



TECHNICAL ARTICLE

CTS Cement Manufacturing Corp. January 2021



CONCRETING IN THE COLD? NO PROBLEM.

For cold weather concrete, Rapid Set® cement products bring best results



Slab replacement on route 31

Despite the chill in the air from temperature plunges, concrete can still be safely placed as long as adequate precautions are implemented. By the time a concrete mix reaches the jobsite, the weather conditions may be vastly different from when the mix was selected. All it takes is proper planning for successful cold weather concreting. Taking the right precautions and making the switch to Rapid Set Cement products allow for quick and successful cold weather concreting.

WHAT IS CONSIDERED COLD WEATHER?

Cold weather concreting is defined in American Concrete Institute's Guide to Cold Weather Concreting (ACI 306R-16) as when "for more than three successive days the average daily air temperature drops below 40 degrees Fahrenheit and stays below 50 degrees Fahrenheit for more than one-half of any 24-hour period."

Concrete sets slower in cold weather. It starts slowing down below 50 degrees F and then

when the temperatures fall below 40 degrees F, the hydration reaction normally stops. The problem is at that point, the concrete isn't gaining any strength. The concrete needs to quickly reach 500-psi compressive strength so the cement will have consumed enough water in the mix to prevent damage caused by freezing.

To help the concrete reach 500-psi strength in cold weather, here are some important tips:

- Heat water to 140 degrees or more and heat aggregates in extremely cold temperatures.
- Avoid frozen subgrades—heating blankets can be used to thaw and warm substrates prior to installation.
- Use heating units, insulating blankets and enclosures after the pour.
- Use heat curing boxes for test cylinders.
- Maintain proper temperatures throughout set times.



Rapid Set Cement products allow for quick and successful cold weather concreting.

WHY FOLLOW THESE GUIDELINES?

If cold weather concreting best practices are ignored, the result is loss of strength and surface degradation. While tight construction schedules are always an issue, long-term concrete durability is more important. Freezing of freshly placed concrete can seriously reduce its strength and other problems often appear in the springtime, such as flaking, scaling, pock marks and other surface blemishes.

A LOOK AT RAPID SET CEMENT AND PORTLAND CEMENT

Because Rapid Set Cement reaches opening strength for traffic in a few hours, contractors don't need to blanket the concrete as long when compared to using portland cement concrete. With portland cement, opening strengths may not be reached for days in cold weather and it requires blanketing the entire time. Even a Type III cement may not hit opening strengths for 24 hours, so



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again, blanketing and traffic control would be required the entire time. This delays the traveling public and also affects safety on the road. The longer construction barrels are out on a roadway, the more likely there is to be an accident. While contractors still need to blanket Rapid Set Cement concrete in extreme cold temperatures, the blanketing process is only hours, not days.

With Rapid Set Cement, the return to service is quicker than when using portland cement. Contractors still use the same cold weather concreting procedures; they just don't need to take the precautions for the length of time that portland cement concrete requires.

RAPID SET PRODUCTS USED IN COLD WEATHER PROJECTS

Google Fiber Micro-trenches

When Google Fiber was being placed in Salt Lake City, micro-trenches measuring 2 inches wide by 9 inches deep were cut into pavement. After conduit was placed, the trenches required backfilling. However, the 2-inch-wide trenches were too narrow to easily backfill with concrete. The solution was CTS Flowable Fill. Sixty cubic yards of Flowable Fill (4 tons of Rapid Set Cement) were used, mixed with a volumetric mixer, and requiring no finishing or curing.



CTS Flowable Fill used to fill micro-trench for Google Fiber

The micro-trenching work occurred between February 12 and March 2, 2020, when Utah was still experiencing winter weather. Not only did Flowable Fill flow well into the trench's small space, but it set up quickly despite the cold weather, achieving the specified requirement of 500 psi in 28 days, with 1/2 maximum strength at opening, which was achieved in a few

hours. Achieving the specified opening time to traffic would not have been possible with conventional portland cement flowable fill. Because of the severe winter temperatures, portland cement concrete would have taken days to gain structural strength.

Salem End Road Bridge Repairs

Salem End Road Bridge, which spans the Stearns Reservoir, was originally built in 1870, then rebuilt in 1927. Over time, the concrete became severely deteriorated. Concrete repairs were performed to extend the useful life of the bridge.



Pouring heated DOT Concrete mix on Salem End Road Bridge

DOT Concrete Mix, a fast-setting concrete repair mix, was used for the repair areas. For the repair, materials were mixed in a Hippo mixer and poured in five separate placements. Weather conditions during the late-summer, early-fall time frame were extreme and ranged from 90 degrees F to 10 degrees F. Mixing water had to be temperature-adjusted to suit the environmental conditions, with the desired temperature of the mix (as it left the mixer) at 60 degrees. During hot weather, ice water was used to cool the mix and during cold weather, a hot water heater was used to bring the water up to the appropriate temperature.

Rt. 31 Slab Replacement

Contractor J. Fletcher Creamer & Son was asked to replace bridge approach slabs on Rt. 31 in Hopewell, N.J. The contractor was already doing utility work on the bridge and the slabs needed to be replaced. The work was performed on November 18 and 19, 2020. The temperatures varied between 18 degrees F and 49 degrees F. The project included approximately 100 cubic yards of Rapid Set DOT Cement concrete. It was

mixed in volumetric mixers using hot water and aggregates that were protected from the extreme cold. The strengths averaged 3810 psi after 3 hours, 4900 psi after 6 hours and 5215 psi after 7 hours. The high early strengths allowed the concrete to be exposed to freezing temperatures that portland cement concrete could not handle.

Pier Repair in Harsimus Cove

Over time, a substantial amount of damage had occurred to the pier in Harsimus Cove, Jersey City, New Jersey. Precast was brought in for the repairs and there were height elevation differences. To fix this, Rapid Set Mortar Mix Plus (MMP) was used. The repairs were all made in December 2018 during winter temperatures varying from the mid-30 degrees F to the upper-40 degrees F. To perform the repairs in the cold weather, the water was heated and the MMP was mixed in a Hippo mixer. The big advantage to using CTS products for this job was that the relationship was already established with both the distributor and the customer, so they knew Rapid Set MMP would work well for these weather conditions.



Fixing elevation differences at the Pier in Harsimus Cove

SUMMARY

Using Rapid Set Cement products can produce better results on projects that take place in cold weather. They achieve fast early strength and can meet tight construction windows, even in cold weather conditions. See [our video](#) about using Rapid Set Cement products on your next cold weather project. For more information, visit www.ctscement.com.