

Cold Weather CONCRETING

A new chemical admixture takes the heating and hoarding headaches out of cold-weather concreting as Dominion Construction erects two buildings.

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Cold-weather concreting isn't what it used to be for Al Brunette, construction manager for Dominion Construction Company Limited in Toronto. Gone are the costly headaches of heating and hoarding.

Winter conditions

Since turning to chemical admixtures, Brunette has been able to complete winter-condition concrete jobs faster, easier and cheaper. Likened to an "antifreeze for concrete," the admixture prevents the concrete from freezing without the nuisance of supplementary heat, and enables it to reach full strength quicker.

Brunette has recently completed two jobs using Pozzutec 20, a chemical admixture introduced by The Master Builders Company Limited in late 1986. More than a little impressed by the product, he boasts that "basically, it gives you summer weather pouring in winter conditions."

No heat or hoard

Cold weather has often meant delays for building contractors. Pouring concrete required additional time and expense for hoarding (erecting housing around newly-poured sections) and

heating to ensure proper curing. Slabs and forms had to be covered with insulated blankets, but the concrete still took longer to reach full strength.

Brunette, a veteran of cold-weather concreting, has had to rely on heating and hoarding in past winter jobs. Winter means challenges for Dominion, which erects many of its buildings using the 'tilt-up' method. A slab on grade is poured first, for the floor. Once the slab has hardened, forms are laid down on the slab and the wall panels are poured. Later, the panels are tilted up, or hoisted into place. Curing the concrete quickly is essential to the process.

High strength

Dominion first used Pozzutec 20 in November when pouring a 2,787 m² slab and corresponding wall panels for the Palco building in Brampton, Ont., northwest of Toronto. Temperatures varied from 5 degrees Celsius to -4 at night, recalls Brunette. "Normally, finishing within that range of temperatures would take about 18 hours."

At the Brampton site, however, Dominion used a mixture of 4.69 litres of

Pozzutec per 100 kg of cement. Without heat, hoarding, or insulated blankets, "we were able to get on there to float it in about one hour," says Brunette. "We walked off, and were able to steel-trowel finish it in five hours. We didn't have to cover that slab, or protect it – even though it went down to -4 Celsius that night."

The addition of Pozzutec 20 enabled Dominion to use a high cement mix – a water-cement ratio of just .38 – and still get "full design strength in 10 days,"



A Dominion Construction worker spreads concrete for a tilt-up building slab, despite sub-zero temperatures.

despite cold temperatures.

As the mercury dipped, Dominion went to Pozzutec 20 again for a building construction project at the corner of Keele St. and Finch Ave. in Toronto. Work was carried out in early December, and this time a super-plasticizer, Rheobuild, was also added to the mix at Toronto's Custom Concrete batch plant.

Panels were poured on top of the slab on grade, which was a chilly -2 Celsius. The concrete "was coming in at 17 degrees Celsius, and this time 5.65 litres per 100 kg of cement were used," says Brunette. As well, an insulating blanket with an R-4 insulation value was used to cover the setting panels. Again, no heat or hoarding was used.

Unbelievable strength

For tilt-up construction, strength is essential. At the Keele-Finch job, panels measuring 7.62 by 6.09 meters had to be hoisted into place. Those are large, heavy panels, notes Brunette, and "we need that 30 MPA strength. Pozzutec 20 is perfect in the cold weather, because it gives me the strength I require, with no heat and hoard."

"With normal cement, the design (strength) on this mix would be 30 MPA (Mega Pascals) in seven days. We need that strength, because we lift the panels right away. But here, we were coming in with strengths of 51.5 MPA in seven days. They were unbelievable strengths."

Substantial savings

Brunette calculates his savings at \$38 per cubic meter for a total of 2,000 m³. He estimates he spent between \$12 and \$13 per cubic meter extra for additives, but saved \$50 to \$60 per cubic meter on other costs.

"Normally, I would spend \$50 to \$60 per (cubic) meter to heat and hoard these. I save material, heat and hoard, and labour, which all comes to about \$50 a meter. That's a savings of \$38 per meter – a substantial amount of money."

Structural applications

Brunette is already looking to Pozzutec 20 for his next winter pouring job. "Now that I'm getting such high strengths, I'm looking at cutting back on my cement content and saving even more money."



Use of a chemical admixture, Pozzutec 20, enables Dominion Construction crews to pour concrete despite winter conditions. The chemical enables pouring in temperatures down to -7 degrees Celsius.

Master Builders' John Smolyn says the work carried out by Dominion represents "the greatest exposure, so far, in this area" for Pozzutec 20. While the product was used in a parking lot project in Brampton last spring, the work by Dominion represents the first structural jobs carried out with Pozzutec 20 in Ontario. The product has seen limited use in other parts of the country.

Smolyn claims the addition of Pozzutec 20 to cement mix (it can be added at the mixing plant) yields concrete with three-day strengths of 20 to 23 MPA. When a super plasticizer like Rheobuild is added, he adds, strengths "jump up by another 15 to 20 MPA."

Non-chloride product

Strength gain is essential for contractors, says Don Lamb, an engineer for Master Builders. "If strength gain is slower, he can't go on to his next step in construction, whether it be flying the form, or doing the tilt up, or whatever it is – and that creates problems."

Another plus for Pozzutec is that it is a non-chloride admixture, says Smolyn. "A lot of engineers, developers and owners do not want calcium chloride used in their concrete now, because of

the oxidization. The MTC (Ontario Ministry of Transportation and Communications) won't allow chloride, structural engineers won't allow chloride. Calcium chloride is taboo with engineers today."

Bottom line

While there are other non-chloride accelerators available, Smolyn says Pozzutec 20 is the only product that will, if you use enough, prevent concrete from freezing down to -7 degrees Celsius. Master Builders guarantees Pozzutec's performance down to that temperature.

The admixture will not prevent concrete from freezing unless the required dosage of 3.7 to 5.7 litres per 100 kg is used, notes Lamb. The product costs about \$2.30 to \$2.40 per litre.

But for Brunette, the cost of the admixture is a small price to pay. The bottom line, he says, is that Pozzutec 20 takes the chill out of winter concrete work.

"We're definitely sold on it, there's no question. We'll be using it in this industry as long as we can and in any application we can." □