MASONRY
stone and brick masonry
this week

**objective:**
to review the types and properties of stone and concrete masonry units

- **stone:**
  - types of building stone
  - quarrying stone
  - milling stone
  - stone patterns

- **brick:**
  - history of the brick
  - mortar
  - making bricks
  - brick varieties
  - laying brick
  - openings in brick walls

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GEOLOGY AND STONE TYPES

3 types of stone

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IGNEOUS ROCK

SEDIMENTARY ROCK

METAMORPHIC ROCK
BUILDING STONE CLASSIFICATION

6 stone groups

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FIELD STONE
stone harvested from the surface
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QUARRIED STONE
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stone excavated
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QUARRYING STONE
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ancient techniques
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STONE MASONRY
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traditional fabrication

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STONE MASONRY
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modern fabrication
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STONE MASONRY PATTERNS

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STONE MASONRY PATTERNS

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random ashlar stone

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STONE MASONRY WALLS

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coursing + joints

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STONE MASONRY CONSTRUCTION

STRONG IN COMPRESSION

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properties

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STONE MASONRY CONSTRUCTION

CAN WORK IN TENSION TO A LIMIT

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properties

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STONE MASONRY STRUCTURES
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plastic potential
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STONE MASONRY STRUCTURES

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plastic potential

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STONE MASONRY STRUCTURES

making monuments

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STONE MASONRY STRUCTURES
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making monuments
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BRICK MASONRY

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texture and form

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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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HISTORY OF BRICK MASONRY

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

fired brick

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HISTORY OF BRICK MASONRY
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mass production
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HISTORY OF BRICK MASONRY
ancient and modern forms
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MORTAR:
- 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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workability
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MORTAR joints
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clay
shale
material is dug, crushed, ground, and screened
tempered w/ water
BRICK

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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
PRE-INDUSTRIAL METHOD OF FABRICATION: HAND MOLDED BRICK
INDUSTRIAL METHOD: PRESSED AND EXTRUDED WIRE CUT BRICK
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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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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Strictly in compression

No tensile strength

✴ fire resistant
✴ modular
✴ raw materials plentiful
✴ durable
✴ reusable
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- small scale
- flexible
- easy to manipulate
- imparts a texture
- variety of shapes, sizes, colors
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✴ wide variety
✴ can customize
✴ sizes allow for adjustment of scale “reading” of the wall
✴ larger sizes are more efficient
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

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

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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 wall terminology

- Rowlock
- Header
- Stretcher
- Soldier
- Shiner
- Rowlock stretcher
- Shiner or rowlock stretcher
- Stretch

Brick positions

- Running
- Common
- Stacked
- V" shaped weathered struck
- Flush (rain cut)
- Raked
- Beaded
- Flush and rodded
- Concave (rodded)

Brick joint types

- Garden wall
- Flemish (diagonal)
- Flemish (parallel)
- Brick bonds
- Brick joints and terms

Brick walls

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ENGLISH BOND

FLEMISH BOND

brick walls bonding patterns
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Common Bond

Stacked Bond

Stretcher Bond

Raking Bond

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brick walls bonding patterns

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COMMON COURSING EQUATION: 3 BRICKS + 3 JOINTS = 8”
Openings: require a spanning element that can safely 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
wrap up

• connects us to our history, to the ancients
• is applicable to a wide variety of uses in buildings
• plastic property facilitates sculptural expression
• flexible: from massive bearing walls to thin cladding material
• durability imparts sense of permanence
• weathering can actually enhance the beauty of the material

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wrap up

- strength as a building element
- color and warmth of the material
- provides a human scale to buildings
- modularity offers geometric patterns and dimensional control
- longevity and durability of material is significant advantage
- adaptable to a variety of applications
- protective, fireproof material
- inherent beauty enhanced by age and weathering

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