

Kvadrat A/S
DK-8400 EBELTOFT
Danmark

Large free-hanging vertical textiles tested according to NT FIRE 043 (3 appendices)

Introduction

SP has at the request of Kvadrat A/S performed a fire test according to NT FIRE 043. The purpose of the test is as a basis for technical fire classification.

Product

Textile called "Time 300", consisting of 100 % Trevira CS. The product has a nominal area weight of 190 g/m².

Manufacturer

Kvadrat A/S, Ebeltoft, Denmark.

Sampling

The sample was delivered by the client. It is not known to SP Fire Technology if the product received is representative of the mean production characteristics.

The sample was received on May 28, 2012 at SP Fire Technology.

Test procedure

The test standard NT FIRE 043 provides a means of determining the burning behaviour of large free-hanging vertical textiles. The ignition source consists of a single burner producing 100 kW. A hood collects all the fire gases and in the exhaust duct from the hood, the smoke production rate is measured. Measurements of volume flow rate and concentration of oxygen and carbon dioxide in the duct is used to calculate the heat release rate.

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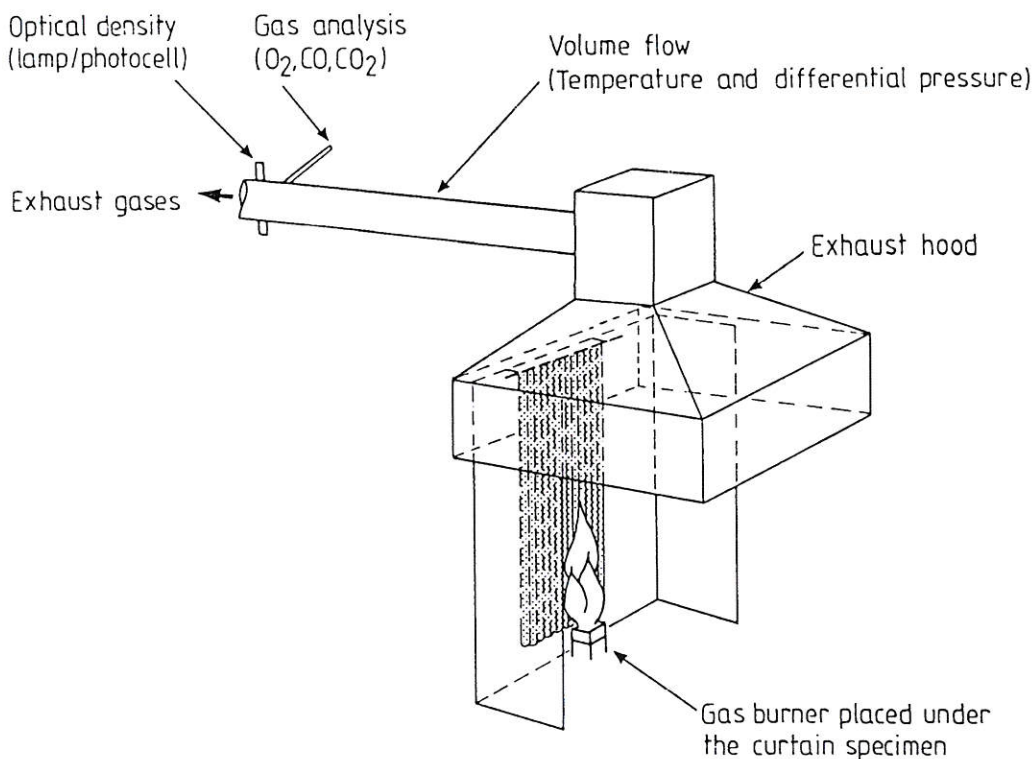


Figure 1 Schematic drawing of the test equipment.

Basis for Assessment

According to NT FIRE 043, to meet the requirements for class I, II, III or IV, the following criteria must be fulfilled:

Table 1 Criteria for the different classes.

Class	Maximum RHR (10 s) (kW)	Maximum smoke (10 s) (dBm ² s ⁻¹)	Maximum weight loss (%)	Total flame spread (yes/no)	Maximum flame height from burning material on the floor (m)
I	150	5	50	No	None
II	800	20	90	No	None
III	1300	-	-	Yes	1.0
IV	-	-	-	Yes	-

Test results

The table below shows the test results from NT FIRE 043. The table shows maximum rate of heat release (RHR) and maximum rate of smoke production expressed as the 10 second mean value of the peak of the curve.

Table 2 Summary of measured data from test 1 and test 2 (the burner output is included in the heat release and smoke production data).

Product	Evaluation time (min)	Maximum RHR (10 s) (kW)	Maximum smoke (10 s) ($\text{dBm}^2\text{s}^{-1}$)	Maximum weight loss (%)	Total flame spread (yes/no)	Maximum flame height from burning material on the floor (m)
Time 300	0 - 5	103	0.7	9	No	0
Time 300	0 - 5	109	1.0	7	No	0

Test results from NT FIRE 043 with observations and graphs of rate of heat release and rate of smoke production are given in appendix 1. Photographs are shown in appendix 2. A test parameter explanation is found in appendix 3.

The test is used to measure and describe the response of the materials, products or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products or assemblies under actual fire conditions.

Deviation from standard

The backing board was only 2.4 m wide and 3.0 – 3.5 m high instead of the stipulated 3.0 m wide and 3.5 m high. The side walls were only 3.0 m high instead of the stipulated 3.5 m.

Assessment

The tested textile called “Time 300” meets the technical fire requirements of class I according to NT FIRE 043, Annex F, table F:1.

SP Technical Research Institute of Sweden Fire Technology - Fire Dynamics

Performed by



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Examined by



Per Thureson

Appendices

1. Test results – NT FIRE 043
2. Photographs from test
3. Test parameter explanation

Appendix 1

Test results – NT FIRE 043:1989

Product

Textile called “Time 300”, consisting of 100 % Trevira CS. The product has a nominal area weight of 190 g/m².

Observations during test 1

Table 3 Observations during test 1.

Time, min:s	Observations during test
00:00	The burner was ignited. See photo 2.
00:14	Melted material starts to fall on to the ground.
00:16	Melted material is running down the backing board.
04:47	Some of the melted material on the backing board is ignited.
05:00	The burner was extinguished and the test terminated. See photo 5.

Observations after fire test 1

The fabric melts away from the burner flame and melted material falls to the ground and runs down the backing board. About 25 non-burning droplets or lumps of material are observed during the test. Most part of the fabric is still hanging from the rod when the test is terminated.

Observations during test 2

Table 4 Observations during test 2.

Time, min:s	Observations during test
00:00	The burner was ignited. See photo 8.
00:10	Melted material starts to fall on to the ground.
00:12	Melted material is running down the backing board.
05:00	The burner was extinguished and the test terminated. See photo 11.

Observations after fire test 2

The fabric melts away from the burner flame and melted material falls to the ground and runs down the backing board. About 25 non-burning droplets or lumps of material are observed during the test. Most part of the fabric is still hanging from the rod when the test is terminated.

Appendix 1

Measured results

Table 5 Summary of measured data (the burner effect is included in the heat release and smoke production data).

Test	Evaluation time (min)	Maximum RHR (10 s) (kW)	Maximum smoke (10 s) ($\text{dBm}^2\text{s}^{-1}$)	Maximum weight loss (%)	Total flame spread (yes/no)	Maximum flame height from burning material on the floor (m)
1	0 - 5	103	0.7	9	No	0
2	0 - 5	109	1.0	7	No	0
	Mean	106	0.9	8		

Graph of heat release rate

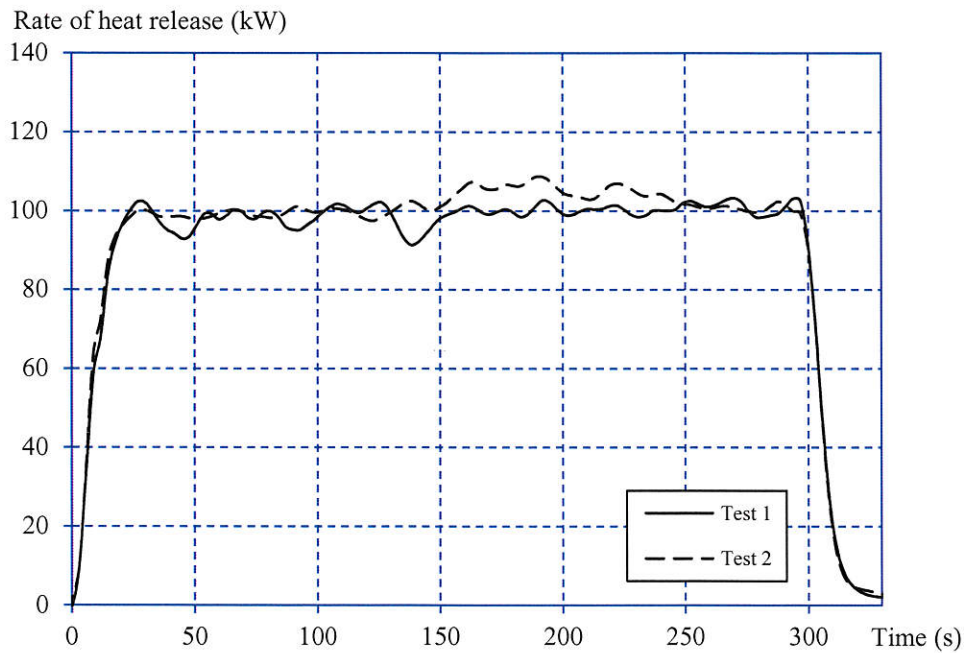


Figure 2 Rate of heat release from product during test (including burner).

Appendix 1

Graph of smoke production rate

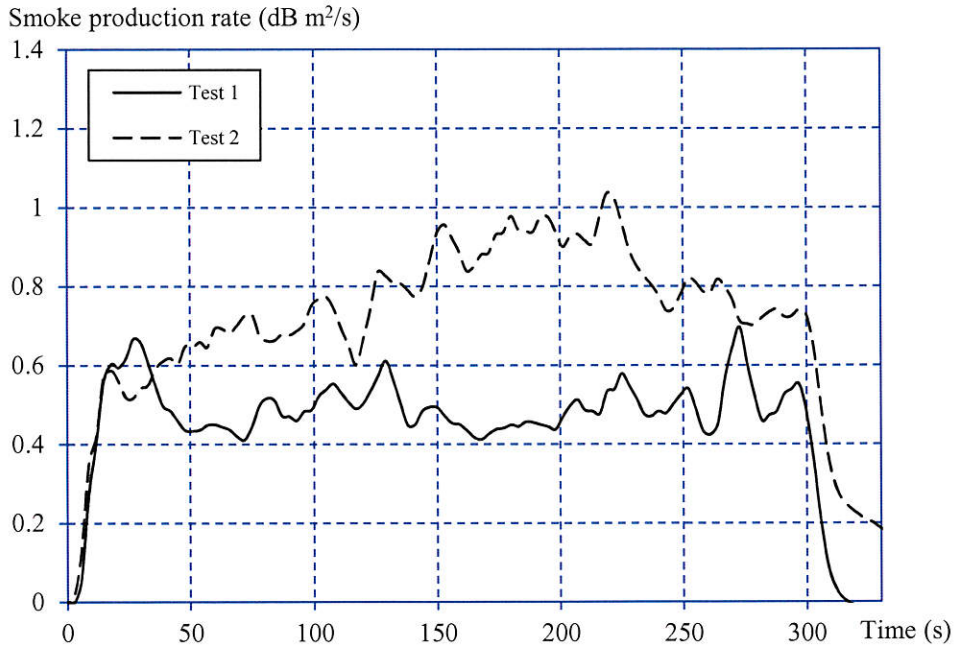


Figure 3 Rate of smoke production from product during test (including burner).

Graph of production of carbon monoxide

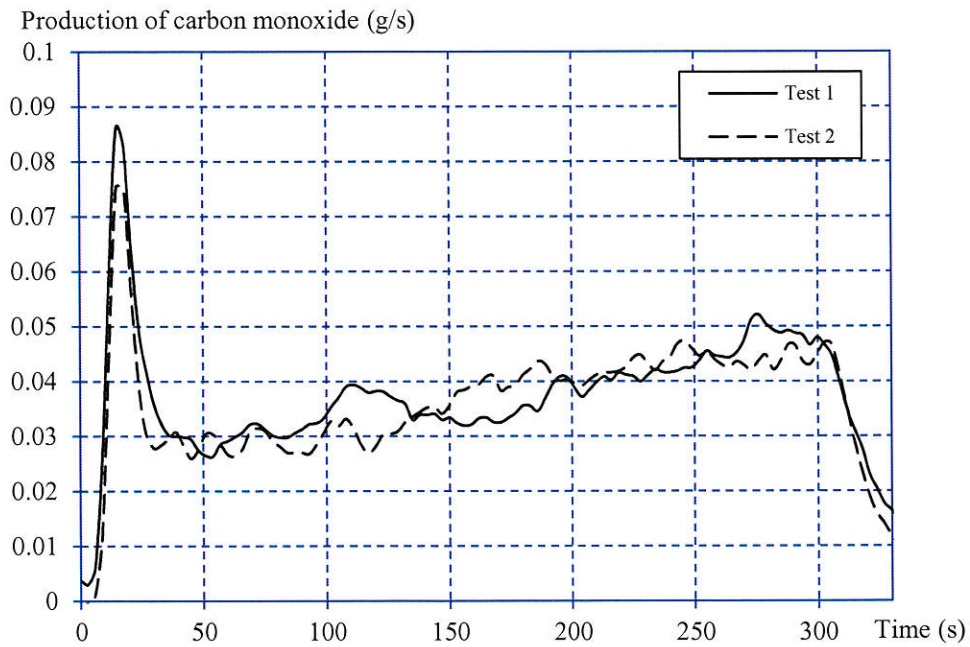


Figure 3 Rate of smoke production from product during test (including burner).

Appendix 1

Graph of production of carbon dioxide

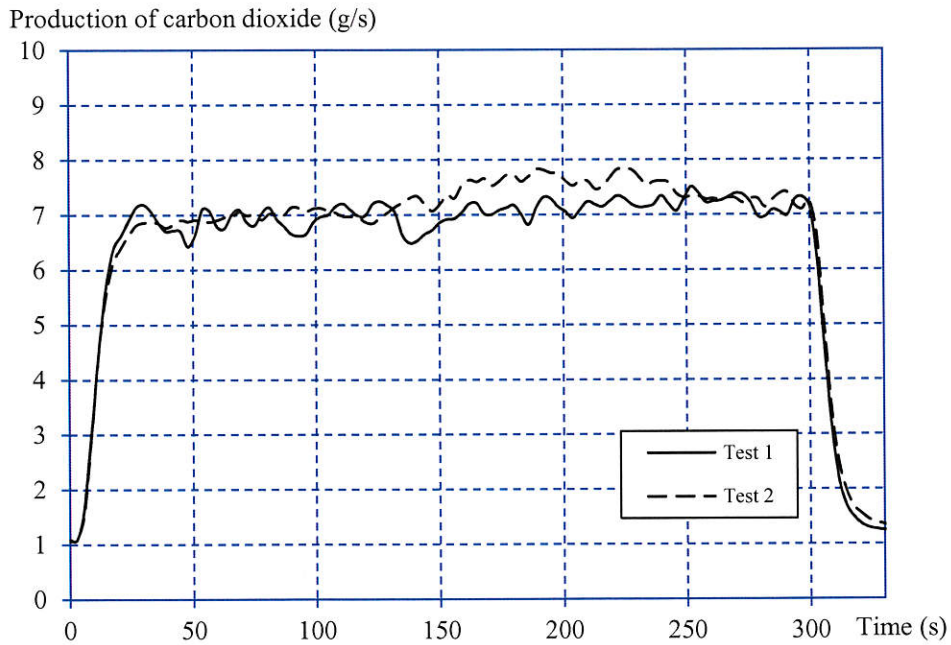


Figure 3 Rate of smoke production from product during test (including burner).

Conditioning

The test specimen was conditioned for more than 16 h in temperature $(23 \pm 2) ^\circ\text{C}$ and relative humidity $(50 \pm 5) \%$ before testing.

Measured data

	Specimen 1	Specimen 2
Thickness (mm)	0.4 – 0.5	0.4 – 0.5
Area weight (g/m^2)	180	180
Weight before test (g)	1608	1584
Weight after test (g)	1462	1476
Weight loss (%)	9.08	6.82

Date of test

August 24, 2012.

Appendix 2

Photos - Test 1 “Time 300”

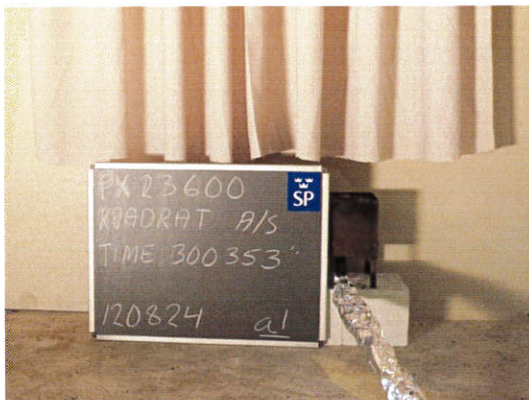


Photo 1 - Prior to test.

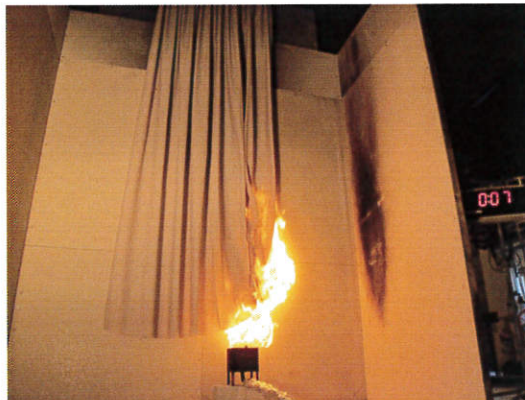


Photo 2 - Time 00:07. The burner has been ignited.

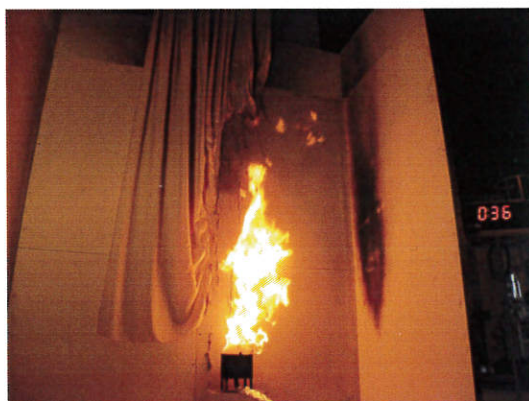


Photo 3 – Time 00:36.

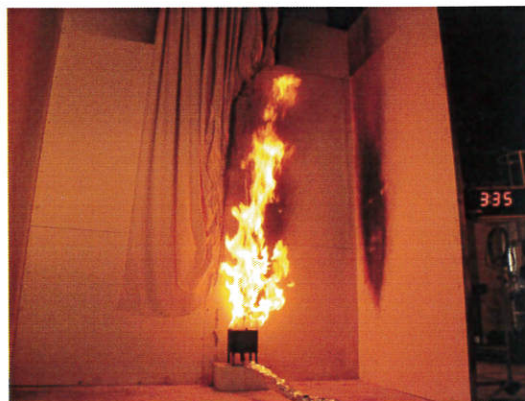


Photo 4 - Time 03:35.



Photo 5 – Time 05:00 The burner has just been extinguished. The test is terminated.

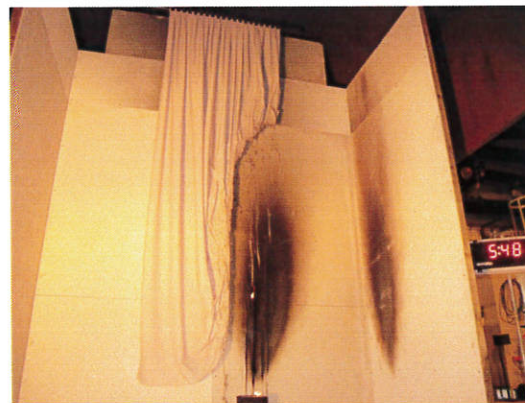


Photo 6 – After test. A dot of melted material is still burning on the backing board.

Appendix 2

Photos - Test 2 "Time 300"



Photo 7 - Prior to test.



Photo 8 - Time 00:06. The burner has been ignited.

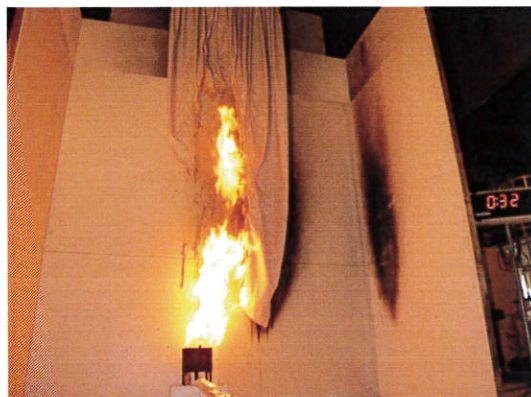


Photo 9 - Time 00:32

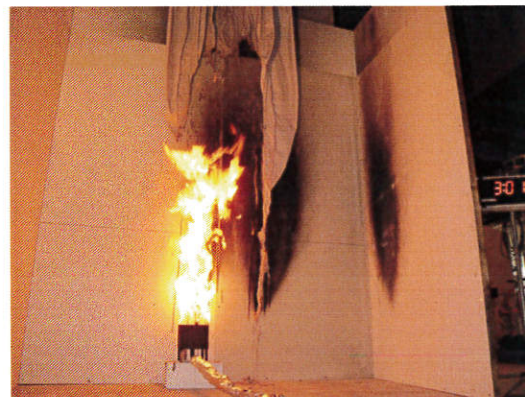


Photo 10 - Time 03:01.

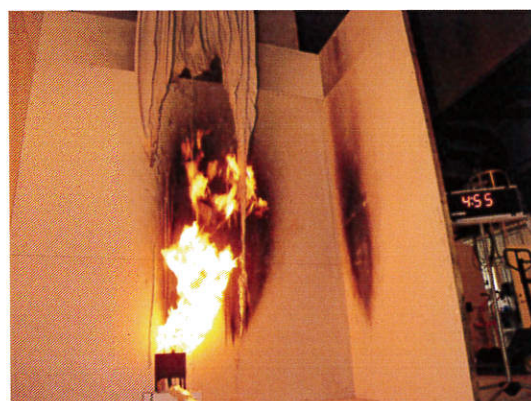


Photo 11 - Time 04:55 The burner is just about to be extinguished and the test terminated.

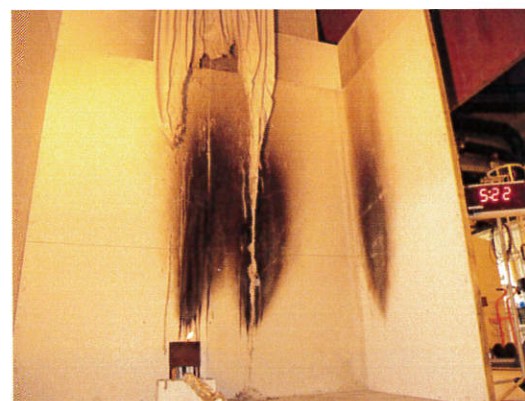


Photo 12 - After test.

Appendix 3

Test parameter explanation

Parameter	Explanation
Test start	The specimen is exposed to the ignition source.
End of test	When 5 minutes has elapsed since the start of the burner exposure.
HRR _{max} , kW	Maximum Heat Release Rate expressed as the 10 second mean value of the peak of the curve, included contribution from ignition source.
SPR _{max} , dBm ² s ⁻¹	Maximum Smoke Production Rate expressed as the 10 second mean value of the peak of the curve, included contribution from ignition source.

The rate of smoke production is calculated as follows:

$$SPR = \frac{10}{L} * \log\left(\frac{I_0}{I}\right) * \dot{V}$$

where

\dot{V} Volume flow in exhaust duct at actual temperature (m³/s).

L Length of beam through smoky environment (m).

I_0 The initial light intensity of a beam of parallel light rays in a smoke free environment.

I Light intensity of a parallel light beam having traversed a certain length of smoky environment.

Total flame spread	Virtually no undamaged material still hanging after the test.
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