EU Construction Products Regulation for Cables
The manufacturer is the person who places the product on the market in the EU. It may be the actual manufacturer, or an importer.
Construction Products Regulation (CPR)

The European Union, with the aim of improving the safety of buildings, has created a construction products classification system in agreement with their fire behaviour, which is common for the whole of Europe within the Construction Products Regulation (CPR). The Institutions’ concern to protect people against fire is fully shared by B-Cables and by the cable industry in general, and thus cables with low smoke and toxic gas emission have been developed. These cables give more time to evacuate in the case of fire and are less harmful for the protection teams, facilitating rescue tasks.

The CPR, with its new product classification system and the quality control requirements entailed by this classification, represents an important step towards improving the performance of cables and their safety level, moving forward along the path that the cable industry has been setting for the last few years.

What is the objective of the CPR?

There are different legislations for cables at European and national levels that result in different safety levels. The CPR regulation introduces new classification criteria and common classes, the so-called Euroclasses, for the entire European space, creating a common language and a classification, assessment and certification system for all member countries, for construction products. With regards to fire behaviour, it permits establishing common standards to carry out assessment comparisons in equivalent conditions, guaranteeing the veracity of the information the products subject to this regulation.
**New table of classification for be market**

<table>
<thead>
<tr>
<th>Classification of Building</th>
<th>Situation &lt; 30/06/2017</th>
<th>Situation &gt; 30/06/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE1, CA1, BD1</td>
<td>F1</td>
<td>E\text{ca} or behaviour to superior fire à E\text{ca}</td>
</tr>
<tr>
<td>BE2, BE3, CA2, CB2, BD2</td>
<td>F2</td>
<td>C\text{ca} or behaviour to superior fire à C\text{ca}</td>
</tr>
<tr>
<td>B2, B3, BD4</td>
<td>SA</td>
<td>a1</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>s1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Possibilities of evacuation</th>
<th>Population density</th>
<th>Conditions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD1</td>
<td>Normal</td>
<td>Low</td>
<td>Easy</td>
<td>Standard homes &lt; 25 m high, home office, technical room, heating room, branches, sanitary for public use, etc.</td>
</tr>
<tr>
<td>BD2</td>
<td>Long</td>
<td>Low</td>
<td>Difficult</td>
<td>Buildings &gt; or = 25 m high, schools, meeting rooms, offices, staircases, offices, restaurants, dormitories, sports hall, waiting room, parking space, etc.</td>
</tr>
<tr>
<td>BD3</td>
<td>Congested</td>
<td>Important</td>
<td>Easy</td>
<td>Buildings accessible for public like theaters, cinemas, super market, dancing room, archives, libraries, shopping centers, restaurants, hospitals, hotels, banks, creches, parking &gt; 100 m²</td>
</tr>
<tr>
<td>BD4</td>
<td>Long and congested</td>
<td>Important</td>
<td>Difficult</td>
<td>Buildings &gt; or = 25 m and accessible for public like hospitals, hotels, and see also BD2 and BD3...</td>
</tr>
</tbody>
</table>

*Important Note: all electrical wires complying to F1,F2,SD,SA classification and Article 104 that has been put on the Belgian market before 1/07/2017 will be accepted for installation without any limit in time.*
Summary

- CPD has changed to CPR
- Cables will become part of CPR, in December 2015
- New classification scheme for cables
- Reaction to fire tests
- Not yet applicable to fire resistant cables
- Surveillance testing and surveillance audit for 1+
- Notified bodies-role and activities
- Requirements by European country will vary
Reaction to Fire Classification of Cables

- Requirements of CPR are not being included into normal cable product design standards
- Overall ‘Product Standard’ setting out requirements > EN 50575
- Classification standard setting out test requirements > EN 13501-6
- Extended application rules to minimise testing >TS 50576
- Existing and new test methods > EN 50399
- Measure of smoke density > EN 61034-2
- Measure of the evolution of the combustion of the materials of the cables > EN 60754-2
- Performance of acidity > EN 50867-2-3
Structure of Standards

EN 50575
Product Standard

EN 13501-6
Classification Standard

TS 50576
EXAP Rules
EN 50575

- Power cables, data / communication and fibre optic cables
- List of allowed classifications
- Tests required for each classification
- Type testing
  - Product families - results characteristic of all members of family
  - EXAP (Extended application) rules
- Assessment and verification of constancy of performance ("AVCP")
- Factory production control
- Surveillance testing - one sample per family
**Summary**

- **A_{ca}**  
  No reaction

- **B_{1ca}**  
  Very low reaction  
  Non-flame propagator. Non-fire propagator (1.75m)  
  Very low heat emission.

- **B_{2ca}**  
  Low reaction  
  Non-flame propagator. Non-fire propagator (1.5m)  
  Low heat emission.

- **C_{ca}**  
  Reduced reaction  
  Non-flame propagator. Non-fire propagator (2m)  
  Reduced heat emission and low Smoke Capacity and Low Smoke Acidity

- **C_{s1a1}**  
  Reduced reaction  
  Non-flame propagator. Non-fire propagator (2m)  
  Reduced heat emission.

- **D_{ca}**  
  Improved reaction  
  Non-flame propagator  
  Improved heat emission

- **E_{ca}**  
  Basic reaction  
  Non-flame propagator

- **F_{ca}**  
  Undetermined
What does the Euroclass initial mean?

The designation of the fire reaction characteristics of electrical cables is based on a code that indicates their performance. This code specifies the Euroclass and, if applicable, additional classifications.

This is an example of how to understand the symbols:

- **C_{ca}**: Class; satisfies the non propagation of the flame or of the fire, and emitted heat limits
- **s1b**: Reduced smoke emission and transmittance of $> 60\% < 80\%$
- **d1**: Flammable particles; no burning droplets or particles that persist for more than 10 s during the 1200 s of the test
- **a1**: Reduced acidity and corrosiveness of the emitted gases (conductivity $< 2.5 \mu S/mm$ and pH $> 4.3$)
**Fire Performance**

Fire propagation and heat emission performance, cable class ($A_{ca}$, $B1_{ca}$, $B2_{ca}$, $C_{ca}$, $D_{ca}$, $E_{ca}$, $F_{ca}$).

- $A_{ca}$: They do not contribute to the fire.
- $B1_{ca}$ - $B2_{ca}$: Minimum contribution to the fire.
- $C_{ca}$ - $D_{ca}$ - $E_{ca}$: Combustible, they contribute the fire, from lower to higher contribution.
- $F_{ca}$: Undetermined contribution properties.

**Smoke**

Smoke emission properties ($s1$, $s1a$, $s1b$, $s2$, $s3$). This classification provides information about the opacity of the emitted smoke ($s$: smoke).

- $s1$: Little smoke production and slow smoke propagation.
  - $s1a$: Transmittance >80%.
  - $s1b$: Transmittance >60% et <80%.
- $s2$: Average smoke production and propagation.
- $s3$: None of the above.

**Droplets**

Burning droplets/particles ($d0$, $d1$, $d2$). This classification provides information about the dripping of burning material during the fire ($d$: droplet).

- $d0$: No burning droplets or particles.
- $d1$: No burning droplets or particles that last more than 10 seconds.
- $d2$: None of the above.

**Acidity**

Acidity performance ($a1$, $a2$, $a3$) in addition applying the test described in standard UNE-EN 50267-2-3. This classification provides information about the emission of acid gases during the fire ($a$: acidity).

- $a1$: Conductivity < 2.5 μS/mm and pH > 4.3.
- $a2$: Conductivity < 10 μS/mm and pH > 4.3.
- $a3$: None of the above.
## Euroclass classification

<table>
<thead>
<tr>
<th>Classes</th>
<th>EN ISO 1716</th>
<th>EN 50399</th>
<th>EN 50399</th>
<th>EN 60332-1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Calorific value</td>
<td>Heat emission and Fire growth rate</td>
<td>Non-fire propagation</td>
<td>Non-flame propagation</td>
</tr>
<tr>
<td>A_{ca}</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B_{1ca}</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>B_{2ca}</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>C_{ca}</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>C_{s1a2}</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>D_{ca}</td>
<td>✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>E_{ca}</td>
<td>✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
<tr>
<td>F_{ca}</td>
<td>✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔ ✔</td>
</tr>
</tbody>
</table>

* Important for Belgian Market
### Additional classification
(only for classes B1ca, B2ca, Cca and Dca)

<table>
<thead>
<tr>
<th>EN 50399</th>
<th>EN 61034</th>
<th>EN 50399</th>
<th>EN 60754-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke production</td>
<td>Smoke transmittance</td>
<td>Burning droplets and particles</td>
<td>Acidity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>s1 - s2 - s3</th>
<th>s1a - s1b</th>
<th>d0 - d1 - d2</th>
<th>a1 - a2 - a3</th>
</tr>
</thead>
<tbody>
<tr>
<td>s1</td>
<td>s1a - s1b</td>
<td>nihil</td>
<td>a1</td>
</tr>
<tr>
<td>s2 - s3</td>
<td>nihil</td>
<td>nihil</td>
<td>nihil</td>
</tr>
<tr>
<td>s1 - s2 - s3</td>
<td>s1a - s1b</td>
<td>d0 - d1 - d2</td>
<td>a1 - a2 - a3</td>
</tr>
</tbody>
</table>

- ✔️: Present
- *: Present with additional requirement
- nihil: Not essential
EN 50576 - Extended Application Rules (exap)

- Prepared for power cables, others in preparation
- Circular cables only
- Product families
  - Same general construction and voltage rating
  - Varying only by conductor size / number of cores
- ‘Cable Parameter’ calculated from diameter of cable, number of conductors and non-metallic volume per metre
- Cables within smallest and largest values of cable parameter deemed to satisfy
EN 50399

- New test based on IEC ladder rig
- R&D results in CEMAC report
- 20kW or 30kW flame
- Main measurements
  - Vertical flame spread (m)
  - Total heat released during test (MJ)
  - Peak heat release rate (kW)
  - Fire growth rate index (FIGRA) (Ws-1)

ADDITIONAL CLASSIFICATIONS:
- Smoke evacuation: s1, s2, s3
- Inflamed Drops/Particles: d0, d1, d2
- PH - Acid conductivity: a1, a2, a3
Requirements – class B₁ca

- EN 50399 test (flamme 30kW)
  - FS ≤ 1.75 m
  - THR₁₂₀₀ ≤ 10 MJ
  - Pic HRR ≤ 20 kW
  - FIGRA ≤ 120 Ws⁻¹
- EN 61034-2 - Inflamed Drops/Particles
- EN 60754-2 - pH and propagation of acidity
- EN 60332-1-2 - test ‘Bunsen’
  - Height of the burned zone < 425 mm
- Prediction: class only used for high performance, polymeric cables
Requirements – class B2\textsubscript{ca}

- EN 50399 test (flamme 20kW)
  - FS ≤ 1.5 m
  - THR\textsubscript{1200s} ≤ 15 MJ
  - Pic HRR ≤ 30 kW
  - FIGRA ≤ 150 Ws-1
- EN 61034-2 - Smoke emission (s1 - s2 - s3)
- EN 60754-2 - pH and conductivity (a1 - a2 - a3)
- EN 60332-1-2 - test ‘Bunsen’
  - Height of the burnt area < 425 mm
- Prediction : commonly used class for many LSHF cables
Requirements – class $C_{ca}$

- EN 50399 test (20kW flame)
  - $FS \leq 2.0\ m$
  - $THR_{1200s} \leq 30\ MJ$
  - Peak HRR $\leq 60\ kW$
  - FIGRA $\leq 300\ Ws^{-1}$
- EN 61034-2 - smoke emission (s1 - s2 - s3)
- EN 60754-2 - pH and conductivity (a1 - a2 - a3)
- EN 60332-1-2 - ‘Bunsen’ test
  - Height of burnt area $< 425\ mm$
- Prediction: Commonly used class for many LSHF cables

THR: total heat release
Requirements – class D<sub>ca</sub>

- EN 50399 test (20kW flame)
  - THR<sub>1200s</sub> ≤ 70 MJ
  - Peak HRR ≤ 400 kW
  - FIGRA ≤ 1300 Ws⁻¹
- EN 61034-2 - smoke emission (s1 - s2 - s3)
- EN 60754-2 - pH and conductivity (a1 - a2 - a3)
- EN 60332-1-2 - ‘Bunsen’ test
  - Height of burnt area < 425 mm
- Prediction: Lower performing LSHF cables - less use
Requirements – class $E_{ca}$

- EN 60332-F1 ‘Bunsen’ test
- Height of burnt area < 425 mm
- Prediction: many common PVC and other cables which have no additional claims of fire or smoke performance
Requirements – class $F_{ca}$

- Lowest level of performance
- No tests specified
- No test requirements
- Low AVCP requirements
- Prediction: Temporary use by many cable manufacturers
- EN 60 332-1-2 (non-propagation de la flamme)
## Classes comparison

<table>
<thead>
<tr>
<th>TEST</th>
<th>Class A</th>
<th>Class B1</th>
<th>Class B2</th>
<th>Class C</th>
<th>Class D</th>
<th>Class E</th>
<th>Class F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross calorific potential</td>
<td>&lt;2.0MJ/kg</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flame power kW</td>
<td>-</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max. Flame spread m</td>
<td>1.75</td>
<td>1.5</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max. THR MJ</td>
<td>10</td>
<td>15</td>
<td>30</td>
<td>70</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max. PHRR kW</td>
<td>20</td>
<td>30</td>
<td>60</td>
<td>400</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Max. FIGRA Ws-1</td>
<td>120</td>
<td>150</td>
<td>300</td>
<td>1300</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IEC 60332-1-2</td>
<td>&lt;425mm</td>
<td>&lt;425mm</td>
<td>&lt;425mm</td>
<td>&lt;425mm</td>
<td>&lt;425mm</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
AVCP Requirements
Assessment and verification of constancy of performance

<table>
<thead>
<tr>
<th>Levels or Classes of Performance</th>
<th>AVCP System</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A_{ca}$, $B1_{ca}$, $B2_{ca}$, $C_{ca}$</td>
<td>1+</td>
</tr>
<tr>
<td>$D_{ca}$, $E_{ca}$</td>
<td>3</td>
</tr>
<tr>
<td>$F_{ca}$</td>
<td>4</td>
</tr>
</tbody>
</table>
AVCP System 1+ ($A_{ca}, B_{1ca}, B_{2ca}, C_{ca}$)

- Manufacturer:
  - Factory production control
  - Further testing of samples

- Notified Product Certification Body tasks:
  - Issues certificate of constancy of performance
  - Determines product-type on the basis of type testing etc.
  - Includes initial sampling by the notified certification body
  - Initial inspection of plant and factory production control
  - Continuous surveillance, assessment and evaluation of factory production control
  - Audit-testing of samples

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AVCP System 3 ($D_{ca}$, $E_{ca}$)

- Manufacturer tasks:
  - Factory production control
- Notified Test Laboratory tasks:
  - Determines product-type on the basis of type testing etc.
  - Sampling undertaken by the manufacturer
- No third party inspection of factory production control
- No audit testing
AVCP System 4 ($F_{ca}$)

- Manufacturer tasks:
  - Factory production control
  - Type testing
- No tasks for a Notified Body (Certification or Laboratory)
- No third party inspection of factory production control
- No audit testing
Notified Bodies

- CPR has three types of notified bodies:
  - Product Certification Body
  - Factory Production Control Certification Body
  - Testing Laboratory
- Notification only as appropriate for levels of AVCP
- Testing Laboratory may not be notified for system 1+
- Notified body must undertake sampling for system 1+
Procedural Requirements

- Engage Notified Product Certification Body (if required)
- Engage Notified Test Laboratory (if required)
- Testing carried out
- Factory inspections carried out
- Prepare EC Declaration of Performance
- Carry out CE marking / labeling of product
- Surveillance testing / factory inspection (if required)
- Market surveillance authorities actions
Marking of Product

- On product, packaging or labeling
  - Manufacturer’s name or trademark
  - Product description or code designation
  - Reaction to fire class

- Additional permitted marking:
  - Information required by other product standards
  - Year of production
  - Voluntary certification marks
  - Any additional information provided that it does not conflict with, nor confuse any of the other required marking
EC Declaration of Performance (DoP)

- Required contents include:
  - Unique ID for specific product
  - Intended uses
  - Manufacturer information (Is the person who places the product on the market in the EU)
  - AVCP system applied
  - Dated reference of harmonised standard
  - Notified bodies used
  - Declared performance (‘NPD’ if no performance determined)
CE Marking / Labeling Requirements

- CE mark in the correct format
- Last two digits of the year
- Name and address of the manufacturer or importer on the EU market
- Unique identification code of the product
- Reference number of declaration of performance
- Class of performance declared
- Dated reference of harmonized technical specification
- Identification number of the notified body
- Intended use as stated in harmonized technical specification

The dealer will be considered as manufacturers in situation when they are the first to offer non European products on the market
Publication Status

- Standards published:
  - EN 50399, EN 13501-6, EN 50575, TS 50576
- Standards not yet published:
  - Resistance to fire
- Procedural documents not yet published
  - Notified Body guidance documents
- Official Journal for Product Standard (EN 50575)
  - Published July 2015
Timetable

  - Co-existence period begins 1st December 2015
  - Mandatory requirement from 1st December 2016
- Notified Bodies can be appointed upon publication in OJ
- Manufacturers may classify products straight away
- Manufacturers must classify products 12 months later
Example Label

Industriesezone E17/3 nr 3504, Mosten 3 B-9160 Lokeren, Belgium

**B-CABLES**
EN 50575:14
Code: LSOHTGGF1X4X0.8T5

DoP Number: xxx
Date: 07/03/2017

**TYPE:** TGGF 1X4X0.8

**Color:** GREEN
**Lotnr:** xxx

**LENIGHT:**

Reaction to Fire: Cca s1a1 Dangerous Substance: None

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Industriesezone E17/3 nr 3504, Mosten 3 B-9160 Lokeren, Belgium

**B-CABLES**
EN 50575:14
Code: EXVB4X16T5

DoP Number: XXXXX
Date: 07/03/2017

**TYPE:** EXVB 4X16

**Color:** BLACK
**Lotnr:** XXXXX

**LENIGHT:**

Reaction to Fire: Eca Dangerous Substance: None