

Abstract

Life safety and property protection are the two main objectives of a performance-based design. At Carleton University in Canada, a quantitative fire risk analysis computer model CURisk is being developed to evaluate the fire risk levels in mid-rise buildings. By using this model, this thesis evaluated the fire safety in multi-storey buildings with different building construction materials, heights and floor areas.

The CURisk Evacuation submodel is compared with other methods including the Pathfinder models and the Society of Fire Protection Engineers (SFPE) analytical calculations. Case studies were performed by applying these models to different building design conditions and the results were compared. The comparisons showed that the CURisk Evacuation submodel produce results comparable to those of the other models.

CURisk was applied to evaluate the fire risk level in buildings of non-combustible frame and combustible frame. Fire development in concrete, unprotected CLT, protected CLT and light-frame timber were compared and the performance of different fire protection systems was evaluated. Finally, the fire risks in buildings with higher building height or larger building area were compared. The results of this study show that CURisk is an effective model to assess fire risks in multi-storey buildings.