



TECHNICAL DROP-IN SPECIFICATION

Dura-Skrim[®] N-Series & NT-Series
Reinforced Polyethylene

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TECHNICAL DROP-IN SPECIFICATIONS

REINFORCED POLYETHYLENE GEOMEMBRANE SPECIFICATION

Reinforced Polyethylene Geomembranes serve as liners and covers for the containment of water, leachate or other liquids. As a liner they can contain the liquid to prevent leakage or environmental impact, and as a cover to minimize evaporation or contamination. It is of great importance that the Reinforced Polyethylene Geomembrane be free from defects and installed without damage to perform as designed.

A. DESCRIPTION

1. 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 Geomembrane including all necessary and incidental items as detailed or required to complete the installation in accordance with the Contract Drawing and these Specifications

2. RELATED WORK:

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

3. 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.

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 Certified Under the NSF/ANSI Standard 61, Drinking Water System Components - HealthEffects.

4. QUALITY ASSURANCE:

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

5. MANUFACTURERS QUALIFICATIONS:

a. The Manufacturer shall have previously demonstrated his ability to produce the required Reinforced Polyethylene Geomembrane by having successfully manufactured a minimum of 10,000,000 ft² of scrim reinforced Polyethylene Geomembrane.

b. Manufacturer must be ISO 9001 certified

6. INSTALLER QUALIFICATIONS:

The Reinforced Polyethylene 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 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.

B. 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.

2. REINFORCED POLYETHYLENE GEOMEMBRANE MATERIALS:

a. Reinforced Polyethylene Geomembrane shall be manufactured to meet the following requirements:

1. Provide finished product free from holes, pin holes, bubbles, blisters, excessive gels, undispersed resins and/or carbon black, or contamination by foreign matter.
2. Reinforced Polyethylene Geomembrane shall be a Linear Low-Density Polyethylene Geomembrane composed of a heavy encapsulated 9 X 9 weft inserted 1000 denier polyester reinforcement for the 30 mil, 36 mil, and 45 mil geomembranes.

b. Approved Reinforced Polyethylene Geomembrane:

1. Dura-Skrim N30B
Dura-Skrim N30BT1 (Textured One-Side)
Dura-Skrim N36B
Dura-Skrim N36BT1 (Textured One-Side)

- Dura-Skrim N36BT2 (Textured Two-Sides)
 - Dura-Skrim N45B
 - Dura-Skrim N45BT1 (Textured One-Side)
 - Dura-Skrim N45BT2 (Textured Two-Sides)
 - As manufactured by Raven Industries of Sioux Falls, SD.
2. Equal material, as approved by the Engineer.

C. FACTORY FABRICATION

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

D. SUBMITTALS

The Contractor shall submit the following to the CQA Engineer:

1. PRE-INSTALLATION REQUIREMENTS:

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

- a. 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 Geomembrane attesting that the Reinforced Polyethylene Geomembrane meets the physical and manufacturing requirements stated in these Specifications. The Contractor shall also submit a sample of the Reinforced Polyethylene 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.
- b. Shipping, Handling, and Storage Instructions: The Manufacturer's plan for shipping, handling, and storage shall be submitted for review.
- c. 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 Geomembrane to satisfy the Contractor's Performance Warranty. This plan shall be approved by the Engineer prior to construction.
- d. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into the construction.

2. POST-INSTALLATION REQUIREMENTS:

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

- a. Completed material performance warranty.

E. SITE PREPERATION AND INSTALLATION

1. Installation shall be in done in accordance with the Manufacturers Geomembrane Installation Guidelines.

TABLE 1:

REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 30 MIL

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Thickness	ASTM D5199	mil	mm	27	0.69
Weight	ASTM D751	lbs./msf	g/m ²	126	615
Tongue Tear	ASTM D5884	lbf	N	70	311
Grab Tensile at Break	ASTM D7004	lbf	N	220	979
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	80	356
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 2:

REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 30 MIL TEXTURED ONE-SIDE

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Core Thickness	ASTM D5994	mil	mm	27	0.69
Asperity Height	ASTM D7466	mil	mm	16	0.41
Weight	ASTM D751	lbs./msf	g/m ²	127	620
Tongue Tear	ASTM D5884	lbf	N	70	311
Grab Tensile at Break	ASTM D7004	lbf	N	220	978
Tensile Elongation at Break	ASTM D7004	%		22	

Puncture Resistance	ASTM D4833	lbf	N	80	356
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 3:
REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 36 MIL

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Thickness	ASTM D5199	mil	mm	32	0.81
Weight	ASTM D751	lbs./msf	g/m ²	151	737
Tongue Tear	ASTM D5884	lbf	N	80	356
Grab Tensile at Break	ASTM D7004	lbf	N	240	1068
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	85	378
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 4:
REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 36 MIL TEXTURED ONE-SIDE

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Core Thickness	ASTM D5994	mil	mm	31	0.79
Asperity Height	ASTM D7466	mil	mm	16	0.41
Weight	ASTM D751	lbs./msf	g/m ²	156	762
Tongue Tear	ASTM D5884	lbf	N	80	356
Grab Tensile at Break	ASTM D7004	lbf	N	240	1068
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	85	378
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 5:
REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 36 MIL TEXTURED TWO-SIDES

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Core Thickness	ASTM D5994	mil	mm	31	0.79
Asperity Height	ASTM D7466	mil	mm	16	0.41
Weight	ASTM D751	lbs./msf	g/m ²	162	791
Tongue Tear	ASTM D5884	lbf	N	80	356
Grab Tensile at Break	ASTM D7004	lbf	N	240	1068
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	85	378
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 6:
REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 45 MIL

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Thickness	ASTM D5199	mil	mm	40	1.02
Weight	ASTM D751	lbs./msf	g/m ²	189	923
Tongue Tear	ASTM D5884	lbf	N	100	445
Grab Tensile at Break	ASTM D7004	lbf	N	275	1223
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	108	480
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 7:

REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 45 MIL TEXTURED ONE-SIDE

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Core Thickness	ASTM D5994	mil	mm	39	0.99
Asperity Height	ASTM D7466	mil	mm	16	0.41
Weight	ASTM D751	lbs./msf	g/m ²	194	947
Tongue Tear	ASTM D5884	lbf	N	100	445
Grab Tensile at Break	ASTM D7004	lbf	N	275	1223
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	108	480
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

TABLE 8:

REQUIRED REINFORCED POLYETHYLENE GEOMEMBRANE PROPERTIES 45 MIL TEXTURED TWO-SIDES

PROPERTY	TEST METHOD	IMPERIAL UNITS	METRIC UNITS	IMPERIAL MIN. ROLL AVERAGES	METRIC MIN. ROLL AVERAGES
Core Thickness	ASTM D5994	mil	mm	39	0.99
Asperity Height	ASTM D7466	mil	mm	16	0.41
Weight	ASTM D751	lbs./msf	g/m ²	200	976
Tongue Tear	ASTM D5884	lbf	N	100	445
Grab Tensile at Break	ASTM D7004	lbf	N	275	1223
Tensile Elongation at Break	ASTM D7004	%		22	
Puncture Resistance	ASTM D4833	lbf	N	108	480
Standard OIT	ASTM D3895	min		100	
High Pressure HPOIT	ASTM D5885	min		400	

NOTES:

1. The Engineer may allow alternates to these requirements.