

The Adobe logo, consisting of the word "adobe" in a lowercase, bold, sans-serif font. The letters are a golden-yellow color with a subtle drop shadow, giving it a three-dimensional appearance. It is positioned at the top center of the slide.

adobe

The Material
Its Deterioration
Its Coatings

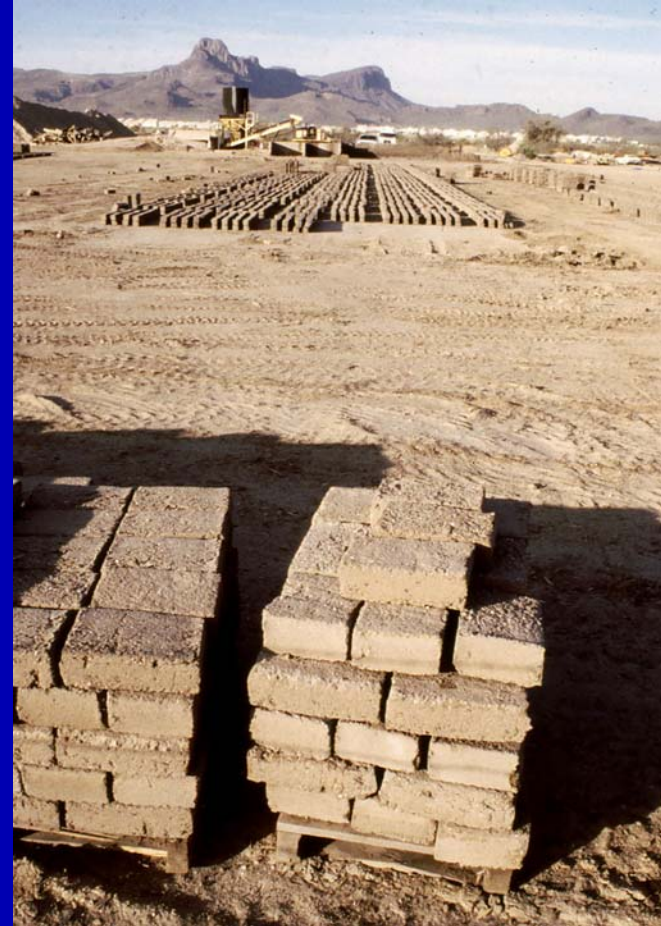
James Garrison

adobe: The Material

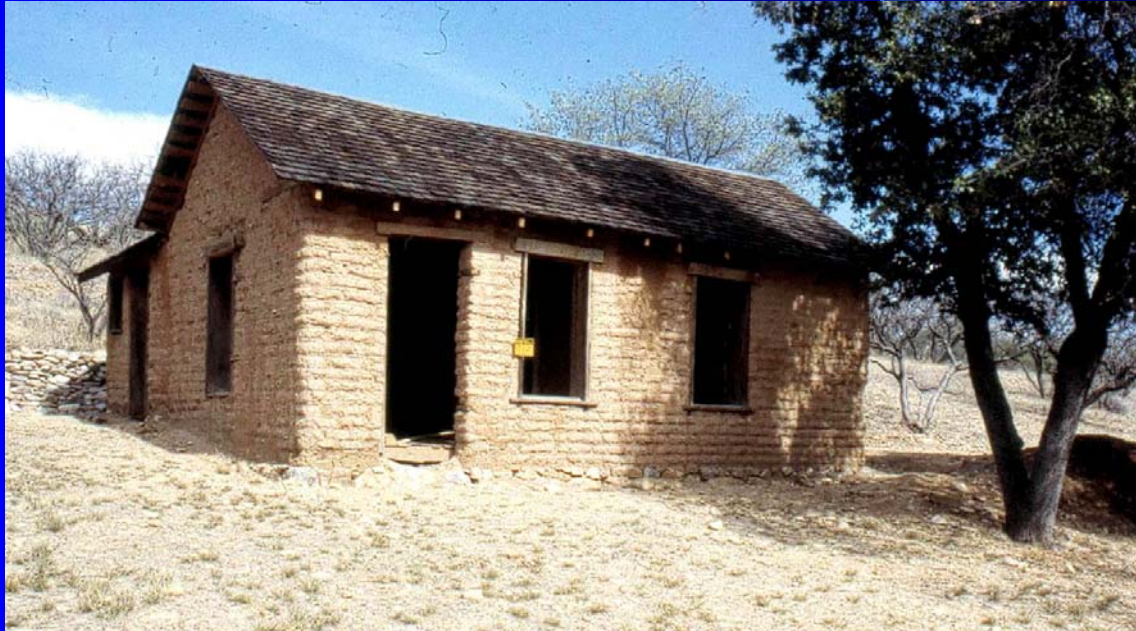
- A-do-be, n. 1: a brick or building material of sun-dried earth and straw 2: a heavy clay used in making adobe bricks 3: a structure made of adobe bricks.



adobe: The Material



adobe: The Material

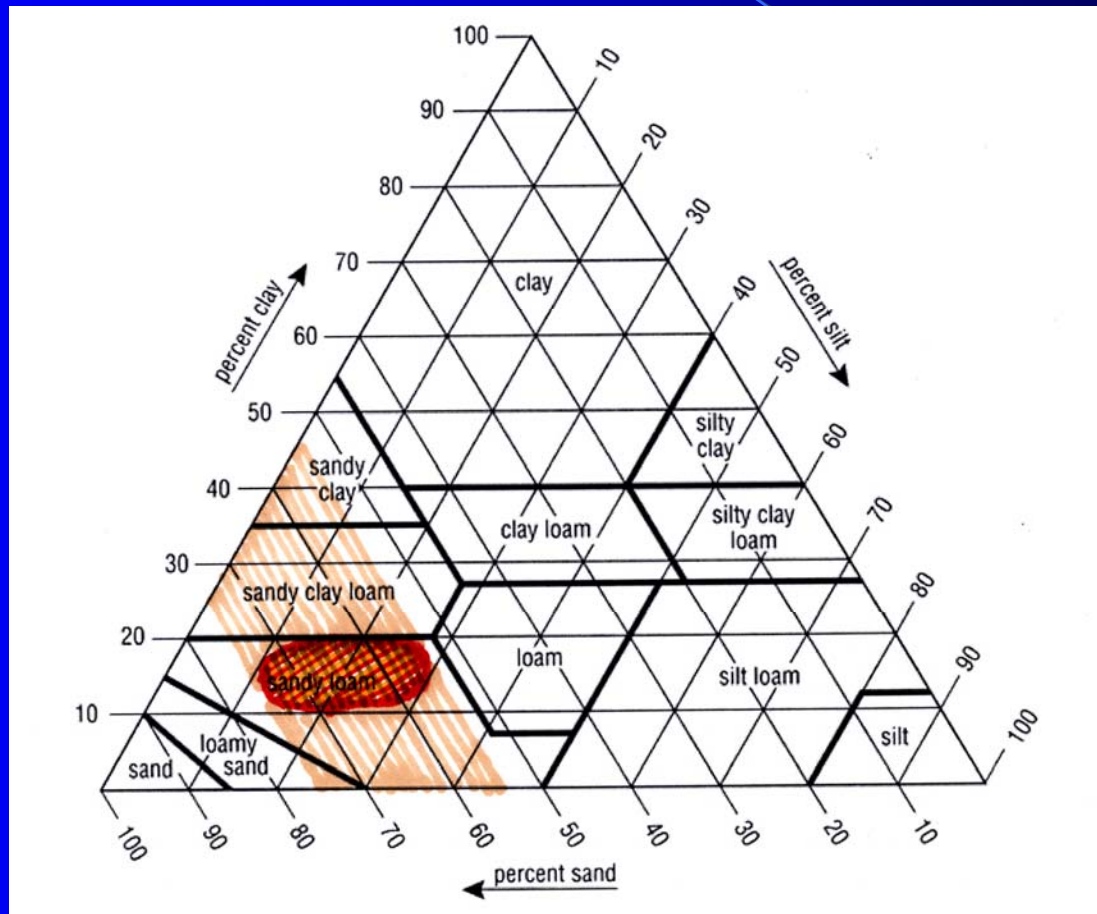


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CLAY 15%
SILT 10-30%
SAND 55-75%

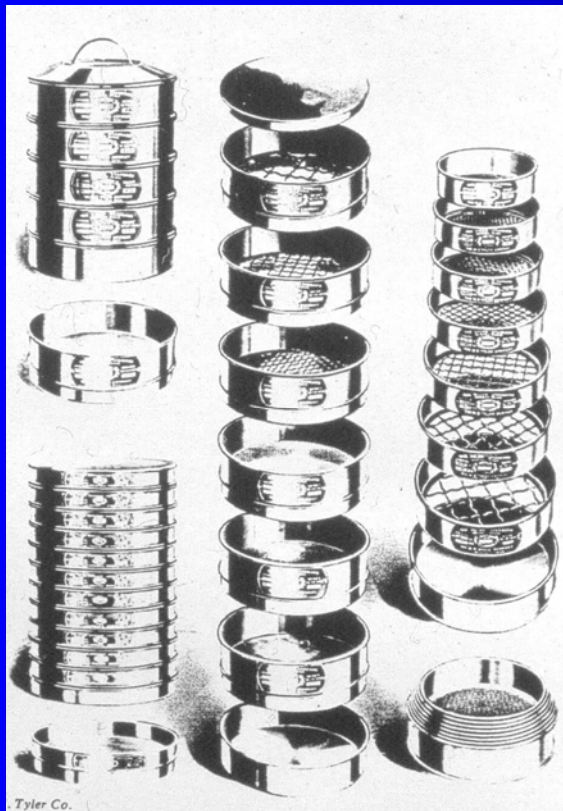


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USDA Textural Classification Chart

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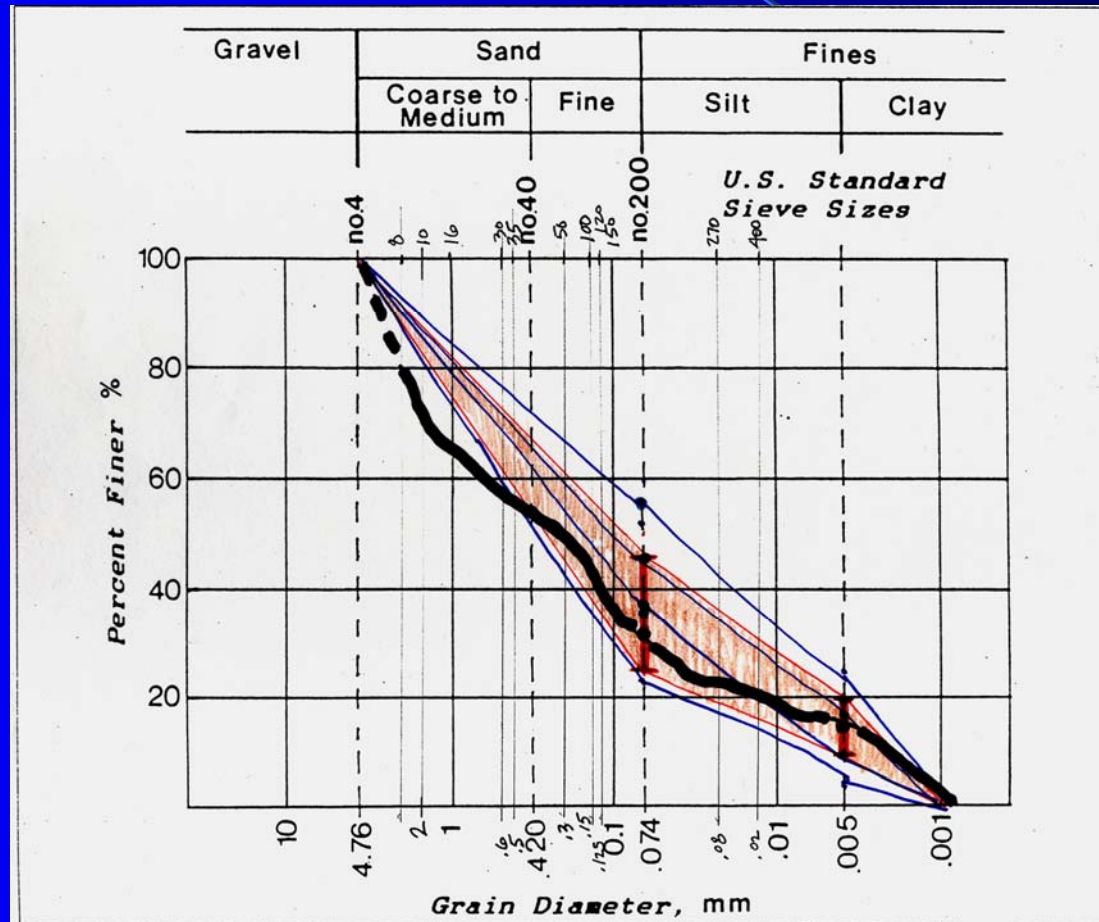


Sieve Analysis - Grain Size Distribution

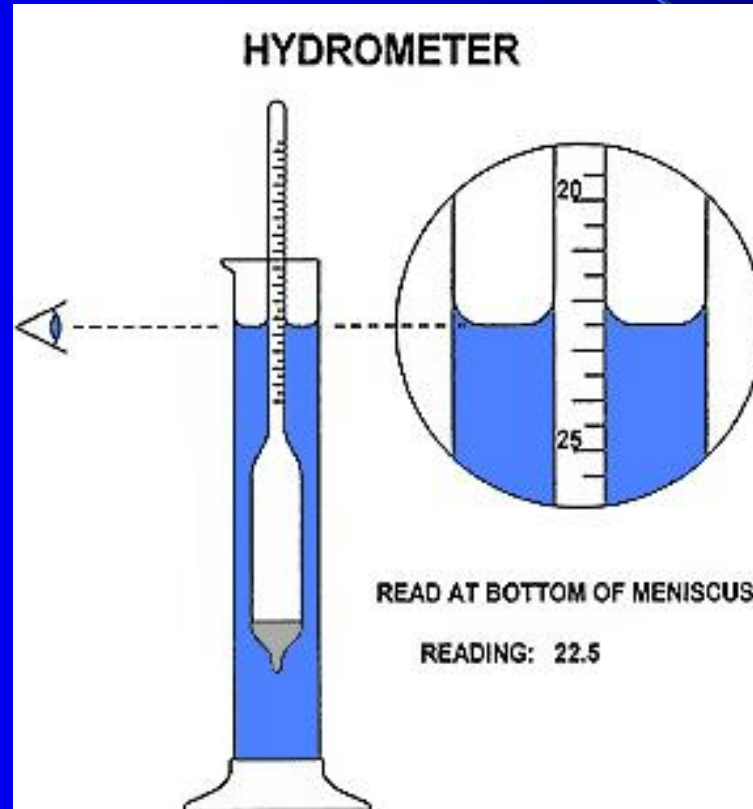
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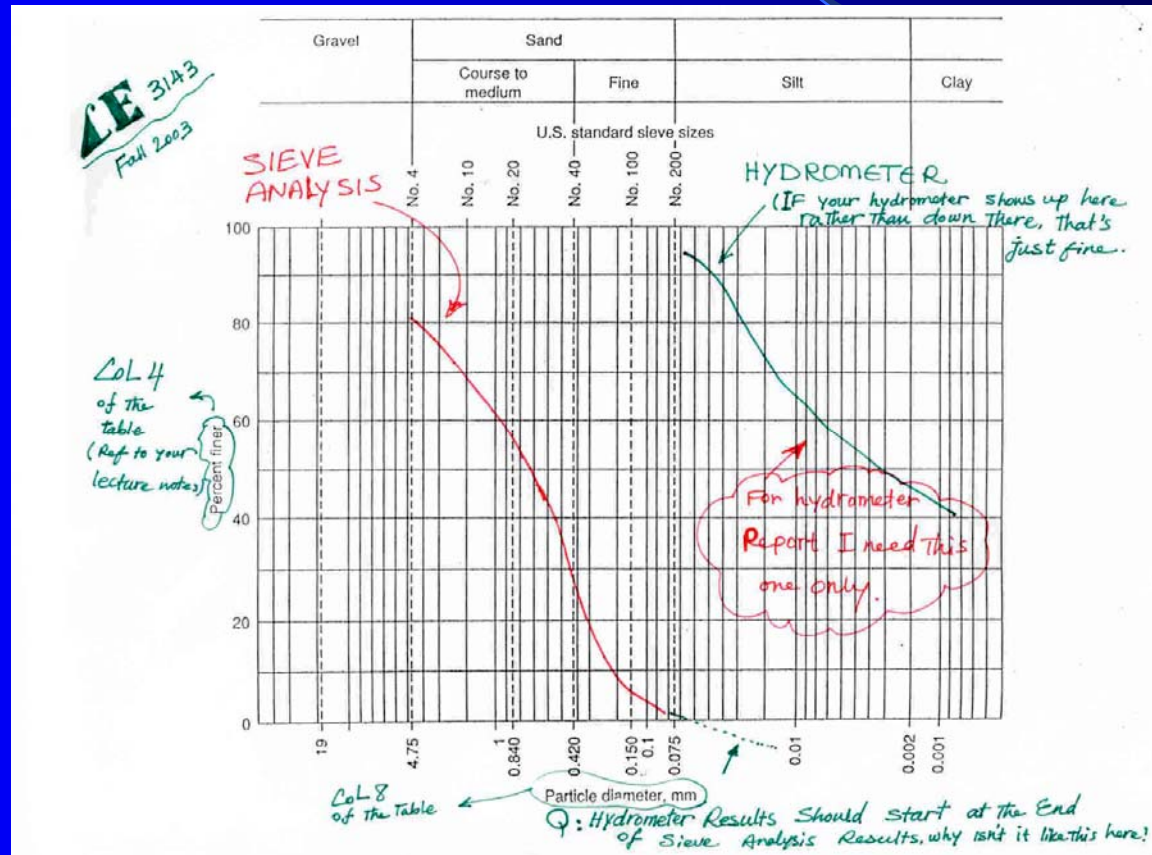
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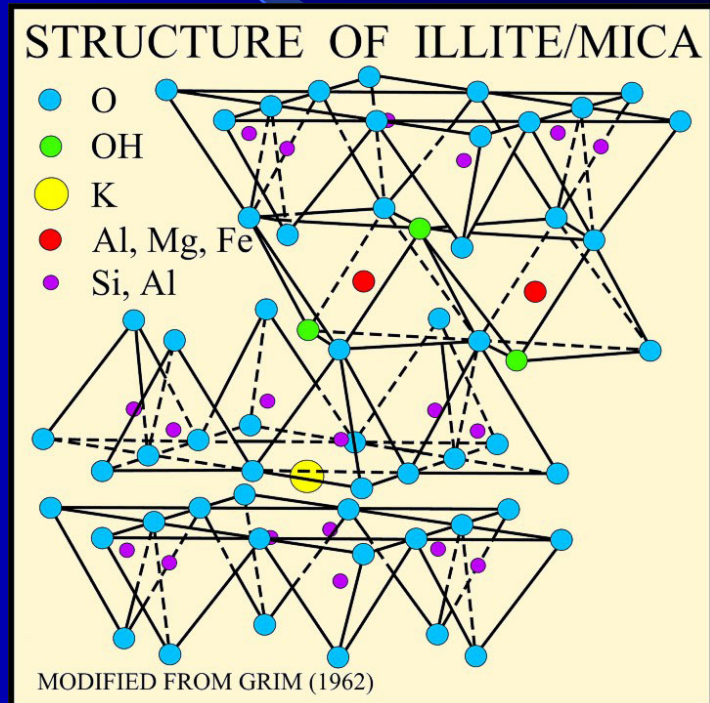
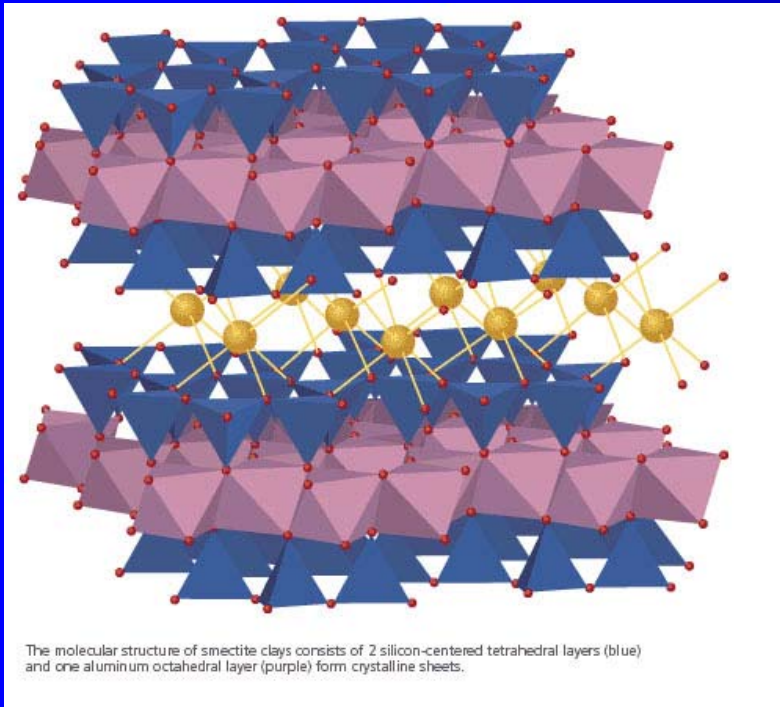
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- Clay Minerals: Hydrous Aluminium Phyllosilicates
Weathering of Feldspar
- Kaolin Group
- Smectite Group
- Illite Group
- Chlorite Group

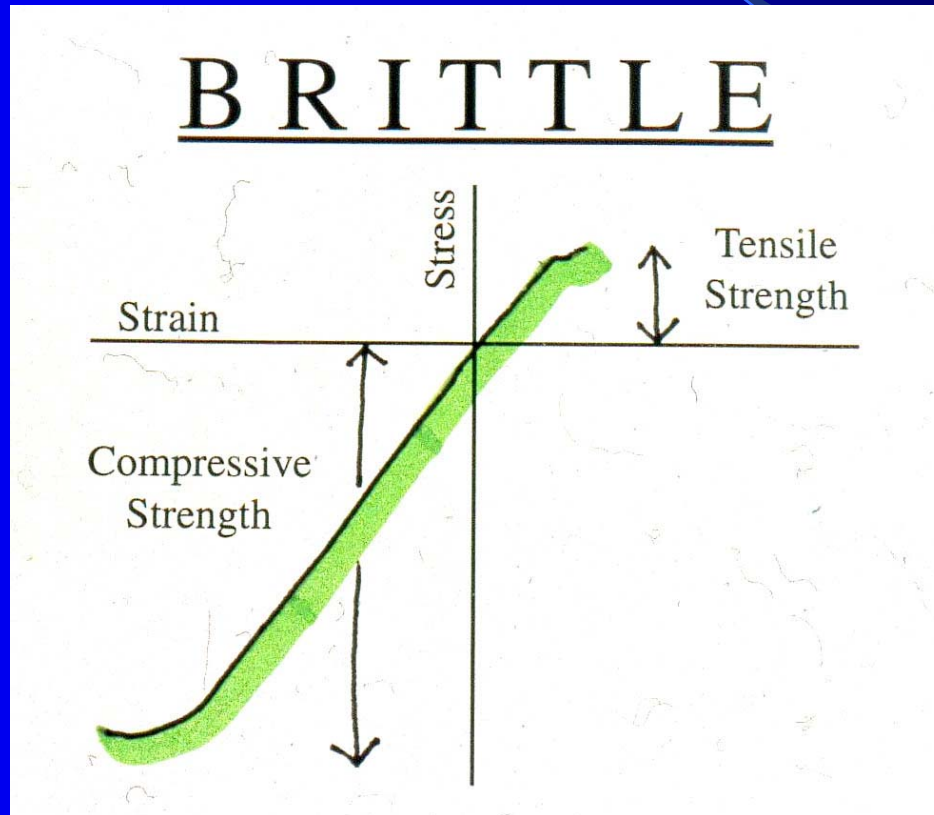
adobe: The Material



adobe: The Material

- Characteristics of Masonry Materials, Stone, Brick, Block, Adobe
 - Brittle
 - low tensile strength
 - high compressive strength

adobe: The Material



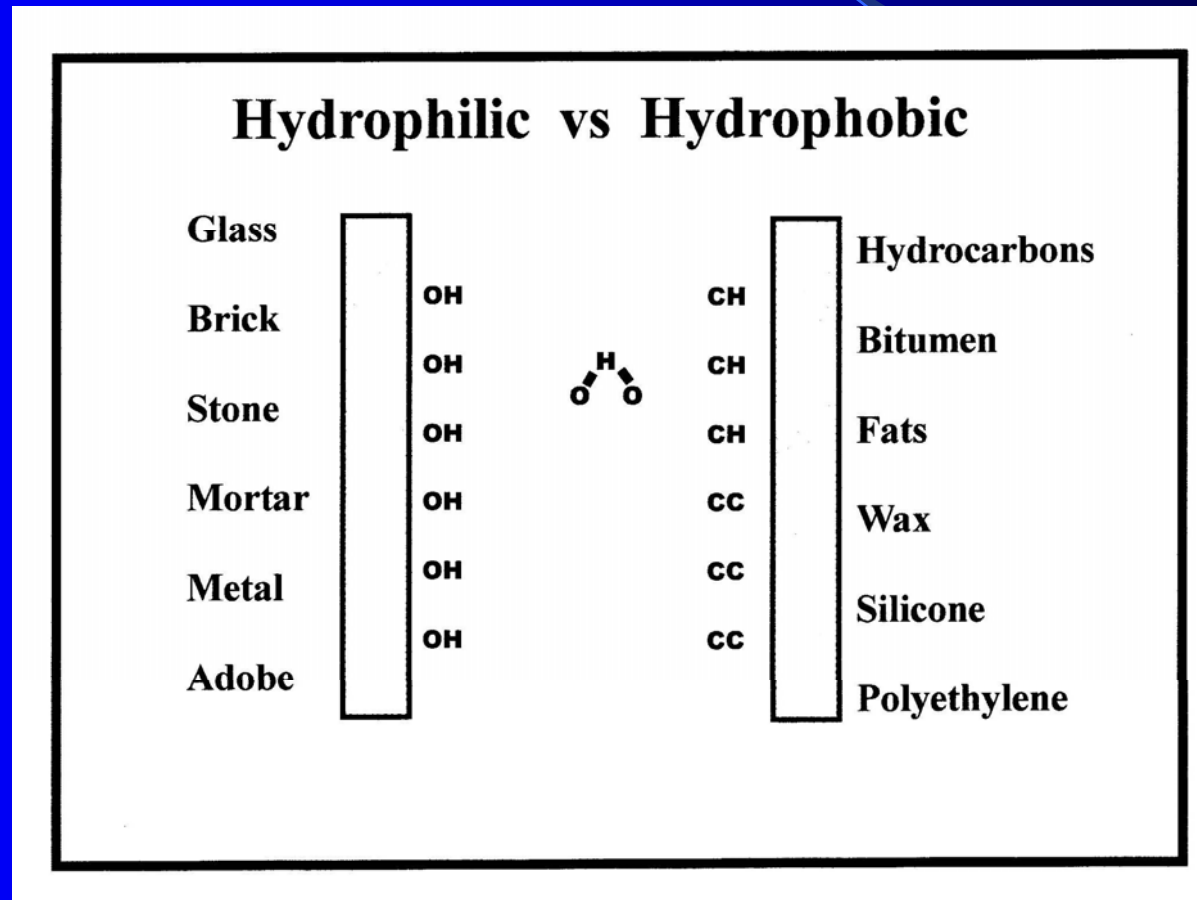
Material Properties

	ADOBE	SANDSTONE	CONCRETE	STEEL
Density (#cf)	95	147	150	
Compressive Strength (psi)	50-300	120-1800	625-2500+	
Resistance	.23	.08	.08	
Coefficient of Thermal Expansion	3.0×10^{-6}	4.4	6.5	6.7

adobe: The Material

- Characteristics of Masonry Materials, Stone, Brick, Block, Adobe
 - Brittle
 - low tensile strength
 - high compressive strength
 - Hydrophilic
 - Water Loving

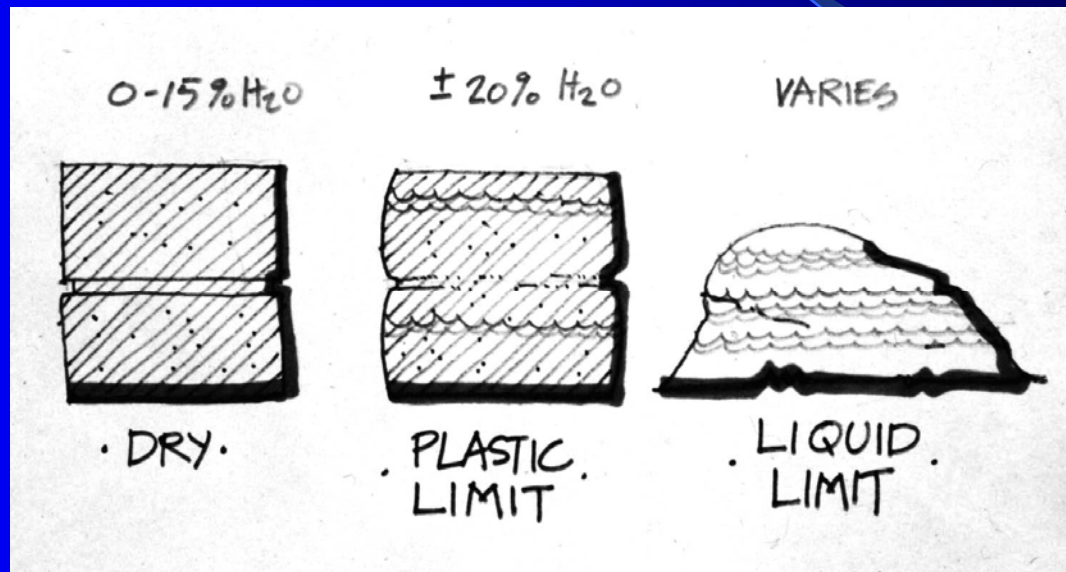
Hydrophilic vs Hydrophobic



adobe: The Material

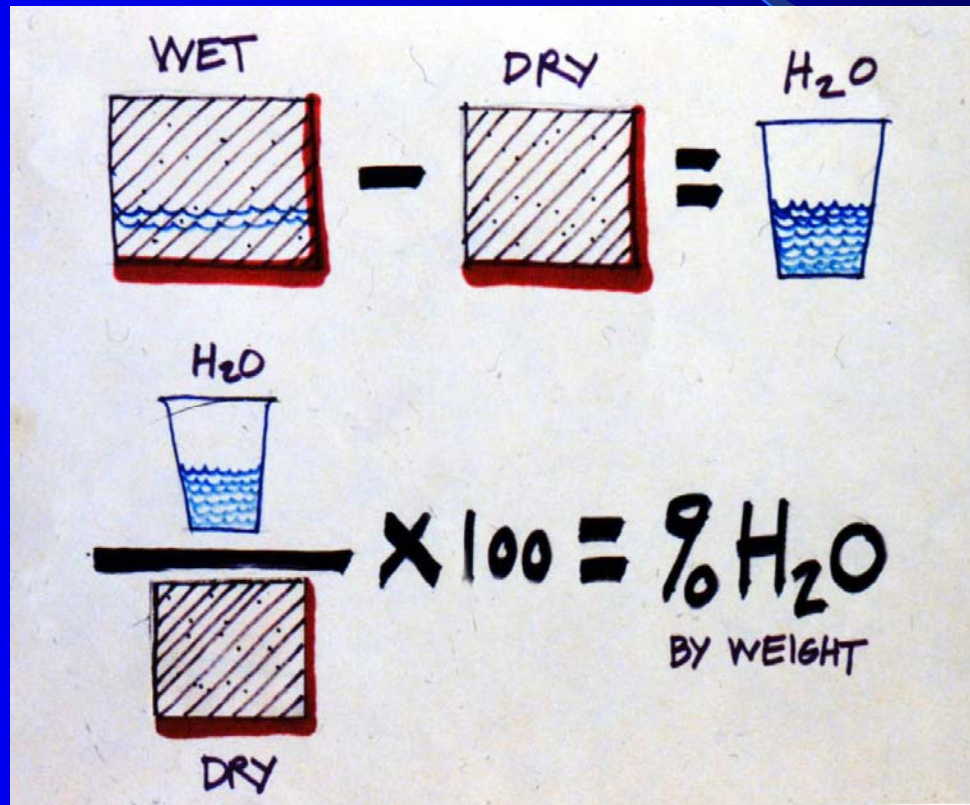
- Characteristics of Masonry Materials, Stone, Brick, Block, Adobe
 - Brittle
 - low tensile strength
 - high compressive strength
 - Hydrophilic
 - Water Loving
 - Porous
 - Permeable by water or air

adobe: The Material



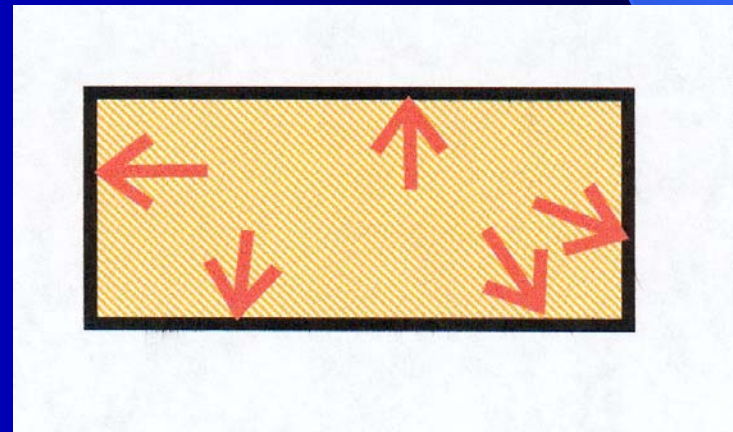
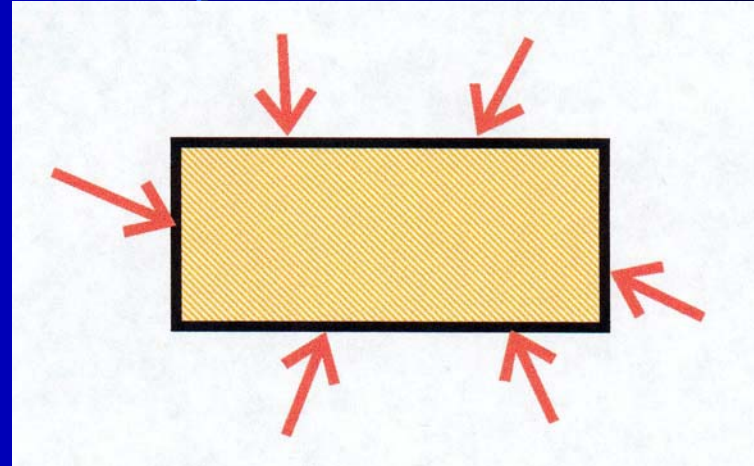
Atterberg Limits

adobe: The Material



Deterioration

- Stress
 - Extrinsic
 - Intrinsic



Deterioration

- Basal Erosion (Rising Damp)
- Surface Erosion
- Cracks or Bulges
- Coating Failure
- Slump or Creep
- Displacement
- Collapse

Basal Erosion

- Rising Damp



Basal Erosion

- Rising Damp



Basal Erosion

- Rising Damp



Basal Erosion

- Rising Damp



Basal Erosion

- Rising Damp

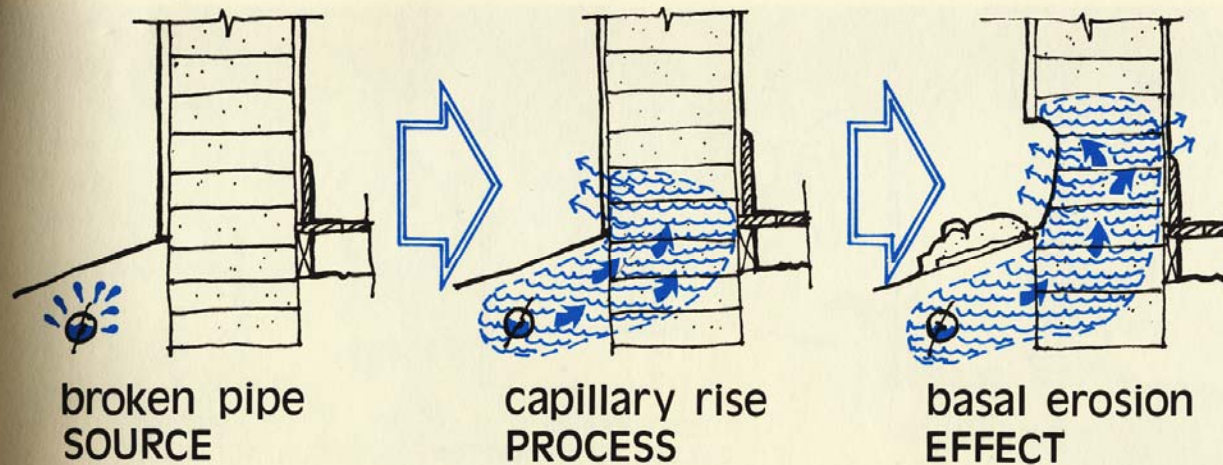
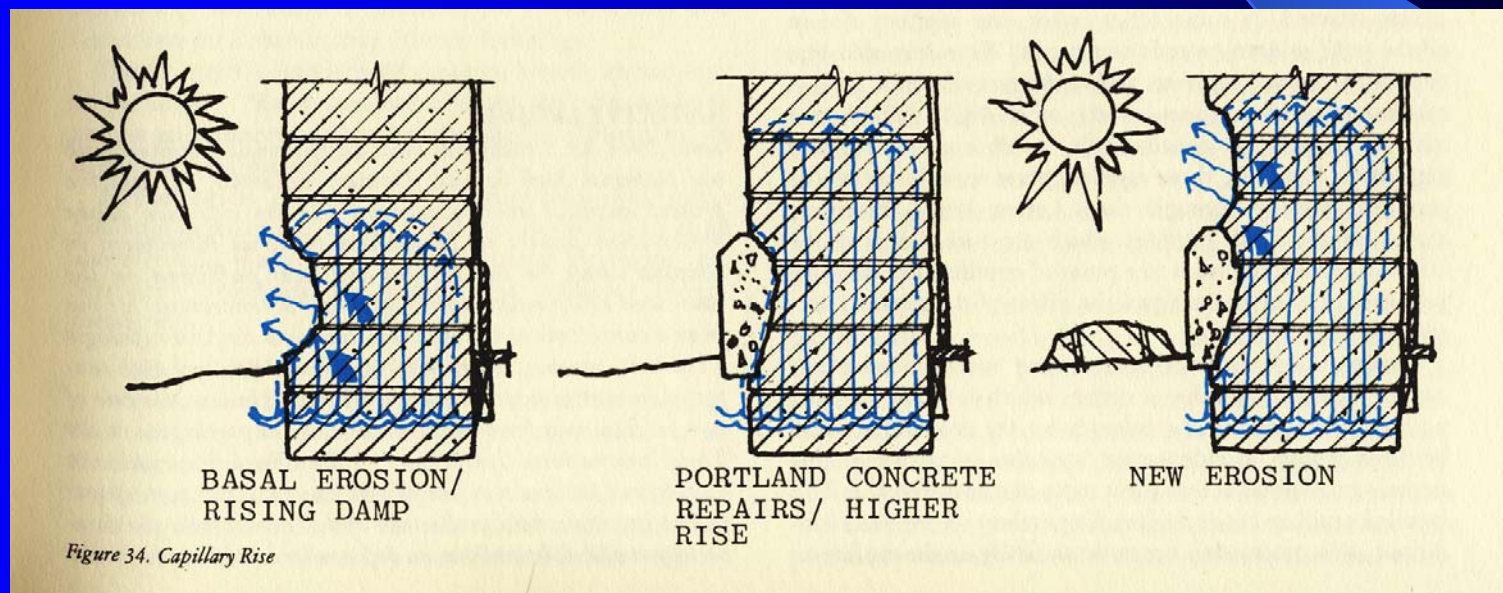


Figure 28. Deterioration is a process which has a cause and effect.

Basal Erosion

- Rising Damp



Basal Erosion



Surface Erosion

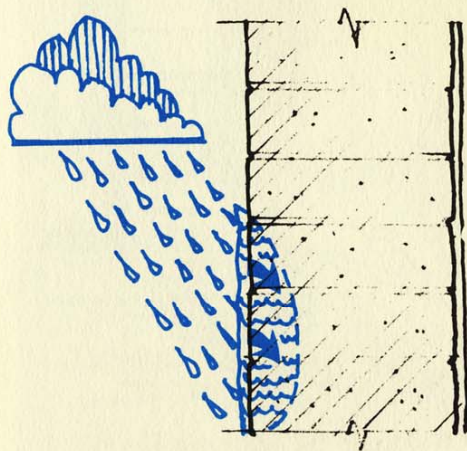
- Uniform Coverage
- Concentrated Run-off



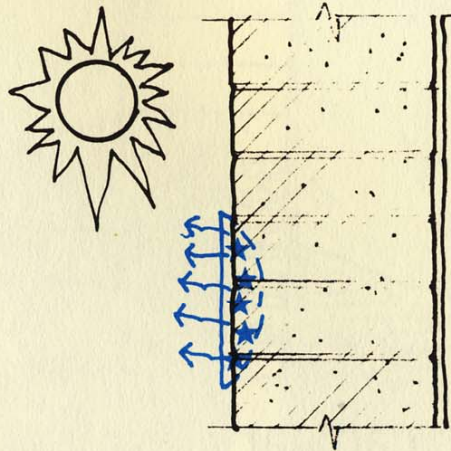
Surface Erosion



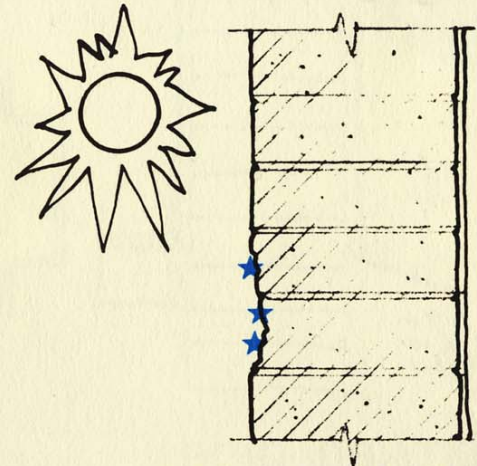
Surface Erosion



WALL SATURATION



DISSOLVED SOLUABLE
SALTS/ EVAPORATION



SALT CRYSTALLIZATION/
SURFACE EROSION

Figure 30. The Wet/Dry Cycle

Surface Erosion

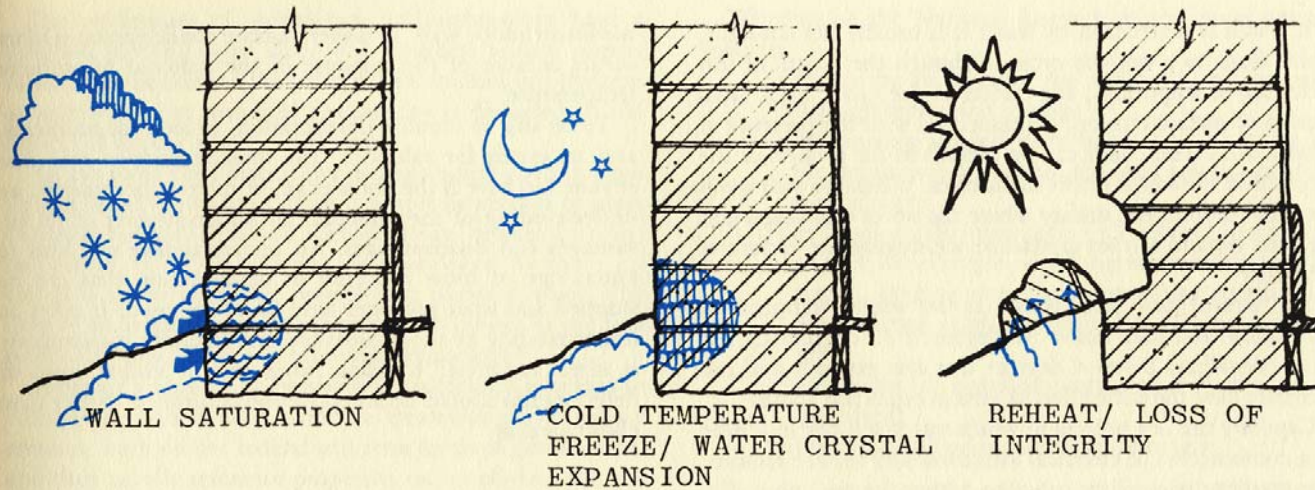
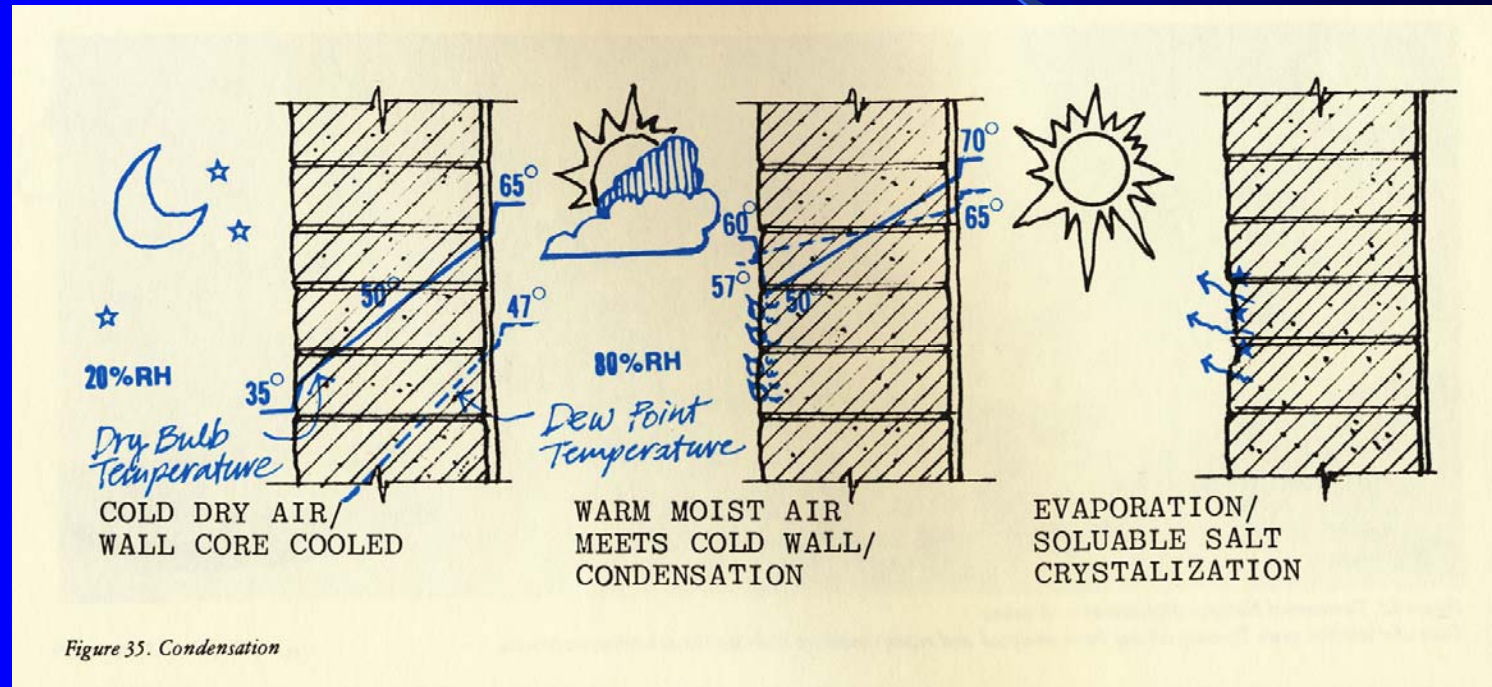


Figure 33. The Freeze/Thaw Cycle

Surface Erosion



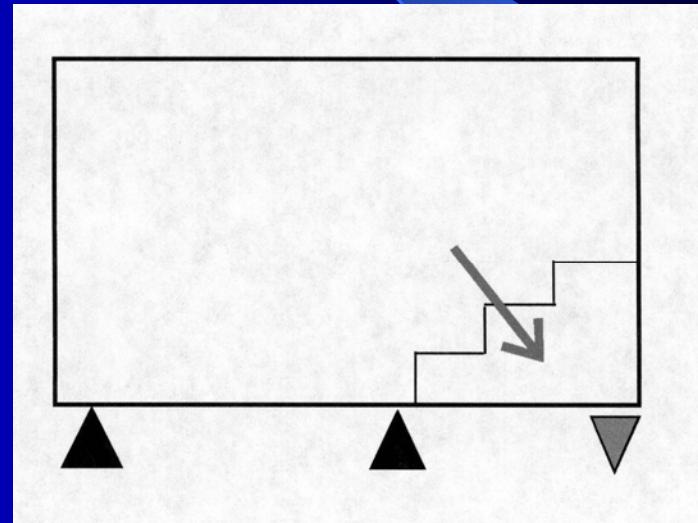
Cracks or Bulges

- Diagonal
- Tension
- Compression
- Shear



Cracks

- Diagonal Cracks



Cracks

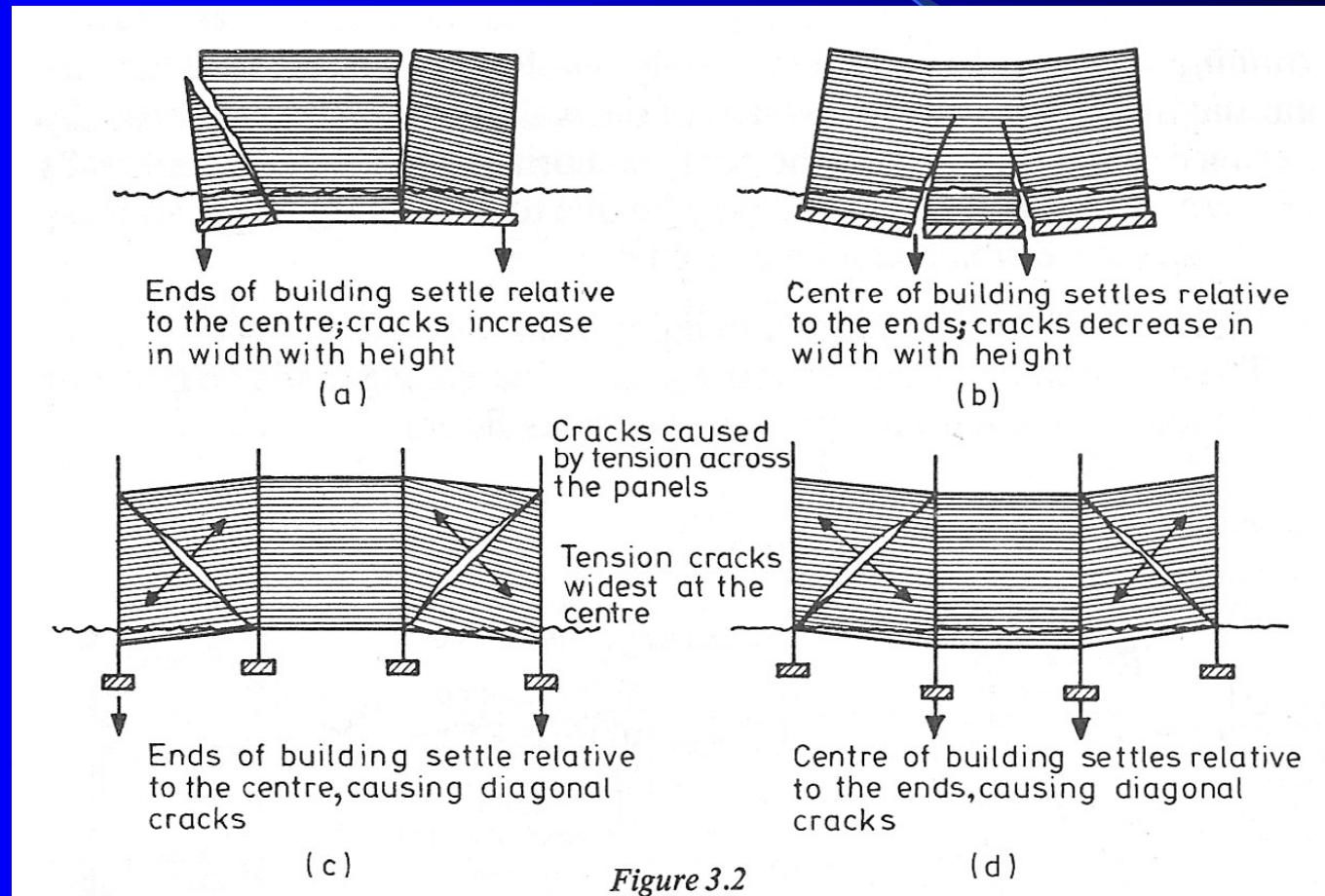
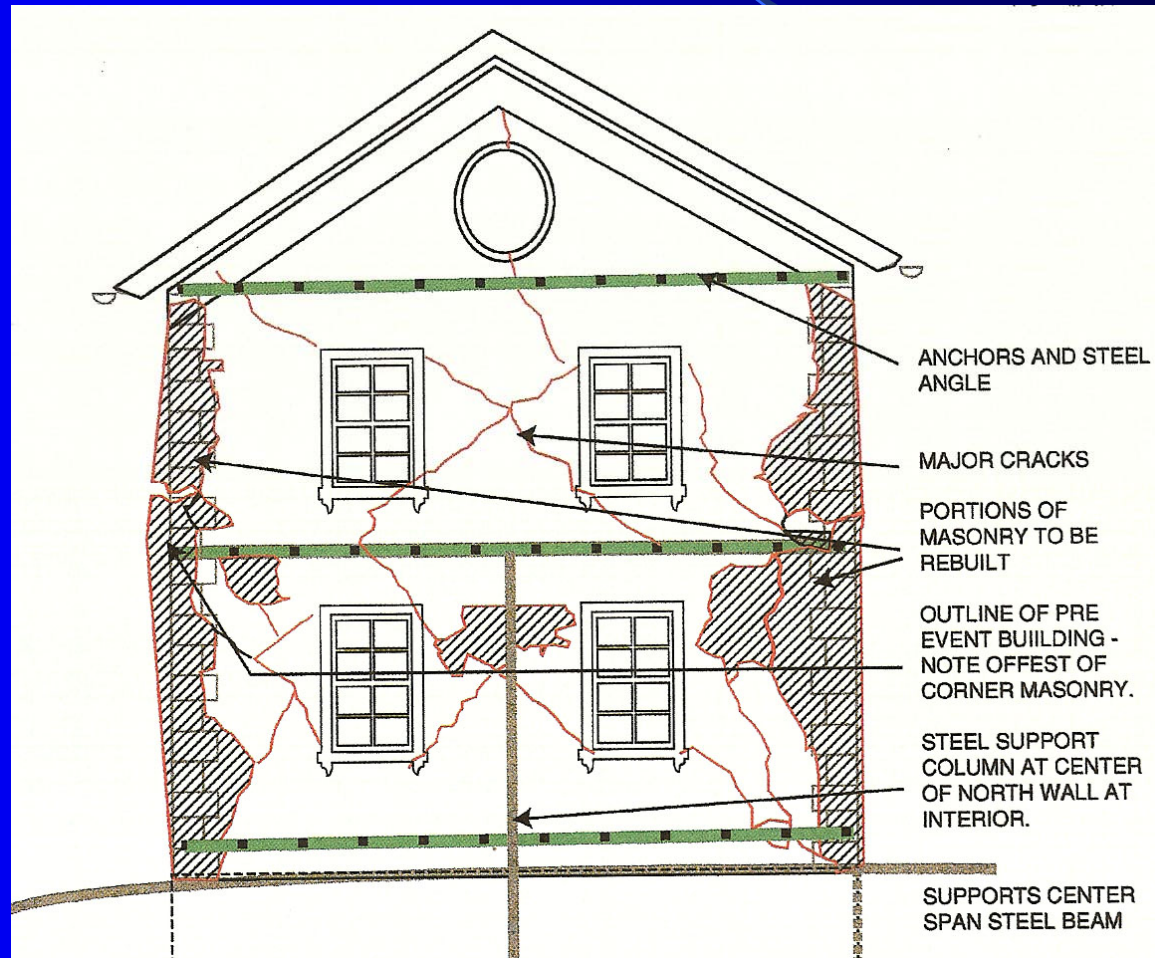


Figure 3.2

Cracks

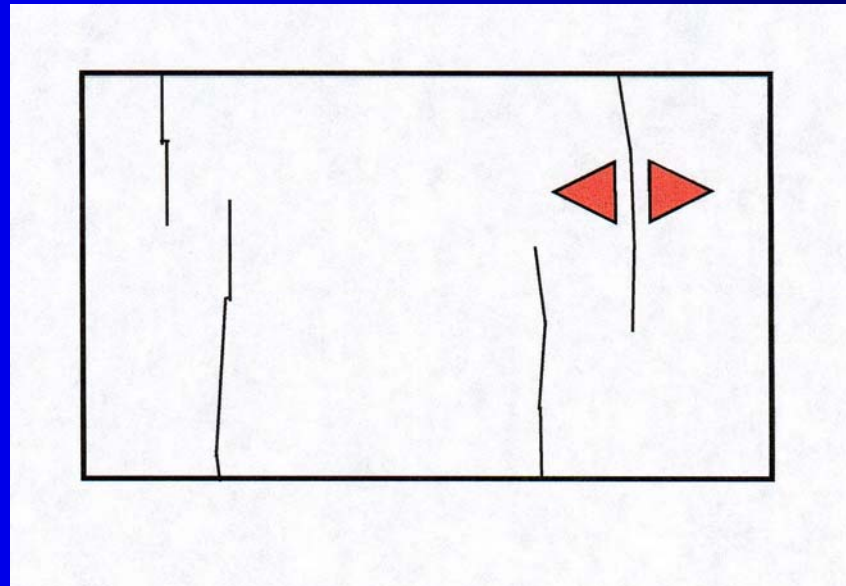


Cracks



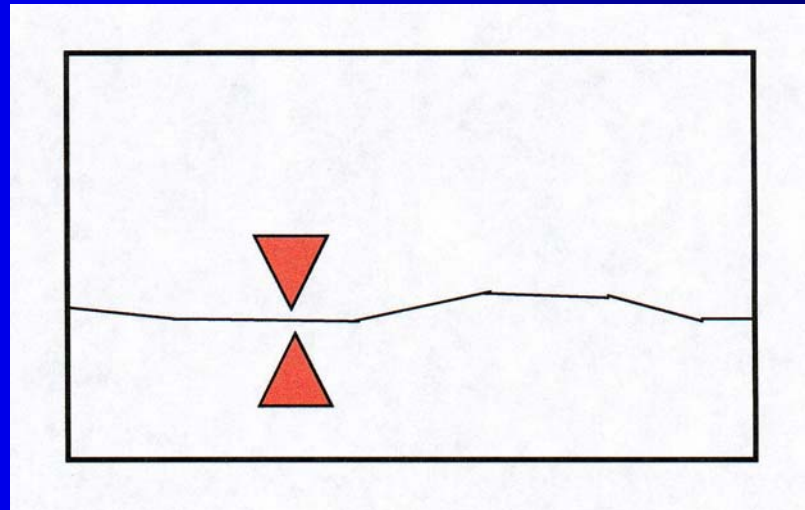
Cracks

- Tension Cracks



Cracks

- Compression Cracks



Cracks



Cracks



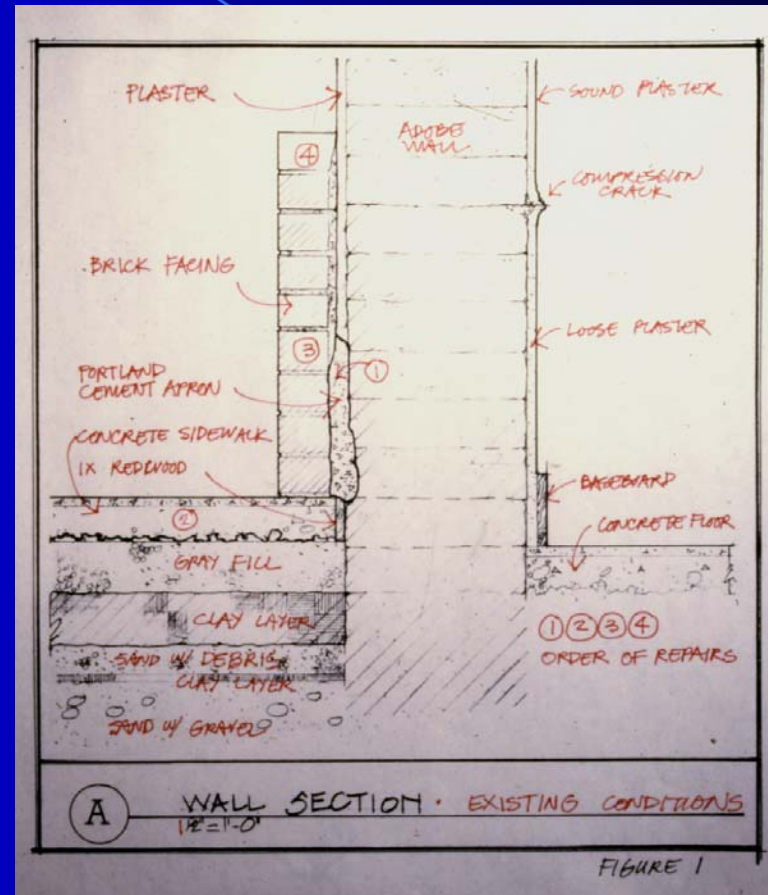
Cracks



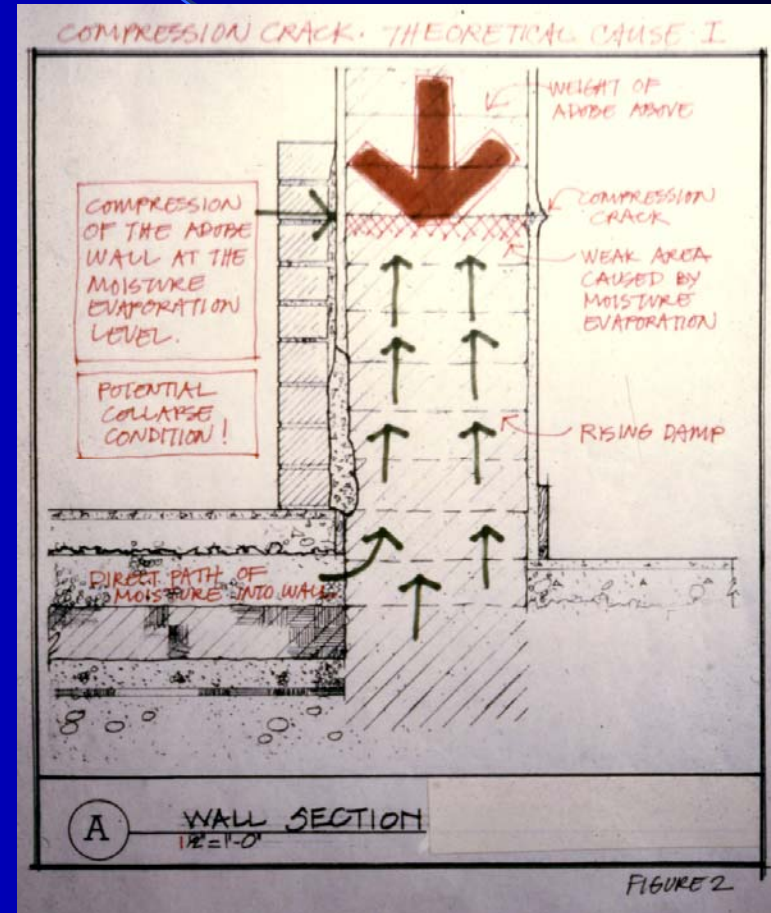
Cracks



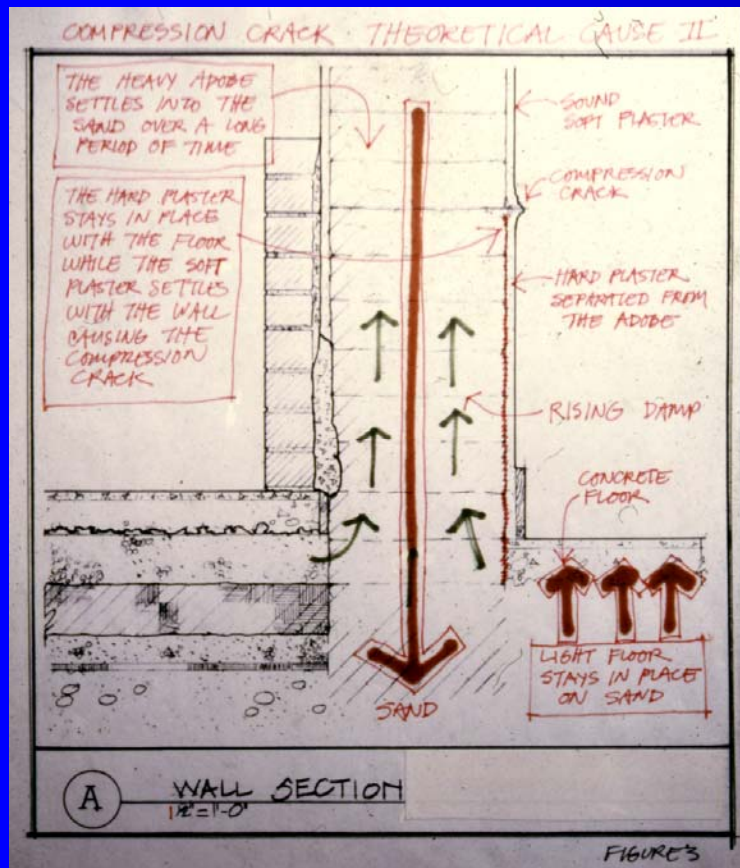
Cracks



Cracks



Cracks

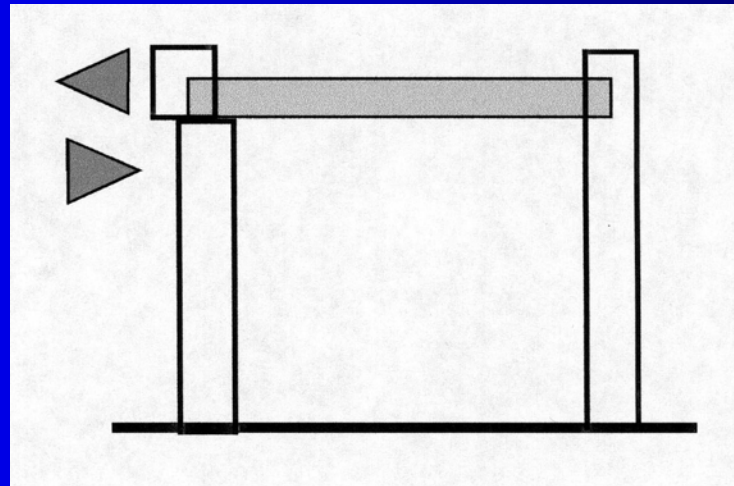


Cracks



Cracks

- Shear Cracks



Coating Failure

- Detachment



Coating Failure

- Detachment



Slump or Creep

- Elastic Limit
- Plastic Limit



Displacement

- Center Third Rule



Collapse

- Center Third Rule



Coatings

- Mud Plaster
- Gypsum Plaster
- Lime Plaster
- Cement Plaster

Mud Plaster

- Sand
- Silt
- Clay



Mud Plaster

- Sand
- Silt
- Clay



Mud Plaster

- Sand
- Silt
- Clay



Mud Plaster

- Sand
- Silt
- Clay



Gypsum Plaster

- Calcium Sulfate Dihydrate
Gypsum
 $2\text{CaSO}_4 \cdot 4\text{H}_2\text{O}$
- Calcium Sulfate Hemihydrate
Plaster of Paris
 $2\text{CaSO}_4 \cdot \text{H}_2\text{O} + 3\text{H}_2\text{O}$
- Martin's Cement (1834)
Keene's Cement (1838)
Parian Cement (1846)

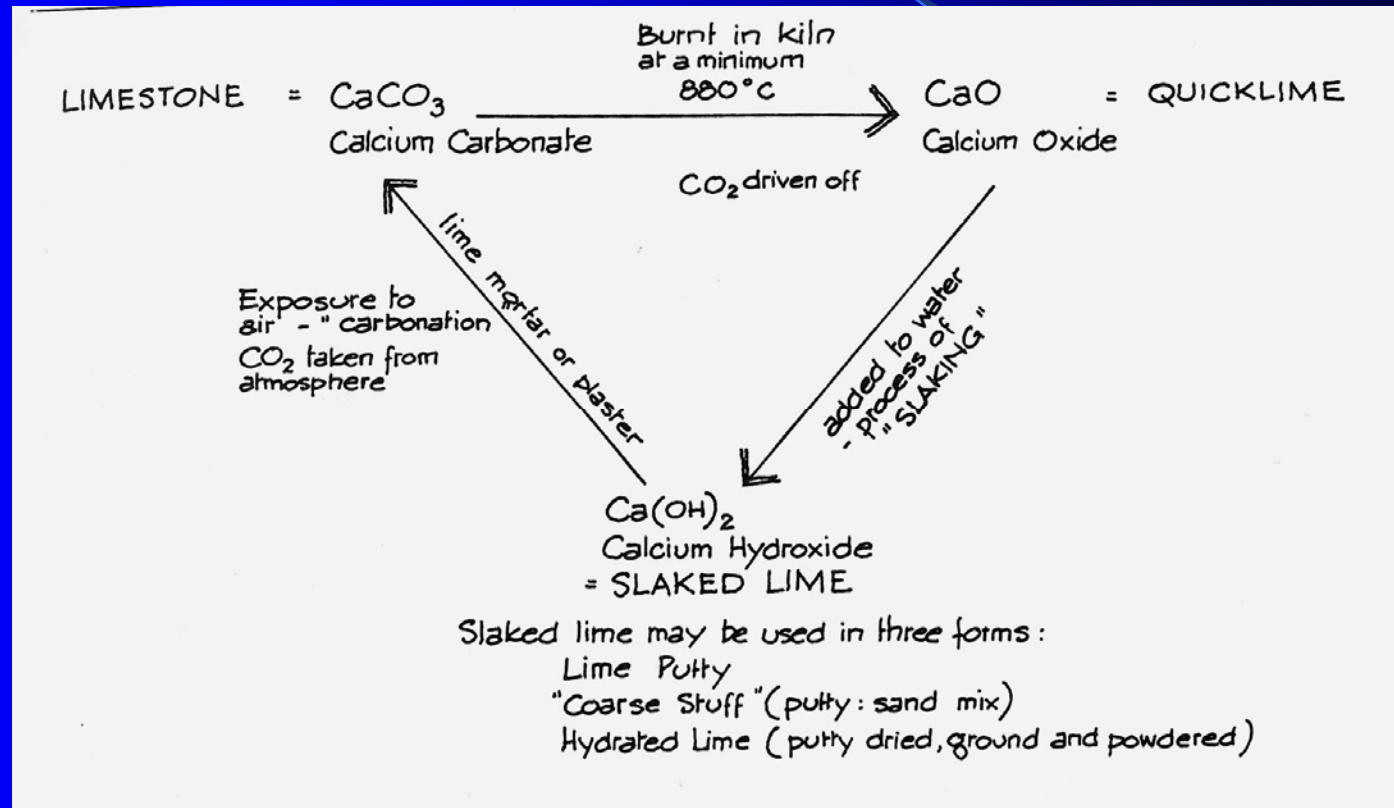
Mortar Basics

- MaSoN wOrK
- 1 part binder to 3 parts sand (by volume)
- M $4 \cdot 1 \cdot 15$
- S $2 \cdot 1 \cdot 9$
- N $1 \cdot 1 \cdot 6$
- O $1 \cdot 2 \cdot 9$
- K $1 \cdot 4 \cdot 15$
- Plaster Basics: 1 part binder to 4 parts sand

Lime Plaster

- Calcium Carbonate
 - CaCO_3
- Calcium Oxide (Quick Lime)
 - CaO
- Calcium Hydroxide (Slaked Lime)
 - Ca(OH)_2

Lime Plaster



Lime Cycle

Lime Plaster

	150 BC Egyptian	46 BC Vitruvius' time	23 AD Pliny	800 AD Rochester Cathedral	1200 Middle Ages	1500	1653 Plat	1703 Neve, Moxon	mid-1700s	1837 Vicat, Smith	1850 Burnell & periodicals
albumen	X										
animal glue	X							X			X
barley			X						X		
beer					X	X			X		
beeswax					X	X		X	X		X
blood	X	X	X	X		X	X	X	X		X
butter										X	
buttermilk									X		
casein	X										
cheese								X	X	X	X
cotton											X
curdled milk		X							X	X	
dung									X		
eggs	X				X	X		X	X		X
egg whites	X	X			X	X	X	X		X	X
elm bark			X								

Lime Plaster

fibers			X							
fig juice	X	X	X					X		
fruit juices				X	X			X		
gluten				X	X			X		
gum arabic	X				X	X				X
hair			X							
hogs' lard		X	X				X			X
keratin	X									
malt				X	X					
milk		X	X				X	X	X	X
molasses									X	
oil			X						X	X
resin							X			
rice				X	X					
rye dough		X						X		
saffron			X							
shellac										X
size			X	X	X					
suet			X							
sugar				X	X				X	
tannin			X							
urine				X	X					
vegetable juice								X		
wine			X							
wort				X				X		

Gauging Lime Plaster

- A non-hydraulic lime can be made to set much more rapidly by the addition of an hydraulic or ‘pozzolanic’ additive.
- Crushed brick powder
- Pozzolana
- Trass
- Portland Cement

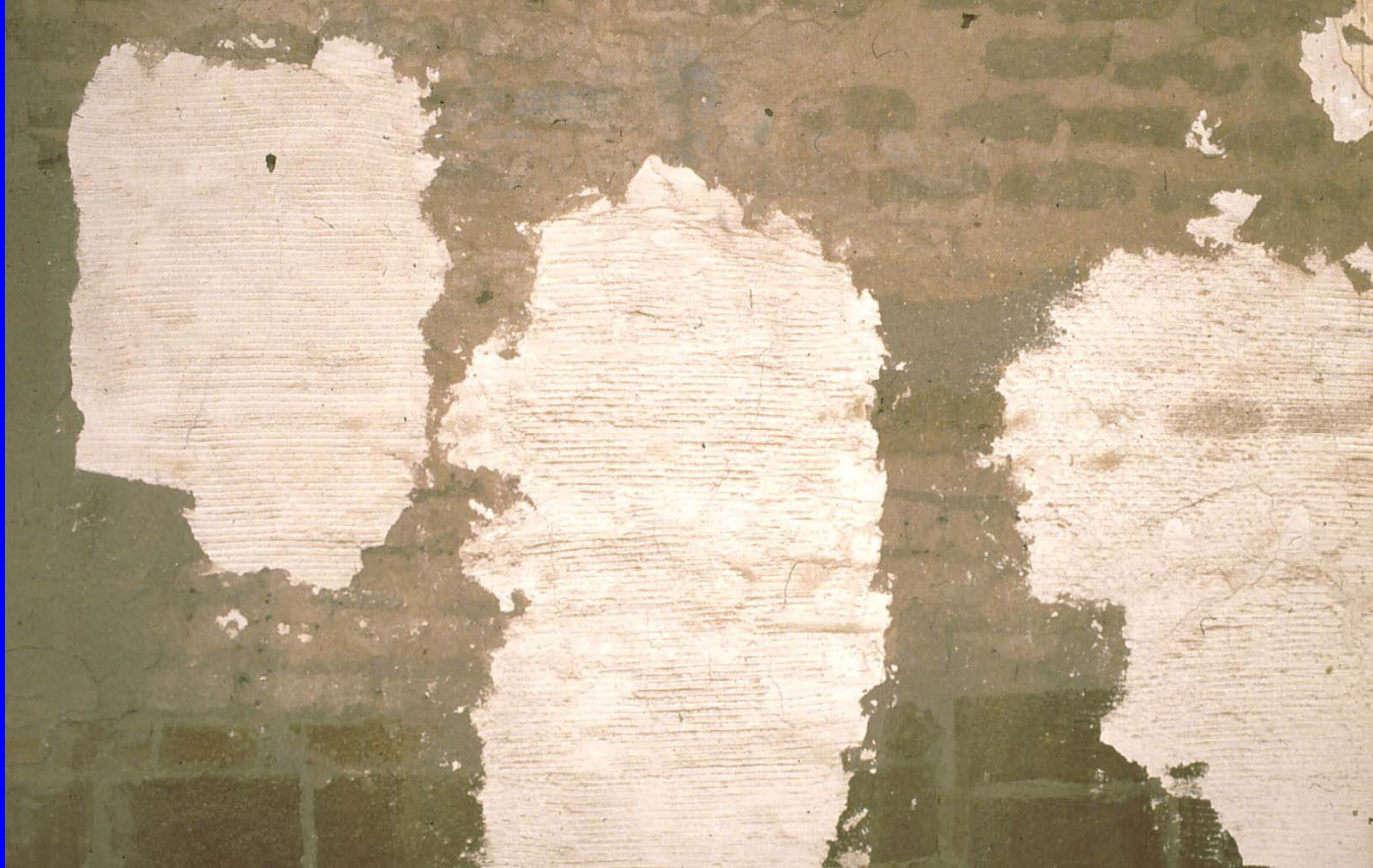
Lime Plaster



Lime Plaster



Lime Plaster



Lime Plaster



Lime Plaster



Cement Plaster

- Portland Cement



Cement Plaster

- Portland Cement/ Chicken Wire



Cement Plaster

- Portland Cement/ Chicken Wire



Cement Plaster



Cement Plaster



Conclusion

- Know the Material
- Know the Causes of Deterioration
- Know the Coating

The Adobe logo, consisting of the word "adobe" in a lowercase, bold, sans-serif font. The letters are a golden-yellow color with a subtle drop shadow, giving it a three-dimensional appearance. It is positioned at the top center of the slide.

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