



Bedford Materials Co., Inc.  
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## SPECIFICATION

# WH90<sup>®</sup> QUICK BOND LOW TEMPERATURE BOND ENVIRONMENTALLY SOUND HEAT CURABLE EPOXY DIAMOND PATTERN COATED KRAFT PAPER

1. This specification covers thermally upgraded electrical kraft paper coated on both sides in a diamond pattern with heat curable modified epoxy resin.  
NOTE: The SI (metric) values where included with customary U.S. values are rounded equivalents of the U.S. values and are for reference only.
2. No change shall be made in the quality and/or formulation of successive shipments of material furnished under this specification without first obtaining the approval of the purchaser.

### MANUFACTURE

3. Paper: WH90 Thermally upgraded electrical kraft paper.
4. Coating:
  - 4.1 Smooth, uniform coating of heat curable epoxy resin shall be applied to the kraft paper per Section 4.2 The coated paper shall be free from resin droplets.
  - 4.2 The epoxy resin shall be applied to the kraft paper in a diamond pattern such that the diagonals of the treated areas fall on straight lines approximately parallel and perpendicular to the machine direction of the paper. Each diamond shaped area shall be approximately 0.375 inch (9.5 mm) on a side spaced on 0.625 inch (15.9 mm) centers.

### PHYSICAL PROPERTIES AND TESTS

5. **MOISTURE CONTENT:** The moisture content shall be such that the paper can be run through a cuffing machine without separating the paper. Moisture content is 3 to 7% when determined per ASTM D 202.
6. **BURSTING STRENGTH:** Uncured (See Section 13).

Bursting Str., (ASTM D 203), Min.

Thickness, Nom.		Avg. of 10 Samples	
<u>Inch</u>	<u>mm</u>	<u>PSI</u>	<u>mPa</u>
0.005	0.127	80	0.59
0.007	0.178	100	0.69
0.010	0.255	155	1.07
0.015	0.380	225	1.55



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7. DIELECTRIC STRENGTH: Determine per ASTM D 202 at 500 volt per second rate of rise and 60 Hz on paper dried for one hour (min) at 125°C (257°F) and allowed to cool at room temperature in a desiccator. (see Section 13).

Thickness, Nom.		Dielectric Str., Total Volts, Min.
<u>Inch</u>	<u>mm</u>	<u>Avg. of 10 Samples</u>
0.005	0.127	1200
0.007	0.178	1600
0.010	0.255	2100
0.015	0.380	3000

8. BOND TEST:

8.1 The tensile shear strength of a sample prepared per Sections 8.2 and tested at 100 ± 2°C (212 ± 3.6°F) with a pull rate of six inches (152mm) per minute shall be 40 psi (0.275 mPa) minimum.

8.2 Specimen shall be prepared using two pieces of clean flattened aluminum (Westinghouse PDS 12002BT) or copper (Westinghouse PDS 113402QA) sheet, .018 to .032 inch (0.457 – 0.813 mm) thick, 2 inches (51 mm) wide, and 6 inches (152 mm) long. The metal strips shall be cleaned using naphtha solvent (Westinghouse PDS 55812AB) followed by an oven drying of one hour at 100°C (212°F). A two inch (51 mm) length of each sheet shall form an overlap. Between the two overlapped sheets, place four layers of coated paper, 2 inches (51 mm) by 2 inches (51 mm). The sandwich shall be held at a pressure of 2 psi (0.0138 mPa) and 92°C ± 2°C (194°F ± 3.6°F) for 90 minutes. Whatever the method for applying pressure, the device shall be preheated to 92°C ± 2°C (194°F ± 3.6°F) prior to application.

9. DIELECTRIC LIQUID COMPATIBILITY: When 15 grams of coated paper is cured for 6 hours at 140 ± 2°C (284 ± 3.6°F) and thermally aged per ASTM D3455 for 168 hours at 105 ± 2°C (221 ± 3.6°F), the coated paper shall be compatible with Wemco C oil (Westinghouse PDS 55822AG), Wemco FR (Westinghouse PDS 55822AR), and silicone fluid (Westinghouse PDS 53846BE).

<u>Test</u>	<u>Wemco C Oil</u>	<u>Wemco FR</u>	<u>Silicone Fluid</u>
Dissipation Factor	0.05% (max.)	0.05% (max.)	0.05% (max.)
Neutralization Number	0.04 mg. KOH (max.)	0.04 mg. KOH (max.)	0.04 mg. KOH (max.)
Interfacial Tension	38 dynes/cm (min.)	38 dynes/cm (min.)	38 dynes/cm (min.)
Dielectric Strength	28 kv (min.)	28 kv (min.)	28 kv (min.)

10. THERMAL AGING IN DIELECTRIC LIQUID: After 7 days at 150°C (302°F) in a sealed stainless steel tank per Westinghouse Dwg. 5853D61 (or equivalent) containing 1807 grams of insulating oil, (Westinghouse PDS 55822AG); 107.5 grams of electrical steel (to be supplied by purchaser); 5 bonded specimens prepared per Section 8.2\*, the bonded specimen shall retain at least 60% of the original tensile shear strength measured at room temperature and pulled at 6 inches (152 mm) per minute.

\*NOTE: Prior to the aging tests, all materials, with the exception of the dielectric liquid, shall be dried at 125°C (257°F) for 18 hours; and the dielectric liquid shall be heated to 80°C (176°F) and degassed in a vacuum chamber under a vacuum of 0.5 mm Hg or less.



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11. STORAGE LIFE: When stored at a maximum temperature of 30°C (85°F), material is not subject to rejection on the basis of the requirement specified in Sections 8.2 after 6 months has elapsed from date of receipt.
12. SAMPLING: Samples shall be taken from the beginning and end of each production lot (See Section 13), uniformly distributed across the width of the mill roll.
13. REFEREE SAMPLING PROCEDURE: For any Bursting Strength or Dielectric Strength test performed by either the manufacturer or purchaser on a production lot\* of material resulting in test values which are not within specification limits, the resampling procedure shall be as follows:

1. If only one specimen of the group fails, another group shall be tested from the given area of the production lot\*. If more than one specimen of the first group fails, the given production lot\* shall be rejected. If any of the second group fails, the given production lot shall be rejected.
2. If two or more values are not within specification limits, the given production lot\* shall be rejected.

\*NOTE: A production lot is defined as "all paper submitted on a particular order that is the same nominal thickness, from the same mill roll of uncoated paper, produced in a given production run on a given tower under the same conditions."

14. WIDTH TOLERANCE:  $\pm .500$  inch ( $\pm 12.7$  mm) per individual roll from roll to roll in any production lot.
15. TEST REPORT: At any time of delivery, manufacturer shall submit to the Purchasing Dept. originating the Purchase Order, a copy of the Certificate of Compliance from paper supplier, and a copy of bare paper test results.
16. PUT UP:

#### 16.1 Rolls

- 16.1.1 Furnished in roll diameter as follows:

Permissible OD Variation

<u>Inches</u>	<u>Millimeters</u>
18 to 30	455 to 760

- 16.1.2 Rolls shall be wound on a substantial fiber or chipboard tube of one continuous length having a wall thickness of 0.25 inches (6.4 mm) minimum. Inside diameter of tube shall be  $3 \pm 0.125$  inch ( $76 \pm 3.2$  mm). A tight fitting plug having a 0.75 to 1.25 inch (19 to 32 mm) diameter hole shall be inserted in each end of the tube.

- 16.2 The coated paper shall be securely fastened to the tube along the full width of the paper.

17. SPLICES:



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- 17.1 Number of splices shall be kept to the minimum and shall not exceed 5 per roll with a minimum of 200 feet (61 m) between splices.
- 17.2 Splices shall not be taped, but shall be left open.
- 17.3 Each splice shall be flagged with a piece of red paper projecting at least one inch (25.5 mm) from the roll on one end.
18. WRAPPING: Each roll shall be wrapped with waterproof material, and the ends of the roll shall be covered with a waterproof material and bonded.
19. PACKAGING: Properly packed to prevent damage during shipment.
20. MARKING: Each roll plainly marked as follows: Purchase Order Number; Treated Paper, Spec. Number; Size of Roll; Width: Gross; Tar and Net Weight; Roll and Production Lot Numbers; Date of Manufacture; Name of Manufacturer.