Sohatsu Systems Laboratory Inc.

Title:
EMERGENCY VENTILATION CONTROL FOR A TUNNEL WITH
LONGITUDINAL AND TRANSVERSE SYSTEMS COMBINED
Symposium:
BHR11th ISAVVT, 2003

AKISATO MIZUNO   Kogakuin University, Tokyo, Japan

FUMITOSHI MORI   Nagoya Expressway Public Corporation

TAKEO IMAI Nagoya   Expressway Association

ICHIRO NAKAHORI   Sohatsu System Laboratory

ABSTRACT

The Higashiyama Tunnel in Japan is a double-tube road tunnel that is 3.5km long. It is located in the eastern part of the Nagoya Expressway, route 1, which runs through the center of Nagoya from east to west. This tunnel consists of five sections from the ventilation point of view. Central three sections of them have transverse ventilation to ensure safety in the case of fire and the other two sections on both sides have longitudinal ventilation. The two exit-side sections of the latter, in particular, have an exhaust fan in the vertical shaft near the portal and this prevents polluted air from being emitted out of the portal. In Japan, many tunnels have longitudinal ventilation systems, which means when a fire breaks out, the control system often makes airflow velocity decrease to as low as $0\sim2$m/s by operating jet fans. However, this conventional control cannot be used in tunnels with transverse and longitudinal ventilation combined because the first priority in the case of fire is to get rid of smoke in the fire area.

This paper suggests a new control procedure for this type of tunnels. In the procedure transverse ventilators eject smoke under controlled small longitudinal airflow. More precisely, in case of fire a group of transverse ventilators in each section are controlled based on patterns that have been determined for each section beforehand, while the airflow velocity at the fire point is measured by a couple of anemometers to control the exhaust fan in the vertical shaft in order to adjust the longitudinal airflow there to a preferable lower velocity.

The validity of this control procedure has been certified by both one- and two-dimensional ventilation simulations.