TECHNICAL DROP-IN SPECIFICATION

Dura-Skrim® NB-Series Reinforced Gas/VOC Barrier Polyethylene 45 Mil

The following technical drop-in specifications are provided as guidelines to be customized and finalized by the design engineer for preparing specific project specifications. This information is provided for reference purposes only and is not intended as a warranty or guarantee. Viaflex Inc. assumes no liability in connection with the use of this information. Please visit the Viaflex website at www.viaflex.com for current product specification sheets.

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**Table 1: Required Reinforced Polyethylene Gas Barrier Geomembrane Properties 45 Mil**

**7-LAYER CAST LAMINATED REINFORCED LLDPE-R GAS/VOC BARRIER GEOMEMBRANE SPECIFICATION**

The 7-layer cast laminated geomembrane consists of very flexible, linear, low-density polyethylene (LLDPE-R) and an inner core of chemically resistance EVOH barrier resin. The 7-layer cast laminated gas/VOC geomembranes serve as covers for the repelling of water and infiltration of oxygen into the containment as well as barriers to methane/H2S and other harmful VOC gases into the environment. As a liner, the gas/VOC barriers perform as barriers to any VOCs permeating through the liner and contaminating the subgrade beneath the liner. The inner core of the barrier layer is designed specifically to act as a barrier to VOCs such as radon, methane, and hydrocarbons. It is of great importance that the 7-layer cast laminated reinforced gas/VOC geomembrane be free from defects and installed without damage.

1. **DESCRIPTION**
2. General:

The purpose of this specification is to provide details of Manufacturing Quality Control (MQC), Manufacturing Quality Assurance (MQA), Construction Quality Control (CQC), and Construction Quality Assurance (CQA) for the manufacture and pre-assembly of geomembrane products. The Contractor shall furnish all labor, material, and equipment to install the Reinforced Polyethylene Gas Barrier Geomembrane including all necessary and incidental items as detailed or required to complete the installation in accordance with the Contract Drawing and these Specifications.

1. RELATED WORK:

Related Contract Work is described in the following section of the specification as approved by the CQA Engineer.

1. REFERENCE STANDARDS:

ASTM D5199 *Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.*

ASTM D5994 *Standard Test Method for Measuring Core Thickness of Textured Geomembranes.*

ASTM D7466 *Standard Test Method for Measuring Asperity Height of Textured Geomembranes.*

ASTM D751 *Standard Test Methods for Coated Fabrics.*

ASTM D5884 *Standard Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes.*

ASTM D7004 *Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.*

ASTM D4833 *Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.*

ASTM D3895 *Standard Test Method for Determining Oxidative-Induction Time (OIT) of Polymeric Materials by Standard Differential Scanning Calorimetry.*

ASTM D5885 *Standard Test Method for Determining Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.*

ASTM E96 *Standard Test Methods for Water Vapor Transmission of Materials*

The latest revision of the following standard of the Geosynthetic Research Institute (GRI) are hereby made a part of these specifications:

GRI GM25 *Standard Specification for Test Methods, Test Properties and Testing Frequency for Reinforced Linear Low-Density Polyethylene (LLDPE-R) Geomembranes.*

The latest revision of the following standard of the NSF/ANSI Standard 61 are hereby made a part of these specifications:

NSF/ANSI 61 C*ertified Under the NSF/ANSI Standard 61, Drinking Water System Components* – \_*HealthEffects*

4. QUALITY ASSURANCE:

Quality Assurance during installation of Reinforced Polyethylene Gas Barrier Geomembrane will be provided by the Owner as described in the accompanying Project CQA Manual.

5. MANUFACTURER QUALIFICATIONS:

1. The Manufacturer shall have previously demonstrated his ability to produce the required Reinforced Polyethylene Gas/VOC Barrier Geomembrane by having successfully manufactured a minimum of 10,000,000 ft2 of scrim reinforced Polyethylene Geomembrane.
2. Manufacturer must be ISO 9001 certified
3. INSTALLER QUALIFICATIONS:

The Reinforced Polyethylene Gas/VOC Barrier Geomembrane Installer shall have installed a minimum of 500,000 ft2 of Reinforced Polyethylene Geomembrane (or similar material).

7. Warranties:

The manufacturer of the Reinforced Polyethylene Gas/VOC Barrier Geomembrane will warrant the material to the installer on a pro-rata basis for up to 20 years after the final acceptance of the work, based on thickness of product, the application and location of the installation. This warranty shall include but not be limited to defects related to workmanship and manufacturing.

1. **MATERIALS**

1. GENERAL:

The materials supplied under these Specifications shall consist of first-quality 100% virgin products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.

1. REINFORCED POLYETHYLENE GAS/VOC BARRIER GEOMEMBRANE MATERIALS:
	1. Reinforced Polyethylene Gas/VOC Barrier Geomembrane shall be manufactured to meet the following requirements:
2. Provide finished product free from holes, pin holes, bubbles, blisters, excessive gels, undispersed resins and/or carbon black, or contamination by foreign matter.
3. Reinforced Polyethylene Gas/VOC Barrier Geomembrane shall be a Linear Low-Density Polyethylene Geomembrane composed of a heavy encapsulated 9 X 9 weft inserted 1000 denier polyester reinforcement for 45 mil Gas/VOC Barrier geomembranes.
	1. Approved Reinforced Polyethylene Gas/VOC Barrier Geomembrane:
		* 1. Dura-Skrim NB45B as manufactured by Viaflex of Sioux Falls, SD.
			2. Equal material, as approved by the Engineer.
4. ra-Skrim N30B

Dura-Skrim N30BT1 (Textured One-Side)

Dura-Skrim NDura-Skrim N30BDura-Skrim N30Equal material, as approved by the Engineer.

1. **FACTORY FABRICATION**
2. The Reinforced Polyethylene Gas/VOC Barrier Geomembrane shall be supplied in panels, which shall be of maximum size to provide the largest manageable sheet for the fewest seams.
3. Factory seams are produced by thermal sealing methods and shall have a minimum seam width of 1 ½ inch scrim to scrim.
4. Factory seams are 100% visually inspected and destructive testing is done to verify quality compliance.
5. Labels on the panels shall identify the thickness, length, width, lot and panel numbers, and name of Manufacturer.
6. Factory pre-assembled panels are accordion folded and rolled on a cardboard core. Rolled panels are wrapped in a protective layer for shipment.
7. **SUBMITTALS**

The Contractor shall submit the following to the CQA Engineer:

1. PRE-INSTALLATION REQUIREMENTS:

Prior to Reinforced Polyethylene Gas Barrier Geomembrane installation, the Contractor shall submit the following:

1. Certificate of Conformance and Sample: Prior to shipping to the site, the Contractor shall submit a certificate or affidavit signed by a legally authorized official of the Manufacturer for the Reinforced Polyethylene Gas/VOC Barrier Geomembrane attesting that the Reinforced Polyethylene Gas/VOC Barrier Geomembrane meets the physical and manufacturing requirements stated in these Specifications. The Contractor shall also submit a sample of the Reinforced Polyethylene Gas/VOC Barrier Geomembrane to be used (sample may be of different color). The sample shall be labeled with the product name and be accompanied by the Manufacturer's specifications.
2. Shipping, Handling, and Storage Instructions: The Manufacturer's plan for shipping, handling, and storage shall be submitted for review.
3. Installation Procedures: Submit installation procedures for carrying out the work. Installation procedures to be addressed shall include but not be limited to material installation, repair, and protection to be provided in the event of rain or strong winds. With regard to protection, the Contractor shall provide a plan of sufficiently anchoring the Reinforced Polyethylene Gas/VOC Barrier Geomembrane to satisfy the Contractor’s Performance Warranty. This plan shall be approved by the Engineer prior to construction.
4. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into the construction.
5. POST-INSTALLATION REQUIREMENTS:

Upon completion of the Reinforced Polyethylene Geomembrane installation, the Contractor shall submit the following:

1. Completed material performance warranty

**E. SITE PREPARATION AND INSTALLATION**

Installation shall be done in accordance with the Manufacturers Reinforced Gas/VOC Barrier Geomembrane Installation Guidelines.

**TABLE 1:**

REQUIRED REINFORCED POLYETHYLENE GAS/VOC BARRIER GEOMEMBRANE PROPERTIES 45 MIL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PROPERTIES** | **TEST METHOD** | **MINIMUM** | **TYPICAL** | **MINIMUM** | **TYPICAL** |
| Appearance |   | Black Tan |
| Core Thickness | ASTM D5199 | 40 mil | 45 mil | 1.02 mm | 1.14 mm |
| Weight | ASTM D751 | 189 lbf/msf | 213 lbf/msf | 923 g/m² | 1040 g/m² |
| Construction |   | 9x9-1000 Denier PET scrim reinforced polyethylene |
| Tongue Tear Strength | ASTM D5884 | 100 lbf | 135 lbf | 445 N | 601 N |
| Grab Tensile at Break | ASTM D7004 | 275 lbf | 350 lbf | 1223 N | 1557 N |
| Tensile Elongation at Break | ASTM D7004 | 22% | 30% | 22% | 30% |
| Puncture Resistance | ASTM D4833 | 108 lbf | 125 lbf | 480 N | 556 N |
| Standard OIT or High Pressure OIT | ASTM D3895 ASTM D5885 | 100 min | 150 min | 100 min | 150 min |
| 400 min | 2400 min | 400 min | 2400 min |
| Hydraulic Conductivity |  ASTM E96 | 1.47 x 10-10 cm/sec |
| Benzene Permeance | See Note 6 | 2.27 x 10-10 m2/sec or 1.81 x 10-13 m/s |
| Toluene Permeance | See Note 6 | 3.15 x 10-10 m2/sec or 7.28 x 10-14 m/s |
| Ethylbenzene Permeance | See Note 6 | 2.47 x 10-10 m2/sec or 1.67 x 10-14 m/s |
| M & P-Xylenes Permeance | See Note 6 | 2.33 x 10-10 m2/sec or 1.91 x 10-14 m/s |
| O-Xylene Permeance | See Note 6 | 2.20 x 10-10 m2/sec or 1.71 x 10-14 m/s |
| Methane Permeance | ASTM D1434 | < 3.70E-13 m/s |
| Hydrogen Sulfide | See Note 9 | 1.09E-09 m/s |
| Trichloroethylene (TCE) | See Note 6 | 1.53 x 10-10 m2/sec or 5.25 x 10-15 m/s |
| Perchloroethylene (PCE) | See Note 6 | 1.44 x 10-10 m2/sec or 5.22 x 10-15 m/s |
| Max Static Use Temperature  |   | 180° F | 82° C |
| Min Static Use Temperature |   | -70° F | -57° C |

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| ² Tests are an average of primary reinforcement directions. |
| 6 Aqueous Phase Film Permeance. |   |

Notes:

1. The Engineer may allow alternates to these requirements.