Simplified Calculation Methods on Smoke and Temperature Stratification in Ventilated Compartments

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Abstract. Using different calculation methods with respect to smoke and heat evacuation systems (SHEVS), a comparative study is presented with regards to enclosure fire in large single storey compartments. A focus is made on European and American manual methods for which a set of graphical Matlab routines are developed. The results obtained with several modeling approaches are discussed in this paper.

Keywords: smoke and heat evacuation, calculation methods, natural/mechanical ventilation, fire engineering software.

1 Introduction

A fire can be defined as undesirable burning of materials with release of heat and toxic gases, causing hazards to people and structures. In this context, it has been shown that human causalities are much more due to smoke exposure than burns by flames (Stec et al., 2010). Consequently, some efforts are needed to explore fire safety engineering issues, more particularly those related with heat and smoke dynamics. In this direction, there is a specific need for fire simulation softwares, as well as predictive tools for the design of smoke and heat evacuating systems (SHEVS). These devices are supposed to allow for thermal comfort under safe (no fire) conditions while providing optimal circumstances for survival and egress of occupants. Design procedures for SHEVS use manual-based methods, which obey to regionally standardizations and safety regulations.

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