



**To:** Bio Plastics Company  
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**ELECTRICAL TESTS OF POLYESTER WEB WITH POLYURETHANE COATING  
WITH SPECIAL ELECTRICAL PROPERTIES**

**Kinectrics Inc. Report No.: 422520-RC-0001-R00  
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On December 9, 2003, at the request of Gary Flynn, Electrical Tests were performed on two samples of one-inch width, Polyurethane coated Polyester Web.

**TEST PROCEDURE**

Two different electrical test procedures were performed on each web sample, both dry & wet conditioned samples outlined in ASTM F1701 Standard – “Standard Specification for Unused Polypropylene Rope with Special Electrical Properties”.

Dry Electrical Acceptance Test - A 60 Hz voltage was applied across a 12-inch section of the coated web sample equipped with electrodes designed to shield out stray capacitive currents (Fig. 4 ASTM F1701). The voltage was raised from 0 to 100 kV in not less than 5 or more than 15 seconds. The voltage was held at 100 kV for 5 minutes and the leakage current was monitored and recorded for the test duration.

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Wet Electrical Acceptance Test – Electrodes designed to shield out stray capacitive currents were used as detailed in Fig 4 - ASTM F1701. The electrodes were spaced 1 foot apart and the upper attachment point was 1 foot from the HV electrode. The weight attachment point on the sample was 2 feet from the LV electrode as specified in the F1701 standard. The coated web test specimen was then preconditioned by submerging the entire sample in water horizontally at a depth of 1 foot for duration of 15 minutes. The electrical resistivity of the water used for the wetting preconditioning was 100  $\Omega$ m at ambient temperature +/- 15<sup>0</sup>C. Within 1 minute after removing the specimen from the wetting tank, the web sample was hung in a vertical position with an unrestrained weight of 10 LB attached and allowed to dry at as near standard atmospheric conditions as possible for 15 minutes. The 60 HZ test voltage was applied immediately following the 15-minute drying period. The test voltage was raised from 0 to 50 kV in not less than 5 or more than 15 seconds and held at the 50 kV level for 5 minutes. The leakage current was monitored and recorded at the end of the 5-min. test duration provided the readings were stable.

Dry & Wet Electrical Test – Electrodes consisting of 22 gage copper conductor were applied to an 8-foot sample of coated web. The electrodes were 2 feet apart and the upper attachment point was 1 foot from the HV electrode and the weight attachment point on the sample was 2 feet from the LV electrode as specified in the F1701 standard (Fig. 2). A 60 HZ test voltage of 100 kV was applied to the dry samples and leakage currents were monitored for the 30-second duration. The web test specimen was then preconditioned by submerging the entire sample in water horizontally at a depth of 1 foot for duration of 15 minutes. The electrical resistivity of the water used for the wetting preconditioning was 100  $\Omega$ m at ambient temperature +/- 15<sup>0</sup>C. Within 1 minute after removing the specimen from the wetting tank, the rope sample was hung in a vertical position with an unrestrained weight of 10 LB attached and allowed to dry at as near standard atmospheric conditions as possible for 15 minutes. The 60 HZ test voltage was applied immediately following the 15-minute drying period. The test voltage was raised from 0 to 30 kV in not less than 5 or more than 15 seconds and held at the 30 kV level for 30 seconds. The leakage current was monitored and recorded over the 30-second test duration. For informational purposes one sample was taken to failure and another sample was retested with the coating being compromised (cut) in two locations.

**Table 1 Dry Electrical Acceptance Leakage Tests**

<b>Sample Number</b>	<b>AC Voltage Dielectric Test – 5 min Duration (kV)</b>	<b>AC Current Leakage <math>\mu</math>a</b>	<b>Observations</b>	<b>Below the 100 <math>\mu</math>a allowable Level</b>	<b>Results</b>
1	100 kV	6 $\mu$ a	No Flashover	Yes	Pass
2	100 kV	5 $\mu$ a	No Flashover	Yes	Pass

**Table 2 Wet Electrical Acceptance Leakage Tests**

Sample Number	AC Voltage Dielectric Test – 5 min Duration (kV)	AC Current Leakage $\mu$ a	Observations	Below the 100 $\mu$ a allowable Level	Results
1	50 kV	14 $\mu$ a	No Flashover	Yes	Pass
2	50 kV	12 $\mu$ a	No Flashover	Yes	Pass

**Table 3 Dry Electrical Leakage Test**

Sample Number	AC Voltage Dielectric Test – 30 sec Duration (kV)	AC Current Leakage $\mu$ a	Observations	Below the 100uA allowable level	Results
2	100 kV	50 $\mu$ a	No Flashover	Yes	Pass

**Table 4 Wet Electrical Leakage Test**

Sample Number	AC Voltage Dielectric Test – 30 sec Duration (kV)	AC Current Leakage $\mu$ a	Observations	Below the 50uA allowable level	Results
2	30 kV	5 $\mu$ a	No Flashover	Yes	Pass

**Table 5 Wet Electrical Failure Test**

Sample Number	AC Voltage Dielectric Test – 5 sec Duration (kV)	AC Current Leakage $\mu$ a	Observations	Below the 50uA allowable level	Results
2	100 kV	50 $\mu$ a	No Flashover	NA	Ok
2	120kV	64 $\mu$ a	No Flashover	NA	Ok
2	130kV	80 $\mu$ a	No Flashover	NA	OK
2	200kV	Flashover	Flashover	NA	Failure

**CONCLUSIONS**

The 2 Polyurethane Coated Polyester Web samples submitted meet the pass/fail criteria of both the Wet/Dry Electrical Acceptance and Electrical Test Procedures as outlined in ASTM F1701 Standard. During all tests other than the failure and cut sample tests, there were no observed flashovers and the leakage current recorded for both rope samples did not exceed the maximum levels of 100  $\mu$ a for the Dry Electrical Tests, 50  $\mu$ a for the Wet Electrical Tests or 100  $\mu$ a for the Wet/Dry Electrical Acceptance Tests.

The compromised (cut) sample demonstrated unstable increasing leakage currents upon application of voltage, which indicated that the compromised coating had allowed water absorption into the web material resulting in high leakage currents across the test sample. The Wet Electrical Failure test with 2-foot electrode spacing experienced voltage flashover across the sample surface at 200 kV.

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