Monitoring the temperature of your pour after placement is one of the most important steps in the construction of a concrete structure. That is why ensuring optimal curing conditions for your element is critical, especially during extreme weather conditions. The hydration process can be drastically impacted if freshly placed concrete is exposed to temperatures that are too high or too low, compromising the strength development of a mix design. Furthermore, if the temperature differentials are too high, thermal cracking can occur. By closely monitoring temperature variances in your concrete element during curing you will ensure that the strength, quality, and durability of your structure is acceptable.

When monitoring concrete temperature, one of the most common methods that is used is thermocouples or wired sensors. The end of the thermocouple is placed at a specific location prior to the pour and wired outside of the formwork. Depending on the type of system, thermocouples are attached to a data logger which is used to record the temperature at a certain time interval. Another variant to the wired systems is a data logger/transmitter which sits outside the concrete in the form of a box connected to a number of temperature sensors. The transmitter uploads the data to the cloud server using wireless or cellular transmission technology. However, with these devices the time it takes to gather, record, and analyze data is very labor intensive.

For this reason, game-changing wireless systems, like SmartRock™, are being used on jobsites more often. With this method, temperature data is gathered, recorded, and analyzed entirely in an app. Not only does this save time, it also reduces labor costs.

Learn more about the benefits of wired vs. wireless sensors for temperature monitoring [Here](https://www.giatecscientific.com)

**How Do Wireless Concrete Temperature Sensors Work?**
During installation, wireless temperature sensors, like SmartRock™, are attached to the rebar before the concrete pour. Once the wires are twisted together around the rebar the sensor is activated and begins logging data. To access this data, someone must go onsite with their mobile device and connect to the sensors using the app (available on Android and iOS) where it is updated every fifteen minutes for a two-month period. Connecting to the sensor and uploading the data is done automatically in your app once you are within 26 feet (8 meters) of any sensor. The sensors’ battery remains active for an additional two-months in case additional data is wanted.

This method not only allows for highly accurate data to be collected and reported, it also enables project members to make appropriate and well-informed decisions onsite regarding the temperature of their element during the curing stages of the project.

Since the system is completely wireless, temperature data can be accessed from any smartphone device or tablet through Bluetooth communication. These wireless capabilities allow for more freedom and security by removing the risk of damaging wires, mislabelling sensors, and general human-error associated with data acquisition and interpretation. Throughout the data gathering process there is no need for last-minute repairs or adjustments once the sensor is placed in the concrete. The installation process is fast and simple, enabling nearly anyone onsite to implement temperature monitoring.
Look at this simple three step process for installing wireless SmartRock temperature sensors:
**SmartRock™ QuickStart Guide**

1. **Add Sensor**

   Twist wires together to activate sensor.

   To add sensor in the mobile app, select:
   - New Project
   - New Section
   - New Sensor
   - Select your sensor > Name > Done

   Untwist the sensors' wires to preserve battery and memory.

2. **Install**

   Install on the top of a **rebar intersection** with the white label facing the surface of the concrete.

   Install **less than 2 inches (5cm)** from the surface of the concrete.

   Tightly twist the two metal wires together to activate.

3. **Secure**

   Secure the sensor using **tape** or **plastic zip ties** so it doesn't rotate.

   **Run the temperature cable along the bottom of the rebar and secure***.

   *Avoid using metal rebar ties as they can damage the temperature cable.*

   **Questions?**
   support@giatec.ca    +1(877)497-6278
Download the full instructions for installing SmartRock [Here](https://www.giatecscientific.com)

**Additional SmartRock Features**

**Giatec 360: Web-Based Cloud Dashboard**

Giatec360 is a web-based cloud dashboard where users can readily access all their project’s data in one place. The application allows you to monitor progress on multiple projects at the same time. This includes advanced analytical features such as; temperature gradient analysis and threshold settings. These features create a robust all-in-one product which enables project managers to generate reports and share data with ease, while receiving vital updates on the curing conditions of their in-place concrete.

[Learn more about Giatec360](https://www.giatecscientific.com)

**Collect and Access Data Even Easier with the SmartHub™ Remote**

https://www.giatecscientific.com Monitoring Concrete Temperature with Wireless Sensors
Monitoring System

With the addition of the SmartHub remote monitoring system, users can access temperature data from anywhere without needing to be onsite. The Hub automatically collects data recorded by your SmartRock™ sensors and uploads it to the Giatec360 cloud via LTE/Wi-Fi connection. This minimizes delays and saves you from wasting time and money by having an unnecessary number of workers on your jobsite to collect data to be analyzed.

Learn more about SmartHub Here

Practical Applications for Wireless Temperature Concrete Sensors

Temperature Monitoring for Mass Concrete Elements

Temperature gradients refers to the difference in temperature of measured sections of your concrete element, such as the inner core compared to the surface. Temperature gradients in mass concrete elements require continuous monitoring during curing and must adhere to a thermal control plan, as outlined in a project’s specifications. ACI 207.2R-07: “Report on Thermal and Volume Change Effects on Cracking of Mass Concrete,” provides guidance on calculating the maximum allowable temperature differences based on the properties of the concrete and specifications for a structure to prevent thermal cracking. Typical gradient temperature thresholds are in the range of 20°C (35°F).
SmartRock sensors come in two lengths to aid in monitoring both the core and the surface of mass elements. The real-time monitoring and data management provided by this product line assists in controlling information and decision-making for the curing process. Furthermore, the addition of temperature gradient thresholds enables project members to receive automatic push notifications in the Giatec360 dashboard. Also, if team members are not present on-site the Hub will enable them to receive real-time updates on the status of in-place concrete.

**Cold Weather Concreting**

Concrete production costs are increased to accommodate cold weather conditions. High costs associated with hoarding include manpower to erect the structure, materials and enclosure heating. Concrete producers will employ temperature safety measures by heating aggregate and water, which typically utilizes steam to generate acceptable batching temperatures. ACI provides recommendations for temperature and relative humidity of enclosures, with ideal conditions being 10°C (50°F) and 40% respectively.

By providing added value in determining optimum heating conditions, SmartRock sensors allows you to create the ideal curing conditions for your projects. This can drastically reduce costs associated in the hoarding process. Added precautionary measures can be secured through our Giatec360 dashboard, which allows the user to set temperature thresholds. When temperatures exceed these set parameters a push notification will be sent to project members. More information on concreting in cold weather conditions is specified in ACI 306R-16 Standard Specification for Cold Weather Concreting.
Read these 7 tips for monitoring temperature while during cold weather conditions [Here](https://www.giatecscientific.com)

**Hot Weather Concreting**

During the hot weather months temperature and thermal conditions need to be constantly monitored to ensure proper concrete placement. Project specifications outline the maximum allowable delivery and curing temperatures of your element. The purpose of limiting the maximum temperature is to ensure the concrete has enough moisture for the hydration process so that the concrete performs well. There are many temperature reduction precautions that can be taken to achieve optimal curing. This can be done, for example, by adding ice and cooling aggregates in a batch. More information can be found in ACI 305.1-14 “Specification for Hot Weather Concreting”.

During hot weather concreting, SmartRock provides added insight into the curing cycle of your element. With the ability to generate temperature data in real-time you can see how your concrete is curing. This allows you to proactively determine if any cooling solutions are needed to contain how your concrete is curing.

**Using wireless temperature sensors onsite**

![Concrete construction site](https://www.giatecscientific.com)

SmartRock sensors have been successfully implemented on numerous projects with outstanding results. An example of project success comes from Graham construction, a general contracting company based out of Calgary Alberta. During the construction of a 130-million-dollar transit facility in Edmonton, the lead superintendent, Frank Hoffmann,
decided to exclusively use SmartRock sensors for temperature monitoring. Being very user friendly, the team was able to eliminate the need to have a dedicated lab technician to monitor temperature. Eliminating the need for specialized labor ensured the project could control costs, obtain accurate results, and efficiently report real-time data to the project members.

It was very easy and self-explanatory. No need even for training. It took me 30 minutes to install 10 sensors. Anyone on my jobsite could do it.

- Frank Hoffman, Superintendent, Graham Construction

**Following Industry Standards with SmartRock Temperature Sensors**

- ASTM 1064 Standard Testing Method of Freshly Mixed Hydraulic Cement
- ASTM 1074 Standard Practice for Estimating Concrete Strength by the Maturity Method
- ACI 207.1 R-05 Guide to Mass Concrete
- ACI 207.2R-07 Report on Thermal and Volume Change Effects on Cracking Mass Concrete
- ACI 301-16 Specifications for Structural Concrete
- ACI 305.1-14 Specification for Hot Weather Concreting
- ACI 306R-16 Guide to Cold Weather Concreting
- CSA A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

**Learn more about SmartRock wireless temperature sensors Here**