

arch 1100 + 1140

professor Montgomery

autumn 2010



SUBJECT

BRICK MASONRY

chapter 8

history+mortar+making bricks+walls

DATE

AUTUMN 2010

PROFESSOR

MONTGOMERY

this week

objective:

understand the properties of brick masonry + the forms and elements of brick masonry construction



- * history of the brick
- * mortar
- * making bricks
- * brick varieties
- * laying brick

- * openings in brick walls
- * reinforcing brick masonry
- * masonry wall construction



- * simple fabrication
- * mud readily available
- * susceptible to deterioration - must be protected by:
 - * stucco or
 - * roof eaves

HISTORY OF BRICK MASONRY

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sun dried brick

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HISTORY OF BRICK MASONRY

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sun dried brick

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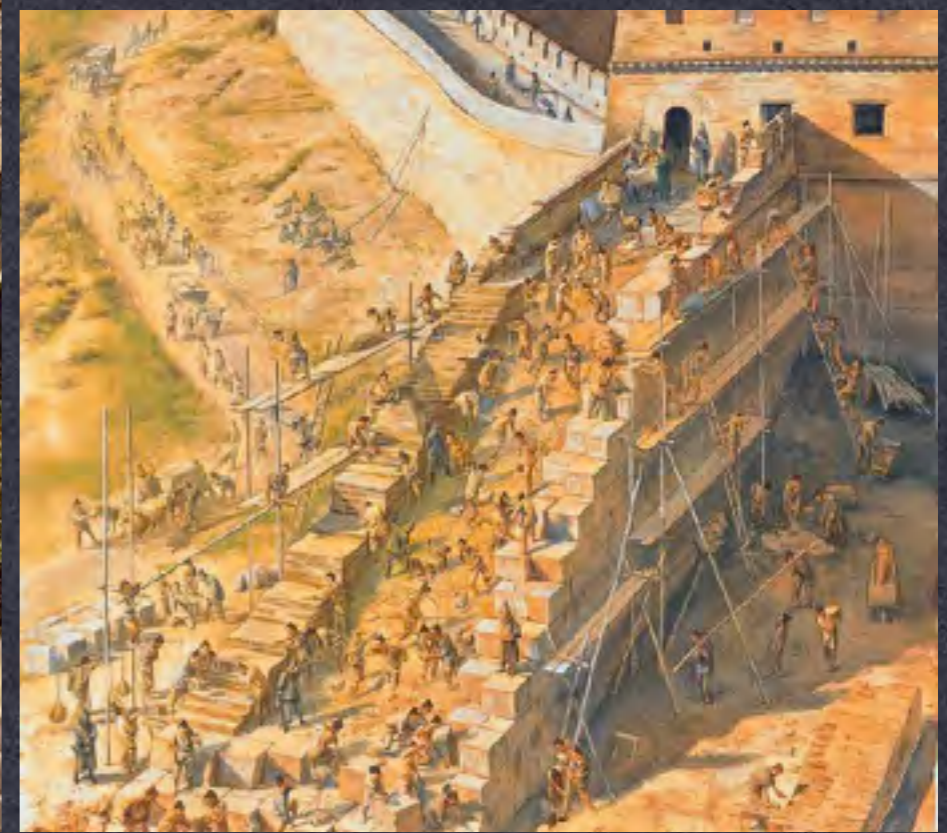
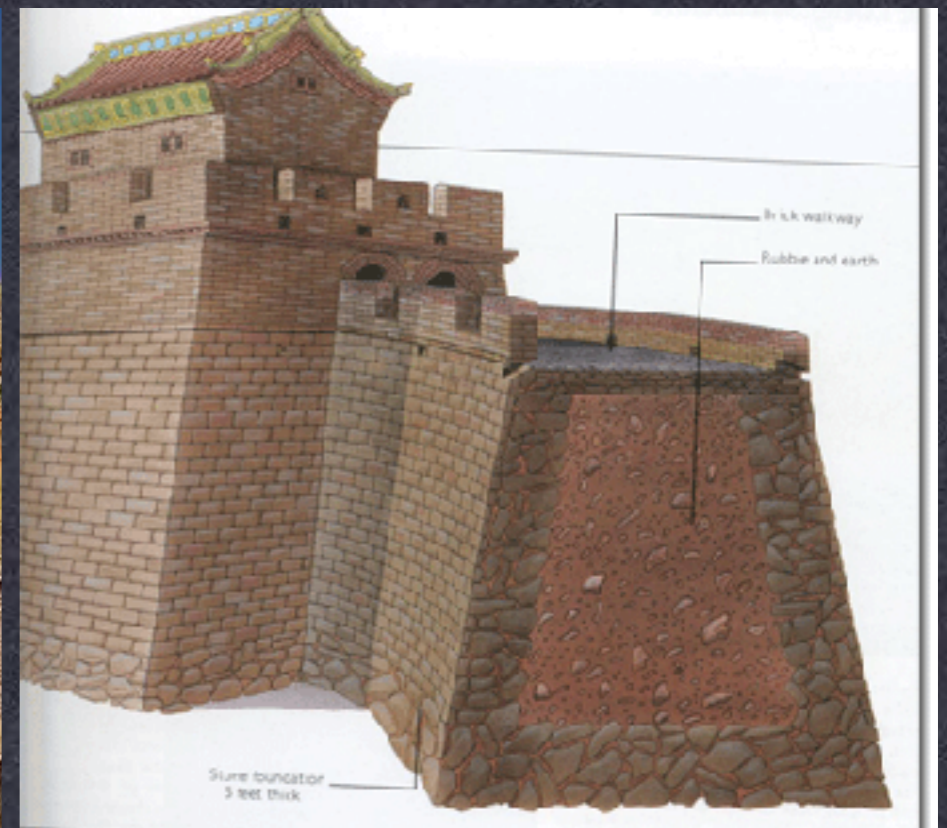
- * sophisticated mortar
- * labour intensive construction
- * maximizing structural potential
- * tectonic invention

HISTORY OF BRICK MASONRY

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fired brick

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HISTORY OF BRICK MASONRY

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massive infrastructure

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HISTORY OF BRICK MASONRY

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large public buildings

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HISTORY OF BRICK MASONRY

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surface and form

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HISTORY OF BRICK MASONRY

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solid and void

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*ELEMENTS:

- *CEMENT
- *HYDRATED LIME
- *SAND
- *WATER

*FUNCTION:

- *CUSHION MASONRY UNITS
- *SEAL GAPS FROM WATER + AIR PENETRATION
- *ADHERES UNITS TO EACH OTHER
- *AESTHETIC OF WALL

MORTAR

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elements and function

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MORTAR

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workability

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Flush



Recessed



Bucket or
trowel handle



Struck or
weathered



'V'



'Y'



MORTAR

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joints

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* clay

* shale

* material is dug, crushed, ground, and screened

* tempered w/ water

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elements

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- * **SOFT MUD PROCESS**
 - * **MOLDED BRICK (BY HAND OR MACHINE)**
 - * **WATER-STRUCK**
 - * **SAND-STRUCK**
- * **DRY PRESS PROCESS**
 - * **MOLDED BRICK**
 - * **HIGH PRESSURE PROCESS**
- * **STIFF MUD PROCESS**
 - * **EXTRUDED AND CUT**

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fabrication

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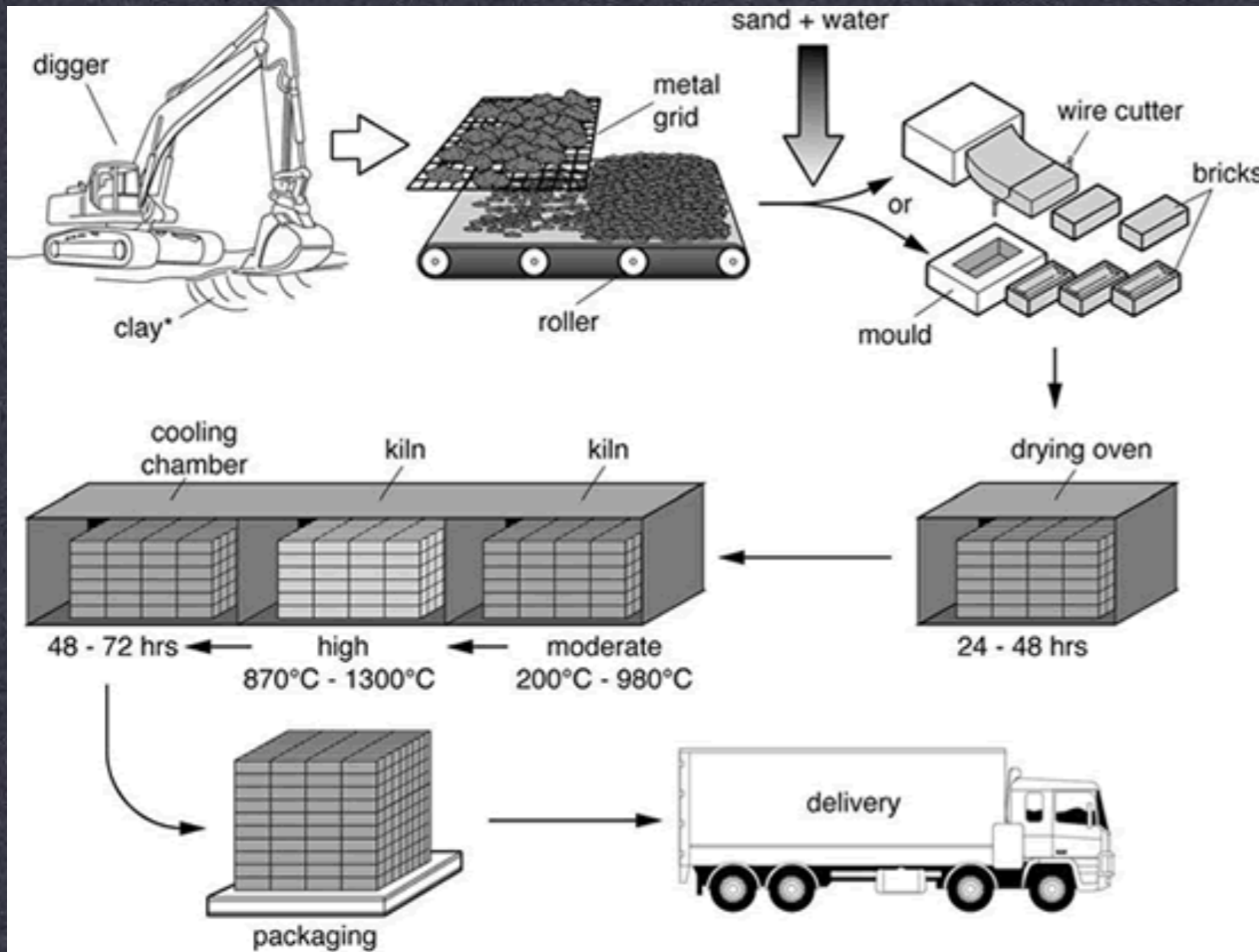
PRE-INDUSTRIAL METHOD OF FABRICATION: HAND MOLDED BRICK

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fabrication

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INDUSTRIAL METHOD: PRESSED AND EXTRUDED WIRE CUT BRICK

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fabrication

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Following Fabrication:

- * Drying Period 1- 2 days
- * Firing 40 - 150 hours
- * Kiln Types: Periodic Kiln (fixed)

Tunnel Kiln (bricks in motion)



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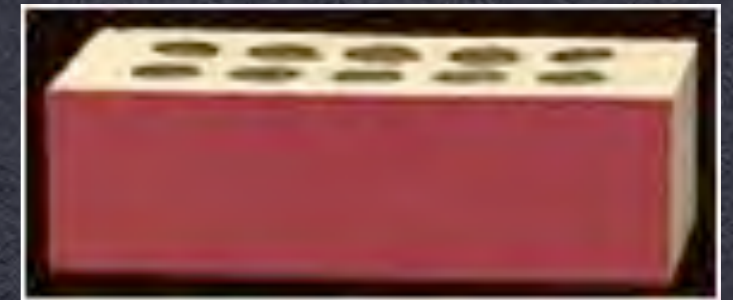
drying and firing bricks

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MOLDED



EXTRUDED



HAND MOLDED



WIRE CUT



GLAZED

MACHINE MOLDED

TUMBLED

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bricks by manufacturing process

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* variations in color can be achieved during firing process

* fired bricks lose more moisture and shrink (comparison of dried and fired bricks above)

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properties

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- * strong in compression
- * fire resistant
- * modular
- * raw materials plentiful
- * durable
- * reusable

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properties

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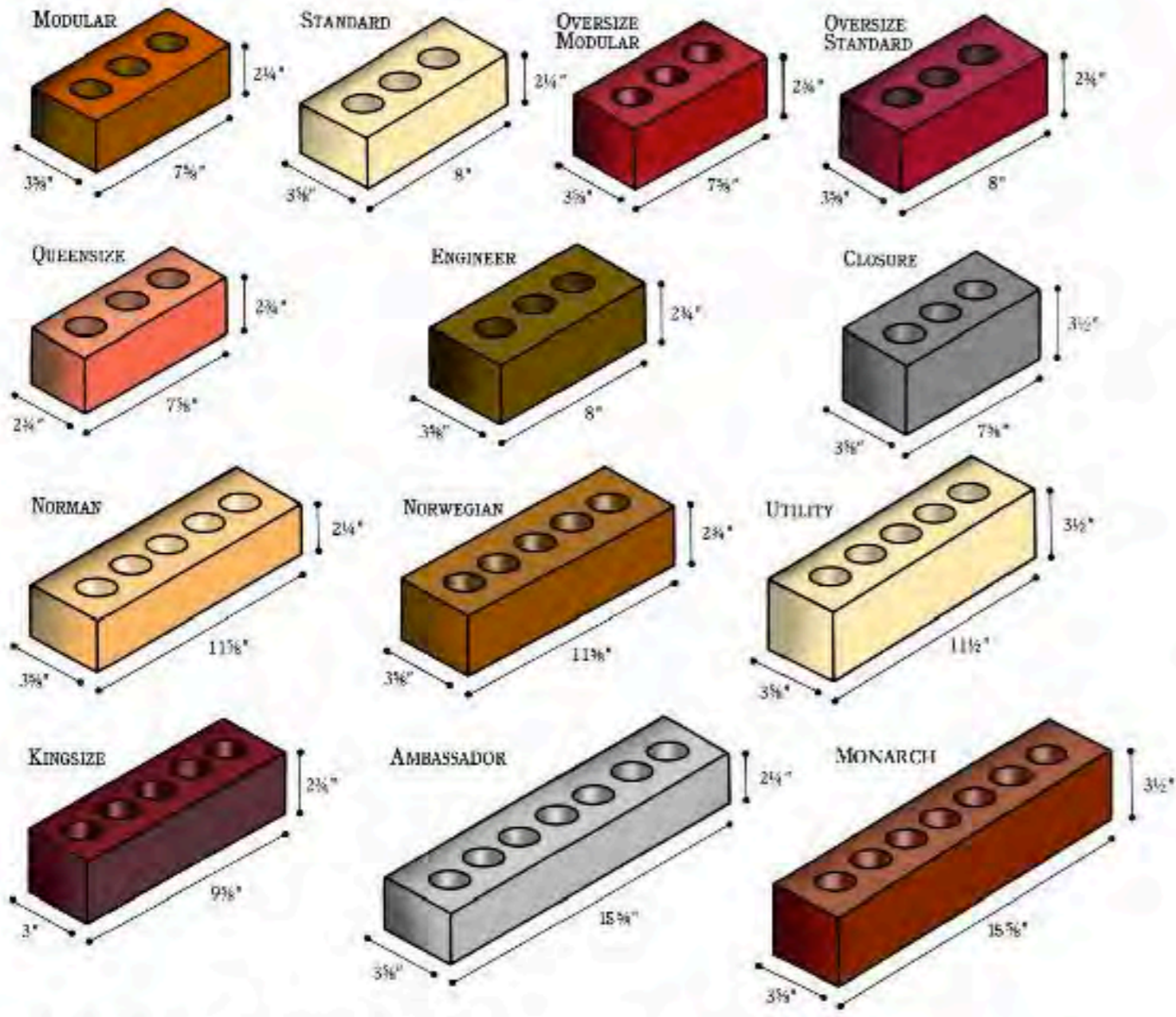
- * small scale
- * flexible
- * easy to manipulate
- * imparts a texture
- * variety of shapes, sizes, colors

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properties

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- * wide variety
- * can customize
- * sizes allow for adjustment of scale “reading” of the wall
- * larger sizes are more efficient

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sizes

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* **FACE BRICK**

* **BUILDING BRICK**

* **SOLID BRICK**

* **CORED BRICK**

* **FROGGED BRICK**

* **HOLLOW BRICK**

* **PAVING BRICK**

* **FIREBRICK**

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brick classifications

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ASTM STANDARDS

* BRICK GRADE

- * SW (exterior)
- * MW (above grade)
- * NW (interior or sheltered)

* COMPRESSIVE STRENGTH:

- * 1500 - 3000 psi
- * 10,000-20,000 psi high strength

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brick grade and strength

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*TYPE FBS

general
purpose

*TYPE FBX

stringent
limits on
appearance
and size
tolerances

*TYPE FBA

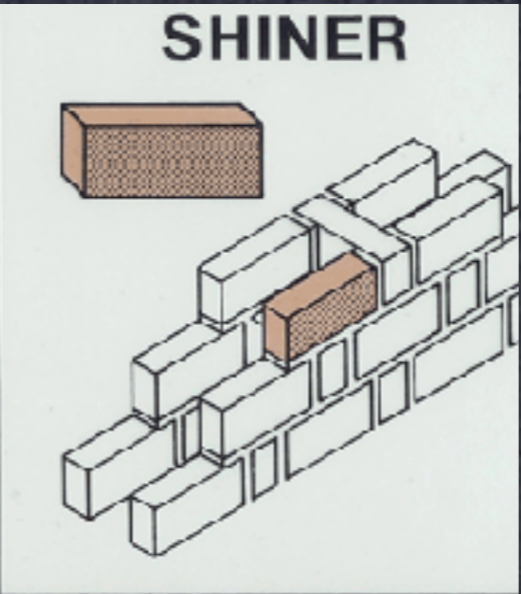
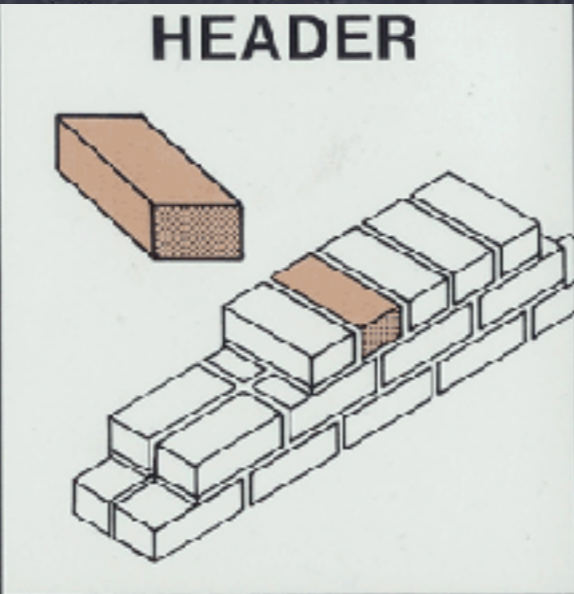
large
variations in
size and
shape

BRICK

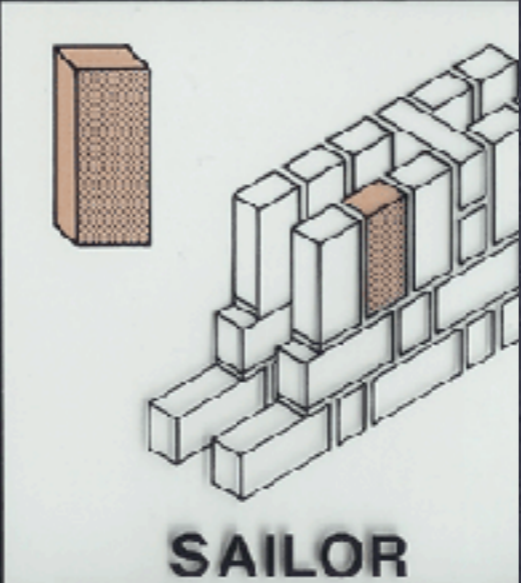
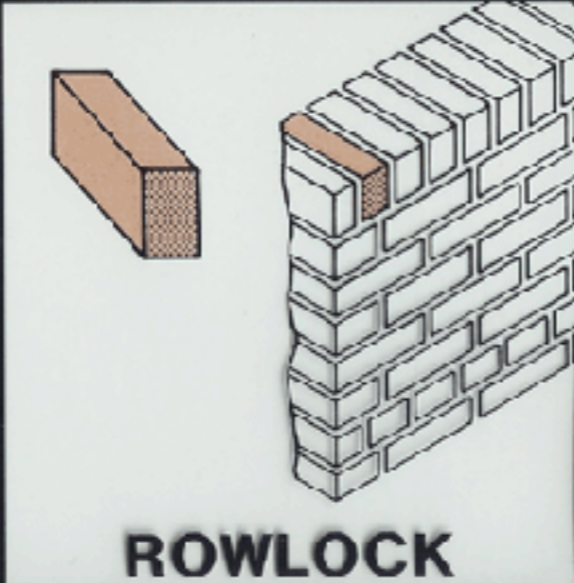
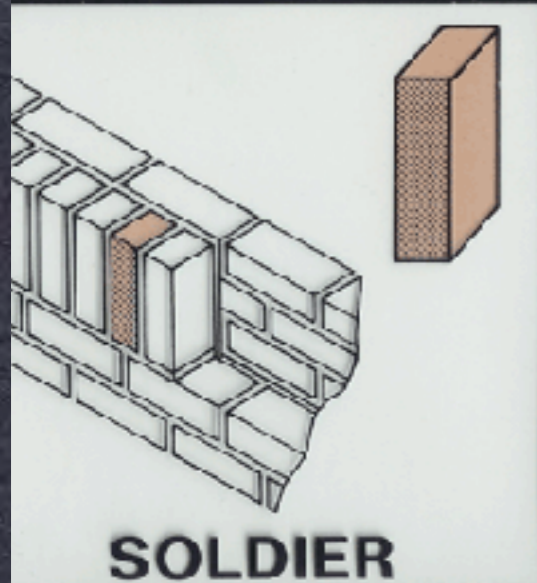
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brick type

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BASIC BRICK POSITIONS



- * the same brick size can be placed in multiple positions within a wall
- * brick position impacts bonding of wall
- * brick position impacts appearance of the wall

BRICK

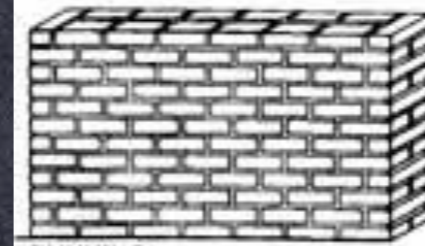
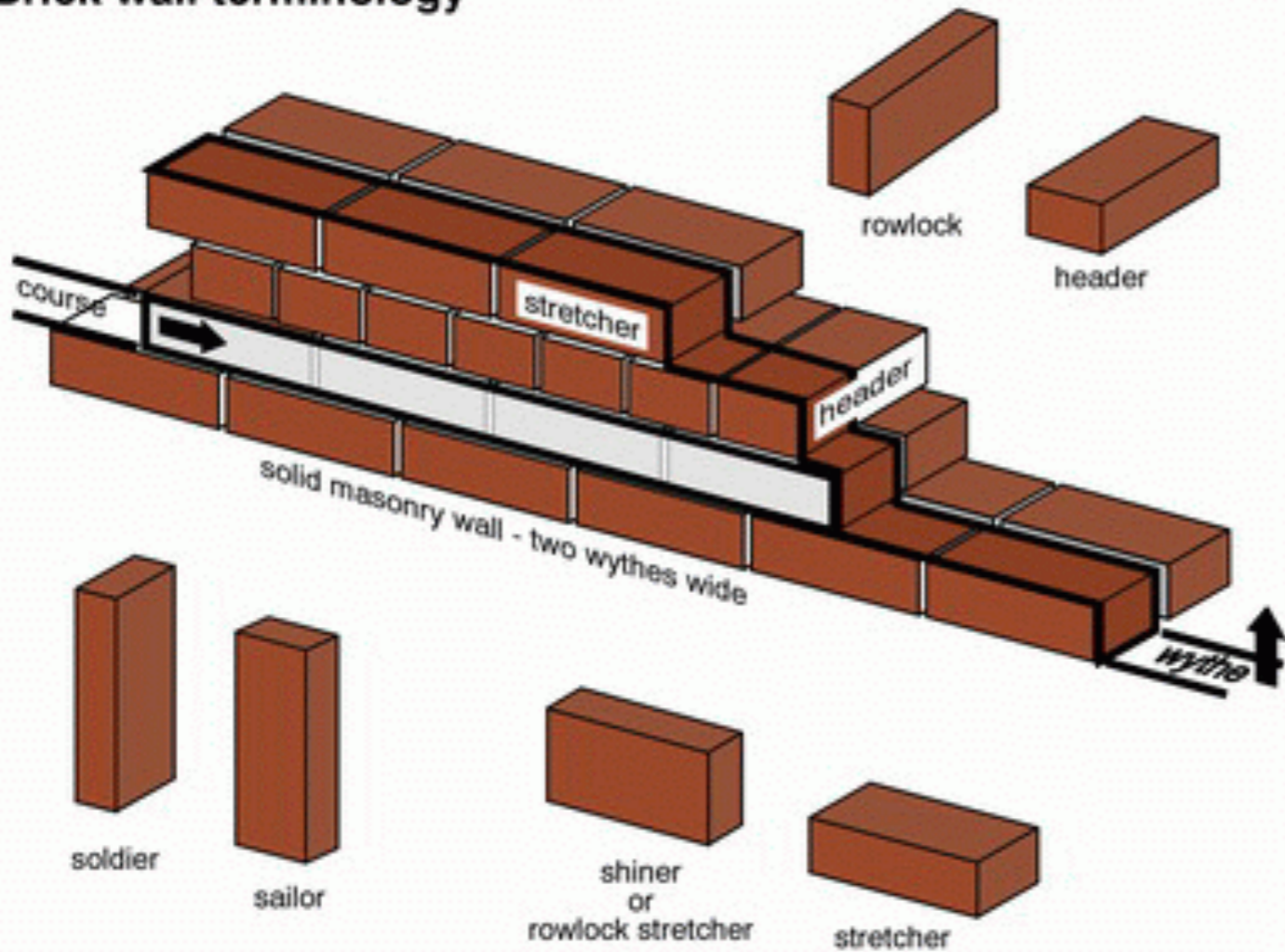
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brick position names

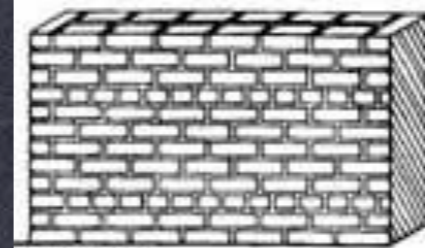
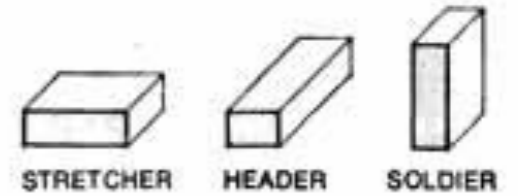
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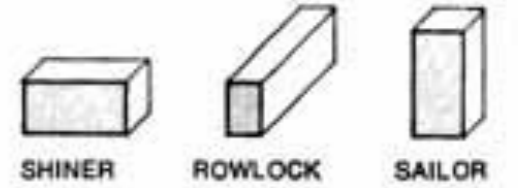
Brick wall terminology



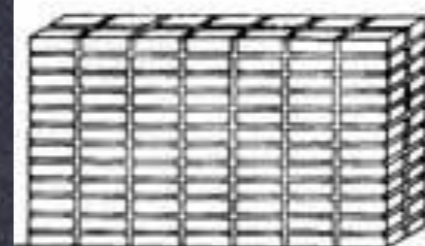
RUNNING



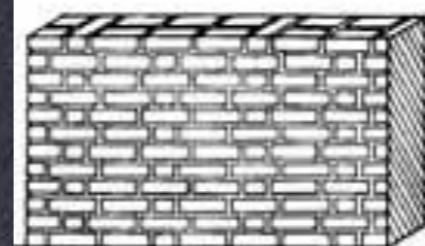
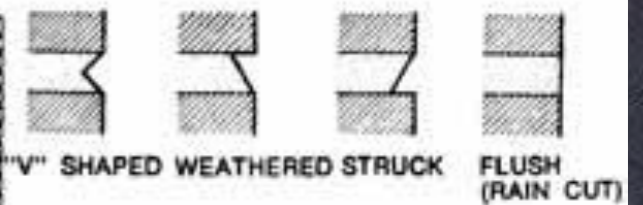
COMMON



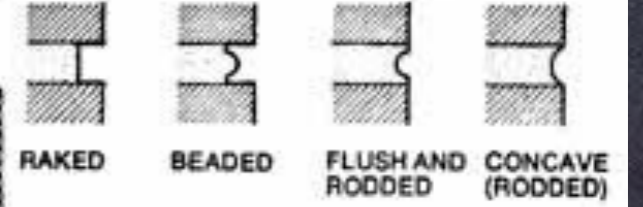
BRICK POSITIONS



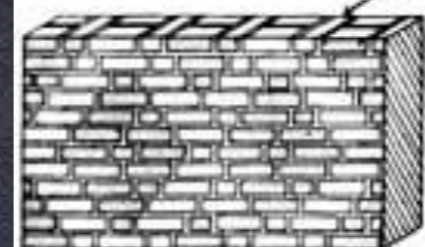
STACKED



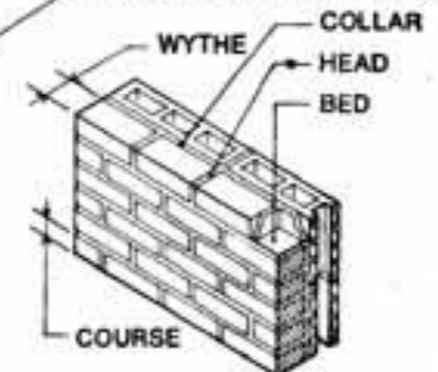
GARDEN WALL



BRICK JOINT TYPES



FLEMISH (DIAGONAL)



BRICK JOINTS AND TERMS

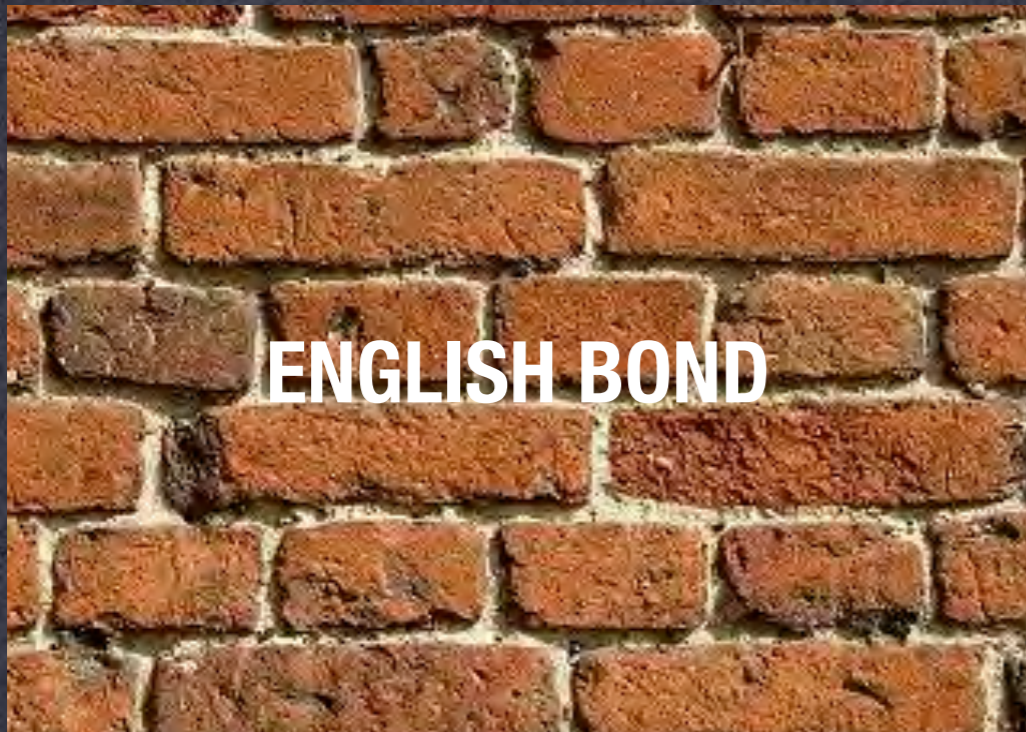
BRICK BONDS

BRICK

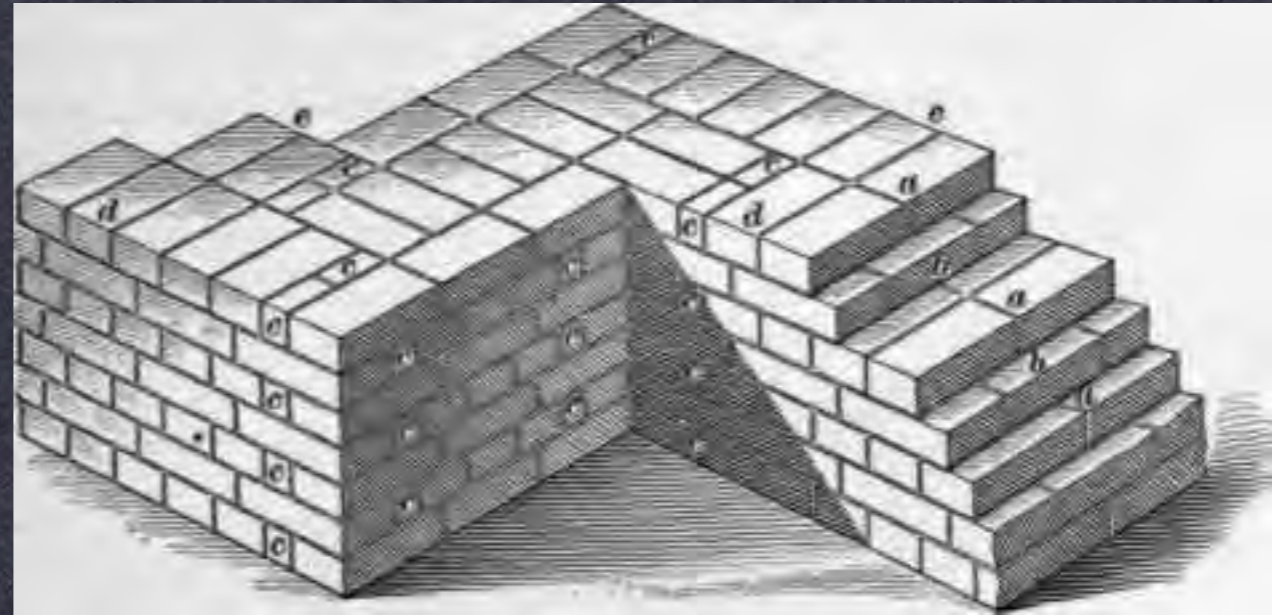
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brick walls

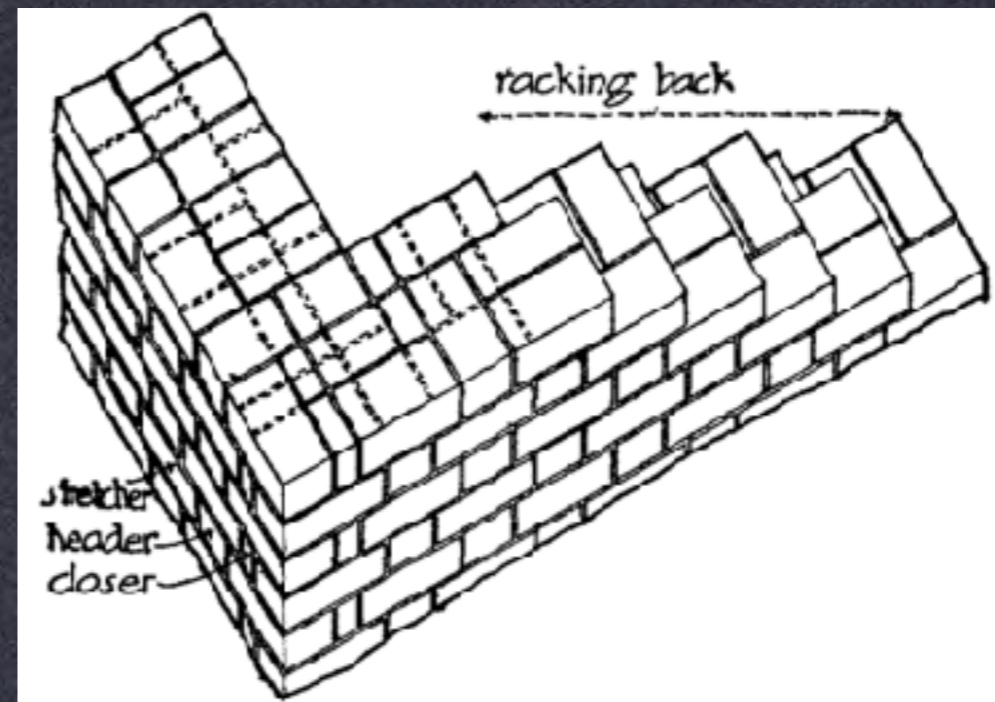
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ENGLISH BOND



FLEMISH BOND



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brick walls bonding patterns

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COMMON BOND



STRETCHER BOND



STACKED BOND



RAKING BOND

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brick walls bonding patterns

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* require a spanning element that can transfer the load of the masonry units + other building elements above the opening

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openings in brick walls

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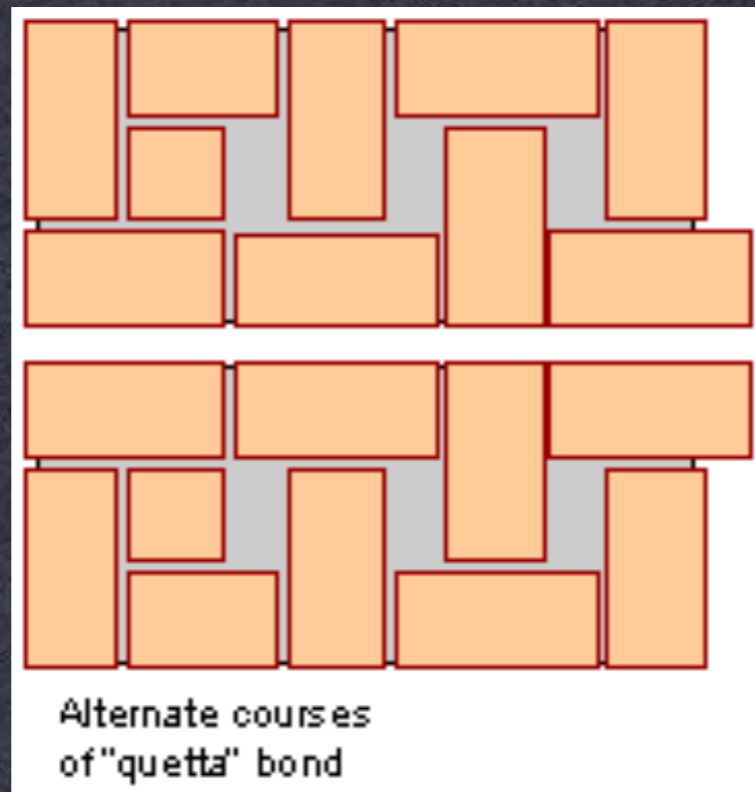
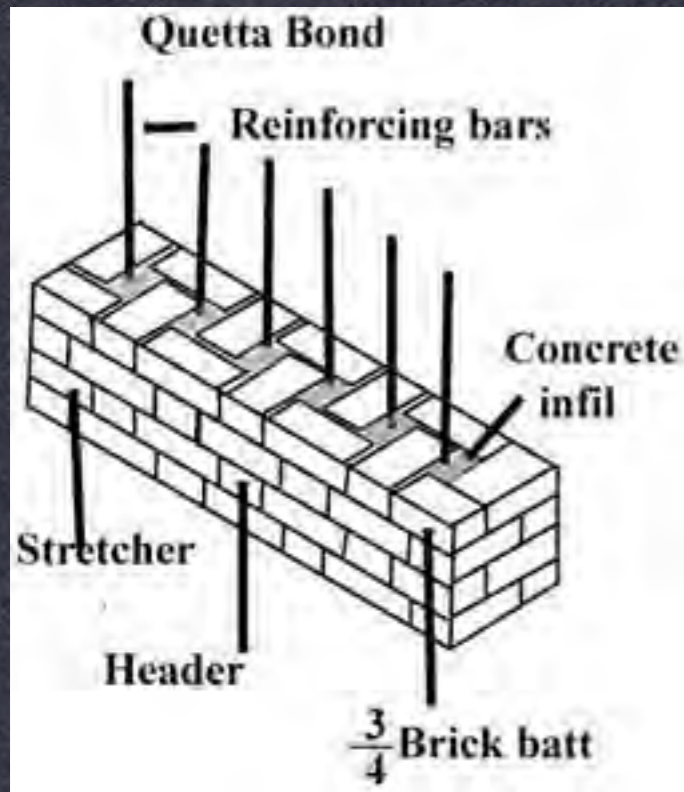
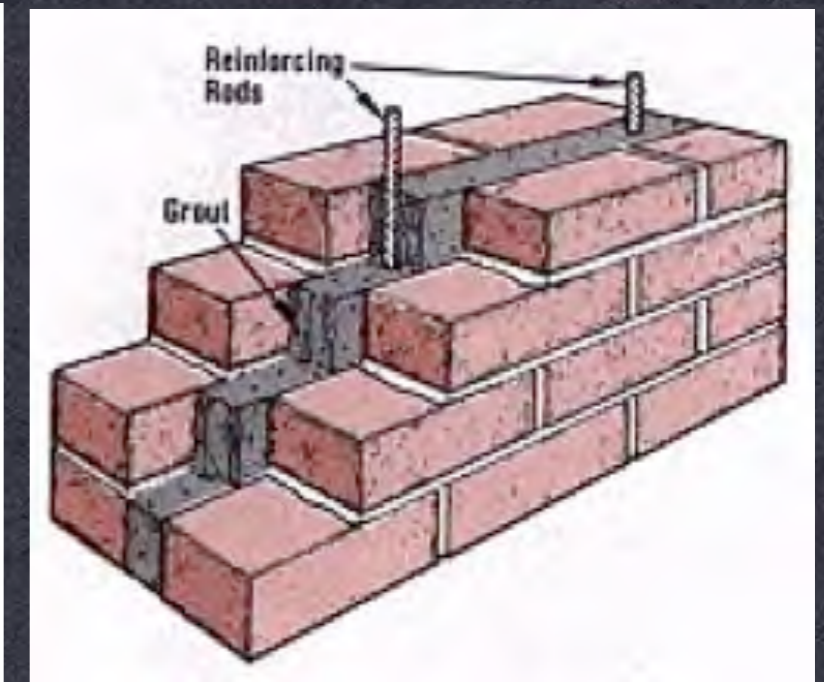
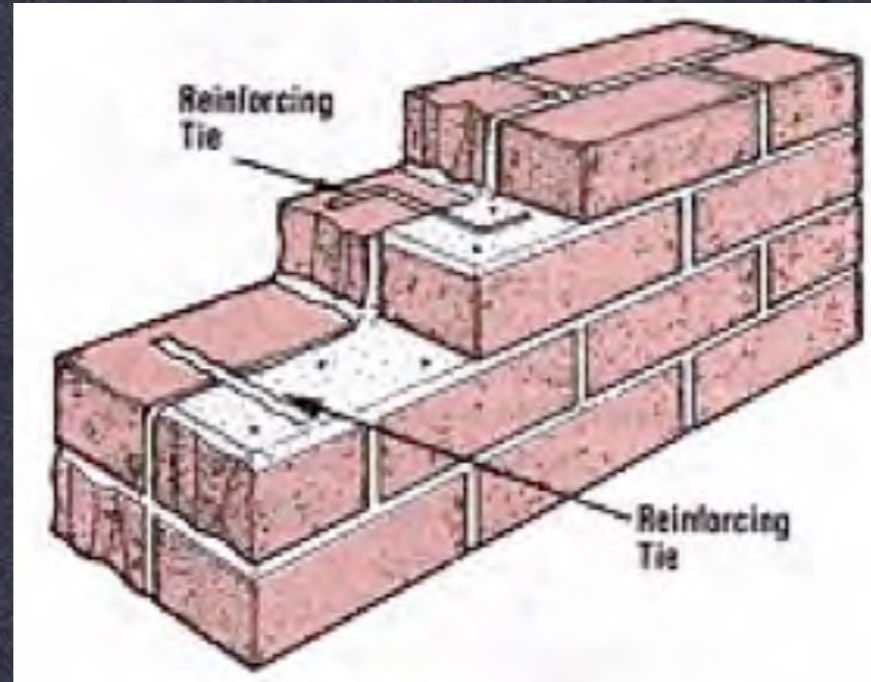
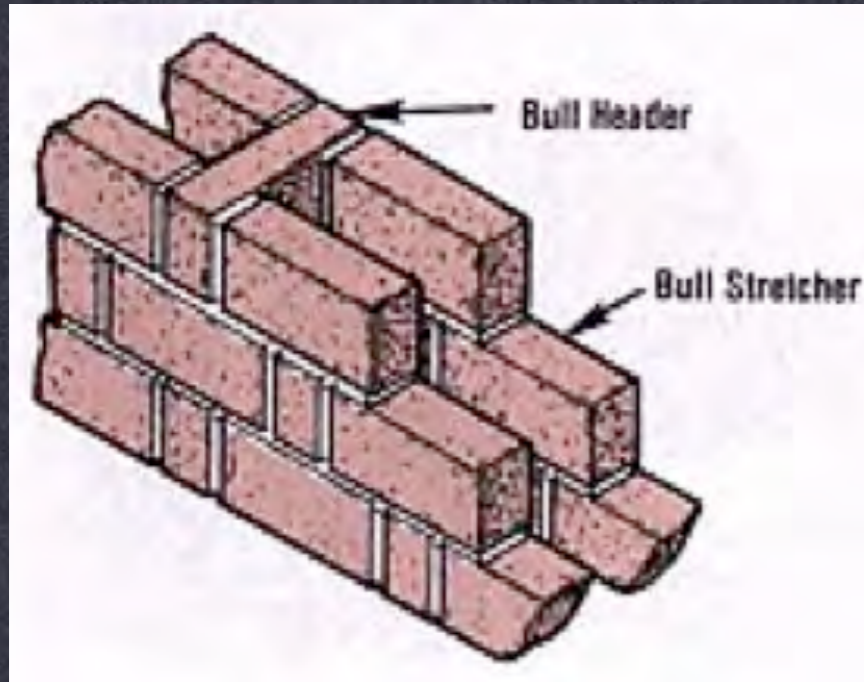


* Louis Kahn's immersion in the tectonics of brick openings

* Mario Botta playfully subverts tectonics of brick openings

openings in brick walls

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* steel reinforcing ties replaces function of header courses in walls 2 wythes thick.

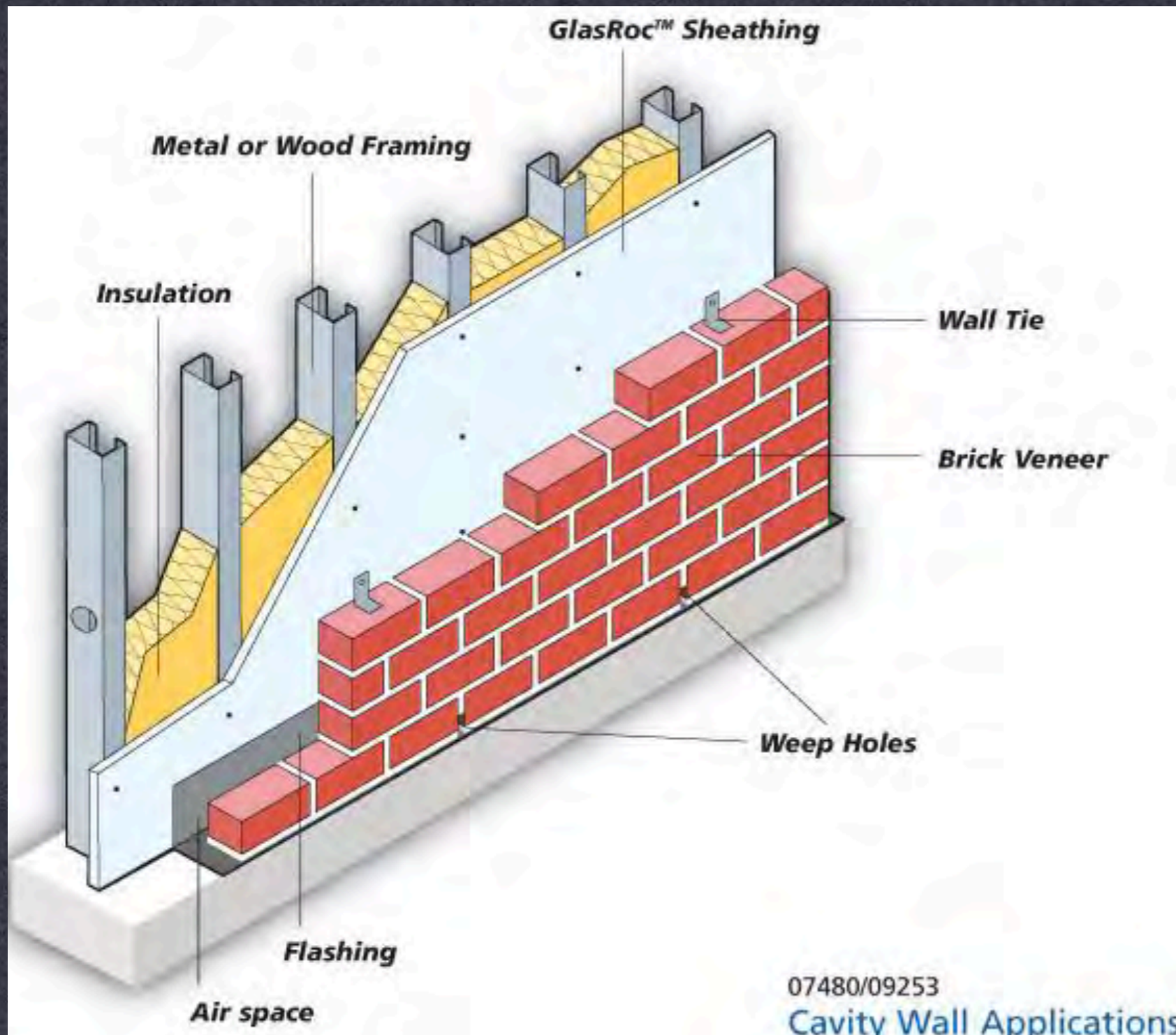
* reinforcing rods provide tensile strength to load bearing masonry walls

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reinforced brick walls

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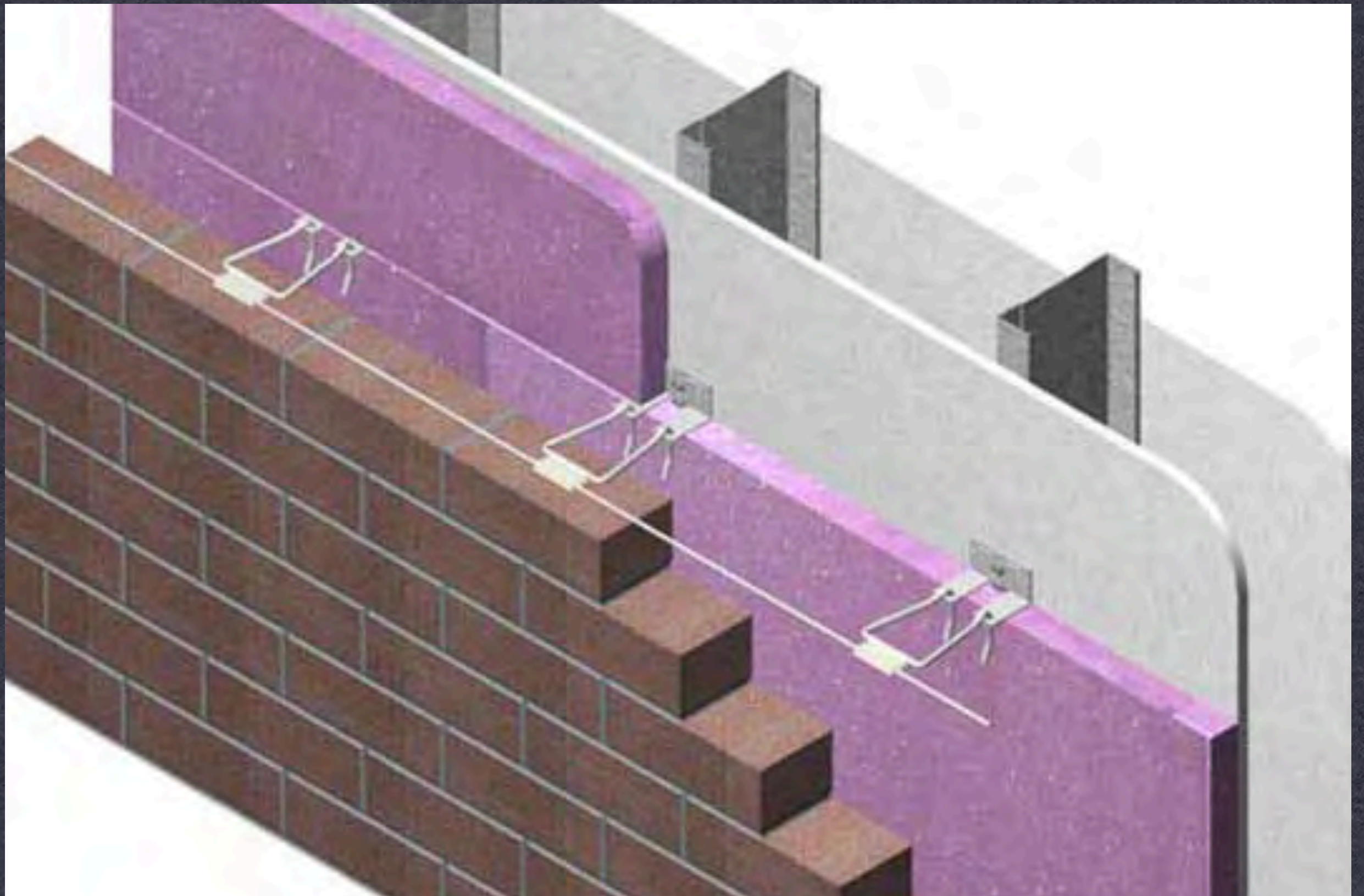
- * composite construction
- * improved thermal and moisture penetration performance (cavity + additional insulation)
- * reduced cost of material and labor
- * improved speed of construction (framed walls installed quickly to enclose building interior)

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cavity wall construction with brick veneer

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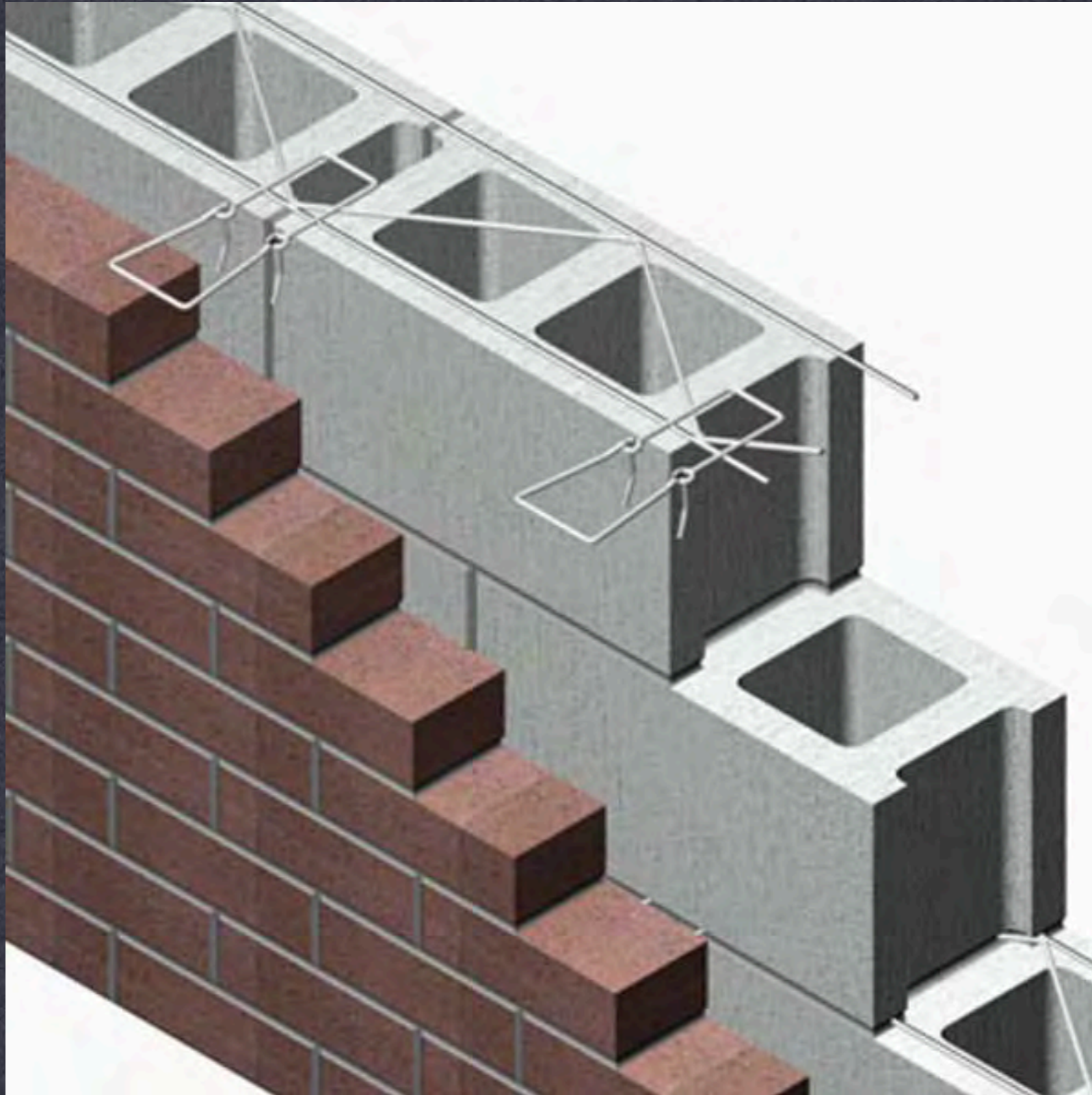


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cavity wall construction with brick veneer

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- * composite construction
- * improved thermal and moisture penetration performance (cavity)
- * durable + structural + fire resistant load bearing wall
- * steel reinforcing ties bond together the brick veneer and cmu backup (providing improved lateral tensile strength)

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cavity wall construction with cmu backup

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wrap up

- * strength
- * warmth
- * scale
- * modular
- * longevity
- * adaptable
- * protective
- * inherent beauty

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