

## Why It's Important and How It's Done

In recent years, the development of large concrete structures has become increasingly common due to its many structural benefits. Concrete presents a number of characteristics that improve the sustainability performance of a structure. Not only does it offer advantages regarding sustainability due to its low carbon emission during the construction phase, but it also offers durability and increased structural capacity, as well as resistance to fire and flooding, and optimal sound isolation. One of, if not the most important factor when it comes to mass concrete elements is temperature monitoring.

## What is a Mass Concrete Element?



Mass concrete is categorized as any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat hydration of the cement and attendant volume changes to [minimize cracking](#). When it comes to large bodies of concrete, one of the most important characteristics is thermal behavior. For mass concrete projects such as buildings, dams, bridges, tunnels, etc., the rate at which the heat is generated is higher than that of which it is released causing the overall temperature to increase over the duration of the curing stage.

Due to the slow release of heat from concrete during this stage, and concrete's low conductivity, mass concrete can experience gradients in temperature and a portion of heat can become trapped in the center of the mass concrete element, which can cause a slow release of the heat and lead to cracking.

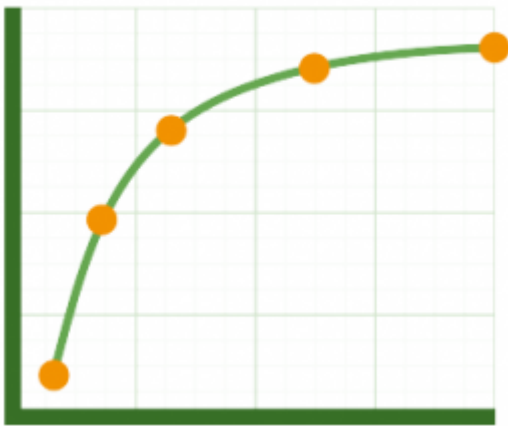
**Curious About Determining the Allowable Variation in Concrete Temperature**  
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## What is Mass Concrete Temperature Monitoring?

Mass concrete temperature monitoring is the action of recording and reading the temperature of freshly poured mass concrete elements. This requires a concrete temperature sensor to be placed near the center of the element.

## Why Mass Concrete Temperature Monitoring is Important

In order to ensure the quality and durability of larger projects, it is important to monitor and control concrete mix temperature, ambient temperature, and differential temperature in mass concrete elements. Temperature differences can cause stress that leads to thermal cracks, as well as loss of structural integrity, thus shortening the life and decreasing the strength of the mass concrete element. If the temperature goes below a certain number, the hydration of water can slow or stop meaning the concrete won't set properly and won't achieve optimal strength. When concrete temperatures are properly monitored, it allows for appropriate adjustments to be made when needed.



Heat generation depends on many factors such as the compound composition, the initial temperature of the concrete, the ambient temperature, the shape of the mass concrete element, the volume to surface ratio, as well as other surrounding conditions. Generally, the higher the cement content, the more heat will be produced.

There are a number of ways in which you can regulate the temperature of mass concrete elements during a project starting with an initial cooling of the concrete mixture. This can

be done with the use of chilled water, ice, or liquid nitrogen. Temperature regulation can also be done throughout the project by running cool water through cooling pipes which are installed before the concrete placement. In order to know when it is appropriate to undertake cooling processes, temperatures must be monitored in real-time.

**Read More About Monitoring Concrete Temperature in Cold Weather [Here!](#)**

## Temperature Monitoring Process



The initial process for heat monitoring of concrete mixtures is based on predictions made by taking into account the design of the concrete mix, the shape of the project, the ambient temperature, and more. Once the concrete is in place, temperature monitoring sensors and devices are used to report on changing temperatures.

There are a few different temperature monitoring devices and sensors currently on the market including Flir Intellirock, Con-Cure, Wake HardTrack, Command Maturity Central, Doka Concremote, and SmartRock. Each offers its temperature analysis through the different stages of the project so you can gather accurate data and make necessary adjustments.

## SmartRock Wireless Concrete Temperature Sensor

The [SmartRock sensor](#) allows for high-accuracy data collection and easy report sharing through the Android and iOS app. Like other temperature monitoring devices, the sensors are placed on the rebar before the concrete pour and can be used from the moment the concrete is poured to the completion of the project. The sensors measure the temperature

development at regular intervals to deliver high-accuracy data and enable contractors to make appropriate decisions regarding temperature control during the curing stages of the project. This ensures the best possible results for the project.

Unlike many other sensors on the market, the SmartRock is completely wireless and can be accessed from a smartphone device or tablet. The wireless capabilities allow for more freedom and security by removing the risk of tripping over wires or protruding devices. Contractors also benefit from less destructive testing methods. All of the hardware used as well as the concrete stays intact throughout the data gathering process and there is no need for last-minute repairs or adjustments. Contractors also benefit from additional features such as a database of mix calibrations and easy software upgrades.

The advances in concrete temperature monitoring technology are helping contractors and the construction industry move towards more sustainable, durable, and safe environments.

**Learn More About How Wireless Sensors Can Benefit Your Jobsite [Here!](#)**