

***Fastener Withdrawal and Lateral Resistance Testing of Airlite Fox Blocks to ASTM D1761-88: Standard Test Methods for Mechanical Fasteners in Wood***

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## REVISION SUMMARY

Revision Date	Section Revised		Type of Revision	Technician Initials	Reviewer Initials
19 Mar 07	4.4.1	Fastener Withdrawal	Added sentence "The allowable design . . . Section 4.0 of AC 116 dated March 2005.	A.S.	
	4.4.2	Fastener Lateral Resistance			
	5	Test Results	Added allowable design values for withdrawal and lateral resistance.		
	App	Appendix A			

## 2 Preface

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## 3 Introduction

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Intertek Testing Services NA Ltd. (Intertek) personnel have conducted a test program for Airlite Plastics on plastic web products. Fastener withdrawal capacity and fastener lateral resistance tests were carried out in accordance with ASTM D1761-88 "*Standard Test Methods for Mechanical Fasteners in Wood*" (reapproved 2000). This evaluation was completed during the month of August 2006.

## 4 Materials and Methods

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### 4.1. SAMPLE SELECTION

All samples were provided by the client on August 18, 2006. The product was an expanded polystyrene coated web intended for use as a concrete form. The product dimensions can be found in Appendix C.

An IR scan was performed to identify the material. See Appendix B for the IR scan results.

### 4.2. SPECIMEN PREPARATION

All specimens were cut to the required dimensions using a table saw and radial arm saw.

### 4.3. CONDITIONING

Before testing, all specimens were held in standard laboratory conditions for at least 24 hours at a temperature of  $23 \pm 2^\circ\text{C}$  and relative humidity of  $50 \pm 5\%$  in accordance with ASTM C870-96.

### 4.4. TEST PROCEDURES FOR REINFORCING TIES

#### 4.4.1. Fastener Withdrawal

The fastener withdrawal was evaluated in accordance with ASTM D1761-88. Ten specimens were prepared, each consisting of a representative section of the ICF block with the fastener driven through the insulation and into the reinforcing tie. The fasteners were then withdrawn at a constant rate of 2.54 mm (0.1 in.)/min. in a self-aligning test assembly and loading machine. The maximum load for each specimen was measured and reported. The allowable design load for fastener withdrawal was calculated as per Section 4.0 of AC 116 dated March 2005.

#### 4.4.2. Fastener Lateral Resistance

The fastener lateral resistance was evaluated in accordance with ASTM D1761-88. Ten specimens were prepared, each consisting of a representative section of the ICF block, and additional sections of  $\frac{1}{2}$  in. Douglas fir code-approved sheathing. For each specimen assembly, a fastener was driven through the section of sheathing, insulation, then into the reinforcing tie. Each specimen assembly was laterally supported in a test jig and placed in a compression loading apparatus. A self-aligning load head applied a lateral load evenly across the top edge of the sheathing at a constant rate of 2.54 mm (0.1 in.)/min. The maximum load and load at 0.1 in deflection for each specimen was measured and reported. The allowable design load for fastener lateral resistance was calculated as per Section 4.0 of AC 116 dated March 2005.

## 5 Test Results

The fastener withdrawal and fastener lateral resistance test results are presented in Table 1 and 2 respectively. A full set of test results is included in Appendix A.

Fastener Description	Paulin (sku #)
1) #10 wood screw	197-702
2) Type W coarse thread drywall screw	NA
3) Type S fine thread drywall screw	NA
4) Ring shank nail (bright ringed common)	NA
5) #8 exterior deck screw	214-545

**Table 1. Fastener Withdrawal Test Data**

Fastener	Length (in)	Test Result (lbf)	COV (%)	Allowable Design Load <sup>1</sup>	Failure Mode
# 10 Wood Screw	1 ½	133	9.0	27	Fastener Pull Out
Coarse Thread Drywall Screw	1 5/8	124	7.3	25	Fastener Pull Out
Fine Thread Drywall Screw	1 5/8	122	20.0	24	Fastener Pull Out
Ring Shank Nail	1 ¼	68	12.9	14	Fastener Pull Out
#8 Exterior Deck Screw	2	134	9.6	27	Fastener Pull Out

<sup>1</sup> Allowable design load calculate as per Section 4.0 of AC 116 dated March 2005

**Table 2. Fastener Lateral Resistance Test Data**

Fastener	Length (in)	Test Result (lbf)	COV (%)	Allowable Design Load <sup>1</sup>	Failure Mode
# 10 Wood Screw	2 ½	293	8.3	92	Web Separation
• Load at 0.1 in		48			
Coarse Thread Drywall Screw	1 5/8	123	17.1	36	Screw Head Failure
• Load at 0.1 in		37			
Fine Thread Drywall Screw	1 5/8	123	21.7	33	Screw Head Failure
• Load at 0.1 in		50			
Ring Shank Nail	2	103	24.8	23	Fastener Pull Out
• Load at 0.1 in		20			
#8 Exterior Deck Screw	2	252	19.1	70	Web Separation
• Load at 0.1 in		75			

Note - #6 and #8 screw results are located in Appendix A

<sup>1</sup> Allowable design load calculate as per Section 4.0 of AC 116 dated March 2005

## 6 Conclusion

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The Airlite plastic webs identified and evaluated in this report has been tested in accordance with ASTM D1761-88 "*Standard Test Methods for Mechanical Fasteners in Wood*" (reapproved 2000). The product was evaluated for fastener withdrawal and fastener lateral resistance using seven standard fasteners as presented in Section 5 of this test report.

### INTERTEK TESTING SERVICES NA LTD.

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Reviewed by:



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## **Appendix A: Test Data (49 pages)**

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# ETL SEMKO

Test: **Fastener Withdrawal**  
 Date: 18-Aug-06 Project: 3103286 Eng/Tech: Kevin Saito  
 Client: Airlite Plastics Josh Chapman  
 Product: EPS  
 Fastener: **Coarse Drywall Screws**  
 Fastener Length: **1 5/8 in**  
 Method: ASTM D1761-06 Standard Test Methods for Mechanical Fasteners in Wood  
 Conditioning: 7 days at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%  
 Crosshead Speed: 0.1 in/min  
 Support diameter: in.  
 Equipment: Instron (Intertek ID 000568)  
 Mitutoyo Digital Calipers (Intertek ID P52606)  
 25K Load Cell (Intertek ID 000567)

Specimen	Failure Mode	Maximum Load		Allowable Design Load	
		(lbf)	(N)	(lbf)	(N)
1	Fastener Pullout	141	629	28	126
3	Fastener Pullout	119	528	24	106
4	Fastener Pullout	127	564	25	113
5	Fastener Pullout	115	509	23	102
6	Fastener Pullout	120	533	24	107
7	Fastener Pullout	121	539	24	108
8	Fastener Pullout	124	550	25	110
9	Fastener Pullout	133	593	27	119
10	Fastener Pullout	113	504	23	101
Mean:		123.6	550	24.7	110
StdDev:		9.0	40.2	1.8	8.0
COV:		7.3%	7.3%	7.3%	7.3%