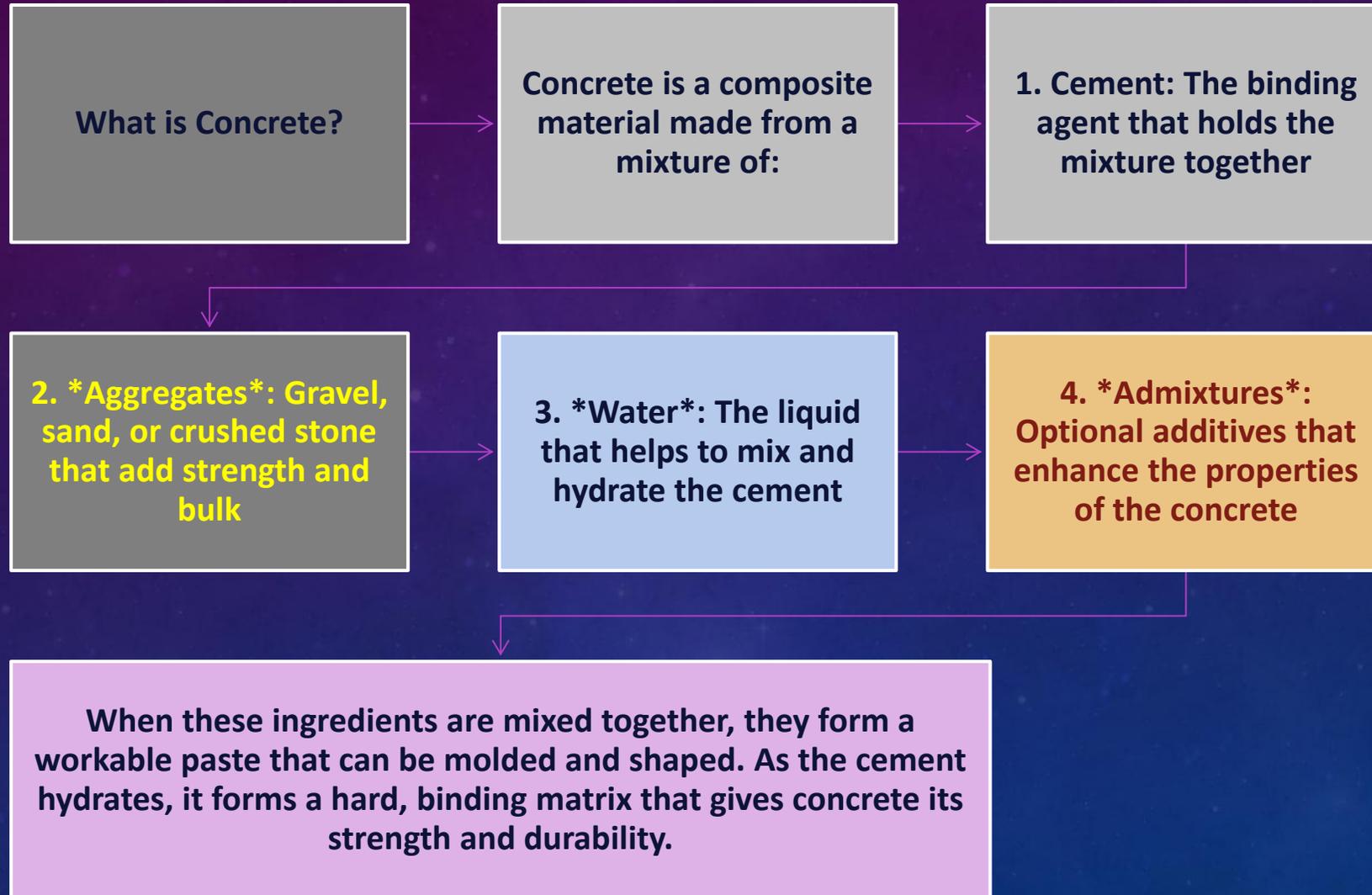


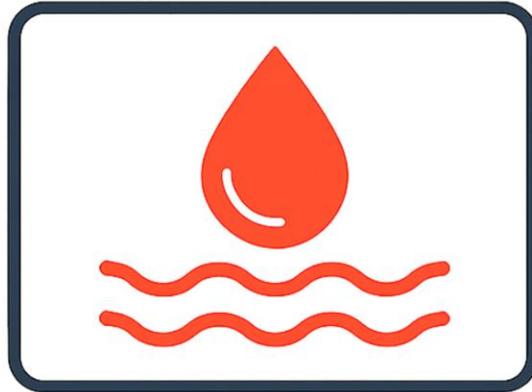
Curing Compounds : Smarter Alternative to Water curing

**By:
Mahesh Ashok Banda
Principal Specialist-Admixtures (W&S)
Asian Paints Limited**

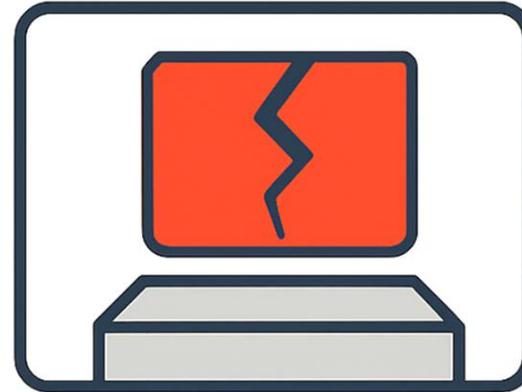
What is Concrete?



Why Does Concrete Require Curing?



Prevents Moisture Loss



Reduces Shrinkage

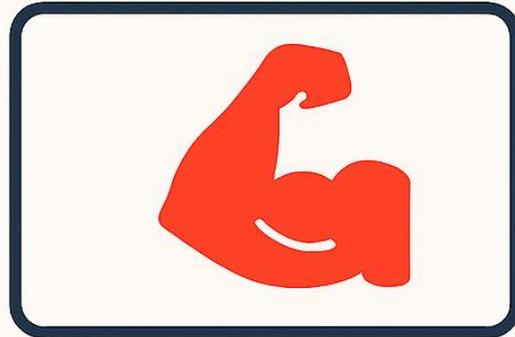


Enhances Strength

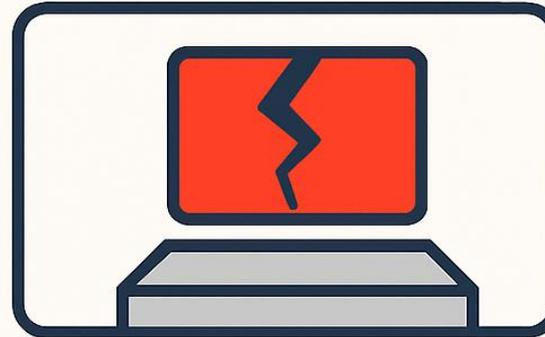


Improves Durability

Consequences of Inadequate Curing



Reduced strength
and durability



Increased shrinkage
and cracking



Surface defects
and damage

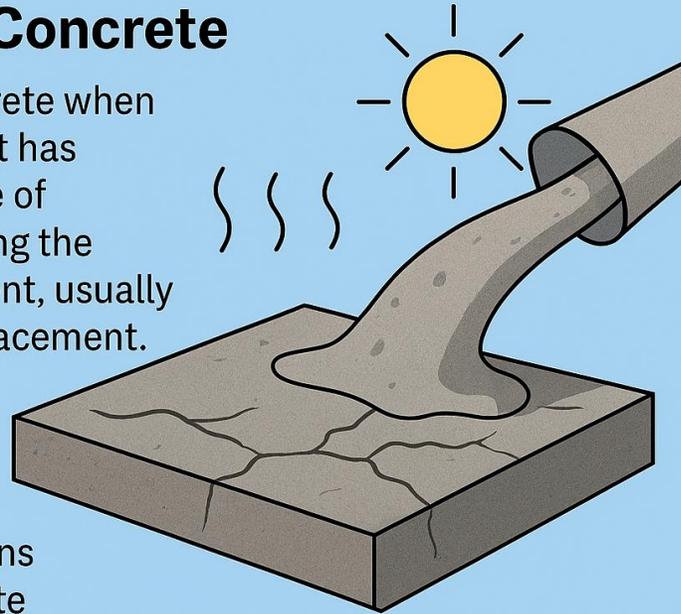


Decreased resistance to
environmental factors

Why Curing is important in early hours after placement of Concrete?

Plastic Shrinkage in Concrete

Plastic shrinkage occurs in concrete when it is in a “plastic state,” meaning it has not yet set or hardened. This type of shrinkage typically happens during the early stages of concrete placement, usually within the first few hours after placement.



Plastic shrinkage typically happens during the early stages of concrete placement, usually within the first few hours after placement.



Factors Contributing to Plastic Shrinkage



1. Rapid moisture loss: When the surface of the concrete dries too quickly, it shrinks faster than the underlying material.



2. High temperature: High temperatures can accelerate moisture loss and increase the risk of plastic shrinkage.



3. Low humidity: Dry air can cause the surface of the concrete to dry too quickly, leading to plastic shrinkage.



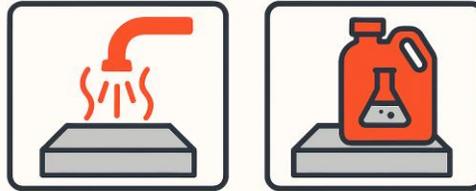
4. Wind: Wind can accelerate moisture loss and increase the risk of plastic shrinkage.

Types of General Curing Methods



Ponding Spraying Wet Burlap

Water Curing



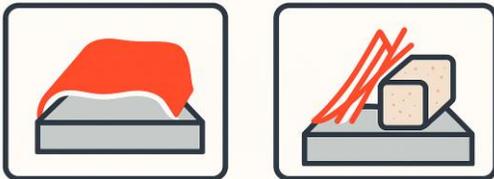
Heating Chemical Accelerators

Accelerated Curing



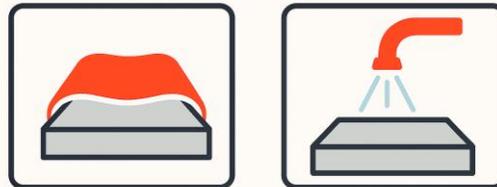
Atmospheric Steam Curing High-Pressure Steam Curing

Steam Curing



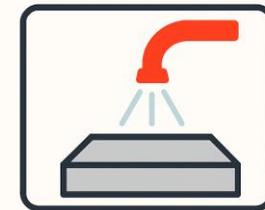
Insulating Blankets Insulating Materials

Insulating Curing



Plastic Sheetting Curing Compounds

Membrane Curing

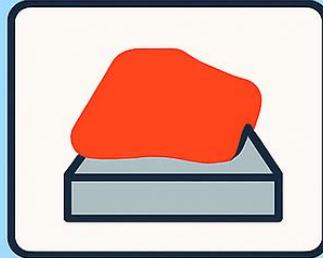


Curing Compounds

Curing Compound

Curing Compounds for Concrete

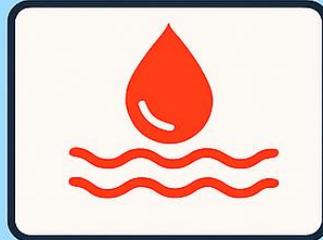
Types of Curing Compounds



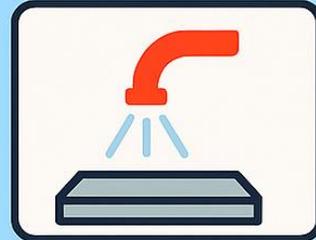
Wax-Based



Resin-Based



Promouts proper curing



Cost-effective

Benefits of Curing Compounds



Prevents moisture loss
Reduces shrinkage and cracking



Promotes proper curing
Ensures optimal strength development and durability



Easy to apply
Can be applied using sprayers or rollers



Cost-effective
Reduces labor and water costs associated with traditional curing methods

Acrylic Vs Resin Vs Wax based Curing Compound

Acrylic-Based Curing Compounds

- Forms a breathable membrane, allowing for moisture transfer

- Easy to apply and remove

- Suitable for most concrete applications including architectural concrete, slabs, and pavements.

- Reduces dusting and improves surface hardness

Aluminized Curing Compounds

- Provides excellent reflectivity, reducing surface temperature

- Can be used in high-temperature applications

Wax-Based Curing Compounds

- Provides good moisture retention

- Can be used in cold weather applications

Advantages of Acrylic over Aluminized and Wax-Based Compounds:

- Does not leave a residue or discoloration

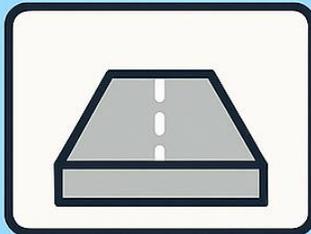
- Do not required additional cleaning or preparation before applying finishes

- Allows for better bonding between concrete layers

- Can be used on surfaces that will be exposed to view

Applications of Curing Compounds

Types of Curing Compounds



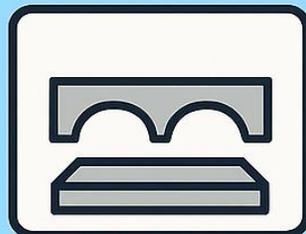
Highway and Road Construction



Building Foundations



Airport Runways and Taxiways



Bridge Decks

Advantages of Curing Compounds



Easy to apply

Uniform coverage



Reduced labor costs



Improved durability

Reduced shrinkage and cracking



Flexibility



Cost-effective

Reaction Bond between Curing Compounds and Concrete

Physical Interactions

1. Adhesion:

The curing compound forms a strong bond with the concrete surface.



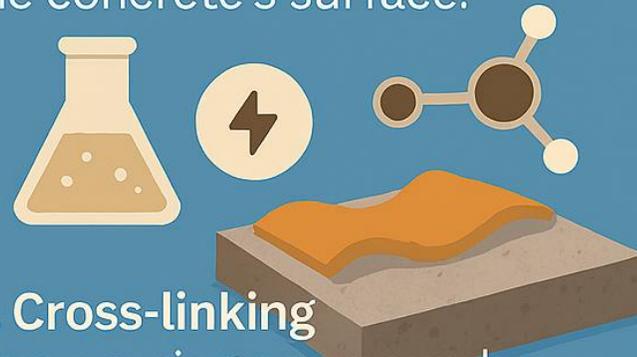
2. Mechanical interlock

The curing compound fills the pores and irregularities on the concrete surface.

Chemical Interactions

1. Chemical bonding

Some curing compounds react with the cement paste, forming a strong chemical bond that enhances the concrete's surface.



2. Cross-linking

Some curing compounds undergo cross-linking reactions

Factors and Importance of Reaction Bond

Factors Affecting the Reaction Bond

Factors Affecting the Reaction Bond

1. Surface preparation:

A clean and prepared surface is essential for a strong bond.



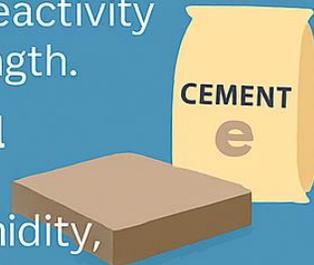
2. Curing compound type:

Different types of curing compounds may have varying levels of reactivity and bonding strength.



3. Environmental conditions:

Temperature, humidity, and wind velocity



Importance of a Strong Reaction Bond

1. Durability:

A strong reaction bond ensures the curing compound remains effective over time.



2. Surface protection:

A strong bond helps protect the concrete surface from environmental factors.



3. Reduced maintenance:

A strong reaction bond can reduce the need for costly repairs and maintenance.



Removing of Wax and Resin Based Curing Compound



Solvent-based cleaners



POTASSIUM HYDROXIDE

Alkaline-based cleaners



High-pressure washing



Abrasive Blasting

Side Effects of Cleaning on Concrete

1. Surface damage*: Abrasive blasting or high-pressure washing can damage the concrete surface.



3. Residue: Solvent-based cleaners can leave behind residues

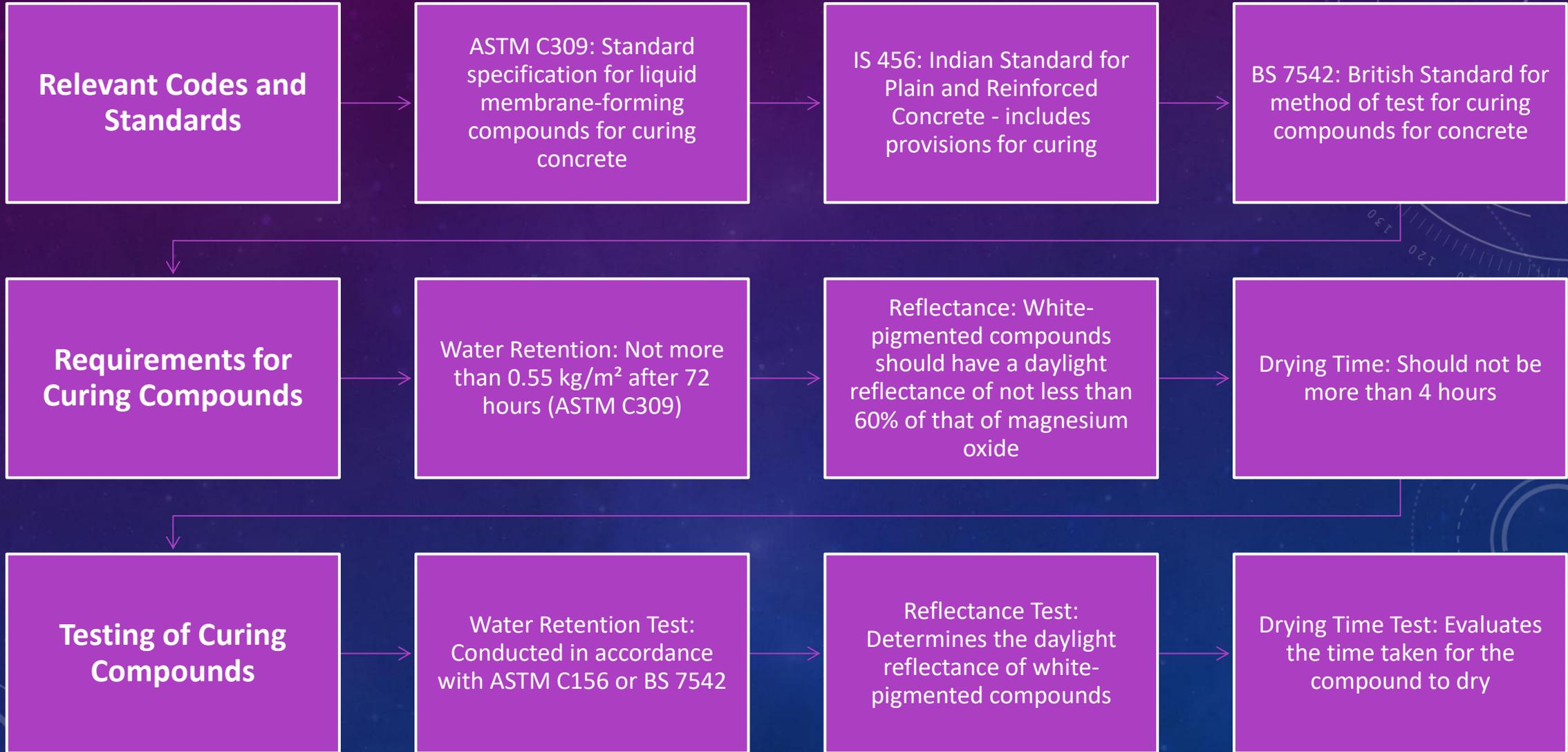


2. Alkalinity: Alkaline-based cleaners can react with concrete, causing etching or discoloration.



4. pH level changes: Some cleaning methods can alter the pH level of the concrete, potentially affecting its durability.

Relevant Codes and Standards



Testing of Curing Compounds

Water Retention: Measures the compound's ability to retain moisture in concrete, which is critical for proper hydration and strength development.

Standards: Conducted as per ASTM C156 or BS 7542. **Method:** A sample is applied to a concrete surface and monitored for moisture loss over time.

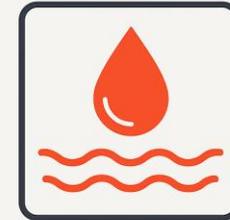
Reflectance Test: Assesses the daylight reflectance of white-pigmented curing compounds. High reflectance helps reduce surface temperature, minimizing thermal cracking.

Standard Reference: Often compared to magnesium oxide reflectance benchmarks.

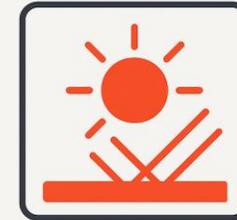
Drying Time

Test Purpose: Evaluates how quickly the curing compound dries after application.

Importance: Ensures timely protection of concrete and compatibility with construction schedules.



Water Retention Test



Reflectance Test



Drying Time Test

Do's



Dos:



Read the manufacturer's instructions*:
Follow the recommended application rate, timing, and method.



Apply after finishing: Apply curing compound after the concrete surface has been finished and the free water has disappeared.



Use the right equipment*: Use a sprayer or roller suitable for the type of curing compound being used.



Apply uniformly*: Ensure uniform coverage to prevent uneven curing.



Monitor environmental conditions*: Consider temperature, humidity, and wind velocity when applying curing compounds.



Test the compound: Perform a trial application to ensure the compound works as expected.

Don'ts

Don'ts:

1. Don't apply too early: Avoid applying curing compound before the concrete surface is finished and ready for curing.
2. Don't apply too late: Apply curing compound before the concrete starts to dry out.
3. Don't overapply: Avoid applying too much compound, which can lead to uneven curing or surface defects.
4. Don't underapply: Ensure adequate coverage to prevent insufficient curing.
5. Don't mix different types: Avoid mixing different types of curing compounds or using them in combination with other products without testing compatibility.
6. Don't ignore weather conditions: Avoid applying curing compounds in extreme weather conditions, such as high winds, direct sunlight, or rain.



THANK YOU