

Open Roads Sooner with Concrete Curing Sensors

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Road construction can be a lengthy, disruptive process—so ensuring your project stays on schedule is one of your most important responsibilities.

Even before any groundwork can be completed, the planning stages of some roadways can take months of soil analysis by engineers. Public consultation can also be a factor in road-building plans. These activities are crucial in defining the scope of the project and estimating potential risks.

Once the planning stage is complete, contractors bid on the job. With a winning bid selected, further land surveying begins. Geographical obstacles are removed, and the foundation of the roadway can be cut, filled, and compacted with different layers of soil and aggregate material. This ensures that the pavement will have a stable surface to sit on.

At this point, drainage systems and electrical infrastructure can be put in place before the pavement material is laid.

Asphalt is the chosen pavement material for many road construction projects due to its low cost—but concrete is becoming increasingly popular for a number of reasons:

- Concrete is rigid, so it withstands greater traffic loads for longer.
- It's more weather and chemical resistant than asphalt.
- Asphalt's binding ingredient is bitumen—which is derived from crude oil and releases toxic chemical fumes as it cures. Concrete has less impact on the environment.
- Its overall durability means much lower maintenance costs over time and longer life cycles for finished roadways.

In short, concrete roads are a better long-term investment.

What about Concrete Testing?

One thing traditionally seen as an obstacle with concrete is the need for concrete cylinder testing. This requires samples of various mix designs to be cured and tested for compressive strength, as outlined by

ASTM and AASHTO T 22 Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens.

Whether these samples are cured onsite or in a laboratory, they need to be tested in a third-party lab. As a project manager, this can be frustrating as the testing schedule is completely out of your control. Waiting for samples to be picked up, tests to be run on them, and for results to be communicated are all steps that can create significant delays for your crew.

According to Plangrid and FMI, 35% of construction professionals' time is spent (over 14 hours per week) on non-productive activities including looking for project information, conflict resolution and dealing with mistakes and rework.

In the already unpredictable world of construction, adding the additional variable of a third-party lab to test your concrete strength can feel like a significant sacrifice. It can push a lot of contractors building roads to choose the cheaper—albeit shortsighted—solution of paving with asphalt.

But there's a better way.

Concrete maturity testing using curing sensors

Maturity is a non-destructive approach to testing concrete that allows you to estimate the early-age and compressive strength of in-place concrete in real-time. Adopting the maturity approach in your jobsite eliminates the need for concrete cylinder break tests, allowing you to greatly optimize your schedule.

ASTM C1074 is the standard for concrete maturity. AASHTO T 325—Standard Method of Test for Estimating the Strength of Concrete in Transportation Construction by Maturity Tests—provides procedures for estimating concrete strength in roads, bridges, and other transportation structures through the use of a maturity index.

Both standards require that the mix design is calibrated for maturity testing. ASTM and AASHTO have slightly different requirements (ASTM C511 vs AASHTO T 276), so make sure you are clear about which standard applies to you based on your location. Each state has its own Department of Transportation with unique specifications, so make sure you familiarize yourself with any applicable rules.

After your concrete mix is calibrated for maturity testing, you can use wireless concrete curing sensors to test the maturity of your in-situ slab and monitor the strength of your poured concrete onsite, in real-time!

How will the maturity method save you time on road-building projects?

Opening roads to traffic after construction is complete is one of the highest priorities in terms of meeting project deadlines. Even just opting for lane closures can be extremely expensive due to costly penalties for delays—so the sooner you can open roads, the better!

The U.S. Department of Transportation Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects FP-14 outlines that new or restored roads can't be opened to traffic sooner than 14 days after the slabs have been placed unless they reach a Compressive strength of 4000 pounds per square inch (28 MPa).

Sometimes, concrete strength can surpass that threshold sooner than the 14-day mark, but AASHTO T 22 requires break testing. Also, if the strength threshold hasn't been met by the 14-day mark, break test intervals can extend well past 14 days.

If—before your slab is poured—you install SmartRock™ sensors on the formwork, you and your crew will be able to monitor the strength of your concrete in real-time as it cures, from the SmartRock Mobile App. Depending on your mix design, this could enable you to open roads to traffic much sooner.

As of 2017, the Colorado Department of Transportation requires maturity testing for the opening of bridge decks and concrete pavement to traffic. In Texas, Alabama, Florida, Idaho, Iowa, Kansas, Minnesota, Missouri, Montana, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Utah, Virginia, Washington, West Virginia, and Wisconsin maturity testing is becoming a normal requirement across many applications.

C.L. Heilman began work on a major new interchange north of Coeur d'Alene, Idaho. The project involved a 138 foot, four-lane bridge spanning the U.S. 95 and a two-lane, 250-foot bridge spanning the Union Pacific railroad track.

"It's always been an option to use the maturity curve, but in 2018 the Idaho Transportation Department made it mandatory for Highway Construction projects to perform maturity testing in accordance with ASTM C1074 to confirm compressive strength for form removal and loading," says Heilman.

Heilman estimates that SmartRock saved half-a-day per pour for every pour that was on the "critical path." The IDT interchange project involved over 20 pours. Over a two-month period, Heilman says "I'd say we shaved five-to-ten days off the schedule by using SmartRock...and completed the work 10 to 15 percent faster."

Take control of paving projects

If you build concrete roads, you've undoubtedly experienced project delays because of concrete cylinder testing. If you switch to testing concrete strength with SmartRock and the maturity method, you'll be able to obtain data regarding the curing and hardening of your concrete elements—onsite or remotely, in real-time.

From the moment your crew pours its first slab, you'll have access to all the information you need to open roads to traffic ahead of schedule.

Source: Giatec Scientific Inc.