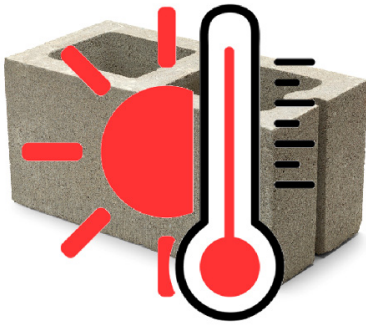


Hot Weather Concreting

Dry Cast Concrete - What to know as temperatures rise



Concrete professionals know that weather can have a big impact on concrete performance. Here's a short primer on high temperature challenges.

Cement hydration basics

Concrete is made up of aggregates (sand and stone), cementitious materials and water. The chemical reaction between cement and water is called hydration. The cement hydration reaction slows down as it gets colder, and speeds up as it gets hotter.

In general, hot weather measures should be implemented when concrete temperatures exceed 90° F (32° C).

What happens to concrete made above 90° F (32° C)?

- Hot materials drive off water fast, so more moisture evaporates from aggregates before they are mixed into the concrete.
- The rate of cement hydration accelerates so the mix stiffens and loses workability faster. The mix may not feed and compact well in the mold.

- Poor compaction leads to more interconnected voids.
- More interconnected voids lead to lower density and higher absorption, which negatively affects strength, durability and the general quality of the concrete.

What does faster cement hydration mean to me?

Faster cement hydration means less time to work with concrete before it loses workability and begins to harden. When this happens it can lead to the following:

1. The amount of time that concrete can be held without forming product decreases.
2. There is less time to move concrete through the machine before the mix feed and flow slow down, making it harder to fill the molds and compact the mix properly.
3. Improper mold filling means that product heights can be inconsistent, and corners may be compromised with greater potential for cracks and damage.
4. Lack of compaction means more interconnected voids in the mix. This translates to reduced density and increased absorption, which in turn affects product quality and durability in freeze-thaw environments.
5. Mixer efficiency may be compromised as hardened concrete builds up faster on mixer paddles and walls. Poor mixing can lead to segregation, or uneven distribution of cement, water and aggregates throughout the mix.
6. Excessive buildup in the mixer also means a lot more work for the cleaning crew.

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Which units are most affected?

In general, units that are the hardest to make under ideal conditions will often also be negatively affected by hot weather conditions.

1. Lightweight mixes – due to their already high water demand, lightweight aggregates must be pre-wetted in hot weather to ensure that there is sufficient moisture available to hydrate the cement. Pre-wetting methods can include: spraying the stockpile, spraying on the belt, or adding lightweight aggregates into the mixer with additional water prior to adding cement and other raw materials.
2. White cement – white cement may be more likely to lose workability as temperatures rise. Use of a retarding admixture, like **ProCast™ 710**, is strongly recommended during hot weather conditions.
3. Face mix – the smaller volume of face mix compared to the base mix means that it is essential to calibrate the batch size and timing of the base and face batches. Smaller face mix batches are often helpful.
4. Smaller units - like *twinkies*. Compromised feed and fill make it harder to fill smaller mold cavities.
5. Blends – as mixed materials sit in their individual hoppers they may begin hydrating and stiffening before there is time to place them in the mold cavity.
6. Mixes with a high percentage of fines, like face mix, have a naturally higher water demand due to the higher aggregate surface area, and may be harder to mix and hydrate properly.

What can we do to mitigate the negative effects of heat on concrete and equipment?

- Keep raw materials as cool as possible. Add shade over aggregate bins.
- Use a retarding admixture, like **ProCast 710**, to slow down the cement hydration reaction, and gain more time for mixing and molding operations.
- Adjust mixing time and machine settings. Your ACM Technical Services Representative can advise you on how to do this if needed.
- Expect more buildup on boards, molds and equipment and implement measures for routine cleaning and maintenance.
- Install a board scraper and use a board cleaner product, like **BoardShield™**, to condition and clean boards.
- Use a metal cleaner, like **ProClean™**, to condition and clean the mixer so that concrete buildup is reduced and the mixer is easier to clean.
- Try to minimize air movement over raw materials and fresh concrete in the plant. Air movement aids moisture evaporation from raw materials and product surfaces.

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When is it too hot to make concrete?

Good question! That's hard to put an exact number on, but if hot weather is preventing you from meeting your QA/QC performance targets, then it is time to consider implementing some of the measures we mentioned above.

How can I learn more about cement hydration?

ACM has a Learning Center on our website with many tools to help dry cast producers with daily production needs. We have two free learning tools, available 24/7 on our Learning Center, that are focused on cement hydration.

- **Concrete 101 – Cement.** A 15 minute video on the basics of cement
- **ACM Academy – Cement.** A one hour webinar for concrete professionals for a deeper dive into cement chemistry.



Use the QR code to access our Learning Center

Who should I contact if I have questions?

Your Technical Services Representative can assist you with questions about all aspects of concrete technology. Please reach out to them directly, or call our office number below.

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