FQ0670/4

Report on ISO TC 92 SC4 Meeting, April 2009

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Report on ISO TC 92 SC4 Meeting, April 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 TC 92 SC4 (fire safety engineering) and to serve as a record of attendance at ISO TC 92 SC4 during the week of April 19 – 24, 2009 in Lund, Sweden.

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 and is 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 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);

- Working Group WG12 (fire performance of structures);
- Joint meeting with SC3 WG5 on life safety criteria
- SC4 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 WG1 (general principles and concepts)

4. Convenor: Prof. Takeyoshi Tanaka, Japan.

Meeting No. 1 (22 April, 4.00 pm)

Due to the need for handling new work items linked to the General Principles standard ISO 23932, it was proposed to reactivate WG 1 which previously had the name "Application of fire safety performance concepts to design objectives" in order to:

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

WG 1 will also now be the place for the maintenance of ISO 23932 in five years time given the disbanding of TG2.

Professor Takeyoshi Tanaka agreed to become convenor of the work group.

Experts provided by the National Standards Bodies included experts from Austria, Canada, France (4), Hungary, Japan, New Zealand, The Netherlands and USA (2).

There were no work items yet assigned to this work group.

Prof Tanaka gave a presentation on the Japanese performance based design method which is partly the result of the BRI's fire safety design method developed 1981-1986. The Japanese system is somewhat similar in concept to the fire design framework being considered in New Zealand i.e. identification of design fires, and performance criteria. They also include a series of supporting technical standards which can be either prescriptive or performance based solutions depending on the state of the art.

A description of the Japanese framework and commentary on its use can be found in Appendix D.

4.1 Working Group WG6 (design fire scenarios and design fires)

Convenor: C. Wade, BRANZ, New Zealand

Meeting No. 19 (21 April, 9.00am)

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 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.

C. Wade 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. The attendees were reminded of the status of the example and that the design fire scenarios had been already developed previously and were included in Annex 2 of ISO/TS 16733. The current PWI 29241 was to document the next step of developing the actual design fire specifications for these design fire scenarios.

C Wade described the example for a multi-purpose covered stadium following ISO TS 16733. Design fire characteristics for 4/6 scenarios were presented and discussed, covering fires in the main arena and in an adjacent retail area. C Wade will now complete the example and prepare a revised draft for discussion at the next meeting.

Jürgen Weise made a presentation on the deliberations of a German group who came together to prepare the second example for storage of a commodity in a warehouse building and applying the TS16733 document. It was reported that the group had many different opinions and found it difficult to apply the TS 16733 document as it was not specific enough and did not provide the needed data and methods to complete the task.

It was noted that t-squared fires may not be appropriate for this example. The use of geometric growth rates (fire spread rates) was demonstrated, varying the location of the fire around the compartment.

C. Wade noted additional data would be useful for inclusion in an annex, but calculation methods and equations would come from other ISO documents, or other sources.

G. Cooke observed the example illustrated many practical issues in applying the Technical Specification.

J. Hall stated that it was necessary for the TS to be very flexible, otherwise it would be a prescriptive standard. He also suggested that the example be structured to better show the linkages between the branches of the event tree from the scenario selection and the range of design fires identified. He also suggested that decisions leading to the construction of the heat release graphs should be explained.

C.Wade suggested to also try to identify what changes/improvements should be made to the main document TS 16733.

Jürgen Weise will continue work on this example for further discussion at the next meeting.

Other business:

SC3 WG5 and SC4 joint meetings led by D. Gann of NIST has 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. C. Wade is to consider the matter further in liaison with D. Gann and report back for further discussion by WG6 at the next meeting.

The minutes for this WG6 meeting is attached as Appendix A to this report.

4.2 Working Group WG7 (verification and validation of calculation methods)

Convenor: Mr Dieter Brein, Germany

Meeting No. 19 (20 April, 9.00am)

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

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 two preliminary work items and one work item.

Work item: ISO/PWI 24677 Data for validation of calculation methods.

The first preliminary work item is ISO/PWI 24677: to develop a TS or TR: Data for validation of calculation methods.

PWI 24677 work on “Data for validation of calculation methods” comprises a draft contents list and some text outlining the principal procedures and requirements for data. General work is currently pending due to an open discussion within SC4 on how to progress the data requirements issue across the WG’s involved. However, in addition to the development of a guideline it is intended to develop one example (at least) on the checking of data for suitability for the purpose of validation of a calculation method. 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 in connection with the plate thermometer.

Work item: ISO/PWI 10796 Examples on verification and validation of a calculation method.

Following the ISO TC92 SC4 workshop in San Antonio, TX, USA on April 10, 2006, 5 examples on calculation methods are being developed to demonstrate the application of ISO 16730 on distinct calculation methods for several types of physics based mathematical models (zone model “CFAST”, CFD model “ISIS”, and structural model “WALL2D” on predicting the fire performance of wood-framed wall assemblies) as well as for equation based calculation methods (model of activation of a detector “Detect-TS”, egress model “EXIT89”). Work on 4 out of 5 examples was assigned (currently not for the “DETACT-TS”-model).

Four draft documents are available, in different stages of completion. These were discussed during the 19th meeting of WG7. The examples are developed as stand-alone documents, parts 1 to 4 of FSE-examples for assessment, verification and validation of calculation methods, but may later on be included in a revised ISO 16730 as (informative) Annexes.

Work item: ISO/WI 13447 Guidance on applications of zone compartment fire models

A project "Guidance for use of zone fire models" with C. Wade as task leader and principal author is underway in order to address the particular characteristics of zone models with a special emphasis on the ranges of applicability, limitations etc. This project intends to provide guidance on where zone models may be used and where it is better to apply more elaborate approaches, i.e. CFD models. After balloting with responses from 18/22 p-members (16 yes, 2 abstentions, 4 did not reply), the document now has WD status.

Other business:

Material relating to "FSE - Assessment procedures for specific types of models" may be needed to extend information from ISO 16730 towards a better description of the assessment of specific models like human behavioural and risk assessment models and will be treated in close cooperation with WG10 and WG11. Since this information is intended to go into the next revision of ISO 16730, no action by SC4 need be taken for now.

4.3 Working Group WG9 (calculation methods)

Convenor: Prof. Takeyoshi Tanaka, Japan.

Meeting No. 19 (22 April, 9.00am)

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, a revision of the International Standard ISO 16737: 2006 "Fire safety engineering - Requirements governing algebraic equations - Vent flows". The revision of the document by the project leader K. Harada was presented and discussed. After some related discussions, WG9 agreed that the revision has been almost completed, except some minor corrections that might be still needed, So it is appropriate the work now proceed to the next stage.

Work item: Revised PWI 24678: Requirements governing algebraic equations on flashover related phenomena. Although the project leader, N. Alvares was absent, the document revised by him was discussed. WG9 felt that it would be too difficult to develop it as an IS so decided to explore a way to develop it as a TR.

Work item: PWI 29763

Revised Drafts on PWI 29763: Requirements governing thermal radiation from pool fire flames. Although the project leader, A. Alvarez, was absent, the document revised by him was discussed. Also, the accuracy of rectangular and elliptical source simplifications of the configuration factor proposed by G. Cooke was discussed and WG9 agreed that the simplified method is useful for FSE practice and that WG9 should explore an appropriate way to include it into the document.

Other business:

Because of T. Tanaka's new appointment as WG1 convenor, WG9 selected Prof. K. Harada, Kyoto Univ. , Japan as the new WG9 convenor.

4.4 Working Group WG10 (fire risk assessment)

Convenor: Mr. John Hall, NFPA, USA.

Meeting No. 19 (24 April, 9.00am)

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 successfully completed systematic review and is approved for another term. The TS has been revised with results of a general review by experts. The plan is to progress the TS to an IS with one now-completed example attached as an annex; that example is NWI 29243, Part II. The long-term plan is to complete other examples, including PWI 29242, in the future and to attach them as additional examples.

John Hall: ready to make final edits following this meeting and then put forward the document for balloting as international standard. It is currently in the second 3 year period as a technical specification.

Hakan: There is a need for peer review as part of the process in the document. C Wade to provide some text about need for peer review due to the subjective nature of some of the input data, need to distinguish between peer review during the project and regulatory review that may be requested by the AHJ. Send to J Hall by the end of May.

G. Cooke: Discussion about the UK system for annual workplace fire risk assessment being a qualitative assessment. Should this type of method be mentioned in the document, even briefly? G. Cooke to provide John Hall with a copy to have a look at.

There was a presentation by D Parisse of a proposal by France to develop a document describing what fire incident statistics should be collected by national fire brigades.

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.

WG10 asks SC4 to take all steps required in order to ballot TS16732 with an annex consisting of NWI 29243, Part II, as DIS.

4.5 Working Group WG11 (Behaviour and movement of people)

The convenor is Prof David Purser, UK.

Meeting No. 19 (19 April, 2.00pm)

Work item: ISO/CD TR 16738

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

The draft of ISO/TR 16738 (ISO/TC 92/SC4 N515) Fire Safety Engineering – Evaluation of behaviour and movement of people was amended in response to comments received from the USA and Japan and sent to Geneva for publication.

Work item: PWI 29761 Occupant behavioural scenarios

As proposed at the Seoul meeting, worked examples of an approach to characterise design behavioural scenarios and means of escape were discussed. It was decided that a drafting group should consider the selection of a worked example to append to the 29761 document. A possible example involving the covered stadium from WG6 was discussed. A task group was identified including R. Fahy, S. Gwynne, E. Kuligowski, D. Nilsson and A. Robbins.

Daniel Nilsson, Erica Kuligowski and Steve Gywnne have done work on the worked example. They gave example of how they approached the problem of selecting behavioural scenarios using the WG6 covered stadium example.

A draft of Preliminary Work Item 29761 (WG11 N75) on 'Design Occupant Behavioural Scenarios and Design Behaviours' (project leader Dr. Fahy), was only very briefly discussed at the meeting with most attention given to the discussion regarding possible examples. An amended text for PWI 29761 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:

Consideration was given to ISO DTR 25743 from ISO/TC178 regarding use of lifts for evacuation and comments to TC178. D. Purser will provide comments to TC 178.

4.6 Working Group WG12 (fire performance of structures)

Convenor: Dr Noureddine Benichou, NRC, Canada

Meeting No. 11 (22 April, 2.00pm)

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 11th meeting of the WG. The progress of the NWI was presented as follows:

Following the draft document presented in Karlsruhe, Germany (10th Meeting), the document was updated based on the feedback received. The document was then sent for balloting as DTS on 18 December 2008. Comments were received by the closing date (18 March 2009). During this meeting, some of the comments were resolved and more feedback was received at the meeting.

The next actions of the WG are:

The convenor will address the remaining comments to the extent of fulfilling the content of the document as a Technical Specification (at this stage). The convenor will send this updated document to the members by June 15, 2009. Note: Further revisions will be done to move the Technical Specification to an International standard (more normative language will be implemented in this new document - this will be completed at a later stage after the Technical Specification is published)).

The members will review and provide feedback on the content of the updated document to the convenor by the end of July 2009.

The convenor to update the document based on the received feedback.

The convenor to send the updated document to the WG12 members by the beginning to middle of September 2009. At the next meeting the document will be finalized for submission for publication.

4.7 Joint Meeting SC3/WG5 and SC4

Convenor: Dr D Gann

Meeting No. 3 (21 April, 2.00pm)

D. Gann presented a 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 B of this report.

4.8 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 D.

Location and date of next meeting: Lancaster, USA, October 18 – 24, 2009.

5. SUMMARY

This report summarises activity in ISO TC 92 SC4 on fire safety engineering as discussed at the April 2009 meeting in Lund, Sweden.

APPENDIX A

ISO/TC92/SC4/WG6	N116

2009-04-21

ISO/TC 92/SC 4 Fire Safety Engineering

Working Group 6: Design fire scenarios and design fires

Minutes of the Nineteenth Meeting
Ideon Science Centre, Lund, Sweden, April 21, 2009

1. Opening of the meeting

C Wade opened the SC4 WG6 meeting on Tuesday 9.00 am as convenor. She welcomed the attendees and thanked the host from Lund for providing the venue.

2. Roll call of delegates and apologies for absence

Members in attendance (9):

- N. Bénichou, Canada
- J.M. Blanchet, France
- G. Cooke, UK
- J. Hall, USA
- K. Harada, Japan
- I. Kwon, Korea
- Z. Ni, China
- C. Wade, New Zealand (WG6 Convenor)
- J. Wiese, Germany

Observers in attendance (15):

- S. Craft, Canada
- R. Fahy, USA
- J. Gross, USA
- I. Hagiwara, Japan
- H. Hartl, Austria
- J. Kruppa, France (SC4 Chairman)
- A. Nazih, France
- P. Qiu, China
- P. Pourcel, France
- B. Smerecki, France (SC4 Secretary)
- T. Tanaka, Japan
- G. Taveau, France

W. Wittbecker, Germany
Z. Xiangyang, China
E. Zalok, Canada

Apologies had been received from (2):
D. Brein, Germany
N. Smithies, UK

3. Adoption of the agenda

The draft agenda (N115) was adopted without change, except swapping the order of the items under section 6. The convenor had previously circulated electronic copies of documents N113 (Minutes of the 18th meeting in Karlsruhe, Germany), N114 (WG6 Report of the 18th meeting to SC4), and N96Rev3 (Design fires for a covered stadium) along with a copy of ISO/TS 16733 for reference.

4. Minutes of the 18th meeting – Karlsruhe, Germany

C. Wade guided the attendees through the draft minutes. As there were no corrections, the minutes of the 18th meeting (N113) were adopted as circulated.

5. Report on Action Items from 18th meeting

Action 18.1: *By 31 December 2008, C. Wade is to circulate a revised covered stadium example to TG-A for input and comment.* ***N96Rev3 example design fires for covered stadium was sent to WG6 directly and not to TG-A due to lateness.***

Action 18.2: *By 28 February 2009, members of TG-A to return comments to C. Wade.* ***N/A due to Action 18.1 not being completed.***

Action 18.3: *J. Weise (leader), D. Brien and W. Wittbecker to develop example design fire characteristics for example 2, following the parts of section 7 of TS 16733. Send draft to C. Wade by 28 February 2009 for distribution to WG6 prior to the next meeting.* ***Material not circulated prior but an oral report/presentation was given to this meeting. The presentation by J. Weise was also circulated on memory stick for the attendees.***

Action 18.4: *By 28 February 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.* ***Not done.***

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

Example 2 Warehouse Commodity - example from TS 16733 Annex C

J. Weise made a presentation on the deliberations of a German group who came together to prepare this example applying the TS16733 document. It was reported that the group had many different opinions and found it difficult to apply the TS 16733 document as it was not specific enough and did not provide the needed data and methods to complete the task.

It was noted that t-squared fires may not be appropriate for this example. Use of geometric growth rates (fire spread rates) was demonstrated, varying the location of the fire around the compartment.

C. Wade noted additional data would be useful for inclusion in annex, but calculation methods and equations would come from other ISO documents, or other sources.

G. Cooke observed the example illustrated many practical issues in applying the TS.

J. Hall stated that it was necessary for the TS to be very flexible, otherwise it would be a prescriptive standard. He also suggested that the example be structured to better show the linkages between the branches of the event tree from the scenario selection and the range of design fires identified. Also try to explain the decisions leading to constructing the heat release graphs.

C. Wade suggested to also try to identify what changes/improvements should be made to TS 16733.

Action 19.1: J. Weise (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.

Example 1 Covered Stadium (N96Rev3)

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.

In order to assist in developing the example further, C. Wade proposed that a real world example of a multi-purpose covered stadium be used as a basis for the assumed building design and uses. Examples of different layouts for the building when using for concerts, sports events, seminars, trade show and banquets were previously shown. The multi-purpose covered stadium included a main arena, with tiered seating on the sides. There were storage areas beneath the area of fixed tiered seating and food service/sales area adjacent to the main circulation route providing access to the arena from the main entrance. However, the actual building would not be identifiable as part of the example developed for Annex B of ISO/TS 16733.

Document N96rev3 as revised by C. Wade was presented covering the four of the six scenarios listed in ISO/TS 16733 in Annex B. The construction of the heat release rate curves versus time, taking into account the operation or not of sprinklers, the size of the compartments, and the total amount of fuel in the fuel package was described as well as the basis for selection of the species yields. It was noted that in practice there may be more scenarios needed but for the purpose of the example it needed to be more limited to avoid excessive duplication and to keep it to a sensible size.

John Hall suggested that for scenario 4 it may not be necessary to presume use of a ‘drop-down shutter’ around the server area, if the behavioural scenario included good staff management procedures that would direct occupants away from the retail area using other escape routes in the building.

John Hall suggests try to explain the decisions leading to constructing the heat release graphs.

Gordon Cooke suggested identifying which assumptions are generally accepted with reference to external sources, and which assumptions are arbitrary for the purpose of the example.

A. Nazih thought an electrical fire in a cabinet would be worthwhile to include in the selected scenarios.

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.

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 of finished products in relation to their toxic species production given it is not practical to expect that all products would able to be tested. (See SC4 N535 section 8). C. Wade volunteered to consider the matter further in liaison with D. Gann and draft appropriate text for further discussion by WG6 at the next meeting. This was held over from the previous meeting.

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.

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 due this year (2009) and WG6 support renewal as a technical specification for a further three years.

9. Any other business

- **Two IEC documents** were circulated on the memory stick for information of the attendees.

  IEC 60695-1-11 Ed 1.0: Fire hazard testing –

  Part 1-10: Guidance for assessing the fire hazard of electrotechnical products - General guidelines

  Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment

- **Data requirements for WG6** – there was no detailed discussion on this but it was noted that in future each working group should try and identify what are the data needs related to the work group activity for possible inclusion as an annex to the main document.

10. Arrangements for next meeting

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

- Tuesday 22 October 2009 in Lancaster, USA in the morning.

10. Close of the meeting

The meeting was adjourned at 12:30 pm.

Colleen Wade
Convenor of WG6

APPENDIX B

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 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.

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 WG?)**

   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.

APPENDIX C

Recommendations on
PERFORMANCE‐BASED FIRE SAFETY DESIGN OF BUILDINGS

Architectural Institute of Japan

PREFACE

1. BACKGROUND

The fire protection measures of buildings in Japan have been controlled according to the provisions in the Building Standard Law, the Fire Service Law and other related regulations. These provisions are mostly so-called prescriptive standards, which prescribe some of the acceptable solutions of fire safety requirements to a building in terms of kinds of permissible materials, fire resistance rating of structures, design of equipments and dimension of space and so forth. On the reform of the Building Standard Law in 1998-2000, performance-based standards were partially introduced, i.e.: the verification methods for egress safety and for fire resistance performance. However, the Building Standards Law still retains prescriptive nature as a whole. This is not peculiar for Japanese building code alone, but is a traditional and persistent custom of worldwide fire safety regulations from the past, such as when National Board of Fire Underwriters in U.S.A. began to make fire safety standards for buildings almost 100 years ago. Most of these prescriptive standards are based on empirical judgments of so-called fire experts, so their scientific and engineering bases were not always solid. Nevertheless, now that the fire loss has been stabilized at a low level for considerable period of time, at least in developed countries, so it may be said that the role that these prescriptive provisions have played to enhance the level of fire safety of buildings cannot be underestimated.

On the other hand, the system of building control for fire safety by means of prescriptive regulations, which has been the mainstream for almost a century from its birth, seems to be on a deadlock at last. It seems that the building regulations, which have been multiplied and complicated through frequent revisions, and thereby increasingly intensified restrictions to building designs and construction methods, are no longer able to provide effective and economical solutions to the buildings in this age. In general, prescriptive fire safety provisions are inflexible in accepting new building designs, innovative materials and technologies, and thereby tend to discourage such attempts.

2. THE MOC 5 YEAR PROJECT FOR FIRE SAFETY DESIGN METHOD

The project; " Development of the Comprehensive Fire Safety Design Method of Buildings" (commonly called as "The fire safety design 5 year project" or “Fire Safety So-pro”), which was carried out 1982-1986 by Building Research Institute (BRI), the Ministry of Construction (MOC), marked the beginning of objective-based and performance-based fire safety standard or fire safety design method. This project aimed to build a fire safety design system that, instead of prescribing fire safety solutions, defines the conditions to ensure the fire safety performance of buildings. The expectation was that the design method can be an alterative to the Building Standards Law in fire safety designs of buildings.

If the fire safety design method aims to be an alternative to the Building Standards Law, it must take into consideration of the equivalency between the Building Standards Law and the design method. This equivalency means that the purpose, the contents of requirements and the level of safety to be achieved are the same between the design method and the Building Standards Law. For this reason, first of all, the fundamental requirements for fire safety of buildings were defined by uncovering the fire safety objectives embedded in the provisions of the law, which are identified through the investigations of the sprits of standards in the Building Standard Law and associated regulations, and of the historical development of the law, including “the Law of Buildings in Urban Districts”, which preceded the existing Building Standards Law. In any country, building codes usually prescribe the requirements for fire safety in terms of the specifications of structures, materials, facilities, dimensions of space, sites of buildings etc to be satisfied, but do not explicitly state the purpose and performance to be achieved of the requirements. It follows that the defining the fundamental requirements meant the change from the viewpoint of the conventional building regulation systems and addressed an objective-based or a function-based design method.

The fundamental requirements can be said the basis of the design method. However, in order to enable the verification of compliance of actual designs of a building with these requirements, each of the requirements must be further broken down to more concrete and definite ones, and it is necessary to provide them with technical standards for concrete verification. It is important that each technical standard is clear enough to avoid the difference in its interpretations between designers and building officials. Prescriptive standards are qualified to be included into the technical standard in the sense of the clarity alone, but the majority of them have to be performance-based in order to allow wider freedom to building designs. In the outcome report of the Fire safety design 5 year project, each of the performance-based standards is expressed by a pair of design fire, or standard fire, and acceptable safety criterion.

It can be said that the fire safety design 5 year project has reached the important concepts, i.e. “objective-based design method” and “performance-based standard” at relatively early stage of the project. These concepts are now becoming common key words in the area of performance-based fire safety design of buildings. But, regrettably, we could not perfect all the requirements and the corresponding criteria to verify the compliance with the requirements within the period of this project.

3. The reaction to the Fire safety design 5 year project

The outcome report of the Fire safety design 5 year project, which was published in the title of "The Comprehensive Fire Safety Design Method of Buildings" has been widely utilized in the fire safety designs of actual buildings through the administrative system for the approval of special building conception by the Minister of Construction based on the Building Standards Law article 38th. The increase of the number of applications of fire safety plans approved by the Minister of Construction since the end of the Fire safety design 5 year project may be said impressive. This successful increase may be attributed to the following reasons: firstly as a background, building related communities had been unhappy with the excessive restrictions to building designs and sought for more flexible design systems; secondly, various fire safety engineering tools were introduced to the practitioners as a result of the Fire safety design 5 year project, and thirdly, the procedure of verification of fire safety became much more transparent through providing design fire sources and acceptable safety criteria for.

4. The improvement on the design method after the Fire safety design 5 year project

However, the flaws of "The Comprehensive Fire Safety Design Method” had been also recognized. It still had so many imperfections, which hindered it to be a self-sufficient design method, but allow it to play a role to merely complement the deficits of the current laws and provisions. The largest flaw was that, unlike the existing building codes, it lacked many technical standards which are necessary for a building fire safety design system to be self-sufficient.

Immediately after the end of the Fire safety design 5 year project, 1986, the effort to complete "The comprehensive fire safety design method" as a self-sufficient design system was started and continued mainly at the ‘fire safety design method subcommittee’ formed under the ‘fire-safety committee’ of the Architectural Institute of Japan (AIJ).

It is actually no easy task to construct a performance-based fire safety standards of buildings. In addition to technical issues, what are most difficult are to take into consideration of the cost effectiveness of fire safety measures and the influence on the convenience in normal time use. Also important was the deliberation of easiness of understanding by practitioners. Though the work required much longer time than anticipated at the beginning, it is still far from perfect and there remains much to be improved by the future studies. Nevertheless, it can be said that one of the frameworks of performance-based fire safety design method is presented. It would be our great pleasure if this publication can be any help with further refinement of performance-based design methods in the future.

2000.07 Architectural Institute of Japan

THE STRUCTURE OF RECOMMENDATION ON PERFORMANCE‐BASED FIRE SAFETY DESIGN

1. The purpose of this Recommendation on fire safety design

The provisions of the Building Standards Law for fire safety of buildings prescribe the minimum requirements and technical standards imposed to a building from the viewpoint to protect people's life and property and public welfare against building and urban fires. The majority of these technical standards are prescriptive and present only a part of potential solutions to meet the requirements on fire safety.

This 'Recommendation on performance-based fire safety design of buildings' (called also as 'the Recommendation on fire safety design' in the following) defines the requirements for fire safety of a building and presents the technical standards for the verification of compliance of actual designs of buildings with the requirements. The ultimate purpose of the Recommendation on fire safety design is to contribute to the realization of buildings more economically while retaining equal or higher fire safety performance level compared with those designed according to the Building Standard Law.

2. Principle and structure of this Recommendation on fire safety design

This Recommendation on fire safety design is basically made based on the principles and has the structure mentioned as follows:

(1) Maintaining the equivalency to the fire safety provisions of Building Standards Law

The Recommendation on fire safety design makes it an important rule that it does not lower but ensures equivalent performance on fire safety to the provisions of the Building Standard Law. Therefore, the requirements and the technical standards presented in this Recommendation on fire safety design have generally the same content and safety level as those of the Building Standard Law.

Though the Fire Service Law plays an important role on fire safety of building as well as the Building Standard Law, the provisions under the jurisdiction of the Fire Service Law and its associated regulations are beyond the scope of the Recommendation.

(2) Hierarchical structure of fundamental requirements and technical standards

In the Recommendation, the objectives associated with fire safety of a building are classified and arranged into the fundamental requirements for fire safety. And to each of the requirements technical standards are provided for the compliance verification.

The requirements describe the fire safety objectives and the basic functional requirements imposed for the compliance with each of the objectives. Technical standards are expressed generally by concrete numerical values or formulas so that whether or not specific building designs comply with the corresponding requirement can be judged without ambiguity.

(3) Use of performance-based standards

The fundamental requirements are further broken down into more concrete and detailed functional requirements, and technical standards are provided to each of them for the compliance verification. The technical standards may include prescriptive standards, but for wider flexibility in building designs, as many performance-based standards as possible are developed and incorporated into the technical standards.

3. The fundamental requirements for fire safety of buildings

Usually, conventional fire safety codes prescribe how each part of a building should be designed but do not explicitly state why it must be so. This has been one of the causes that alternative measures are practically rejected, and that excessive restrictions have been imposed to building designs.

In this Recommendation, the spirits of the provisions of the Building Standards Law are extracted through the investigations of Building Standards Law, the related regulations, the explanatory documents by the Ministry of Construction (MOC) and the histories and circumstances when the laws were enacted. They are defined as 'the fundamental requirements for fire safety' as follows.

A. Requirements for fire safety of individual building
1. Prevention of fire outbreak
2. Measures to hazardous materials
3. Ensuring of life safety
  3-1. Making adequate evacuation plan
  3-2. Limitation on usage of fire hazardous materials
  3-3. Ensuring safe evacuation space
  3-4. Ensuring safe evacuation route
4. Securing other's property
  4-1. Prevention of fire spread to other's building
  4-2. Prevention of hazardous collapse to other's building
  4-3. Prevention of fire spread to other's space
  4-4. Reuse of building after suffer fire
5. Ensuring fire fighting activity
  5-1. Ensuring the base of fire fighting activity
  5-2. Ensuring the route to fire fighting activity base
  5-3. Control of fire size
B. Requirements for fire safety of urban district
1. Building in fire-prevention district
  1-1. Breaking fire spread in urban district
  1-2. Protecting the streets important for emergency management
  1-3. Ensuring the districts important for emergency management
2. Building in quasi-fire-prevention district
  2-1. Mitigation of fire spread in urban district

Recently buildings have become increasingly larger in scale and more complex in use, conception and function, thereby complicating a fire safety design. If a large and complex building can be dealt as an assembly of multiple parts independent each other with respect to fire safety, it will be clearer and simpler to deal with its fire safety design. So the concept of 'independence with respect to fire safety' is introduced. When a building is divided into multiple parts according to this concept, the above requirements apply to each part of the building independently.

4. The standards to verify compliance with requirements on fire safety

It can be said that a performance-based standard is the most desirable type of standards in readiness in compliance verification and in flexibility in building design. But considering the present state of the art in the field of fire safety, it is practically impossible to construct all the technical standards as performance-based ones. In addition, a certain standards are not considered to contribute meaningful merit in fire-safety design but only compel a complicated procedure even if converted into a performance-based one. Furthermore, some standards may be rather convenient for verification work if simplified into prescriptive standards at adequately safer side.

Because of such reasons as above, not all of the standards in this Recommendation are performance-based ones. The priority here is to provide at least one standard in any forms to each of corresponding requirements so that this Recommendation can stand alone not depending on existing regulations. Consequently, the acceptable safety criteria of several types as follows have been introduced into this Recommendation.

P : Performance criterion
C : Complementary semi-performance criterion for convenience of verification
S : Specification criterion
D : Deemed to satisfy criterion
E : Expert judgement, which trusts the discretion of fire experts or building official

Of these types of criteria, expert judgment (E) should be converted into other type of standard as early as possible when the relevant knowledge matures, because it is not desirable to leave the safety criteria, which must be equitable in principle to a personal judgment. But, considering the incessant progress of building technologies, it is thought to be unavoidable that a certain portions of standards always remain to be left to personal discretion. This problem can be moderated if the competence of judgment would be limited to the Minister in charge or the officially approved evaluating bodies.

The type of each safety criterion is identified by the symbols, P, C, S, D or E appended to the head of the criterion number. Some technical standards may include different types of criteria. For example there are several criteria described together with performance criterion (P) and complementary criterion (C), in which case 'PC' is appended to the standard number. And some criteria may be invoked commonly to multiple requirements. For example, the criterion for stability of structure is referred at many part of the Recommendation. Such frequently used criteria are described in chapter-5 "common criteria" and referred in relevant part of the technical standards.

5. The composition of the performance-based criteria

The performance-based criteria, most emphasized in this Recommendation, are expressed by the combination of a design fire condition and an acceptable safety criterion. In the technical standards the design fire is coupled not only with a performance criterion but often with a complementary criterion.

Peoperly speaking, a design fire condition should contain not only design fire sources but also fire scenarios such as the conditions of door opening, but unfortunately the fire scenarios could not be sufficiently incorporated in this Recommendation. Further efforts are necessary on this regard in the future.

6. Predictive calculation methods for fire behavior

To make use of the Recommendation, not only the sets of the requirements for fire safety and the technical standards but also the calculation methods for various fire conditions are necessary. Considering that it is sufficient to predict fire condition at safer side for practical verification purpose, a considerable number of calculation methods now existing may be used. But without a standard predictive procedure, it would cause some problems that whether or not a specific design meets the requirements depends on the calculation methods. However, the related predictive procedures are numerous, it was not enough time to provide all necessary predictive procedures in this Recommendation. This is the subject to be investigated in the future as well.

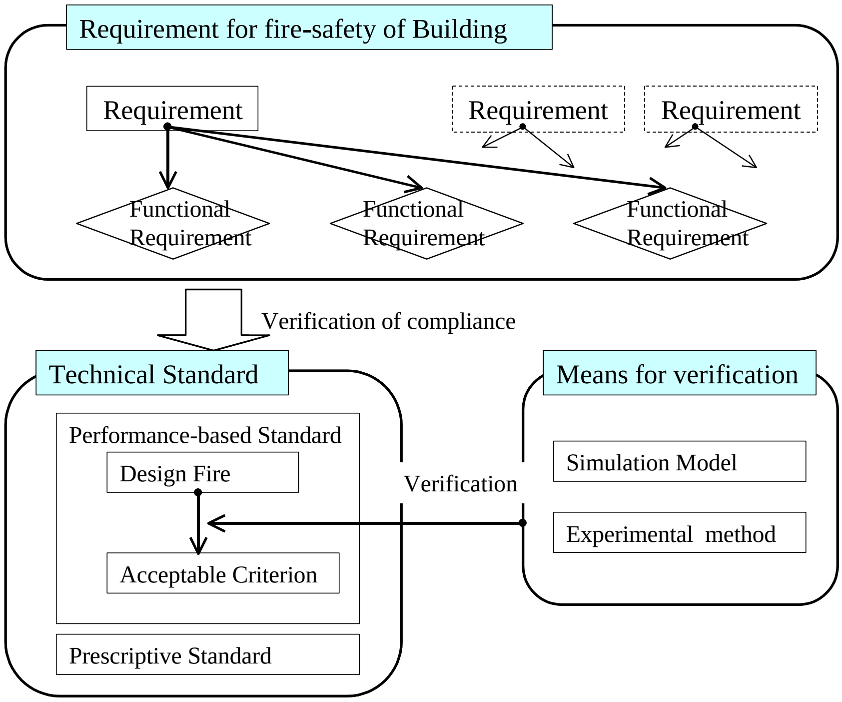

Fig.0.1 Structure of this Recommendation on fire safety design of buildings

Member of the committee related to this recommendation

Fire safety design method sub-committee (1993.4-2001.3, 2001.4-)

Chief	TANAKA, T. (1993.4 - 2001.3), HAGIWARA, I. (2001.4 -)
Secretary	YASHIRO, Y., HAGIWARA, I., OHMITA, Y.
Member	UESUGI, H., EBIHARA, M., OHMITA, Y., KASAHARA, I., KODAIRA, A. SATOH, H., SEKIZAWA, A., TAKAHASHI, H., TAKENAKA, A., TANAKA, T. TSUJIMOTO, M., NAKAMICHI, A., NARA, M., NOTAKE, H., TOMATSU, T. HASHIMOTO, S., HASEMI, Y., HARADA, K., HAYASHI, H., FUKUI, K. HOKUGO, A., MATSUYAMA, K., MIZUNO, K., MIYAGAWA, Y., MUROSAKI, Y.YAMAGUCHI, J., YAMADA, T.

Contents

APPENDIX D

ISO/TC 92/SC 4
"Fire Safety Engineering"
Resolutions
Lund, SWEDEN
24th April 2009

Resolution SC4 N186 – Lund 1, 09/04/24 – New title for WG 1

As proposed by WG 1 in document SC4 N554,

ISO/TC 92/SC 4 agrees the following title for WG 1:

"General principles and performance concepts"

Resolution SC4 N187 – Lund 2, 09/04/24 – Convenorship of WG 1

As proposed by TG1 in document SC 4 N553 and acknowledged by WG 1 in document SC4 N554,

ISO/TC 92/SC 4 appoints Prof Takeyoshi TANAKA as Working Group 1 convenor.

Resolution SC4 N188 – Lund 3, 09/04/24 – Launch of New Work Item Proposals for WG 7

As proposed by WG 7 in document SC4 N556,

Subject to the agreement of TPMG, SC4 agrees on sending to SC4 member countries for vote as New Work Items the following parts, as four separate documents under PWI 10796:

Part 1 – Fire safety Engineering – Example on the application of IS 16730 to the assessment, verification and validation of a fire zone model

Part 2 – Fire safety Engineering – Example on the application of IS 16730 to the assessment, verification and validation of a CFD model

Part 3 – Fire safety Engineering – Example on the application of IS 16730 to the assessment, verification and validation of a structural model

Part 4 – Fire safety Engineering – Example on the application of IS 16730 to the assessment, verification and validation of an egress model

Resolution SC4 N189 – Lund 4, 09/04/24 – Appreciation for the contribution of Loïc CHESNE

Considering the decision of Loïc CHESNE to resign as ISO/TC 92/ SC 4 expert and to stop his WG 8 Convenorship,

ISO/TC 92/SC 4 wishes to thank him a lot for the hard work he has done as TC 92/SC4/WG 8 Convenor and wishes him an enjoyable retirement.

Resolution SC4 N190 – Lund 5, 09/04/24 – Future of WG 8

As proposed by WG 8 in document SC4 N557,

ISO/TC 92/SC 4 agrees:

– to split the subject of data elements among the different SC4 working groups;

– to make WG 8 dormant.

Resolution SC4 N191 – Lund 6, 09/04/24 – Data needed for FSE

As proposed by WG 8 in document SC4 N557,

ISO/TC 92/SC 4 agrees the following methodology to deal with data:

– SC 4 Working Groups have to consider the data needed by practitioners for the use of relevant standards and/or TS. When improvement to some sources is needed, the relevant WG should have to be in touch with the relevant SC or TC to inform it about which kind of data is needed.

– Information on how to get data could be introduced in an annex of documents prepared by relevant Working groups, and/or when dealing with examples or in specific documents.

– SC4 Working Groups have to add a specific item on data to their agenda for each meeting and also to their report to SC 4.

– TG1 must prepare for the Working Groups a format for doing this.

– TG 1 is in charge of coordinating the work on data throughout the WGs to avoid the risk of overlapping or of missing necessary data elements.

Resolution SC4 N192 – Lund 7, 09/04/24 – Convenorship of WG 9

As proposed by WG 9 in document SC4 N558,

ISO/TC 92/SC 4 thanks Prof. Takeyoshi TANAKA for his efficient Convenorship and appoints Prof. Kazunori HARADA as Working Group 9 convenor.

Resolution SC4 N193 – Lund 8, 09/04/24 – Launch of New Work Item Proposal for WG 9

As proposed by WG 9 in document SC 4 N558,

ISO/TC 92/SC 4 agrees to send a New Work Item Proposal for making a revision of ISO 16737:2006.

Resolution SC4 N194 – Lund 9, 09/04/24 – Conversion of TS 16732:2005 to an international standard

As proposed by WG 10 in document SC4 N559,

Further to the Systematic Review Balloting, ISO/TC 92/SC 4 agrees to convert ISO/TS 16732:2005 as an International Standard and decides to launch the DIS vote on a revised draft document according to comments to be received by end of May 2009, with an annex consisting of NWI 29243, Part II.