

# ETL SEMKO

## *Physical Testing of 10 mm Sure Cavity™ Membrane*

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*Applicant:*  
Masonry Technology Inc.  
24235 Electric Street  
Cresco, Iowa 52136



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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 test program for Masonry Technology Inc. on an open drainage membrane. This evaluation was completed in the month of August 2006.

### **4 Materials and Methods**

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#### **4.1. SAMPLE SELECTION**

Intertek representative, Allen Zepper, selected a series of finished rolls of open drainage membrane on July 27, 2006. The membrane was selected and manufactured at Masonry Technology, 24235 Electric Street, Cresco, IA 52136. The sample selection process was carried out in accordance with independent approved sampling procedures.

The material was identified as 10 mm Sure Cavity™. Sure Cavity™ is a perforated 0.024 in. (0.6 mm) thick high impact polystyrene strip formed with 0.39 in. (10 mm) deep corrugations and 31.5 in. wide with a spunbonded polypropylene fabric on one side with a 2 in. (51 mm) skirt on one edge.

A roll of polystyrene prior to corrugations and perforations being added was supplied by the manufacturer to complete tensile and elongation testing. This sample was received at the Intertek laboratory on September 15, 2006. An IR scan was performed to verify the identity of this sample material.

#### **4.2. SPECIMEN PREPARATION**

All specimens were cut to the required dimensions using a sharp knife.

#### **4.3. TEST PROCEDURES**

##### **4.3.1. Conditioning**

Before testing, all 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 C870-96.

##### **4.3.2. Thickness and Weight**

Thickness was measured using digital calipers. The mean value of ten measurements determined the thickness. Weight per unit area was calculated for three samples approximately 10 in. (250 mm) square, ignoring the effect of protrusions and bubbles. Dimensions were measured to the nearest 0.02 in. (0.5 mm), and weight was measured using a balance with a resolution of 0.001 g.

#### 4.3.3. Dynamic Impact Test

Three specimens measuring approximately 3.5 in. (90 mm) square were tested with an impact tester using a 2.2 lbs (1 kg) impact load, an impactor with a flat impact end with cross sectional area of 0.15 in<sup>2</sup> (100 mm<sup>2</sup>), and an aluminum block as substrate. The impactor was released from a height of 9.8 in. (250 mm). The test was repeated five times on each specimen for a total of 15 impacts. The specimens were then visually examined for indentation and punctures.

#### 4.3.4. Static Puncture

Three specimens measuring approximately 3.5 in. (90 mm) square, were tested. A 55.1 lbs (25 kg) weight was placed onto the surface of each specimen for one hour. A flat aluminum block was used as a substrate. The load was applied through a tip with cross-sectional area of 0.155 in<sup>2</sup> (100 mm<sup>2</sup>). The test was conducted at two different spots on each specimen and then visually examined for indentation and punctures.

#### 4.3.5. Low-temperature Flexibility

Three specimens measuring approximately 2.5 in. x 5 in. (60 mm x 120 mm), and a 0.125 in. diameter (3.2 mm) mandrel, were conditioned at -22 ± 1°F (-30 ± 1.5°C) for two hours. Each specimen were bent over the mandrel through 180° in 1 to 1.5 seconds and then visually examined.

#### 4.3.6. Water Vapor Permeance

The water permeance was determined as per ASTM E96-00, Procedure B Water Method. Four 9 in. (228 mm) diameter specimens were prepared for testing. Three test dishes with the same measurements were filled with distilled water to within 3/4 in. (19 mm) of the top. The circular specimens were then attached to the top of each dish by sealing the perimeter of the material to the dish with a molten wax blend. An additional control specimen was prepared in an identical manner to the other three test specimens with the exception that no distilled water was placed in the dish. The four assemblies were placed in a controlled chamber operating at a temperature and relative humidity of 23°C and 50% respectively. The assemblies were then weighed periodically until (eight) 8 data points were obtained. The water-vapor permeance was calculated as follows:

$$WVT = G/tA$$

$$WVP = WVT/\Delta P = WVT/S (R_1 - R_2) 0$$

Where:	WVT	=	rate of water vapor transmission, g/m <sup>2</sup> s
	G	=	weight change, g
	t	=	time during which G occurred
	A	=	moisture transfer area, m <sup>2</sup>
	WVP	=	Permeance, g/Pa s m <sup>2</sup>
	ΔP	=	vapor pressure difference, Pa
	S	=	saturation vapor pressure at test temperature, Pa
	R <sub>1</sub>	=	relative humidity at the source expressed as a fraction
	R <sub>2</sub>	=	relative humidity at the vapor sink expressed as a fraction
	0	=	overlap factor

#### 4.3.7. Tensile Strength and Elongation

Five specimens, 0.5 in. (12.7 mm) wide x 3.94 in. (100 mm) long were cut in both machine and cross-machine directions from flat material. Each specimen was tested using a tensile testing machine equipped with self-aligning grips with an initial separation of 2.95 in. (75 mm). The loading rate was 2.95 in. (75 mm) per minute. The breaking strength was based on the maximum load recorded. Elongation was based on the extension at the point. The elongation calculation was summarized as follows:

$$E = 100(L_O - L_F)/L_O \quad \text{where:} \quad \begin{array}{ll} E & = \text{elongation, \%} \\ L_a & = \text{original length, m} \\ L_F & = \text{final length, m} \end{array}$$

#### 4.3.8. Water Immersion

Three specimens, measuring approximately 4 in. (100 mm) square were prepared from flat material and then placed in a water bath at 122°F (50°C) for seven days. Each specimen was weighed and measured before and after immersion. Dimensional and weight change due to immersion were calculated as a percentage of initial values. Results were calculated as a percentage of the original.

#### 4.3.9. Heat Aging

Three specimens, measuring approximately 6 in. (150 mm) square were prepared from flat material and then placed in an air circulating oven maintained at 176°F (80°C) for seven days. Each specimen was weighed and measured before and after heat aging. Dimensional and weight change due to heat aging were calculated as a percentage of initial values. Results were calculated as a percentage of the original.

#### 4.3.10. Chemical Exposure

Two specimens, measuring approximately 6 in. (150 mm) square were prepared from flat material. Half the samples were placed in a 1 N solution of ammonium chloride the rest in a 1 N solution of sodium sulfate. After seven days the samples were washed clean and visually inspected for deterioration. Two samples were put and then placed in a water bath at 122°F (50°C) for seven days. Results were calculated as a percentage of the original.

#### 4.3.11 Compressive Strength

Three specimens, measuring approximately 3.5 in. (90 mm) square and including nine raised portions were prepared. Each was uniformly compressed in a machine at a rate of 0.20 in. (5 mm) per minute. A plot of load versus deflection was recorded for each specimen and these results were used to calculate values for compressive strength per raised support and unit area on a 10% core deformation as follows:

$$Sc = W / A \quad \text{Where:} \quad \begin{array}{ll} Sc & = \text{Compressive Strength, Pa (psi)} \\ W & = \text{Load at 10\% deformation, N (lbf)} \\ A & = \text{Initial horizontal cross-sectional area, mm}^2 \text{ (in}^2\text{.)} \end{array}$$

$$Sc = W / A \quad \text{Where:} \quad \begin{array}{ll} Sc & = \text{Compressive Strength, lbf/support (N/support)} \\ W & = \text{Load at 10\% deformation, lbf (N)} \\ A & = \text{\# of supports} \end{array}$$

## 5 Test Results

The sample test results are shown in the Table 1 below. A full set of test results is included in the Appendix.

Property	Test
Thickness, mm	0.8
Mean Weight, g/m <sup>2</sup>	968
Dynamic Impact Load	14 of 15
Static Puncturing	6 of 6
Low-temp Flexibility	No Cracking
Water Vapor Permeability, g/h/m <sup>2</sup>	10.3
Tensile Strength, kN/m	
o Machine Direction, % of original	14
o Cross-Machine Direction, % of original	13
Elongation, %	
o Machine Direction, % of original	59
o Cross-Machine Direction, % of original	49
Water Immersion:	
• Dimensional Change, %	0
■ Weight Change, %	0.08
■ Tensile Strength, %	
o Machine Direction, % of original	103
o Cross-Machine Direction, % of original	102
• Elongation, %	
o Machine Direction, % of original	113
o Cross-Machine Direction, % of original	120
Heat Aging:	
■ Dimensional Change, %	0
■ Weight Change, %	0.02
■ Tensile Strength, %	
o Machine Direction, % of original	100
o Cross-Machine Direction, % of original	105
■ Elongation, %	
o Machine Direction, % of original	120
o Cross-Machine Direction, % of original	95
Chemical Exposure to Ammonium Chloride:	
■ Observation	No visible deterioration
■ Tensile Strength	
o Machine Direction, % of original	121
o Cross-Machine Direction, % of original	92
■ Elongation	
o Machine Direction, % of original	92
o Cross-Machine Direction, % of original	92
Chemical Exposure to Sodium Sulfate:	
■ Observation	No visible deterioration
■ Tensile Strength	
o Machine Direction, % of original	108
o Cross-Machine Direction, % of original	88
■ Elongation	
o Machine Direction, % of original	89
o Cross-Machine Direction, % of original	92
Mean Compressive Strength, kPa	106

Tests were conducted on flat material with no ncmplng or perforations.

## 6 Conclusion

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The 10 mm Sure Cavity™ product identified and evaluated in this report has shown physical properties as presented in Section 5 of this report.

### INTERTEK TESTING SERVICES NA LTO.

Tested/  
Reported by:

  
Baldeep Sandhu  
**Technologist, Construction Products**

Reviewed by:

  
Craig Lawson, Mech. (NZCE)  
**Manager, Construction Products**

BSS/ahvs

**Appendix A: Test Data (18 pages)**

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# Intertek ETL SEMKO

Test: Thickness and Weight  
 Date: 10-Aug-06 Project No: 3100715  
 Client: Masonry Technology EngfTech: B. Sandhu  
 Product: 10 mm Sure Cavity  
 Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Equipment: Mitutoyo Digital Calipers (Intertek 10 52639)  
 Setra balance 2000g (Intertek 10 P 52606)

Weight per unit area ( $\text{g}/\text{mm}^2$ )										
Specimen	Length (mm)			Width (mm)			Surface Area ( $\text{mm}^2$ )	Weight (g)	$\text{g}/\text{mm}^2$	$\text{kg}/\text{m}^2$
1	245.60	246.97	251.26	257.67	256.30	254.52	63513.99	61.62	0.000970	0.970
2	250.68	251.14	249.73	252.71	253.53	254.67	63540.21	61.73	0.000971	0.971
3	253.65	253.52	252.83	254.72	256.34	257.20	64875.29	62.39	0.000962	0.962

Flat Area	
Specimen	Thickness (mm)
1	0.86
2	0.89
3	0.81
4	0.84
5	0.79
6	0.74
7	0.67
8	0.78
9	0.67
10	0.81
Mean	0.79

# Intertek ETL SEMKO

**Test:** Dynamic Impact Test  
**Date:** 10-Aug-06  
**Client:** Masonry Technology  
**Product:** 10mm Sure Cavity  
**Conditioning:** 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
**Impact Load:** 1 kg (2.2lbs)  
**Drop:** 250 mm 9.8 in.  
**Substrate:** Aluminum Block  
**Equipment:** Mitutoyo Digital Calipers (Intertek 10 52650)  
 Setra balance 2000g (Intertek 10 P 52606)

Project No: 3100715  
 Eng/Tech: B. Sandhu

Sample	Test	10 mm
1	1	Pass
	2	Pass
	3	Pass
	4	Pass
	5	Pass
2	6	Pass
	7	Pass
	8	Pass
	9	Pass
	10	puctured
3	11	Pass
	12	Pass
	13	Pass
	14	Pass
	15	Pass
<b>Mean</b>		14 Pass 1 Fail

**Pass/Fail criteria:** 12 of 15 tests shall demonstrate no indentation or puncture

# Intertek ETL SEMKO

**Test:** Static Puncture Test  
**Date:** 9-Aug-06 Project No: 3100715  
**Client:** Masonry Technology Eng/Tech: B. Sandhu  
**Product:** 10 mm Sure Cavity  
**Conditioning:** 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
**Weight:** 25 kg (55.1 lbs)  
**Load area:** 100 sqmm (0.155 sqin.)  
**Substrate:** Aluminum Block  
**Equipment:** Mitutoyo Digital Calipers (Intertek ID 52650)  
 Setra balance 2000g (Intertek ID P 52606)

Sample	Test	10 mm
1	1	Pass
	2	Pass
2	3	Pass
	4	Pass
3	5	Pass
	6	Pass
<b>Mean</b>		6 Pass 0 Fail

**Pass/Fail criteria:** 5 of 6 tests shall demonstrate no indentation or puncture

# Intertek ETL SEMKO

Test: **Low Temperture Flex**

Date: 10-Aug-06

Project No: 3100715

Client: Masonry Technology

EngfTech: B. Sandhu

Product: 10mm Sure Cavity

Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$

Exposure: 2 Hours at a temperature of  $-30 \pm 1.5^{\circ}\text{C}$

Equipment: Temperature-controlled Freezer (Intertek 10 012784)  
Diameter 3.2 mm Mandrel

Specimen	10 mm
MD-1	Pass
MD-2	Pass
MD-3	Pass

Pass/Fail: Visually examine each specimen for cracks in the area of the bend.

# Intertek ETL SEMKO

Test: Water Vapor Transmission  
 Date: 15-Aug-06 Project: 3100715 Eng/Tech: Baldeep Sandhu  
 Client: Masonry Technology  
 Product: 10mm Sure Cavity  
 Orientation: Exterior Face Up  
 Test Methods: ASTM E96-00 Test Methods for Water Vapour Transmission of Materials  
 Test Procedure: Water Method  
 Conditioning: 24 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Equipment: Test Chamber (Intertek 10 9-0473) Setra Balance 2000g (Intertek 10 P52606)  
 Gemini Tinytag Ultra (Intertek 10 02693) Digital Anemometer (P60000)  
 Mitutoyo Digital Calipers (Intertek 10 )

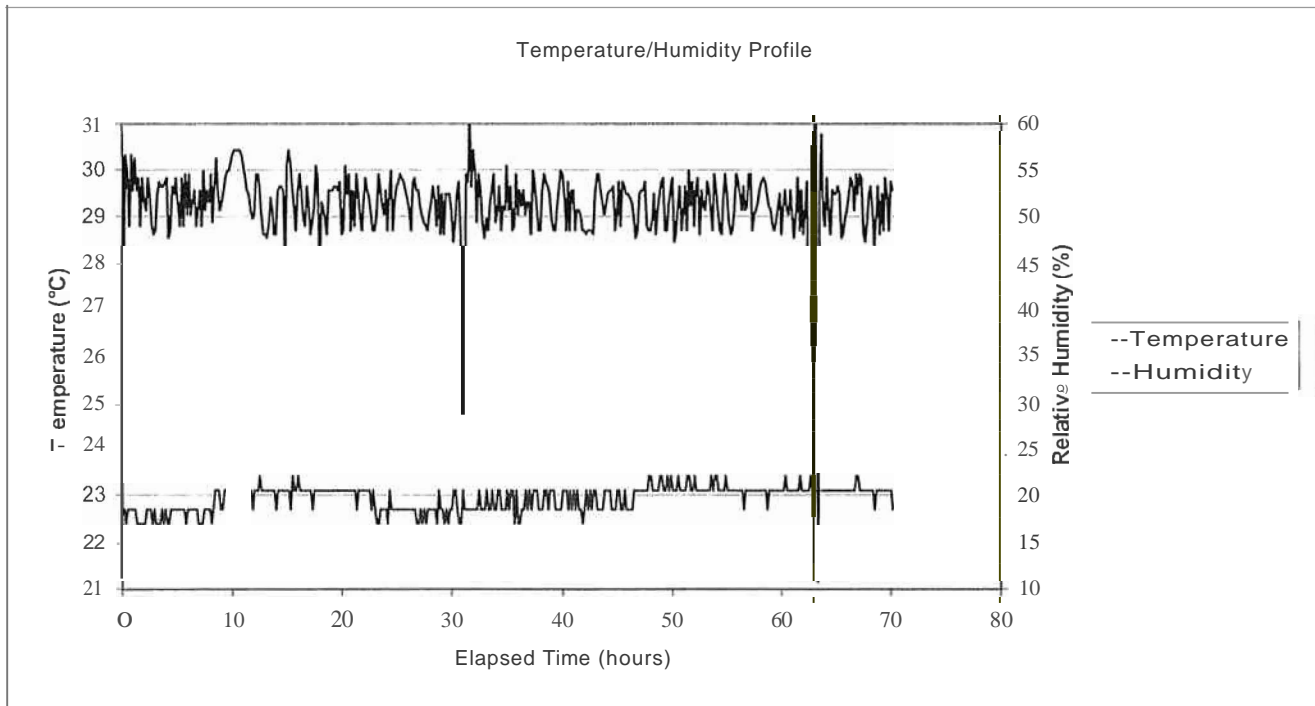
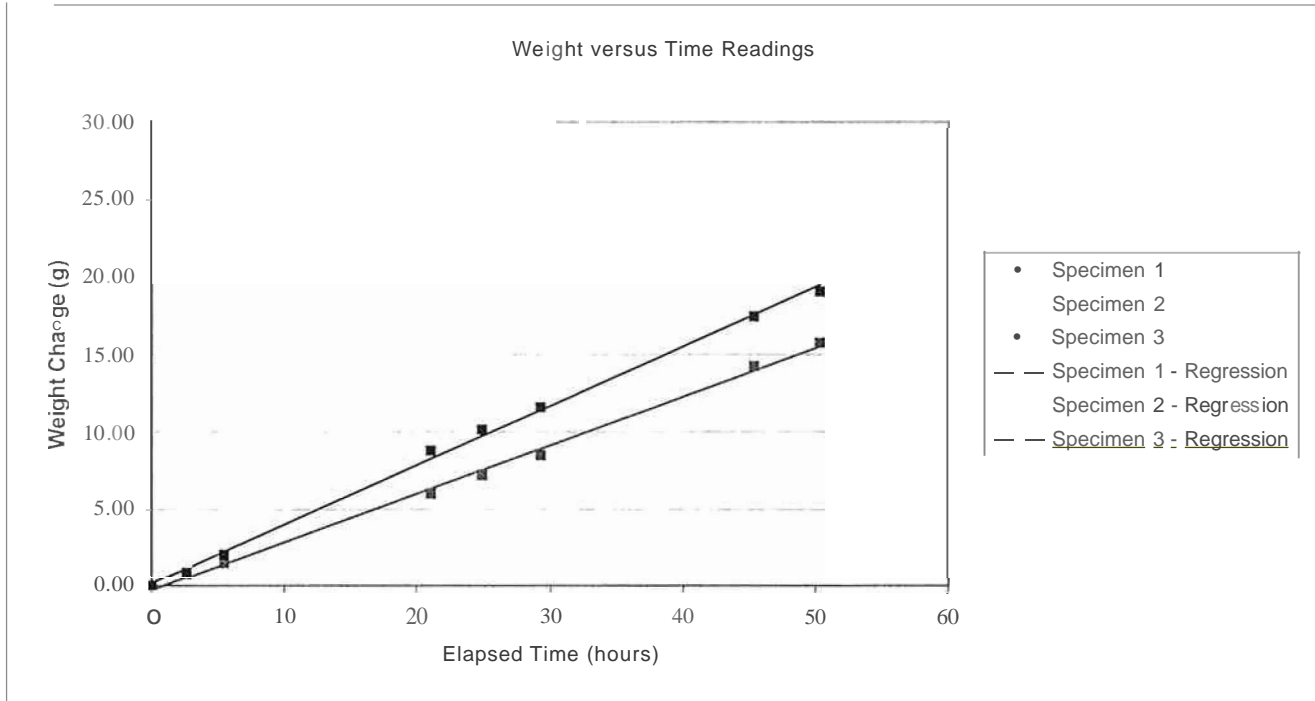
Measurement	Specimen		
	1	2	3
Mean Air Temperature (°C)	22.9	22.9	22.9
Saturation Vapour Pressure <sup>1</sup> (Pa)	2833	2833	2833
Mean Relative Humidity in chamber (%)	49.5	49.5	49.5
Relative Humidity in test dish (%)	100	100	100
Initial Air Velocity (m/s)	0.21	0.21	0.21
Final Air Velocity (m/s)	0.28	0.28	0.28
Air Velocity Minimum Control Limit (m/s)	0.02	0.02	0.02
Air Velocity Maximum Control Limit (m/s)	0.3	0.3	0.3
Mass of oessicant (g)	n/a	n/a	n/a
Specimen Weight Change (g)	15.750	27.880	19.050
Moisture Gain of Dessicant (%)	n/a	n/a	n/a
Moisture Gain Control Limit (%)	10	10	10
Test Dish Diameter (mm)	228	228	228
Test Area (m <sup>2</sup> )	0.041	0.041	0.041
Gradient of weight/time graph (g/hour)	3.13E-01	5.64E-01	3.83E-01
Mean Thickness (mm)	9.44	9.46	9.45
Water Vapour Transmission (g/hour.m <sup>2</sup> )	7.67E+00	1.38E+01	9.39E+00
Water Vapour Permeance (ng/Pa.s.m <sup>2</sup> )	1.49E+03	2.68E+03	1.82E+03
Water Vapour Permeability (ng/Pa.s.m)	1.41 E+04	2.54E+04	1.72E+04

<sup>1</sup> Estimated by the Clausius-Clapeyron equation

Test Result Summary	Metric units	Imperial Units
Water Vapor Transmission	1.03E+01 g/hr.m <sup>2</sup>	1.47E+01 grains/hr.ft <sup>2</sup>
	2.47E+02 g/day.m <sup>2</sup>	3.53E+02 grains/day.ft <sup>2</sup>
Water Vapor Permeance	2.00E+03 ng/Pa.s.m <sup>2</sup>	3.49E+01 perms
	7.55E+02 per 25 mm	9.40E+01 per in.
	per X mm	per X in.
Water Vapor Permeability	1.89E+04 ng/Pa.s.m	9.40E+01 Perm inch
Coefficient of Variation	31 %	31 %

# Intertek ETL SEMKO

Test: Water Vapor Transmission  
Date: 15-Aug-06 Project: 3100715 Eng/Tech: Baldeep Sandhu  
Client: Masonry Technology  
Product: 10mm Sure Cavity



# Intertek ETL SEMKO

**Test: Maximum Load and Elongation**  
**Date:** 23-Aug-06 **Project No:** 3100715  
**Client:** Masonry Technology  
**Product:** 10 mm Sure Cavity  
**Conditioning:** 24 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
**Gauge Length:** 75 mm  
**Ramp Rate:** 75 mm/min.  
**Equipment:** Instron 8516 loading apparatus (Intertek 10 000568)  
 Mitutoyo Digital Calipers (Intertek 10 52650)

**Treatment:** As Received

<i>As Recieved - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	25.4	113.3	8.92	50.8	52.88	70.5
2	12.7	25.5	113.5	8.94	50.9	50.44	67.3
3	12.7	29.2	130.4	10.27	58.5	52.98	70.6
4	12.7	21.8	97.0	7.64	43.5	47.72	63.6
5	12.7	20.3	90.7	7.14	40.7	46.63	62.2
Mean:	12.7	24.4	109.0	8.6	48.9	50.1	66.8
StdDev:	0.0	3.5	15.6	1.2	7.0	2.9	3.9
COV:	0.0%	14.3%	14.3%	14.3%	14.3%	5.8%	5.8%

<i>As Recieved - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	28.6	127.7	10.06	57.3	0.9	1.2
2	12.7	26.1	116.5	9.17	52.3	0.8	1.0
3	12.7	34.5	153.7	12.10	68.9	1.0	1.3
4	12.7	31.7	141.5	11.14	63.4	0.9	1.2
5	12.7	26.8	119.4	9.40	53.6	0.8	1.1
Mean:	12.7	29.5	131.8	10.4	59.1	0.9	1.2
StdDev:	0.0	3.5	15.6	1.2	7.0	0.1	0.1
COV:	0.0%	11.9%	11.9%	11.9%	11.9%	8.8%	8.8%

# Intertek ETL SEMKO

Test: Water Immersion  
 Date: 11-Aug-06  
 Client: Masonry Technology  
 Test Methods: ICC-ES EG 114  
 Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Exposure: 7 days immersed in water at a temperature of  $50^{\circ}\text{C}$   
 Equipment: Mitutoyo Digital Calipers (Intertek ID 52650)  
 Temperature-controlled oven (Intertek ID 9-0476)

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	99.83	98.90	99.67	102.71	102.49	102.40	9.44
2	99.21	99.27	99.89	99.13	99.31	99.61	9.22
3	99.92	100.36	100.84	104.75	104.75	104.56	9.73

After Exposure							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	99.77	98.90	99.65	102.69	102.49	102.71	9.45
2	99.22	99.16	99.78	99.14	99.31	99.60	9.23
3	99.92	100.29	100.85	104.77	104.73	104.36	9.74

Change							
Specimen	Length (%)			Width (%)			Weight (%)
1	-0.1	0.0	0.0	0.0	0.0	0.3	0.1
2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.1
3	0.0	-0.1	0.0	0.0	0.0	-0.2	0.1

Mean Change		
Specimen	Weight (%)	Dimensions (%)
1	0.07	0.03
2	0.09	-0.04
3	0.08	-0.04
Mean:	0.08	-0.01
StdDev:	0.01	0.04
COV:	7.88	-291.41
	Pass	Pass

# Intertek ETL SEMKO

Test: **Heat Aging**  
 Date: 11-Aug-06  
 Client: Masonry Technology  
 Product: 10mm Sure Cavity  
 Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Exposure: 7 days at a temperature of  $100^{\circ}\text{C}$   
 Equipment: Mitutoyo Digital Calipers (Intertek ID 52650)  
 Temperature-controlled oven (Intertek ID 9-0476)

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	148.33	148.04	149.01	151.95	152.40	153.59	21.55
2	148.50	148.26	148.42	153.90	153.76	153.00	21.65
3	151.87	149.02	149.26	154.74	154.98	155.23	22.09

After Exposure							
Specimen	Length (mm)			Width (mm)			Weight (g)
1							21.55
2							21.63
3							22.09

Change							
Specimen	Length (%)			Width (%)			Weight (%)
1							0.0
2							-0.1
3							0.0

Note: **No** dimension measurements taken due to distortion of sample

Mean Change		
Specimen	Weight (%)	Dimensions (%)
1	-0.02	
2	-0.06	
3	0.00	
Mean:	-0.03	
StdDev:	0.03	
COV:	-111.86	
	Pass	

# Intertek ETL SEMKO

**Test: Maximum Load and Elongation**  
 Date: 23-Aug-06 Project No: 3100715  
 Client: Masonry Technology  
 Product: 10 mm Sure Cavity  
 Conditioning: 24 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Gauge Length: 75 mm  
 Ramp Rate: 75 mm/min.  
 Equipment: Instron 8516 loading apparatus (Intertek 10 000568)  
 Mitutoyo Digital Calipers (Intertek 10 52650)

Exposure: 7 days immersed in water at a temperature of  $50^{\circ}\text{C}$

<i>Water Immersed - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	36.3	161.8	12.74	72.6	63.7	84.9
2	12.7	32.0	142.7	11.23	64.0	58.6	78.1
3	12.7	29.6	132.0	10.39	59.2	45.6	60.9
Mean:	12.7	32.6	145.5	11.5	65.3	56.0	74.6
StdDev:	0.0	3.4	15.1	1.2	6.8	9.3	12.4
COV:	0.0%	10.4%	10.4%	10.4%	10.4%	16.6%	16.6%

<i>Water Immersed - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	28.5	127.2	10.02	57.1	0.8	1.0
2	12.7	24.7	110.3	8.68	49.4	0.8	1.0
3	12.7	34.7	154.8	12.19	69.4	1.0	1.3
Mean:	12.7	29.3	130.7	10.3	58.6	0.8	1.1
StdDev:	0.0	5.0	22.5	1.8	10.1	0.1	0.1
COV:	0.0%	17.2%	17.2%	17.2%	17.2%	13.2%	13.2%

# Intertek ETL SEMKO

**Test: Maximum Load and Elongation**  
 Date: 23-Aug-06 Project No: 3100715  
 Client: Masonry Technology  
 Product: 10 mm Sure Cavity  
 Conditioning: 24 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Gauge Length: 75 mm  
 Ramp Rate: 75 *mmlmin.*  
 Equipment: Instron 8516 loading apparatus (Intertek ID 000568)  
 Mitutoyo Digital Calipers (Intertek 10 52650)  
 Exposure: 7 days immersed in Ammonium Chloride

<i>Ammonium Chloride - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	28.8	128.5	10.12	57.6	51.8	69.1
2	12.7	22.4	99.9	7.87	44.8	44.5	59.3
3	12.7	31.6	140.7	11.08	63.1	43.2	57.6
4	12.7	31.7	141.4	11.13	63.4	48.7	64.9
5	12.7	34.2	152.7	12.02	68.5	43.2	57.6
Mean:	12.7	29.7	132.6	10.4	59.5	46.3	61.7
StdOev:	0.0	4.5	20.2	1.6	9.1	3.8	5.1
COV:	0.0%	15.2%	15.2%	15.2%	15.2%	8.2%	8.2%

<i>Ammonium Chloride - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	26.4	117.9	9.28	52.9	0.8	1.0
2	12.7	30.4	135.5	10.67	60.8	0.9	1.2
3	12.7	26.5	118.1	9.30	53.0	0.9	1.3
4	12.7	26.1	116.3	9.16	52.2	0.8	1.0
5	12.7	27.6	123.3	9.71	55.3	0.9	1.2
Mean:	12.7	27.4	122.2	9.6	54.8	0.9	1.1
StdDev:	0.0	1.8	7.9	0.6	3.5	0.1	0.1
COV:	0.0%	6.4%	6.4%	6.4%	6.4%	9.1%	9.1%

# Intertek ETL SEMKO

**Test: Maximum Load and Elongation**  
**Date:** 23-Aug-06 **Project No:** 3100715  
**Client:** Masonry Technology  
**Product:** 10 mm Sure Cavity  
**Conditioning:** 24 hours at a temperature of  $23 \pm 2^\circ\text{C}$  and relative humidity of  $50 \pm 5\%$   
**Gauge Length:** 75 mm  
**Ramp Rate:** 75 mm/min.  
**Equipment:** Instron 8516 loading apparatus (Intertek 10000568)  
 Mitutoyo Digital Calipers (Intertek 10 52650)

**Exposure:** 7 days immersed in Sodium Sulfate

<i>Sodium Sulfate - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	34.3	153.0	12.04	68.6	46.4	61.9
2	12.7	31.6	141.1	11.11	63.3	45.6	60.8
3	12.7	14.5	64.5	5.08	28.9	46.6	62.2
4	12.7	20.0	89.0	7.01	39.9	42.5	56.7
5	12.7	32.3	144.0	11.34	64.6	42.7	56.9
Mean:	12.7	26.5	118.3	9.3	53.1	44.8	59.7
StdDev:	0.0	8.8	39.2	3.1	17.6	2.0	2.7
COV:	0.0%	33.1%	33.1%	33.1%	33.1%	4.5%	4.5%

<i>Sodium Sulfate - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	26.2	116.6	9.18	52.3	0.9	1.2
2	12.7	22.3	99.3	7.82	44.5	0.8	1.1
3	12.7	34.5	153.7	12.10	68.9	0.9	1.2
4	12.7	21.3	94.8	7.46	42.5	0.8	1.0
5	12.7	24.8	110.7	8.71	49.6	0.9	1.2
Mean:	12.7	25.8	115.0	9.1	51.6	0.9	1.1
StdDev:	0.0	5.2	23.3	1.8	10.5	0.0	0.1
COV:	0.0%	20.3%	20.3%	20.3%	20.3%	5.8%	5.8%

# Intertek ETL SEMKO

Test: **Compressive Strength**

Date: 16-Aug-06 Project No: 3100715  
 Client: Masonry Technology EnglTech: B Sandhu  
 Product: 10 mm Sure Cavity

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

Speed: 0.20 in/min 5.08 mm/min

Equipment: *Loading:* Tinius Olsen Universal Testing Machine (Intertek ID #9-04329)

*Load Cell:* Artech 1000lb Load Cell (Intertek ID D2740)

*Deflection:* Sensotec LVDT (Intertek ID D2668)

*Dimensions:* Mitutoyo Digital Calipers (Intertek ID 52651 )

Specimen	Number of Risers	Length (mm)			Width (mm)			Thickness (mm)				Load at 10% Deformation		Compressive Strength			
		L1	L2	L3	W1	W2	W3	D1	D2	D3	D4	(lbf)	(N)	(kPa)	(psi)	(lbf/support)	(N/support)
1	5	95.4			90.6			9.5				207	920	106.52	15.45	41.4	184.0
2	5	96.6			90.0			9.5				223	991	113.90	16.52	44.6	198.2
3	5	95.9			89.8			9.5				191	852	98.95	14.35	38.3	170.4

# Intertek ETL SEMKO

**Test: Maximum Load and Elongation**  
**Date:** 26-Sep-06 **Project No:** 3100715  
**Client:** Masonry Technologies  
**Product:** Flat Roll  
**Conditioning:** 24 hours at a temperature of  $23 \pm 2^\circ\text{C}$  and relative humidity of  $50 \pm 5\%$   
**Gauge Length:** 75 mm  
**Ramp Rate:** 75 mm/min.  
**Equipment:** Instron 8516 loading apparatus (Intertek ID 000568)  
 Mitutoyo Digital Calipers (Intertek ID 52650)

**Treatment:** As Received

<i>As Recieved - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	42.7	190.6	15.01	85.5	50.62	67.5
2	12.7	38.4	171.0	13.47	76.7	38.99	52.0
3	12.7	40.5	180.8	14.24	81.1	36.27	48.4
4	12.7	43.5	194.1	15.28	87.1	52.71	70.3
5	12.7	38.5	171.7	13.52	77.0	41.55	55.4
Mean:	12.7	40.7	181.6	14.3	81.5	44.0	58.7
StdDev:	0.0	2.4	10.6	0.8	4.7	7.3	9.7
COV:	0.0%	5.8%	5.8%	5.8%	5.8%	16.5%	16.5%

<i>As Recieved - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	37.0	165.0	12.99	74.0	36.2	48.3
2	12.7	35.4	158.0	12.44	70.9	41.8	55.7
3	12.7	36.6	163.3	12.86	73.3	41.3	55.1
4	12.7	36.6	163.2	12.85	73.2	38.0	50.7
5	12.7	36.8	164.3	12.93	73.7	26.0	34.7
Mean:	12.7	36.5	162.8	12.8	73.0	36.7	48.9
StdDev:	0.0	0.6	2.8	0.2	1.2	6.4	8.5
COV:	0.0%	1.7%	1.7%	1.7%	1.7%	17.4%	17.4%

# Intertek ETL SEMKO

Test: **Water Immersion**  
 Date: 18-Sep-06 Project No: 3100715  
 Client: Masonry Technologies  
 Product: Flat Roll  
 Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Exposure: 7 days immersed in water at a temperature of  $50^{\circ}\text{C}$   
 Equipment: Mitutoyo Digital Calipers (Intertek 10 52650)  
 Temperature-controlled oven (Intertek 109-0476)

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	100.98	101.58	102.23	102.78	102.42	102.34	6.81
2	104.14	104.11	104.15	102.85	102.43	101.95	6.89
3	103.86	103.59	103.38	102.38	102.13	101.79	6.85

After Exposure							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	100.95	101.54	102.24	102.78	102.43	102.38	6.80
2	104.14	104.11	104.14	102.88	102.42	101.97	6.89
3	103.81	103.59	103.37	102.41	102.13	101.81	6.84

Change							
Specimen	Length (%)			Width (%)			Weight (%)
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Mean Change		
Specimen	Weight (%)	Dimensions (%)
1	-0.03	0.00
2	-0.03	0.00
3	-0.01	0.00
Mean:	-0.02	0.00
StdDev:	0.01	0.00
COV:	-34.64	670.48
	Pass	Pass

# Intertek ETL SEMKO

Test: **Maximum Load and Elongation**  
 Date: 26-Sep-06 Project No: 3100715  
 Client: Masonry Technologies  
 Product: Flat Roll  
 Conditioning: 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%  
 Gauge Length: 75 mm  
 Ramp Rate: 75 mm/min.  
 Equipment: Instron 8516 loading apparatus (Intertek ID 000568)  
 Mitutoyo Digital Calipers (Intertek 10 52650)

Exposure: 7 days immersed in water at a temperature of 50°C

<i>Water Immersed - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	42.8	190.8	15.03	85.6	54.0	72.0
2	12.7	40.7	181.4	14.28	81.4	43.3	57.7
3	12.7	42.1	187.7	14.78	84.2	52.5	69.9
Mean:	12.7	41.9	186.7	14.7	83.7	49.9	66.5
StdDev:	0.0	1.1	4.8	0.4	2.2	5.8	7.7
COV:	0.0%	2.6%	2.6%	2.6%	2.6%	11.6%	11.6%

<i>Water Immersed - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	35.3	157.2	12.38	70.5	36.0	48.0
2	12.7	36.5	162.8	12.82	73.0	46.1	61.5
3	12.7	40.2	179.4	14.12	80.5	49.7	66.2
Mean:	12.7	37.3	166.5	13.1	74.7	43.9	58.5
StdDev:	0.0	2.6	11.5	0.9	5.2	7.1	9.5
COV:	0.0%	6.9%	6.9%	6.9%	6.9%	16.2%	16.2%

# Intertek ETL SEMKO

Test: **Heat Aging**  
 Date: 18-Sep-06 Project No: 3100715  
 Client: Masonry Technologies  
 Product: Flat Roll Membrane  
 Conditioning: 88 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Exposure: 7 days at a temperature of  $20^{\circ}\text{C}$   
 Equipment: Mitutoyo Digital Calipers (Intertek 10 52650)  
 Temperature-controlled oven (Intertek 10 9-0476)

Initial Measurement							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	153.06	153.96	154.12	151.06	151.20	151.80	15.09
2	153.30	153.62	153.94	156.07	156.47	156.12	15.40
3	155.17	156.13	157.74	154.63	155.26	156.63	15.83

After Exposure							
Specimen	Length (mm)			Width (mm)			Weight (g)
1	151.10	152.80	153.23	151.53	151.18	151.81	15.10
2	152.60	152.97	153.20	156.04	154.45	156.13	15.39
3	154.45	155.41	156.96	154.66	155.28	156.59	15.83

Dimensional Change							
Specimen	Length (%)			Width (%)			Weight (%)
1	-1.3	-0.8	-0.6	0.3	0.0	0.0	0.0
2	-0.5	-0.4	-0.5	0.0	-1.3	0.0	-0.1
3	-0.5	-0.5	-0.5	0.0	0.0	0.0	0.0

Mean Dimensional Change		
Specimen	Weight (%)	Dimensions (%)
1	0.0	-0.38
2	-0.1	-0.44
3	0.0	-0.24
Mean:	-0.02	-0.35
StdDev:	0.05	0.11
COV:	-317%	-30.3%
	Pass	Pass

# Intertek ETL SEMKO

Test: **Maximum Load and Elongation**  
 Date: 26-Sep-06 Project No: 3100715  
 Client: Masonry Technologies  
 Product: Flat Roll  
 Conditioning: 24 hours at a temperature of  $23 \pm 2^{\circ}\text{C}$  and relative humidity of  $50 \pm 5\%$   
 Gauge Length: 75 mm  
 Ramp Rate: 75 mm/min.  
 Equipment: Instron 8516 loading apparatus (Intertek ID 000568)  
 Mitutoyo Digital Calipers (Intertek 1052650)

Treatment: 7 days at a temperature of  $80^{\circ}\text{C}$

<i>As Recieved - machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	40.5	180.7	14.23	81.0	44.55	59.4
2	12.7	38.4	171.3	13.49	76.8	25.55	34.1
3	12.7	41.4	184.6	14.53	82.8	38.25	51.0
4	12.7	41.0	182.8	14.39	82.0	44.02	58.7
5	12.7	42.0	187.2	14.74	84.0	48.39	64.5
6	12.7	40.7	181.3	14.28	81.3	50.70	67.6
Mean:	12.7	40.7	181.3	14.3	81.3	41.9	55.9
StdDev:	0.0	1.2	5.4	0.4	2.4	9.1	12.1
COV:	0.0%	3.0%	3.0%	3.0%	3.0%	21.7%	21.7%

<i>As Recieved - cross-machine direction</i>							
Specimen	Width (mm)	Max Load (lbs)	Max Load (N)	Breaking Strength (kN/m)	Breaking Strength (lbs/inch)	Length at break (mm)	Elongation at break (%)
1	12.7	38.4	171.4	13.50	76.9	51.5	68.6
2	12.7	37.9	169.1	13.31	75.8	34.4	45.9
3	12.7	39.9	178.1	14.02	79.9	46.9	62.5
4	12.7	38.5	171.8	13.53	77.1	47.1	62.9
5	12.7	37.1	165.3	13.01	74.1	37.5	50.0
6	12.7	38.1	169.9	13.37	76.2	47.4	63.1
Mean:	12.7	38.3	170.9	13.5	76.7	44.1	58.8
StdDev:	0.0	0.9	4.2	0.3	1.9	6.6	8.8
COV:	0.0%	2.5%	2.5%	2.5%	2.5%	15.0%	15.0%