

***Confirmatory Testing of Expanded Polystyrene (EPS) Foam:  
Density, Flexural and Compression Strength***

**Final Report #3068980  
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*for*  
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## 2 Preface

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### 3 Introduction

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Intertek Testing Services NA Ltd. (Intertek) has conducted a confirmatory test program for Phil-Insul Corporation (Phil-Insul) on an expanded polystyrene (EPS) foam product. The program was carried out to determine whether the material would comply with ASTM C 578-03 Standard "*Specification for Rigid, Cellular Polystyrene Thermal Insulation*" (referred to as ASTM C 578-03 in this report). This evaluation was completed in the month of April 2005.

### 4 Materials and Methods

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#### 4.1. SAMPLE SELECTION

Intertek representative, Kenny Heitzman, selected a series of Phil-Insul's IntegraSpec Insulated Concrete Forms (ICF) on March 17, 2005. The product was manufactured at Contour Products Ltd., 4001 Kaw Street, Kansas City, Kansas, 66210. The panels were selected as follows:

Production Lot No.	Raw Material Identification	Bead Manufacturer	Address
J428214S20	BASF BFL 422	BASF Corporation	1065 Cranbury and South River Road, Jamesburg, New Jersey 08861
594264	Starex SF301H	Cheil Industries, Inc.	Yosso Plant Chemical Division Cheil Industries, Inc. 62, Pyong Yo-Dong, Yosso-Shi, Cheon Nam, Korea

The sample selection process was carried out in accordance with ICC Evaluation Services AC 85 "*Acceptance Criteria for Test Reports and Product Sampling*" dated July 2003.

#### 4.2. TEST PROCEDURES

##### 4.2.1. Conditioning

Before testing, prepared specimens were held in standard laboratory conditions for at least 88 hours at a temperature of  $23 \pm 2^\circ\text{C}$  and relative humidity of  $50 \pm 5\%$  in accordance with ASTM C 870-96.

##### 4.2.2. Density

The density was determined in accordance with ASTM D 1622-03 on a minimum of six specimens measuring 100 mm (4 in.) long x 100 mm (4 in.) wide by 25.4 mm (1 in.) thick. The specimens were weighed, and then measured for length, width, and thickness at three points for each dimension. The density was calculated as follows:

$$D = W_s / V$$

Where D = Density,  $\text{kg/m}^3$  ( $\text{lbs/ft}^3$ )  
W<sub>s</sub> = weight of specimen, kg (lbs)  
V = volume of specimen,  $\text{m}^3$  ( $\text{ft}^3$ )

### 4.2.3. Flexural Strength

The flexural strength was evaluated using ASTM C 203-99, Method 1. To comply with the US test requirement, Procedure A (section 10.1) was adopted which stipulates an outer fiber strain rate of 0.01 in/in/min.

Six samples measuring 300 mm (12 in.) long by 100 mm (4 in.) wide by 25.4 mm (1 in.) thick were prepared. All specimens were simply supported and loaded to failure. The flexural strength was calculated as follows:

$$S = 3PL / 2bd^2$$

Where

- S = Stress in the outer fibers, kPa (psi)
- P = Ultimate load, N (lbf)
- L = Support span, mm (in.)
- b = width of specimen, mm (in.)
- d = width of specimen, mm (in.)

### 4.2.4. Compressive Strength

The compressive strength was evaluated using ASTM D 1621-00. Six specimens measuring 100 mm (4 in.) long x 100 mm (4 in.) wide by 25.4 mm (1 in.) thick were prepared. A plot of load versus deflection was recorded for each specimen and these results were used to calculate values for compressive strength based on a 10 % core deformation as follows:

$$E_c = WH / AD$$

Where

- E<sub>c</sub> = modulus of elasticity in compression, Pa (psi)
- W = Load, N (lbf)
- H = initial specimen height, mm (in.)
- A = initial horizontal cross-sectional area, mm<sup>2</sup> (in<sup>2</sup>.)
- D = deformation, mm (in.)

## 5 Test Results

The EPS foam density, flexural strength, and compressive strength test results, together with physical property requirements of ASTM C 578-03 are shown in Table 1 below. A full set of test results is available upon request.

Table 1. Physical Properties as per US requirements					
Physical Property	Test Results		Specification <sup>1</sup>		Pass/Fail
	BASF BFL 422	Samsung SF 301H	Minimum	Maximum	
Density, lbs/ft <sup>3</sup>	1.63	1.68	1.35	---	Pass
Flexural Strength, psi	49.0	56.0	35.0	---	Pass
Compressive Strength, psi	23.1	26.1	15.0	---	Pass


<sup>1</sup>Type II specifications


## 6 Conclusion

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The EPS foam product identified and evaluated in this report has met density, flexural strength and compressive strength requirements of ASTM C 578-03 Standard "Specification for Rigid, Cellular Polystyrene Thermal Insulation."

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