Macrocategoria: Geometria e Sicurezza.

Titolo articolo: A 3D computational fluid dynamics model for assessing the concrete spalling of a tunnel lining in the event of a fire.

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Nome rivista: Computers and Geotechnics.

Anno di pubblicazione: 2022.

Numero rivista, article number: 152, 105041.

DOI: https://doi.org/10.1016/j.compgeo.2022.105041

Abstract: A 3D Computational Fluid Dynamics (CFD) model is presented to assess the entity and extension of concrete spalling induced by a fire in a road tunnel, simulating the material loss by means of eliminating elements exceeding a pre-fixed critical temperature. In the proposed 3D CFD model, spalling was assumed to occur when the temperature of the front surface of the infinitesimal elements in which the thickness of the tunnel lining was discretized reaches a pre-fixed critical temperature. The results showed that the fire-induced damage may be underestimated if the material loss in not considered in the spalling analysis. Moreover, the depth and extension of spalling were affected by the value of the critical temperature used as a criterion for element elimination. The maximum depth of spalling at the ceiling was found to be 6–19 cm. The maximum depth of the spalling on the right wall of the tunnel was found to be 17–33 cm. This study increases the state-of-the-art about the entity and extension of the concrete spalling in road tunnels mechanically ventilated, and it can serve to recommend the use of more fire-resistance concretes or fire protection coatings.

Keywords: Road tunnels; Concrete spalling; 3D CFD modeling; Elements elimination criterion.

Link: https://www.sciencedirect.com/science/article/pii/S0266352X22003780?via%3Dihub