

Use of Numerical Tools Dedicated to Fire Safety Engineering for the Rolling Stock

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Abstract : This study shows the opportunity to use numerical tools dedicated to Fire Safety Engineering for the Rolling Stock. Indeed, some lawful requirements can now be demonstrated by using numerical tools. The first part of this study presents the use of modelling evacuation tool to satisfy the criteria of evacuation time for the rolling stock. The buildingEXODUS software is used to model and simulate the evacuation of rolling stock. Firstly, in order to demonstrate the reliability of this tool to calculate the complete evacuation time, a comparative study was achieved between a real test and simulations done with buildingEXODUS. Multiple simulations are performed to capture the stochastic variations in egress times. Then, a new study is done to calculate the complete evacuation time of a train with the same geometry but with a different interior architecture. The second part of this study shows some applications of Computational Fluid Dynamics. This work presents the approach of a multi scales validation of numerical simulations of standardized tests with Fire Dynamics Simulations software developed by the National Institute of Standards and Technology (NIST). This work highlights in first the cone calorimeter test, described in the standard ISO 5660, in order to characterize the fire reaction of materials. The aim of this process is to readjust measurement results from the cone calorimeter test in order to create a data set usable at the seat scale. In the second step, the modelisation concerns the fire seat test described in the standard EN 45545-2. The data set obtained thanks to the validation of the cone calorimeter test was set up in the fire seat test. To conclude with the third step, after controlled the data obtained for the seat from the cone calorimeter test, a larger scale simulation with a real part of train is achieved.

Keywords : fire safety engineering, numerical tools, rolling stock, multi-scales validation

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