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. $\text{CFS} = 0.515 \ A_T$ when $A_T$ is less than or equal to 97.5 minute-foot.

B. $\text{CFS} = \frac{4900}{(195-A_T)}$ 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:

\[ \text{CSD} = \left( \frac{A_m}{A_{ro}} \right) \times 100 \]

Where:

\( A_m \) = 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:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PVC Sheeting material - 3mm.</td>
</tr>
<tr>
<td>2</td>
<td>PVC Sheeting material - 6mm.</td>
</tr>
<tr>
<td>3</td>
<td>PVC Sheeting material 10mm.</td>
</tr>
<tr>
<td>4</td>
<td>PVC Sheeting material 12.7mm.</td>
</tr>
<tr>
<td>5</td>
<td>PVC Sheeting material 16mm.</td>
</tr>
<tr>
<td>6</td>
<td>PVC Sheeting material 19mm.</td>
</tr>
<tr>
<td>7</td>
<td>PVC Sheeting material 25mm.</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Client Name:</th>
<th>Jain (Americas) Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Duration</td>
<td>10 Minutes</td>
</tr>
<tr>
<td>Test No.:</td>
<td>1</td>
</tr>
<tr>
<td>Hot Test:</td>
<td>No</td>
</tr>
<tr>
<td>Mounting:</td>
<td>Rods &amp; Wire</td>
</tr>
<tr>
<td>Test Type:</td>
<td>CITS</td>
</tr>
<tr>
<td>Burn-Out Required:</td>
<td>No</td>
</tr>
</tbody>
</table>

Test Sample: PVC Sheeting material - 3mm.

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>28</td>
</tr>
<tr>
<td>0.5</td>
<td>46</td>
</tr>
<tr>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>1.5</td>
<td>58</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
</tr>
<tr>
<td>2.5</td>
<td>88</td>
</tr>
<tr>
<td>3</td>
<td>290</td>
</tr>
<tr>
<td>4</td>
<td>294</td>
</tr>
</tbody>
</table>

- 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
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**

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>24</td>
<td>2.5</td>
<td>70</td>
</tr>
<tr>
<td>0.5</td>
<td>44</td>
<td>3</td>
<td>333</td>
</tr>
<tr>
<td>1</td>
<td>48</td>
<td>3.5</td>
<td>351</td>
</tr>
<tr>
<td>1.5</td>
<td>52</td>
<td>4</td>
<td>401</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Client Name:</th>
<th>Jain (Americas) Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Duration</td>
<td>10 Minutes</td>
</tr>
<tr>
<td>Test No.:</td>
<td>3</td>
</tr>
<tr>
<td>Hot Test:</td>
<td>No</td>
</tr>
<tr>
<td>Mounting:</td>
<td>Rods &amp; Wire</td>
</tr>
<tr>
<td>Test Type:</td>
<td>CITS</td>
</tr>
<tr>
<td>Burn-Out Required:</td>
<td>No</td>
</tr>
</tbody>
</table>

**Test Sample:** PVC Sheeting material 10mm.

### FLAME SPREAD RESULTS

#### Flame Spread Data

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>28</td>
<td>2.5</td>
<td>60</td>
</tr>
<tr>
<td>0.5</td>
<td>48</td>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>3.5</td>
<td>286</td>
</tr>
<tr>
<td>1.5</td>
<td>54</td>
<td>4</td>
<td>460</td>
</tr>
<tr>
<td>2</td>
<td>58</td>
<td>4.5</td>
<td>542</td>
</tr>
</tbody>
</table>

- 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  Test Code: 12030715
File: SV17122  Date: 12/03/07
Tested by: SMITH  Engineer: KIEFER
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.: 4  Hot Test: No
Mounting: Rods & Wire  Test Type: CITS  Burn-Out Required: No

Test Sample: PVC Sheeting material 12.7mm.

FLAME SPREAD RESULTS

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>26</td>
<td>2.5</td>
<td>72</td>
</tr>
<tr>
<td>0.5</td>
<td>46</td>
<td>3</td>
<td>80</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>3.5</td>
<td>154</td>
</tr>
<tr>
<td>1.5</td>
<td>56</td>
<td>4</td>
<td>410</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>4.5</td>
<td>560</td>
</tr>
</tbody>
</table>

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  Test Code: 12030716
File: SV17122
Tested by: SMITH  Date: 12/03/07
Engineer: KIEFER
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.: 5  Hot Test: No
Mounting: Rods & Wire  Test Type: CITS  Burn-Out Required: No

Test Sample: PVC Sheeting material 16mm.

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FLAME SPREAD RESULTS

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>34</td>
<td>2.5</td>
<td>86</td>
</tr>
<tr>
<td>0.5</td>
<td>48</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>52</td>
<td>3.5</td>
<td>176</td>
</tr>
<tr>
<td>1.5</td>
<td>58</td>
<td>4</td>
<td>378</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
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

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>30</td>
<td>3</td>
<td>86</td>
</tr>
<tr>
<td>0.5</td>
<td>48</td>
<td>3.5</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>52</td>
<td>4</td>
<td>226</td>
</tr>
<tr>
<td>1.5</td>
<td>58</td>
<td>4.5</td>
<td>480</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>5</td>
<td>532</td>
</tr>
<tr>
<td>2.5</td>
<td>82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Client Name:</th>
<th>Jain (Americas) Inc.</th>
<th>Test Duration</th>
<th>10 Minutes</th>
<th>Test No.: 7</th>
<th>Hot Test: No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting:</td>
<td>Rods &amp; Wire</td>
<td>Test Type:</td>
<td>CITS</td>
<td>Burn-Out Required: No</td>
<td></td>
</tr>
</tbody>
</table>

**Test Sample:** PVC Sheeting material 25mm.

### Flame Spread Results

#### Flame Spread Data

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
<th>Distance (Feet)</th>
<th>Time (Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition</td>
<td>34</td>
<td>2.5</td>
<td>76</td>
</tr>
<tr>
<td>0.5</td>
<td>52</td>
<td>3</td>
<td>102</td>
</tr>
<tr>
<td>1</td>
<td>58</td>
<td>3.5</td>
<td>130</td>
</tr>
<tr>
<td>1.5</td>
<td>64</td>
<td>4</td>
<td>158</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>4.5</td>
<td>514</td>
</tr>
</tbody>
</table>

- 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