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Numerical Modelling of Movement and Behaviour of Smoke from Fires in the Ville-Marie and L.-H.-La Fontaine Tunnels

Objectives

To evaluate the effectiveness of current ventilation strategies in controlling smoke spread in the event of fire in two of Montreal's main expressway tunnels, and to minimize the impact of smoke on tunnel users while at the same time providing for safe access for firefighters.

Background

Fire can pose extreme risks and cause major disruption to transportation systems. The smoke and the enclosed space in a tunnel fire can be terrifying and life threatening to tunnel users and can also present a big problem for firefighters in terms of fighting the fire efficiently while maintaining their own safety. To address these critical issues, researchers in IRC's Fire Research program were asked to investigate, using a combination of numeric modelling and experimental techniques, the capability of emergency ventilation strategies to control smoke spread in the Montreal tunnels.

Statement of Work

- Conducted full-scale tests in the two tunnels to provide input for numerical models and validate their results.
- Used numerical models based on the Computational Fluid Dynamics (CFD) technique to predict the temperature, air velocity and smoke concentrations at various points in the tunnel under specific fire scenarios, allowing researchers to evaluate the effectiveness of different emergency ventilation strategies. In addition, numerical analysis is used to investigate critical fire scenarios that it is not possible to examine experimentally.

Results

The fire tests verified the results of the CFD models, confirming their predictive value. In addition, the study yielded guidelines for improving the performance of ventilation systems in tunnels during firefighting operations and provided information that contributes to the development of an operation system to aid decision-making in emergency situations.

Partner

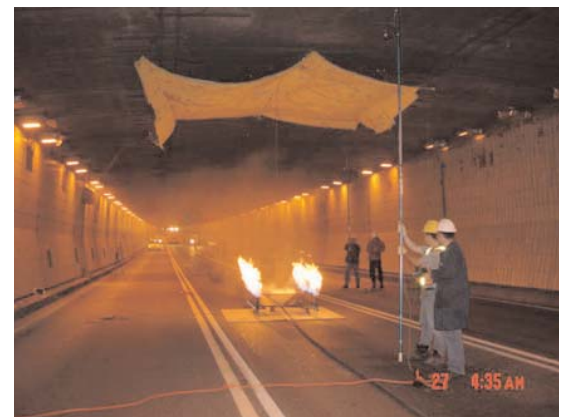
Ministère des transports du Québec (MTQ)

Start/Completion Date

The project began in April 2002 and is expected to be completed in 2008.

Project Manager

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Researchers use propane burner to simulate a fire in Montreal's Louis-Hippolyte-La Fontaine Tunnel.

Pour de plus amples renseignements, consultez la page http://irc.nrc-cnrc.gc.ca/fr/smbc/smoketunnels_e.html

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