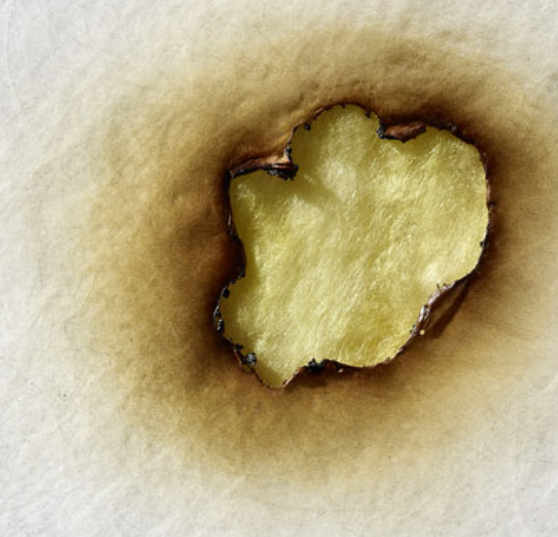


# BRINGING BUILDING PROTECTION TO A NEW LEVEL



An important aspect of the safety performance of a building is how the various materials used in the construction behave in case of a fire, allowing more time for building occupants to escape and potentially saving lives.

A variety of regulations, based on national traditions and safety level estimations are being used in different European countries to ensure the fire safety of buildings. Euroclasses for the reaction to fire performance of construction products have to be implemented in the building codes in all Member States, but this occurs at different rates. There is a clear need for a move toward integration and harmonisation across the European market.

In a reaction to recent major fires, national or local authorities are working to increase the requirements for the non-flammability of all products used in construction.



## Our mission: greater safety

One of the most important core values of DuPont is safety. We're at the forefront of developing products that meet or exceed regulations and also make life easier for specifiers and builders. DuPont is dedicated to increasing the protection of buildings and, more importantly, the people inside it.

„DuPont is working with customers, partners, governments, NGOs, academics, and other organizations to develop a vast range of materials, products, and consulting solutions that help ensure the protection of life and help safeguard our environment.“ Extract of the *Welcome to The Global Collaboratory*.™

## Euro Fire class system based on EN 13501-1

In the 90s, a major effort was undertaken by the CEN (Comité Européen de Normalisation), which was charged by the European Commission with the goal of harmonising the classification of the reaction to fire for building materials.

In February 2002, EN 13501-1 (Classification of construction products and building elements on reaction to fire) became a European Standard. As of this date, the European classification system on "reaction to fire" was defined and was gradually integrated into the different product standards (EN 13859-1 & 2 Flexible sheets for water proofing): Part 1: Underlays for discontinuous roofing, Part 2: Underlays for walls.

But before October 2004, the majority of underlay products remained classified according DIN 4102-2 in class B2 (German standard for fire behaviour of building materials and building components).

DIN 4102-2 B2 reaction to fire class has long since been the minimum fire class for building products. The DIN 4102-2 Class B2 was intended to allow sufficient time for occupants to evacuate a structure in case of a fire.

The European fire classes for building materials start from F up to Class A. For all harmonised product standards, the Euro fire class E is intended to replace the DIN 4102-2 fire class B2. It represents the lowest classification on reaction to fire within EN 13501-1 (Euro fire class F remains for „not tested“).

**For detailed information on the Euro Fire class system please refer to the appendix at the end of this white paper.**

**EURO FIRE CLASS SYSTEM AND NATIONAL FIRE CLASS SYSTEM**

Euro class EN13501-1	Germany DIN 4102	France NFP 92-501	United Kingdom BS 476 Pts. 6 & 7	Denmark DS 1065-1
A1	A1	M0		
A2	A2	M0	Class 0	
B	B1	M1	Class 0	A
C	B1	M1	Class 1	
D	B2	M2	Class 1	B
E	B2	M3	Class 2	
F	B3	M3	Class 3	

Source: [www.fireretard.com](http://www.fireretard.com)

**In recent technical literature, national fire class systems are often confused with the European classification. Special attention should always be paid to the norm behind the Fire Class information. If in doubt you can obtain the information at the manufacturer.**

## What is Euro Fire Class B? How it is measured ?

DuPont is introducing a new technology in order to upgrade the current standard Class E fire rating up to Euro Class B. The construction products directive (89/106/EEC) of the European Commission requires that all European Member states use the same rating and move from national standard to European ones.

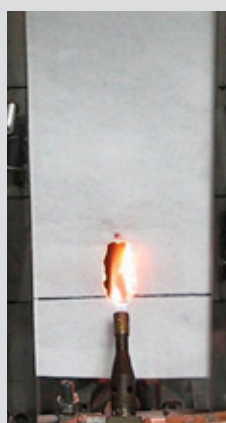
### Requirements for Euro Fire Class B:

#### What is being measured?

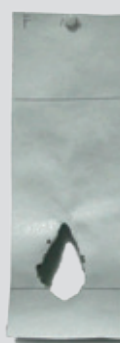
- Ignition of the sample
- Reach of the flame below 150mm and time of occurrence
- Any other behavior of the sample (smoke, droplets)

**Two different test standards need to be passed** (For test standards, please refer to appendix)

#### 1. Ignitability test EN ISO 11925-2



**Tyvek® FireCurb™ with Class B**



Ignition time = 30 s  
Flame spread (Fs) ≤ 150 mm within 60 s

**Typical underlay with standard Class E**



Ignition time = 15 s  
Flame spread (Fs) ≤ 150 mm within 60 s

#### 2. SBI Test EN13823



The Single Burning Item is a method of test for determining the reaction to fire behaviour of building products (excluding floorings) when exposed to the thermal attack by a single burning item (a sand-box burner supplied with propane). The reaction of the specimen to the burner is monitored instrumentally and visually. Heat and smoke release rates are measured instrumentally and physical characteristics are assessed by observation.

**FIGRA** Fire Growth Rate Index needs to stay below 120 W/s

**THR** Total Heat Release from the specimen in the first 600 s of exposure to the main burner flames.

**LFS** Lateral Flame Spread on the long specimen wing shall not be reached.

Subclassification is made on

- smoke production (s1, s2 or s3)
- burning droplets (d0, d1 or d3)



## DuPont™ Tyvek® FireCurb™ – New Patented Technology

### What is currently used on the market?

Many construction products contain ingredients which are designed to make the product less easily flammable, and such flame retardants may be either added to the bulk of the material or applied as a coating on the surface before or after installation. These treatments can be very effective in preventing fires starting, or slowing the spread of a fire once established, so allowing more time for building occupants to escape and saving lives. Many of the most effective flame retardants used in the past contain halogens (especially chlorine and/or bromine) which, when the material begins to burn, are released along with other gases and which interfere with the combustion reactions in the flame and so extinguish or diminish the fire. However, if a fire does become established in the flame retardant material, the halogens released may contribute to the toxicity of any fumes and smoke produced, and this has led many manufacturers to look for alternatives.

### What is behind the new FireCurb™ technology?

DuPont has developed a new range of flexible building membranes using a novel flame retardant technology to reduce the flammability of polymer based substrates. This technique does not involve the use of any halogens, and instead employs a phosphorous containing agent.

The Tyvek® FireCurb™ coating promotes the formation of a 'char' layer at the surface when it is contacted by an ignition source. This thin layer of carbonized polymer is difficult to burn and so forms a barrier, slowing the release of flammable materials from the membrane into the flame. Starved of fuel, the flame spreads over the membrane more slowly or not at all. DuPont's flame retardant flexible building membranes also produce less smoke when the membrane does burn; another advantage for people attempting to flee a burning building.

The new, flame-retardant material is applied by surface engineering techniques so that the strength, durability and water resistance of the original membrane are retained. The specially designed coating pattern only marginally influences the ability of water vapour to pass through the membrane.

### What is the environmental impact?

No solvents are used when applying the flame retardant so emissions of volatile organic compounds (VOCs) are extremely low, and the surface engineering technique developed for these products consumes less energy than conventional coating processes.

### Which will be the main applications for Tyvek® FireCurb™ breather membranes for buildings?

DuPont will continuously develop specific membranes for buildings with increased fire retardancy.



#### *Ventilated façades for high rise buildings*

*Limitation of fire propagation between floors by external envelope*



#### *Open rain screen cladding*

*Increases safety due to inattentively small fire sources (ex: cigarettes)*



#### *Timber frame building construction*

*Limitation of fire propagation during construction phase*



#### *Roofing constructions*

*Increased safety during and after construction phase*

**Please contact us for more information:**  
[www.FlameRetardant.tyvek.com](http://www.FlameRetardant.tyvek.com)



*The miracles of science™*

## Appendix: Euro Fire Class Definition

**Table 1: EN13501-1**

Euro fire classes for building materials

CLASS	TEST METHOD(S)	CLASSIFICATION CRITERIA	ADDITIONAL CLASSIFICATION
A1	EN ISO 1182 <sup>(1)</sup> and	$\Delta T \leq 30^{\circ} \text{C}$ ; and $\Delta m \leq 50\%$ ; and $t_r = 0$ (i.e. no sustained flaming)	–
	EN ISO 1716	$PCS \leq 2,0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> and $PCS \leq 2,0 \text{ MJ.kg}^{-1}$ <sup>(2)</sup> <sup>(2a)</sup> and $PCS \leq 1,4 \text{ MJ.m}^{-2}$ <sup>(3)</sup> and $PCS \leq 2,0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	–
A2	EN ISO 1182 <sup>(1)</sup> or	$\Delta T \leq 50^{\circ} \text{C}$ ; and $\Delta M \leq 50\%$ ; and $t_r \leq 20 \text{ s}$	–
	EN ISO 1716 and	$PCS \leq 3,0 \text{ MJ.kg}^{-1}$ <sup>(1)</sup> ; and $PCS \leq 4,0 \text{ MJ.m}^{-2}$ <sup>(2)</sup> ; and $PCS \leq 4,0 \text{ MJ.m}^{-2}$ <sup>(3)</sup> ; and $PCS \leq 3,0 \text{ MJ.kg}^{-1}$ <sup>(4)</sup>	–
	EN 13823 (SBI)	$FIGRA \leq 120 \text{ W.s}^{-1}$ ; and $LFS < \text{edge of specimen}$ ; and $THR_{600 \text{ s}} \leq 7,5 \text{ MJ}$	Smoke production <sup>(3)</sup> ; and Flaming droplets/particles <sup>(6)</sup>
B	EN 13823 (SBI) and	$FIGRA \leq 120 \text{ W.s}^{-1}$ ; and $LFS < \text{edge of specimen}$ ; and $THR_{600 \text{ s}} \leq 7,5 \text{ MJ}$	Smoke production <sup>(3)</sup> and Flaming droplets/particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : Exposure = 30 s	$F_s \leq 150 \text{ mm}$ within 60 s	
C	EN 13823 (SBI) and	$FIGRA \leq 250 \text{ W.s}^{-1}$ ; and $LFS < \text{edge of specimen}$ and $THR_{600 \text{ s}} \leq 15 \text{ MJ}$	Smoke production <sup>(3)</sup> ; and Flaming droplets/particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : Exposure = 30 s	$F_s \leq 150 \text{ mm}$ within 60s	
D	EN 13823 (SBI) and	$FIGRA \leq 750 \text{ W.s}^{-1}$	Smoke production <sup>(3)</sup> ; and Flaming droplets/particles <sup>(6)</sup>
	EN ISO 11925-2 <sup>(8)</sup> : Exposure = 30 s	$F_s \leq 150 \text{ mm}$ within 60s	
E	EN ISO 11925-2 <sup>(8)</sup> : Exposure = 15 s	$F_s \leq 150 \text{ mm}$ within 20s	Flaming droplets/particles <sup>(7)</sup>
F		No performance determined	

<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 xxxx (SBI):  $FIGRA \leq 20 \text{ W.s}^{-1}$ ; and  $LFS < \text{edge of specimen}$ ; and  $THR_{600 \text{ s}} \leq 4.0 \text{ MJ}$ ; 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  $\text{TSP}_{600 \text{ s}} \leq 50 \text{ m}^2$ ;  $s2 = \text{SMOGR} \leq 180 \text{ m}^2.\text{s}^{-2}$  and  $\text{TSP}_{600 \text{ s}} \leq 200 \text{ m}^2$ ;  $s3 = \text{not } s1 \text{ or } s2$ .

<sup>(6)</sup>  $d0 = \text{No flaming droplets/ particles in ENxxxx (SBI) within 600s}$ ;  $d1 = \text{no flaming droplets/particles persisting longer than 10s in ENxxxx (SBI) within 600s}$ ;  $d2 = \text{not } d0 \text{ or } d1$ ; Ignition off the paper 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.