COMMS EXPO 2012
Potential impact of CE marking of cables for reaction to fire performance under the CPR
Terry Journeaux
26 June 2012
CE marking cable reaction to fire performance

Contents

• The purpose
• The journey
• Scope, status inter-relation of the mandated standards for reaction to fire
• Technical background for the standards
• Future work on the mandated standards for resistance to fire
• Future CE marking of cables under the CPD / CPR
• Conclusions
CE marking cable reaction to fire performance

• CE marking signifies compliance with applicable legislation and is passport to the “common” market
• CE marking under the CPD / CPR for reaction to fire performance
• CE marking already in place under LVD for other safety requirements
CE marking cable reaction to fire performance

A 10 year journey

• **Cables 2003 – Cables and the CPD – Threat or opportunity?**
  Classes of reaction to fire performance established / Integrated large scale test based on FIPEC project / Cenelec start work on test method development / Many details remain to be confirmed

• **Cables 2007 – Progress on the new European reaction to fire classification for cables**
  Commission decision published in 2006 / Euroclass limits and basic test methodology defined / Draft mandate for standardisation work on test methods, classification standard, product standard and EXAP rules / First enquiry for prEN 50399 issued

• **Cables 2008 – European reaction to fire classification of cables under the CPD – Implementation progress**
  Standardisation mandate agreed but not issued / Industry funded CEMAC II project to create technical background and facilitate introduction of CE marking under CPD started / Second enquiry for prEN 50399 including technical improvement after round robin / prEN 50399 repeatability and reproducibility comparable with other fire tests (SBI)
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A 10 year journey

• **Cables 2009 – the CEMAC II project – CE marking of cables for reaction to fire under the CPD**
  
  Standardisation mandate still not issued to CEN/CLC / Draft test method, classification and product standards available / Large number of tests on different European product families carried out in order to develop EXAP rules and procedure

• **Cables 2010 – Reaction to fire performance of cables – Implementation of CE marking under the CPD and beyond**
  
  Standardisation mandate (M/443) issued and CLC preparing a response / prEN 50399 at final vote / Final CEMAC II report issued / Sound technical background established / Simple EXAP rule and procedures established for wide range of power cable families / Historical industry approach validated with detail changes due to new tests / Possible future developments in real time effluent measurement via FTIR and use of test data in escape simulation studies

• **Cables 2012 – Standards for the implementation of CE marking of cables for reaction to fire performance**
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Overview of the journey

Decision on Classification (Euroclasses) 2006

Decision on AoC (Certification) 2011

Mandate to Cenelec M/443 2009

Implementation in Member States

Existing test standards
- EN 60332-1-2
- EN 61034-2
- EN 50267-2-3

EN 50399 (test standard) 2011

prEN50575 (Product standard)
- prTS50576 (EXAP standard)
- prEN13501-6 (Classification standard)

FIPEC 1996 - 1999

CEMAC II 2007 - 2010

Escape Simulation 2010

Regulatory

Standards

Supporting projects
## CE marking cable reaction to fire performance

### Classification and AoC systems

<table>
<thead>
<tr>
<th>Euroclass (ca)</th>
<th>Classification criteria</th>
<th>Additional criteria</th>
<th>Attestation of conformity system</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>EN ISO 1716</td>
<td></td>
<td>1+</td>
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<td></td>
<td>Gross heat of combustion</td>
<td></td>
<td>- initial type-testing and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>continuous surveillance with</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>audit testing of samples</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>by 3rd party certification body</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- factory production control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(FPC) by manufacturer</td>
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<tr>
<td>B1</td>
<td>EN 50399</td>
<td>Smoke production</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Heat release</td>
<td>(s1a, s1b, s2, s3)</td>
<td>- initial type-testing by 3rd</td>
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<tr>
<td></td>
<td>Flame spread</td>
<td></td>
<td>party laboratory</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- FPC by manufacturer</td>
</tr>
<tr>
<td>B2</td>
<td>EN 60332-1-2</td>
<td>Acidity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flame propagation</td>
<td>(a1, a2, a3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Flaming droplets</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(d0, d1, d2)</td>
<td>- initial type-testing and FPC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>by manufacturer</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Heat release</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flame spread</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>EN 60332-1-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flame propagation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **"Non combustible"** (e.g. unsheathed mineral insulated)
- **"Low-Fire-Hazard"** cables (various levels)
- **"Standard"** cables
- No performance determined
CE marking cable reaction to fire performance

Scope of mandated standards

- **prEN 50575** Power, control and communication cables – Cables for general applications in construction works subject to reaction to fire requirements
  Specifies reaction to fire performance requirements. Specifies test methods for reaction to fire classes. Covers power cables / control and communication cables / optical fibre cables with no voltage restriction. Does not replace the electrical, mechanical and environmental requirements in other applicable cable standards/specifications

- **prEN 13501-6** Fire classification of construction products and building elements – Part 6: Classification using data from reaction to fire tests on electric cables
  Provides reaction to fire classification procedure for electric cables
  The term electric cables covers all power, control and communication cables

Mandated (M/443) standards for reaction to fire

- prEN 50575
- prTS 50576
- prEN 13501-6
- Supporting test methods
  - EN 50267-2-3
  - EN 50399
  - EN 60332-1-2
  - EN 61034-2
  - EN ISO 1716
CE marking cable reaction to fire performance

The Product standard – prEN 50575 (enquiry stage)

Contents

- Requirements for reaction to fire and release of dangerous substances
- Test methods for reaction to fire classes
- Evaluation of conformity including Initial type testing and Factory production control (FPC)
- Marking, labelling and packaging
- Informative annex on clauses addressing provisions of EU Construction Products Directive including procedures for attestation of conformity and CE marking and labelling
- Informative annex addressing provisions of EU Low Voltage Directive including procedures for declaration of conformity and CE marking
CE marking cable reaction to fire performance

The Classification standard – prEN 13501-6 (enquiry stage)

Contents

• Classes for reaction to fire performance
• Test methods for reaction to fire classes
• Number of tests and criteria for classification
• Classification criteria for electric cables
• Field of application of the classification
• Classification report
CE marking cable reaction to fire performance

Status of test method standards

- **EN 50267-2-3** Tests on gases evolved during combustion of material from cables – Part 2-3: Procedures – determination of degree of acidity of gases for cables by determination of the weighted average of pH and conductivity
  - Published 1998
  - Agreed by CLC TC20 for replacement by the technically equivalent 2011 edition of IEC 60754-2 and subsequent parallel vote

- **EN 50399** Heat release and smoke production measurement on cables during flame spread test – Test apparatus, procedures, results
  - Published 2011
  - First amendment will include procedure for flat cables

- **EN 60332-1-2** Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame
  - Published 2004
  - Parallel vote of IEC 60332-1-2

- **EN 61034-2** Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements
  - Published 2005
  - Parallel vote of IEC 61034-2
  - Amendment to IEC 61034-2 currently at CDV

- **EN ISO 1716** Reaction to fire tests for building products – Determination of the gross heat of combustion (calorific value)
  - Published 2002

Mandated (M/443) standards for reaction to fire

- **Supporting test methods**
  - **EN 50267-2-3**
  - **EN 50399**
  - **EN 60332-1-2**
  - **EN 61034-2**
  - **EN ISO 1716**
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Technical background and the EXAP standard – prTS 50576

- Technical background for Classes B2 – E established through the CEMAC II project collaboration between manufacturers, test houses and research establishments
- Large reaction to fire test program (200 tests to EN 50399) on market based cable selection (120 types from 10 cable families)
- Data collection, compilation and analysis enabled EXAP rules for power cables to be proposed
CE marking cable reaction to fire performance

Technical background

CEMAC results – HRR for families with low and high performance

HRR “low” performance               HRR “high” performance
CE marking cable reaction to fire performance

Technical background
CEMAC results – SPR for families with low and high performance

“low” smoke

“high” smoke

![Graphs showing SPR results for families with low and high performance.](image)
## CE marking cable reaction to fire performance

### Technical background

**CEMAC EN50399 results – 4p Data Cables – Heat release and flame spread**

<table>
<thead>
<tr>
<th>Peak HRR kWh</th>
<th>THR MJ</th>
<th>Cable type</th>
<th>Class</th>
<th>Burn Length (m)</th>
<th>Cable Diameter (mm)</th>
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<tr>
<td>408.4</td>
<td>40.6</td>
<td>F/UTP</td>
<td>E</td>
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<td>309.0</td>
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<td>U/UTP</td>
<td>D</td>
<td>3.3</td>
<td>6.0</td>
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<td>265.7</td>
<td>33.5</td>
<td>U/UTP</td>
<td>D</td>
<td>3.3</td>
<td>5.8</td>
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<td>211.1</td>
<td>36.5</td>
<td>F/UTP</td>
<td>D</td>
<td>3.3</td>
<td>6.8</td>
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<td>162.6</td>
<td>27.5</td>
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<td>D</td>
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<td>6.1</td>
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<td>31.1</td>
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<td>C</td>
<td>1.3</td>
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<td>B2</td>
<td>0.3</td>
<td>7.7</td>
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**Special Jacket material!**
CE marking cable reaction to fire performance

Technical background

CEMAC EN50399 results – 4p Data cables - Smoke production and droplets

<table>
<thead>
<tr>
<th>Peak SP M³/s</th>
<th>TSR M²</th>
<th>Cable type</th>
<th>Class</th>
<th>Droplets &lt;1s</th>
<th>Droplets &gt;10s</th>
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<tr>
<td>3.8</td>
<td>393</td>
<td>F/UTP</td>
<td>S3</td>
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<td>N</td>
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<td>0.48</td>
<td>91</td>
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<td>S2</td>
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<td>S2</td>
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<td>0.46</td>
<td>100</td>
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<td>S2</td>
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<td>S/FTP</td>
<td>S1</td>
<td>N</td>
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</table>
Technical background

- CEMAC report available at www.safety-during-fire.com
- Escape simulation
- Non combustible, Low Fire Hazard and Standard cables
Cable resistance to fire performance

Scope and Status of test method standards

- **EN 50200  Method of test for resistance to fire of unprotected small cables for use in emergency circuits**
  
  Published 2000 with revision in 2006
  Revised edition due in 2012 with editorial and clarifying improvements

  Small scale test method used to obtain a PH classification for cables not exceeding 20 mm diameter and 2,5 mm² conductor size

- **prEN 50577  Electric cables – Fire resistance test for unprotected electric cables (P classification)**
  
  First enquiry stage expected February 2012

  Large scale furnace test method used to obtain P classification for any cable

  Exposure to the standard time/temperature curve for up to 120 minutes

  Cables tested in a standardised representative installation

  “U” or “S” bend configuration in horizontal or vertical furnace possible

  Failure criteria based on inability of cable to maintain test voltage and/or conductor rupture

Mandated (M/117) standards for resistance to fire

- Supporting test methods

  - **EN 50200**

  - **prEN 50577**

- Referenced test procedures

  - **prEN 50289-4-16**

  - **prEN 50582**
CE marking cable reaction to fire performance

- CE marking signifies compliance with applicable legislation and is passport to the "common" market
- CE marking already in place under LVD with manufacturer declaration whereas CPD requires third party intervention
- CE marking under the CPD for reaction to fire performance will be possible once all necessary standards are issued and endorsed by EC
- Standards anticipated to be available in first half of 2013
- From July 2013 CPR will replace CPD and declaration/attestation of performance will be obligatory (mark + performance level) but No Performance Declared (NPD) is possible
- CE marking under CPR for resistance to fire at later stage
Conclusions

- All standards required to enable the CE marking of cables for their reaction to fire performance under the CPD/CPR anticipated to be available in 2013
- Incremental rather than step change to performance requirements
- Impact of mandatory new third party certification
- Euroclass structure gives potential basis for improvement in reaction to fire safety
- Need to declare performance under CPR will give higher visibility of cable reaction to fire performance
- Implementation of the Euroclasses into Regulation is a National matter
- A long, difficult and expensive journey – will the benefits justify the investment?
Thank you