FSEU proposal for future proofing the CPR

To ensure that the CPR will fulfil its intention of having construction works fit for use according to the 7 defined basic requirements, the test methods and classification systems called upon must be based on sound science and be updated when deemed to be outdated. The Commission Decisions must ensure that the information provided in supporting documents, which defines how the harmonised standards were developed, is kept alive. If the principles on which the harmonised standards are based are not preserved they will be lost as time moves on. The principles and history behind the basic work requirement on safety in case of fire is provided in Annex 1.

The following steps are needed to ensure that the CPR will be future proof relating to fire safety:

- The principles for the fire testing and classification system (Guidance Paper G[1]) shall be formally incorporated into the CPR. This can be done in two steps:
    - Appoint a small ad hoc group to edit Guidance Paper G into a format suitable to be issued as a Commission Decision.
        - Replace references to the "FRG" by "European Commission acting on the advice of CEN"
        - For the avoidance of doubt it should be confirmed in this update that the performance levels are those determined in the large scale Reference Scenario and that "*If a small scale test(s) with correlated performance against the large scale test is available, the European Commission acting on the advice of CEN may endorse this and an associated classification system, as being appropriate for regulatory purposes within the EU.*"
    - A Mandate to CEN requesting them to make a Technical Report describing the necessary implementation of the new Commission Decision.
- The majority of fire related fatalities are due to the inhalation of toxic smoke. The original intention of Interpretative Document 2[2] to include smoke toxicity in the harmonised standards shall be reflected in the CPR by specifying that consideration of smoke hazard shall include the consideration of both opacity and toxicity. Annex 2 provides a proposed wording for Basic Work Requirement no. 2 to reflect this.

[1] Guidance Paper G : The European Classification system for the Reaction to Fire Performance of Construction Products, European Commission, 2003
[2] Interpretative Document No. 2, European Commission, 1994

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- The CPR shall have a clause added after clause (18) that clarifies that harmonised horizontal standards used to fulfil the requirements of the CPR shall be given a fitness test every 5 years to ensure that they are still applicable to any new construction products on the market. This will preserve the established link between small-scale tests and product performance in relevant reference scenarios.

Annex 1: CPR and Fire Safety

On July 1st 2013 the Construction Products Regulation (CPR) came into force. It replaced the Construction Products Directive[3] (CPD), which dated back to 1989.

The CPR is meant to ensure reliable information on construction products in relation to their performances. This is achieved by providing a "common technical language", offering uniform assessment methods of the performance of construction products. These methods have been compiled in harmonised European standards (hEN) and This common technical language is to be applied by:

- the manufacturers when declaring the performance of their products, but also by
- the authorities of Member States when specifying requirements for them, and by
- their users (architects, engineers, constructors…) when choosing the products most suitable for their intended use in construction works.

The CPR defines 7 Basic Requirements for Construction Works. According to the CPR: "Construction works as a whole and in their separate parts must be fit for their intended use, taking into account in particular the health and safety of persons involved throughout the life cycle of the works. Subject to normal maintenance, construction works must satisfy these basic requirements for construction works for an economically reasonable working life."

This is largely based on the CPD (which defined 6 Essential Requirements) with the addition of Basic Work Requirement: 7. Sustainable use of natural resources.

CPR and Fire Safety

The CPR only deals directly with Fire Safety through its definition of the Basic Work Requirement: 2. Safety in case of fire:

"The construction works must be designed and built in such a way that in the event of an outbreak of fire:

[3] Construction Products Directive, European Commission, 1998

a. the load-bearing capacity of the construction can be assumed for a specific period of time;
b. the generation and spread of fire and smoke within the construction works are limited;
c. the spread of fire to neighbouring construction works is limited;
d. occupants can leave the construction works or be rescued by other means;
e. the safety of rescue teams is taken into consideration."

This is more or less a copy of the essential requirement no. 2 from the CPD.

The development of the harmonised European fire testing and classification system

To give concrete form to the essential requirements defined in the CPD, 6 interpretative documents were published. These interpretative documents give the links between the essential requirements set out in the CPD and the mandates for the preparation of harmonised standards and guidelines for European technical approvals. Interpretative document no. 2 (ID 2) is about safety in case of fire. This document defines a number of measures for the satisfaction of the Essential requirement Safety in case of fire. The Harmonised European fire testing and classification standards were developed based on the measures provided in ID2.

The different levels of reaction to fire performance as required by ID2 were first presented in a Commission Decision from 1994[4]. However, this decision does not give the thresholds for the several classes defined, as the decision required a new test method, the Single Burning Item (SBI) test to be developed.

After the development of the SBI test the commission decision from 1994 was replaced with a new commission decision in 2000[5], which defines classes for reaction to fire performance of construction products, the so called Euroclasses. However, this Commission Decision was not operational until the SBI test was published as a European Standard[6] in February 2002.

According to an agreement within the European Commissions Fire Regulators Group (FRG) the Euroclass system was to be linked directly to perceived hazards in a reference fire scenario. This is also reflected in article 1, section 2 of the Commission Decision from 2000

[4] 94/611/EC Commission Decision of 9 September 1994, European Commission, 1994
[5] 2000/147/EC Commission decision of February 2000, European Commission, 2000
[6] EN 13823, Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item, CEN, 2002

where it is stated that: “If the classification based on the standardised tests and criteria listed in Tables 1 and 2 of the Annex is not appropriate, one or more reference scenarios (representative scale test(s) typifying agreed hazard scenario(s)) may be called on, within the context of a procedure providing for alternative tests.”

The FRG had agreed that the relevant fire scenario for the Euroclass system was fire in a room and that ISO 9705[7] the Room Corner test should be the large-scale reference test.

Based on the experiences from the first round robin with the SBI test it was agreed that the role of the large scale reference test in the Euroclass system needed to be defined. It was also agreed that it should be possible to further develop the classification system or even request the use of another large scale reference test where this could be justified. In 1999 the principle behind the Euroclass system and possible routes for developing the classification system was given in the document Construct 99/376, 1999[8]. This paper became Guidance Paper G[9] one of several Guidance Papers dealing with specific matters relating to the implementation of the CPD.

Guidance Paper G

According to Guidance Paper G the fundamental principles behind the existing Euroclass system are:

- The FRG, on the basis of real or perceived fire hazards, may decide upon appropriate reference scenarios. (The current Euroclass system for reaction to fire performance of all products[10] other than floorings is based upon fire development within a room).
- The perceived hazard condition(s) associated with any reference fire scenario should be defined by the FRG in functional terms. (The current Euroclass system for reaction to fire performance of all products other than floorings uses the time to flashover as the behavioural reference).
- A large scale reference test representative of a particular reference fire scenario shall be agreed by the FRG as the fundamental basis for the evaluation of the fire

[7] ISO 9705, Fire Tests – Full Scale Room Test for Surface Products, ISO 1993
[8] Construct 99/376, European Commission, 1999
[9] Guidance Paper G : The European Classification system for the Reaction to Fire Performance of Construction Products, European Commission, 2003
[10] Since 2003, an equivalent scheme has been developed for cables and pipe insulation products

performance of products in relation to their potential behaviour. (The current Euroclass system for the reaction to fire performance of all products other than floorings uses ISO 9705 Room Corner test. The time to flashover - and related parameters - in that test is identified as the underlying basis of the main classification).

- In the absence of any small scale test with correlated performance against the large scale test, products will be evaluated on the basis of their performance in the large scale test, against the agreed functional performance criteria. (Not applicable to the current Euroclass system).
- If a small scale test(s) with correlated performance against the large scale test is available, the FRG may endorse this and an associated classification system, as being appropriate for regulatory purposes within the EU. If this is the case, all products concerned shall be evaluated using the small scale test(s) and the related classification system. (The current Euroclasses system for the reaction to fire performance of all products is based on small scale tests).
- Subject to certain conditions (as indicated in Guidance Paper G), where the small scale test and related classification, is considered to be deficient, products may be submitted to the large scale test and their performance level evaluated against the functional criteria defined for that test. Any resulting classification will be expressed in the same manner as for the small scale test, unless there is a change in the reference scenario. Where relevant, the results of the small scale test shall always be reported in conjunction with the results of the large scale test.
- Finally, the current Euroclass system is, in principle, applicable to all construction products other than floorings. Deviations from this defined system, either relating to the reference scenario or recourse to the reference test, should only be considered where absolutely necessary.

The principles defined in Guidance Paper G and how they are applied in the present harmonized reaction to fire classification system can be summarized as shown:

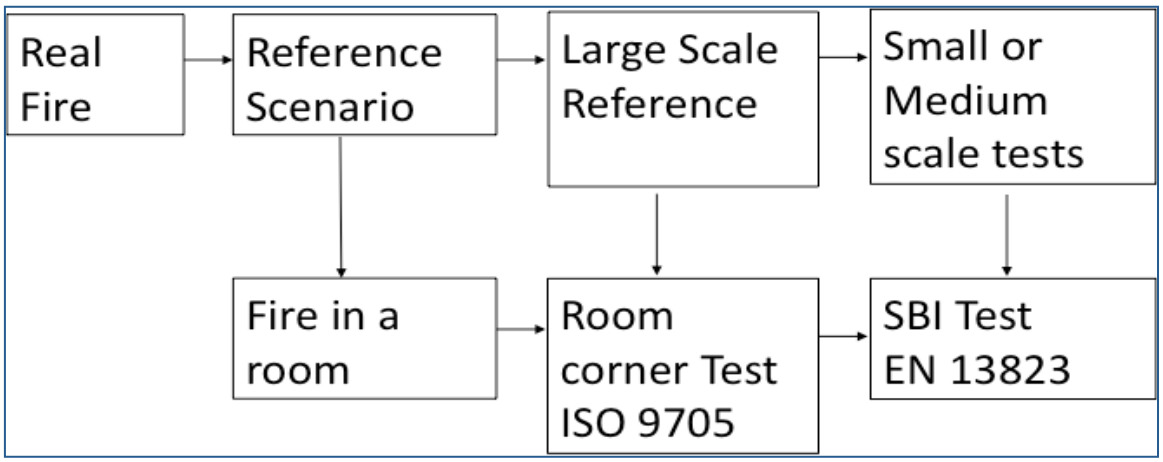

Figure 1 - Philosophy of Euroclass Fire Test system

The scheme is based on the premise that small scale testing has limitations in predicting real fire performance and that the limitations reduce with increasing scale. The system works as long as the products performance in the agreed small or intermediate scale test represents its behaviour in the large scale reference test. In practice correlation coefficients better than 80% have been demonstrated between the Room Corner Test (ISO9705) and the smaller scale Single Burning Item (EN13823) for a number of wall lining products[11]. Critically it has been found that for certain products the correlation coefficient falls outside these limits and for such products the use of SBI data should be considered as unsafe.

The focus on normative requirements for the small scale test is unsafe as their validity is completely dependent upon a poorly defined correlation with the larger scale tests. The basic principle of Guidance Paper G that a large scale reference test representative of a particular reference fire scenario shall be the fundamental basis for the evaluation of the fire performance of products in relation to their potential behaviour should be emphasised.

The missing link in CPR

Guidance Paper G provides an excellent definition of the structure of the harmonised European fire testing and classification system. The document provides a definition of terms (missing elsewhere

[11] Björn Sundström, The development of a European Fire Classification System for Building Products Test Methods and Mathematical Modelling, Doctoral Thesis, Department of Fire Safety Engineering, Lund University, Sweden, 2007

within the system) and a detailed appreciation of the requirements of suitable reference scenario. It also defines the procedures to establish alternative scenarios in the case that a fire in a small room does not adequately describe the scenario relevant for a product family and/or ISO 9705 is deficient. The cable and pipe insulation industries followed these guidelines to establish new scenarios upon which their respective classification systems are based.

Having the fire classification linked to the performance of the product in a relevant scenario as well as the possibility to adapt the system to take into account the fire behaviour of construction materials, which were not considered when the system was developed, made the European system unique compared to those of other parts of the world. Having Guidance Paper G in play made the system a living entity that could be adapted following a specified process when needed. The process was overseen by a group of fire regulators and experts under the European Commission named the Fire Regulators group (later renamed Expert Group on Fire).

With the replacement of the CPD with the CPR the supporting documents to the CPD such as ID2 and Guidance Paper G are no longer valid. Sadly no steps have been taken to update these papers to keep them as intricate supporting documents. Consequently the principles behind the fire testing and classification system will be forgotten and the possibility to adapt the system to be able to handle modern construction products is lost. The system will simply be frozen in place at the level it was at on July 1st 2013. New construction products will be tested only to the defined small scale tests and the link to their performance in a relevant reference scenario will never be considered. In time this will lead to the European fire tests and classification system becoming a simple comparison of products with an output that does not provide any meaningful link to the products behaviour in a real fire. When that is the case it will not be possible for member states to provide safety in case of fire in construction works!

Smoke Toxicity the forgotten requirement

ID 2 dealt with the aspects of the works where "Safety in case of fire" may be concerned. It identified products or product families and characteristics relating to their satisfactory performance. For the requirement: “the generation and spread of fire and smoke within the construction works are limited”, ID2 noted that smoke includes both the opacity and toxicity. Opacity being how the smoke obscures visibility and toxicity how the smoke can irritate and asphyxiate the occupants. It is specifically mentioned that: ”Critical life-threatening conditions for the occupants should not be reached in the escape routes. The propagation of heat and smoke (opacity - toxicity) beyond the room of origin can reduce the time until critical conditions are reached.”

Despite ID2 making it clear that for smoke both the opacity and the toxicity should be considered the harmonised test and classification standards for fire only address smoke opacity and do not deal with smoke toxicity. Considering that published data[12] confirms that in excess of 50% of fatalities and injuries resulting from fire are due to the inhalation of toxic smoke this is a severe failure of the harmonised fire test and classification system. The argument that products exhibiting reduced fire growth are automatically safer is clearly invalid as reduced fire growth is often at the expense of increased smoke hazard. Short term hazard is mostly linked to asphyxiation due to the inhalation of CO or HCN. The longer term impact is due to the inhalation of a variety of chemicals or particles which can give health impact years after the exposure. An issue of concern not only to people injured in fires but even more to fire fighters who suffer the consequences on being exposed to toxic smoke in their daily job.

The standards are available from ISO to deal with smoke toxicity. ISO WD 16405[13] defines techniques to determine the composition of Reference Scenario fire effluent while ISO DIS 19700[14] defines a small-scale test for smoke toxicity. ISO 13571[15] defines criteria to characterise the hazard. To ensure safety in case of fire smoke toxicity must be addressed preferably directly in the CPR alternatively in a commission decision.

Annex 2: Proposed new text for Basic Work Requirement no. 2

"The construction works must be designed and built in such a way that in the event of an outbreak of fire:

a. the load-bearing capacity of the construction can be assumed for a specific period of time;
b. the generation and spread of fire and smoke (opacity and toxicity) within the construction works are limited;
c. the spread of fire to neighbouring construction works is limited;
d. occupants can leave the construction works or be rescued by other means;
e. the safety of rescue teams is taken into consideration."

[12] Department for local communities and government, Fire Statistics Great Britain 2011 – 2012, December 2012.
[13] ISO WD16405, FTIR ISO 9705, ISO 2014
[14] ISO DIS 19700, Controlled equivalence ratio method for the determination of hazardous components of fire effluents - The steady state tube furnace, ISO 2014
[15] ISO 13571, Life-threatening components of fire - Guidelines for the estimation of time to compromised tenability in fires, ISO 2012