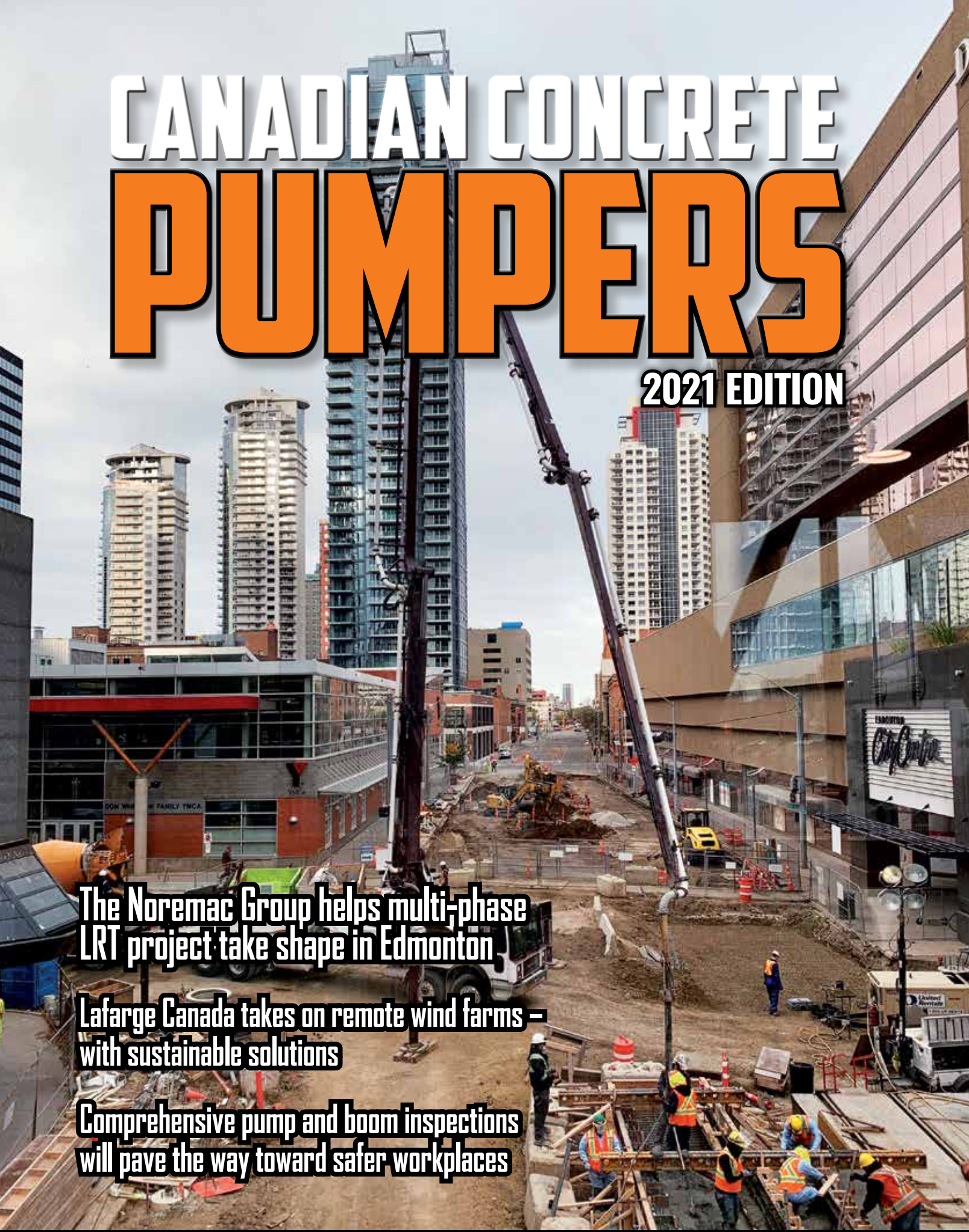
CANADIAN CONCRETE PUMPERS

2021 EDITION



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PUBLICATION MAIL AGREEMENT #40934510

Wireless sensors, like SmartRock™, are placed within the concrete formwork and secured on the rebar before pouring.

The importance of monitoring concrete temperature differentials during cold weather

By Alicia Hearns

During the winter months, when snow has taken over every inch of not only your driveway, but also your jobsite, it can be incredibly frustrating to carry on with regular construction operations. If you are working on a concrete structure, especially one with mass elements, the process of monitoring the temperature of your concrete becomes even more critical in these weather conditions.

Generally speaking, the higher the cement content, the more heat will be produced. However, when the exterior of the mass concrete is exposed to an environment that has a lower temperature, it cools down while the temperature of its core remains the same. Because the core is at a higher temperature, it expands in volume while conversely, the exterior contracts due to its cooler temperature. As a result, these opposing forces create tension. If that tension exceeds the tensile strength of the concrete, thermal cracking will occur.

One activity that helps engineers, contractors, and project managers minimize

The SmartRock Wireless Maturity Sensor.
Inset: Temperature data from the SmartRock is collected by the sensors and uploaded to an app on any smart device using

cracking in mass concrete is measuring its concrete temperature differential. This specification is the difference between the temperature of the core and the exterior of a mass concrete element. The higher the concrete temperature differential, the more the structural integrity and service-life of a concrete structure are jeopardized. According to ACI 301-16: Specifications for Structural Concrete, the maximum concrete temperature differential should not exceed 35 °F (19 °C) during curing. 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.

Dropping temperatures can therefore significantly impede the strength development and durability of your concrete structure. For this reason, accurate and consistent readings of your concrete temperature are important so that the quality of your structure is optimized. When working in cold weather conditions, the faster you can gather concrete strength data, the better. Wireless sensors, like SmartRock™, are placed within the concrete formwork and secured on the rebar before pouring. The SmartRock sensors measure temperature at two points per sensors, located in the body of the sensor and the tip of the temperature cable. This allows for easy temperature differential analysis. Temperature data is collected by the sensors and uploaded to an app on any smart device using a wireless connection. There is no need to lift heavy heating blankets to collect data from a thermocouple. You are also notified right away if the temperature of your in-situ concrete has dropped too low.

This method not only allows for highly accurate data to be collected and reported, but it also enables project members to make timely and well-informed decisions onsite regarding the temperature of their element during the curing stages of the project. Equipped with real-time results, contractors can improve the heating process, decrease energy costs, and save time in their project schedule by knowing when to move on to subsequent construction operations, such as formwork removal or post-tensioning.

Alicia Hearns is a content marketing specialist with Giatec Scientific Inc., a global company revolutionizing the construction industry by bringing smart IoT-based testing technologies and real-time data collection to the forefront of every jobsite. Learn more at www.giatec.ca. ■