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BSI Standards Publication

Fire safety engineering — Assessment, verification and validation of calculation methods

Part 3: Example of a CFD model

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National foreword

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Part 3: Example of a CFD model

Ingénierie de la sécurité incendie — Évaluation, vérification et validation des méthodes de calcul —

Partie 3: Exemple d'un modèle CFD



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Foreword

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The committee responsible for this document is ISO/TC 92, *Fire safety*, Subcommittee SC 4, *Fire safety engineering*.

ISO 16730 consists of the following parts, under the general title *Fire Safety Engineering — Assessment, verification and validation of calculation methods*:

— *Part 3: Example of a CFD model*

— *Part 5: Example of an Egress model* (Technical report)

The following parts are under preparation:

— Part 2: *Example of a fire zone model* (Technical report)

— Part 4: *Example of a structural model* (Technical report)

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For the particular case of the example application of ISO 16730-1 described in this part of ISO 16730, ISO takes no responsibility for the correctness of the code used or the validity of the verification or the validation statements for this example. By publishing the example, ISO does not endorse the use of the software or the model assumptions described therein, and state that there are other calculation methods available.

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TECHNICAL REPORT **ISO/TR 16730-3:2013(E)**

Fire safety engineering — Assessment, verification and validation of calculation methods —

Part 3: Example of a CFD model

1 Scope

ISO 16730-1 describes what the contents of a technical documentation and of a user's manual should be for an assessment, if the application of a calculation method as engineering tool to predict real-world scenarios leads to validated results. The purpose of this part of ISO 16730 is to show how ISO 16730-1 is applied to a calculation method, for a specific example. It demonstrates how technical and users' aspects of the method are properly described in order to enable the assessment of the method in view of verification and validation.

The example in this part of ISO 16730 describes the application of procedures given in ISO 16730-1 for a computational fluid dynamics (CFD) model (ISIS).

The main objective of the specific model treated in this part of ISO 16730 is the simulation of a fire in an open environment or confined compartments with natural or forced ventilation system.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16730-1, *Fire safety engineering — Assessment, verification and validation of calculation methods — Part 1: General*

3 General information on the CFD model considered

The name given to the CFD model considered in this part of ISO 16730 is "ISIS". The computer code ISIS, developed by The French Institute for Radiological Protection and Nuclear Safety (IRSN) and defined as a computational fluid dynamic model (also called CFD or field model), is based on a coherent set of models that can be used to simulate a fire in large and mechanically ventilated compartments. This kind of configuration involving complex flows requires an accurate physical modelling and efficient numerical methods. Usually, the spatial and time scales encountered in fires are very disparate and the coupling between phenomena is very strong.

The verification and validation phases of the code are two distinct processes which are constantly updated based on the last code developments. The verification phase employs a wide range of techniques such as the comparison to an analytical solution for model problems, the use of manufactured solution, and the comparison to benchmark result. The validation process is based on the so-called building-block approach including first-unit problems, sub-system cases, and then large-scale realistic fire experiments. This process allows dividing a complex engineering system into several simpler cases. Consequently, the validation guide of this code[1] includes laminar, turbulent, and fire cases and contains a total of 18 test cases.

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