Informal document No. **GRSG-97-34**
(97th GRSG, 20 – 23 October 2009
agenda item 5)

A comparative study of test methods for assessment of fire safety performance of bus interior materials

Presentation at GRSG 97, October 20-23, 2009, Geneva

Michael Försth
SP Technical Research Insitute of Sweden
Fire Technology

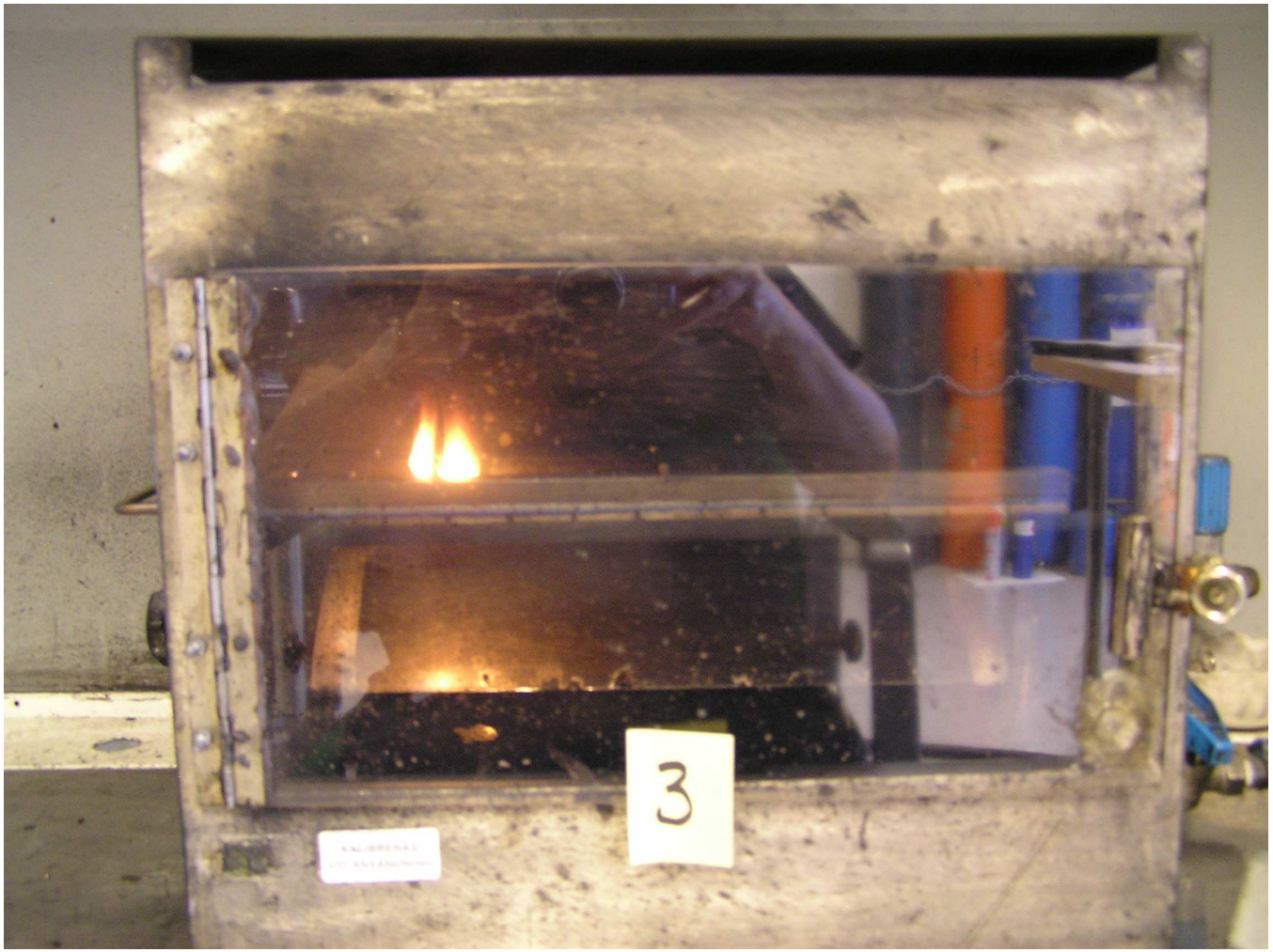
On behalf of
Norwegian Public Roads Administration, and
Swedish Transport Agency

SP Sveriges Tekniska Forskningsinstitut

Test methods

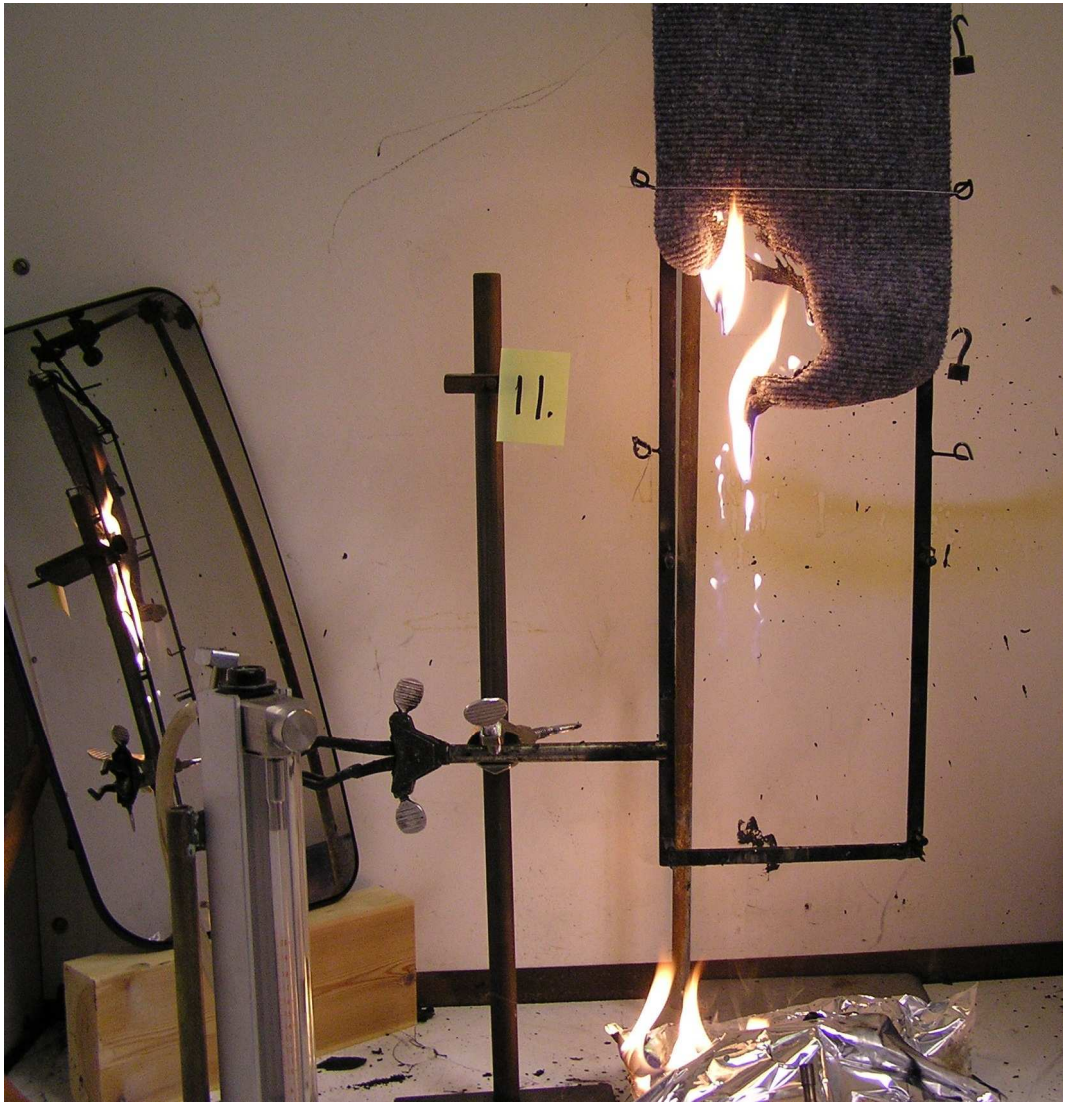
- ISO 3795 (ECE Reg No 118 annex 6), horizontal burning rate
- ISO 6941 (ECE Reg No 118 annex 8), vertical burning rate
- ISO 5658-2 (IMO Res A.643(16), CEN/TS 45545-2), Spread of flame

ISO 3795 (ECE Reg No 118 annex 6), horizontal burning rate



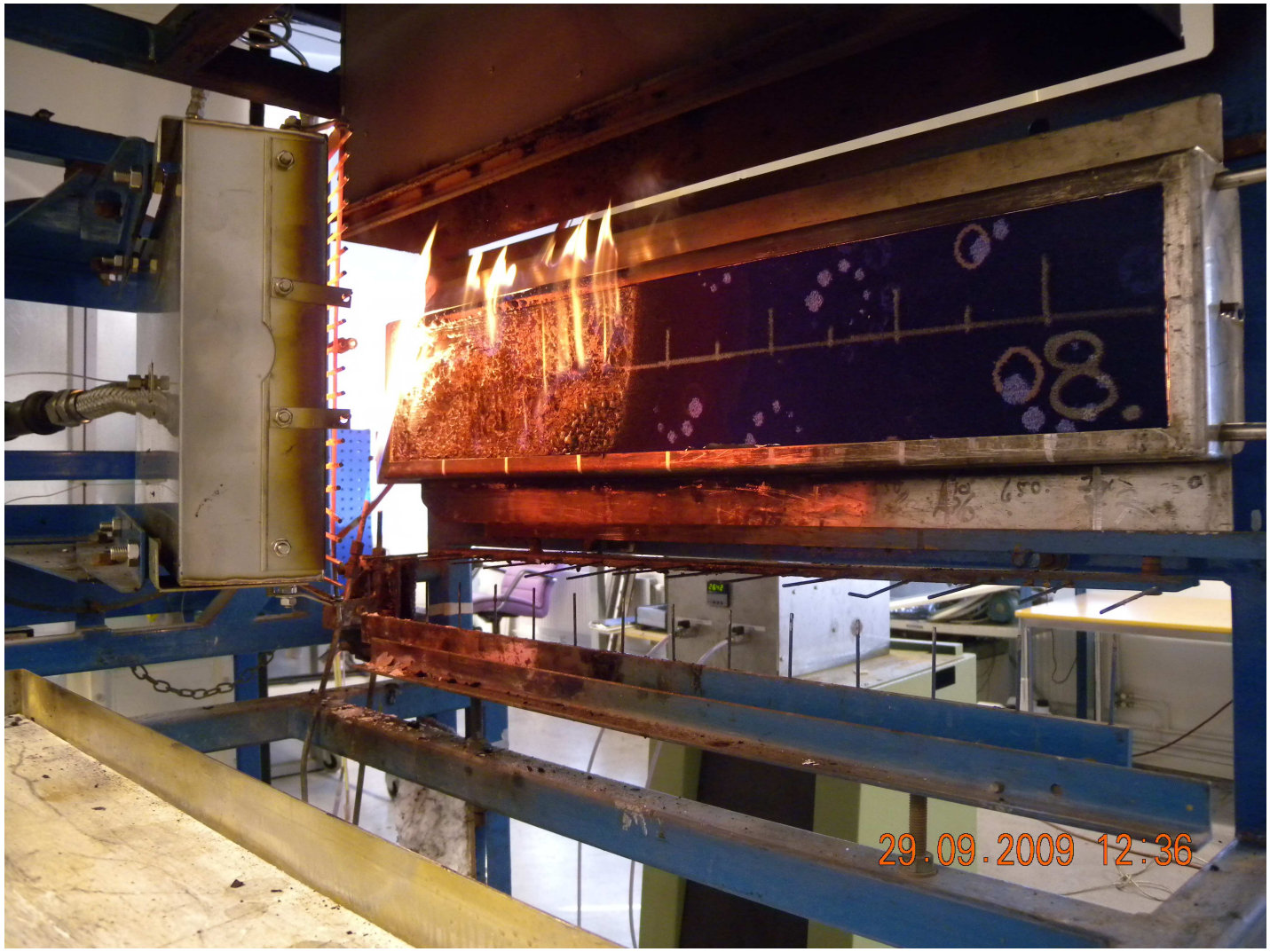
Test of Product No.3, wool velvet blend fabric, according to ISO 3795.

ISO 6941 (ECE Reg No 118 annex 8), vertical burning rate



Test of Product No.11, polypropylene needle felt, according to ISO 6941.

ISO 5658-2 (IMO Res A.643(16), CEN/TS 45545-2), Spread of flame



Test of Product No.8, wool + nylon fabric, according to ISO 5658-2.

Tested products

Prod. No.	Description	Content	Thickness [mm]	Area weight [g/m^2]
1	Plastic	ABS	3.1	3040
2	Perstorp laminate	Paper-reinforced thermosetting plastic	5.8	8780
3	Fabric	Wool velvet blend	2.8	311
4	Artificial leather	91.5% PVC + 0.5% Polyamide	1.1	814
5	Fabric	70% PES + 30% wool	3.2	627
6	Fabric	55% Polyester + 45% wool	3.9	829
7	Fabric	Wool velvet blend	4.4	973
8	Fabric	85% wool + 15% nylon	4.3	856
9	Fabric	65% PES + 20% wool + 15% CV	3.0	676
10	Fabric	56% wool + 35% cotton + 9% nylon	4.2	826
11	Fabric	Polypropylene fibre	4.4	510

Results

Prod No.	Thickness [mm]/ Area weight [g/m^2]	Hor. burning rate [mm/min]	Hor. pass/fail [1]	Vert. burning rate [mm/min]	Vert. pass/fail [2]	SoF [kW/m2]	SoF pass/fail [3]
1	3.1/3040	19	pass	178	fail	1.64	fail
2	5.8/8780	0	pass	0	pass	22.8	pass
3	2.8/311	169	fail	0	pass	2.12	fail
4	1.1/814	0	pass	0	pass	17.5	fail
5	3.2/627	24	pass	578	fail	12.0	fail
6	3.9/829	10	pass	440	fail	4.35	fail
7	4.4/973	0	pass	262	fail	20.4	pass
8	4.3/856	0	pass	351	fail	27.8	pass
9	3.0/676	31	pass	505	fail	-[4]	-[4]
10	4.2/826	0	pass	0	pass	20.5	pass
11	4.4/510	79	pass	103	fail	12.0	fail

1-2) According to ECE Reg No 118 and directive 95/28/CE the result of the tests shall be considered satisfactory if, taking the worst results into account, the horizontal or vertical burning rate is not more than 100 mm/minute.

3) According to IMO Res A.643(16) and CEN/TS 45545-2, Requirement 1, the average critical heat flux at extinguishment, CFE, should be ≥ 20 kW/m2 when evaluated according to the test standard ISO 5658-2, Spread of Flame (SoF), for a material to be considered satisfactory. As a consequence 20 kW/m2 has been suggested for an amendment of ECE Reg No 118.

4) No tests peformed due to lack of material.

Conclusions

•ISO 3795, horizontal burning rate, is the most forgiving test method 91% of the products passed the requirement for ISO 3795.

•If the products instead are tested for vertical burning rate according to ISO 6941 the situation is very different. Only 36% of the products pass the requirements for ISO 6941.

•40% of the products pass the requirements for spread of flame, ISO 5658.

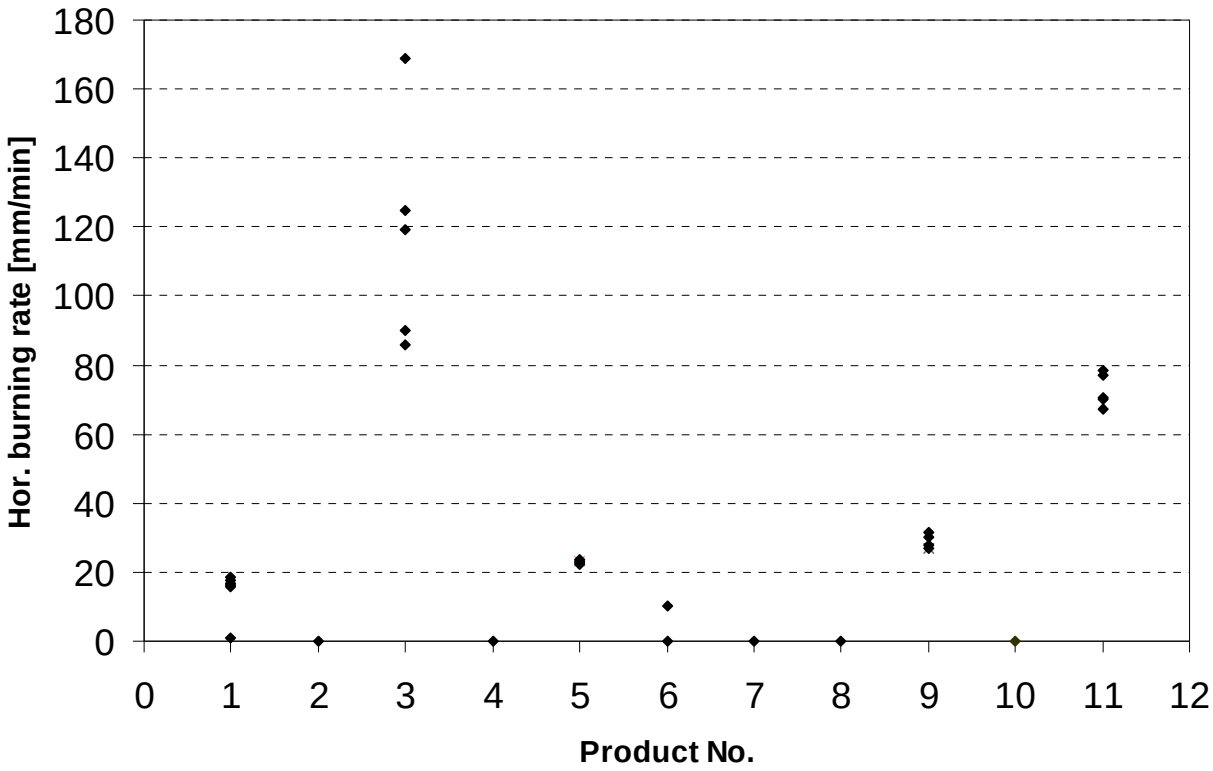
•There is little or no correlation between the test methods and the associated test criteria. Only for product No. 2 (Perstorp laminate) and No. 10 (fabric) do all methods give the same, positive, result.

•More studies are required.

END

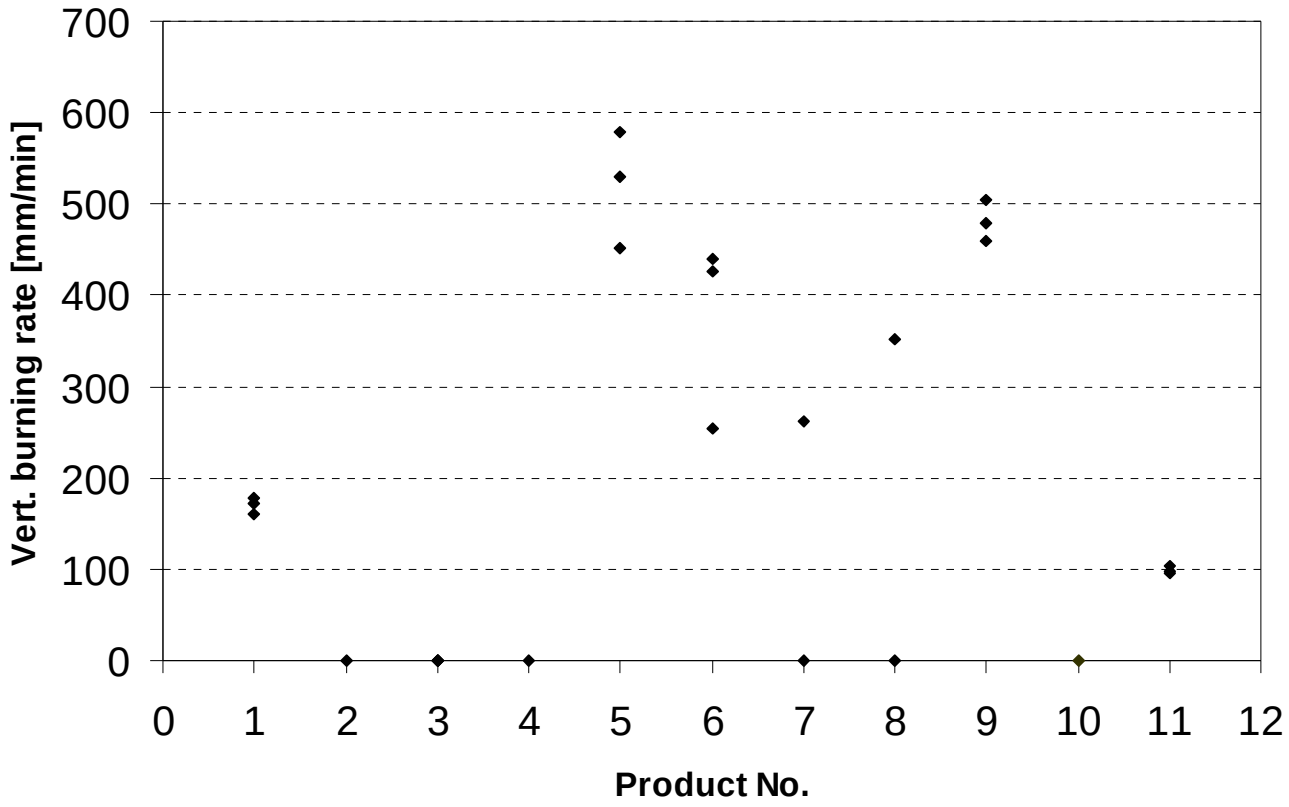
Thank you!

Horizontal burning rate (ISO 3795, ECE Reg No 118 annex 6, directive 95/28/CE annex IV)



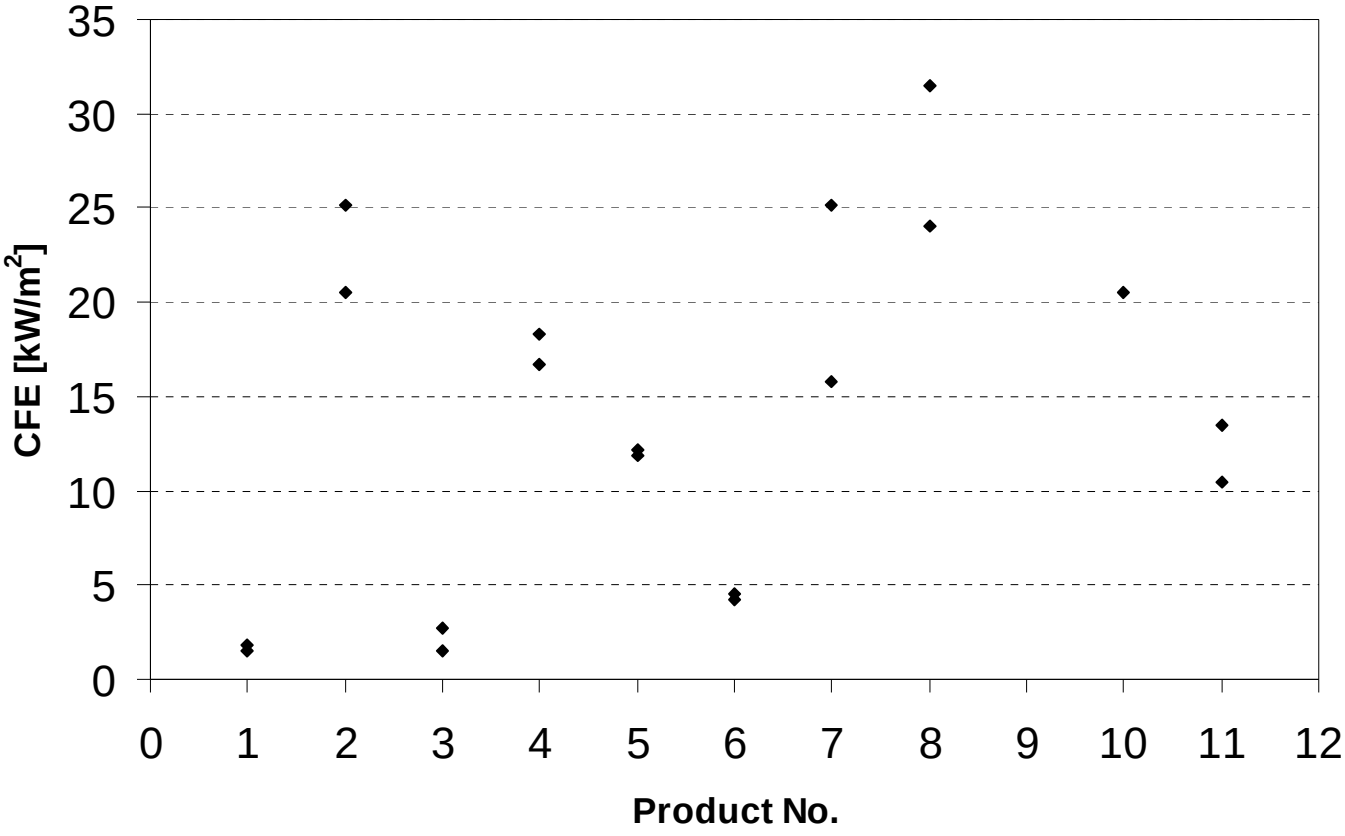
Results for horizontal burning rate according to ISO 3795.

Vertical burning rate (ISO 6941, ECE Reg No 118 annex 8, directive 95/28/CE annex VI)



Results for vertical burning rate according to ISO 6941.

Spread of Flame, SoF (ISO 5658-2)



Results for CFE (Critical heat Flux at Extinguishment) according to ISO 5658-2 (Spread of Flame).