

December 06, 2007

Jain (Americas) Inc.
Ms. Sara B. Schopfer
1819 Walcutt Road
Suite 1
Columbus, OH 43228

Our Reference: SV17122 / 07CA56359

Subject: Report Of Surface Burning Characteristics Tests On PVC Sheeting As Submitted By Jain (Americas) Inc.

Dear Ms. Schopfer:

This is a Report summarizing the results of tests conducted under the Commercial Inspection and Testing Services (CITS) program identified as Assignment No. 07CA56359.

GENERAL:

The results relate only to items tested.

METHOD:

Each test was conducted in accordance with Standard ANSI/UL723, ninth edition; dated August 29, 2003, "Test for Surface Burning Characteristics of Building Materials" (ASTM E84).

The test determines the Surface Burning Characteristics of the material, specifically the flame spread and smoke developed indices when exposed to fire.

The maximum distance the flame travels along the length of the sample from the end of the igniting flame is determined by observation. The Flame Spread Index of the material is derived by plotting the progression of the flame front on a time-distance basis, ignoring any flame front recession, and using the equations described below:

- A. $CFS = 0.515 A_T$ when A_T is less than or equal to 97.5 minute-foot.
- B. $CFS = 4900/(195-A_T)$ when A_T is greater than 97.5 minute-foot.

Where A_T = total area under the time distance curve expressed in minute-foot.

The Smoke Developed Index (SDI) is determined by rounding the Calculated Smoke Developed (CSD) as described in UL 723. The CSD is determined by the output of photoelectric equipment operating across the furnace flue pipe. A curve is developed by plotting the values of light absorption (decrease in cell output) against time. The CSD is derived by expressing the net area under the curve for the material tested as a percentage of the area under the curve for untreated red oak.

The CSD is expressed as:

$$\text{CSD} = (A_m/A_{ro}) \times 100$$

Where:

CSD = Calculated Smoke Developed

A_m = The area under the curve for the test material.

A_{ro} = The area under the curve for untreated red oak.

SAMPLES:

The samples utilized in this investigation were neither prepared nor selected by a Laboratories' representative such that no verification of composition can be provided.

The samples consisted of various thicknesses of PVC sheeting as described below:

Sample Description	
Test No.	System
1	PVC Sheeting material - 3mm.
2	PVC Sheeting material - 6mm.
3	PVC Sheeting material 10mm.
4	PVC Sheeting material 12.7mm.
5	PVC Sheeting material 16mm.
6	PVC Sheeting material 19mm.
7	PVC Sheeting material 25mm.

Each test sample consisted of three 8 by 2 ft wide boards butted end-to-end to form the required 24 ft. long surface.

Each test sample was supported by 2 in. hexagonal poultry netting supported by 1/4 in. diameter steel rods spaced 2 ft apart.

RESULTS:

The results are tabulated below are considered applicable only to the specific samples tested.

Data sheets and graphical plots of flame travel versus time and smoke developed versus time are also enclosed.

Table 1: Test Summary

Test No.	Test Code	Sample Description	CFS Calculated Flame Spread	FSI Flame Spread Index	CSD Calculated Smoke Developed	SDI Smoke Developed Index
1	12030712	PVC Sheeting material - 3mm.	15.67	15	469.9	450
2	12030713	PVC Sheeting material - 6mm.	15.03	15	826.0	Over 500
3	12030714	PVC Sheeting material 10mm.	16.46	15	971.0	Over 500
4	12030715	PVC Sheeting material 12.7mm.	17.10	15	996.2	Over 500
5	12030716	PVC Sheeting material 16mm.	16.69	15	990.0	Over 500
6	12030717	PVC Sheeting material 19mm.	18.65	20	986.9	Over 500
7	12030718	PVC Sheeting material 25mm.	18.25	20	986.2	Over 500

The Classification Marking of Underwriters Laboratories Inc. on the product is the only method provided by Underwriters Laboratories Inc. to identify products, which have been produced under its Classification and Follow-Up Service. No use of a Classification Marking has been authorized as a result of this investigation.

Since the anticipated work has been completed, we have instructed our Accounting Department to terminate the investigation and invoice you for the charges incurred to date.

Should you have any questions, please contact the undersigned.

Very truly yours,



Robert Kiefer (ext. 42014)
Senior Engineering Associate
Fire Protection Division

Reviewed by:



James Smith (ext. 42666)
Staff Engineering Associate
Fire Protection Division

Underwriters Laboratories Inc.

Project: 07CA56359
Tested by: KNIGHTON
Employee #: 1291

File: SV17122
Engineer: KIEFER
Emp. #: 98874

Test Code: 12030712
Date: 12/03/07

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.		
Test Duration: 10 Minutes	Test No.: 1	Hot Test: No
Mounting: Rods & Wire	Test Type: CITS	Burn-Out Required: No

Test Sample: PVC Sheeting material - 3mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)		Time (Sec)
Ignition		28
0.5		46
1		52
1.5		58
2		76
2.5		88
3		290
4		294

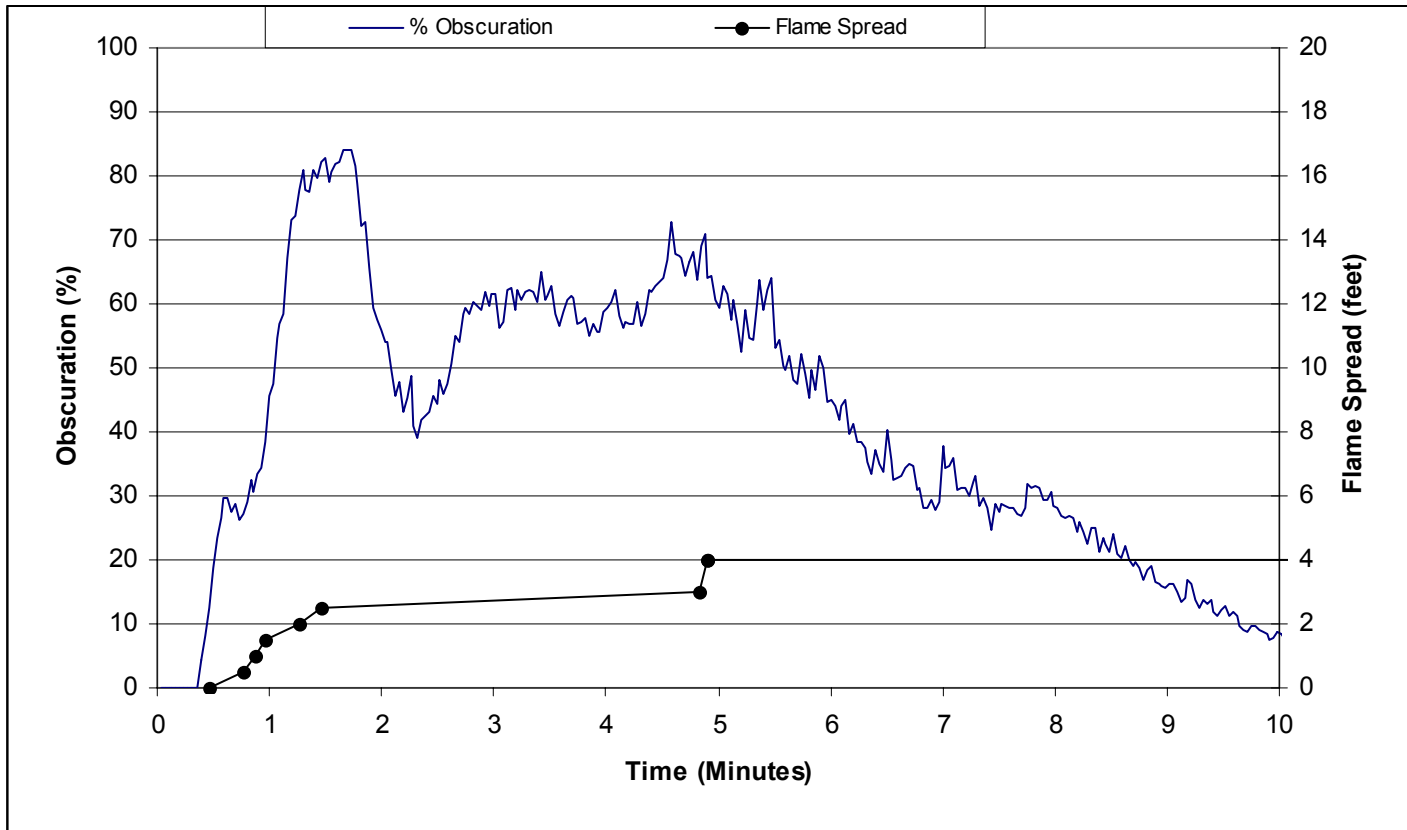
Calculated Flame Spread (CFS): 15.67
Flame Spread Index (FSI): 15
Time to Ignition (sec): 28
Maximum Flame Spread (ft): 4.0
Area Under the Flame Spread Curve (ft.-min): 30.4

SMOKE RESULTS

Calculated Smoke Developed (CSD): 469.9
Smoke Developed Index (SDI): 450
Area Under the Smoke Curve (sq. in.): 418.29
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material - 3mm.



Test No. 1
07CA56359 / SV17122
12030712

Flame Spread Index: 15
Smoke Developed Index: 450
Max. Flame Spread: 4.0

Underwriters Laboratories Inc.

Project: 07CA56359
Tested by: KNIGHTON
Employee #: 1291

File: SV17122
Engineer: KIEFER
Emp. #: 98874

Test Code: 12030713
Date: 12/03/07

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	2	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material - 6mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)	Time (Sec)	Distance (Feet)	Time (Sec)
Ignition	24	2.5	70
0.5	44	3	333
1	48	3.5	351
1.5	52	4	401
2	60		

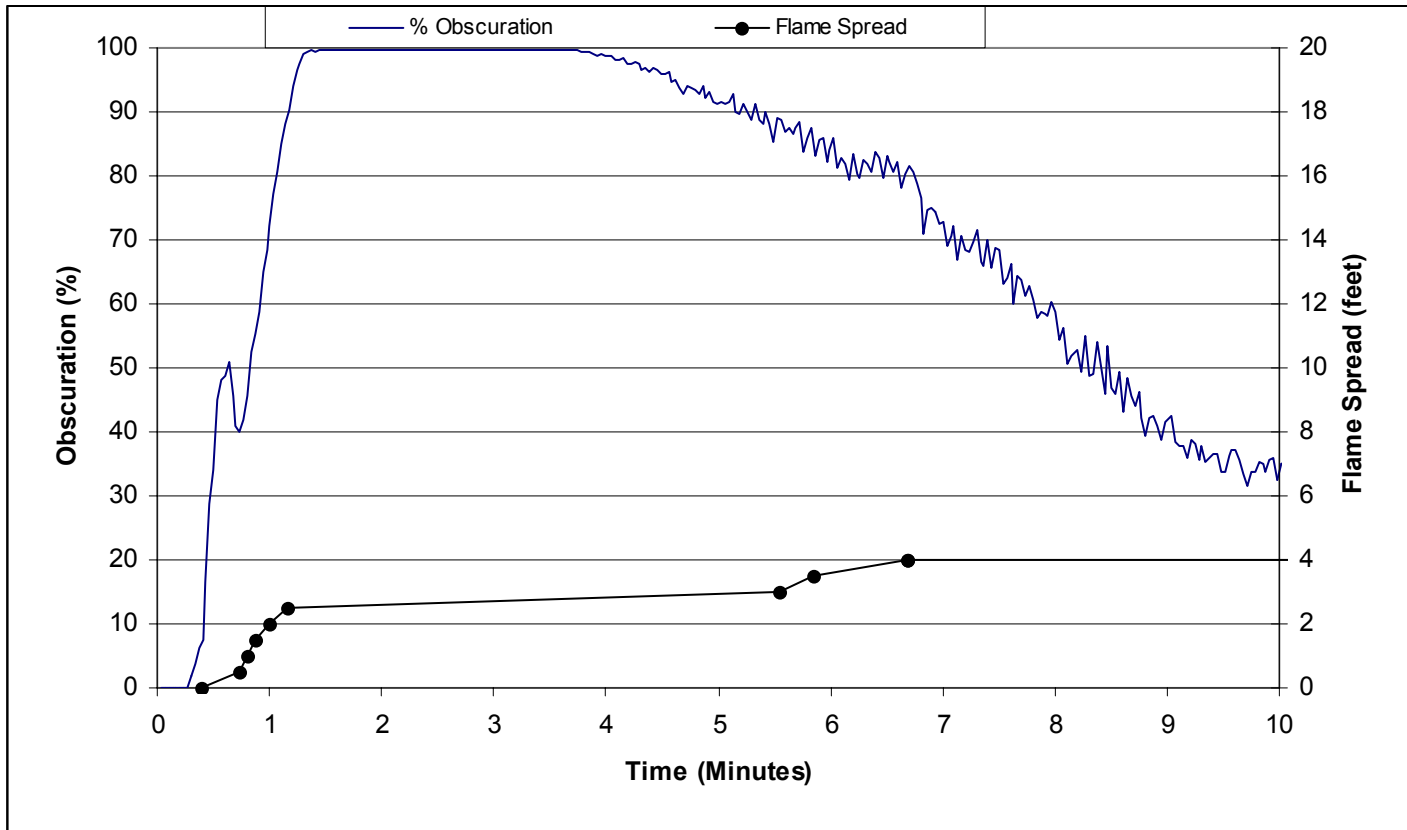
Calculated Flame Spread (CFS): 15.03
Flame Spread Index (FSI): 15
Time to Ignition (sec): 24
Maximum Flame Spread (ft): 4.0
Area Under the Flame Spread Curve (ft.-min): 29.2

SMOKE RESULTS

Calculated Smoke Developed (CSD): 826.0
Smoke Developed Index (SDI): Over 500
Area Under the Smoke Curve (sq. in.): 735.18
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material - 6mm.



Test No. 2
07CA56359 / SV17122
12030713

Flame Spread Index: 15
Smoke Developed Index: Over 500
Max. Flame Spread: 4.0

Underwriters Laboratories Inc.

Project: 07CA56359 File: SV17122 Test Code: 12030714
Tested by: KNIGHTON Engineer: KIEFER Date: 12/03/07
Employee #: 1291 Emp. #: 98874

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	3	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material 10mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)	Time (Sec)	Distance (Feet)	Time (Sec)
Ignition	28	2.5	60
0.5	48	3	76
1	50	3.5	286
1.5	54	4	460
2	58	4.5	542

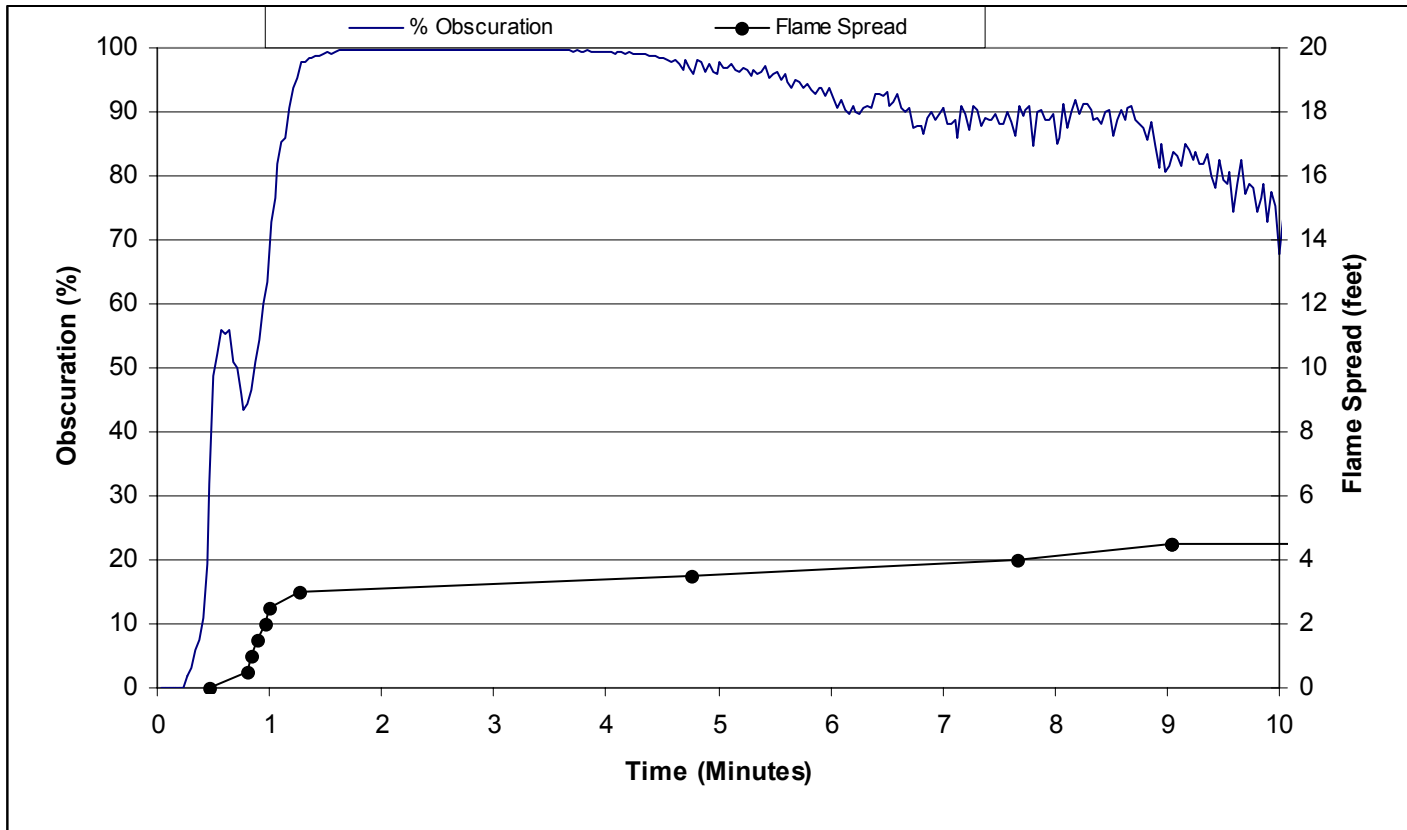
Calculated Flame Spread (CFS): 16.46
Flame Spread Index (FSI): 15
Time to Ignition (sec): 28
Maximum Flame Spread (ft): 4.5
Area Under the Flame Spread Curve (ft.-min): 32.0

SMOKE RESULTS

Calculated Smoke Developed (CSD): 971.0
Smoke Developed Index (SDI): Over 500
Area Under the Smoke Curve (sq. in.): 864.23
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material 10mm.



Test No. 3
07CA56359 / SV17122
12030714

Flame Spread Index: 15
Smoke Developed Index: Over 500
Max. Flame Spread: 4.5

Underwriters Laboratories Inc.

Project: 07CA56359
Tested by: SMITH
Employee #: 4105

File: SV17122
Engineer: KIEFER
Emp. #: 98874

Test Code: 12030715
Date: 12/03/07

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	4	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material 12.7mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)	Time (Sec)	Distance (Feet)	Time (Sec)
Ignition	26	2.5	72
0.5	46	3	80
1	50	3.5	154
1.5	56	4	410
2	60	4.5	560

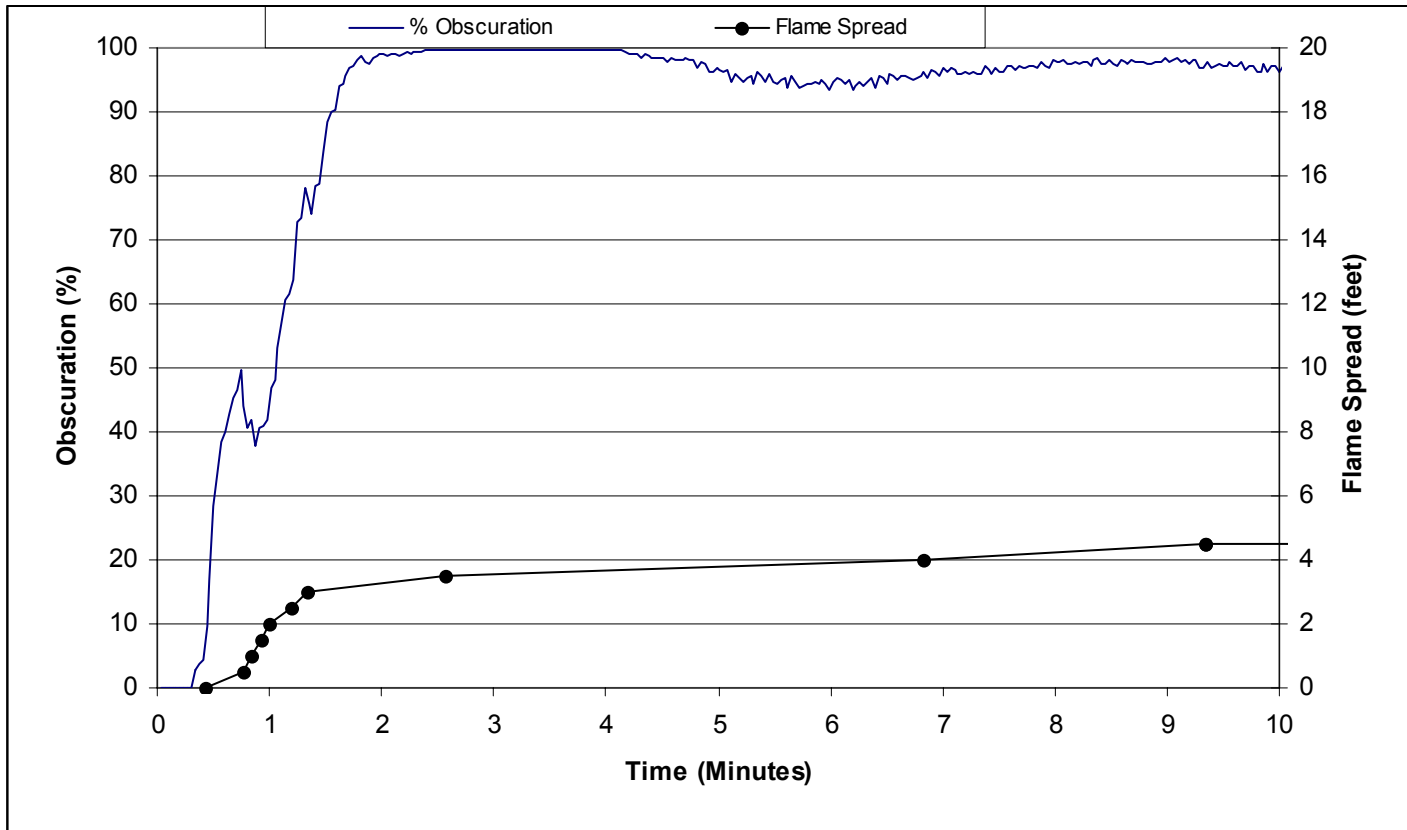
Calculated Flame Spread (CFS): 17.10
Flame Spread Index (FSI): 15
Time to Ignition (sec): 26
Maximum Flame Spread (ft): 4.5
Area Under the Flame Spread Curve (ft.-min): 33.2

SMOKE RESULTS

Calculated Smoke Developed (CSD): 996.2
Smoke Developed Index (SDI): Over 500
Area Under the Smoke Curve (sq. in.): 886.70
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material 12.7mm.



Test No. 4
07CA56359 / SV17122
12030715

Flame Spread Index: 15
Smoke Developed Index: Over 500
Max. Flame Spread: 4.5

Underwriters Laboratories Inc.

Project: 07CA56359
Tested by: SMITH
Employee #: 4105

File: SV17122
Engineer: KIEFER
Emp. #: 98874

Test Code: 12030716
Date: 12/03/07

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	5	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material 16mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)	Time (Sec)	Distance (Feet)	Time (Sec)
Ignition	34	2.5	86
0.5	48	3	100
1	52	3.5	176
1.5	58	4	378
2	76		

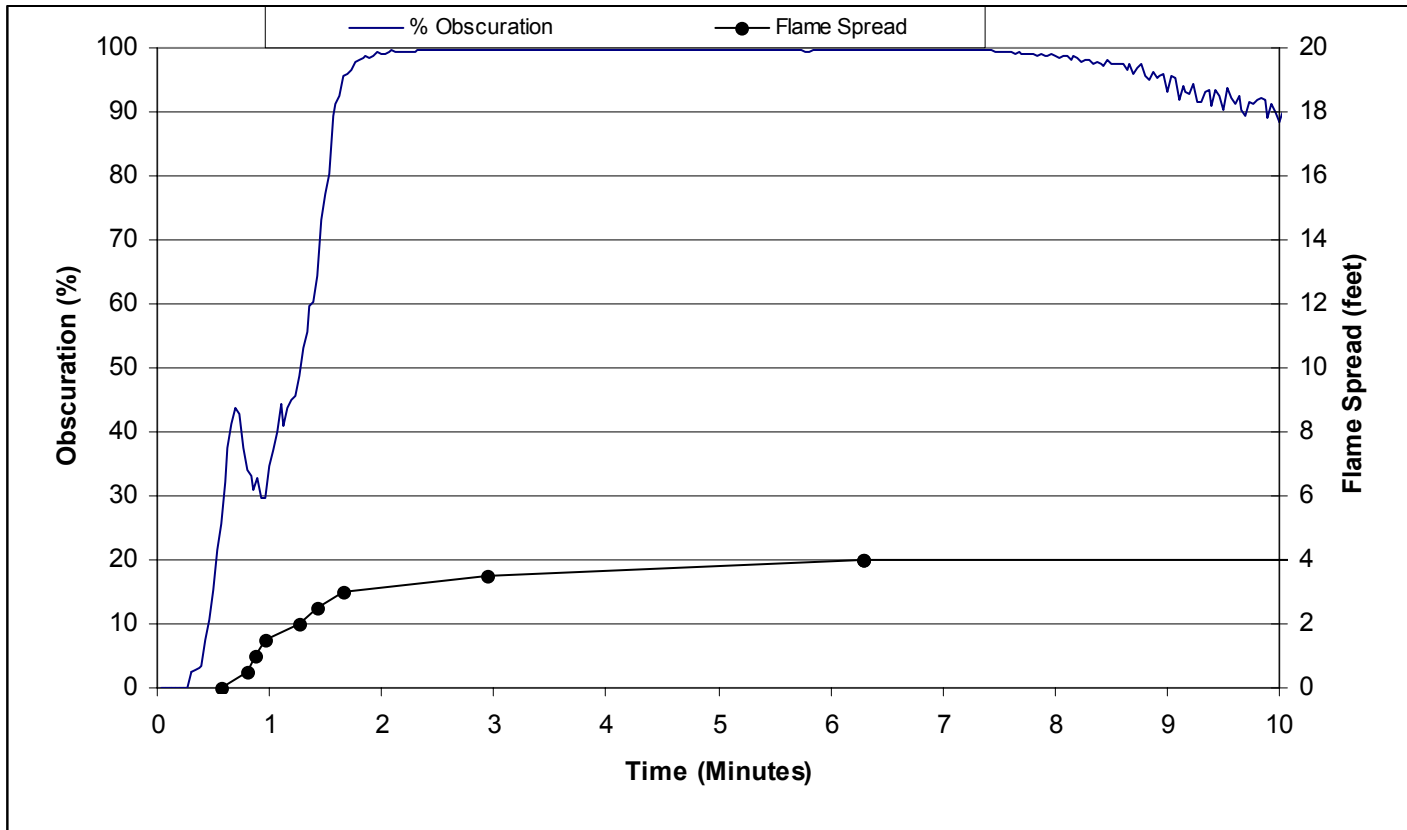
Calculated Flame Spread (CFS): 16.69
Flame Spread Index (FSI): 15
Time to Ignition (sec): 34
Maximum Flame Spread (ft): 4.0
Area Under the Flame Spread Curve (ft.-min): 32.4

SMOKE RESULTS

Calculated Smoke Developed (CSD): 990.0
Smoke Developed Index (SDI): Over 500
Area Under the Smoke Curve (sq. in.): 881.16
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material 16mm.



Test No. 5
07CA56359 / SV17122
12030716

Flame Spread Index: 15
Smoke Developed Index: Over 500
Max. Flame Spread: 4.0

Underwriters Laboratories Inc.

Project: 07CA56359 File: SV17122 Test Code: 12030717
Tested by: SMITH Engineer: KIEFER Date: 12/03/07
Employee #: 4105 Emp. #: 98874

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	6	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material 19mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)		Time (Sec)		Distance (Feet)		Time (Sec)
Ignition		30		3		86
0.5		48		3.5		100
1		52		4		226
1.5		58		4.5		480
2		70		5		532
2.5		82				

Calculated Flame Spread (CFS): 18.65
Flame Spread Index (FSI): 20

Time to Ignition (sec): 30
Maximum Flame Spread (ft): 5.0
Area Under the Flame Spread Curve (ft.-min): 36.2

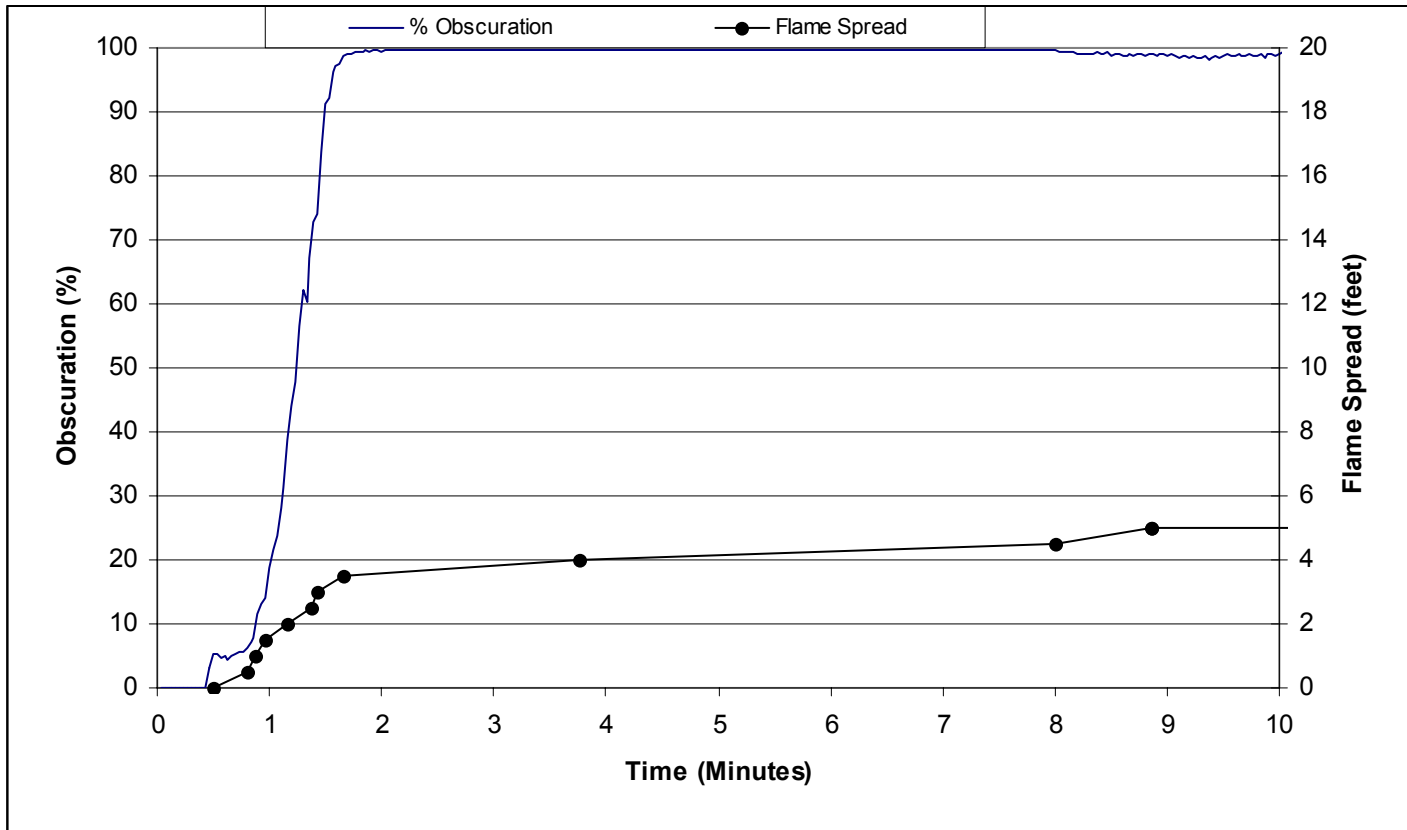
SMOKE RESULTS

Calculated Smoke Developed (CSD): 986.9
Smoke Developed Index (SDI): Over 500

Area Under the Smoke Curve (sq. in.): 878.44
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material 19mm.



Test No. 6
07CA56359 / SV17122
12030717

Flame Spread Index: 20
Smoke Developed Index: Over 500
Max. Flame Spread: 5.0

Underwriters Laboratories Inc.

Project: 07CA56359
Tested by: SMITH
Employee #: 4105

File: SV17122
Engineer: KIEFER
Emp. #: 98874

Test Code: 12030718
Date: 12/03/07

TEST METHOD: The test was conducted in accordance with UL 723, 9th Edition

Client Name: Jain (Americas) Inc.					
Test Duration	10 Minutes	Test No.:	7	Hot Test:	No
Mounting:	Rods & Wire	Test Type:	CITS	Burn-Out Required:	No

Test Sample: PVC Sheeting material 25mm.

FLAME SPREAD RESULTS

Flame Spread Data

Distance (Feet)		Time (Sec)		Distance (Feet)		Time (Sec)
Ignition		34		2.5		76
0.5		52		3		102
1		58		3.5		130
1.5		64		4		158
2		70		4.5		514

Calculated Flame Spread (CFS): 18.25
Flame Spread Index (FSI): 20

Time to Ignition (sec): 34
Maximum Flame Spread (ft): 4.5
Area Under the Flame Spread Curve (ft.-min): 35.4

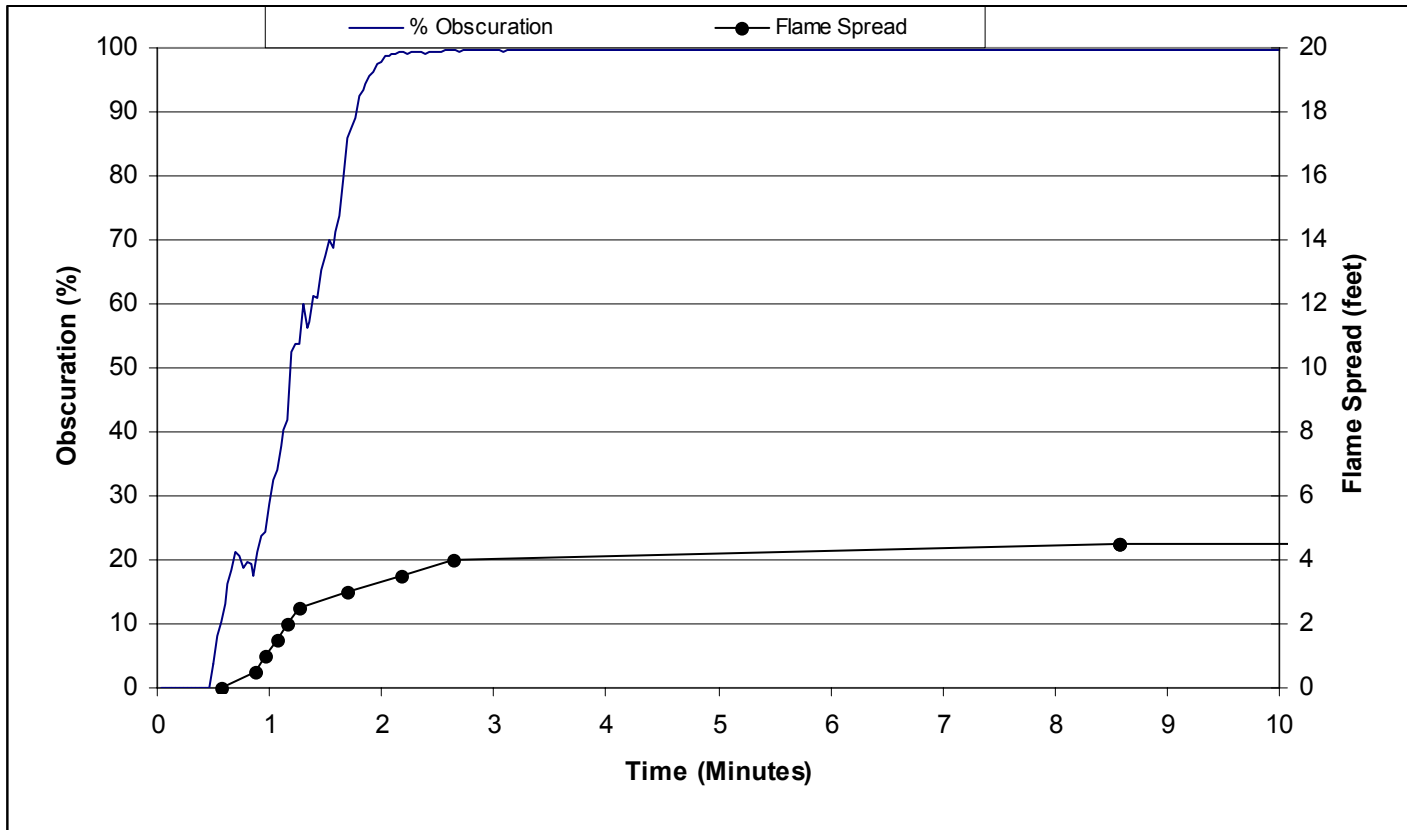
SMOKE RESULTS

Calculated Smoke Developed (CSD): 986.2
Smoke Developed Index (SDI): Over 500

Area Under the Smoke Curve (sq. in.): 877.80
Area Under Red Oak Curve (sq. in.): 89.01

Flame Spread / Smoke Results

Jain (Americas) Inc.
PVC Sheeting material 25mm.



Test No. 7
07CA56359 / SV17122
12030718

Flame Spread Index: 20
Smoke Developed Index: Over 500
Max. Flame Spread: 4.5