



## FQ0670/7

### Report on ISO TC 92 SC4 Meeting, October 2009

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# Report on ISO TC 92 SC4 Meeting, October 2009

## 1. CLIENTS

- Foundation for Research Science and Technology
- BRANZ
- Department of Building and Housing
- Standards New Zealand

## 2. BACKGROUND

The purpose of this report is to provide information to BRANZ, Standards New Zealand (SNZ) and the Department of Building and Housing (DBH) about the activities of ISO TC92 SC4 (fire safety engineering) and to serve as a record of attendance at ISO TC 92 SC4 during the week of October 18 – 24, 2009 in Lancaster, PA.

### 2.1 Background for attendance at meeting and representation on committee

The Foundation for Research Science and Technology, BRANZ and the Department of Building and Housing are funding research to develop a risk-based design fire tool in recognition of the need for the development and support of design methodologies that will lead to greater robustness and confidence in fire safety engineering design. The current review of the Building Code by DBH may also lead to significant changes to how fire safety engineering is conducted in New Zealand. The possible adoption of several ISO TC92 produced documents is also being considered as part of a fire safety engineering framework.

ISO TC92 SC4 is an International Standards Organisation sub-committee that is responsible for developing international standards and guidance documents related to fire safety engineering. New Zealand participation in ISO TC92 SC4 and its associated working groups provides an important opportunity to ensure the New Zealand research, and new Building Code changes benefit from international linkages by working closely with other international experts in this field as well as providing an opportunity to learn from and influence international directions in fire safety engineering.

### 2.2 Structure of ISO TC 92 SC4

This sub-committee consists of the main plenary group supported by a number of working groups and task groups. Most of the actual work done takes place in the working and task groups.

The meetings attended included the following:

- Task Group 1 (convenors meeting)
- Working Group WG1 (general principles and performance concepts);
- Working Group WG6 (design fires);
- Working Group WG7 (verification and validation of calculation methods);
- Working Group WG9 (calculation methods);
- Working Group WG10 (fire risk assessment);
- Working Group WG11 (behaviour and movement of people);

  
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- Working Group WG12 (fire performance of structures);
- Joint meeting with SC3 on life safety criteria based on toxic hazard
- Joint meeting with SC1 on data requirements
- Joint meeting with SC2 on data requirements
- SC4 plenary session
- TC92 plenary session

The various working groups are currently drafting a range of documents, some of which will ultimately become international standards. Depending on the final intended application of a document and its stage of development the following abbreviated notations are used in identifying relevant documents:

PWI	preliminary work item
NP	approved work item
WD	working draft
CD	committee draft
DIS	draft international standard
FDIS	final draft international standard
DTS	draft technical specification
TS	technical specification
TR	technical report
IS	international standard

A technical specification (ISO/TS) is reviewed/balloted after three years in order to decide if it will be confirmed for a further three years, revised to become an international standard or be withdrawn. Final outputs are either technical reports or international standards, with a strong preference for the latter wherever possible.

### 3. ACTIVITIES

#### 3.1 Working Group TG1 (meeting of convenors)

**Convenor: J Kruppa, France.**

**Meeting No. 21 (19 October, 9.30 am)**

This was a general meeting of working group convenors to liaise on the program for the week and brief each other on common issues and items to be discussed in the working groups during the week.

- Discussion of an appropriate home for work on smoke removal calculations for atria or similar (WG9/7).
- How to ensure our documents are more useful for practising engineers.

  
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- Need to look at future leadership of various working groups and new participation in SC4 as over the next 5 years a number of existing convenors may be retiring. (David Purser now wishes to retire from the convenorship of WG11 – Rita Fahy of NFPA may take over this one; Dieter Brein and John Hall are also likely to retire from WG7 and WG10 respectively within five years).
- Each Working Group is to consider data requirements and report back to SC4. Relevant information could be included in an annex to the WG main document. Format might be - data, definition, unit, value or where it can be found.
- The subject of how safety factors can be applied across WG's needs more discussion in WG1.

### **3.2 Working Group WG1 (general principles and performance concepts)**

**Convenor: Prof. Takeyoshi Tanaka, Japan**

**Meeting No. 2 (21 October 2009, 9.00 am)**

Due to the need for handling new work items linked to the General Principles standard ISO 23932, WG 1 was reactivated in order to:

- develop a specific document on performance criteria,
- to prepare examples to demonstrate application of the General Principles document.

WG 1 is now responsible for the maintenance of ISO/DIS 23932 and progression to IS status in five years time given the disbanding of TG2.

Minutes of the previous meeting held in Lund, Sweden were reviewed and accepted with minor changes.

Prof. Tanaka presented a summary of the main document and ideas for developing a document on mandatory objectives and requirements for non-industrial buildings.

Mr Wiese, Germany presented ideas for a new work item considering the application of safety factors in fire safety engineering. A small task group was formed and they will develop the proposal further for discussion at the next meeting.

### **3.3 Working Group WG6 (design fire scenarios and design fires)**

**Convenor: C. Wade, New Zealand**

**Meeting No. 20 (20 October 2009, 8.30am)**


This working group has previously produced a Technical Report ISO/TR 13387-2 Fire Safety Engineering - Part 2: Design fire scenarios and design fires, as part of the suite of ISO/TR 13387 reports.

More recently this has been supported by Technical Specification ISO/TS 16733 "Fire safety engineering – selection of design fire scenarios and design fires" published on the 7 July 2006. Two examples of the selection of design fire scenarios are presented in the technical specification: for a multipurpose covered stadium, and for a warehouse containing a single commodity.

The guidance provided in ISO/TS 16733 is of a general nature and takes users through the process (steps) of identifying design fire scenarios and their characteristics. It does

  
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not give any detailed specifications (i.e. numerical values) for design fires to be used for any particular occupancy. The technical specification is written with a deterministic assessment in mind and therefore is aimed at providing guidance on how to reduce a very large number of possible fire scenarios down to a manageably small set of design fire scenarios (scenario clusters) that can be used in an analysis.

**Work item:** PWI 29241

WG6 is in the process of developing two examples of the selection of design fires characteristics to accompany the design fire scenarios given in Annex B and Annex C of ISO TS 16733. The first example is for a multi-purpose covered stadium and the second for a warehouse with a single commodity. The intention is to follow the subsections of ISO TS 16733 Section 7 to illustrate its use.

Since the previous meeting, C. Wade had revised the example and distributed to group members. She raised an issue with how the TS is applied regarding the first part of the example (as already published in the TS). It was suggested that if only the scenarios that have the highest risk ranking from the event tree are used as the design fire scenarios then scenarios which allow the performance of sprinklers and venting to be evaluated may not be included. There was some discussion of this, however it may be addressed if the starting point in developing the event tree did not include the sprinklers and venting. These systems would be added later as measures to mitigate the risk.

It was felt that the example is progressing well and should be ready for possible balloting from the next meeting. C. Wade will distribute a revised example to the task group members by mid-December and the task group members to provide input and comment by 31 January 2010.

Jürgen Weise made a presentation related to the second example of a warehouse building. The German mirror group did not feel able to advance the example without changes to the fire safety objective. Jürgen Weise will continue work on this example but perhaps focus it more toward a structural fire protection objective.

**Other business:**

SC3 and SC4 joint meetings led by D. Gann of NIST previously identified topics of potential new work items. One of the possible areas of activity was related to developing guidance for how to go about grouping finished products in relation to their toxic species production given it is not practical to expect that all products would be able to be tested. It was felt that it is not possible to progress this immediately and research may be necessary in the first instance as discussed at the joint SC3/SC4 meeting. It is proposed that a related seminar be held in conjunction with the next full plenary in April 2011 to identify the state of knowledge in this area.

Data related to this work group will be considered in more detail. C Wade will prepare a table that can form the basis for discussion at the next meeting.

The minutes of the WG6 meeting are included in Appendix C.

### **3.4 Working Group WG7 (verification and validation of calculation methods)**


**Convenor:** Mr Dieter Brein, Germany

**Meeting No. 20 (18 October 2009, 2.00pm)**

**Main Document:** ISO 16730 Fire safety engineering -- Assessment, verification and validation of calculation methods (Published in July 2008).

  
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ISO 16730:2008 provides a framework for assessment, verification and validation of all types of calculation methods used as tools for fire safety engineering. It does not address specific fire models, but is intended to be applicable to both analytical models and complex numerical models that are addressed as calculation methods in the context of this International Standard. It is not a step-by-step procedure, but does describe techniques for detecting errors and finding limitations in a calculation method.

ISO 16730:2008 includes the following:

- a process to ensure that the equations and calculation methods are implemented correctly (verification) and that the calculation method being considered is solving the appropriate problem (validation);
- requirements for documentation to demonstrate the adequacy of the scientific and technical basis of a calculation method;
- requirements for data against which a calculation method's predicted results shall be checked;
- guidance on use of ISO 16730:2008 by developers and/or users of calculation methods, and by those assessing the results obtained by using calculation methods.

This working group is now dealing with six work items.

#### **Work item: ISO/NP TS 13447 Guidance for the use of fire zone models**

This project with C Wade as task leader and principal author is underway in order to address particular characteristics of zone models with special emphasis on ranges of applicability, limitations etc.. This is done in order to ultimately make clear where zone models may be used and where it can be wise to apply more elaborated approaches, i.e. CFD models. A WD manuscript is available and will be further developed by a Task Group.

#### **Work item: PWI 24677 Data for validation of calculation methods**

This currently comprises a draft contents list and some text outlining the principal procedures and requirements for data. The reason behind this work is, that quality requirements need to be defined for the usability of independent reference data as reliable sources for validation and assessment purposes for calculation methods of any kind of sophistication.

WG7 cooperates with other SC4 WG's that develop calculation methods in order to identify which data are needed to process the assessment of the particular calculation method considered.

Both input data and results are addressed. The data to be checked according to the procedures outlined in this new work come from measurements made, and other data (e.g. surveys).

To support conclusions about the validity of the particular calculation method, any validation exercise must assess the magnitude and nature of errors in the reference data and assess the impact of those errors on the differences between quantities and data. Therefore, the completeness, quality, precision and bias of the reference data must be characterized before it can be used for validation. General work is currently

  
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pending due to open discussion within SC4 on how to progress the issue across the WGs involved. In addition to the development of the main document of the guideline type it is intended to develop one example to show the usefulness of the checking procedure. Currently the intention is to describe how data for validation of heat conduction models can be produced by using the technique of adiabatic surface temperature.

**Work item:** ISO/NP TR 10796- 1 through 4:

4 examples on calculation methods are developed to demonstrate the applicability of procedures described in ISO 16730 on distinct calculation methods for several types of physics based mathematical models (zone model "CFAST", CFD model "ISIS", structural model "WALL2D" on predicting the fire performance of wood-framed wall assemblies) as well as for equation based calculation methods (egress model "EXIT89").

Four draft documents are available, in different stages of completion. These were discussed during the 20th meeting of WG7. The work is assigned to project leaders.

The examples are developed as stand-alone Technical Reports, but may later on be included in a revised IS 16730 as (informative) Annexes.

There was discussion about proprietary nature of the examples, and the extent to which they can be more anonymous. There was some disagreement in this regard with some members happy to leave the examples as they are while others thought they implied endorsement by ISO of the particular example. As a minimum it was agreed there should be a clear disclaimer at the start of each example that ISO does not endorse the method and the example is only intended to show how the main document is intended to be applied to a specific application.

### 3.5 Working Group WG9 (calculation methods)

**Convenor:** Prof. K Harada, Japan.

**Meeting No. 20 (21 October 2009, 1.00pm)**

WG9 are preparing documents describing the use of specific calculation methods relating to various fire phenomena. Describing the limitations of calculations as well as the actual equations is seen to be important.

There are three relevant work items for WG9:

1. PWI 16737: a revision to ISO 16737 Fire safety engineering -- Requirements governing algebraic equations -- Vent flows
2. PWI 24678: for algebraic equations on flashover-related phenomena.
3. PWI 29763: for thermal radiation from pool fire flames.

**Work item:** PWI 16737

PWI 16737, revision of the International Standard ISO 16737:2006 "Fire safety engineering - Requirements governing algebraic equations - Vent flows". The editorial corrections of the document by the project leader K. Harada were presented and confirmed. The WG members agreed to send the document for DIS balloting.

  
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**Work item:** Revised PWI 24678

Requirements governing algebraic equations on flashover related phenomena. Working Group members agreed that further development of the document should be continued by project leader N. Alvares.

**Work item:** PWI 29763

Revised Drafts on PWI 29763: Requirements governing thermal radiation from pool fire flames. Working Group members agreed that further development of the document should be continued by project leader A. Alvarez.

**Other business:**

The possibility of future development of more calculation documents was discussed. WG agreed to consider further the source of input data for algebraic calculations (in conjunction with SC1), criteria for flame spread algorithms (in conjunction with SC3) and spill plumes and related physical phenomena.

### **3.6 Working Group WG10 (fire risk assessment)**

**Convenor:** Dr. John Hall, NFPA, USA.

**Meeting No. 20 (20 October, 1.30pm)**

This working group has previously prepared ISO/TS 16732 guidance on risk assessment for use in fire safety engineering. This document has been published.

TS 16732 provides the conceptual basis for fire risk assessment by stating the principles underlying the quantification and interpretation of fire-related risk. These fire risk principles apply to all fire-related phenomena and all end-use configurations, which means these principles can be applied to all types of fire scenarios.

TS 16732 has recently begun DIS balloting with an example annex consisting of NWI 29243, Part II.

**Work item:** PWI 29242

This covers the two common examples with WG6. These examples are being developed within WG6 and it is expected that they will be able to be used as a basis for WG10 examples at a later time.

**Work item:** PWI 29243

This includes N. Benichou's example using Firecam for a multistorey office building which is the most advanced example and in relatively good shape. There was no further discussion on this example.

**Other business:**

Dr Taveau presented a proposed new example for a propane storage facility with an objective to reduce the probability of a BLEVE to an acceptable level. Dr Hall noted that the example seemed to be very advanced and addressed the sections in the main document very well, and proposed that the example should be developed as a new work item.

There was informal agreement for the Working Group convenor to invite a group of interested people to discuss specification of the task and task group corresponding to the SC4 item 4 task in the SC3/ SC4 matrix of candidate work items; this task would

  
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seek to provide guidance on methods to prioritize scenarios, especially for countries without advanced fire incident data of their own.

No specific task yet proposed; the plan is to take over the data elements proposed for fire risk assessment in the last W8 document.

### **3.7 Working Group WG11 (Behaviour and movement of people)**

**The convenor is Prof David Purser, UK. (absent)**

**The acting convenor was Mr Geoff Harris, BSI, UK**

**Meeting No. 20 (19 October, 2.00pm)**

**Work item:** ISO/CD TR 16738

WG11 is a work group concerned with behaviour and movement of people.

ISO/TR 16738 (ISO/TC 92/SC4 N515) Fire Safety Engineering – Evaluation of behaviour and movement of people was published in July 2009.

**Work item:** PWI 29761 Occupant behavioural scenarios

A new draft of Preliminary Work Item 29761 (WG11 N75) on 'Design Occupant Behavioural Scenarios and design Behaviours' (project leader Dr. Fahy), was discussed at the meeting. An amended text will be circulated for consideration at the next WG11 meeting. It was decided to maintain the status as PWI for the present, until a more definitive text has been agreed.

#### **Other business:**

The convenor Prof Purser has retired from the convenorship of WG11 but will continue to act as an expert. Dr Fahy was proposed as the new Convenor and this was endorsed by the work group.

### **3.8 Working Group WG12 (fire performance of structures)**

**Convenor: Dr Nouredine Benichou, NRC, Canada**

**Meeting No. 12 (22 October 2009, 9.00am)**

**Work item:** ISO/WD 24679 Fire safety engineering – Performance of structures in fire

This working group is currently engaged in the preparation of a technical specification for guidance on structures in fire for use by fire and structural engineers.

This was the 12th meeting of the Work Group. The progress of the NWI was presented as follows:

Following the draft document presented in Lund, Sweden (at the 11th Meeting), the comments from the balloting results were addressed and the document was updated accordingly. Further feedback was received before the Lancaster meeting and implemented in the document. The document is now ready for publication as a Technical Specification and the convenor will work with the SC4 secretary to proceed with the publication in the next few months.

The WG also discussed the following new items:

A joint SC2/SC4 meeting was held to discuss data needed for FSE practitioners for structures in fire. The initial scope and strategy were defined and some data was

  
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identified. A task group (TG) was formed from member countries from around the world. The TG members were asked to provide information on data to the convenor. The convenor will then prepare an outline and an initial skeleton document and distribute this to the TG by January 15, 2010 for their input and feedback. The convenor will then distribute a preliminary document to the members by end of March 2010.

A new preliminary work item on the fire resistance design of oversized structural steel elements was proposed by Mr Kwon, South Korea. In order to determine the applicability of this item to WG12, a detailed proposal on this item will be submitted by the end of March 2010 and discussed at the next meeting.

A new preliminary work item on examples to show application of ISO/TS 24679 was suggested. The convenor identified potential project leaders. The project leaders will prepare proposals of the examples for discussion at the next meeting. The project leaders will send the proposals and initial outlines to the convenor who will distribute them by mid to end of March 2010 for discussion at the next meeting.

It is also necessary to start the work to move the Technical Specification to an International Standard (more normative language will need to be implemented in this new document).

### 3.9 Joint Meeting SC3/WG5 and SC4

**Convenor:** Dr D Gann, NIST

**Meeting No. 4 (21 October 2009, 2.00pm)**

D. Gann summarised and updated the status of the list of potential new work items previously prepared for discussion and consideration by the various work groups in SC3 and SC4. The list is included as Appendix A of this report.

### 3.10 SC4 plenary session

**Chairman:** Dr Joël Kruppa

**Secretariat :** AFNOR – Mr Benoît Smerecki

The working group convenor reports were presented at the plenary session.

A copy of the resolutions made by SC4 are given in Appendix B.

At the SC1/SC4 joint meeting, K. Yoshida put a proposal that SC4 documents on FSE (1673X series) should be reviewed aiming at identifying what parameters are to be derived by SC1 ISO standards. It was also pointed out that conditions for obtaining such parameters should be also identified. The joint group agreed that, as the first stage, a team with small number of people should be established to conduct such exercise on the SC4 standard developed by WG9 (ISO 16734, 16735, 16736 and 16737). The team would consist of Prof. Harada as SC4 and Mr. Yoshida as SC1. The joint group noted that the outcome of the exercise could be used as future addition of informative annexes to the ISO standards for FSE in SC4 and the ISO standards for fire test in SC1. It was agreed to continue the cooperation of SC1 and SC4 on identifying joint data needs and the usefulness of a liaison of a SC4 member with SC1/WG11 “Applicability of reaction to fire tests to FSE” was noted. C. Wade agreed to act as the liaison member.

Location and date of next meeting: Christchurch, New Zealand, April 19 – 23, 2010.

  
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Meeting rooms will be provided by the University of Canterbury.

## 4. SUMMARY

This report summarises activity in ISO TC 92 SC4 on fire safety engineering as discussed at the October 2009 meeting in Lancaster, USA.

  
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# APPENDIX A

## ISO/TC 92/SC 4 N535

### Candidate Work Items from Matrix for Use of Tenability and Smoke Toxic Potency Information in Fire Safety Engineering RGG; 8/22/2008

#### SC3

1. Standard on requirements for large-scale test methods to represent toxic gas and smoke hazards in different fire scenarios Document on scenarios for large-scale fire tests **(SC3 WG1)**

This International Standard will provide guidance for the set-up of large-scale fire tests which represent different well-defined fire scenarios, and presents guidance on the measurement of toxic gas and smoke hazards. It provides bases for comparing the results among different types and scales of such tests.

2. Normative documents on obtaining fire effluent data for finished products **(SC3 WG1)**
  - a. Standard for correlation of toxicity data among physical fire models and full-scale tests **(PWI 29903)**

This International Standard will provide principles for characterizing the yields of toxic gases from a laboratory fire test and provides bases for comparing the results among different types and scales of such tests. This Standard also includes consideration of the uncertainties in the gas yield determinations. The combined uncertainty is a key factor in the ability to establish similarity or difference of test results. The sufficiency of the agreement between a bench-scale test and a real-scale test depends on the needed precision in the fire hazard or risk assessment. This is not covered in this Standard.

- b. Controlled equivalence ratio method for the determination of hazardous components of fire effluents **(ISO/TS 19700)**

This Technical Specification describes a tube-furnace method for the generation of fire effluent for the identification and measurement of its constituent combustion products, in particular, the yields of toxic products under a range of fire decomposition conditions. The use of this apparatus is generally applicable to individual materials, to products that are layered such that the layering will not result in a significant change in product yields with time in real fires, i.e. to


products where the upper surface does not provide major protection to the sub-layers. This method has been designed to provide data for input to hazard assessments and fire-safety engineering design calculations.

3. Technical Report Document on the effect of combustion conditions on effluent components **(SC3 WG2)**

This document summarizes and interprets the findings of research on the variation of the yields of toxic compounds, visible smoke, and heat with

  
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combustion conditions, notably equivalence ratio and possible the chemical composition of the combustible.

4. International Standard on calculation of wall losses of gases and smoke **(SC3 WGx)**

This document would include the published methods for assessing the decrease in gas and smoke concentrations as a function of distance from the fire. Non-normative annexes would compile the results of tests of wall losses.

5. Examples of calculations of FED and ASET **(SC3 WG5)**

This Annex to **ISO 13571** provides examples of the use of the equations within the Standard.

6. Technical Report on the sub-incapacitating effects of fire effluent **(SC3 WG5)**

This document compiles and interprets the published literature on the effects of toxic gases, visible smoke, and heat at levels below those that lead to incapacitation.

7. Compilation of limiting hazard by product type and fire scenario **(SC3 WG5)**

## SC4

1. Include consideration of tenability conditions in revisions of **ISO/TS 16733 (SC4 WG6) and ISO/TS 16732 (SC4 WG10)**

For both design fire scenarios and risk assessment, this would be in the form of new examples. In these examples, the effects of delay in evacuation or incapacitation (before or during evacuation) would be included.

2. Normative document on effects of smoke and toxicants on human behavior and judgment and thus on time required for escape **(SC4 WG11)**

This would be a follow-on to **ISO/DTR 16738** in **SC4 WG11**. It would include effects of toxicants on movement speed and choices. An annex would include treatment of statistical distribution of behavioral response.

3. Include consideration of fire effects on people in document on selection and implementation of behavioral scenarios **(SC4 WG11)**

This would be an extension of **WD 29761**.

4. Technical Report on relative importance of various fire scenarios, including guidance for jurisdictions that do not have fire incidence data compilations **(SC4 WG6 & WG 10)**

This document would guide authorities on how to weight fire scenarios, including the likelihood that people would be moving within the occupancy.

5. International Standard(s) on flame spread algorithms **(SC4 WG9)**

This Standard would establish criteria for equations and software for calculating fire growth, including changes in equivalence ratio that might affect combustion product yields, as in Item 3 under SC3.

6. International Standard for fire growth capability in zone and CFD models **(SC4 WG7)**

This Standard would establish criteria for equations for effluent generation and transport models, including changes in equivalence ratio that might affect combustion product yields, as in Item 3 under SC3.

  
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7. International Standard on transport and losses of effluent and effluent components in zone and CFD models **(SC4 WG7)**, using output from Item 4 under SC3.
8. Technical Report on approach to grouping finished products by magnitude and nature of effluent potency **(SC3/SC4 WG6)**

Since, for a single building, there are many combinations of combustible products present, it is unlikely that someone would examine all the possible fire scenarios and use the results to select chairs, carpet, wall coverings, etc. Therefore, this document would describe the basis for identifying products of ordinary burning rate and toxic product yields. It would also describe the basis for determining whether a product should be identified as "not ordinary," depending on the mass of the product, its burning rate, the yields of smoke and/or toxic gases, what other products might be burning at the same time, etc.

9. Guide to estimating ASET. **(SC3/SC4)**

This would be a guide to using all the above documents, along with other appropriate TC92 documents, for estimation of whether people would be able to escape from a fire.

  
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## APPENDIX B

# ISO/TC 92/SC 4 "Fire Safety Engineering" Resolutions Lancaster, Pennsylvania, USA 23<sup>rd</sup> October 2009

### Resolution SC4 N195 – Lancaster 1, 09/10/23 – Appreciation for the contribution of David PURSER

Considering the decision of David PURSER to stop his WG 11 Convenorship,

ISO/TC 92/SC 4 wishes to thank him a lot for the hard work he has done as TC 92/SC4/WG 11 Convenor, with the publication of ISO/TR 16738 in July 2009 and wishes him an enjoyable retirement.

### Resolution SC4 N196 – Lancaster 2, 09/10/23 – Convenorship of WG 11

As proposed by TG1 in document SC 4 N571 and in accordance with WG 11,

ISO/TC 92/SC 4 appoints Dr Rita FAHY as Working Group 11 Convenor.

### Resolution SC4 N197 – Lancaster 3, 09/10/23 – Addition to the SC4 work programme of a Preliminary New Work Item

As proposed by WG10 in document SC4 N576,

ISO/TC 92/SC 4 agrees to add to the SC4 work programme a preliminary new work item given an example for an industrial property following the ISO/TS 16732 methodology, subject to the agreement of TPMG, with Jérôme TAVEAU (France) as project leader. This example will be attached to the future ISO 16732, as an annex.

### Resolution SC4 N198 – Lancaster 4, 09/10/23 – Publication of ISO/TS 24679

As proposed by WG12 in document SC4 N578,

ISO/TC 92/SC 4 agrees to publish ISO/TS 24679 "Performance of structures in fire" as discussed at the Lancaster meeting.

  
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**Resolution SC4 N199 – Lancaster 5, 09/10/23 – Results of the Systematic review balloting for WG 9 documents**

As proposed by WG9 in document SC4 N575 and considering the results of the systematic review balloting,

ISO/TC 92/SC 4 agrees to confirm ISO 16734:2006 on fire plumes and also ISO 16736:2006 on ceiling jet flows.

**Resolution SC4 N200 – Lancaster 6, 09/10/23 – Launch the DIS ballot for ISO/DIS 16737 (Revision of ISO 16737:2006)**

As proposed by WG9 in document SC4 N575,

ISO/TC 92/SC 4 agrees to send the updated version of the document on vent flows (Revision of ISO 16737:2006) according to the output from the WG9 meeting to ISO/CS (Geneva) in order to launch the DIS stage.

**Resolution SC4 N201 – Lancaster 7, 09/10/23 – ISO/TR 3956:1975**

Further to the result of the systematic review balloting as proposed by the joint SC2/SC 4 meeting held at Lancaster on 22nd October 2009, ISO/TC 92/SC 4 decides to withdraw the ISO/TR 3956:1975 "Principles of structural fire-engineering design with special regard to the connection between real fire exposure and the heating conditions of the standard fire-resistance test (ISO 834)" because this document already covered by other ISO documents.

  
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## APPENDIX C

### Minutes of the Twentieth Meeting SC4 WG6 Marriott, Lancaster, USA, October 20, 2009

#### 1. Opening of the meeting

C Wade opened the SC4 WG6 meeting on Tuesday 8.30 am as convenor. She welcomed the attendees and thanked the hosts from USA for providing the venue.

#### 2. Roll call of delegates and apologies for absence

##### *Members\* in attendance (11):*

*N. Alvares, USA  
N. Bénichou, Canada  
J.M. Blanchet, France  
D. Brein, Germany  
S. Craft, Canada  
I. Hagiwara, Japan  
J. Hall, USA  
J. Kruppa, France (SC4 Chairman)  
B. Smerecki, France (SC4 Secretary)  
C. Wade, New Zealand (WG6 Convenor)  
J. Wiese, Germany*

##### *Observers in attendance (11):*

*A. Alvarez  
H. Colina, France  
J. Gross, USA  
G. Harris, UK  
W.H. Kim, South Korea  
A. Kosachev, Russia  
T. McAllister, USA  
A. Nazih, France  
P. Qiu, China  
G. Taveau, France  
P. Wu, China*

##### *Apologies had been received from (3):*

*N. Smithies, UK  
G. Cooke, UK  
K. Harada, Japan*

*\*as listed in the ISO Global Directory – please update your status with your national standards body if required.*

The draft agenda (N118) was adopted without change, except swapping the order of the items under section 6. The convenor had previously circulated electronic copies of documents N116 (Minutes of the 19th meeting in Lund, Sweden), N117 (WG6 Report of the 19th meeting to SC4), and N96Rev4 (Design fires for a covered stadium).



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#### 4. Minutes of the 19<sup>th</sup> meeting – Lund, Sweden

C. Wade guided the attendees through the draft minutes. As there were no corrections, the minutes of the 19<sup>th</sup> meeting (N116) were adopted as circulated.

#### 5. Report on Action Items from 19<sup>th</sup> meeting

*Action 19.1: J. Wiese (leader) to revise the example in a form that could be included as an annex, with help and input from C. Wade, by 30 August 2009 for circulation and discussion at the Lancaster meeting. There was no document available for distribution, but progress will be discussed today.*

*Action 19.2: By 30 August 2009, C. Wade is to circulate a revised covered stadium example to TG-A for input and comment. Circulate to WG6 prior to Lancaster meeting. Document N96rev4 was previously circulated and will be discussed today.*

*Action 19.3: By 30 August 2009, C Wade to consider the possible work area described in SC4 N535 Section 8 in liaison with D. Gann and draft appropriate text for further discussion by WG6 at the next meeting. There was no document distributed and the item will be discussed later in the meeting.*

#### 6. Report on PWI 29241 (Examples of selection of design fires)

C. Wade briefly summarised the purpose and status of the examples (particularly for the experts that are new around the table). The document is based on ISO/TS16733. One of the purposes is to find out how well the main document is working or whether changes are required. At the current time the stadium example is quite well developed while the warehouse is at an earlier stage of development.

##### Example 2 Warehouse Commodity - example from TS 16733 Annex C

J. Wiese presented the outcome of his Task Group on design fires for the warehouse example. They found that for large spaces a geometrical model is needed for fire spread and simple rules are needed for the activation of detectors or sprinklers. Simple rules are also needed for smoke removal in large spaces, flashover and glass breaking. There is also a need for burning rate data of commodities and maximum heat release rates.

J. Wiese: In Germany there is no experience of designing sprinkler installations by applying fire safety engineering tools, but the instead rules like CEA 4001 are used. There is little known about the interactions between water and smoke. One approach may be an energy balance between cooling vaporization and heat release but no models are available. Design of sprinkler systems should not be the purpose of this example.

J. Wiese also noted points related to –

- Functional requirements for business interruption, as one of several objectives, cannot be done by the FSE engineer; rather it is the task of the building owner.
- Safety factors from the philosophy of fire resistance time for load bearing building elements.
- Outlining the fire safety concept on NAD (National German Application Document for the Eurocode). Lack of statistics leads one to accept data from international statistics.
- P1 probability, p2 probability failure that a fire brigade or installation will not be able to stop the fire in the compartment, p3 probability for consequences, according to the 'te' table displayed on screen for large, moderate and small losses.

  
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J. Wiese displays the importance of safety concept considerations to arrive at design fires, and to arrive at safety margins for the description of the design fires. There is no real guidance with design fires for the application of sprinkler systems.

C. Wade suggested the objective is to develop the design fire, not the sprinkler system.

J. Wiese says if the work is to be similar to the stadium example, more advice is needed for the Task Group. The business interruption is a real problem for FSE engineers. If we look at different objectives the design may become easier.

**Discussion:**

J. Hall: Often industrial fires do not start in the big areas of the warehouse, but rather in adjacent areas. Are there dangerous cases where the fire did not fill the whole volume? Even then the damage can be very large. Fires that are blocked can be a certain type of scenario, so that the protection of a facility of that kind can be challenged.

J. Wiese. Arson is a typical cause for big fires. Also fires resulting from repair work on roofs. But if the fire starts inside a sprinklered building there is only a scarce number of fires growing fast and causing great damage.

J. Hall: come up with critical scenarios, that would not occur very often, but with high consequences.

C. Wade: the scenario could be targeted at limiting the potential for damage.

A disclaimer is needed to make clear that the design fire developed towards a particular objective and functional requirements cannot be transferred to other objectives.

C. Wade to email J. Wiese's presentation to WG6.

***Action 20.1: J. Wiese (leader) to continue to revise the example, since the input to SC4 is valuable. C. Wade and J. Hall invited to give more input. Deadline is end of December 2009 for revision and to be discussed at the Christchurch meeting in April.***

**Example 1 Covered Stadium (N96Rev4)**

C. Wade briefly described the first worked example to develop design fires for a multipurpose covered stadium including both a smoke removal system and fire sprinklers. The design objective was to provide for life safety, with a functional requirement to provide safe egress for the occupants.

Since the previous meeting, C. Wade had revised the example and distributed to group members. She raised an issue with how the Technical Specification is applied regarding the first part of the example (as already published in the TS). She suggested that if only the scenarios that have the highest risk ranking from this event tree are used as the design fire scenarios then scenarios which allow the performance of sprinklers and venting to be evaluated may not be included.

There was some discussion of this however it may be addressed if the starting point in developing the event tree did not include the sprinklers and venting. These systems would be added later as measures to mitigate the risk.

J. Hall: Common cause failure modes may have an outcome so that individual measures would not work. But, if a system is not effective by itself – make it more effective or more reliable.

  
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N. Benichou: when do we decide what systems to put in a building and how many?

D. Brein: multiple points of origin of fire are or are not a design feature? “Sophisticated” arson is excluded. How should the multiple failures be handled?

C. Wade on Scenario 4: (from N96 rev 4): the concern in this scenario is not an inherent sprinkler failure where the fire would continue to grow, but rather the hazard presented by a fire that grows to a size not quite large enough to operate the sprinkler.

J. Hall: Level of detail is high, while the data is poor for numbers.

N. Benichou: standard scenarios (prescriptive ones) should be given in order not to forget about these, but additional ones may be developed. Perhaps this indicates a lack of preciseness in TS 16733?

J. Hall: what if an engineer limits the scenario arbitrarily to end up with a design to prove that the traditional requirements need not be met? In that case, a 3<sup>rd</sup> party review might help to overcome the trouble.

J. Wiese: Regarding the event tree, we should start with “nothing”. What is the benefit of multiple measures e.g. installation of a detection system will lead to early alarm. A sprinkler system will reduce the HRR etc. These measures operate at different times. May help to understand what optimum fire safety designs will be.

Consider the consequences for 16733 and revisit the language in the main document.

C. Wade: the document should show the different approaches to developing the design fire based on differing places of origin, therefore 3 design fires were chosen to be developed.

A. Nazih: At that stage the consequences are not yet taken into account.

Regarding design fire D1 as presented in Document N96Rev4. The principle has been to assume materials are present and fire growth rate is ultrafast as a consequence. Fuel loads, energy contents determine the design fire over time. It is questioned whether the design fire resembles reality. But on the other hand J. Hall points out that the structure applied is straightforward. Need to consider whether the structure for the document should be altered to better explain the process of arriving at design fires. Details on the value of the design fire meeting expected reality should be reconsidered by the Task Group.

***Action 20.2: C. Wade will amend the document by the mid-December 2009 and distribute to task group. To be returned by 31 January for comments to be incorporated and sent to the WG6 members by end of February 2010.***

## **7. Possible new work item – guidance on grouping finished products for toxic species production**

One of the possible areas of activity was related to developing guidance for how to go about grouping finished products in relation to their toxic species production given it is not practical to expect that all products would be able to be tested. (See SC4 N535 section 8). The suggested work item relating to a classification approach for assessing toxic hazard of finished products in buildings is not adequately developed for action at this stage. Further preliminary research may be needed. It is proposed that the topic be discussed in a seminar associated with TC92 meetings in Paris 2011.

  
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*Action 20.3: Currently to be postponed, perhaps until after the Paris 2011 meeting and the accompanying workshop.*

## **8. Report on PWI (evolving TS 16733 to a DIS)**

It was agreed that it was premature to prepare a PWI proposal on evolving ISO/TS 16733 to a DIS. Three year systematic review is underway with balloting closing on December 15, 2009. WG6 support renewal as a technical specification for a further three years.

## **9. Report to SC4**

### **10. Any other business**

- **Data requirements for WG6**

C. Wade extracted some data requirements from the last WG8 document such as Heat Release Rate suggested it could go into an Annex of the main document.

J. Hall feels perhaps there is no need for specific data for WG6, as it should be provided from outside WG6, but from where and which WGs? N. Benichou says there is a need for data for input for WG12 and he says he needs the data from WG6.

J. Weise would like to reconsider the TC92 information bus, where the developments since 2000 are included.

*Action 20.4: C. Wade will draft a preliminary table concentrating on data items referred to in TS 16733 for discussion at the April meeting.*

- **Update on NZ regulatory proposals in fire safety engineering**

C. Wade offered to report about the progress in New Zealand for develop a framework for Performance Based fire safety design. The AHJ is concerned about the some aspects of the approach currently taken and wishes to be clearer about the regulators' expectations regarding design fires and acceptable criteria. For practical reasons, the regulators currently often rely on 3<sup>rd</sup> party review. The regulators would now like to put boundaries around the quantitative design fires and scenarios to be addressed. Quantitative acceptance criteria are also specified for toxic gases, visibility etc as well as pre-movement times and egress parameters. The regulators define functional criteria for the appropriate design. Recently a proposal was released by the Department of Building and Housing in NZ to enable the proposal to be field tested by fire engineers. A decision will be made next year whether to continue to develop and implement the proposal.

J. Gross points out that most of the prescriptive contents and criteria seems to be restricted to the needs of safety of people, not so much structural. C. Wade indicated that structural considerations were included but not elaborated in the material presented at the meeting.


C. Wade offers to check whether the New Zealand draft document can be made available to WG6 and if so, will distribute to interested persons.

### **11. Arrangements for next meeting**

The next meeting of SC4 (TGs and WGs) will be:

  
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- Wednesday 21 April 2009 in Christchurch, New Zealand in the morning.

## 12. Close of the meeting


The meeting was adjourned at 12.20 pm.

Notes of meeting for minutes were recorded with the assistance of D. Brein.

Colleen Wade  
Convenor of WG6

  
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