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HOLA,

AQUI TE ENVIO LO QUE ME PEDIAS.
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Document2

VTT BUILDING TECHNOLOGY

RESEARCH REPORT NO. RTE11868/99

3 September 1999

**Fire tests of Wisa®-Wire F Birch Plywood
according to the SBI test procedure**

Requested by
Schauman Wood Oy

Date of tests
18 August 1999

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Task Fire tests of Wisa®-Wire F Birch Plywood according to the SBI test procedure

Product tested Wisa®-Wire F Birch Plywood, 15 mm 11 ply

Date of supply 16.6.1999

Date of test 18.8.1999

Test specimens The Single Burning Item (SBI) test specimens are installed on a specimen holder with two vertical wings made of non-combustible board. The specimen holder wings of sizes 1,0 m × 1,5 m and 0,5 m × 1,5 m form a right-angled corner configuration (see Appendix 1). The basic rule is that the installation of the test specimens shall correspond to the end-use condition of the product.

The specimens were mounted on 12 mm thick CaSi boards as presented in Appendix 2. The wings parts of the specimens were fixed together using L-profiles in the external corners.

Before the tests, the specimens were conditioned to constant mass at a temperature of (23 ± 2) °C and a relative humidity of (50 ± 5) %. The conditioning period was 16.6. 18.8.1999. The density and grammage of the specimens were 719 kgm^{-3} and 10.8 kgm^{-2} , respectively.

Test method The SBI tests were carried out according to the prEN SBI test procedure. In an SBI test, the thermal exposure on the surface of the specimen is produced by a right-angled triangle-shaped propane gas burner (so-called main burner) placed in the corner formed by the specimen wings. The heat output of the



main burner is 30 kW resulting in a heat exposure on an area of about 300 cm² with a maximum heat flux of about 40 kW/m².

The SBI test specimen and the main burner are mounted on a trolley which is placed under a hood for the tests. The hood is supported by a frame into which the trolley fits. The frame is mounted in an enclosure with windows allowing observation of the test from the outside. Above the hood, there is a collector with an exhaust duct linked to a ventilator inlet. The combustion gases are drawn to the duct equipped with sensors to measure the temperature, light attenuation, O₂ and CO₂ mole fractions and flow-induced pressure difference in the duct. The data are recorded with intervals of 3 seconds by a computer controlled data acquisition system. The test apparatus is shown schematically in Appendix 1.

During the SBI tests, the rate of heat release (RHR) is measured by using oxygen consumption calorimetry. The rate of smoke production (RSP) is measured in the exhaust duct. Falling of flaming droplets or particles is visually observed during the first 600 seconds (10 minutes) of the heat exposure on the specimen. In addition, the lateral flame spread is observed to determine whether the flame front reaches the edge of the large specimen wing during the test. The tests are recorded on video.

During a period of 5 minutes before the beginning of an SBI test, i.e. the ignition of the main burner, the baseline of the measuring equipment is determined, settings are adjusted, and the heat output of the burner alone is measured. The measurement of the burner heat output is carried out using an auxiliary burner, identical to the main burner, mounted on a post of the frame away from the specimen.

The SBI test specimen is exposed to the flames of the main burner for 21 minutes. The performance of the specimen is evaluated during the first 20 minutes of the exposure period. The additional one minute is needed due to the delay times of the measurements and for the calculation of time-averaged quantities.

Test results

The RHR and RSP curves of the tests are shown in Appendix 3. The RHR and RSP data plotted in the figures are sliding averages over 30 and 60 seconds, respectively. The heat output and smoke base level due to the burners were subtracted from the measured RHR and RSP values. The actual SBI test period is 5–25 minutes in the figures. The period 0–5 minutes is related to initial adjustments and checkings before the heat exposure period.

The SBI test results and preliminary classification according to the forthcoming Euroclass system are summarised in Table 1. The classification is based on the average of three tests. The criteria of the classes of reaction to fire performance for construction products excluding floorings are presented in Appendix 4.

Table 1. Summary of SBI test results.

Quantity	Test 1	Test 2	Test 3	Average	SBI class
FIGRA (W/s)	210	242	206	219	C
THR _{600s} (MJ)	12,2	12,9	11,7	12,3	
LFS	No	No	No	No	
SMOGRA (m ² /s ²)	0	0	0	0	s1
TSP _{600s} (m ³)	20,7	17,7	19,7	19,0	
Droplets/particles	No	No	No	No	00

Heat release

The FIGRA (fire growth rate) index is defined as the maximum value of the quotient of heat release rate and time, multiplied by 1000. The RHR data is averaged over 30 seconds for the calculation. RHR values less than 3 kW are excluded.

The total heat release (THR_{600s}) is calculated over the first 600 seconds of the exposure period for the classification purposes.

The average FIGRA of the three replicate tests was 219 W/s, meeting the requirement of class C (FIGRA ≤ 250 W/s). Also the THR_{600s} value of 12,2 MJ meets the requirements of class C (THR_{600s} ≤ 15 MJ).

Lateral flame spread

In Euroclasses A2, B and C it is required that the lateral flame spread (LFS) does not reach the outer edge of the larger specimen wing in the SBI test. This requirement was met in all three replicate tests.

Smoke production

The SMOGRA (smoke growth rate) index is defined as the maximum value of the quotient of smoke production rate and time, multiplied by 10000. The RSP data is averaged over 60 seconds for the calculation. RSP values less than 0,1 m²/s are excluded in the calculation.

The total smoke production (TSP_{600s}) is calculated over the first 600 seconds of the exposure period for the classification purposes.

The average SMOGRA of the three replicate tests was 0 m²/s², meeting the requirement of class s1 (SMOGRA ≤ 30 m²/s²). Also the TSP_{600s} value of 19,1 m³ in average leads to class s1 (TSP_{600s} ≤ 50 m³).



Burning particles and droplets

Dropping of burning particles or droplets did not occur in any of the tests, resulting in d0 classification in SBI tests.

Conclusions

The classification of the Wisa Wire P board would be class C in the forthcoming Euroclass system. The smoke production class would be s1, and classification for flaming droplets/particles would be d0.

The test results relate to the behaviour of the test specimens of a material under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use.

Espoo, 3 September 1999

Esko Mikkola
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Jukka Hietaniemi
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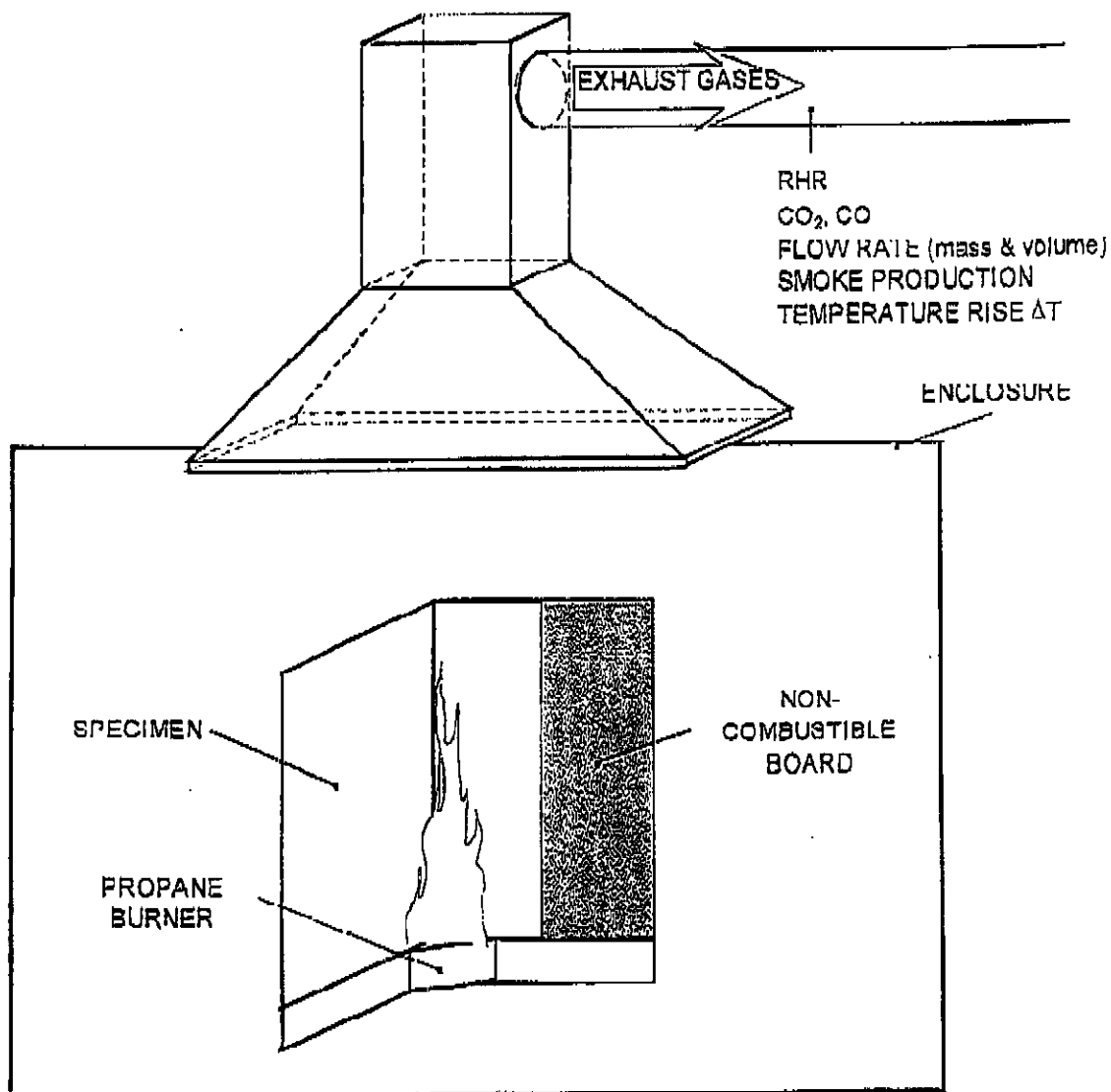
Appendices

1. Schematic illustration of the SBI test apparatus
2. Mounting of the test specimens
3. RHR, RSP and RHR/(t-300 s) curves
4. Classes of reaction to fire performance for construction products excluding floorings

Distribution

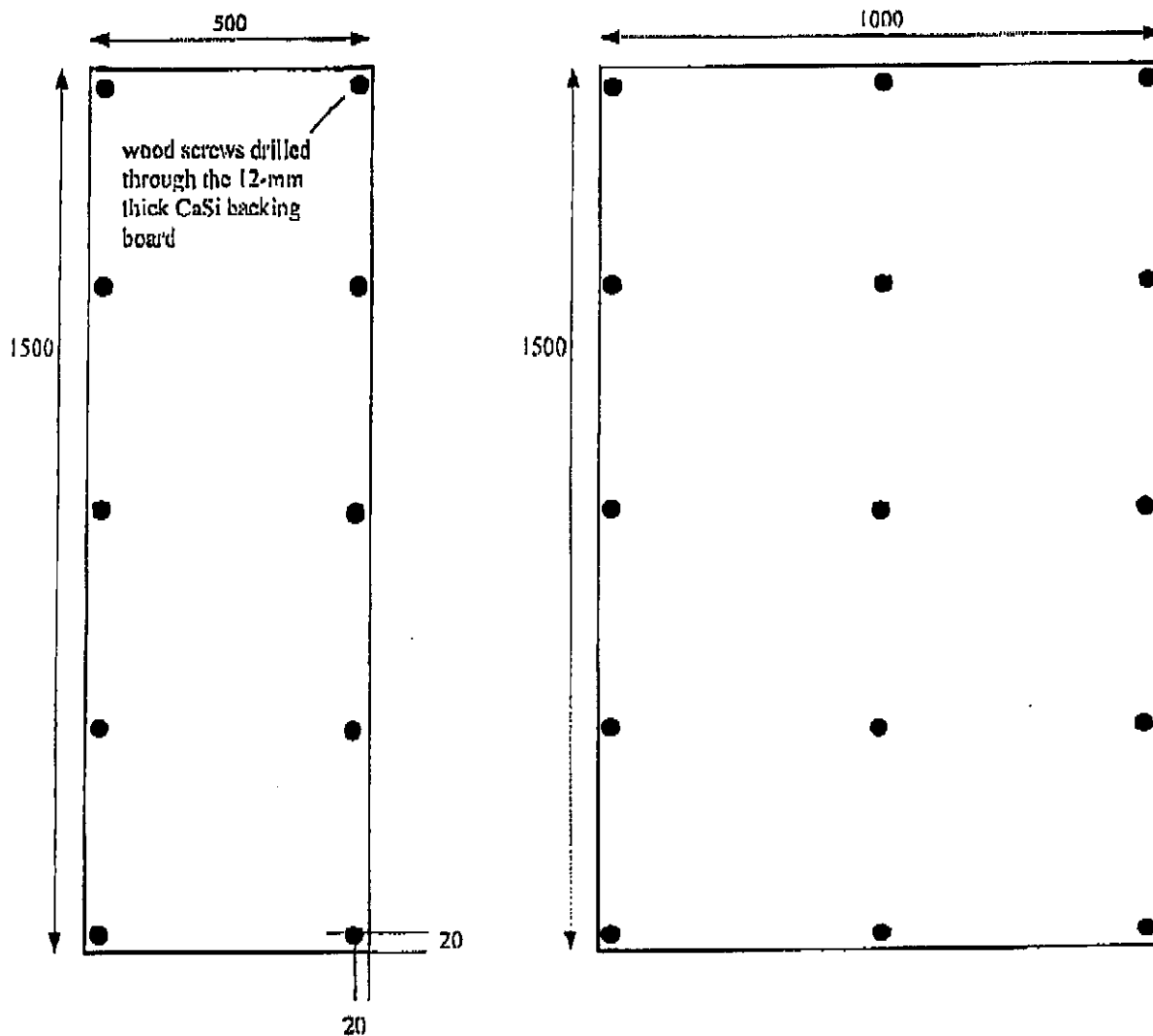
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Schematic picture of SBI test apparatus



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Mounting of the test specimens



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RHR, RSP and RHR/(t-300 s) curves

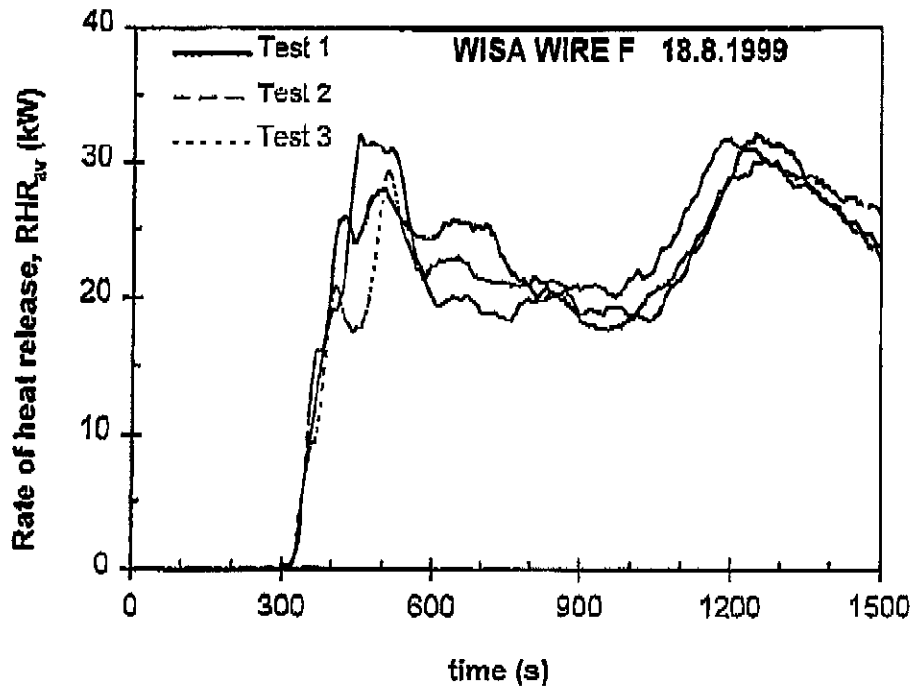


Figure 1. Rate of heat release ($RHR_{av}(t)$) of the three Wisa Wire F specimens.

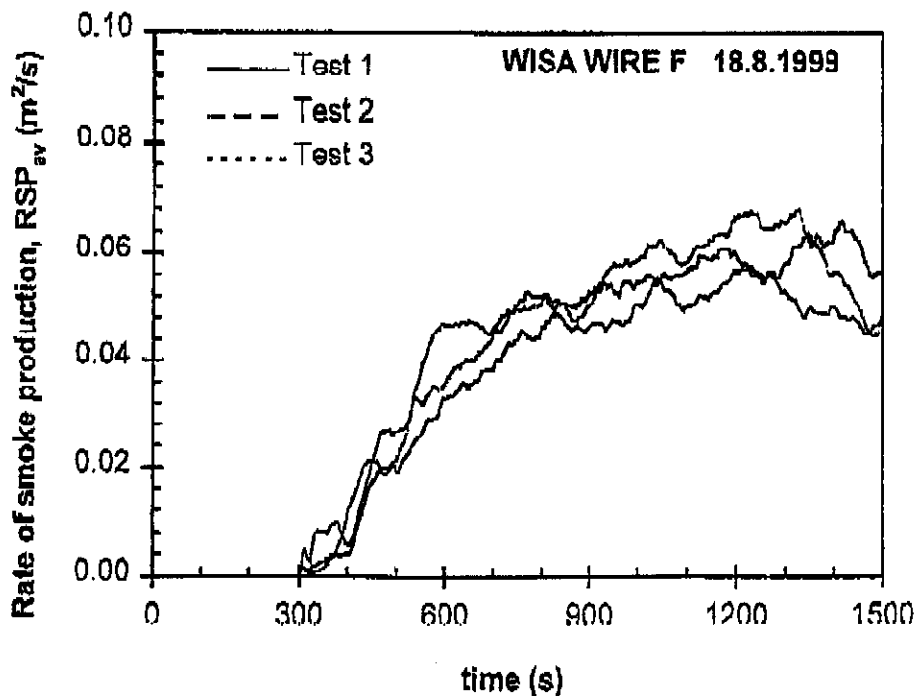


Figure 2. Rate of smoke production ($RSP_{av}(t)$) of the three Wisa Wire F specimens.

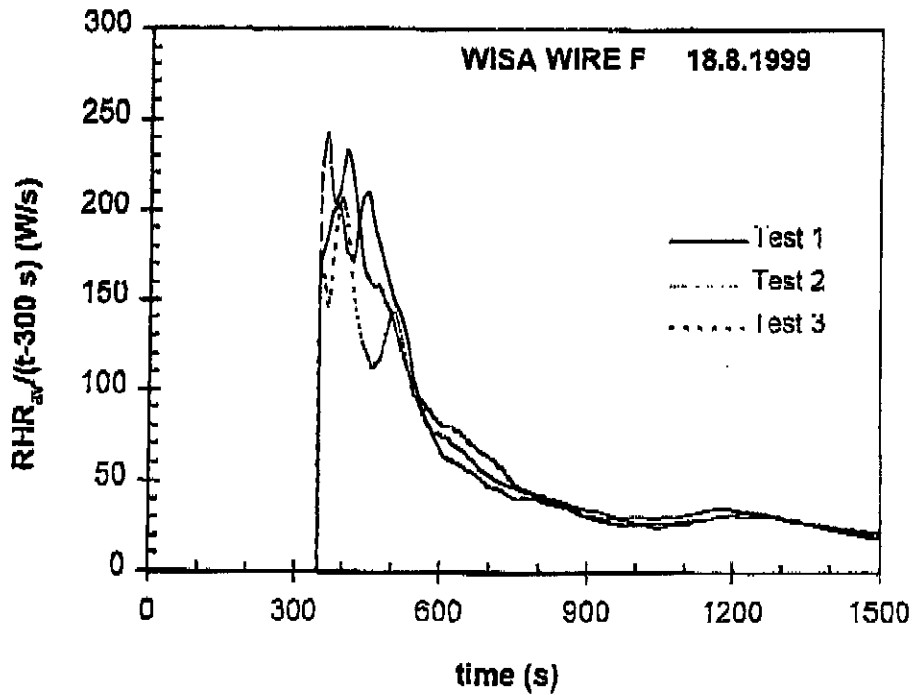


Figure 3. Quotient $RHR_{av}(t)/(t-300 \text{ s})$ of the three Wisa Wire F specimens.

CLASSES OF REACTION TO FIRE PERFORMANCE FOR CONSTRUCTION PRODUCTS EXCLUDING FLOORINGS *

Class	Test method(s)	Classification criteria	Additional classification
A1	EN ISO 1182 (1); and EN ISO 1716	$\Delta T \leq 30^\circ\text{C}$; and $\Delta m \leq 50\%$; and $t_f = 0$ (i.e. no sustained flaming) $PCS \leq 2.0 \text{ MJ.kg}^{-1}$ (1); and $PCS \leq 2.0 \text{ MJ.kg}^{-1}$ (2) (2a); and $PCS \leq 1.4 \text{ MJ.m}^{-2}$ (3); and $PCS \leq 2.0 \text{ MJ.kg}^{-1}$ (4)	
A2	EN ISO 1182 (1); or EN ISO 1716; and EN xxxx (SBI)	$\Delta T \leq 50^\circ\text{C}$; and $\Delta m \leq 50\%$; and $t_f \leq 20\text{s}$ $PCS \leq 3.0 \text{ MJ.kg}^{-1}$ (1); and $PCS \leq 4.0 \text{ MJ.m}^{-2}$ (2), and $PCS \leq 4.0 \text{ MJ.m}^{-2}$ (3); and $PCS \leq 3.0 \text{ MJ.kg}^{-1}$ (4)	Smoke production(5); and Flaming droplets/ particles (6)
R	EN xxxx (SBI); and EN ISO 11925-2(8): Exposure = 30s	$FIGRA \leq 120 \text{ W.s}^{-1}$; and LFS < edge of specimen; and $THR_{600s} \leq 7.5 \text{ MJ}$ $F_s \leq 150\text{mm}$ within 60s	Smoke production(5); and Flaming droplets/ particles (6)
C	EN xxxx (SBI); and EN ISO 11925-2(8): Exposure = 30s	$FIGRA \leq 250 \text{ W.s}^{-1}$; and LFS < edge of specimen; and $THR_{600s} \leq 15 \text{ MJ}$ $F_s \leq 150\text{mm}$ within 60s	Smoke production(5); and Flaming droplets/ particles (6)
D	EN xxxx (SBI); and EN ISO 11925-2(8): Exposure = 30s	$FIGRA \leq 750 \text{ W.s}^{-1}$ $F_s \leq 150\text{mm}$ within 60s	Smoke production(5); and Flaming droplets/ particles (6)
E	EN ISO 11925-2(8): Exposure = 15s	$F_s \leq 150\text{mm}$ within 20s	Flaming droplets/ particles (7)
F	No performance determined		
<p>(1) For homogeneous products and substantial components of non-homogeneous products. (2) For any external non-substantial component of non-homogeneous products. (2a) 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 < edge of specimen; and $THR_{600s} \leq 4.0 \text{ MJ}$; and s1; and d0. (3) For any internal non-substantial component of non-homogeneous products. (4) For the product as a whole. (5) $s1 = \text{SMOORA} \leq 30\text{m}^2.\text{s}^{-2}$ and $\text{TSP}_{600s} \leq 50\text{m}^2$; $s2 = \text{SMOORA} \leq 180\text{m}^2.\text{s}^{-2}$ and $\text{TSP}_{600s} \leq 200\text{m}^2$; $s3 = \text{net } s1 \text{ or } s2$. (6) d0 = No flaming droplets/ particles in ENxxxx (SBI) within 600s; d1 = No flaming droplets/ particles persisting longer than 10s in ENxxxx (SBI) within 600s; d2 = not d0 or d1; Ignition of the paper in EN ISO 11925-2 results in a d2 classification. (7) Pass = no ignition of the paper (no classification); Fail = ignition of the paper (d2 classification) (8) Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame attack.</p>			

* The treatment of some families of products, e.g. linear products (pipes, ducts, cables etc), is still under review and may necessitate an amendment to this decision.

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