



Technical Digest

Burke Rubber Company

Burke Flexible Membrane Floating Covers

Burke Industries offers natural and synthetic rubber products of the highest quality. For more information please contact your nearest Burke Technical Sales Representative, or call our Toll Free number: (800) 669-7010.

All statements, technical information and recommendations made in this Technical Digest are, to the company's knowledge, true and accurate and are based on our own research and research of others. The information contained herein does not constitute a recommendation of suitability for use of Burke products for any specific application, since conditions of use are beyond Burke's control. Burke assumes no liability in connection with any use of this information.

Hypalon is a registered trademark of DuPont.

Benefits

- Lower initial investment
- Dramatic savings on chlorine treatment
- Significant savings on algae control chemicals
- Reduced chemical and water evaporation losses
- Protection from atmospheric pollution and damage, including heat and ozone
- Less damage from snow, ice, hail or rain
- Increased safety
- Solid seismic resistance
- Reduced maintenance
- Reduced need for drainage and cleaning
- Attractive appearance with natural color materials
- Full weathering warranty
- 20 years and 300 million square feet of flexible membrane experience.

Applications

- Potable Water
- Chemical Processing
- Mining
- Agricultural
- Power and Utilities
- Wastewater and Sewage Treatment
- Food Processing

When the American Water Works Association (AWWA) recommended that new reservoirs be designed with covers, they also recommended the retrofitting of roofs on existing reservoirs. At the same time, private and public water works across the country were becoming increasingly concerned about the high and rising costs of conventional rigid roofs.

After years of work and experimentation, Burke and its contractors developed quality, economical alternatives...flexible membrane floating roofs. The flexible membrane is attached to the perimeter of the pond or lagoon with sufficient slack to accommodate the rise and fall of water or other liquids. A system of floats and pumps minimizes damage and provides proper rainwater drainage.

Burke pioneered the development of a special 5-ply cover material made of Hypalon® that provides the added toughness engineers demand, without sacrificing the flexibility required by the dynamic loading of a floating cover.

Floating covers require no supporting structures or foundation reinforcement. As a result, the covering of new or existing reservoirs is not only simple, it's inexpensive.

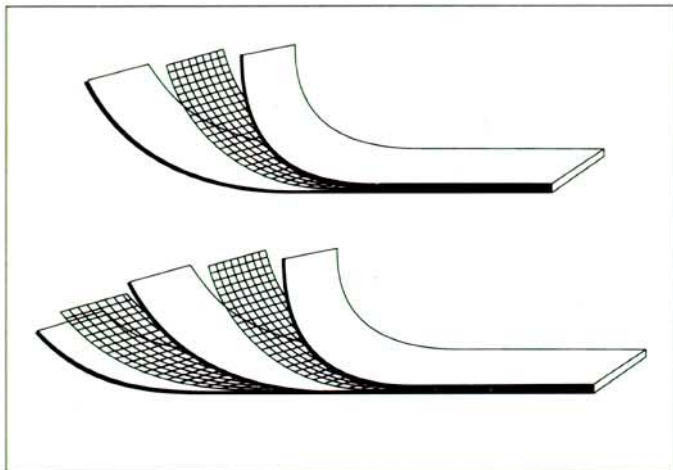
In addition, Burke floating covers provide added savings by reducing required levels of treatment chemicals while retarding evaporation.

A number of organizations have been using Burke floating covers to control odors from wastewater, chemicals, treatment and sewage lagoons. The covers also provide an anaerobic environment to collect methane gas generated by the digestive process. And, in many industrial applications, chemical fumes can be successfully controlled with the Burke floating cover.

Today, Burke has more than 20 years of experience in the flexible membrane field and over 45 years in the rubber industry. During this time we have encountered and solved a broad range of liquid containment and storage problems for organizations around the world.



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We have helped hundreds of cost-conscious water districts throughout the U.S. to cover new or existing potable water reservoirs and protect city water supplies. We have also aided municipalities as well as chemical and industrial plants with their wastewater, sewage and treatment lagoons.

Quality and Performance

Burke calendars the floating cover material into 45-mil thick sheets. Up to five feet wide, a roll of Burke flexible membrane contains about 10,000 square feet of material. In addition to calendered rolls, for speed and ease of installation Burke offers factory-fabricated panels. These are seamed into large panels, up to 20,000 square feet, to custom fit your installation.

And because we know you're concerned about the aesthetics of your cover in addition to its cost and durability, Burke offers floating cover materials in four colors—designed specifically to blend with your environment—with no loss of weather resistance. Covers can be produced in either earth, forest, sky or white colors—the colors that are closest to nature.

Complete Support

In addition to extensive experience in the field, Burke has one of the most advanced rubber laboratories in the industry today. Our engineering, manufacturing and fabrication teams concentrate on meeting your needs the first time...every time.

And to ensure the quality of your installation, Burke has developed a worldwide network of highly qualified Burke-approved installation contractors. These contractors provide prompt response for "turn key" installations and technical assistance.

In addition, our technical staff is available for every installation—large or small—to oversee the installation from beginning to end. This ensures that you receive maximum support in every area, and complete satisfaction.

Whatever your requirements...wherever your location...Burke will be there to provide complete assistance.

Burke Total Assistance Program

Burke offers every client complete service. This assures you of quality and reliability at every level of production and installation of your Burke flexible membrane floating cover.

To help you obtain the best floating cover for your specific installation, Burke has developed a complete range of technical, engineering, financing, design and installation brochures. These include:

- Specification Sheets
- Customer Installation Lists
- Installation Procedures
- Weathering Warranty
- Layout/Estimating Sketches for Ponds/Reservoirs
- Pond/Reservoir Plans
- Design Detail Sheets
- Chemical Resistance Tables
- Field Patching and Seaming Procedures
- Technical Digest Reports
- Case History Reports
- Alternative Financing Brochure

For more information and assistance, contact Burke's technical staff or the Burke-approved contractor nearest you. They will provide complete assistance and information.



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Effects of Fabric Reinforcement on Tensile Properties of Burke Hypalon® Flexible Membrane Liners

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Tensile Performance Factor

The measurement of Tensile Properties by ASTM D751—Grab Method, provides an important set of comparisons of fabric-reinforced lining materials. This test provides for the measurement of the Breaking Strength, along with the corresponding Elongation at Break.

An Instron tensile testing machine is used with a 4" x 6" material sample held by 1 inch square jaws clamped symmetrically on the sample and 3" apart in the long dimension at the start of the test. The jaws are separated at 12 inches per minute, and a continuous recording of the tensile force (pounds) vs. Elongation (inches) is made. The test is continued to the rupture point of the sample—(where the liner will leak). An initial peak is reached at failure of the reinforcing fibers—but no membrane ruptures occurs. A second peak is reached at the failure of the rubber, which is the point of rupture.

Using the proper scale conversion, a direct reading of the Break Strength (pounds) is obtained. Dividing the Elongation (inches) by the original jaw separation (3 inches) x 100% gives Elongation (percent).

The total area under the graph between the starting point and the point of rupture (adjusted for the recording scale), gives a value (inch-pound) relative to the energy absorbed by the liner sample before rupture occurs.

To say it another way, the enclosed area measures the total ability of the liner to absorb force through its strength and conformability properties. This value could be called the

liner's "Tensile Performance" Factor.*

The following table, compiled from typical average values, compares two types of fabric reinforcement used in Burke Hypalon. Testing was conducted on samples taken from both the machine direction and the transverse direction of the calendered sheet. "Tensile Performance" values shown represent the lower values of the two directions. Each fabric type provides a different support of reinforcement to the rubber to meet the wide range of field conditions likely to be encountered.

The lightweight support provided by the Type 1 fabric is achieved by a 16x8 leno weave of 140 x 250 denier yarn (giving an apparent 8 x 8-250 denier). It prevents stretch and sag, which can occur under adverse conditions with unsupported thermoplastic CSPE membrane.

Type 2 fabric is a 10 x 10-1000 denier plain weave with highest strength for maximum or continuous stress conditions. The reduced elongation accompanying the more tightly woven, high-strength fabric accounts for a lower "Tensile Performance".

Conclusions

Tensile strength alone, as expressed by Breaking Strength of the reinforcing fabric, does not measure the total "Tensile Performance" capabilities of a fabric-reinforced membrane liner. Elongation to the point of rupture must also be included to determine optimum performance. A carefully considered balance of properties should determine the final choice of a flexible membrane liner.



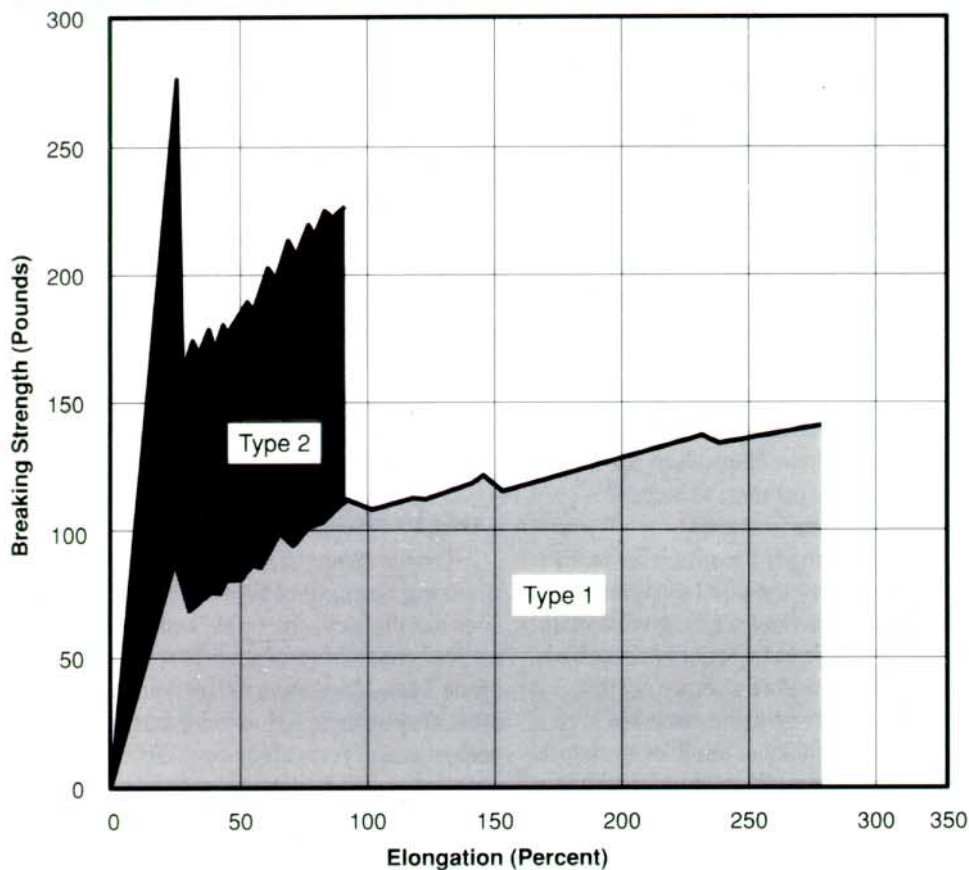
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Comparison of Tensile Properties ASTM-D751 – Grab Method

	Type 1	Type 2
1. Breaking Strength, Fabric (Pounds)	85	275
Breaking Strength, Rubber (Pounds)	140	225
2. Elongation at Break, Fabric (Percent)	25%	25%
Elongation at Break, Rubber (Percent)	280%	90%
3. "Tensile Performance" (Inch-Pounds)	855	515
4. Comparison of "Tensile Performance" Factors (Type 1 = 100 percent)	100%	60%

*Reference is made in ASTM D885 to the area under the Load/Elongation Curve in specifying tests for industrial filament yarns. It is called "Work-to-Break", and is defined as "the total energy required to rupture a specimen during a tensile test. Work-to-Break is proportional to the area under the Load/Elongation Curve from the origin to the breaking point and commonly is expressed in inch/pounds".

"Tensile Performance" Factor for Burke supported CSPE membranes



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High Purity Applications For Burke Hypalon® Membranes

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Water purity, taste and odor. When either one or all of these criteria are important, Burke's Hypalon liners and floating covers have passed the test.

Agency Approvals

Back in 1971, Burke Rubber Company received approval from the EPA for use of Hypalon in potable "finished" drinking water reservoirs. Chlorosulfonated Polyethylene (Hypalon) is listed in the Federal Register under "21 Food and Drugs", revised as of April 1, 1980, under 177.2210, "component of articles intended for use as liners and covers for reservoirs intended for the storage of water for drinking purposes."

Burke Hypalon was the first to qualify under Table 10A of the National Sanitation Foundation standard no. 54 for potable water use. Both the Hypalon compound and the companion adhesive have passed the rigorous testing which includes chemical analysis as well as taste and odor evaluations.

The California Department of Public Health has approved Burke Hypalon adhesive (high purity grade) for use in installations in potable water reservoirs, when used in accordance with the Burke application instructions. The Burke seaming adhesive is a high-solids solution of the potable compound, formulated to an optimum viscosity of 400 centipoises as tested by ASTM D2256. The solids content at that viscosity runs between 12% and 16%, providing the "body" needed for maximum strength seaming.

Since then, the U.S. Department of Agriculture and the Food Safety and Inspection

Service approved Burke's Hypalon for use as a component part of food processing equipment in Federally inspected meat and poultry plants.

Applications

The extremely high purity and absence of extractables that could affect the chemical/taste and odor of Burke high purity grade Hypalon has promoted its use in areas other than drinking water storage. Aquatic life can be very sensitive to water purity, taste and odor. Burke's Hypalon has been widely used for many years for both fresh water and salt water applications, including:

- fish hatchery in San Marcos, Texas
- fish traps used by the State of Alaska for fish farming
- rearing tank liners for fresh water and brine shrimp for laboratory use
- rearing tank liners for trout, salmon, and other fish

Only Burke's Hypalon

An unusual application of Burke high-purity grade Hypalon was as a floating cover over "super pure" water used in a physics experiment to determine the rate of decay of protons. Burke's Hypalon was the only commercially produced elastomer that could contain "30 meter water" without contamination (by comparison, distilled water is only "10 meter" quality.)

Few applications may require purity in the "30 meter" range, but Burke high purity Hypalon provides that superior quality to all applications.



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