Kraft Curing Systems GmbH, 49699 Lindern, Germany

The Evergreen Line Tunnel Project

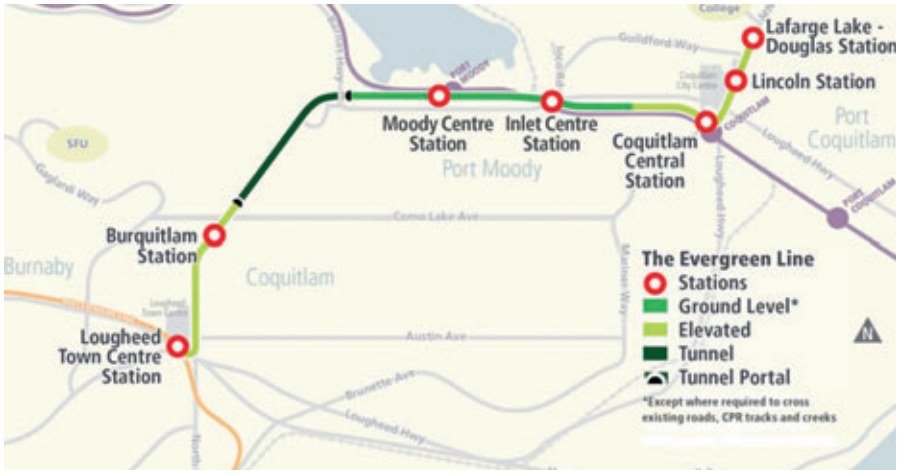
In late 2013, Vancouver, BC topped the list of most congested cities in North America by the annual TomTom Travel Index. On average, peak hour travel time was 36% longer than during non-rush hours. For a Vancouver commuter with a 30-minute drive, the cumulative delay amounted to an additional 93 hours (more than 11 working days) behind the wheel each year. TomTom, a leader in consumer GPS units, obtained this data from its millions of GPS units and tracked traffic flow to compile its yearly report. Vancouver's significant strain on transportation stemmed from the population and economic growth in the region.

The Evergreen Line is one of a series of regional transit and transportation improvements that address these challenges, and is an important element of the Provincial Transit Plan. The Evergreen Line will connect Coquitlam to Vancouver via Port Moody and Burnaby. Planning began back in the 1990s and has an estimated cost of about $1.4 billion. The Mayors' Council approved the project in fall 2011. The Evergreen Line is expected to provide a rapid transit option, encourage growth and support environmental sustainability. The additional transportation choice should reduce automobile use, increase transit capacity in the Northeast sector and ensure reliability of the overall system, while addressing the challenges faced by Vancouver.

EGRT Construction, a consortium led by SNC-Lavalin, was awarded the contract to design, build and finance the Evergreen Line after a rigorous, competitive selection process. The Evergreen Line Project underwent an Environmental Assessment Review under the British Columbia Environmental Assessment Act (BCEAA) and was issued an Environmental Assessment Certificate in Feb 2011. The project will also utilize Advanced Light Rapid Transit (ALRT) opposed to Light Rail Transit (LTR), which will move people almost twice as fast.

To get started, tunnels are being constructed from large precast concrete tunnel segments. ERGT reached out to APS Architectural Precast Structures to supply 2.0 kms of 8-meter diameter concrete tunnel lining rings. APS will also cast up to 48 segments a day, having casted 3504 segments to date. Each ring takes 15.16 m3 of concrete, equaling 18,382 m3 of concrete to complete all of the 1300 tunnel rings needed for the Evergreen Project. Molds are poured twice a day to produce the 48 segments needed. 105 rings are rebar reinforced (they will be installed at both ends of the tunnel) while the rest of the segments are reinforced with steel fiber.

In order to keep up with the tight production timeline of casting twice per shift and ensure proper curing, APS contracted Kraft Curing Systems, Inc. to engineer a custom designed Vapor Curing™ System. Mark Kraft, Sales Manager of Kraft Curing, stated, "We delivered their custom designed and built machine in only 4 weeks. It has VaporWare™ V2 data recording software and an Internet accessible HMI (human machine interface) control panel. This is unique because anyone can go from an intranet computer and access the HMI as if they were standing in front of the machine. They can also check on the curing (which usually happens overnight) from home, the bar or wherever they have an Internet connection and browser." Kraft's high-tech system is built to CSA standards and achieves extremely strict curing parameters. The monitoring system has unique features that allow for APS to keep a solid, consistent pace during production.



The Evergreen Line will carry up to 70.000 passengers every day by 2016

VaporWare™ Recording Software

Vapor control valve with hose connections to inject vapor underneath the molds.

Evergreen Mold Segments cleaned and ready to pour concrete, molds are poured twice a day producing 48 segments a day which equals 6 tunnel rings.

KC 20-1S Vapor Generator –
Compact but powerful vapor system during installation

APS' Langley yard shows some of the 3504 segments/438 rings poured to date.

The custom solution created by Kraft allows the large tunnel segments to be vapor cured in stationary molds. The molds are covered by an insulated tarp that is tightly sealed. The forms are cured with vapor via an automatic valve and hoses. The temperature of the concrete is closely monitored with internal temperature measurement. The vapor provides the heat and moisture required for proper curing. All curing data (e.g. time, temperature, humidity, batch number and mold station) is sent to the VaporWare system that records this data for quality control and for the inspectors. This way, the segments are cured to the specifications of the project and in the most energy efficient way possible. After initial concrete set, the segments are heated to 50°C and 100% humidity so that the product can be demolded and transported within four hours, allowing for double pours per shift and greater mold utilization. For the second pour of the day, the curing temperature is reduced to 25°C to allow for 12 hour curing. Kraft went on to say, "Changing the temperature or conditions a very tiny amount can significantly affect the way concrete cures. And, efficient curing isn't just a benefit to the concrete, it also saves a substantial amount of money."

According to APS Chief Engineer, Mehrdad Ahmadi, "[the] first cast starts before 7:00 am every day and takes about 2.5 hours to finish. Demolding of the first cast starts around noon and the second cast starts around 1:00 pm, finally finishing around 4:00 pm." Mehrdad continued, "In order to be able to continue with other structural products that are set up, Evergreen items are molded at another part of the plant. We have other Kraft Curing systems that have performed well so we chose to procure a new Vapor Generator from Kraft for the Evergreen project."

The decision to purchase another Kraft unit was an important factor for the success of the Evergreen project, as those in charge know the technology advantage and reliability of a genuine Kraft unit.

The Evergreen Line Project (www.evergreenline.gov.bc.ca) is expected to be completed and servicing commuters by summer 2016.

FURTHER INFORMATION

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