IN RE: ABRAMS November 1992

LOW COST, HIGH TEMPERATURE ASBESTOS
ELECTRICAL INSULATION

MWBB-0005822

Johns-Manville

22 East 40th Street • New York, N.Y. 10016

Sales Offices in Principal Cities

JM

PLAINTIFF'S EXHIBIT
WH-572

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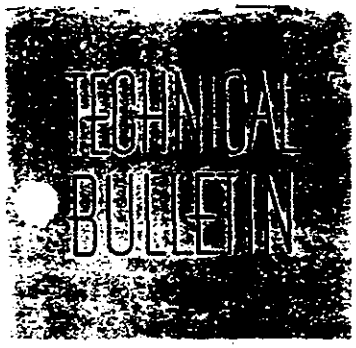
Litho in U.S.A.

INTERLAKE ARMS INVOICE 1 0999



Johns-Manville QUINORGO®

NO. 3000, 4000, 5000 & 6000

LOW COST, HIGH TEMPERATURE ASBESTOS ELECTRICAL INSULATION FOR SAFE, LONG-LIFE EQUIPMENT DESIGN.

M88-0005819

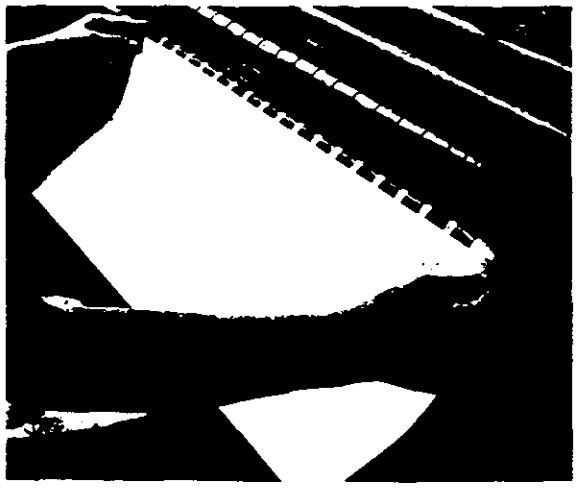
DESCRIPTION

Quinorgo Electrical Insulations are high temperature dielectric papers available in a thickness range from 3 to 15 mils. Principally inorganic, they contain over 80% selected Canadian Chrysotile asbestos fibers. Selected organic binders are added to impart specific product features. Different styles vary in stiffness, stretch, saturability and other physical properties. All types are noted for outstanding retention of dielectric strength after long term exposure to high operating temperatures. Low cost and excellent performance in electrical apparatus and related service have made Quinorgo an industry standard of recognized quality.

NO. 3000 & 4000 QUINORGO

These heat resistant dielectric sheet materials contain over 83% specially processed, highly purified asbestos fiber. A unique treating process leaves the asbestos fibers free of dirt, dust and water soluble electrolytes. These two Quinorgo insulations may be readily treated or combined with organic or inorganic reinforcing materials such as glass cloth or plastic film. No. 3000 Quinorgo is absorbent, especially in the thinner calipers. This permits thorough impregnation with any of the various resins, varnishes or fluid dielectrics in use today. No. 4000 Quinorgo is practically identical to No. 3000 except that it contains about 3% resin added to reduce its absorption and penetration characteristics. This combination provides an ideal laminating material. One surface may be coated with shellac or varnish to permit bonding or cementing to inorganic woven cloth, mica or organic films. The bonding coat that is applied does not tend to strike through to the other side. Thus, the untreated surface is left ready to absorb the varnishes used in further processing of equipment.

No. 4000 Quinorgo—3 mil thickness—shown used as layer insulation on stick wound coils.



NO. 5000 QUINORGO

This is a thin, flexible, heat-resistant electrical insulation composed of purified asbestos fiber and a small amount of high temperature rubber binder. The sheet is formed by a special fiber cleaning and wet felting process. This results in a thin, tightly matted and highly uniform material. Thermal stability and lasting dielectric strength are characteristic. Actual tests conducted at 200°C show no loss of dielectric strength with temperature exposure, however, binder deterioration above 150°C is apparent under humid conditions.

No. 5000 Quinorgo may be applied "as is" or used as a base sheet for treating with a variety of resins and varnishes. It may also be combined with films and fabrics for extra strength. Because of the rubber binder, it has more resistance to moisture than the usual untreated asbestos paper. Good stretch properties compensate for lower tensile giving an extra flexible but tough sheet. Available in a selection of thicknesses, No. 5000 Quinorgo can be supplied in tapes, cut pieces and 36" wide rolls.

NO. 6000 QUINORGO

This newest addition to the Quinorgo product group has the lowest organic binder content (maximum 5% acrylic resin). Low in basis weight, the sheet has an open structure which makes it very easy to saturate. The minimum binder content permits highest temperature service, following proper resin treatment.

J-M and other composite insulation manufacturers combine No. 6000 with glass cloth and organic films. In addition, manufacturers of rigid plastic laminates use this porous sheet as a substitute for glass cloth and mat. It produces a plastic sheet with comparable physical characteristics plus outstanding thermal and dimensional stability. Available in 5 and 7 mil thicknesses.

TEMPERATURE CLASSIFICATION AND DESIGN CONSIDERATIONS

All the different styles of Quinorgo require further treatment for optimum performance in electrical insulation systems. Treatment by varnish impregnation, unit encapsulation, or impregnation and coating are necessary to insure maximum moisture resistance. However, impregnation can be readily accomplished with suitable equipment.

Use tests and other performance data indicate that well impregnated Quinorgo sheets assume the thermal aging characteristics of the saturating resin. J-M initially classifies all basic Quinorgo styles as Class 130. This arbitrary classification is based solely on the known temperature stability of the organic binders.

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IN USE: AIRBAMS November 1992

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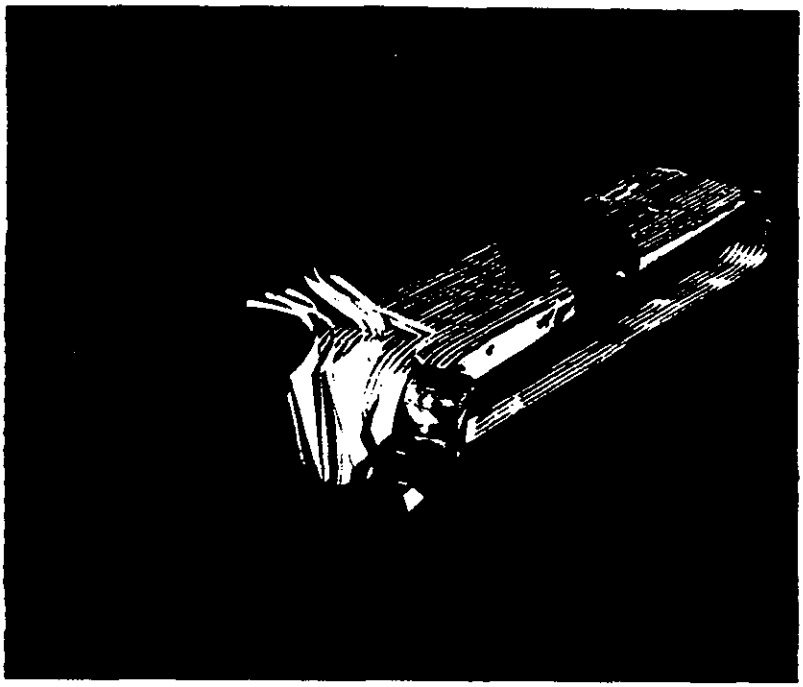
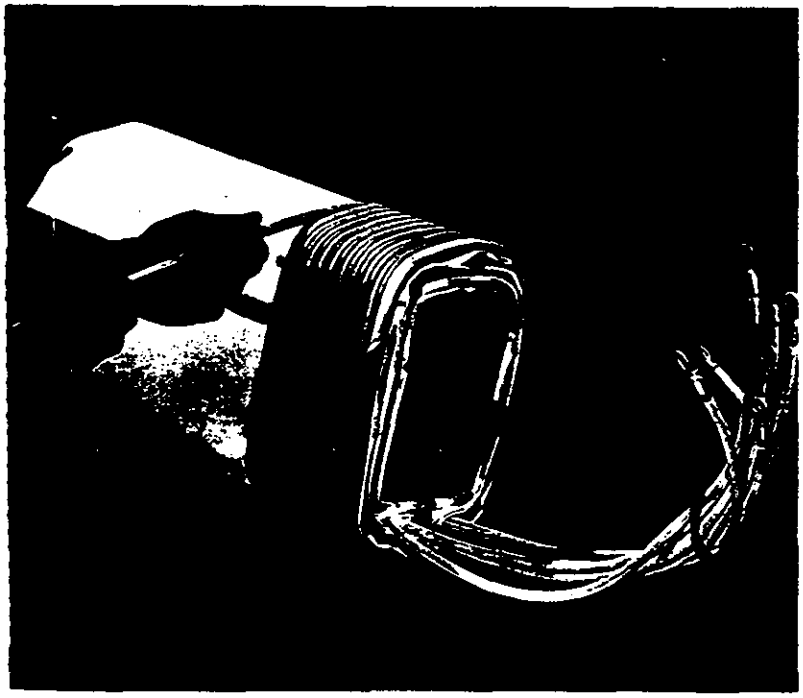


Quinorgo turn insulation being trimmed on edge wound field coils.

Dry type transformer winding using Quinorgo layer insulation.



APPLICATIONS

Electrical

- **Transformers, coils and reactors —layer and barrier insulation.**
- **Lifting magnets—turn insulation, strap wound pancake coils.**
- **Motor field coils, edge wound coils—turn insulation (See Note 1).**
- **Hydro generator rotor coils—turn insulation.**
- **Bobbin coils—layer and wrapper insulation.**
- **Electrical insulation, coaters—base sheets for saturating and coating.**
- **Electrical insulation composite manufacturers—film and cloth combinations (See Note 2).**
- **Electrical laminates—base sheet for saturating and pressing, high and low pressure laminates.**
- **Round and rectangular tubes—transformer cores, coil cores and bobbins, cartridge fuses, control devices, reactor cores, etc. (A list of tube manufacturers is available on request.)**

General

- **Optical—lens retainer during fusing of bifocal or trifocal lens blanks.**
- **Gaskets—high temperature.**
- **Identification—fire proof labels.**
- **Chemical service—filtration.**

Note 1. For insulating/bonding applications see data sheets on J-M No. 486 Quinorgo.

Note 2. J-M and other leading electrical insulation manufacturers offer a broad line of Quintarra and Quinorgo composites for transformer, motor, electronic and cable applications.

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IN RE: ABRAMS November 1992

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TYPICAL TEST DATA

(All tests made after conditioning at 23°C, 50% R.H.)

PRODUCT	[illegible]		[illegible]	STRENGTHS					
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NO. 3000 QUINORGO	4	3.6-4.4	1.6	7	5	850	—	Less than 1%	110
	5	4.5-5.5	2.1	9	7	1100	1400		140
	7	6.3-7.7	3.2	11	8	1500	1800		220
	10	9.0-11.0	4.3	16	12	2000	2400		375
	15	13.5-16.5	6.3	18	14	2900	3300		575
NO. 4000 QUINORGO	3	2.7-3.3	1.1	6	6	600	—	Less than 1%	110
	5	4.5-5.5	2.0	14	10	1100	1500		190
	7	6.3-7.7	3.0	17	15	1600	1900		350
	10	9.0-11.0	4.2	20	20	2000	2400		600
	15	13.5-16.5	6.5	23	25	2900	3300		900
NO. 5000 QUINORGO	3	2.7-3.3	1.2	1.4	7	550	650	5.0	—
	4	3.6-4.4	1.7	2.2	8	750	850	6.0	10
	5	4.5-5.5	2.3	3.5	8	1000	1110	6.5	18
	7	6.3-7.7	3.5	5.0	11	1500	1850	6.0	39
	10	9.0-11.0	4.9	6.5	13	2200	2500	5.0	60
	15	13.5-16.5	7.3	7.5	15	3100	3450	4.0	136
NO. 6000 QUINORGO	5	4.5-5.5	1.5	2	4	950	1200	1.5	—
	7	6.3-7.7	2.3	3	5	1200	1400	1.5	—

ELECTRICAL PROPERTIES AFTER AGING

(Typical average laboratory test values—not for specification)

TEST AND CONDITIONING*	NO. 3000	NO. 4000	NO. 5000	NO. 6000
Dielectric Strength, Volts/Mil, Standard Cond.	230	250	240	210
Dielectric Strength Retained, After 168 Hrs. at 175°C	95%	95%	100%	105%
Dielectric Strength Retained, After 168 Hrs. at 200°C	—	—	102%	108%
Dielectric Constant, 60 CPS, Standard Cond.	8.9	6.7	15.1	20.3
Dielectric Constant, After 168 Hrs. at 175°C	9.0	4.8	3.9	4.1
Dielectric Constant, After 168 Hrs. at 200°C	—	—	3.5	6.5
Dissipation Factor, 60 CPS, Standard Cond.	.35	.27	.62	.89
Dissipation Factor, 60 CPS, After 168 Hrs. at 175°C	.42	.20	.14	.16
Dissipation Factor, 60 CPS, After 168 Hrs. at 200°C	—	—	.17	.39
Volume Resistivity, OHM-CM, Stand.	3.5×10^9	2.9×10^{10}	2.1×10^9	1.5×10^9

*CONDITIONING: Standard—Conditioned 40 hrs./23°C/50 RH
Dielectric Strength tested at aging temperature.
Dielectric Constant and Dissipation Factor tested at Standard.

Note: These insulations may be stocked over long periods without deterioration. Being naturally porous, however, they should be either maintained in a dry or heated storage space or should be dried before impregnation. When rolls of these materials have been impregnated or treated before storage, they should be given a slight drying cycle before using. This drying would depend upon the known protective ability of the particular varnish used and efficiency of the storage facilities to preclude moisture absorption.

TEST METHODS

Caliper—TAPPI, T-441 (Rest Method) or ASTM D-374 Method C

Breaking Load, Bursting Strength, Stretch—ASTM D-202

Clark Stiffness—TAPPI T-451

Dielectric Strength—ASTM D-149 (short time test method) using 2" diameter brass electrodes at 15 psi in air. The minimum Dielectric Breakdown Strength of the material is the lowest average value for any individual lot. The average Dielectric Breakdown Strength is the normal quality level which the material will average.

Volume Resistivity—ASTM D-257

Dielectric Constant & Dissipation Factor—ASTM D-150

03111907

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NOVEMBER 1982

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