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Thesis

Evaluation of Atrium Smoke Exhaust Make-up Air Velocity.

Abstract

Atria are becoming popular elements in commercial, office and residential buildings for providing attractive, environmentally controlled, naturally lit spaces. Smoke management systems often play an important role in extending the use of an atrium space or providing additional protection for occupants and property.

The rapid smoke spread through the atrium in case of fire is one of the major concerns. Even if there are smoke barriers between the surrounding spaces and the atrium, the smoke layer may descent to a lower level endangering occupants. Natural ventilation can be used to keep the smoke layer at high levels, but in some cases, such system may not be effective and it is not frequently used in North America. Buildings with atrium are getting larger and they are designed with mechanical smoke management systems.

In this study a CFD model was used to evaluate the existing criterion of make-up air velocity and to determine if the 200 fpm (1 m/s) make-up air velocity limit is valid, or whether other values or methods are appropriate. For this, different size fires were simulated in various size atria equipped with smoke exhaust systems. The results of the analysis indicate that, for the large atrium, the imposed velocity limit may be too restrictive.

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Supervisor

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