COST Workshop Cracow

Thought on the upgrade of EC1 Annex E

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Safety concept in Annex E - Background

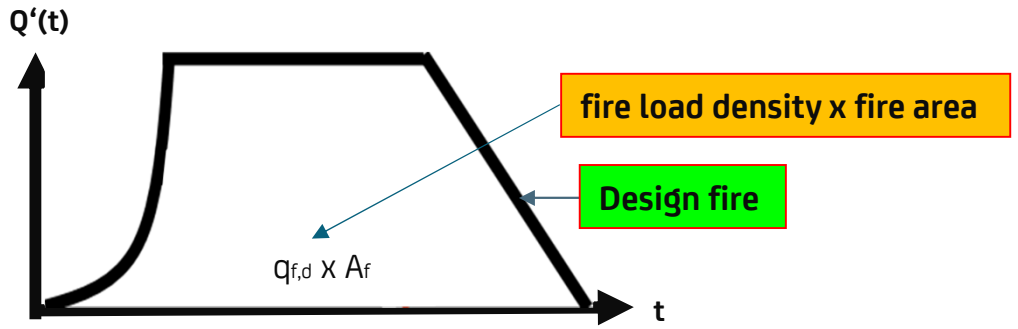
1

- The Eurocodes use a semi-probabilistic safety concept to ensure that the probability of a failure of the building (or structural member) is at least as low as 1:1 000 000
- The design rules of the Eurocodes incorporate partial safety and combination factors for loads and partial safety factors for material properties
- In case the methods of FSE are used in conjunction with the Eurocodes, a similar safety concept should be applied to ensure sufficient safety in case of a fire

Status quo

1

- Annex E of Eurocode 1 (EN 1991-1-2) incorporates a safety concept that affects the fire load density q



- Design value of q according to equation E.1: $q_{f,d} = q_{f,k} \cdot m \cdot \delta_{q1} \cdot \delta_{q2} \cdot \delta_n$ [MJ/m²]
- The multiplicative factors δ_n indicate ten safety factors that consider active safety measures (fire alarms system, sprinklers, fire brigades, etc.)

Deficiencies of the safety concept

2

- The fire load density is not the only important input parameter of FSE calculations, especially for steel structures the maximum heat release has more significant effect
- The individual factors δ_n remain the same - even in case the active fire protection measures are clearly dependent:
  e.g. the effects of a fire brigade (δ_{n7}=0,61) can be considered additionally to effects of a sprinkler system (δ_{n1}=0,61)

Improved safety concept

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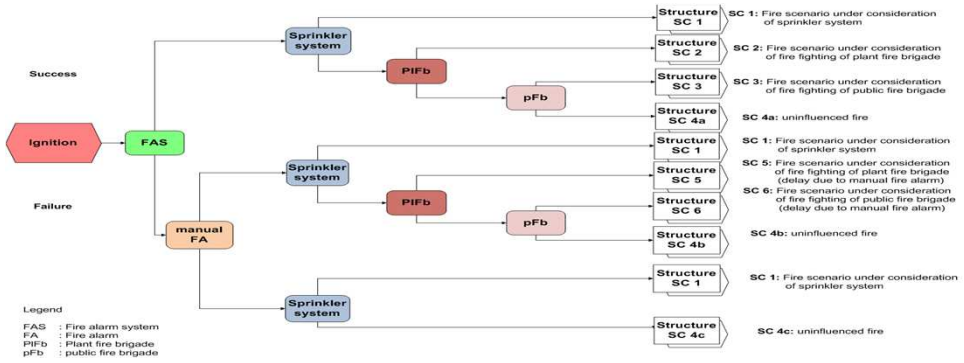
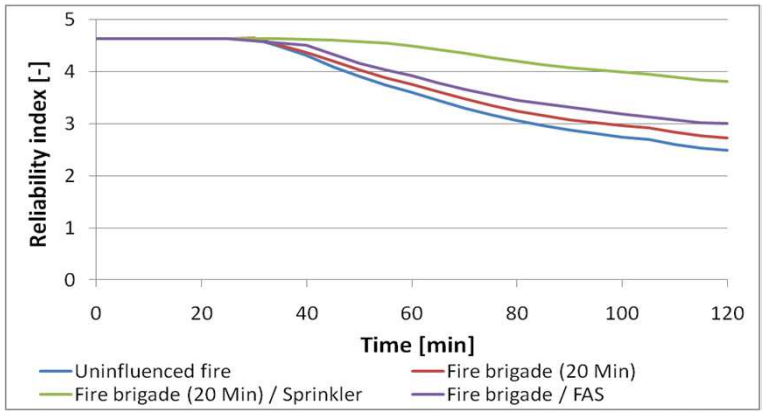
- The safety concept of EC1 was not accepted in Germany, an improved safety concept was developed, could be included in further editions of Eurocode
- The improved safety concept is based on full probabilistic analyses





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Improved safety concept

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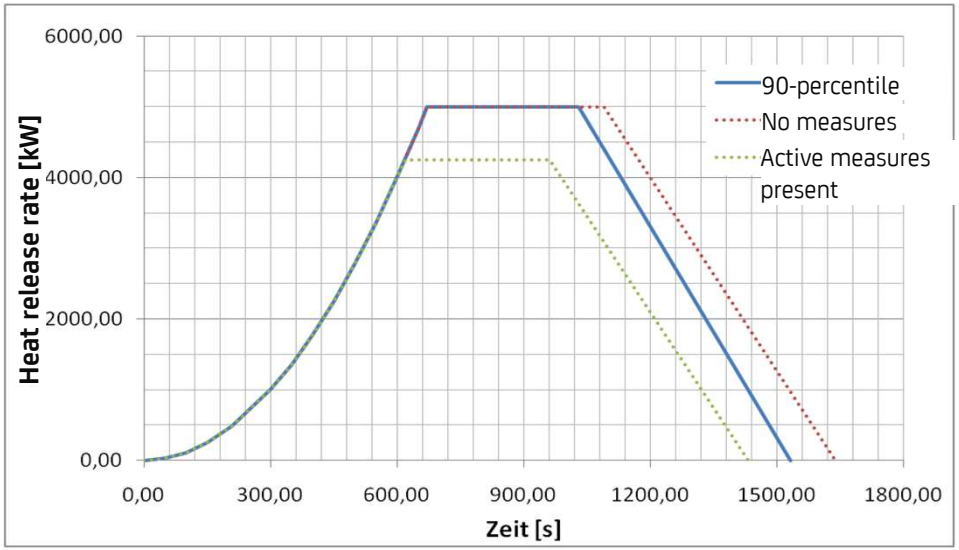
- Published in the German National Annex of Eurocode 1-1-2
- The design fire is based on the HRR of an undisturbed fire
- 90-percentile of fire load density and heat release rate
- Partial safety factors for fire load density and heat release rate Q' that were calibrated according to the safety benefit of the different active fire protection measures

- Published in Interflam Proceedings 2010



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Thank you!

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