COST Action FP1404

Fire Safe Use of Bio-based Building Products

Regulations and standards for fire safety
WG3

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Fire safety in buildings

Construction Regulation Products **CPR**

EU 305/2011

Basic Works Requirements

- Mechanical Resistance and Stability
- **Safety in Case of Fire**
- Hygiene, Healt And the Environment
- Safety in Use
- Protection against Noise
- Energy, Economy and Heat Retention
- Sustainable Use of Natural Resources

Fire safety in buildings

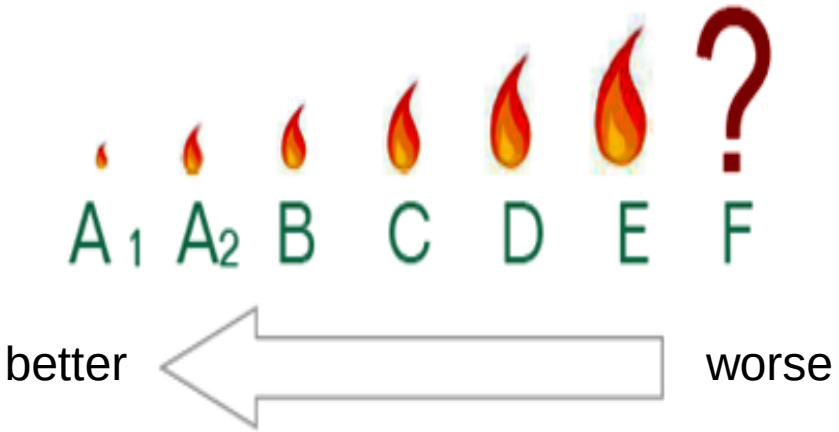
The basis of requirement for fire safety concerning building products is defined in the **CPR** :

- the load-bearing capacity of the construction can be assumed for a specific period of time;
- the generation and spread of fire and smoke within the construction works are limited;
- the spread of fire to neighbouring construction works is limited;
- occupants can leave the construction works or be rescued by other means;
- the safety of rescue teams is taken into consideration

Fire classification

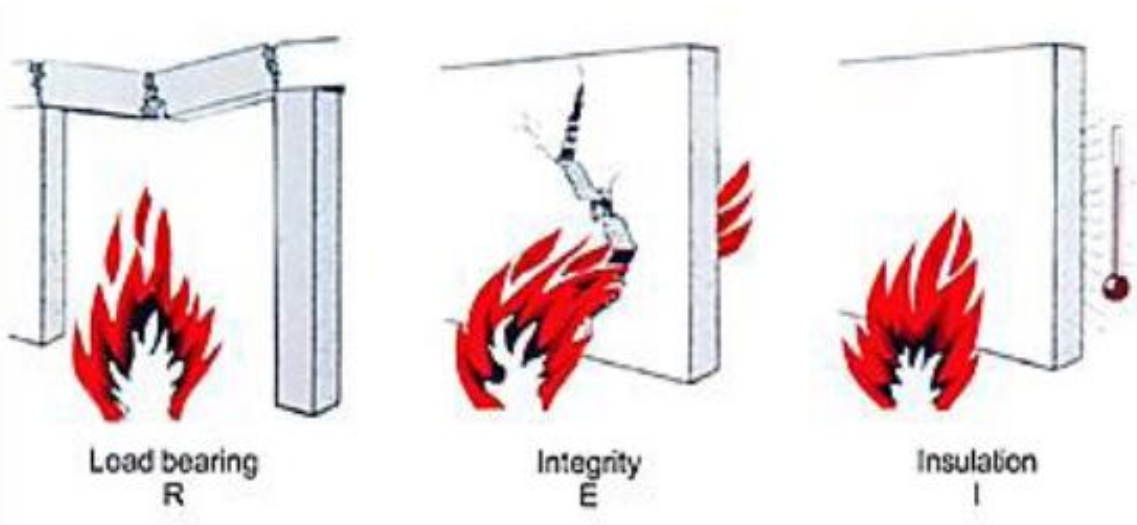
The European fire classification system includes:

- Reaction to fire of building products
  - contribution to fire/heat release levels
  - smoke production
  - burning droplets/particles



Fire classification

- Fire resistance of structural elements
  - load-bearing capacity (R)
  - separating function (E)
  - insulating performance (I)
  - fire protection ability (K)



- R 90
- EI 30
- REI 60

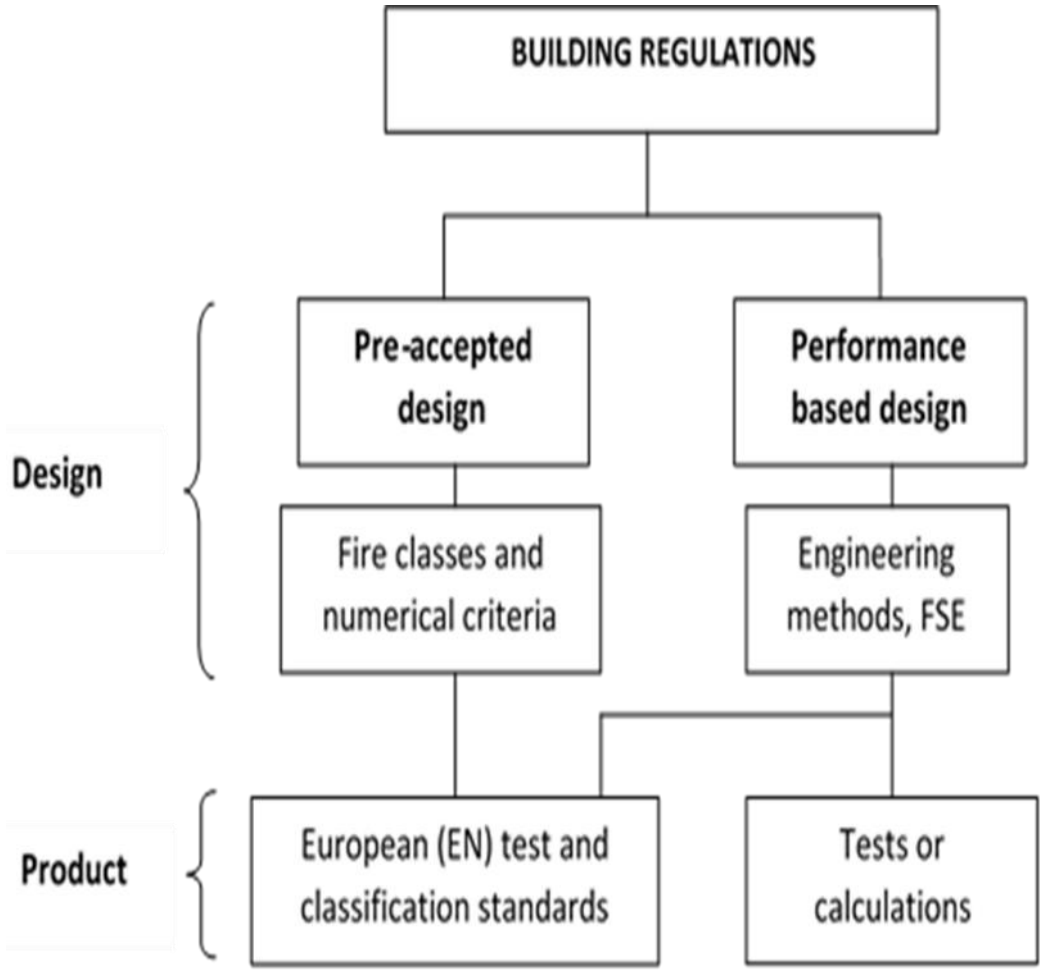
Fire classification

- External fire performance of roofs

All the testing methods are not material specific and performance levels (fire classes) are as results.

Use of standards in fire regulations

- National regulations have to use the European fire classes, but there is a freedom to select among the available classes.
- The general principles and levels of regulatory tools concerning fire safety are shown in the Figure.
- Either pre-accepted design using fire classes and numerical values (prescriptive regulations), or performance based design utilising fire safety engineering (FSE) is possible in many countries.
- At product level, either European test and classification methods or calculation methods are used to determine required classes or performance of materials, products and building elements.



Restrictions in regulations

- Regulations based on prescribed solutions are often causing problems by categorising materials and products as:
  - non-combustible (at least A2 fire class), and
  - combustible (not allowed at defined applications)

  So these may become very restrictive in some cases.

- Performance based regulations (or performance based options in regulations) are more flexible when being material independent.

Example of prescribed requirements

TABLE 6.2.1 CLASS REQUIREMENTS FOR LOAD-BEARING CONSTRUCTIONS

	Fire class of the building				
	P1			P2	P3
	Fire load MJ/m²				
	over 1200	600–1200	under 600	under 600	
Column	1	2	3	4	5
Buildings with not more than 2 storeys, in general	R 120*	R 90*	R 60*	R 30	—
– if the insulation materials in the building are not at least of class A2–s1, d0	R 120	R 90	R 60	R 30	—
– institutions, accommodation premises, basements	R 120	R 90	R 60	R 30	—
Buildings with 3-8 storeys, in general	R 180	R 120	R 60	■	■
Residential or office buildings with 3-8 storeys					
– storeys	R 180	R 120	R 60	R 60*	■
– basement storeys	R 180	R 120	R 60	R 60	■
Buildings with more than 8 storeys	R 240	R 180	R 120	■	■

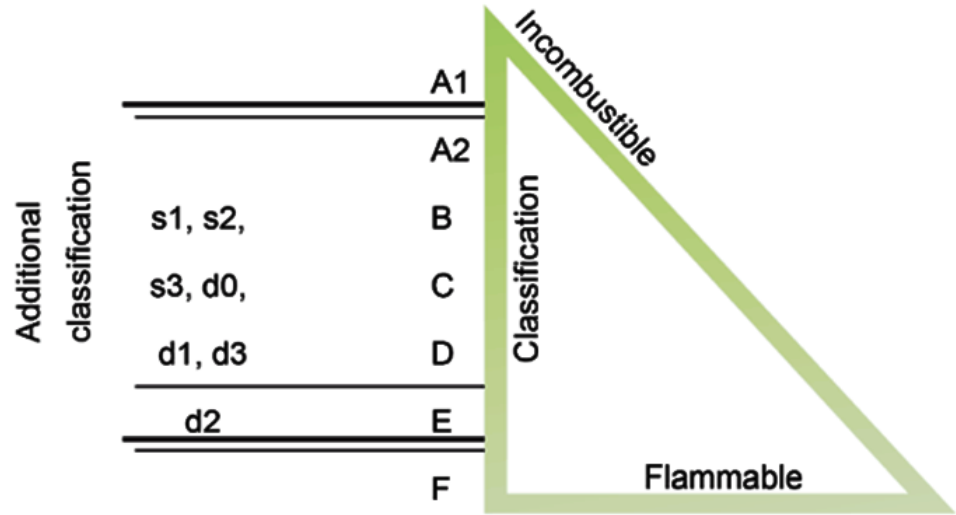
* = if the load-bearing constructions are not at least of class A2–s1, d0, the insulation materials of the building shall be made of materials at least of class A2–s1, d0.

■ = not possible

( ) = the load-bearing constructions shall be made of materials at least of class A2–s1, d0.

Reaction to fire classification

- Construction products are divided into 7 classes according to their heat release and spread of flame properties:
  - A1, A2 (non-combustible)
  - B, C, D, E and F (possible for bio-based products)
- Additional classifications for smoke (s1, s2, s3) and flaming droplets/particles (d0, d1, d2)
  - Class designations are e.g. D-s1,d0
- Flooring classes include heat/flame spread and smoke
  - Class designations are e.g. D_{FL}-s1



Classification Without Further Testing

Possibility for new bio-based building products

- In parallel with product standardisation

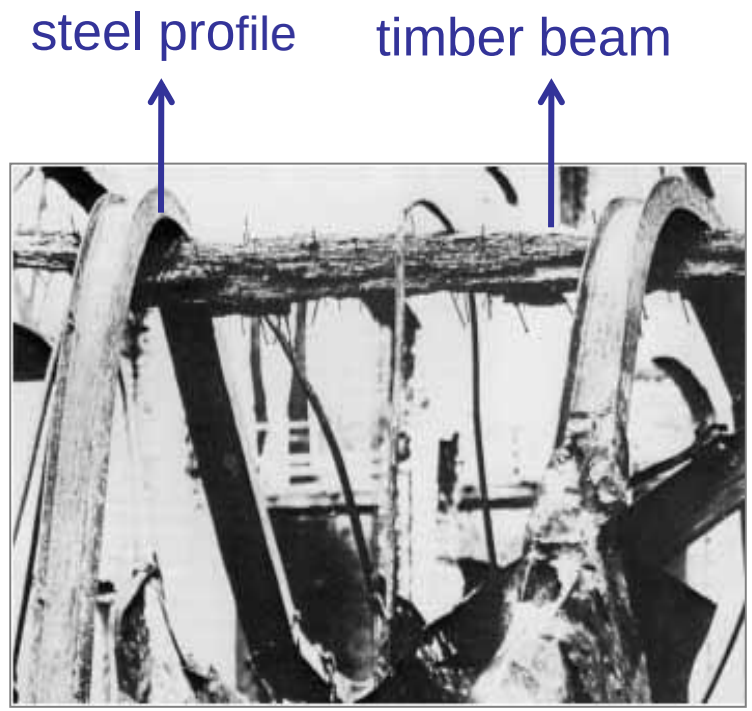
Principles and procedures

- Application and test evidence to the Commission
- National expert review of the evidence submitted
- Commission Decisions which are today named as Commission Delegated regulations
- Publication in Official Journal
- Included in Harmonised product standards

Classification Without Further Testing

- Products with known and stable fire performance
  - e.g. many cellulosic based products may have D class performance and charring materials can have good fire resistance

D/D_{FL}-s1/s2, d0 reaction to fire class



Two latest CWFT publications:

L 349/28 EN Official Journal of the European Union 5.12.2014

ANNEX

Product (1) (7)	Product detail (4)	Minimum mean density (5) (kg/m³)	Minimum overall thickness (mm)	End use condition	Class for floorings (3)
Wood flooring	Solid wood flooring of pine or spruce	Pine: 480 Spruce: 400	14	Without air gap underneath	D_{fl}-s1
Wood flooring	Solid flooring of beech, oak, pine or spruce	Beech: 700 Oak: 700 Pine: 430 Spruce: 400	20	With or without air gap underneath	D_{fl}-s1
Wood parquet	Solid wood (one layer) parquet of walnut	650	8	Glued to substrate (6)	D_{fl}-s1
Wood parquet	Solid (one layer) parquet of oak, maple or ash	Ash: 650 Maple: 650 Oak: 720	8	Glued to substrate (6)	D_{fl}-s1
Wood parquet	Multilayer parquet with oak top layer, at least 3,5 mm	550	15 (2)	Without air gap underneath	D_{fl}-s1
Wood flooring and parquet	Solid wood flooring and parquet not specified above	400	6	All	E_{fl}

(1) Mounted in accordance with EN ISO 9239-1, on a substrate of at least Class D-s2, d0 with minimum density of 400 kg/m³ or with an air gap (minimum height 30 mm) underneath.
(2) An interlayer of at least Class E_{fl} and with maximum thickness 3 mm and minimum density of 280 kg/m³ may be included.
(3) Class as set out in Table 2 of the Annex to Decision 2000/147/EC.
(4) Without surface coatings.
(5) Conditioned in accordance with EN 13238 (50 % RH, 23 °C).
(6) Substrate at least Class D-s2, d0.
(7) Applies also to steps of stairs.

ANNEX

Product (1)	EN product standard	Product detail (2)	Minimum mean density (kg/m³)	Minimum thickness (mm)	K Class (3)
Hardboard	EN 13986	With and without tongue and groove (5)	800	9	K_2 10 (4)
OSB	EN 13986	With and without tongue and groove (6)	600	10	K_2 10 (4)
Particleboard	EN 13986	With tongue and groove (7)	600	10	K_2 10 (4)
Particleboard	EN 13986	With and without tongue and groove (6)	600	12	K_2 10 (4)
Plywood	EN 13986	With and without tongue and groove (6)	450	12	K_2 10 (4)
Solid wood panels	EN 13986	With and without tongue and groove (6)	450	12	K_2 10 (4)
Particleboard	EN 13986	With tongue and groove (8)	600	25	K_2 30
OSB	EN 13986	With tongue and groove (8)	600	30	K_2 30
Plywood	EN 13986	With tongue and groove (8)	450	26	K_2 30
Solid wood panels	EN 13986	With tongue and groove (8)	450	26	K_2 30
Solid wood panels	EN 13986	With tongue and groove (9)	450	53	K_2 60
Solid wood panelling and cladding	EN 14915	With tongue and groove (10)	450	15	K_2 10 (4)
Solid wood panelling and cladding	EN 14915	With tongue and groove (10)	450	27	K_2 30
Solid wood panelling and cladding	EN 14915	With tongue and groove (11)	450	2 × 27 (12)	K_2 60

WG3 Regulation and standards for fire safety

Main activities include:

- Comparing regulatory approaches in different countries and identifying unsolved topics/obstacles to use of bio-based materials.
- Based on performance/risk based approach development of performance criteria for harmonisation of technical fire safety requirements.
- Reducing burden of unnecessary fire testing.

The overall aim is to ensure safety of people and property in use and also in construction phase.

Collaboration between FP1303 and FP1404

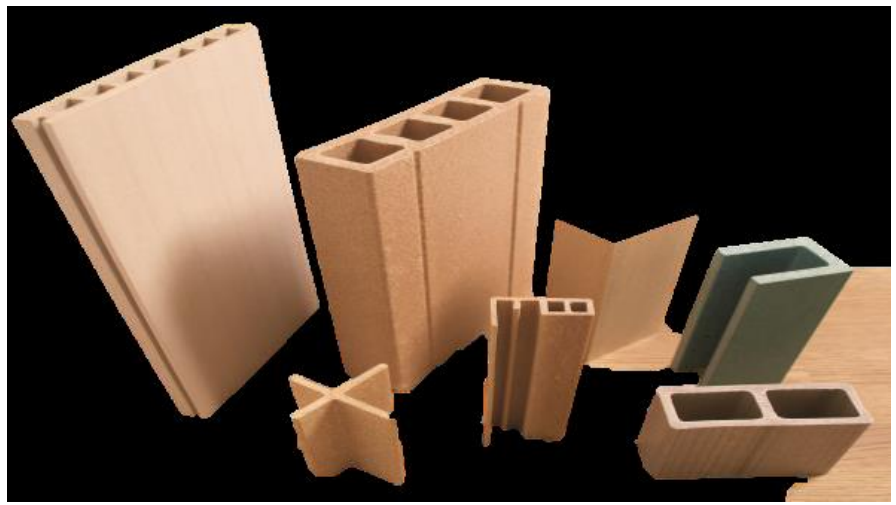
- FP1303 can provide basic material data on a large variety of bio-based building materials

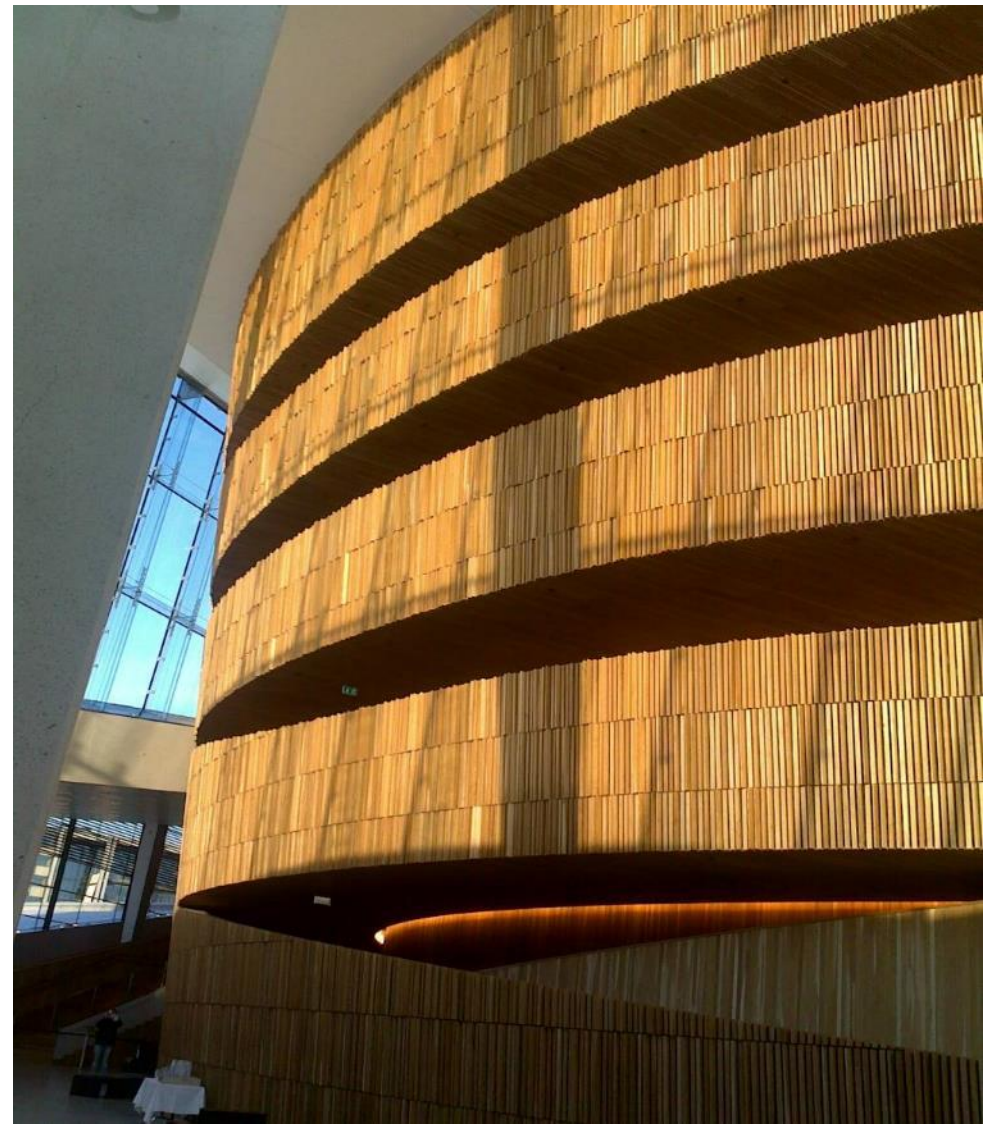
- FP1404 can provide information on:
  - testing methods
  - national requirements
  - fire safety engineering methods
  - methods to predict fire classes of new products in development phase

Challenges of bio-based products

- How to reach the best reaction to fire performance classes
  - low combustibility (B and C classes)
  - low smoke generation
  - use of optimal fire retardants – indoor/outdoor
- How to incorporate these materials within building elements (e.g. insulation materials)
  - need for protective layers?
  - use of fire protection barriers?
- Also toxicity aspects may be relevant in the future

Thank you for your attention





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