

Thermal and Hydraulic Modeling of Road Tunnel Joints

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Abstract

This paper focuses on the use of the COMSOL Multiphysics® software to develop a 2D numerical model of expansion joints for road tunnels. The model was developed using the coefficient form PDEs interface. The model includes water and energy conservation equations. It takes into account the influence of temperature on liquid water saturation and hydraulic conductivity. Under proper boundary conditions, the model allows the temperature, pressure and seepage velocity fields around the joint to be evaluated. The model also allows solutions for different expansion joint problems to be tested. Examples of solutions to prevent the formation of ice in the expansion joints during winter are presented. The model also shows how the temperature gradient close to the joints can be used to estimate their permeability.