

CABLES 2010

Reaction to Fire Performance of Cables – Implementation of CE marking under the CPD and beyond

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Reaction to Fire Performance of Cables – Implementation of CE marking under the CPD and beyond

The information given in this presentation represents the position as at mid-January 2009. Any important updates will be included in the version presented at the Cables 2010 Conference.

Reaction to Fire Performance of Cables – Implementation of CE marking under the CPD and beyond

- Contents
- CE marking under the CPD – Latest news on implementation progress
- CEMAC II Project – Overview of conclusions
- Reaction to fire performance of cables beyond the CPD – Potential new work areas
- Conclusions

CE marking of cables for reaction to fire under the CPD

The present situation

- **The Commission decision on the European classification for the reaction to fire performance of cables was published in 2006**
- **Why are there no cables CE marked under the CPD on the market?**
- **What has to be done before this can happen?**
- **When will it be done?**

CE marking of cables for reaction to fire under the CPD

Required actions for CE marking of cables

- **Issue of Mandate for cables by EC**
- **Publication of decision on attestation of conformity by EC**
- **Product standards and supporting test standards by CLC and classification standard by CEN**
- **Extended application rules (EXAP) through CEMAC II project and CLC**

CE marking of cables for reaction to fire under the CPD

Latest implementation position

- **Mandate (M/443) covering power, control and communication, and optical fibre cables for use in buildings and other civil works subject to regulation (all voltages included) issued in June 2009**
- **Scope covers performance characteristics of reaction to fire, resistance to fire and release of dangerous substances**
- **Draft response submitted to the Consultant**
- **Formal CLC response expected March 2010 with anticipated timescales for the work**

CE marking of cables for reaction to fire under the CPD

Required standards and timescales

- **The information given is based upon the anticipated CLC response to Mandate M/443**
- **There is no certainty that the CLC response will be acceptable to the EC**
- **Further significant delays to the work programme may result**

CE marking of cables for reaction to fire under the CPD

Required standards and timescales

Standard	Status	Potential Publication
Product Standard – Reaction to fire prhEN xx	Initial draft	2012?
Test standard EN ISO 1716 EN 60332-1-2 EN 61034-2 EN 50267-2-3 prEN50399	Published Published Published Published Final draft	Q1/2011?
Classification standard EN 13501-1/prA2	Mature draft	?
Extended application rules prCLC/TRyy	Initial draft	2011?

CE marking of cables for reaction to fire under the CPD

Actual implementation at product level

- **Implementation is a National matter and will vary from country to country**
- **Implementation at a Regulatory level will apply in some countries**
- **In other countries use of the Euroclassification on a voluntary basis may occur**
- **Comparison with existing regulation based upon other tests has not been carried out but some general information has been gained from the CEMAC II project**

CEMAC II Project

Project objectives

- To facilitate through a Europacable funded project the orderly and timely introduction of CE marking for cables under the CPD
- To bring together cable manufacturers, research and testing laboratories, and research establishments in the implementation process
- To create the technical background
- To develop rules and procedures for extended application of test results (EXAP)

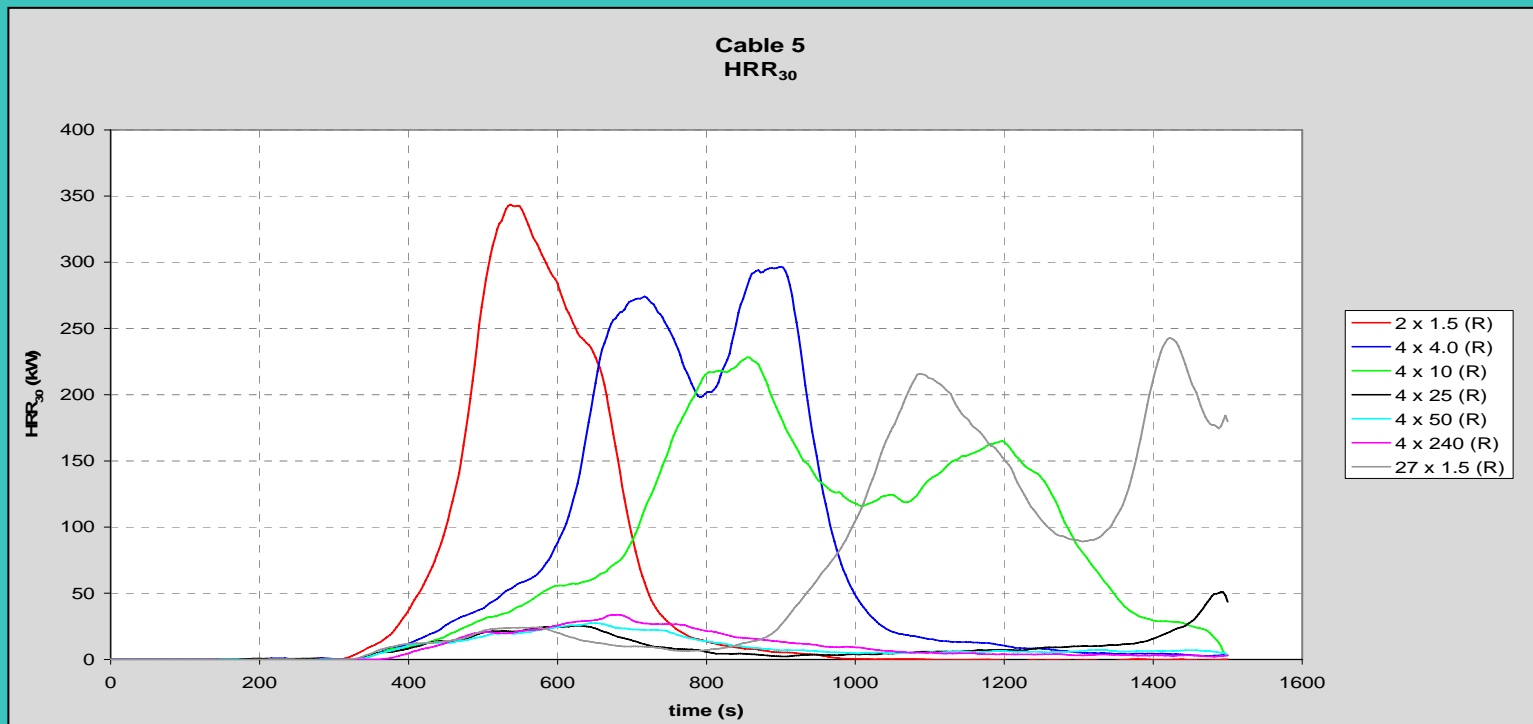
CEMAC II Project

Project status

- **Final report issued to project sponsors (Europacable)**
- **Anticipated that the report will be made publicly available in May 2010**
- **The technical content will be reported at future conferences (e.g. Interflam/FR2010)**

CEMAC II Project

Some typical project results



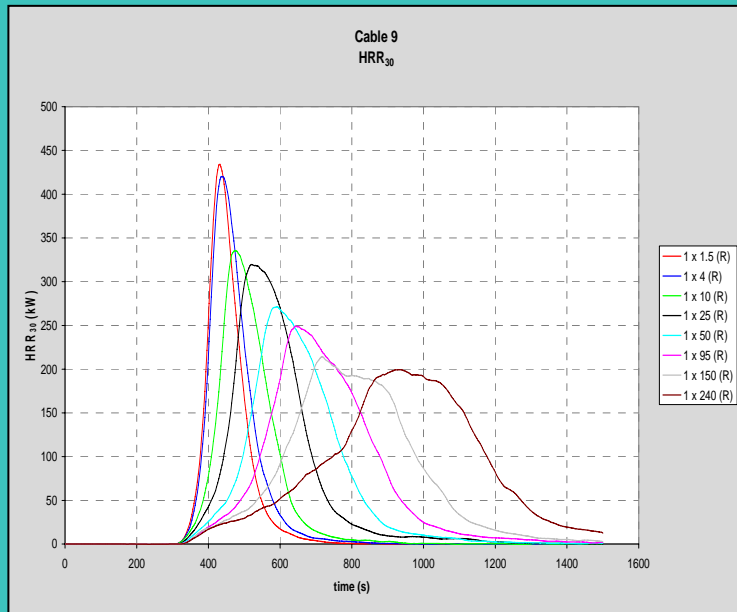
Family exhibiting whole range of fire performance (HRR)

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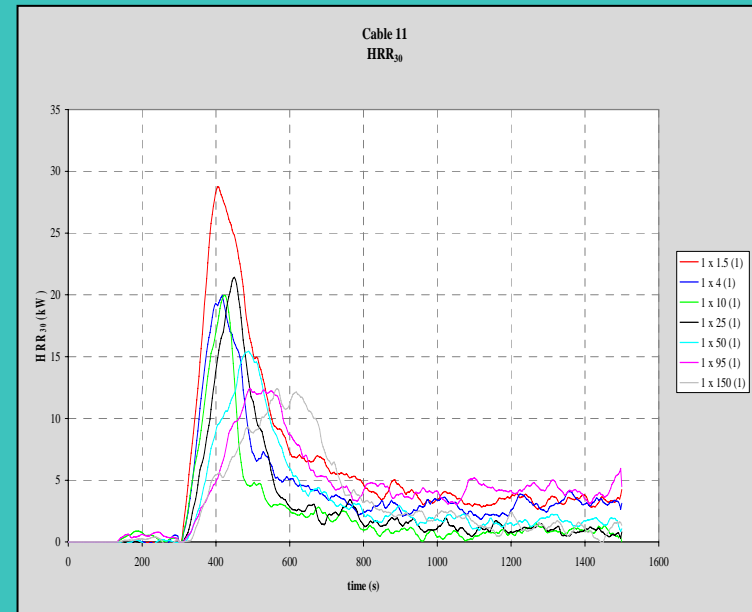
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CEMAC II Project

Some typical project results



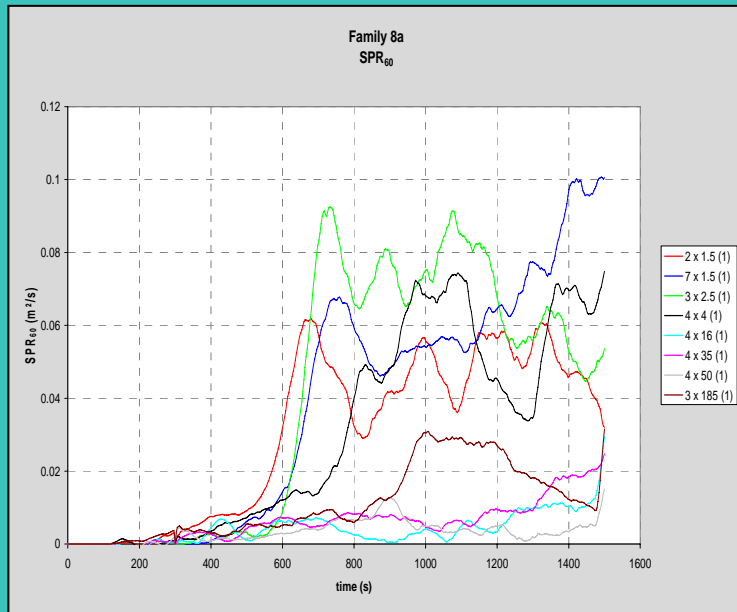
Family with “low” performance



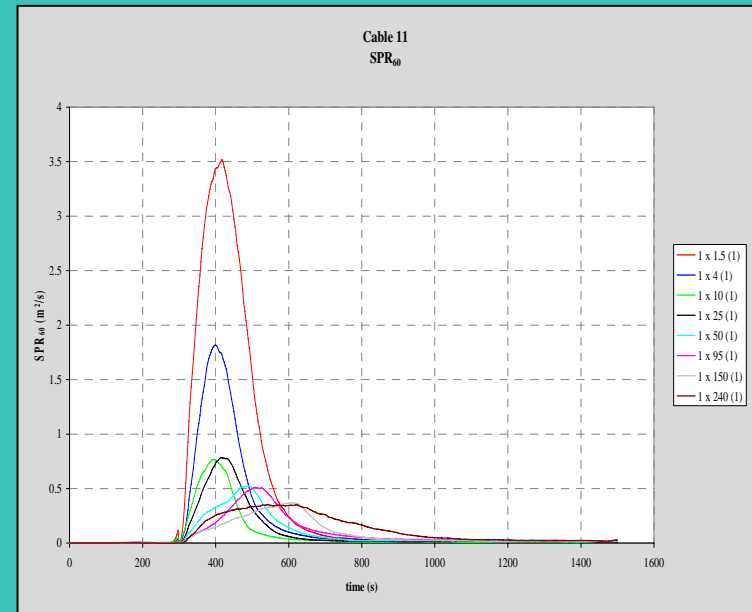
Family with “high” performance

CEMAC II Project

Some typical project results



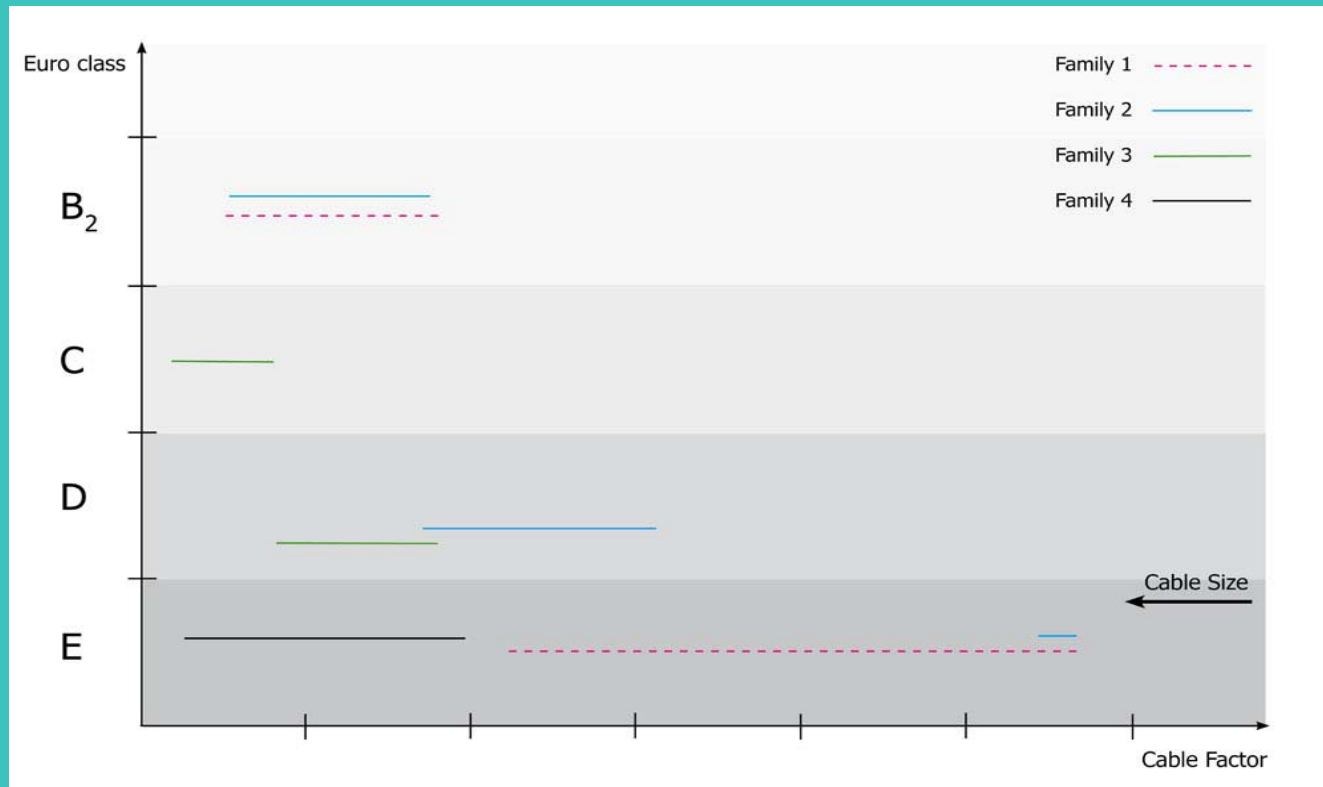
“Low smoke” family



“Smoky” family

CEMAC II Project

Range of classification for different product families



CEMAC II Project

Factors determining classification for cables tested

Class	Number In Class	Single determining classification factor				Multiple determining classification factors			
		THR	HRR	Figra	FS	THR	HRR	Figra	FS
B ₂	39								
C	27	5	3	4	1	14	14	-	4
D	28	-	-	-	4	22	21	10	22
E	20	14	-	1		5	-	5	

CEMAC II Project

Some conclusions

- A simple EXAP rule covering a wide range of energy cable families has been developed based upon the use of a “safety margin” and “cable parameter”
- The prEN50399 test procedure has been found to be well developed, repeatable and reproducible
- The small scale EN60332-1-2 flame test has been found to be not significant and a candidate for CWFT
- Smoke production classification has been found to be consistent between prEN50399 and EN61034-2 but no correlation between the tests was found

CEMAC II Project

EXAP procedures

- **The EXAP rule developed will potentially allow the certification of a cable family on the basis of tests on two defined cables**
- **The rules will not cover cable sizes tested as bundles as the mounting causes discontinuity in performance**
- **The error rates in classification resulting from the proposed procedure appear to be virtually zero based upon more than 100 tests**

Reaction to fire performance of cables

Possible future developments

Flame spread, heat release and opacity

- European position will be dictated by implementation of European cable classification using EN50399 test method
- CEMAC II project and other Europacable sponsored research has been undertaken to create the technical background
- IEC review during 2012-2015 will consider possible greater alignment of IEC and North American test methods and possible adoption of EN50399

Reaction to fire performance of cables

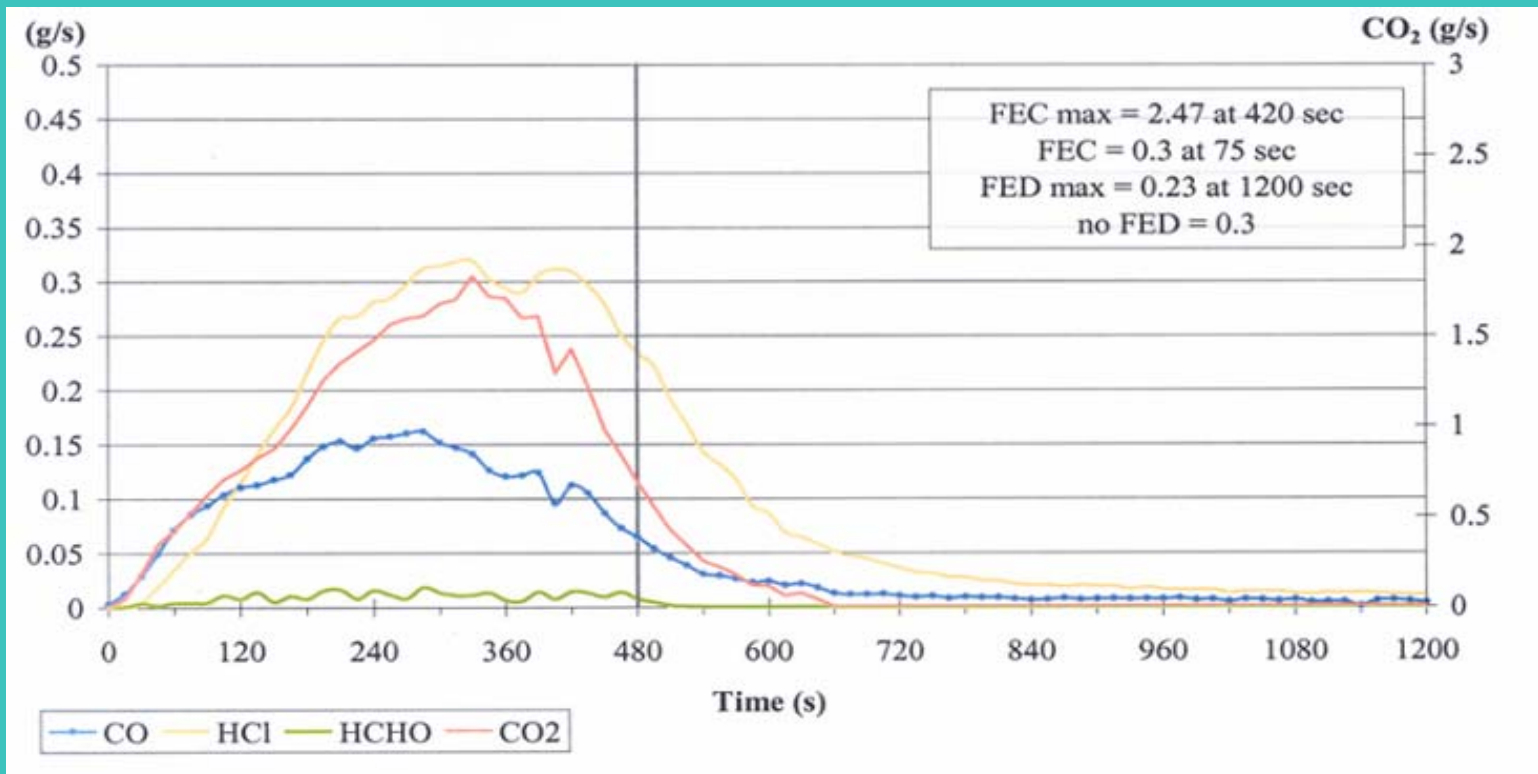
Possible future developments

Effluents and toxicity

- Direction of toxicity work unclear in absence of strong regulatory or user driven impetus except in specific application areas (e.g. rail)
- Current new toxicity work on irritant effects appears to reinforce position of “acidity” as an “indicator” for important irritant toxic effects for common cables
- Use of FTIR techniques to measure effluent quality in integrated EN50399 test shows early potential
- Test output may be used as input for simulation studies

Reaction to fire performance of cables

Possible future developments

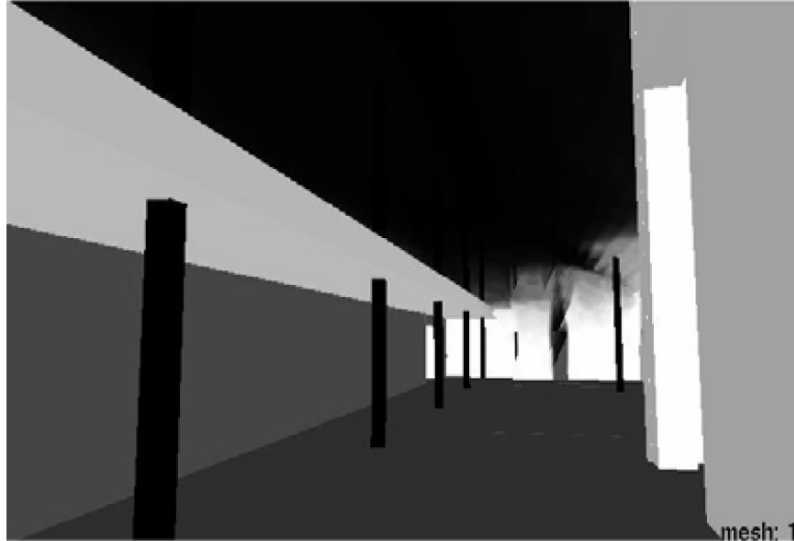


Typical output curve of toxic gas production from EN50399 test by FTIR

Reaction to fire performance of cables

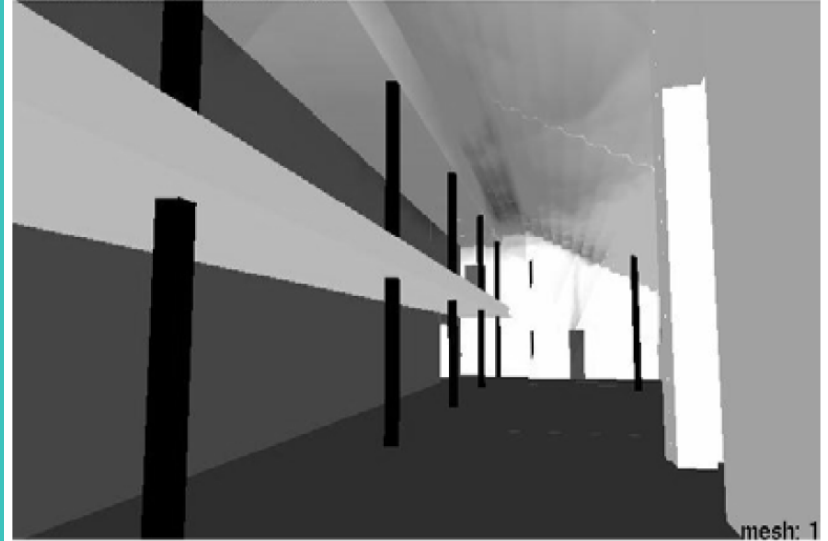
Results of CFD simulations

Smokeview 5.2.2 - Jul 18 2008



Frame: 30
Time: 300.0

Smokeview 5.2.2 - Jul 18 2008



Frame: 30
Time: 300.0

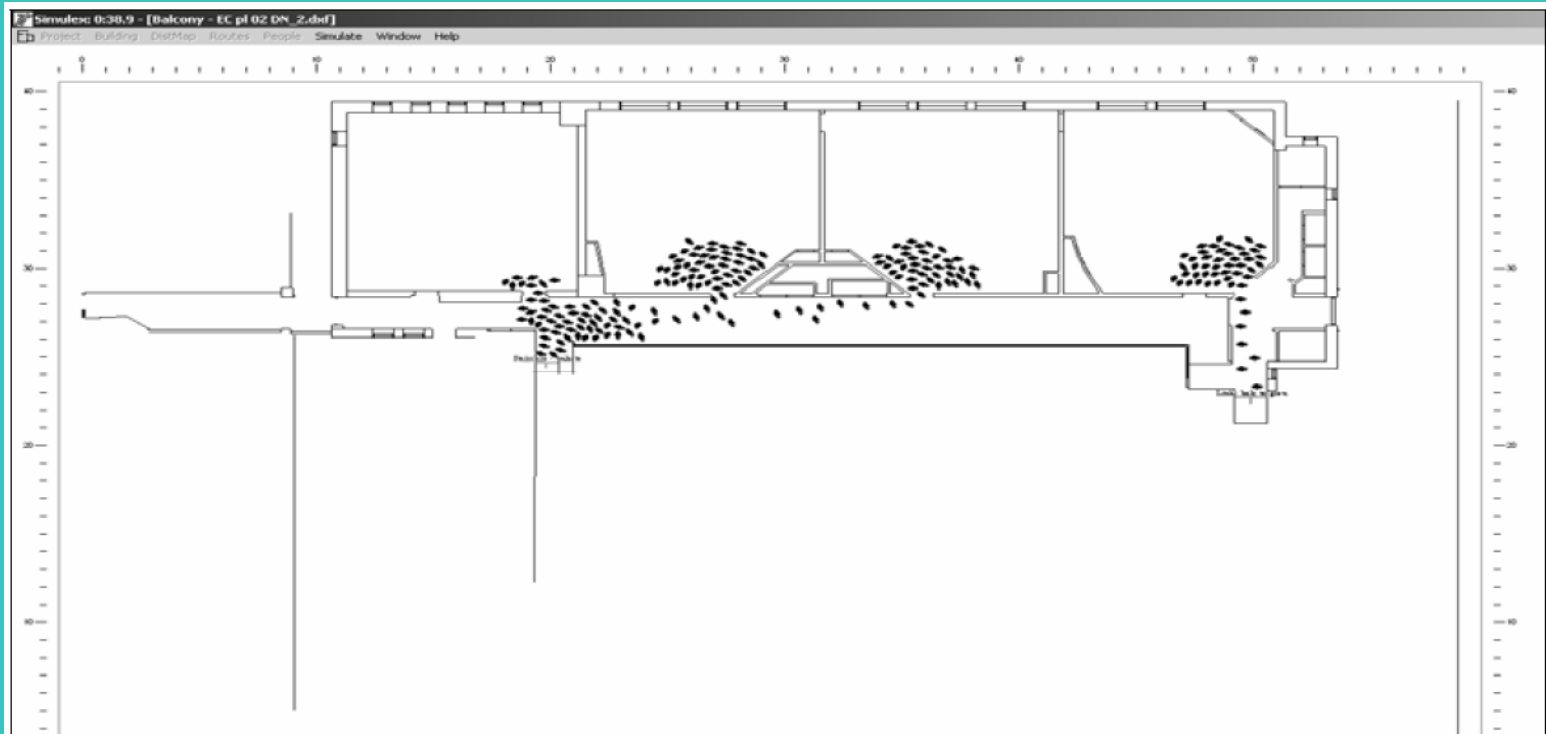
Comparison of soot concentration at 300s for pvc cable (left) and LFH cable (right)

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Reaction to fire performance of cables

Results of evacuation simulations



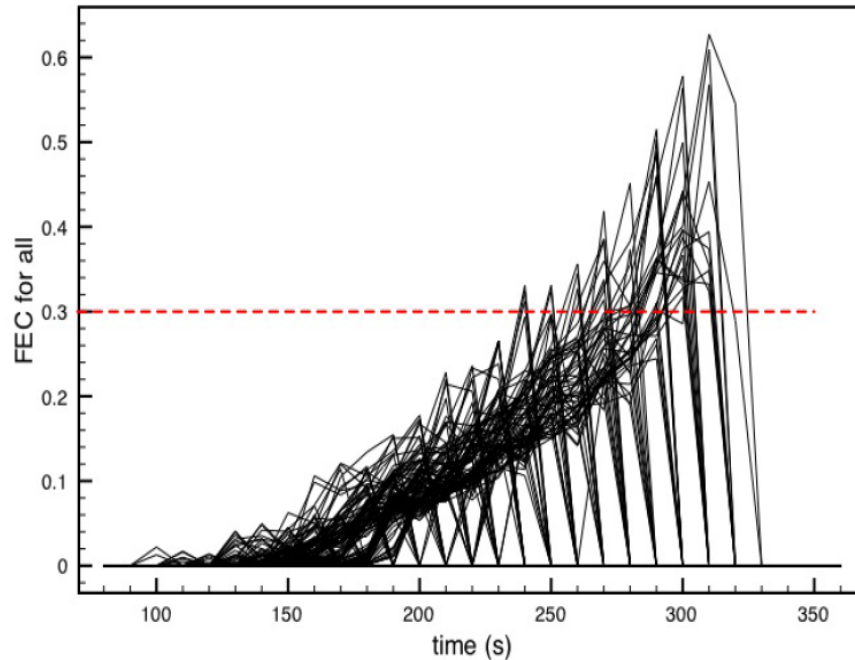
Example of the queue at the platform on the first level (balcony) for one of the evacuation scenarios

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Reaction to fire performance of cables

Results of FED and FEC calculations



MAX FEC	Number of Occupants	Number of Occupants
	Pvc cable	LFH cable
0	269	446
0 – 0.1	57	0
0.1 – 0.2	39	0
0.2 – 0.3	40	0
>0.3	41	0

Results of total FEC for pvc cable for each occupant for one simulation evacuation. Each curve represents the FEC value as a function of time for one person

Number of occupants exposed to particular FEC values for the same scenario

Reaction to Fire Performance of Cables – Some conclusions

- **ISO Focus: June 2009 “Fire safety saves lives”** Bjorn Sundstrom, Chair and Magdalena Di Carlo, Secretary of ISO/TC92
- **Direct property losses 0,1% - 0,2% of GDP**
- **Total losses approach 1% of GDP**
- **Measures to reduce fires through standardisation are a very good investment in life and property safety**

Reaction to Fire Performance of Cables – Some conclusions

- **ISO Focus: June 2009 “Fire safety saves lives”**
- **Smoke travelling throughout a building is the greatest threat to inhabitant’s lives and their chances for escape**
- **The generation of smoke and its toxic effects are fundamental parameters for safety**
- **The hazard of toxic fire gases is a growing concern**

Reaction to fire performance of cables

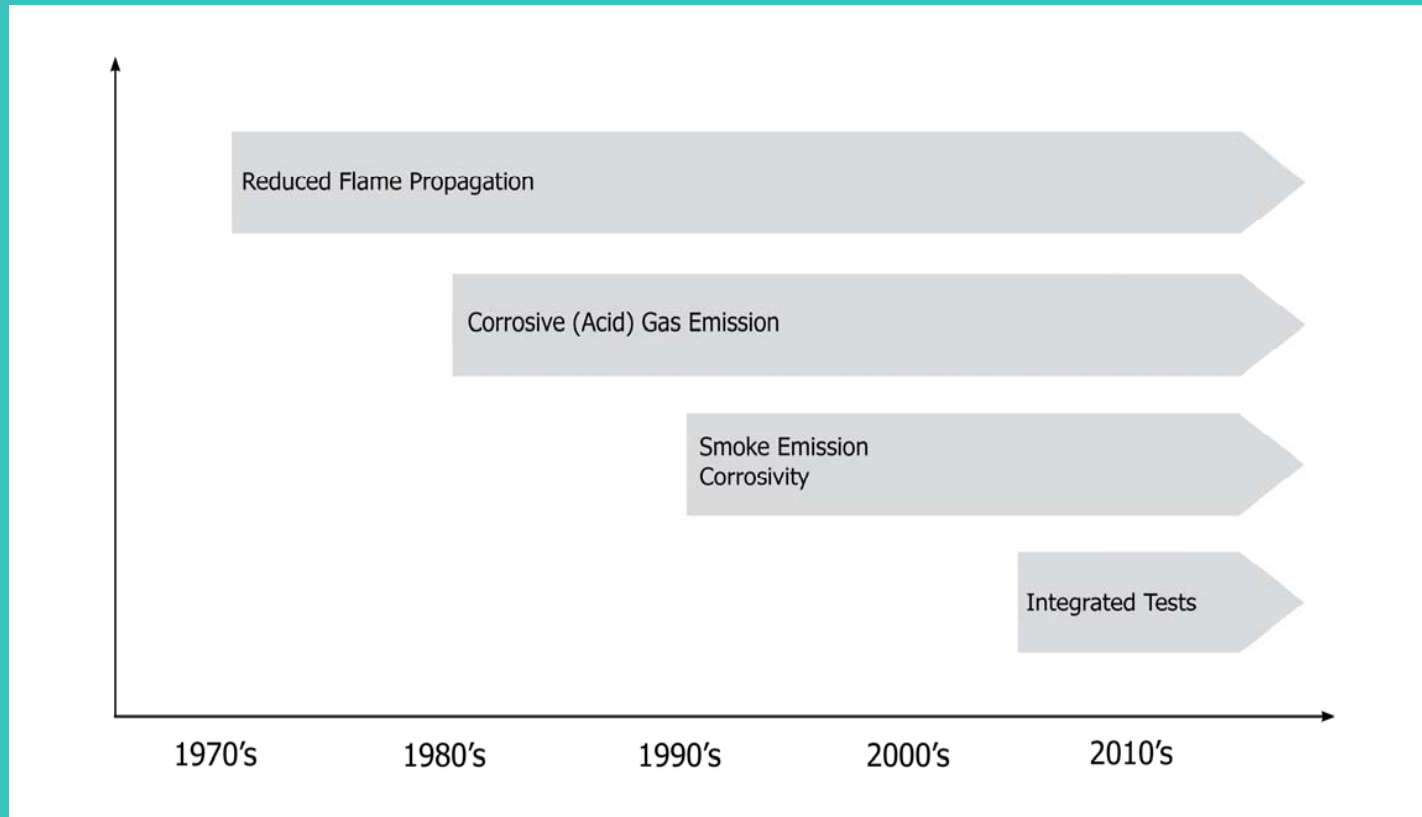
Historical development 1970's and 1980's

Four stage approach

- **minimise the hazard by restriction of the amount of burning by reduction of the propagation of fire along cable runs**
- **minimise the emission of smoke leading to obscuration of exits and prevention of escape**
- **minimise the emission of acid gas leading to corrosion of equipment**
- **minimise the emission of toxic fumes leading to incapacity and prevention of escape**

Reaction to fire performance of cables

Historical development



Reaction to fire performance of cables

The current market situation

- **Reduced flame propagation cables**
IEC 60332-3
- **Low smoke cables**
IEC 61034
- **Low corrosive gas emission cable**
IEC 60754-1 (Halogen acid gas)
IEC 60754-2 (Degree of acidity)

**Low Fire
Hazard
Cables**

Reaction to fire performance of cables

Possible future market situation

- **Reduced flame propagation cables**
Euroclass B2 or C
- **Low smoke cables**
Additional classification s1 or s1a
or s1b
- **Low corrosive gas emission cable**
Additional classification a1 or a2

Low Fire
Hazard
Cables

Reaction to fire performance of cables

Conclusions

- **Mandate for cables published June 2009 but response not yet agreed**
- **Europacable remain committed to orderly implementation of CE marking under the CPD**
- **CEMAC II project has established good technical background and EXAP rules**
- **Draft test, classification and product standards available**
- **Historical industry approach still valid with detail changes due to new tests**
- **Potential for real time measurement of effluent and input for simulation studies**

Information sources

For more information on Safety during fire, Low Fire Hazard cables and cables under the Construction Products Directive

- www.safety-during-fire.com
- www.prysmian.com
- www.prysmian.co.uk