MATERIAL OF MY MASONRY

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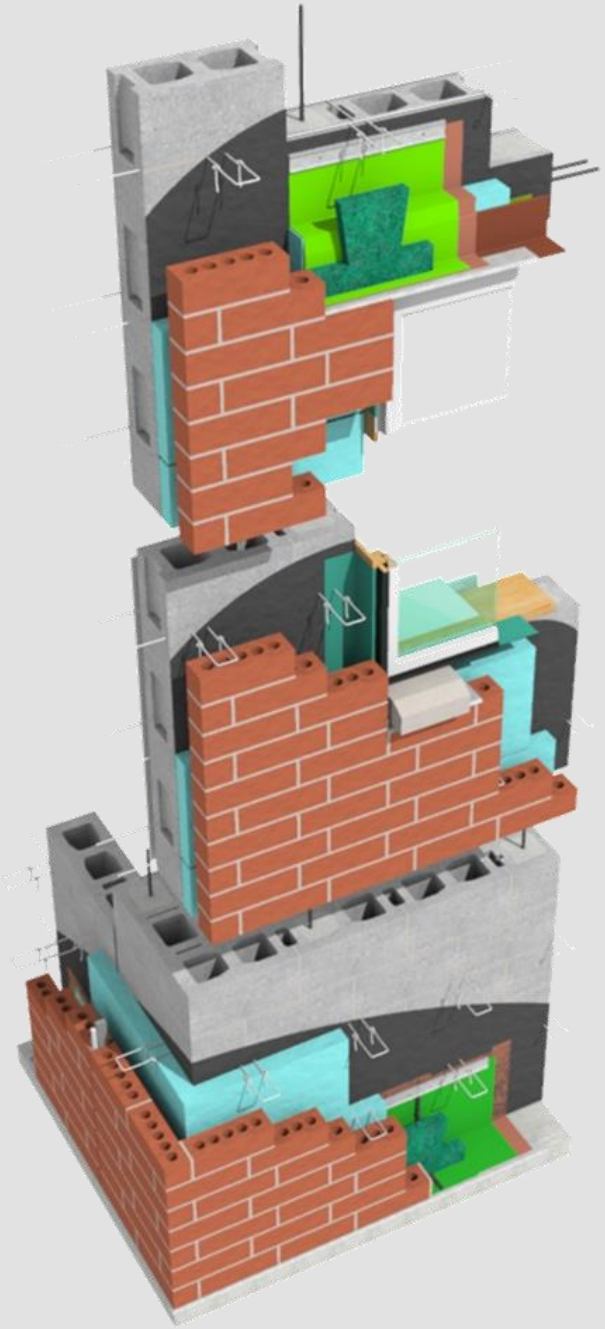
CHICAGO BUILD 2024 EXPO
OCTOBER 22 - 23
McCORMICK PLACE

INTERNATIONAL MASONRY INSTITUTE



MASONRY MATERIALITY

INTRODUCTION

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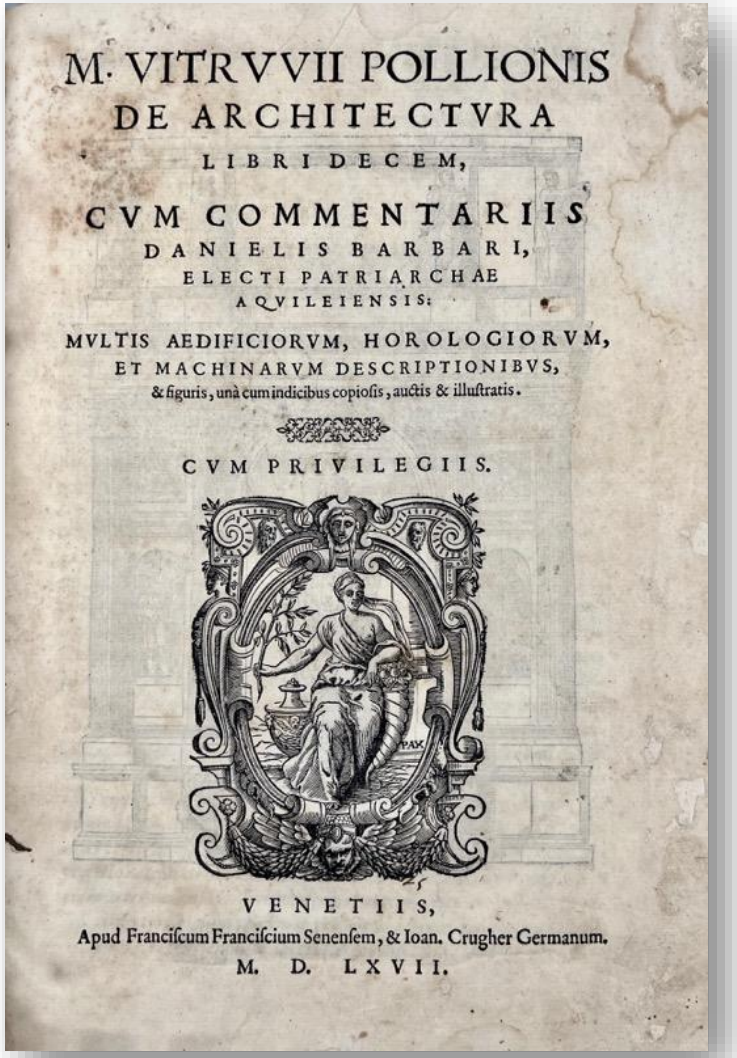
Architecture starts
when you carefully
put two bricks together.
There it begins…

- Ludwig Mies van der Rohe

MASONRY ARCHITECTURAL WALLS



Firmness

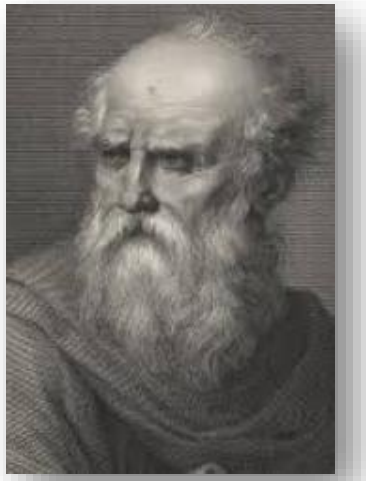
- Structural
- High performing
- Long lasting

Commodity

- Useful
- Functional
- Efficient

Delight

- Beautiful
- Inspiring



Vitruvius, 30 BC

MASONRY | MATERIAL TYPES

Brick

- Made from clay & shale
- May be used structurally or as a veneer
- ASTM C216

Concrete block

- Made from concrete
- a.k.a. CMU (concrete masonry unit)
- ASTM C90

Stone

- Naturally occurring
- Rough stone or dimension stone
- Various ASTM standards
- Natural Stone Institute (NSI)

Tile

- Fired ceramic facing unit
- Thin relative to facial area
- ANSI A137.1
- Tile Council of North America (TCNA)

Terrazzo

- Composite material
- Strips, aggregate, binder
- Usually poured in place
- National Terrazzo & Mosaic Association (NTMA)

Terra cotta

- Made from clay
- ASTM C212
- Traditional & modern applications

MASONRY MATERIALITY

BRICK

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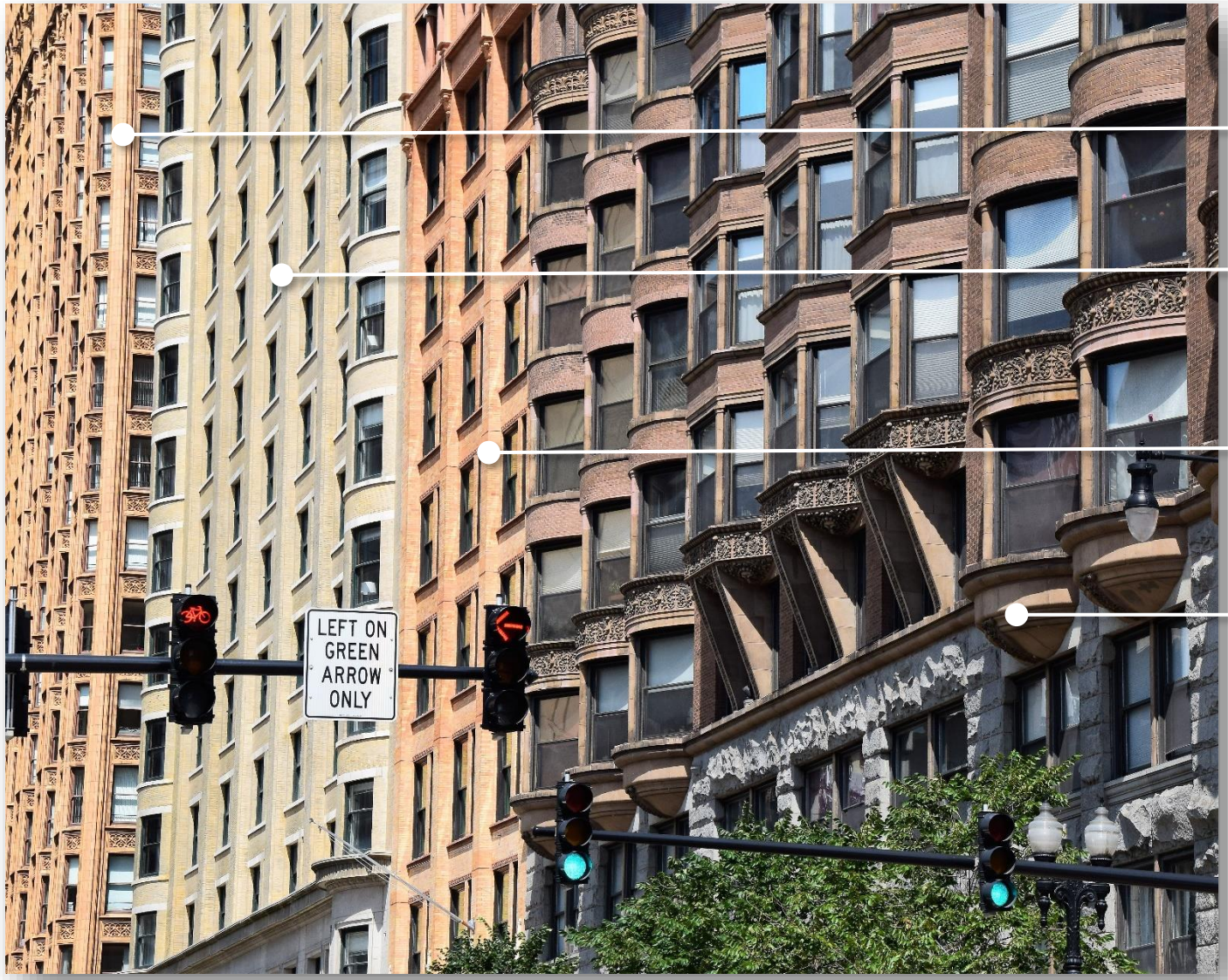
BRICK



Masonry street-wall, South Dearborn Street, Chicago

🔥 Great Chicago Fire, 1871

Fisher Building,
Daniel Burnham, 1896

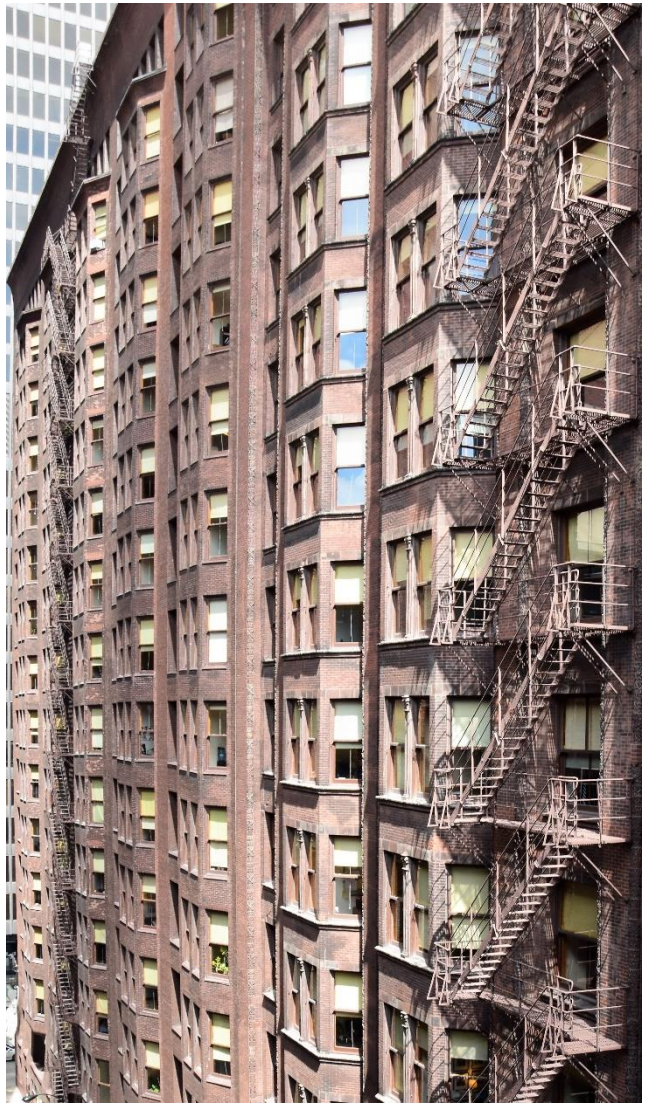
Old Colony Building,
Holabird & Roche, 1894

Plymouth Building
Simeon Eisendrath, 1899

Manhattan Building,
William LeBaron Jenney,1891

Monadnock Building
Burnham & Root, 1891
(opposite side of Dearborn)

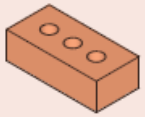
BRICK



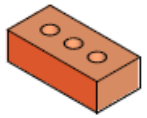
Monadnock Building Burnham & Root, 1891; 16 stories. World's tallest loadbearing brick building. Walls are 6' thick at the base.

The Columbian, 2008; 47 stories; brick veneer

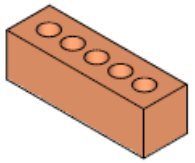
BRICK | UNITS



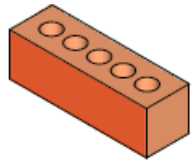
01M Face brick, modular
3 5/8" x 2 1/4" x 7 5/8"



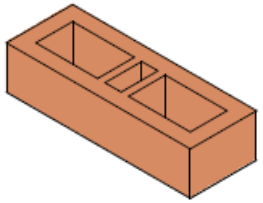
01MZ Face brick, glazed, modular
3 5/8" x 2 1/4" x 7 5/8"



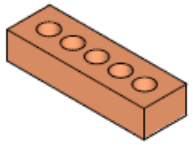
01U Face brick, utility
3 5/8" x 3 5/8" x 11 5/8"



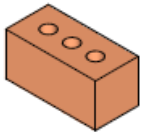
01UZ Face brick, utility, glazed
3 5/8" x 3 5/8" x 11 5/8"



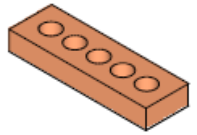
01S.06 Structural brick, 6-in.
5 5/8" x 3 5/8" x 15 5/8"



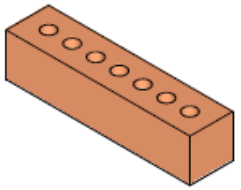
01N Face brick, norman
3 5/8" x 2 1/4" x 7 5/8"



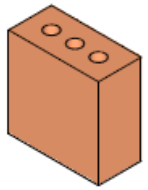
01EC Face brick, economy (closure)
3 5/8" x 3 5/8" x 7 5/8"



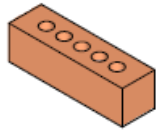
01R Face brick, Roman
3 5/8" x 1 5/8" x 11 5/8"



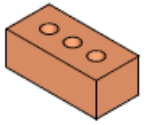
01C Face brick, monarch
3 5/8" x 3 5/8" x 15 5/8"



01W Face brick, wall
3 5/8" x 7 5/8" x 7 5/8"

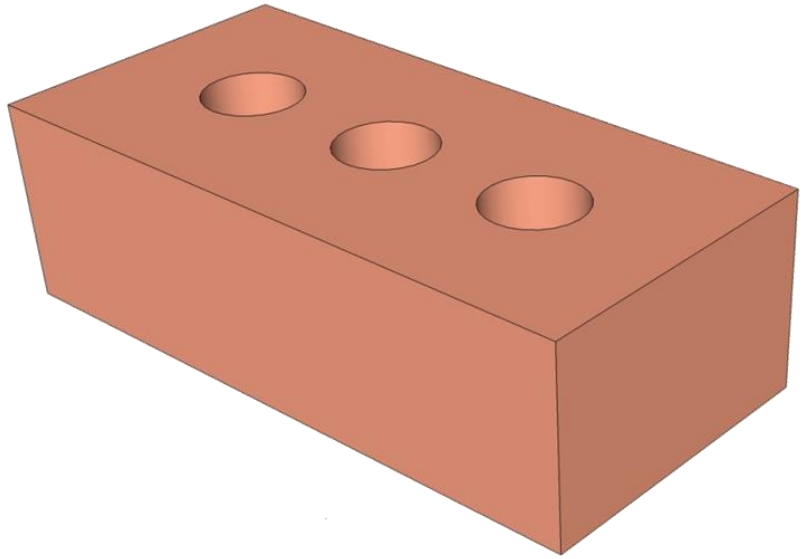


01K Face brick, king
2 3/4" x 2 13/16" x 9 5/8"

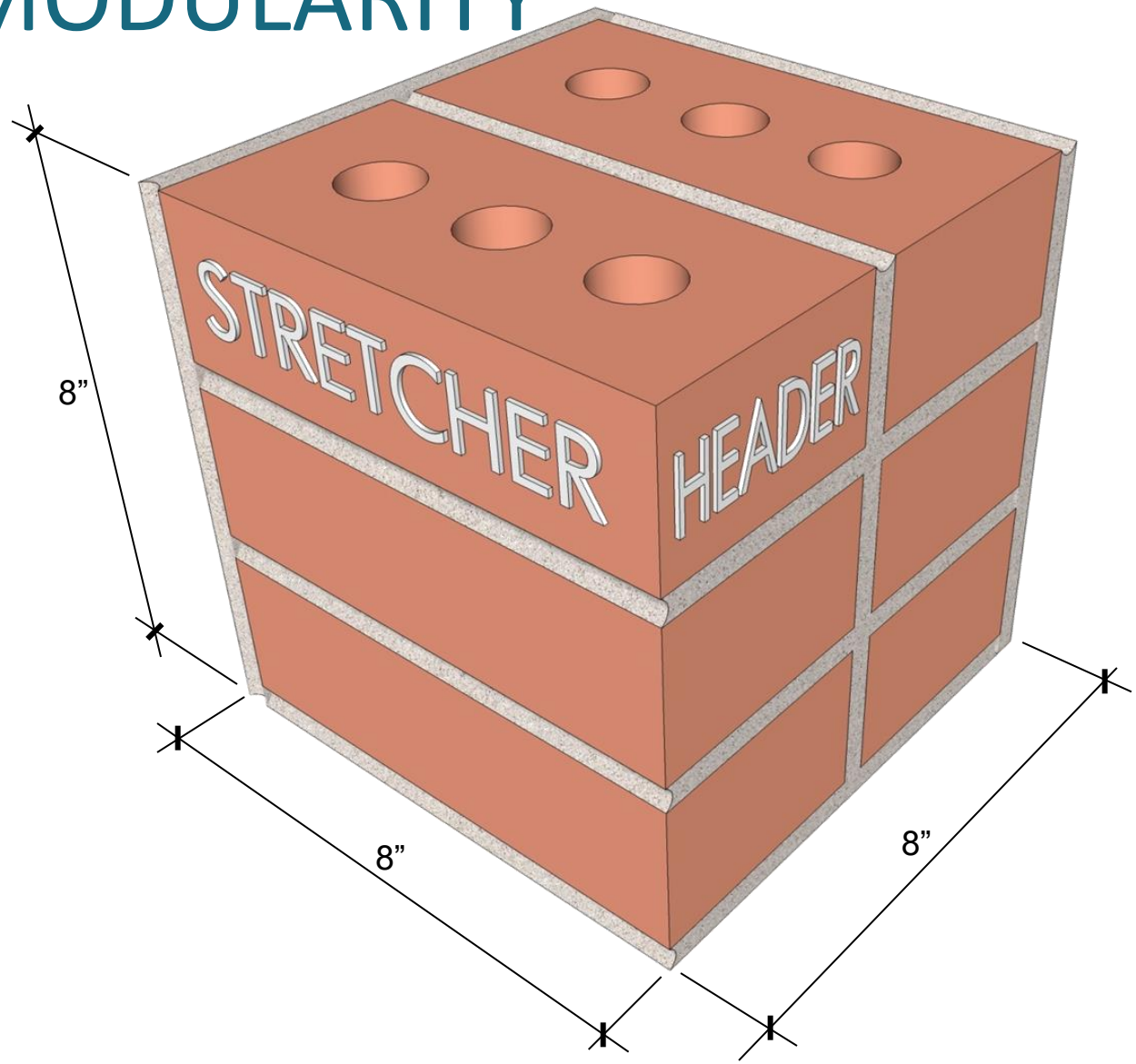


01EN Face brick, engineer
3 5/8" x 2 13/16" x 7 5/8"

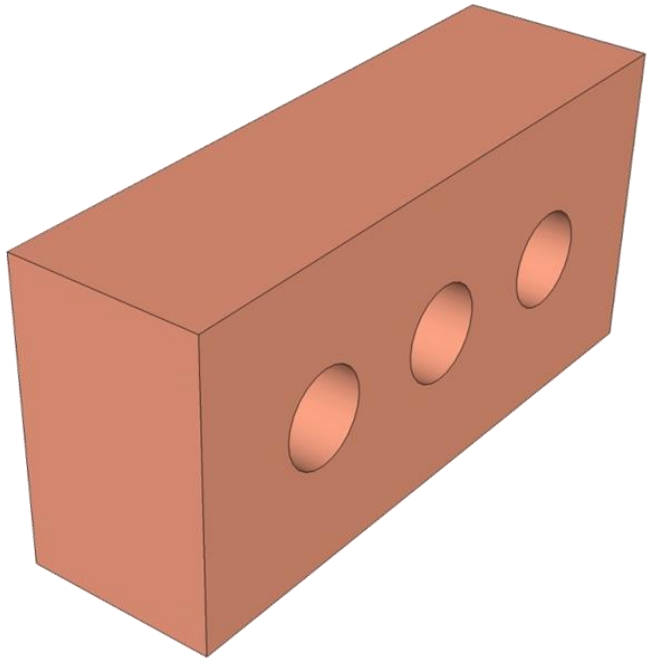
BRICK | MODULARITY



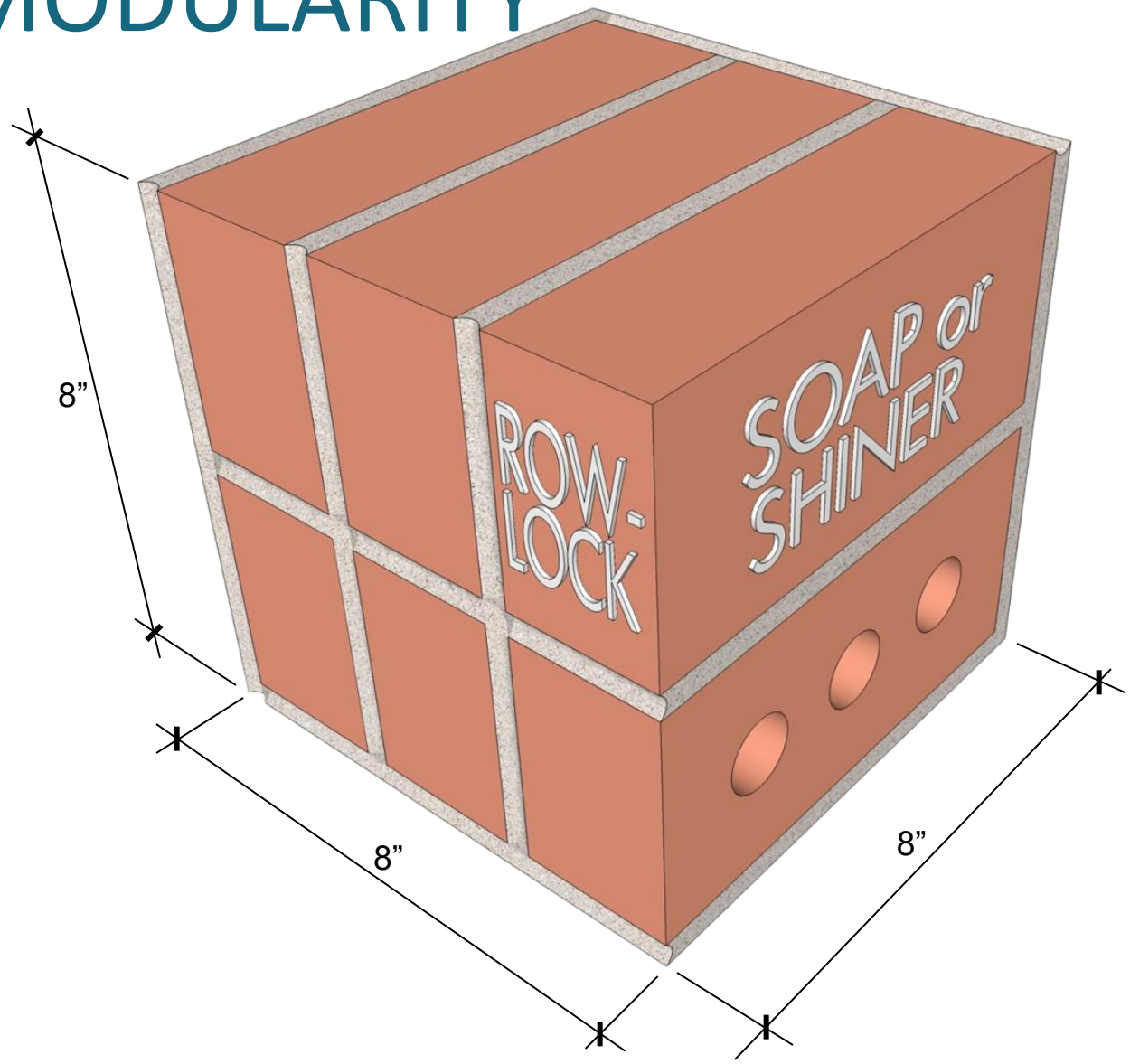
BRICK | MODULARITY



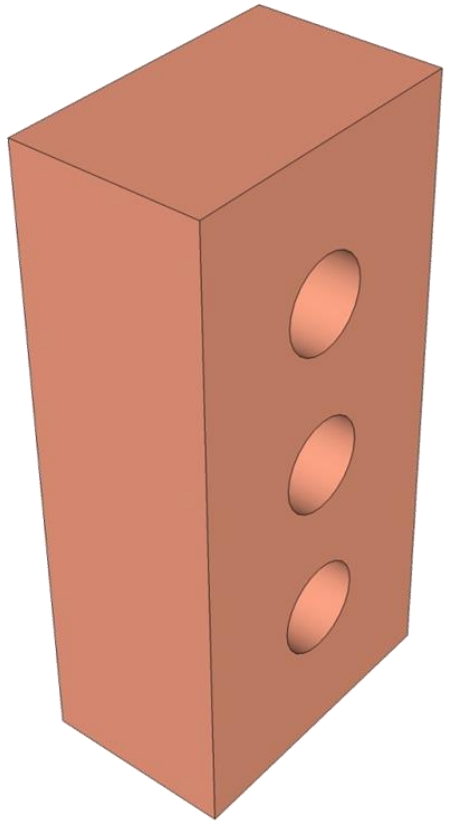
BRICK | MODULARITY



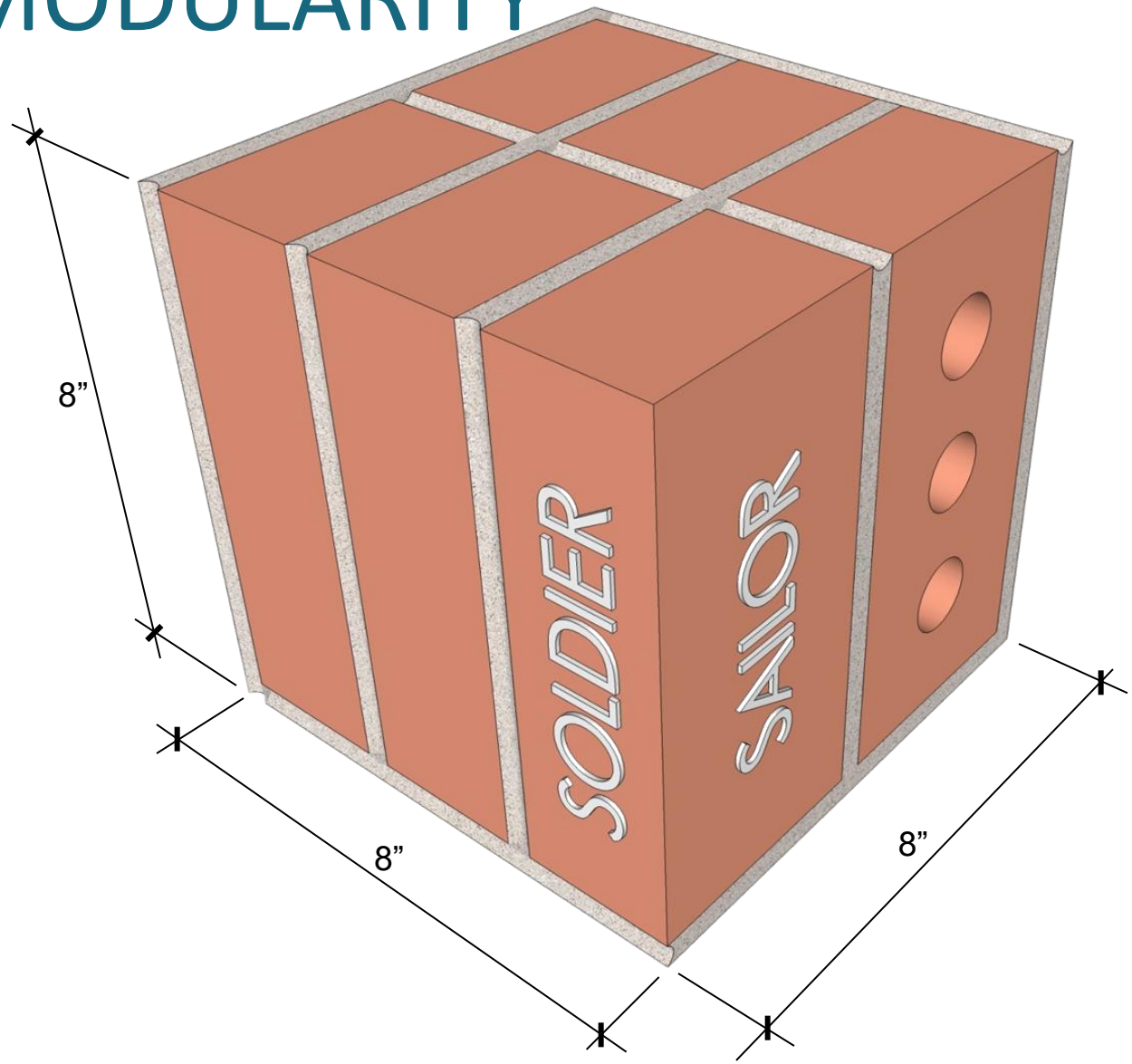
BRICK | MODULARITY



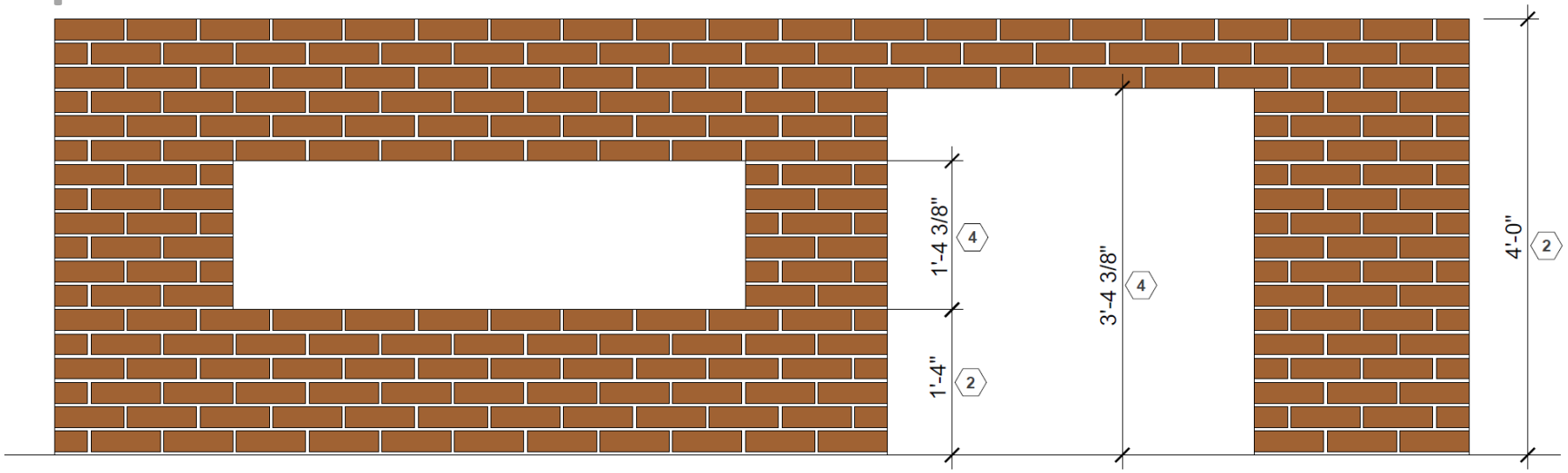
BRICK | MODULARITY



BRICK | MODULARITY



BRICK | MODULAR DIMENSIONING



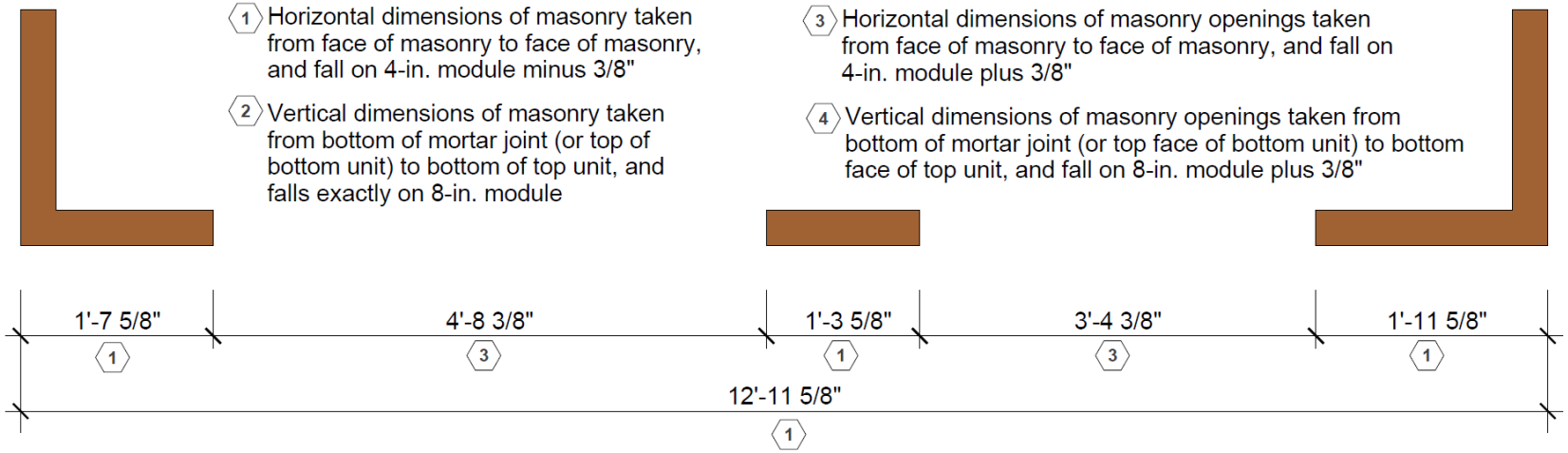
1 Vertical dimensioning of modular brick masonry
Scale: 3/4" = 1'-0"

Dimensioning Masonry

1. Horizontal dimensions of masonry taken from face of masonry to face of masonry, and fall on 4-in. module minus 3/8"
2. Vertical dimensions of masonry taken from bottom of mortar joint (or top of bottom unit) to bottom of top unit, and falls exactly on 8-in. module

Dimensioning Masonry Openings

3. Horizontal dimensions of masonry openings taken from face of masonry to face of masonry, and fall on 4-in. module plus 3/8"
4. Vertical dimensions of masonry openings taken from bottom of mortar joint (or top face of bottom unit) to bottom face of top unit, and fall on 8-in. module plus 3/8"



2 Horizontal dimensioning of modular brick masonry
Scale: 3/4" = 1'-0"

BRICK | UNITS

Combining bricks of different sizes

BRICK | VARIETY

- Color
- Shape
- Size
- Bonding pattern
- Orientation
- Texture of unit
- Texture of wall
- Accent units

BRICK | VARIETY

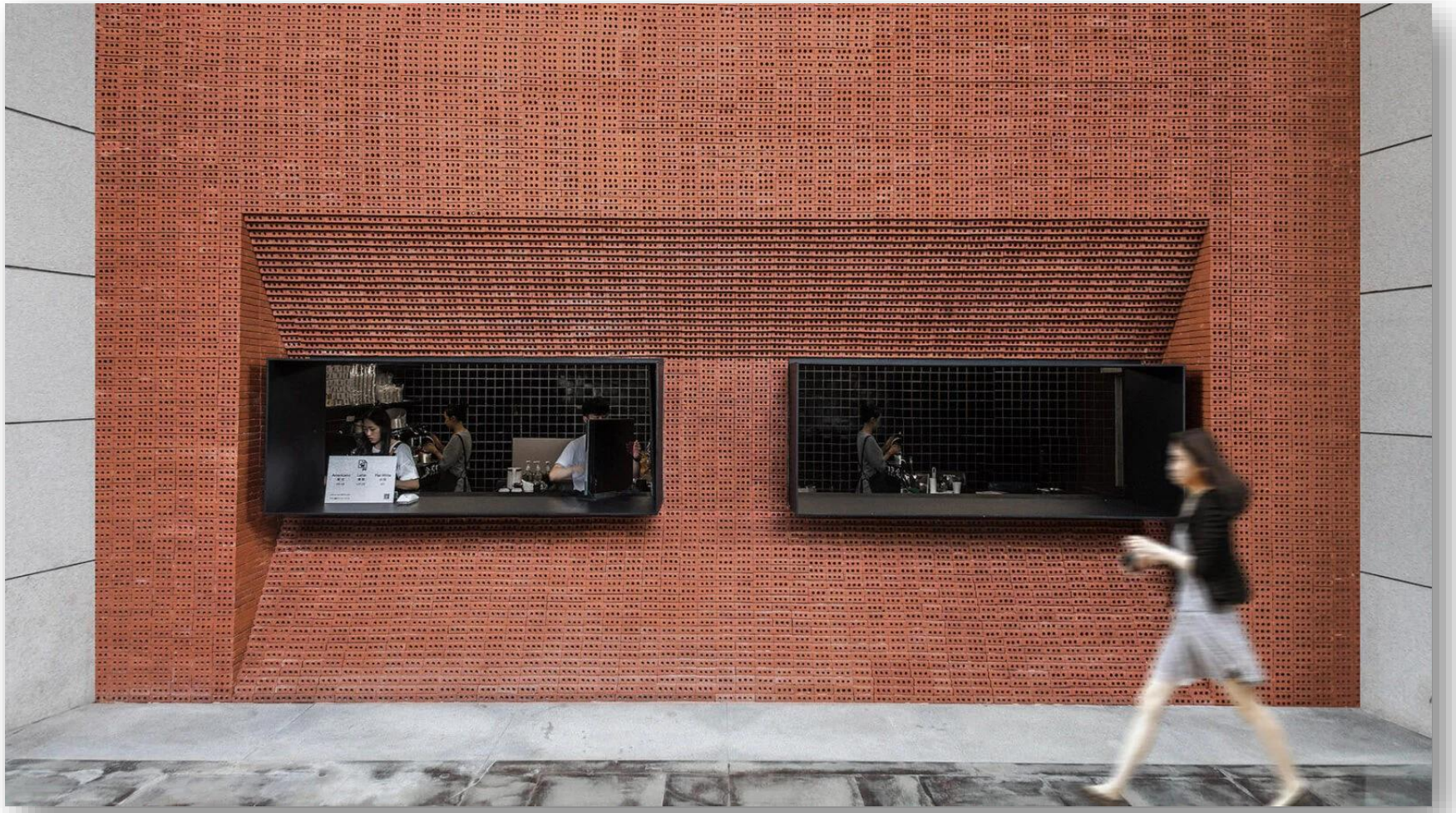
- Color
- Shape
- Size
- Bonding pattern
- Orientation
- Texture of unit
- Texture of wall
- Accent units

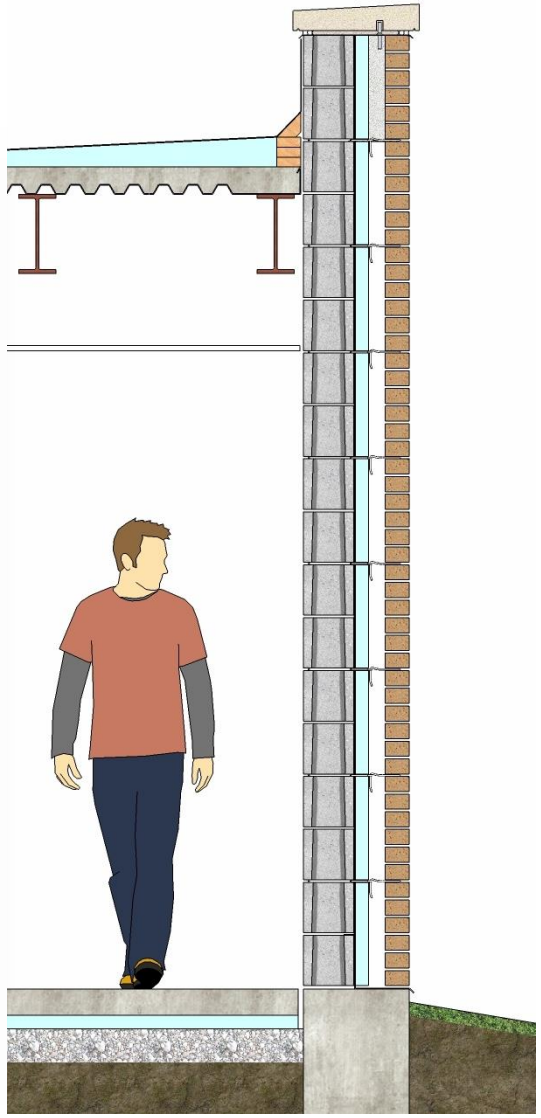
BRICK | VARIETY IN ARCHITECTURAL STYLE

BRICK | VARIETY IN ARCHITECTURAL STYLE

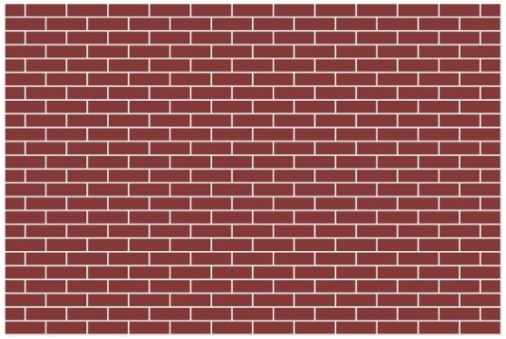
Chau Chak Building, University of Technology, Sydney, Frank Gehry

BRICK | HUMAN SCALE

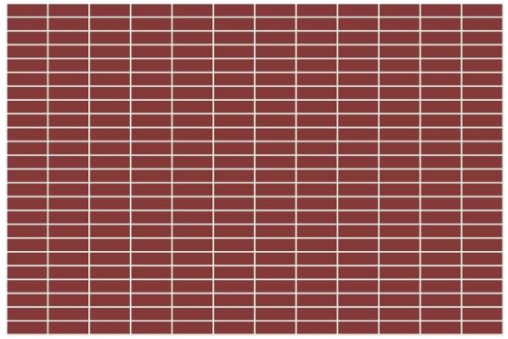




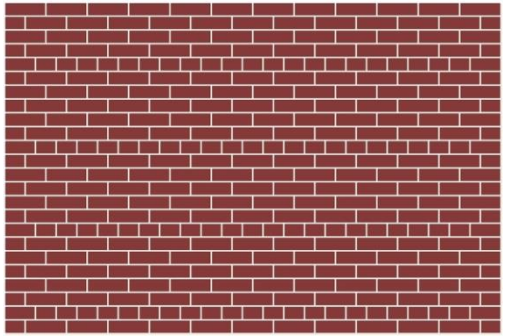
BRICK | BOND PATTERNS



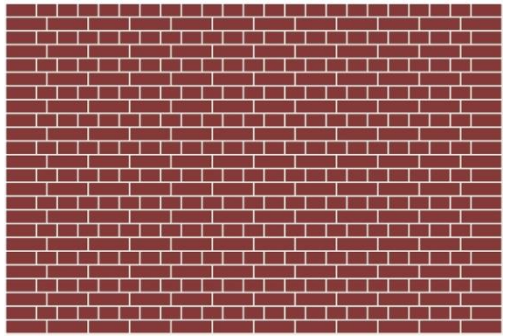
RUNNING BOND



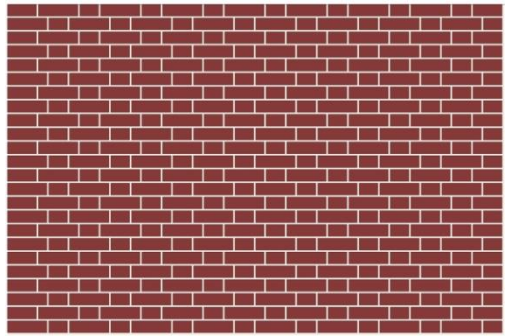
STACKED BOND



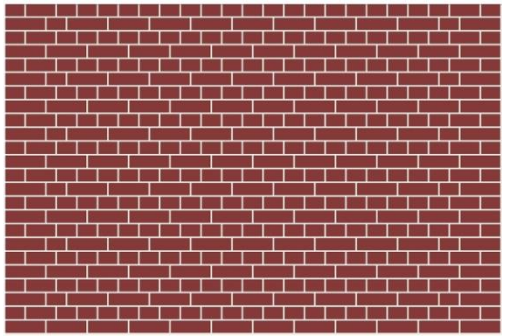
COMMON BOND (AMERICAN BOND)



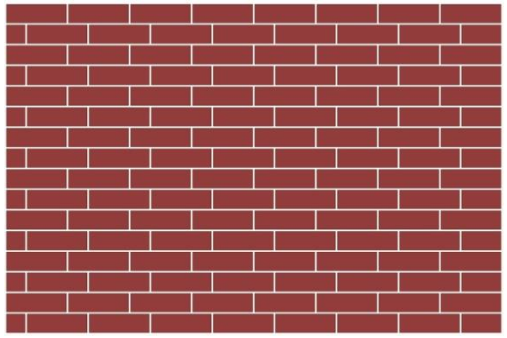
ENGLISH BOND



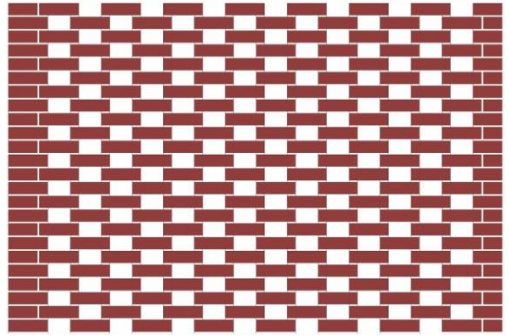
FLEMISH BOND



ENGLISH CROSS BOND



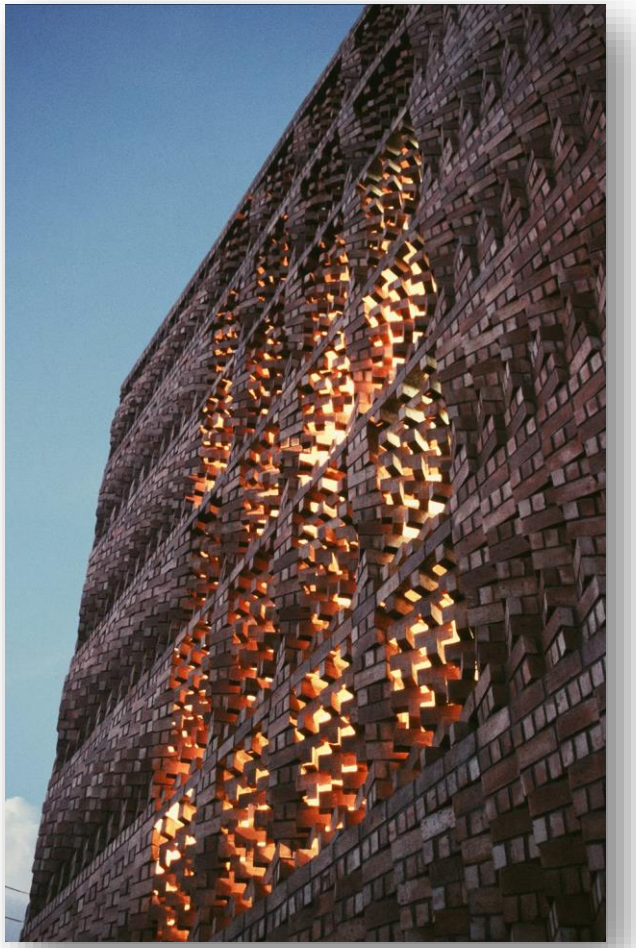
1/3 BOND (UTILITY BRICK)



GARDEN WALL

BRICK | BOND PATTERNS

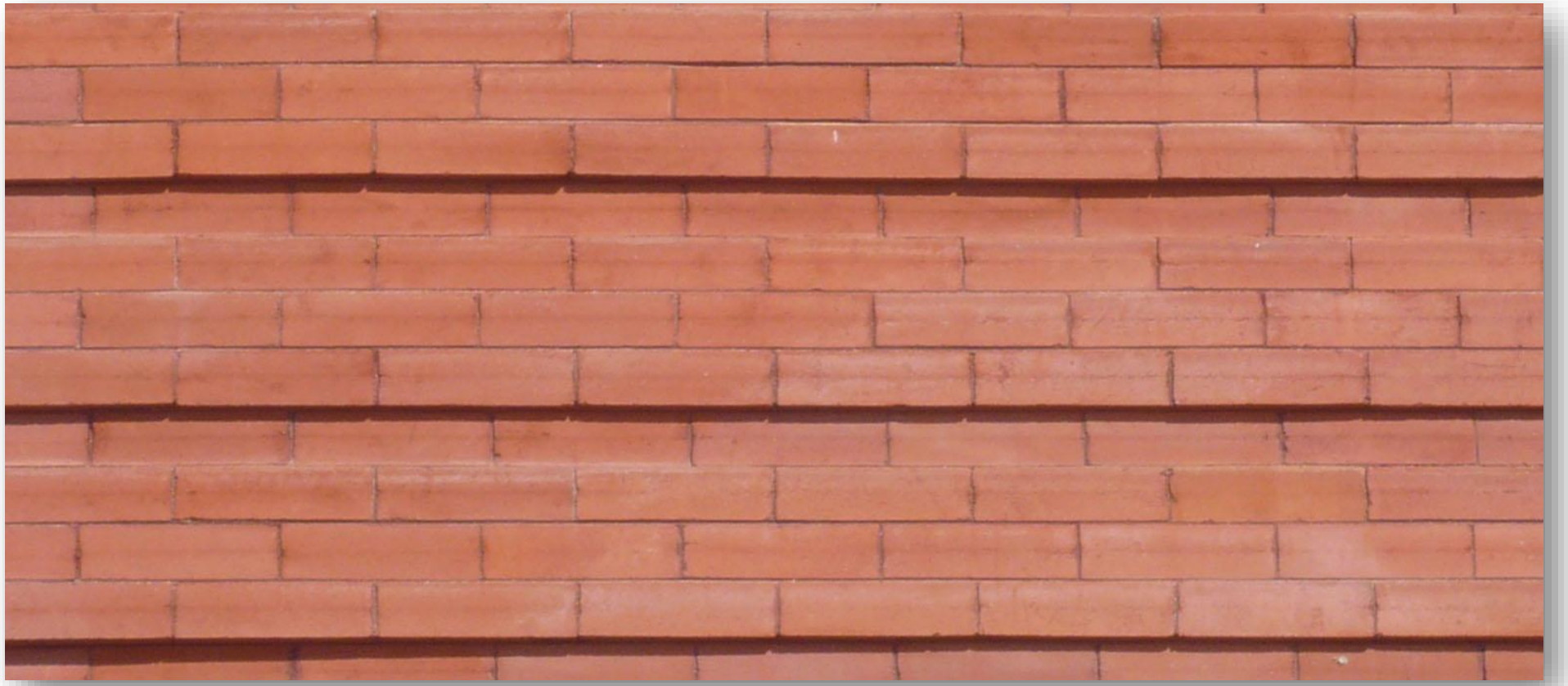
BRICK | BOND PATTERNS



South Asian Human Rights Documentation Centre, New Delhi, Anagram Architects

BRICK | BOND PATTERNS

BRICK | RECESSED & PROJECTING COURSES



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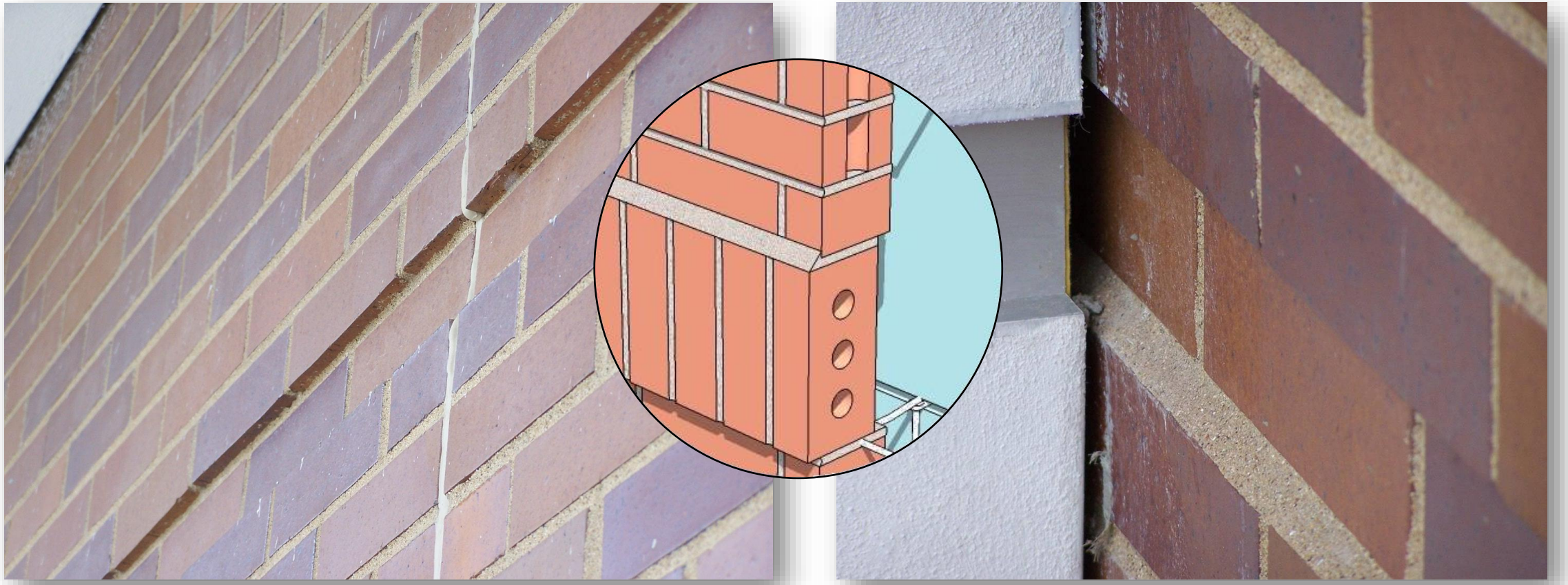
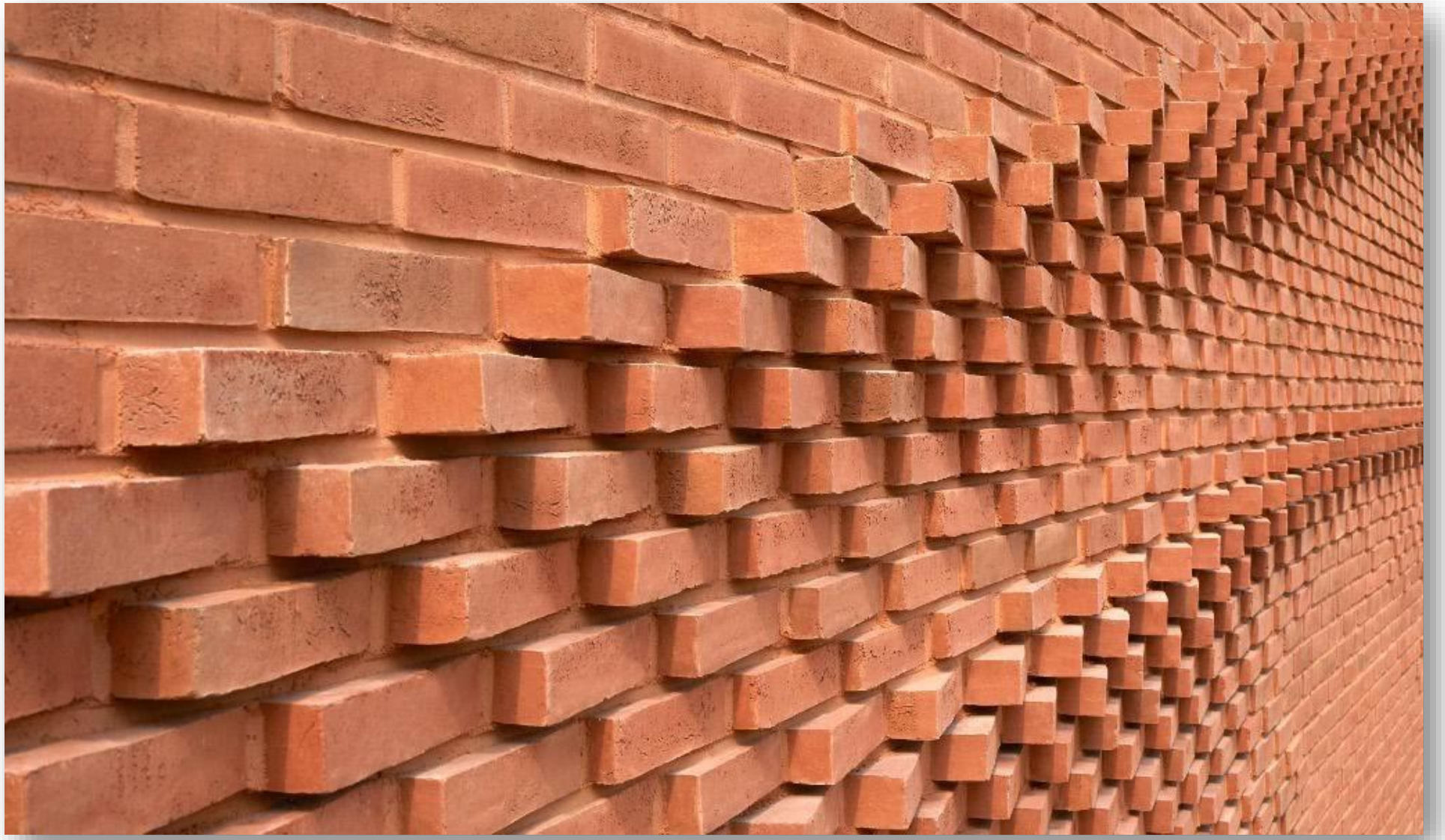


Mortar wash

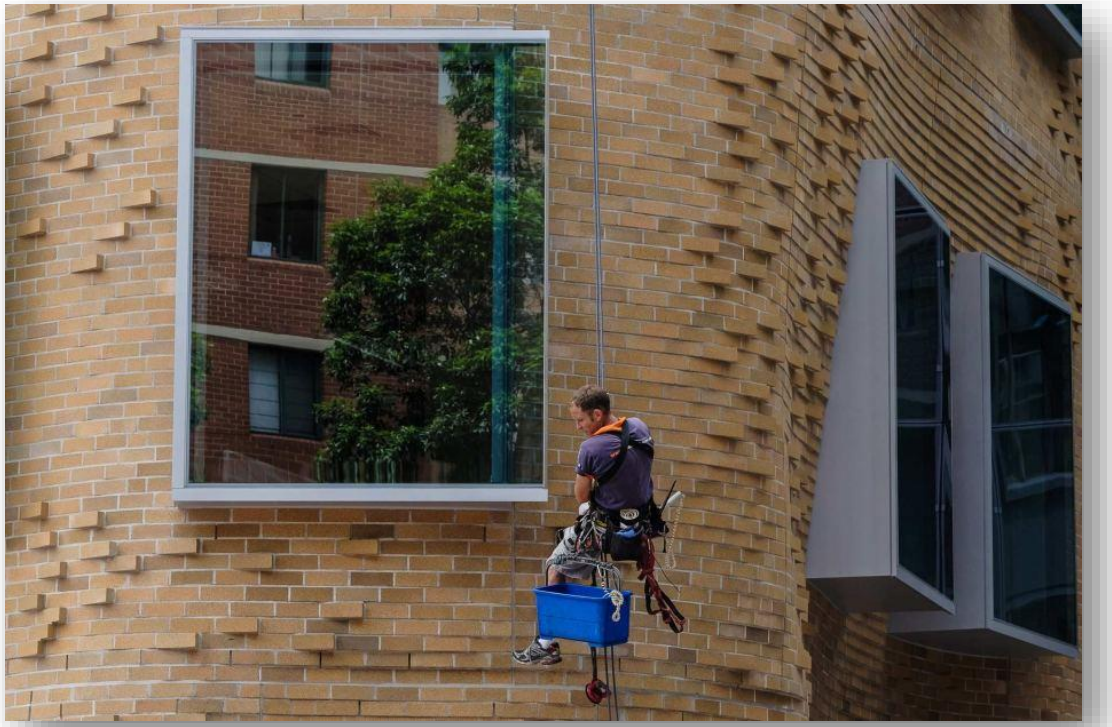
BRICK | RECESSED & PROJECTING COURSES

Mortar wash

BRICK | PROJECTING UNITS

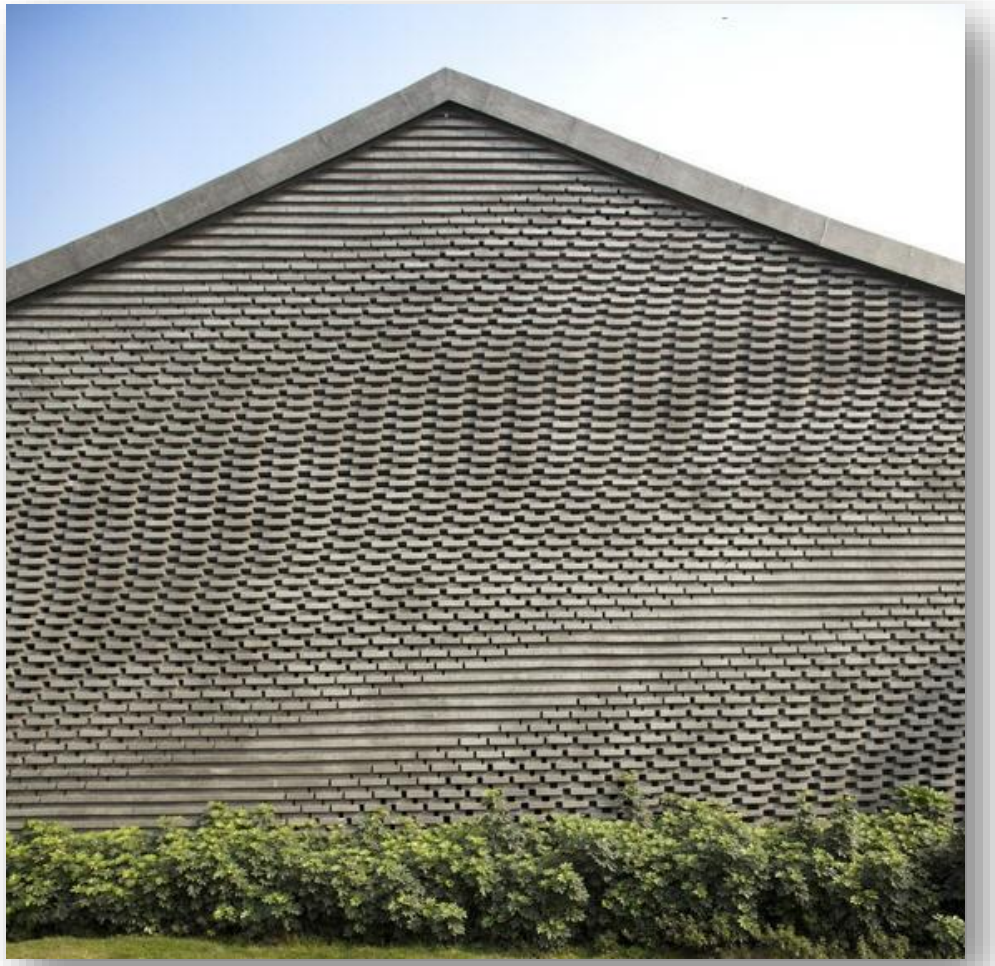


BRICK | PROJECTING UNITS



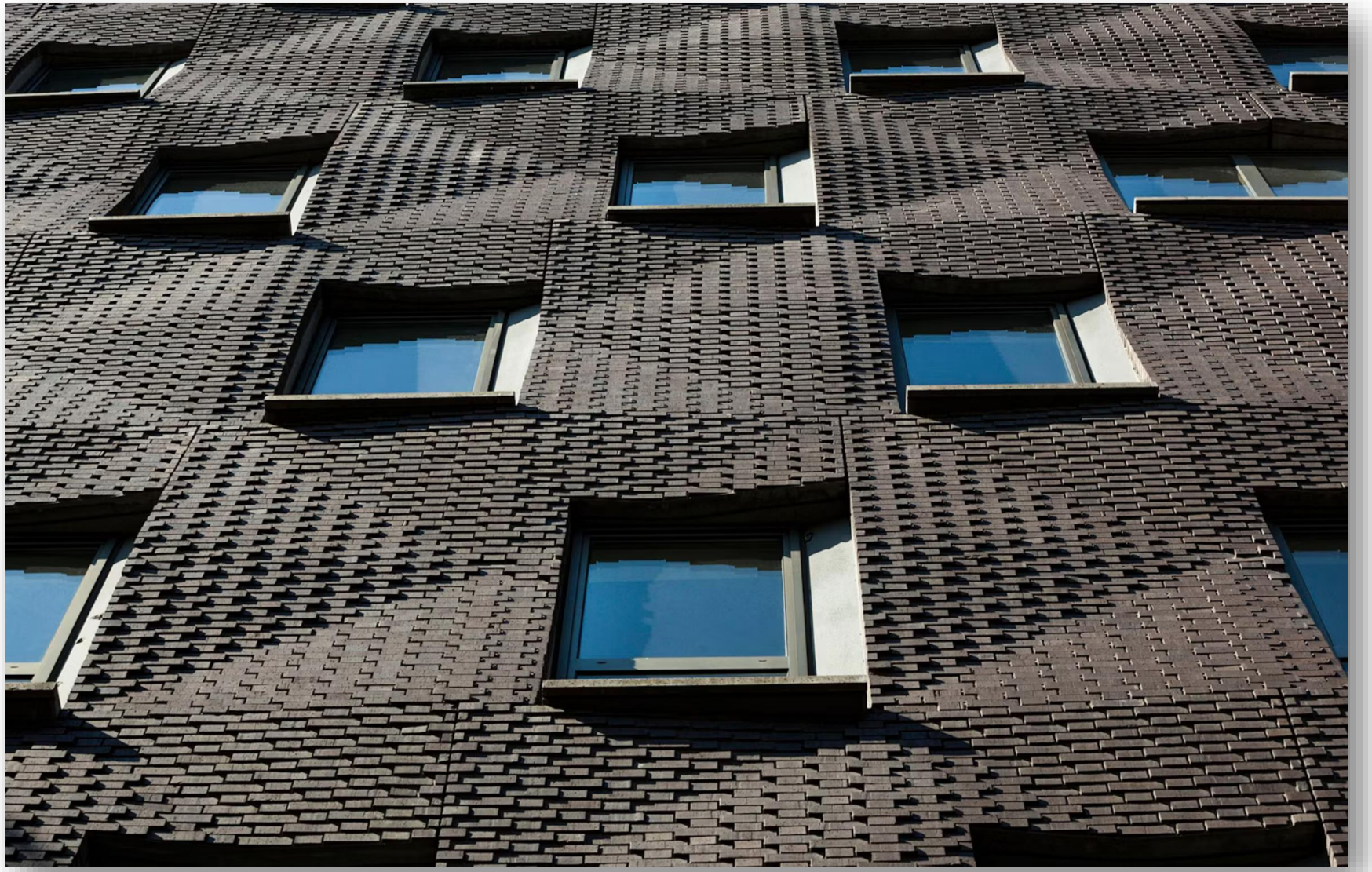
Chau Chak Building, University of Technology, Sydney, Frank Gehry

BRICK | PROJECTING UNITS



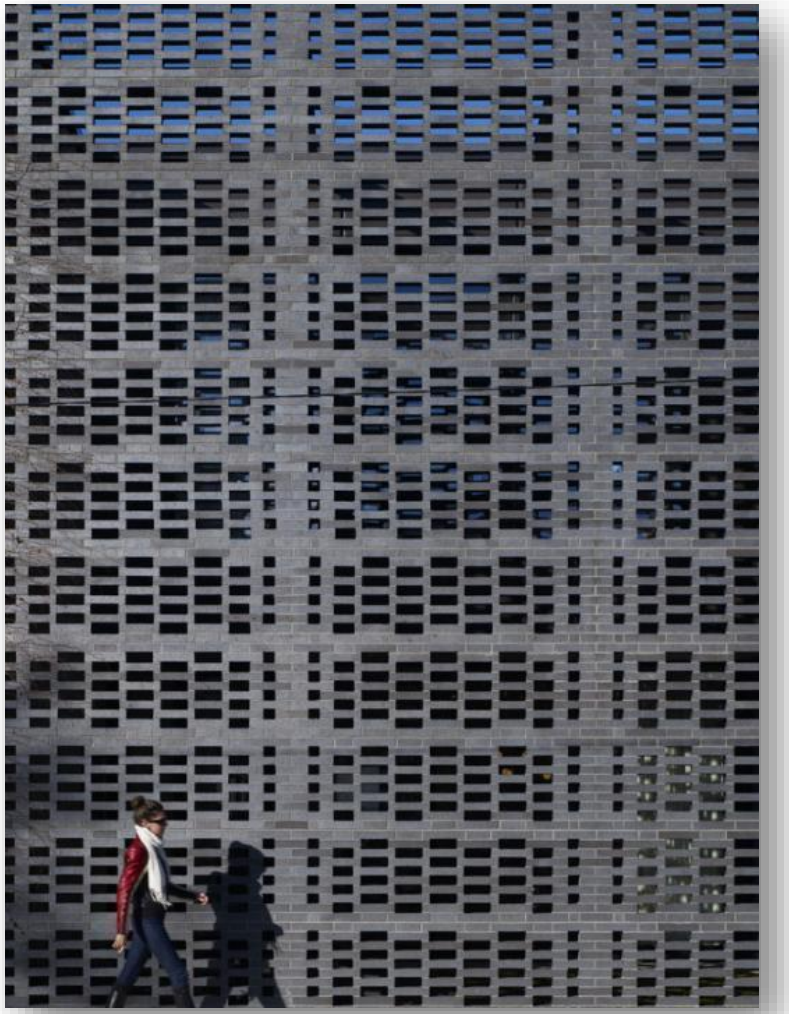
Lanxi Curtilage, China, Union Architects

BRICK | PROJECTING UNITS



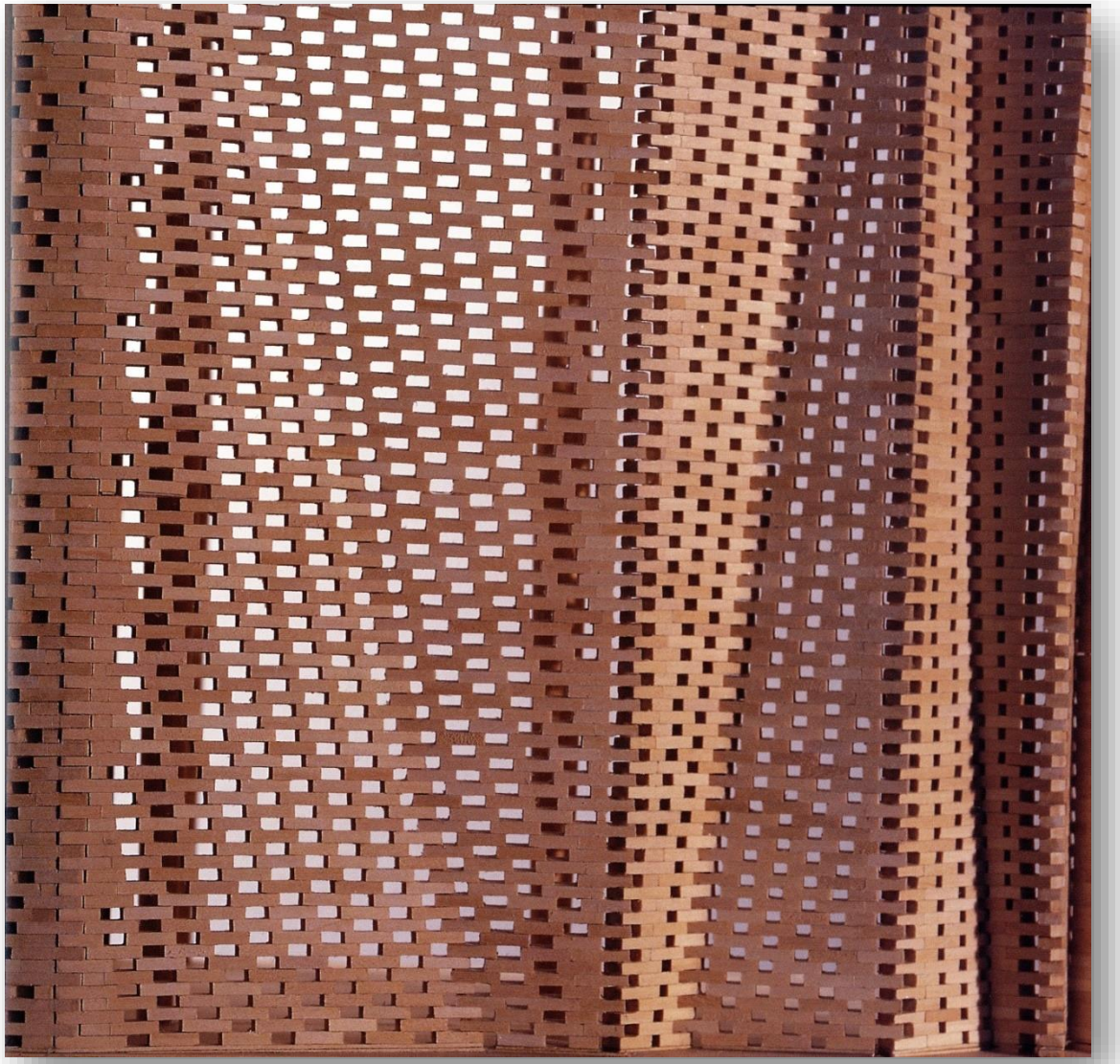
Mulberry House, New York City, SHoP Architects

BRICK | PERFORATED WALLS



Weave House, Chicago, Studio Gang Architects

BRICK | PERFORATED WALLS



BRICK | PERFORATED WALLS

BRICK | CORBELING

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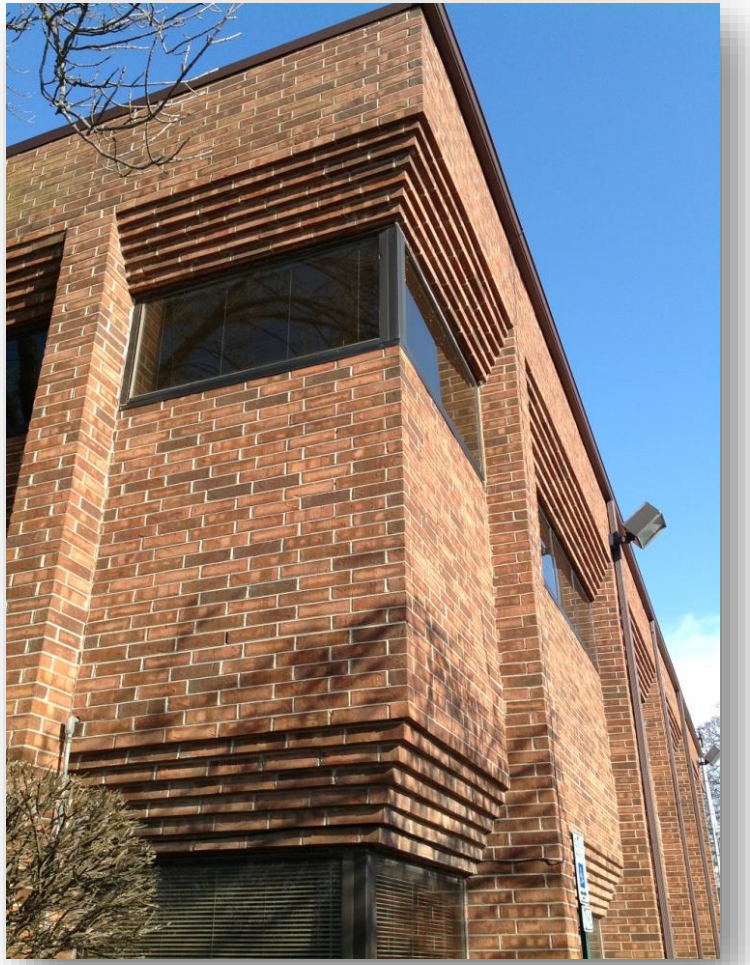

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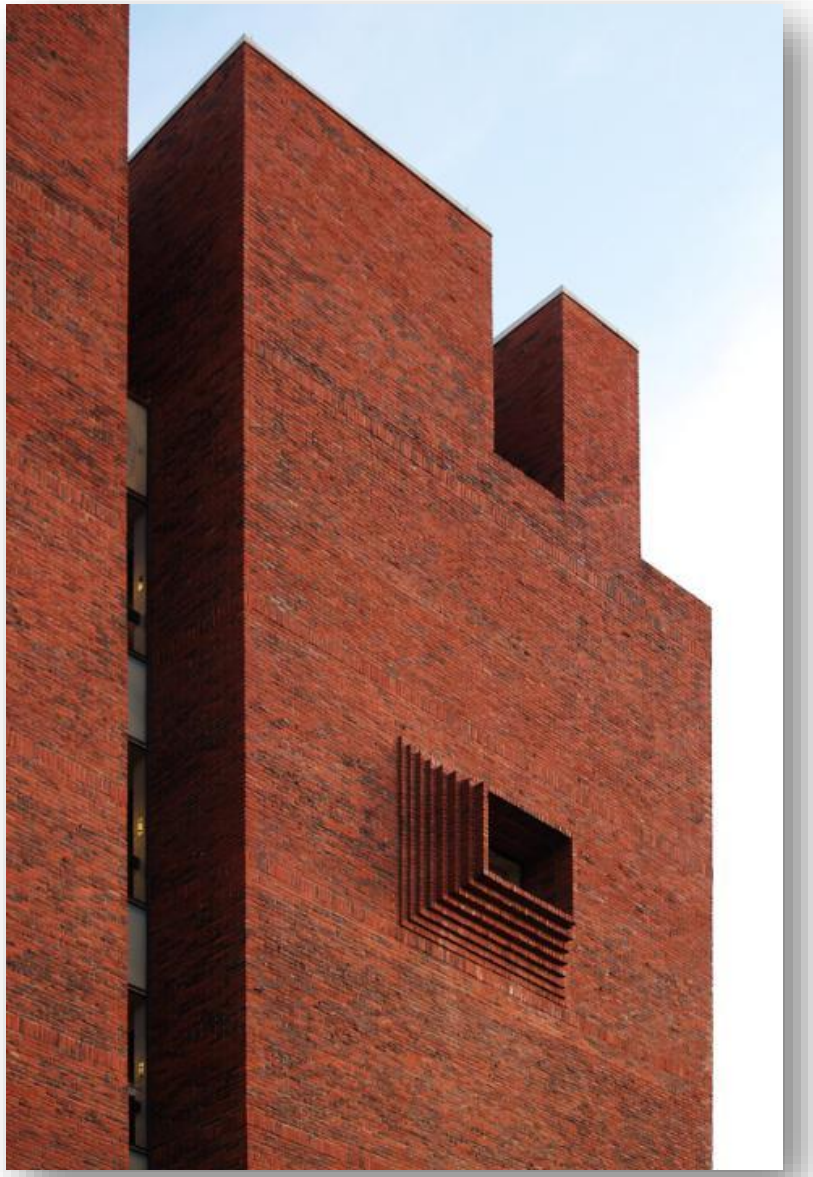
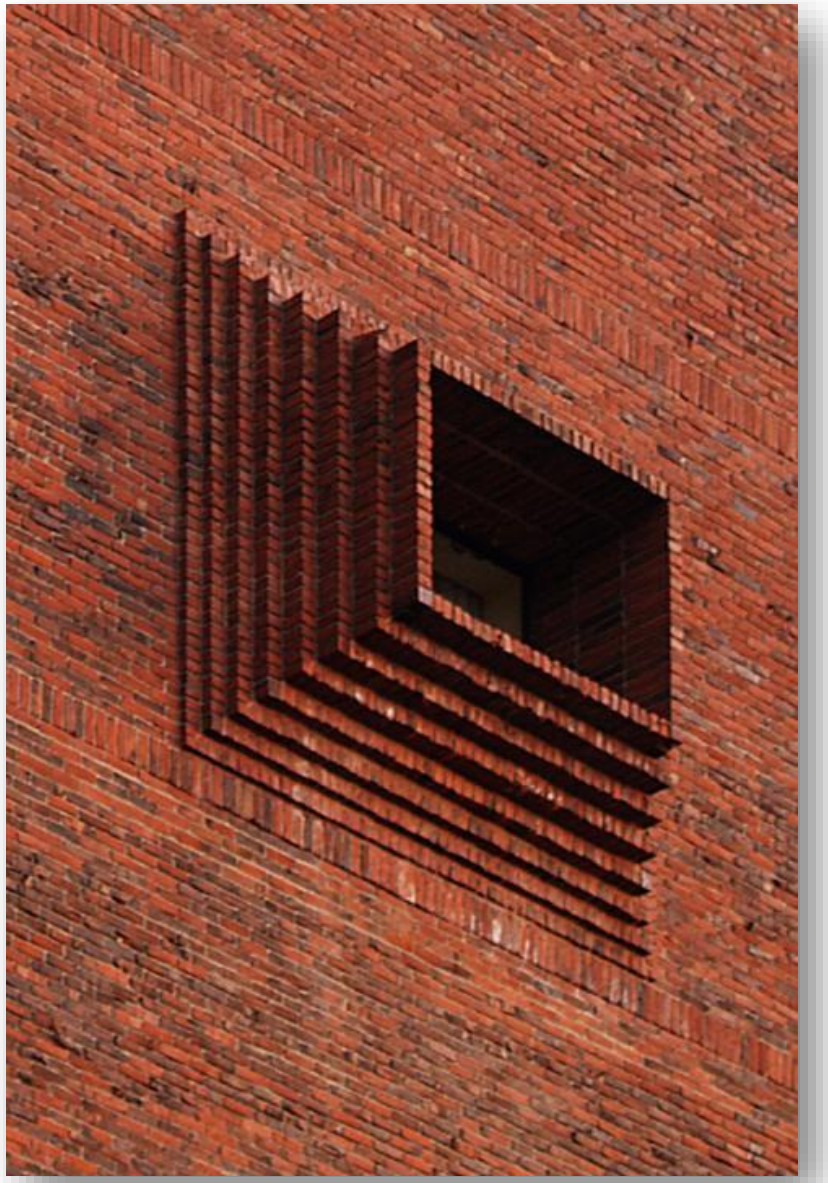
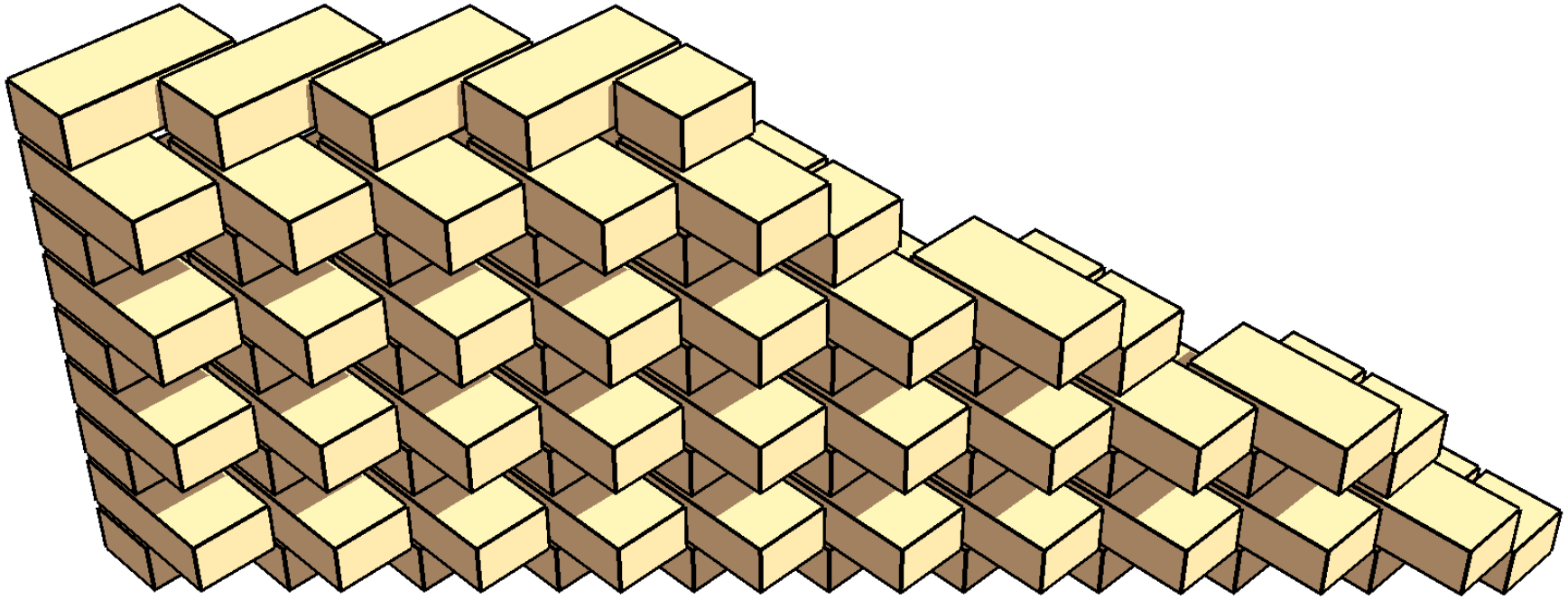




BRICK | RACKING

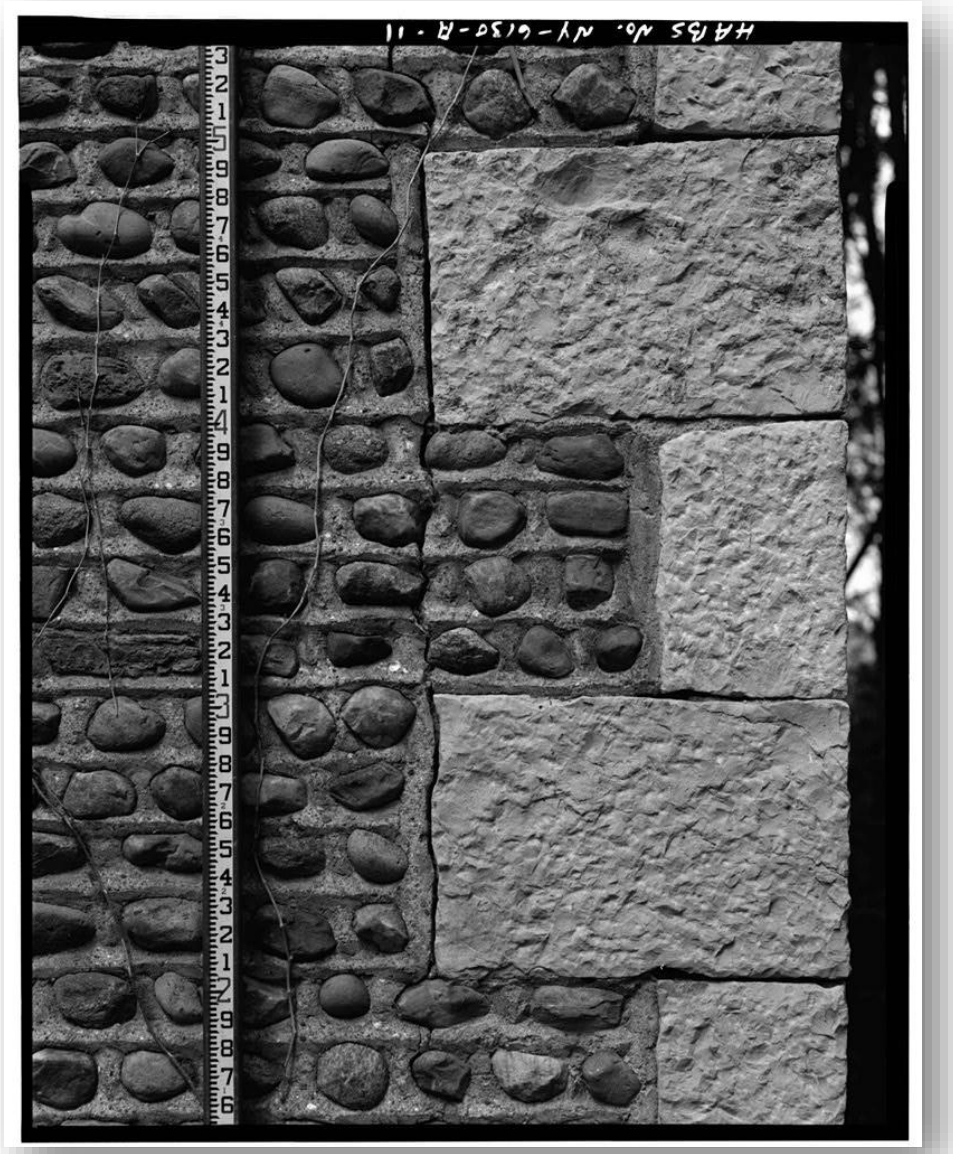
BRICK | DOGS TOOTH

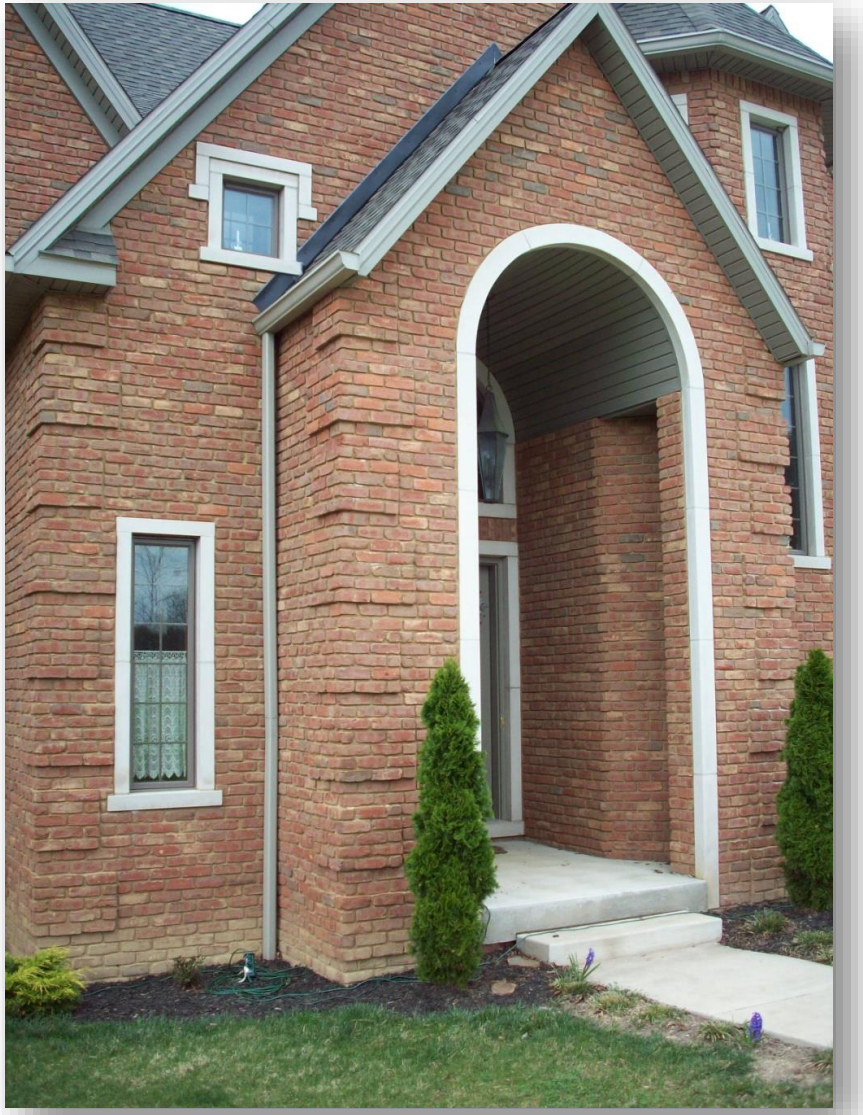


BRICK | PROJECTING UNITS

Prairie Shores Clubhouse, Chicago, Gensler

BRICK | QUOINS





BRICK | ARCHES

And if you think of brick,
for instance

And you say to brick,
"What do you want, Brick?"

And brick says to you,
"I like an arch."

And if you say to brick, "Look,
arches are expensive. Can I use a
concrete lintel over you? What
do you think of that, Brick?"

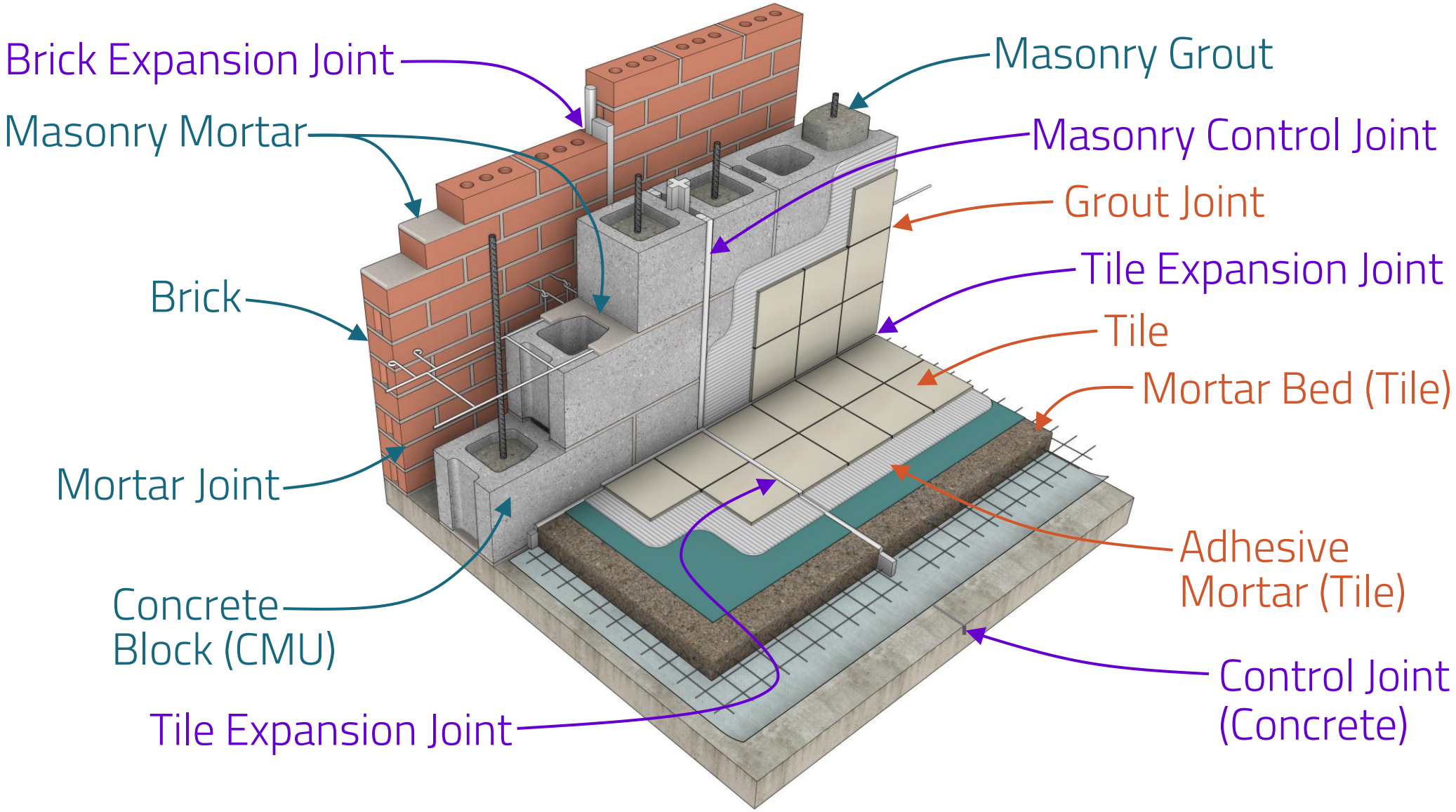
Brick says,
"I like an arch."

- Louis I. Kahn

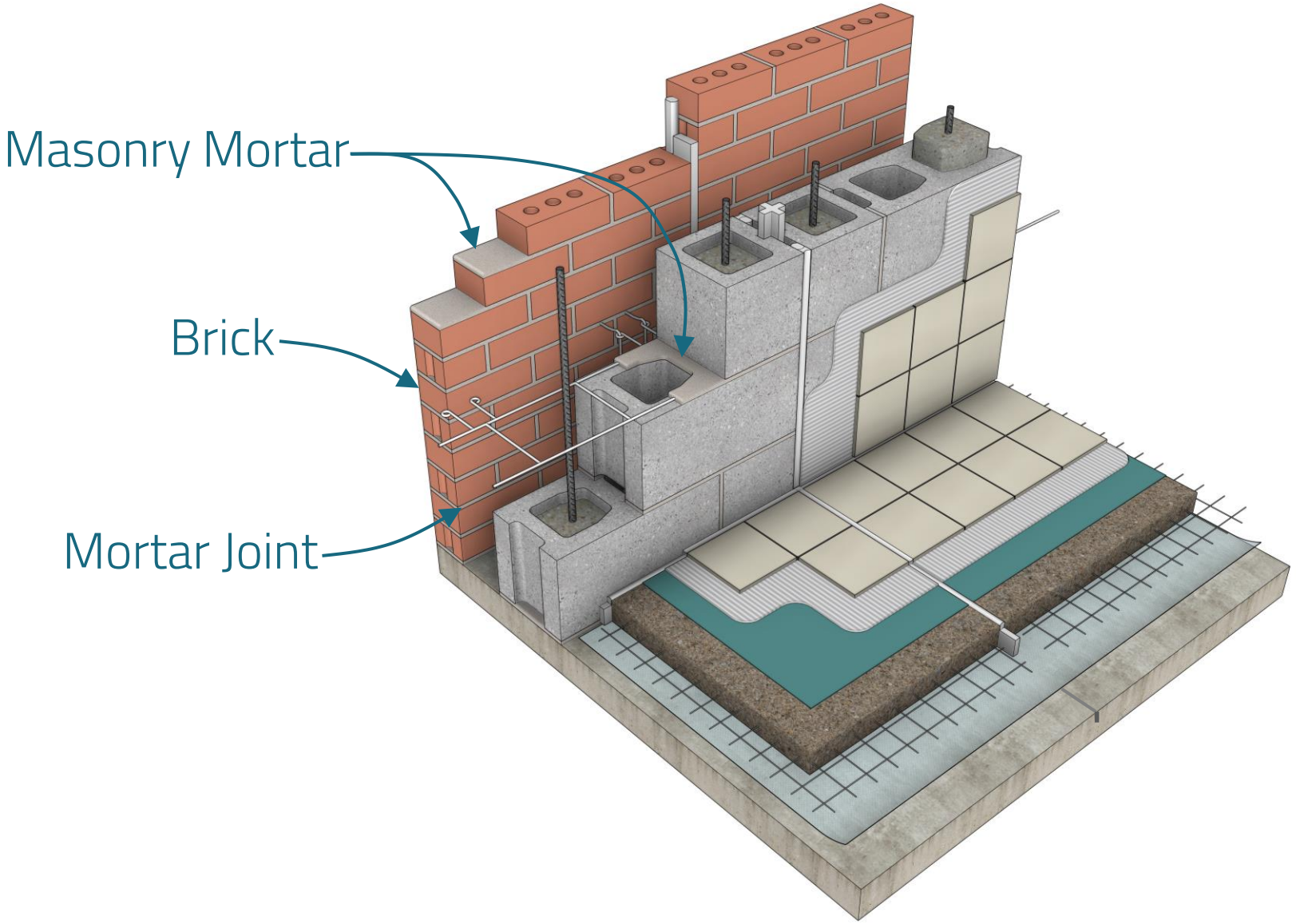
BRICK | ARCHES

Merida National Museum of Roman Art, Rafael Moneo

MORTAR vs. GROUT | MASONRY & TILE



MORTAR JOINTS



MORTAR JOINTS

18%

ONE SQUARE FOOT
MODULAR BRICK, RUNNING BOND

BED JOINTS	4 @ 12” x 3/8” =	18.000 SQ. IN.
HEAD JOINTS	8 @ 2.3125” x 3/8” =	6.938 SQ. IN.
	2 @ 1.3125” x 3/8” =	0.984 SQ. IN.
		25.922 SQ. IN. MORTAR

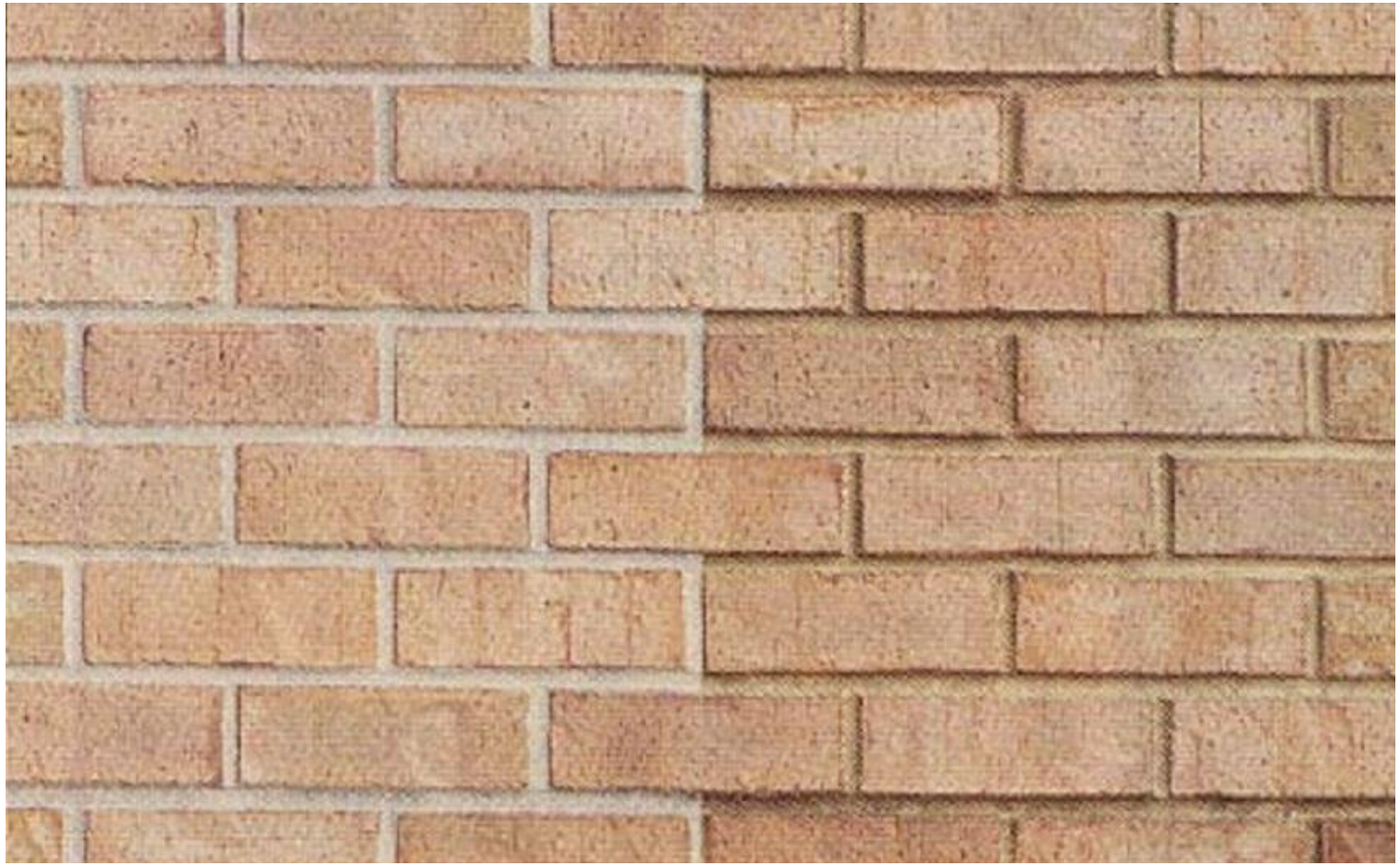
12%

ONE SQUARE FOOT
UTILITY BRICK, RUNNING BOND

	3 @ 12” x 3/8” =	13.500 SQ. IN.
	3 @ 3.625” x 3/8” =	4.078 SQ. IN.
		17.578 SQ. IN. MORTAR

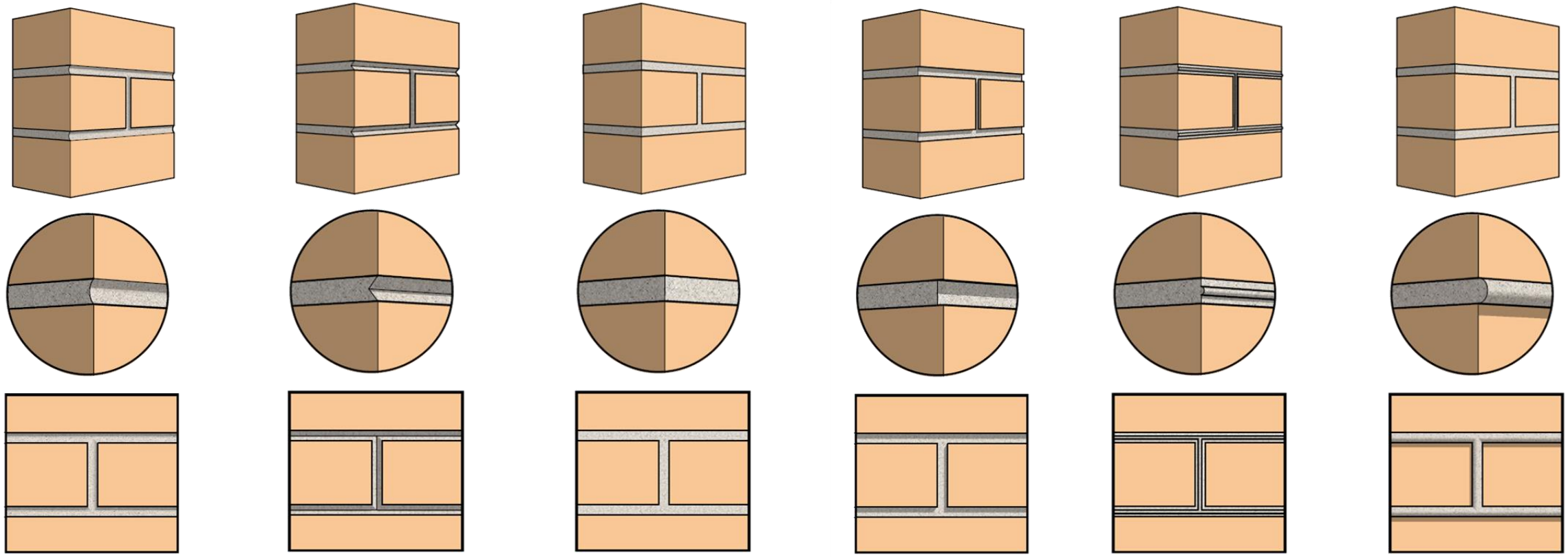
ELEVATIONS MORTAR JOINT MATERIAL TAKEOFF
DIAGRAM 01.410.0311 REV. 08/10/09

MORTAR JOINTS

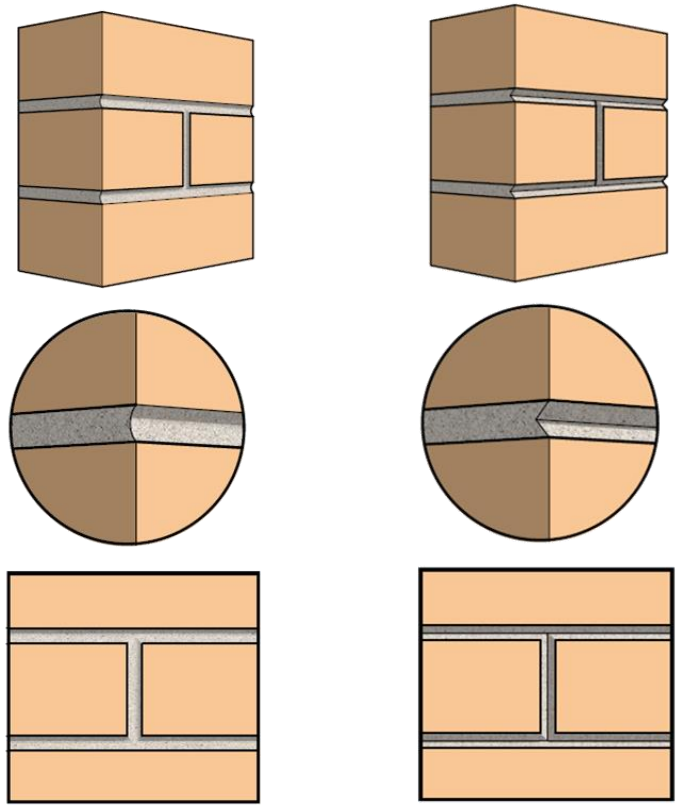


Same brick, different color mortar

MORTAR JOINTS



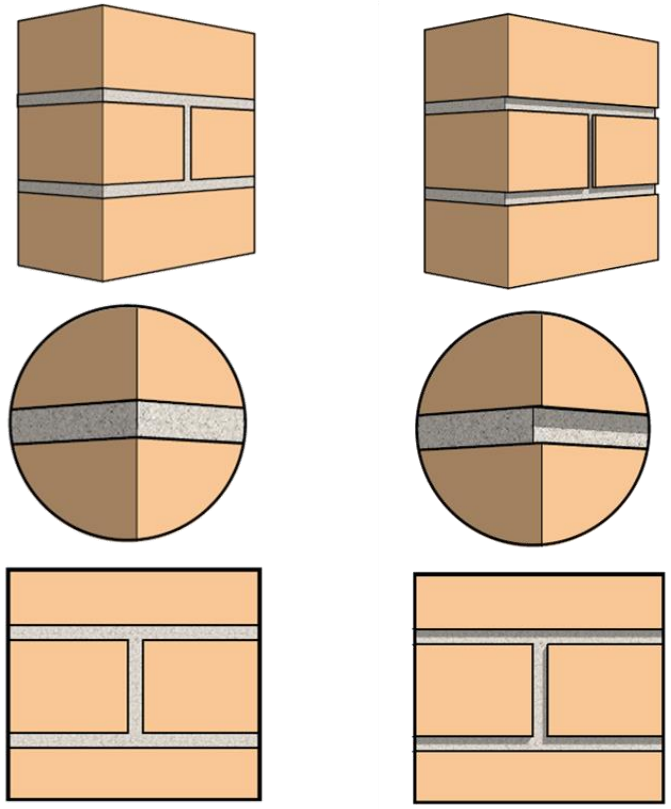
MORTAR JOINTS



Concave Vee

Moisture resistant mortar joints

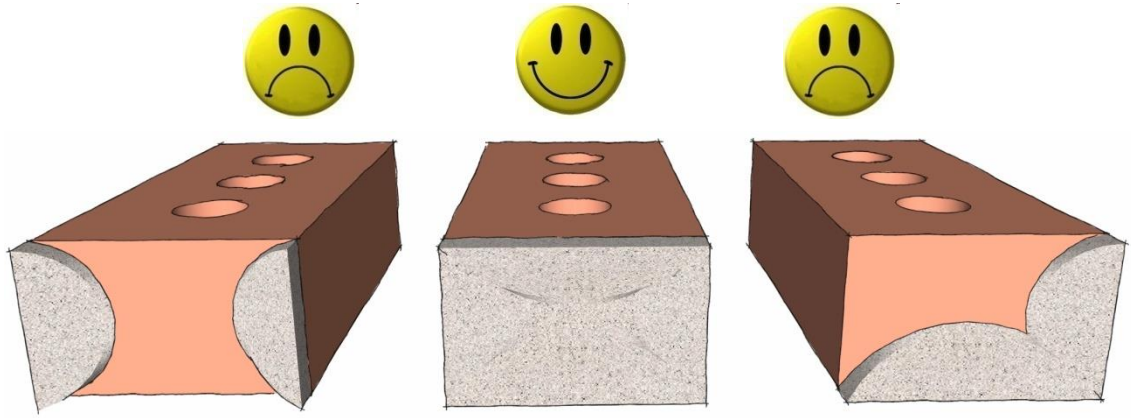
MORTAR JOINTS



Flush Raked

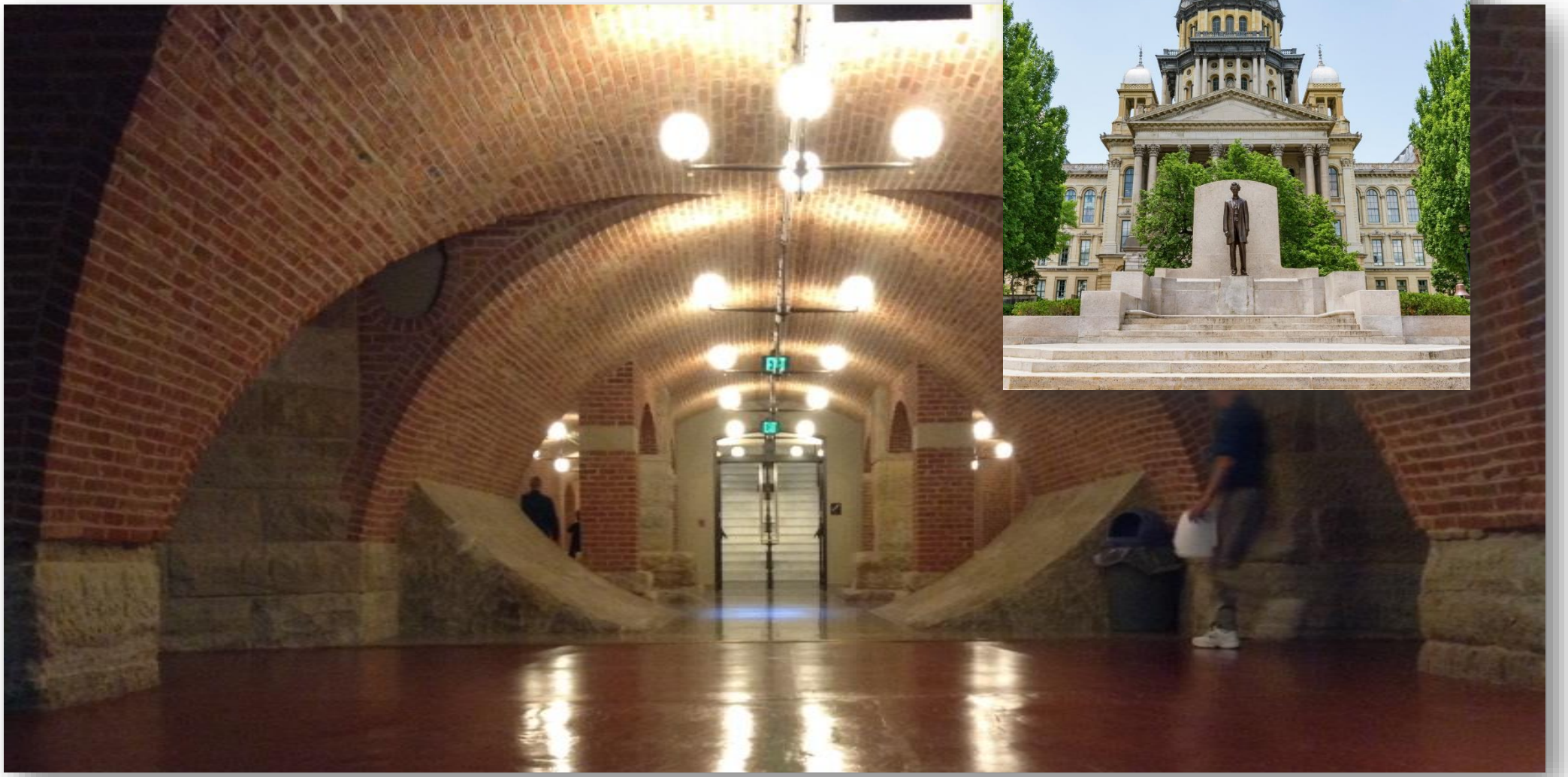
Dana Thomas House, Frank Lloyd Wright, 1904

MORTAR JOINTS



Full head joints

BRICK | STRUCTURAL

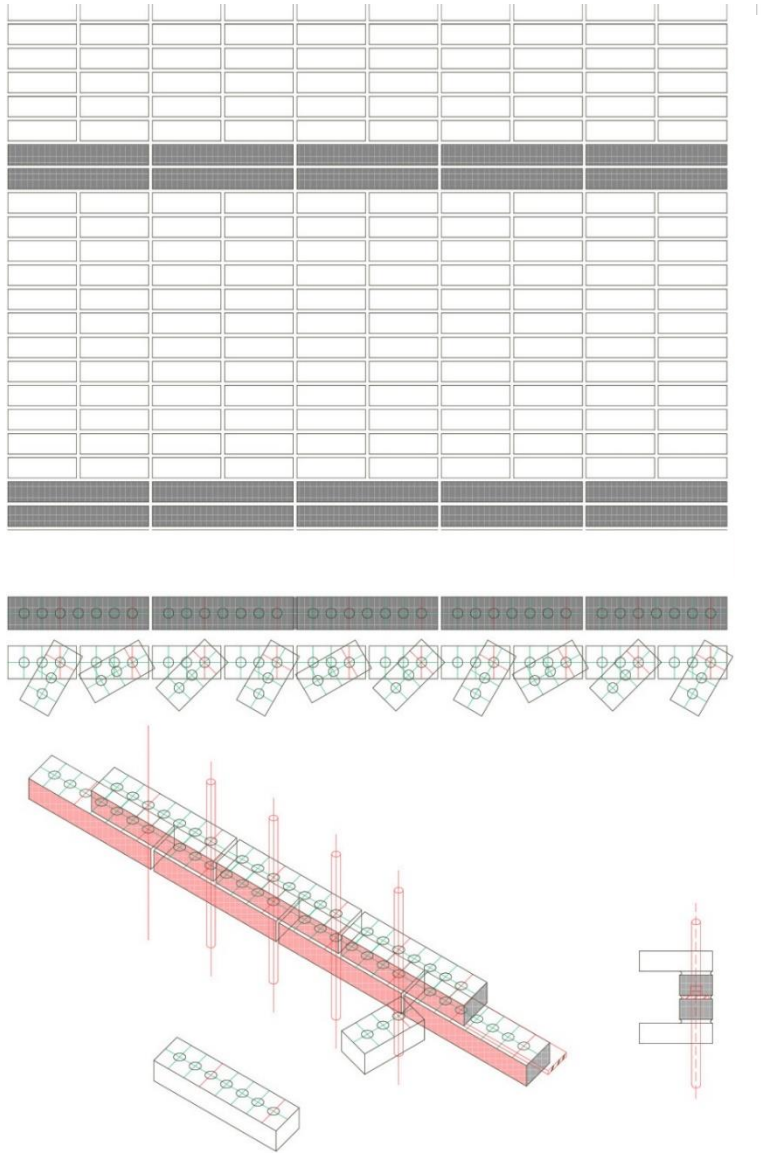


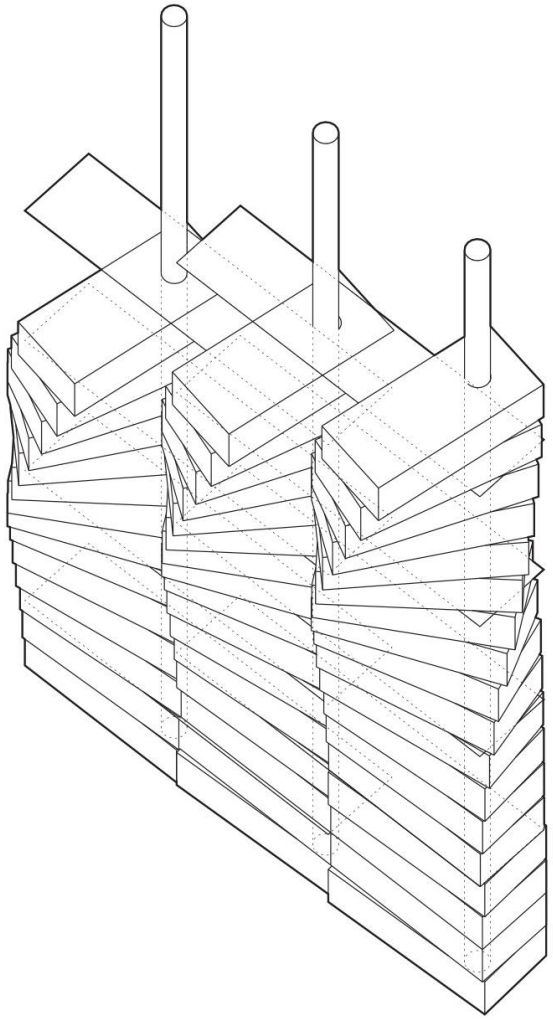
Illinois State Capitol, basement

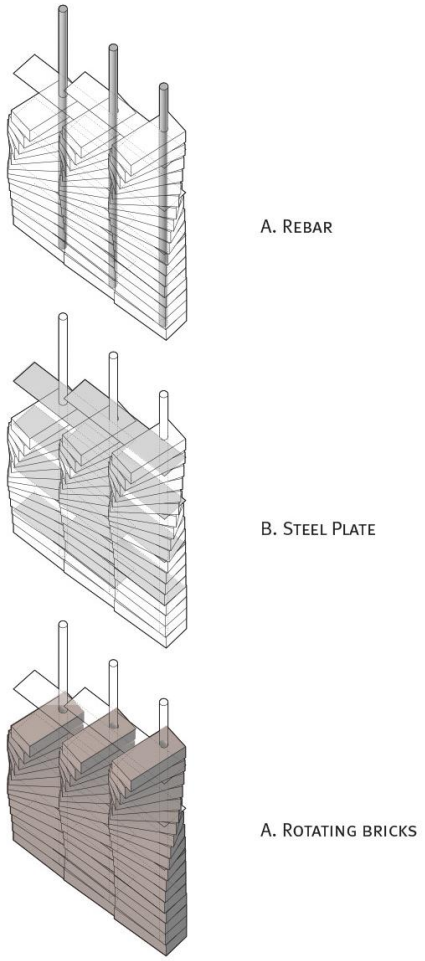
BRICK | STRUCTURAL

BRICK | STRUCTURAL

BRICK | ROTATING BRICKS





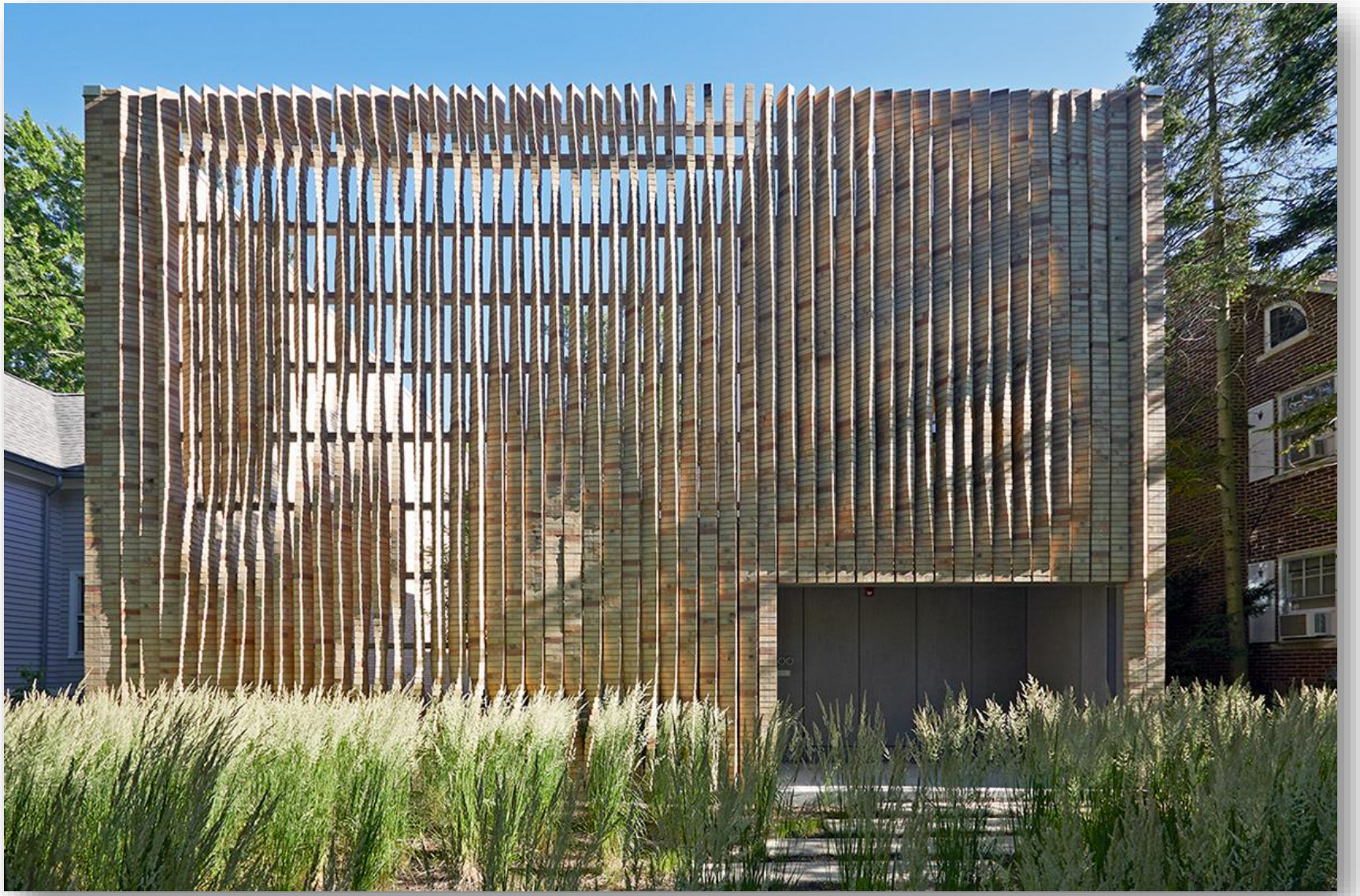


Private residence, Evanston, IL, Brooks + Scarpa Architects

BRICK | ROTATING BRICKS

Private residence, Evanston, IL, Brooks + Scarpa Architects

BRICK | ROTATING BRICKS



Private residence, Evanston, IL, Brooks + Scarpa Architects

BRICK | ROTATING BRICKS

Private residence, Evanston, IL, Brooks + Scarpa Architects

BRICK | ROTATING BRICKS

Private residence, Evanston, IL, Brooks + Scarpa Architects

MASONRY MATERIALITY

CONCRETE BLOCK

INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

CONCRETE BLOCK | DEFINITION

Portland cement

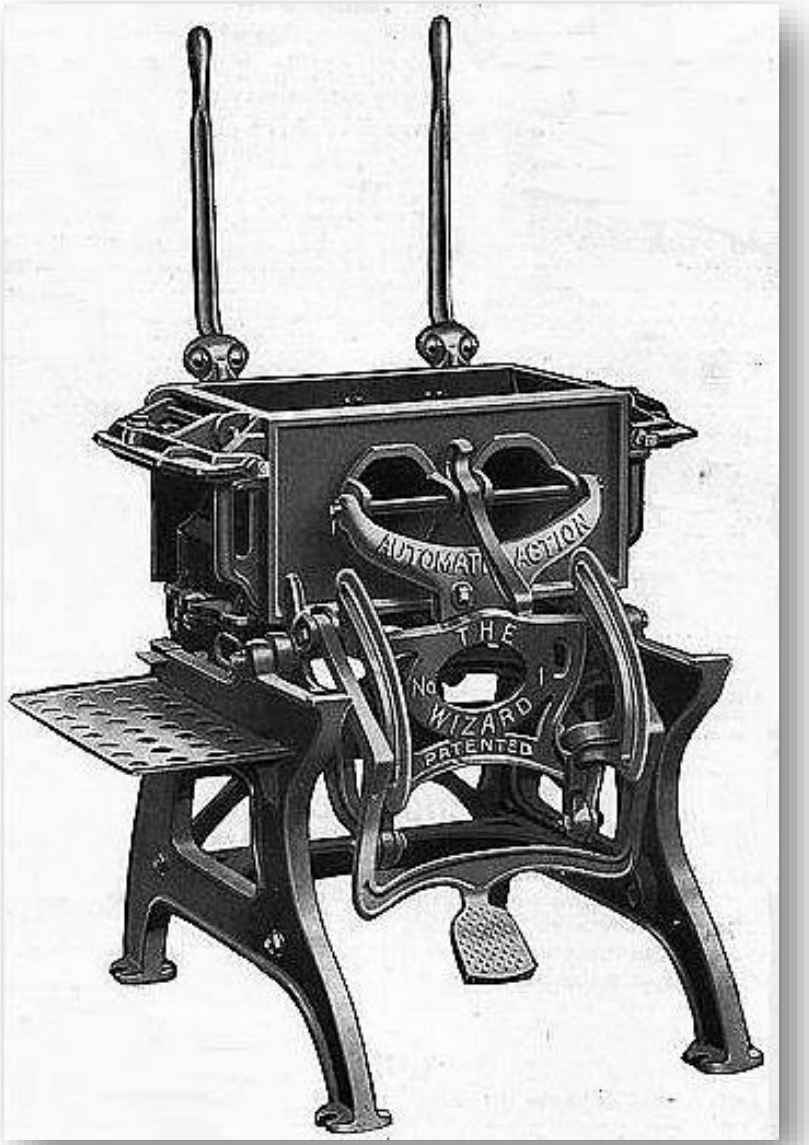
- Limestone (Calcium Carbonate)
- Calcium Silicates
- Alumina & Iron
- Gypsum (Calcium Sulfate)

Aggregate

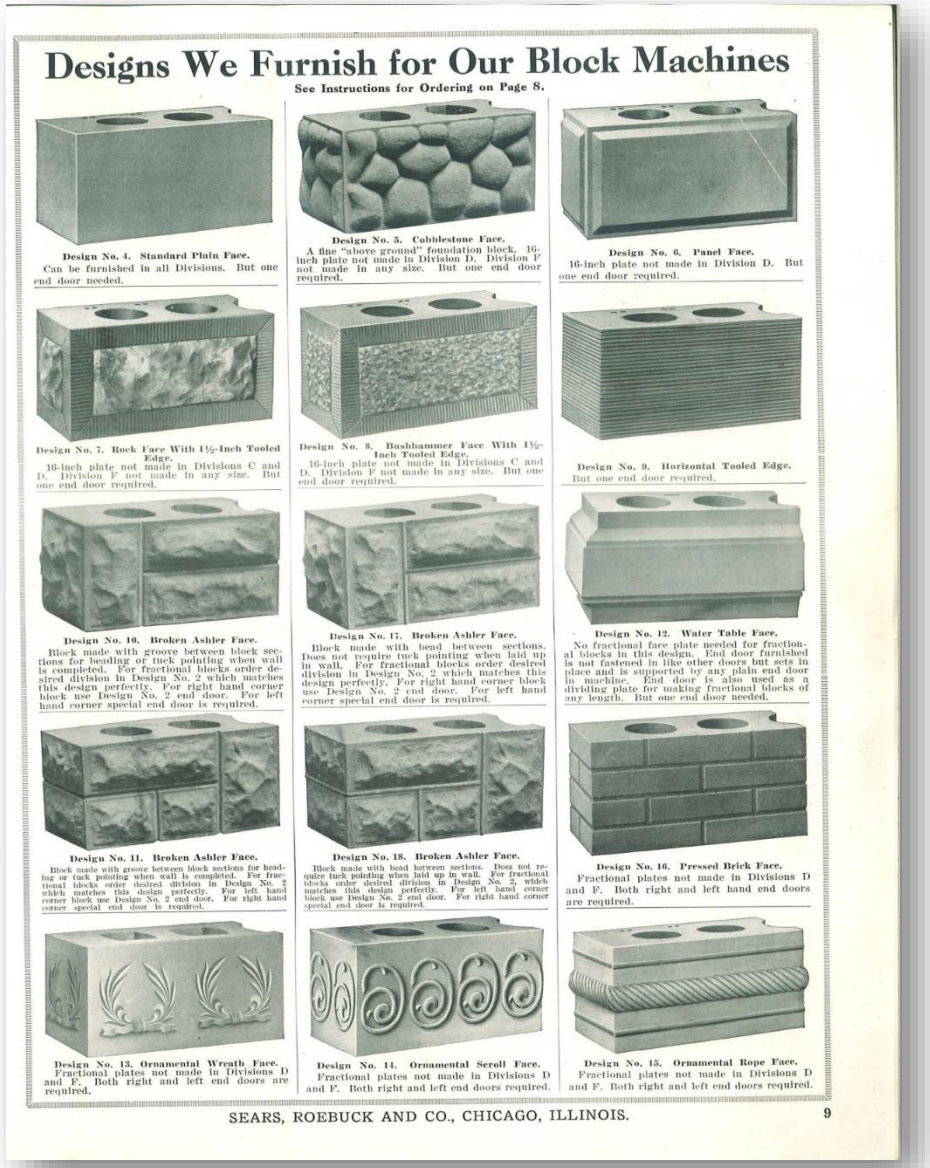
- Sand (0.0625 mm – 2 mm)
- Fine gravel (2 mm – 4 mm)

Water

CONCRETE BLOCK



First commercial machine used to make concrete block patented in 1900



Designs We Furnish for Our Block Machines

See Instructions for Ordering on Page 8.

Design No. 4. Standard Plain Face. Can be furnished in all Divisions. But one end door needed.

Design No. 5. Cobblestone Face. A fine "above ground" foundation block. 16-inch plate not made in Division D. Division F not made in any size. But one end door required.

Design No. 6. Panel Face. 16-inch plate not made in Division D. But one end door required.

Design No. 7. Rock Face With 1½-Inch Tooled Edge. 16-inch plate not made in Divisions C and D. Division F not made in any size. But one end door required.

Design No. 8. Bushhammer Face With 1½-Inch Tooled Edge. 16-inch plate not made in Divisions C and D. Division F not made in any size. But one end door required.

Design No. 9. Horizontal Tooled Edge. But one end door required.

Design No. 10. Broken Ashlar Face. Block made with groove between block sections for bedding or tuck pointing when wall is completed. For fractional blocks order desired division in Design No. 2 which matches this design perfectly. For right hand corner block use Design No. 2 end door. For left hand corner special end door is required.

Design No. 17. Broken Ashlar Face. Block made with bead between sections. Does not require tuck pointing when laid up in wall. For fractional blocks order desired division in Design No. 2 which matches this design perfectly. For right hand corner block use Design No. 2 end door. For left hand corner special end door is required.

Design No. 12. Water Table Face. No fractional face plate needed for fractional blocks in this design. End door furnished is not fastened in like other doors but sets in place and is supported by any plain end door in machine. End door is also used as a dividing plate for making fractional blocks of any length. But one end door needed.

Design No. 11. Broken Ashlar Face. Block made with groove between block sections for bedding or tuck pointing when wall is completed. For fractional blocks order desired division in Design No. 2 which matches this design perfectly. For left hand corner block use Design No. 2 end door. For right hand corner special end door is required.

Design No. 18. Broken Ashlar Face. Block made with bead between sections. Does not require tuck pointing when laid up in wall. For fractional blocks order desired division in Design No. 2, which matches this design perfectly. For left hand corner block use Design No. 2 end door. For right hand corner special end door is required.

Design No. 16. Pressed Brick Face. Fractional plates not made in Divisions D and F. Both right and left hand end doors are required.

Design No. 13. Ornamental Wreath Face. Fractional plates not made in Divisions D and F. Both right and left end doors are required.

Design No. 14. Ornamental Scroll Face. Fractional plates not made in Divisions D and F. Both right and left end doors required.

Design No. 15. Ornamental Rope Face. Fractional plates not made in Divisions D and F. Both right and left end doors required.

SEARS, ROEBUCK AND CO., CHICAGO, ILLINOIS. 9

Sears catalog, 1920s

CONCRETE BLOCK

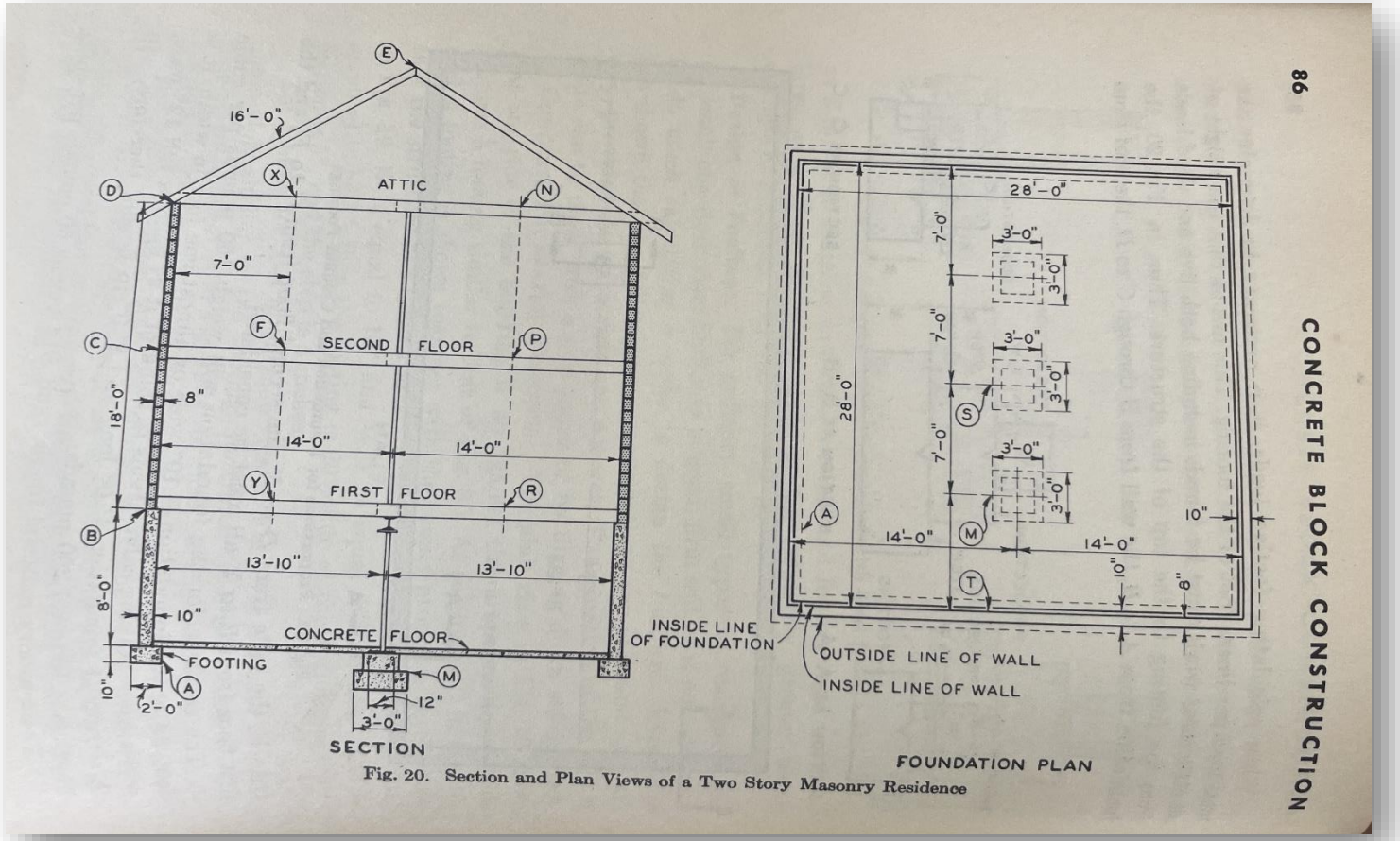


Fig. 20. Section and Plan Views of a Two Story Masonry Residence

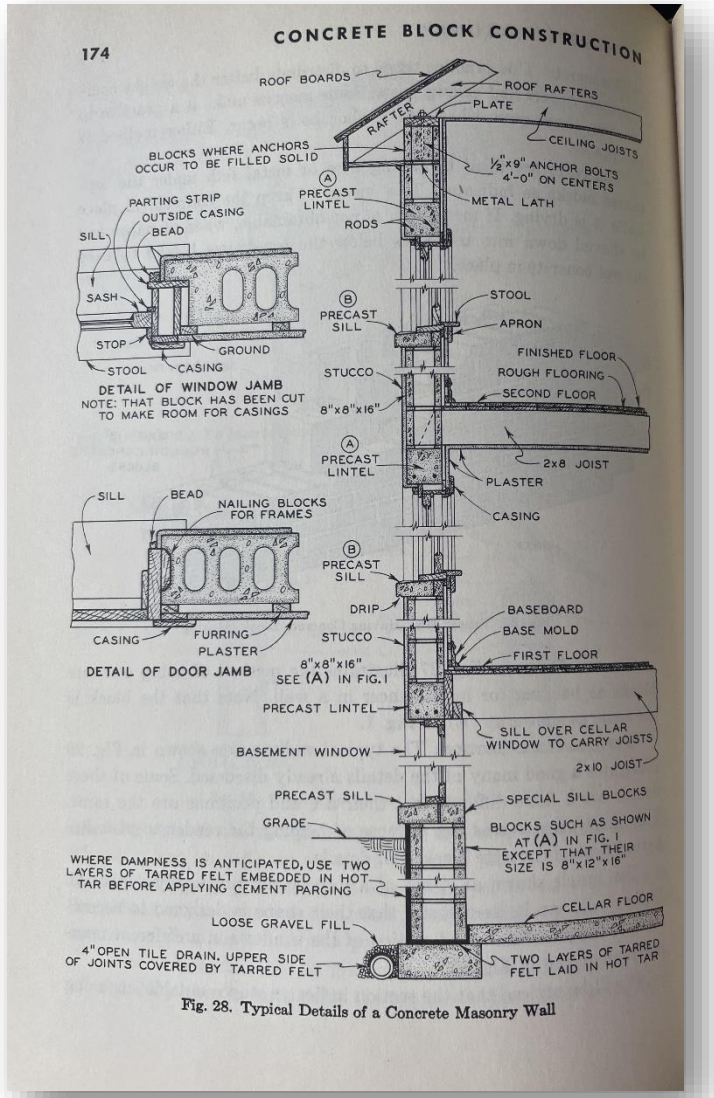


Fig. 28. Typical Details of a Concrete Masonry Wall

Illustrations from Concrete Block Construction for Home and Farm, 1952

CONCRETE BLOCK | ARCHITECTURAL

- Frank Lloyd Wright

We would take that
despised outcast of
the building industry,

the concrete block,

out from underfoot,
from the gutter,

find hitherto
unsuspected soul in it

make it live as a
thing of beauty

textured like the trees.

Yes, the building would
be made of the blocks
as a kind of tree itself

standing at home
among the other trees
in its own native land

CONCRETE BLOCK | ARCHITECTURAL

Storer House, Hollywood, CA, Frank Lloyd Wright, 1923

CONCRETE BLOCK | ARCHITECTURAL

Ennis House, Los Angeles, Frank Lloyd Wright, 1924

CONCRETE BLOCK | ARCHITECTURAL

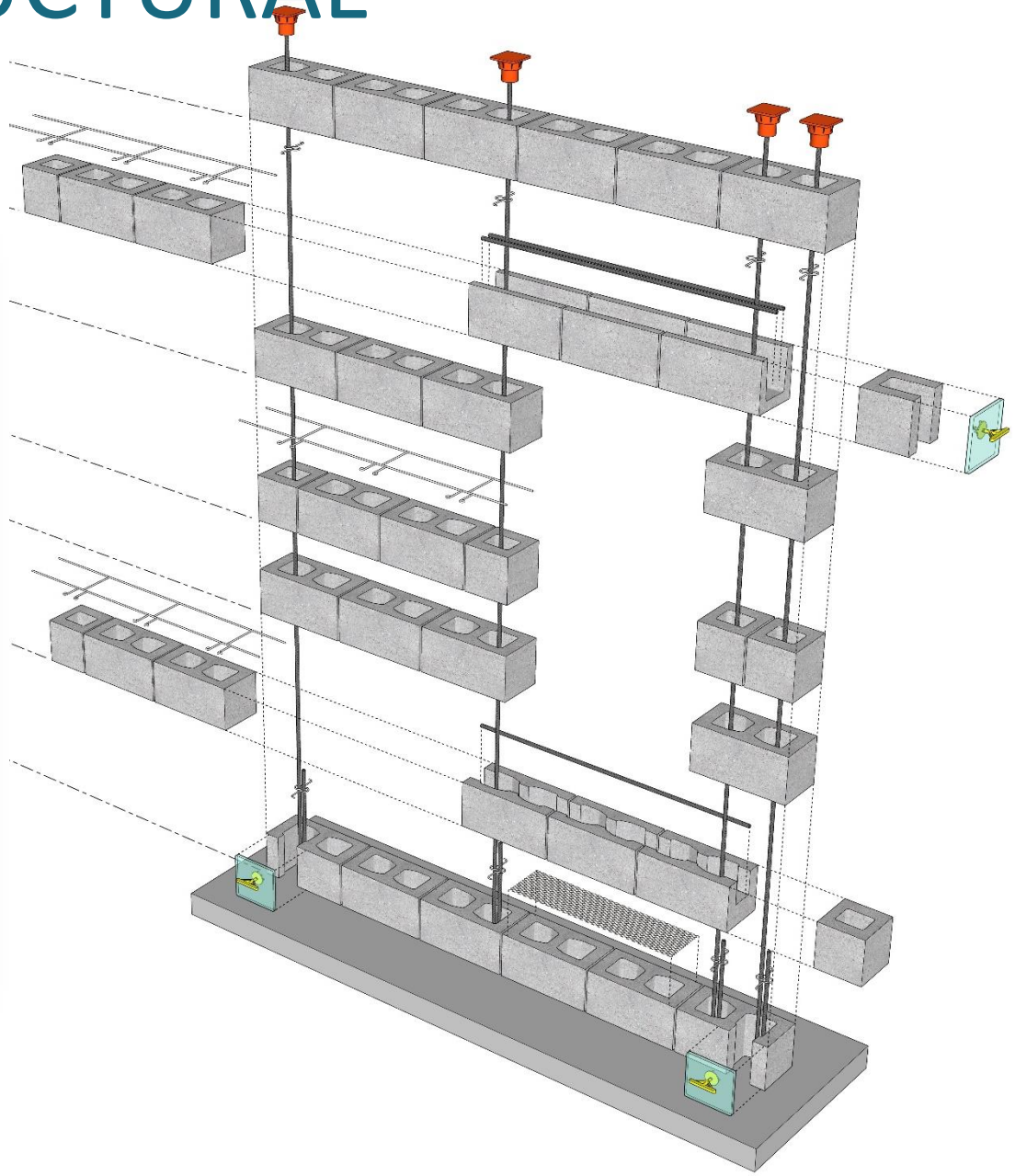
CMU exterior

CMU interior finish

CONCRETE BLOCK | ARCHITECTURAL

Perforated wall

CONCRETE BLOCK | STRUCTURAL

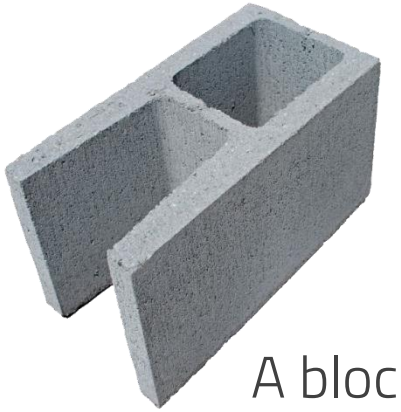


CONCRETE BLOCK | STRUCTURAL

Vertical reinforcement

Horizontal reinforcement

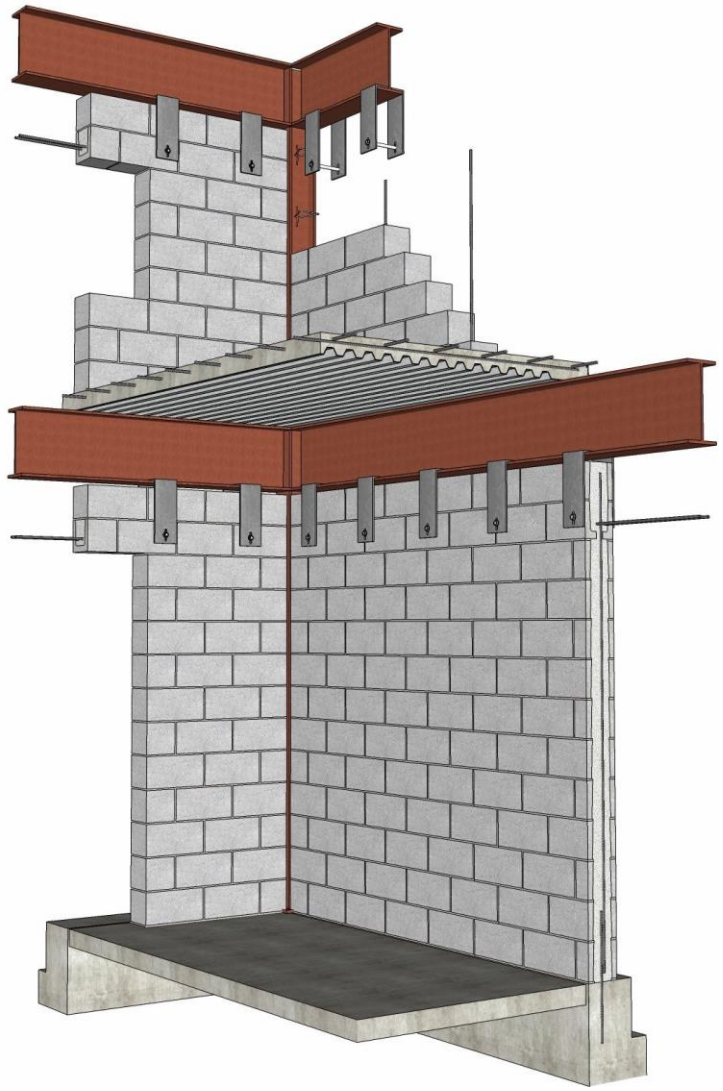
CONCRETE BLOCK | STRUCTURAL



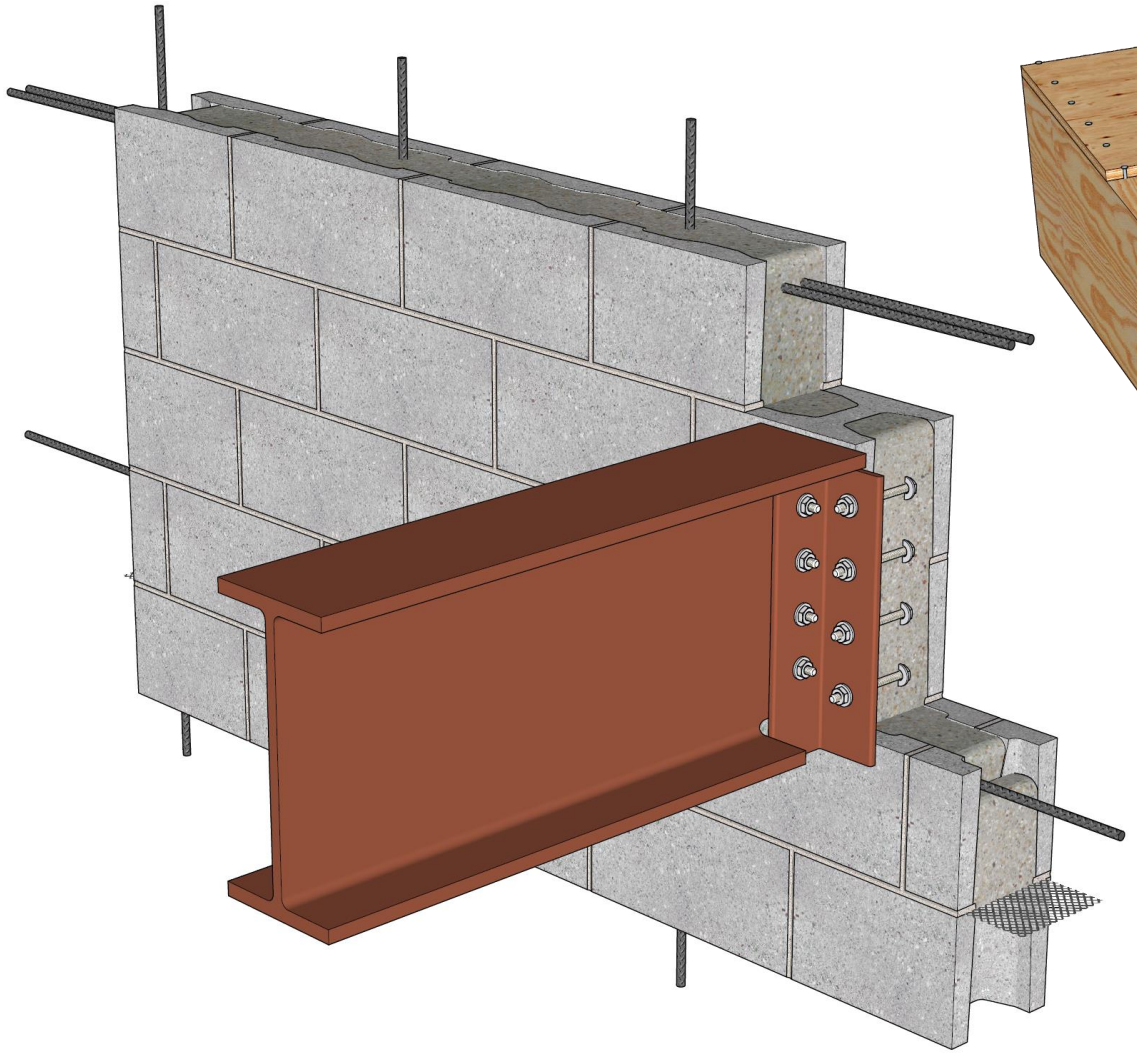
A block

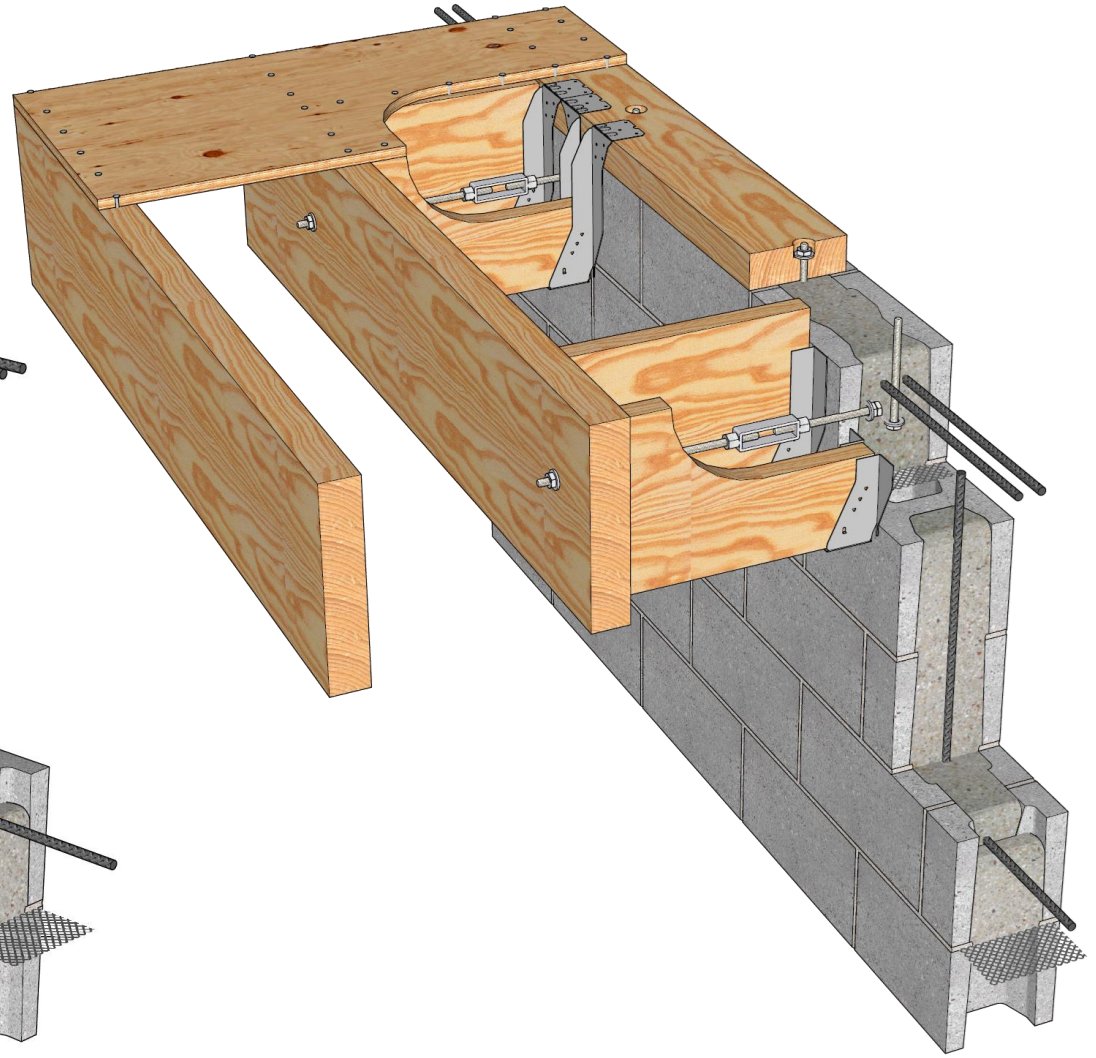
H block

CONCRETE BLOCK | STRUCTURAL

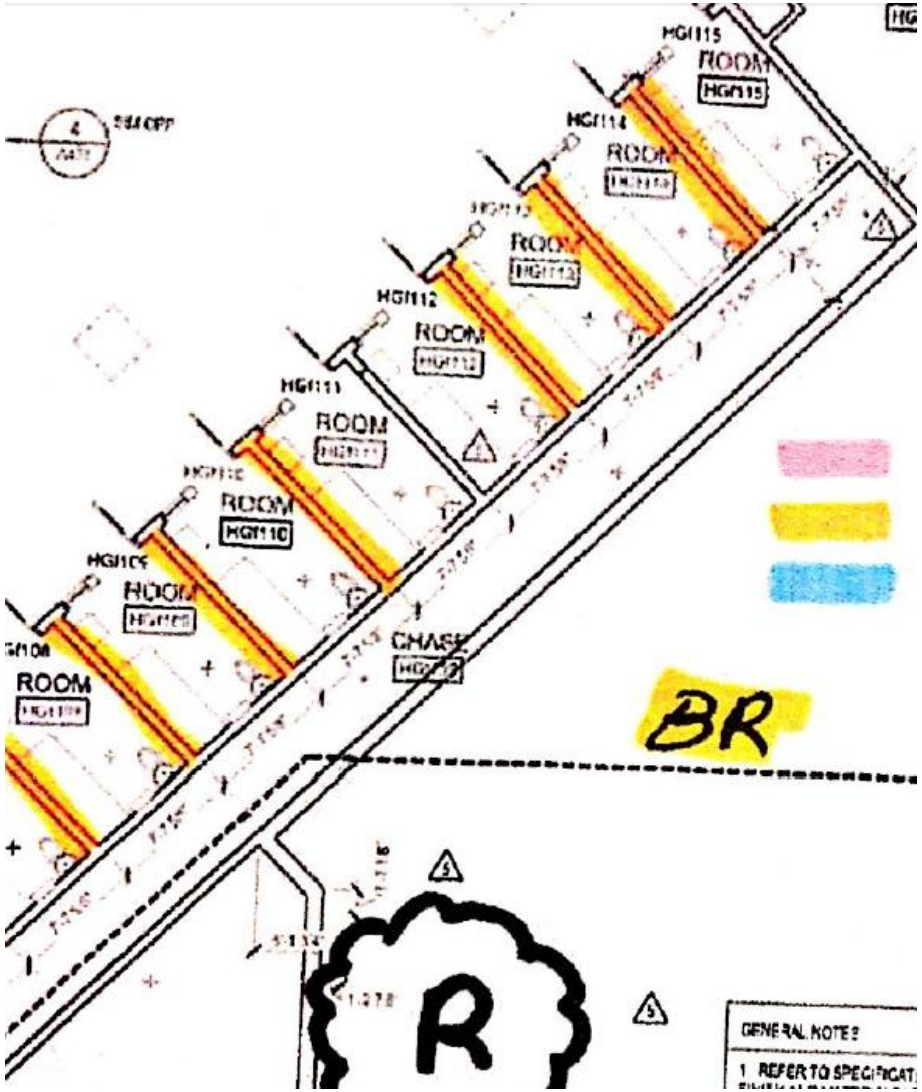


CONCRETE BLOCK | CONSTRUCTABILITY



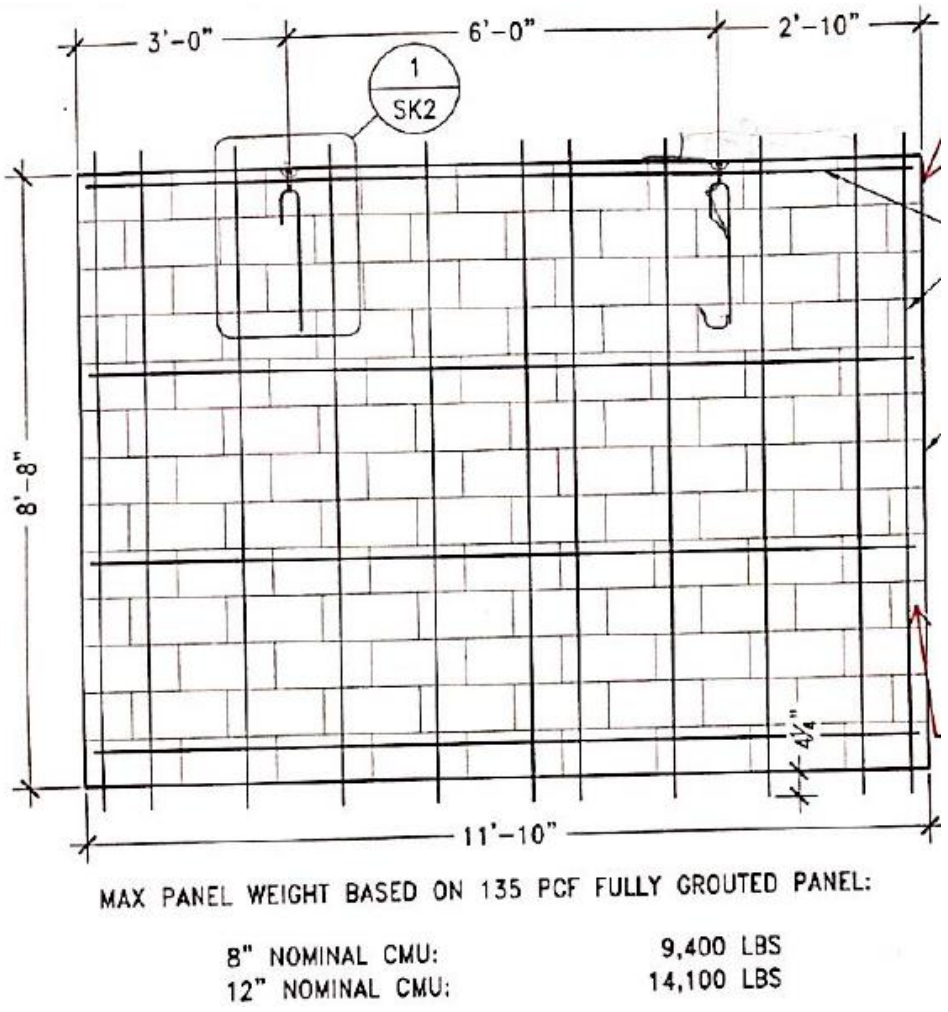


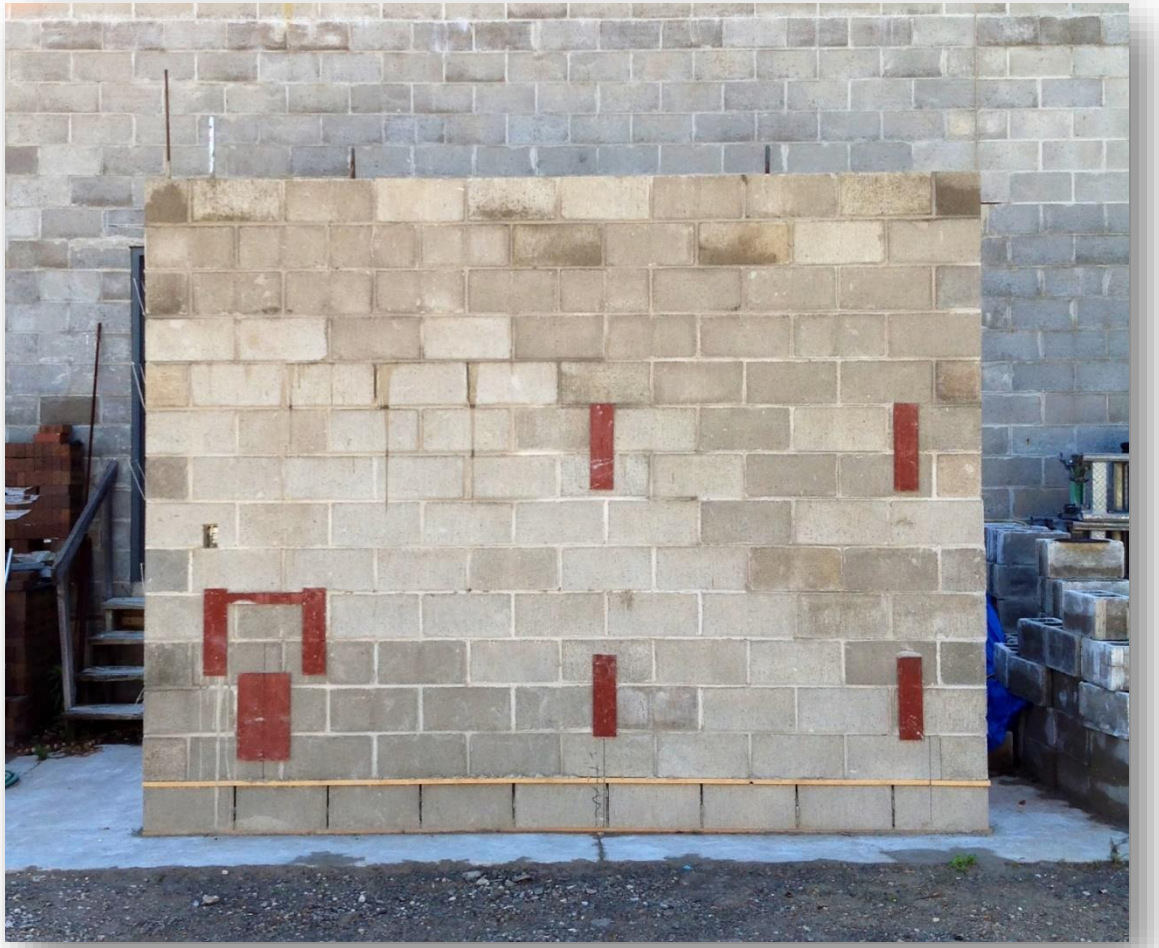
CONCRETE BLOCK | PREFABRICATED WALLS



- 45 fully grouted, reinforced CMU partition walls with steel embeds for wall mounted fixtures
- Walls were constructed before the foundation was poured

CONCRETE BLOCK | PREFABRICATED WALLS





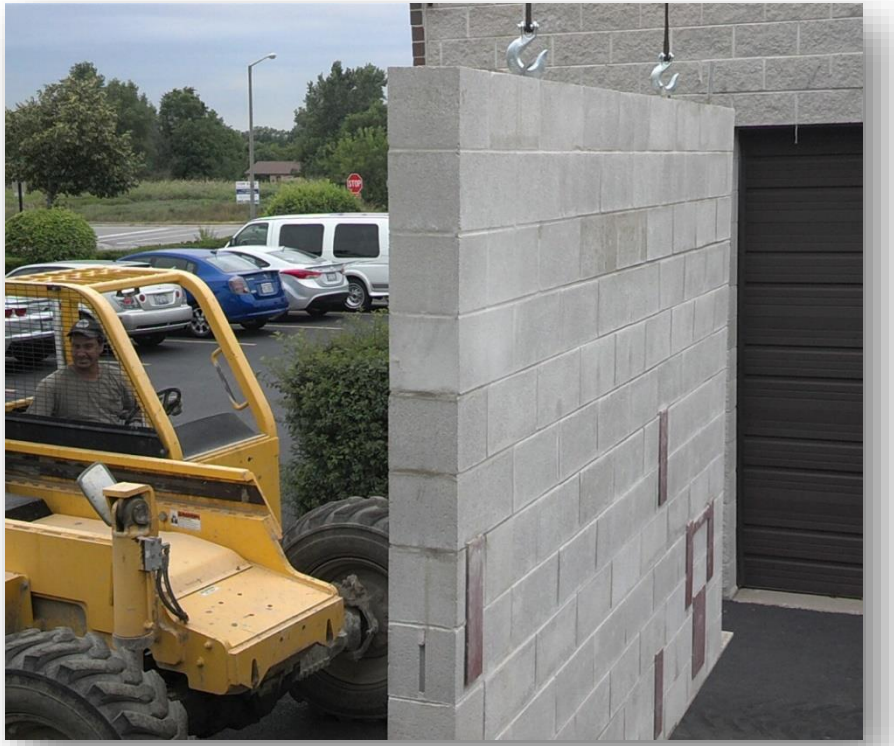
Prototype wall

Prefabricated 11'-10" long x 8'-8" high, 8" thick fully grouted, reinforced cell partition wall w/ steel embeds for bunks, bench, and shelf.

CONCRETE BLOCK | PREFABRICATED WALLS

Wall fabrication, Woodstock, Illinois

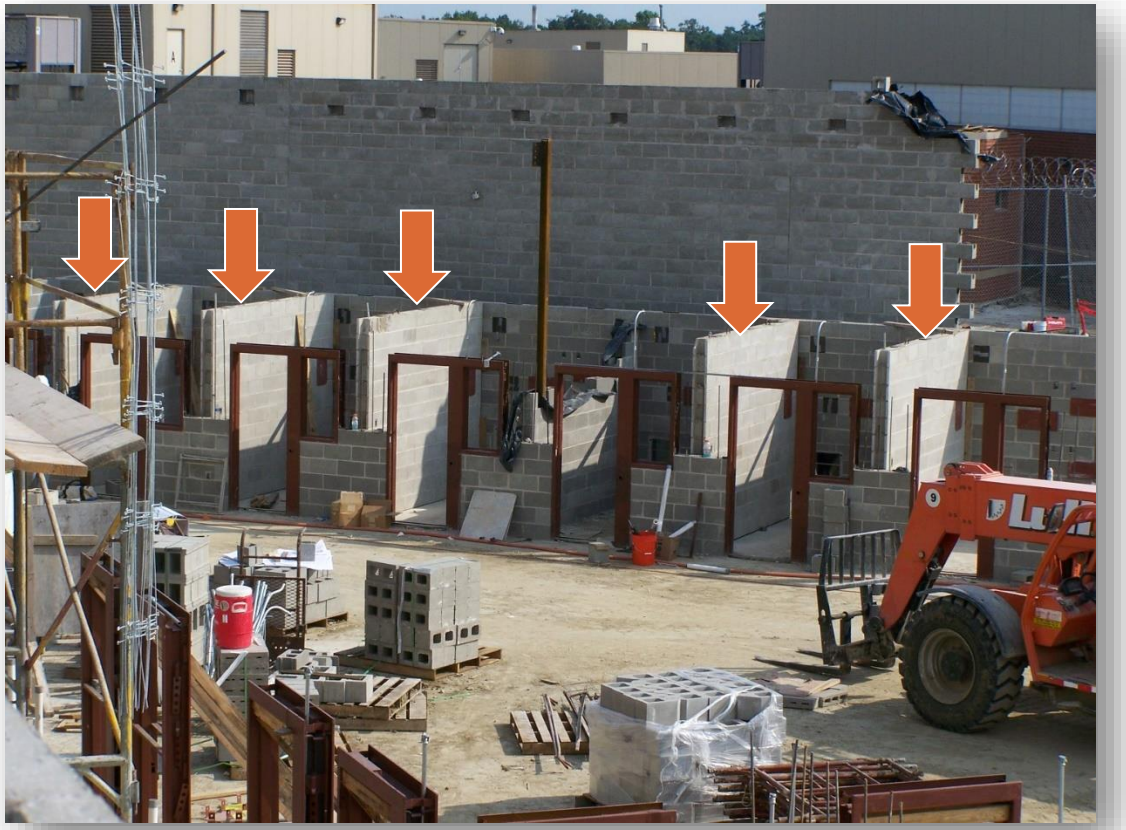
CONCRETE BLOCK | PREFABRICATED WALLS



Transporting the walls to jobsite

CONCRETE BLOCK | PREFABRICATED WALLS

Staged walls



Walls set in place by crane

CONCRETE BLOCK | MASONRY UNIT LIFT ENHANCER (MULE)

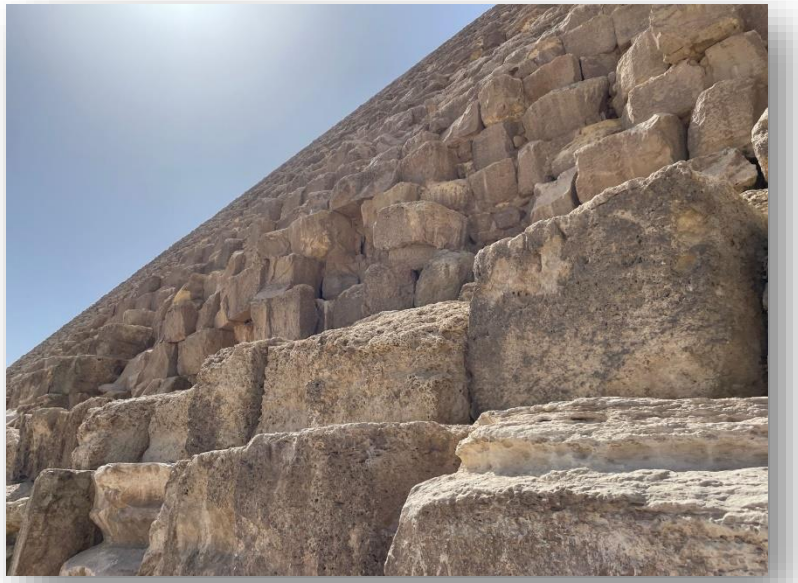
MASONRY MATERIALITY
STONE

INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

STONE

Khafre,
2532 BC



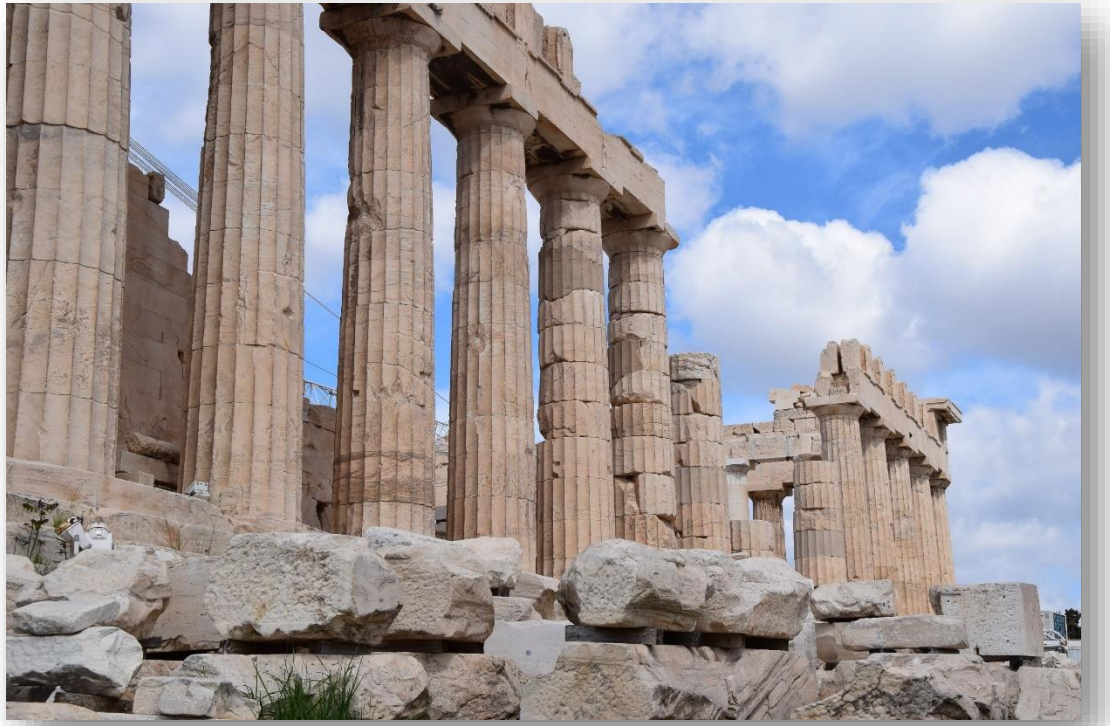
Khufu,
2566 BC

The Pyramids at Giza, 2566 – 2504 BC

Khufu

- 2.3 million blocks of limestone
- Each stone weighs 2.5 tons, average
- Built in less than 30 years by 20,000-30,000 artisans and stone masons
- Originally clad in slabs of white Tura limestone

STONE



The Parthenon, 447-438 BC

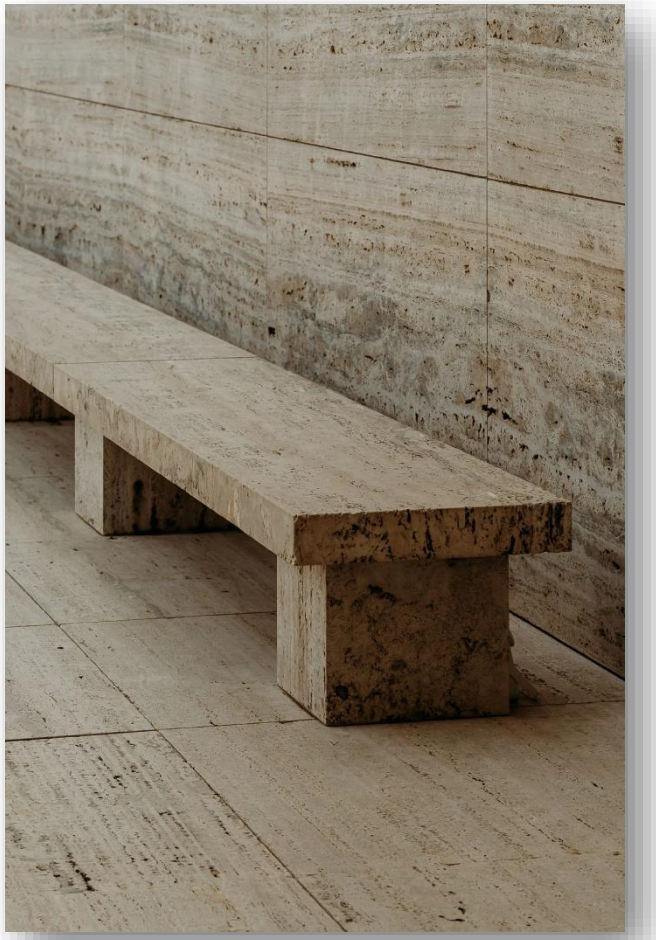
STONE

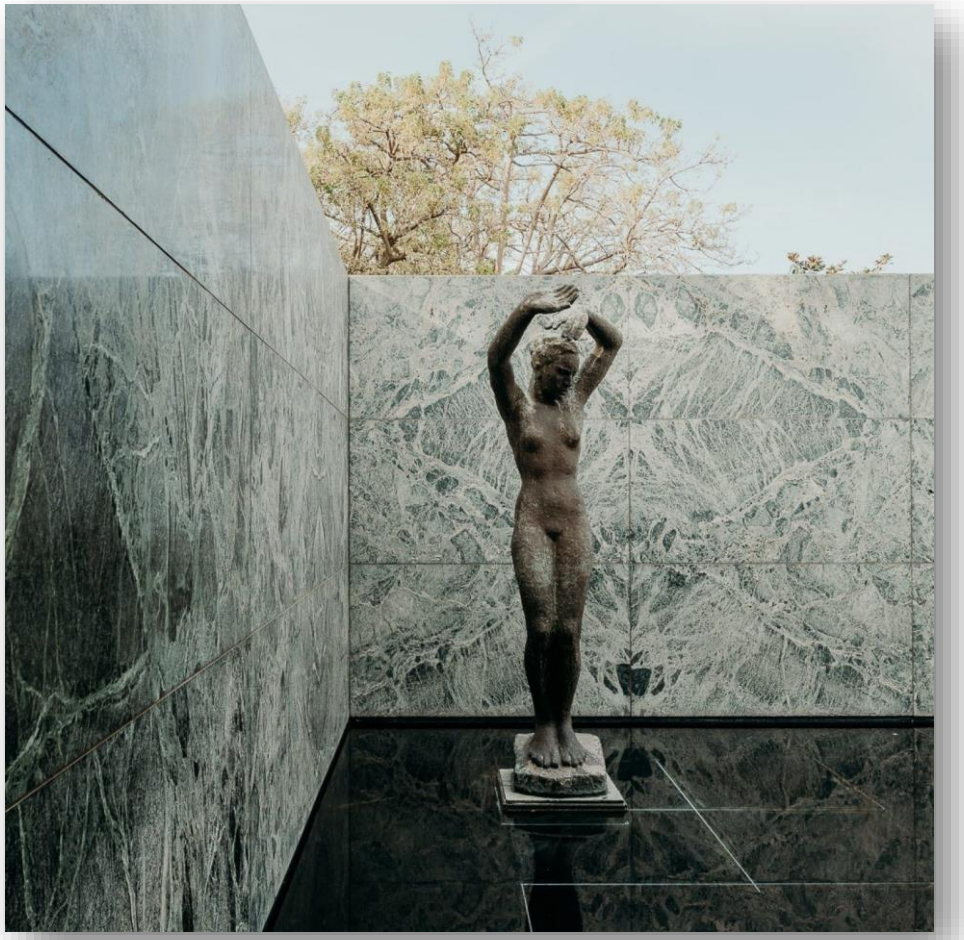
Agora of Smyrna, Cryptoportico, 200 AD

STONE

Barcelona Pavilion, Ludwig Mies van der Rohe, 1929 (reconstructed in 1986)

STONE



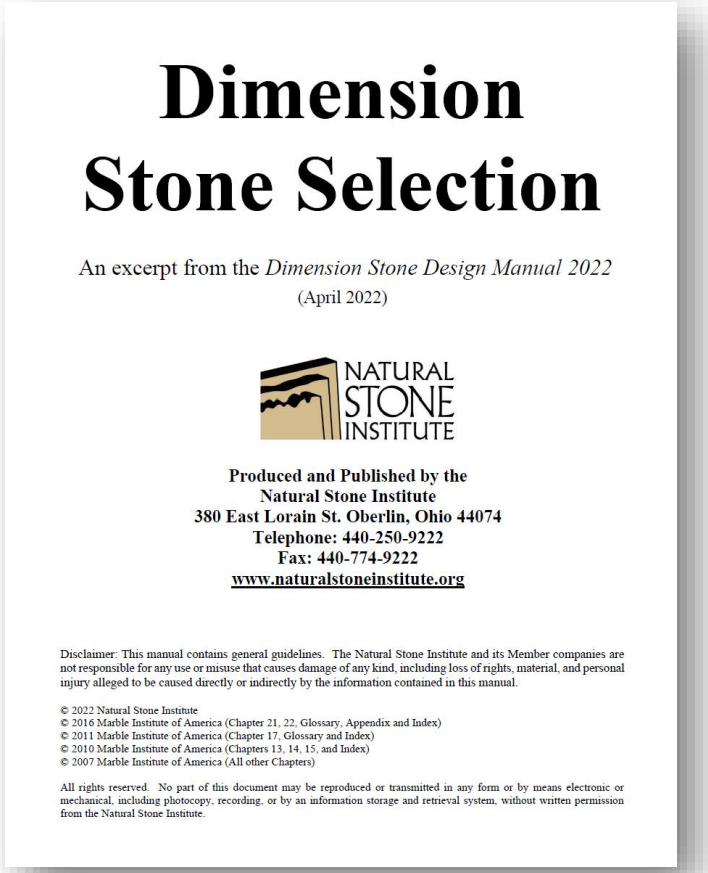


Barcelona Pavilion, Ludwig Mies van der Rohe, 1929 (reconstructed in 1986)

STONE

Barcelona Pavilion, Ludwig Mies van der Rohe, 1929 (reconstructed in 1986)

STONE | RESOURCES



Dimension Stone Selection

An excerpt from the *Dimension Stone Design Manual 2022*
(April 2022)

NATURAL STONE INSTITUTE

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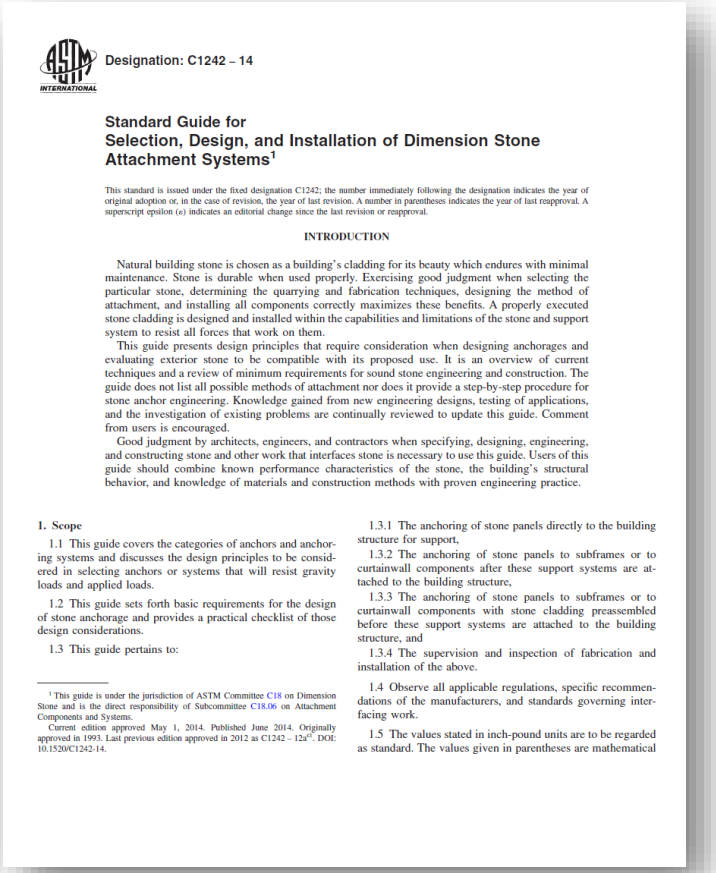
NSI Dimension Stone Design Manual 2022



Designation: C1242 – 14

Standard Guide for
Selection, Design, and Installation of Dimension Stone Attachment Systems[1]

This standard is issued under the fixed designation C1242; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Natural building stone is chosen as a building's cladding for its beauty which endures with minimal maintenance. Stone is durable when used properly. Exercising good judgment when selecting the particular stone, determining the quarrying and fabrication techniques, designing the method of attachment, and installing all components correctly maximizes these benefits. A properly executed stone cladding is designed and installed within the capabilities and limitations of the stone and support system to resist all forces that work on them.

This guide presents design principles that require consideration when designing anchorages and evaluating exterior stone to be compatible with its proposed use. It is an overview of current techniques and a review of minimum requirements for sound stone engineering and construction. The guide does not list all possible methods of attachment nor does it provide a step-by-step procedure for stone anchor engineering. Knowledge gained from new engineering designs, testing of applications, and the investigation of existing problems are continually reviewed to update this guide. Comment from users is encouraged.

Good judgment by architects, engineers, and contractors when specifying, designing, engineering, and constructing stone and other work that interfaces stone is necessary to use this guide. Users of this guide should combine known performance characteristics of the stone, the building's structural behavior, and knowledge of materials and construction methods with proven engineering practice.

1. Scope

1.1 This guide covers the categories of anchors and anchoring systems and discusses the design principles to be considered in selecting anchors or systems that will resist gravity loads and applied loads.

1.2 This guide sets forth basic requirements for the design of stone anchorage and provides a practical checklist of those design considerations.

1.3 This guide pertains to:

1.3.1 The anchoring of stone panels directly to the building structure for support,

1.3.2 The anchoring of stone panels to subframes or to curtainwall components after these support systems are attached to the building structure,

1.3.3 The anchoring of stone panels to subframes or to curtainwall components with stone cladding preassembled before these support systems are attached to the building structure, and

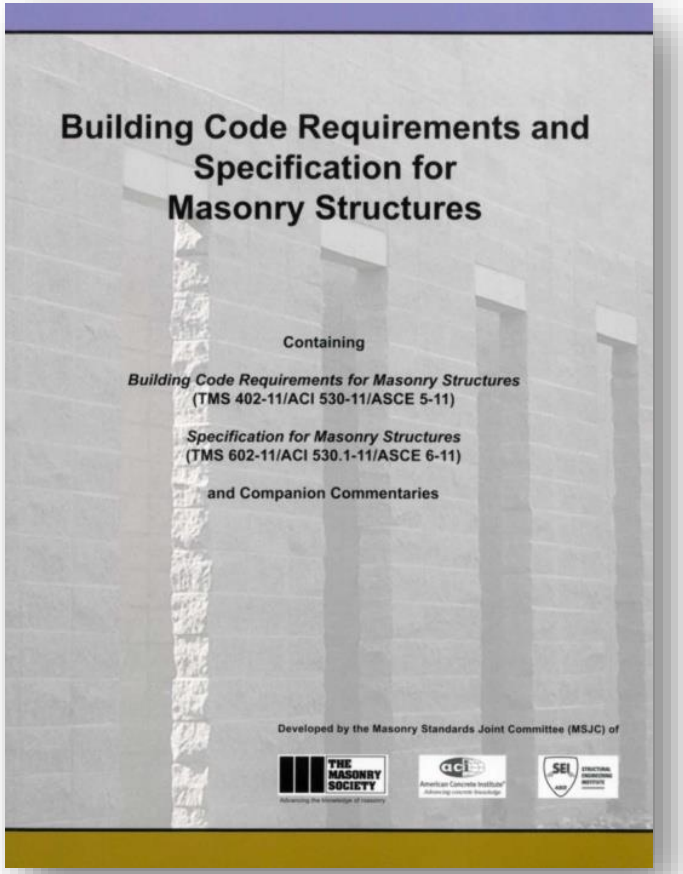
1.3.4 The supervision and inspection of fabrication and installation of the above.

1.4 Observe all applicable regulations, specific recommendations of the manufacturers, and standards governing interfacing work.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical

[1] This guide is under the jurisdiction of ASTM Committee C18 on Dimension Stone and is the direct responsibility of Subcommittee C18.06 on Attachment Components and Systems.
Current edition approved May 1, 2014. Published June 2014. Originally approved in 1993. Last previous edition approved in 2012 as C1242 – 12a[ε2]. DOI: 10.1520/C1242-14.

ASTM C1242 Standard Guide for Selection, Design and Installation of Dimension Stone Attachment Systems



Building Code Requirements and Specification for Masonry Structures

Containing

Building Code Requirements for Masonry Structures
(TMS 402-11/ACI 530-11/ASCE 5-11)

Specification for Masonry Structures
(TMS 602-11/ACI 530.1-11/ASCE 6-11)

and Companion Commentaries

Developed by the Masonry Standards Joint Committee (MSJC) of

THE MASONRY SOCIETY

TMS 402-602 Building Code Requirements for Masonry Structures 2016

STONE | DEFINITIONS

WHAT IS NATURAL STONE?

Stones that have been harvested from their in-situ position in the earth, then cut and machined into final products.

https://www.youtube.com/watch?v=du9_Kn2y2VA
Chapter 2, Chapter 9

STONE | CUTTING & FINISHING

RUBBLE STONE / ROUGH CUT STONE

Natural stone that is rough and uneven, and may or may not be laid in regular courses

DIMENSION STONE

Natural stone that has been selected and finished to specific sizes or shapes; Larger than a stone tile

STONE TILE

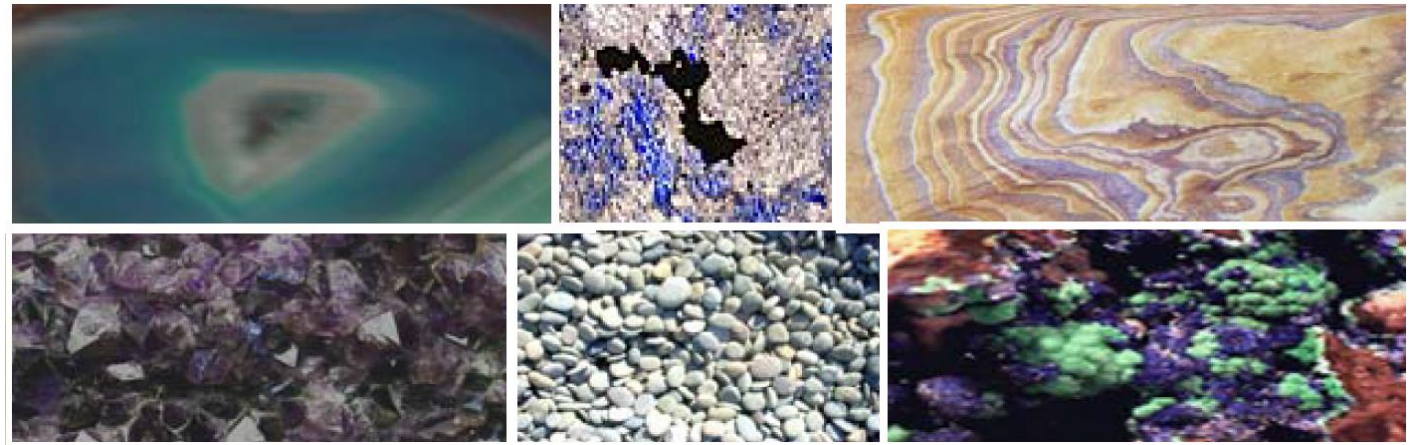
Cut-to-size pieces of stone typically 24" x 24" x 2cm (3/4 ") thick or smaller

STONE SELECTION | STONE FORMATION

MINERALS

There are more than 3,500 different minerals. Only about a dozen make up the majority of dimension stone used for interior finishes.

- Quartz
- Feldspar
- Mica
- Calcite
- Garnet
- Magnesium
- Iron



STONE SELECTION | STONE FORMATION & COMPOSITION

BASIS OF STONE FORMATION

Sedimentary

- Formed on the earth's crust over thousands of years; have bedding planes

Metamorphic

- Formed by heat & pressure transforming one rock into another rock type

Igneous

- Formed from volcanic activity

BASIS OF STONE MAKEUP

Calcareous Stones

- Made up of Calcium Carbonate

Siliceous Stones

- Made up of Silica or Silicates

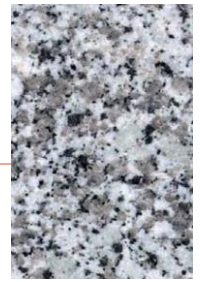
STONE SELECTION | STONE FORMATION & COMPOSITION



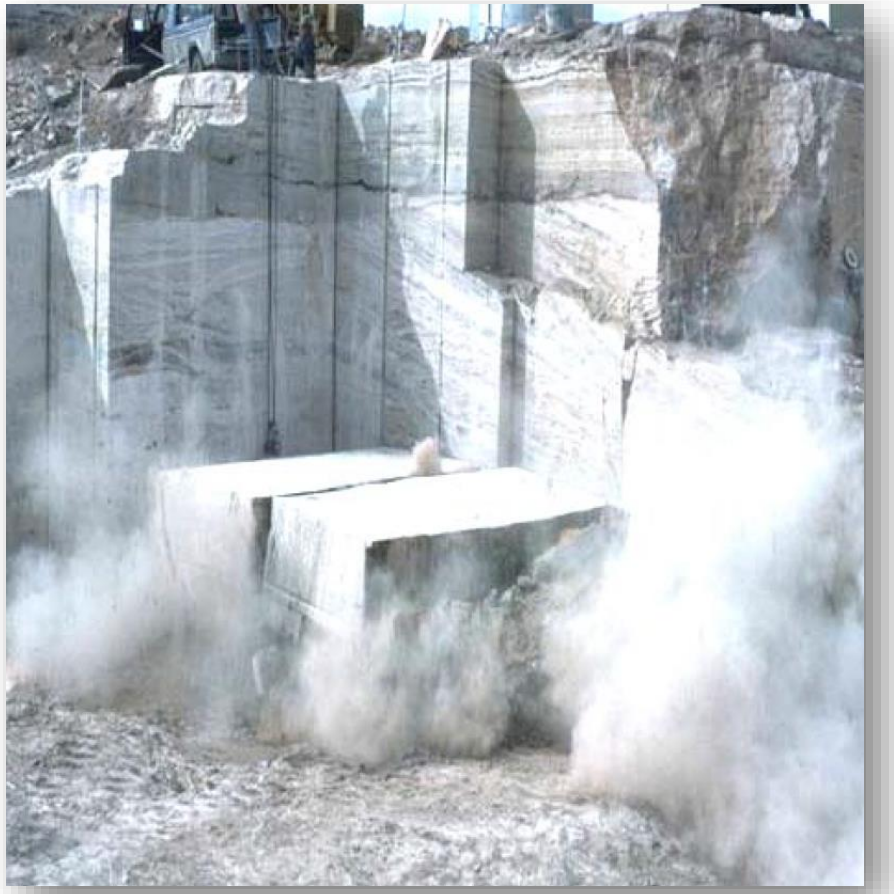

	Sedimentary	Metamorphic	Igneous
Calcareous	Limestone Travertine Onyx	Marble	
Siliceous	Sandstone	Slate Quartzite Serpentine	Granite Basalt

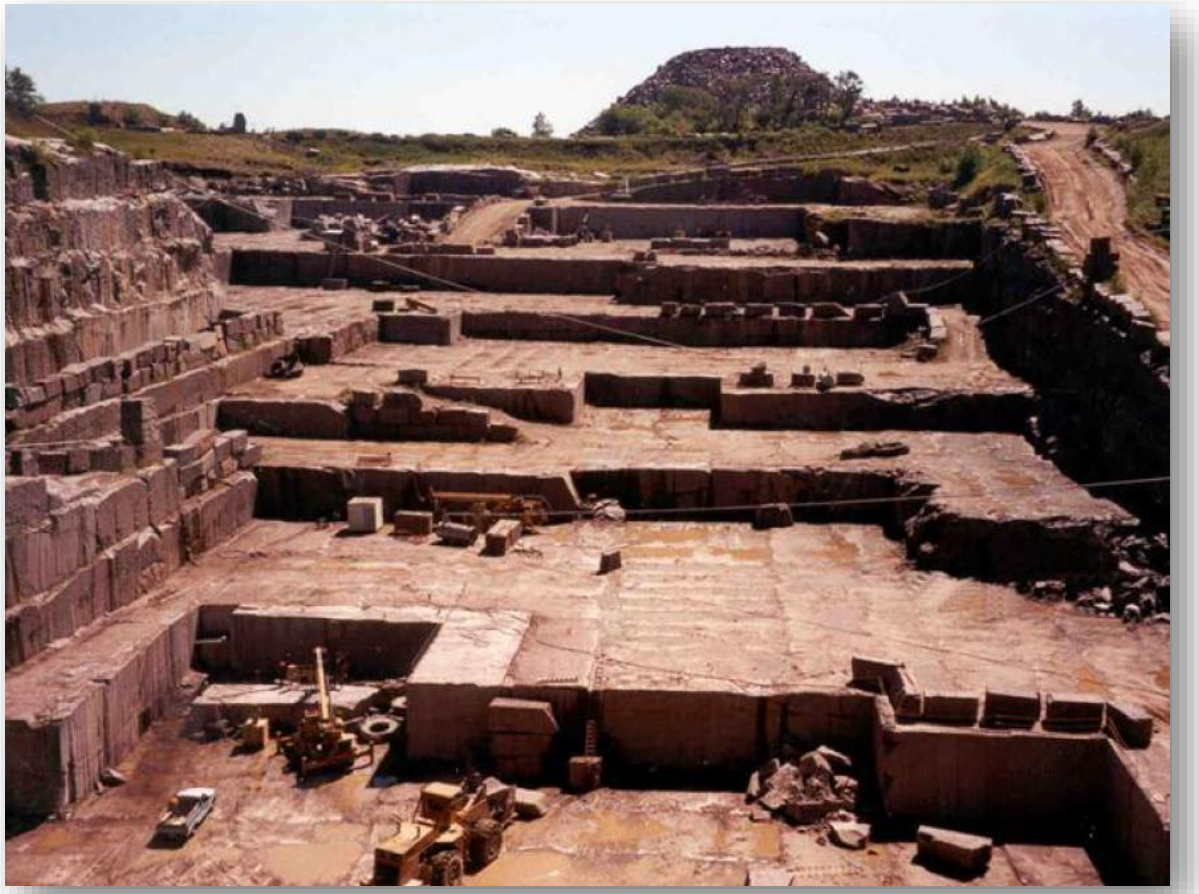







STONE SELECTION & FABRICATION | QUARRYING





Open-air quarry

https://www.youtube.com/watch?v=du9_Kn2y2VA Chapter 2, Chapter 9

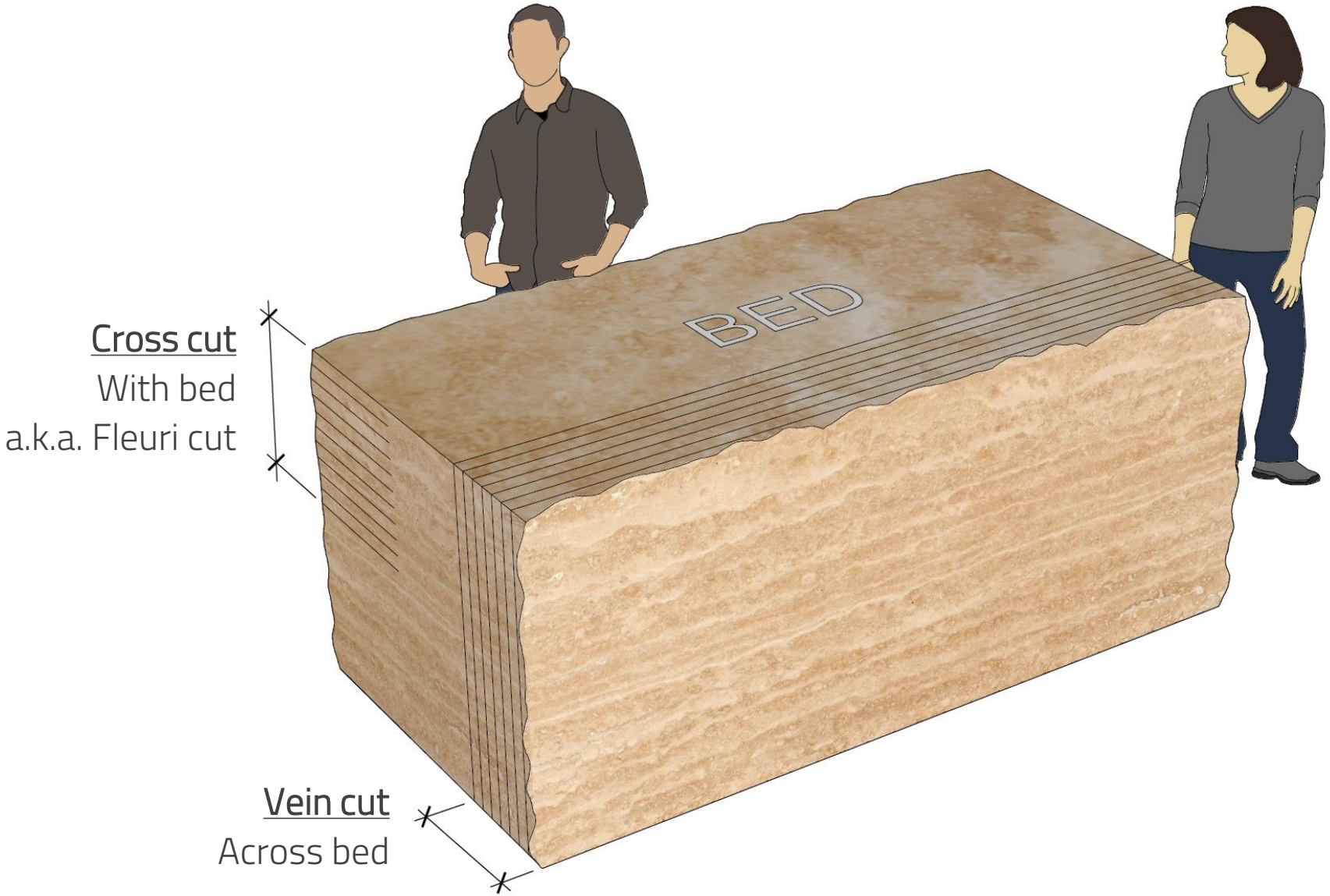
STONE SELECTION & FABRICATION | QUARRYING

Tunnel quarry

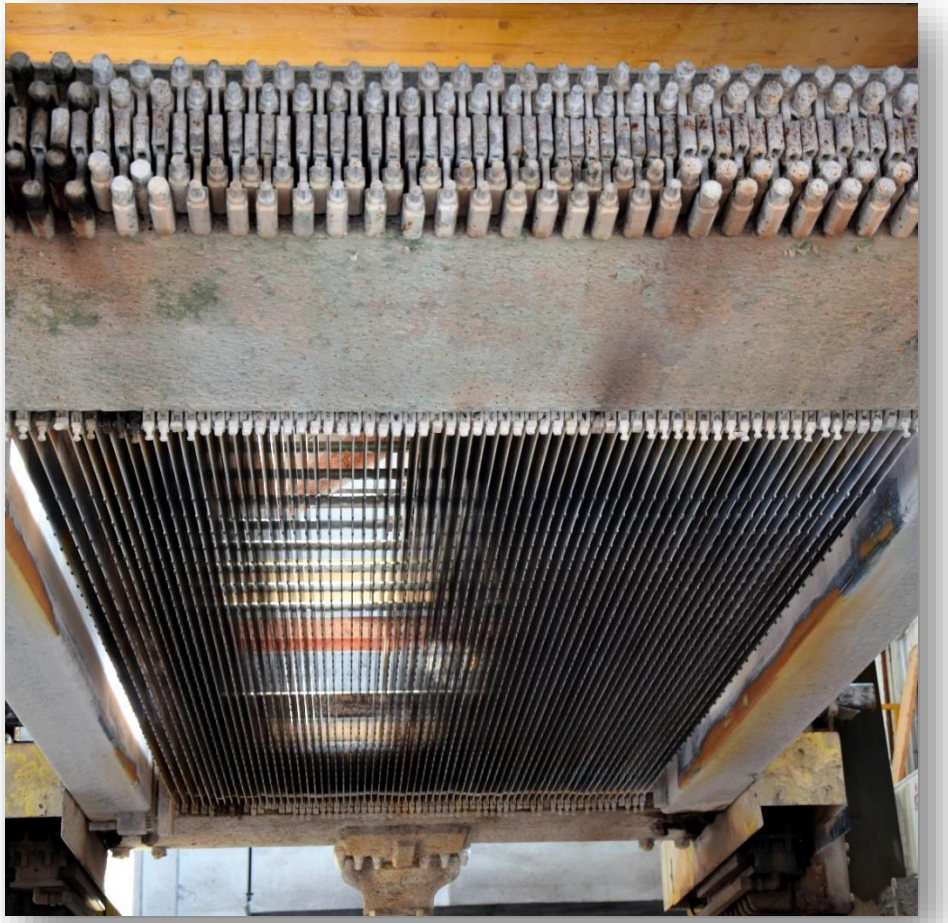
STONE SELECTION & FABRICATION | QUARRYING

Stone blocks, approx. 8-10 ft. long x 4-5 ft. deep x 3-6 ft. high

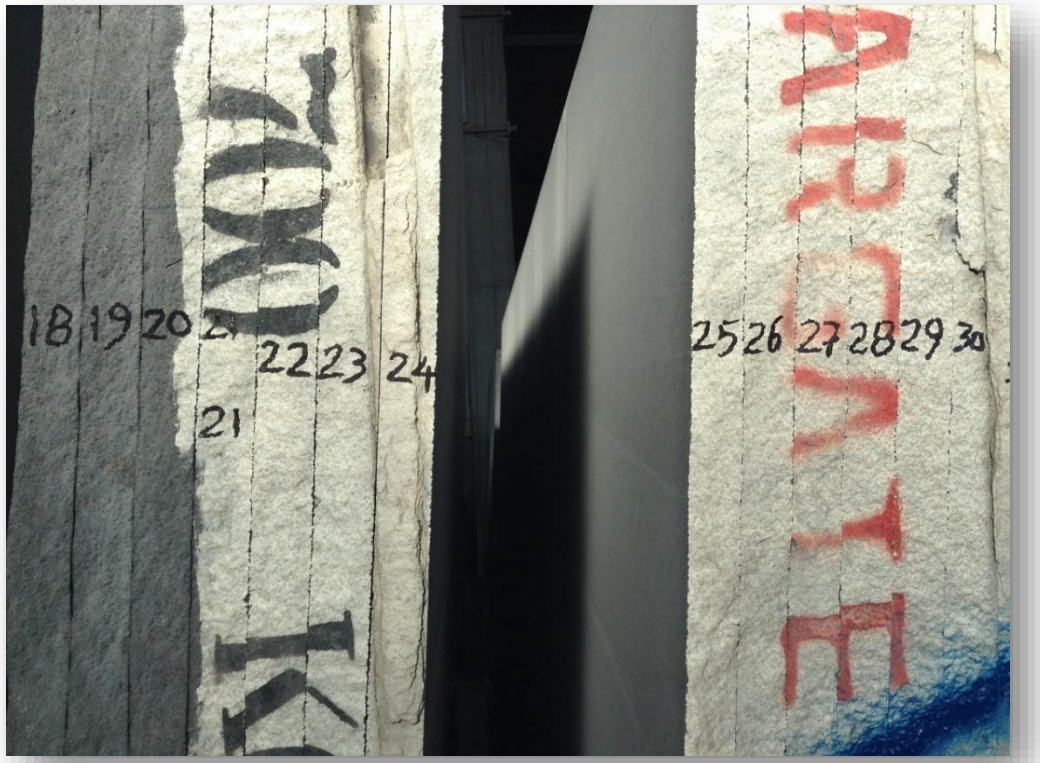
STONE SELECTION & FABRICATION | VENEER CUTTING



STONE SELECTION & FABRICATION | VENEER CUTTING



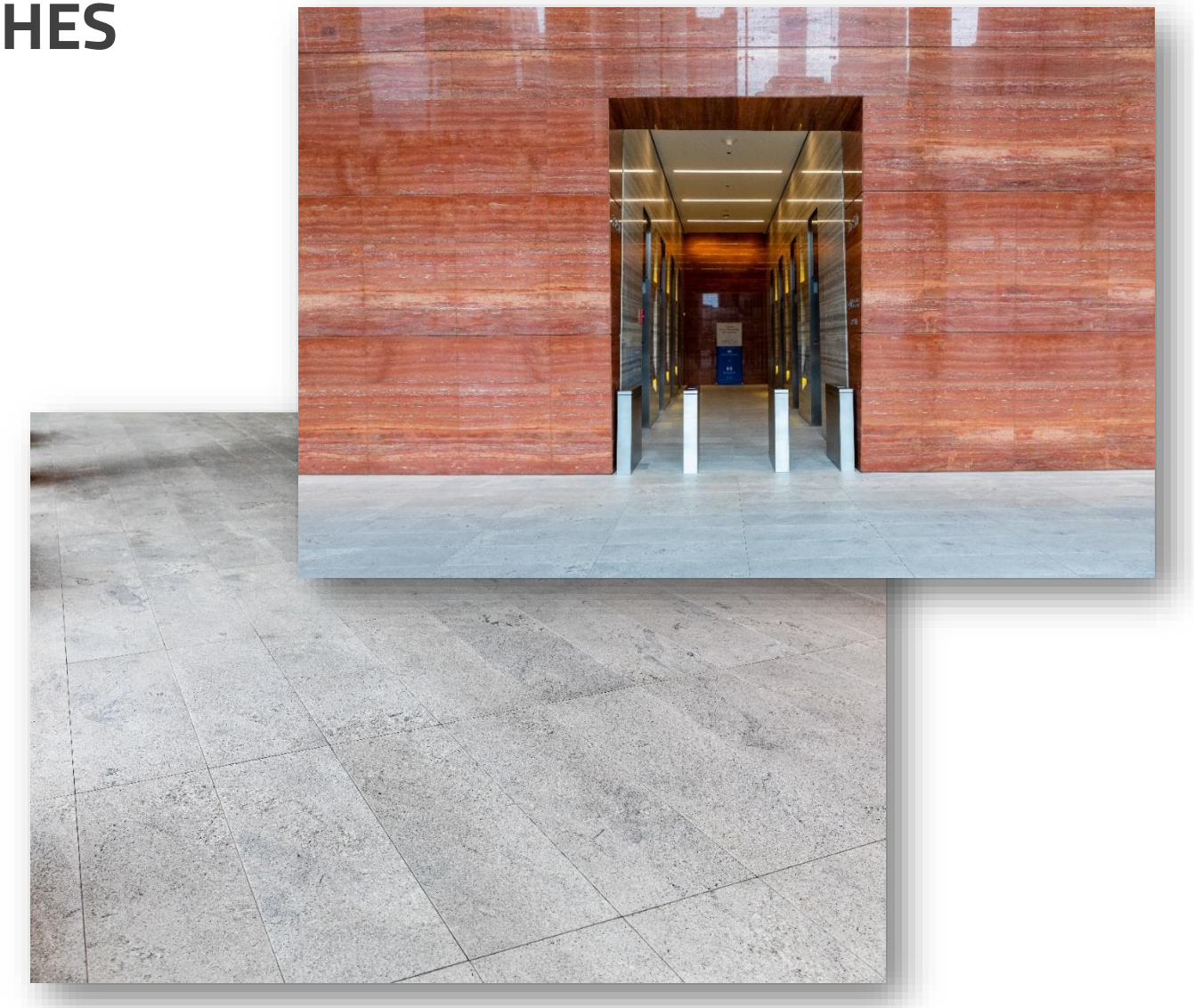
STONE SELECTION & FABRICATION | VENEER CUTTING



STONE SELECTION & FABRICATION | FINISHES

COMMON STONE FINISHES

- Polished
- Honed
- Flamed
  (a.k.a. Thermal)
- Sawn
- Sanded
- Others



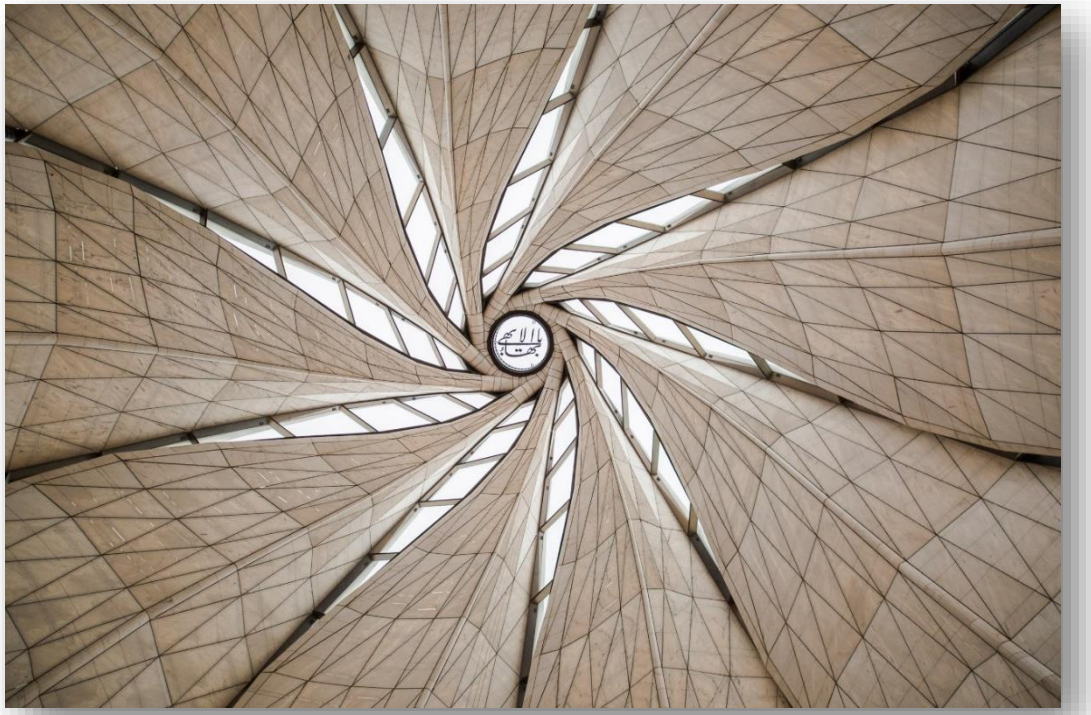
STONE | MODERN APPLICATIONS

STONE | MODERN APPLICATIONS

STONE | MODERN APPLICATIONS

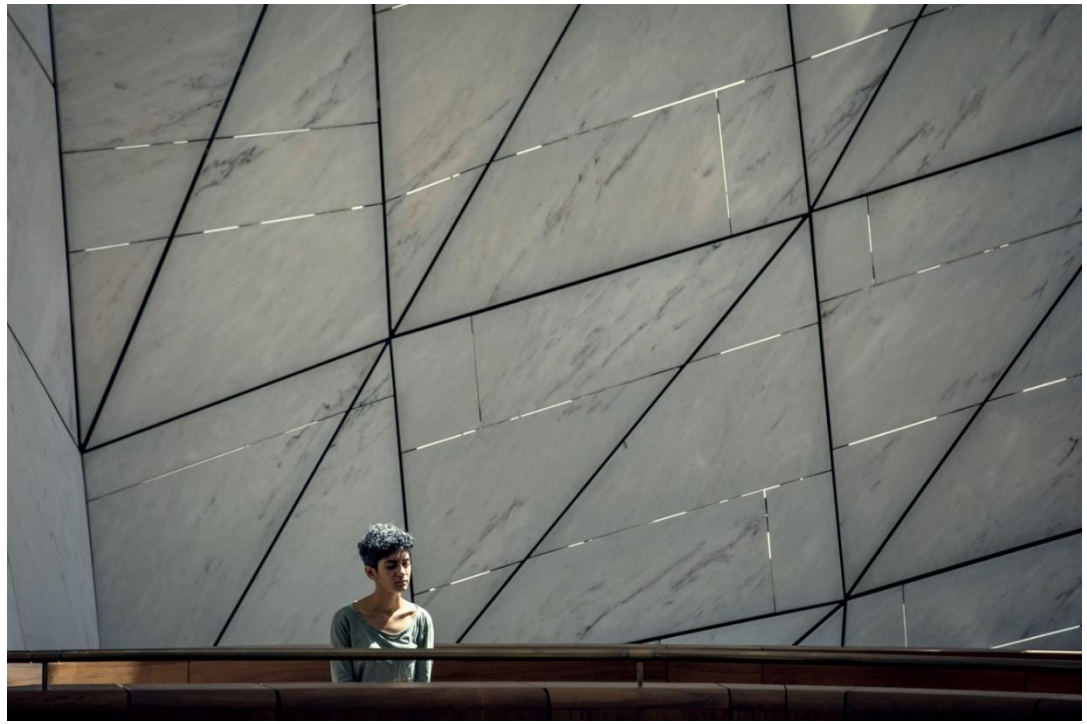
Bahá'í Temple, Santiago, Chile, 2016, Hariri Pontarini Architects

STONE | MODERN APPLICATIONS



Bahá'í Temple, Santiago, Chile, 2016, Hariri Pontarini Architects

STONE | MODERN APPLICATIONS



Bahá'í Temple, Santiago, Chile, 2016, Hariri Pontarini Architects

STONE | MODERN APPLICATIONS

Two Union Square office lobby, Seattle, WA, 2019, NBBJ

STONE | MODERN APPLICATIONS

Two Union Square office lobby, Seattle, WA, 2019, NBBJ

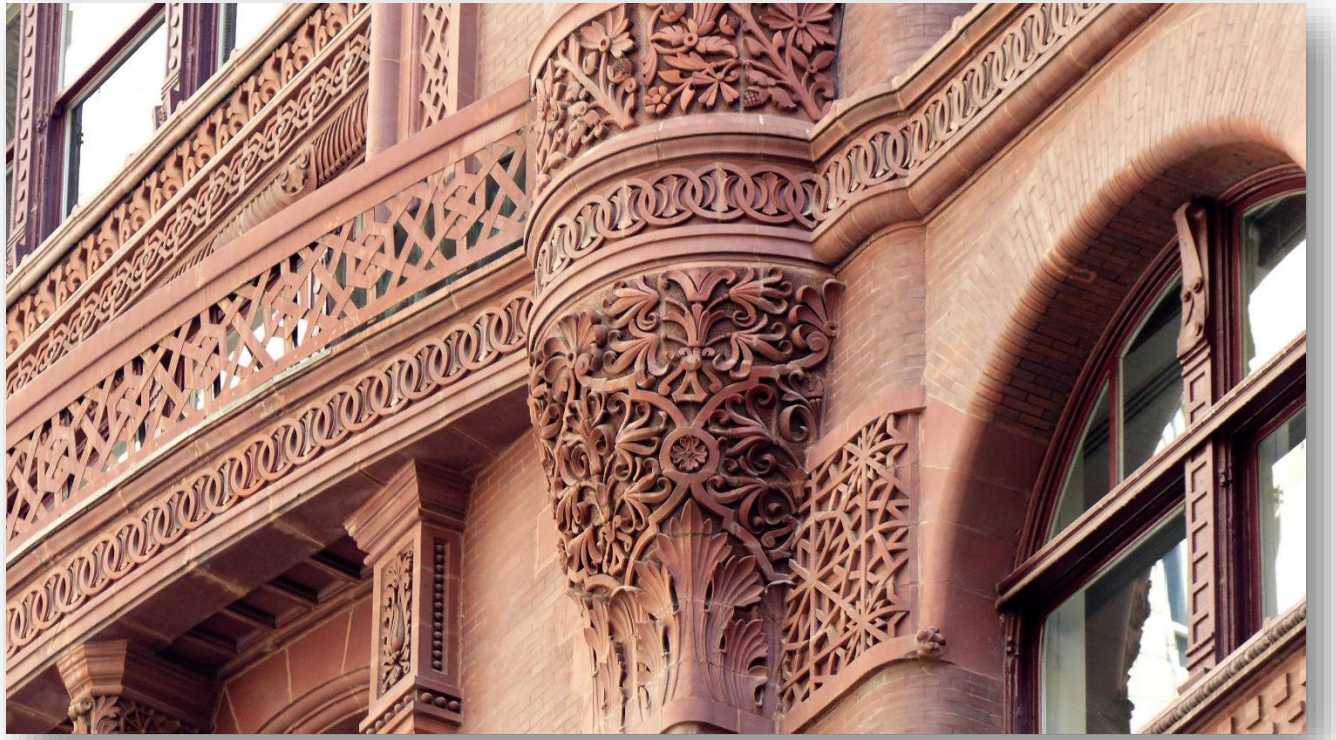
MASONRY MATERIALITY

TERRA COTTA

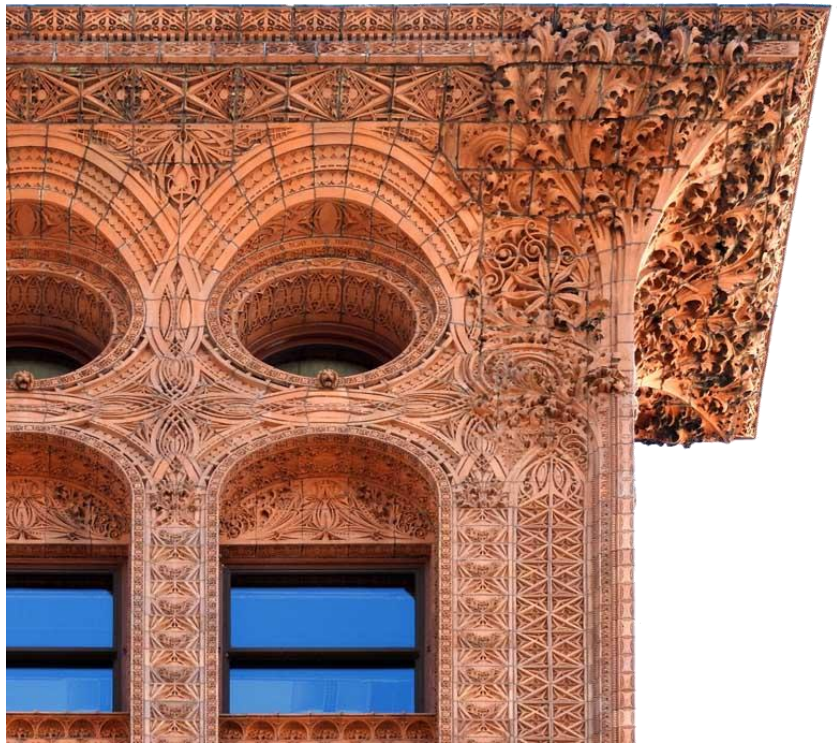
INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

TERRA COTTA



Rookery Building, Chicago, Burnham & Root, 1888

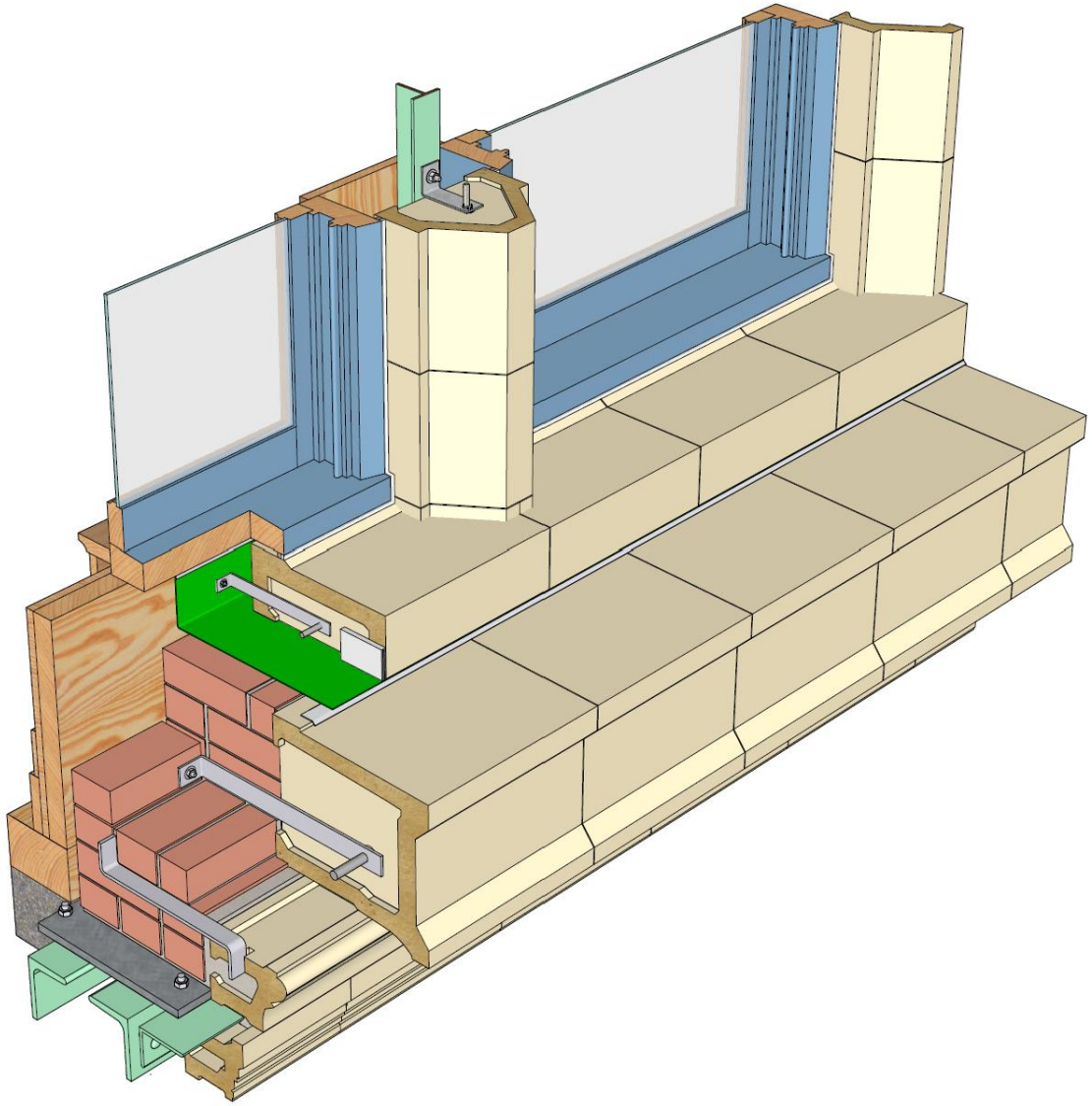


Guaranty Building, Buffalo, NY, Louis Sullivan, 1896

TERRA COTTA

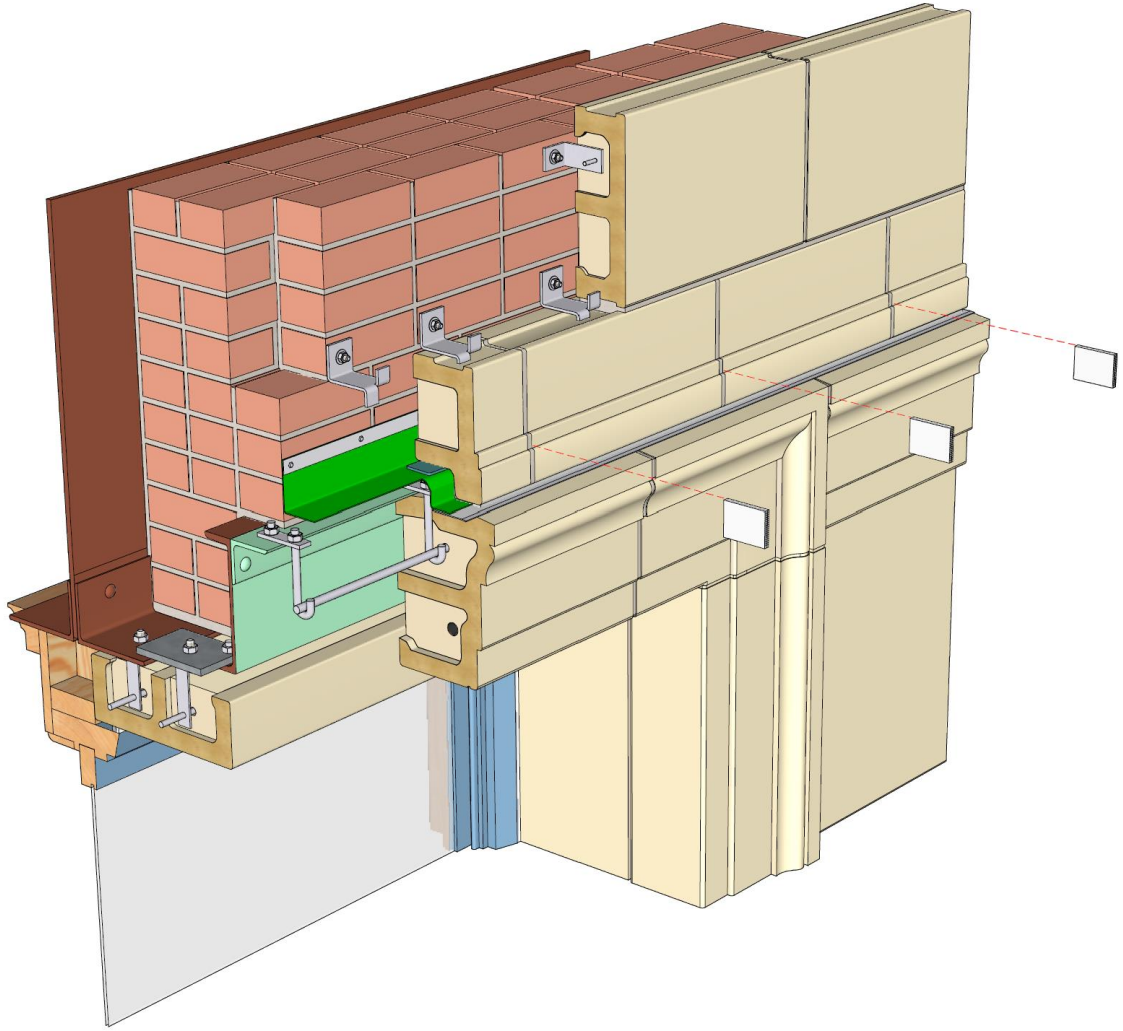
Wrigley Building, Chicago, Graham Anderson Probst & White, 1921-1924

TERRA COTTA

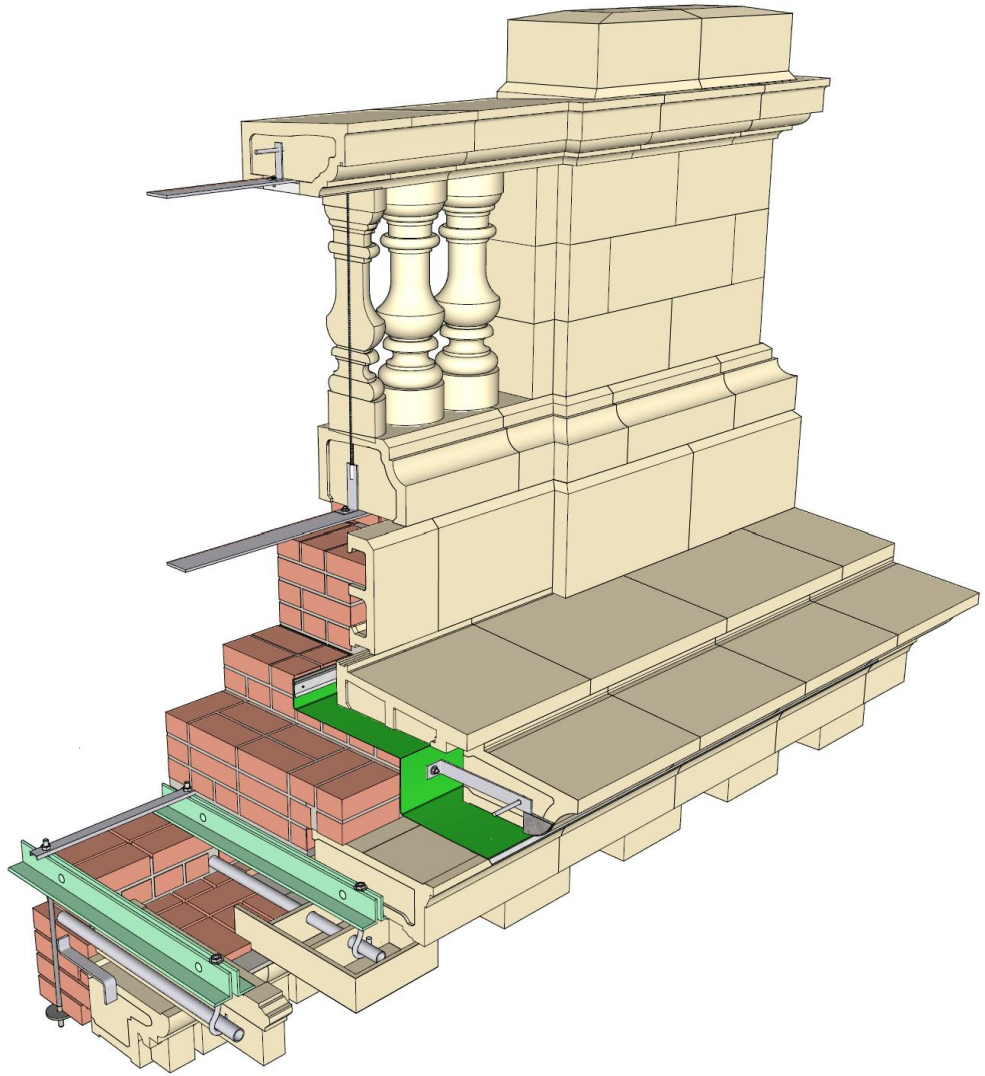


Terra cotta sill and mullion reconstruction detail

TERRA COTTA



Terra cotta lintel reconstruction detail



Terra cotta cornice and parapet reconstruction detail

TERRA COTTA

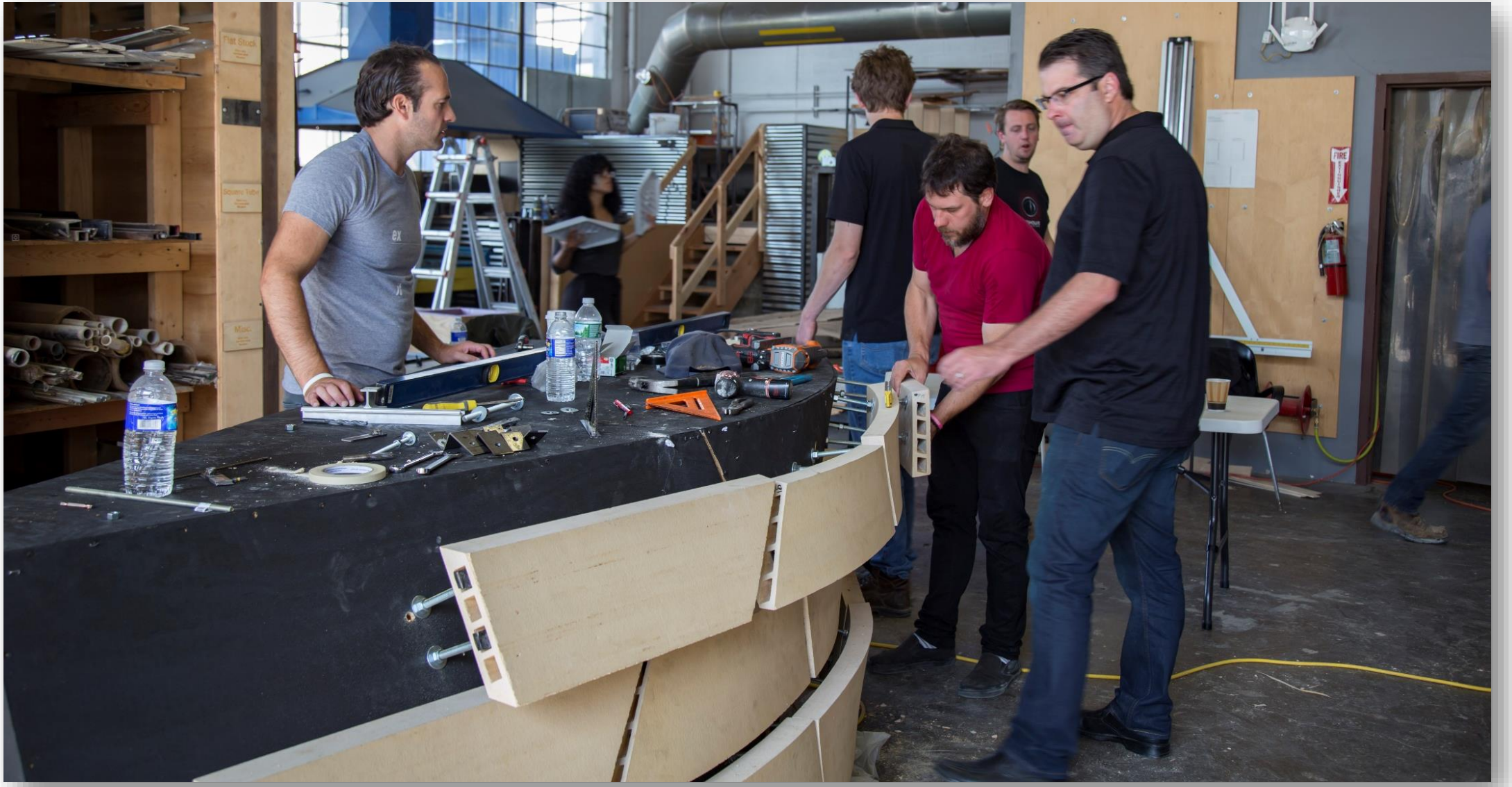
TERRA COTTA

Domestic Violence Courthouse, Chicago, Campbell Tiu Campbell Architects

TERRA COTTA

Oakton Community College Lee Center, Legat Architects

TERRA COTTA



Architectural Ceramic Assemblies Workshop, School of Architecture, Carnegie Mellon University

TERRA COTTA

Architectural Ceramic Assemblies Workshop, School of Architecture, Carnegie Mellon University

TERRA COTTA

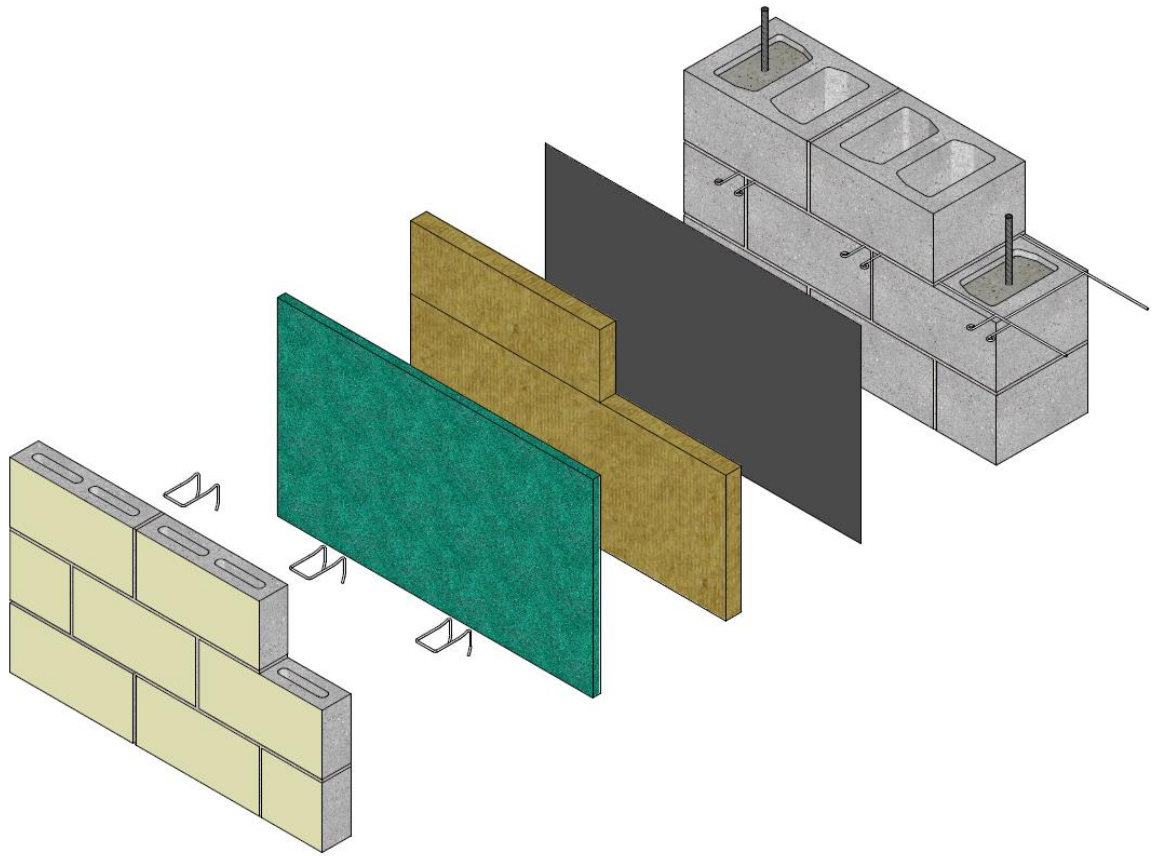
Architectural Ceramic Assemblies Workshop, School of Architecture, Carnegie Mellon University

TERRA COTTA

Architectural Ceramic Assemblies Workshop, School of Architecture, Carnegie Mellon University

MASONRY MATERIALITY

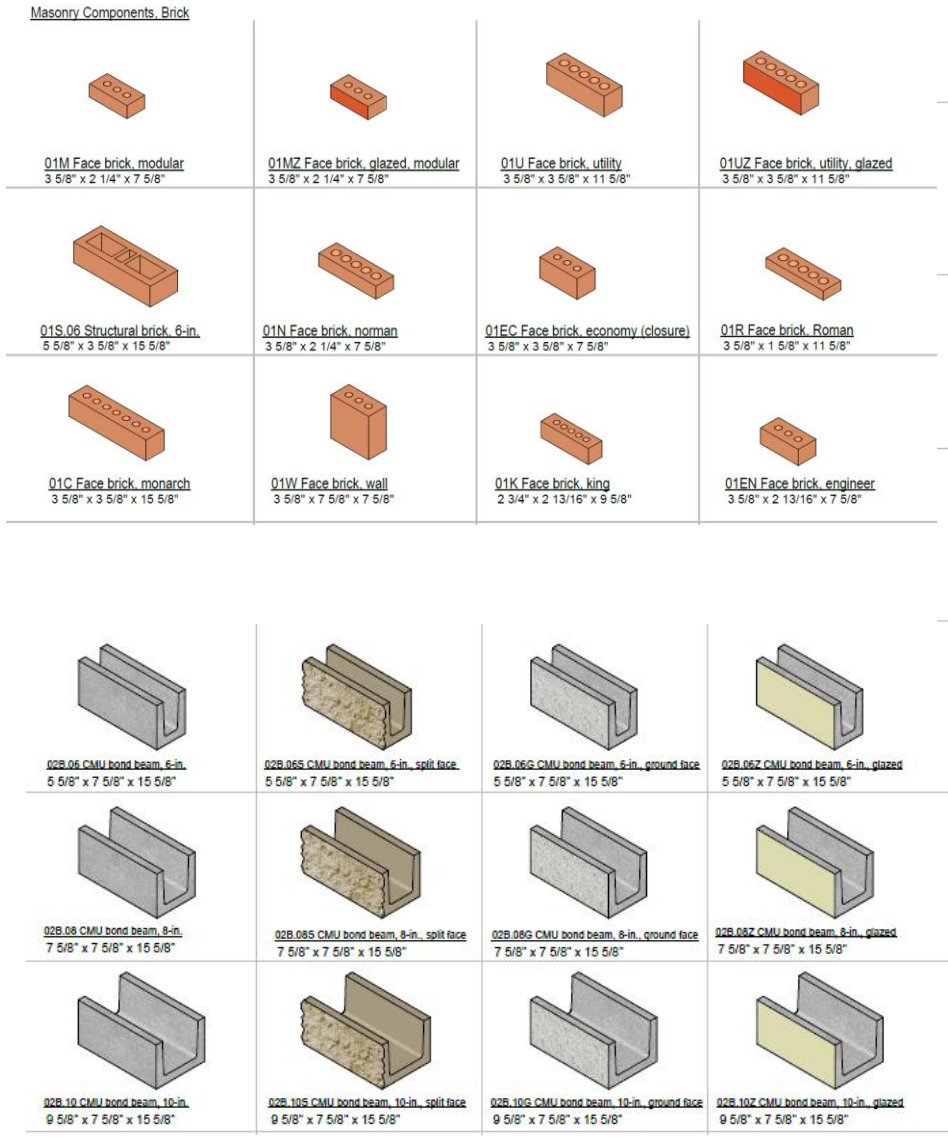
WALL ASSEMBLIES

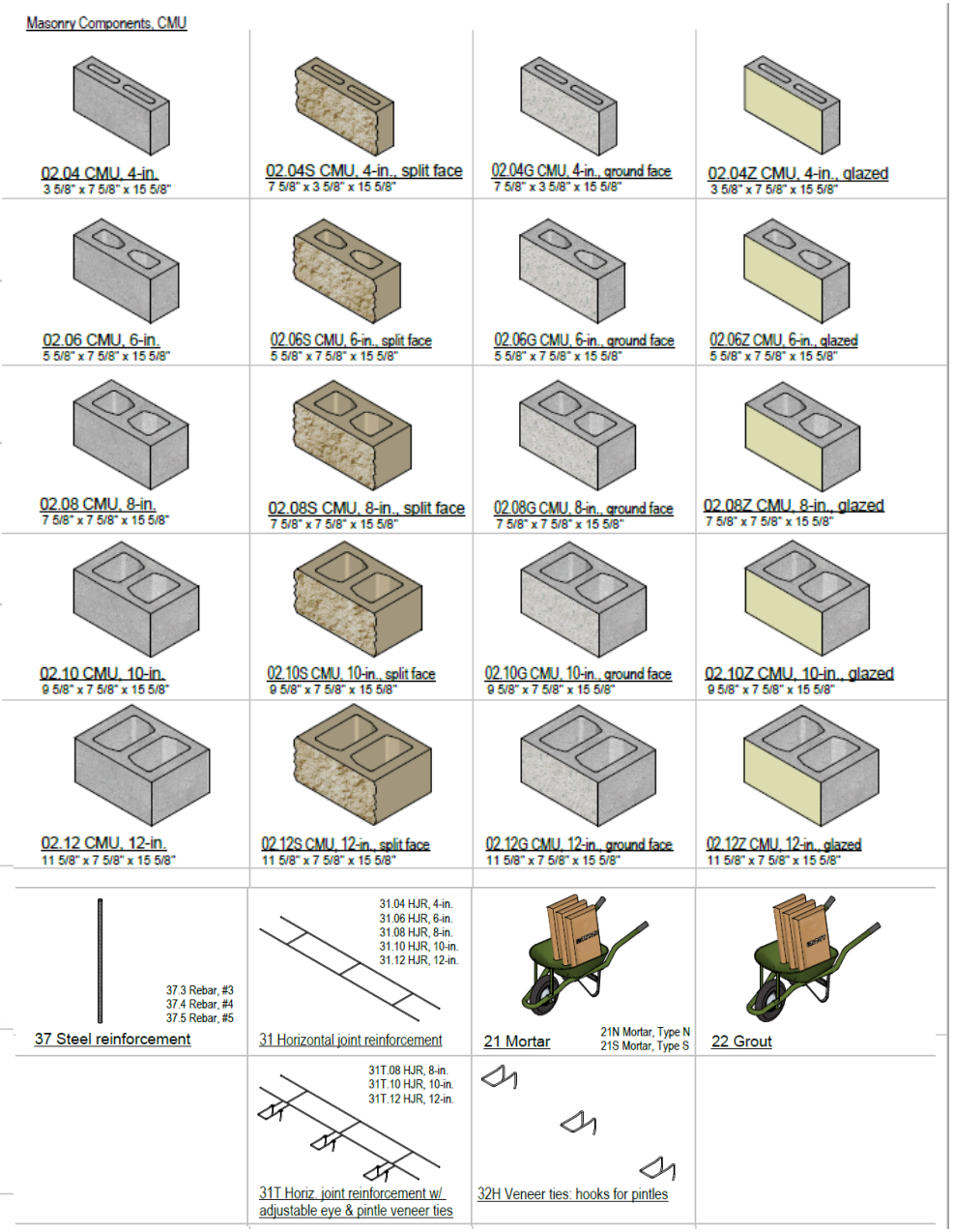


INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

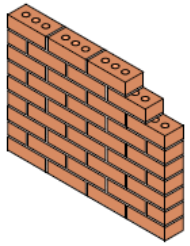
MASONRY | UNITS



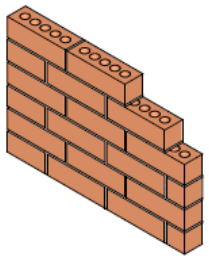


MASONRY | WYTHES

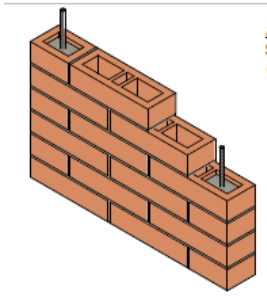
Masonry Assemblies, Brick



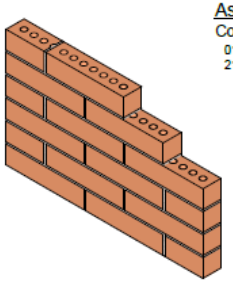
Assembly 01
Face brick, modular
Components:
01M Face brick, modular
21 Mortar



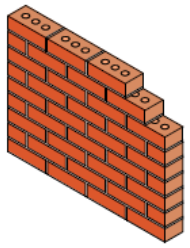
Assembly 02
Face brick, utility
Components:
01U Face brick, utility
21 Mortar



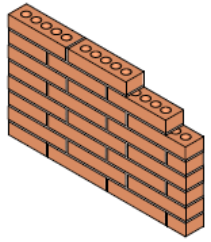
Assembly 32
Structural brick, 6-in.
Components:
01S.06 Structural brick, 6-in.
21 Mortar
22 Grout
37 Steel reinforcement



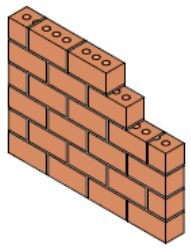
Assembly 7
Components:
01M Face brick, monarch
21 Mortar



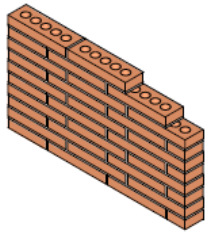
Assembly 19
Components:
01ZM Face brick, glazed, modular
21 Mortar



Assembly 01N
Face brick, monarch
Components:
01N Face brick, norman
21 Mortar

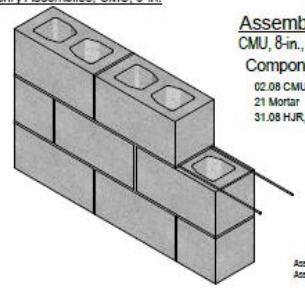


Assembly 03
Face brick, economy (closure)
Components:
01EC Face brick, economy
21 Mortar



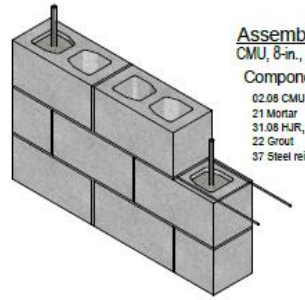
Assembly 01R
Face brick, Roman
Components:
01R Face brick, Roman
21 Mortar

Masonry Assemblies, CMU, 8-in.

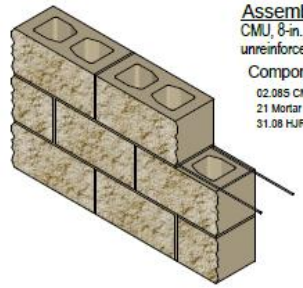


Assembly 33, 34
CMU, 8-in., unreinforced
Components:
02.08 CMU, 8-in.
21 Mortar
31.08 HJR, ladder-type, 8-in.

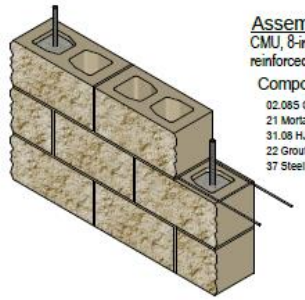
Assembly 33 is normal weight block
Assembly 34 is lightweight block



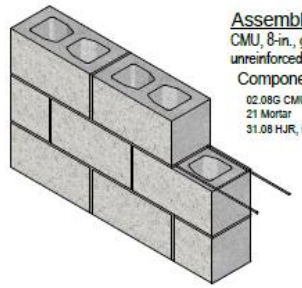
Assembly 33R
CMU, 8-in., reinforced
Components:
02.08 CMU, 8-in.
21 Mortar
31.08 HJR, ladder-type, 8-in.
22 Grout
37 Steel reinforcement



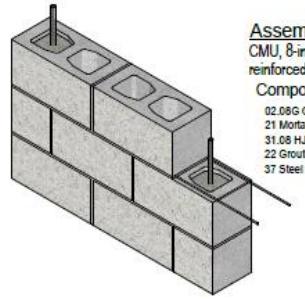
Assembly 36
CMU, 8-in., split face, unreinforced
Components:
02.085 CMU, 8-in., split face
21 Mortar
31.08 HJR, ladder-type, 8-in.



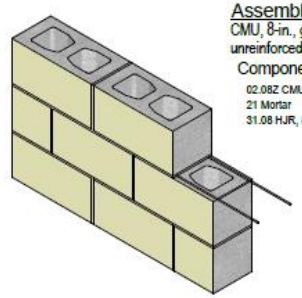
Assembly 36R
CMU, 8-in., split face, reinforced
Components:
02.085 CMU, 8-in., split face
21 Mortar
31.08 HJR, ladder-type, 8-in.
22 Grout
37 Steel reinforcement



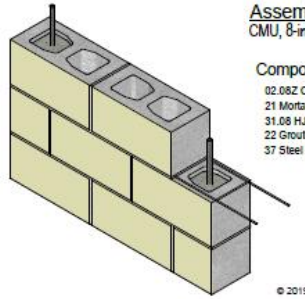
Assembly 37
CMU, 8-in., ground face, unreinforced
Components:
02.08G CMU, 8-in., ground face
21 Mortar
31.08 HJR, ladder-type, 8-in.



Assembly 37R
CMU, 8-in., ground face, reinforced
Components:
02.08G CMU, 8-in., ground face
21 Mortar
31.08 HJR, ladder-type, 8-in.
22 Grout
37 Steel reinforcement



Assembly 35
CMU, 8-in., glazed, unreinforced
Components:
02.08Z CMU, 8-in., glazed
21 Mortar
31.08 HJR, ladder-type, 8-in.



Assembly 35R
CMU, 8-in., glazed, reinforced
Components:
02.08Z CMU, 8-in., glazed
21 Mortar
31.08 HJR, ladder-type, 8-in.
22 Grout
37 Steel reinforcement

MASONRY | VENEER

TMS 402

Veneer

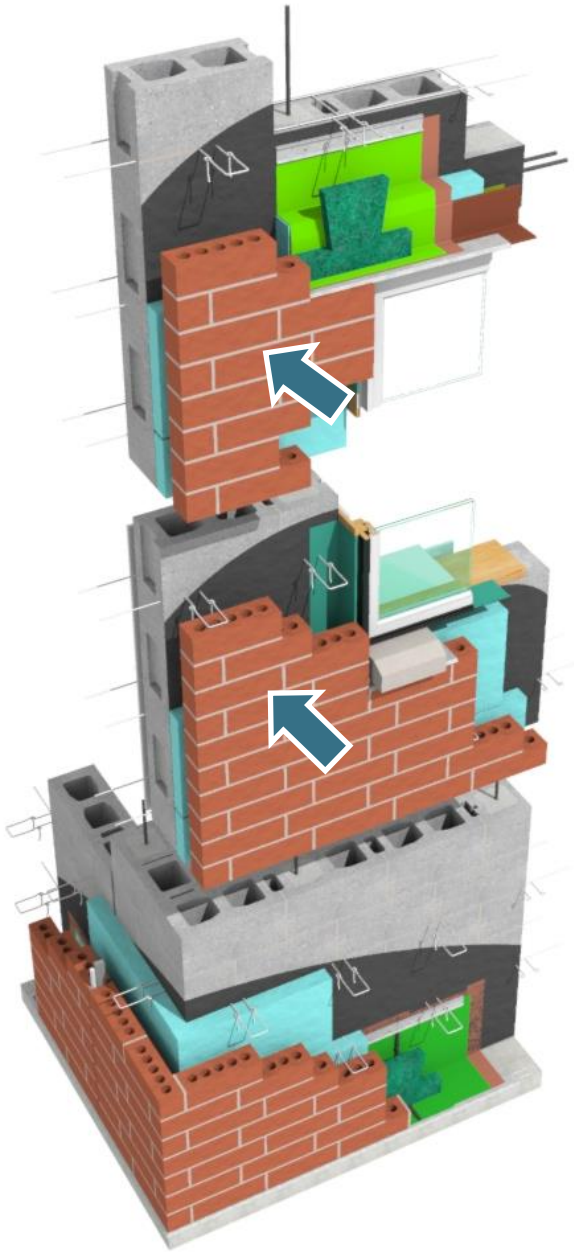
Exterior finish of a wall system which transfers out-of-plane load directly to a backing but is not considered to add strength or stiffness to the wall system.

Anchored veneer

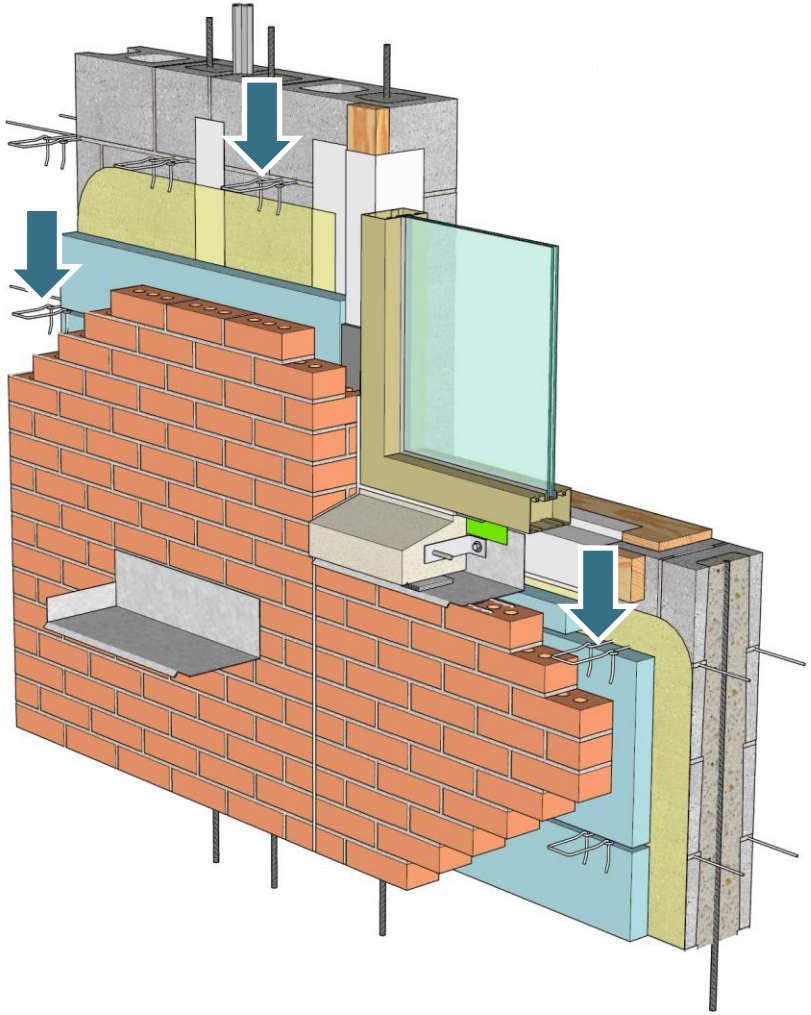
Veneer secured to and supported laterally by the backing through anchors and supported vertically by the foundation or other structural members.

Adhered veneer

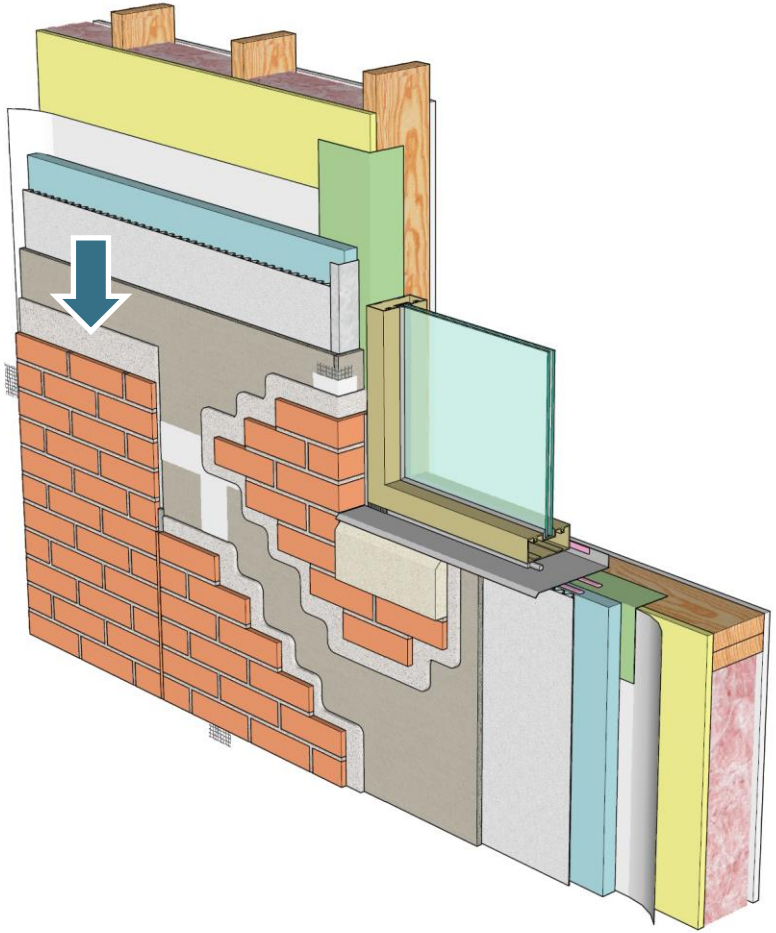
Masonry veneer secured to and supported by the backing through adhesion.



TYPES OF VENE

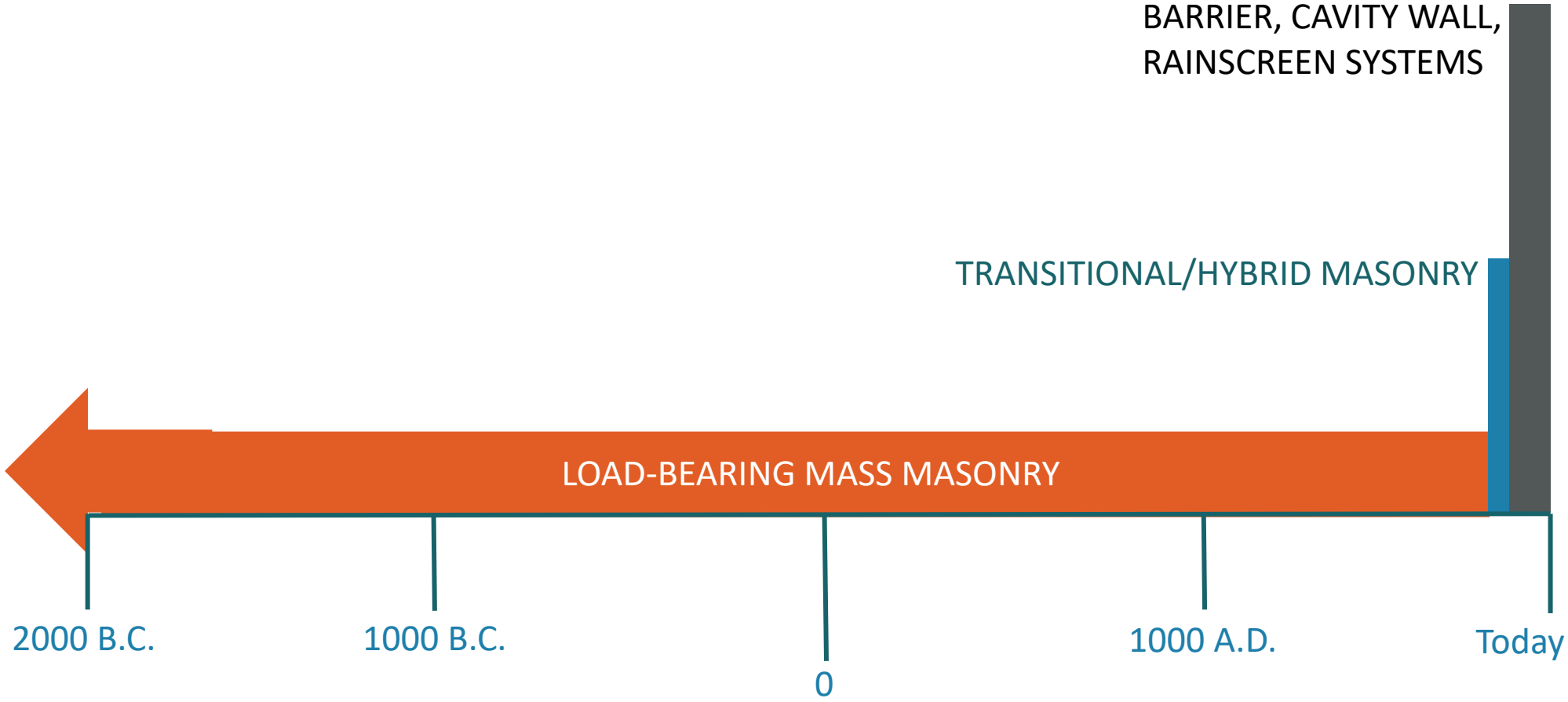


Anchored veneer

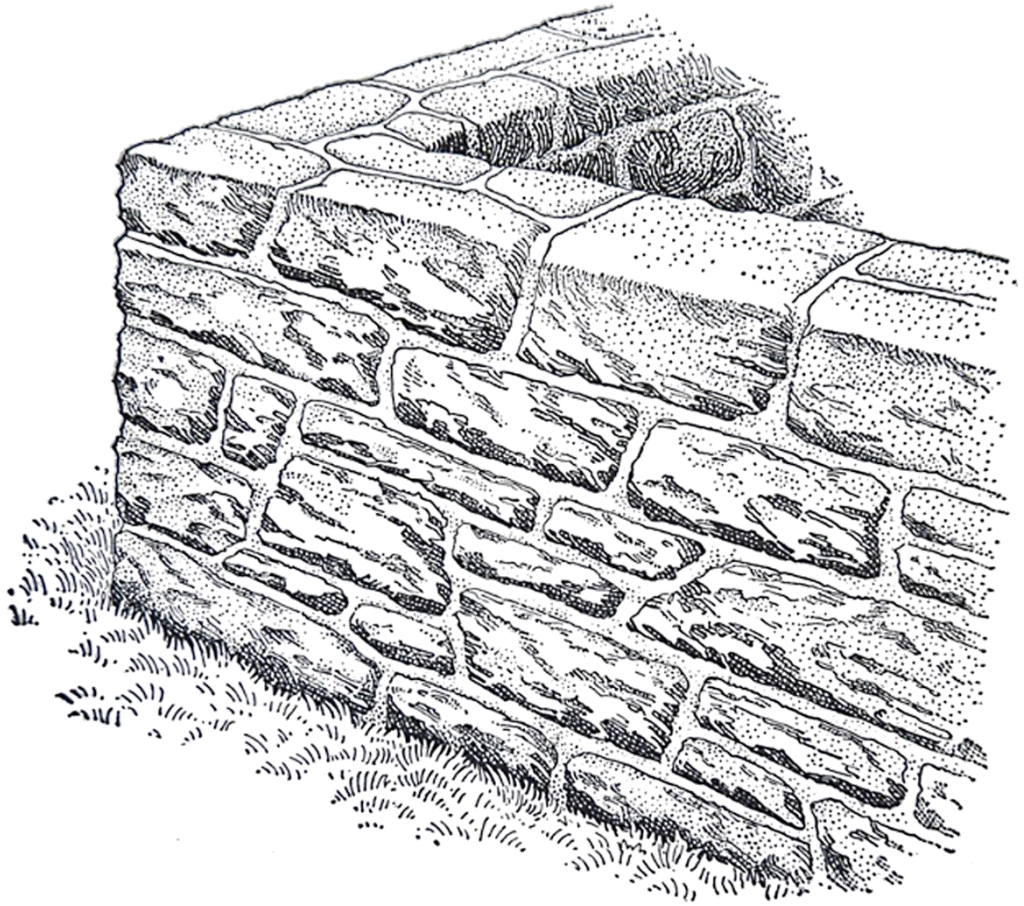


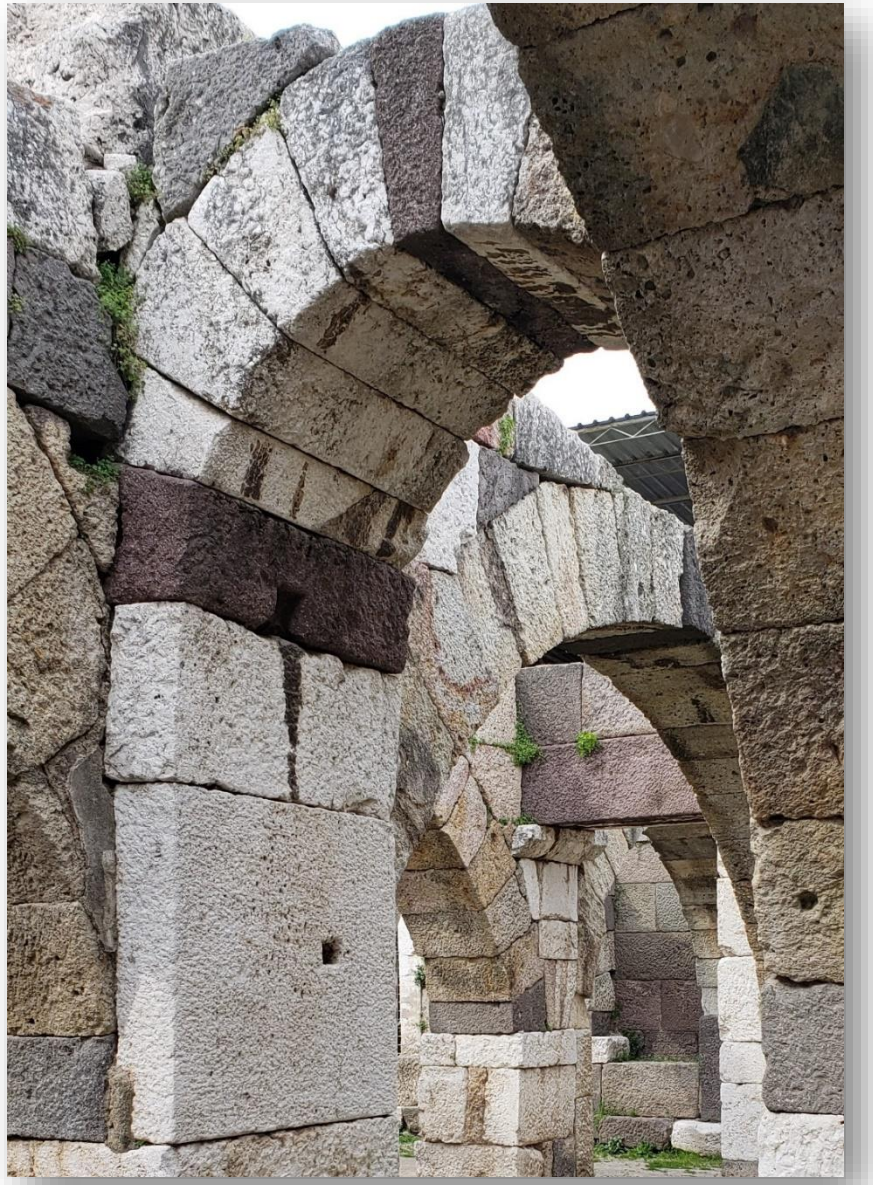
Adhered veneer

STONE MASONRY WALLS | TIMELINE



MASS MASONRY | STONE

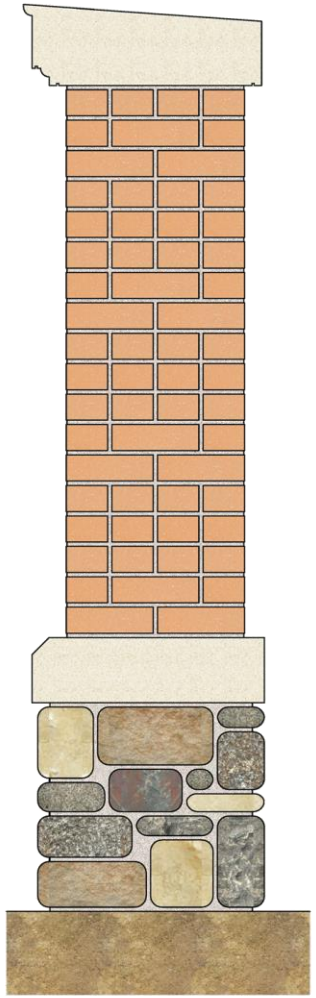




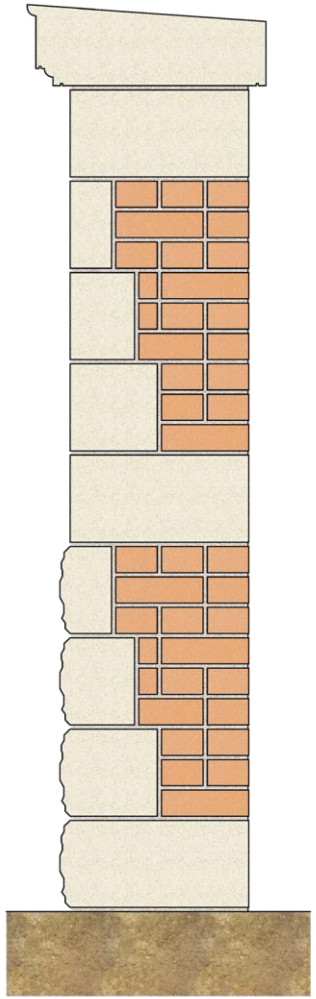
Just stone.

MASS MASONRY | VARIATIONS OF STONE WALLS

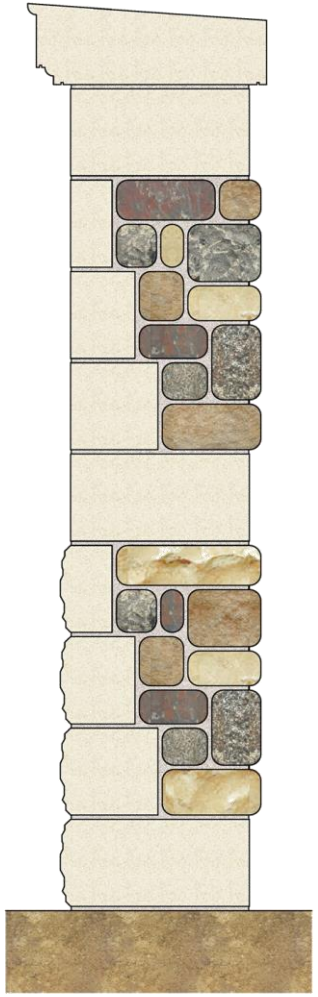
Mass rubble wall



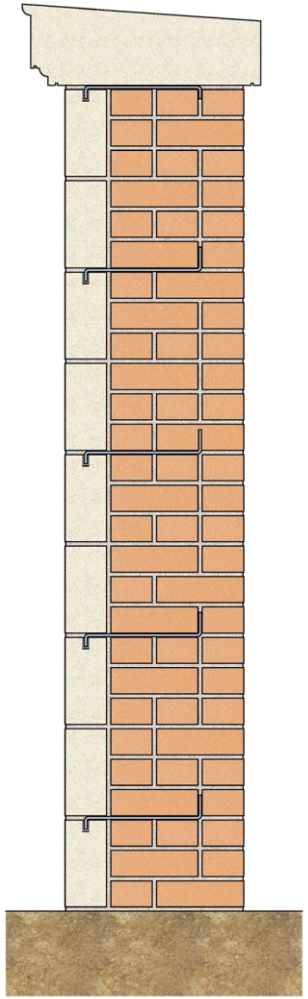
Mass brick wall w/ rubble foundation



Coursed ashlar wall w/ brick backing



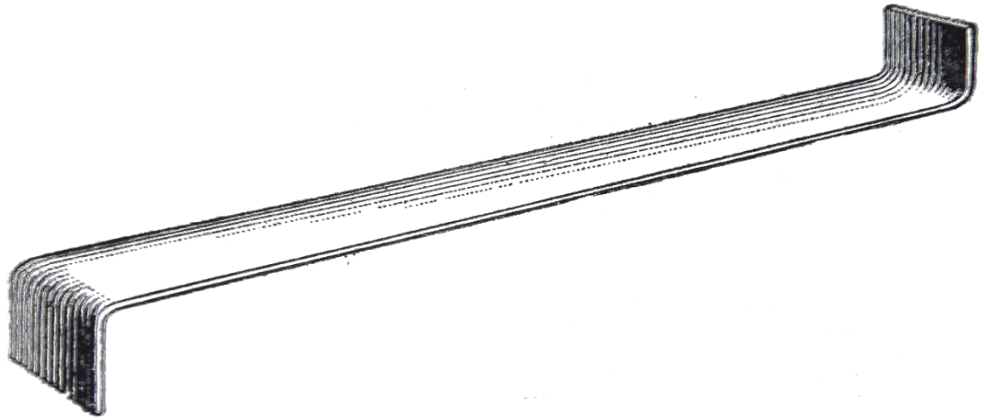
Ashlar wall w/ rubble backing

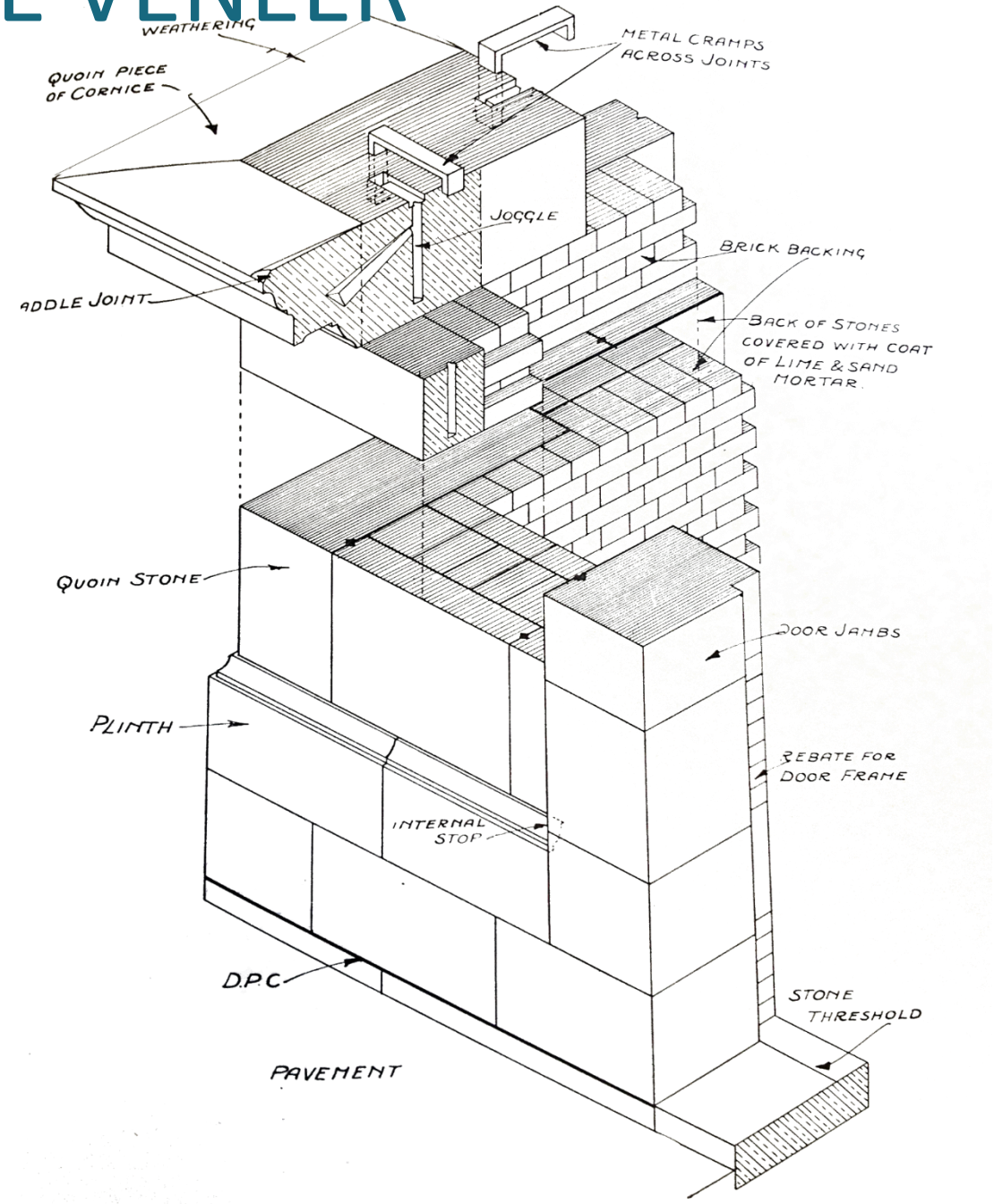


Ashlar veneer wall w/ brick backing

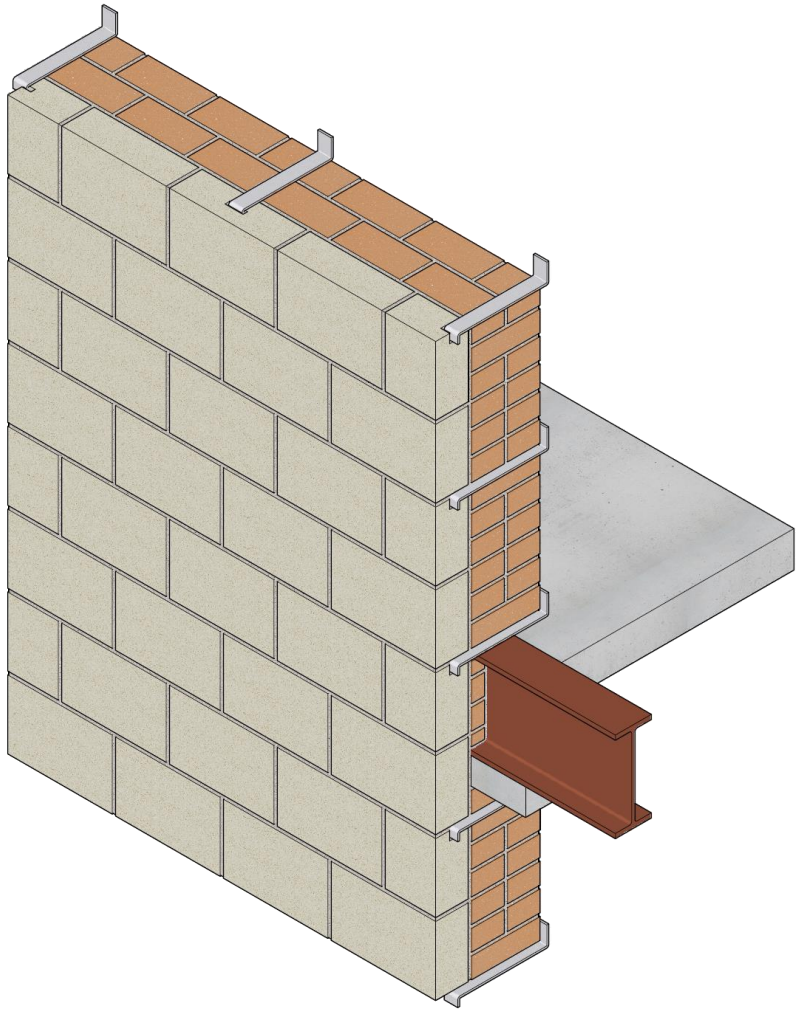
MASS MASONRY | STONE VENEER

Earliest uses of steel integrated into a masonry assembly around late 19th Century

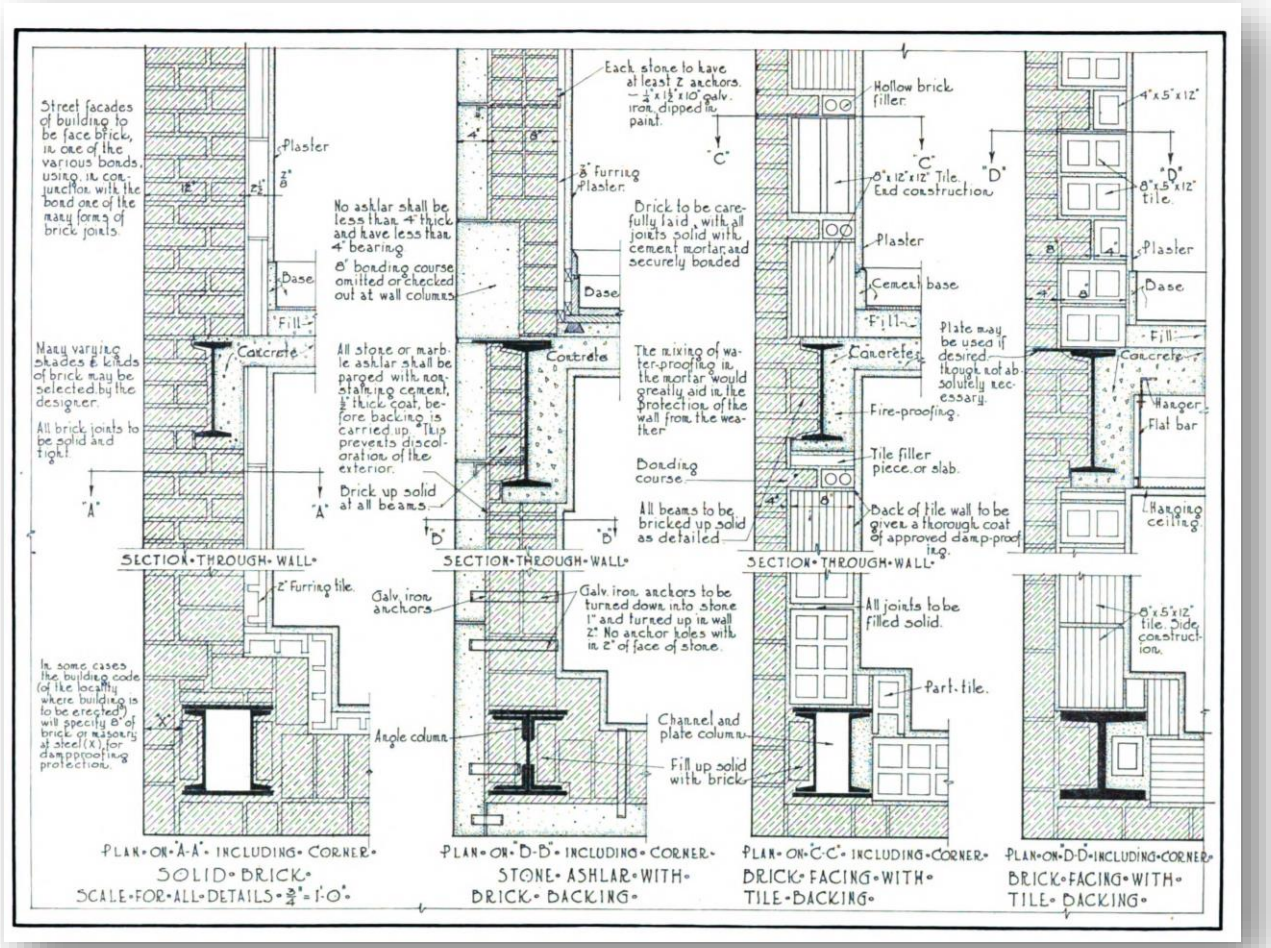




TRANSITIONAL MASONRY



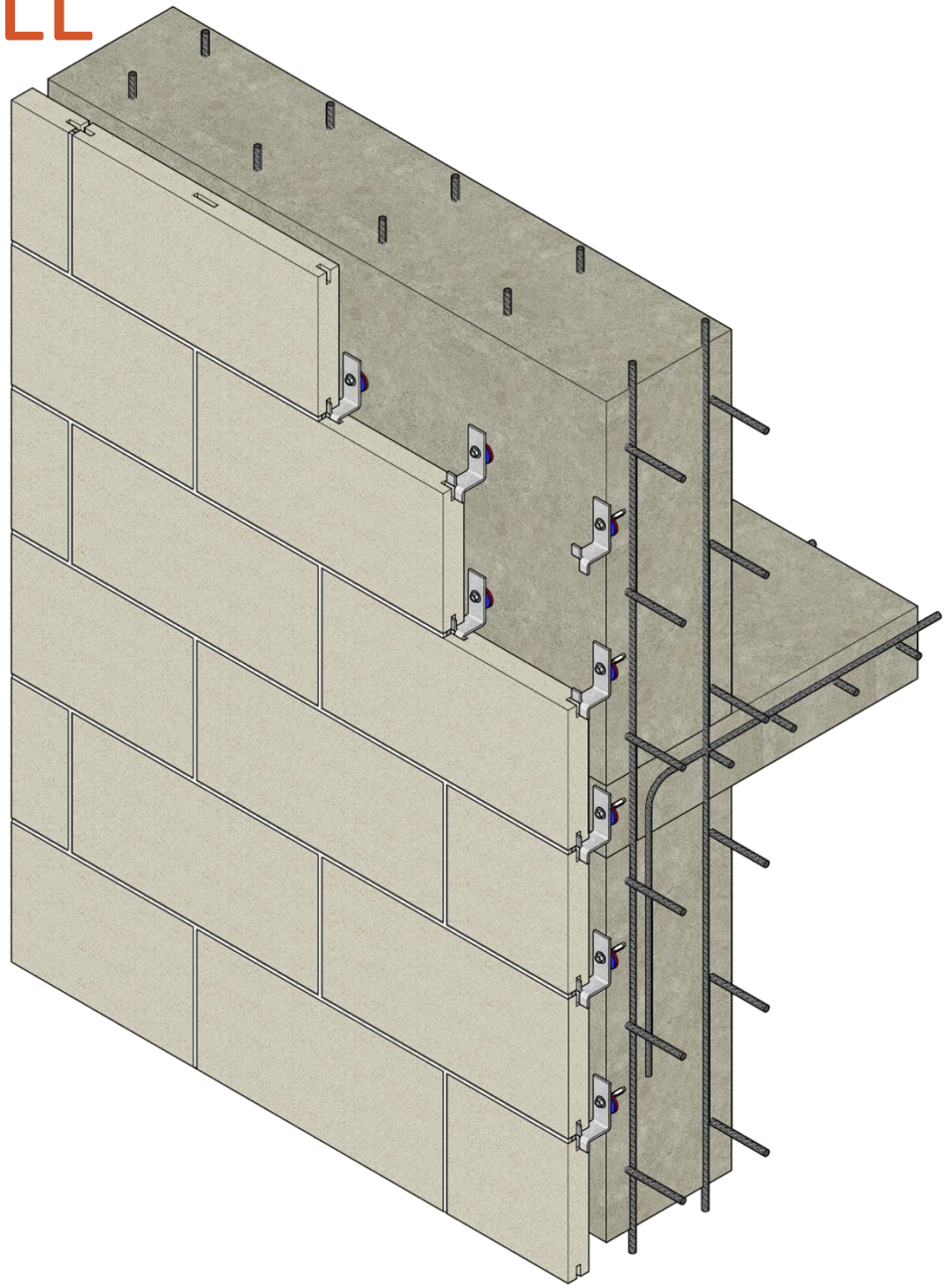
Transitional stone veneer w/ brick backing, structural steel framing



Good Practice in Construction, Philip Knobloch, 1923, Pencil Points Press

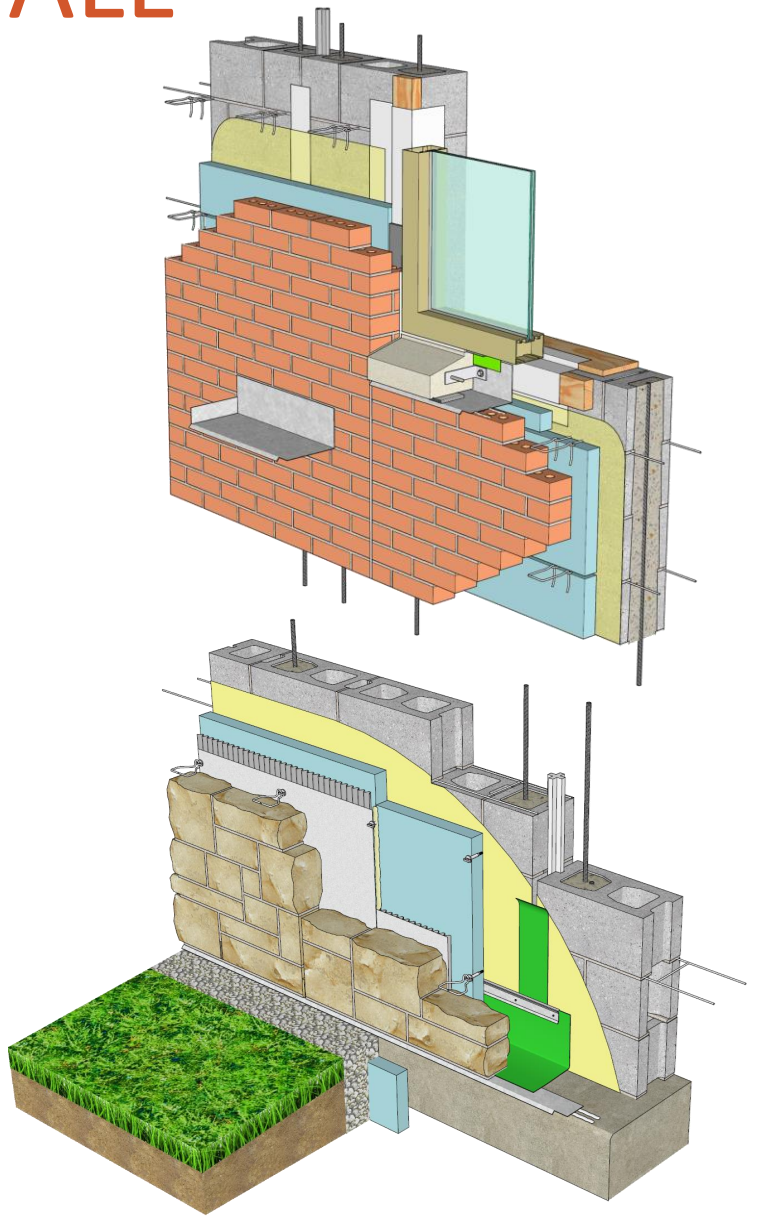
MID-CENTURY BARRIER WALL

- 1950s to present
- Interior structure supports floors and exterior structure
- Exterior cladding becomes thinner
- No weeps or moisture path



ANCHORED VENEER CAVITY WALL

- 1970s to present
- Brick or stone anchored to backing of concrete masonry or studs & sheathing
- Drainage cavity collects moisture that penetrates veneer
- Moisture diverted out of wall via flashing & weeps

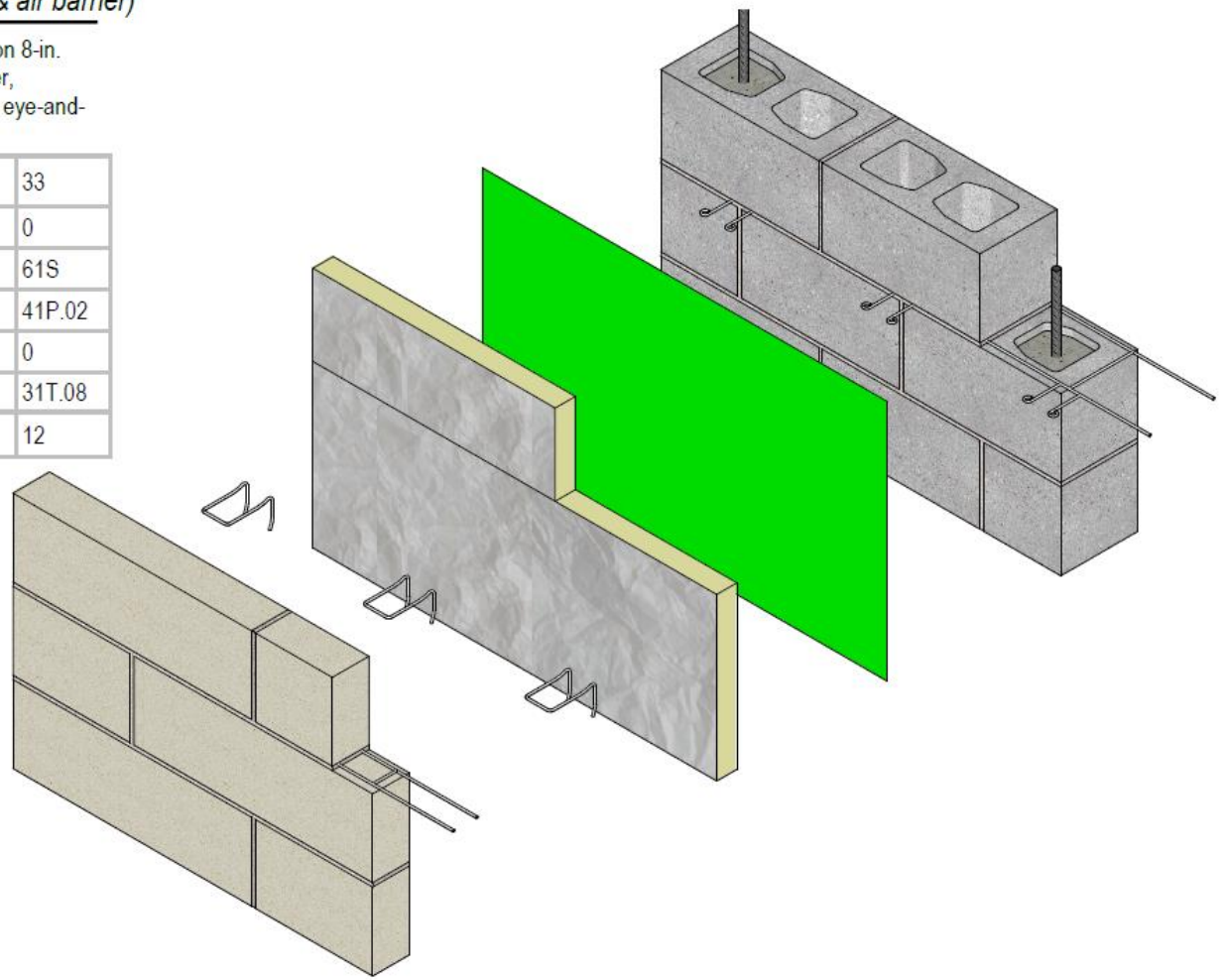


MASONRY | MULTIWYTHE ASSEMBLIES

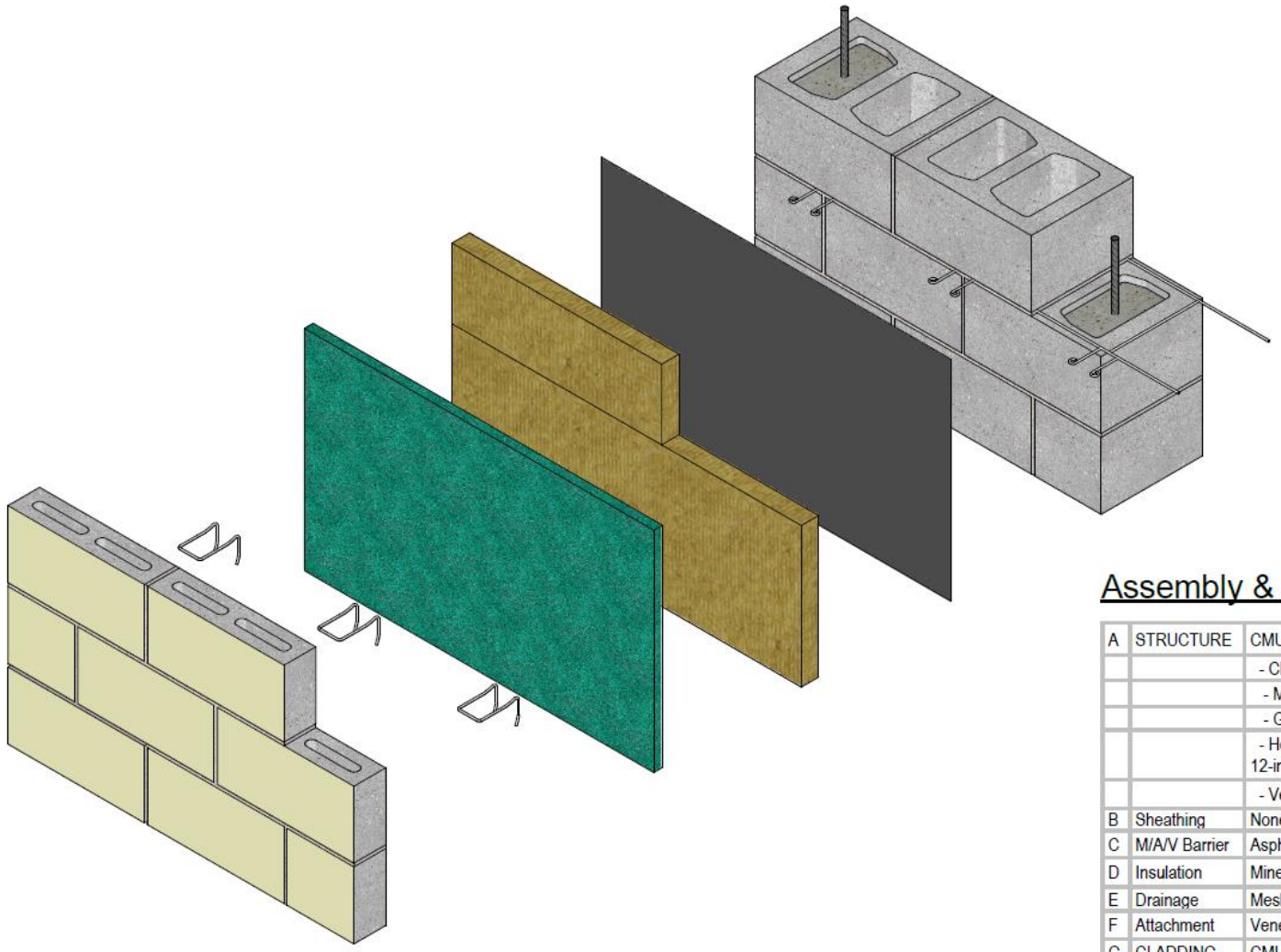
System 67 *(modified for insulation & air barrier)*

4-in. calcium silicate (Renaissance Stone) veneer on 8-in. unreinforced CMU backing; sheet-applied air barrier, polyisocyanurate insulation, 2 1/4" drainage cavity, eye-and-pintle veneer ties

A	Structure	CMU, 8-in., unreinforced	33
B	Sheathing	None	0
C	M/A/V Barrier	Sheet	61S
D	Insulation	Polyisocyanurate, 2-in.	41P.02
E	Drainage	2 1/4" drainage cavity	0
F	Attachment	Veneer ties, eye pintle	31T.08
G	Cladding	Calcium Silicate, 4-in.	12



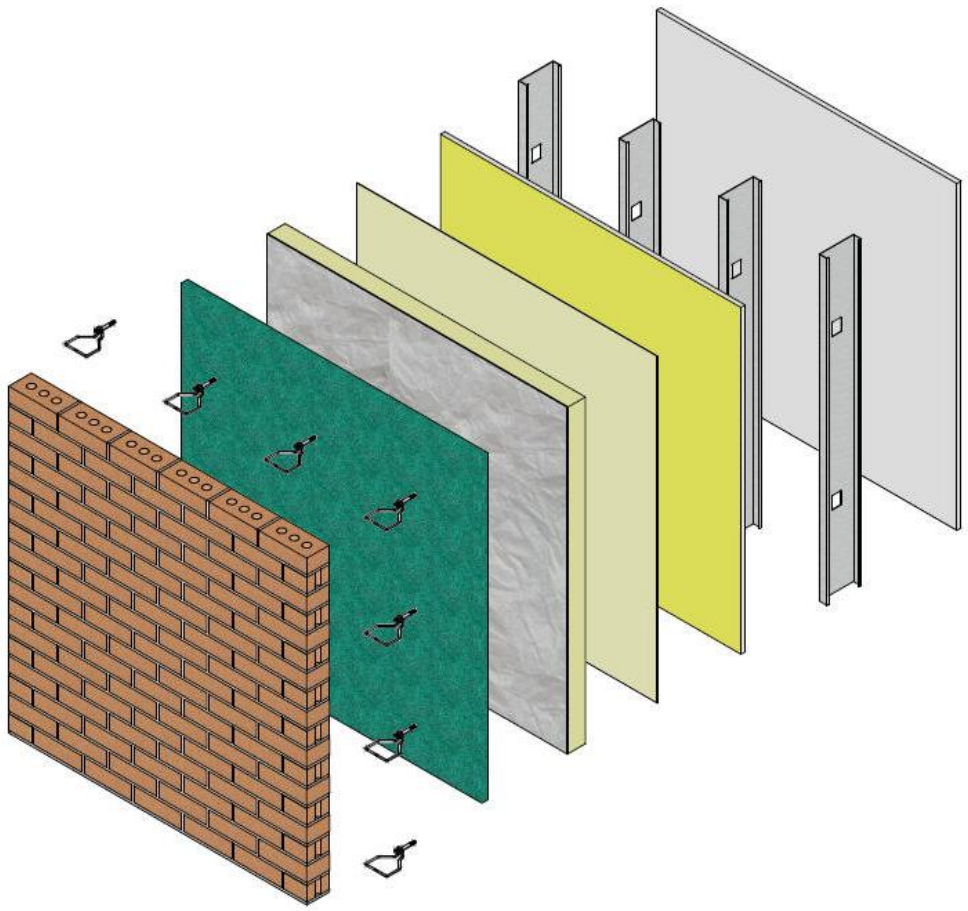
MASONRY | MULTIWYTHE ASSEMBLIES



Assembly & Component Schedule

A	STRUCTURE	CMU, 12-IN., REINFORCED	53R
		- CMU, 12-in., medium wt.	02M.12
		- Mortar, Type S	21S
		- Grout, 3,000 psi	22
		- Horizontal joint reinforcement, 12-in., ladder-type, eye & pintle	31T.12
		- Vertical reinforcement, #5	37.5
B	Sheathing	None	None
C	M/A/V Barrier	Asphaltic felt	61A
D	Insulation	Mineral wool, 2-in.	41M.02
E	Drainage	Mesh-type insert	35M
F	Attachment	Veneer ties, eye pintle	31T.12
G	CLADDING	CMU, 4-IN., GLAZED	18
		- CMU, 4-in., glazed	02.04Z
		- Mortar,Type S	21S

MASONRY | MOLDWYTHE ASSEMBLIES



A. Structure

B. Sheathing*

C. Air/moisture barrier*

D. Insulation*

E. Drainage*

F. Attachment*

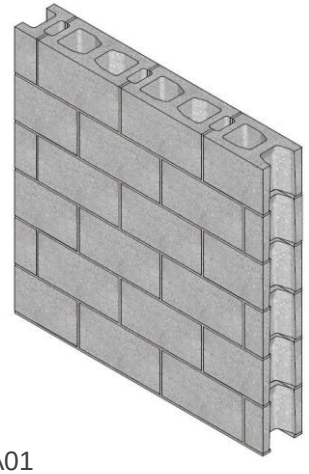
G. Cladding*

H. Interior finish*

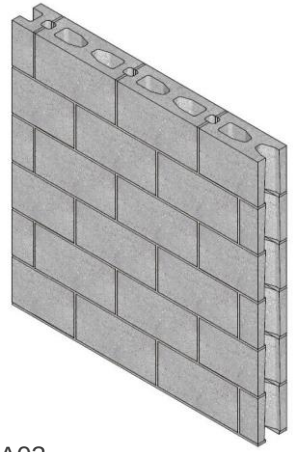
* optional

MASONRY | MOLDWORK ASSEMBLIES

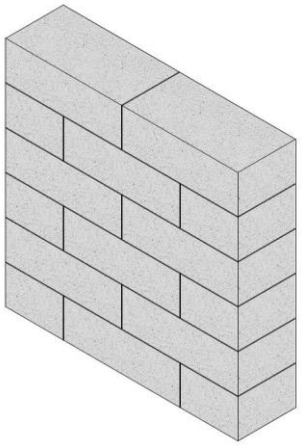
A. Structure



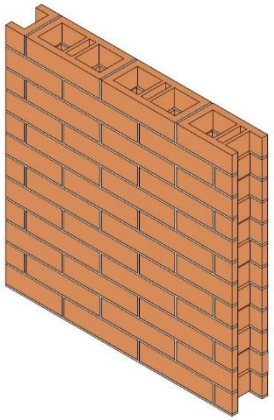
A01
Concrete masonry, 8-in.



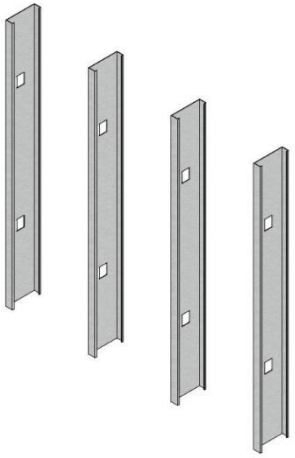
A03
Concrete masonry, 6-in.



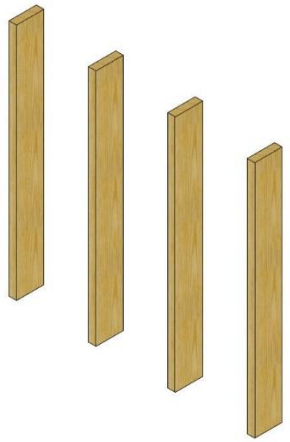
A19 Autoclaved aerated concrete, 12-in.



A07
Structural clay brick

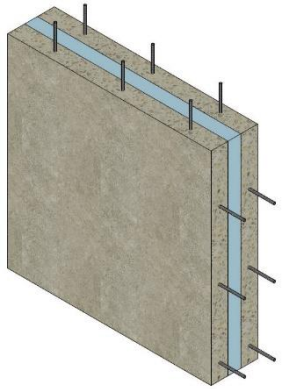


A09
Steel studs, 6-in.



A14
Wood studs, 6-in.

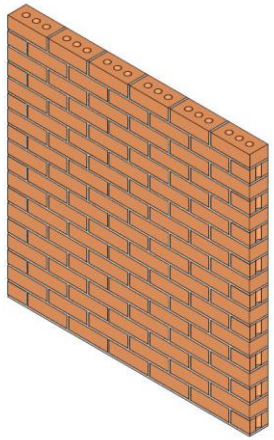
A16
Concrete, cast-in-place



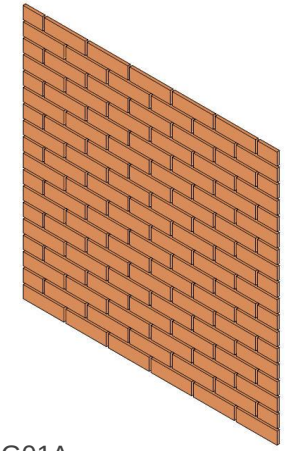
A17
Concrete, precast

MASONRY | MOISTURE ASSEMBLIES

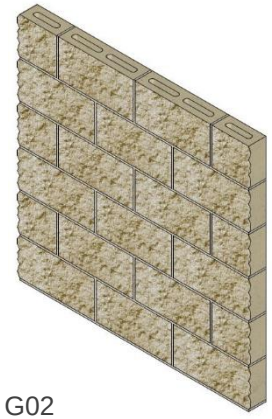
G. Cladding



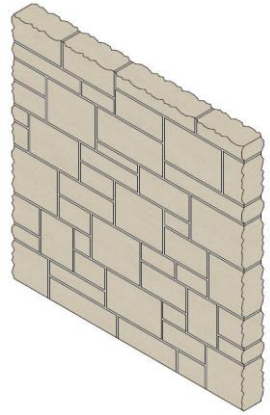
G01
Face brick



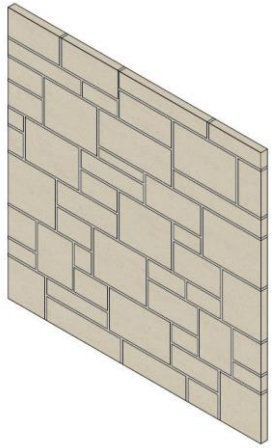
G01A
Face brick, thin



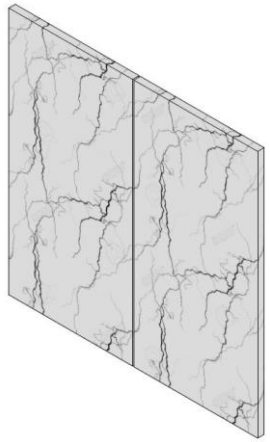
G02
Concrete masonry, architectural



G03
Stone

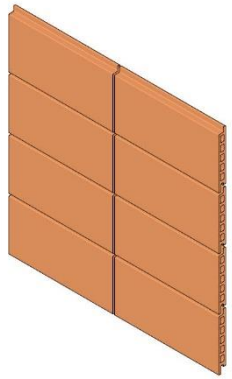


G03A
Stone, thin



G04
Dimension stone

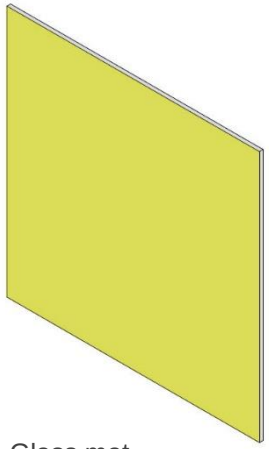
G06
Tile



G07
Terra cotta

MASONRY | MOISTURE ASSEMBLIES

B. Sheathing



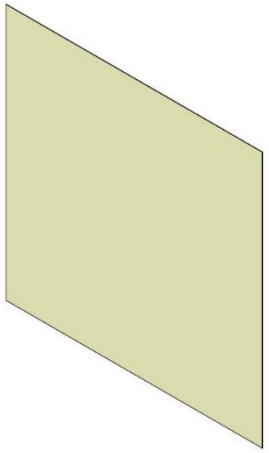
B1 Glass mat reinforced gypsum board

B2 Plywood

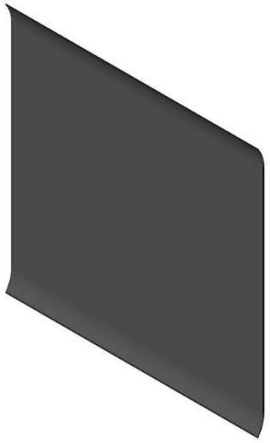
B3 Oriented strand board

B5 Cement board

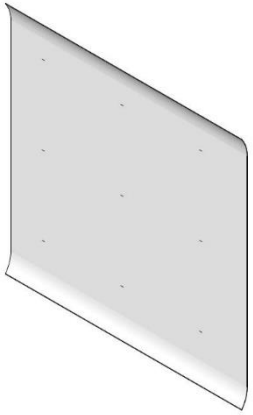
C. Air/Moisture Barrier



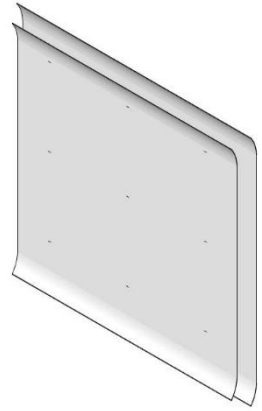
C1 Fluid-applied



C4 Building felt



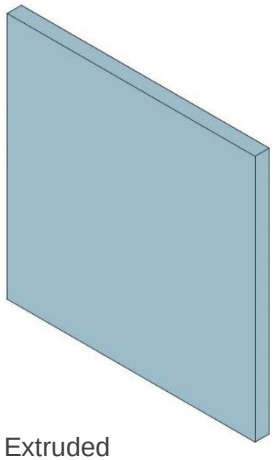
C5 Polyolefin sheet wrap



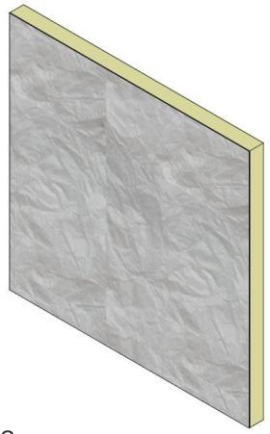
C6 Polyolefin sheet wrap, 2 layers

MASONRY | MOISTURE ASSEMBLIES

D. Insulation



D1 Extruded polystyrene (XPS)

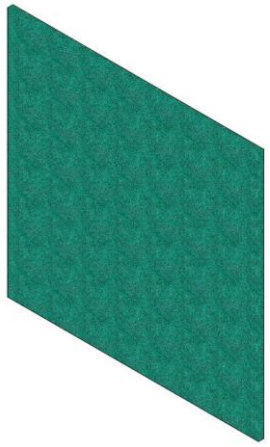


D3 Polyisocyanurate

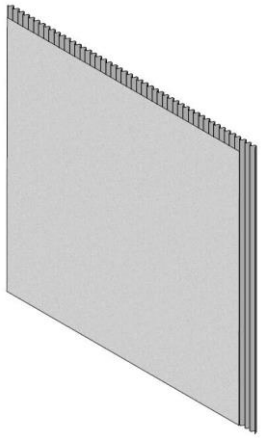
D4 Spray polyurethane foam (SPF)

D5 Mineral wool

E. Drainage



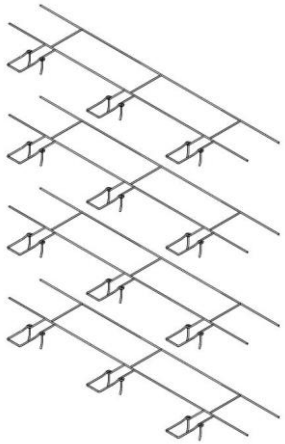
E2 Drainage insert, mesh type



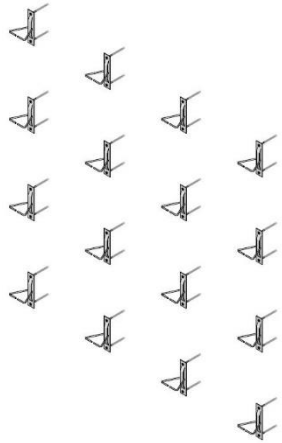
E3 Drainage insert, channel type

MASONRY | MOLDWORK ASSEMBLIES

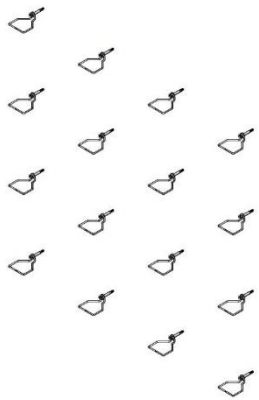
F. Attachment



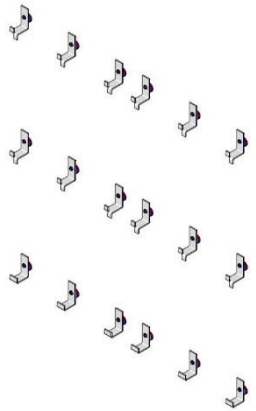
F1 Horizontal joint reinforcement w/ wall ties



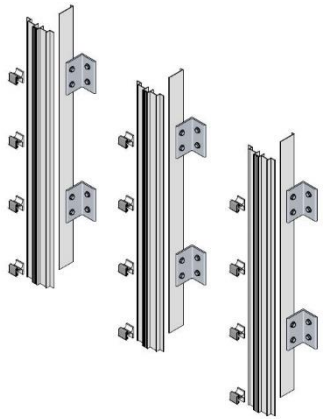
F2 Adjustable anchors, slot-type



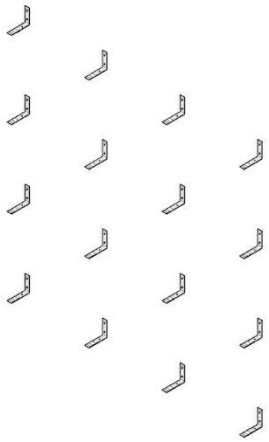
F3 Adjustable anchors, pintle-type



F4 Stone anchors

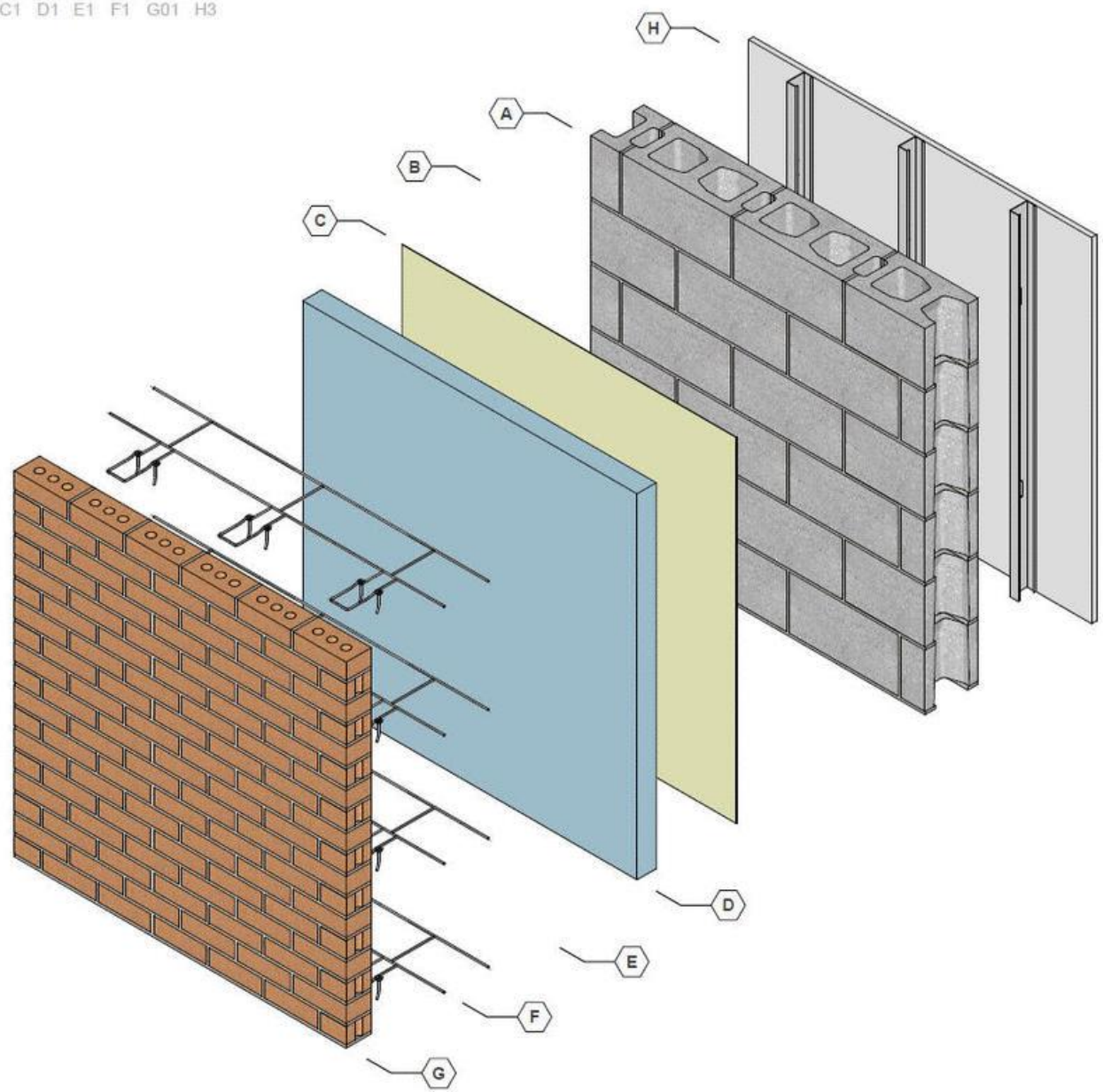


F5 Engineered framing system



F7 Corrugated sheet metal anchors

A05 B0 C1 D1 E1 F1 G01 H3



Wall sub-assemblies

A Wall structure
Concrete masonry, 12-in.

B Sheathing
No sheathing

C Air/moisture barrier
Fluid-applied air/moisture barrier

D Insulation
Extruded polystyrene (XPS), thickness as specified

E Drainage
Air space, width as specified

F Attachment
Horizontal joint reinforcement w/ integral wall ties

G Cladding
Brick veneer

H Interior finish
Painted wallboard on steel studs

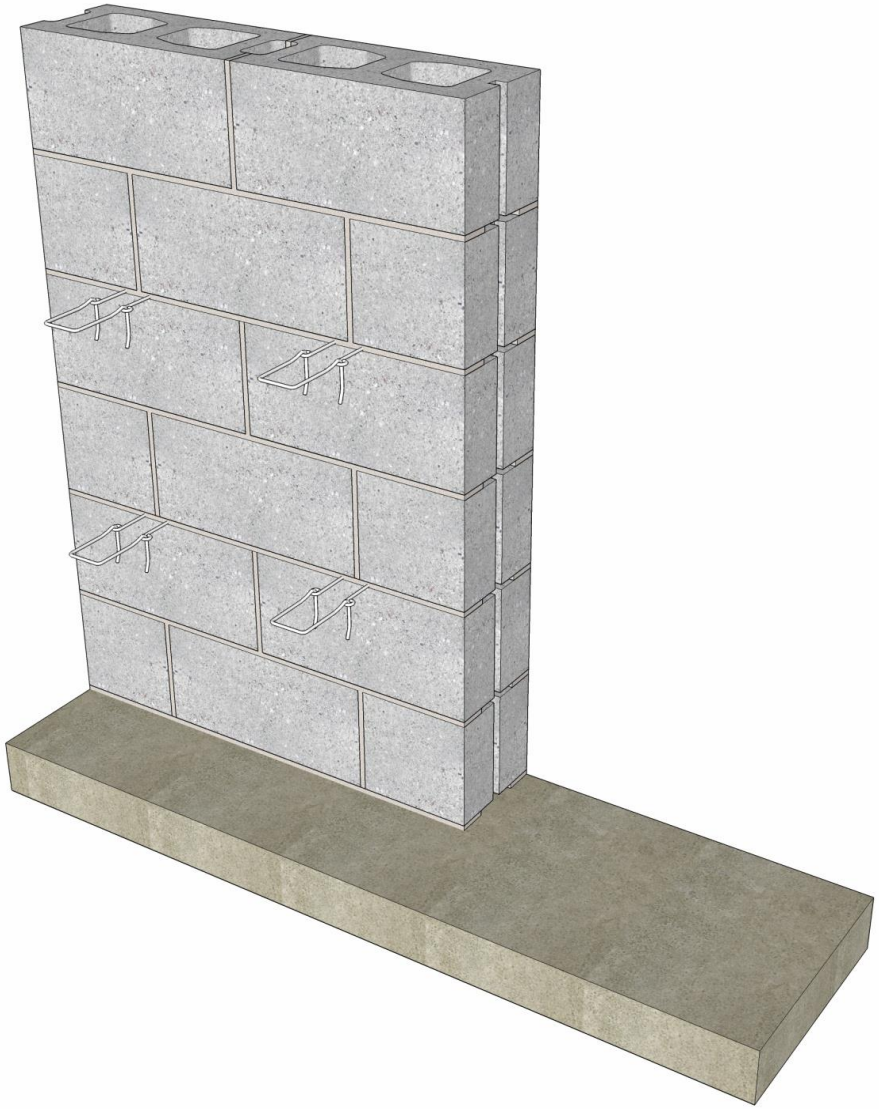
01.032.011113 Brick veneer on 12-in. concrete masonry backing

No sheathing, fluid-applied air barrier, XPS insulation, air space, horizontal joint reinf. w/ integral wall ties, painted wallboard on steel studs

International Masonry Institute
team IMI WALL SYSTEMS LIBRARY
800-IMI-0988 www.imiweb.org
11/23/16

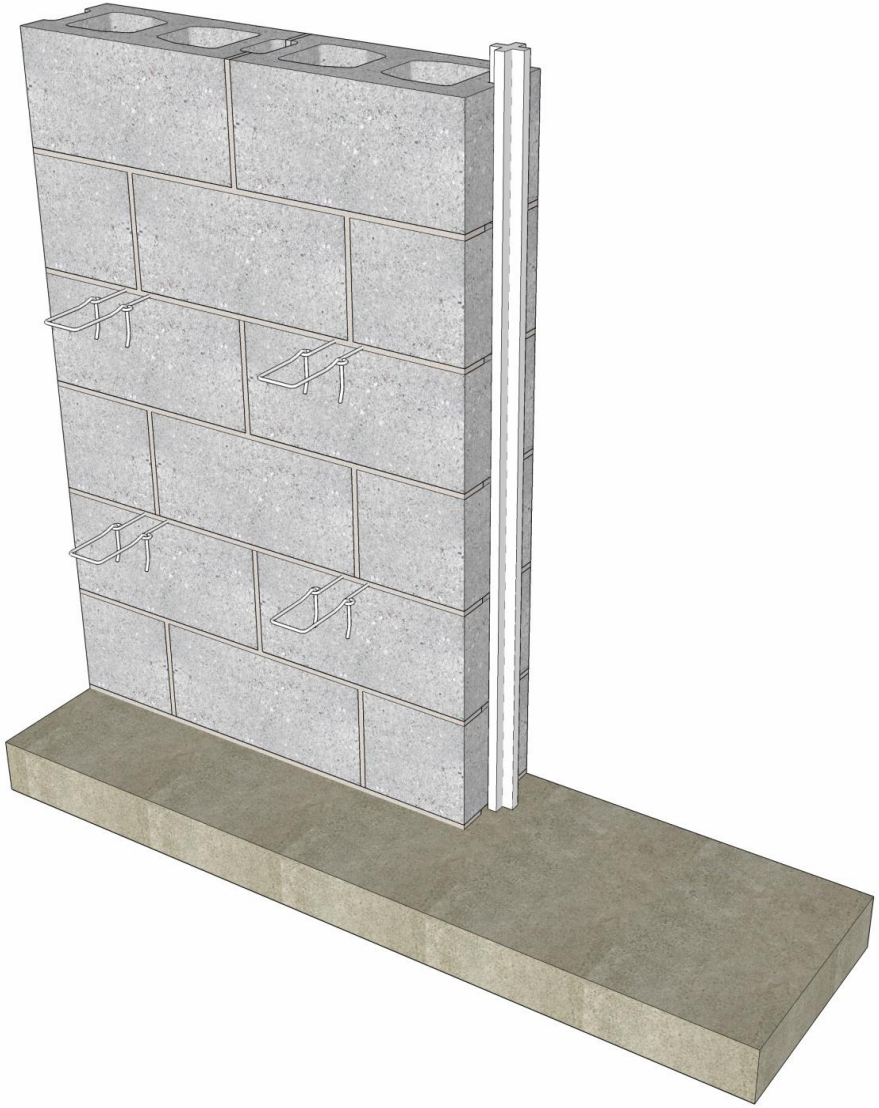
CAVITY WALL | COMPONENTS

- **CMU backing w/ HJR**



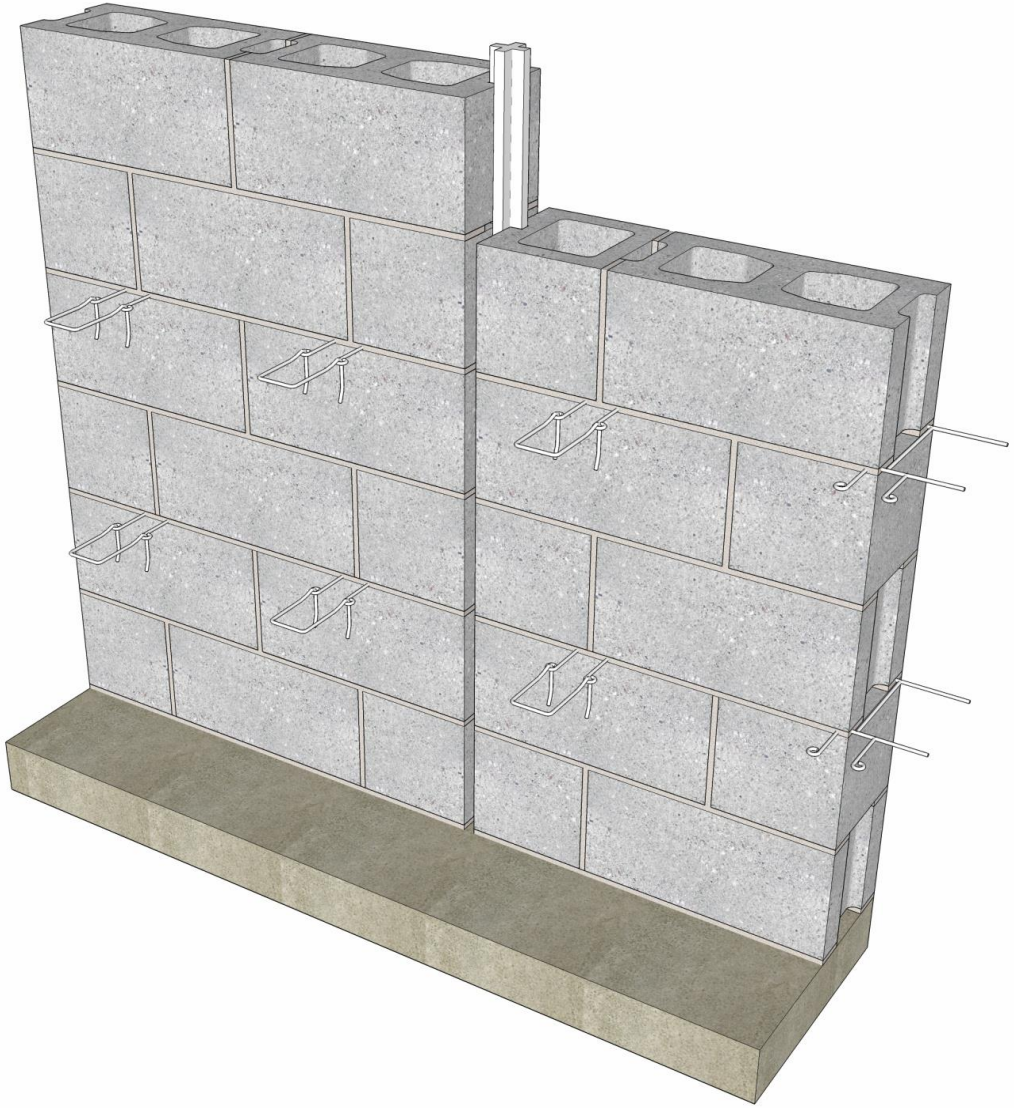
CAVITY WALL | COMPONENTS

- CMU backing w/ HJR
- **Control joint material**

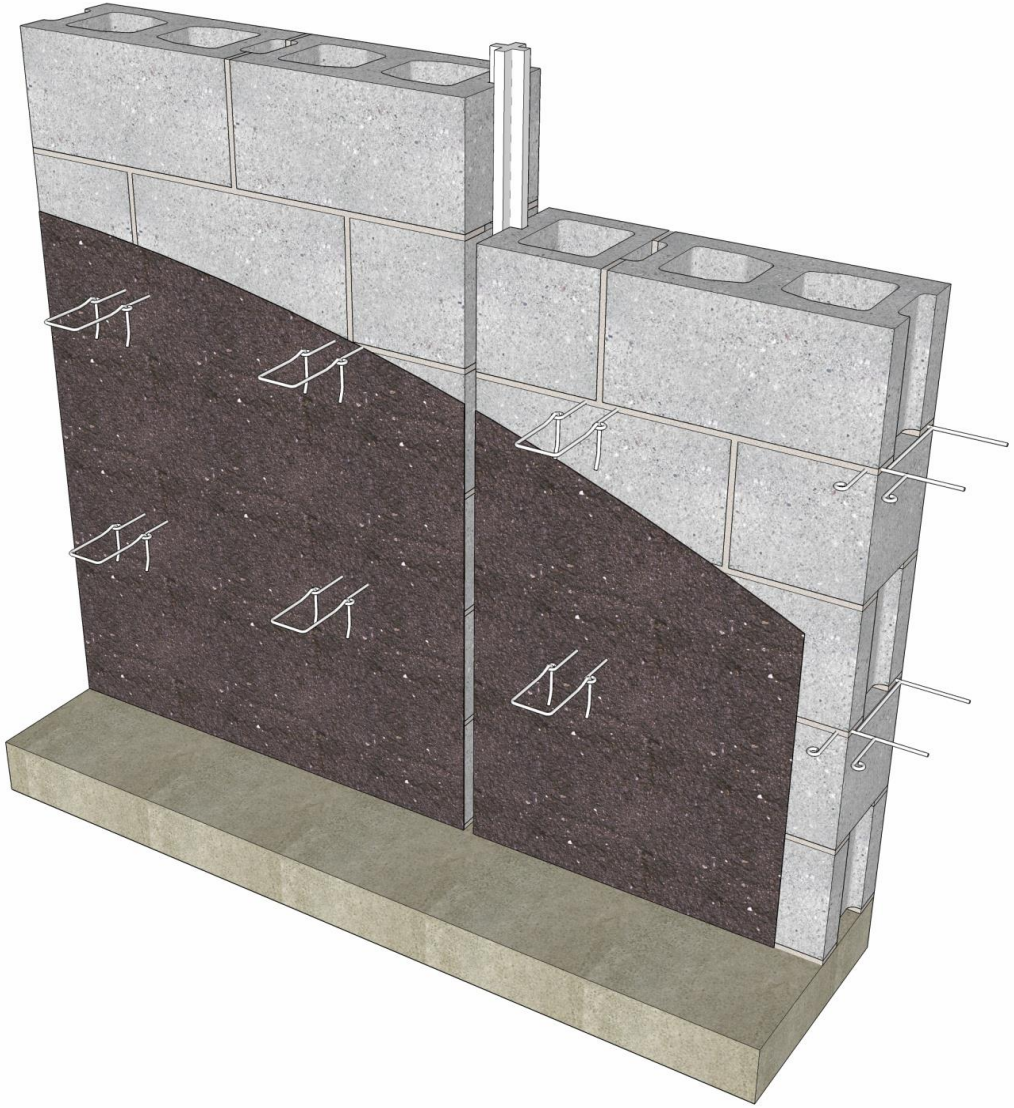


CAVITY WALL | COMPONENTS

- CMU backing w/ HJR
- Control joint material

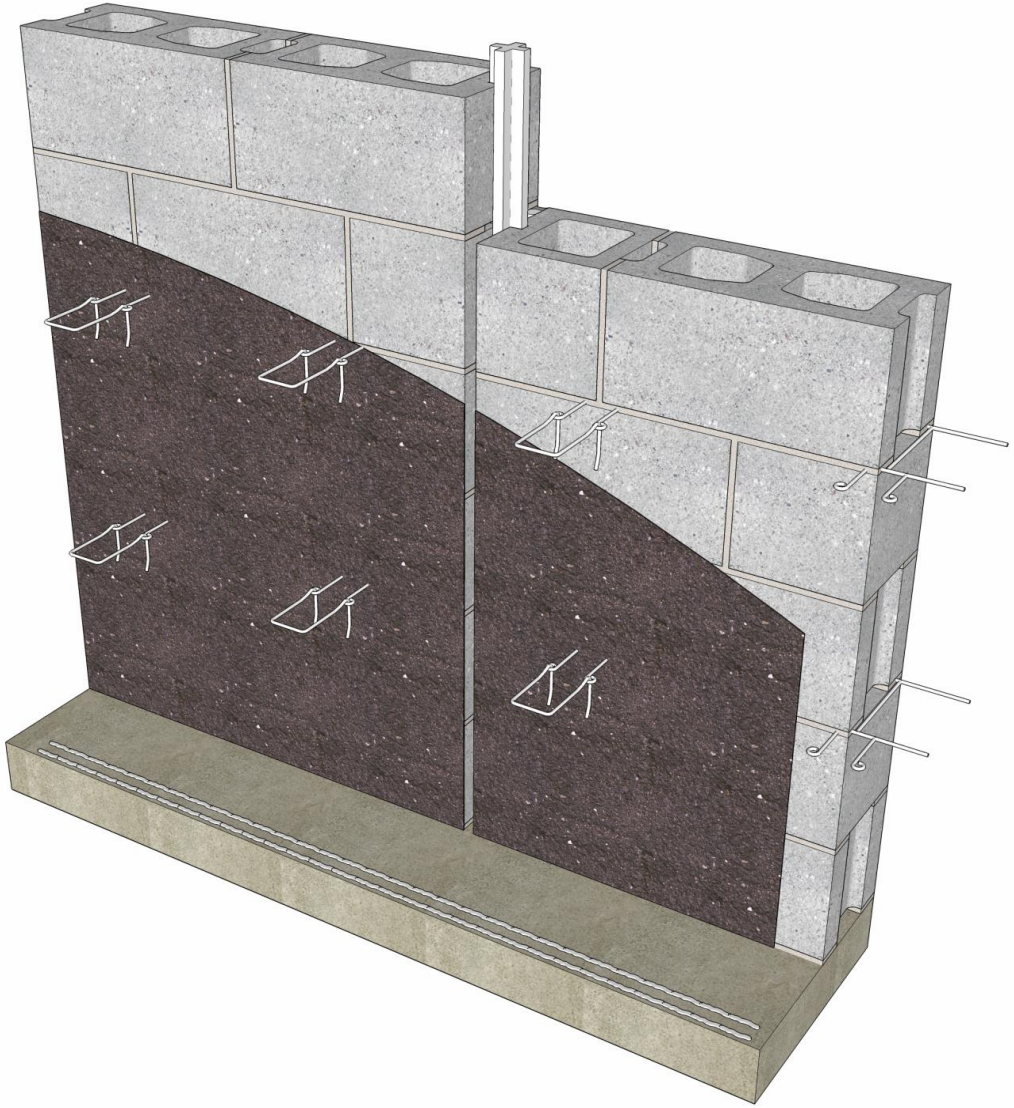


CAVITY WALL | COMPONENTS



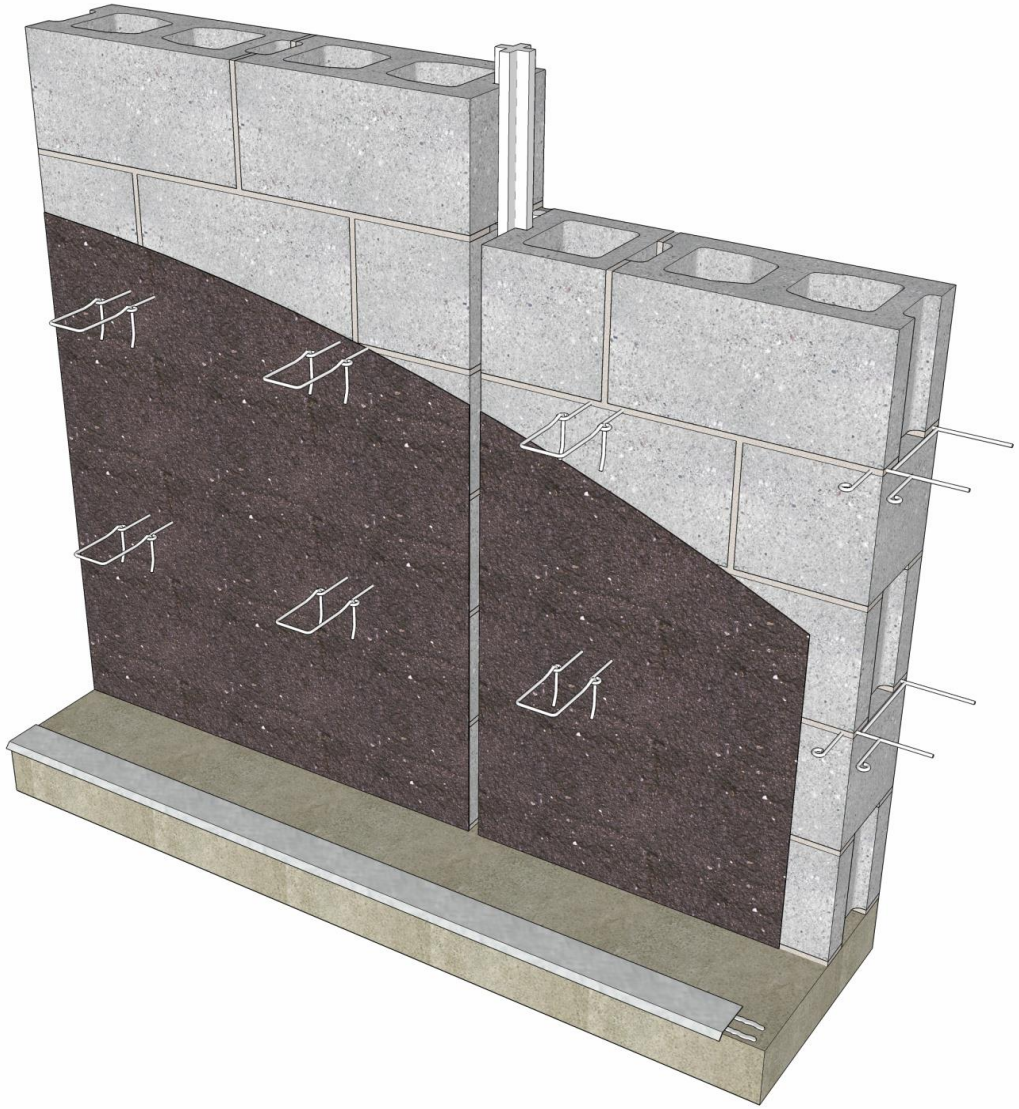
- CMU backing w/ HJR
- Control joint material
- **Air barrier**

CAVITY WALL | COMPONENTS



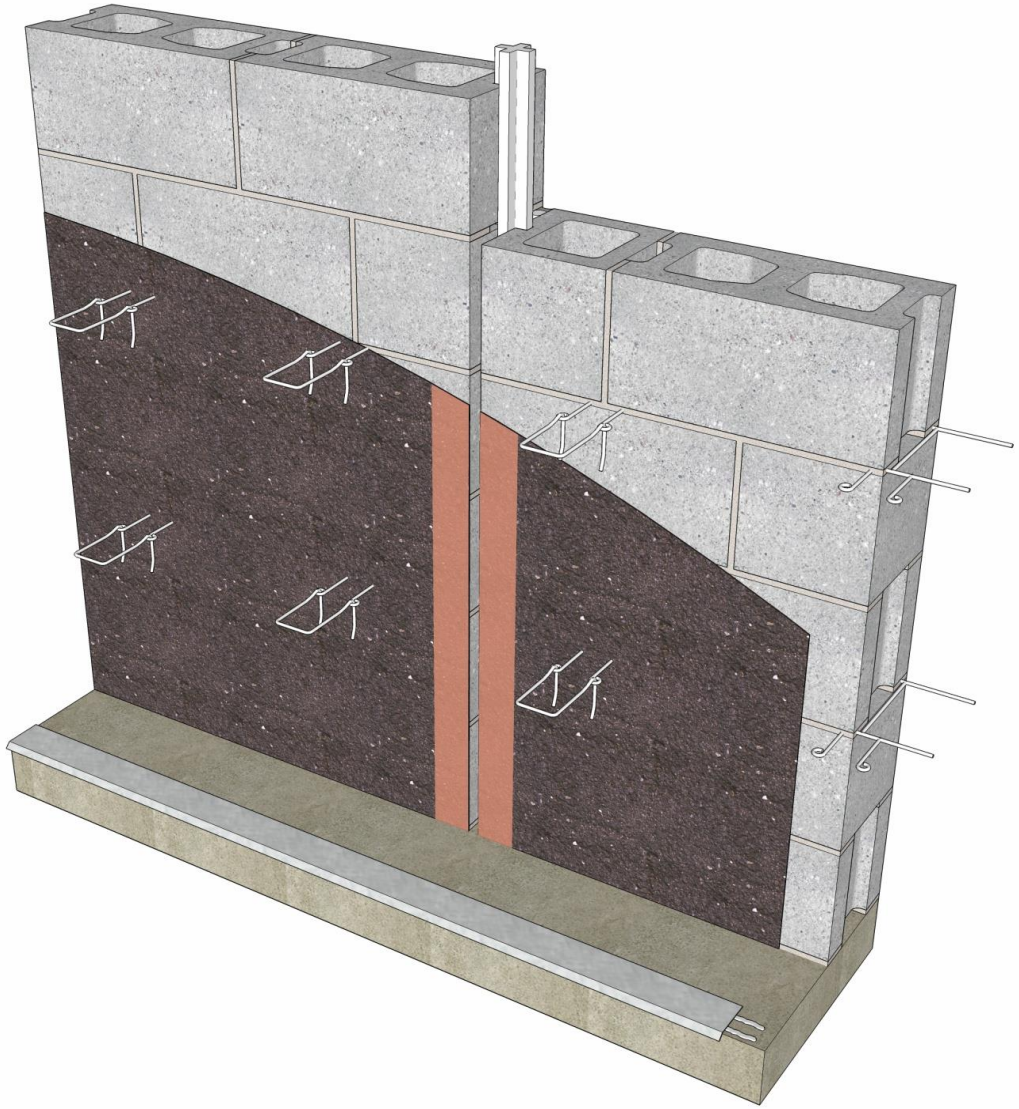
- CMU backing w/ HJR
- Control joint material
- Air barrier
- **Sealant or adhesive**

CAVITY WALL | COMPONENTS



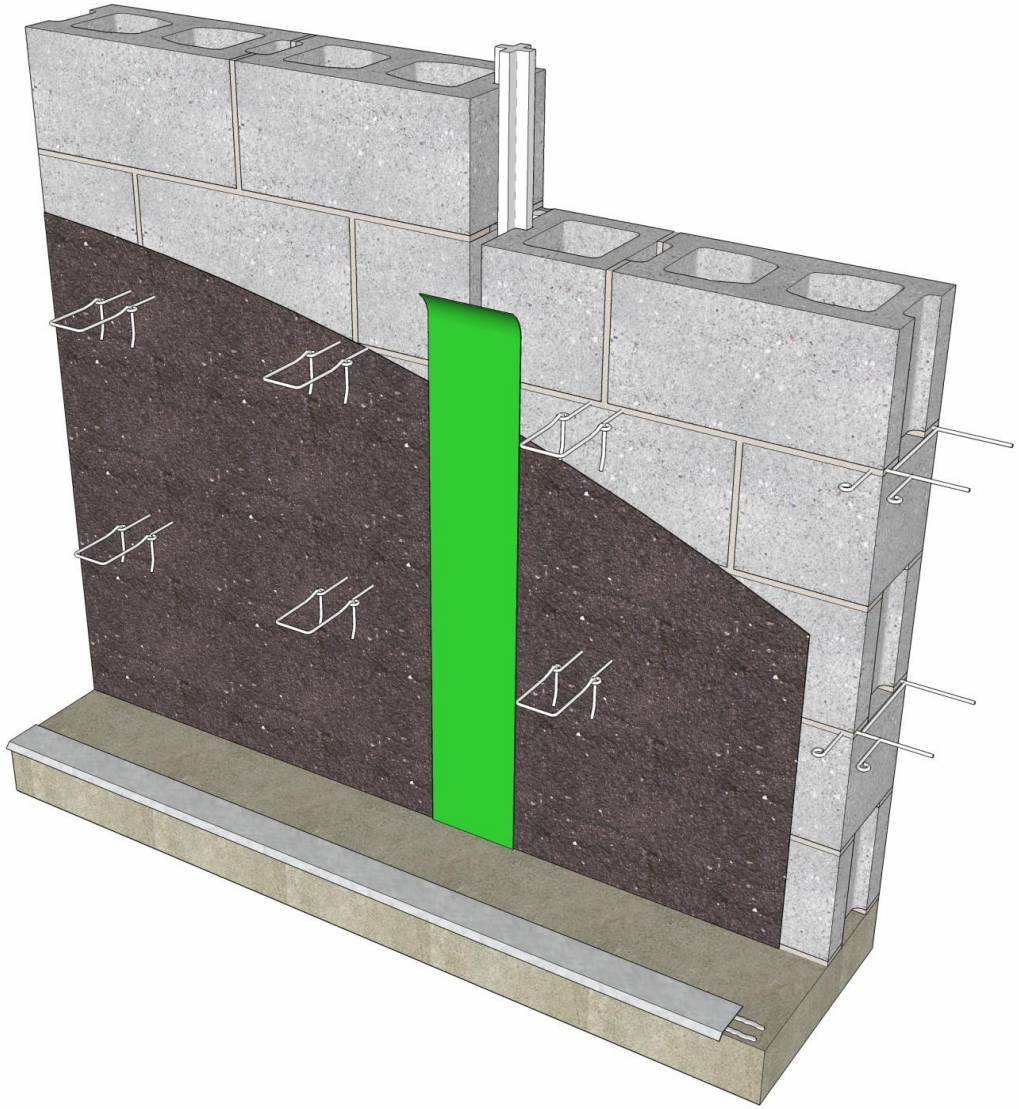
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- **Flashing drip edge**

CAVITY WALL | COMPONENTS



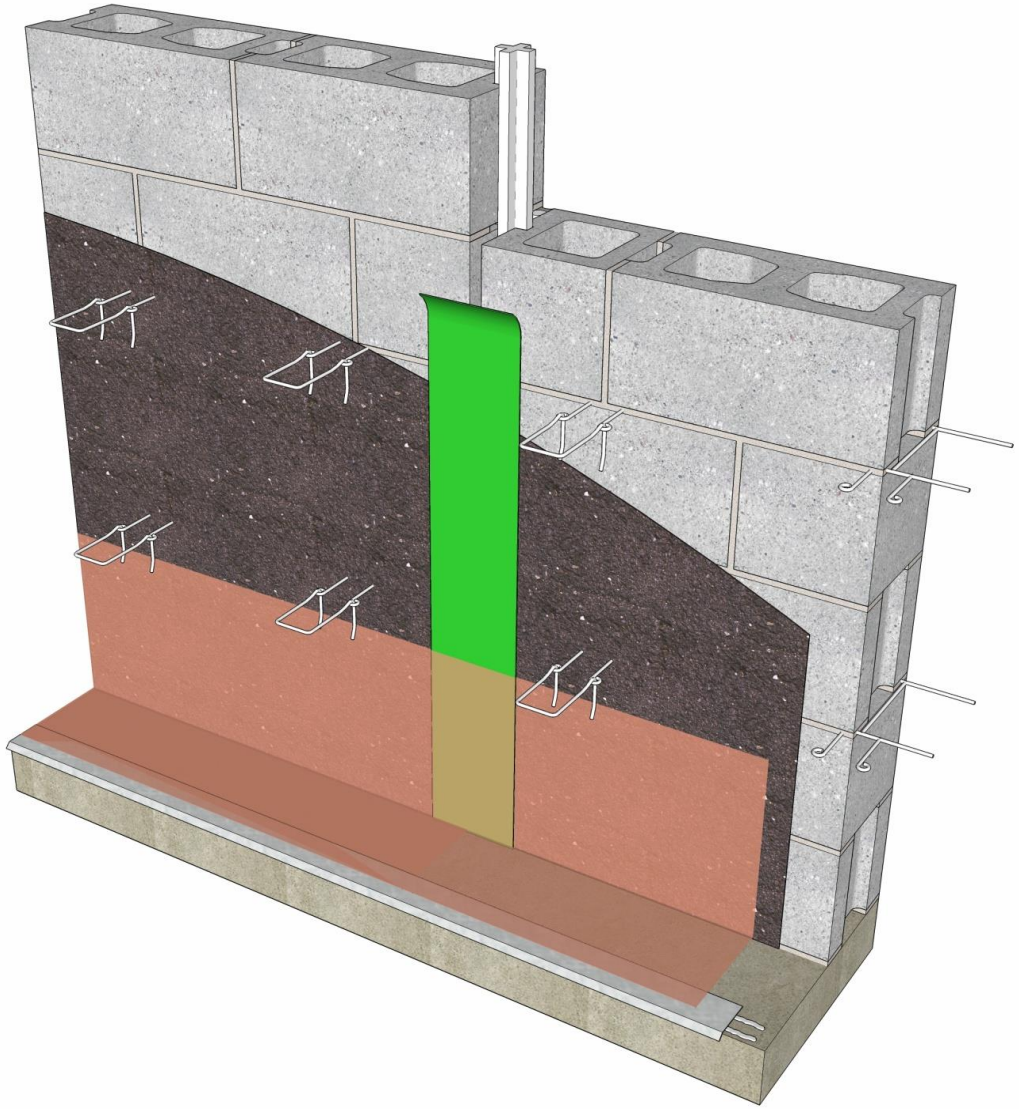
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- **Primer**

CAVITY WALL | COMPONENTS



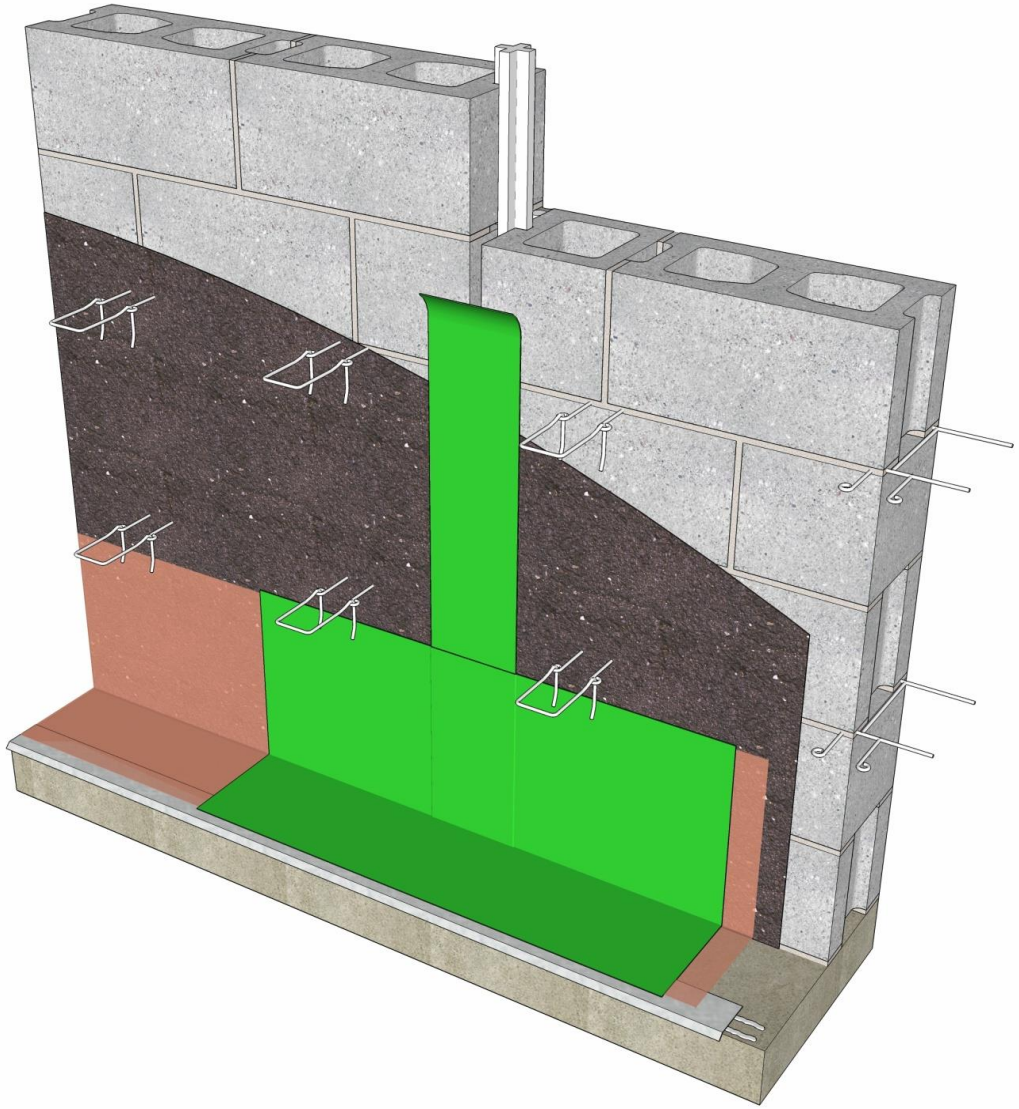
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- **Transition membrane**

CAVITY WALL | COMPONENTS



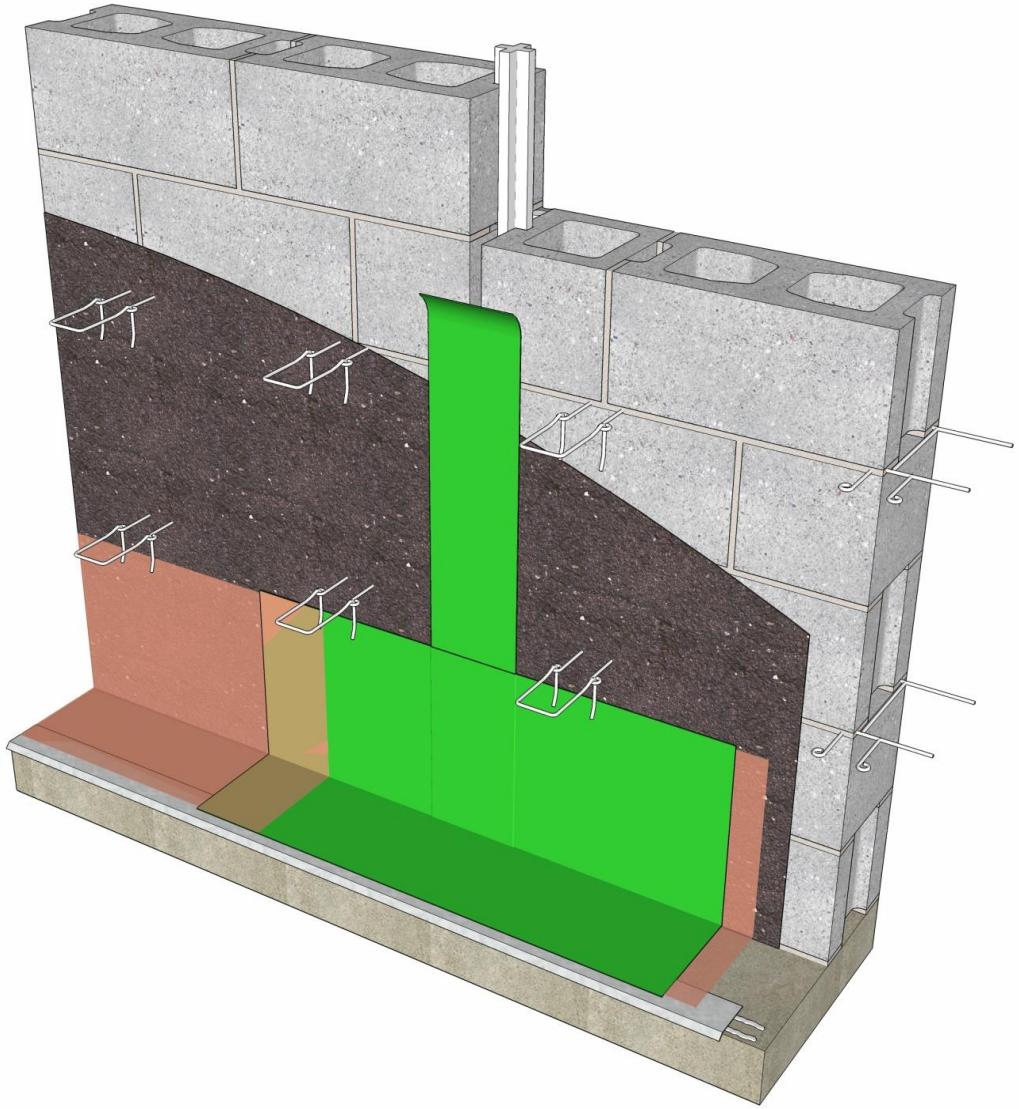
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- **Primer**

CAVITY WALL | COMPONENTS



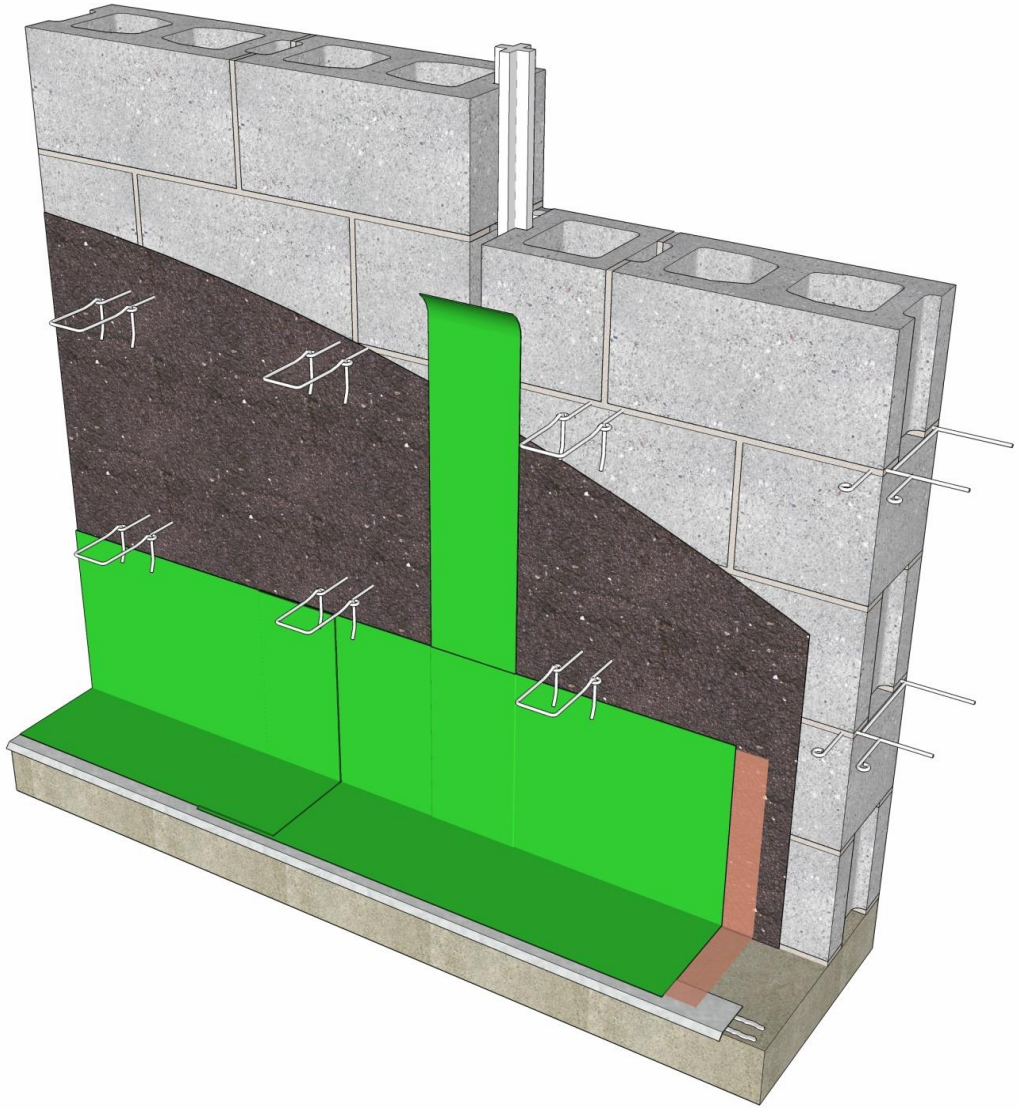
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- **Thru-wall flashing**

CAVITY WALL | COMPONENTS



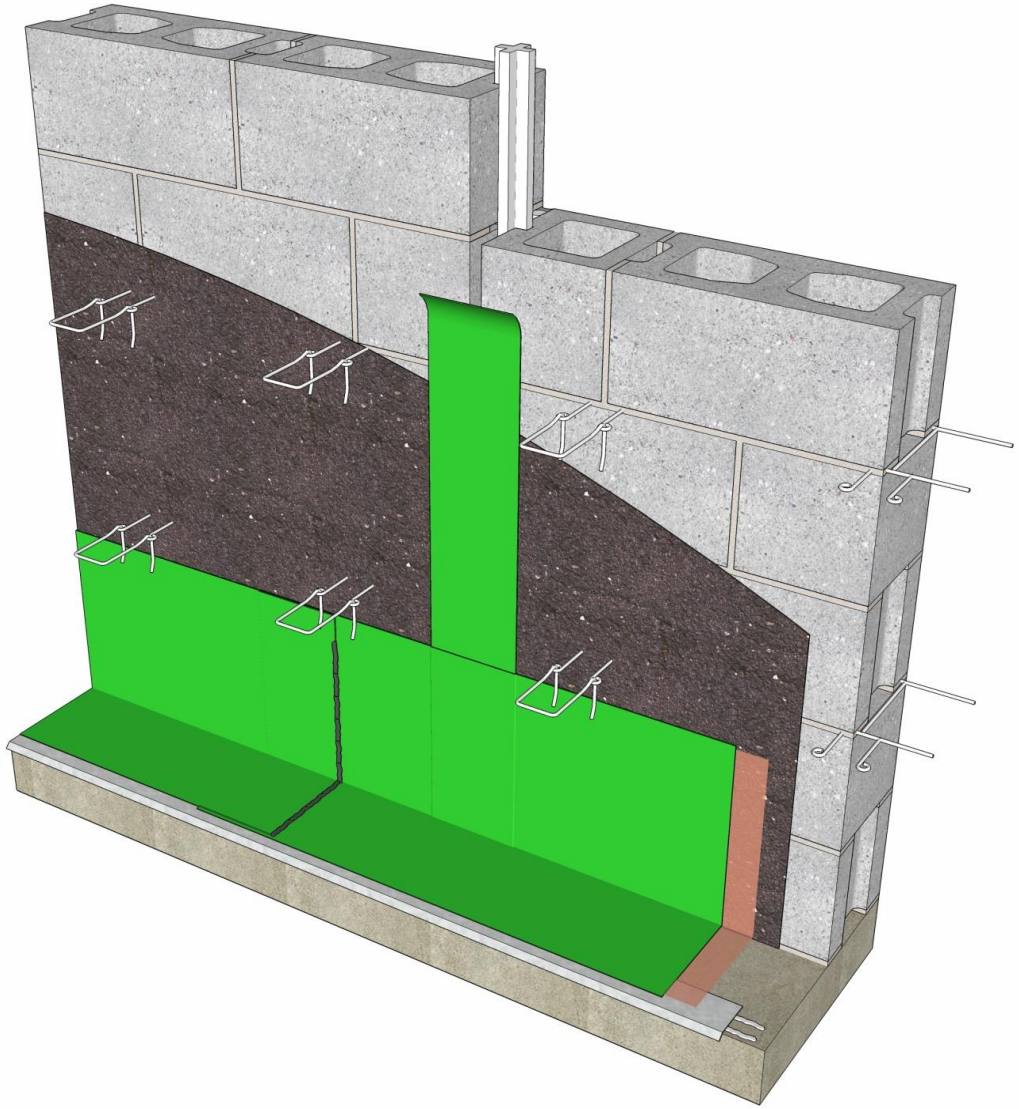
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- **Lap & seal flashing**

CAVITY WALL | COMPONENTS



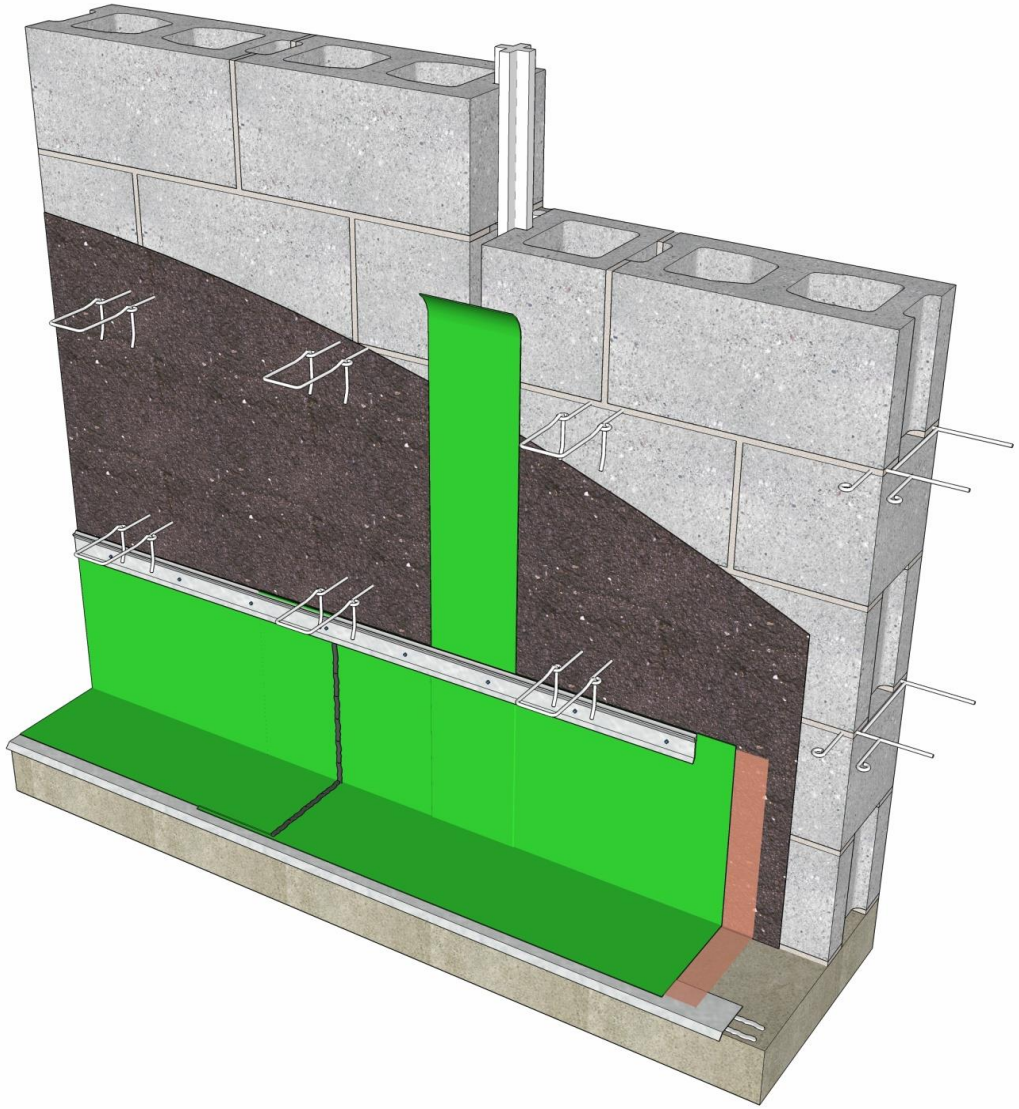
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- **Lap & seal flashing**

CAVITY WALL | COMPONENTS



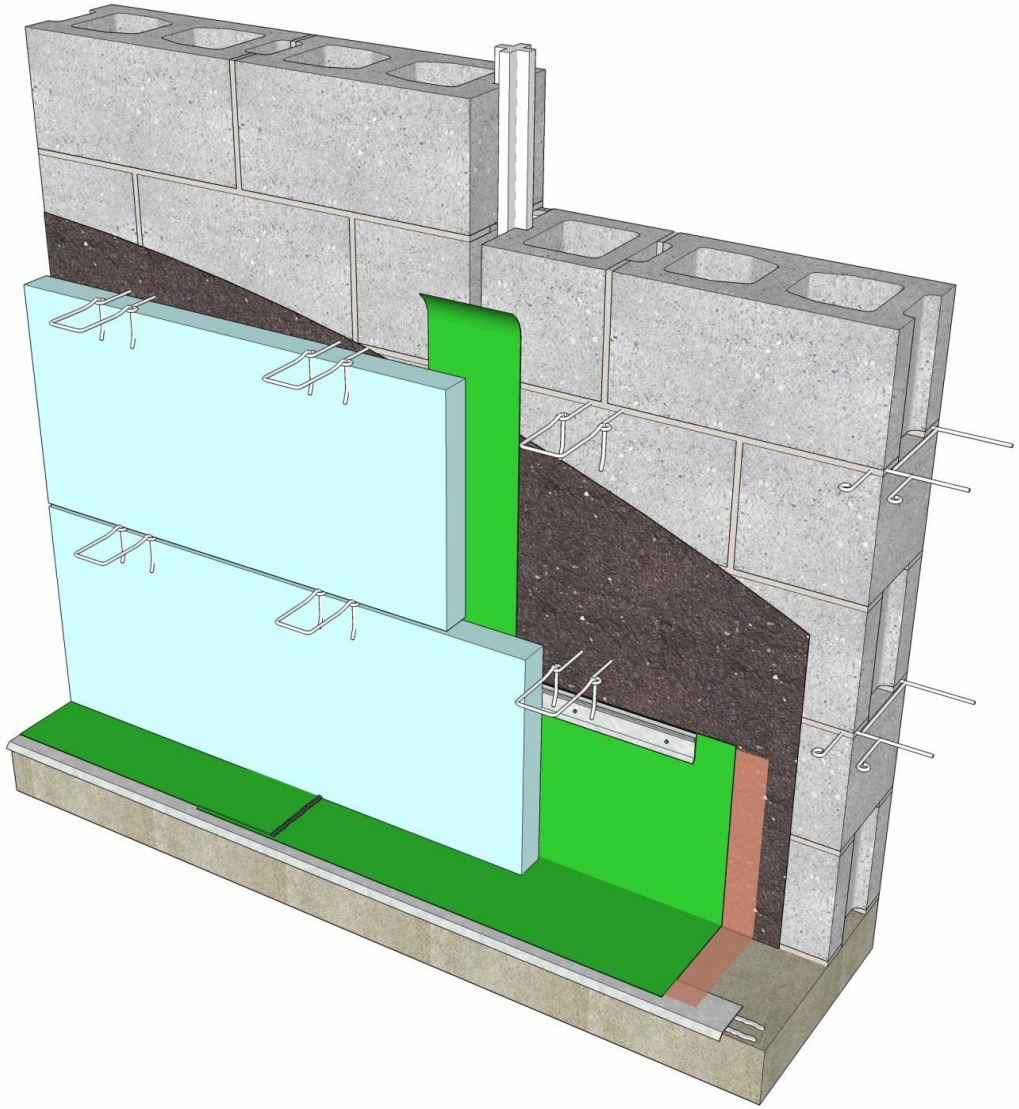
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- **Lap & seal flashing**

CAVITY WALL | COMPONENTS



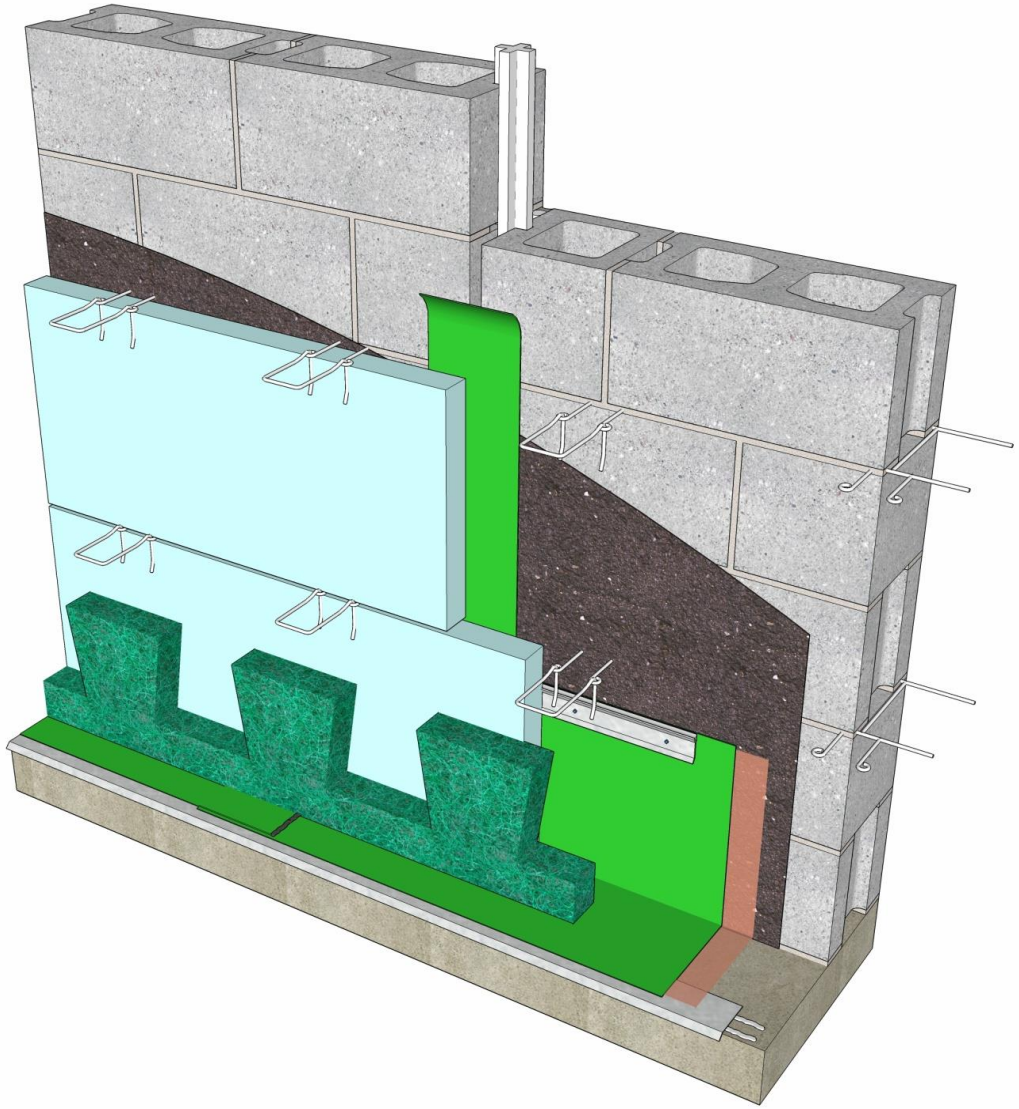
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- Lap & seal flashing
- **Termination bar**

CAVITY WALL | COMPONENTS



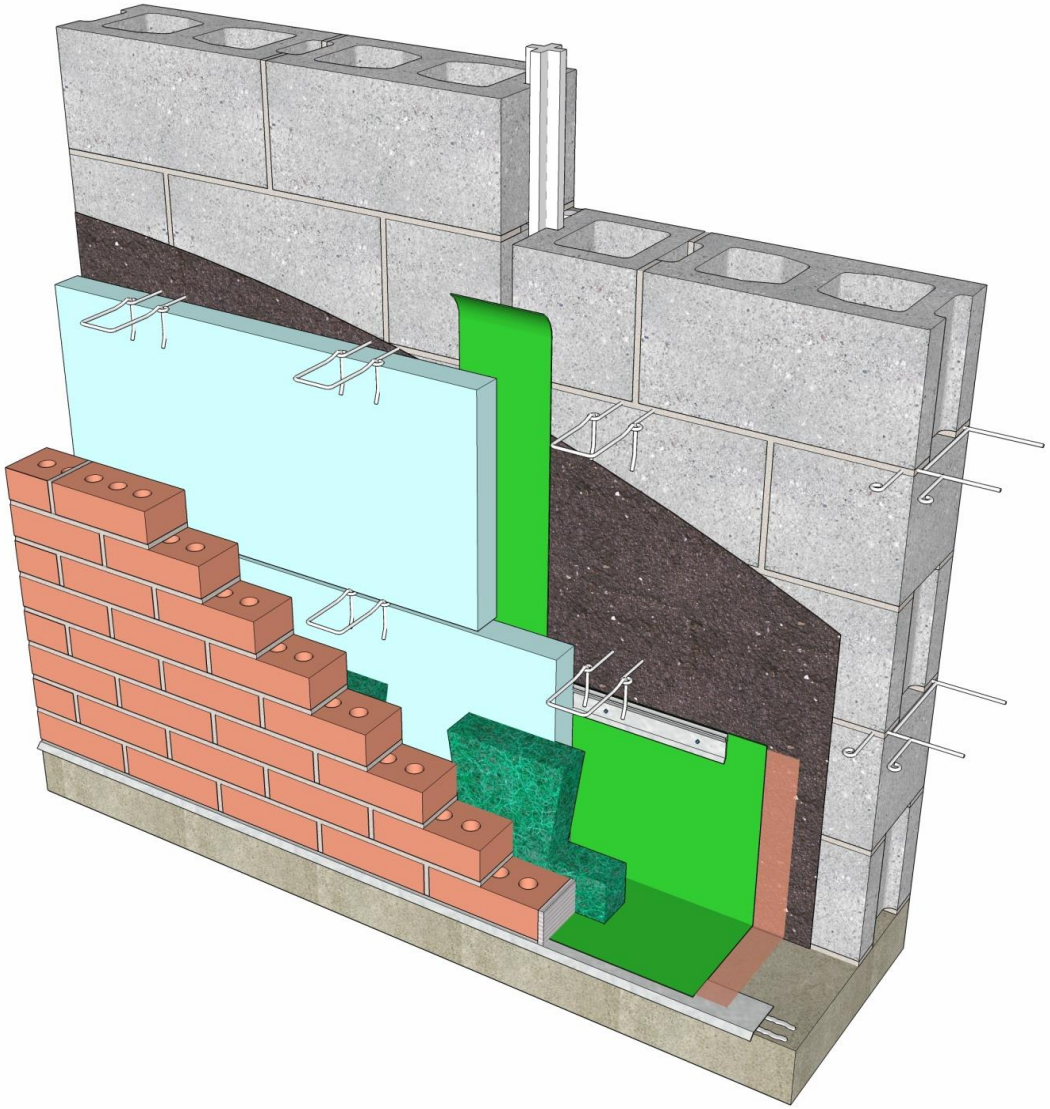
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- Lap & seal flashing
- Termination bar
- **Insulation**

CAVITY WALL | COMPONENTS



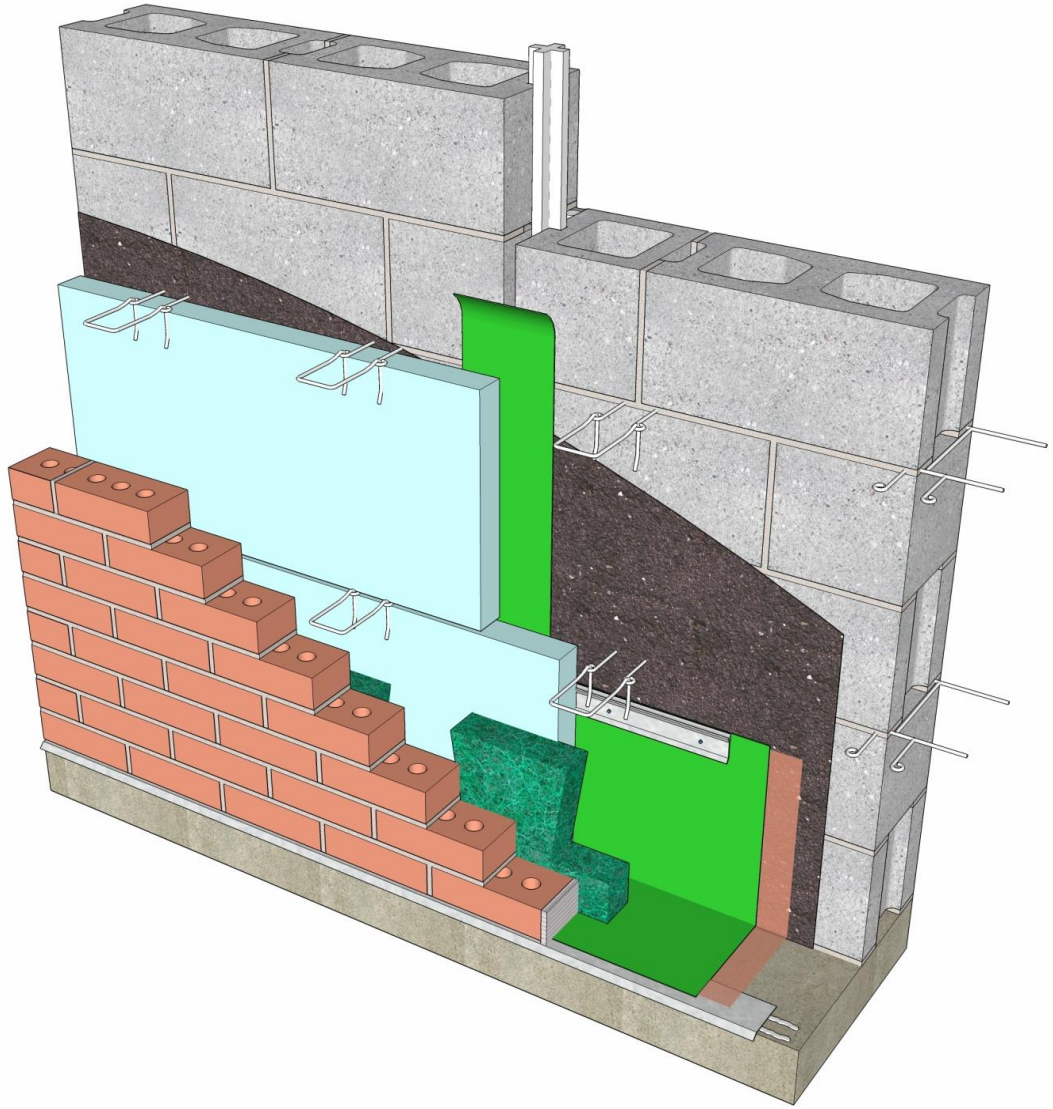
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- Lap & seal flashing
- Termination bar
- Insulation
- **Cavity insert**

CAVITY WALL | COMPONENTS



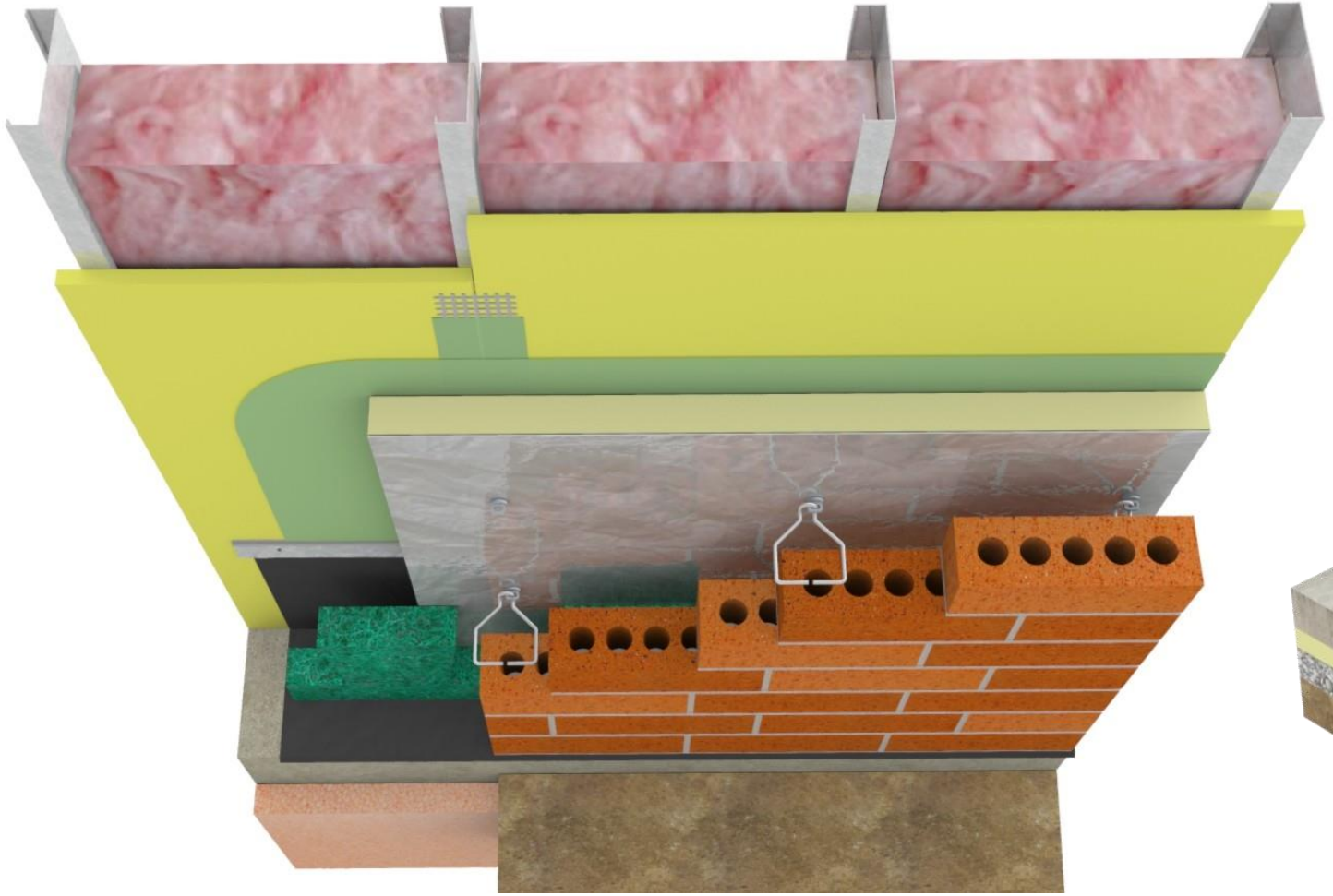
- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- Lap & seal flashing
- Termination bar
- Insulation
- Cavity insert
- **Brick veneer**

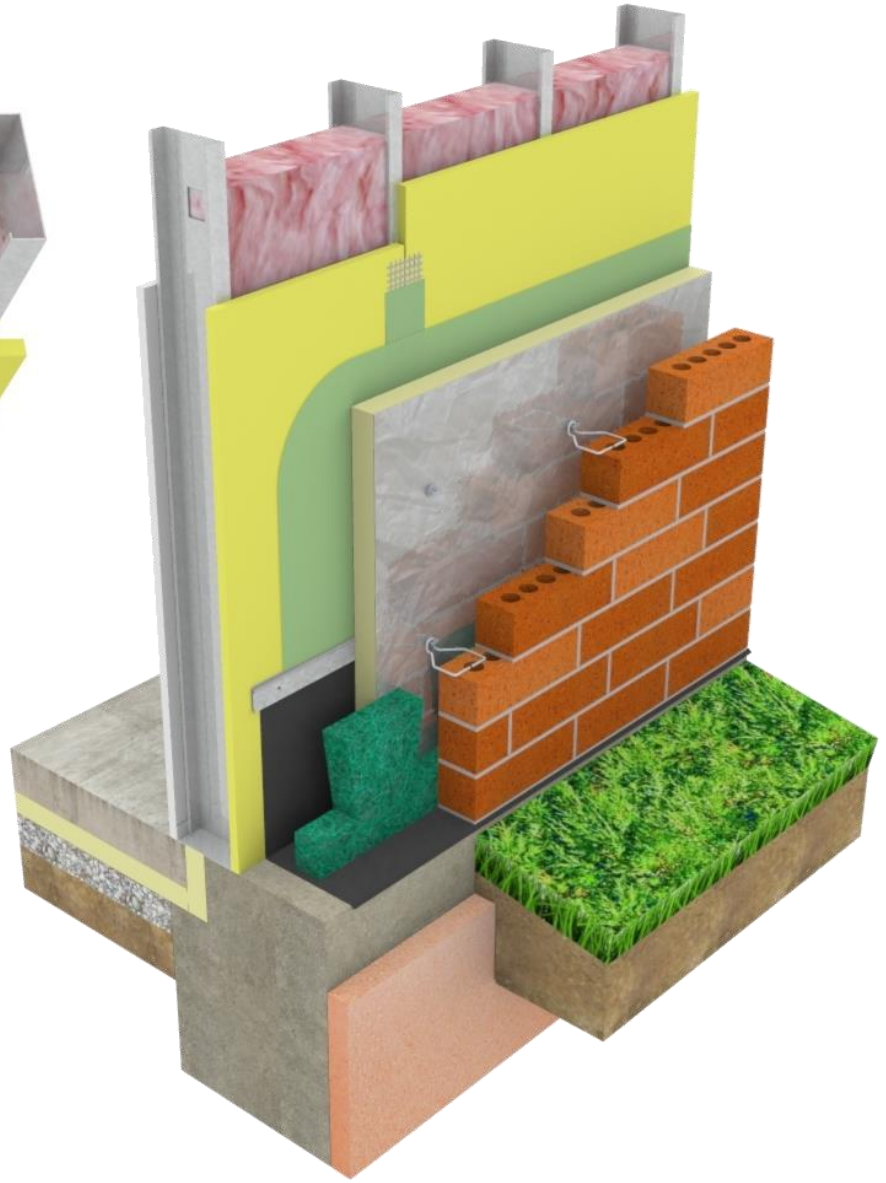
CAVITY WALL | COMPONENTS



- CMU backing w/ HJR
- Control joint material
- Air barrier
- Sealant or adhesive
- Flashing drip edge
- Primer
- Transition membrane
- Primer
- Thru-wall flashing
- Lap & seal flashing
- Termination bar
- Insulation
- Cavity insert
- Brick veneer
- **Weep vents**

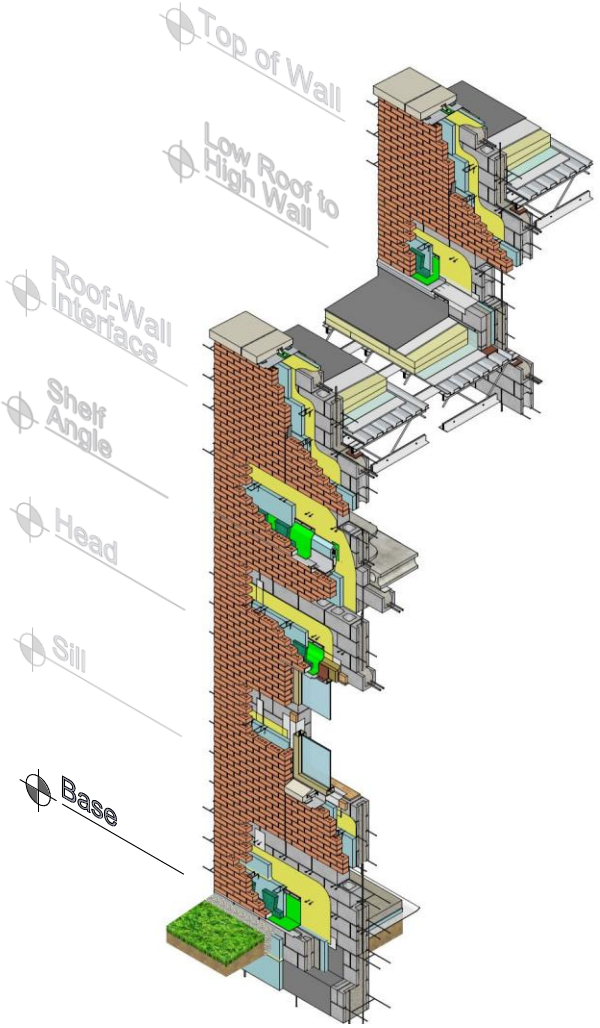
CAVITY WALL | COMPONENTS

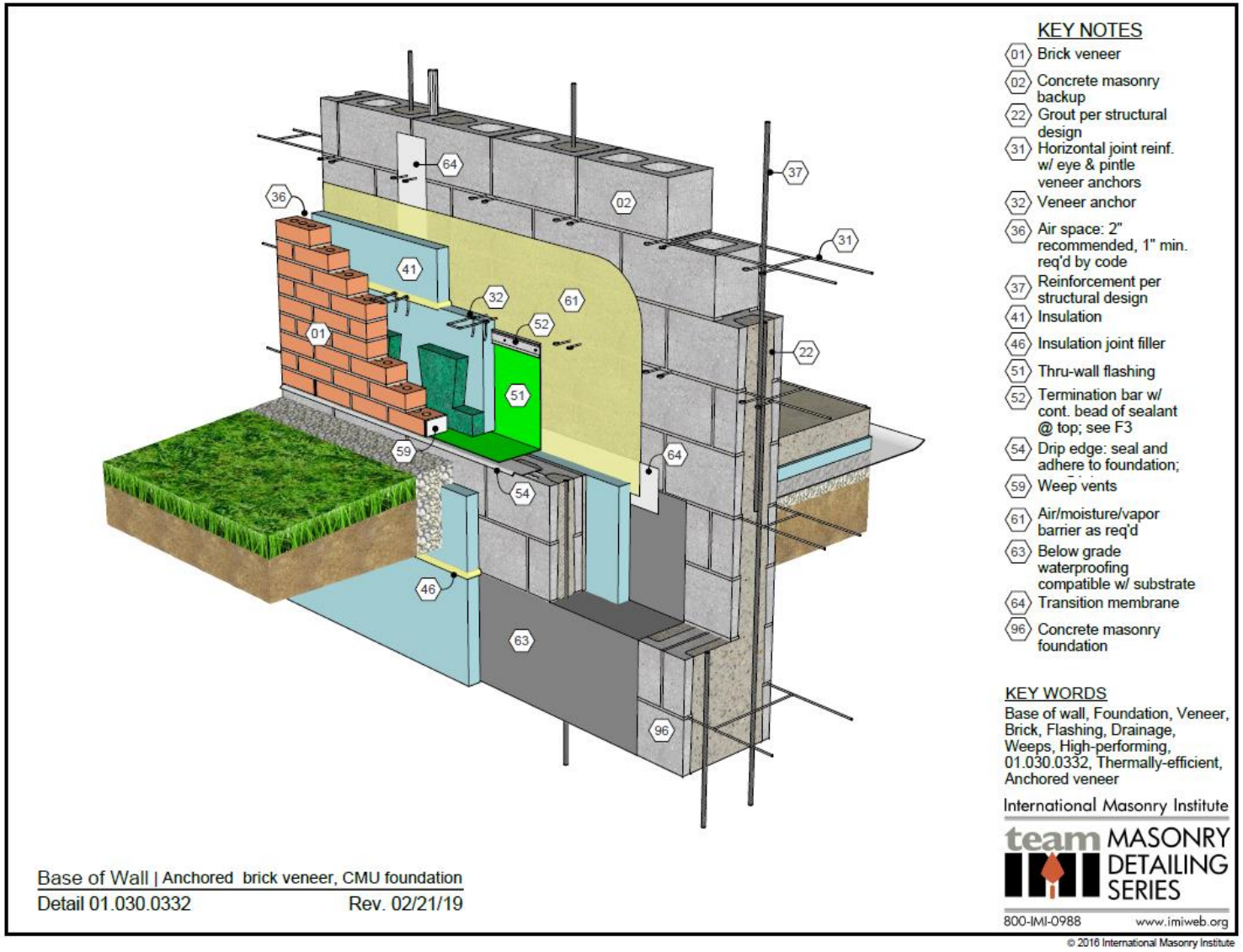




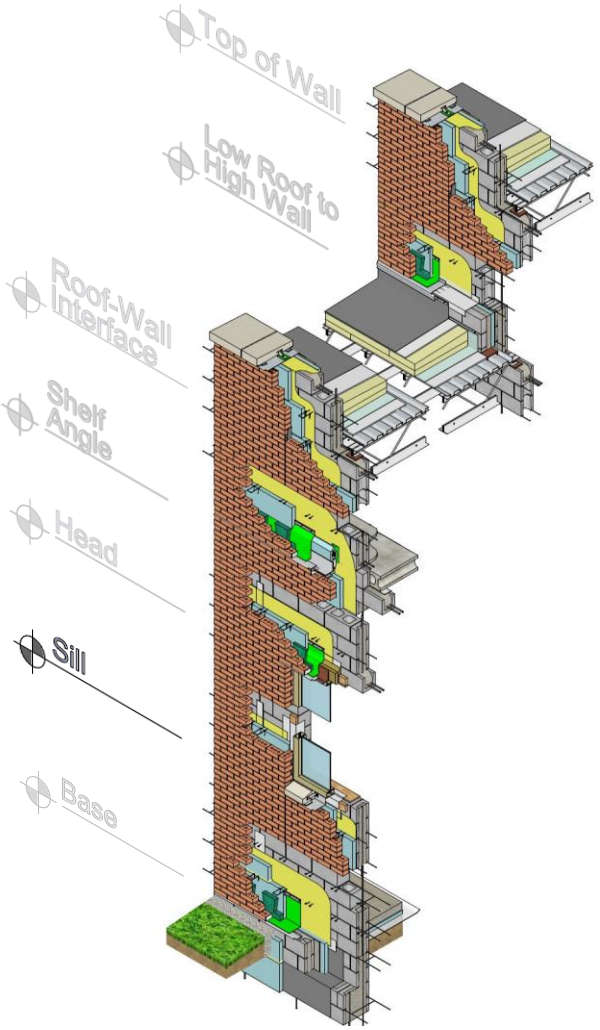
Light gauge steel stud framing

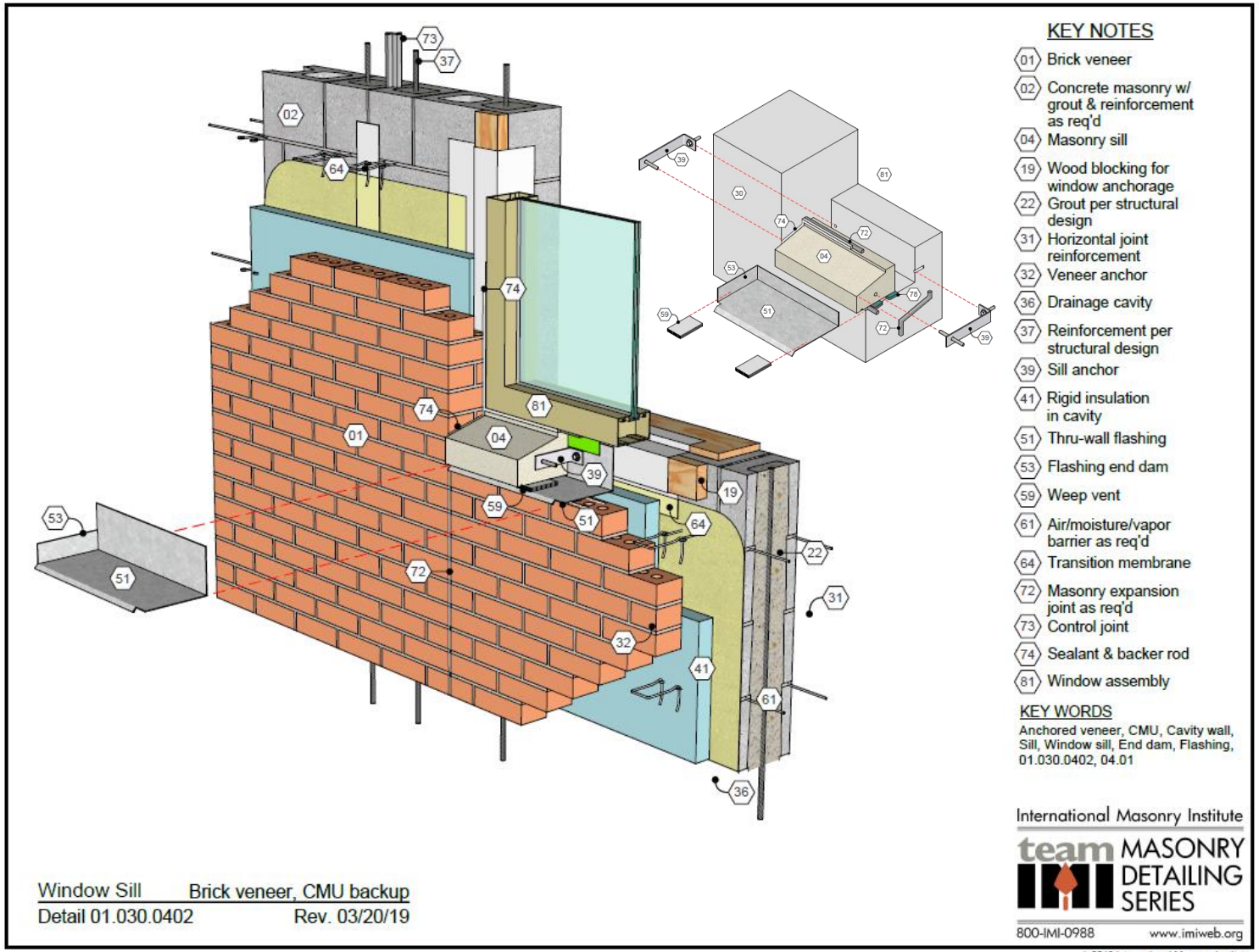
CAVITY WALL | BASE OF WALL



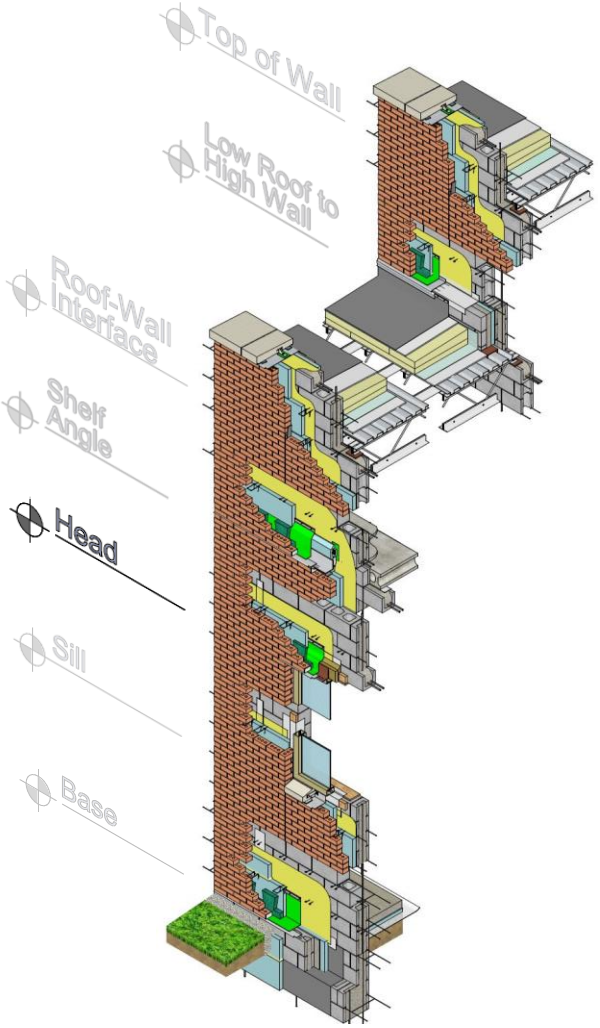


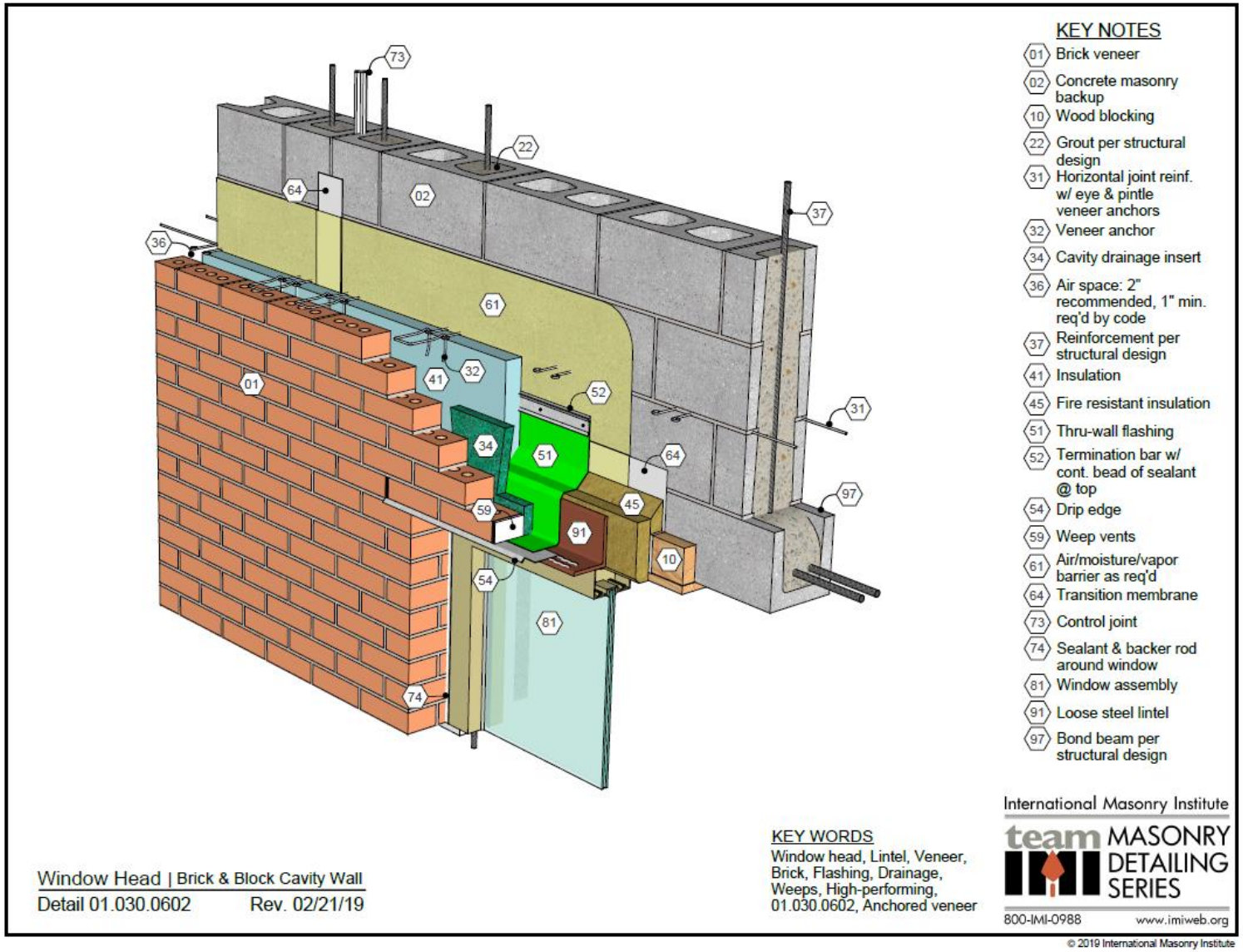
CAVITY WALL | SILL



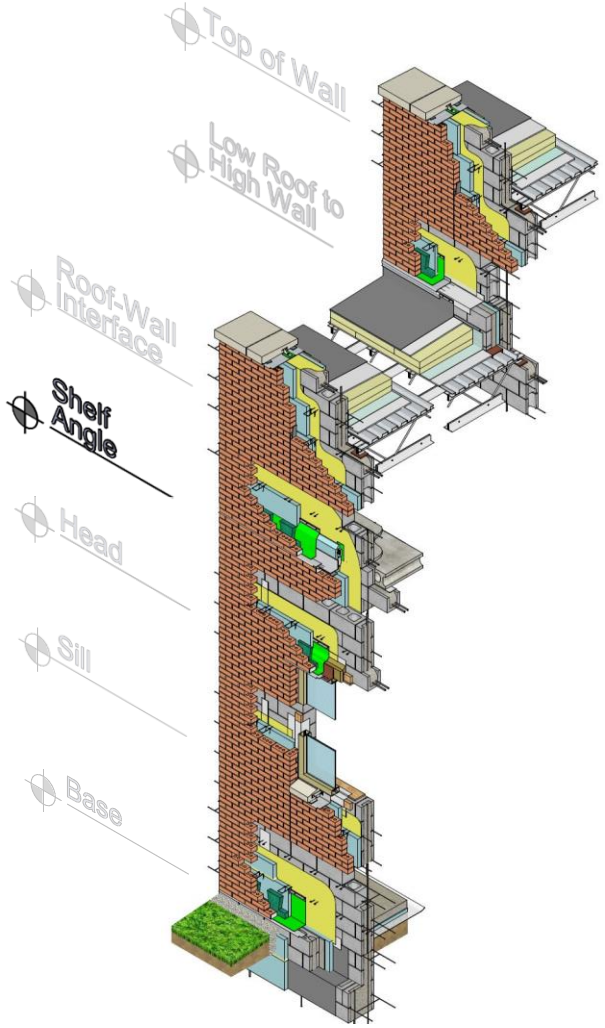


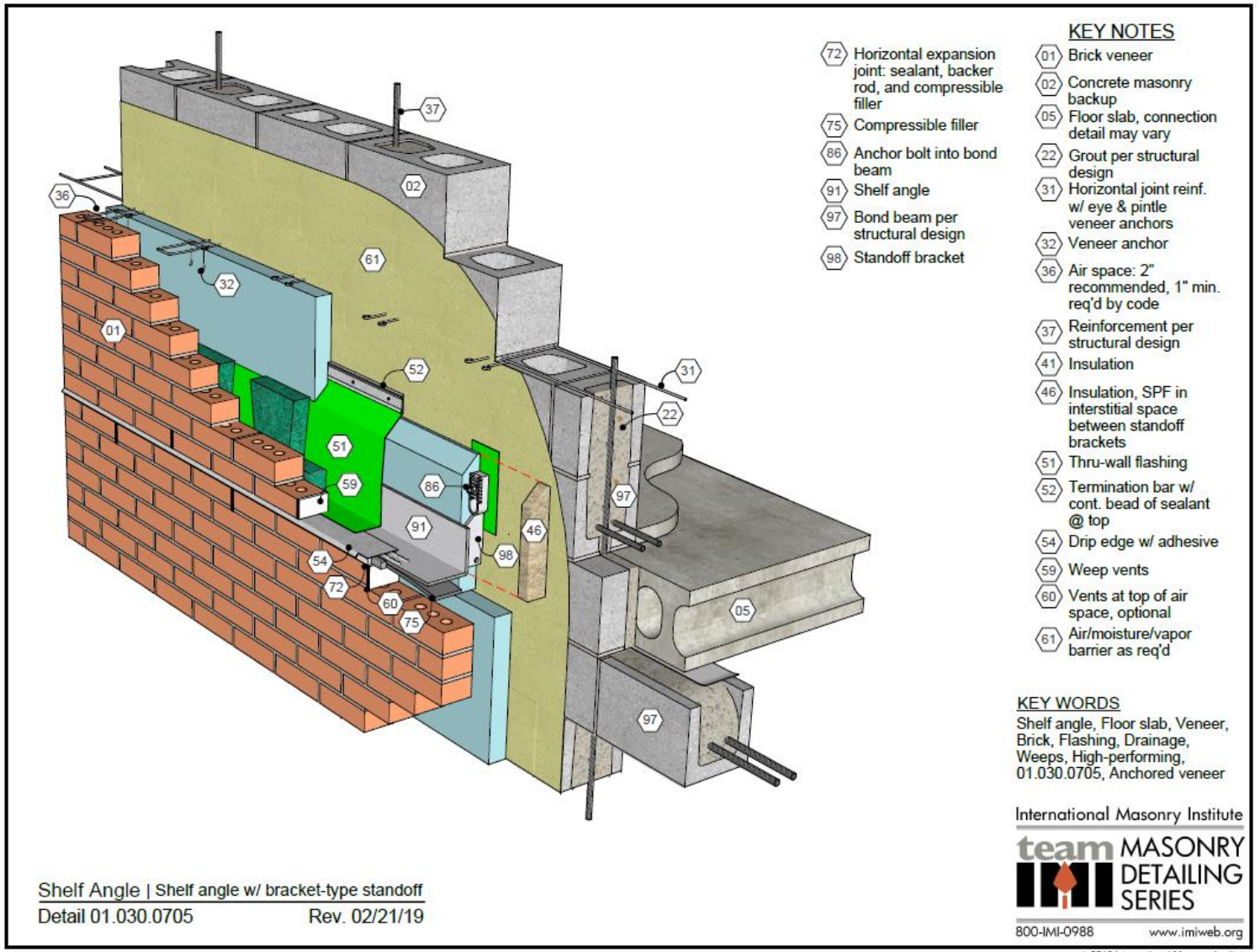
CAVITY WALL | HEAD



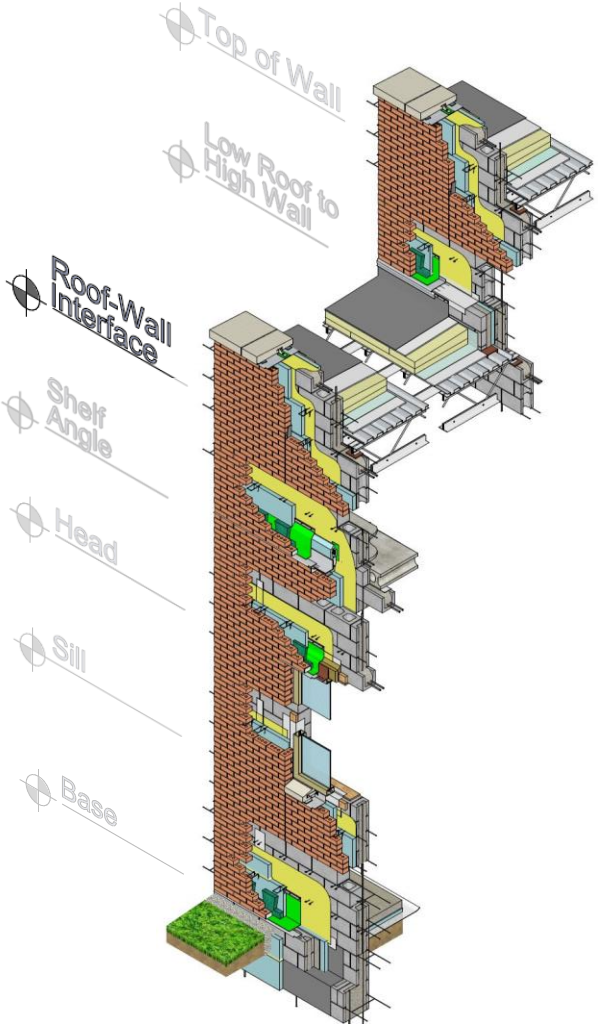


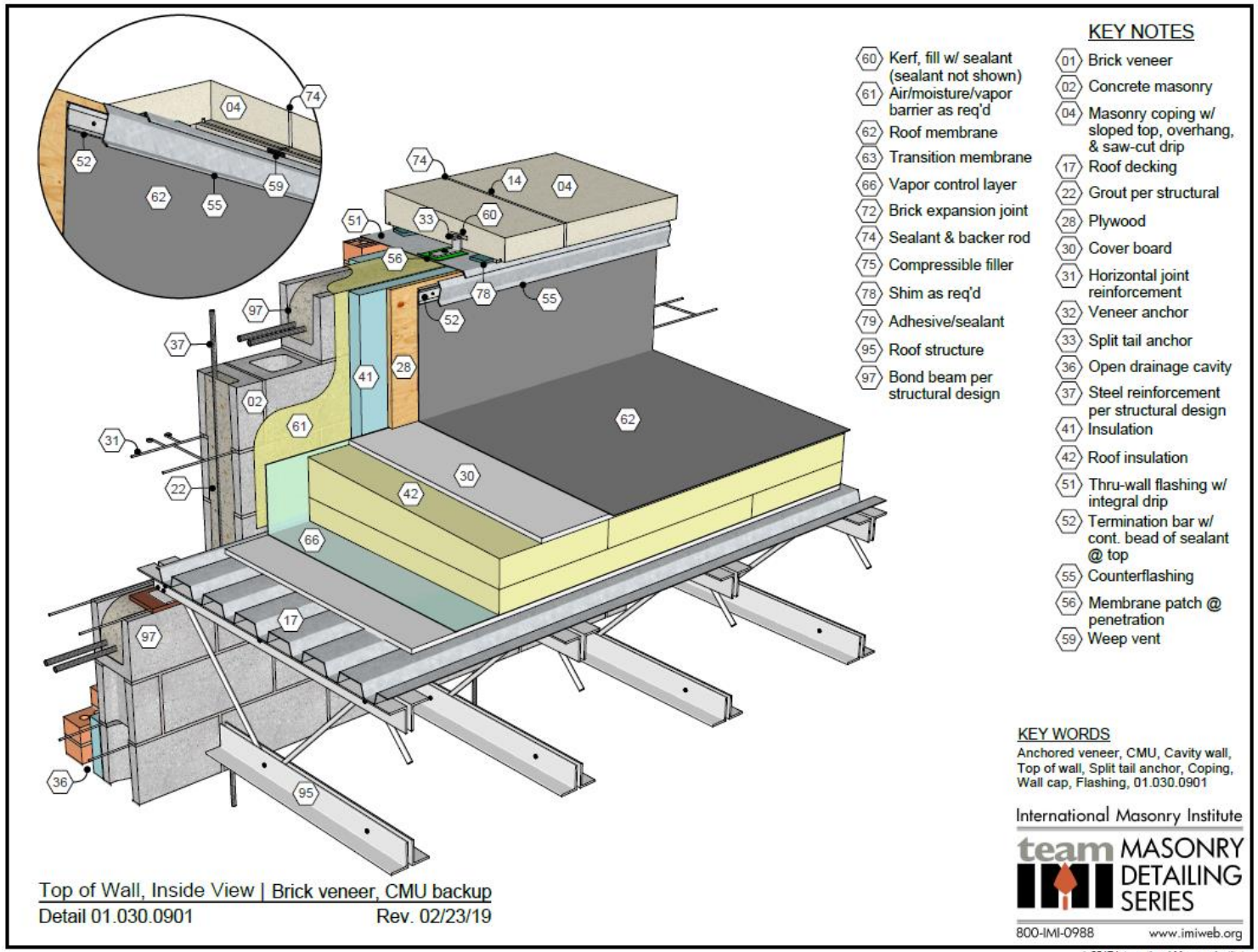
CAVITY WALL | SHELF ANGLE



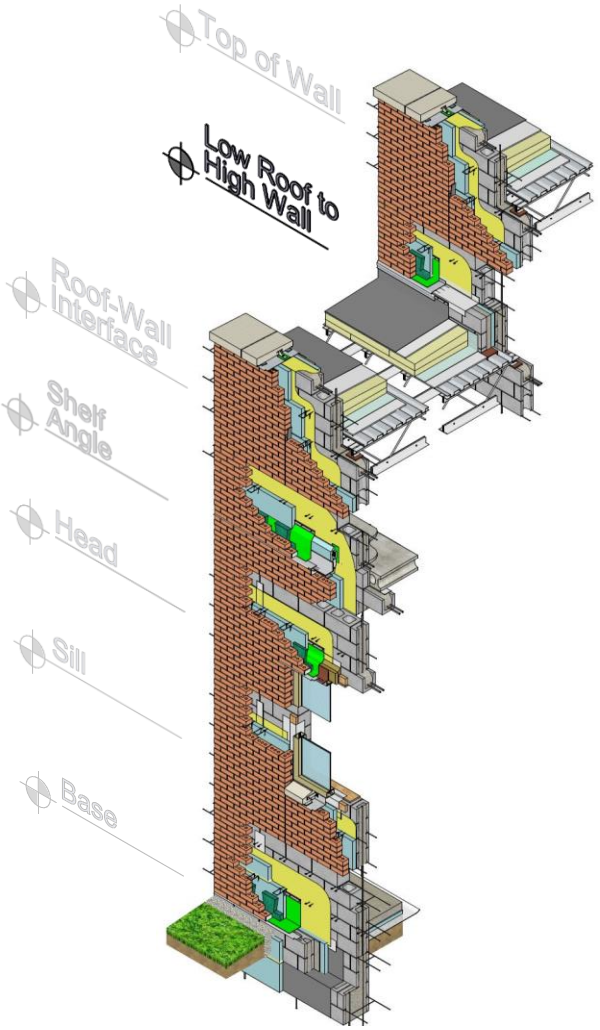


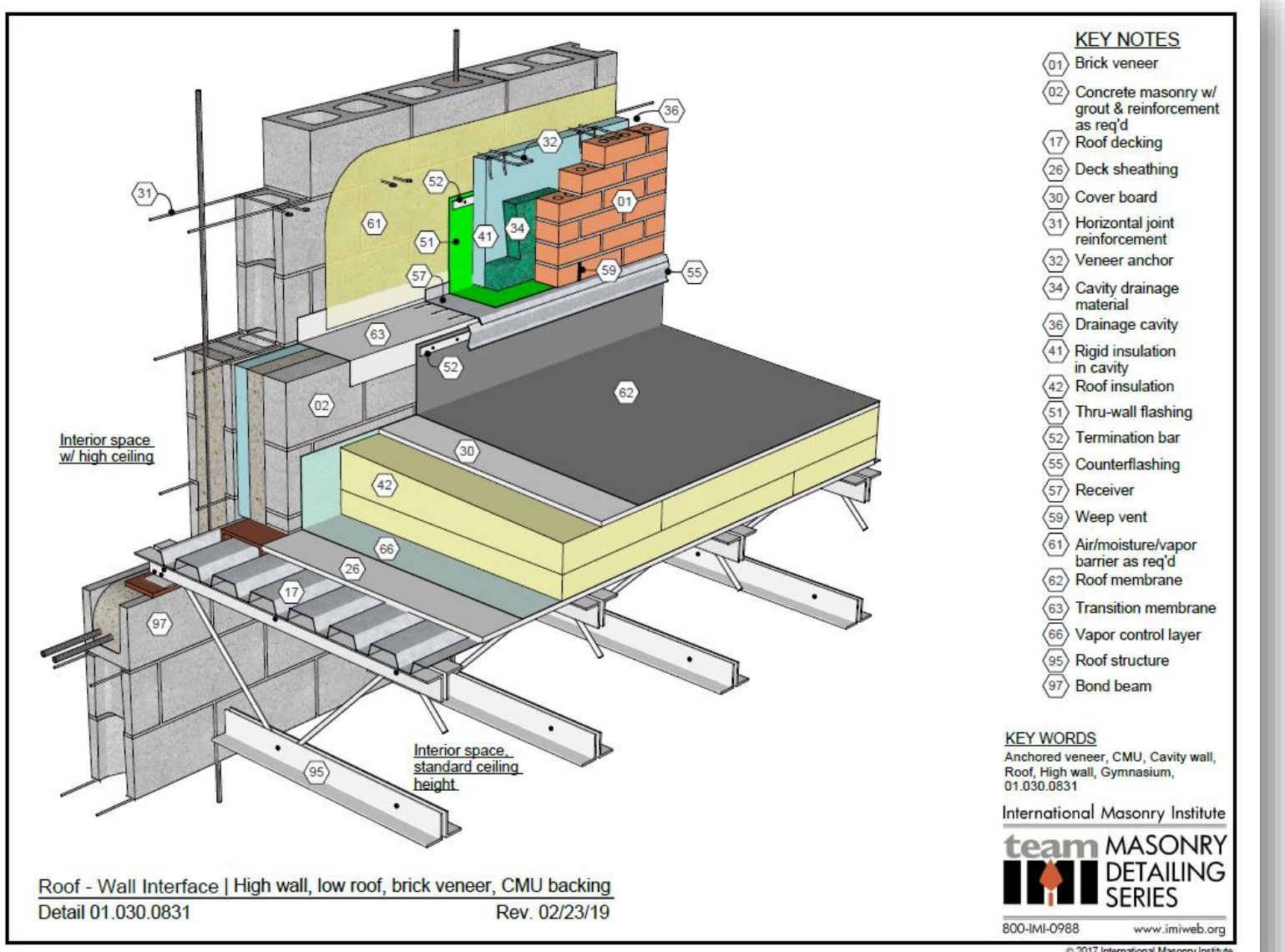
CAVITY WALL | ROOF-WALL INTERFACE



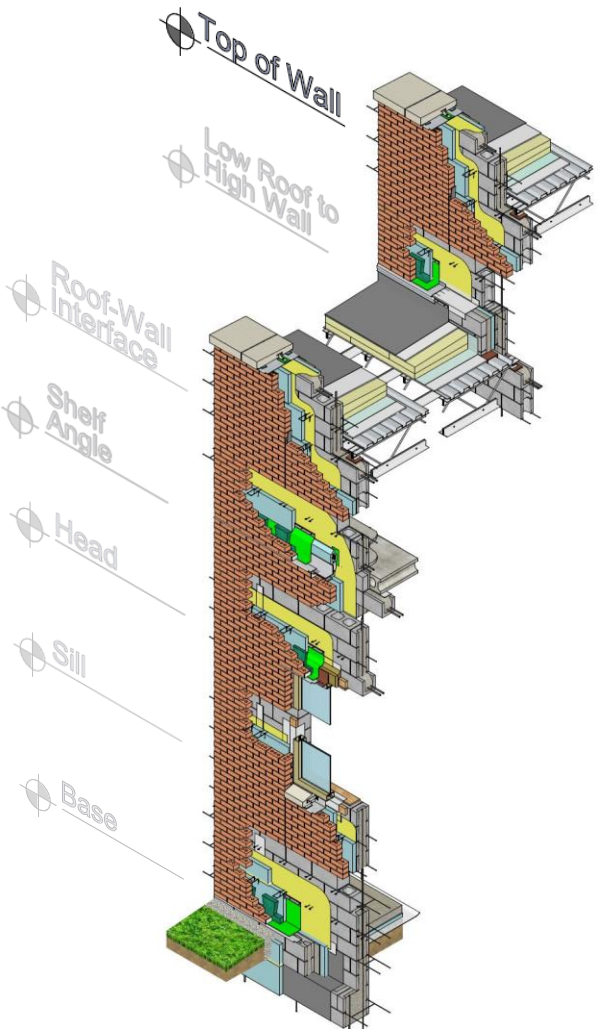


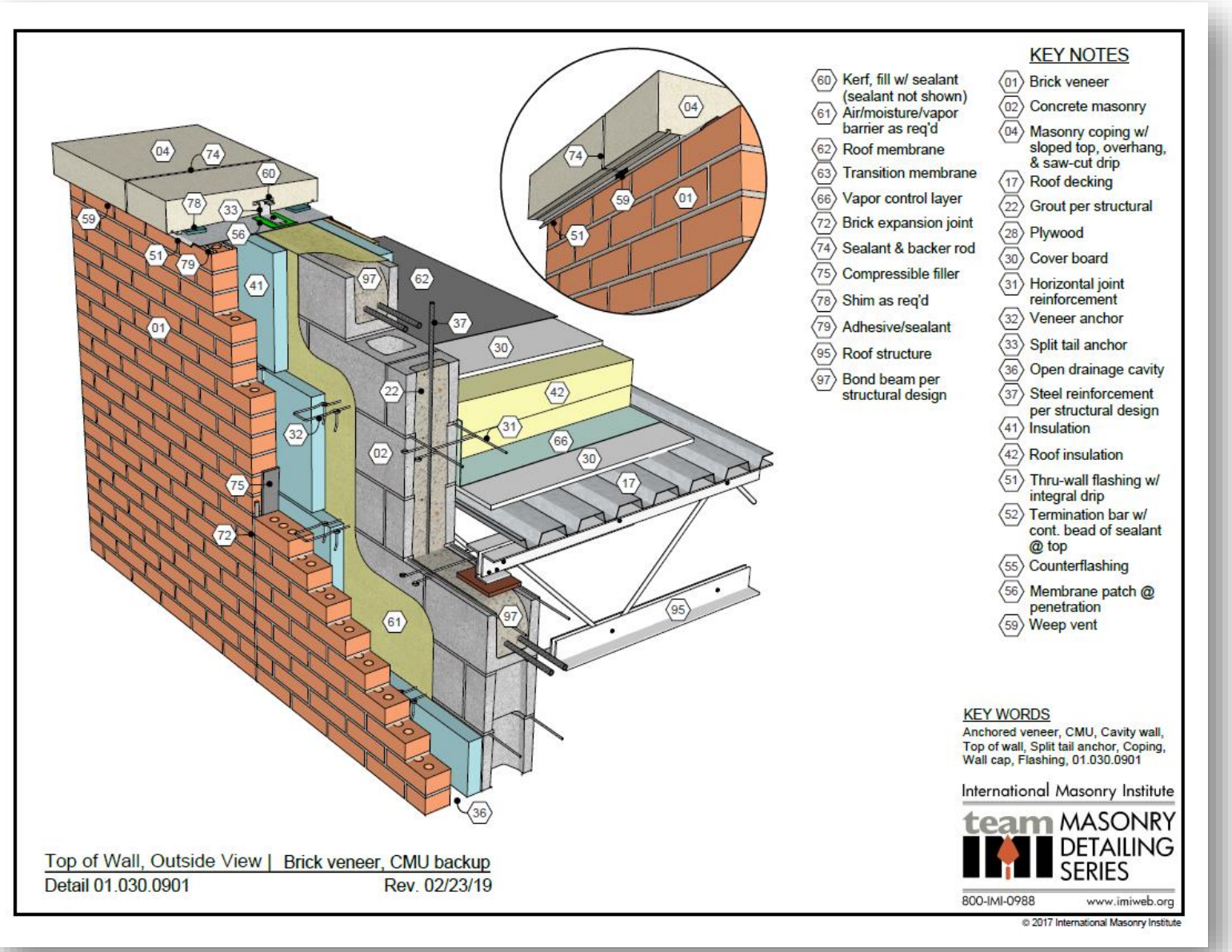
CAVITY WALL | LOW ROOF TO HIGH WALL



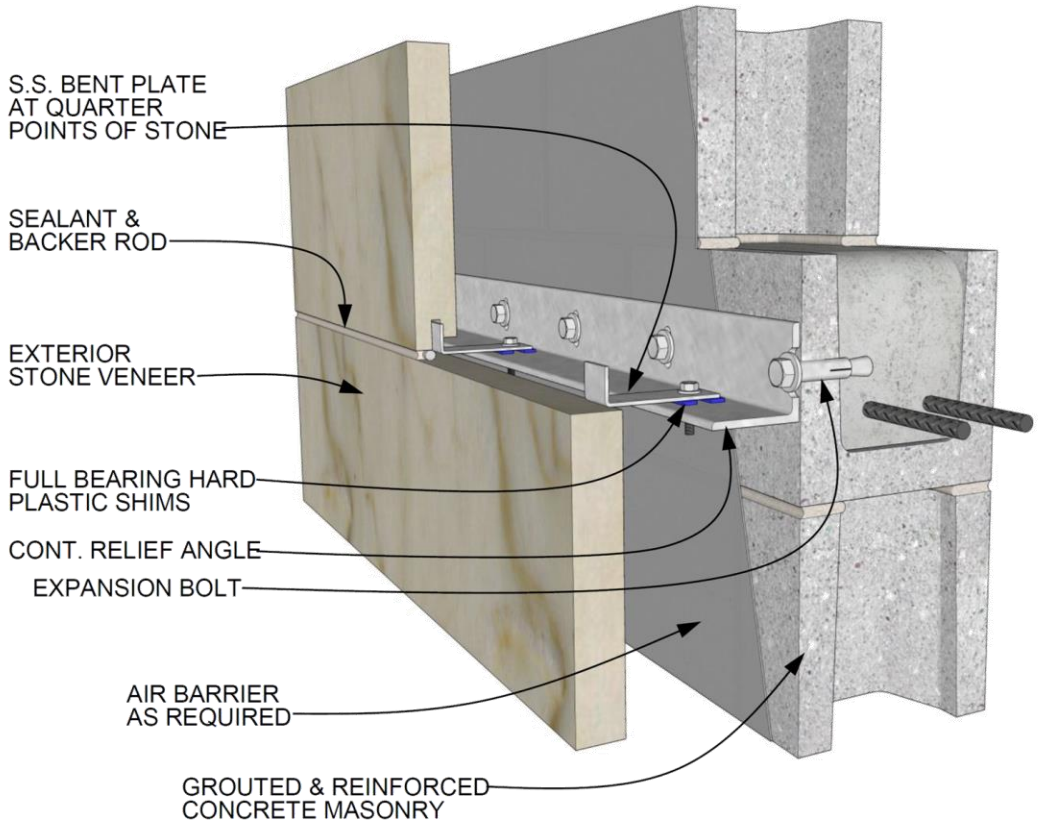


CAVITY WALL | TOP OF WALL

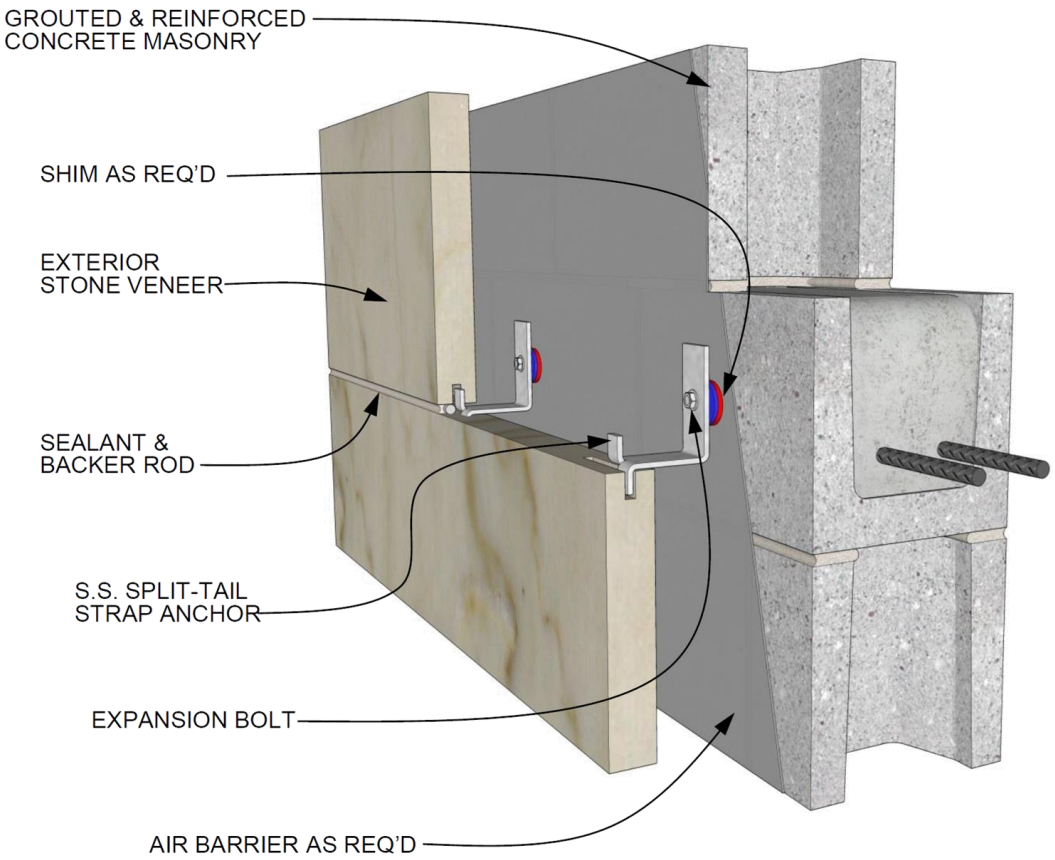




DIMENSION STONE WALLS | ANCHORAGE

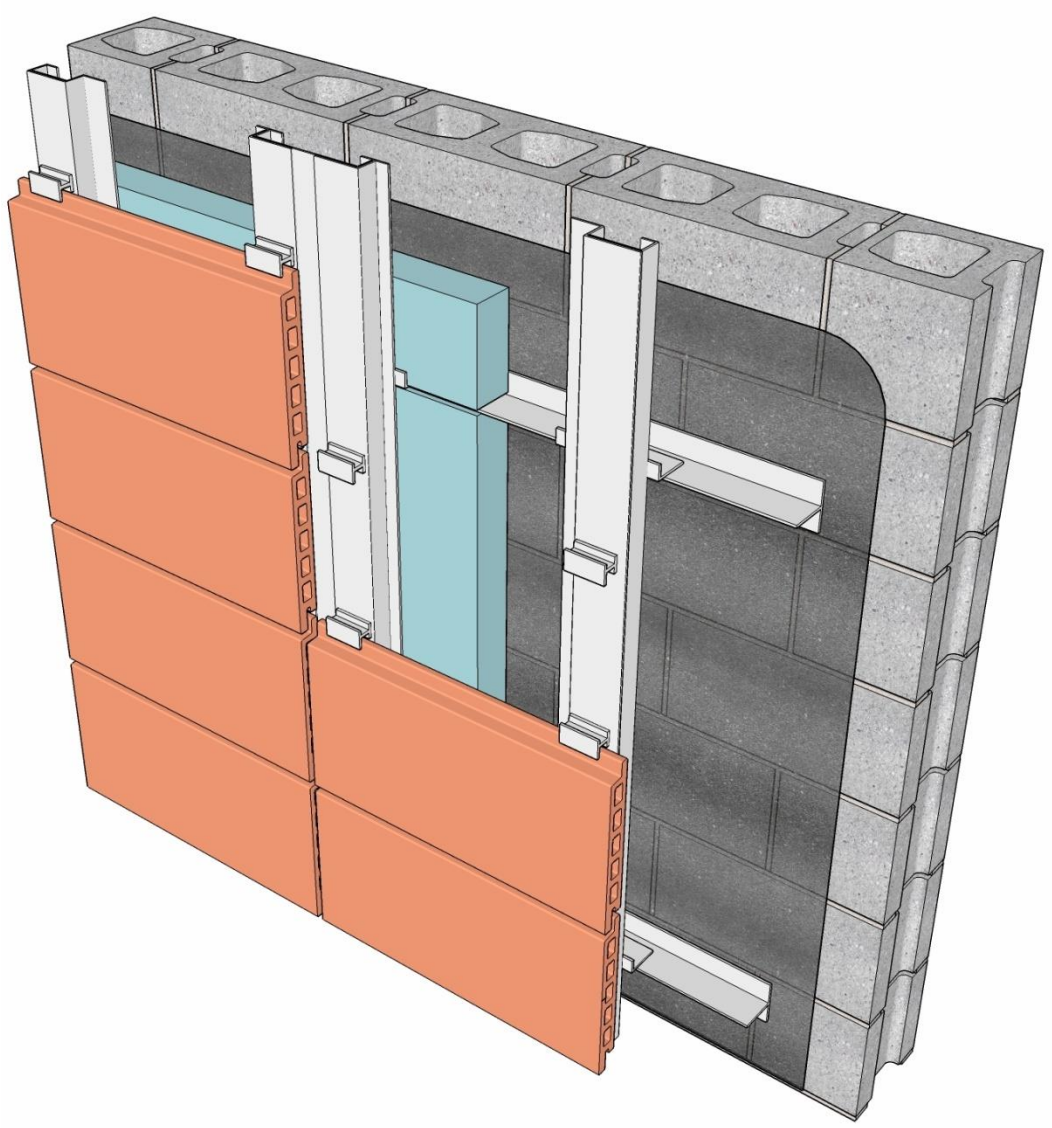


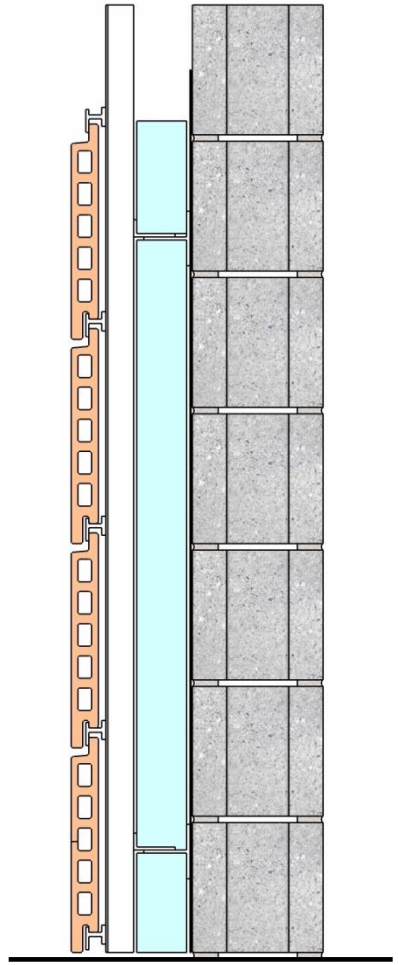
Relief angle & bent plate



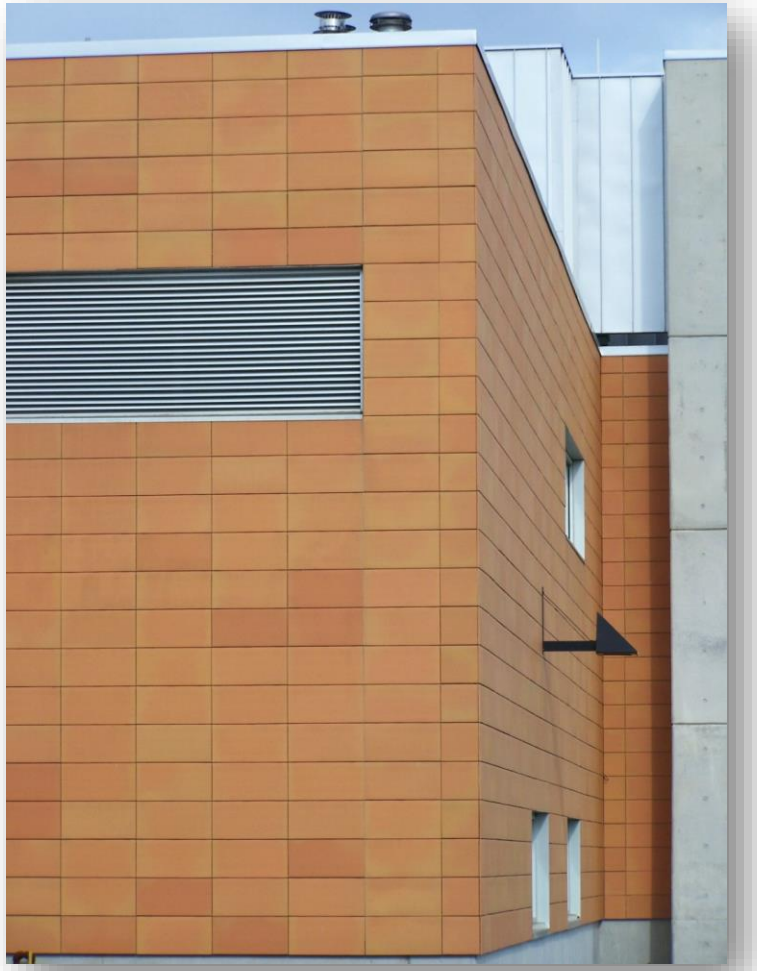
Split tail strap anchor

RAINSCREEN ASSEMBLIES



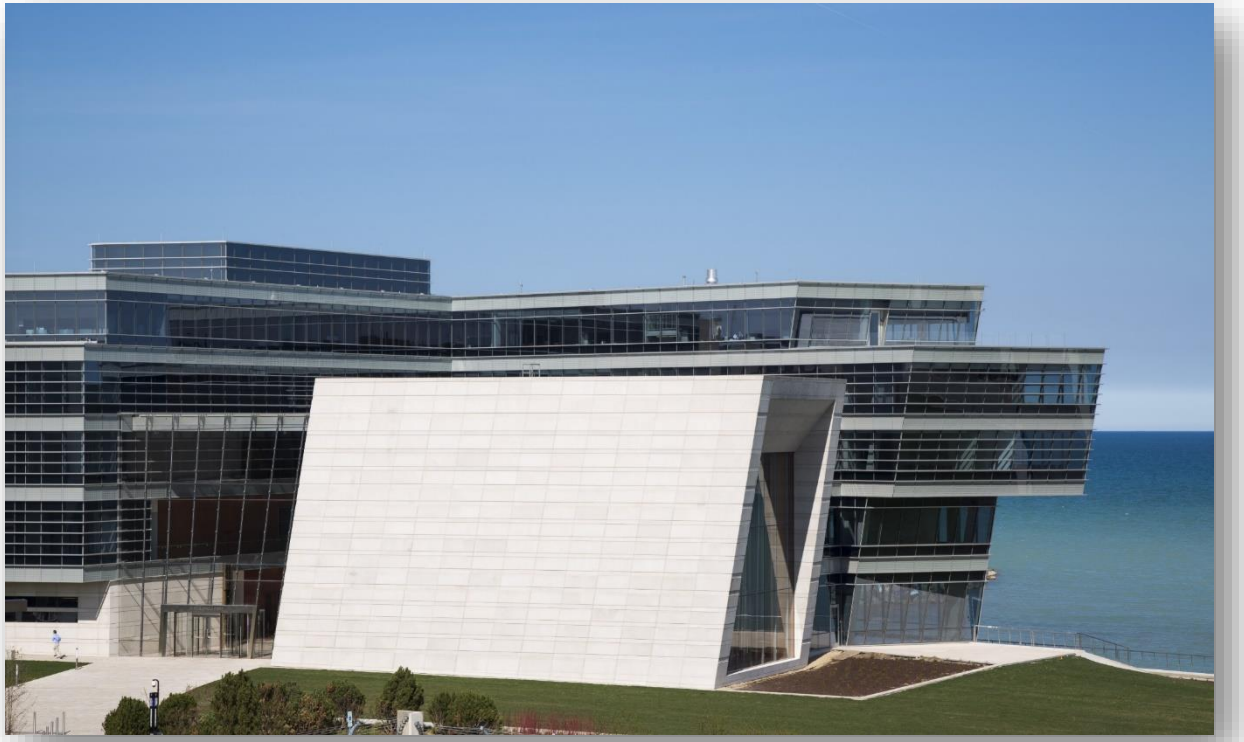


RAINSCREEN ASSEMBLIES



Naperville Public Library, Dewberry Architecture

RAINSCREEN ASSEMBLIES

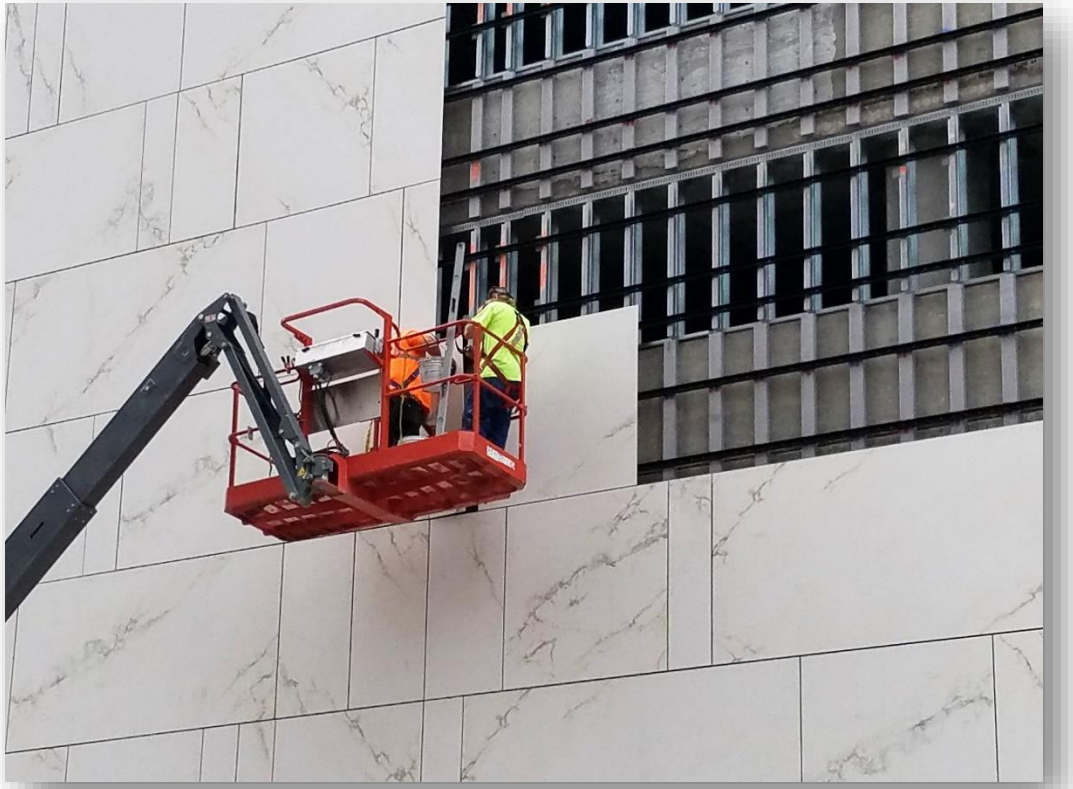


Northwestern University School of Music, Goettsch Partners

RAINSCREEN ASSEMBLIES

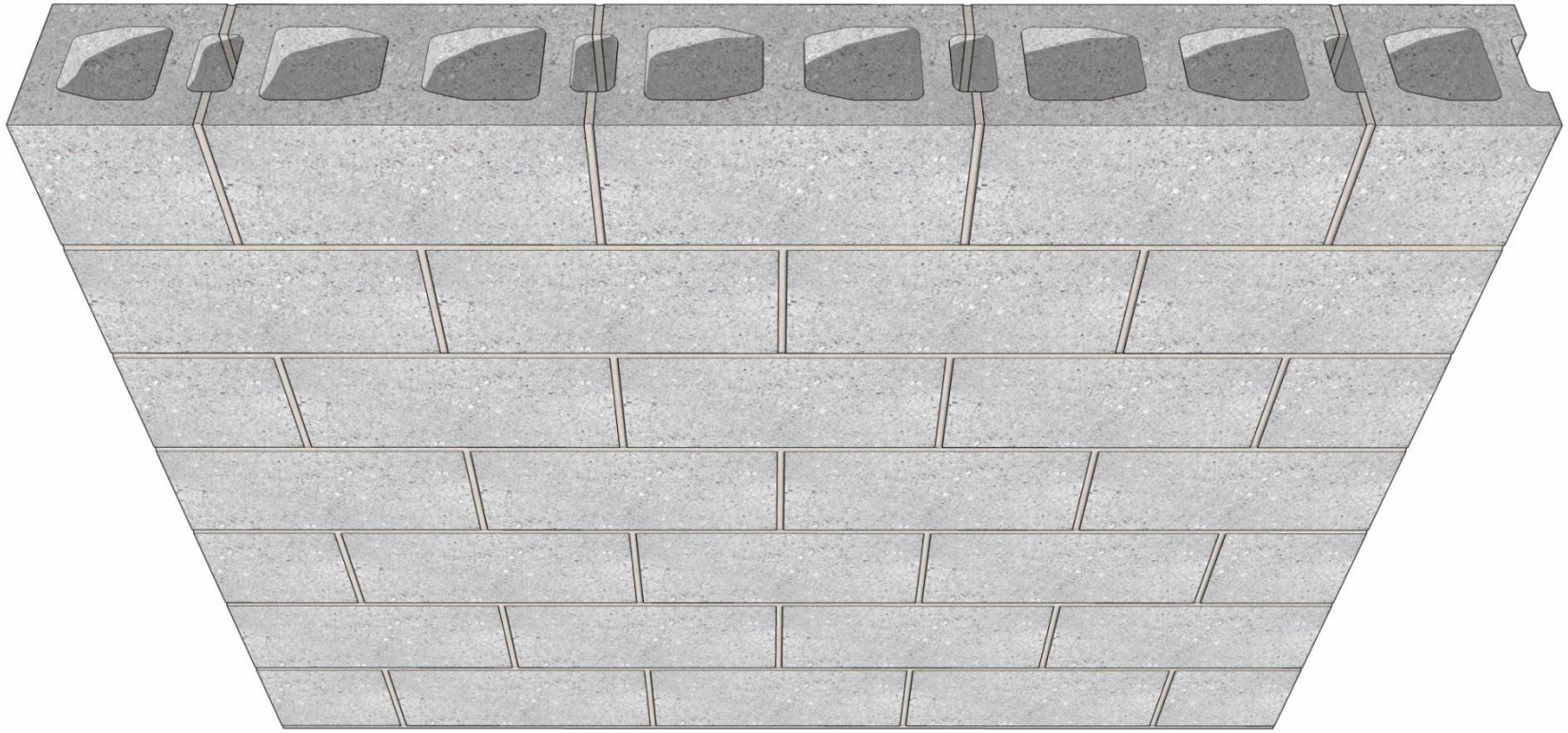
640 N. Wells, Chicago, Hartshorne Plunkard

RAINSCREEN ASSEMBLIES



640 N. Wells, Chicago, Hartshorne Plunkard

RAINSCREEN ASSEMBLIES



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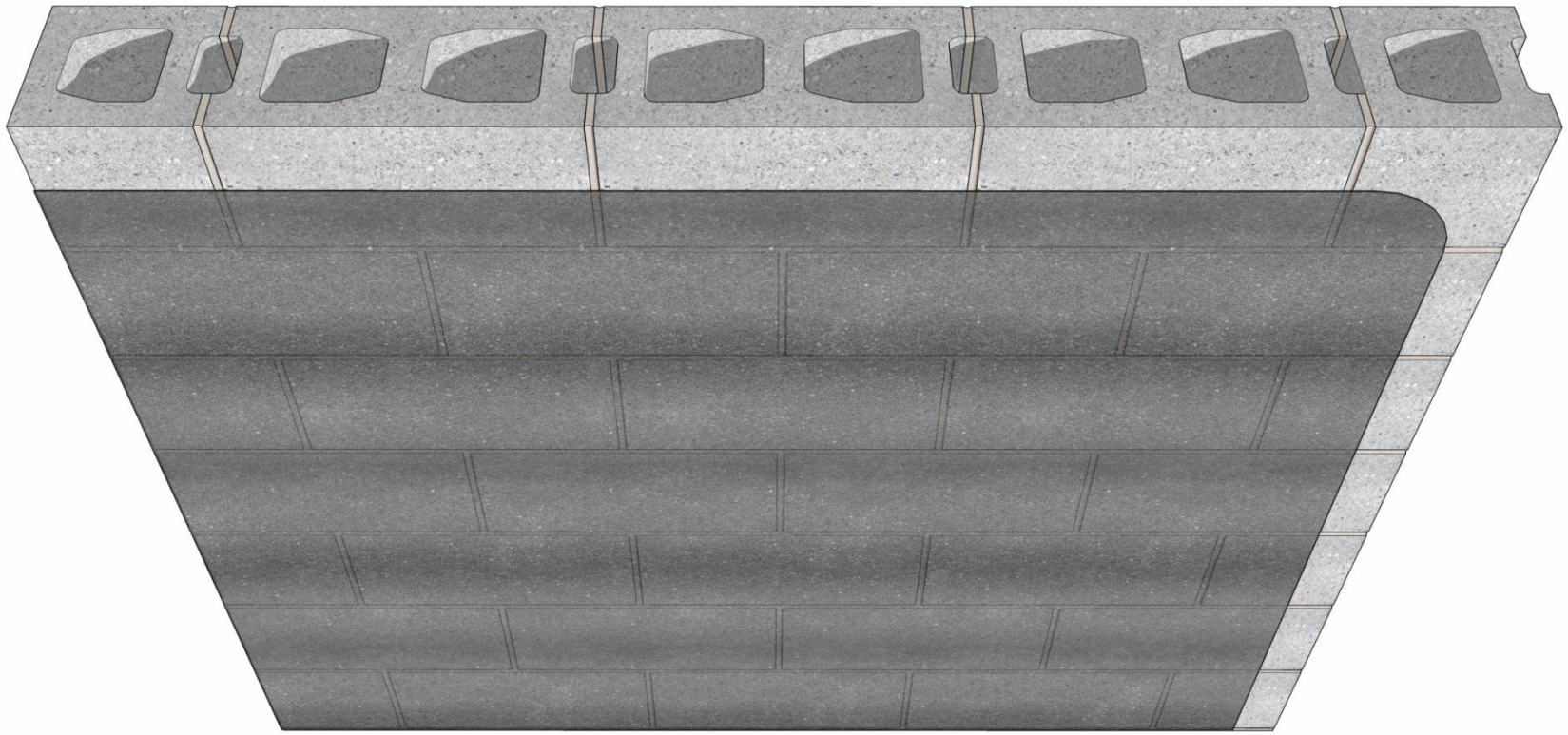

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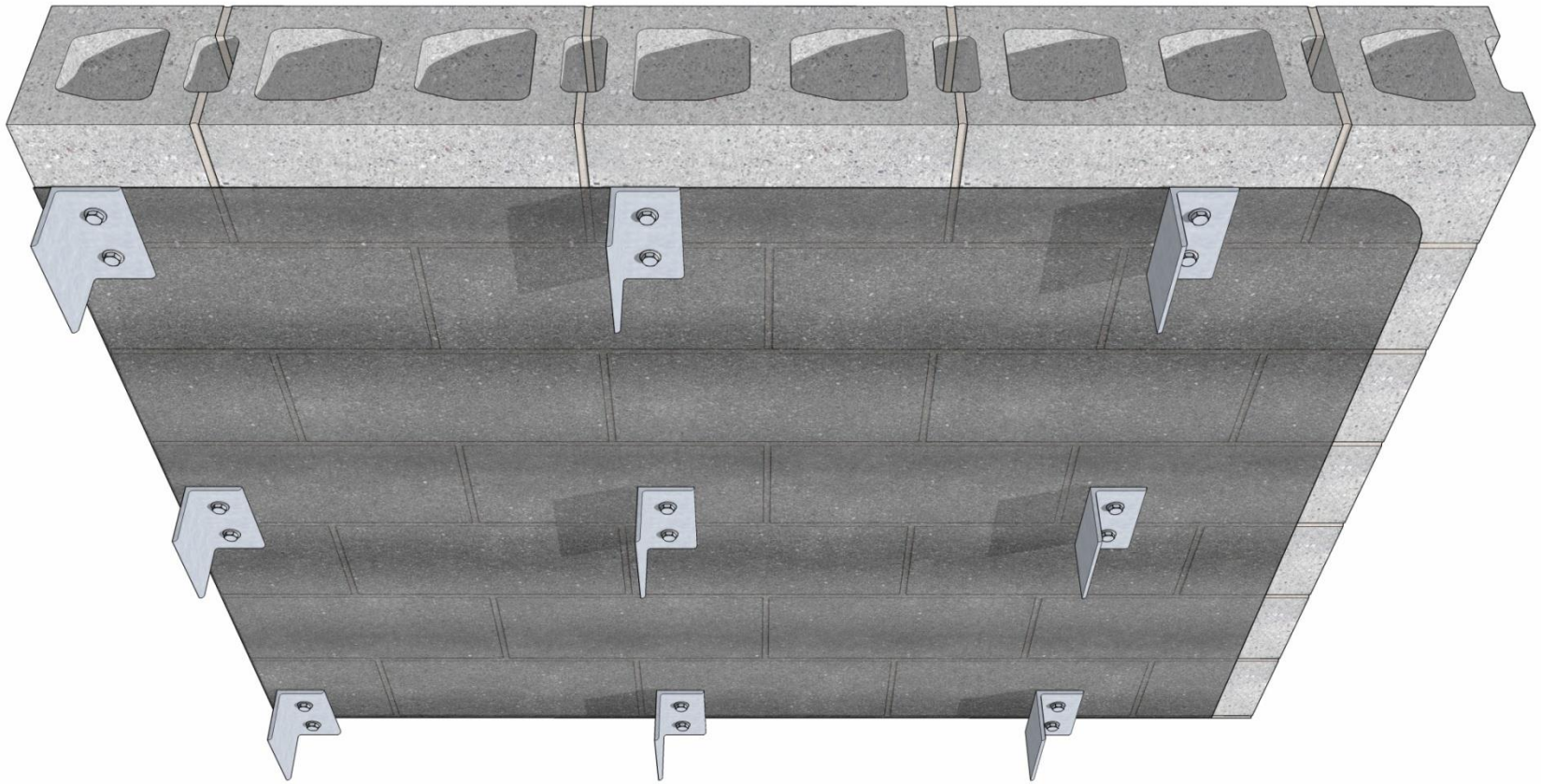

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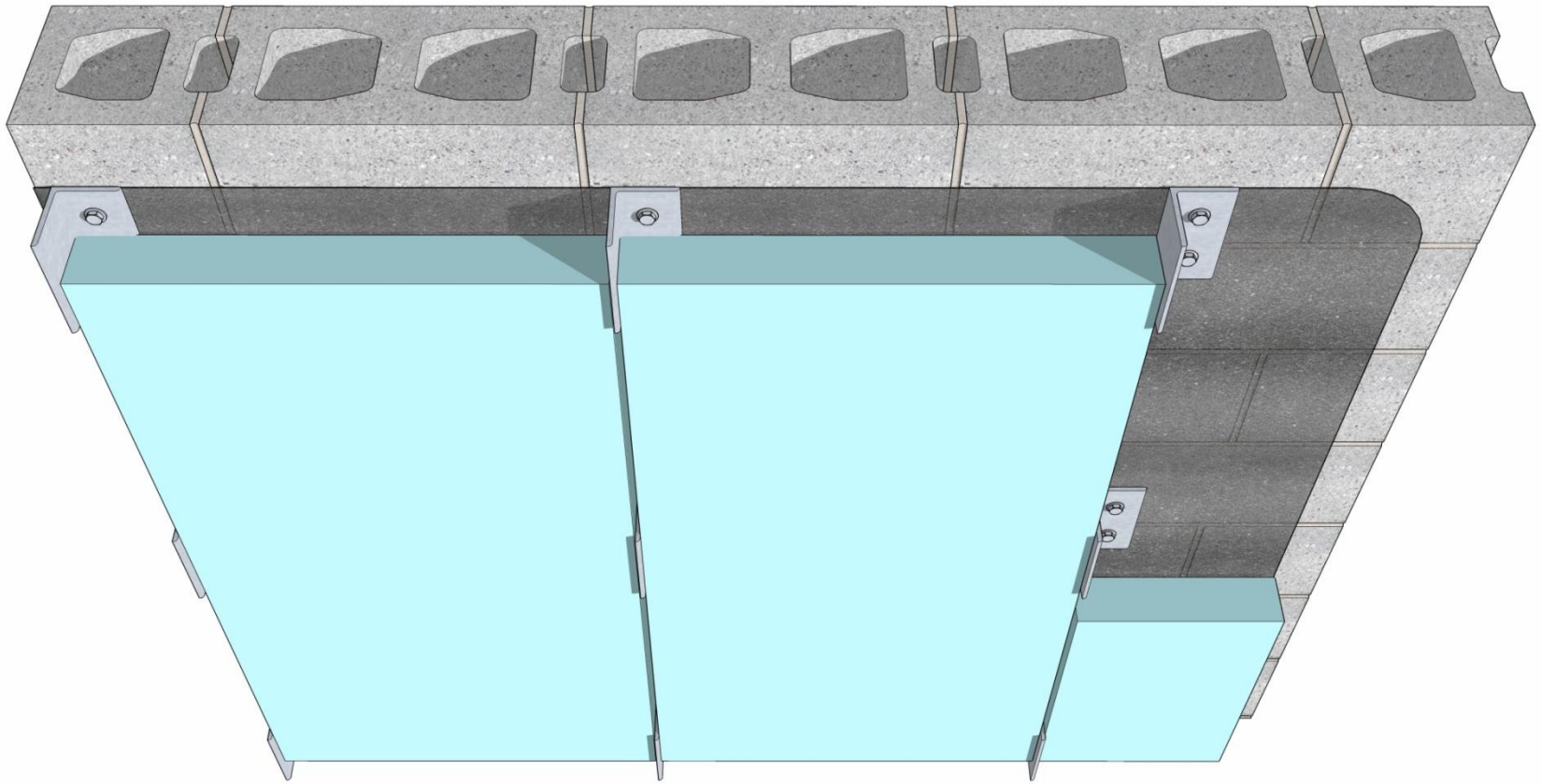

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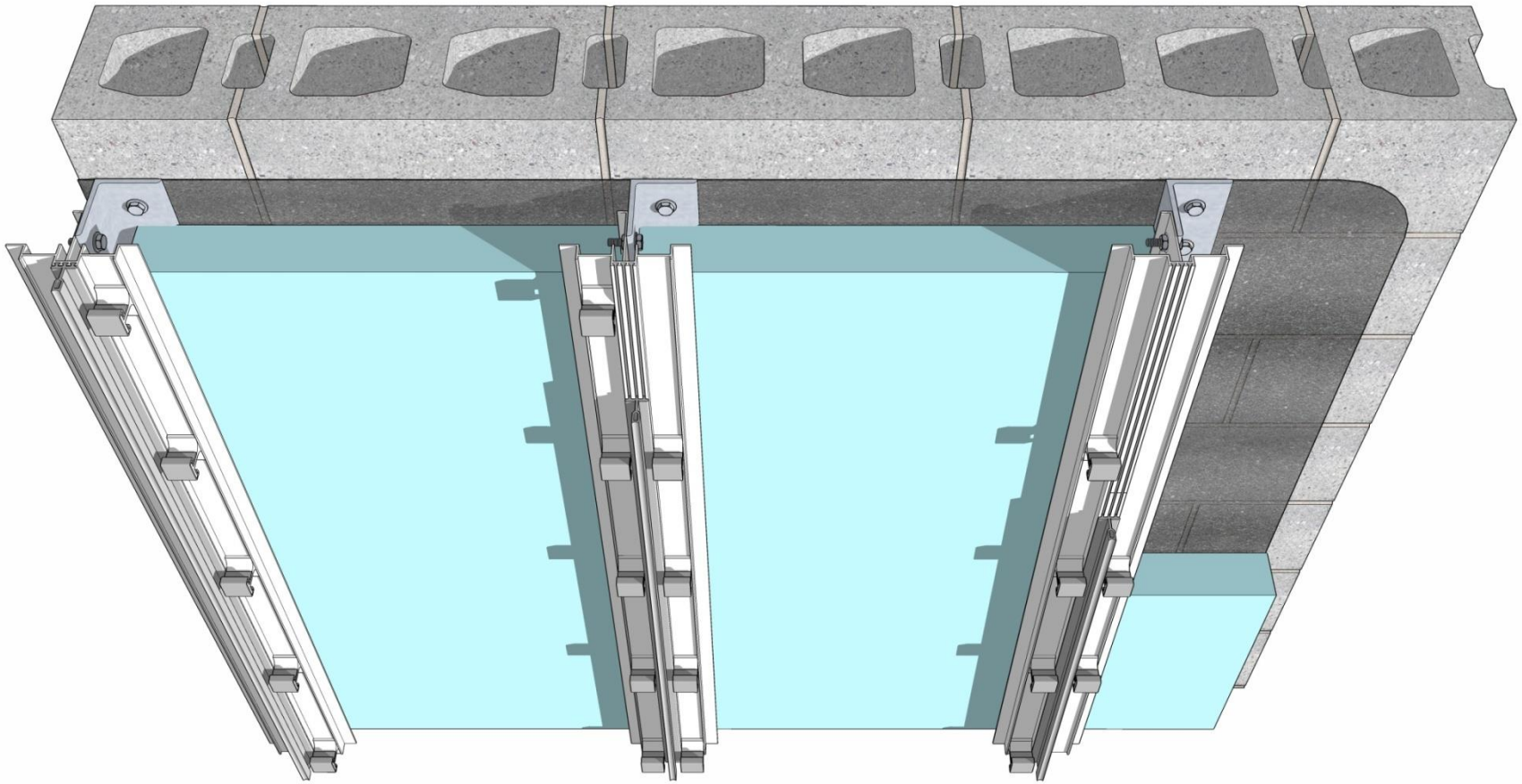
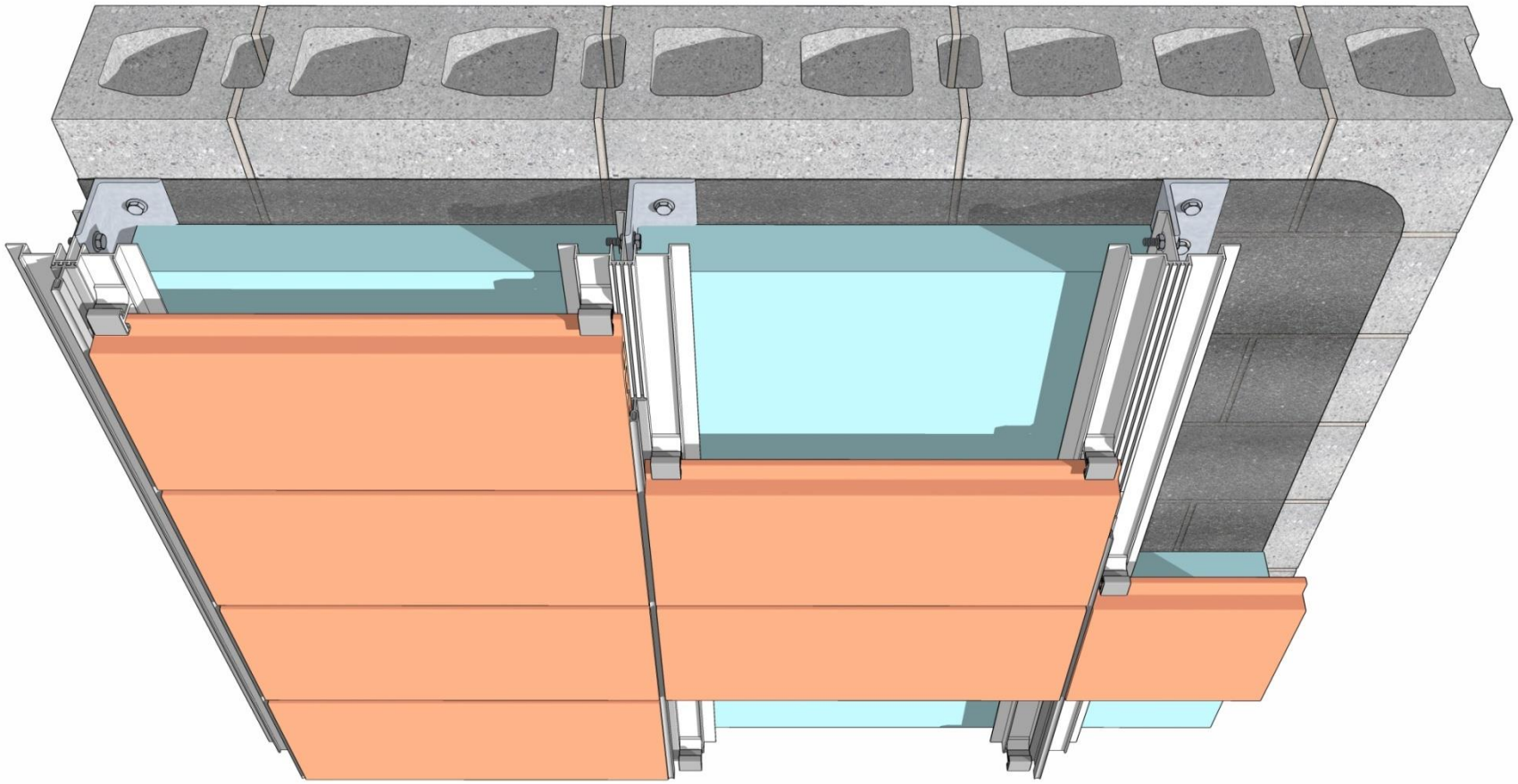
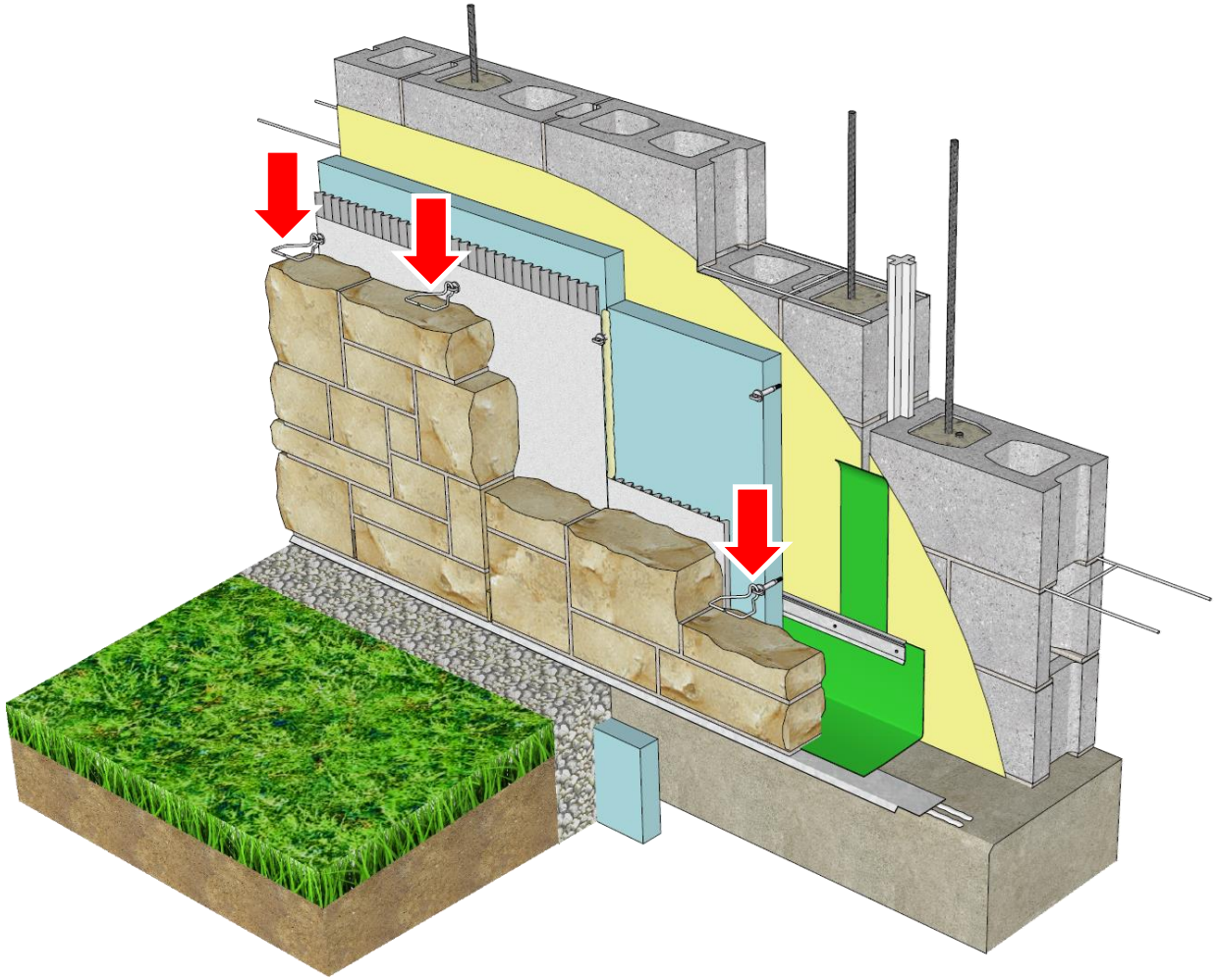


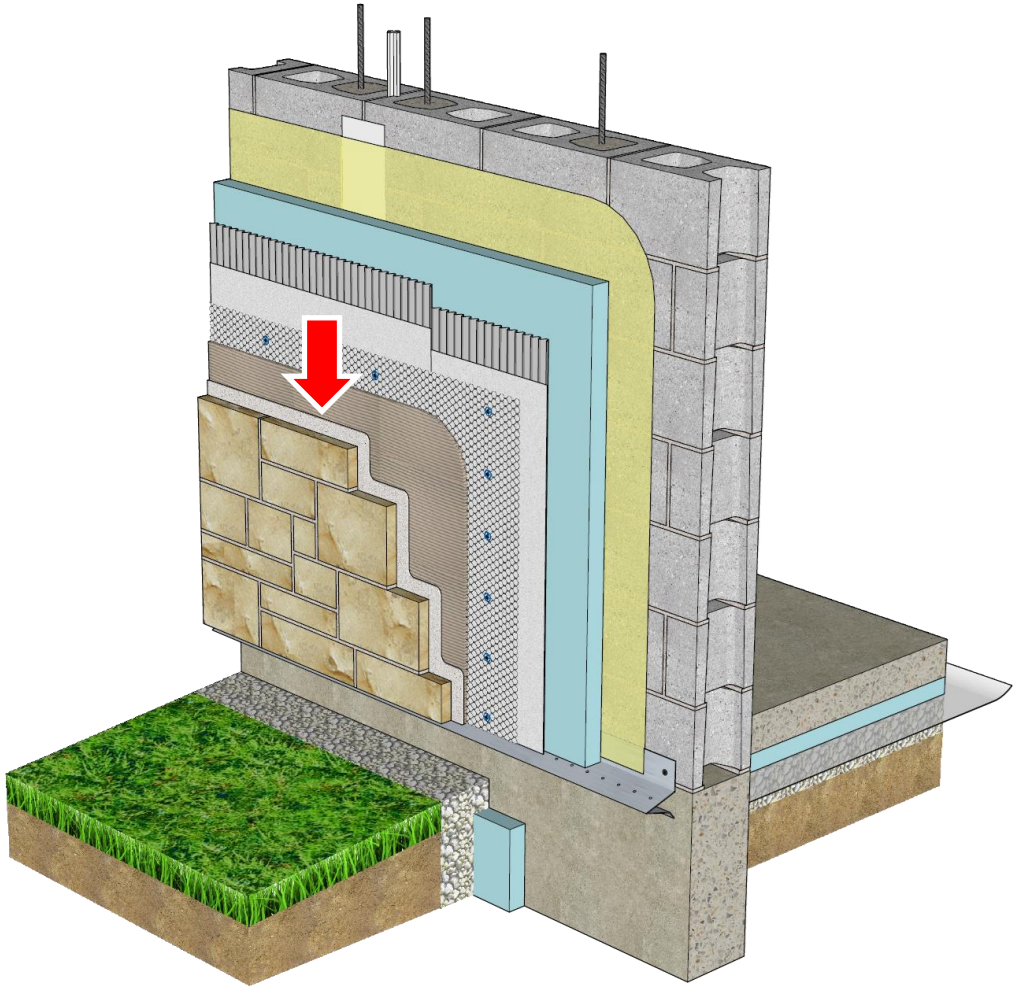
RAINSCREEN ASSEMBLIES



TYPES OF VENEERS

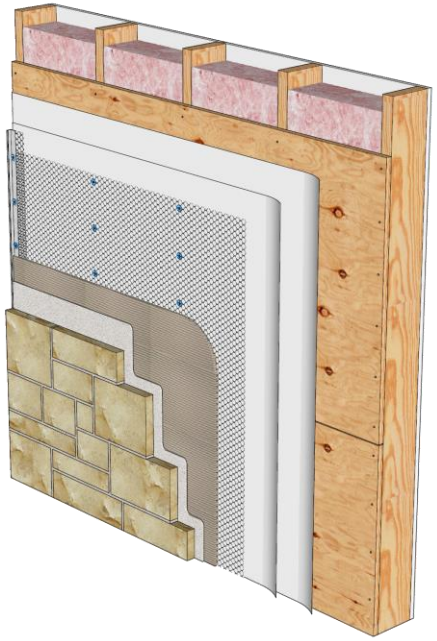


Anchored veneer

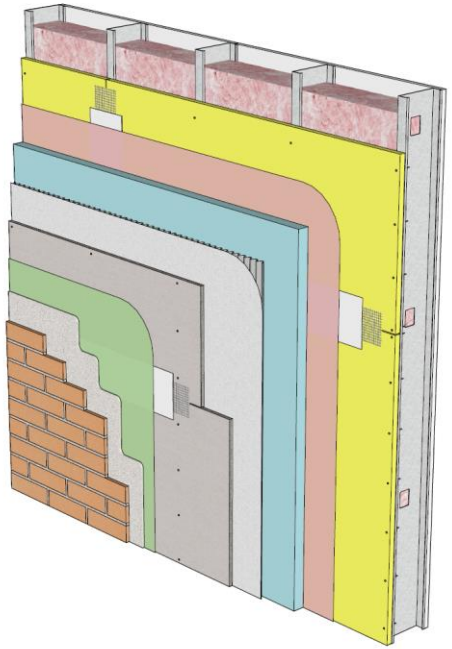


Adhered veneer

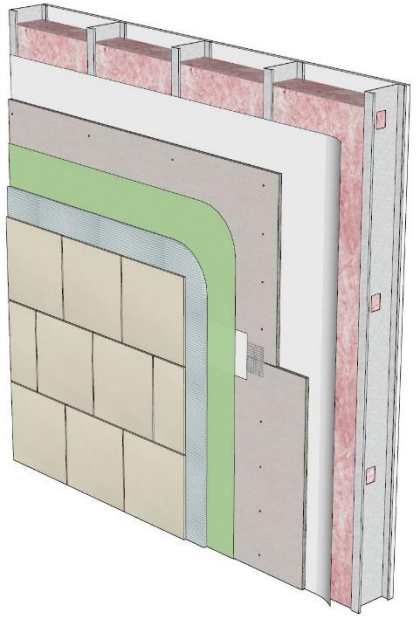
ADHERED VENEER | EXAMPLES



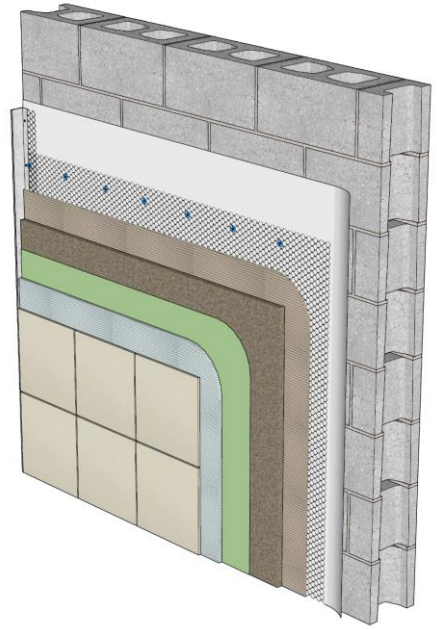
03.090.0223 Adhered stone veneer, wood framing, plywood sheathing, 2 layers building wrap, lath & scratch



01.080.0223 Adhered brick veneer, steel stud framing, glass mat reinforced gypsum board sheathing, air/moisture barrier, CI, drainage, cement board w/ topical waterproofing



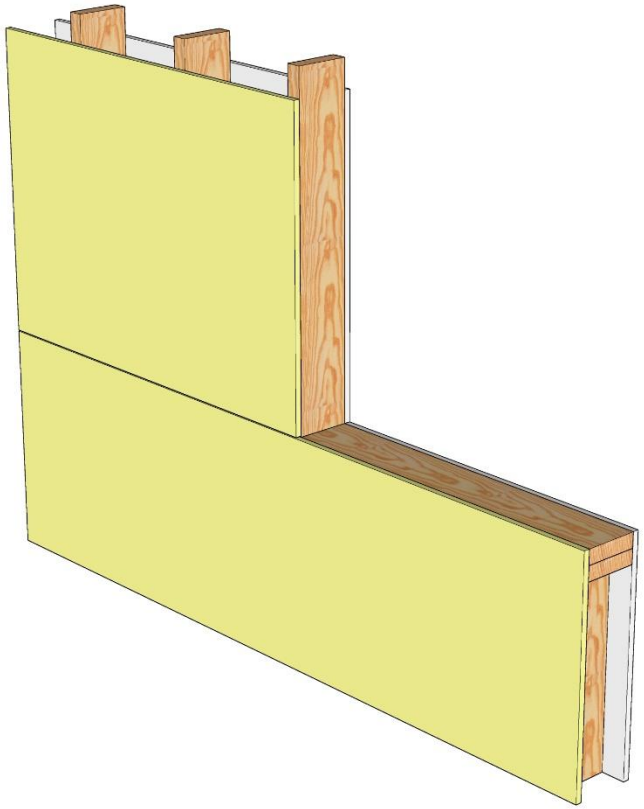
06.080.0244 Adhered tile, steel studs, building wrap, cement board sheathing w/ topical waterproofing



06.070.0201 Adhered tile, CMU backing, cleavage membrane, lath & scratch, cured mortar bed w/ topical waterproofing

ADHERED VENEER

ADHERED VENEER



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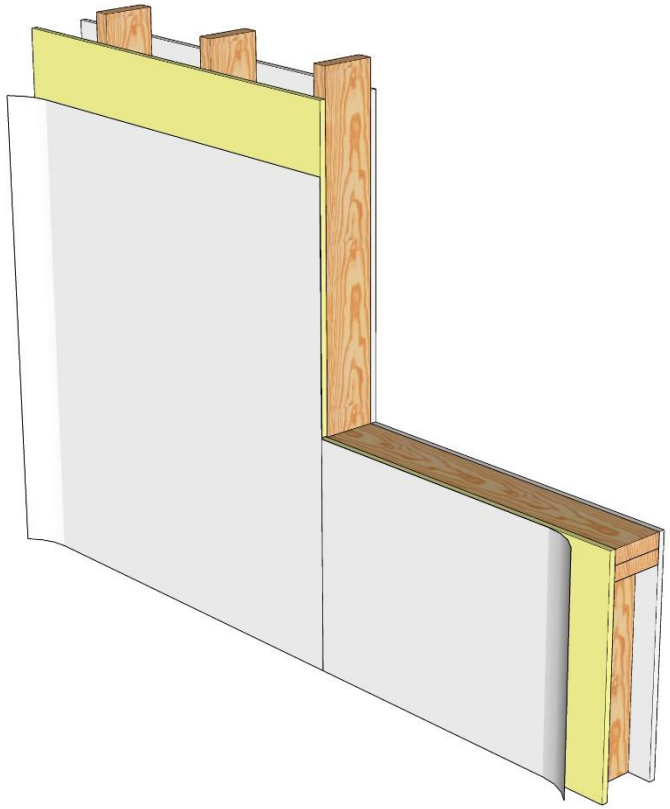

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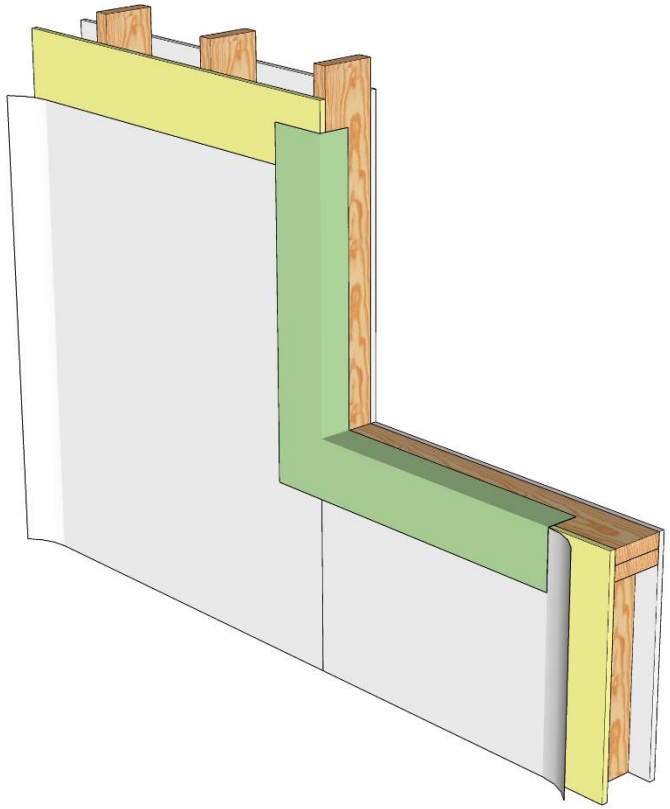

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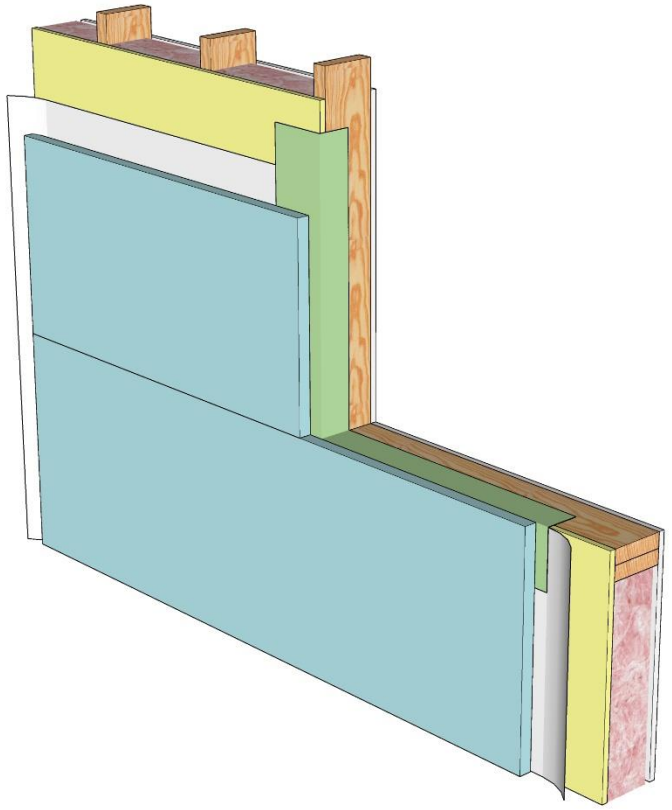

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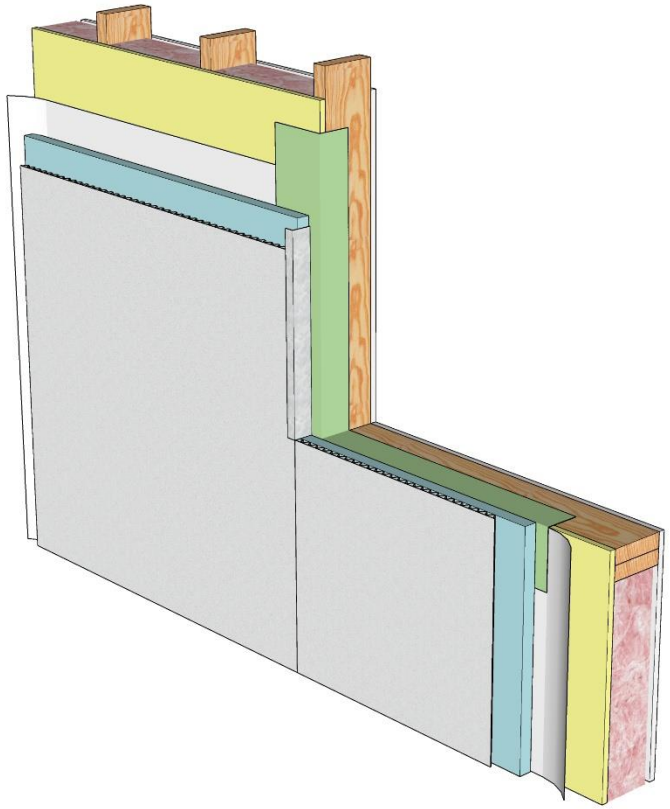

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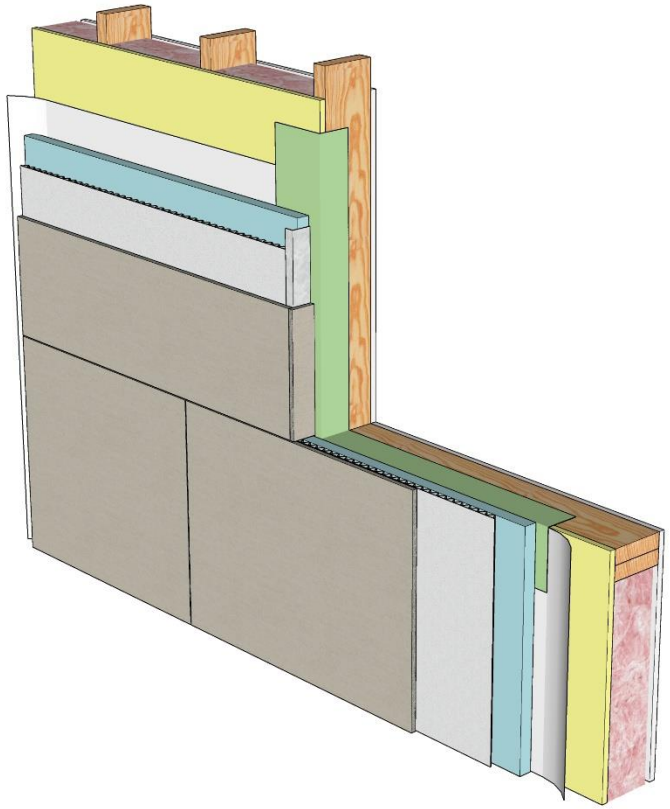

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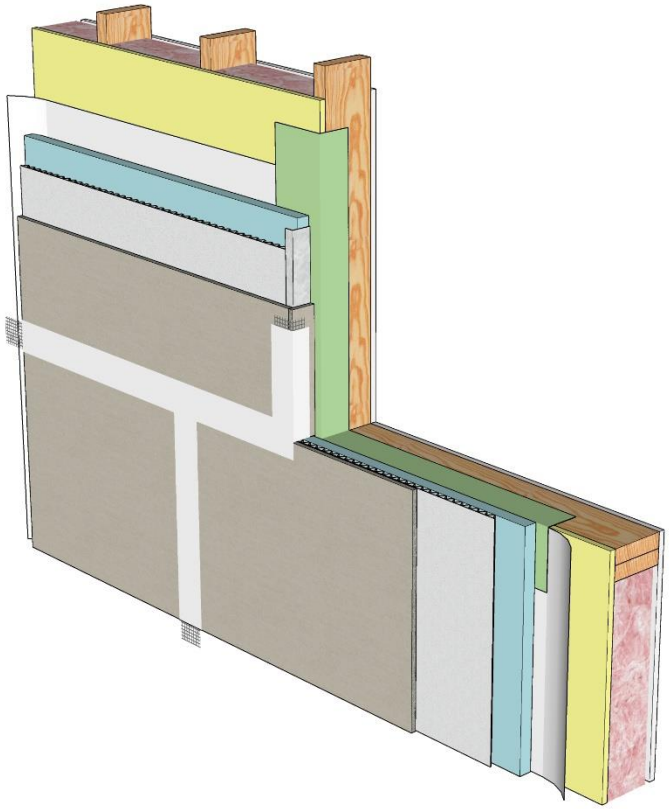

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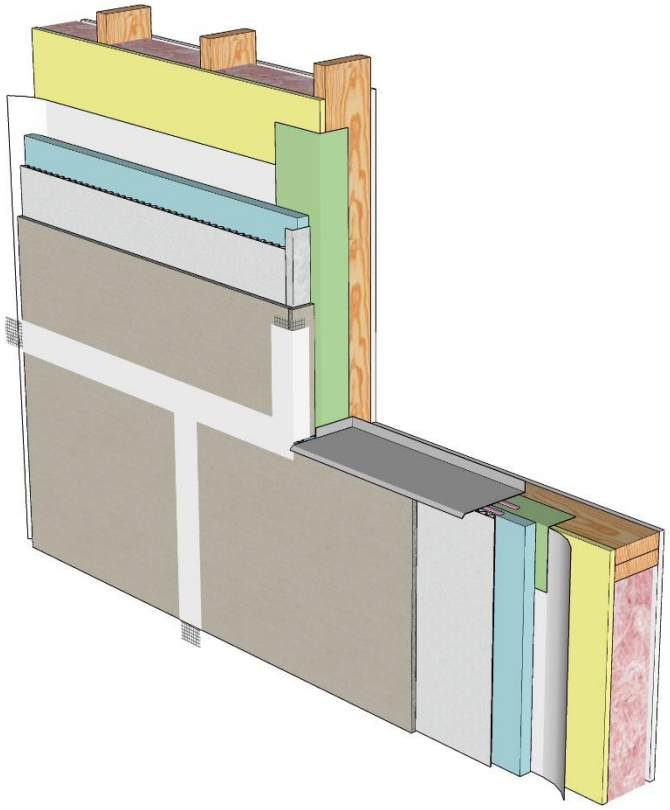

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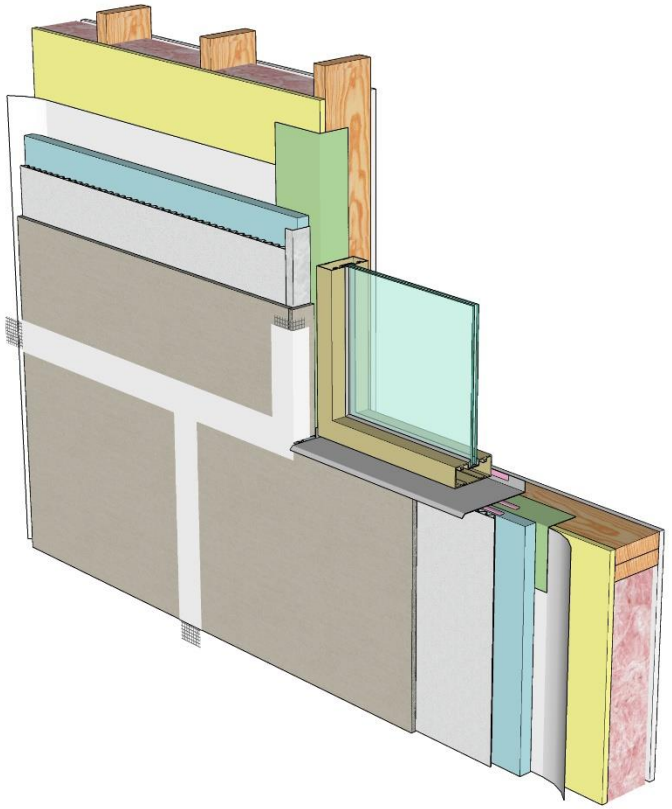

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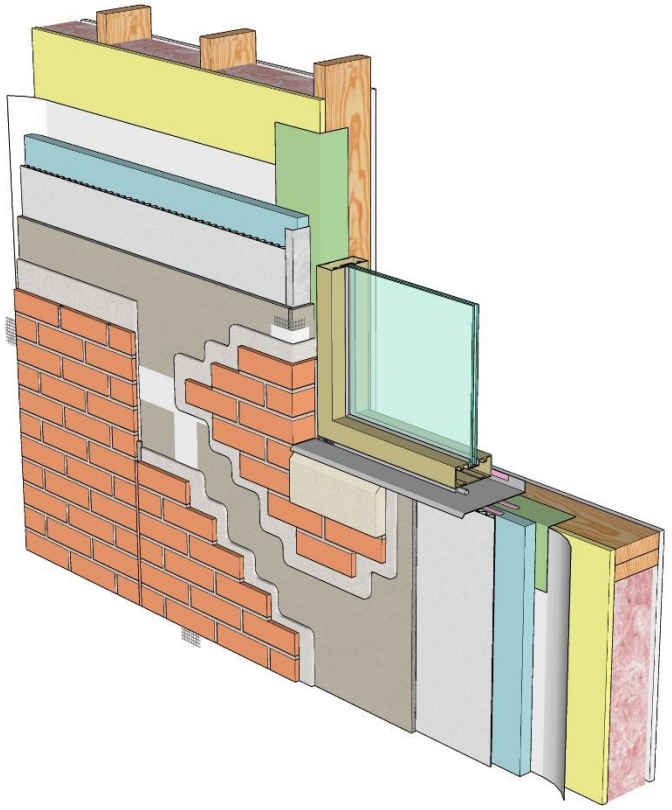

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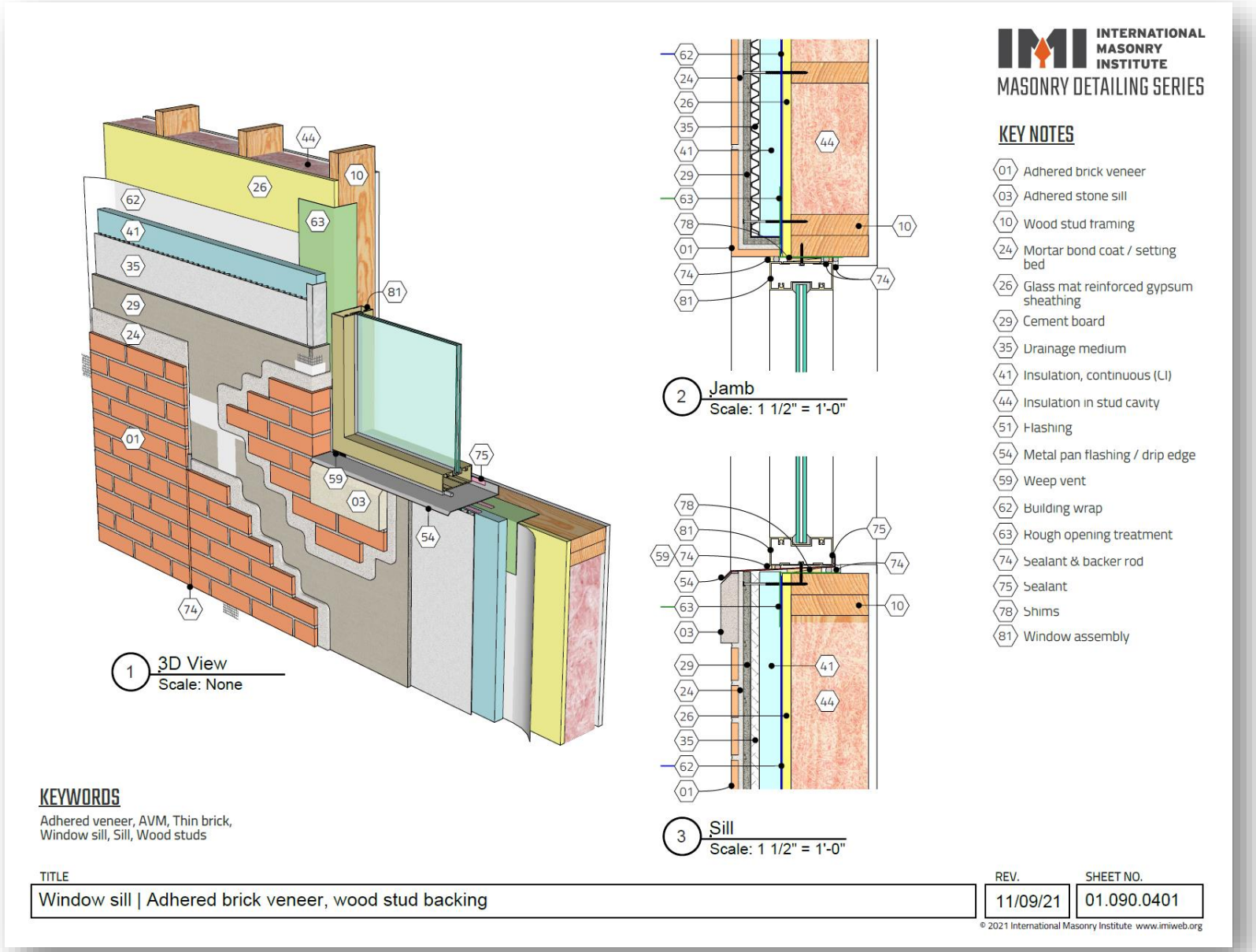


MASONRY MATERIALITY

TILE

INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

TILE

Mosaic remnants, Laodicea, Turkey, 100 AD

TILE

Sullivan Center (Carson Pirie Scott), Chicago

TILE

1960's moving into larger 4", 6", 8" formats

TILE

1980’s large format = 12” x 12”

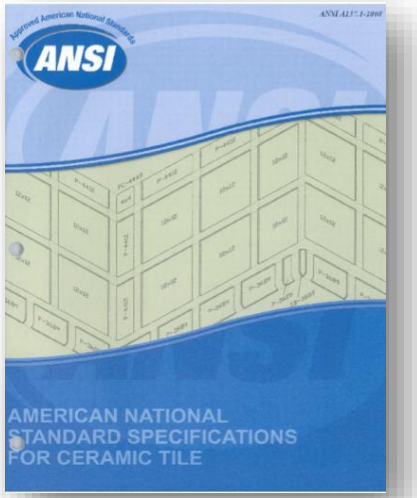
TILE

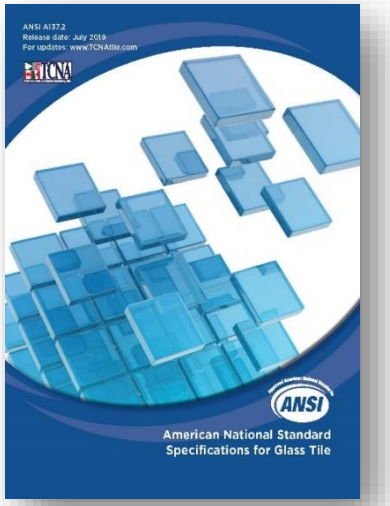
TILE

TILE | STANDARDS

ANSI A137.1 American National Standard Specifications for Ceramic Tile includes performance and aesthetic criteria for the five primary types of ceramic tiles:

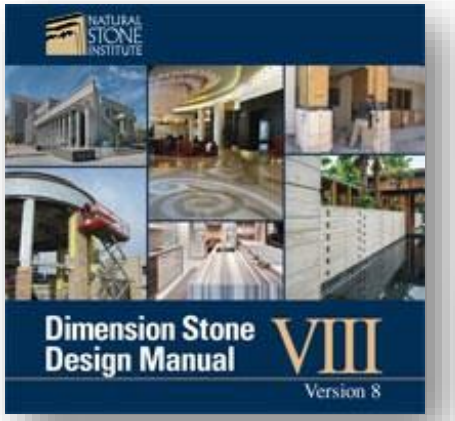
- **Porcelain tile**
- **Pressed floor tile**
- **Mosaic tile**
- **Quarry tile**
- **Glazed wall tile**





ANSI A137.2 covers:

- **Glass tile**

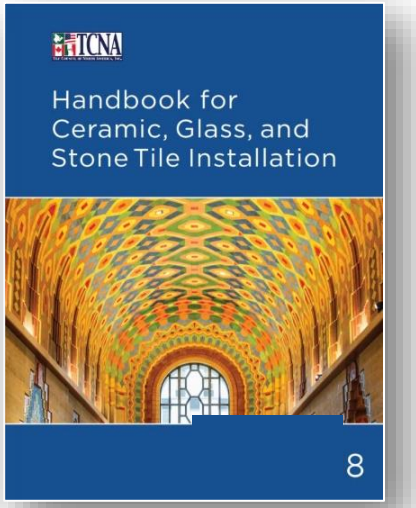


ANSI A137.3 covers:

- **Gauged Porcelain Tile (GPT) & GPT Panels**

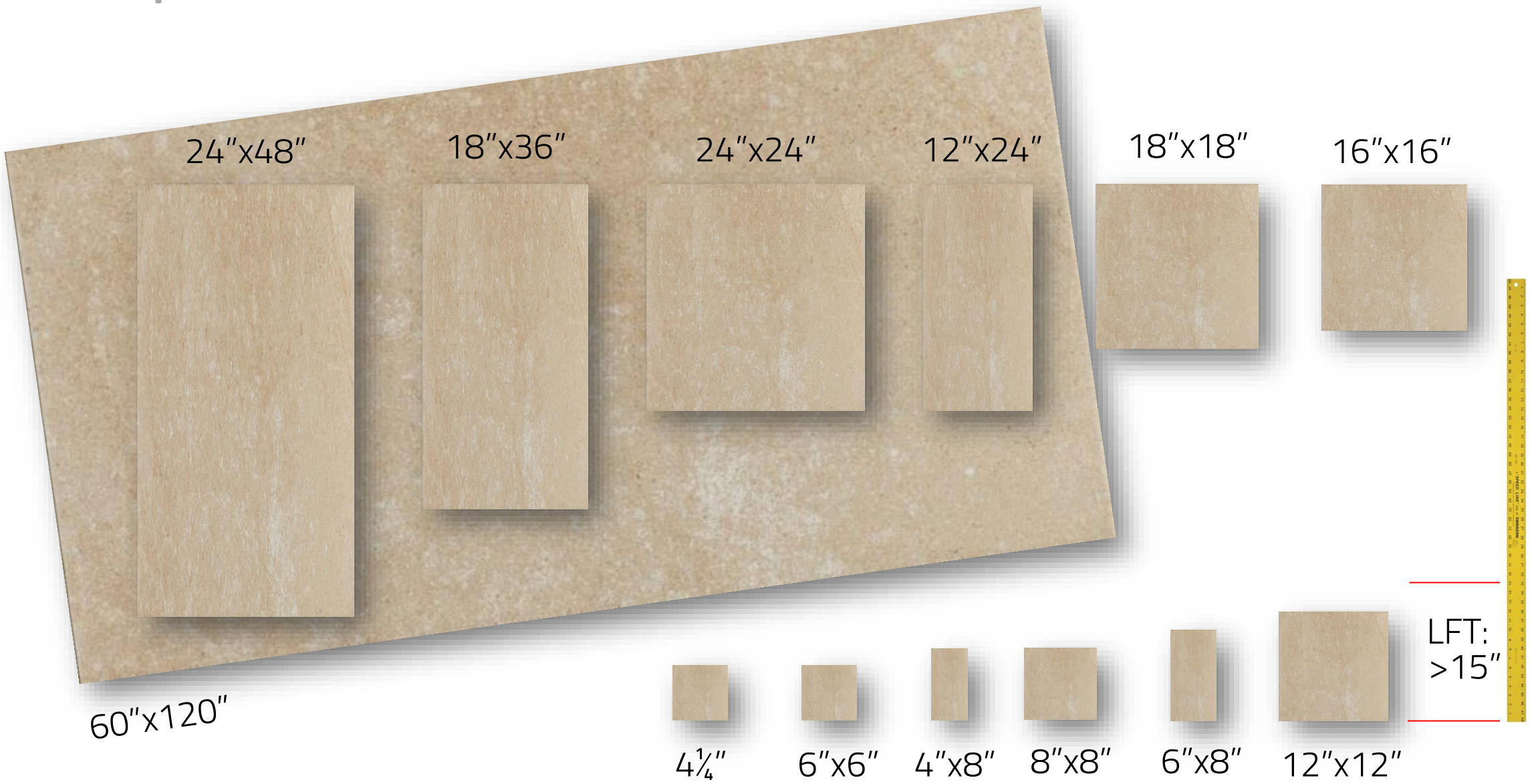
ASTM C1242 and **Natural Stone Institute** cover:

- **Natural stone tile**



TCNA Handbook includes selections guides and installation methods for **all of the above**

TILE | SIZES



TILE | LARGE FORMAT

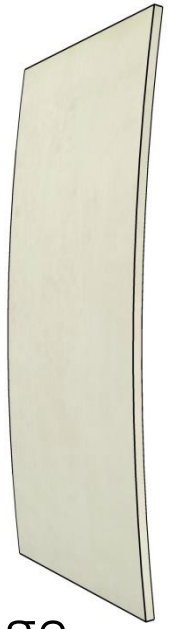
6’ x 12’ thin gauged porcelain tile panel

TILE | LARGE FORMAT

12″ x 24″ porcelain tile

Tiles with at least one side ≥ 15″ require special design considerations

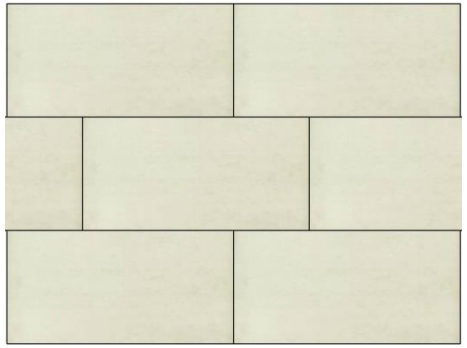
TILE | LARGE FORMAT



Warpage

Lippage

Substrate tolerance



Bonding pattern

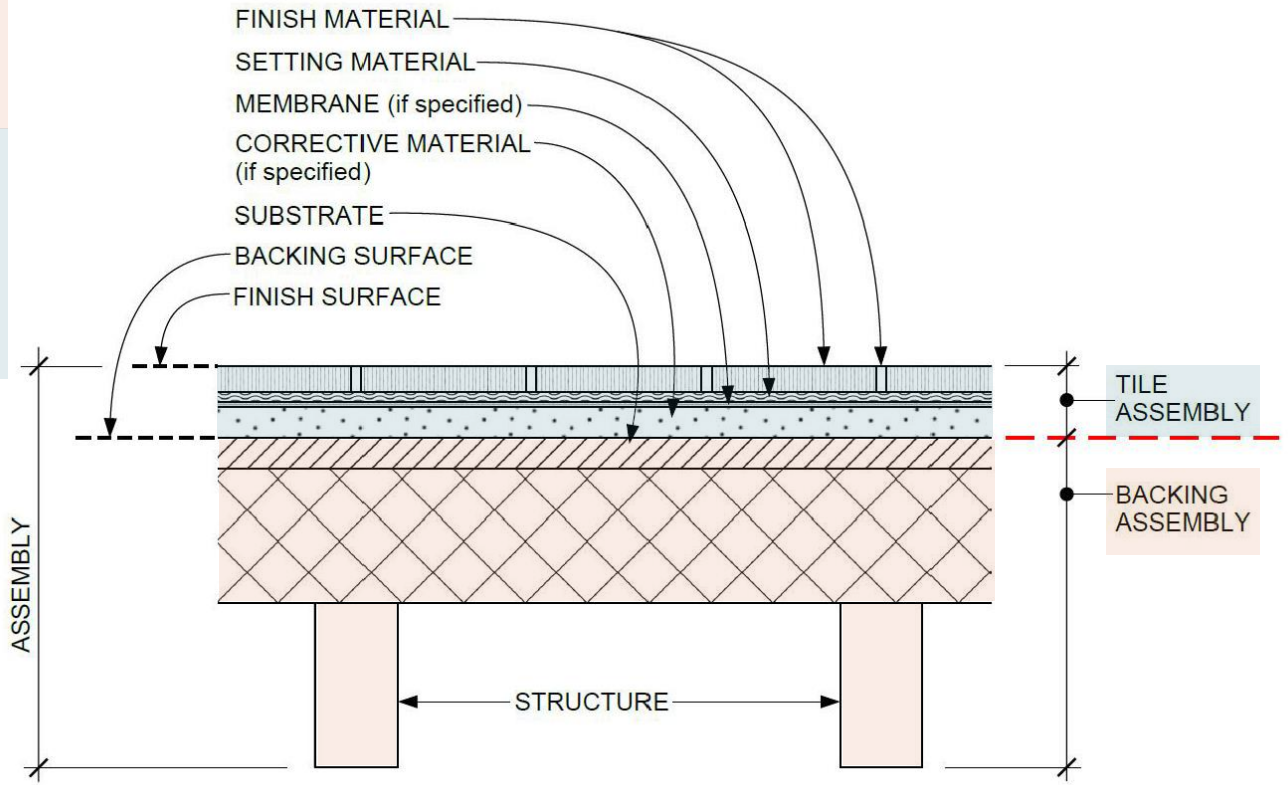
Coverage

TILE | TERMINOLOGY

Assembly The entire wall, ceiling, or floor construction including the backing assembly and the finish assembly.

Backing Assembly The portion of the assembly made up of the structure and the substrate; the subassembly behind the tile assembly.

Tile Assembly The portion of the assembly that includes the corrective material (if present), membrane (if present), setting material, and finish material.



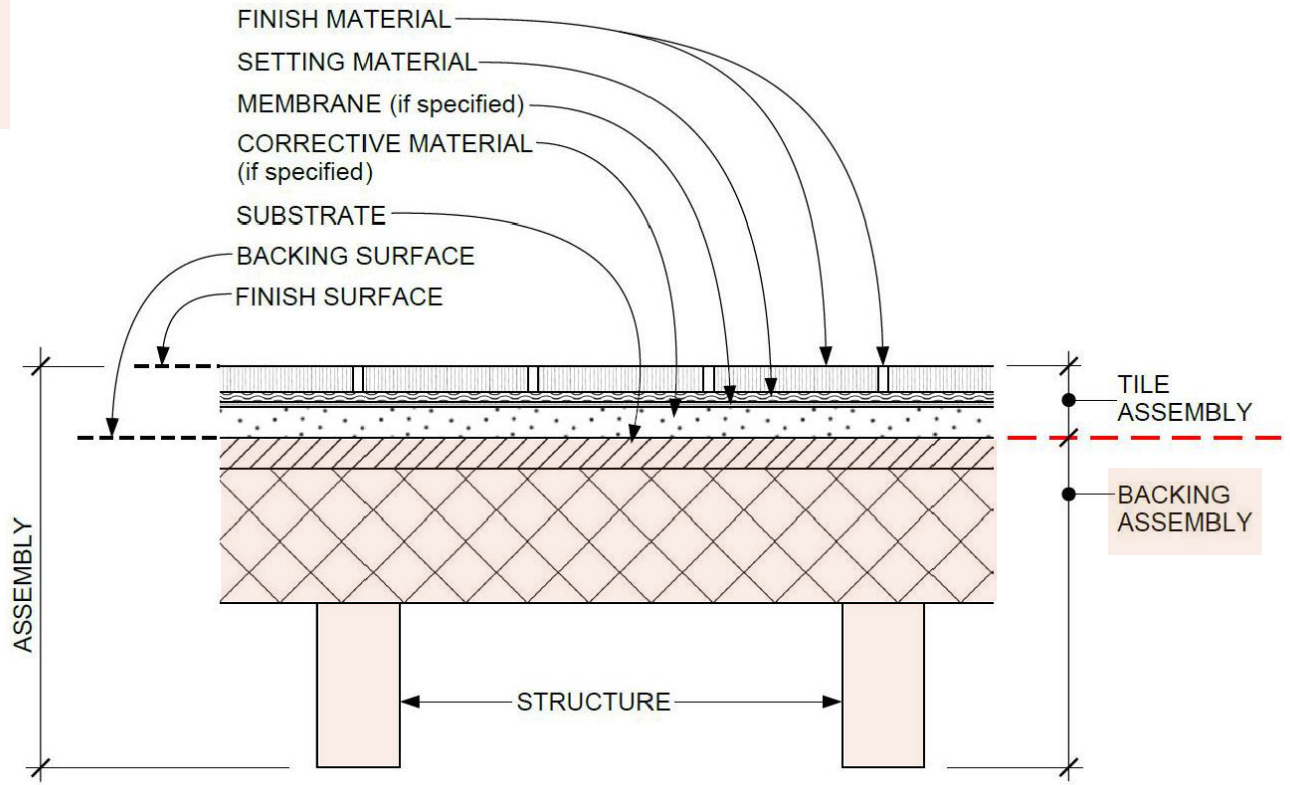
TILE | TERMINOLOGY

Assembly The entire wall, ceiling, or floor construction including the backing assembly and the finish assembly.

Backing Assembly The portion of the assembly made up of the structure and the substrate; the subassembly behind the tile assembly.

Structure The portion of the backing assembly that includes fixed framing, supporting, or load bearing members.

Substrate The uppermost material of the backing assembly to which the tile assembly is applied.



TILE | TERMINOLOGY

Assembly The entire wall, ceiling, or floor construction including the backing assembly and the finish assembly.

Tile Assembly The portion of the assembly that includes the corrective material (if present), membrane (if present), setting material, and finish material.

Corrective Material Material within the tile assembly applied to bring a non-conforming substrate to desired tolerances or a coating to facilitate bonding to the surface for the installation of tile materials.

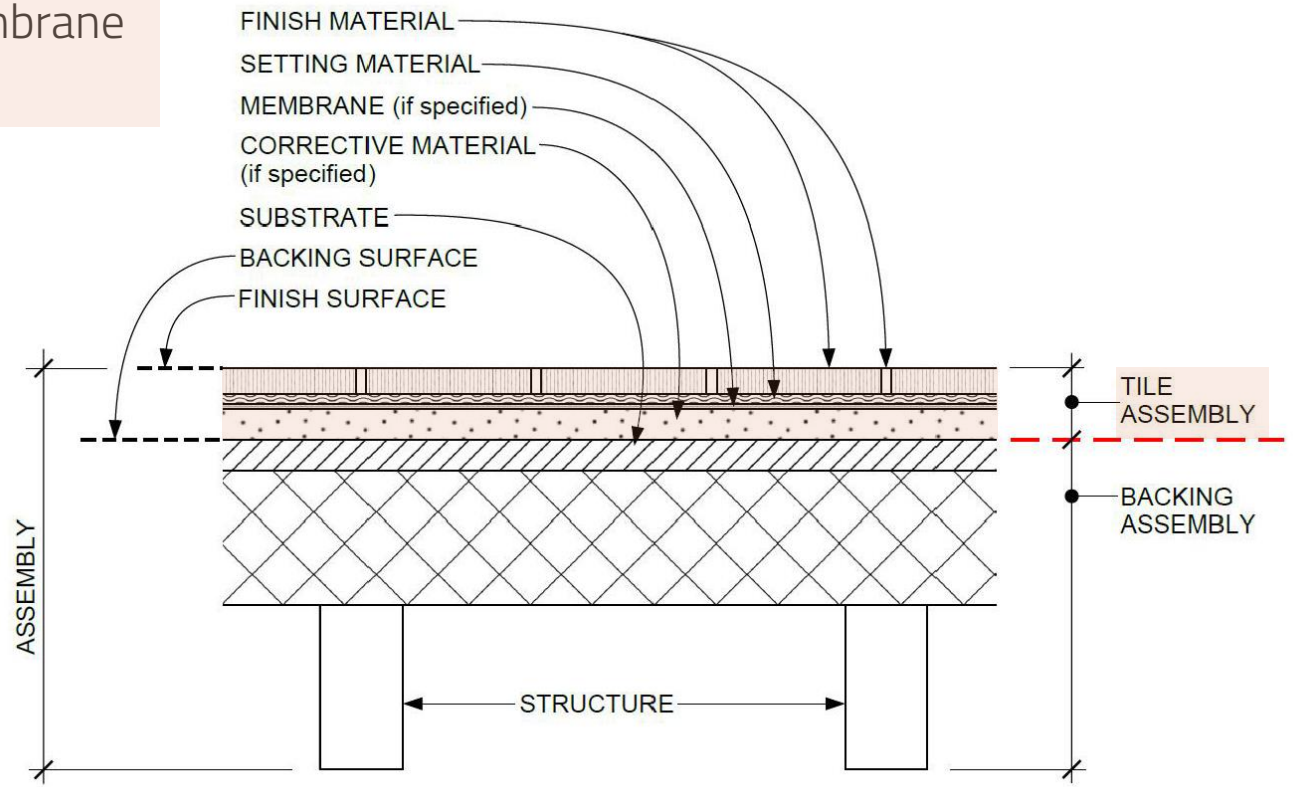
Membrane A material within the tile assembly installed to impart special properties to the tile assembly.

Setting Material Mortar or adhesive material used to bond tile.

Finish Material The exposed portion of the tile assembly that includes tile, grout, sealant joints, and surface treatments if present.

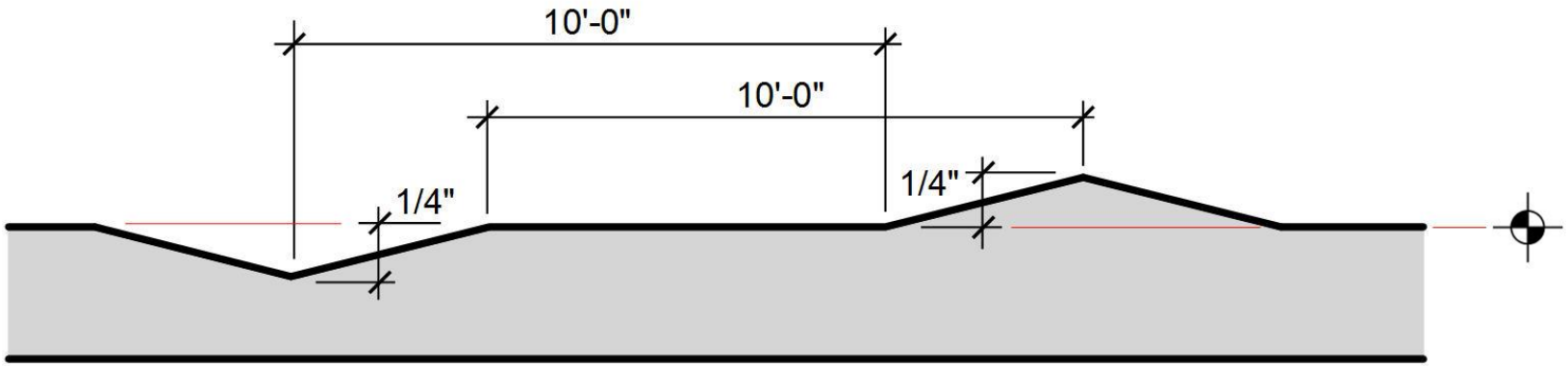
Tile Assembly: The portion of the assembly that includes the corrective material (if present), membrane (if present), setting material, and finish material.

Note: The work of the tile contractor generally includes, but is not necessarily limited to, installation of the tile assembly.

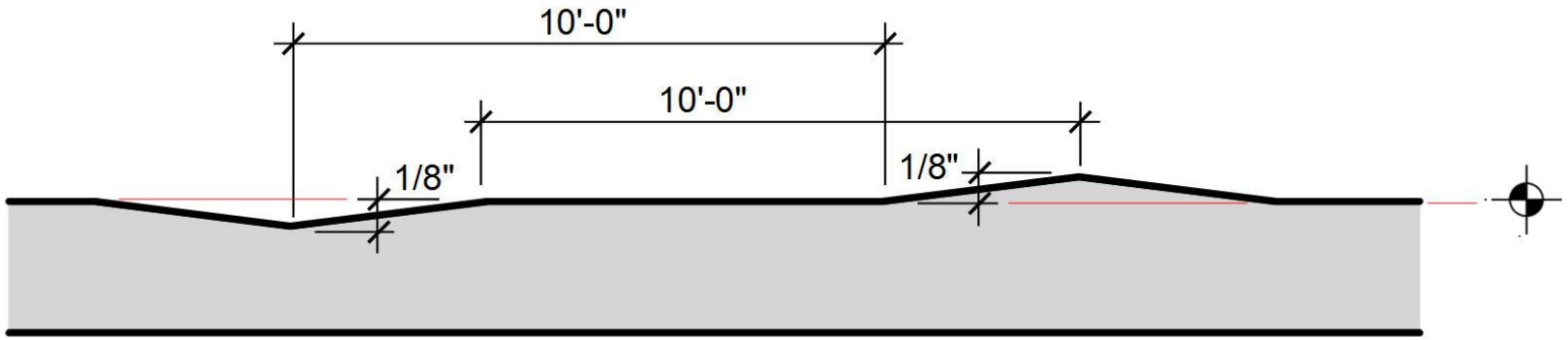


TILE | SUBSTRATE FLATNESS

ANSI A108



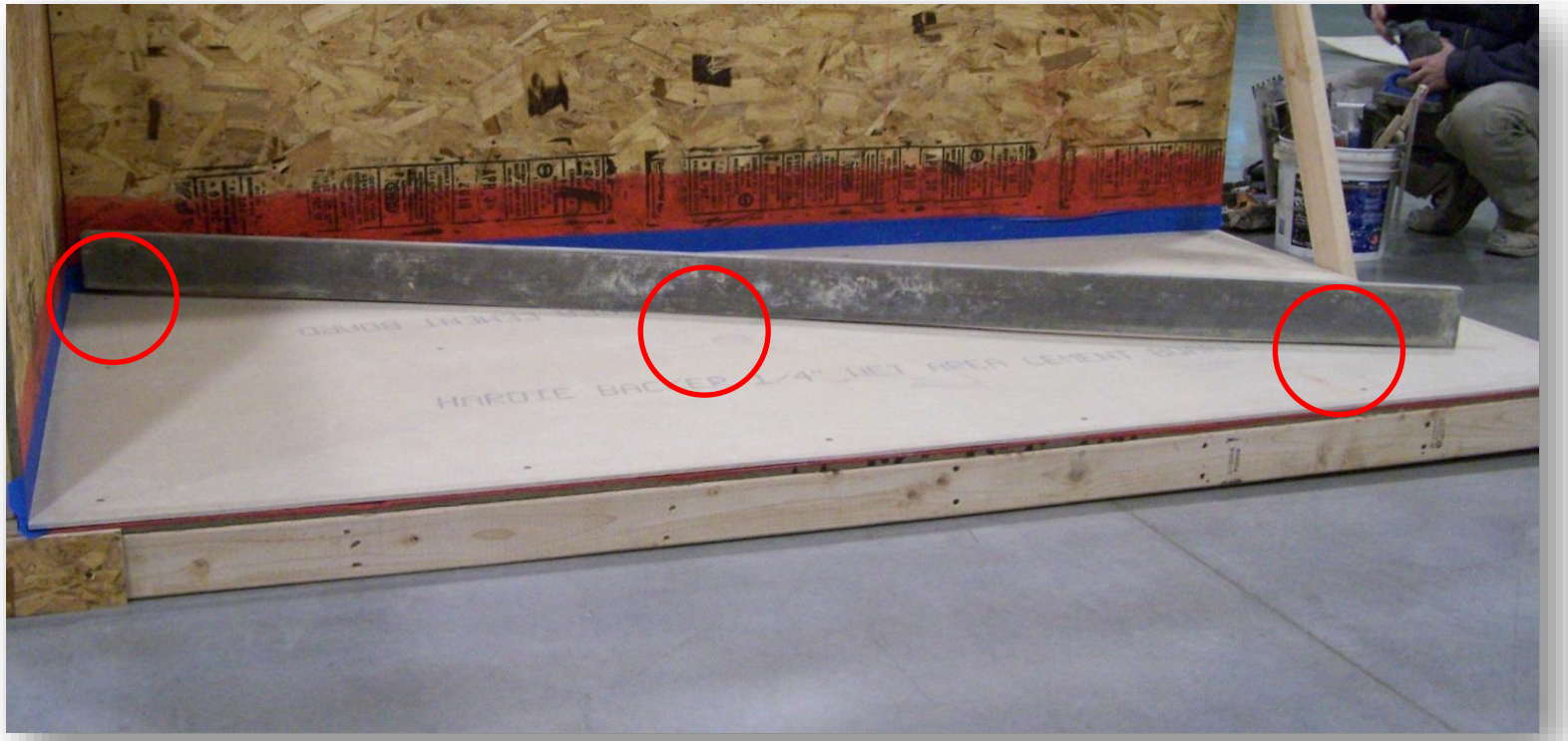
For tiles with all edges shorter than 15 in., the maximum allowable variation is no more than 1/4 in. in 10 ft.

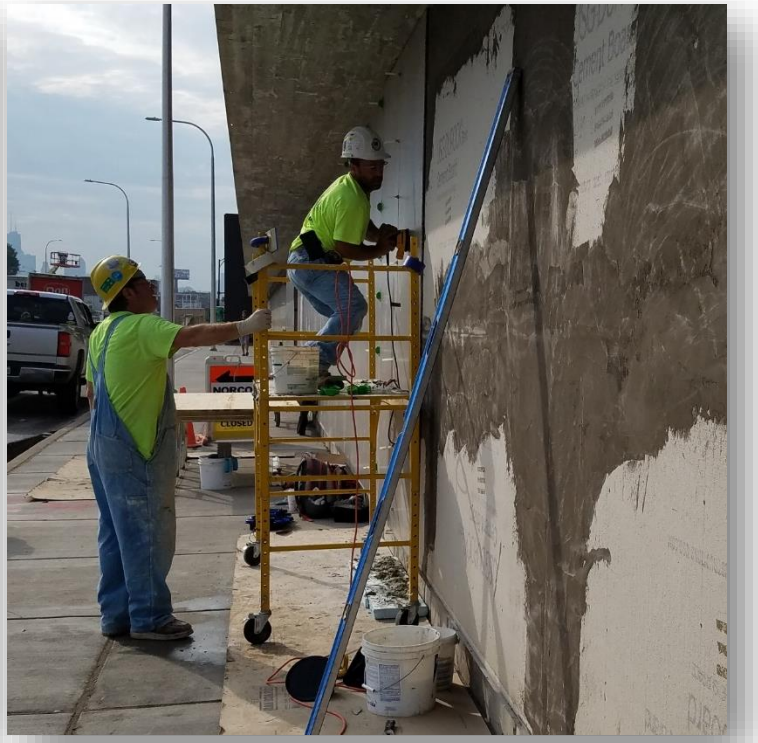


For tiles with at least one edge 15 in. or longer, the maximum allowable variation is no more than 1/8 in. in 10 ft.

TILE | SUBSTRATE FLATNESS

ANSI A108





Tile installers check individual areas with a 10-ft straightedge

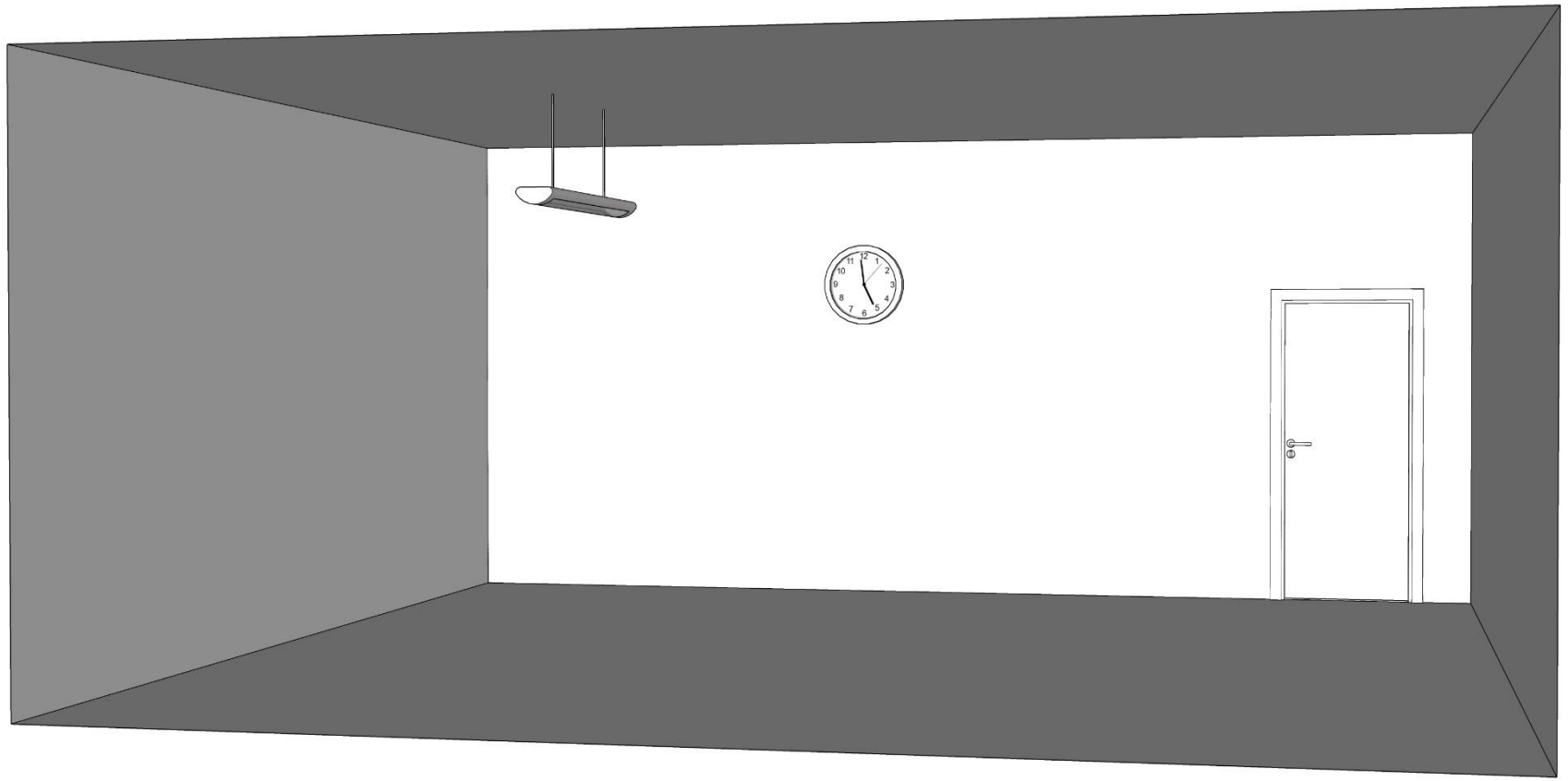
TILE | VISUAL INSPECTION

ANSI A137.1

Before any other testing, tile manufacturers visually inspect a sample of the lot size for facial and structural defects.

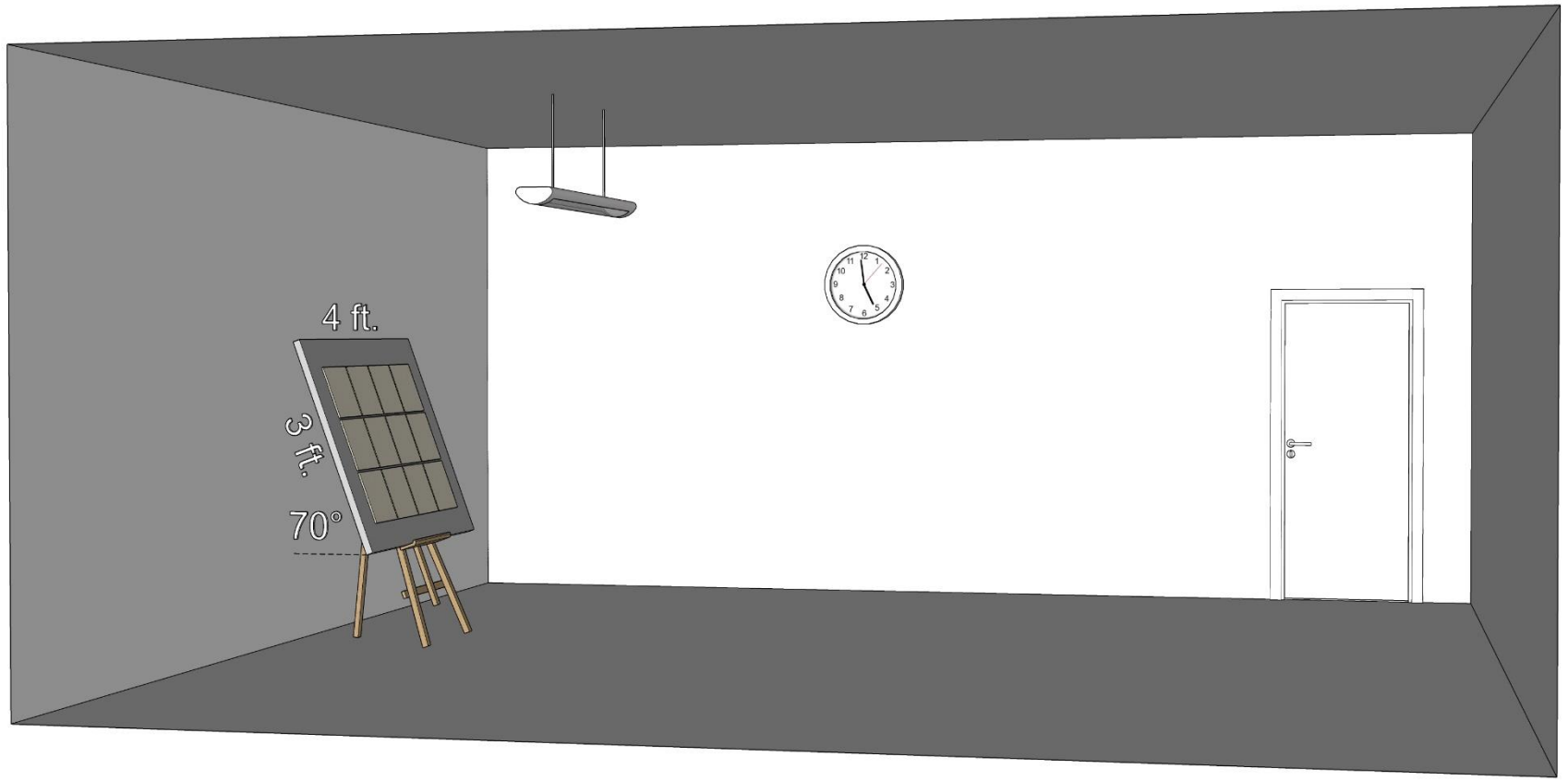
TILE | VISUAL INSPECTION

ANSI
A137.1



TILE | VISUAL INSPECTION

ANSI A137.1



Array of tiles mounted to a light grey viewing board.

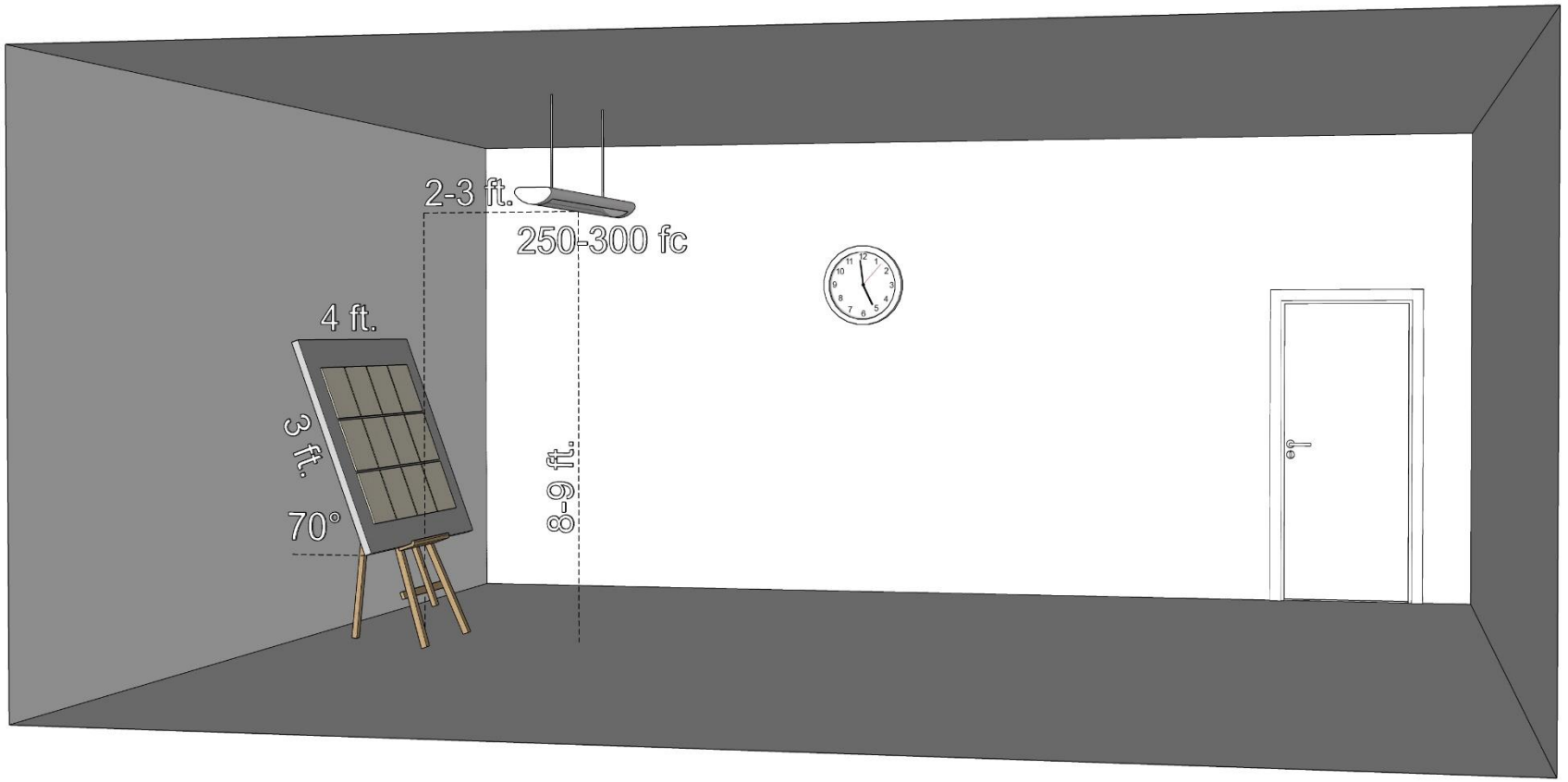
Board is at least 36 in. high x 48 in. long.

Board is supported by a framework holding the board 70 degrees from horizontal.

Top edge of tile array is at or below eye level of evaluator.

TILE | VISUAL INSPECTION

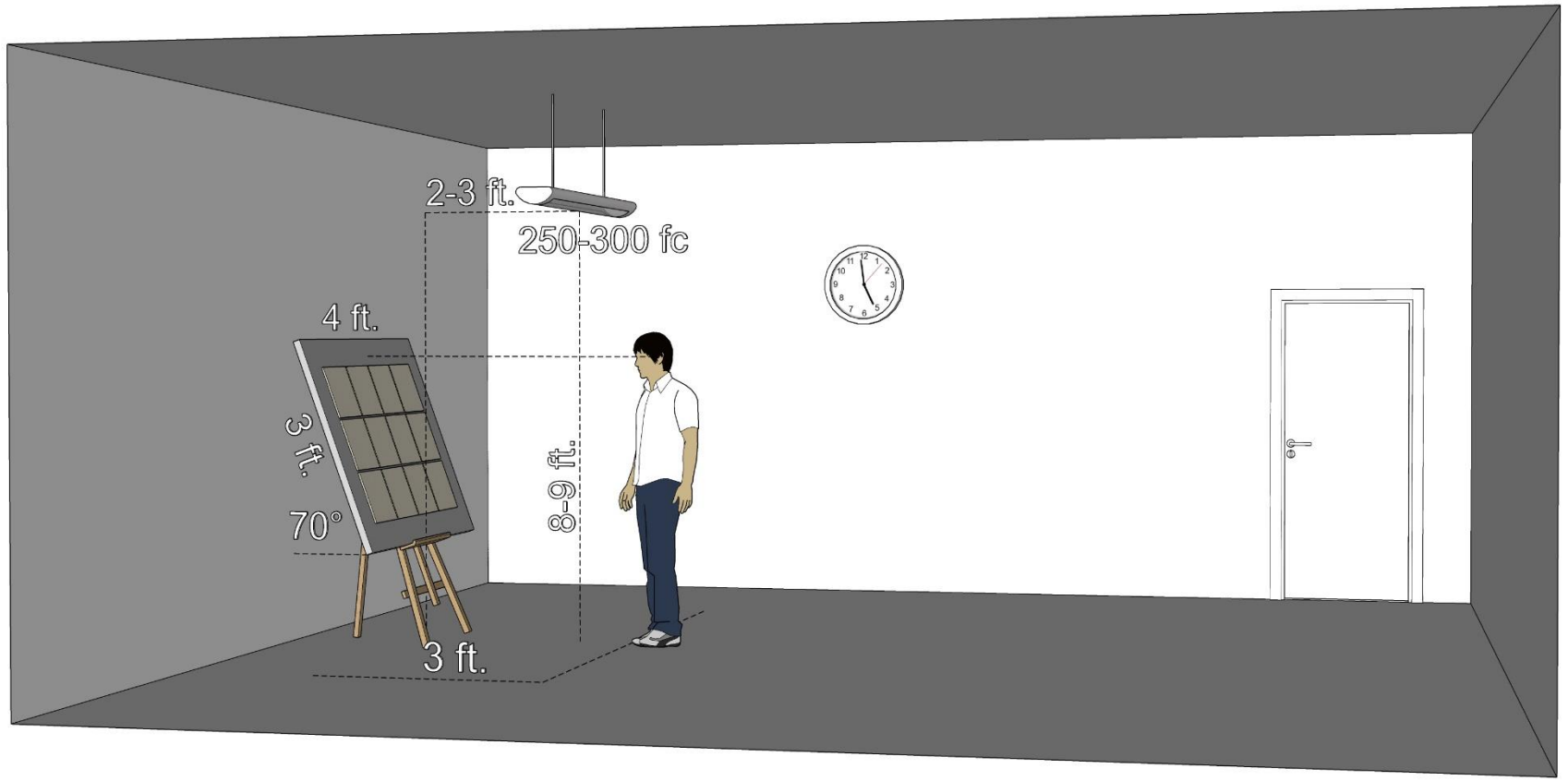
ANSI A137.1



A white fluorescent lamp emitting 250-300 footcandles is positioned 8-9 feet above the floor and 2-3 feet from the front edge of the viewing board.

TILE | VISUAL INSPECTION

ANSI A137.1



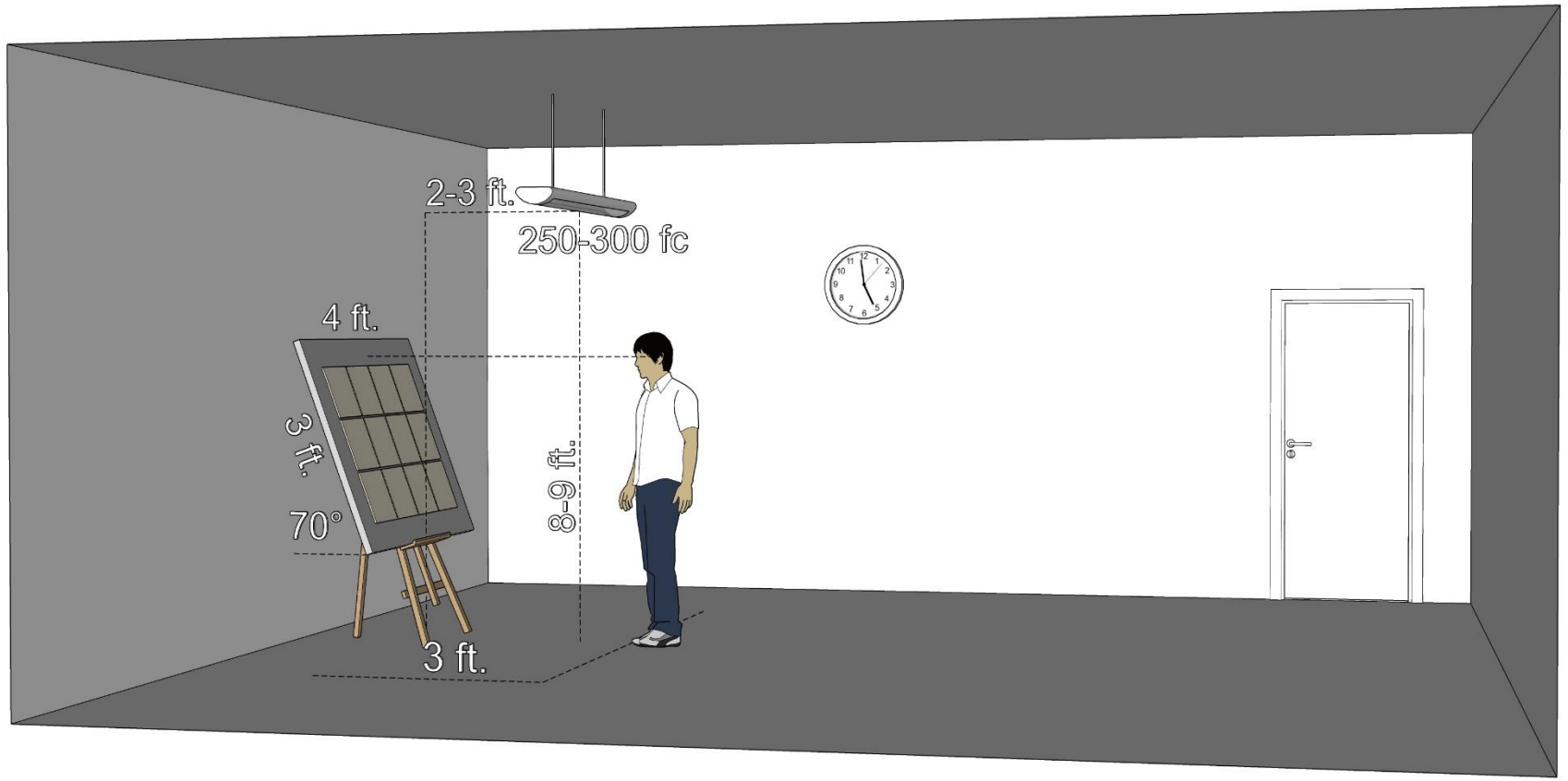
Evaluator stands erect, 3 feet from bottom of the viewing board, aligned with center of the board.

Evaluator must not be color blind and must have 20/20 to 20/40 vision.

Viewing time is 6 seconds per square foot of tile array evaluated.

TILE | VISUAL INSPECTION

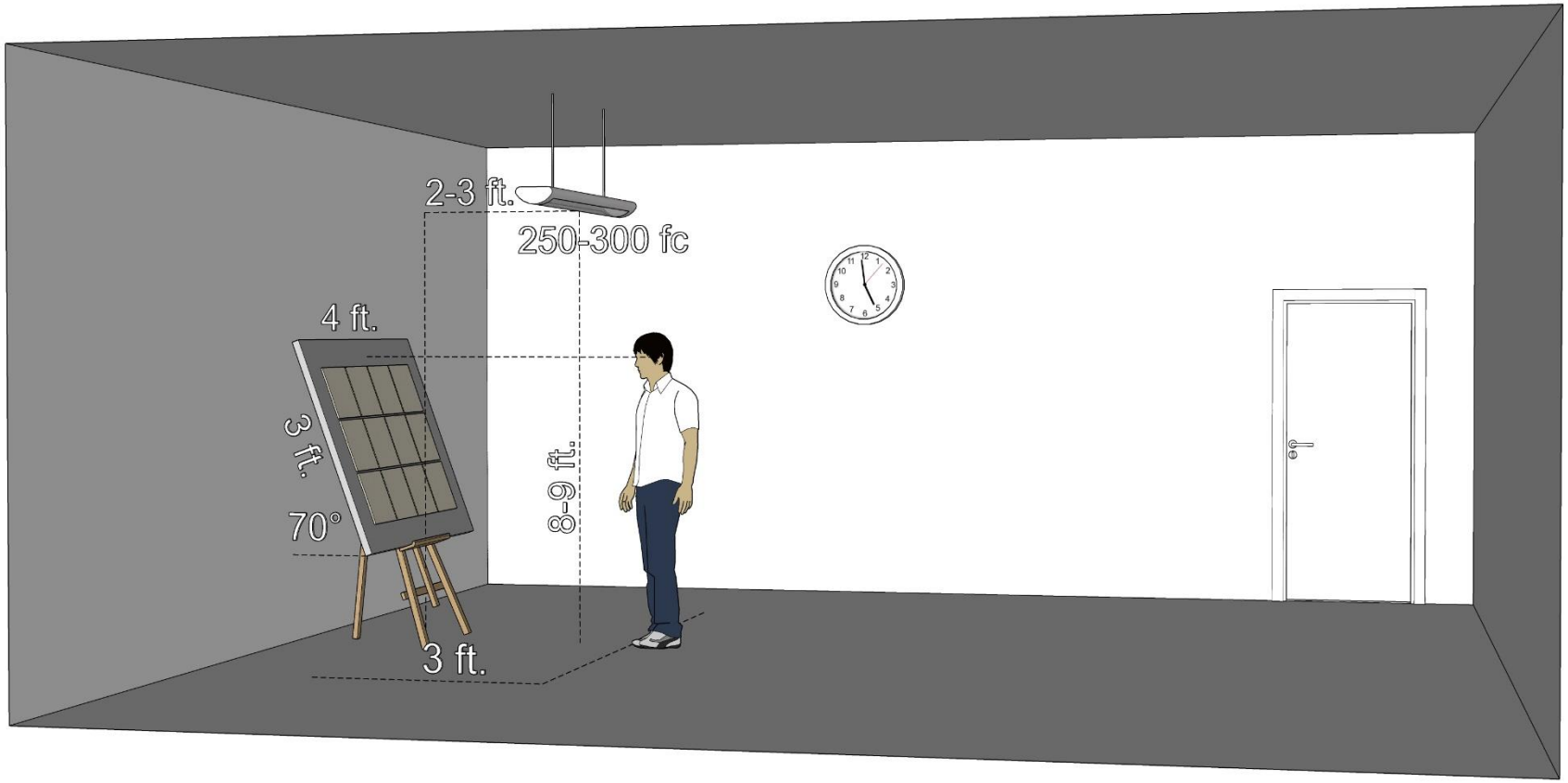
ANSI A137.1



If the sample passes visual inspection, it moves on to subsequent testing and may be sold as standard grade tile.

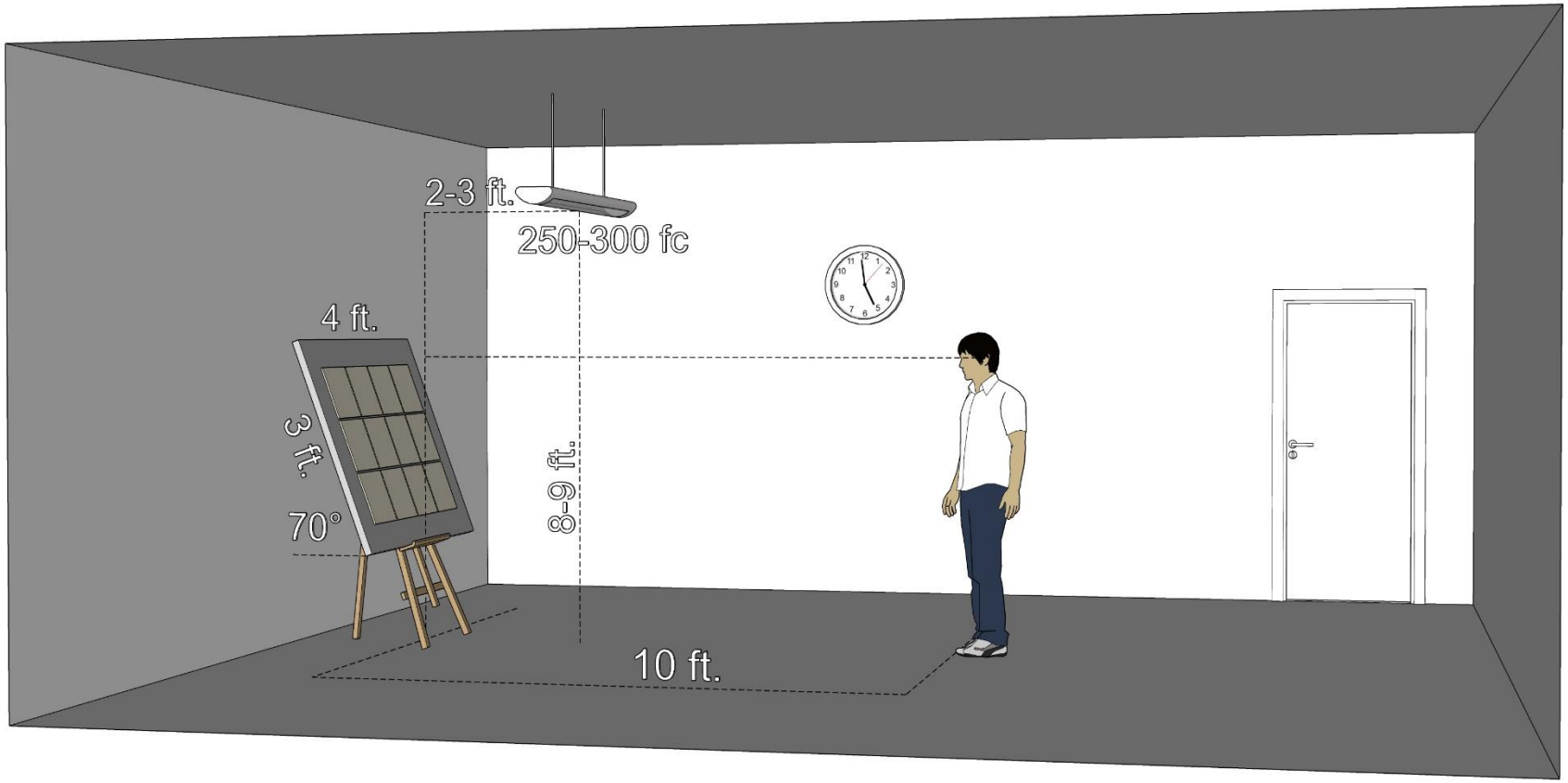
TILE | VISUAL INSPECTION

ANSI A137.1



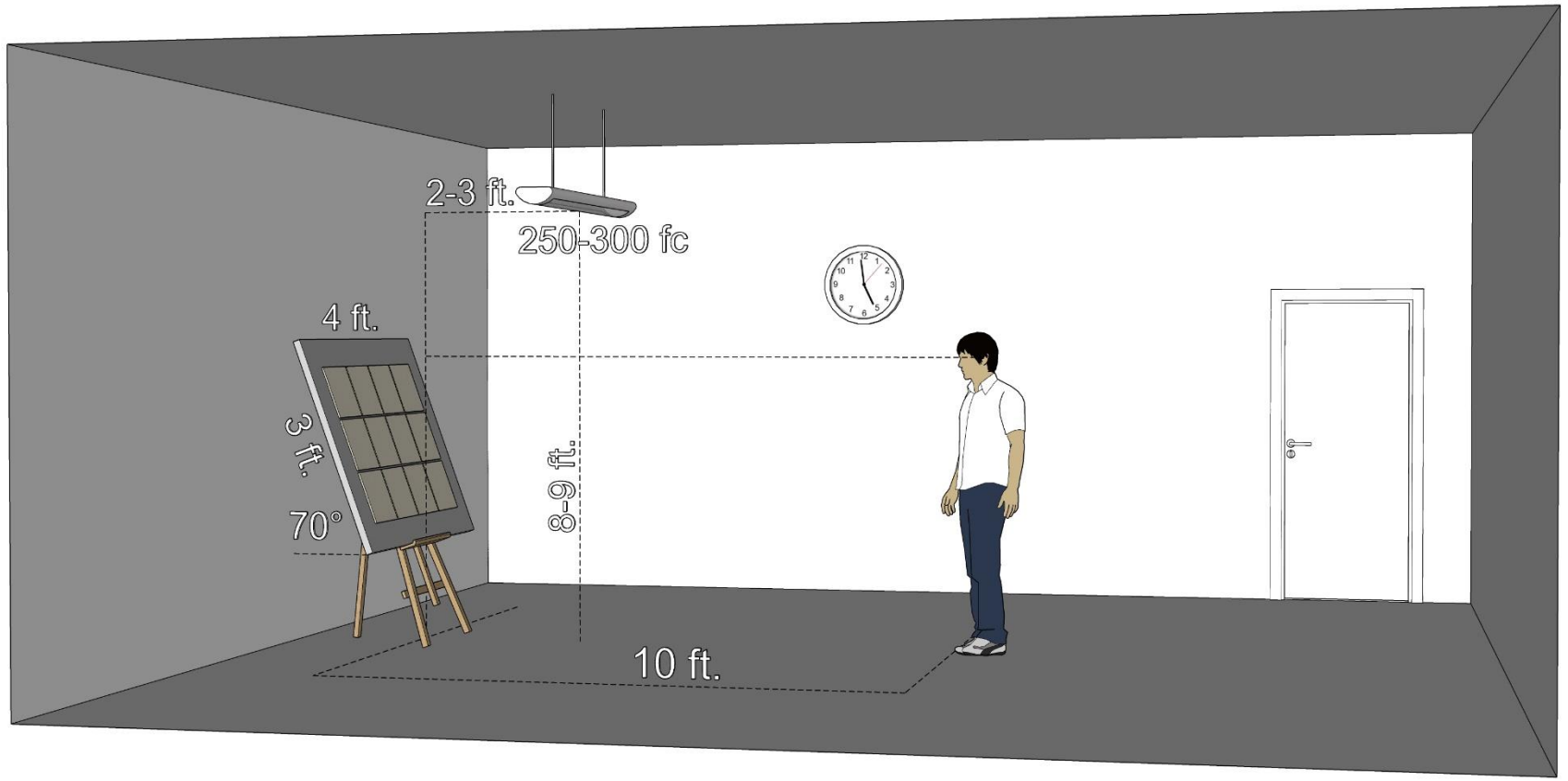
TILE | VISUAL INSPECTION

ANSI A137.1



TILE | VISUAL INSPECTION

ANSI A137.1



If the sample is found to contain excessive facial defects, the inspection may be repeated from a distance of ten feet instead of three feet, and if accepted from ten feet, it may be sold as second grade tile.

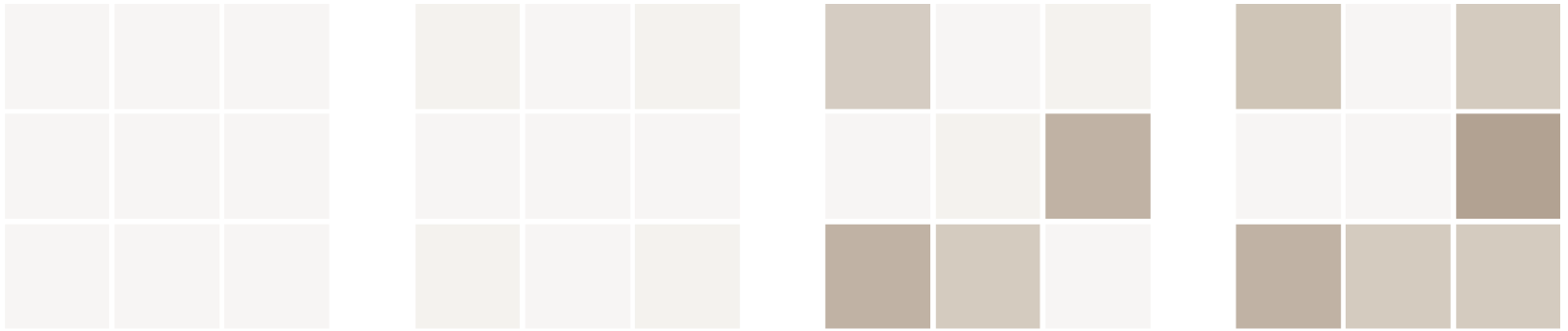
TILE | VISUAL INSPECTION

ANSI
A137.1

TILE | AESTHETIC CLASSIFICATIONS

ANSI A137.1

Shade & Texture Index



V1 = Uniform Appearance	Differences among pieces from the same production run are minimal.
V2 = Slight Variation	Clearly distinguishable texture and/or pattern within similar colors.
V3 = Moderate Variation	While the colors and/or textures present on a single piece of tile will be indicative of the colors and/or textures to be expected on the other tiles, the amount of colors and/or texture on each piece may vary significantly. It is recommended that the range be viewed before selection.
V4 = Substantial Variation	Random color and/or texture differences from tile to tile, so that one tile may have totally different colors and/or textures from that on other tiles. Thus, the final installation will be unique. It is recommended that the range be viewed before selection.

Inspect products upon delivery and for best results, blend tile from several cartons during installation.

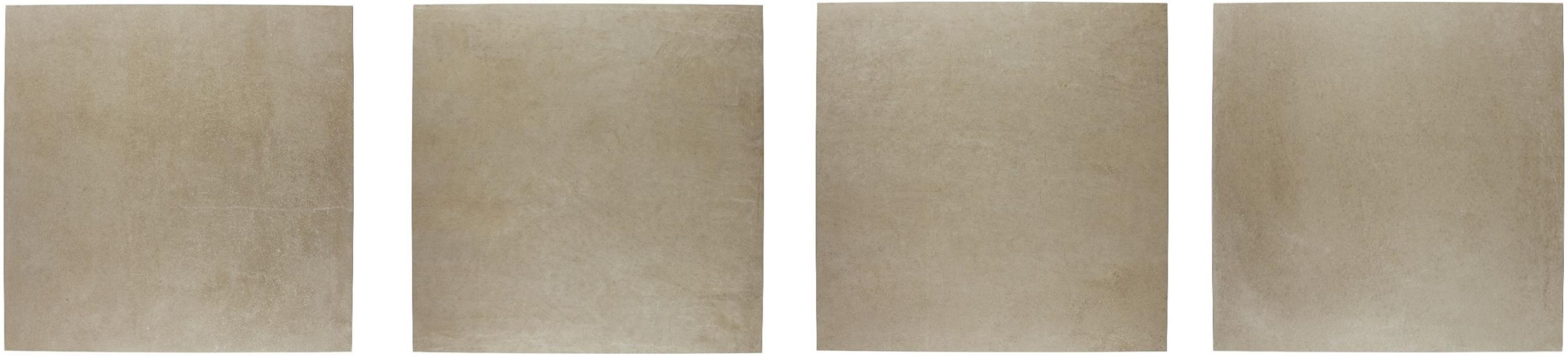
ANSI A137.1 Table 3

TILE | AESTHETIC CLASSIFICATIONS

V1, Uniform appearance

Differences among pieces from the same production run are minimal.

TILE | AESTHETIC CLASSIFICATIONS



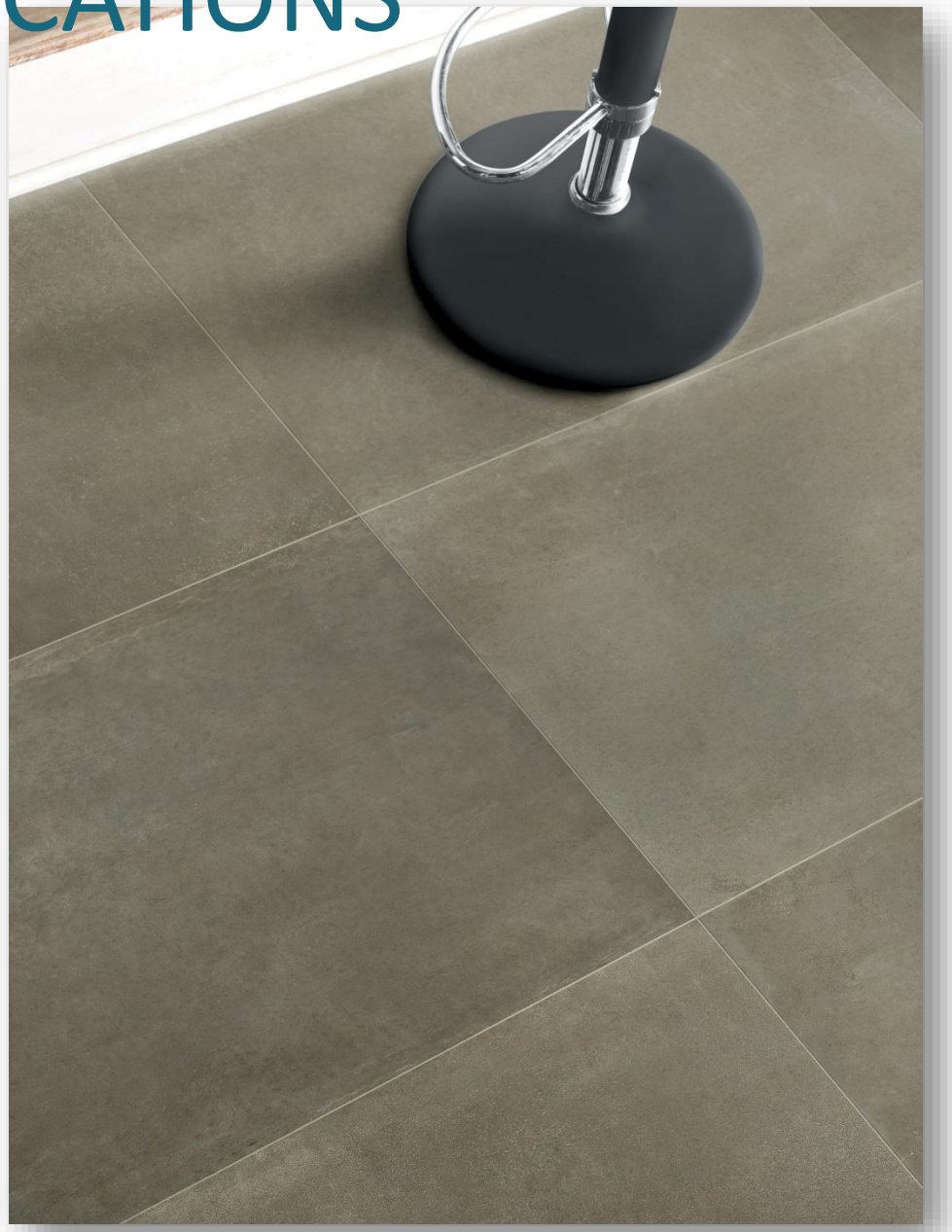
V2, Slight variation

Clearly distinguishable differences in texture and/or pattern within similar colors.

TILE | AESTHETIC CLASSIFICATIONS

V2, Slight variation

Clearly distinguishable differences in texture and/or pattern within similar colors.



TILE | AESTHETIC CLASSIFICATIONS

V3, Moderate variation

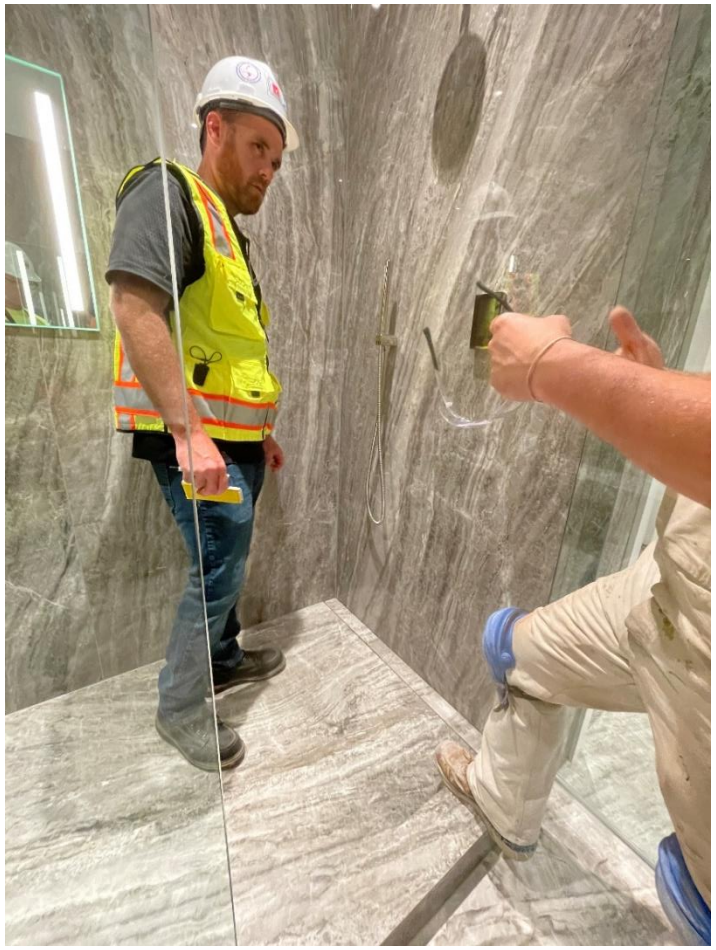
While the colors and/or texture present on a single piece of tile will be indicative of the colors and/or texture to be expected on the other tiles, the amount of colors and/or texture on each piece may vary significantly. It is recommended that the range be viewed before selection.

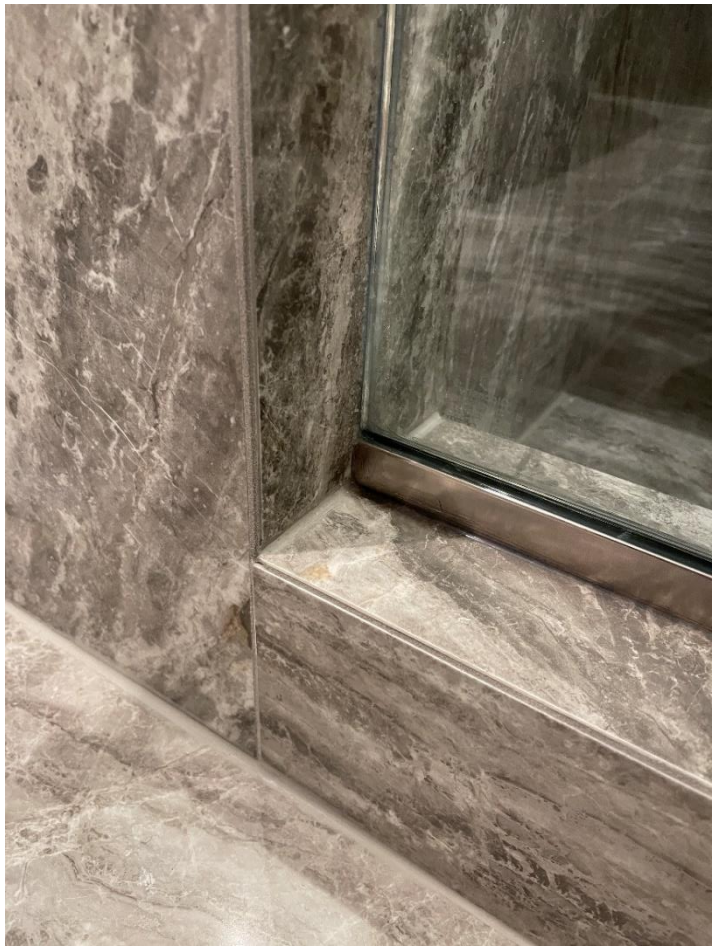
TILE | AESTHETIC CLASSIFICATIONS

V4, Substantial variation

Random color and/or texture differences from tile to tile, to the extent that one tile may have totally different colors and/or texture from that on other tiles. Thus, the final installation will be unique. It is recommended that the range be viewed before selection.

TILE | SHOWERS

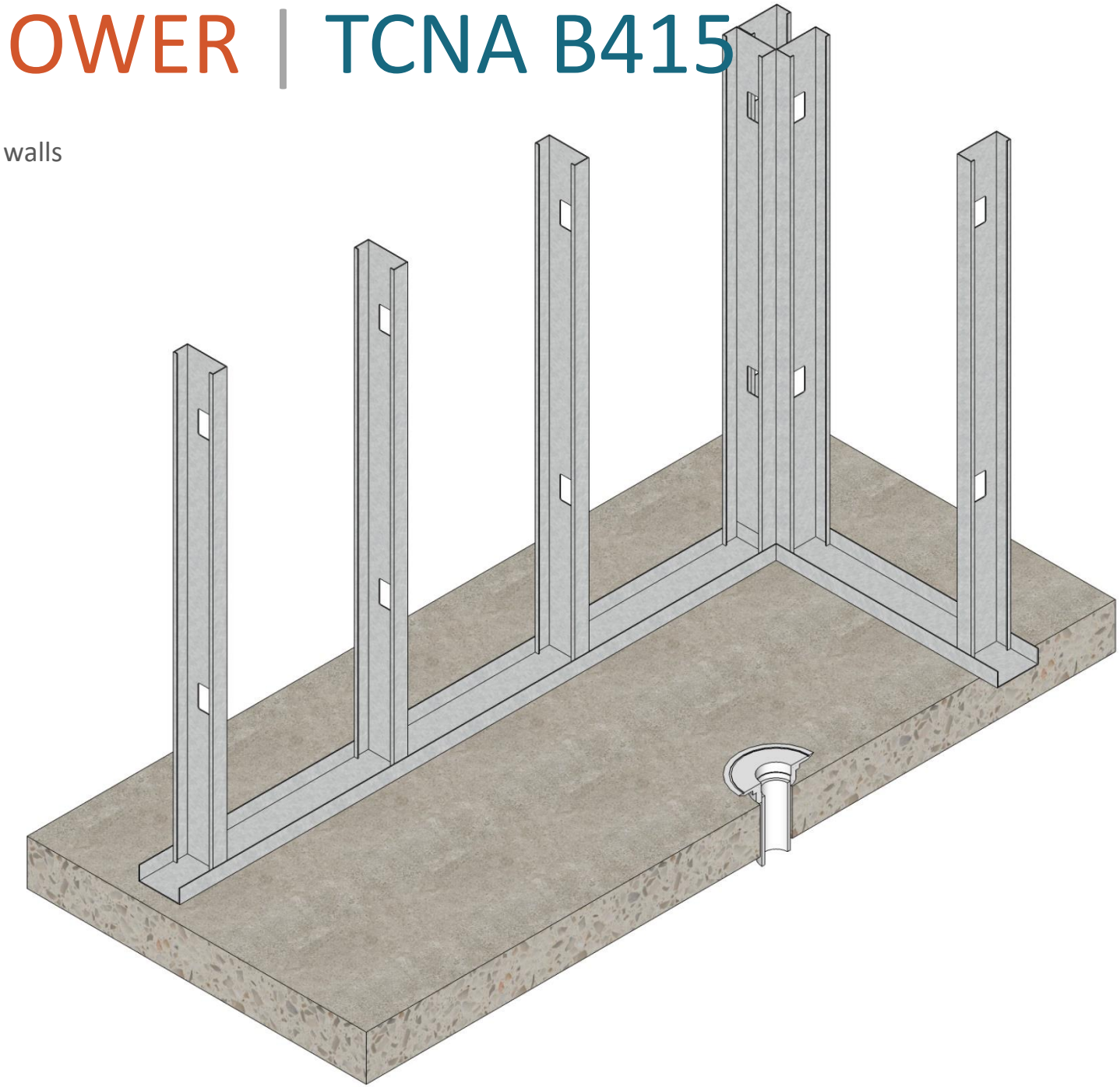




Showers at Chicago high rise

TILE SHOWER | TCNA B415

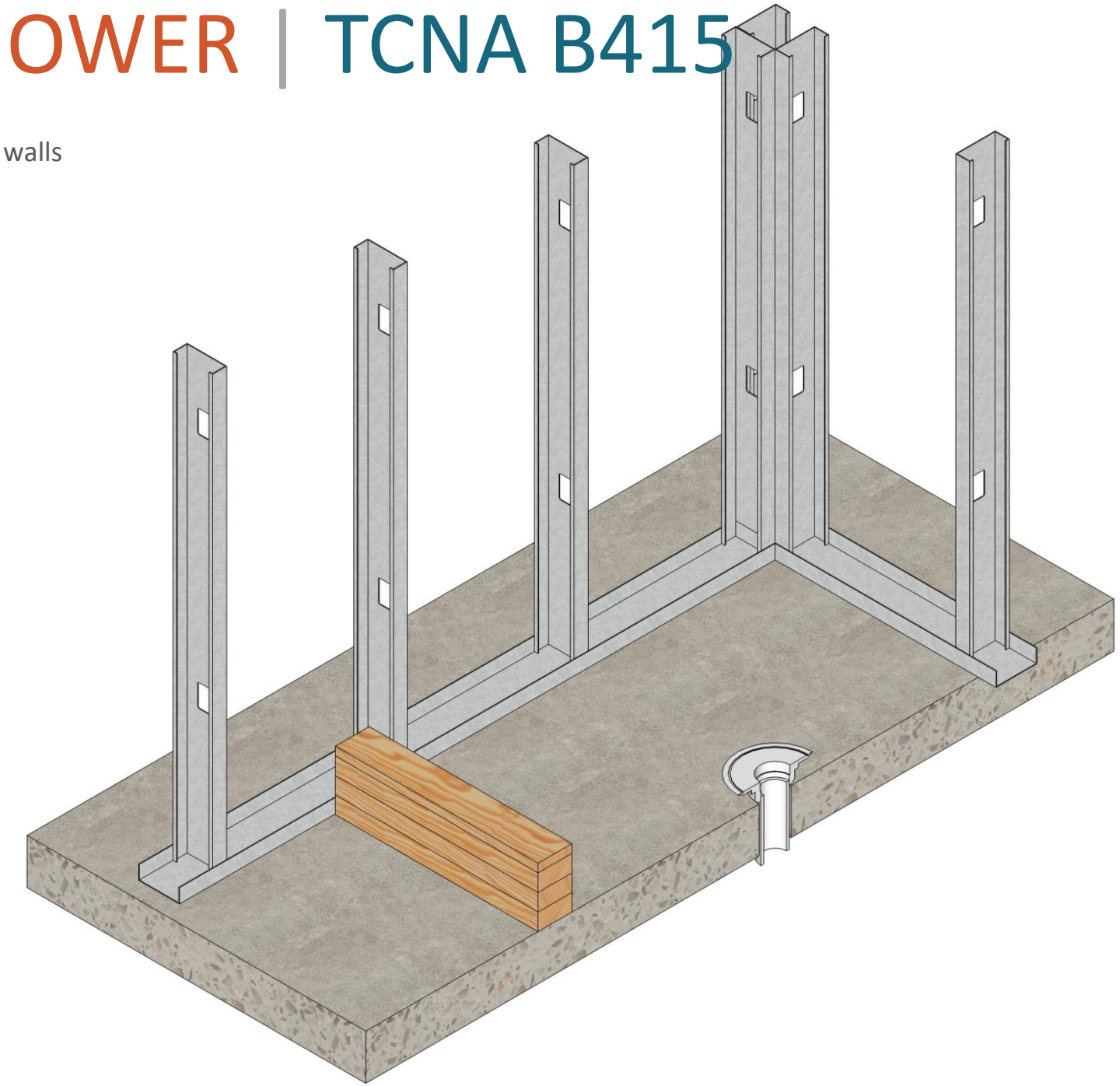
Wood or metal studs
Cement backer board walls
Mortar bed floor
Ceramic tile, glass tile



Slab & framing
Curb
Bond coat
Mortar pre-pitch
Blocking
Sealant @ drain collar
Shower pan membrane
Preformed corners
Clamping ring
Weep protector
Vapor retarder (opt.)
Backer board
Tape seams
Lath
Mortar bed
Bond coat
Tile

TILE SHOWER | TCNA B415

Wood or metal studs
Cement backer board walls
Mortar bed floor
Ceramic tile, glass tile



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TILE SHOWER | TCNA B415

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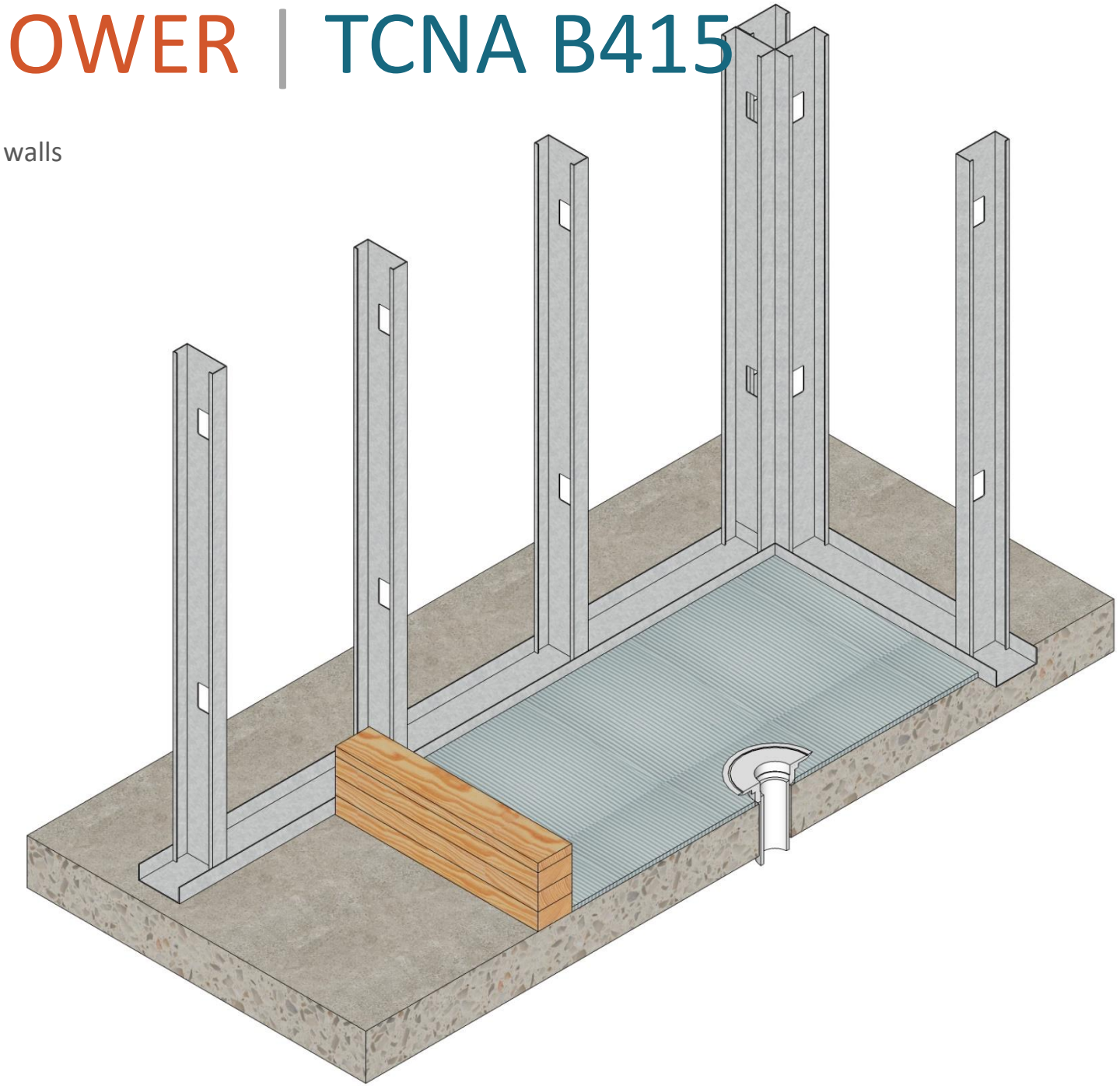
Cement backer board walls
Mortar bed floor
Ceramic tile, glass tile



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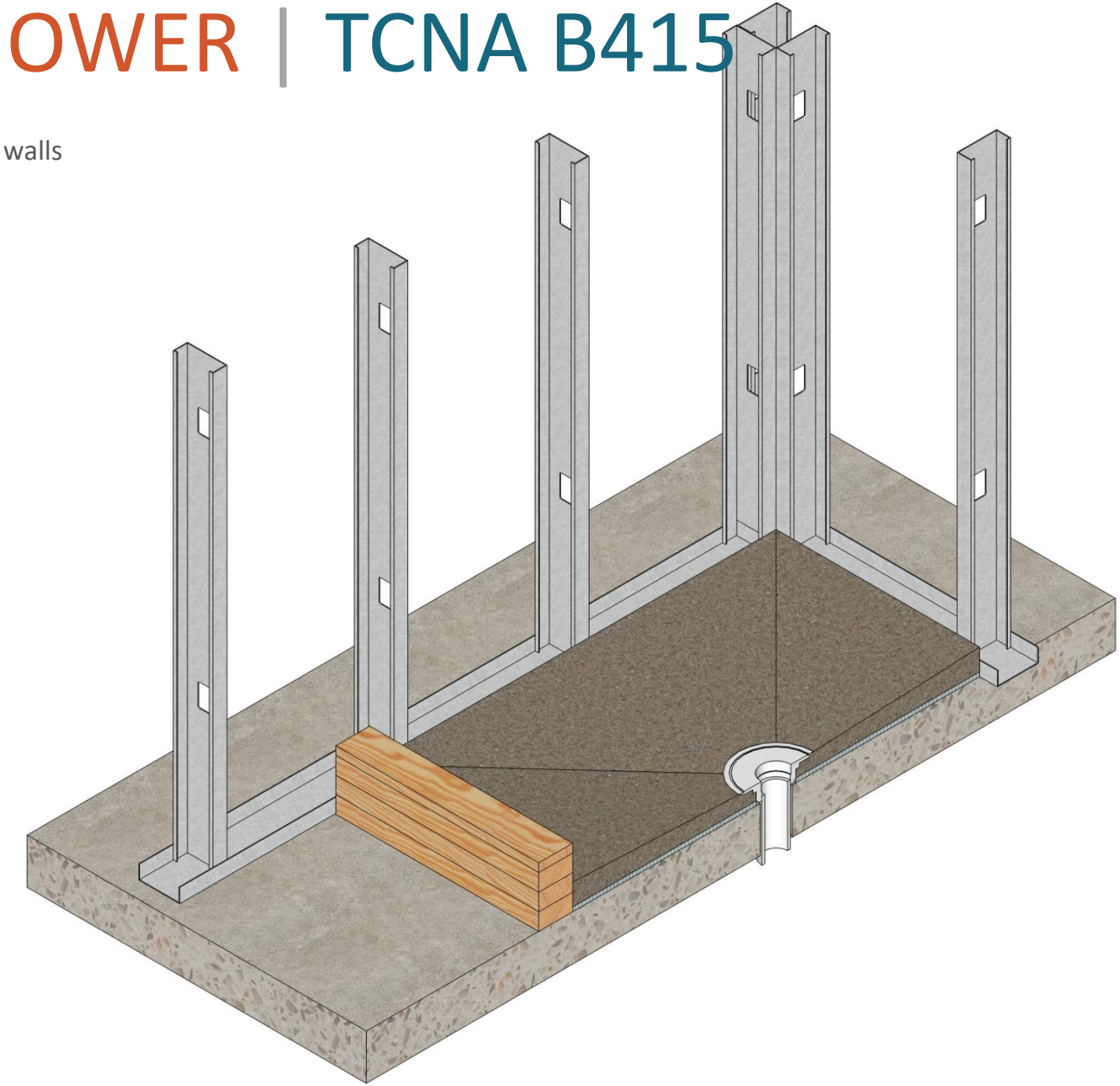

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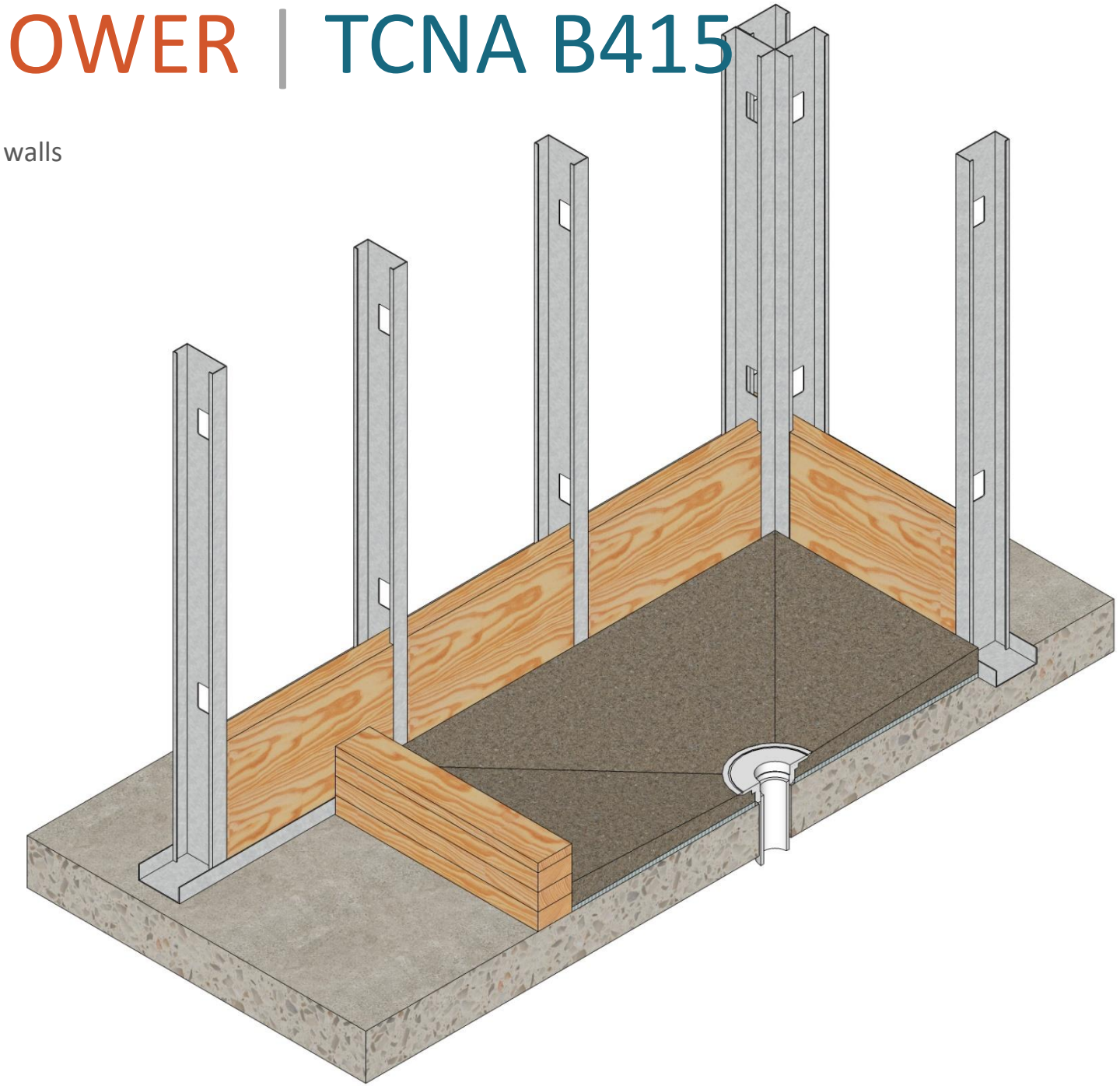

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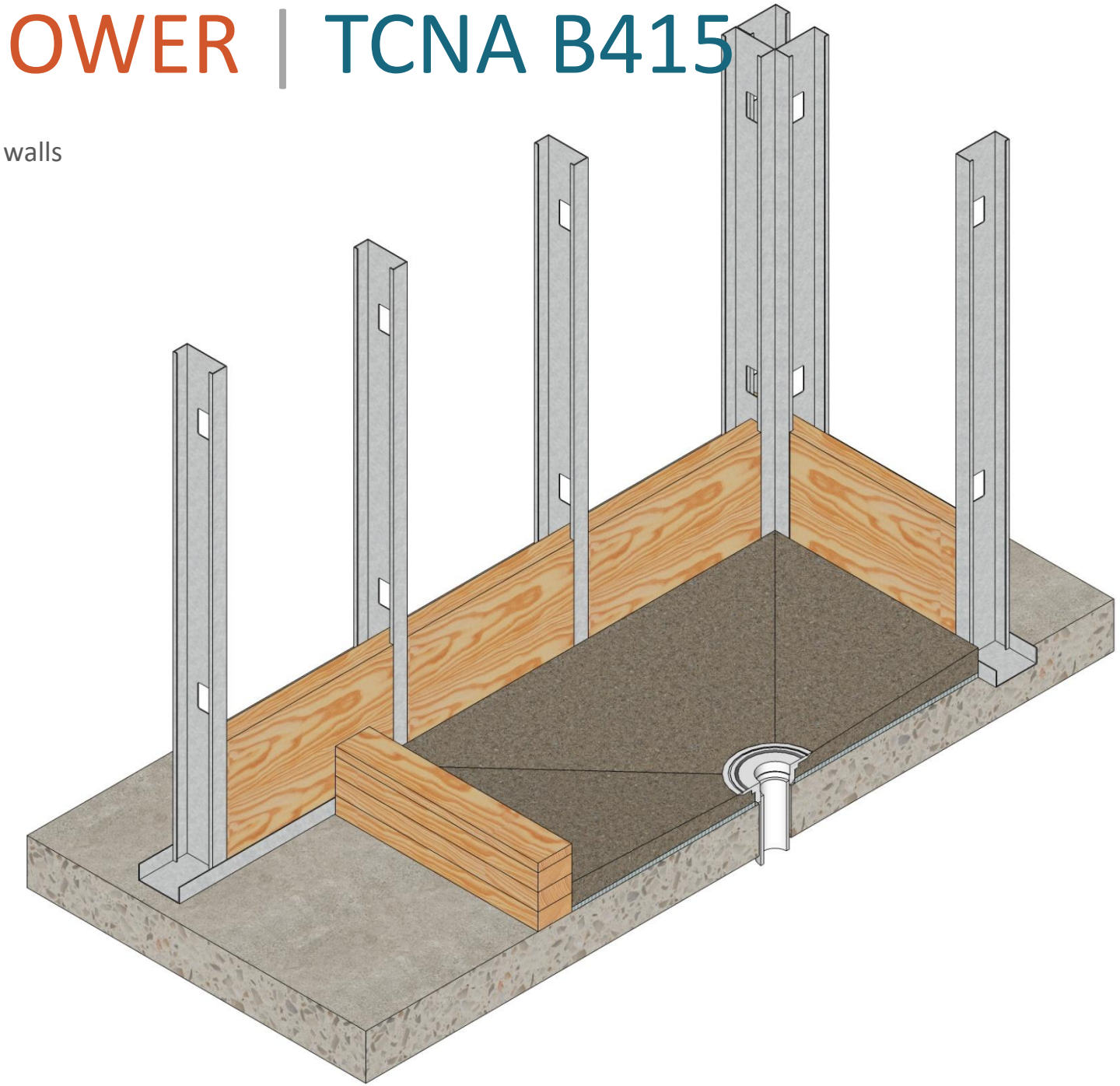

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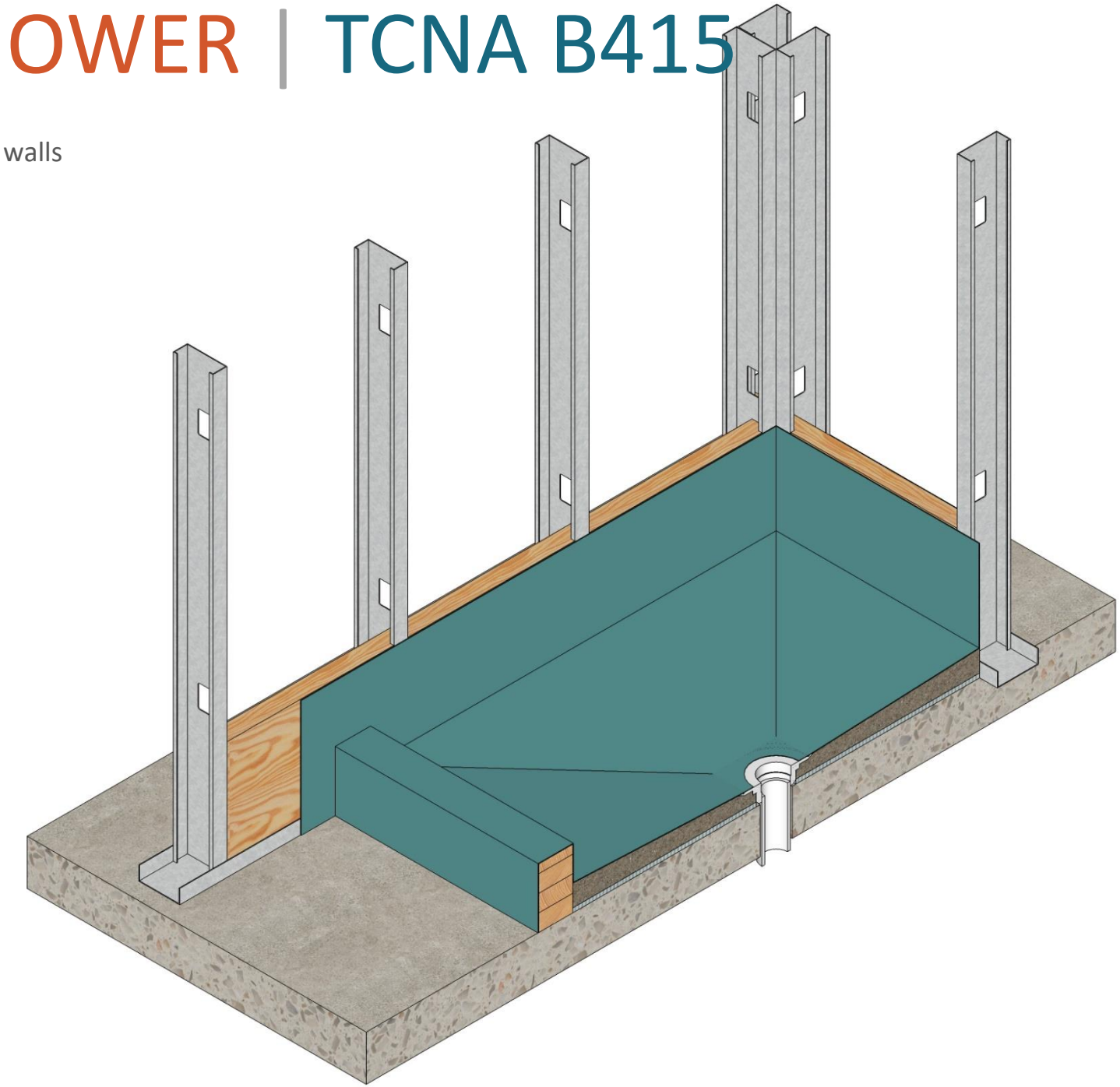

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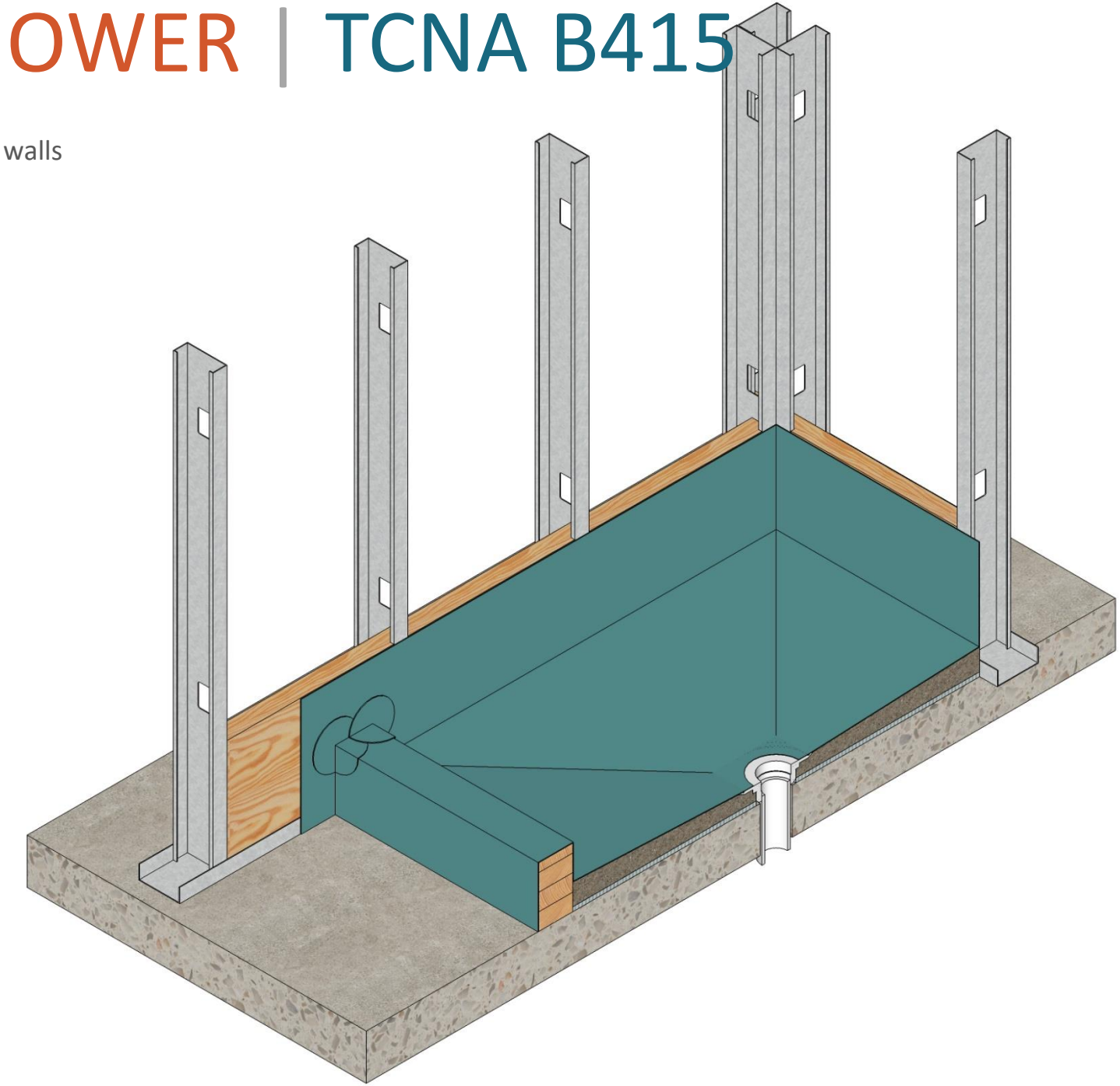

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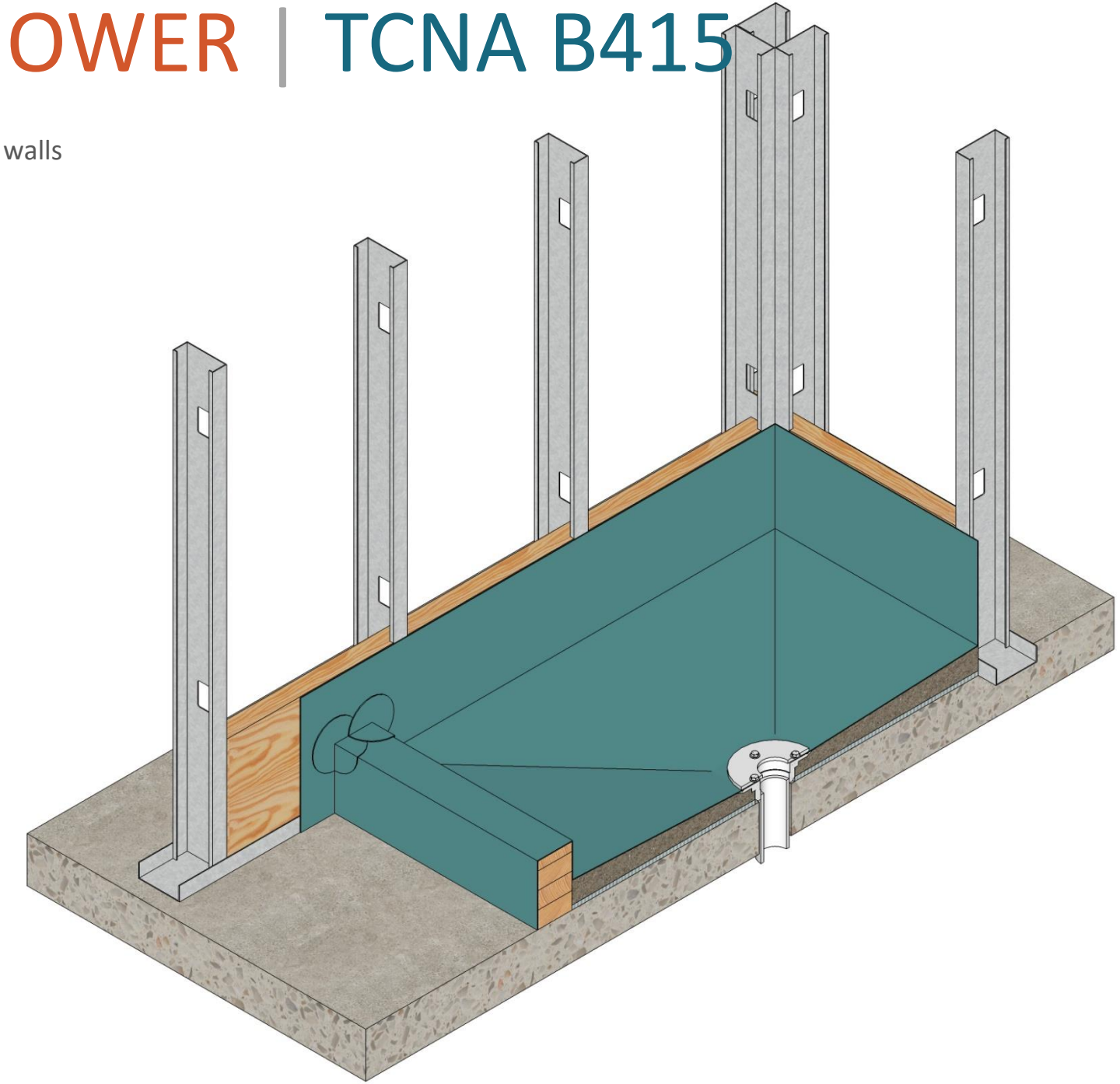

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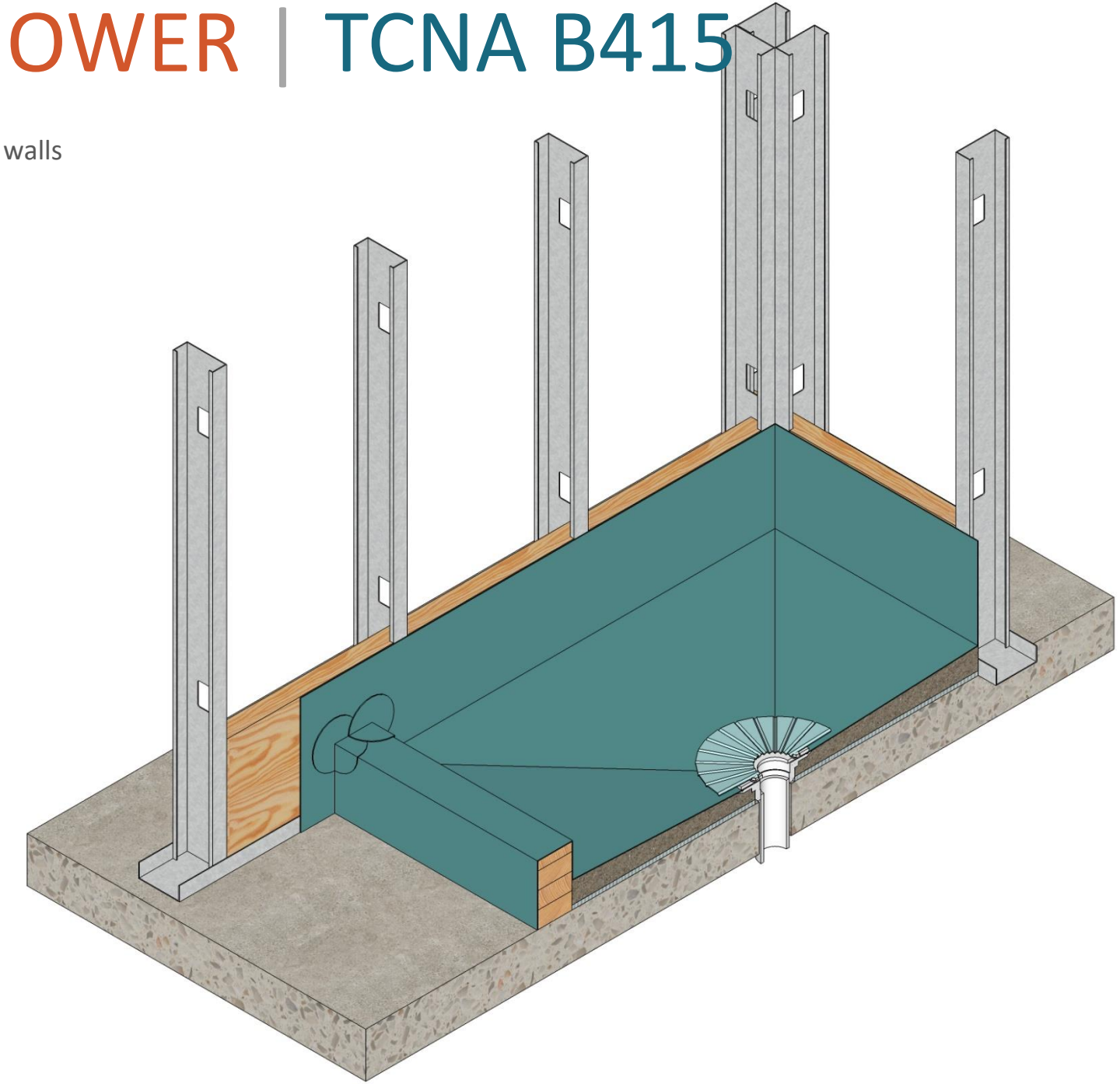

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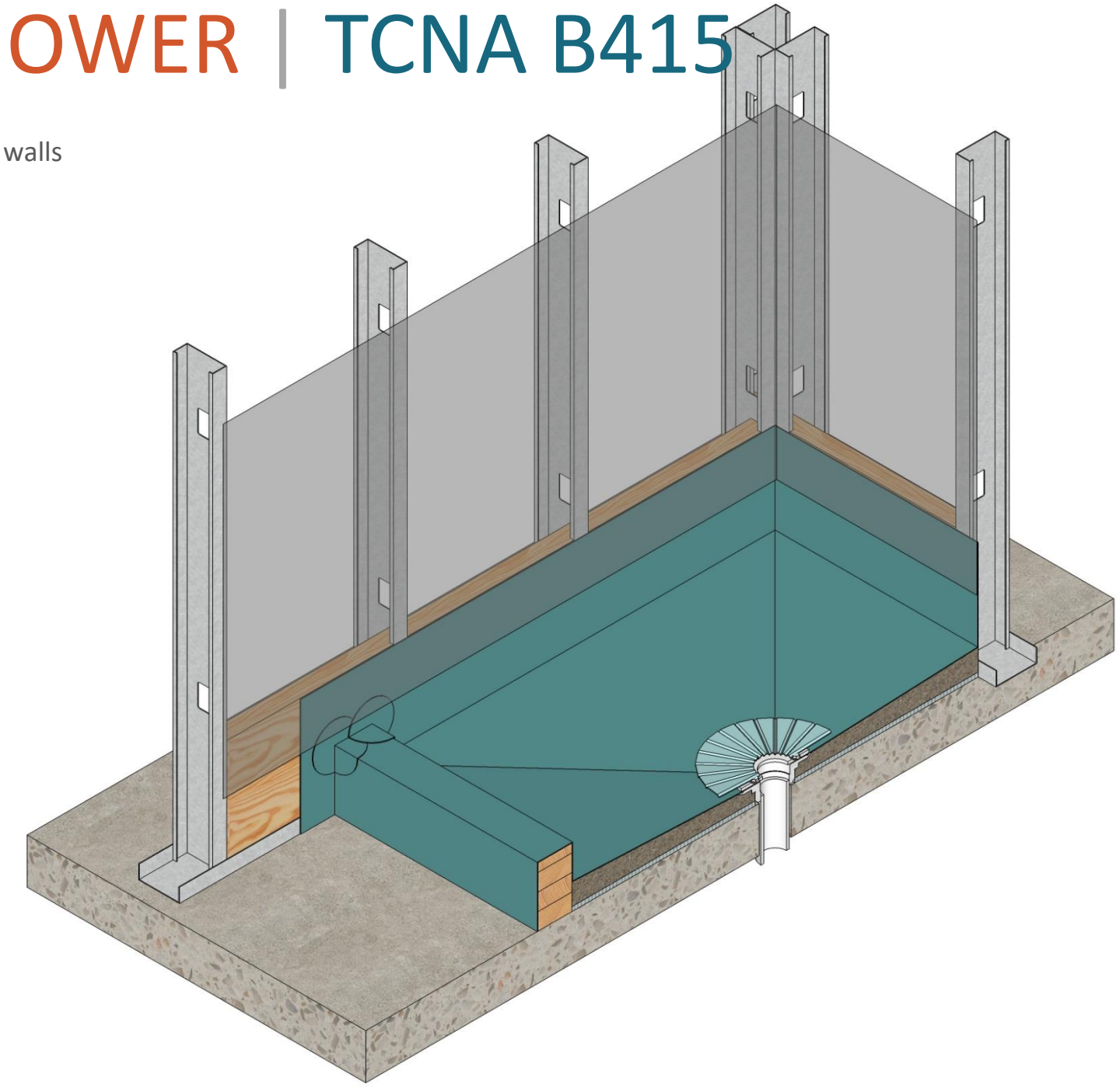

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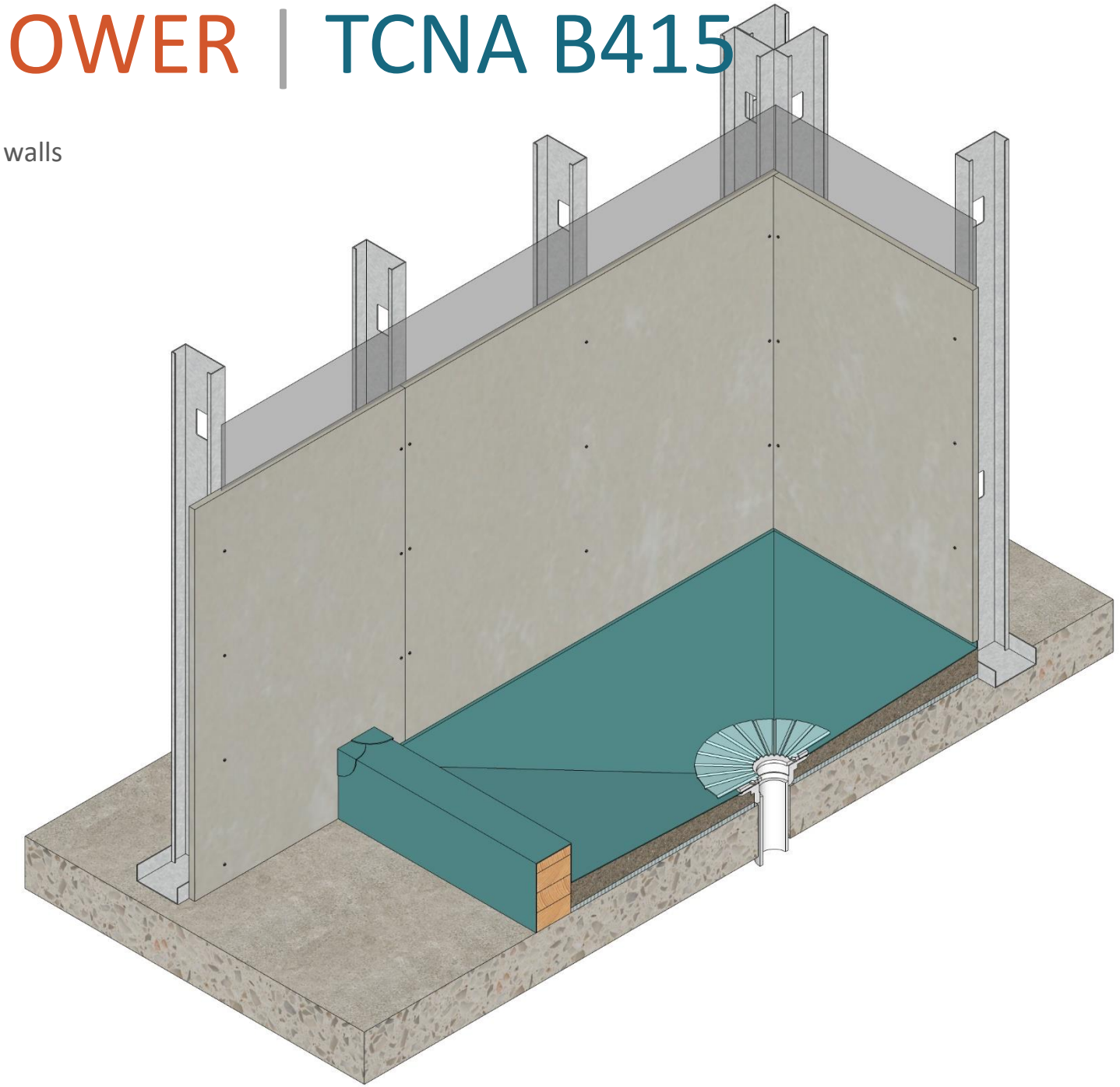

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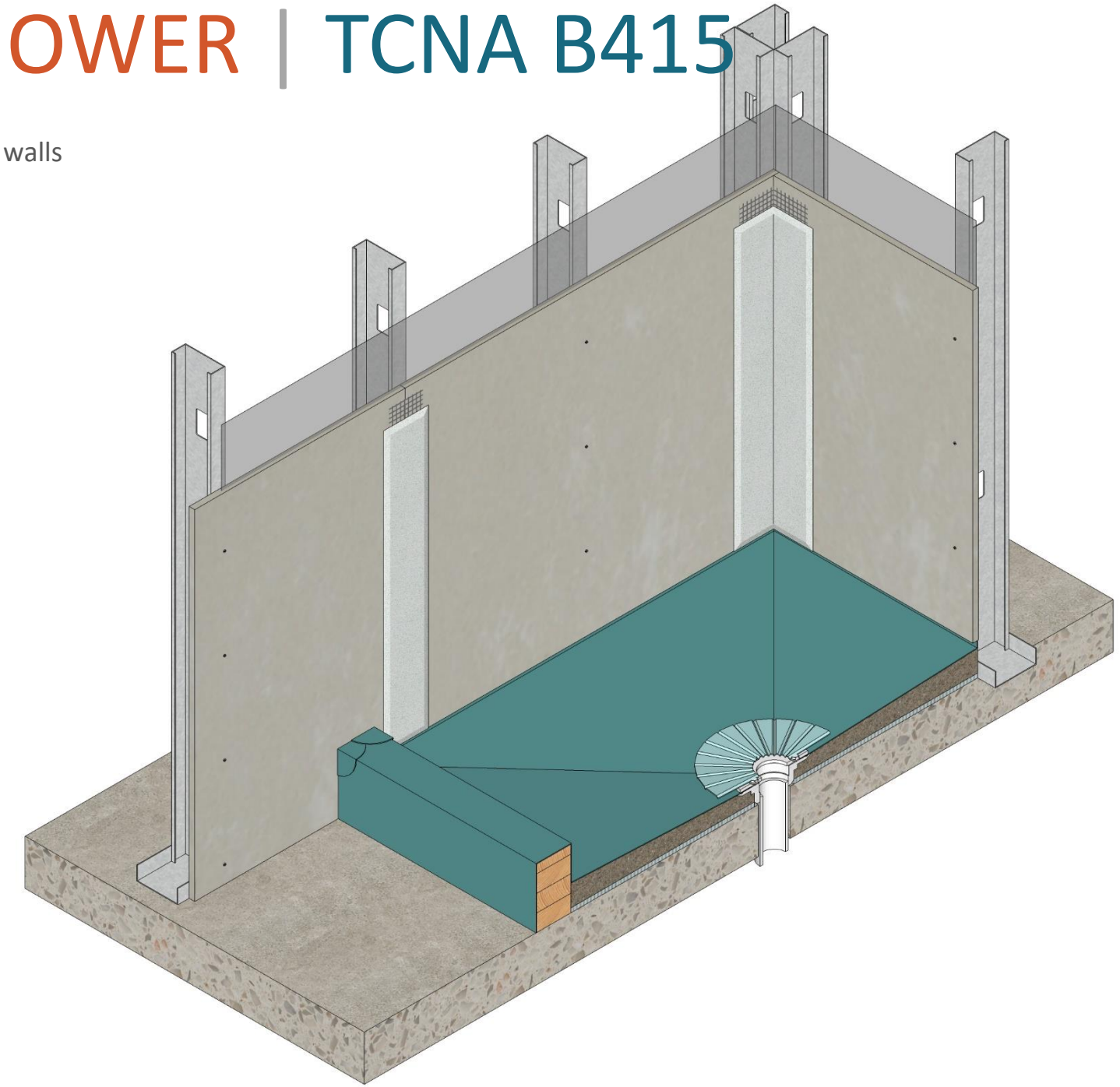

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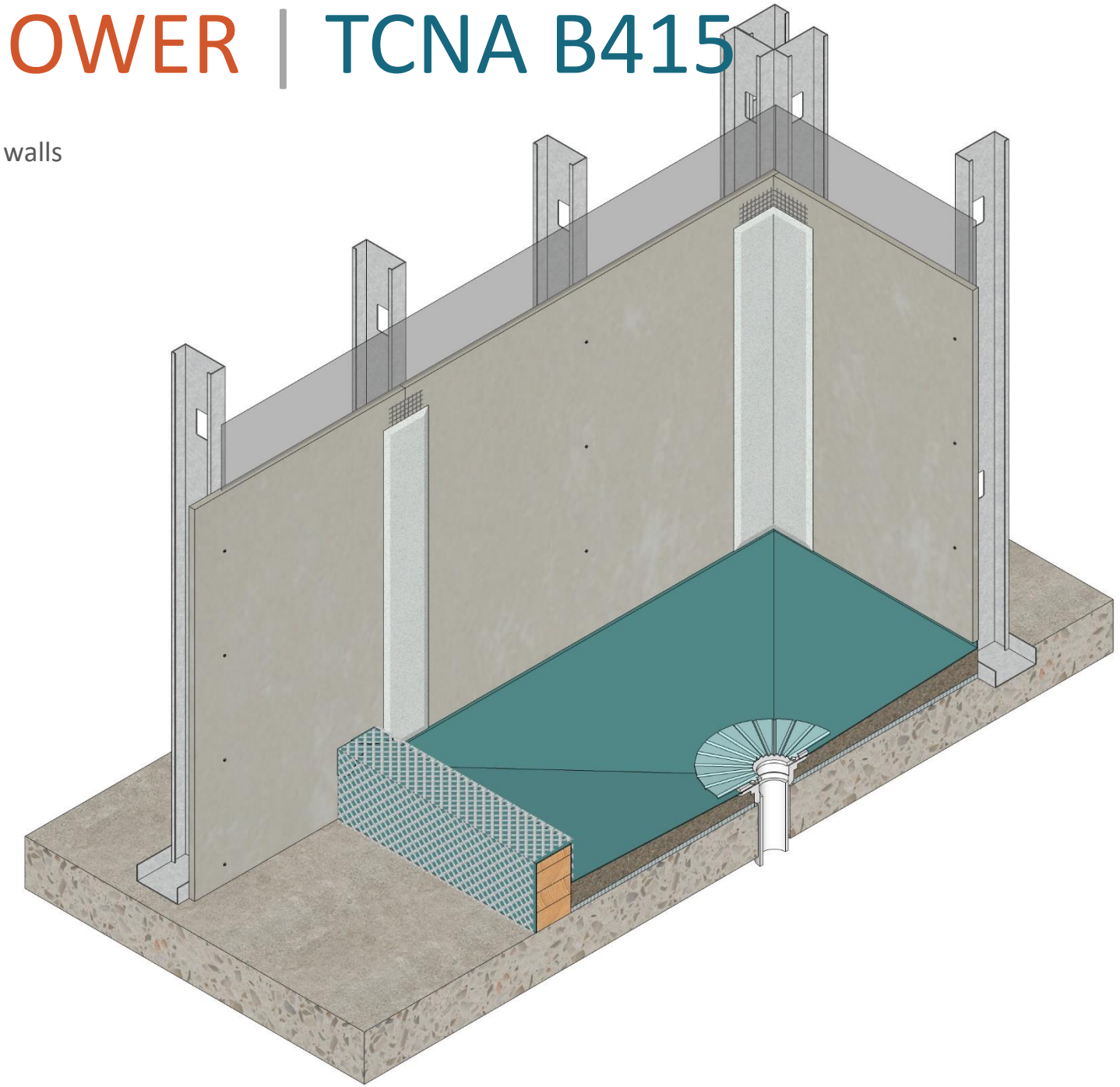

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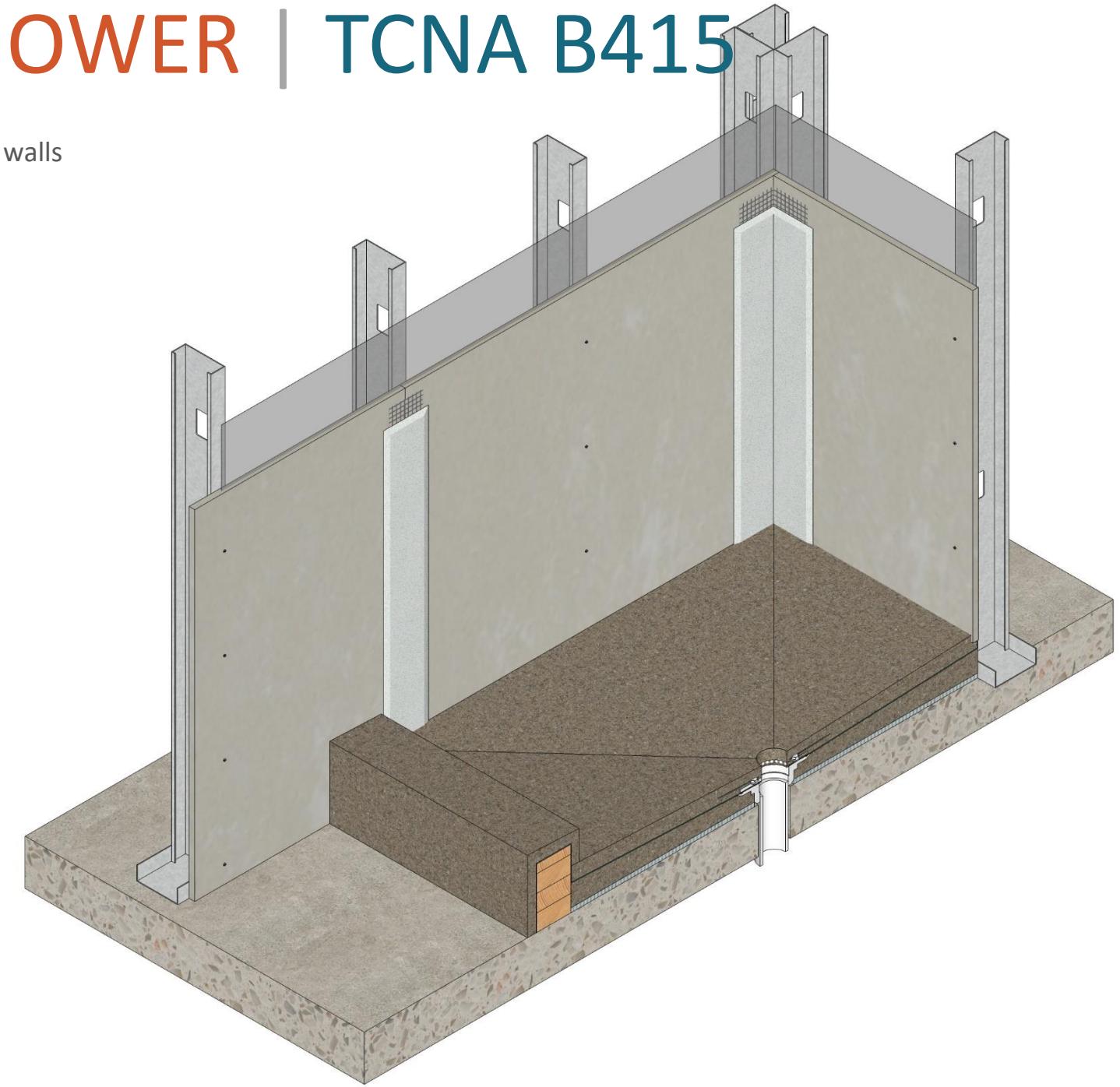
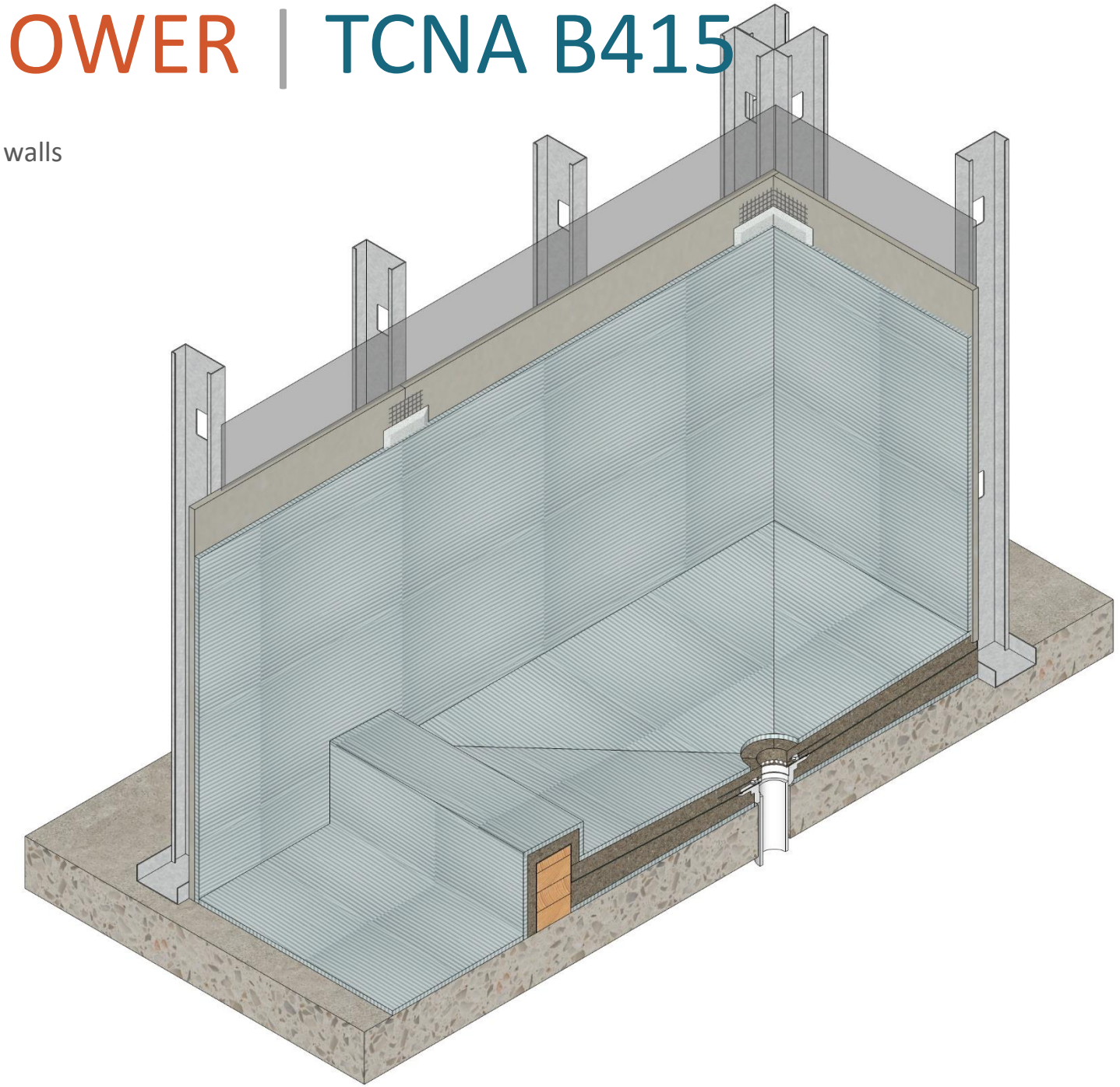
Mortar bed floor
Ceramic tile, glass tile



Slab & framing
Curb
Bond coat
Mortar pre-pitch
Blocking
Sealant @ drain collar
Shower pan membrane
Preformed corners
Clamping ring
Weep protector
Vapor retarder (opt.)
Backer board
Tape seams
Lath
Mortar bed
Bond coat
Tile

TILE SHOWER | TCNA B415

Wood or metal studs
Cement backer board walls
Mortar bed floor
Ceramic tile, glass tile



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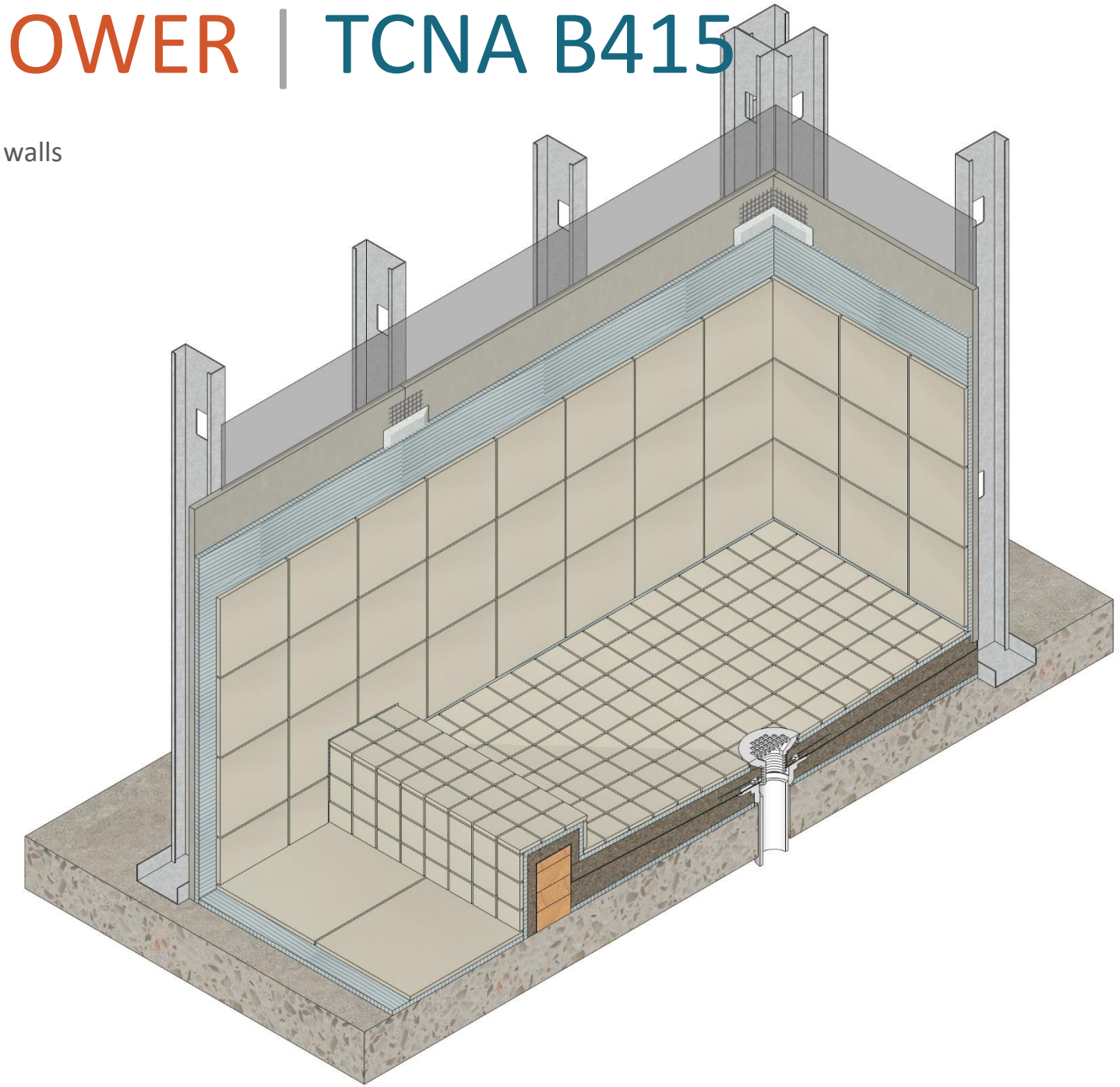

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TILE | GAUGED PORCELAIN PANELS

Midtown Athletic Club, Chicago, IL

TILE | GAUGED PORCELAIN PANELS

Perry's Steakhouse, Schaumburg, IL, Aria Group

TILE | GAUGED PORCELAIN PANELS

Perry's Steakhouse, Schaumburg, IL, Aria Group

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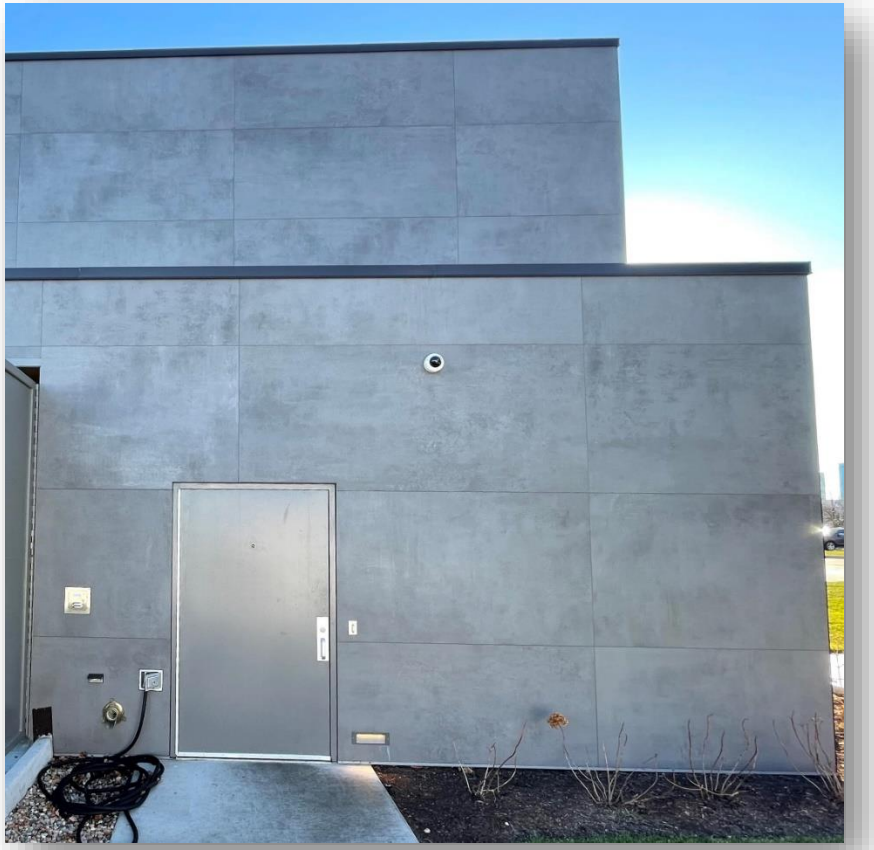
Perry's Steakhouse, Schaumburg, IL, Aria Group

TILE | GAUGED PORCELAIN PANELS



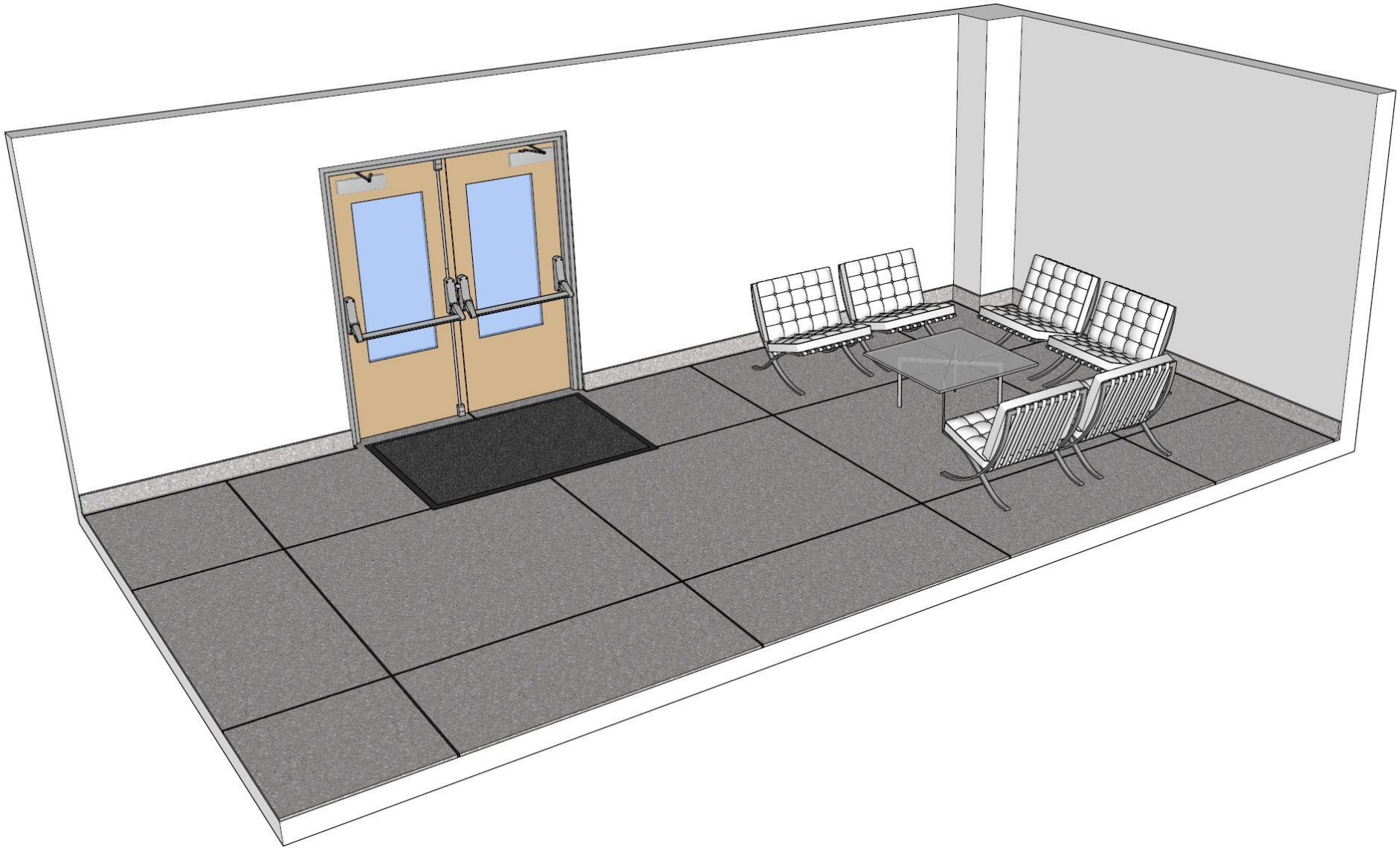
Perry's Steakhouse, Schaumburg, IL, Aria Group

TILE | RETROFITS

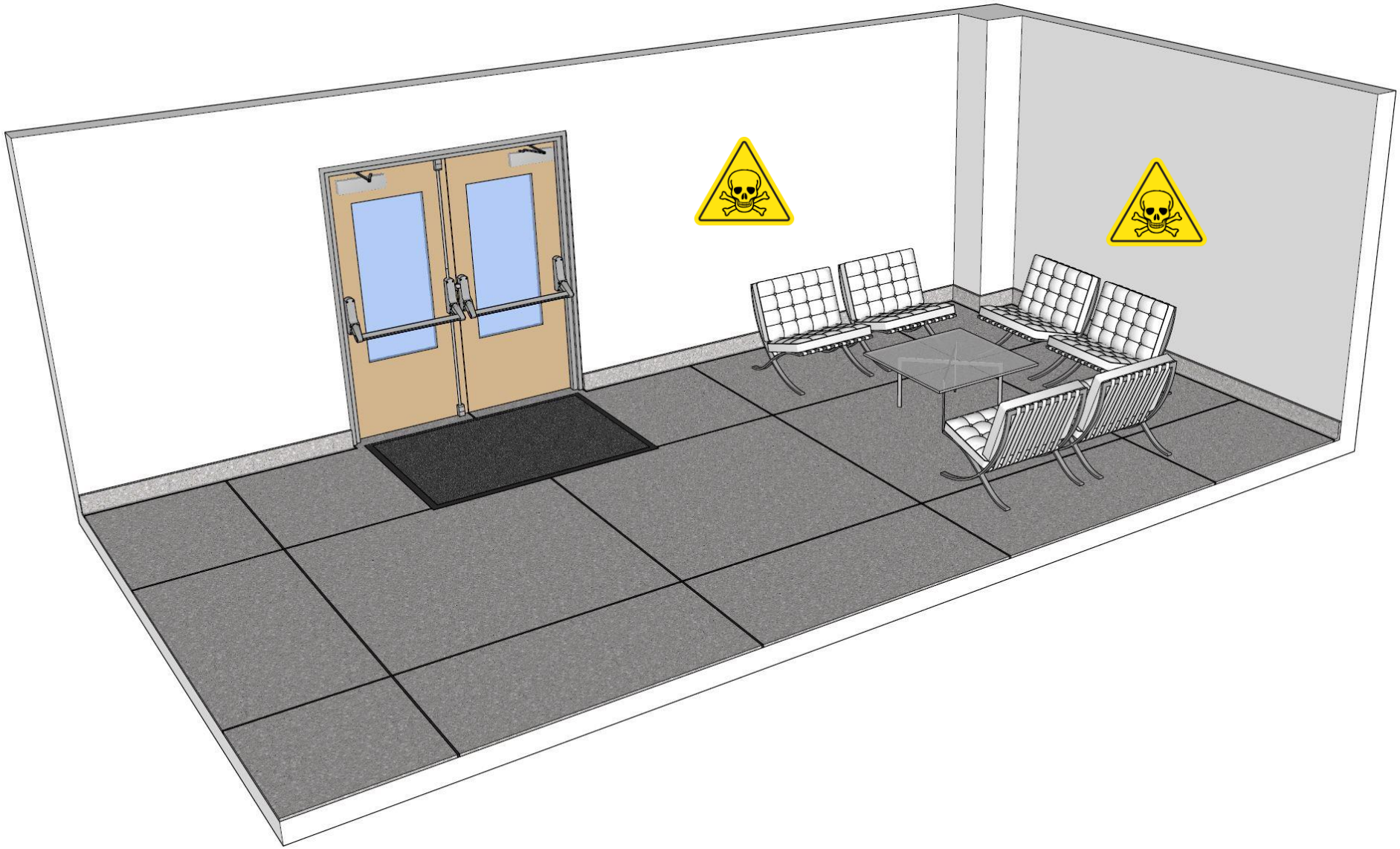
Gauged porcelain tile
3 mm (1/8 in.) to 5.5 mm (7/32 in.)

Standard porcelain tile
7 mm (9/32 in.) to 14 mm (9/16 in.)

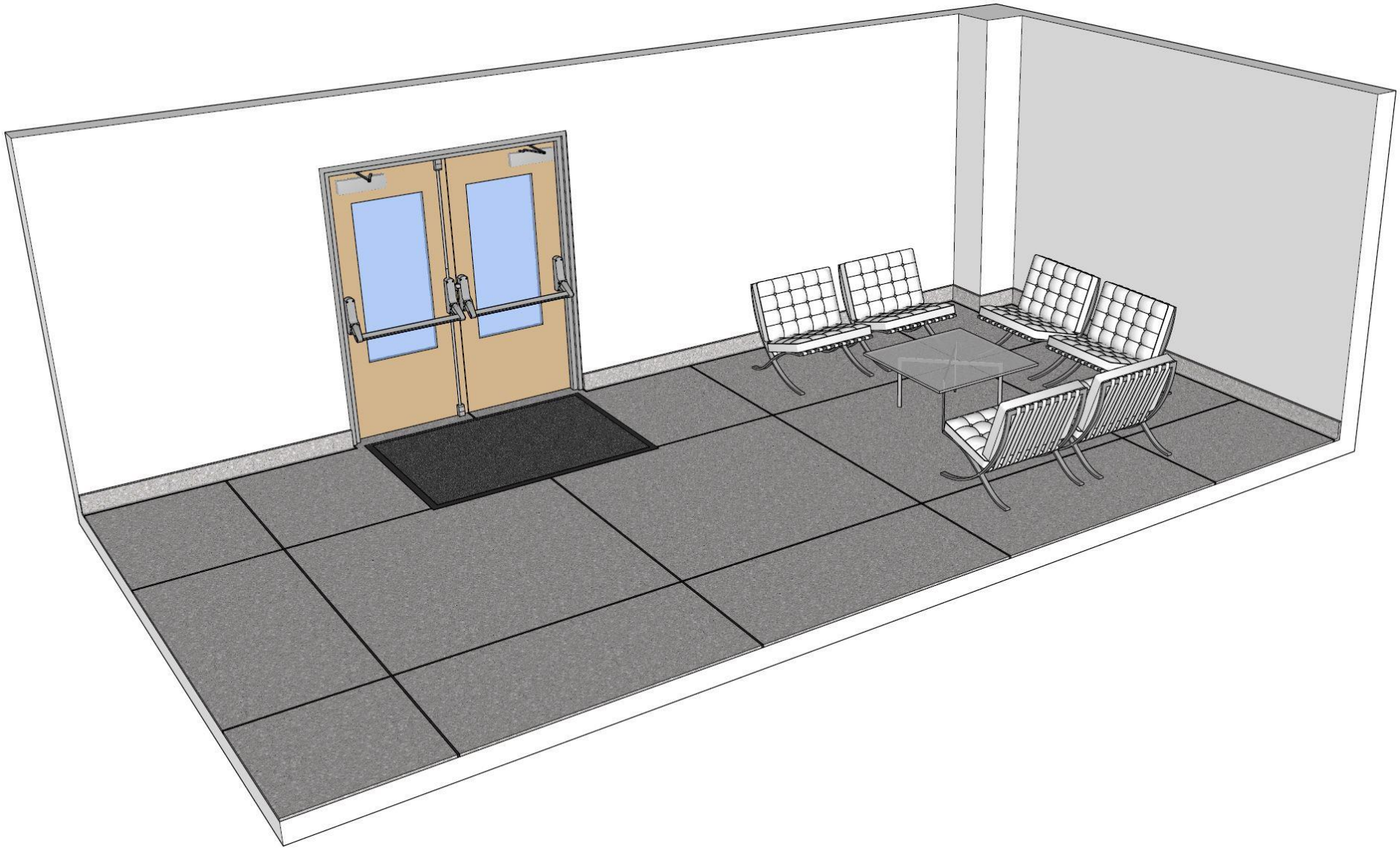
TILE | RETROFITS



TILE | RETROFITS



TILE | RETROFITS



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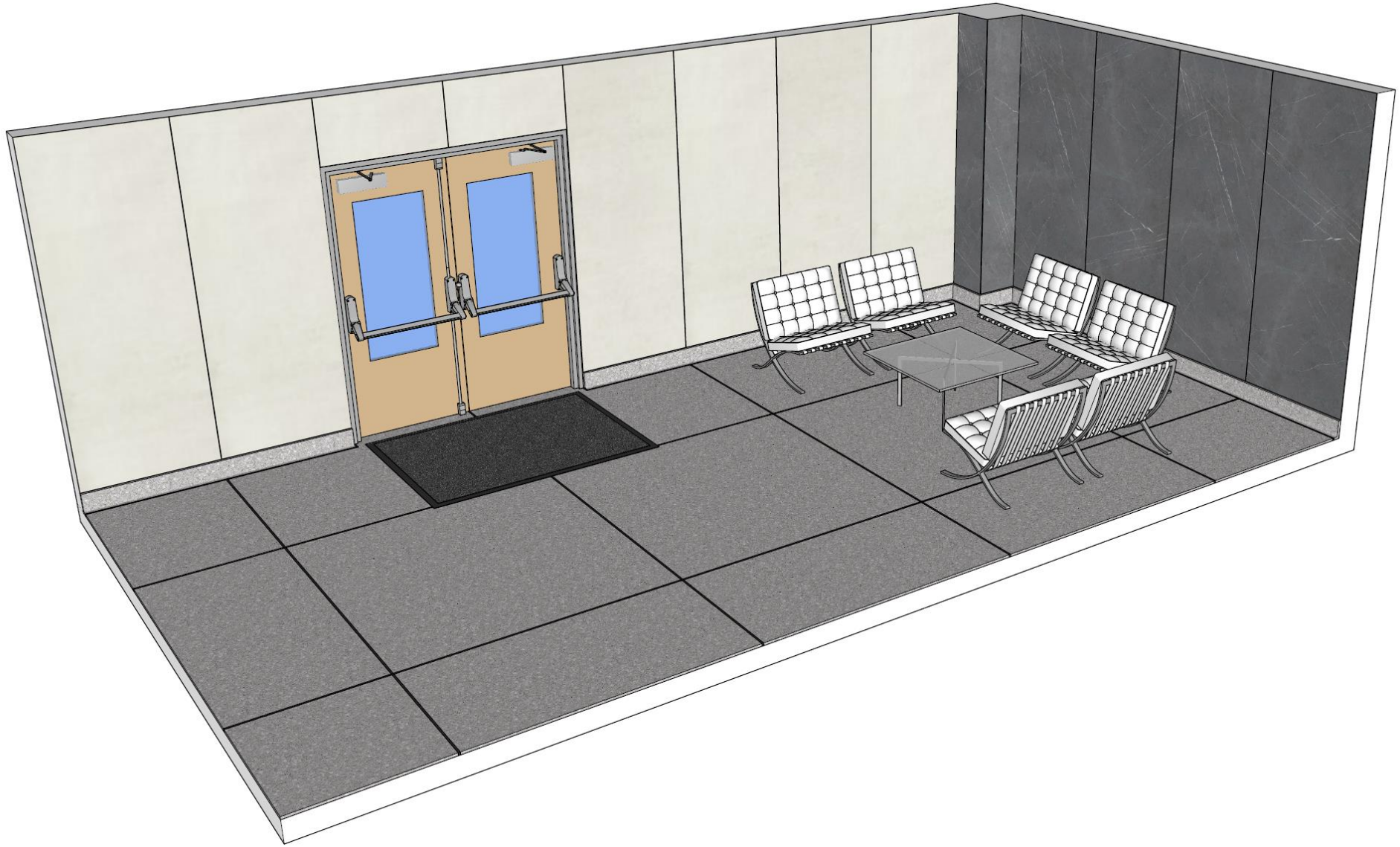

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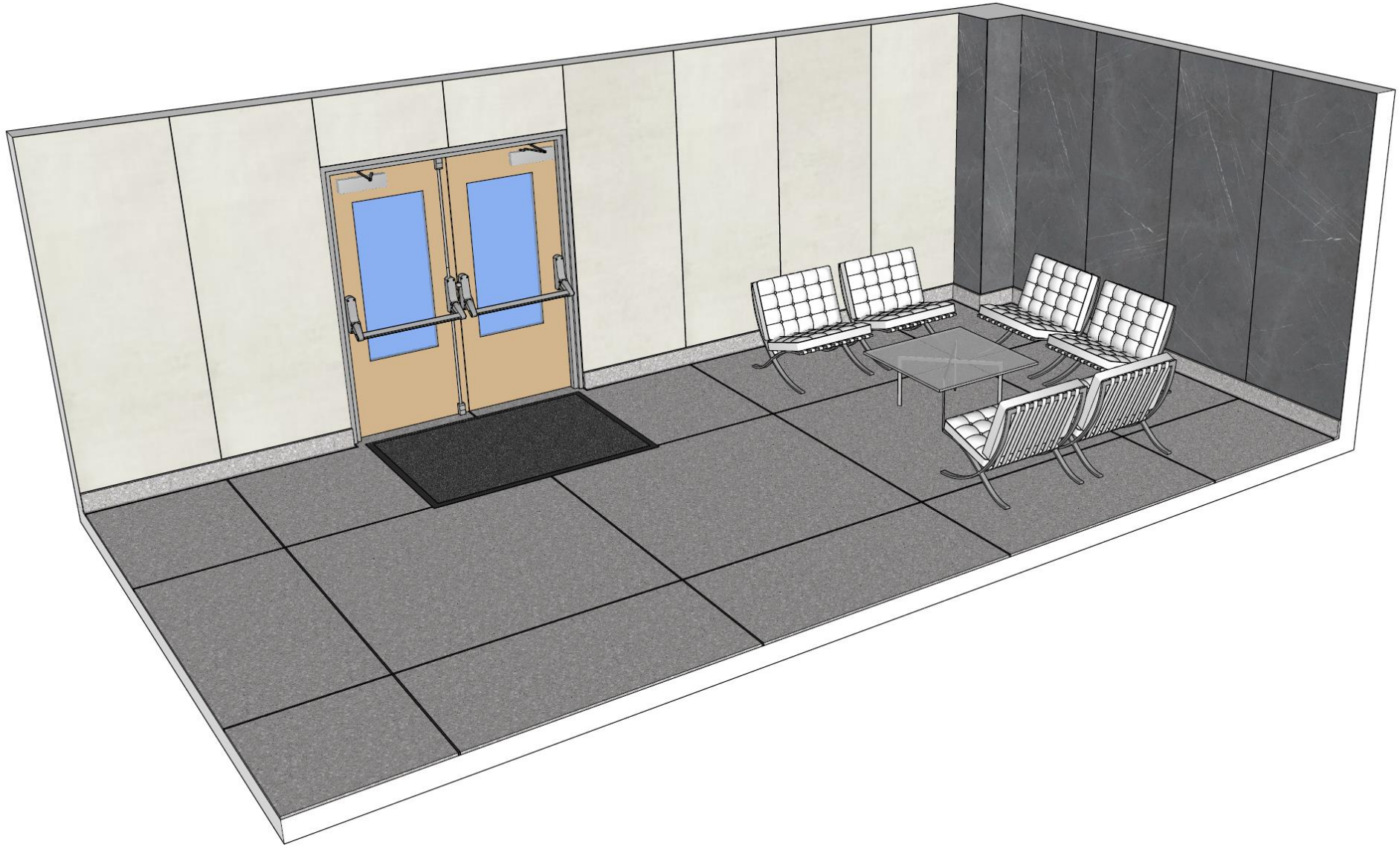
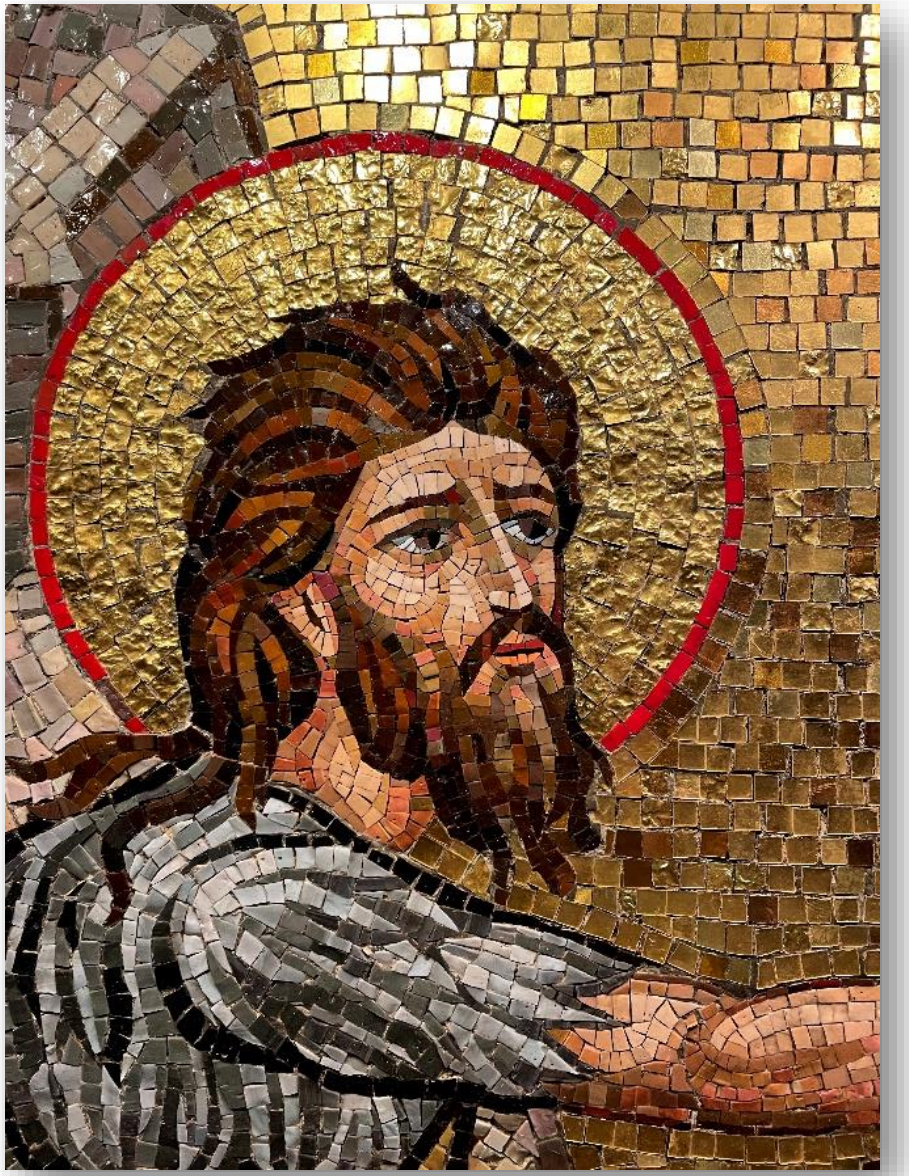
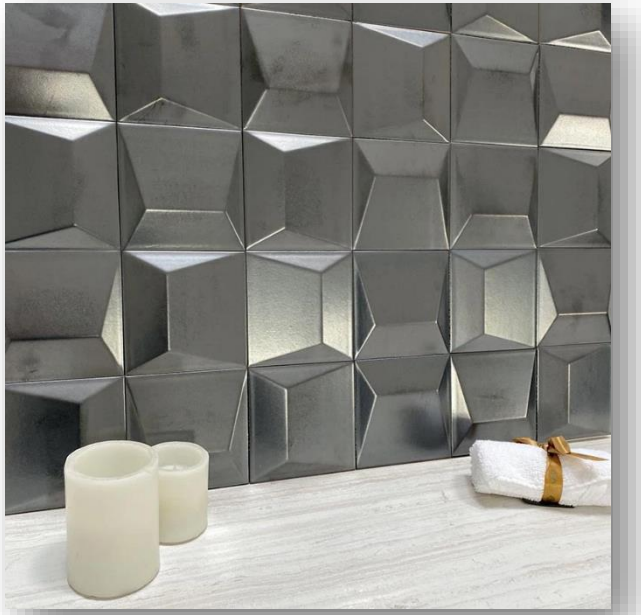


TILE | MOSAICS



TILE | 3D TILES



MASONRY MATERIALITY

TERRAZZO

INTERNATIONAL MASONRY INSTITUTE

AIA Continuing Education Provider

TERRAZZO | DEFINITION

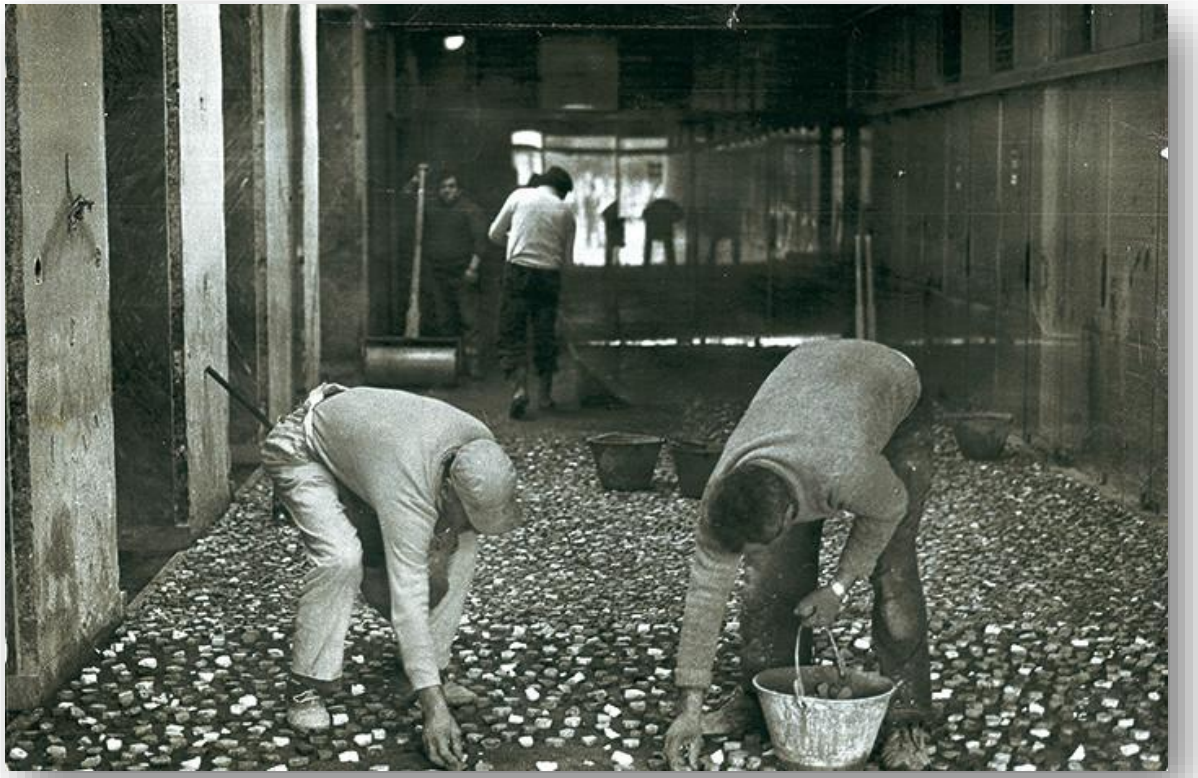
- A composite material, poured in place or precast, used primarily for floor surfaces
- Poured with a cementitious or resinous binder
- Optional membranes to combat moisture & cracking
- Divider strips
- Aggregates
- Cured, ground, and polished to produce a smooth or otherwise uniformly textured surface
- Sealed and maintained by water based products

TERRAZZO | DESIGN

Minneapolis St. Paul Airport

Fire station, Canyon County, California

TERRAZZO | HISTORY



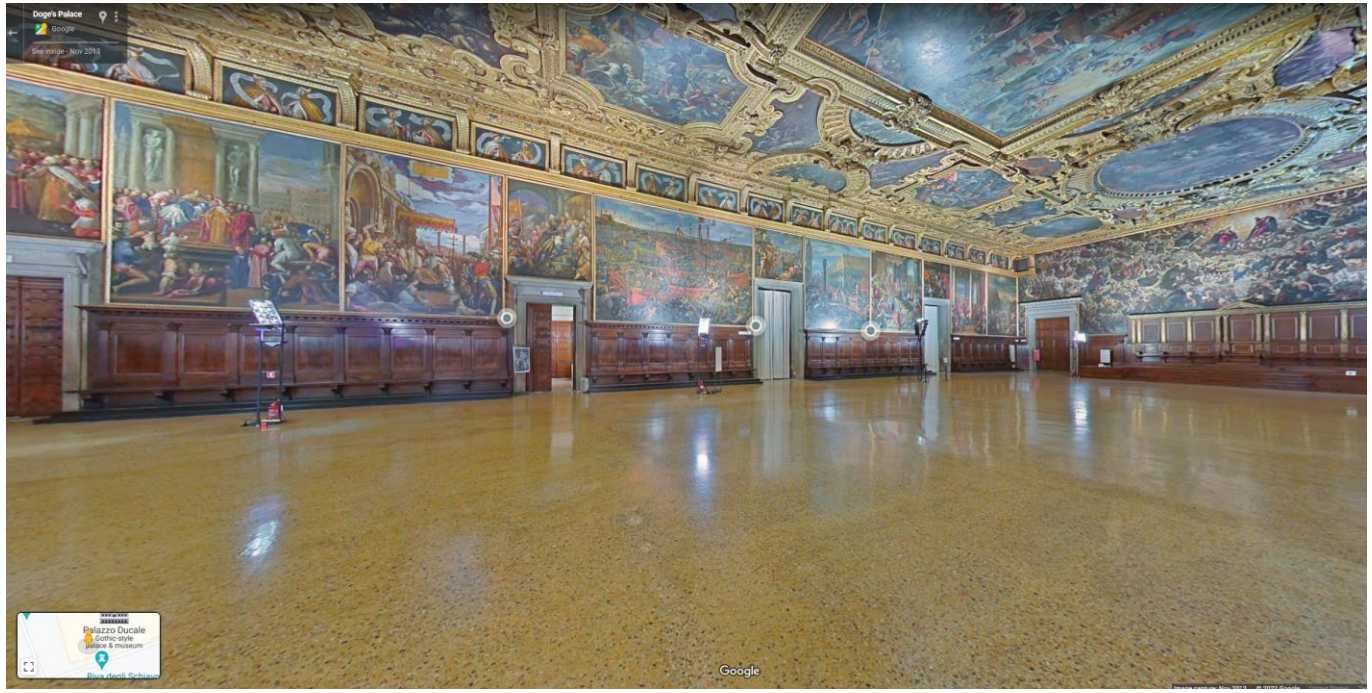
15th century marble masons, northern Italy

TERRAZZO | HISTORY

Grand Council Chamber, Doge's Palace, Venice, 14,000 square feet

TERRAZZO | HISTORY

- Sala del Maggior Consiglio, (Grand Council Chamber) is the largest room in Europe
- 174′ x 82′, 14,000 s.f.
- Built in 1424, rebuilt in 1577
- Marble aggregate: Gold, white, pink; Deep red, grey, black.
- No divider strips!



Google Maps 360° view

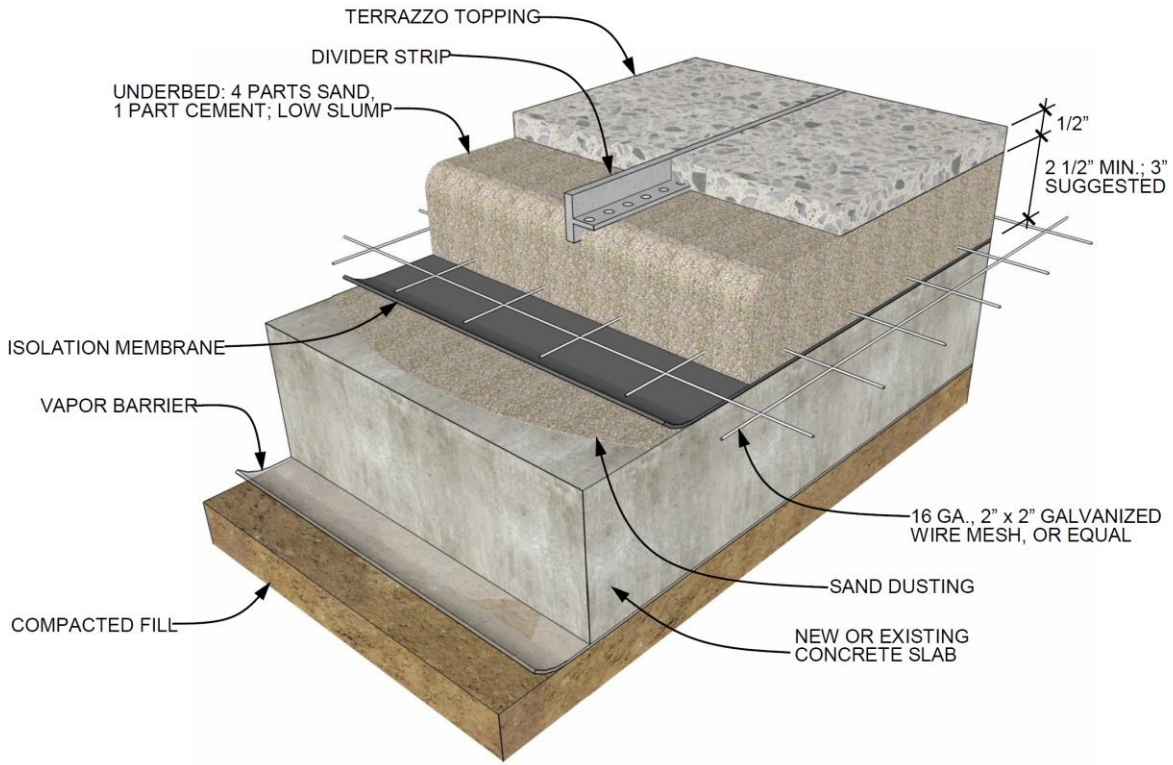
Grand Council Chamber, Doge's Palace, Venice, 14,000 square feet

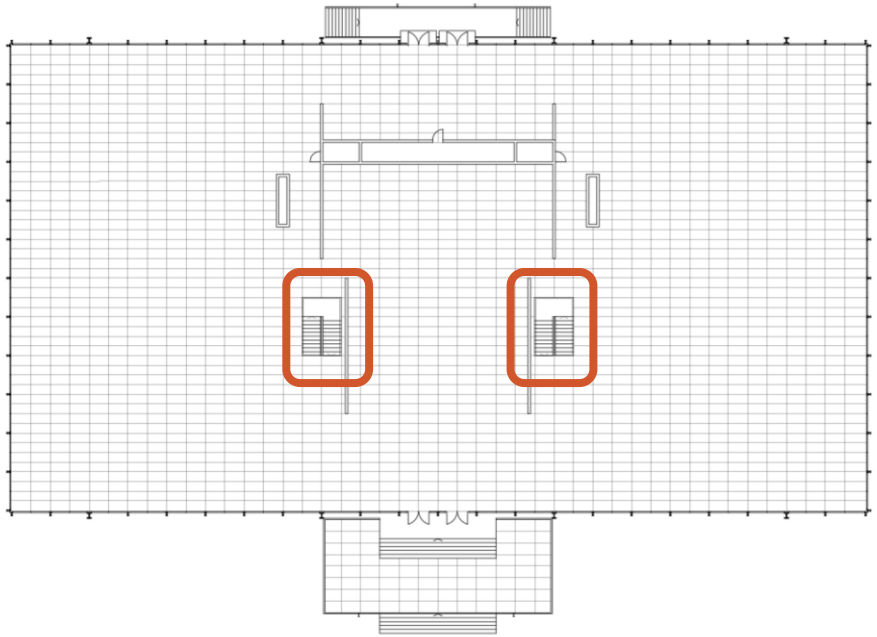
TERRAZZO

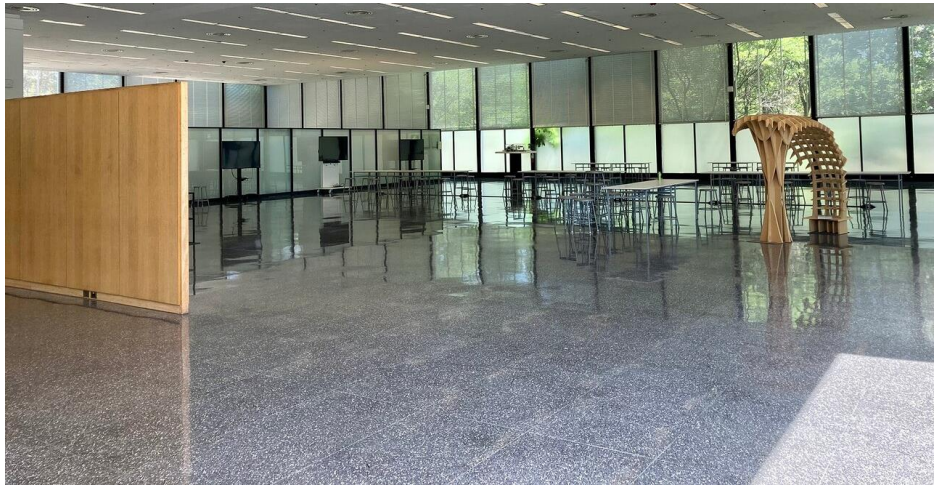
Crown Hall, Illinois Institute of Technology, 1956, Mies van der Rohe

TERRAZZO

- Sand cushion cement terrazzo is on 2′-6″ x 5′-0″ module

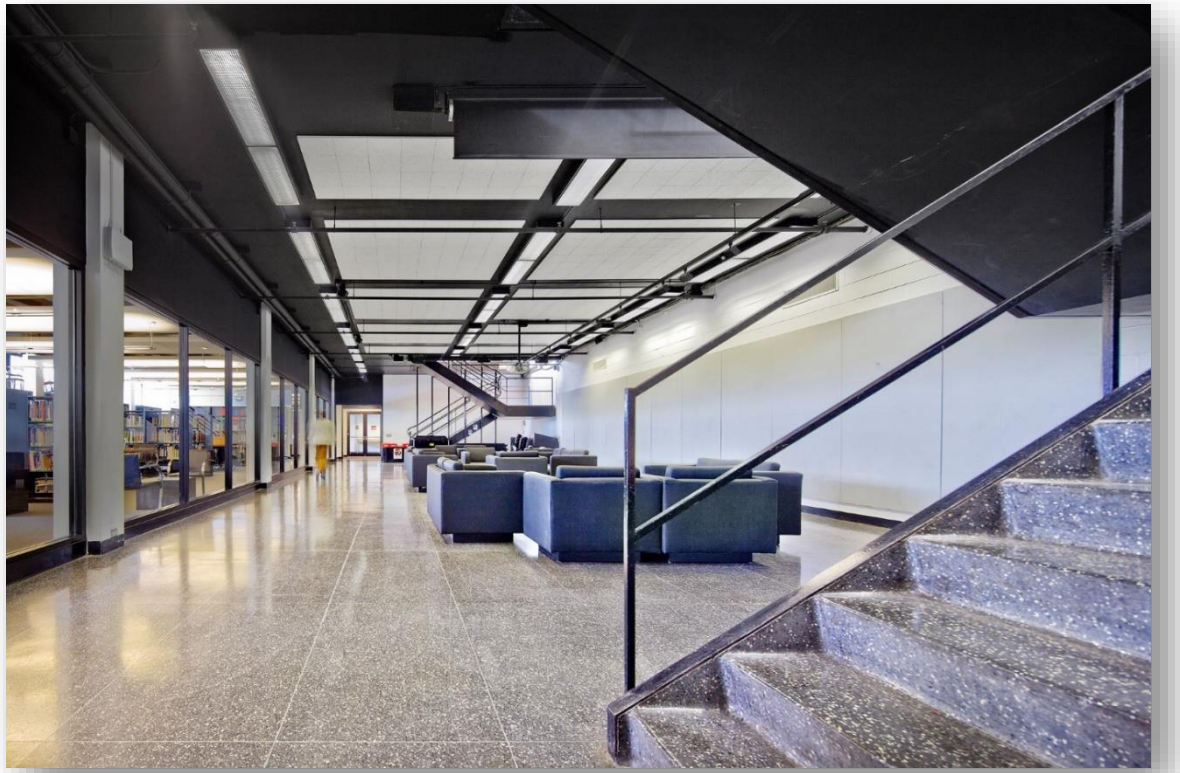


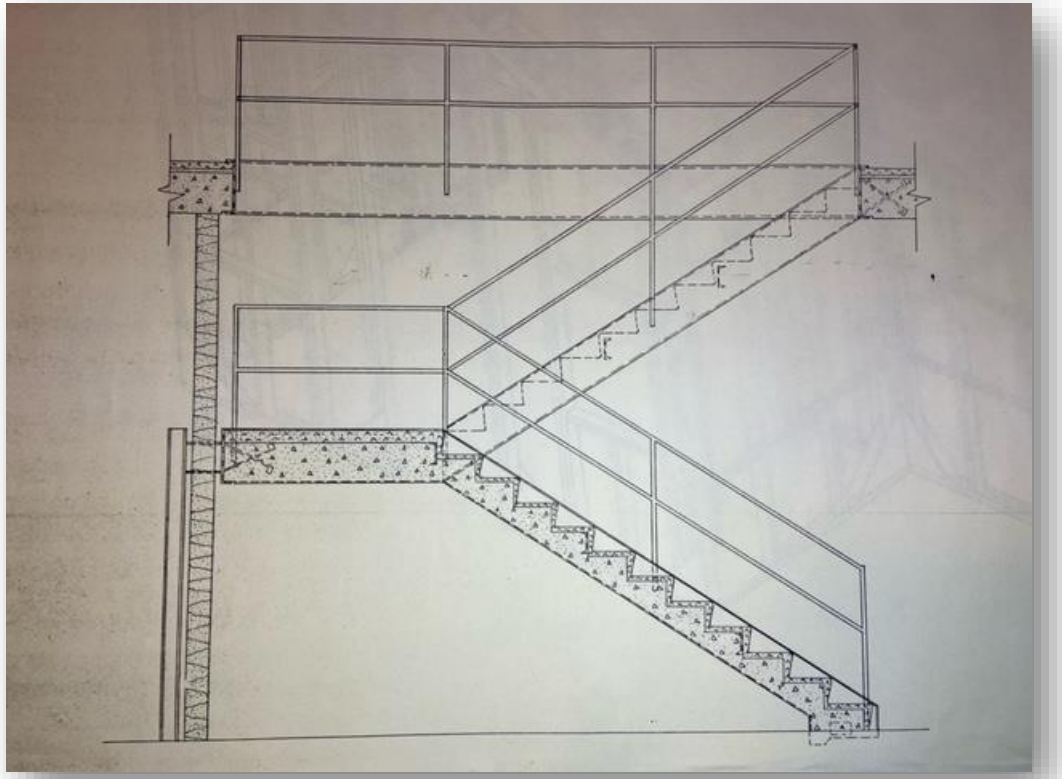




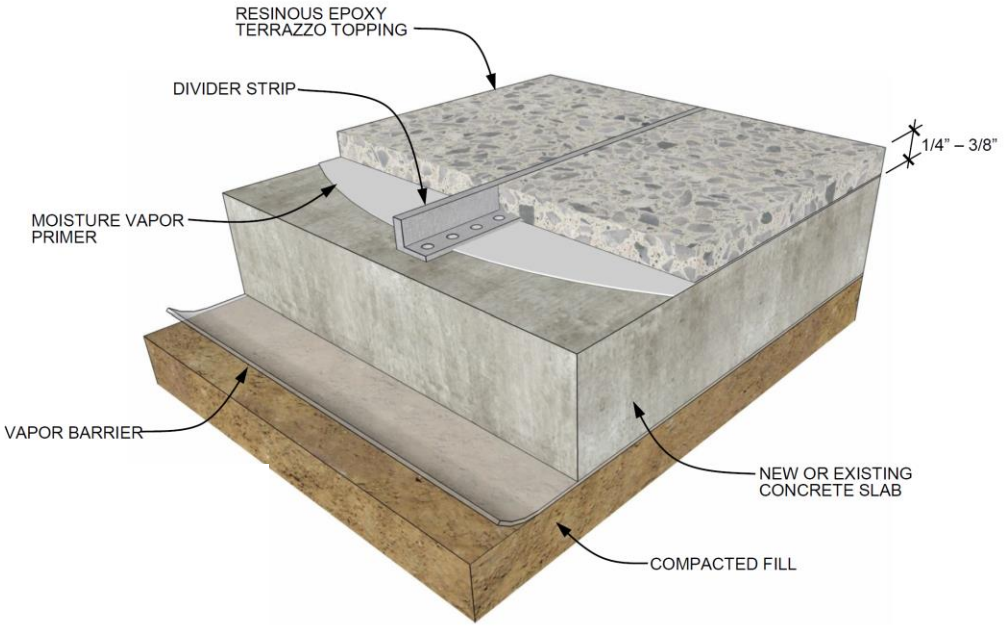
Crown Hall, Illinois Institute of Technology, 1956, Mies van der Rohe

TERRAZZO





TERRAZZO | EPOXY



TERRAZZO | PALLADIANA

Office building lobby, Varick Street, New York – Yorie Tile & Terrazzo

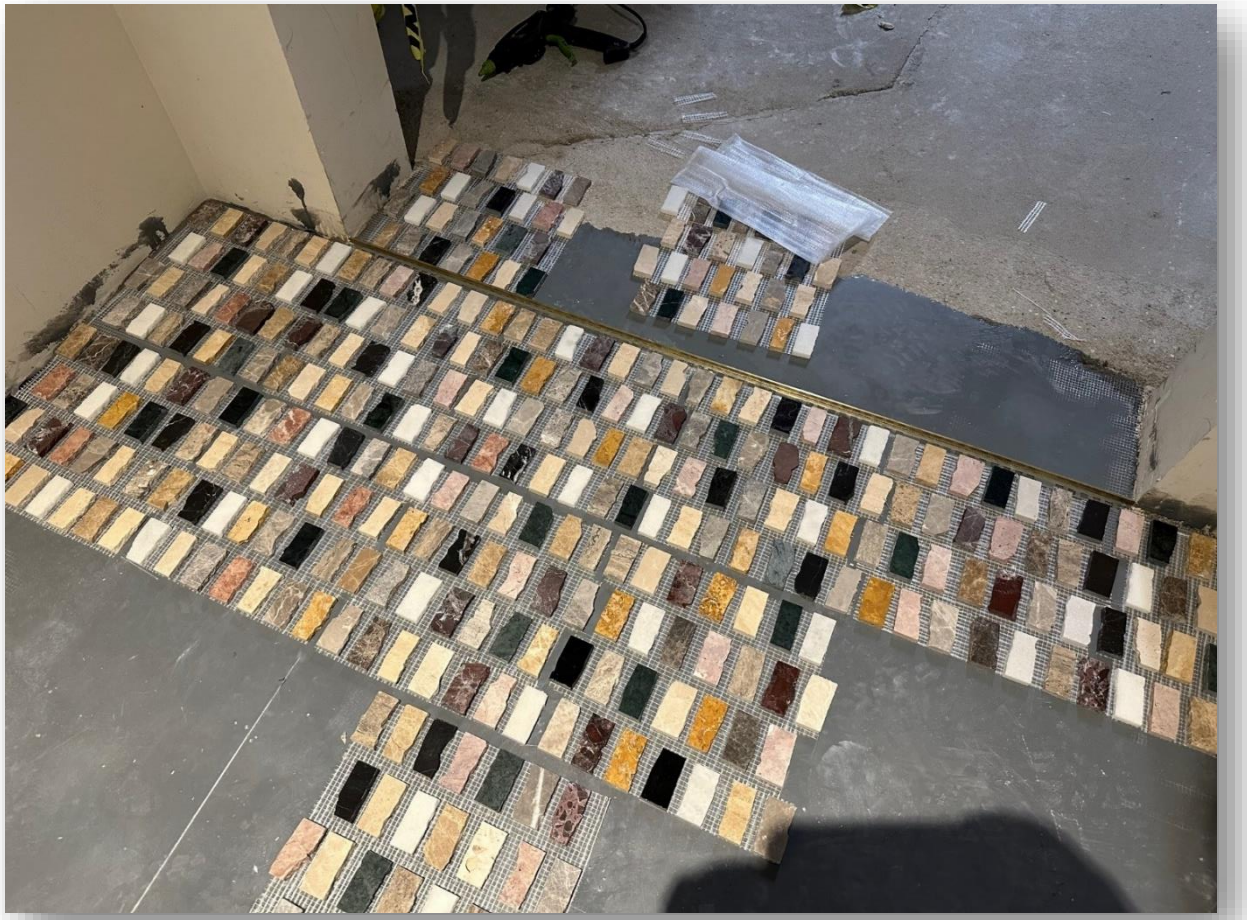
TERRAZZO | PALLADIANA

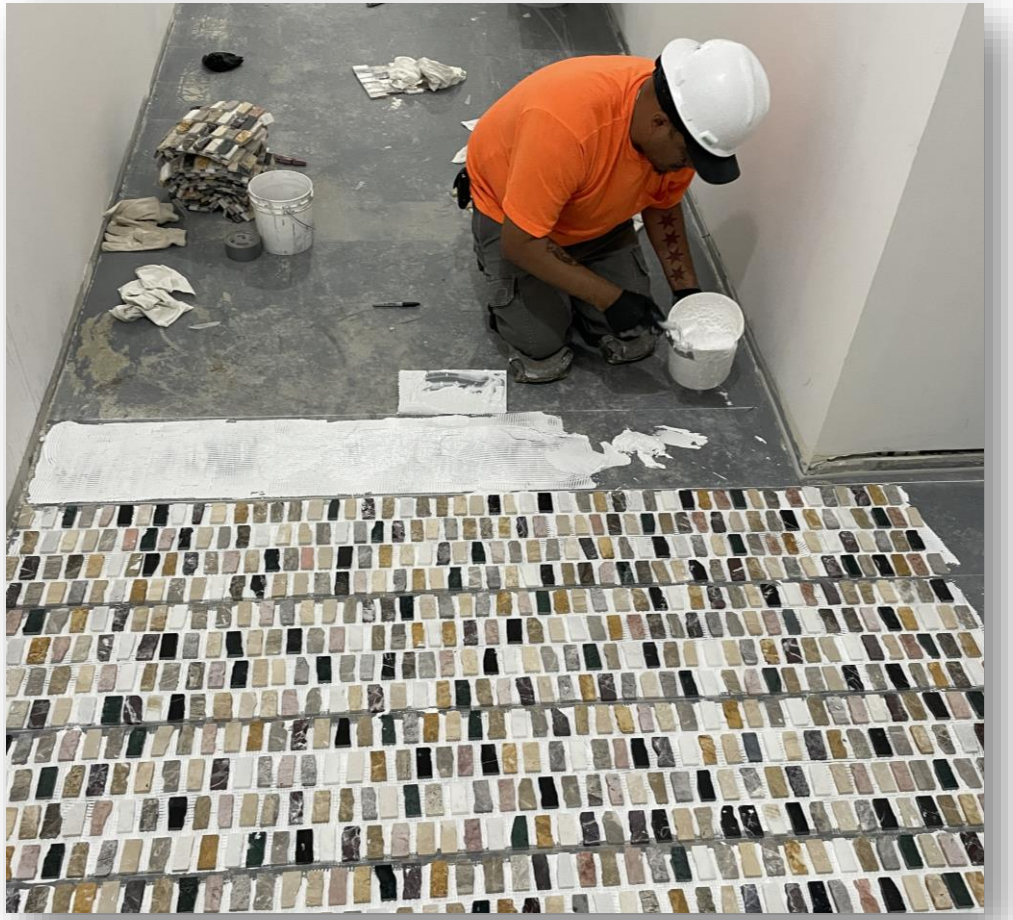
Rockford, Illinois residence, Venice Tile & Terrazzo

TERRAZZO | PALLADIANA

Valentino store, New York City, David Chipperfield Architects

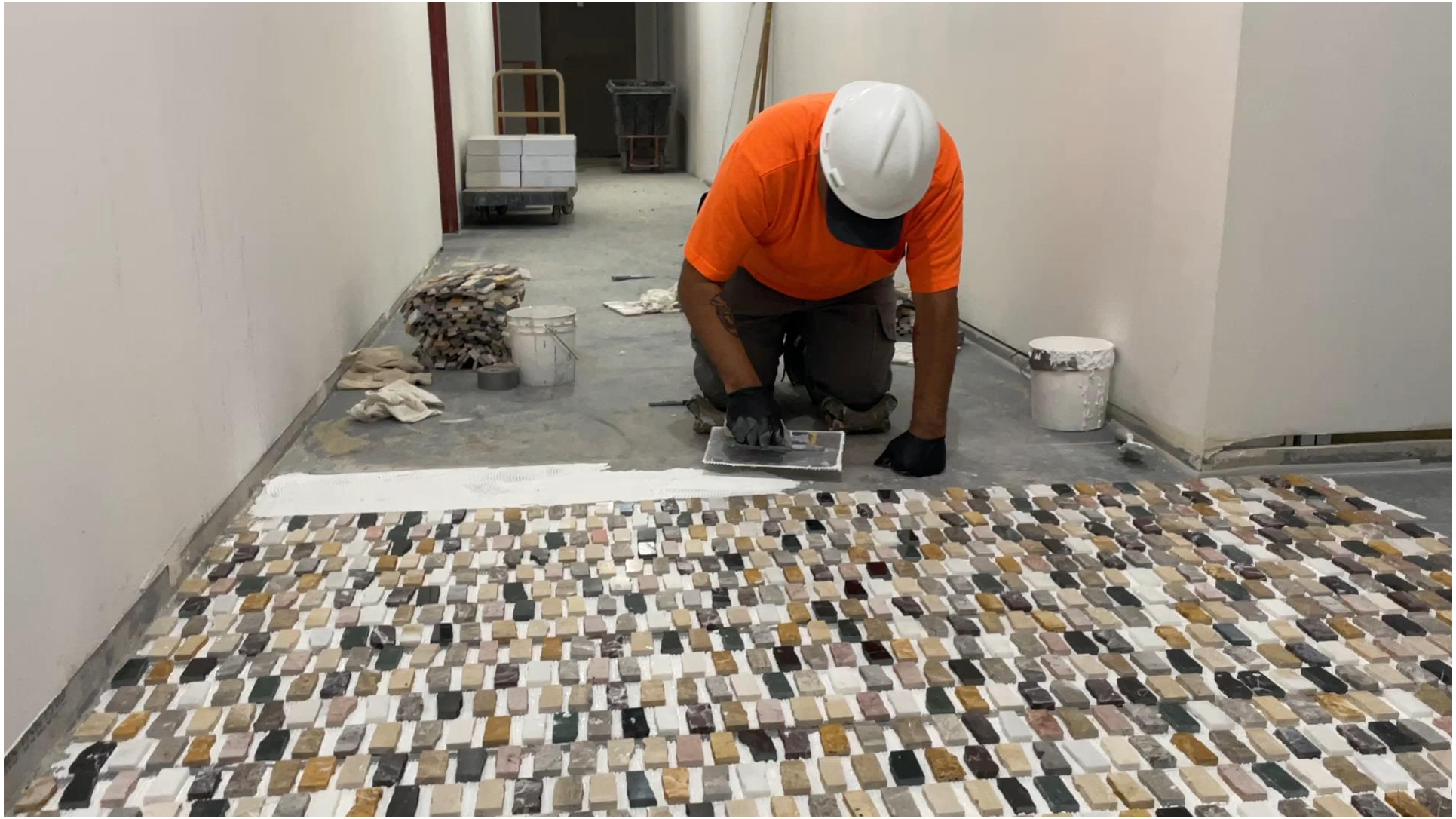
TERRAZZO | PALLADIANA





St. Regis Hotel, Chicago

TERRAZZO | PALLADIANA



St. Regis Hotel, Chicago

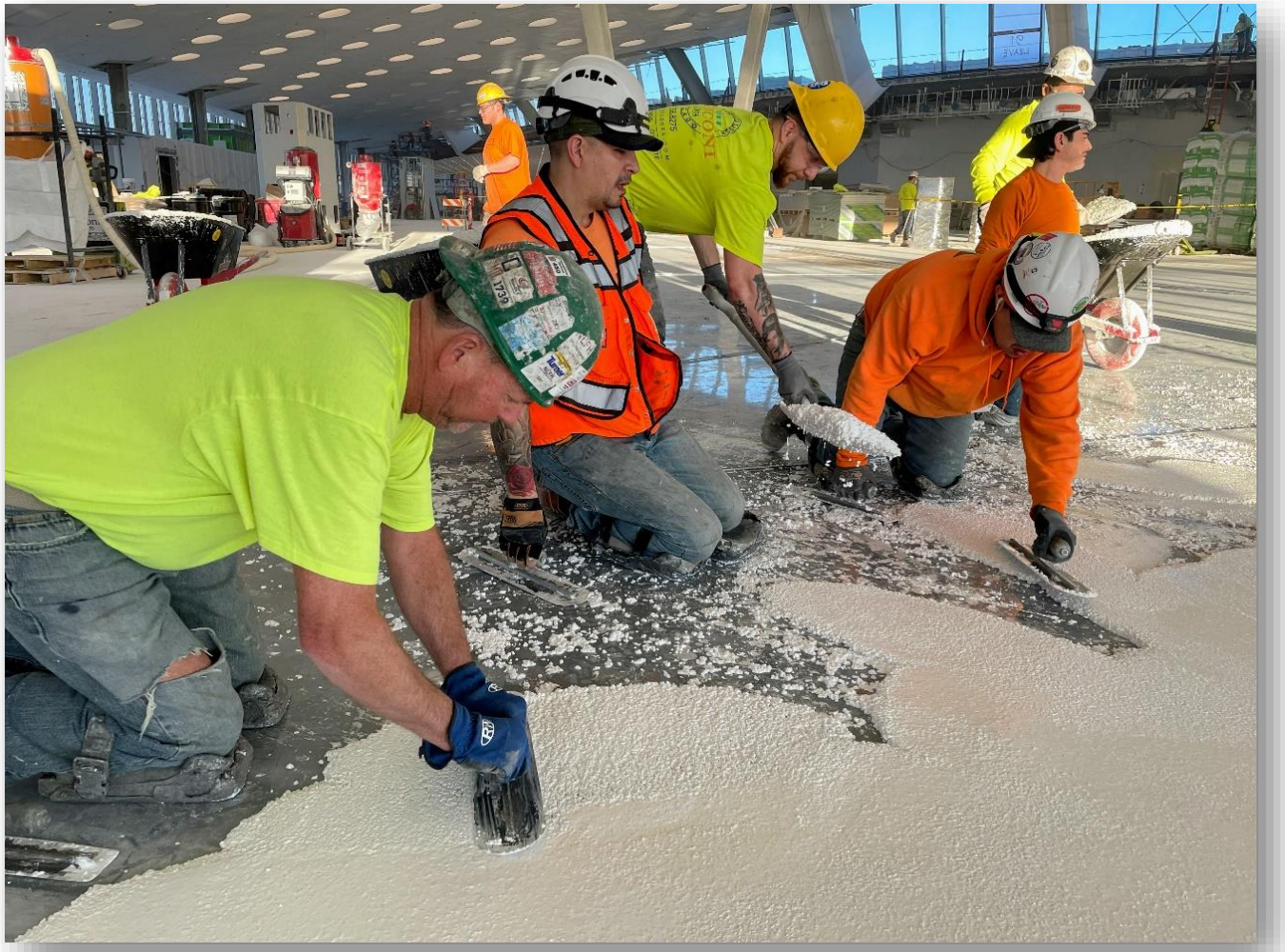
TERRAZZO | PALLADIANA

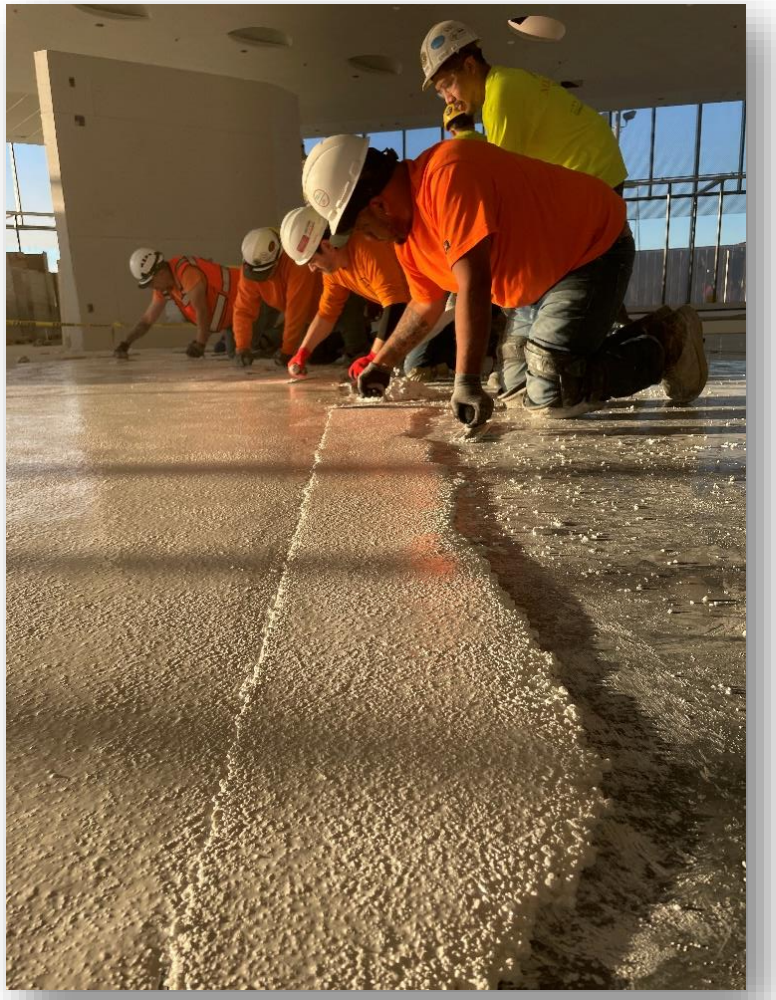
St. Regis Hotel, Chicago

TERRAZZO | PALLADIANA

St. Regis Hotel, Chicago

TERRAZZO | POURING & GRINDING





O’Hare Airport, Chicago

TERRAZZO | POURING & GRINDING

O’Hare Airport, Chicago

MASONRY MATERIALITY

ADAPTIVE REUSE

INTERNATIONAL MASONRY INSTITUTE

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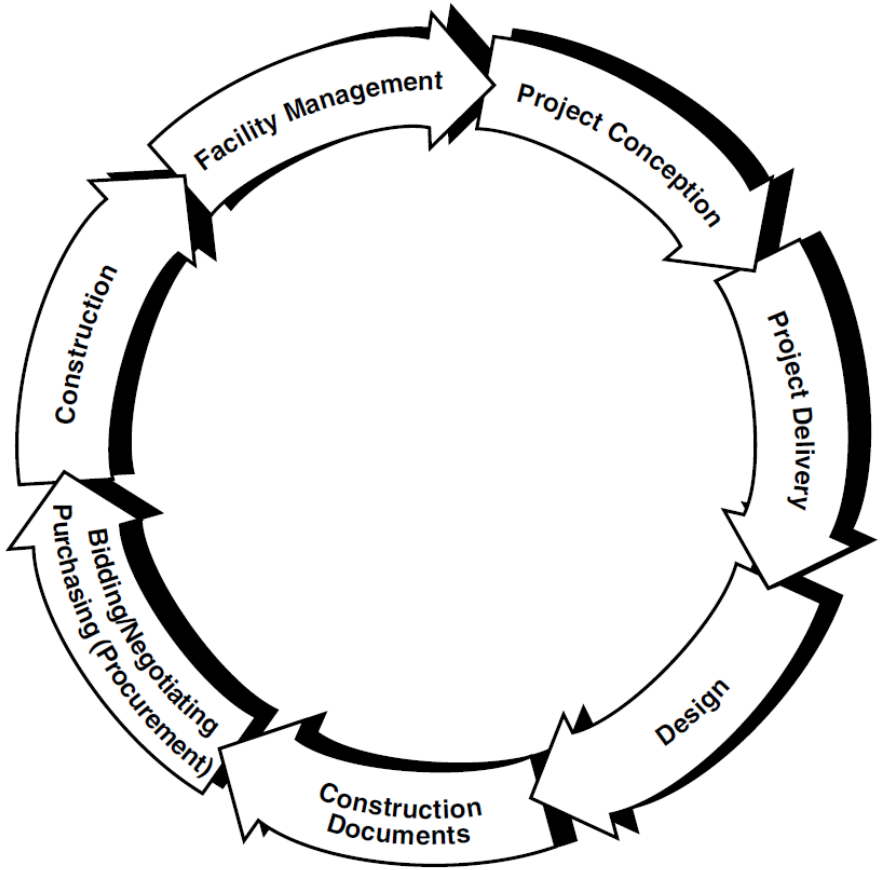
SUSTAINABILITY | DEFINITION

Sustainability

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

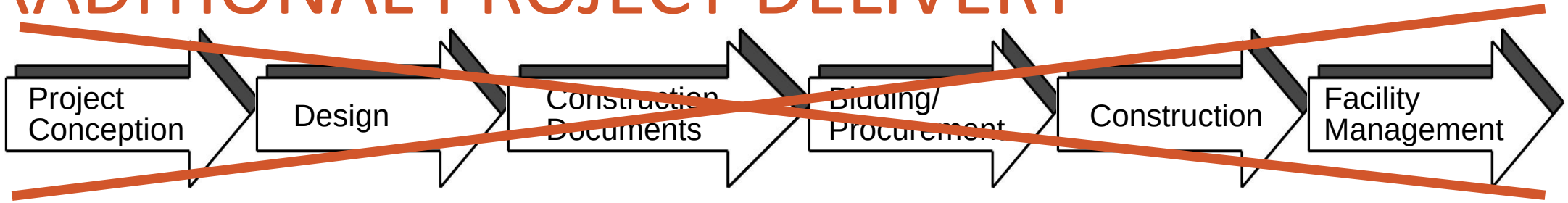
ASTM E 2114, "Standard Terminology for Sustainability Relative to the Performance of Buildings," ASTM International

CIRCULAR ECONOMY

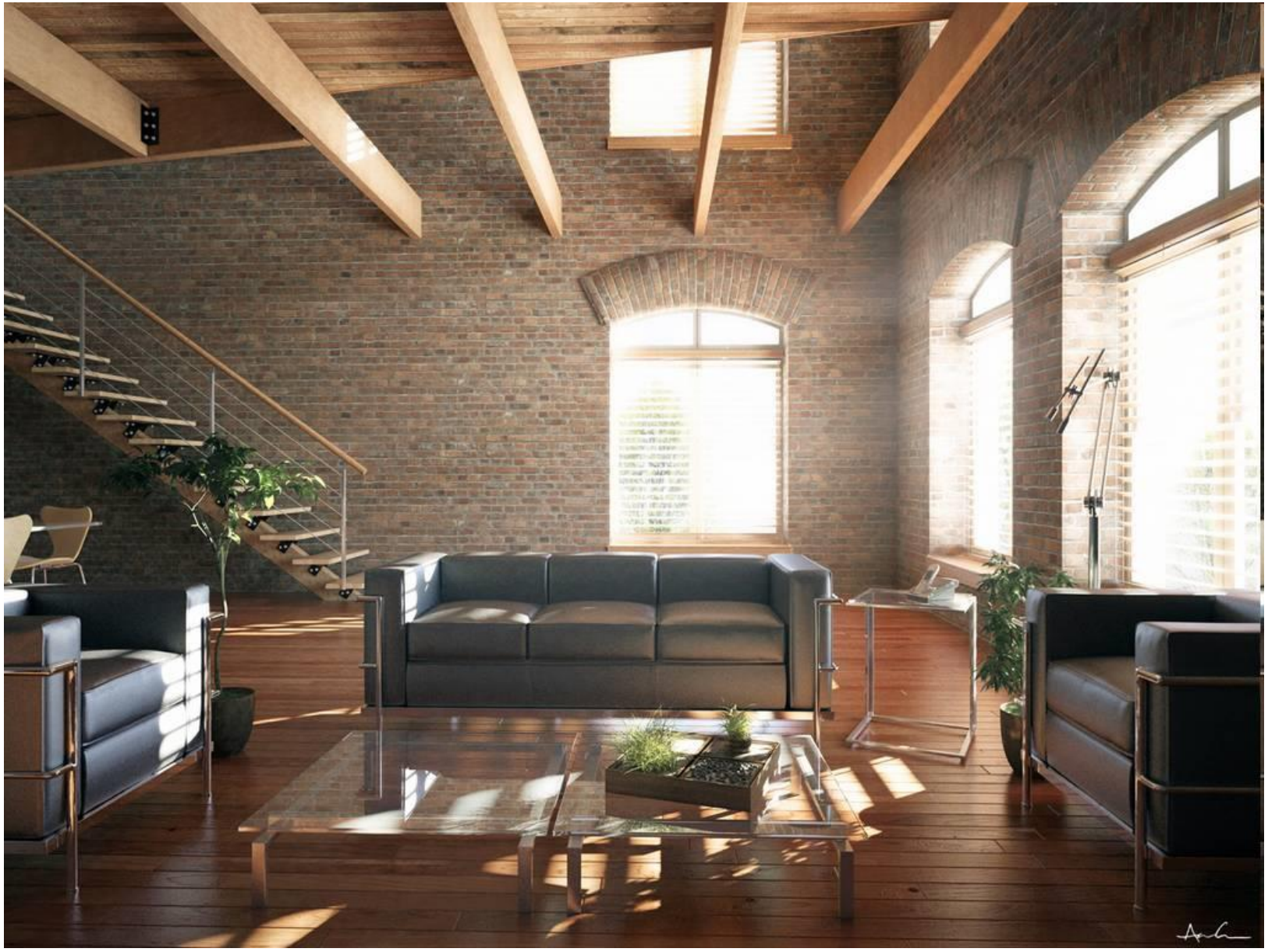


Facility evaluation may identify needs that lead to expansion, remodeling, renovation, or restoration of an existing facility to accommodate growth or changes in function; or may result in abandonment, deconstruction, sale, or adaptive reuse of an existing facility.

TRADITIONAL PROJECT DELIVERY



ADAPTIVE REUSE



ADAPTIVE REUSE | CASE STUDY

Case Study: Walsh Construction Headquarters, Chicago, IL

ADAPTIVE REUSE | CASE STUDY

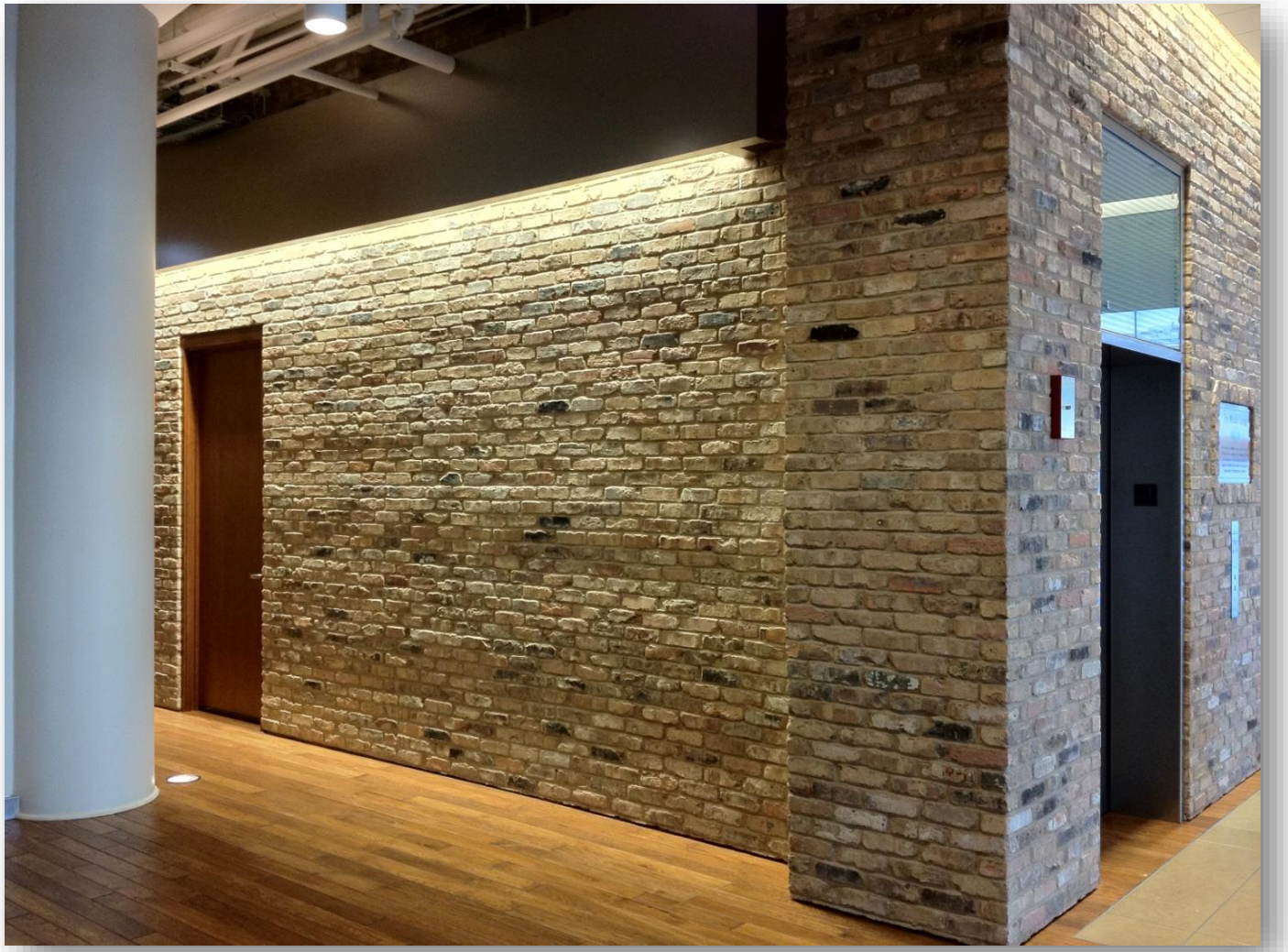
Common brick facade removed

New face brick installed on existing concrete structure.

ADAPTIVE REUSE | CASE STUDY

Common brick from facade is preserved and cleaned.

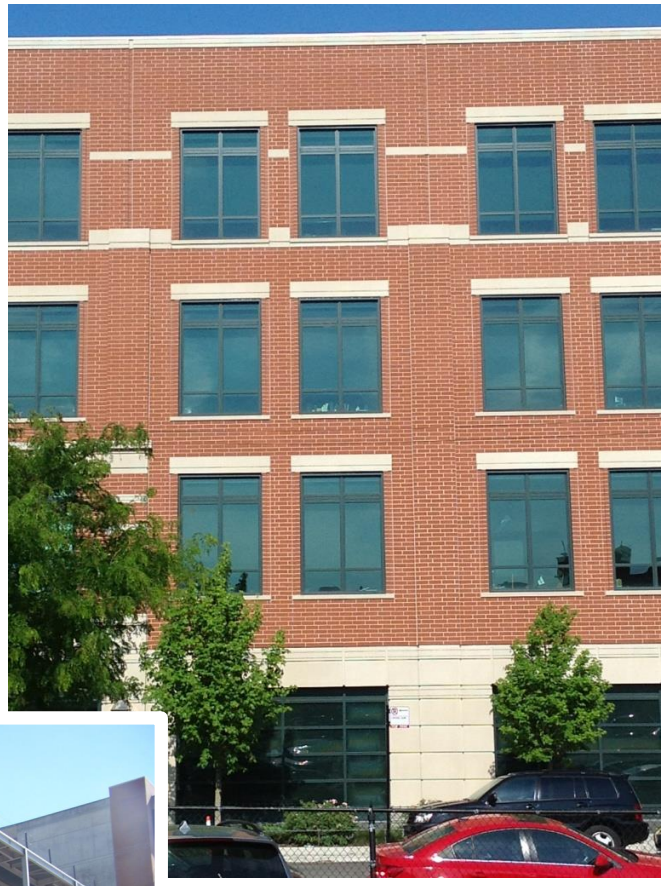
ADAPTIVE REUSE | CASE STUDY



Common brick used as interior finish at corridor walls and elevator lobbies.

ADAPTIVE REUSE | CASE STUDY

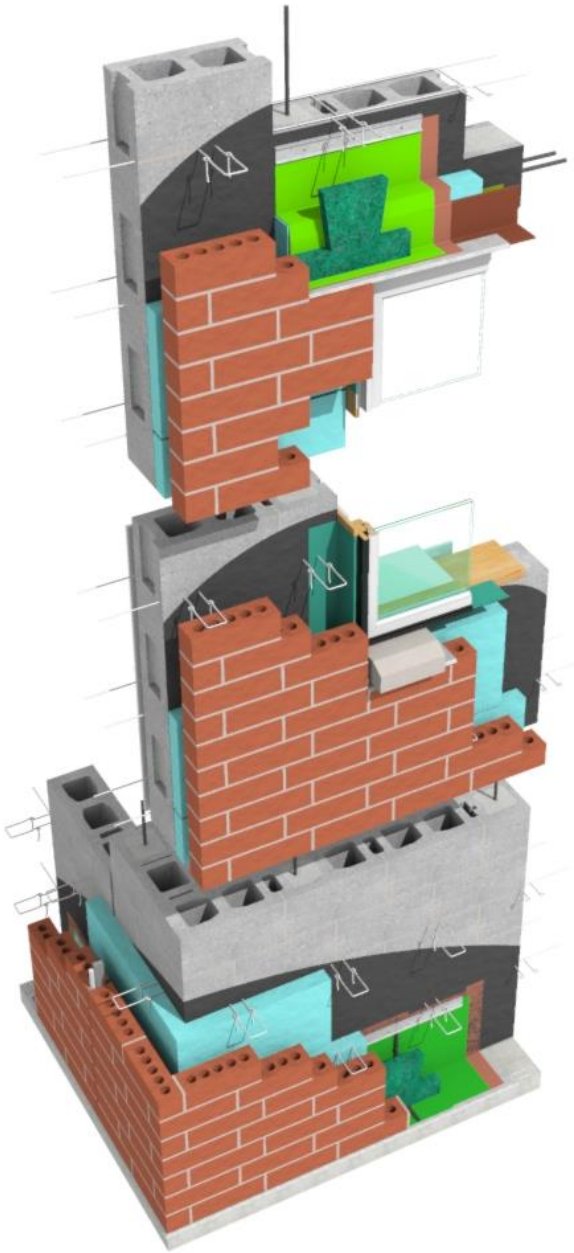
after



after

before

MASONRY MATERIALITY
WRAP-UP



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ARCHITECTURE → MASONRY

Firmness

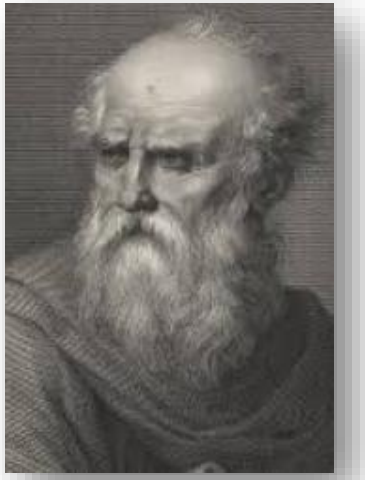
- Structural
- Fire & Impact Resistant
- Durable / Low Maintenance
- High Performance

Commodity

- Ease of Construction
- Energy Efficient
- Economic
- Sustainable
- Qualified Local Labor

Delight

- Beauty
- Versatility of Design
- Contextual / Relatable



Vitruvius, 30 BC

Therefore when we build,
let us think that we build forever.

Let it not be for present delight,
nor for present use alone;

Let it be such works as
our descendants will thank us for.

And let us think
as we lay stone upon stone

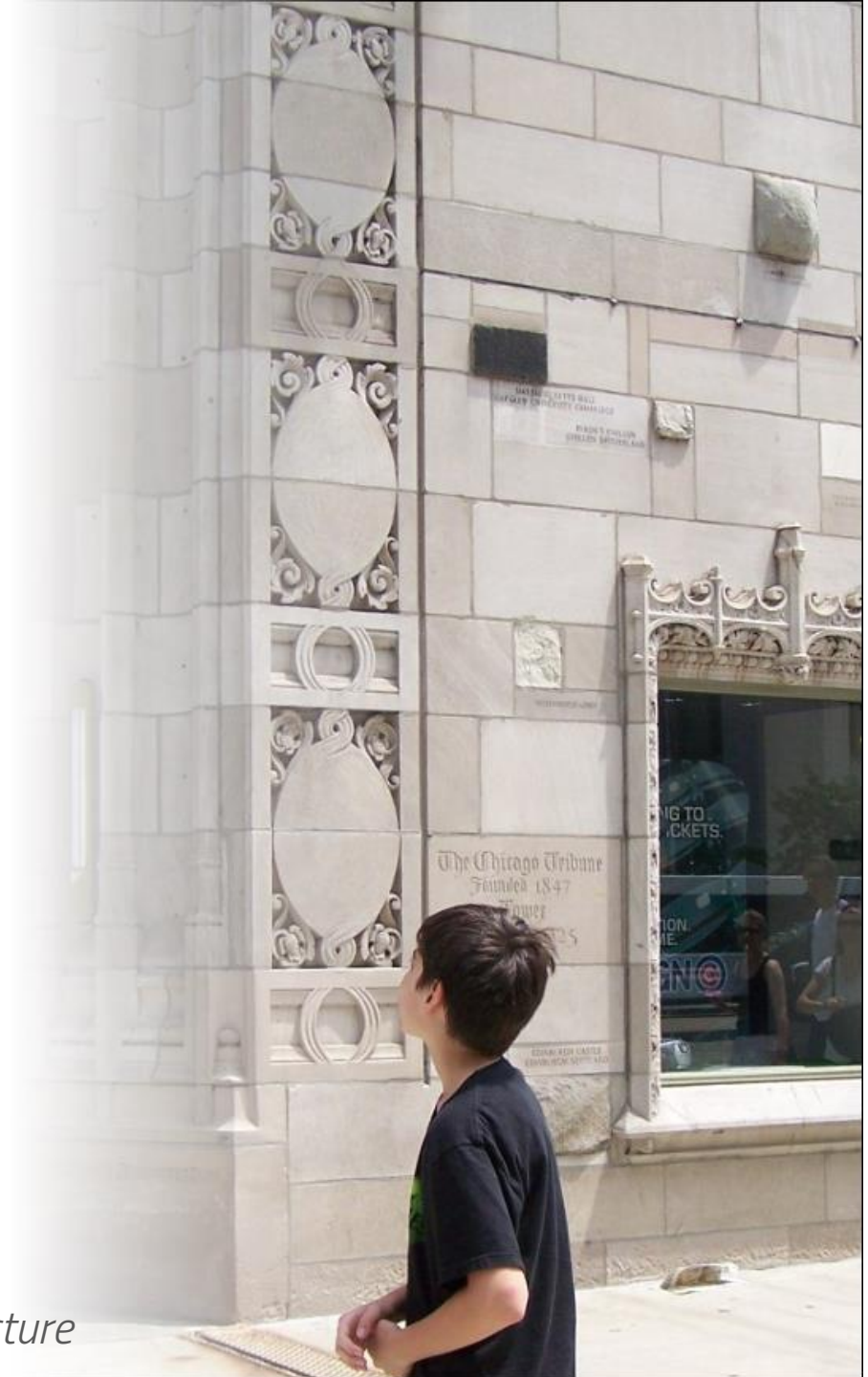
that a time is to come

when those stones will be held sacred
because our hands have touched them;

And that men will say
as they look upon the labour
and wrought substance of them:

"See! This our fathers did for us"

John Ruskin, 1849 *The Seven Lamps of Architecture*



MATERIAL OF MY MASONRY

Scott Conwell FAIA, FCSI, LEED AP
Director of Industry Development
International Masonry Institute

CHICAGO BUILD 2024 EXPO
OCTOBER 22 - 23
McCORMICK PLACE

INTERNATIONAL MASONRY INSTITUTE