Architectural Testing

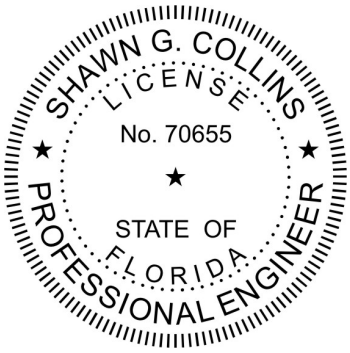
PERFORMANCE TEST REPORT

Rendered to:

KOMMERLING USA, INC.

For:

KÖMATEX



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Report Date: **02/08/12**
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Expiration Date: **02/08/16**

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Architectural Testing

TEST REPORT

A6480.02-401-44
February 8, 2012

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Architectural Testing

PERFORMANCE TEST REPORT

Rendered to:

KOMMERLING USA, INC
3402 STANWOOD BLVD.
HUNTSVILLE, AL 35811

Report No:	A6480.02-401-44
Test Dates:	02/23/11
Through:	09/12/11
Report Date:	08/10/11

1.0 General Information

1.1 Product

KÖMATEX

1.2 Project Summary

Architectural Testing was contracted by KOMMERLING USA, INC. to perform material property tests on their *KÖMATEX* non-load bearing exterior trim product. The purpose of testing was code compliance evaluation according to the following criteria:

> ICC-ES™ AC227, Effective January 1, 2005 (Editorially revised August 2008), *Acceptance Criteria for Rigid Cellular PVC Nonload-Bearing Exterior Trim*

1.3 Product Description

A single material formulation of the *KÖMATEX* product was tested. All test specimens were a flat sheet profile. Closed-cell, rigid foam uPVC test specimens were white in color and included one product thickness: 3/4 in.

1.4 Qualifications

Architectural Testing has demonstrated compliance with ANS/ISO/IEC Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. A portion of the testing described herein was performed at Architectural Testing's Tampa, Florida laboratory which is also demonstrated compliance to ANS/ISO/IEC Standard 17025 and accredited as a Testing Laboratory (TL-332). Architectural Testing is accredited to perform all testing reported herein with the exception of ASTM E 84 and ASTM D 3345 which were subcontracted to laboratories accredited to perform those respective tests.

1.5 Product Sampling

A representative of Architectural Testing visited KOMMERLING USA'S facility in Huntsville, Alabama on 01/20/11, to observe manufacturing and select the components used for testing. Samples were randomly selected from stock and the production line. All samples selected for testing were marked for identification and were the samples used for all tests reported herein. See photographs in Appendix B for typical sampling mark.

1.6 Witnessing

There were no witnesses from KOMMERLING USA, INC. present for any of the testing conducted and reported herein.

1.7 Conditions of Testing

Unless otherwise indicated, all testing reported herein was conducted in a laboratory set to maintain temperature in the range of 68 ± 4ºF and humidity in the range of 50 ± 5% RH. All test specimen materials were stored in the laboratory environment for no less than 40 hours prior to testing. The wind loading specimens were tested at ambient air conditions in the Tampa, Fl laboratory at a temperature of 89 ºF

2.0 Reference Standards

KÖMATEX was evaluated in accordance with the following test methods as modified by ICC-ES™ AC227. Any deviation from a method is noted in the respective Section of this report.

AATCC Test Method No. 127-2008 *Water Resistance: Hydrostatic Pressure Test*, American Association of Textile Chemists and Colorists

ASTM D 570-98, *Standard Test Method for Water Absorption of Plastics*, ASTM International

ASTM D 638-08, *Standard Test Method for Tensile Properties of Plastics*, ASTM International

ASTM D 648-08, *Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position*, ASTM International

ASTM D 696-08, *Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer*, ASTM International

ASTM D 792-08, *Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement*, ASTM International

ASTM D 3345-08, *Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites*, ASTM International

ASTM D 5420-10, *Standard Test Method* for *Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)*, ASTM International

ASTM D 6110-10, *Standard Test Method for Determining the Charpy Impact Resistance of Notched Specimens of Plastic*, ASTM International

ASTM D 6662-01, *Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards*, ASTM International

ASTM E 84-04, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ASTM International

ASTM E 330-02, *Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference*, ASTM International

ASTM G 154-06, Standard Practice for Operating Flourescent Light Apparatus for UV Exposure of Nonmetallic Materials, ASTM International

AWPA E1-09, *Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites*, American Wood-Preservers' Association

AWPA E12-94, *Standard Method of Determining Corrosion of Metal in Contact with Treated Wood*, American Wood-Preservers' Association

3.0 Summary of Test Results

A separate table containing summary test results for each material formulation follows.

3/4" KÖMATEX

ICC-ES™ AC227 Section	Test Method		Test Results
4.1.1	ASTM G 154 Accelerated Weathering - and - ASTM D 638 Tensile Properties	Control	Average Tensile Strength 1820.1 psi
		Accelerated Weathering Resistance	Average Tensile Strength 1878.5 psi
4.1.2	ASTM D 6662 Freeze-Thaw Cycling - and - ASTM D 638 Tensile Properties	Control	Average Tensile Strength 1820.1 psi
		Freeze -Thaw Cycling	Average Tensile Strength 1896.90 psi
4.1.3	Section 7.5 of ASTM D 570 Water Absorption - and - AATCC Test Method No. 127 Water Resistance		No Visible Penetration
4.2	AWPA E1 Termite Resistance		Rating = 9.9
4.3	ASTM E 84 Surface Burning Characteristics		FSI = 35
4.4	ASTM D 1761 Mechanical Fastener	Not Tested	Not Tested
		Not Tested	Not Tested
4.5	ASTM E 330 Negative Transverse Wind Load	3/4 in Thick	50.67 psf Allowable Pressure
4.6	ASTM D 792 Density		742.6 kg/m^3
4.6	ASTM D 5420 Gardner Impact Resistance	3/4 in Thick	MFE = 126.0 in·lbf

3.0 Summary of Test Results (Continued)

3/4" KÖMATEX (Continued)

ICC-ES™ AC227 Section	Test Method		Test Results
4.6	ASTM D 6110 Charpy Impact Resistance	Crosswise Direction	29.5 J/m (0.553 ft·lb/in)
		Lengthwise Direction	29.9 J/m (0.559 ft·lb/in)
4.6	ASTM D 696 Coefficient of Linear Thermal Expansion		1.82 x10^{-6} / °C
4.6	ASTM D 648 Heat Deflection Temperature Under Flexural Load		166.5°F at 66 psi
			158.9°F at 264 psi
4.7	AWPA E12 Corrosion by Preservative-Treated Wood		No Weight Loss

4.0 Tensile Properties (Accelerated Weathering Resistance)

4.1 Reference Standards

ICC-ES™ AC227 Section 4.1.1; ASTM G 154 and ASTM D 638

4.2 Test Specimens

Two sets of ten test specimens were prepared from flat trim sheets. All test specimens were 10 in long. Kömatex test specimens were 1.0 in wide by full/minimum product thickness (0.75 in). One set of ten specimens was maintained in laboratory conditions as the control set, and one set of ten specimens was exposed to accelerated weathering conditions as described herein.

4.3 Accelerated Weathering Procedure

Artificially weathered specimens were subjected to 2000 hours of Xenon-Arc exposure in an Atlas Ci5000 Xenon Weather-Ometer® in accordance with ASTM G 155 using Test Cycle 1. Exposure conditions were as follows:

Cycle: 102 minutes light only followed by 18 minutes of light with water spray
Black Panel Temp: 63 ± 2ºC
Irradiance: 0.35 ± 0.02 W/m^2 at 340 nm

4.4 Tensile Test Setup

Test Specimen Description and Preparation: Five test specimens were cut from the *KÖMATEX* boards. Specimens were 1 in. wide by 8 in. long by full board nominal thickness of 3/4 in. and machined to Type I tensile coupons according to ASTM D 638.

Test Set-up: Specimens were individually mounted in a Instron Model 3369 Universal Testing Machine (ICN: 005740).

Test Procedure: Testing was conducted according to the test method. Applied load was continuously recorded by the test machine. The test speed was 0.2 in./min.

4.5 Test Results

Control Set – 3/4" KÖMATEX

Specimen	Width (in)	Depth (in)	Peak Load (lb)	Tensile Strength (psi)
1	0.749	0.749	1020.3	1818.6
2	0.748	0.751	1023.4	1821.8
3	0.750	0.762	1020.7	1785.9
4	0.749	0.754	1012.3	1792.4
5	0.747	0.765	1021.0	1786.7
6	0.747	0.765	1053.3	1843.2
7	0.748	0.749	1029.5	1837.6
8	0.748	0.749	1034.3	1846.1
9	0.755	0.753	1035.2	1820.9
10	0.750	0.750	1039.4	1847.8
			Average:	1820.1
			Standard Deviation:	24.4

Artificially Weathered Set – 3/4" KÖMATEX

Specimen	Width (in)	Depth (in)	Peak Load (lb)	Tensile Strength (psi)
1	0.749	0.740	1038.2	1873.1
2	0.749	0.749	1053.7	1878.2
3	0.751	0.748	1046.8	1863.4
4	0.742	0.762	1084.1	1917.4
5	0.748	0.750	1048.5	1868.9
6	0.751	0.763	1072.6	1871.8
7	0.750	0.755	1044.2	1844.0
8	0.748	0.754	1064.6	1887.6
9	0.749	0.748	1047.8	1870.2
10	0.749	0.747	1068.8	1910.2
			Average:	1878.5
			Standard Deviation:	21.7

3/4" KÖMATEX

Specimen	Tensile Strength (psi)		
	Control	Artificially Weathered	Percent Difference
1	1818.6	1873.1	2.95%
2	1821.8	1878.2	3.05%
3	1785.9	1863.4	4.25%
4	1792.4	1917.4	6.74%
5	1786.7	1868.9	4.50%
6	1843.2	1871.8	1.54%
7	1837.6	1844.0	0.35%
8	1846.1	1887.6	2.22%
9	1820.9	1870.2	2.67%
10	1847.8	1910.2	3.32%
Minimum:	1837.6	1844.0	0.35%
Maximum:	1792.4	1917.4	6.74%
Mean:	1820.1	1878.5	**3.16%**

4.7 Conclusion

AC227 states that the conditions of acceptance for accelerated weathering resistance testing are as follows: "The average flexural or tension strength of weathered samples shall be at least 90 percent that of the control samples tested." Based on this statement, the test results for the material formulation tested herein (Kömatex) pass the accelerated weathering resistance test by conforming to the conditions of acceptance as stated in Section 4.1.1 of AC227.

5.0 Tensile Properties (Freeze-Thaw Resistance)

5.1 Reference Standards

ICC-ES™ AC227 Section 4.1.2; Section 6.3.3.1 of ASTM D 6662 and ASTM D 638

5.2 Test Specimen Description and Preparation

Per material formulation, two sets of five test specimens were prepared from flat trim sheets. Kömatex test specimens were 8 in long. by 1.0 in wide by full/minimum product thickness (0.75 in). One set of five specimens was maintained in laboratory conditions as the control set, and one set of five specimens was exposed to freeze-thaw cycling conditions as described herein.

5.3 Hygrothermal Cycling Procedure (Freeze-Thaw)

Cycling was performed using the methods described in Section 6.3.3.1 of ASTM D 6662. The sample set consisted of five test specimens and was weighed to the nearest 0.1 gram. Specimens were submerged in water for a period of 24 hours. After removing the specimens from the water, each specimen's outer surface was wiped down with a dry cloth and weighed within 20 minutes upon removal from the water. If any specimen of a particular set exceeded a 1% weight gain, the entire set was resoaked until such time as the weight changed less than 1% per 24 hour period. At such time, these specimens were then considered to have reached moisture absorption equilibrium, and specimens were then placed in a freezer at -20ºF for 24 hours. After removal from the freezer, the specimens were returned to lab conditions for 24 hours. This process was repeated two more times for a total of three cycles of water submersion, freezing, and thawing.

5.4 Tensile Test Setup

Test Specimen Description and Preparation: Five test specimens were cut from the Kömatex boards. Specimens were 1 in. wide by 8 in. long by full board nominal thickness of 3/4 in. and machined to Type I tensile coupons according to ASTM D 638.

Test Set-up: Specimens were individually mounted in a Instron Model 3369 Universal Testing Machine (ICN: 005740).

Test Procedure: Testing was conducted according to the test method. Applied load was continuously recorded by the test machine. The test speed was 0.2 in./min.

5.5 Test Results

Control Set – 3/4" KÖMATEX

Specimen	Width (in)	Depth (in)	Peak Load (lb)	Tensile Strength (psi)
1	0.749	0.749	1020.3	1818.6
2	0.748	0.751	1023.4	1821.8
3	0.750	0.762	1020.7	1785.9
4	0.749	0.754	1012.3	1792.4
5	0.747	0.765	1021.0	1786.7
6	0.747	0.765	1053.3	1843.2
7	0.748	0.749	1029.5	1837.6
8	0.748	0.749	1034.3	1846.1
9	0.755	0.753	1035.2	1820.9
10	0.750	0.750	1039.4	1847.8
			Average:	1820.1
			Standard Deviation:	24.4

Freeze-Thaw Set – 3/4" KÖMATEX

Specimen	Width (in)	Depth (in)	Peak Load (lb)	Tensile Strength (psi)
1	0.748	0.750	1049.0	1869.9
2	0.750	0.756	1047.1	1846.7
3	0.747	0.753	1057.0	1879.3
4	0.746	0.758	1031.0	1823.2
5	0.750	0.756	1171.1	2065.4
			Average:	1896.9
			Standard Deviation:	96.7

5.6 Test Summary

3/4" KÖMATEX

Specimen	Tensile Strength (psi)		
	Control	Freeze-Thaw	Percent Difference
1	1818.6	1869.9	2.78%
2	1821.8	1846.7	1.36%
3	1785.9	1879.3	5.10%
4	1792.4	1823.2	1.70%
5	1786.7	2065.4	14.47%
6	1843.2	-	0.00
7	1837.6	-	0.00
8	1846.1	-	0.00
9	1820.9	-	0.00
10	1847.8	-	0.00
Minimum:	1821.8	1846.7	1.36%
Maximum:	1786.7	2065.4	14.47%
Mean:	1820.10	1896.90	4.13%

5.7 Conclusion

AC227 states that the conditions of acceptance for freeze-thaw resistance testing are as follows: "The average flexural or tension strength of weathered samples shall be at least 90 percent that of the control samples tested." Based on this statement, the test results for the material formulation tested herein (Kömatex) pass the freeze-thaw resistance test by conforming to the conditions of acceptance as stated in Section 4.1.2 of AC227.

6.0 Water Absorption and Resistance

6.1 Reference Standards

ICC-ES™ AC227 Section 4.1.3; Section 7.5 of ASTM D 570 and AATCC Test Method No. 127

6.2 Test Specimens

Five 8 inch square by 3/4 inch thick specimens were cut from flat trim sheets.

6.3 Test Procedure

The Kömatex test specimens were tested from 03/02/11 to 03/07/11. Per Section 7.5 of ASTM D 570, test specimens were submerged in boiling deionized water for two hours. After the two-hour boiling period, test specimens were removed and allowed to cool sufficiently in laboratory conditions before preparing them to be tested per the hydrostatic head method described by AATCC Test Method No. 127 as modified by ICC-ES™ AC227. Each specimen was towel-dried and then exposed to a constant head of 55 cm (21.7 in) water pressure by sealing a 22 in long section of 6 in Schedule 80 PVC pipe to its surface. The exposed surface area was 26.1 square inches. The specimens were placed on an elevated wire rack so the bottom surfaces could be examined for wetness due to water penetration. Each vertical pipe column was filled with de-ionized water at laboratory temperature to a height of 21.7 in and allowed to stand for at least five hours. See photograph in Appendix B for test setup.

6.4 Test Results

No underside wetness or evidence of water penetration / leakage was observed after the five hour period specified in ICC-ES™ AC227 Section 4.1.3. Furthermore, no underside wetness or evidence of water penetration / leakage was observed after a twenty-four hour period.

6.5 Conclusion

AC227 states that the conditions of acceptance for water absorption and resistance testing are as follows: "There shall be no visible leakage during the five-hour test period." Based on this statement, the test results for the material formulation tested herein (Kömatex) pass the water absorption and resistance test by conforming to the conditions of acceptance as stated in Section 4.1.3 of AC227.

7.0 Termite Resistance

7.1 Reference Standards

ICC-ES™ AC227 Section 4.2; AWPA E1-09

7.2 Test Specimens

Five 1 in square by 3/4 in thick specimens were supplied by Architectural Testing to Mississippi State University (MSU), Forest Products Department, Box 9820, Mississippi State, Mississippi, 39762-9820.

7.3 Test Facility

Testing was performed by MSU, which is accredited by International Accreditation Service, Inc. (IAS) as a Testing Laboratory (TL-301) and is accredited to perform AWPA E1-09 testing.

7.4 Test Procedure

Tests were performed from 06/10/11 through 0708/11 using the methods described by AWPA E1-09. As specified by ICC-ES™ AC227, Formosan Termites (*Coptotermes formosanus*) were used in the testing. Deviations from the standard by MSU are as follows:

1. *by omitting sections 6.4.2 and 8.1.4 - 8.1.6 pertaining to termite mortality following testing. We will approximate termite mortality per American Society for Testing and Materials (ASTM) Standard D3345-08 section 12.2.4.*
2. *we will deviate from 6.2.2 in that we will add 1 gram of termites to each jar per ASTM D3345 11.1.*
3. *by omitting the mositure content portion of 6.3.1 and 6.3.2 as bottles maintained in our chamber do not require this procedure and to avoid disrupting termite activity during the course of the study. We will maintain temperature requirements.*

7.5 Test Results

Reference MSU Test Report titled "Termite Testing for Architectural Testing" and dated 07/21/11. A summary of the test data follows:

Test Material	Average Weight Loss	Rating
Kömatex	0.07 %	9.9
Treated So. Pine	1.24%	9.9
Untreated SYP sapwood control	13.89 %	6.4

7.0 Conclusion

AC227 states that the conditions of acceptance for termite resistance testing are as follows: "The tested samples shall demonstrate equivalent termite resistance to that of an approved preservative-treated wood or naturally durable wood in accordance with the applicable code." Based on this statement, the test results for the material formulation tested herein (Kömatex) pass the termite resistance test by conforming to the conditions of acceptance as stated in Section 4.2 of AC227.

8.0 Surface Burning Characteristics

8.1 Reference Standards

ICC-ES™ AC227 Section 4.3; ASTM E 84

8.2 Test Specimens

Three 8 ft long by 24 in wide by full/maximum product thickness flat trim sheets were supplied by Architectural Testing to Southwest Research Institute (SwRI®), Chemistry and Chemical Engineering Division, Fire Technology Department, 6220 Culebra Road, San Antonio, Texas 78238.

8.3 Test Facility

Testing was performed by SwRI®, which is accredited by International Accreditation Service, Inc. (IAS) as a Testing Laboratory (TL-214) and is accredited to perform ASTM E 84 testing.

8.4 Test Procedure

Testing was performed using the methods described by ASTM E 84 using a Steiner tunnel with the test specimens mounted in the ceiling position.

8.5 Test Results

A summary of test results follows:

Test Material	SwRI® Project No.	Date of Report	Flame Spread Index (FSI)
3/4" Kömatex	01.16045.01.082a	03/11/2011	35

8.6 Conclusion

AC227 states that the conditions of acceptance for surface burning characteristics testing are as follows: "The product shall demonstrate a flame-spread index no greater than 200." Based on this statement, the test results for the material formulation tested herein (Kömatex) pass the surface burning characteristics test by conforming to the conditions of acceptance as stated in Section 4.3 of AC227.

9.0 Mechanical Fastener Testing by Fastener Pull-Through Resistance

ICC-ES™ AC227 Section 4.4; ASTM D 1761

9.1 General

Testing in accordance with ASTM D 1761 was not performed by Architectural Testing, Inc. The allowable load capacity of the fasteners used was in accordance with NDS per section 4.4 of AC227.

10.0 Structural – Negative Transverse Wind Load

10.1 Reference Standards

ICC-ES™ AC227 Section 4.5; ASTM E 330

10.2 Test Specimens

Test specimens were prepared from Kömatex flat trim sheets. Three 48 in wide by 96 in long test specimens were used for testing.

10.3 Test Setup

Three test bucks were constructed using a framed wall consisting of 2x4 non-preservative-treated Spruce/Pine/Fir (SPF) No. 2 Grade lumber. The overall size of the framed wall was 96" wide by 48" high. Studs were laid out on 16" centers and attached to the top and bottom plates using #9 x 3" Philips flat head deck screws. A sheet of 15/32" OSB was used over the framed wall. The OSB was attached to the studs and plates using #9 x 3" Philips flat head deck screws 6" around the perimeter with 12" spacing in the field. Each test specimen was attached to the framed wall using sixteen #9 x 3" Philips flat head deck screws per panel. Screws were positioned approximately 1/2 in from each edge. Fastener spacing was 24" on center with each successive row being offset 12" from the last. To retain air pressure on the test specimens during testing, a layer of 4-mil thick polyethylene plastic was loosely draped between the plywood substrate and the test specimen prior to securing the test specimens. Refer to photographs in Appendix B for test setup.

10.4 Test Procedure

The test assembly was installed against a Lexan test wall and a static negative air pressure was applied between the test specimen and test wall. Test pressure was applied starting at 50 psf and increased gradually (in 5 psf increments) until failure. The reported sustained pressure was the pressure that was held for 10 seconds prior to failure.

10.5 Test Results

3/4" KÖMATEX
Test Date: 04/18/11

Test	Pressure at Failure (psf)	Maximum Sustained Pressure (psf)	Mode of Failure
1	110	105	Fastener withdrawal from substrate
2	140	135	
3	145	140	
	Average:	**126.67**	

10.6 Test Summary

Allowable pressure in accordance with Section 4.5 of ICC-ES™ AC227:

Allowable pressure = maximum sustained pressure divided by a safety factor of 2.5.

3/4 in (19mm) Thick K allowable pressure = 126.67 / 2.5 = 50.67 psf

10.7 Conclusion

AC227 states that the conditions of acceptance for structural – negative transverse wind load testing are as follows: "The allowable load shall be the failure load divided by a safety of factor of 2.5." Based on this statement, the test results for the material formulation tested herein (Kömatex) are not considered to pass or fail the conditions of acceptance for the structural – negative transverse wind load test; rather, they are assigned an allowable load (pressure) rating, as shown in Section 10.6 herein. This conforms to the conditions of acceptance as stated in Section 4.5 of AC227.

11.0 Density

11.1 Reference Standards

ICC-ES™ AC227 Section 4.6; ASTM D 792

11.2 Test Specimens

Three specimens were cut from flat trim sheets. The nominal specimen dimensions are as follows:

KÖMATEX: 1.00 in long by 1.00 in wide by full product thickness (3/4 in)

11.3 Test Procedure

Tests were performed on 03/11/11 using the methods described by Test Method A, water immersion method, of ASTM D 792. Specimens were weighed using a Mettler Toledo AX504 balance to the nearest 0.0001 g. Specimens were suspended from the balance with wire and a wire mesh platform weighted to keep the specimens from floating. The water tank contained deionized water. Temperatures were measured with an Omega thermocouple and Model HH509 thermocouple reader accurate to 0.1°C. The water level in the tank was maintained at a constant level for weighing the wire, wire mesh platform and weight alone, and weighing each suspended specimen. The wire, wire mesh platform, weight, and each specimen were also weighed in air. Refer to photograph in Appendix B.

11.4 Test Results

Specific gravity and density are to be reported at 23°C. Average water temperature was 18.0°C, and average air temperature was 20.6°C. Water density at 19°C is specified by the standard as 998.6 kg/m^3. Water density at 25.0°C is 997.05 kg/m^3. The specific gravity and density correction for this difference in water temperature is insignificant: (997.54 - 997.05) / 997.54 = 0.0005, or 0.05%. This correction was not applied to the results presented below.

11.4 Test Results (continued)

3/4" KÖMATEX

Specimen	Mass (g)		Specific Gravity	Density (kg/m³)
	In Air	In Water		
1	8.6098	-3.1597	0.732	730.511
2	8.8025	-2.9510	0.749	747.877
3	9.2383	-3.0706	0.751	749.487
		Average:	**0.744**	**742.625**
		Standard Deviation:	0.01	10.52
		Coefficient of Variation:	1.42%	

11.5 Conclusion

AC227 states that the conditions of acceptance for density testing are as follows: "The physical properties testing described in this section shall be used to establish control values for quality control." Based on this statement, Kommerling USA, Inc. shall be required to establish quality control values based on the test results for the material formulation tested herein (Kömatex). This will conform to the conditions of acceptance as stated in Section 4.6 and the quality control requirements of Section 5.0 of AC227.

12.0 Gardner Impact Resistance

12.1 Reference Standards

ICC-ES™ AC227 Section 4.6; ASTM D 5420

12.2 Test Specimens

Five 48 in long by 6 in wide by full product thickness specimens were cut from flat trim sheets.

12.3 Test Setup

Specimens were tested with a Pacific Scientific IG 1140 Gardner Impact Tester equipped with a GE Geometry of a 0.500 in diameter striker and a 0.640 in inside diameter support plate. Refer to photograph in Appendix B.

12.4 Test Procedure

Testing was conducted on 03/03/11 using an 8.0 lb steel-rod impact mass. The first specimen was tested to obtain an anticipated failure height, and each subsequent specimen was tested at a height dependent on the pass or fail status of the preceding specimen as stated in the referenced standard.

12.5 Mean Failure Energy (MFE) Calculation

Mean Failure Energy (MFE) is calculated for each sample set as described in ASTM D 5420, which is as follows:

$MFE = w \cdot (h_o + [d_h \cdot (A/N \pm 0.5)])$

where,

h = mean-failure height, in;

d_h = increment of height, in;

N = total number of events, failures or nonfailures, whichever is smaller;

h_o = lowest height at which an event occurred, in;

i = 0, 1, 2 ... k (counting index, starts at h_o);

n_i = number of events that occurred at h_i;

$h_i = h_o + id_h$;

$A = \sum_{i=0}^{k} i \cdot n_i$

w = constant mass, lb;

12.6 Test Results

As defined by ASTM D 5420, specimens were considered to have failed if the impact generated at least "spiderweb" cracks on the surface opposite the impacted-surface or penetrated the full thickness of the specimen. In the tables below, the failure height for each specimen is indicated with an "X", and specimens that did not fail at a given height are indicated with an "O". Refer to photograph in Appendix B.

Energy (in·lb)	Height (in)	3/4 in Thick KÖMATEX																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
124.0	15.5	X																				
120.0	15.0		X		X																	
116.0	14.5			O		X																
112.0	14.0						X				X											
108.0	13.5							X		O		X										
104.0	13.0								O				X									
100.0	12.5													X								O
96.0	12.0														X		X		X		O	
92.0	11.5															O		O		O		

Energy (in·lb)	Height (in)	i	n_i	$i \cdot n_i$
13.11	14.5	6	1	6
12.65	14.0	5	0	0
12.20	13.5	4	1	4
11.75	13.0	3	1	3
11.30	12.5	2	1	2
10.85	12.0	1	1	1
10.39	11.5	0	3	0
		N =	8	
			A =	16

$$MFE = w \cdot (h_o + [d_h \cdot (A / N \pm 0.5)])$$

$$= 8\ lb \cdot (14.5\ in + [0.5\ in \cdot (16 / 8 + 0.5)]$$

$$= \mathbf{126.0\ in \cdot lbf}$$

12.7 Test Summary

The Mean Failure Energy (MFE) for each material formulation and product thickness as tested herein is as follows:

Material Formulation	Profile Thickness (in)	Mean Failure Energy (in·lbf)
KÖMATEX	3/4	126.0

12.8 Conclusion

AC227 states that the conditions of acceptance for Gardner impact resistance testing are as follows: "The physical properties testing described in this section shall be used to establish control values for quality control." Based on this statement, Kommerling USA, Inc. shall be required to establish quality control values based on the test results for the material formulation tested herein (Kömatex). This will conform to the conditions of acceptance as stated in Section 4.6 and the quality control requirements of Section 5.0 of AC227.

13.0 Charpy Impact Resistance

13.1 Reference Standards

ICC-ES™ AC227 Section 4.6; ASTM D 6110

Note: ASTM D 6110 is cited in ASTM D 256 as the appropriate document for Charpy Impact Reistance testing.

13.2 Test Specimen Description and Preparation

Ten 0.50 in square by 2.50 in long specimens were machined from flat trim sheets and notched according to ASTM D 6110 specifications. Specimens were measured to an accuracy of 0.001 in. for compliance with ASTM D 6110. Depth at notch was measured using a contour anvil insert in a digital depth gauge accurate to 0.0001 in.

13.3 Test Setup

Specimens were tested in a SATEC BLI Impact Tester equipped with a 2 ft·lb Izod pendulum. The pendulum had a 24 in drop height from 60º above the horizontal and a 13 in radius to the striker. Refer to photograph in Appendix B. Windage and friction tests were conducted.

13.4 Test Procedure

Testing according to Test Methods A and C of ASTM D 6110was conducted on 04/07/11. Each specimen was placed in a jig that located the horizontal notch centerline relative to the specimen holder. Each specimen was mounted as a horizontal simply supported beam, and the pendulum was released. The indicated breaking energy was recorded.

13.5 Test Results

Crosswise Direction

Each specimen was broken by a single swing of the pendulum and failed completely at the notch. The broken half of the specimen was tossed. Refer to photograph in Appendix B.
7.3.1 Crosswise direction

3/4" KÖMATEX

Specimen	Test Angle, B (degrees) [1]	Correction Energy, E_{TC} ft·lb)	Impact Resistance, I_S	
			(ft·lb/in)	(J/m)
1	122.478	0.058	0.551	29.405
2	122.478	0.058	0.550	29.347
3	122.165	0.058	0.560	29.889
4	122.165	0.058	0.559	29.859
5	122.165	0.058	0.562	29.978
6	122.478	0.058	0.544	29.058
7	122.165	0.058	0.554	29.595
8	122.478	0.058	0.552	29.464
9	122.540	0.058	0.548	29.268
10	122.540	0.058	0.551	29.385
		Average:	**0.553**	**29.525**
		Standard Deviation:	0.006	0.300

[1] *Max angle, ß$_M$ = 144.026 degrees*

Lengthwise Direction

3/4" KÖMATEX

Specimen	Test Angle, B (degrees) [1]	Correction Energy, E_{TC} (ft·lb)	Impact Resistance, I_S	
			(ft·lb/in)	(J/m)
1	122.165	0.058	0.559	29.859
2	122.165	0.058	0.561	29.918
3	122.165	0.058	0.562	29.978
4	122.478	0.058	0.553	29.493
5	122.165	0.058	0.558	29.800
6	122.165	0.058	0.558	29.800
7	122.478	0.058	0.550	29.376
8	121.853	0.058	0.573	30.582
9	122.165	0.058	0.559	29.859
10	000.000	0.000	0.000	0.000
		Average:	**0.559**	**29.852**
		Standard Deviation:	0.006	0.338

[1] *Max angle, ß$_M$ = 144.026 degrees*

AC227 states that the conditions of acceptance for Charpy impact resistance testing are as follows: "The physical properties testing described in this section shall be used to establish control values for quality control." Based on this statement, Kommerling USA, Inc shall be required to establish quality control values based on the test results for the material formulation tested herein (Kömatex). This will conform to the conditions of acceptance as stated in Section 4.6 and the quality control requirements of Section 5.0 of AC227.

14.0 Coefficient of Linear Thermal Expansion

14.1 Reference Standards

ICC-ES™ AC227 Section 4.6; ASTM D 696

14.2 Test Specimens

Two 3 in long by minimum product thickness (3/4 in for Kömatex) test specimens were cut from flat trim sheets.

14.3 Test Setup

Specimens were tested in a Thermo Electron Quartz Tube Dilatometer submerged in a NESLAB RTE 140 Refrigerated Bath controlled by a Digital ONE Temperature Controller. Specimen length change was measured using digital dial indicators with ± 0.001 mm accuracy.

14.4 Test Procedure

Testing was conducted using the methods described by ASTM D 696. The length of each specimen was measured to 0.01 mm accuracy. Two specimens were placed in a dilatometer at -30.0ºC, and the temperature was maintained until each specimen's length reached steady state over a 10-minute period. The bath temperature was increased to +30.0ºC, and the temperature was maintained until each specimen's length reached steady state over a 10-minute period. The bath temperature was decreased to -30.0ºC, and the temperature was maintained until each specimen's length reached steady state over a 10-minute period. In any case that the change in length due to heating disagreed by more than 10% with the change in length due to cooling, the test was repeated. Kömatex specimens were tested on 04/26/11 through 05/18/11.

14.5 Test Results

3/4" KÖMATEX

Specimen	Length (mm)	Length Change (mm)		CLTE (mm/mm/°C)	Variability Check
		-30°C → 30°C	30°C → -30°C		
1	76.50	0.008	-0.008	1.83E-06	3.8%
2	76.30	0.008	-0.008	1.80E-06	0.9%
			Average:	**1.82E-06**	

14.6 Conclusion

AC227 states that the conditions of acceptance for coefficient of linear thermal expansion testing are as follows: "The physical properties testing described in this section shall be used to establish control values for quality control." Based on this statement, Kommerling USA, Inc. shall be required to establish quality control values based on the test results for the material formulation tested herein (Kömatex). This will conform to the conditions of acceptance as stated in Section 4.6 and the quality control requirements of Section 5.0 of AC227.

15.0 Heat Deflection Temperature Under Flexural Load

15.1 Reference Standards

ICC-ES™ AC227 Section 4.6; ASTM D 648

15.2 Test Specimens

Six test specimens per material formulation were milled from flat trim sheets. The Kömatex test specimens were. 5 in long by .5 inch wide by 3/4 in thick.

15.3 Test Setup

15.4 Test Procedure

Tests were performed on 06/17/11 using Method B of ASTM D 648. An ATLAS HDV2 Automated instrument was used to perform testing at both stress levels specified by the standard.

15.5 Test Results

Stress (psi)	3/4" KÖMATEX Average HDT (°C)	(°F)
66	77.4	171.3
264	71.9	161.4

15.6 Conclusion

AC227 states that the conditions of acceptance for heat deflection temperature under flexural load testing are as follows: "The physical properties testing described in this section shall be used to establish control values for quality control." Based on this statement, Kommerling USA, Inc shall be required to establish quality control values based on the test results for the material formulation tested herein (Kömatex). This will conform to the conditions of acceptance as stated in Section 4.6 and the quality control requirements of Section 5.0 of AC227.

16.0 Corrosion by Preservative-Treated Wood

16.1 Reference Standards

ICC-ES™ AC227 Section 4.7; AWPA E12

16.2 Test Specimens

Two 2 in long by 1 in wide by 3/4 in thick specimens were cut from flat trim sheets.

16.3 Test Setup

Specimens were weighed to an accuracy of 0.01 grams and individually mounted between pairs of 1-1/2 in by 3 in by 0.8 in thick blocks of ACQ-D preservative-treated lumber cut from the surface of 2x8 SYP Grade 2 prime lumber. The treatment retention level was 0.20 pcf, and the AWPA Use Category was UC3B. Each assembly was held together by two 1/4 in-20 nylon bolts, nylon nuts, and nylon washers. The nuts were tightened until thread slippage.

16.4 Test Procedure

The wood blocks were conditioned in an ESPEC Model ESX-4CW temperature – humidity chamber in an atmosphere of 118°F to 122°F and 89% to 91% relative humidity. During this exposure period, the wood blocks were removed and weighed at 24 hour-increments to check for equilibrium of their mass. When equilibrium was obtained, the specimens were installed between the conditioned wood blocks, as stated in Section 16.3, and the assemblies were returned to the chamber at the same conditions for a total of 240 hours (10 days) of exposure. Assemblies were then removed from the chamber and disassembled. The test specimens were brushed clean and re-weighed for comparison to their pre-exposure weights. The test specimens were then also placed under a microscope at 5x magnification, and observations relative to any visual defects were taken. Refer to Appendix B for photographs of the magnification.

16.5 Test Results

3/4" KÖMATEX

Specimen	Weight (g)			Weight Change	Observation at 5x Magnification
	Pre-Exposure	Post-Exposure	Change		
1	19.64	19.69	+0.05	+0.3%	No visual defects
2	19.65	19.69	+0.04	+0.2%	No visual defects

Calculations

Per Section 6 of AWPA E12, the corrosion rate in mils per year is computed from the weight loss using the following formula:

Corrosion Rate (*CR*), mils of corrosion per year = $\left(3.45\times10^{8}\right)\left(W\right)\left(A\times T\times D\right)$

Where:

W = mass loss in g
A = area in mm^2
T = time to nearest hour
D = density [of test specimens] in g/mL (see Section 11.0 Density above)

Being that the Kömatex material formulation exhibited a weight gain rather than a weight loss, the corrosion rate does not apply to this material formulation.

16.6 Conclusion

AC227 states that the conditions of acceptance for corrosion by preservative-treated wood testing are as follows: "There shall be no visual defects at 5x magnification, and weight loss of exposed vinyl coupons computed per E12 shall be a maximum of five percent." Based on this statement, the test results for the material formulation tested herein (Kömatex) passes the corrosion by preservative-treated wood test by conforming to the conditions of acceptance as stated in Section 4.7 of AC227.

17.0 Closing

Data sheets, representative samples of test specimens, a copy of this report, or other pertinent project documentation will be retained by Architectural Testing for a period of four years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured by using the designed test methods. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING:

John C. McClane
Laboratory Manager

Shawn G. Collins, P.E.
Manager-Regional Operations

JRH:sgc/jcm

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix B - Photographs (8 pages)

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	02/08/12	N/A	Original report issue
1	02/09/12	6	Corrected Product trade name to Kömatex in section 4.4

APPENDIX A

Drawings

NOT USED

APPENDIX B

Photographs

Photo No. 1
ASTM D 790 Flexural Test Setup (*KÖMATEX* Pictured)

Photo No. 2
ASTM D 570-Exposed Specimens Undergoing AATCC Test Method No. 127 Hydrostatic Head Testing (File Photo)

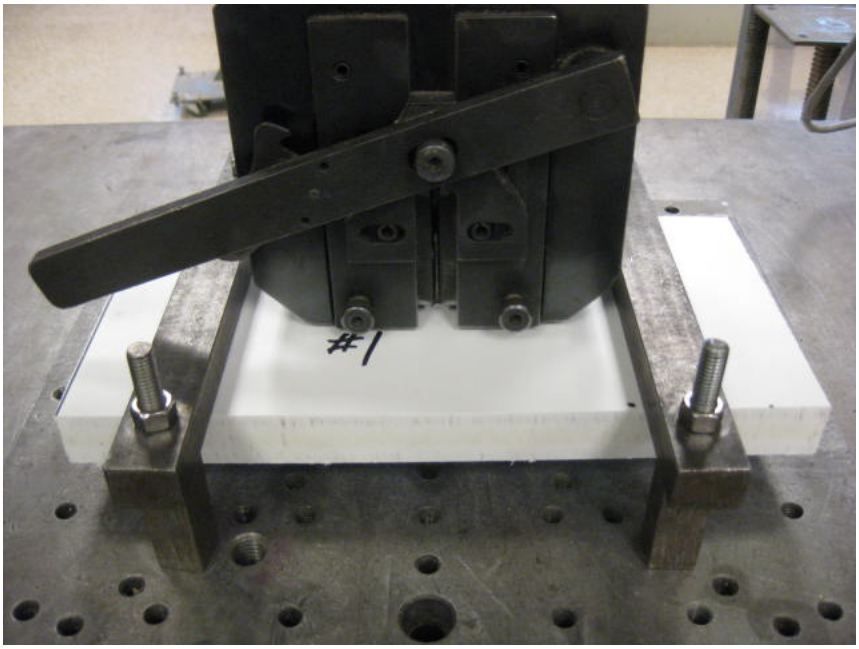

Photo No. 3
ASTM D 1761 Pull-Through Testing of Mechanical Fastener (File Photo)

Photo No. 4
Typical ASTM E 330 Transverse Wind Load Test Specimen

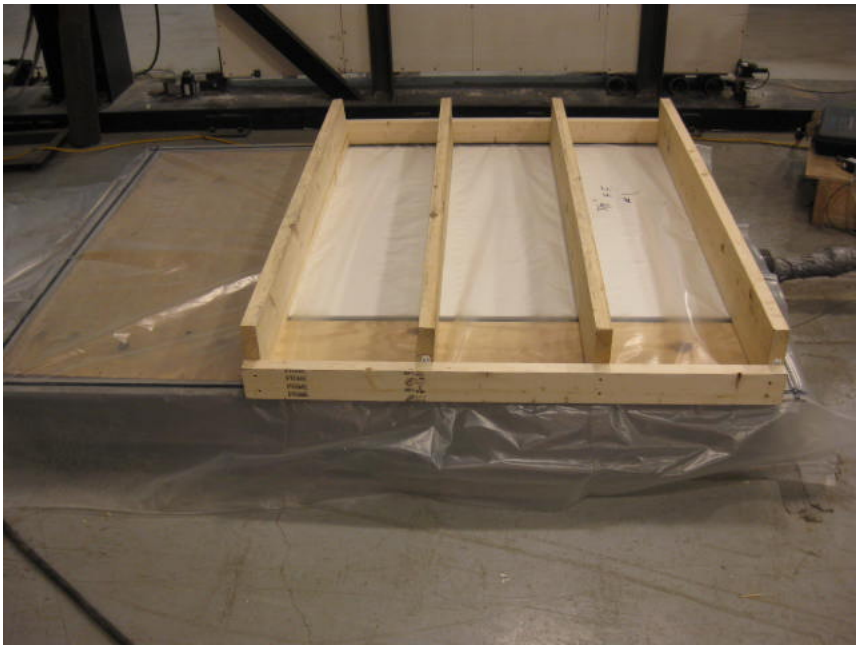

Photo No. 5
Installation of ASTM E 330 Specimen onto Test Chamber (File Photo)

Photo No. 6
ASTM E 330 Blower and Pressure Measuring Device (File Photo)

Photo No. 7
ASTM D 792 Density Specimen Being Weighed in Water (File Photo)

Photo No. 8
ASTM D 5420 Gardner Impact Testing Setup (File Photo)

Photo No. 9
Close-up of ASTM D 5420 Gardner Impact Testing Setup (File Photo)

Photo No. 10
ASTM D 256 Izod Impact Test Setup (File Photo)

Photo No. 1
ASTM D 696 CLTE Test Setup (File Photo)

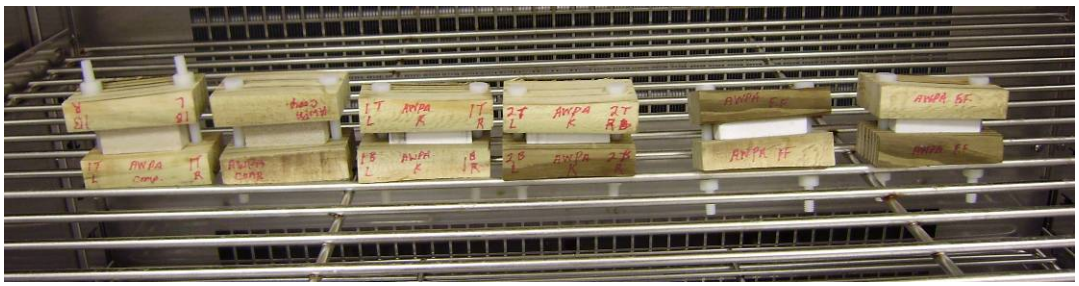

Photo No. 12
AWPA E12 Corrosion by Treated Wood
Specimens in Environmental Chamber (File Photo)

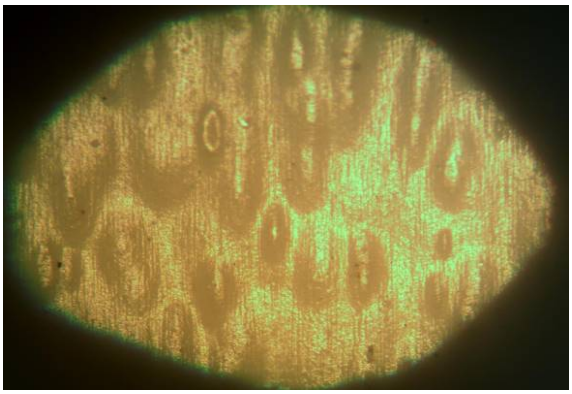

Photo No. 13
AWPA E12 – *KÖMATEX* Control Specimen at 10x Magnification

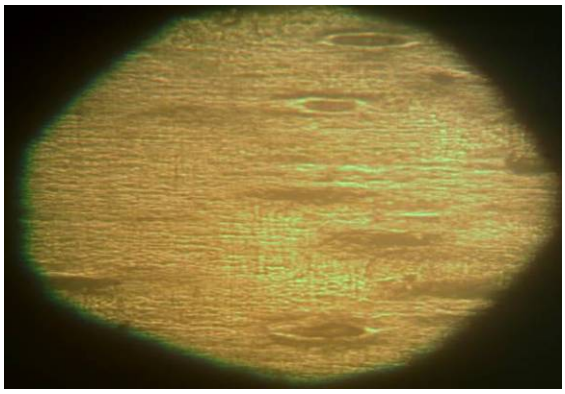

Photo No. 14
AWPA E12 – *KÖMATEX* Test Specimen No. 1 at 10x Magnification
(No Visual Defects When Compared to Photo No.)

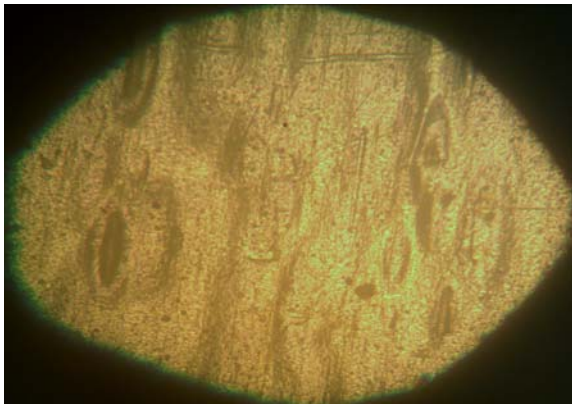

Photo No. 15
AWPA E12 – *KÖMATEX* Test Specimen No. 2 at 10x Magnification
(No Visual Defects When Compared to Photo No.)

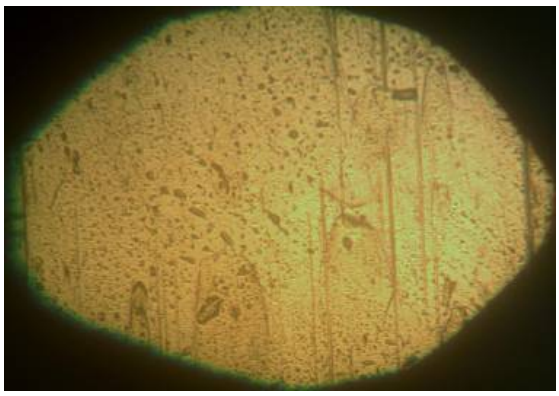

Photo No. 16
AWPA E12 – *KÖMATEX* Control Specimen at 10x Magnification

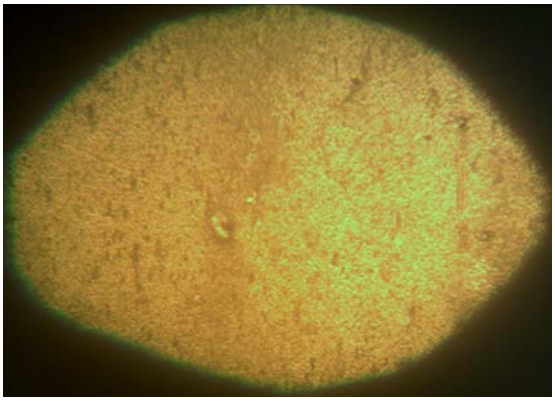

Photo No. 17
AWPA E12 – *KÖMATEX* Test Specimen No. 1 at 10x Magnification
(No Visual Defects When Compared to Photo No.)

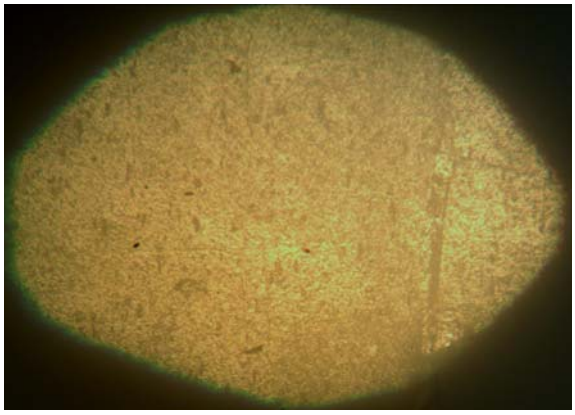

Photo No. 18
AWPA E12 – *KÖMATEX* Test Specimen No. 2 at 10x Magnification
(No Visual Defects When Compared to Photo No.)