


NPCA
Precast... The Concrete Solution



◆ CALENDAR
◆ MAGAZINES
◆ NPCA SHOP
◆ CONTACT US

- ◆ HOME
- ◆ ABOUT NPCA
- ◆ MEMBERSHIP
- ◆ PRODUCERS
- ◆ SUPPLIERS
- ◆ SPECIFIERS
- ◆ PRECAST PRODUCTS
- ◆ TECHNICAL EDUCATION
- ◆ TECHNICAL SERVICES
- ◆ PLANT CERTIFICATION
- ◆ ON-SITE WASTEWATER ACCREDITATION PROGRAM
- ◆ FIND A PRODUCT
- ◆ EDUCATIONAL FOUNDATION
- ◆ MAGAZINES
- ◆ ONLINE REGISTRATION
- ◆ THE NPCA SHOP
- ◆ CONTACT US
- ◆ MEMBERS ONLY
- ◆ THE PRECAST SHOW

◆ MC MAGAZINE ARCHIVE

CURING COMPOUNDS

Curing is one of the last and perhaps the most neglected step in the manufacture of precast concrete products. The need for rapid production is of great importance in this industry. Balance between production rates and quality can be achieved through continuous improvement in product design, raw materials, manufacturing processes and employee education.

What Is Curing?

Simply stated, proper curing creates the optimum environment to promote the hardening or hydration of freshly cast concrete. Hydration is the chemical process that ultimately binds cement particles and aggregates into hardened concrete. Creating the optimum environment involves:

- Monitoring and controlling the humidity to prevent moisture loss from the fresh concrete. The primary object of curing is to prevent or replenish the loss of necessary moisture during the early, relatively rapid stage of hydration.
- Monitoring and controlling the temperature of the concrete and gradients (i.e., providing a favorable temperature (50-90 °F) under conventional curing conditions and up to 150 °F under low-pressure steam curing).

Curing practices that promote prolonged hydration of the cement results in gel development which reduces the size of the concrete's internal voids and thereby greatly increases the water tightness of the concrete. For this reason, prolonged hydration through curing is a significant factor in attaining impermeable, watertight concrete.

Prevention of the loss of water from the concrete is of importance not only for the loss of strength, but it also leads to increased permeability, plastic shrinkage and other undesirable factors.

Conventional curing and low-pressure steam curing are two of the more common methods of curing precast concrete products.

Other Concerns During Curing

During curing, concrete products should also be protected from impact, loading, vibration, and other mechanical disturbances.

Why Cure Concrete?

Concrete gets hard as a result of the chemical reaction of the mix water and the cement, a reaction that starts at the instant the two materials first come in contact with each other, and can continue for many years. Concrete that "dries" out will not reach its design strength or meet specifications. The longer the cure, the better the concrete.

In general, all specifications will include details regarding curing of concrete products.

Curing Methods

Physical barriers to prevent evaporation

- Leaving forms in place
- Polyethylene sheets/tarps
- Curing papers

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- Saturated burlap

Water Spray/Immersion

- Ponding
- Fog Spray

Membrane Curing Compounds

- Synthetic resin (plastic) base
- Wax base
- Wax and synthetic resin base
- Acrylic polymers in water base

Advantages of Curing Compounds

- Easy to apply
- Cost effective
- No need for continuous monitoring or application as would be required for fog-spray systems or wetting burlap
- Minimal equipment requirements and costs
- No debris or tarps to reuse and store

Essential Properties of a Curing Compound

- Forms an impervious film on concrete
- Free of pinholes
- Strongly adheres to surface of concrete
- Prevents the concrete mixing water from evaporating

Percent Solids, What's it All About?

In general, high-solids curing compounds (about 30% solids) greatly reduce moisture loss. Better polymers in newer formulations can also be extremely effective, even with lower solids content. ASTM C-309 requires curing compounds to have a maximum moisture loss rate of 0.55 kilograms per square meter of surface in 72 hours. This standard requires a coverage rate of 200 square feet per gallon. Moisture loss when using a high solids curing compound at a coverage rate of 300 square feet per gallon will generally allow a lower maximum moisture loss of about 0.30 kilograms per square meter.

Products that cure and seal concrete tend to have higher solid content. Application of high-solids products is easier because they are unlikely to be applied too thin. These compounds leave a gloss on the concrete surface, so it is easy to see when coverage is complete.

Questions to Ask Your Curing Compound Supplier

- Compliant with ASTM C-390, Liquid Membrane - Forming Compounds for Curing Concrete
- Non-hazardous. Read the MSDS (Material Safety Data Sheet) before ordering
- VOC (Volatile Organic Compound) Compliant
- Compatible with form release agent
- Will not adversely affect subsequent use of sealers, coatings, and paint applied to the cured concrete
- Cost per square applied: _____
- Mixing requirements, one part component
- Ease of applying to recommended thickness
- Application equipment concerns:
 - Ease of use
 - Maintenance and Cleanup
 - Initial cost

- Presence of fugitive dye or pigment (will show during application, but fades in a few days)
- Staining of finished product
- Percent/Solids: _____
- Storage requirements

Cure and Seal

Some curing compounds can also be used as a sealer, hardener, and dust reducer. These products may have an acrylic polymer, sodium silicate, or chlorinated rubber base. Some cure and seal products can interfere with the bonding of coatings, coverings, or tile to the finished precast surface. Check with your supplier for use in these applications.

Application

"Prepare surfaces and apply curing compound in accordance with manufacturer's recommendations."

Read the Directions

After the concrete has received its final finish (1-3 hours after concrete placement) and the water sheen has disappeared from the surface. Pinholes in the curing compound film will occur if applied when there is still standing water on concrete surface. Using pigmented curing compounds helps achieve complete application coverage. If the concrete appears to be dry, wet the surface before applying the curing compound.

Curing compounds should be sprayed on uniform surfaces as soon as the water sheen disappears but while the surface is still moist to ensure adequate performance (i.e., 1-3 hours after concrete placement). Curing compounds should be stirred or agitated as needed prior to use.

Apply the curing compound in two applications, at right angles, to form a continuous film coating all surfaces of the precast product. Application of the coats in two directions (i.e., vertically and horizontally) will help to ensure full coverage.

Don't thin or alter curing compounds

When possible, keep steel forms on new precast concrete products as long as possible. This is an excellent first step in protecting against loss of moisture.

Other concerns during curing

During curing, concrete products should also be protected from impact, loading, vibration, and other mechanical disturbances.

All beneficial properties of precast concrete including strength, durability and watertightness are enhanced through proper curing techniques.

Don't Forget to CURE Curing, particularly within the first few hours after concrete placement, is one of the most important factors in manufacturing top quality precast concrete products. Properly cured precast concrete products have superior early and long term strength. Well cured precast concrete products are less permeable, more durable, and have greater surface hardness.

Proper use of quality curing compounds is an excellent method to facilitate the production of top notch precast products. But don't forget to maintain proper temperatures during curing and to protect your products from impact and vibration during this period.

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[Back to top](#)

[Back to MC Magazine Archive](#)