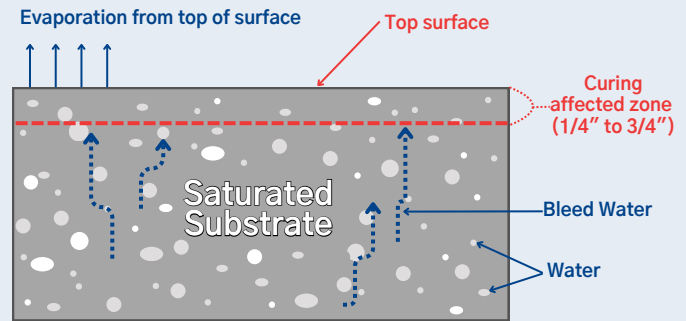




The Relationship Between Internal Cure & External Cure of Concrete

What is meant by “internal cure” of concrete?

The American Concrete Institute (ACI) defines internal curing as a “process by which the hydration of cement continues because of the availability of internal water that is not part of the mixing water”. This is accomplished by addition of pre-wetted lightweight aggregates, super absorbent polymers (SAP’s), saturated wood fibers, polyethylene glycol, hydrophilic crystalline admixtures, and water-entraining agents.



What is meant by “external cure” (surface cure) of concrete?

The American Concrete Institute (ACI) defines curing as an “action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration and (if applicable) pozzolanic reactions to occur so that the potential properties of the mixture may develop”. Acceptable curing methods include water cure (ponding, sprinkling, or fogging), water-retention sheet material, liquid membrane forming curing compound, and wet absorbent material (including burlap and blankets).

How Do They Differ?

Internal cure supplies additional water within the concrete to extend hydration, while external cure prevents the evaporation of water at the concrete surface (top 1/4” to 3/4” referred to as the “cure affected zone”). ACI emphasizes that while internal curing provides internal moisture for hydration, it is not a replacement for external curing. External curing is necessary to maintain surface moisture and prevent defects like surface cracking.



Internal Cure is Optional

The process enhances the performance and longevity of concrete by addressing internal moisture needs. It is particularly beneficial for high-performance concrete and structures requiring high durability.

External Cure is Mandatory

It is essential and mandatory to retain moisture at the concrete surface, ensuring the surface quality and overall durability of the concrete within the “cure affected zone” (top 1/4” to 3/4”).

Type	Mandatory per ACI	Prevents Water Loss at Concrete Surfaces	Cures to ASTM C309 Specs	Prevents Near Surface Craze/Map Cracking	Improves Properties of Hardened Concrete
Internal Cure	✗	✗	✗	✗	✓
External Cure	✓	✓	✓	✓	✓

Numerous research studies have shown that while internal curing improves internal hydration and reduces shrinkage, external curing methods are crucial for surface quality and overall durability. For additional information you may consider referencing:

Determination of Curing Efficiency of Externally and Internally Cured Concrete Using Neutron Radiography
M Khanzadeh et al

Expanded Shale, Clay & Slate Institute
www.escsi.org

Reduce Early-Age Shrinkage: Thinking Beyond The Mix
Weiss, J et al

Research on Performance Deterioration of Internally Cured Pavement Concrete under the Coupling Effect of Salt Freeze-Thaw
Chaofeng Cao, Junhong Liu, Qingjian Huang

Water-Entrained Cement-Based Materials: II. Experimental Observations
Jensen, OM & Hansen, PF

Combined Effect of Internal Curing and Hydration Promotion on Concrete Performances
Khuat DD, Yamanaka S, Nguyen MH, Nakarai K