TRANSFORMABLE SYSTEMS FOR INCREASING EVACUATION PERIOD AND MINIMIZATION OF DAMAGING FACTORS OF FIRES IN ROAD TUNNELS

O. LANCHAVA[1,2], G. NOZADZE[1,2], M. JANGIDZE[1], S. SEBISKVERADZE[3]

[1]*G. Tsulukidze Mining Institute, Tbilisi, Georgia*
[2]*Georgian Technical University, Tbilisi, Georgia*
[3]*LTD Lochini, Tbilisi, Georgia*

Fires in road tunnels to this day remain a high-risk factor and are still the subject of intensive engineering research. For existing and under construction automobile tunnels in Georgia, the total number of which in the near future will be more than fifty, the only risk factor is a fire. Not looking at the modern methods of designing underground tunnels, which aims to maximize the consideration of fire risk factors, the problem remains unresolved for the existing network of road tunnels, to which great attention and financial resources are directed [1, 2]. After the powerful fires that have occurred in developed western countries, the European Union pays special attention to the Trans-European Network, which is a top priority for the safety of existing and under construction tunnels.

The presented report describes the manufacturing technology of light transformable partitions, with variable aerodynamic resistance, which can be installed without special effort in road tunnels with various ventilation systems.

The proposed idea is to improve ventilation technology to save the lives of people in a fire. It was developed in accordance with our previous studies [3–5], which was also based on the experience that large fires are almost impossible to completely localize in tunnels. The idea of the study is to artificially increase the aerodynamic drag of the tunnel at the right time using transformable systems, which will slow down the diffusion processes of the combustion products along the way people are evacuated.

As a result, the ventilation system will become more flexible to save lives as the evacuation period increases. The proposed technology allows the use of aerodynamic correction to significantly control the flow of heat and toxic gases during fires in order to maximize the time for safe evacuation of people in extreme conditions.

The present study is based on the results of numerical simulations, where tunnel ventilation is modelled using dynamic pressure between portals. The study examines the distribution dynamics of hazardous combustion products for fires with a capacity of up to 30 MW.

A comparative analysis of numerical studies for tunnels with a longitudinal ventilation system, where ventilation processes are examined in a tunnel with and without flexible partitions in fires of various capacities. Analysis of the calculations shows that the proposed low-cost technology of flexible transformable partitions

will be especially competitive in existing road tunnels, since it does not reduce the expensive underground space intended for traffic. In addition, the time and money to install transformable equipment will be minimal, and therefore ventilation systems with transformable elements will also be economical and efficient.

Acknowledgements

This work was supported by Shota Rustaveli National Science Foundation (SRNSF) [Grant number AR-19-1936, Project title "*Development and testing of transformable system to save life in road tunnel in case of fire*"].

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