

Fire Modeling with CAD/GEI Techniques

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Abstract

Innovative building designs have been implemented in many Asia Pacific countries over the past decade for exhibition centers, shopping malls, subway stations, etc. To fit the functional use and / or architectural design, they could not fully comply with the local fire safety codes. For instance, fire compartment volume, smoke zone area, etc. Fire engineering is an acceptable approach to justify the design safety in comparison with the code compliance case. FDS is one of the CFD codes that are accepted by the many local fire authorities in this region. The 3D result visualization could usually give the general idea of the smoke behavior under different fire scenarios to the stakeholders. Nevertheless, due to the limitation of Cartesian grid, the 3D model used may appear a bit rough and difficult for laymen to understand, in particular on some irrelevant architectural details. Increasing the grid density could improve the model geometrical details but would undoubtedly result in a huge demand on computation resource requirement.

To balance the visualization demand and simulation resource, starting from Version 4, 3D CAD/GEI model could be embedded directly in Smokeview to enhance the result visualization. This model is not related to the computation grid used in FDS. In this case the grid specification will not necessarily be related to the 3D model details. However, no much information is provided in the FDS manual regarding this approach. Based on years of research and testing, by using the same 3D CAD files, a systematic approach has been developed for the 3D CAD/GEI model and computation grid generation. This paper is intended to outline this approach by using PyroSim. Several project examples in the Asia region will also be included to illustrate the benefits of the method.