

## **FOI # TRA-2015-54251**

Attached are over 5000 pages of records requested under FOI # TRA-2015-54251 relating to Non-Conformance Reports (NCR), agreements, inspection reports or other correspondence regarding the quality of precast concrete tunnel segments supplied for the Evergreen Line tunnel by APS from November 2012 to the present.

Safety has always been a top priority for the Evergreen Line project and for the contractor, EGRT Construction. Government oversight on this project meant the contractor's procedures and work were being monitored to ensure the Evergreen rapid transit extension was built safely and to industry standards. Engineers and tunnel specialists performed multiple reviews and inspections during construction to ensure all components of the project, including the tunnel, were built appropriately to ensure the safety of the travelling public.

For this project, a comprehensive Quality Management Program was in place to monitor the performance and effectiveness of the construction and installation of all works and assess its general conformance with design and project requirements. Variations or nonconformities to such requirements resulted in the issuance of Non-Conformance Reports (NCR). Design engineers would review the nature and cause of an NCR and recommend corrective action that involved replacement, repair, or confirmation that the work was acceptable for use as-is for its intended purpose.

The Project's Quality Management Program identified that in some cases, the concrete curing at APS was at higher temperatures than specified by the project requirements. Following a detailed review by both EGRT engineers and project team engineers, it was determined that segments heated between 61-70 degrees Celsius did not raise design, performance safety or durability concerns and could be used "as-is". The review identified a further 82 precast concrete tunnel segments out of 10,384 (less than 1% of the total segments) installed in the tunnel that were heat cured at temperatures slightly higher than 70 degrees Celsius that were reviewed more closely.

The project team worked with the contractor and engineering tunnel specialists and reviewed the option of replacing these 82 segments.

Engineering specialists, including the Engineer of Record, Durability Consultants, and Concrete Materials Specialists, confirmed that the higher temperature heat curing did not impact the design, performance, safety, of the segments, but there was a low risk associated with their long term durability. Part of this analysis included independent review by provincially procured experts. Because these segments do not pose a safety risk, the engineers and project team determined that replacing these segments was not practical or necessary.

However, out of an abundance of caution, the Contractor installed interconnecting bolts to create load sharing between each segment to further strengthen these tunnel segments. Further, in addition to the general 2-year work defect warranty under the contract for the other segments, the Province received a 10 year extended warranty from the Contractor with annual inspections and testing for these 82 segments. After the 10 years, the tunnel will fall under the SkyTrain operator's regular 3-year inspection program for structures.

Although the likelihood is low, should minor cracking and flaking in these segments occur, they will be repaired under this warranty using standard accepted repair procedures. Again, these segments will not pose any safety risks to the Evergreen Line or the travelling public.

Please contact Amanda Farrell at (604) 806-4168 if a more detailed technical briefing is desired.