39th IABSE Symposium – *Engineering the Future*
September 21-23 2017, Vancouver, Canada

Calgary Airport Trail Tunnel Temperature Monitoring

Nathan Murdoch, B.Sc., E.I.T., Azita Azarnejad Ph.D., P.Eng., FCSCE

CH2M HILL Canada Limited (CH2M), 540, 12 Avenue SW, Calgary Alberta, T2R 0H4, Canada

Ved Sharma, Ph.D., P.Eng., Jadwiga Kroman, M.Sc., P.Eng., FCSCE

The City of Calgary Transportation Infrastructure, 3rd floor Rocky Mountain Plaza, 615 – Macleod Trail SE, Calgary, Alberta, T2P 2M5, Canada

Contact: azita.azarnejad@ch2m.com

Abstract

The Calgary Airport Trail Tunnel (CATT) is a 620-m-long roadway tunnel constructed under the Calgary International Airport's (YYC's) new parallel runway and three associated taxiways owned by The City of Calgary (The City) on land leased from YYC. The CATT was designed according to the Canadian Highway Bridge Design Code (CHBDC). The question arose during the design stage if the tunnel, which is a buried structure, would be subjected to the same temperature effects (range and gradient) given in CHBDC for bridges. To investigate this question for future designs, a system of wireless sensors was installed in the CATT to monitor temperatures with data being collected remotely. The paper includes an overall explanation of the CATT's design, temperature monitoring instrumentation, and initial findings, including comparisons with temperatures recorded outside the tunnel, and the temperature range and differential provided by the CHBDC.

Keywords: Tunnel; temperature; monitoring; wireless sensors; reinforced concrete.

1 Introduction

The Calgary International Airport (YYC) undertook the Airport Development Program to allow the world's largest aircrafts to land at the airport and facilitate an increase in international air traffic to Calgary. The program necessitated the closure of some of the existing access roads to YYC. The CATT was constructed to provide an access to the airport, and also form part of one of Calgary's main east to west connectors, with future connection to the Calgary Ring Road. The CATT is 620 metres (m) long, with two cells and six lanes. It was constructed under the new parallel runway and three associated taxiways.

The CATT was designed according to the Canadian Highway Bridge Design Code (CHBDC or code), which gives an effective temperature range for Calgary of -43 to 38 degrees Celsius (°C). The question arose during the design stage if the CATT, which is a buried structure, would actually be subjected to this temperature range. In absence of references that addressed temperatures inside tunnels, it was agreed with The City of Calgary (The City) to install a temperature monitoring system in the tunnel to investigate this question for future designs. A system of wireless sensors was installed in the structure that would measure temperatures through the concrete cross-section. Temperature recordings started in spring 2014 and were planned to continue for a minimum of 3 years.

https://doi.org/10.2749/vancouver.2017.2163
Distributed by structurae