

Jobs Don't Stop When the Temperature Drops



Don't let cold weather slow down your pour.

As we head into winter, understanding cold weather concreting will keep the jobs going and the crete flowing. Concrete is often the foundation (literally) of any project, so the job's got to get done in any sort of weather. Knowing how to pour, protect, and cure in frigid temps will help keep your job and budget on track.

Extreme Weather Conditions

When talking temperature, cold weather is defined by the American Concrete Institute (ACI) as when the average daily air temperature falls below 40° Fahrenheit (4° C) for three consecutive days. So, when the mercury dips, poured concrete must be protected until it can handle the cold on its own.

Concrete is less affected by cold weather when it reaches



a minimum strength of 500 pounds per square inch (PSI). Obviously, concrete sets more slowly when it's cold and if it freezes before it gains the 500 psi strength, it will lose strength and can actually break apart.

Once at full strength though, the slab will have absorbed enough of the water from the original mix that there's no water left to freeze; thereby preventing potential damage to the concrete. Getting the concrete to the magic 500 psi number takes a little time and attention.

Know Your Temperatures

Concrete in its plastic form will freeze when its temperature hits 25° F. So, while you're keeping an eye on the outside temps, it is also important to know what's happening inside the concrete. If the plastic in the concrete freezes, durability suffers and strength can be reduced by 50% or more.

When the slab has a low temperature, it slows down setting time and can affect strength. A drop in concrete temperature of 20% can double your set time. This adds time to overall placement, finishing, curing, and form removal time. Cold crete adds time and cost to your project.

Ready Mix Can Warm Things Up

We're not suggesting using hot cement, but concrete producers can use hot water in their ready mix when the temperature dips. Getting that perfect mix of water to aggregate out of the drum is vital—a typical temperature for concrete leaving the plant is 65° F.

Requesting ready mix with a slump of less than 4 inches (optimal for pumping) and air entrained concrete can also improve the durability in harsher environments, like cold weather. The higher the slump, the wetter the mix – which means more chance of freezing. If your slump is too low you may have problems pumping. So shoot for the lowest workable slump to reduced bleed and set time. Less time to set = less time to freeze.

One contractor makes a great point:

"You need to totally know and understand the mix you are working with whether it be in hot or cold temperatures. Most structural concrete used today has very little to no water and is primarily a chemical mix." Chemical admixtures and accelerators can be added to speed up set time in cold weather. Adding 2% calcium chloride by weight of cement to the ready mix is a

common winter practice for a speedier set time. Non-chloride accelerators can also be added but are a bit more expensive. With accelerators, you still need to take measures to keep concrete from freezing but you may be able to reduce your time spent out in the cold watching your wet concrete cure.

Cold weather concreting is a balancing act of keeping the concrete wet – while preventing it from freezing, and dry enough to properly cure – but not too dry. Curing with



surface water will create an ice rink. Overly-dry concrete will cause its plastic particles to shrink and crack. Balance is key.

Protecting The Slab

Once poured, concrete can take 24-48 hours to gain that full 500 psi compressive strength it needs to be strong. As it cures, it's going to need a warm blanket to keep out the cold. There are several ways to shield the pad from elements, including windbreaks, enclosures, and/or sheeting. Site conditions, site size, and project budget will determine which method to use.

A windbreak will provide some protection for workers as well as your curing concrete. Site conditions will dictate the size of windbreak; typically a six-foot high break will block out wind.

Heated enclosures are the most expensive option, but we are talking temperatures below 40° so if it's in budget, your workers will thank you. Heated enclosures can be made of wood, polyethylene, canvas, etc. and use direct fired, indirect fired, and hydronic systems to heat the space. Think of a big ice fishing shanty placed over your job – without the fishing.

Once poured, the concrete itself can also be covered with impervious plastic sheeting, tarps, or insulated blankets. These options help keep you from troweling frozen concrete with a Zamboni (Go Badgers!). This protection from winter's elements as the concrete is finished and curing is crucial. If wood forms are being used, leave them in place as long as possible—up to seven days—

to help keep whatever heat is trapped in there and to prevent drying.

Cold Weather Curing

So, now your concrete is curing. In normal weather, normal curing rules apply. In cold weather, there are different rules. While the curing process does need moisture, don't freeze the concrete with water, especially in the first 24 hours. As mentioned above, keeping the concrete comfortable with blankets or other heating methods is vital to getting the most out of your slab.

Curing time can be based on use. For projects that will carry earlier or heavier loads, the concrete temperature should remain at least 50° F for up to 20 days to be able to handle the eventual structure. In comparison, concrete not exposed to cold weather can cure in as little as one day.

Once your concrete is adequately cured, don't rush to take off forms or other protective measures. Rapid cooling can create more cracking. Gradual cooling practices include first loosening forms while leaving your insulation (plastic sheeting, blankets, etc.) on for a bit or slowly decreasing the heat in an enclosure. A gentle nudge out into the cold is better than an icy shock to the system.



Winter is Coming

Even as winter hits, the jobs must go on. Cold temps in the air and in the concrete must be accounted for when pouring your next job. Understanding cold weather concreting best practices and techniques will keep the drums spinning and the jobs coming. Don't get left out in the cold.

For more info on Cold Weather Concreting:

<https://www.cement.org/learn/concrete-technology/concrete-construction/cold-weather-concreting>

To view the online article go to:

<https://news.whitecap.com/cold-weather-concreting/>