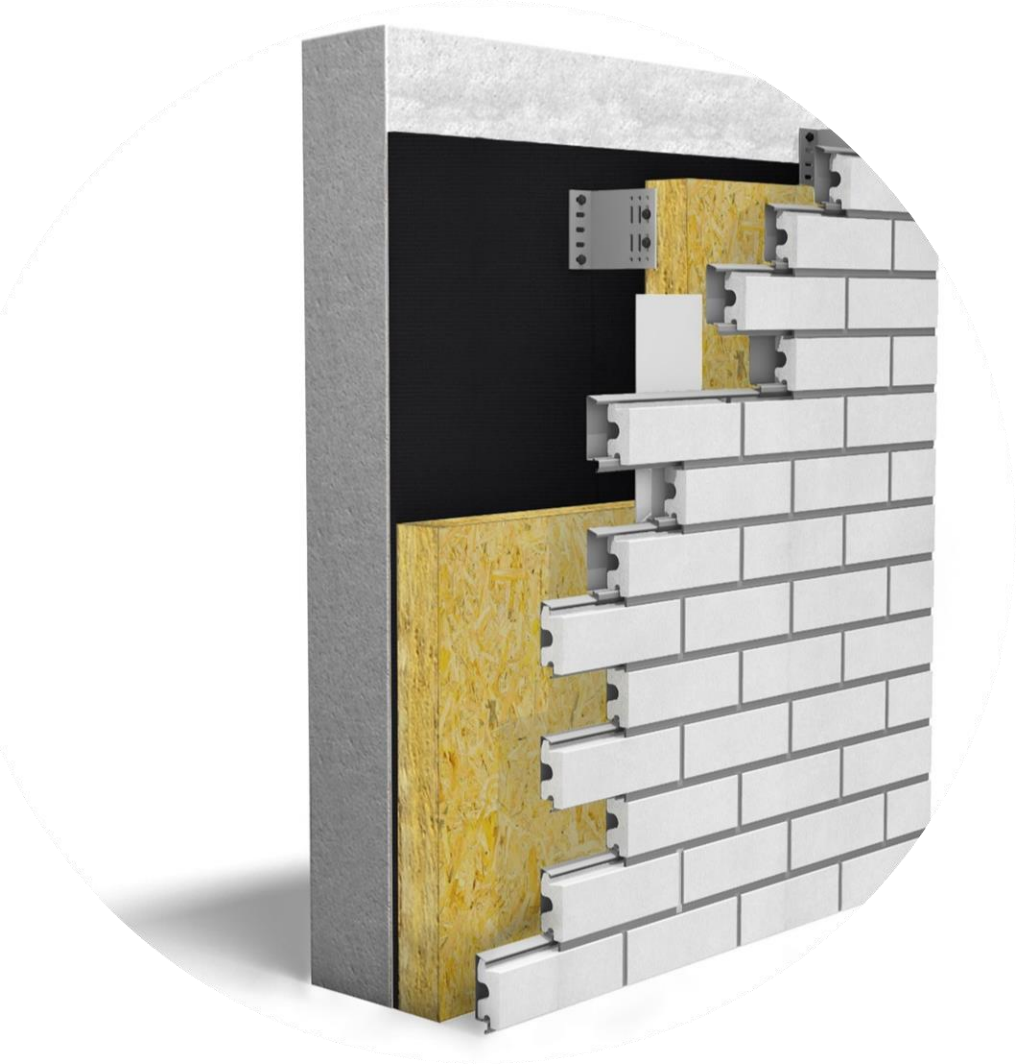
Interra install video



3/8" Mortar Joint Between Bricks

Brick Type	Specified Size D x H x L (in)	Nominal Size D x H x L
Modular	2 1/4 x 7 5/8	2 2/3 x 8
Norman	2 1/4 x 11 5/8	2 2/3 x 12
Roman	1 1/2 x 11 5/8	1 2/3 x 12
Utility	3 1/2 x 11 5/8	4 x 12

Plus custom lengths and depths



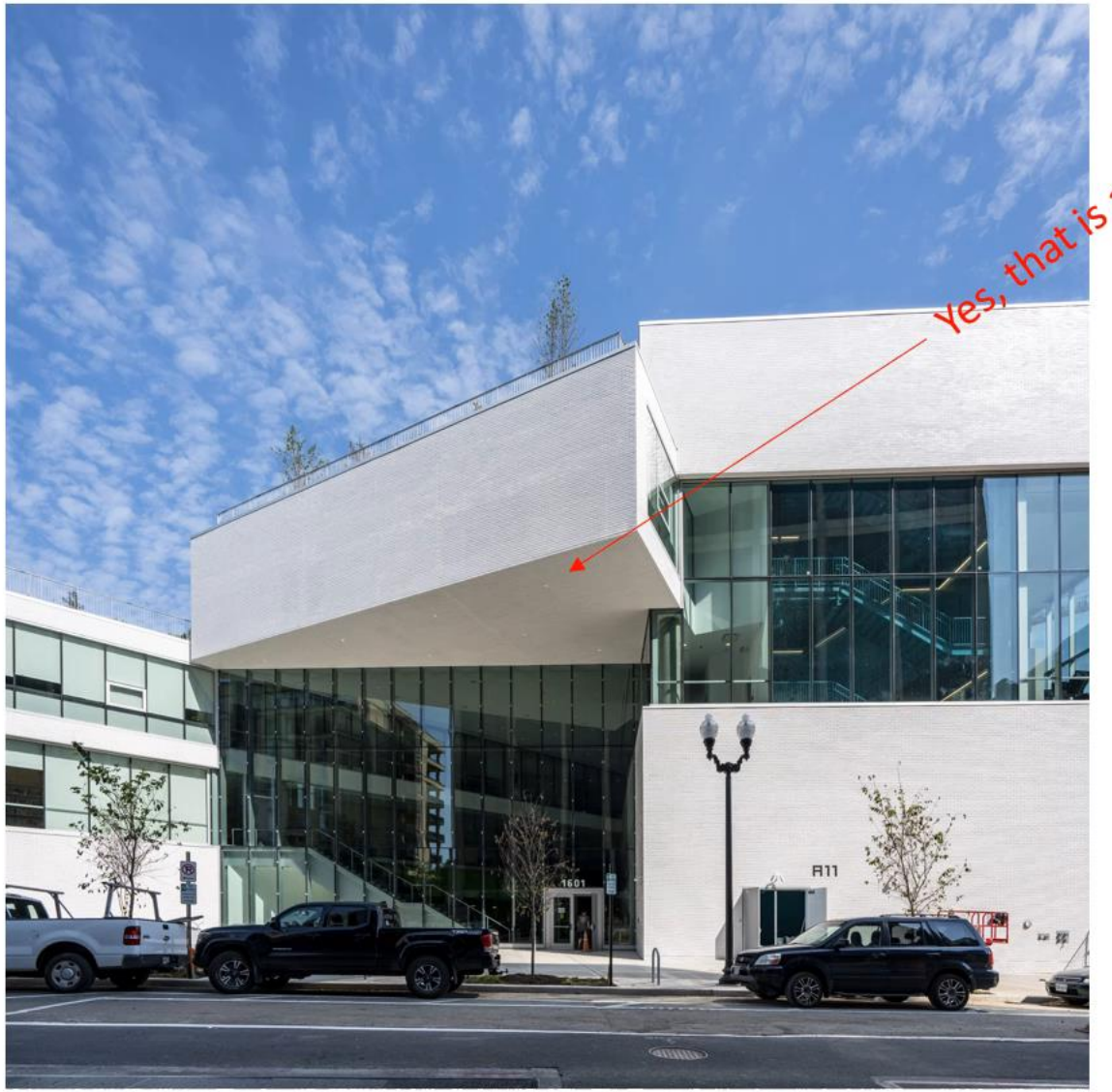
Typical Wall Assembly

- Light gauge steel framing, concrete/CMU or wood back-up.
- AWB Membrane
- Mineral wool Insulation – Variable depth up to 8”
- Cavity – 1” minimum for positive ventilation
- Framing – Wall Brackets and vertical supports designed to accommodate thickness of insulation and cavity. Brackets are thermally isolated and adjustable to offset irregularities in substrate – ASHRAE 90.1 Compliant.
- Supports Installed Perpendicular to Trays
- Trays – Interlocking and Profiled Securing the Brick Tiles
- Brick Tiles – Snap-Locked to Trays
- Lime-Sand Mortar

Click for video review on colours

CORIUM

FSi
FACADE SYSTEMS INC.



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Engineering evaluation:

Brick

ASTM C67;

- min strength 3000psi, Corium is 6700 psi
- Max allowed water absorption 17%, Corium 9.8%

British test: Freeze thaw 100 cycles -15c +25c no failure of brick, mortar or rails. Tested after 7 day soak.

System

Rails: better type of galvanized steel. Coating for exposed roofs and walls. Modeling and testing stated life of min 60 years with no reason recommended on why could not be longer.

System testing

- ASTM E283-04 air leakage
- ASTM 331-00 water penetration
- ASTM E547 water penetration
- ASTM 330-02 structural performance, load cycling, air pressure cycling.

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Corium

1. Brick (half weight)
2. Lime Mortar (much less)
3. Water (much much less)
4. Rails
5. Rainscreen assembly
6. Fasteners
7. Labour can be a variety of skilled trades

Weight 14 lb / sq ft

Traditional Brick

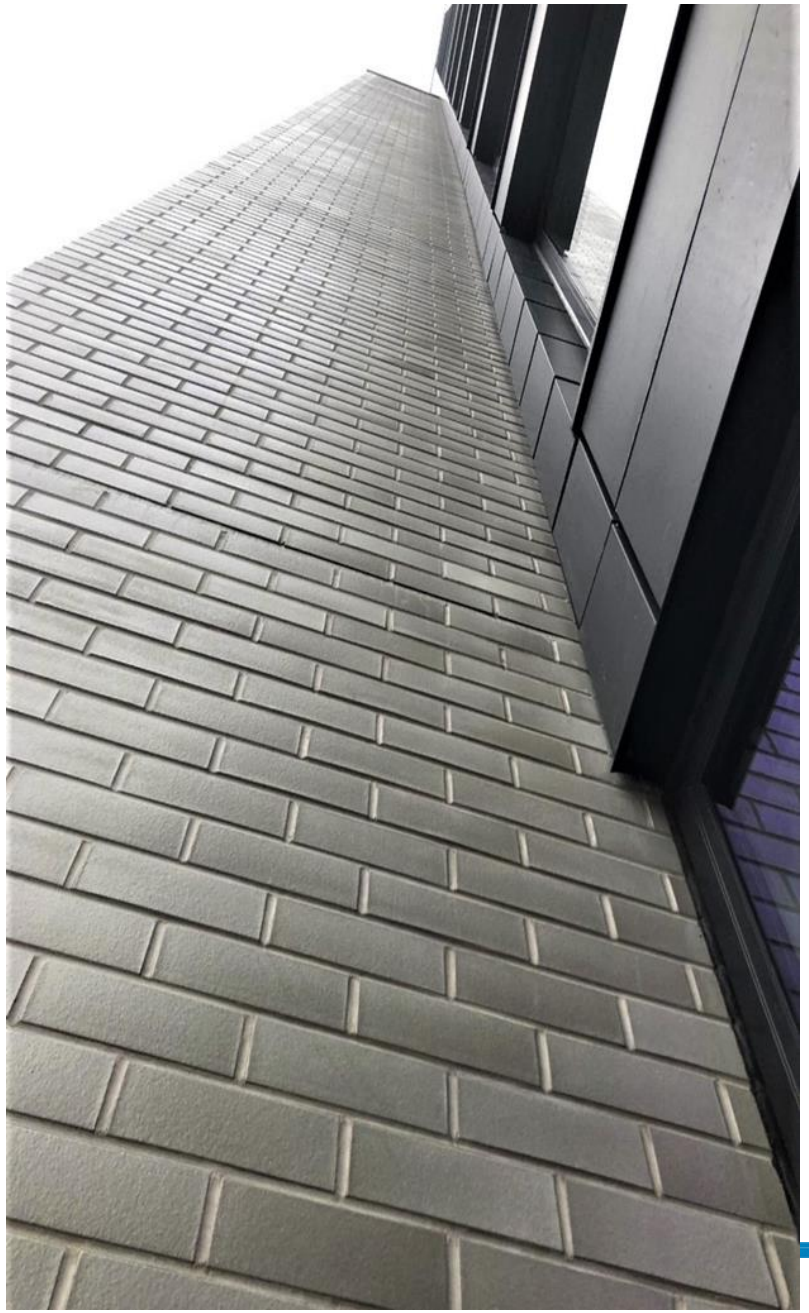
1. Brick
2. Cementous Mortar (much more)
3. Water (much much more)
4. Lintels
5. Tieback to floor slabs
6. Sealants and backing rods
7. Brick ties
8. Vent inserts
9. Reinforced structural wall and assembly
10. Mortar block
11. Labour restricted to bricklayers

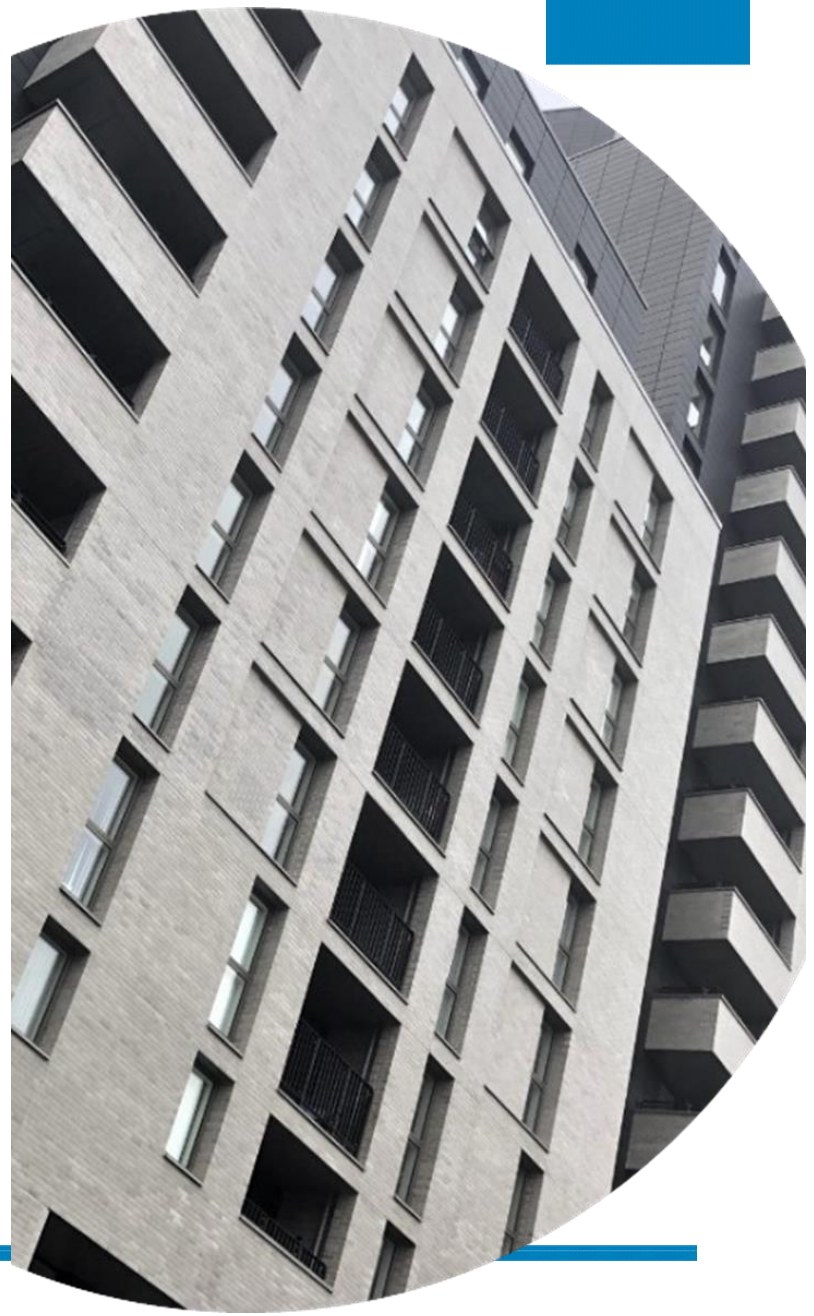
Weight 40 lb / sq ft

Concrete

1. Concrete
2. Concrete
3. Concrete
4. Caulking joints
5. Cranes
6. Attachments and lintels
7. Reinforced slab edge

Weight 100+ lb / sq ft





Theoretically Traditional Brick vs Corium, close but assumes a lot about Brick.

Summary	Brick	Corium
Bricks (all in) units/ person / day)	600.0	503.2
Bricks (all in) sq ft / person / day)	83.4	69.9

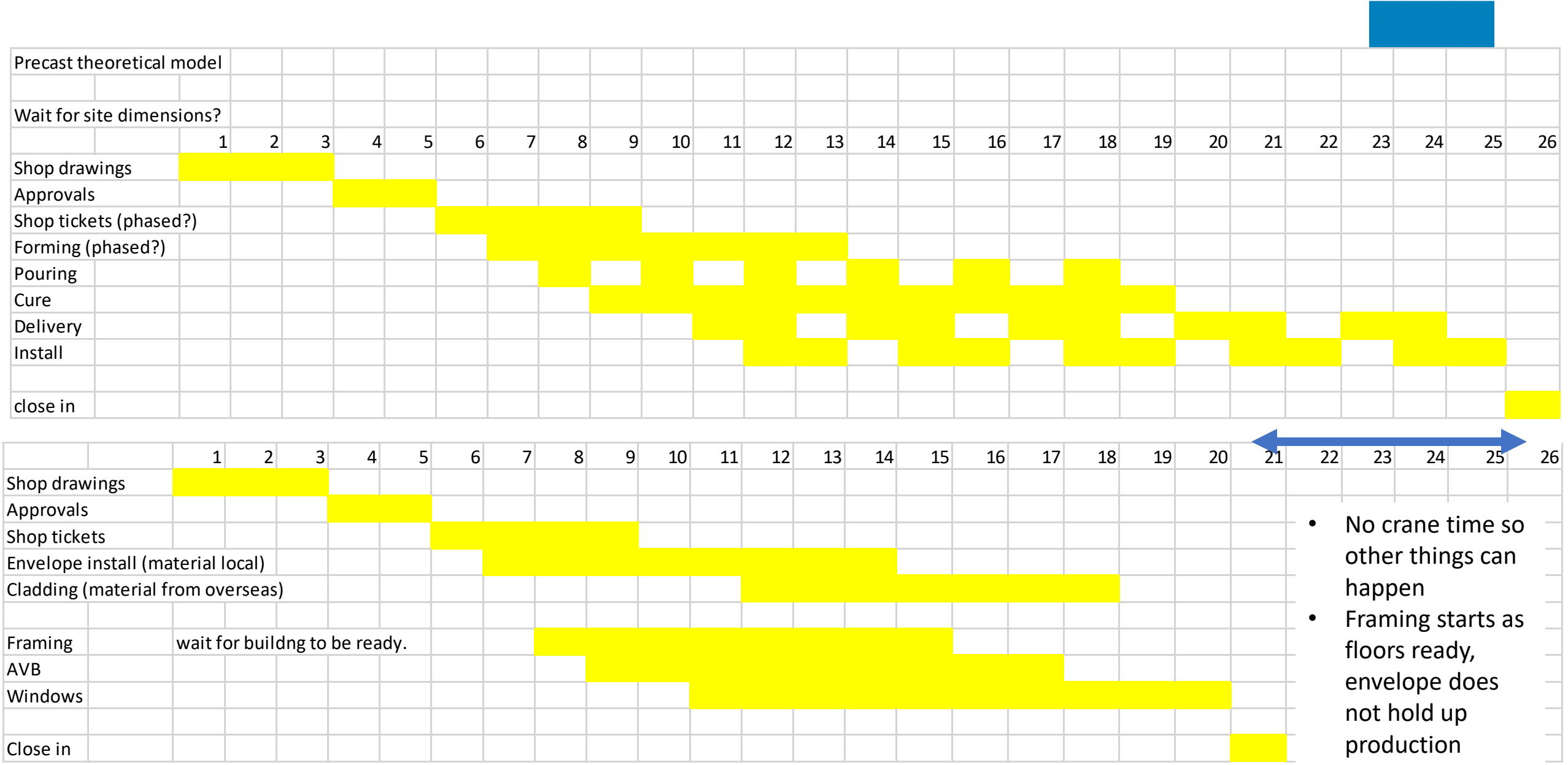
Corium process

- Assume subsystem up
- Rails, brick then mortar
- Little to no rinse
- About the same, but a lot assumptions on Brick

Brick process

- Assume subsystem up
- Simple applying brick, not lintels and other things that stop production.
- Do brick layers stop more, because of sheer weight?
- What is pace of getting material to wall?
- Does equipment type create limitations on height?

Brick data, two sources	Bricks / person / day	sq ft (8"x2.5" = 20sq in = 0.139 sq ft)
Source 1.		
Rate - peak bricks / person / day	1680	234
avg bricks / person / day	1166	162
Source 2.		
old bricks / person / day	1000	139
new bricks / person / day	600	**83**


Precast theoretical model
Wait for site dimensions?
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Shop drawings
Approvals
Shop tickets (phased?)
Forming (phased?)
Pouring
Cure
Delivery
Install
close in
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Shop drawings
Approvals
Shop tickets
Envelope install (material local)
Cladding (material from overseas)
Framing
wait for buildng to be ready.
AVB
Windows
Close in
• No crane time so other things can happen
• Framing starts as floors ready, envelope does not hold up production

Mason:		
Brick, rail, mortar	$	25.00
Masonry install and pointing, incl equipment	$	25.00
Subsystem		
Substructure install	$	19.00
AVB		incl
Horizontal girts and clips		incl
Insulation (how thick)		incl
Vertical girts		incl
General:		
Stamped Shop Drawings	$	1.00
Equipment		incl
	$	70.00

Reasonably complicated 8 storey building Toronto 2019 pricing

- **Same job**
  - Precast $85,
    - Insulation inside?
    - Need crane, priced in?
  - Brick $60
    - Not sure what included

Other systems: What matters to you?

	Corium	Precast	Brick
Design Freedom	★	★	★
Detailing	★	☹	☹
Durability	★	★	★
Thermal performance / investment	★	☹	★
Price range	★	★	★
Speed (close in building)	★	☹	★
Environment	★	☹	★

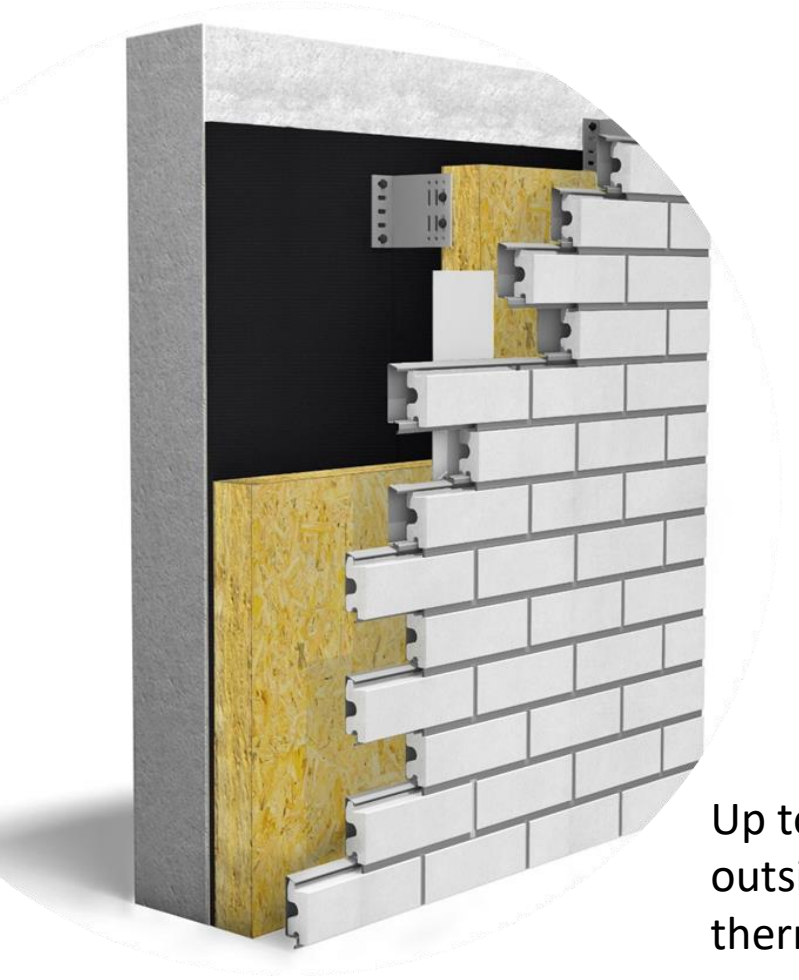
Performance and Detailing

	Corium	Precast	Brick
Continuous Insulation to Code**			
Loading of Slab			
Use of Slab area			
Penetrations of Air Vapour Barrier			

(4-6” of Rockwool for R18+)

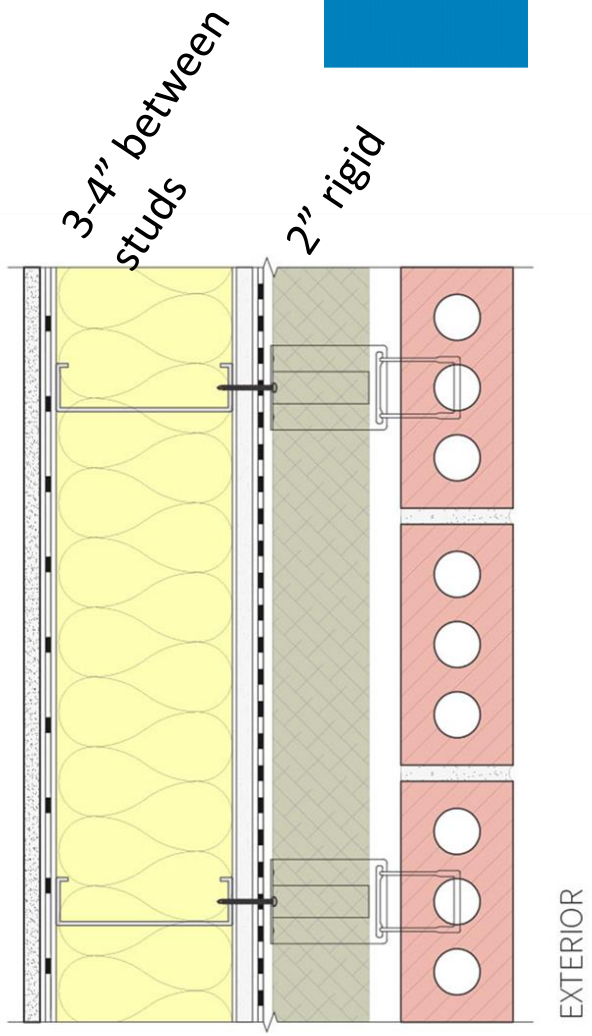
**R value of walls is not only way to meet performance requirements of code

- ✓ Same Wall Depth
- ✓ 2x Exterior Insulation
- ✓ No Interior Insulation
- ✓ No brick ties
- ✓ No thermal bridging



Units (mm)	Brick	Corium	
Brick	92	49	
Gap	25	25	
Subtotal	117	74	43
Insulation	50	100	
	167	174	7

Up to 8” insulation all outside structure, all thermally broken

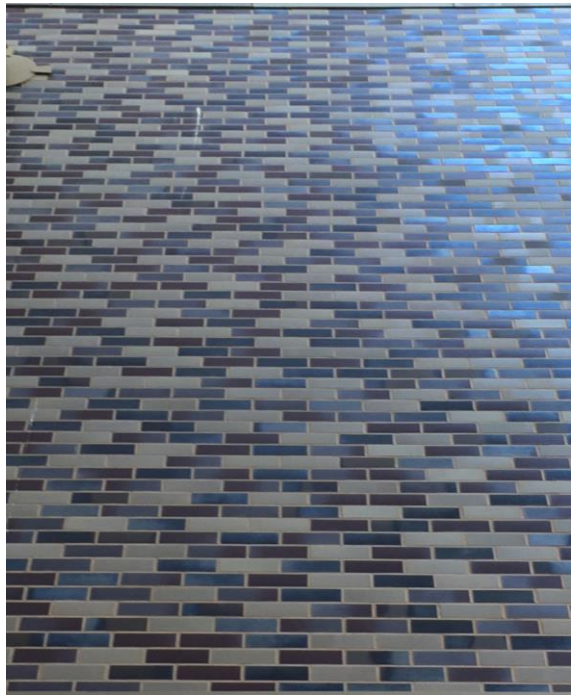


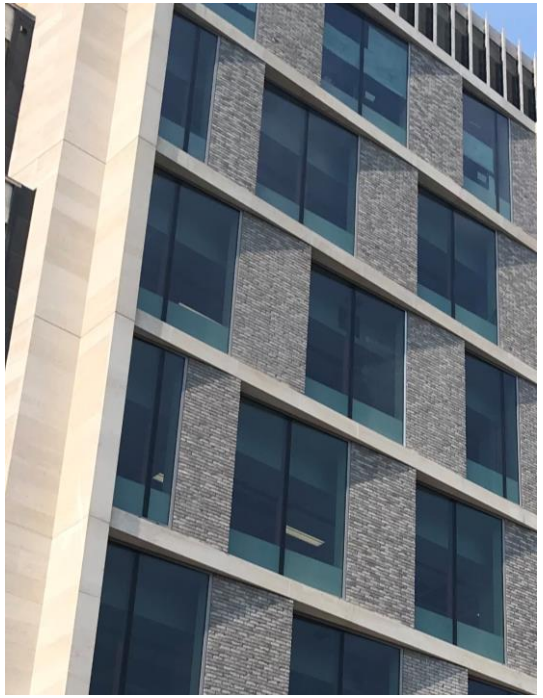
This is not R18 Continuous

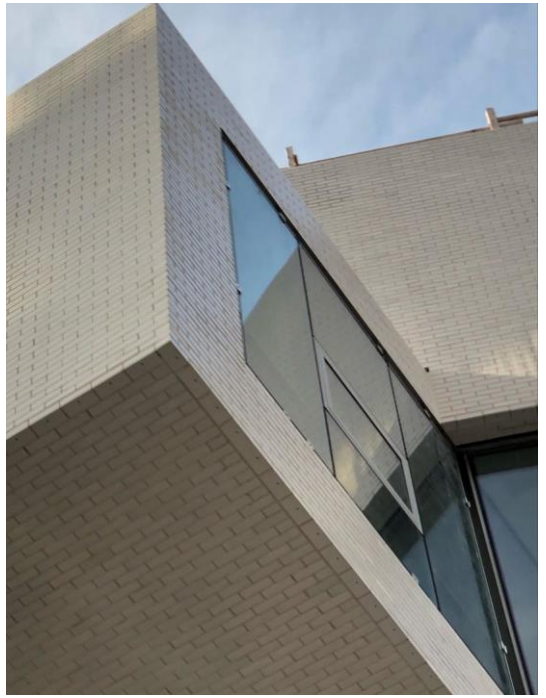
Learning Concepts

- ✓ **Define drained vs ventilated façade.**
- ✓ **"State of the nation" in brick**
- ✓ **World of choices**
- ✓ **Brick + and -**
- ✓ **Precast with Brick + and -**
- ✓ **Corium + and –**
- ✓ **Comparisons**
- ✓ **Projects and applications**

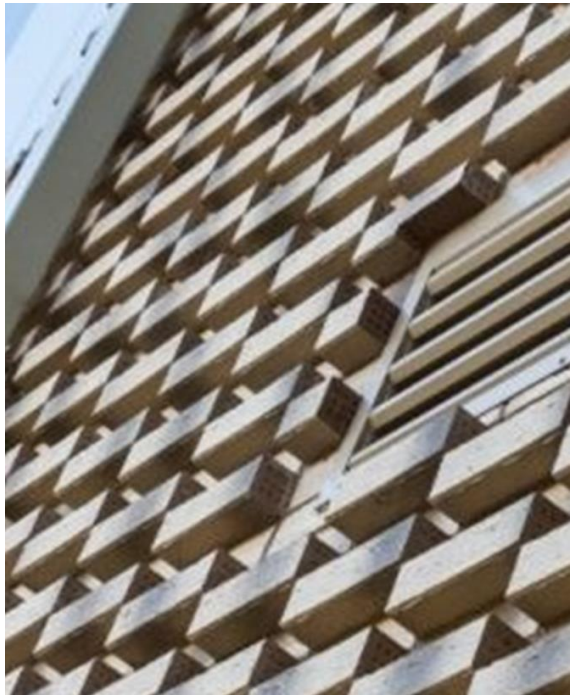
Wilson School, VA







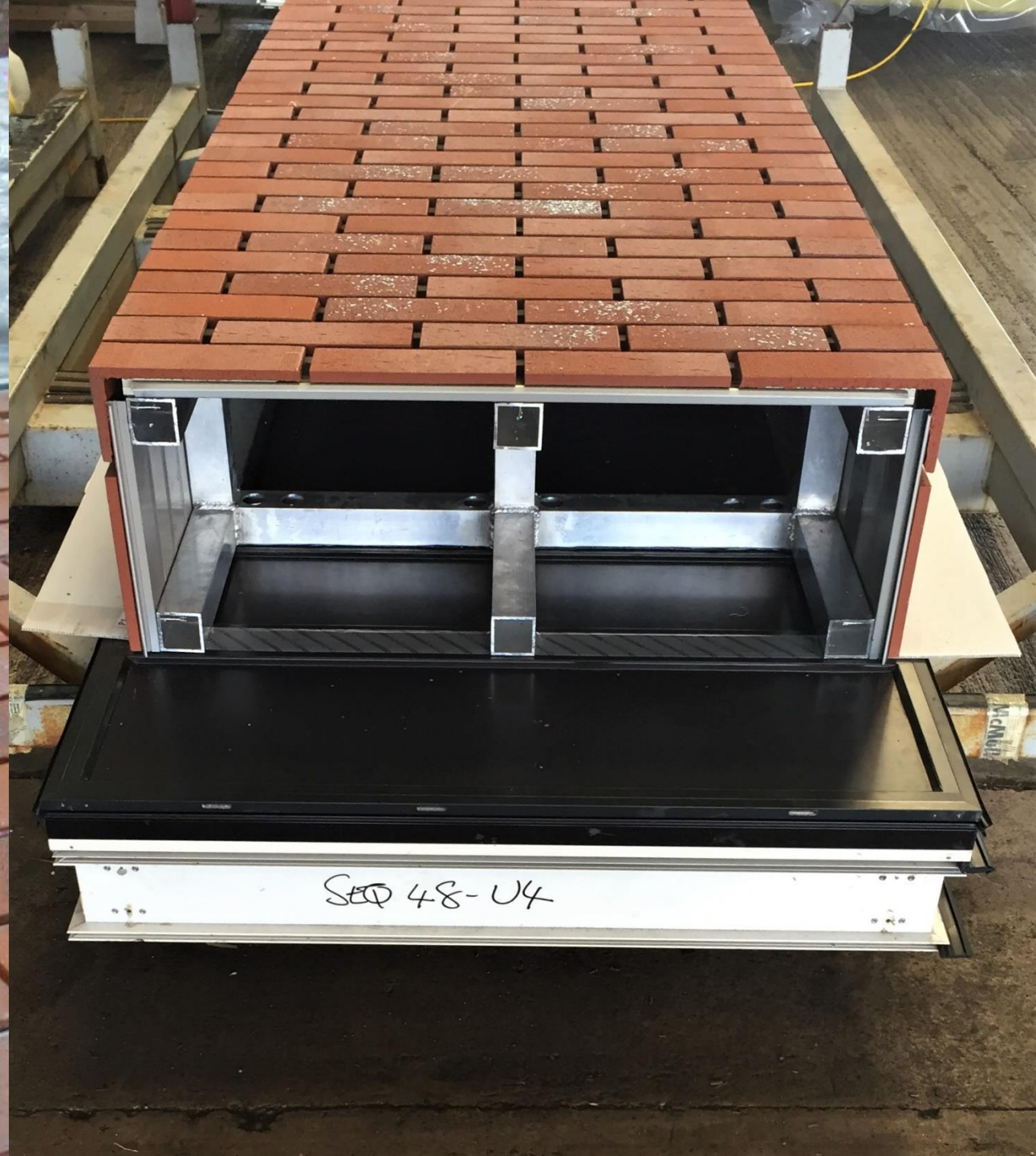
Plinth



Brick Aesthetics and Performance

Unitized Construction

The Corium brick system can also be panelized and mortar applied post erection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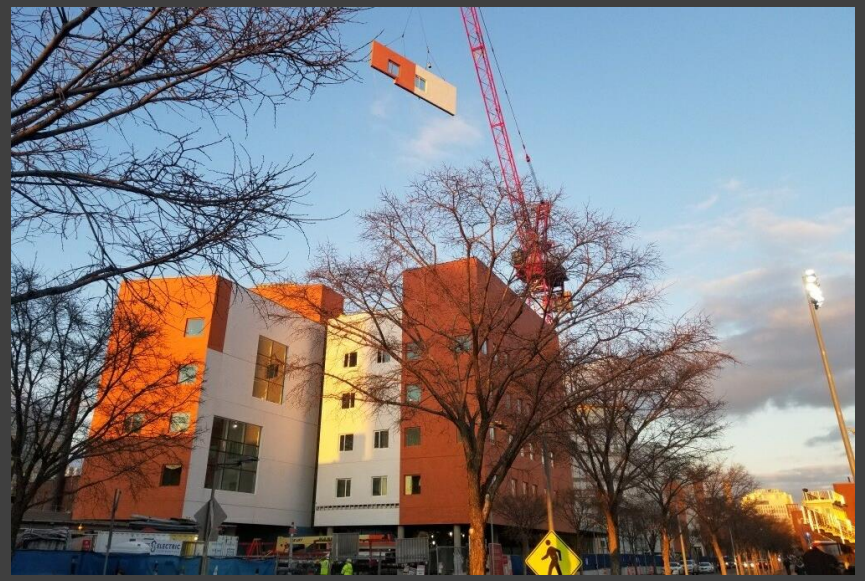

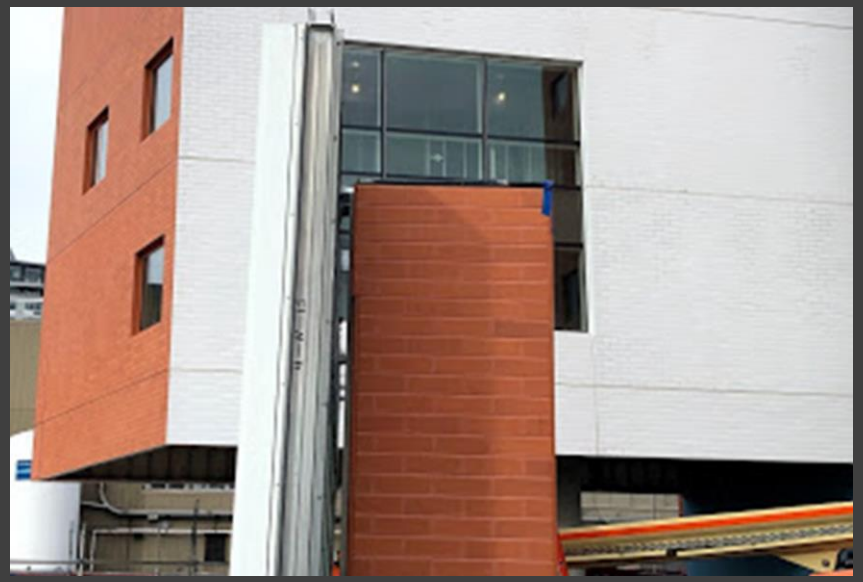

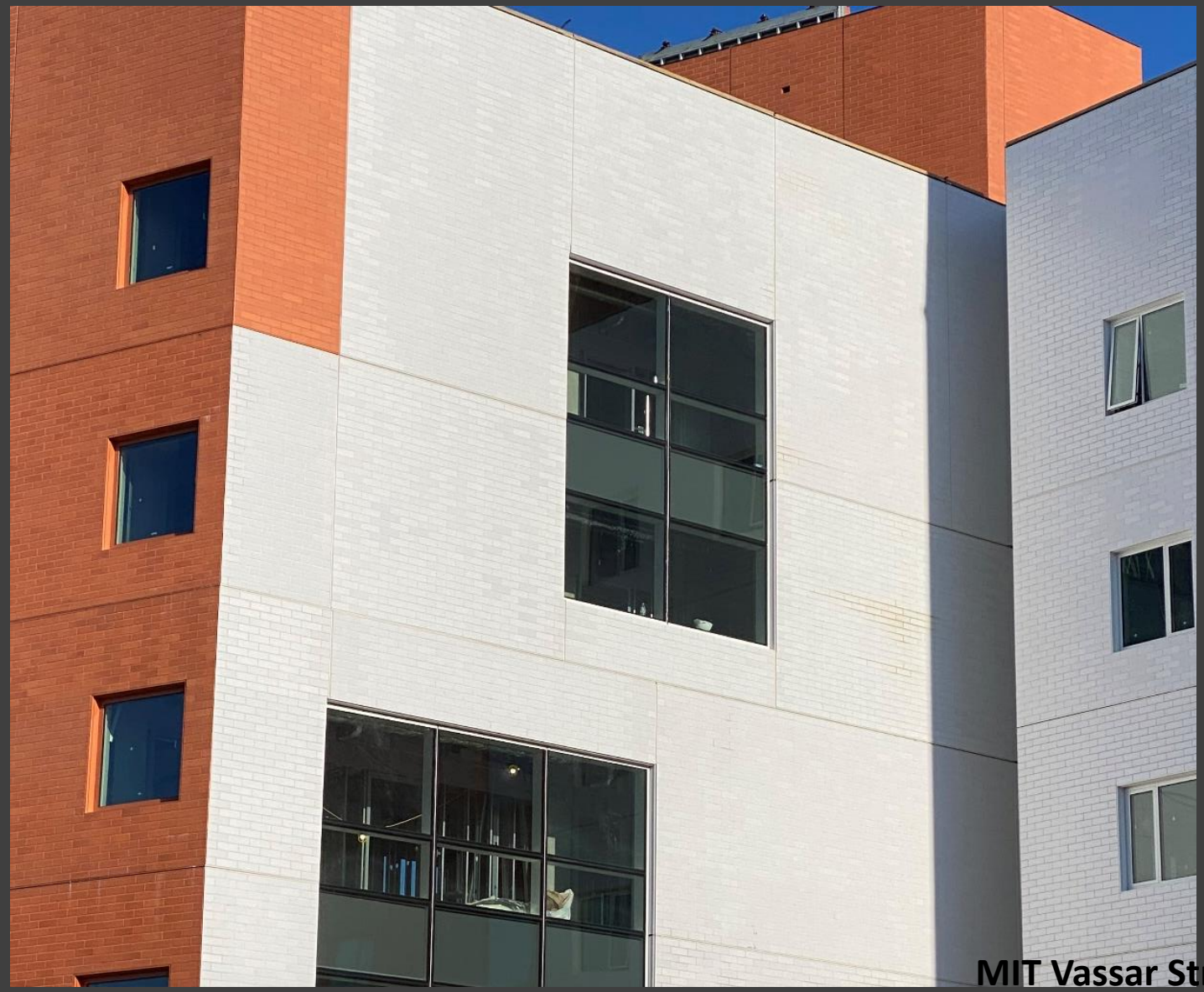

MIT Vassar Street

Cambridge, MA

(under construction)


METROPO


City Park West, London

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