

Date January 31, 2005

Project No. 3067842
Report No. 1
Client No. 45762

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Description: Testing of RAZ In-Floor PanelClient EZ Floor, LLC
W3213 Artesian Road,
Fond du Lac, Wisconsin. 54935

Attention: Mr. Don Regan

Introduction

This report covers testing of In-Floor Panels consisting of EPS Plastic Foam Insulation covered on one side with a plastic shell. Tests were performed in accordance with ASTM C 578-04 "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation" modified to assess the flooring panels as an entire entity and not just the rigid, cellular polystyrene thermal insulation. Due to the configuration of the in-floor panels direct comparisons with the requirements of the various types of EPS foam described in ASTM C 578 are not practical. The in-floor panels were tested for flexural strength according to ASTM C 203-99 Method 1 Procedure A, modified and compressive resistance according to ASTM C 165-00 modified, density according to ASTM D1622-03 modified dimensional stability according to ASTM D 2126-04 modified, water absorption according to ASTM C272-01 modified, water vapor permeance according to ASTM E 96-00^{e1} modified, thermal resistance according to ASTM C 518-04 modified, and oxygen index of the EPS foam according to ASTM D 2863-97. Samples were received for testing December 1, 2004. Testing was performed between the dates of December 16, 2004 and January 31, 2005. Photographs are shown in Appendix attached to this report.

Description

Each panel was 49" long by 25" wide having 1" wide channels at the ends and along the edges, one facing up and the other facing down to allow the panels to be locked together to form panels each 48" long by 24" wide. Panels had total thickness of approximately 2.1" consisting of a major body section having a thickness of approximately 1.23" with protrusions on one side approximately 2" in diameter and a height of approximately 0.71" and nodules on the opposite side approximately 3/8" diameter and approximately 0.16" high. The protrusions were aligned in alternating rows 2" apart on centre. The nodules were aligned in rows 1" apart on centre. Panels consisted of EPS Plastic Foam Insulation covered on one side with a plastic shell 0.010" thick. The plastic shell covered the side of the panel having the protrusions (see photographs numbers 1 to 5).

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Procedure

1. Flexural Strength ASTM C 203-99 Method 1 Procedure A, Modified

Specimens 457 mm (18") long by 152 mm (6") wide were cut and in turn placed in a test jig having a span of 381 mm (15") and tested using centre point loading till failure using an Instron Model 1000 Tester with a 100 pound capacity serial number 1926 weight beam (inventory number 280-01-0082) at a test speed of 0.76 mm (0.30 in)/min. Five specimens were tested with the plastic shell face in tension and five specimens were tested with the exposed EPS plastic foam insulation face in tension. The test span and specimen size were chosen due to the configuration of the samples and in particular the spacing of the protrusions. In each case the specimens failed off centre at the thinnest point between the protrusion on one side of the sample and the nodules on the other side of the sample. The flexural strength was calculated based on the thickness of the major body portion including the thickness of the shell disregarding either the height of the protrusions or nodules (see photographs number 1 to 4).

Specimens were conditioned for a minimum of 40 hours at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Dimensions were measured using a Starrett vernier (inventory number 278-01-0093).

2. Compressive Resistance ASTM C 165-00 Modified.

Specimens 152 mm (6") long by 152 mm (6") wide were cut and in turn placed between compression plates in a Baldwin/UTS Universal testing machine (inventory number 280-01-0015) and tested at a test speed of 5.28 mm (0.208 in)/min. The load at which 10% deformation as specified by ASTM C 578 was calculated from a graph of the load verses deformation.

Due to the configuration of the samples and in particular the spacing of the protrusions, five specimens were tested having four protrusions per specimen and five specimens were tested having five protrusions per specimen (see photograph Number 5).

The compressive resistance was calculated based on the total thickness including the height of the protrusions and thickness of the shell on one side of the sample and the height of the nodules on the other side of the sample. Much of the deformation that occurred appeared to be due to deformation of the nodules and protrusions on the faces of the sample.

Specimens were conditioned for a minimum of 40 hours at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Dimensions were measured using a Starrett vernier (inventory number 278-01-0093).

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Procedure cont'd

3. Density ASTM D1622-03 Modified

Specimens 305 mm (12") long by 305 mm (12") wide by the thickness of the flooring were cut weighed. Specimens of the EPS foam 305 mm (12") long by 305 mm (12") wide by 25 mm (1") were cut from each specimen. The density of the EPS foam specimens, were measured. The plastic shell was removed from each specimen and the density was measured according to ASTM D 792-00. The total mass of EPS foam in each specimen was calculated by subtracting the mass of each plastic shell from the total mass of each specimen. The volume of EPS foam in each specimen was calculated from the total mass and density of the EPS foam in each specimen. The volume of plastic shell in each specimen was calculated from the density of the plastic shell. The total volume of each specimen was calculated from the calculated volumes of EPS foam and plastic shell. The density of each flooring specimen was calculated by dividing the total mass of each specimen by the calculated total volume.

Specimens were conditioned for a minimum of 40 hours at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Dimensions were measured using a Starrett vernier (inventory number 278-01-0093). Specimens were weighed using an Ohaus Model GT4100 balance (inventory number 280-01-0075).

4. Dimensional Stability ASTM D 2126-04 Modified

Specimens each 101 mm (4") long by 101 mm (4") wide by the thickness of the material were cut for testing 7 days at -40°C (-40°F) and 7 days at 70°C (158°F) and 97% RH. Length and width dimensions were measured at the face of the EPS foam and the face of the plastic shell. The thickness of the body of the flooring and the thickness including protrusions were measured.

Specimens were conditioned at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Dimensions were measured using a Starrett vernier (inventory number 278-01-0093). Testing at -40°C (-40°F) was performed using a WVR Brand GS laboratory Equipment Freezer Model A4013U30 (inventory number 278-01-0572). Testing at 70°C (158°F) and 97% RH was performed using a Blue M Oven Model OV-490A-3 (inventory number 280-01-0126). Specimens were suspended over an 8.5 % solution of sulphuric acid having a density of 1.055 g/cm³ in an enclosed container to attain the desired relative humidity.

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Procedure cont'd

5. Water Absorption ASTM C 272-01 Modified

Specimens 305 mm (12") long by 305 mm (12") wide by the thickness of the flooring were used for the test. The test method gives calculations for water absorption as percent mass divided by mass. ASTM C578 gives values based on volume divided by volume. The total volume of the specimen was calculated using the average density as per ASTM D 1622 modified as above.

Specimens were conditioned for a minimum of 40 hours at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Specimens were dried using a Blue M Oven Model OV-490A-3 (inventory number 280-01-0126). Specimens were weighed using an Ohaus Model GT4100 balance (inventory number 280-01-0075).

6. Water Vapor Permeance ASTM E96-00^{e1} Modified

Specimens were cut the full thickness of the flooring for testing. Specimens were exposed with the shell face including the protrusions facing the humidity and with the EPS foam face including the nodules facing the humidity.

Specimens were conditioned at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133).

7. Thermal Resistance according to ASTM C 518-04 modified

Specimens 305 mm (12") long by 305 mm (12") wide by the thickness of the flooring were cut and tested. Since neither side of the flooring is flat testing includes air spaces on both sides of the flooring. Testing was performed with the plastic shell face including the protrusions facing the cold plate of the tester and the EPS foam face including the nodules facing the cold plate of the tester.

Specimens were conditioned at 23°C (73°F) and 50% relative humidity using a Hot Pack, 175 Series Environmental Chamber, Model No. 47532, Serial No. 74571 (inventory number 280-01-0133). Thermal resistance measurements were performed using a Netzsch Lambda 2000 Heat Flow Meter Model 436/3/1, Serial number 183A-1204-0606000390.

8. Oxygen Index of Foam according to ASTM D 2863-97

Specimens 152 mm (6") long by 6 mm (1/4") wide by 3 mm (1/8") thick were cut from the EPS foam part of the flooring and tested for oxygen index by Bodycote as per Report No. 05-02-036 E dated January 31, 2005.

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Test Results

1. Flexural Strength: ASTM C203-99: Method 1, Procedure A Modified

(a) Shell Covered Face in Tension

Specimen No.	Span mm (in.)	Thickness mm (in)	Width mm (in)	Break Load N (lb.)	Maximum Fiber Stress kPa (psi)
1	381 (15)	31.4 (1.237)	153.2 (6.032)	149 (33.41)	561 (81.4)
2	381 (15)	31.2 (1.227)	152.4 (5.999)	124 (27.9)	479 (69.5)
3	381 (15)	31.3 (1.233)	152.6 (6.009)	137 (30.7)	522 (75.7)
4	381 (15)	31.3 (1.234)	150.3 (5.962)	147 (33.0)	568 (82.4)
5	381 (15)	31.4 (1.237)	151.8 (5.977)	129 (29.0)	492 (71.4)
Average					524 (76.1)

(b) Exposed EPS Foam Insulation Face in Tension

Specimen No.	Span mm (in.)	Thickness mm (in)	Width mm (in)	Break Load N (lb.)	Maximum Fiber Stress kPa (psi)
1	381 (15)	31.4 (1.236)	151.0 (5.946)	121 (27.1)	463 (67.1)
2	381 (15)	31.3 (1.233)	153.2 (6.031)	120 (27.0)	457 (66.3)
3	381 (15)	31.3 (1.234)	151.1 (5.949)	117 (26.3)	450 (65.3)
4	381 (15)	31.3 (1.231)	151.0 (5.945)	122 (27.4)	472 (68.4)
5	381 (15)	31.4 (1.236)	150.9 (5.939)	118 (26.6)	455 (66.0)
Average					459 (66.6)

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Test Results cont'd

2. Compressive Resistance ASTM C 165-00 Modified

(a) Four Protrusions / Specimen

Specimen No.	Length mm (in)	Width mm (in)	Depth mm (in)	Area cm ² (in. ²)	Load @ 10% Deformation N (lb)	Compressive Resistance kPa (psi) (psf)
1	153.6 (6.046)	150.7 (5.935)	53.4 (2.102)	231.5 (35.88)	890 (201)	39 (5.6) (810)
2	151.7 (5.972)	150.0 (5.907)	53.0 (2.085)	227.6 (35.28)	850 (191)	37 (5.4) (780)
3	152.9 (6.018)	151.3 (5.958)	53.0 (2.086)	231.3 (35.86)	890 (201)	39 (5.6) (810)
4	154.4 (6.080)	151.4 (5.959)	52.8 (2.080)	233.7 (36.23)	900 (203)	39 (5.6) (810)
5	154.3 (6.074)	153.5 (6.045)	53.3 (2.100)	236.9 (36.72)	940 (212)	40 (5.8) (830)
Average						39 (5.6) (810)

(b) Five Protrusions / Specimen

Specimen No.	Length mm (in)	Width mm (in)	Depth mm (in)	Area cm ² (in. ²)	Load @ 10% Deformation N (lb)	Compressive Resistance kPa (psi) (psf)
1	153.2 (6.029)	151.5 (5.964)	53.2 (2.095)	232.0 (35.97)	1,090 (246)	47 (6.8) (990)
2	152.7 (6.010)	152.3 (5.995)	53.1 (2.089)	232.5 (36.03)	970 (219)	42 (6.1) (880)
3	151.3 (5.958)	149.6 (5.889)	52.7 (2.076)	226.4 (35.09)	920 (207)	41 (5.9) (850)
4	152.0 (5.983)	151.7 (5.972)	53.4 (2.103)	230.5 (35.73)	960 (215)	41 (6.0) (870)
5	151.5 (5.963)	150.5 (5.925)	52.8 (2.077)	227.9 (35.33)	1,050 (236)	46 (6.7) (960)
Average						43 (6.3) (910)

(c) All Specimens

Specimen No.	Length mm (in)	Width mm (in)	Depth mm (in)	Area cm ² (in. ²)	Load @ 10% Deformation N (lb)	Compressive Resistance kPa (psi) (psf)
Average						41 (6.0) (860)

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Test Results cont'd

3. Density ASTM D 1622-03 Modified
 (a) Foam

Specimen No.	Length mm (in)	Width mm (in)	Depth mm (in)	Volume cm ³ (in. ³)	Mass g	Density kg/m ³ (lb./ft. ³)
1	303.1 (11.934)	300.6 (11.835)	23.7 (0.933)	2159 (131.8)	63.39	29.36 (1.833)
2	302.8 (11.920)	302.8 (11.919)	24.4 (0.961)	2238 (136.5)	65.44	29.24 (1.826)
3	302.5 (11.909)	302.5 (11.908)	26.5 (1.043)	2423 (147.8)	71.23	29.40 (1.835)
4	304.7 (11.996)	303.1 (11.934)	25.0 (0.984)	2309 (140.9)	66.81	28.93 (1.806)
5	303.4 (11.944)	302.3 (11.902)	22.4 (0.880)	2050 (125.1)	59.72	29.13 (1.819)
Average						29.21 (1.824)

(b) Plastic Shell

Specimen No.	Mass Specimen in Air (g)	Mass of Immersed Sinkers @ 23±2°C (g)	Mass of Immersed Specimen & Sinkers @ 23±2°C (g)	Specific Gravity @ 23±2°C	Density kg/m ³ (lb./ft. ³)	Volume cm ³ (in. ³)
1	25.19	1412.91	1411.62	0.951	949 (59.2)	26.5 (1.62)
2	24.92	1412.63	1411.67	0.963	961 (60.0)	25.9 (1.58)
3	25.78	1413.29	1412.41	0.967	965 (60.2)	26.7 (1.63)
4	26.17	1413.61	1412.55	0.961	959 (59.9)	27.3 (1.67)
5	25.67	1414.51	1413.01	0.946	943 (58.9)	27.2 (1.66)
Average					955 (59.6)	26.7 (1.63)

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Test Results cont'd

3. Density ASTM D 1622-03 Modified cont'd

(c) Plastic Shell & Foam

Specimen No.	Total Mass of Specimen (g)	Mass of Foam per Specimen (g)	Volume of Foam per Specimen cm ³ (in. ³)	Mass of Shell per Specimen g	Volume of Shell per Specimen cm ³ (in. ³)	Total Volume cm ³ (in. ³)	Density kg/m ³ (lb./ft. ³)
1	120.30	95.11	3240 (197.7)	25.19	26.5 (1.62)	3266 (199.3)	36.8 (2.30)
2	120.03	95.11	3252 (198.4)	24.92	25.9 (1.58)	3278 (1.58)	36.6 (2.29)
3	119.61	93.83	3191 (194.7)	25.78	26.7 (1.63)	3218 (196.4)	37.2 (2.32)
4	120.09	93.92	3247 (198.1)	26.17	27.3 (1.67)	3274 (199.8)	36.7 (2.29)
5	118.87	93.20	3199 (195.2)	25.67	27.2 (1.66)	3227 (196.92)	36.8 (2.30)
Average			3226 (196.9)		26.7 (1.63)	3253 (198.5)	36.8 (2.30)

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Test Results cont'd

4(a). Dimensional Stability: ASTM D2126-04: 7 day @ -40°C (-40°F)

	Sample 1	Sample 2	Sample 3	Average
Initial Length @Foam Face mm (in)	100.4 (3.951)	100.3 (3.949)	100.6 (3.960)	
Final Length @ Foam Face mm (in)	100.4 (3.954)	100.4 (3.951)	100.7 (3.963)	
% Change in Length @ Foam Face	+0.1	+0.1	+0.1	+0.1
Initial Width @ Foam Face mm (in)	101.2 (3.984)	100.9 (3.972)	100.5 (3.956)	
Final Width @ Foam Face mm (in)	101.0 (3.978)	100.8 (3.969)	100.5 (3.956)	
% Change in Width @ Foam Face	-0.2	-0.1	nil	-0.1
Initial Thickness Including Protrusions mm (in)	49.5 (1.950)	49.5 (1.949)	49.4 (1.943)	
Final Thickness Including Protrusions mm (in)	49.6 (1.954)	49.5 (1.949)	49.5 (1.949)	
% Change in Thickness Including Protrusions	+0.2	Nil	+0.3	+0.2
Initial Length @ Shell Face mm (in)	101.1 (3.982)	101.5 (3.995)	101.7 (4.002)	
Final Length @ Shell Face mm (in)	101.1 (3.979)	101.3 (3.990)	101.6 (4.001)	
% Change in Length @ Shell Face	-0.1	-0.1	nil	-0.1
Initial Width @ Shell Face mm (in)	101.9 (4.010)	101.6 (4.001)	101.3 (3.988)	
Final Width @ Shell Face mm (in)	101.8 (4.006)	101.7 (4.005)	101.3 (3.989)	
% Change in Width @ Shell Face	-0.1	+0.1	nil	nil
Initial Thickness of Body mm (in)	31.4 (1.237)	31.6 (1.245)	31.5 (1.241)	
Final Thickness of Body mm (in)	31.5 (1.24)	31.6 (1.243)	31.5 (1.242)	
% Change in Thickness of Body	+0.2	-0.2	nil	nil

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Test Results cont'd

4(b). Dimensional Stability: ASTM D2126-04: 7 day @ 70°C (158°F), 97% RH

	Sample 1	Sample 2	Sample 3	Average
Initial Length @Foam Face mm (in)	100.6 (3.960)	99.9 (3.932)	100.2 (3.946)	
Final Length @ Foam Face mm (in)	100.5 (3.955)	99.5 (3.917)	99.9 (3.933)	
% Change in Length @ Foam Face	-0.1	-0.4	-0.3	-0.3
Initial Width @ Foam Face mm (in)	99.6 (3.920)	100.3 (3.948)	100.3 (3.947)	
Final Width @ Foam Face mm (in)	99.2 (3.904)	99.9 (3.935)	99.9 (3.935)	
% Change in Width @ Foam Face	-0.4	-0.3	-0.3	-0.3
Initial Thickness Including Protrusions mm (in)	49.7 (1.958)	49.6 (1.953)	48.7 (1.920)	
Final Thickness Including Protrusions mm (in)	49.6 (3.951)	49.5 (1.948)	48.5 (1.911)	
% Change in Thickness Including Protrusions	-0.4	-0.2	-0.5	-0.4
Initial Length @ Shell Face mm (in)	102.0 (4.014)	100.6 (3.961)	101.0 (3.975)	
Final Length @ Shell Face mm (in)	101.7 (4.003)	100.4 (3.953)	101.0 (3.975)	
% Change in Length @ Shell Face	-0.3	-0.2	nil	-0.2
Initial Width @ Shell Face mm (in)	100.2 (3.946)	101.2 (3.985)	101.3 (3.988)	
Final Width @ Shell Face mm (in)	99.9 (3.934)	101.0 (3.977)	101.0 (3.978)	
% Change in Width @ Shell Face	-0.3	-0.2	-0.3	-0.3
Initial Thickness of Body mm (in)	31.7 (1.248)	31.6 (1.242)	30.9 (1.217)	
Final Thickness of Body mm (in)	31.6 (1.245)	31.6 (1.244)	30.8 (1.215)	
% Change in Thickness of Body	-0.2	0.2	-0.1	-0.1

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Test Results cont'd

5. Water Absorption ASTM C272-01 Modified, 24h Immersion 305 x 305 mm (12 x x12")
Specimens, measured as % by Volume

Specimen No.	Initial mass g	Density kg/m ³ (lb/ft ³)	Volume cm ³ (in ³)	Final mass g	Gain in Mass g	% by Volume Absorbed
1	117.31	36.8 (2.30)	3,190 (195)	191.50	74.19	2.33
2	117.49	36.8 (2.30)	3,190 (195)	193.90	76.41	2.39
3	115.56	36.8 (2.30)	3,140 (192)	184.72	69.16	2.20
4	116.49	36.8 (2.30)	3,170 (193)	214.84	98.35	3.11
5	119.53	36.8 (2.30)	3,250 (198)	199.18	79.65	2.45
Average						2.50

6(a) Water Vapor Permeance ASTM E96-00^{e1} Modified, Plastic Shell Facing Humidity

	1	2	3	Average
Surface area (m ²)	0.0339	0.0306	0.0306	
Duration (h)	312	312	312	
Test Temperature (°C)	23	23	23	
Relative Humidity (R1-R2)(%)	50	50	50	
Saturation Pressure (Pa)	2810.4	2810.4	2810.4	2810.4
Moisture Gain (g)	1.76 (27.2)	1.49 (23.0)	1.70 (26.2)	
WVT (g/h.m ²)	0.1667	0.1549	0.1779	
Water vapour Permeance ng/Pa.s.m ² (perms)	33 (0.58)	31 (0.54)	35 (0.61)	32 (0.56)

cont'd.....

Test Results cont'd

6(b) Water Vapor Permeance ASTM E96-00^{e1} Modified continued, Foam Facing Humidity

	1	2	3	Average
Surface area (m ²)	0.0243	0.0243	0.0243	
Duration (h)	312	312	288	
Test Temperature (°C)	23	23	23	
Relative Humidity (R1-R2)(%)	50	50	50	
Saturation Pressure (Pa)	2810.4	2810.4	2810.4	2810.4
Moisture Gain (g)	2.59 (40.0)	2.77 (42.7)	2.86 (44.1)	
WVT (g/h.m ²)	0.342 (0.491)	0.366 (0.525)	0.409 (0.587)	
Water vapour Permeance (ng/Pa.s.m ²) (perms)	68 (1.19)	72 (1.26)	81 (1.42)	74 (1.30)

7(a) Thermal Resistance: ASTM C518-98 Modified, Plastic Shell Facing Cold (Upper Surface) Platten

Property	Result
Thickness	53.52 mm (2.107 in)
Upper surface temperature	12.80°C (55.04°F)
Lower surface temperature	34.89°C (94.80°F)
Temperature differential	22.09° (39.75°F)
Mean temperature	23.85°C (74.92°F)
Rate of Heat Flux	18.71 W/m ² (5.931 Btu/h.ft ²)
Thermal conductance	0.8470 W/m ² .K (0.1492 Btu/h.ft ² . °F)
Thermal resistance	1.1807 K.m ² /W (6.7037 °F. ft ² .h/Btu)
Thermal conductivity	0.0453 W/m.K (0.3142 Btu.in./h.ft ² °F)
Resistivity	22.064 K.m/W (3.183 °F. ft ² . h/Btu.in.)

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Test Results cont'd

7(b) Thermal Resistance: ASTM C518-98 Modified continued, Foam Facing Cold (Upper Surface) Platten

Property	Result
Thickness	53.62 mm (2.111 in)
Upper surface temperature	12.92°C (55.25°F)
Lower surface temperature	35.00°C (95.01°F)
Temperature differential	22.08° (39.76°F)
Mean temperature	23.85°C (75.13°F)
Rate of Heat Flux	18.54 W/m ² (5.5.877 Btu/h.ft ²)
Thermal conductance	0.8395 W/m ² .K (0.1478 Btu/h.ft ² . °F)
Thermal resistance	1.1912 K.m ² /W (6.7637 °F. ft ² .h/Btu)
Thermal conductivity	0.0450 W/m.K (0.3121 Btu.in./h.ft ² . °F)
Resistivity	22.222 K.m/W (3.204 °F. ft ² . h/Btu.in.)

8 Limiting Oxygen Index: ASTM D2863-97, of EPS Foam

See Bodycote Report No. 05-02-036 E

Ignition % Oxygen	Non-Ignition % Oxygen	Oxygen Index	Requirement
-	21.9		
30.0	-		
29.5	-		
29.0	-		
-	28.5		
29.0	-		
-	28.9		
29.0	-		
-	28.9		
29.0	-	29.0%	Min. 24%

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Measurement Uncertainty - Since these tests were conducted in compliance with standards that sets limits on the sources of uncertainty and specifies the form of reported results, no measurement uncertainty evaluation has been included in this report.

Tested by: Paul Roberts and Bob Obuchi
Reported by: Paul Roberts

Respectfully submitted,

INTERTEK TESTING SERVICES NA LTD.



Paul Roberts
Physical Testing Services

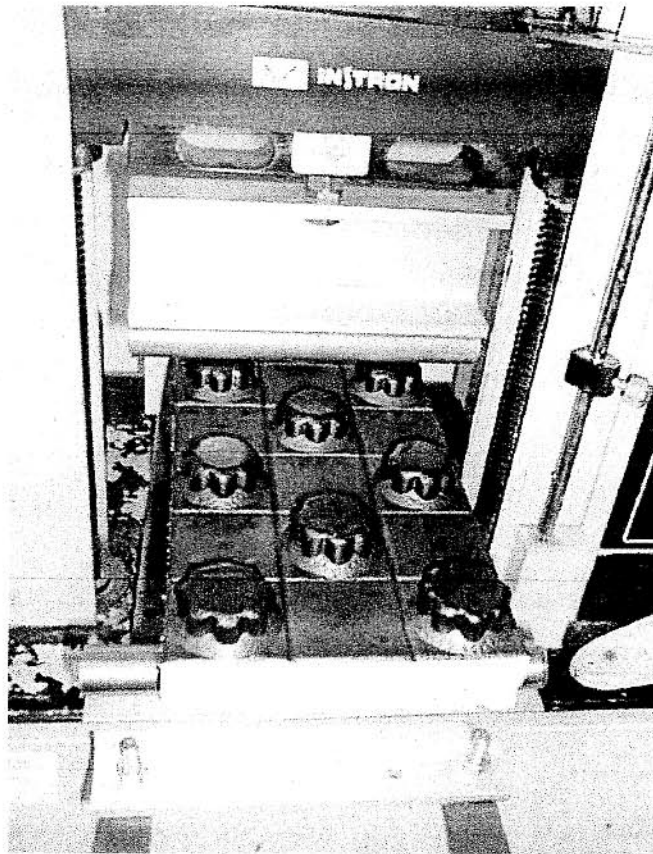
PR/VWJ/pr
2 cc: client

REVIEWED BY:



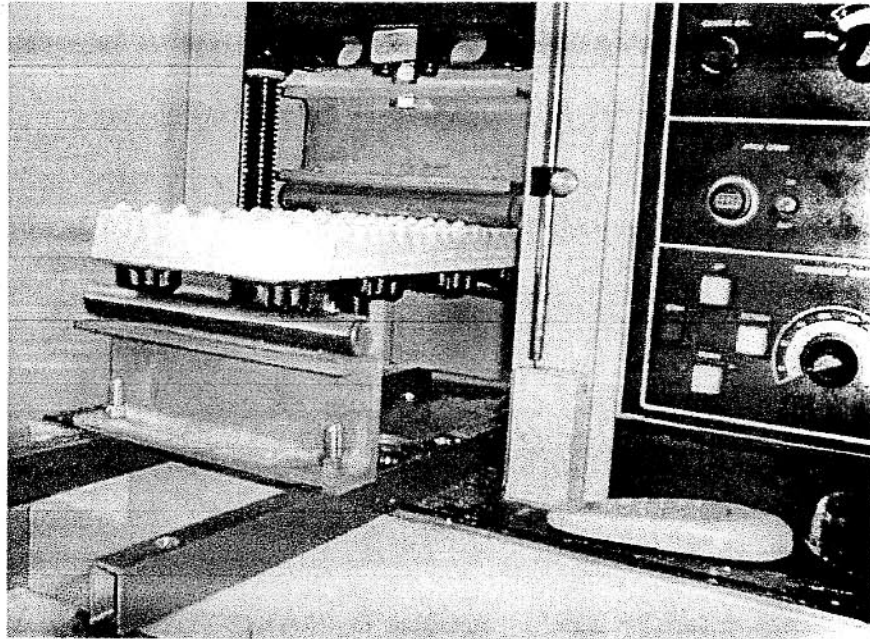
Vern W. Jones, C.E.T.
Manager
Physical Testing Services

APPENDIX



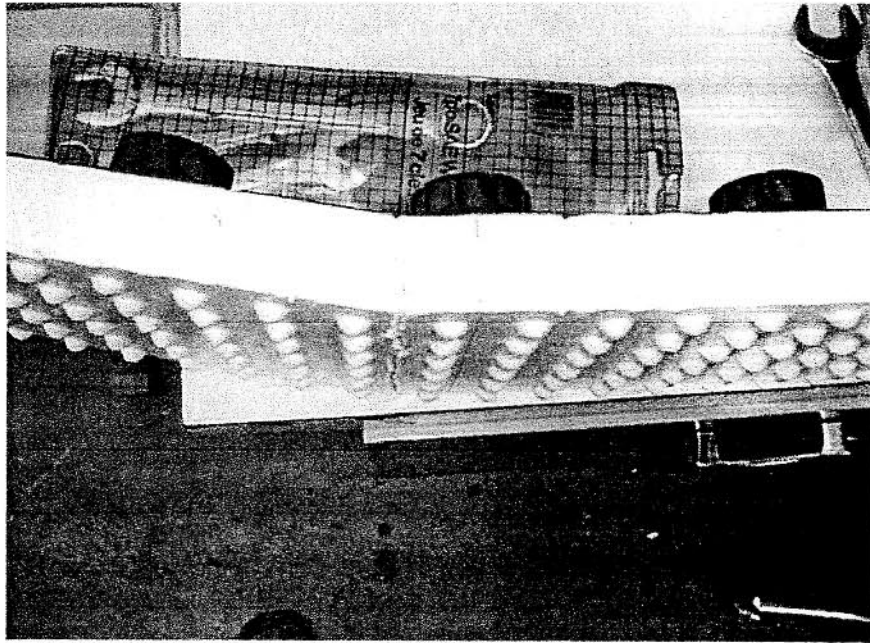
Photograph Number 1: Showing test specimen configuration and test set-up for flexural strength tests with exposed foam face in tension

APPENDIX continued



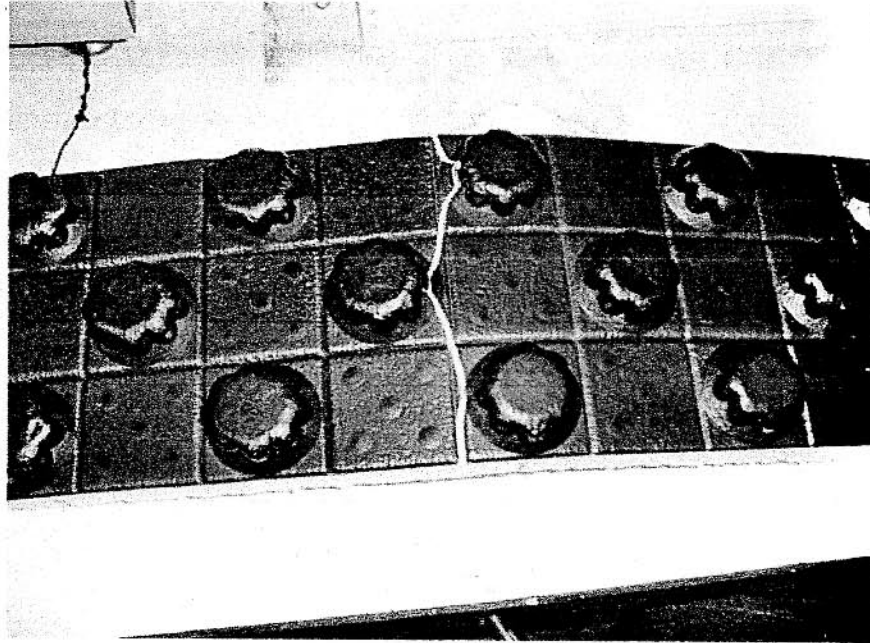
Photograph number 2: Showing test specimen configuration and test set-up for flexural strength tests with shell face in tension

APPENDIX continued



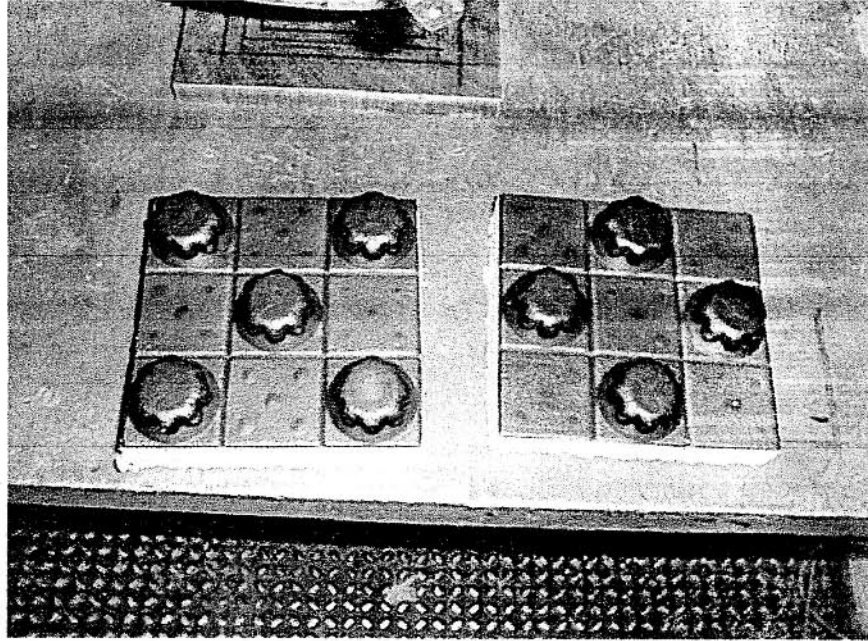
Photograph number 3: Showing mode of failure of specimens tested for flexural strength with exposed foam face in tension

APPENDIX continued



Photograph Number 4: Showing mode of failure of specimens tested for flexural strength with shell face in tension

APPENDIX continued



Photograph Number 5: Showing configuration of test specimens used for compressive resistance tests

**ASTM D 2863 Oxygen Index
of "EPS" Material**

A Report To: **Intertek Testing Services NA Ltd.**
3210 American Drive
Mississauga, Ontario
L4V 1B3

Phone: (905) 678-7820
(905)678-7131

Attention: Vern Jones C.E.T.

Submitted By: Fire Testing

Report No. 05-02-036(E)
3 pages + 1 page appendix

Date: January 31, 2005

ACCREDITATION Standards Council of Canada, Registration #1B.

REGISTRATION ISO 9001:2000, registered by QMI, Registration #001109.

SPECIFICATIONS OF ORDER

Determine limiting oxygen index in accordance with ASTM D 2863-97, as per our Quotation No. 03-06-426, and your Purchase Order No. C11822 dated January 20, 2005.

IDENTIFICATION

EPS material identified as: "#5 EZ". (BMTC sample identification number 05-02-S0036-5)

TEST RESULTS

ASTM D 2863


Standard Method for Measuring the Minimum Oxygen Concentration to Support Candle-like Combustion of Plastics

Percent Oxygen

<u>Ignition</u>	<u>Non-ignition</u>
-	21.9
30.0	-
29.5	-
29.0	-
	28.5
29.0	-
-	28.9
29.0	-
-	28.9
29.0	-

Oxygen Index = 29.0%


R.A. Carleton
Fire Testing.


Richard J. Lederle
Fire Testing.

Note: This report consists of 3 pages, including the cover page, that comprise the report "Body". It should be considered incomplete if all pages are not present. Additionally, the Appendix of this report comprises a cover page, plus 1 page.

Bodycote Materials Testing Canada Inc.

ASTM D 2863 Oxygen Index of "EPS" Material

For: Intertek Testing Services NA Ltd.

Report No. 05-02-036(E)

APPENDIX

(1 Page)

Summary of Test Procedure

ASTM D 2863-97

Standard Method for Measuring the Minimum Oxygen Concentration
to Support Candle-like Combustion of Plastics

The minimum concentration of oxygen in a mixture of oxygen and nitrogen, flowing upward in a test column that will just support combustion, is measured under equilibrium conditions of candle-like burning. The equilibrium is established by the relation between the heat generated from the combustion of the specimen and the heat lost to the surroundings as measured by one or the other of two arbitrary criteria - a time of burning or a length of specimen burned. This point is approached from both sides of the critical oxygen concentration in order to establish the oxygen index.