

# Introduction to Infrastructural Engineering

## Construction Materials3

by

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# Portland cement

## Physical Properties of Portland Cements

- 1) Fineness,
- 2) Soundness
- 3) Consistency
- 4) Setting time
- 5) Compressive strength
- 6) Heat of hydration
- 7) Loss of ignition



# Concrete production

- This process develops physical and chemical properties like mechanical strength, low moisture permeability, and chemical and volumetric stability.

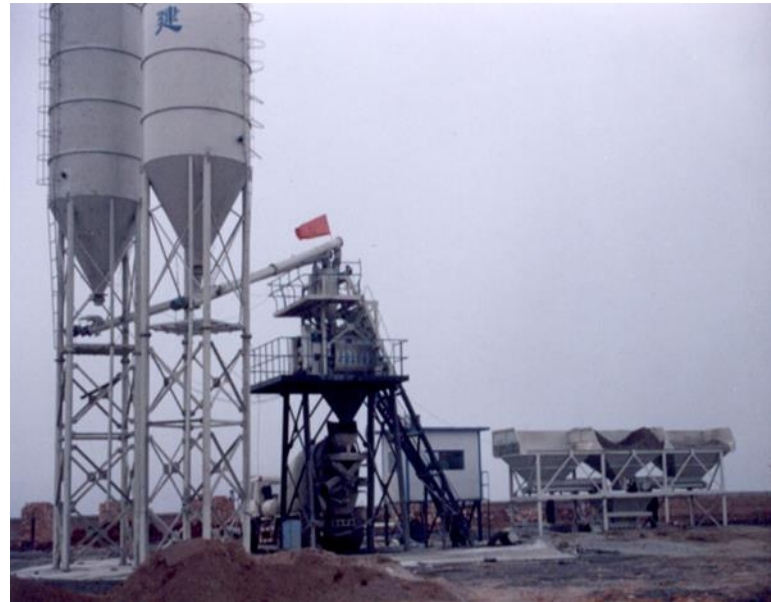
A properly proportioned concrete mix will provide

- Mixing concrete
- Workability
- Curing



# Mixing concrete

- Essential for
  - I. The production of uniform concrete,
  - II. High quality concrete.
- Equipment and methods should be capable of effectively mixing



<http://en.yujianjx.com/upload/Concrete-Mixing-Plants-HZ50.jpg> MD Nurul Islam



# Workability

- The ease with which freshly mixed concrete can be placed and finished without segregation.
- Difficult to measure but ready-mix companies usually have experience in determining the proper mix.
- Important to accurately describe what the concrete is to be used for, and how it will be placed.



# Curing

- Concrete that has been specified, batched, mixed, placed, and finished "letter-perfect" can still be a failure if improperly or inadequately cured.
- Usually the last step in a concrete project and, unfortunately, is often neglected even by professionals.



<http://www.eagleind.com/piclib/324.jpg>



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# Curing

- Curing has a major influence on the properties of hardened concrete such as durability, strength, watertightness, wear resistance, volume stability, and resistance to freezing and thawing.
- Proper concrete curing for agricultural and residential applications involves keeping newly placed concrete moist and avoiding temperature extremes (above 90°F or below 50°F) for at least three days.
- A seven-day (or longer) curing time is recommended.



# Curing

- The best curing method depends on:
  - Cost,
  - Application equipment required,
  - Materials available,
  - Size and shape of the concrete surface.
- Prevent the loss of the mixing water from concrete by sealing the surface.
- Can be done by:
  - Covering the concrete with impervious paper or plastic sheets,
  - Applying membrane-forming curing compounds.





# Curing

- Begin the curing as soon as the concrete has hardened sufficiently to avoid erosion or other damage to the freshly finished surface.
- Usually within one to two hours after placement and finishing.



<http://epg.modot.mo.gov/files/thumb/b/b2/1055.jpg/400px-1055.jpg>



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# Properties of concrete

- Strength
- Elasticity
- Cracking
- Shrinkage cracking
- Tension cracking

