



Drop-In Specifications

INTEGRATED DRAINAGE
SYSTEM GEOMEMBRANE



The following specification is a sample guideline to be customized by the engineer for preparing site specific specification. This information is provided for reference purposes only and is not intended as a warranty or guarantee. AGRU assumes no liability in connection with the use of this information.

Part 1 GENERAL

1.1 DESCRIPTION OF WORK

1. This specification covers the Integrated Drainage System (IDS) geomembrane, a flat cast structured polyethylene geomembrane with integrated drainage layer. For this application the IDS geomembrane shall be covered with a nonwoven geotextile to provide filtration for the capping drainage system. The work for this section includes furnishing all labor, material and equipment to complete the installation of the IDS geomembrane, including all necessary and incidental items, in accordance with the Plans and Specifications.

1.2 RELATED DOCUMENTS

1. The conditions and description of work shown in other sections of these Specifications, the Plans for Construction, Construction Quality Assurance (CQA) Plan, and other Contract Documents apply to this section.

1.3 REFERENCES

A. The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made part of these Specifications.

1. D792 Method B, Density and Specific Gravity of Plastics by Displacement
2. D1004 Initial Tear Resistance of Plastic Film and Sheeting
3. D1238 Flow Rates of Thermoplastics by Extrusion Plastometer
4. D3895 Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
5. D4218 Determination of Carbon Black in Polyethylene Compounds
6. D4833 Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
7. D5397 Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
8. D5596 Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
9. D5994 Measuring Core Thickness of Textured Geomembranes
10. D6392 Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
11. D6693 Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
12. D7466 Measuring Asperity Height of Textured Geomembranes

B. Geosynthetic Research Institute

1. GRI GM 13 Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
2. GRI GM 17 Test Properties, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes
3. GRI GC 8, Standard Guide for Determination of Allowable Flow Rate of a Drainage Geocomposite

1.4 DEFINITIONS

A. Project – **Name and location of project here.**

- B. Owner – **Name of owner here.**
- C. Lot - A quantity of resin (usually a rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.
- D. Construction Quality Assurance Consultant (CONSULTANT) - Party, independent from MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to quality assurance during the lining system construction.
- E. ENGINEER- The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
- F. Geomembrane Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geomembrane rolls.
- G. Geosynthetic Quality Assurance Laboratory (TESTING LABORATORY) - Party, independent from the OWNER, MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the OWNER.
- H. INSTALLER- Party responsible for field handling, transporting, storing, deploying, seaming and testing of the geomembrane seams. The Installer shall be approved by the Manufacturer and shall have current Approved Installation Contractor (AIC) status issued by the International Association of Geosynthetic Installers (IAGI – www.iagi.org).
- I. Panel - Area of a geomembrane that will be seamed in the field that is larger than 100 ft².
- J. Patch - Area of a geomembrane that will be seamed in the field that is less than 100 ft².
- K. Subgrade Surface - Soil layer surface which immediately underlies the geosynthetic material(s).

1.5 SUBMITTALS

- A. The Manufacturer shall furnish the following product data, in writing, to the Consultant for approval at least ten (10) working days prior to shipment of the IDS geomembrane material:
 - 1. Resin Data shall include the following:
 - a. Certification stating that the resin meets the specification requirements (see Table 1.9).
 - 2. Geomembrane Roll
 - a. Statement certifying no recycled polymer and no more than 10% rework of the same type of material is added to the resin (product run may be recycled).
 - b. Material samples for interface shear testing as required.
 - c. Quality Control Certificates signed by the Manufacturer shall be provided for each roll. Each certification shall have the roll identification number, test methods, frequency, and test results. At a minimum, the test results and frequency shall be as shown in Table 1.
- B. The INSTALLER shall furnish the following information to the ENGINEER and OWNER prior to installation:
 - 1. Installation layout drawings
 - a. Must show proposed panel layout including field seams and details
 - Seams should generally follow the direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the Owner's Representative. Butt seams on a slope, if allowed, should be staggered and/or installed at 45° angle to the slope.
 - b. Must be approved prior to installing the geomembrane

2. Approved drawings will be for concept only and actual panel placement will be determined by site conditions.
3. Installer's Geosynthetic Field Installation Quality Control Plan

C. The INSTALLER will submit the following to the ENGINEER upon completion of installation:

1. Material and installation warranties
2. As-built drawings showing actual geomembrane placement and seams including typical anchor trench detail and location of repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Rolls of IDS geomembrane will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading. Labels on each roll of IDS geomembrane shall identify the product, length, width, lot and roll numbers, and name of Manufacturer.

B. Storage

1. The onsite storage location for the IDS geomembrane will be provided by the Owner. The IDS geomembrane shall be protected from punctures, abrasions and excessive dirt and moisture. The storage area shall have the following characteristics:
 - a. Level (no wooden pallets)
 - b. Smooth
 - c. Not subject to ponding or flooding
 - d. Protected from theft and vandalism

C. Handling

1. Materials are to be handled so as to prevent damage and per manufacturer guidelines

1.7 WARRANTY

A. IDS geomembrane material shall be warranted, on a pro-rated basis against Manufacturer's defects for a period of (1) year from the date of IDS geomembrane installation

B. Installation shall be warranted against defects in workmanship for a period of one (1) year from the date of IDS geomembrane installation.

2 PRODUCTS

2.1 IDS GEOMEMBRANE

A. A. The IDS geomembrane shall be, first quality products designed and manufactured specifically for the purpose of this work which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes. The IDS geomembrane rolls shall be seamless, high density polyethylene (HDPE - Formulated Sheet Density ≥ 0.94 g/cc) or linear low density polyethylene (LLDPE - Formulated Sheet Density ≤ 0.939 g/cc) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, verified by 100% in-line spark testing. The IDS geomembrane shall be supplied as a continuous sheet with no factory seams in rolls. The IDS geomembrane will meet the property requirements as shown in (GRI GM 13 for HDPE) or (GRI GM 17 for LLDPE).

B. The IDS geomembrane shall be produced using a flat cast manufacturing process to create a structured geomembrane with inte-

grated drainage layer. The IDS geomembrane shall meet the properties listed in Table 1 of this section.

2.2 GEOTEXTILE

A. A nonwoven fabric produced by needle-punching together 100% synthetic staple fibers, in a random network, forming a high strength, dimensionally stable fabric. Synthetic fibers specially formulated to resist ultraviolet light deterioration, and inert to commonly encountered soil chemicals. The synthetic fiber to be stable within a pH range of 2 to 13.

Table 1: AGRU HDPE Super Gripnet® Liner

Tested Property	Test Method	Frequency	Minimum Average Value			
			50 mil	60 mil	80 mil	100 mil
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³			
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)
Friction Stud Height, mil (mm)	ASTM D7466	second roll	175 (4.45)	175 (4.45)	175 (4.45)	175 (4.45)
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94
Tensile Properties (each direction)	ASTM D6693, Type IV Dumbbell, 2 ipm	20,000 lb	110 (19)	132 (23)	176 (30)	220 (38)
Strength at Break, lb/in-width (N/mm)			110 (19)	132 (23)	176 (30)	220 (38)
Strength at Yield, lb/in-width (N/mm)	G.L. 2.0 in (51 mm) G.L. 1.3 in (33 mm)		200	200	200	200
Elongation at Break, %			12	12	12	12
Elongation at Yield, %						
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	38 (169)	42 (187)	56 (249)	70 (312)
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	80 (356)	90 (400)	120 (534)	150 (667)
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Notched Constant Tensile Load, hr	ASTM D5397, Appendix	200,000 lb	500	500	500	500
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

Table 2: AGRU HDPE Drain Liner®

Tested Property	Test Method	Frequency	Minimum Average Value				
			50 mil	60 mil	80 mil	100 mil	
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)	
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)	
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)	
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)	
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³				
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)	
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94	
Tensile Properties (each direction)	ASTM D6693, Type IV Dumbell, 2 ipm	20,000 lb	110 (19)	132 (23)	176 (30)	220 (38)	
Strength at Break, lb/in-width (N/mm)			110 (19)	132 (23)	176 (30)	220 (38)	
Strength at Yield, lb/in-width (N/mm)			300	300	300	300	
Elongation at Break, %			G.L. 2.0 in (51 mm)	12	12	12	12
Elongation at Yield, %			G.L. 1.3 in (33 mm)				
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	38 (169)	42 (187)	56 (249)	70 (312)	
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	80 (356)	95 (422)	126 (560)	158 (703)	
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	
Notched Constant Tensile Load, hr	ASTM D5397, Appendix	200,000 lb	500	500	500	500	
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140	

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

Table 3: AGRU HDPE MicroDrain® Liner

Tested Property	Test Method	Frequency	Minimum Average Value				
			50 mil	60 mil	80 mil	100 mil	
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	60 (1.5)	100 (2.5)	
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	57 (1.43)	95 (2.38)	
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	54 (1.35)	90 (2.25)	
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	51 (1.28)	85 (2.13)	
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³				
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)	
MicroSpike® Asperity Height, mil (mm)	ASTM D7466	second roll	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)	
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.94	0.94	0.94	0.94	
Tensile Properties (each direction)	ASTM D6693, Type IV Dumbell, 2 ipm	20,000 lb	110 (19)	132 (23)	176 (30)	220 (38)	
Strength at Break, lb/in-width (N/mm)			110 (19)	132 (23)	176 (30)	220 (38)	
Strength at Yield, lb/in-width (N/mm)			300	300	300	300	
Elongation at Break, %			G.L. 2.0 in (51 mm)	12	12	12	12
Elongation at Yield, %			G.L. 1.3 in (33 mm)				
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	38 (169)	42 (187)	56 (249)	70 (312)	
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	80 (356)	95 (422)	126 (560)	158 (703)	
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	
Notched Constant Tensile Load, hr	ASTM D5397, Appendix	200,000 lb	500	500	500	500	
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140	

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

Table 4: AGRU LLDPE Super Gripnet® Liner

Tested Property	Test Method	Frequency	Minimum Average Value			
			50 mil	60 mil	80 mil	100 mil
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³			
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)
Friction Stud Height, mil (mm)	ASTM D7466	second roll	175 (4.45)	175 (4.45)	175 (4.45)	175 (4.45)
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.939	0.939	0.939	0.939
Tensile Properties (each direction)	ASTM D6693, Type IV Dumbbell, 2 ipm	20,000 lb				
Strength at Break, lb/in-width (N/mm)	G.L. 2.0 in (51 mm)		105 (18)	126 (22)	168 (29)	210 (36)
Elongation at Break, %			300	300	300	300
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	30 (133)	40 (178)	53 (236)	67 (298)
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	55 (245)	70 (311)	90 (400)	110 (489)
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Notched Constant Tensile Load, hr	ASTM D5397, Appendix	200,000 lb	500	500	500	500
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

Table 5: AGRU LLDPE MicroDrain® Liner

Tested Property	Test Method	Frequency	Minimum Average Value			
			50 mil	60 mil	80 mil	100 mil
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³			
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)
MicroSpike® Asperity Height, mil (mm)	ASTM D7466	second roll	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.939	0.939	0.939	0.939
Tensile Properties (each direction)	ASTM D6693, Type IV Dumbbell, 2 ipm	20,000 lb				
Strength at Break, lb/in-width (N/mm)	G.L. 2.0 in (51 mm)		105 (18)	126 (22)	168 (29)	210 (36)
Elongation at Break, %			300	300	300	300
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	30 (133)	40 (178)	53 (236)	67 (298)
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	55 (245)	70 (311)	90 (400)	110 (489)
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Notched Constant Tensile Load, hr	ASTM D5397, Appendix	200,000 lb	500	500	500	500
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

Table 6: AGRU LLDPE Drain Liner®

Tested Property	Test Method	Frequency	Minimum Average Value			
			50 mil	60 mil	80 mil	100 mil
Thickness (nominal), mil (mm)	ASTM D5994	every roll	50 (1.25)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			47.5 (1.19)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			45 (1.12)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			42.5 (1.06)	51 (1.28)	68 (1.7)	85 (2.13)
Transmissivity (m ² /sec)	ASTM D4716	500,000 SF	4 x 10 ⁻³			
Drainage Stud Height, mil (mm)	ASTM D7466	second roll	130 (3.30)	130 (3.30)	130 (3.30)	130 (3.30)
Density, g/cm ³	ASTM D792, Method B	200,000 lb	0.939	0.939	0.939	0.939
Tensile Properties (each direction) Strength at Break, lb/in-width (N/mm) Elongation at Break, %	ASTM D6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in (51 mm)	20,000 lb	105 (18) 300	126 (22) 300	168 (29) 300	210 (36) 300
Tear Resistance, lb (N)	ASTM D1004	45,000 lb	30 (133)	40 (178)	53 (236)	67 (298)
Puncture Resistance, lb (N)	ASTM D4833	45,000 lb	55 (245)	70 (311)	90 (400)	110 (489)
Carbon Black Content, % (Range)	ASTM D4218	20,000 lb	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	45,000 lb	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾	Note ⁽¹⁾
Oxidative Induction Time, min	ASTM D3895, 200°C; O ₂ , 1atm	200,000 lb	>140	>140	>140	>140

NOTES:

- ⁽¹⁾Dispersion only applies to near spherical agglomerates. 10 views shall be Category 1 or 2.
- All AGRU geomembranes have dimensional stability of ±2% when tested according to ASTM D 1204 and LTB of <-77° C when tested according to ASTM D 746.
- Transmissivity at a temp. of 21°C, gradient of 0.1 and a load of 10,000 psf: seating time 15 min. between steel plates.

B. Extrudate Rod or Bead

- Extrudate material shall be made from same type resin as the geomembrane.
- Additives shall be thoroughly dispersed.
- Materials shall be free of contamination by moisture or foreign matter.

2.3 SHEAR STRENGTH

A. The IDS geomembrane shall exhibit minimum shear strength characteristics along each interface. These characteristics shall be demonstrated with direct shear testing (ASTM D5321) by an independent CQA laboratory.

B. The minimum design shear strength at each normal stress tested shall be as listed below and determined by test conditions noted:

Geomembrane Interface	Shear Interface Tested	Minimum Required Shear Force (psf)		
		Applied Normal Load (psf)		
		—	—	—
	Peak or Large-Displacement			

1. Tests shall be conducted using “sandwich” configuration with proposed soils above and below geosynthetic system being tested.
2. Test under submerged condition.
3. Use a shearing rate of 0.04 in./min.
4. The spikes and studs shall remain intact under the above test conditions (no peeling or shearing).

2.4 GEOMEMBRANE INSTALLATION

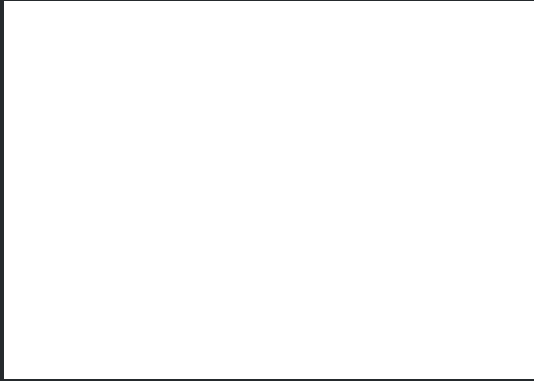
A. Installation of the geomembrane shall follow the most recent version of the International Association of Geosynthetic Installer’s “Guideline for Installation of: HDPE and LLDPE Geomembrane Installation Specification” (Exhibit 1)

B. Project specific geomembrane installation requirements listed below:

2.5 FIELD SEAMING GEOTEXTILE COMPONENT

A. Geotextiles will be aligned with seams parallel to the prevailing slope with the side of the geotextile placed against the IDS Geomembrane drainage studs which was previously tested for transmissivity and interface friction during design or pre-qualification testing. This side should be selected by the design engineer prior to construction.

B. Any holes, tears, or burn through from thermal seaming in geotextiles will be repaired by patching with the same geotextiles. The patch will be a minimum of twelve inches (12”/30cm) larger in all directions than the area to be repaired and will be spot bonded thermally.



Subject to errors of typesetting, misprints and modifications.
Illustrations are generic and for reference only.

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