



Remote, real-time temperature gradient monitoring with *intelliRock* saved 1,000 man-hours on the Intercounty Connector project.

Temperature data from *intelliRock* prevented overheating the concrete, reducing fuel costs while improving the quality of the concrete.



Maryland's Intercounty Connector project

The intelliRock system enabled remote, real-time monitoring of each pour, saving hundreds of man-hours. Temperature data provided by this system prevented overheating of the concrete, which reduced fuel costs. These savings of time and money translated into improved concrete quality.

The Situation

Mass concrete pours in cold weather create challenges, among them temperature monitoring for compliance with winter curing specifications and providing proof of that compliance. There is also a safety issue of having to send someone out to a precarious perch in dark, icy conditions to retrieve temperature data at the prescribed intervals. Finally, there is the matter of having this data soon enough to react when temperatures are approaching specification limits. All of these challenges existed on the Intercounty Connector project and were resolved through the use of the Engiuis *intelliRock* II Concrete Temperature Monitoring System.

The Intercounty Connector (ICC) is a joint project of the Maryland State Highway Administration (SHA), the Maryland Transportation Authority (MdTA) and the Federal Highway Administration (FHWA) to link existing and proposed development areas between the I-270/I-370 and I-95/US 1 corridors. These corridors span a growing and economically vibrant two-county region in the Washington metropolitan area with an approximate population of 1.6 million people.

The ICC project will address some major mobility challenges of this heavily congested area. Contracts worth \$1.5 billion are underway to build 17.9 miles of the ICC, including a seven-mile section being built by MD 200 Constructors, a joint venture comprised of Kiewit, Corman and Wagman. One of Process Control Manager Sean McAfee's challenges was temperature management for the mass concrete pours of the columns and caps on the mainline bridges.

Measuring compliance with temperature specs

Many of these pours occurred during cold weather, requiring McAfee to maintain the concrete temperature above 50 degrees Fahrenheit for seven days after a pour to comply with ACI 306r winter curing specification. McAfee was contractually required to review and log the temperature differential on these pours in four-hour increments for seven days following each pour. For the ICC job, he used *intelliRock* to alert him via email if the pour exceeded a 28-degree differential or the 150-degree internal temperature.

McAfee previously used *intelliRock* on other projects, including a recent Chicago O'Hare Airport runway project. The *intelliRock* system features Loggers that measure and record the temperature profiles and gradients of in-place concrete. For the ICC project, McAfee placed six Loggers in each column and three in each cap, then used the *intelliRock* wireless system to collect the temperature data directly from the Loggers in each placement, storing it on one of the project's PCs.

Remote monitoring saves time and fuel

"We had to pour concrete all through the winter," said McAfee. "We placed Loggers in all the placements and used the *intelliRock* wireless system for all the bridges to transmit the temperature data to a computer on my desk. With the wireless capability, we were able to reach Bridge 30, which was approximately 2.5 miles away, and by utilizing a repeater on top of our noise berms, we could relay the signal another 2.5 miles. Anybody on the job, including the owner, could check temperature at any time. Even with three-feet of snow on the ground, it was easy to monitor temperature in the placements. Using a remote-desktop system, I could do it from home or any internet-connected PC. This was a significant safety benefit because we didn't have to send

crews out at all hours to climb ladders, remove blankets and check temperatures manually or with handheld devices. This remote monitoring saved us a lot of man-hours because we didn't have to pay an extra person to do it." McAfee estimates 1,000 man-hours were saved on the project through the use of the *intelliRock* system.

Because so much concrete was poured during cold weather, McAfee had crews running heaters to keep the concrete at the proper temperature. "We used the *intelliRock* data to create graphs based on heated concrete under blankets," said McAfee. "With these graphs, we could determine how much fuel was needed to maintain the desired temperature. This kept us from overheating the concrete or using too much fuel."

Improved concrete quality & owner relations

The *intelliRock* system sent email alerts to McAfee if the temperature on a pour dropped below specifications. "If anything went wrong with a pour, we knew about it immediately because of *intelliRock*, not the next day. This allowed us to get right on the problem and fix it. Having live data helped us improve the quality of the concrete because we could make changes to heaters and blankets to keep our placements within specifications on temperature differentials. The system also helped us establish great owner relations. Their trust in the project temperature data was never an issue with the owners because the *intelliRock* system is locked."

McAfee's advice for doing mass concrete pours is simple. "For the first bridge on this project, we were using a handheld temperature reader and writing the data on a pad. This wasted our people's time. Start out with the right monitoring equipment. When you understand how live temperature data helps improve concrete quality and owner relations, the *intelliRock* system makes a lot of sense."

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– Sean McAfee, Process Control Manager, MD 200 Constructors