



**ASTM E1354-04a
Test Method for Heat and Visible Smoke
Release Rates for Materials and Products
Using an Oxygen Consumption Calorimeter**

**5958FR VHB foam tape without foil
Lot# 6325-113**

50kW/m²

Project Number 3117723SAT-001

March 14, 2007

Prepared for:

3M
3M Center, Building 207-110-08
Saint Paul, MN. 55144

651-733-8165
Intertek Testing Services NA Inc.
16015 Shady Falls Rd.
Elmendorf, TX 78112
210-635-8100

This report includes test results on the specimens listed below:

5958FR VHB foam tape without foil Lot# 6325-113

Product description:

foam tape on metal backer

Specimens were tested in accordance with ASTM E1354-04a, unless otherwise indicated.

See Appendix 1 on page 16 for further product information.

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested materia, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under Intertek certification program.

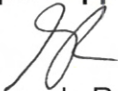
This report contains 16 pages.

Report Written By:



Thomas Haynes
Fire Test Technician

Report Approved By:



Servando Romo
Manager, Small Scale Testing

Date: 3.14.07

INTRODUCTION

The tests described herein were conducted in accordance with ASTM E1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter. Brief descriptions of the apparatus and method will be provided herein; a complete description may be obtained only from the current version of the standard.

The method is based on the observation that the net heat of combustion of most materials is directly related to the amount of oxygen required for combustion. The relationship is approximately 13.1×10^3 kJ of heat released per kg of oxygen consumed. Specimens in the test are burned in ambient air conditions, while being subjected to a predetermined external heat flux, which can be set from 0 to 100 kW/m². Burning is generally induced by a spark ignition source. The primary measurements are oxygen concentration and exhaust gas flow rate. Additional measurements include the mass loss rate of the specimen, the time to sustained flaming and smoke obscuration.

Results of the test are expressed in terms of time to ignition; peak, average and total heat release rates; mass loss and mass loss rate; effective heat of combustion; visible smoke development; and release rates of carbon monoxide and carbon dioxide.

This standard should be used to measure and describe the properties of materials or products in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

TEST PROCEDURE

To assist the reader in understanding the test apparatus and procedures, Figures 1 and 2, at the end of the text of this report, contain a schematic drawing of the cone calorimeter apparatus and an example plot of heat release rate vs. time. In this test method, an electrically heated radiant energy source in the shape of a truncated cone is positioned 25 mm (1 in.) from the surface of the specimen and produces a measured irradiance level of up to 100 kW/m² over the 100 mm x 100 mm (3.9 in. x 3.9 in.) surface area of the specimen. The specimen is wrapped in aluminum foil on all sides except the exposed face and is positioned horizontally, with the load cell beneath and the heater above the specimen (the apparatus and test method also provide a vertical positioning arrangement for specialized testing). For the horizontal configuration, a spark ignition source is positioned 12.5 mm (1/2 in.) above the surface of the specimen.

The specimen is mounted in accordance with one of several different methods which are described in the standard. The most common mounting method consists of placing the specimen on a low density refractory fiber blanket in a pan-shaped, metal holder, which is positioned on the load cell. The other methods involve a metal frame, with or without a metal screen, which masks the edges of the mounted product, and are generally used for composite products in which edge burning would be an undesirable feature. The edge frame reduces the effective exposed surface area of the specimen to approximately 0.0088 m² (from the full 0.010 m²). Specimens up to 50 mm (2 in.) thick can be tested in any of the mounting configurations.

The products of combustion from the specimen are collected in an exhaust duct wherein the concentration of oxygen is continuously measured. The depletion in oxygen from that of normal air (20.95 percent), along with the measured exhaust flow rate (approximately 24 L/s) and temperature, are used to calculate the heat release rate of the specimen as a function of time. The density of the smoke produced by the specimen is measured by attenuation of a beam of light from a helium-neon laser. The extinction coefficient (similar to optical density) is calculated from the percent transmittance (%T). Specific Extinction Area (SEA) is then calculated from the extinction coefficient using the measured velocity of the exhaust duct and the mass loss of the specimen.

Summary Table:

Specimen ID	Test I.D.	t _{ig} (s)	Pk HRR (kW/m ²)	Heat Flux: 50 kW/m ²				
				Avg. HRR, 60 s (kW/m ²)	Avg. HRR, 180 s (kW/m ²)	Avg. HRR, 300 s (kW/m ²)	Avg. Eff, Hc (MJ/kg)	Avg. SEA (m ² /kg)
5958FR VHB foam tape w/o foil Lot# 6325-113	run number 1	18	167.8	88.2	92.8	N/A	20.2	50
5958FR VHB foam tape w/o foil Lot# 6325-113	run number 2	18	172.8	95.2	86.7	N/A	19.1	54
5958FR VHB foam tape w/o foil Lot# 6325-113	run number 3	18	160.9	105.4	88.8	N/A	20.3	54
Overall Average:		18	167.2	96.3	89.4	N/A	19.8	53

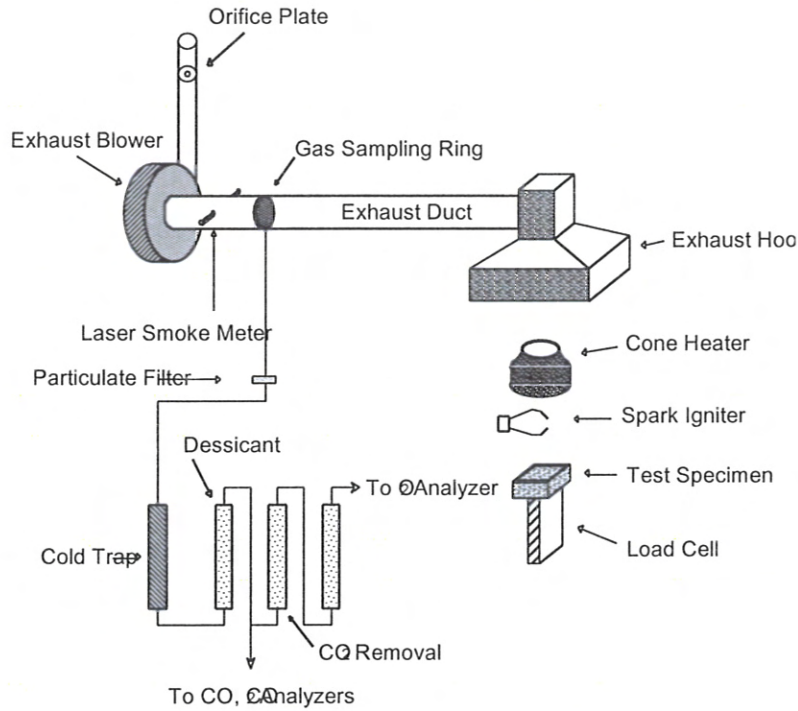
t_{ig} = time to sustained ignition

Pk HRR= Peak Heat Release Rate

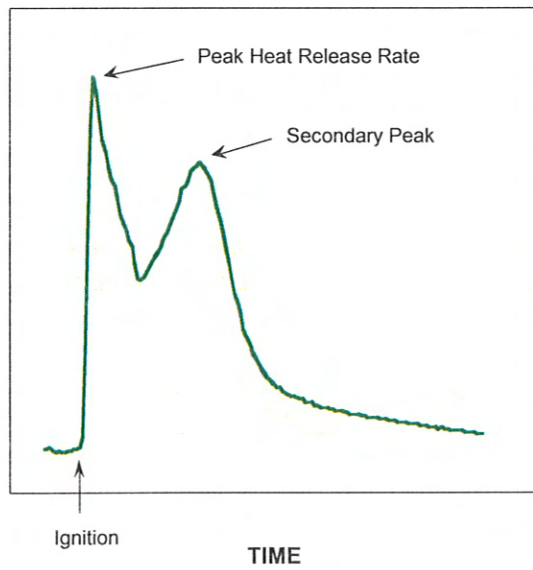
Avg. HRR= Average Heat Release Rate, after ignition

Avg. Eff, Hc= Average Effective Heat of Combustion

Avg. SEA= Average Specific Extinction Area



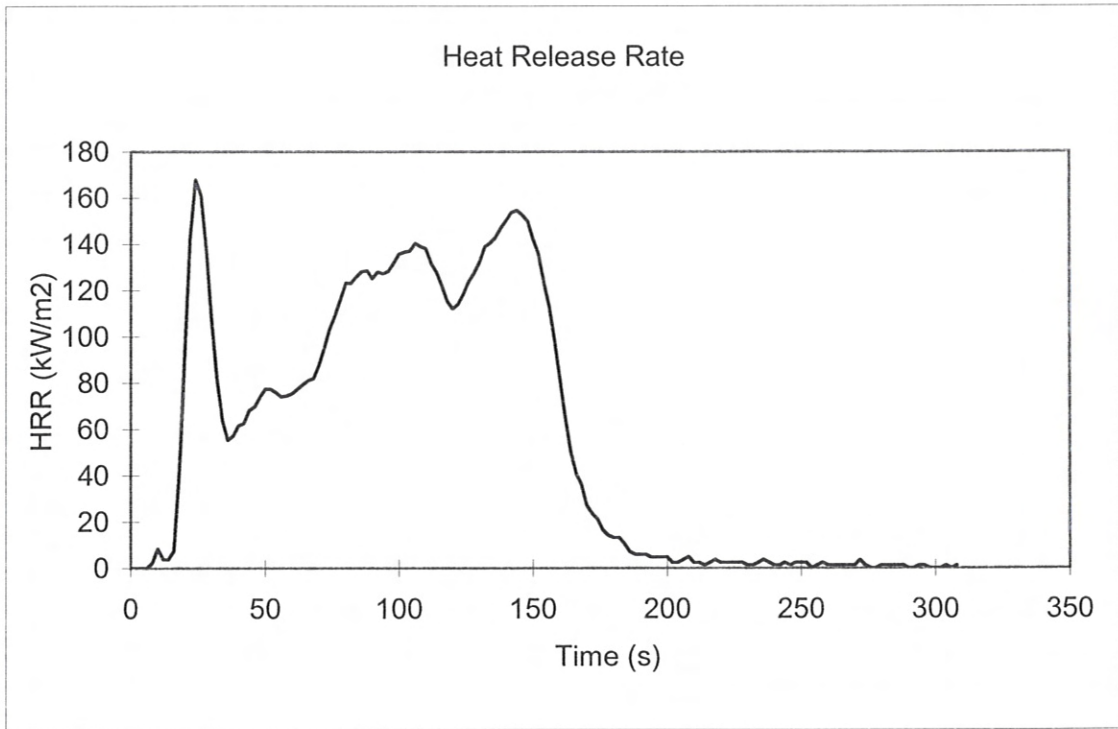
3



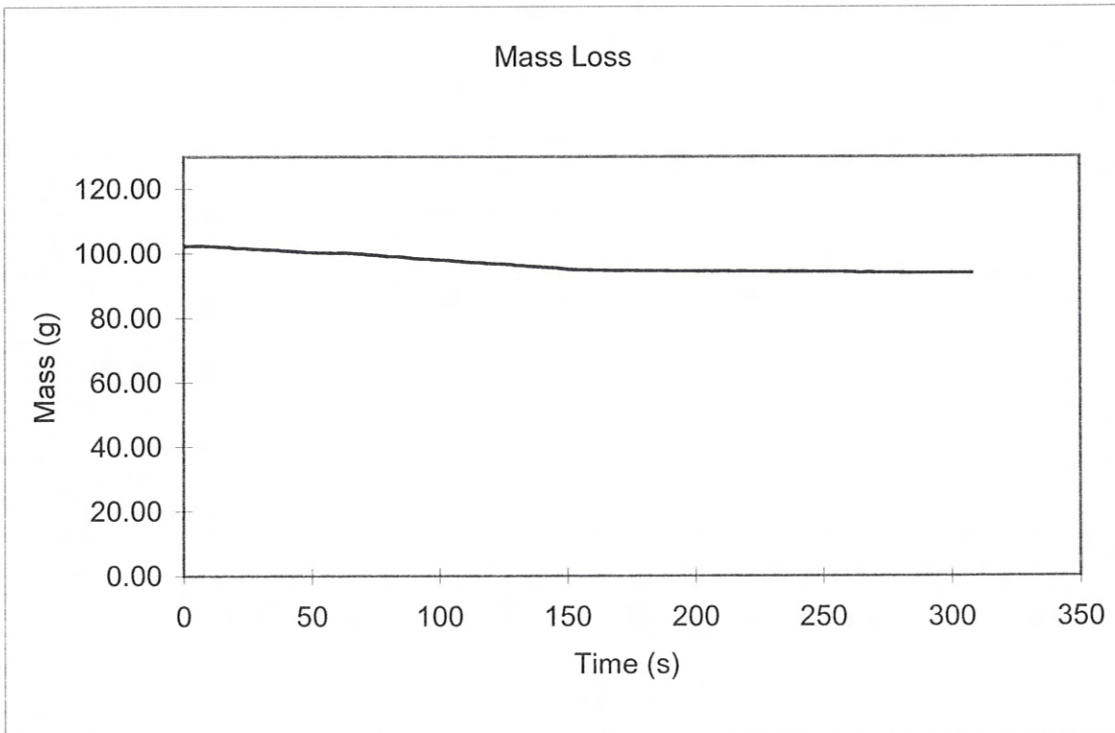
INTERTEK ETL SEMKO CONE CALORIMETER RESULTS SUMMARY

Test I.D.	3117723SAT-001 1		
Client Name	3M		
Sample Received	2.12.07		
Test Date	3.09.07	Operator	TLH
Heat Flux (kW/m²)	50.0	Scan Interval (s)	2
Avg. Exhaust Flowrate (Lps)	24.8		
Procedure	ASTM E1354		
Specimen I.D.	5958FR VHB foam tape w/o foil Lot# 6325-113		
Brief Description	foam tape on metal backer		
Conditioning	standard		
Mounting	standard		
Orientation	horizontal		
Surface Dimensions (mm)	100 x 100		
Thickness (mm)	3.98		
Exposed Area (m²)	0.01000		
Initial Mass (g)	102.36	Final Mass (g)	93.86
R. Temp.	73°F	% R.H.	42%
Transient Ign. (s)	15	Sustained Ign. (s)	18
Flame Out (min)	3.2	End of Test (min)	5.2
Flame Out (s)	189	End of Test (s)	309.00
Peak HRR (kW/m²)	167.8	Time to Peak (s)	24
Add'l Peak HRR, if any (kW/m²)	---	Time to Peak (s)	---
Average HRR, 60 s (kW/m²)	88.2		
Average HRR, 180 s (kW/m²)	92.8		
Average HRR, 300 s (kW/m²)	N/A	Avg. Eff Hc (MJ/kg)	20.2
Total Heat Release (MJ/m²)	17.14	THR (kJ)	171
Mass Loss (g)	8.50	Mass Loss (%)	8.3%
Mass Loss (kg/m²)	0.85	Avg. MLR (g/m² s)	4.90
Avg. SEA (m²/kg)	50		
CO Yield (kg/kg)	0.004	CO₂ Yield (kg/kg)	4.278

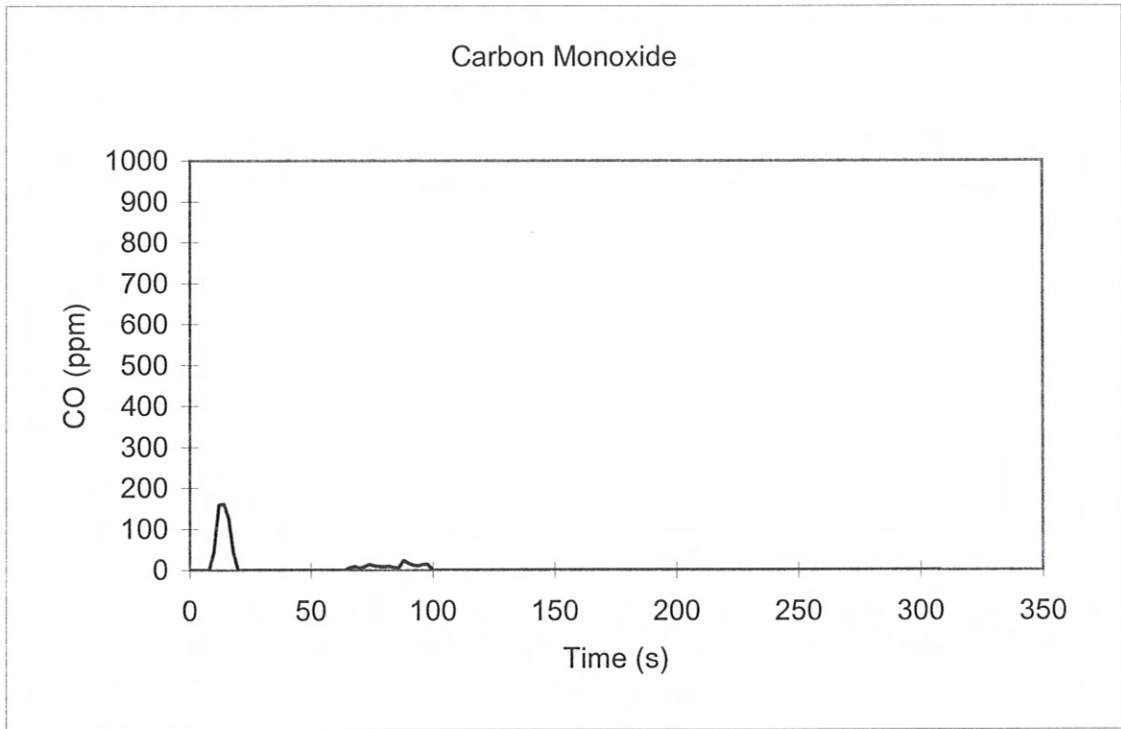
Observations During Test (time is min:sec):
slight intumescence after ignition



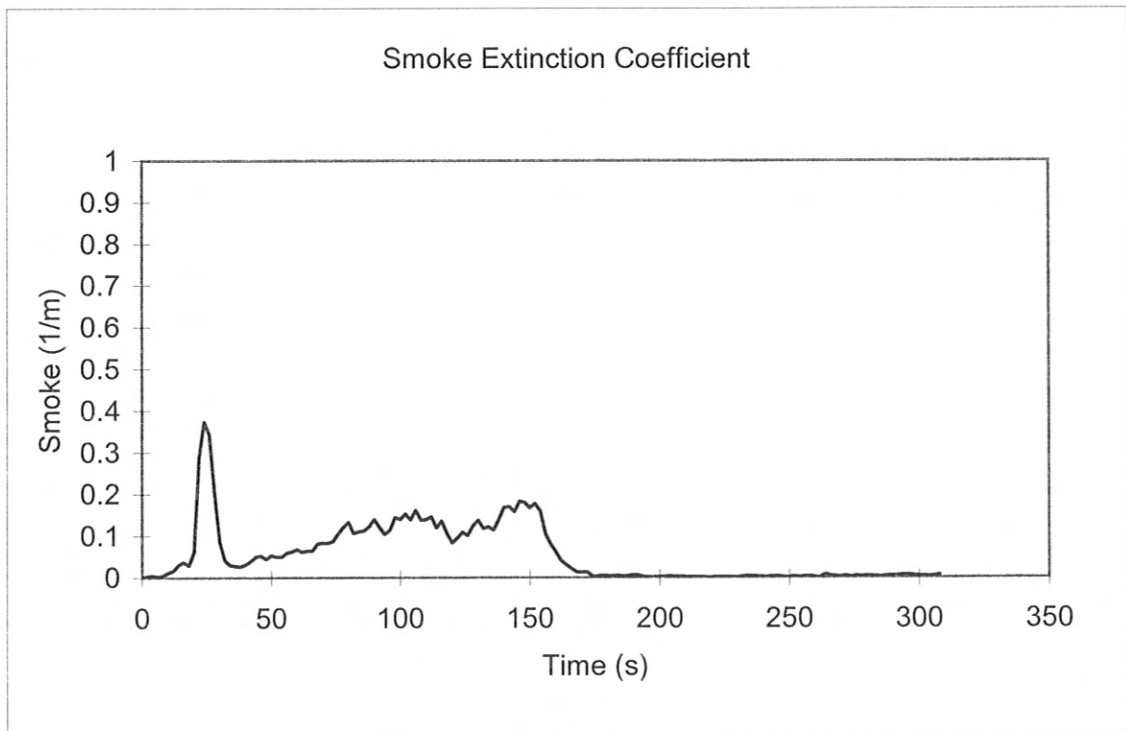
Test ID: 3117723SAT-001 1



Test ID: 3117723SAT-001 1



Test ID: 3117723SAT-001 1



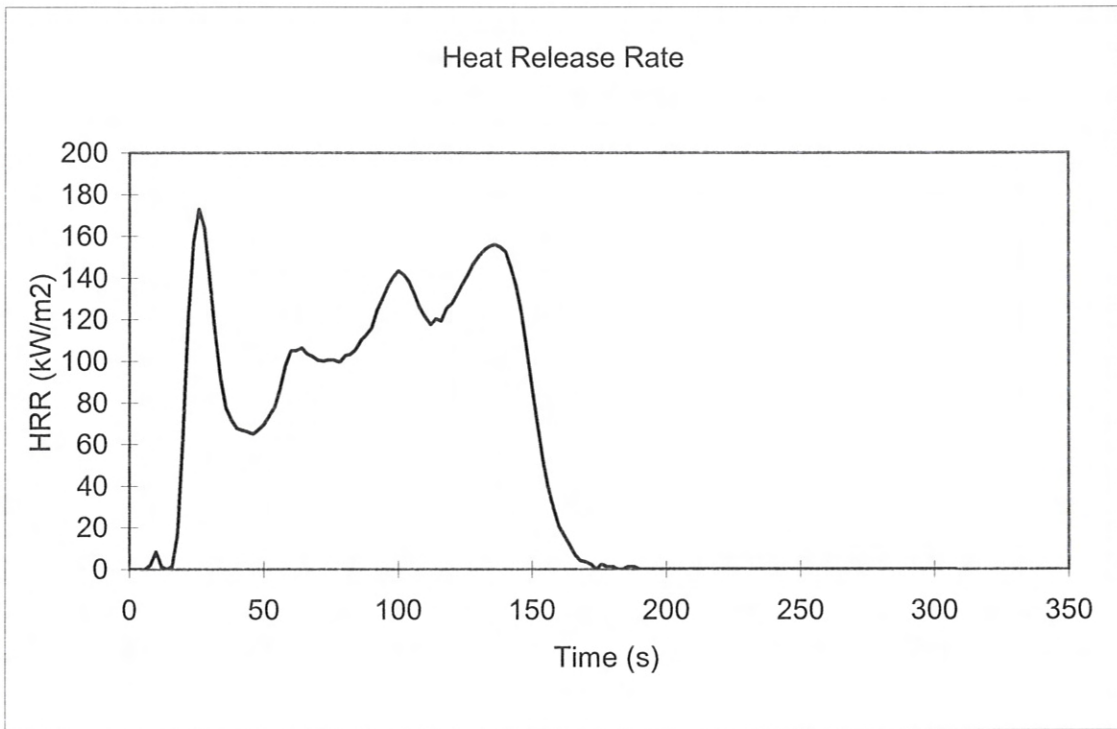
Test ID: 3117723SAT-001 1

INTERTEK ETL SEMKO CONE CALORIMETER RESULTS SUMMARY

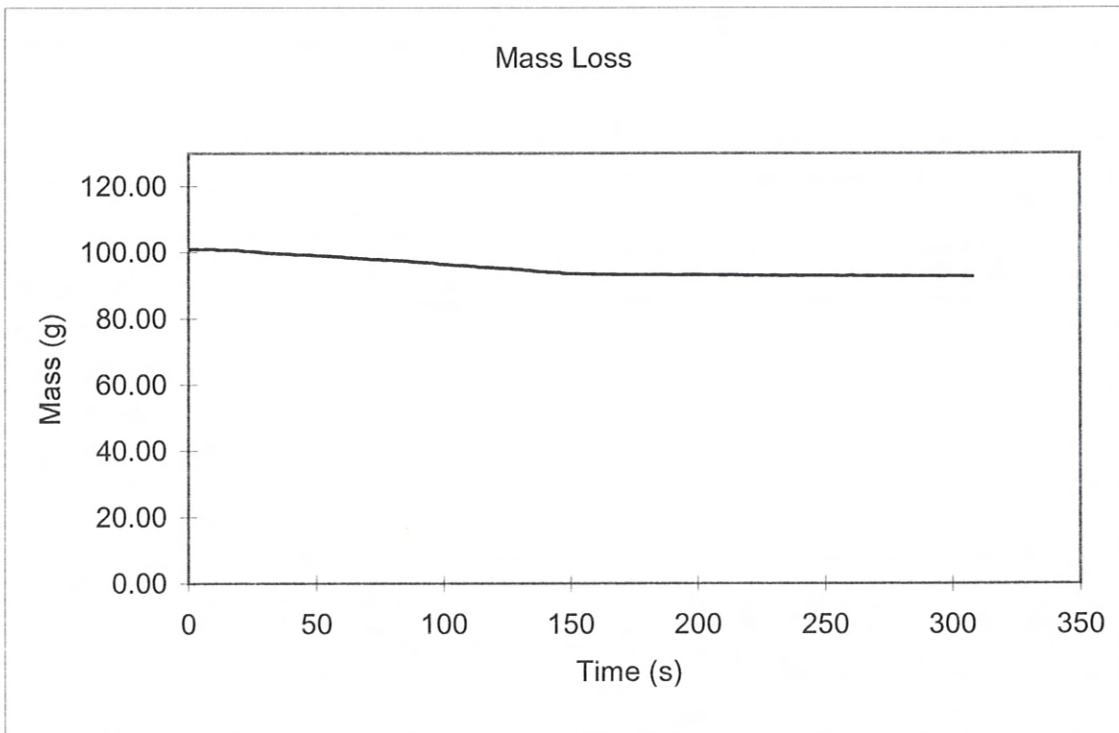
Test I.D.	3117723SAT-001 2		
Client Name	3M		
Sample Received	2.12.07		
Test Date	3.09.07	Operator	TLH
Heat Flux (kW/m²)	50.0	Scan Interval (s)	2
Avg. Exhaust Flowrate (Lps)	24.8		
Procedure	ASTM E1354		
Specimen I.D.	5958FR VHB foam tape w/o foil Lot# 6325-113		
Brief Description	foam tape on metal backer		
Conditioning	standard		
Mounting	standard		
Orientation	horizontal		
Surface Dimensions (mm)	100 x 100		
Thickness (mm)	3.98		
Exposed Area (m²)	0.01000		
Initial Mass (g)	100.97	Final Mass (g)	92.69
R. Temp.	73°F	% R.H.	42%
Transient Ign. (s)	16	Sustained Ign. (s)	18
Flame Out (min)	3.2	End of Test (min)	5.2
Flame Out (s)	194	End of Test (s)	314.00
Peak HRR (kW/m²)	172.8	Time to Peak (s)	26
Add'l Peak HRR, if any (kW/m²)	---	Time to Peak (s)	---
Average HRR, 60 s (kW/m²)	95.2		
Average HRR, 180 s (kW/m²)	86.7		
Average HRR, 300 s (kW/m²)	N/A	Avg. Eff Hc (MJ/kg)	19.1
Total Heat Release (MJ/m²)	15.79	THR (kJ)	158
Mass Loss (g)	8.28	Mass Loss (%)	8.2%
Mass Loss (kg/m²)	0.83	Avg. MLR (g/m² s)	5.26
Avg. SEA (m²/kg)	54		
CO Yield (kg/kg)	0.006	CO₂ Yield (kg/kg)	4.079

Observations During Test (time is min:sec):

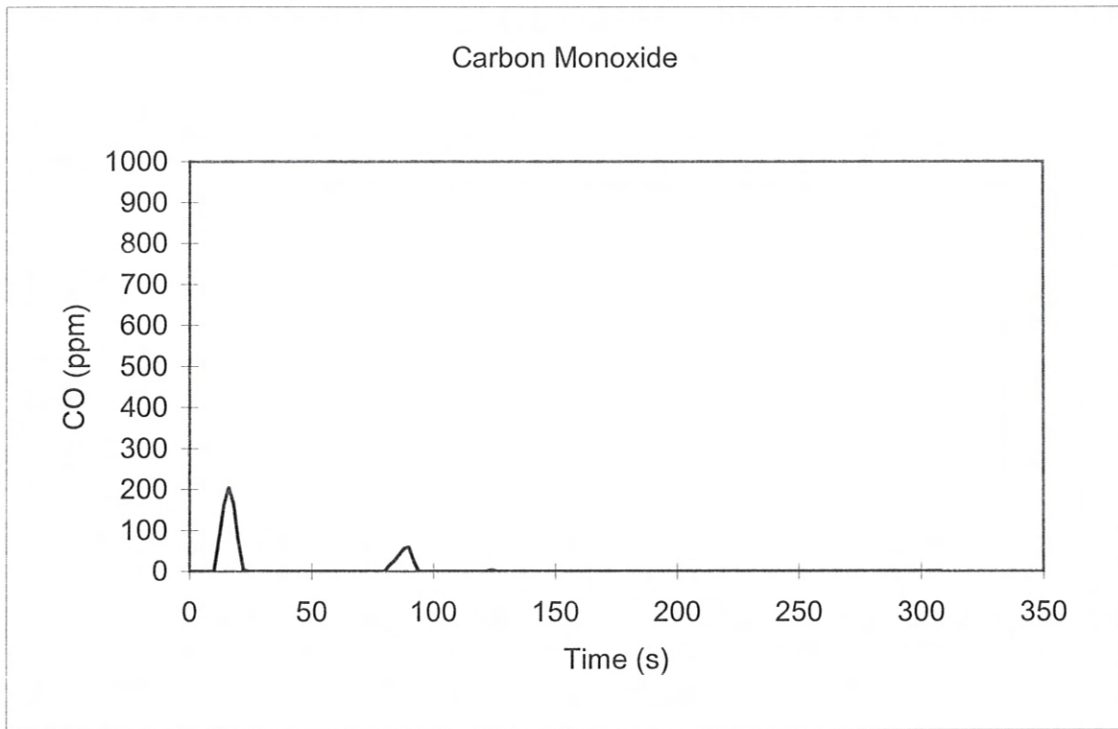
slight intumescence after ignition



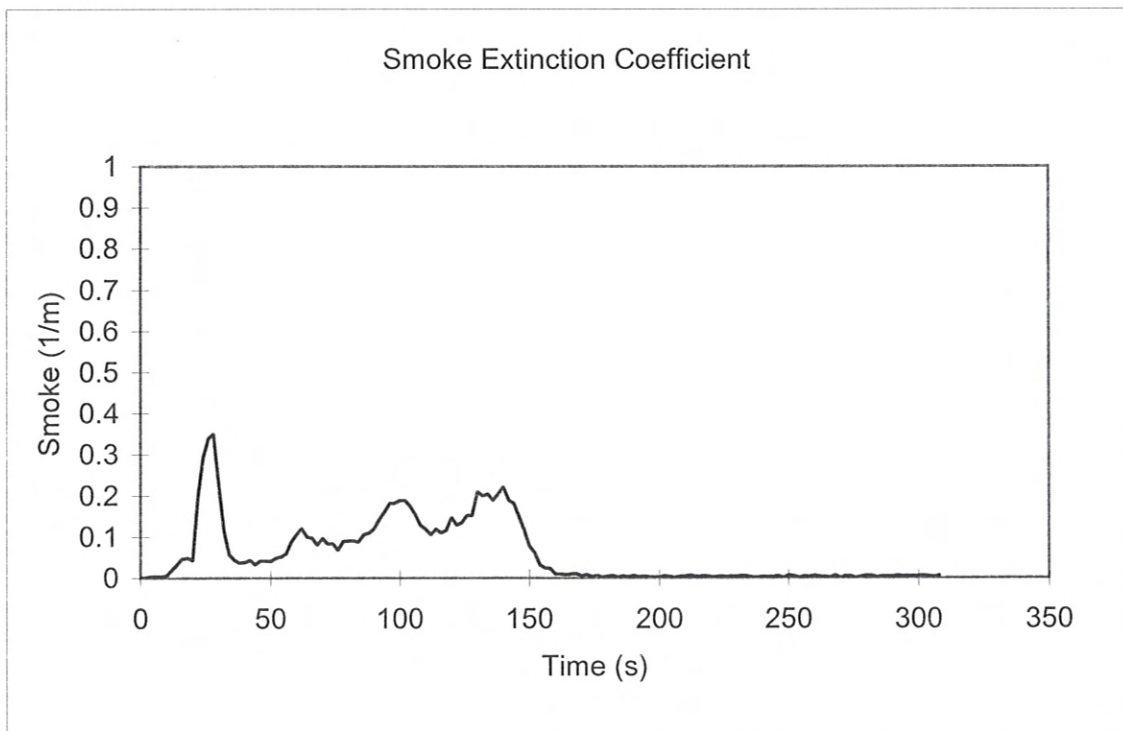
Test ID: 3117723SAT-001 2



Test ID: 3117723SAT-001 2



Test ID: 3117723SAT-001 2



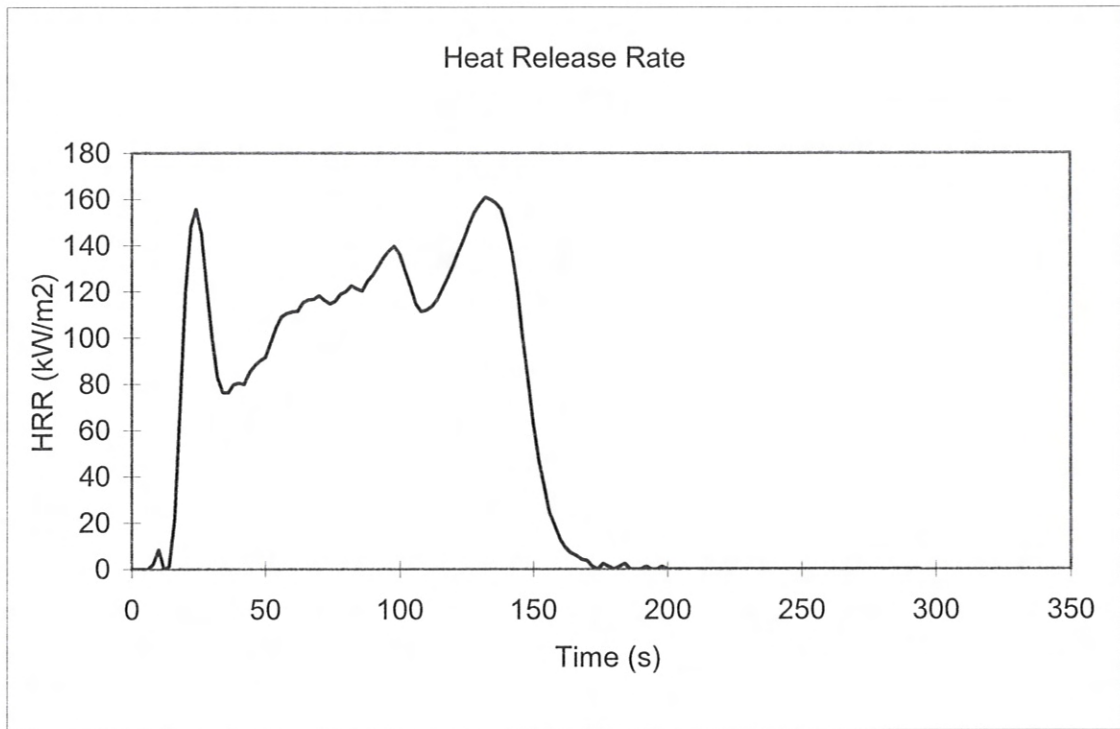
Test ID: 3117723SAT-001 2

INTERTEK ETL SEMKO CONE CALORIMETER RESULTS SUMMARY

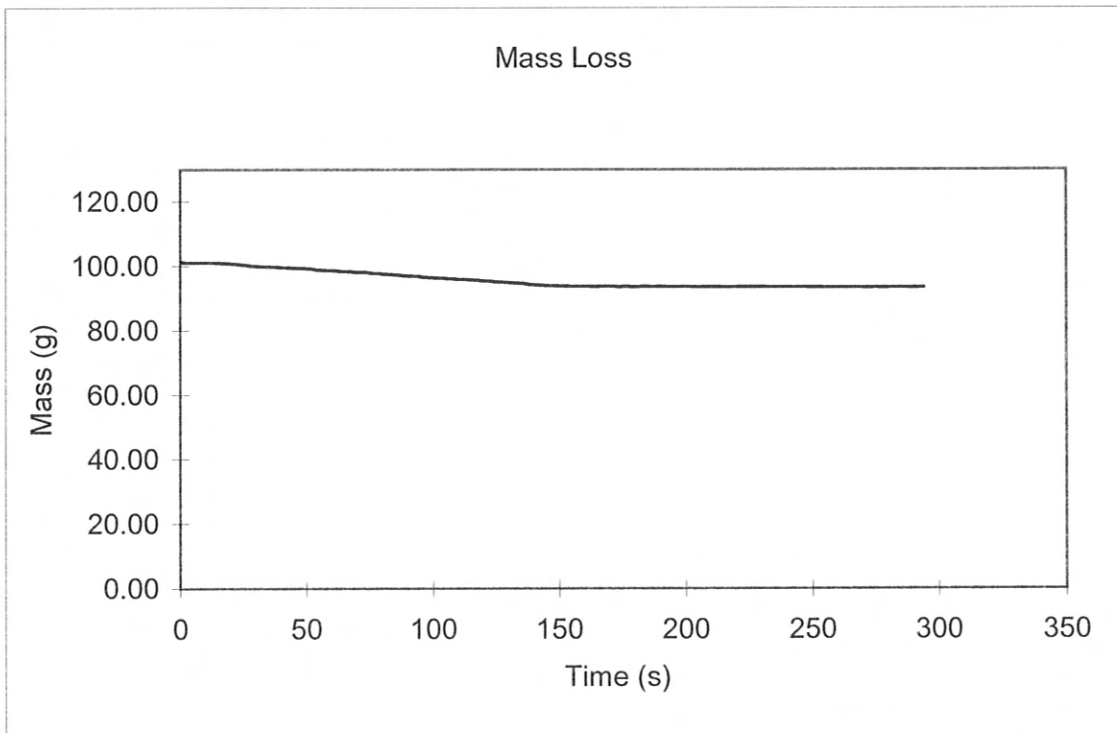
Test I.D.	3117723SAT-001 3		
Client Name	3M		
Sample Received	2.12.07		
Test Date	3.09.07	Operator	TLH
Heat Flux (kW/m²)	50.0	Scan Interval (s)	2
Avg. Exhaust Flowrate (Lps)	24.8		
Procedure	ASTM E1354		
Specimen I.D.	5958FR VHB foam tape w/o foil Lot# 6325-113		
Brief Description	foam tape on metal backer		
Conditioning	standard		
Mounting	standard		
Orientation	horizontal		
Surface Dimensions (mm)	100 x 100		
Thickness (mm)	3.98		
Exposed Area (m²)	0.01000		
Initial Mass (g)	101.24	Final Mass (g)	93.24
R. Temp.	73°F	% R.H.	42%
Transient Ign. (s)	16	Sustained Ign. (s)	18
Flame Out (min)	2.9	End of Test (min)	4.9
Flame Out (s)	175	End of Test (s)	295.00
Peak HRR (kW/m²)	160.9	Time to Peak (s)	132
Add'l Peak HRR, if any (kW/m²)	---	Time to Peak (s)	---
Average HRR, 60 s (kW/m²)	105.4		
Average HRR, 180 s (kW/m²)	88.8		
Average HRR, 300 s (kW/m²)	N/A	Avg. Eff Hc (MJ/kg)	20.3
Total Heat Release (MJ/m²)	16.22	THR (kJ)	162
Mass Loss (g)	8.00	Mass Loss (%)	7.9%
Mass Loss (kg/m²)	0.80	Avg. MLR (g/m² s)	5.44
Avg. SEA (m²/kg)	54		
CO Yield (kg/kg)	0.005	CO₂ Yield (kg/kg)	4.174

Observations During Test (time is min:sec):

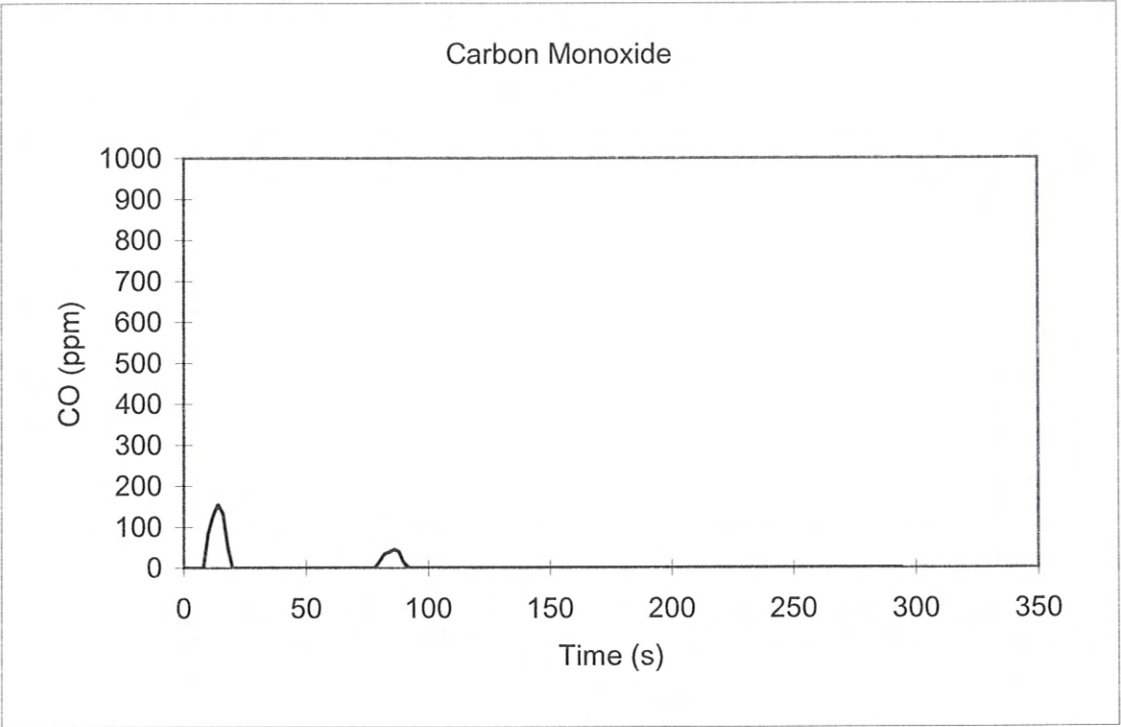
slight intumescence after ignition



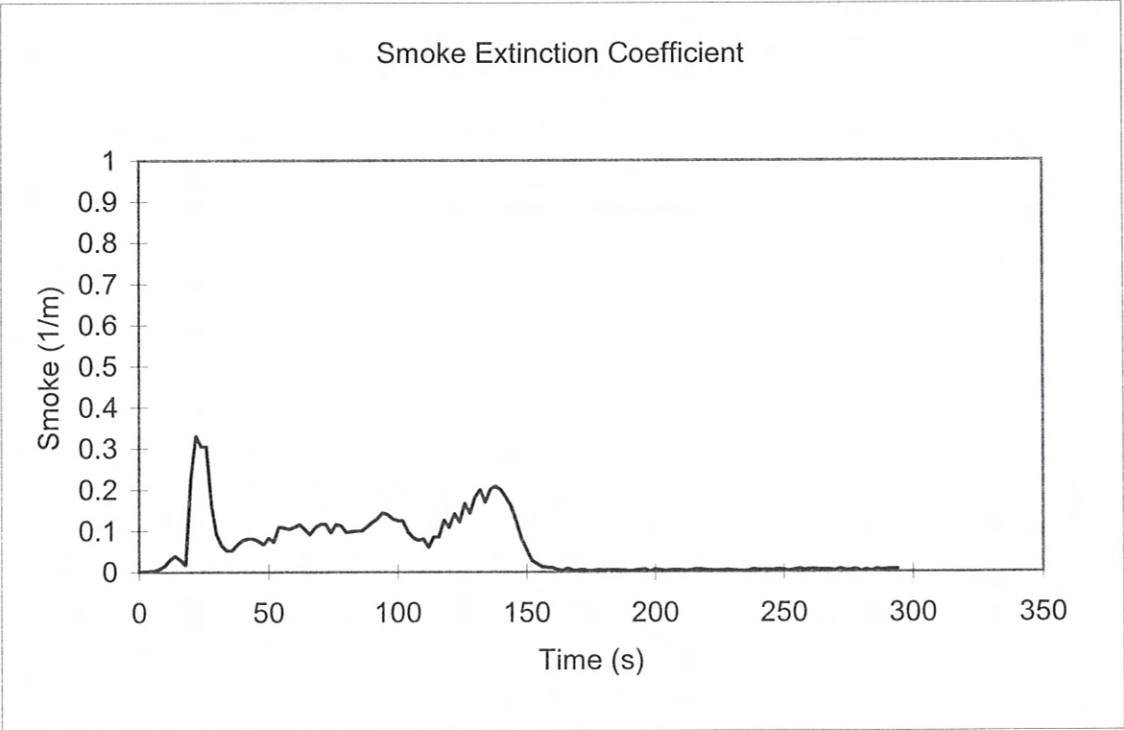
Test ID: 3117723SAT-001 3



Test ID: 3117723SAT-001 3



Test ID: 3117723SAT-001 3



Test ID: 3117723SAT-001 3

Appendix 1

Sample Info:

Samples were received in good condition. No client witnesses were present during testing. Samples were disposed of after testing.