



Brussels, **XXX**  
[...](2014) **XXX** draft

**COMMISSION DELEGATED REGULATION (EU) No .../..**

**of **XXX****

**on the classification of the reaction to fire performance of construction products**

(Text with EEA relevance)

## EXPLANATORY MEMORANDUM

### 1. CONTEXT OF THE DELEGATED ACT

Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC<sup>1</sup>, acknowledges two main alternatives to establish classes of performance in relation to the essential characteristics of construction products. According to Articles 27(1) and 60(f), this can be done by delegated acts of the Commission, whereas Article 27(2) allows for the use of harmonised standards for this purpose.

Commission Decision 2000/147/EC<sup>2</sup> established a European classification system regarding the reaction to fire of construction products based upon European test methods. The subsequent amendments of this Decision have enlarged and clarified the scope of its practical application for different families of construction products. However, no consolidated version of the Decision has been formally adopted.

According to the definition comprised in Article 2(7) of Regulation (EU) No 305/2011, “class” means a range of levels, delimited by a minimum and a maximum value, of performance of a construction product. Classes in Regulation (EU) No 305/2011 are thus always expressing a given range of determined performance of the product.

Moreover, Regulation (EU) No 305/2011 introduces, unlike its predecessor Council Directive 89/106/EEC, clear provisions for the use of NPD, “No Performance Determined”, in the context of manufacturers drawing up the declarations of performance for their products. Pursuant to Article 6(3)(f), the letters NPD are to be used for those listed essential characteristics, for which no performance is declared. This matter has thus been exhaustively regulated in this provision.

Commission Decision 2000/147/EC contains in its Tables respectively Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub>, the content of which is defined as “No performance determined”. Since however this concept cannot be considered a class as foreseen in Regulation (EU) No 305/2011 and therefore cannot be incorporated in a valid classification system under this act, the provisions defining the system in Commission Decision 2000/147/EC should be adjusted in this respect.

Within Commission Decision 2000/147/EC, Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub> are presented as representing the lowest ranges of performance. These classes have been defined with minimum levels of reaction to fire performance. Construction products exist with lower performance than these minimum levels. For such products, the classification system and the manufacturers drawing up their declarations of performance would require an additional class with performance lower than Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub>. The rules defining the classification should thus be amended so as to incorporate such new Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub> into the system to replace the previous provisions on Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub>.

The experience from the application of Commission Decision 2000/147/EC has demonstrated that the classification system has otherwise functioned well and served its purpose. No other substantial changes should therefore be envisaged to it, apart from adapting the wording to the terminology and the concepts used in Regulation (EU) No 305/2011 (notably concerning the intended use of products, which should replace the previous wording of “end-use application”, in Article 1 of Commission Decision 2000/147/EC).

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<sup>1</sup> OJ L 88, 4.4.2011, p. 5.

<sup>2</sup> OJ 50, 23.2.2000, p. 14. Decision as amended by Decision 2003/632/EC (L 220, 3.9.2003, p. 5) and by Decision 2006/751/EC of 27 October 2006 (L 305, 4.11.2006, p. 8).

For these reasons, in addition to consolidating the content of Commission Decision 2000/147/EC as amended and adapting it to Regulation (EU) No 305/2011, the draft Regulation should contain new definitions for Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub>, establishing new classes of lower performance under the existing Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub>. Commission Decision 2000/147/EC should thus be repealed with the customary reference clause. The resulting situation will be simpler and clearer for the whole construction sector.

## **2. CONSULTATIONS PRIOR TO THE ADOPTION OF THE ACT**

*To be added subsequently*

## **3. LEGAL ELEMENTS OF THE DELEGATED ACT**

Pursuant to Article 27 of Regulation (EU) No 305/2011, classes of performance may be established in relation to the essential characteristics of construction products. According to Articles 27(1) and 60(f), this can be done by delegated acts of the Commission.

The European classification system has been established by Commission Decision 2000/147/EC, regarding the reaction to fire of construction products. This Decision as amended contains four classification Tables for different families of construction products. Within all these Tables, Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub> have been introduced for situations where the reaction to fire performance of the product has not been determined.

Pursuant to Article 2(7), classes in Regulation (EU) No 305/2011 are always expressing a given range of determined performance of the product. Classes defined by reference to “no performance determined” are not fulfilling this demand and cannot therefore be incorporated in a classification system under Regulation (EU) No 305/2011.

For these reasons, and in order to consolidate the existing regulatory framework on this classification system, which otherwise has been considered to have functioned well, the draft Regulation should be adopted to contain new definitions for Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub>, establishing new classes of lower performance under the existing Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub>. At the same time, the wording should be adapted to Regulation (EU) No 305/2011, notably as concerns the intended use of construction products.

The draft Regulation conforms to the principle of proportionality. It results in alleviating certain inconsistencies caused by the impact of Regulation (EU) 305/2011 on the existing classification system under Commission Decision 2000/147/EC.

# COMMISSION DELEGATED REGULATION (EU) No .../..

of **XXX**

## on the classification of the reaction to fire performance of construction products

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC<sup>3</sup>, and in particular Article 60(f) thereof,

Whereas:

- (1) Pursuant to Article 27(1) of Regulation (EU) No 305/2011, the Commission may adopt delegated acts in accordance with Article 60(f), to establish classes of performance in relation to the essential characteristics of construction products.
- (2) A system for classifying the performance of construction products with regard to their reaction to fire was adopted in Commission Decision 2000/147/EC<sup>4</sup>. It was based on a harmonised solution of assessing this performance and classifying the results.
- (3) Decision 2000/147/EC foresees several classes of defined reaction to fire performance. In addition, it contains Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub>, which are defined as “No performance determined”.
- (4) However, according to Article 2(7) of Regulation (EU) No 305/2011, a class means a range of levels, delimited by a minimum and a maximum value of performance.
- (5) Moreover, the use of “No Performance Determined” in the context of drawing up the declaration of performance has been prescribed in Article 6(3)(f).
- (6) By means of changing the definition of Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub> accordingly, the manufacturers should be enabled to declare lower reaction to fire performance than that foreseen in Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub>.
- (7) For these reasons, Decision 2000/147/EC should be amended by replacing the existing Classes F, F<sub>FL</sub>, F<sub>L</sub> and F<sub>ca</sub> with a new class, having its maximum value of performance coincide with the minimum value of the existing Classes E, E<sub>FL</sub>, E<sub>L</sub> and E<sub>ca</sub>.

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<sup>3</sup> OJ L 88, 4.4.2011, p. 5.

<sup>4</sup> OJ L 50 23.2.2000, p. 14. Decision as amended by Decision 2003/632/EC (OJ L 220, 3.9.2003, p. 5) and by Decision 2006/751/EC (L 305, 4.11.2006, p. 8).

(8)

Furthermore, Decision 2000/147/EC as amended should be consolidated by replacing it by this Regulation,

HAS ADOPTED THIS REGULATION:

*Article 1*

When the intended use of a construction product is such that the product may contribute to the generation and spread of fire and smoke within the room (or area) of origin or beyond, the performance of the product in relation to reaction to fire shall be classified in accordance with the classification system set out in Tables 1 to 4 of the Annex.

*Article 2*

Decision 2000/147/EC is hereby repealed.

References to the repealed Decision shall be construed as references to this Regulation.

*Article 3*

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,

*For the Commission*  
*The President*  
*[...]*

## ANNEX

### Symbols<sup>5</sup>

$\Delta T$	temperature rise
$\Delta m$	mass loss
$t_f$	duration of flaming
PCS	gross calorific potential
FIGRA	fire growth rate
$THR_{600s}$	total heat release
LFS	lateral flame spread
SMOGRA	smoke growth rate
$TSP_{600s}$	total smoke production
Fs	flame spread

### Definitions

**Material** : A single basic substance or uniformly dispersed mixture of substances, e.g. metal, stone, timber, concrete, mineral wool with uniformly dispersed binder, polymers.

**Homogeneous product** : A product consisting of a single material, having uniform density and composition throughout the product.

**Non-homogeneous product** : A product that does not satisfy the requirements of a homogeneous product. It is a product composed of one or more components, substantial and/or non-substantial.

**Substantial component** : A material that constitutes a significant part of a non-homogeneous product. A layer with a mass per unit area  $\geq 1.0 \text{ kg/m}^2$  or a thickness  $\geq 1.0 \text{ mm}$  is considered to be a substantial component.

**Non-substantial component** : A material that does not constitute a significant part of a non-homogeneous product. A layer with a mass per unit area  $< 1.0 \text{ kg/m}^2$  and a thickness  $< 1.0 \text{ mm}$  is considered to be a non-substantial component.

Two or more non-substantial layers that are adjacent to each other (i.e. with no substantial component(s) in-between the layers) are regarded as one non-substantial component and, therefore, must altogether comply with the requirements for a layer being a non-substantial component.

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<sup>5</sup> The characteristics are defined with respect to the appropriate test method.

For non-substantial components, distinction is made between internal non-substantial components and external non-substantial components, as follows :

**Internal non-substantial component** : A non-substantial component that is covered on both sides by at least one substantial component.

**External non-substantial component** : A non-substantial component that is not covered on one side by a substantial component.

**TABLE 1 : CLASSES OF REACTION TO FIRE PERFORMANCE FOR  
CONSTRUCTION PRODUCTS EXCLUDING FLOORINGS, LINEAR PIPE  
THERMAL INSULATION PRODUCTS, AND ELECTRIC CABLES**

<b>Class</b>	<b>Test method(s)</b>	<b>Classification criteria</b>	<b>Additional classification</b>
<b>A1</b>	EN ISO 1182 <sup>(1)</sup> ; <i>and</i>	$\Delta T \leq 30^{\circ}\text{C}$ ; <i>and</i> $\Delta m \leq 50\%$ ; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	
	EN ISO 1716	$\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(2)</sup> <sup>(2a)</sup> ; <i>and</i> $\text{PCS} \leq 1.4 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	
<b>A2</b>	EN ISO 1182 <sup>(1)</sup> ; <i>or</i>	$\Delta T \leq 50^{\circ}\text{C}$ ; <i>and</i> $\Delta m \leq 50\%$ ; <i>and</i> $t_f \leq 20\text{s}$	
	EN ISO 1716; <i>and</i>	$\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(2)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	
	EN 13823 (SBI)	$\text{FIGRA} \leq 120 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
<b>B</b>	EN 13823 (SBI); <i>and</i>	$\text{FIGRA} \leq 120 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 30s</i>	$F_s \leq 150\text{mm}$ within 60s	
<b>C</b>	EN 13823 (SBI); <i>and</i>	$\text{FIGRA} \leq 250 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 15 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 30s</i>	$F_s \leq 150\text{mm}$ within 60s	
<b>D</b>	EN 13823 (SBI); <i>and</i>	$\text{FIGRA} \leq 750 \text{ W.s}^{-1}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 30s</i>	$F_s \leq 150\text{mm}$ within 60s	



<b>E</b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s \leq 150\text{mm}$ within 20s	Flaming droplets/ particles <sup>(7)</sup>
<b>F</b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s > 150\text{mm}$ within 20s	

<sup>(1)</sup> For homogeneous products and substantial components of non-homogeneous products.

<sup>(2)</sup> For any external non-substantial component of non-homogeneous products.

<sup>(2a)</sup> Alternatively, any external non-substantial component having a  $PCS \leq 2.0 \text{ MJ.m}^{-2}$ , provided that the product satisfies the following criteria of EN 13823(SBI) :  $FIGRA \leq 20 \text{ W.s}^{-1}$ ; and  $LFS < \text{edge of specimen}$ ; and  $THR_{600s} \leq 4.0 \text{ MJ}$ ; and  $s1$ ; and  $d0$ .

<sup>(3)</sup> For any internal non-substantial component of non-homogeneous products.

<sup>(4)</sup> For the product as a whole.

<sup>(5)</sup>  $s1 = \text{SMOGR} \leq 30\text{m}^2.\text{s}^{-2}$  and  $\text{TSP}_{600s} \leq 50\text{m}^2$ ;  $s2 = \text{SMOGR} \leq 180\text{m}^2.\text{s}^{-2}$  and  $\text{TSP}_{600s} \leq 200\text{m}^2$ ;  
 $s3 = \text{not } s1 \text{ or } s2$ .

<sup>(6)</sup>  $d0$  = No flaming droplets/ particles in EN 13823 (SBI) within 600s;  $d1$  = No flaming droplets/ particles persisting longer than 10s in EN 13823 (SBI) within 600s;  $d2$  = not  $d0$  or  $d1$ ; Ignition of the paper in EN ISO 11925-2 results in a  $d2$  classification.

<sup>(7)</sup> Pass = no ignition of the paper (no classification); Fail = ignition of the paper ( $d2$  classification).

<sup>(8)</sup> Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame attack.

**TABLE 2 : CLASSES OF REACTION TO FIRE PERFORMANCE FOR FLOORINGS**

<b>Class</b>	<b>Test method(s)</b>	<b>Classification criteria</b>	<b>Additional classification</b>
<b>A1<sub>FL</sub></b>	EN ISO 1182 <sup>(1)</sup> ; <i>and</i>	$\Delta T \leq 30^{\circ}\text{C}$ ; <i>and</i> $\Delta m \leq 50\%$ ; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	$\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(2)</sup> ; <i>and</i> $\text{PCS} \leq 1.4 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	
<b>A2<sub>FL</sub></b>	EN ISO 1182 <sup>(1)</sup> ; <i>or</i>	$\Delta T \leq 50^{\circ}\text{C}$ ; <i>and</i> $\Delta m \leq 50\%$ ; <i>and</i> $t_f \leq 20\text{s}$	Smoke production <sup>(7)</sup>
	EN ISO 1716; <i>and</i>	$\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(2)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	
	EN ISO 9239-1 <sup>(5)</sup>	Critical flux <sup>(6)</sup> $\geq 8.0 \text{ kW.m}^{-2}$	
<b>B<sub>FL</sub></b>	EN ISO 9239-1 <sup>(5)</sup> <i>and</i>	Critical flux <sup>(6)</sup> $\geq 8.0 \text{ kW.m}^{-2}$	Smoke production <sup>(7)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s \leq 150\text{mm}$ within 20s	
<b>C<sub>FL</sub></b>	EN ISO 9239-1 <sup>(5)</sup> <i>and</i>	Critical flux <sup>(6)</sup> $\geq 4.5 \text{ kW.m}^{-2}$	Smoke production <sup>(7)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s \leq 150\text{mm}$ within 20s	
<b>D<sub>FL</sub></b>	EN ISO 9239-1 <sup>(5)</sup> <i>and</i>	Critical flux <sup>(6)</sup> $\geq 3.0 \text{ kW.m}^{-2}$	Smoke production <sup>(7)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s \leq 150\text{mm}$ within 20s	
<b>E<sub>FL</sub></b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s \leq 150\text{mm}$ within 20s	
<b>F<sub>FL</sub></b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	$F_s > 150\text{mm}$ within 20s	

- (<sup>1</sup>) For homogeneous products and substantial components of non-homogeneous products.
- (<sup>2</sup>) For any external non-substantial component of non-homogeneous products.
- (<sup>3</sup>) For any internal non-substantial component of non-homogeneous products.
- (<sup>4</sup>) For the product as a whole.
- (<sup>5</sup>) Test duration = 30 minutes.
- (<sup>6</sup>) Critical flux is defined as the radiant flux at which the flame extinguishes or the radiant flux after a test period of 30 minutes, whichever is the lower (i.e. the flux corresponding with the furthest extent of spread of flame).
- (<sup>7</sup>) **s1** = Smoke  $\leq$  750%.min; **s2** = not s1.
- (<sup>8</sup>) Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame attack.

**Table 3****CLASSES OF REACTION TO FIRE PERFORMANCE FOR LINEAR PIPE INSULATION PRODUCTS**

<b>Class</b>	<b>Test method(s)</b>	<b>Classification criteria</b>	<b>Additional classification</b>
<b>A<sub>1L</sub></b>	EN ISO 1182 <sup>(1)</sup> ; <i>And</i>	$T \leq 30^{\circ}\text{C}$ ; <i>and</i> $m \leq 50\%$ ; <i>and</i> $t_f = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716	$\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(2)</sup> ; <i>and</i> $\text{PCS} \leq 1.4 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 2.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	-
<b>A<sub>2L</sub></b>	EN ISO 1182 <sup>(1)</sup> ; <i>Or</i>	$T \leq 50^{\circ}\text{C}$ ; <i>and</i> $m \leq 50\%$ ; <i>and</i> $t_f \leq 20\text{s}$	-
	EN ISO 1716; <i>And</i>	$\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(2)</sup> ; <i>and</i> $\text{PCS} \leq 4.0 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; <i>and</i> $\text{PCS} \leq 3.0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	-
	EN 13823 (SBI)	$\text{FIGRA} \leq 270 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
<b>B<sub>L</sub></b>	EN 13823 (SBI); <i>And</i>	$\text{FIGRA} \leq 270 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 7.5 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> ; <i>Exposure = 30s</i>	$F_s \leq 150\text{mm}$ within 60s	
<b>C<sub>L</sub></b>	EN 13823 (SBI); <i>And</i>	$\text{FIGRA} \leq 460 \text{ W.s}^{-1}$ ; <i>and</i> $\text{LFS} < \text{edge of specimen}$ ; <i>and</i> $\text{THR}_{600\text{s}} \leq 15 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> ; <i>Exposure = 30s</i>	$F_s \leq 150\text{mm}$ within 60s	
<b>D<sub>L</sub></b>	EN 13823 (SBI); <i>And</i>	$\text{FIGRA} \leq 2100 \text{ W.s}^{-1}$ $\text{THR}_{600\text{s}} \leq 100 \text{ MJ}$	Smoke production <sup>(5)</sup> ; <i>and</i> Flaming droplets/ particles <sup>(6)</sup>

	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 30s</i>	Fs ≤ 150mm within 60s	
<b>E<sub>L</sub></b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	Fs ≤ 150mm within 20s	Flaming droplets/ particles <sup>(7)</sup>
<b>F<sub>L</sub></b>	EN ISO 11925-2 <sup>(8)</sup> : <i>Exposure = 15s</i>	Fs > 150mm within 20s	

(<sup>1</sup>) For homogeneous products and substantial components of non-homogeneous products.

(<sup>2</sup>) For any external non-substantial component of non-homogeneous products.

(<sup>3</sup>) For any internal non-substantial component of non-homogeneous products.

(<sup>4</sup>) For the product as a whole.

(<sup>5</sup>) **s1** = SMOGRA ≤ 105 m<sup>2</sup>.s<sup>-2</sup> and TSP<sub>600s</sub> ≤ 250 m<sup>2</sup>; **s2** = SMOGRA ≤ 580 m<sup>2</sup>.s<sup>-2</sup> and TSP<sub>600s</sub> ≤ 1600 m<sup>2</sup>; **s3** = not s1 or s2.

(<sup>6</sup>) **d0** = No flaming droplets/ particles in EN13823 (SBI) within 600s; **d1** = No flaming droplets/ particles persisting longer than 10s in EN13823 (SBI) within 600s; **d2** = not d0 or d1; Ignition of the paper in EN ISO 11925-2 results in a d2 classification.

(<sup>7</sup>) Pass = no ignition of the paper (no classification); Fail = ignition of the paper (**d2** classification).

(<sup>8</sup>) Under conditions of surface flame attack and, if appropriate to end-use application of product, edge flame attack.

**Table 4**  
**Classes of reaction to fire performance for electric cables**

Class	Test method(s)	Classification criteria	Additional classification
<b>A<sub>ca</sub></b>	EN ISO 1716	PCS ≤ 2,0 MJ/kg (1)	
<b>B1<sub>ca</sub></b>	FIPEC20 Scen 2 (5)  <i>and</i>  EN 50265-2-1	FS ≤ 1.75 m <i>and</i>  THR <sub>1200s</sub> ≤ 10 MJ <i>and</i>  Peak HRR ≤ 20 kW <i>and</i>  FIGRA ≤ 120 W s <sup>-1</sup>  H ≤ 425 mm	Smoke production (2, 6) and Flaming droplets/particles (3) and Acidity (4)
<b>B2<sub>ca</sub></b>	FIPEC20 Scen 1 (5)  <i>and</i>  EN 50265-2-1	FS ≤ 1.5 m; <i>and</i>  THR <sub>1200s</sub> ≤ 15 MJ; <i>and</i>  Peak HRR ≤ 30 kW; <i>and</i>  FIGRA ≤ 150 W s <sup>-1</sup>  H ≤ 425 mm	Smoke production (2, 7) and Flaming droplets/particles (3) and Acidity (4)
<b>C<sub>ca</sub></b>	FIPEC <sub>20</sub> Scen 1 (5)  <i>and</i>  EN 50265-2-1	FS ≤ 2.0 m; <i>and</i>  THR <sub>1200s</sub> ≤ 30 MJ; <i>and</i>  Peak HRR ≤ 60 kW; <i>and</i>  FIGRA ≤ 300 W s <sup>-1</sup>  H ≤ 425 mm	Smoke production (2, 7) and Flaming droplets/particles (3) and Acidity (4)
<b>D<sub>ca</sub></b>	FIPEC <sub>20</sub> Scen 1 (5)  <i>and</i>  EN 50265-2-1	THR <sub>1200s</sub> ≤ 70 MJ; <i>and</i>  Peak HRR ≤ 400 kW; <i>and</i>  FIGRA ≤ 1300 W s <sup>-1</sup>  H ≤ 425 mm	Smoke production (2, 7) and Flaming droplets/particles (3) and Acidity (4)
<b>E<sub>ca</sub></b>	EN 50265-2-1	H ≤ 425 mm	
<b>F<sub>ca</sub></b>	EN 50265-2-1	H > 425 mm	

(1) For the product as a whole, excluding metallic materials, and for any external component (i.e. sheath) of the product.

(2) **s1** = TSP<sub>1200</sub> ≤ 50 m<sup>2</sup> *and* Peak SPR ≤ 0.25 m<sup>2</sup>/s

**s1a** = **s1** and transmittance in accordance with EN 50268-2 ≥ 80%

**s1b** = **s1** and transmittance in accordance with EN 50268-2 ≥ 60% < 80%

**s2** = TSP<sub>1200</sub> ≤ 400 m<sup>2</sup> *and* Peak SPR ≤ 1.5 m<sup>2</sup>/s

**s3** = not s1 or s2

(3) For FIPEC<sub>20</sub> Scenarios 1 and 2: **d0** = No flaming droplets/particles within 1200 s; **d1** = No flaming droplets/particles persisting longer than 10 s within 1200 s; **d2** = not d0 or d1.

(4) EN 50267-2-3: **a1** = conductivity < 2.5 μS/mm *and* pH > 4.3; **a2** = conductivity < 10 μS/mm *and* pH > 4.3; **a3** = not a1 or a2. No declaration = No Performance Determined.

(5) Air flow into chamber shall be set to 8000 ± 800 l/min.

FIPEC<sub>20</sub> Scenario 1 = prEN 50399-2-1 with mounting and fixing as below

FIPEC<sub>20</sub> Scenario 2 = prEN 50399-2-2 with mounting and fixing as below

(6) The smoke class declared for class B1<sub>ca</sub> cables must originate from the FIPEC<sub>20</sub> Scen 2 test.

(7) The smoke class declared for class B2<sub>ca</sub>, C<sub>ca</sub>, D<sub>ca</sub> cables must originate from the FIPEC<sub>20</sub> Scen 1 test.

**MOUNTING AND FIXING CONDITIONS AND DEFINITIONS OF TEST  
PARAMETERS REGARDING ELECTRIC CABLES (AS MENTIONED IN NOTE (5)  
OF TABLE 4)**

**1 Mounting and fixing conditions**

**1.1 Mounting of the test sample general for classes B1<sub>ca</sub>, B2<sub>ca</sub>, C<sub>ca</sub> and D<sub>ca</sub>**

The cables shall be mounted on the front of a standard ladder (EN 50266-1). Lengths of 3.5 m of cables shall be used. The lower part of the cables shall be 20 cm under the lower edge of the burner. The cables shall be positioned in the middle of the ladder (with respect to its width).

Each test piece or bundle shall be attached individually to each rung of the ladder by means of a metal wire (steel or copper). For cables up to and including 50 mm diameter, use wire between 0.5 mm and up to and including 1.0 mm in diameter. For cables above 50 mm diameter use wire between 1.0 mm and 1.5 mm in diameter.

When mounting the test pieces, the first test piece shall be positioned approximately in the centre of the ladder and further test pieces shall be added on either side so that the whole array of test pieces is approximately centred on the ladder.

The spacing and bundling is explained further below.

At each height of 25 cm a horizontal line shall be drawn in order to measure the flame spread as a function of time. The first line (i.e. zero line shall be at the same height as the burner).

The cables shall be mounted as follows depending on the classification that is applied for.

**1.2 Class B2<sub>ca</sub>, C<sub>ca</sub> and class D<sub>ca</sub>**

The selected mounting procedure is depending on the cable diameter according to Table 1 below.

**Table 4.1 Mounting as a function of cable diameter.**

Cable diameter	Mounting
Larger than or equal to 20 mm	20 mm spacing between cables
Between 5 and 20 mm	One cable diameter spacing between cables
Less than or equal to 5 mm	The cables shall be bundled in bundles of 10 mm diameter. The bundles shall not be twisted. The spacing between bundles shall be 10 mm.

The threshold values are determined with the diameter rounded to nearest mm, except for cables with diameter less than 5 mm, where the diameter shall **not** be rounded.

The following formulae are used for determination of the number of cable lengths per test.

**1.2.1 For cables with diameter greater than or equal to 20 mm**

The number of cables,  $N$ , is given by:

$$N = \text{int}\left(\frac{300 + 20}{d_c + 20}\right) \dots\dots\dots \text{equation 1}$$

where:

$d_c$  is the diameter of the cable (in mm and rounded to the nearest mm).

int function = the integer part of the result (i.e. the value rounded down).

**1.2.2 For cables with diameter greater than 5 mm but less than 20 mm**

The number of cables,  $N$ , is given by:

$$N = \text{int}\left(\frac{300 + d_c}{2d_c}\right) \dots\dots\dots \text{equation 2}$$

where:

$d_c$  is the diameter of the cable (in mm and rounded).

int function = the integer part of the result (i.e. the value rounded down).

**1.2.3 For cables or wires with diameter less than or equal to 5 mm**

The number of 10 mm bundles,  $N_{bu}$  of cables is given by:

$$N_{bu} = \text{int}\left(\frac{300 + 10}{20}\right) = 15 \dots\dots\dots \text{equation 3}$$

Thus 15 bundles with 10 mm distance between the bundles shall be mounted.

The number of cables in each bundle ( $n$ ) is:

$$n = \text{int}\left(\frac{100}{d_c^2}\right) \dots\dots\dots \text{equation 4}$$

where:

$d_c$  is the diameter of the cable (in mm and **not** rounded).

The number of cable lengths ( $CL$ ) for wires or cables with a diameter less than 5 mm will hence be:

$$CL = n \times 15 \dots\dots\dots \text{equation 5}$$

**1.2.4 Total length of cable per test**

The total length  $L$  (m) per test is:

$$L = n \times 15 \times 3.5 \quad \text{for } d_c \leq 5 \text{ mm}$$

or  $\dots\dots\dots \text{equation 6}$

$$L = N \times 3.5 \quad \text{for } d_c > 5 \text{ mm}$$



### 1.3 Class B1<sub>ca</sub>

At the back of the cable tray a non-combustible calcium silicate board shall be mounted with a density  $870 \pm 50 \text{ kg/m}^3$  and a thickness of  $11 \pm 2 \text{ mm}$ . This board can be mounted in two parts.

In all other aspects the mounting of the cables is identical to class B2<sub>ca</sub>, C<sub>ca</sub> and D<sub>ca</sub>.

## 2 Definitions of test parameters

**Table 4.2. Definitions of test parameters in FIPEC<sub>20</sub> Scenarios 1 and 2.**

**All calculated parameters are evaluated during 20 minutes from test start (ignition of burner).**

Parameter	Explanation
Test start	Ignition of burner.
End of test	20 minutes after ignition of burner (End of period for calculation of parameters)
HRR <sub>sm30</sub> , kW	Heat Release Rate averaged by a 30-s sliding average.
SPR <sub>sm60</sub> , m <sup>2</sup> /s	Smoke Production Rate averaged by a 60-s sliding average.
Peak HRR, kW	Maximum of HRR <sub>sm30</sub> between test start and end of test, excluded contribution from ignition source.
Peak SPR, m <sup>2</sup> /s	Maximum of SPR <sub>sm60</sub> between test start and end of test.
THR <sub>1200</sub> , MJ	Total heat release (HRR <sub>sm30</sub> ) from test start until end of test, excluded contribution from ignition source.
TSP <sub>1200</sub> , m <sup>2</sup>	Total smoke production (SPR <sub>sm60</sub> ) from test start until end of test.
FIGRA, W/s	FIre Growth RATE index defined as the highest value of the quotient between HRR <sub>sm30</sub> excluding the contribution of ignition source and time. Threshold values HRR <sub>sm30</sub> = 3 kW and THR = 0.4 MJ
SMOGRA, cm <sup>2</sup> /s <sup>2</sup>	SMOke Growth RATE index is defined as highest value of the quotient between SPR <sub>sm60</sub> and time, multiplied by 10000. Threshold value SPR <sub>sm60</sub> 0.1 m <sup>2</sup> /s and TSP = 6 m <sup>2</sup> .
PCS	Gross calorific potential
FS	Flame spread (damaged length)
H	Flame spread
FIPEC	Fire Performance of Electric Cables