

# Probabilistic approach to damage of tunnel lining due to fire

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**Abstract.** In this paper, risk is perceived as the probable damage caused by a fire in the tunnel lining. In its first part the traffic flow is described as a Markov chain of joint states consisting of a combination of trucks/buses (TB) and personal cars (PC) from adjoining lanes. The heat release rate is then taken for a measure of the fire power. The intensity  $\lambda_f$  reflecting the frequency of fires was assessed based on extensive studies carried out in Austria [1] and Italy [2, 3]. The traffic density AADT, the length of the tunnel  $L$ , the percentage of TBs, and the number of lanes are the remaining parameters characterizing the traffic flow. In the second part, a special combination of models originally proposed by Bažant and Thonguthai [4], and Künzel & Kiessl [5] for the description of transport processes in concrete at very high temperatures creates a basis for the prediction of the thickness of the spalling zone and the volume of concrete degraded by temperatures that exceed a certain temperature level. The model was validated against a macroscopic test on concrete samples placed into the furnace.