

36 Mil Reinforced Hypalon® (CSPER) Membrane Specification Guide

The following is a specification for Burke's flexible membrane pond lining material, and is recommended for us in specifying lining materials.

PHYSICAL PROPERTIES: (These are interim values and subject to change)

| Property | Test Method | Minimum Specification* | Typical Avg. Values |
|--|---|--------------------------------|---------------------|
| Thickness | | | |
| 1 Total overall (mils) | ASTM D751 | 34 | 36 nominal |
| 2. Min. over scrim (mils) | Optical Method | 11 | Pass |
| Tensile Properties (each direction) | ASTM D751 Grab Method | | |
| 1. Breaking Strength (pounds) | | 200 | 275 |
| Fabric Membrane Rupture | | 150 | 225 |
| 2. Elongation at Break | | 15% | 20% |
| Fabric Membrane Rupture | | 30% | 110% |
| Tear Propagation (pounds) | ASTM D751 Tongue Tear (8" x 8") | 80 | 100 |
| Hydrostatic Resistance (psi) | ASTM D751 Method A Procedure 1 | 250 | 405 |
| Puncture Resistance (pounds) | FTMS 101B method 2031 | - | 240 |
| Bonded Seam Strength (pounds) | ASTM D751, Modified (12in./min) | 160 | 175 |
| Ply Adhesion (lbs./in. width) | ASTM D413 Machine Method, Type A (12in./min) | 7 (or film tearing bond) | 8 |
| Ozone Resistance | ASTM D1149 1/8" bent loop, 100 pphm 104°F, 7 days | No cracks at 7 x magnification | pass |
| Low Temperature ¹ | ASTM D2136, 1/8" mandrel, 4 hrs. @ -40°F | Pass | Pass at -45°F |

Notes:

1. These specification tables represent current opinion of the data points to characterize the membrane product as produced and are not necessarily appropriate for product performance or installation or engineering design criteria 'per se'. (For example, the low temperature resistance numbers represent qualities for few minutes at a given temperature and must not be interpreted or extrapolated into installation temperature qualities or comparisons.

*Minimum specification limits are currently proposed industry standards for this type of flexible membrane product. Burke Quality Control monitoring limits for this specification are based on a minimum 97.7% one sided confidence level.

OTHER MATERIAL SPECIFICATIONS AND CHARACTERISTICS:

- A. The thermoplastic elastomer lining material shall be manufactured from a synthetic rubber compound designed to contain Hypalon Type 45 synthetic rubber as the principal elastomer. The compound used in manufacture of the laminate shall conform to the specification of Burke 30 Mil Unsupported Hypalon® M-148 Potable Grade or M-321 Industrial Grade material. (Specification Sheet BR00208).
- B. The thermoplastic elastomer lining shall be manufactured totally by calendaring, with each ply of rubber laminated to the next ply through the openings in the scrim weave to produce a pinhole-free construction. The high strength reinforcing fabric (scrim) shall be a 10 x 10 plain weave 1000 warp / 1000 fill denier construction. The single ply of reinforcing fabric shall be totally encapsulated within two plies of rubber, giving a 3 ply construction of nominal 36 mil thickness. Exposed fabric or indication of delamination will not be permitted.
- C. "Potable Grade" Hypalon® is suitable for the storage of potable water. A colored top ply in white, blue, tan or green is available at additional cost. Operational service temperature should not exceed 120°F maximum. "Industrial Grade" Hypalon® for non-potable use is available only in black. Operational service temperature should not exceed 160°F maximum. Brief or intermittent exposure to higher temperatures may occasionally be tolerated, but may reduce the effective service life of the liner. The required grade must be specified, and the liner manufacturer shall certify compliance.
- D. All membrane lining materials transmit water vapour at a very low rate, which is related to the temperature and relative humidity. The permeability of Burke Hypalon®, as expressed in metric Perm-Centimeters is less than 3×10^{-3} for a 30 mil thickness. (This translates to approximately one gallon per acre per year @ 72°F and 50% R.H.). Permeability can also be expressed as a "K" factor in centimetres/second, a test generally used for more porous materials. Burke Hypalon® has a "K" factor in the range of 10^{-12} .

M-283 Black, Potable Grade
M-307 Black, Industrial Grade
36 Mil, 10x10-1000d Scrim Hypalon® Flexible Membrane

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SEAMING:

1. The calendered roll goods will be fabricated into optimum size panels up to 20m000 square fee, based on weight considerations, using an approved seaming method as prescribed by the manufacturer to achieve the values as specified herein. When the seam is tested in shear according to the specifications, failure of the material including the seam will not occur at the bonded surfaces. All seams must pass at 100% air lance inspection. Recommended maximum panel sizes for varying thicknesses of liner are as follows:

Table on Maximum normal Panel Size (square feet)

| Sheet Thickness | 30 Mil | 36 Mil | 45 Mil | 60 Mil |
|-----------------|--------|--------|--------|--------|
| Panel Size | 20,000 | 18,000 | 14,000 | 10,000 |

2. All factory seams for either fabrication or repairs shall provide a minimum bonded overlap of reinforcing fabric of 1” and shall extend to the edge of the sheet so that no loose edge is present on the top side of the sheet. A loose edge of the underside of the sheet is permissible, as long as the 1” minimum bonded overlap of the reinforcing fabric is maintained.
3. All field seams shall provide a minimum bonded overlap of the reinforcing fabric of 2” and shall extend to the edge of the sheet so that no loose edge is present on the top side of the sheet. Loose edge on the underside of the sheet is permissible as long as the 2” minimum bonded overlap of the reinforcing fabric is maintained. A nominal 6” overlap of liner panels shall be allowed to keep dirt out of the field seams.

3. All field seams are to be 100% inspected per specification by the customer, installation contractor and/or the lining manufacturer’s technical representative.
4. The installation contractor shall furnish shop drawings for the approval of the project engineer. Written approval of the engineer shall be obtained before proceeding with the work. The drawings shall show extent, sizes and details of the linings, including recommendations for terminating the lining and methods of sealing around penetrations. Except for special requirements due to configuration and/or terminating the lining, maximum use of large-size panels shall be made.
5. The manufacturer shall furnish complete written instructions for the storage, handling, installation, seaming and inspection of the material in compliance with this specification and conforming to the conditions of the warranty.

SURFACE PREPARATION:

Surface to be lined shall be smooth and free of all sharp objects, vegetation and stubble. A suitable soil sterilant should be applied when indicated. An authorized representative of the installation contractor shall certify in writing that the surface on which the lining is to be placed is acceptable. No installation of lining shall commence until this certification is furnished to the engineer. It shall be the responsibility of the contractor installing the flexible lining to keep the receiving surface in the accepted condition until complete installation of the lining is accomplished.

FACILITY DESIGNER, MANUFACTURER, FABRICATOR AND INSTALLATION CONTRACTOR:

1. The line facility shall be designed by a qualified, registered professional consulting engineering firm or other qualified designer with experience in the design and installation of the type of facility required. The design process shall have included full consideration of all aspects normally considered critical in lined facilities, including, in part, impoundment design, earthwork specifications, leak detection, prevailing ambient conditions, gas venting potential failure analysis, system upset potential, facility safety and security, liner degradation monitoring, fail-safe provisions, etc...
2. The installation contractor shall have installed a minimum of 250,000 square feet of the specified liner.

All statements, technical information, and recommendations made in this specification are, to the company’s knowledge, true and accurate and are based on our own research and the research of others. This 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. The contractor or purchaser/user is responsible for deciding where the data is appropriate for his own usage and under which circumstances the data should be applied. This specification in no way should be construed as amplifying, modifying or superseding Burke’s warranties on any products or services supplied by Burke and Burke assumes no liability in connection with any use of this information.