TEST REPORT

REPORT NUMBER: 3178560TOR-006a
ORIGINAL ISSUE DATE: March 10, 2010

EVALUATION CENTER

INTERTEK
6225 Kenway Drive
Mississauga, ON L5T 2L3

RENDERED TO

POLYCRETE INCORPORATED /
6958150 CANADA INC,
355 rue des RECOLLETS,
MONTREAL, QUEBEC CANADA H2Y 1V9

PRODUCT EVALUATED: Polycrete Flex 850 and Polycrete Big Block Insulated Concrete Forms

EVALUATION PROPERTY: ICC-ES AC 353 Requirements for Expanded Polystyrene Foam Plastic Insulation

Report of Testing Polycrete Flex 850 Type IX and Polycrete Big Block Type II Expanded Polystyrene Foam Panel components the following criteria: ICC-ES AC 353 *Acceptance Criteria for Stay-in-Place, Foam Plastic Insulating Concrete Form (ICF) System for Solid Concrete Walls* dated October 2007.

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2 Introduction

Intertek Testing Services North America Limited (Intertek) has conducted a testing program for Polycrete Incorporated / 6958150 Canada Incorporated (Polycrete) on Polycrete Flex 850 Type IX and Polycrete Big Block Type II Insulated Concrete Forms (ICF) expanded polystyrene (EPS) panel components. This testing was conducted to determine the physical properties of the EPS foam panel components of the noted Polycrete ICF products in accordance with ICC-ES AC 353 *Acceptance Criteria for Stay-in-Place, Foam Plastic Insulating Concrete Form (ICF) System for Solid Concrete Walls* dated October 2007 referencing ASTM C578-07 *Specification for Rigid, Cellular Polystyrene Thermal Insulation*.

3 Test Samples

3.1. SAMPLE SELECTION

The subject test specimens are traceable samples selected from the manufacturers Quebec facility located at 2450 rue Jules Vachon, Trois-Rivieres Quebec, Canada. The products were witnessed and verified of normal manufacturing procedures by Intertek representative Jean-Philippe Plourde on October 19, 2009. The sample selection was conducted in compliance with Section 3.1 of ICC-ES AC 85.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Polycrete Flex 850 Type IX EPS Insulated Concrete Forms

Material:	Polycrete flex 850 Insulating Concrete Forms composed of EPS plastic foam insulation panels linked with steel cross ties inserted into plastic molding embedded into the EPS panels.
Material:	Type IX expanded polystyrene foam molded from ICC-ES AC12 approved MC590E expandable polystyrene beads.
Foam Panel Dimensions:	305 mm (12 in) high by 2438 mm (96 in) wide by 67 mm thick each side
Color:	White
Web Description:	PolyVinyl Chloride (PVC) reinforcing “T” shaped webs 2438 mm (96 in) 68 mm (2-11/16”) wide across the top with a 38 mm (1-1/2”) long centre leg are cast into one edge of each EPS foam panel. The leg of the “T” shaped web has 5.5 mm (7/32”) holes shaped 25 mm (1”) apart to accommodate the ends of steel wire connectors 4.7 mm (0.185”) diameter used to join the walls of the webs together. The plastic “T” shaped webs are used to join the foam panels together and serve as an anchor point for surface finishing materials.

Polycrete Big Block Type II EPS Insulated Concrete Forms

Material:	Polycrete Big Block Insulating Concrete Forms composed of EPS foam plastic insulation panels linked with steel web ties embedded into the EPS foam panels.
Panel Material:	Type II expanded polystyrene foam molded from ICC-ES AC12 approved MC590E expandable polystyrene beads.
Foam Panel Dimensions:	610 mm (24 in) high by 2438 mm (96 in) wide by 67 mm thick each side
Color:	White
Web Description:	Linked steel wire mesh 4.1 mm (0.160”) diameter webs are cast into EPS foam to create a positive connection between interior and exterior EPS walls with 2438 mm (96”) long 13 mm (0.5”) wide 0.7 mm (0.028”) thick steel strips welded the wire mesh to serve as an anchor point for surface finishing materials.

4 Testing and Evaluation Methods

4.1. DENSITY

The density was determined in accordance with ASTM D1622-03 “Standard Test Method for Apparent Density of Rigid Cellular Plastics” on a minimum of five specimens of each material type. The specimens were conditioned for at least 40 hours at 23±2°C (73±5 °F), and 50% relative, weighed using and then measured for length, width, and thickness at three points for each dimension. The density was calculated as follows:

$\mathbf{D = W_s / V}$ Where **D** = density, lbs/ft^3 (kg/m^3)
W_s = weight of specimen, lbs (kg)
V = volume of specimen, ft^3 (m^3)

4.2. COMPRESSIVE RESISTANCE

The compressive resistance was evaluated in accordance with ASTM D1621-04. Five specimens of each EPS type, measuring 6 in. (150 mm) long by 6 in. (150 mm) wide by 2 in. (50 mm) thick were prepared. Specimens were conditioned for a minimum of 40 hours at 73±5°F (23±2°C) and 50% relative humidity. The specimens were loaded at a constant rate until greater than 10% of thickness deformation was achieved. A plot of load versus deflection was recorded for each specimen and these results were used to calculate values for compressive resistance based on a 10 % core deformation as follows:

$\mathbf{S_C = W / A}$ Where **S_C** = compressive resistance, psi (N/mm^2)
W = load at 10% core deformation, lbf (N)
A = initial horizontal cross-sectional area, in^2 (mm^2)

4.3. FLEXURAL STRENGTH

The flexural strength was evaluated in accordance with ASTM C203-05a, Method 1, Procedure B which stipulates an outer fiber strain rate of 0.10 in/min. Nine specimens of each material type, three from each of three board or block samples measuring 12 in. (300 mm) long by 4 in. (100 mm) wide by 1 in. (25.4 mm) thick were prepared. Specimens were conditioned for at least 40 hours at 73±5 °F (23±2°C), and 50% relative humidity. Specimens were measured for length, width, and thickness at three points for each dimension. All specimens were simply supported with the original surface of the sample in tension and loaded to failure. The flexural strength was calculated as follows:

$\mathbf{S = 3PL / 2bd^2}$ Where **S** = stress in the outer fibers, psi (kPa)
P = ultimate load, lbf (N)
L = support span, in. (mm)
b = width of specimen, in. (mm)
d = depth of specimen, in. (mm)

5 Testing and Evaluation Results

Test results for the Polycrete Big Block ICF Type II EPS panels are found in Table 1 below.

Table 1. Physical Properties of Polycrete Big Block Type II EPS Panels			
Property	**Test Result**	**ASTM C 578 Type II**	**Pass / Fail**
Density, lb/ ft^3 (kg/m^3)	1.44 (20.60)	1.35 (22) min.	Pass
Flexural Strength, psi (kPa)	41.4 (285)	35.0 (240) min.	Pass
Compressive Strength, psi (kPa)	17.9 (123.5)	15.0 (104) min.	Pass

Test results for the Polycrete Flex 850 ICF Type IX EPS panels are found in Table 2 below.

Table 2. Physical Properties of Polycrete Flex 850 Type IX EPS Panels			
Property	**Test Result**	**ASTM C 578 Type IX**	**Pass / Fail**
Density, lb/ ft^3 (kg/m^3)	1.94 (30.93)	1.80 (29) min.	Pass
Flexural Strength, psi (kPa)	67.2 (463)	50.0 (345) min.	Pass
Compressive Strength, psi (kPa)	32.7 (225.8)	25.0 (173) min.	Pass

6 Testing Equipment

Equipment Description	Intertek Equipment Description	Calibration due date	Measurement of Uncertainty
Baldwin Universal Tester	280-01-0015	September 16, 2010	0.25%
0-1” Linear Transducer	280-01-0038	January 21, 2010	0.10%
0-1” Linear Transducer	280-01-0656	January 21, 2010	0.10%
Instron Model 1000 Universal Tester	280-01-0082	September 28, 2010	0.25%
Mitutoya Vernier	280-01-0909	August 25, 2010	0.03%
ABS204-S/Fact model Mettler Toledo analytical balance	280-01-0832	September 28, 2010	0.10%
Hot Pack, 175 Series Environmental Chamber Model No. 47532, Serial No. 74571	280-01-0133	December 10, 2010	0.70%

7 Conclusion

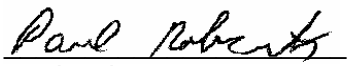
Intertek has conducted a testing program for 6958150 Canada Incorporated / Polycrete (Polycrete) on Polycrete Flex 850 Type IX and Polycrete Big Block Type II ICF EPS panel components. This testing was conducted to determine the physical properties of the EPS foam panel components of the noted Polycrete ICF products in accordance with ICC-ES AC 353 *Acceptance Criteria for Stay-in-Place, Foam Plastic Insulating Concrete Form (ICF) System for Solid Concrete Walls* dated October 2007 referencing ASTM C578-07 *Specification for Rigid, Cellular Polystyrene Thermal Insulation*.

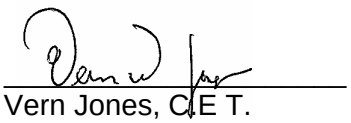
Polycrete Big Block Type II EPS material molded using StyroChem MC90E Expanded Polystyrene Beads has met the requirements for flexural strength, compressive resistance and density for use as Type II material in accordance with ASTM C578-07 as outlined in Sect**ion** 5 of this report.

Polycrete Flex 850 Type IX EPS material molded using StyroChem MC90E Expanded Polystyrene Beads has met the requirements for flexural strength, compressive resistance and density for use as Type IX material in accordance with ASTM C578-07 as outlined in Sect**ion** 5 of this report.

Tested by: Paul Roberts

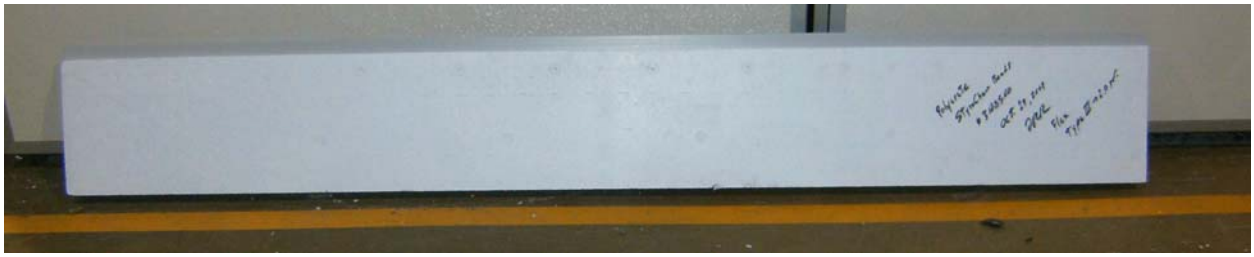
INTERTEK

Reported by: 
Paul Roberts
Physical Testing Services

Reviewed by: 
Vern Jones, C.E.T.
Manager
Physical Testing Services

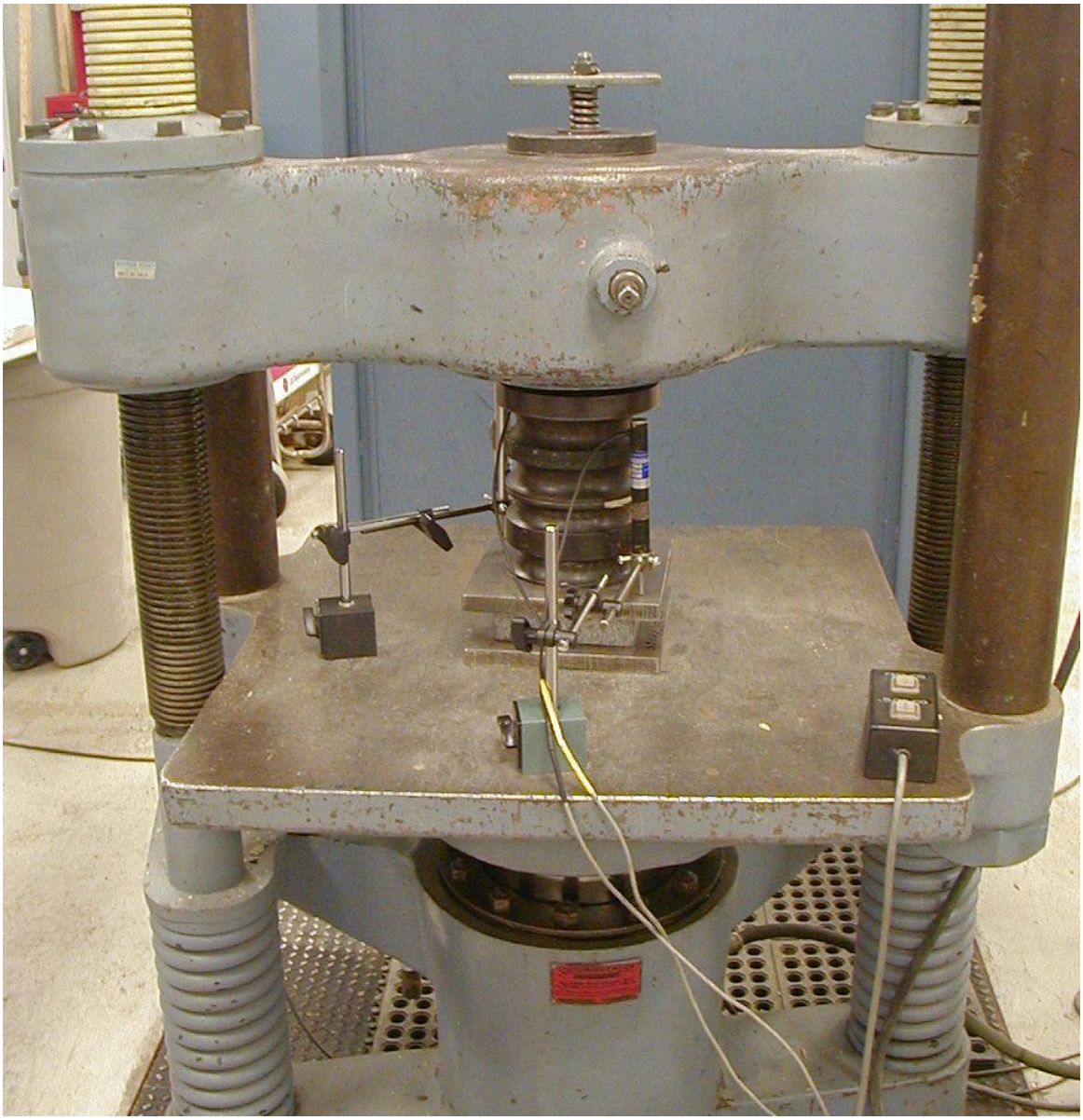
APPENDIX A

Photographs (3 Pages)



Photograph No. 1: Showing a typical Polycrete flex 850 Insulating Concrete Forms wall panel sample

Photograph No. 2: Showing a typical Polycrete Big Block Insulating Concrete Forms sample



Photograph No. 3: Showing the test setup for compressive resistance.

Photograph No. 4: Showing test setup for flexural strength

APPENDIX B

Test Results (6 Pages)

Test: **Expanded Polystyrene Density**

Date: March 11, 2010 **Project:** 3178559

Client: Polycrete Inc. **Eng/Tech:** Robert Giona

Product: Bigblock Type II Expanded Polystyrene **Bead:** **Styrochem**

Test Method(s): ICC ES AC 12 - February 2006 Acceptance Criteria for Foam Plastic Insulation
ASTM C578-08 Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM D1622-03 Test Method for Apparent Density of Rigid Cellular Plastics

Conditioning: 88 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Equipment: Mitutoyo Digital Calipers (Intertek ID 280 01 0909))
Digital Scale (Intertek ID 280 01 0075)

Sample	Length (inch)			Width (inch)			Depth (inch)			Volume	Weight	Density
	L1	L2	L3	W1	W2	W3	D1	D2	D3	(ft3)	(lbs)	(lbs/ft^3)
1	11.98	11.97	11.07	11.95	11.99	11.98	2.51	2.51	2.55	0.2041	0.3000	1.47
2	11.98	11.98	12.00	11.98	11.97	11.97	2.49	2.49	2.52	0.2073	0.2984	1.44
3	11.98	11.98	11.98	11.99	11.98	11.97	2.50	2.51	2.58	0.2099	0.2987	1.42
											Mean:	**1.44**
											StdDev:	**0.02**
											COV:	**1.64%**

Test: **Expanded Polystyrene Density**

Date: March 11, 2010 **Project:** 3178559

Client: Polycrete Inc. **Eng/Tech:** Robert Giona

Product: Flex 850 Type IX Expanded Polystyrene **Bead:** **Styrochem**

Test Method(s): ICC ES AC 12 - February 2006 Acceptance Criteria for Foam Plastic Insulation
ASTM C578-08 Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM D1622-03 Test Method for Apparent Density of Rigid Cellular Plastics

Conditioning: 88 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Equipment: Mitutoyo Digital Calipers (Intertek ID 280 01 0909))
Digital Scale (Intertek ID 280 01 0075)

Sample	Length (inch)			Width (inch)			Depth (inch)			Volume	Weight	Density
	L1	L2	L3	W1	W2	W3	D1	D2	D3	(ft3)	(lbs)	(lbs/ft^3)
1	6.02	6.03	6.02	6.03	6.03	6.02	2.50	2.51	2.50	0.052	0.1025	1.95
2	6.02	6.02	6.02	6.03	6.03	6.03	2.50	2.51	2.50	0.053	0.1031	1.96
3	6.02	6.03	6.03	6.01	6.02	6.03	2.50	2.50	2.50	0.053	0.1011	1.93
											Mean:	**1.94**
											StdDev:	**0.02**
											COV:	**0.87%**

Intertek

Test: **Flexural Strength**

Date: 27-Nov-09 Project No: 3178560

Client: Polycrete Eng/Tech: P. Roberts

Product: Big Block EPS Foam Type II StyroChem Bead

Specimen Thickness: 1.00 in 25.4 mm

Test Method(s): ASTM C578-06 Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C203-05a Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation

Loading: Method I, Procedure B (Centre-Point)

Conditioning: 40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Support Span: 10.00 in 254 mm

Crosshead Speed: 1.667 in/min 42.33 mm/min

Bearing Edges: 1.25 in 31.8 mm

Equipment: *Loading:* Instron 1000 (inventory no.: 280-01-0082)
Load Cell: Model:1926 (0-100 lb.)
Dimensions: Mitutoyo (inventory no.: 280-01-0909)

Sample	Width (mm)			Depth (mm)			Max Load		Flexural Strength	
	W1	W2	W3	D1	D2	D3	(lbs)	(N)	(kPa)	(psi)
1A	101.52	101.68	101.67	25.87	25.96	25.94	11.75	52.3	292	42.3
1B	102.42	102.79	102.72	25.92	25.91	25.98	12.00	53.4	295	42.7
1C	102.75	102.66	102.59	26.06	26.12	25.84	11.82	52.6	288	41.8
2A	101.95	102.03	102.15	26.04	26.03	26.06	11.54	51.3	283	41.0
2B	103.04	102.76	102.41	26.04	26.09	26.03	12.02	53.5	292	42.4
2C	102.14	101.99	101.86	26.19	26.27	26.01	12.19	54.2	296	42.9
3A	102.49	102.67	102.51	26.07	26.10	26.01	11.49	51.1	280	40.6
3B	102.13	101.78	102.33	25.90	25.88	25.87	11.01	49.0	273	39.6
3C	102.67	102.79	103.03	26.13	26.08	25.89	11.03	49.1	268	38.9
								Mean:	**285**	**41.4**
								StdDev:	**9.9**	**1.4**
								COV:	**3.47%**	**3.47%**

Intertek

Test:	**Flexural Strength**					
Date:	27-Nov-09				Project No:	3178560
Client:	Polycrete				Eng/Tech:	P. Roberts
Product:	Flex 850 System EPS Foam Type IX			StyroChem Bead		
Specimen Thickness:	1.00	in	25.4	mm		
Test Method(s):	ASTM C578-06 Specification for Rigid, Cellular Polystyrene Thermal Insulation					
	ASTM C203-05a Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation					
Loading:	Method I, Procedure B (Centre-Point)					
Conditioning:	40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%					
Support Span:	10.00	in	254	mm		
Crosshead Speed:	1.667	in/min	42.33	mm/min		
Bearing Edges:	1.25	in	31.8	mm		
Equipment:	*Loading:*	Instron 1000	(inventory no.:	280-01-0082)		
	Load Cell:	Model:1926	(0-100 lb.)			
	Dimensions:	Mitutoyo	(inventory no.:	280-01-0909)		

Sample	Width (mm)			Depth (mm)			Max Load		Flexural Strength	
	W1	W2	W3	D1	D2	D3	(lbs)	(N)	(kPa)	(psi)
1A	103.45	103.61	102.95	26.45	26.65	26.66	21.00	93.4	487	70.7
1B	102.86	102.88	103.19	27.04	27.13	27.16	20.40	90.7	457	66.3
1C	103.36	103.31	103.28	27.19	27.01	26.88	21.00	93.4	472	68.4
2A	102.26	102.10	101.94	25.75	25.69	25.68	17.90	79.6	450	65.2
2B	101.98	102.07	102.22	26.11	26.02	25.80	19.00	84.5	467	67.8
2C	102.21	102.18	102.23	26.17	26.16	25.94	19.00	84.5	463	67.1
3A	102.46	102.39	102.42	26.04	26.12	26.12	19.60	87.2	476	69.1
3B	102.09	102.13	102.13	26.03	26.00	25.69	18.00	80.1	445	64.6
3C	102.13	102.04	102.10	26.08	26.13	26.08	18.50	82.3	451	65.4
								Mean:	**463**	**67.2**
								StdDev:	**13.9**	**2.0**
								COV:	**3.00%**	**3.00%**

Intertek

Test: **Compressive Strength**

Date: 26-Nov-09 Project No: 3178560

Client: Polycrete Eng/Tech: P Roberts

Product: Big BlockEPS Foam Type II Big Block StyroChem Bead

Specimen Thickness: 2.50 in 63.5 mm

Test Method(s): ASTM C578-06 Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM D1621-04 Method for Compressive Properties of Rigid Cellular Plastics

Conditioning: 40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Crosshead Speed: 0.25 in/min 6.35 mm/min

Deformation at 10% 0.25 in 6.35 mm

Equipment: *Loading:* Baldwin (inventory no. 280-01-0015)
Load Cell:
Deflection: Transducers (inventory no. 280-01-0038 and 280-01-0656)
Dimensions: Mitutoyo (inventory no. 280-01-0909)

Sample	Length (mm)			Width (mm)			Thickness (mm)		
	L1	L2	L3	W1	W2	W3	D1	D2	D3
1	153.05	153.42	153.67	151.97	153.01	153.13	63.04	63.01	63.13
2	152.10	152.61	152.45	153.57	153.44	153.16	63.23	63.37	63.10
3	151.82	152.77	151.72	152.88	152.92	153.31	63.26	63.23	63.32
4	151.92	152.51	152.42	153.75	153.67	153.87	62.99	62.92	63.04
5	152.05	152.62	152.58	153.02	153.81	153.97	62.65	62.73	62.73

Sample	Load at 10% Deformation		Compressive Strength	
	(lbs)	(N)	(kPa)	(psi)
1	677	3011	128.6	18.6
2	616	2740	117.2	17.0
3	627	2789	119.8	17.4
4	667	2967	126.7	18.4
5	658	2927	125.0	18.1
		Mean:	**123.5**	**17.9**
		StdDev:	**4.8**	**0.7**
		COV:	**3.87%**	**3.87%**

Intertek

Test: **Compressive Strength**

Date: 25-Nov-09 Project No: 3178560

Client: Polycrete Eng/Tech: P Roberts

Product: Flex System EPS Foam Type IX StyroChem Bead

Specimen Thickness: 2.50 in 63.5 mm

Test Method(s): ASTM C578-06 Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM D1621-04 Method for Compressive Properties of Rigid Cellular Plastics

Conditioning: 40 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Crosshead Speed: 0.25 in/min 6.35 mm/min

Deformation at 10%: 0.25 in 6.35 mm

Equipment: *Loading:* Baldwin (inventory no. 280-01-0015)
Load Cell:
Deflection: Transducers (inventory no. 280-01-0038 and 280-01-0656)
Dimensions: Mitutoyo (inventory no. 280-01-0909)

Sample	Length (mm)			Width (mm)			Thickness (mm)		
	L1	L2	L3	W1	W2	W3	D1	D2	D3
1	152.87	153.05	152.94	153.09	153.08	152.88	63.44	63.67	63.39
2	152.94	153.01	152.97	153.15	153.28	153.26	63.60	63.84	63.59
3	153.01	153.12	153.24	152.63	152.95	153.05	63.51	63.57	63.46
4	153.51	153.66	153.22	153.15	153.67	153.94	63.39	63.35	63.34
5	152.98	153.69	153.00	153.25	153.64	153.48	63.38	63.32	63.16

Sample	Load at 10% Deformation		Compressive Strength	
	(lbs)	(N)	(kPa)	(psi)
1	1208	5373	229.6	33.3
2	1214	5400	230.4	33.4
3	1184	5267	225.0	32.6
4	1169	5200	220.6	32.0
5	1180	5249	223.2	32.4
		Mean:	225.8	32.7
		StdDev:	4.2	0.6
		COV:	1.85%	1.85%