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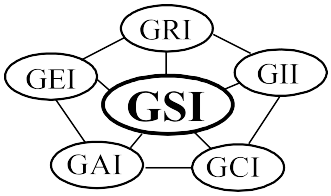

Rev. 5: June 12, 2025
Revision schedule on pg. 15

GRI-GM22 Standard Specification
for
"Test Methods, Required Properties and Testing Frequencies for Scrim Reinforced Polyethylene Barriers (PE-R) Used in Exposed Temporary Applications"

This specification was developed by the Geosynthetic Research Institute (GRI) with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrants or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification covers scrim reinforced polyethylene barriers in thicknesses of 0.50 mm (20 mil), 0.30 mm (12 mil) and 0.20 mm (8 mil) as shown in Figure 1.

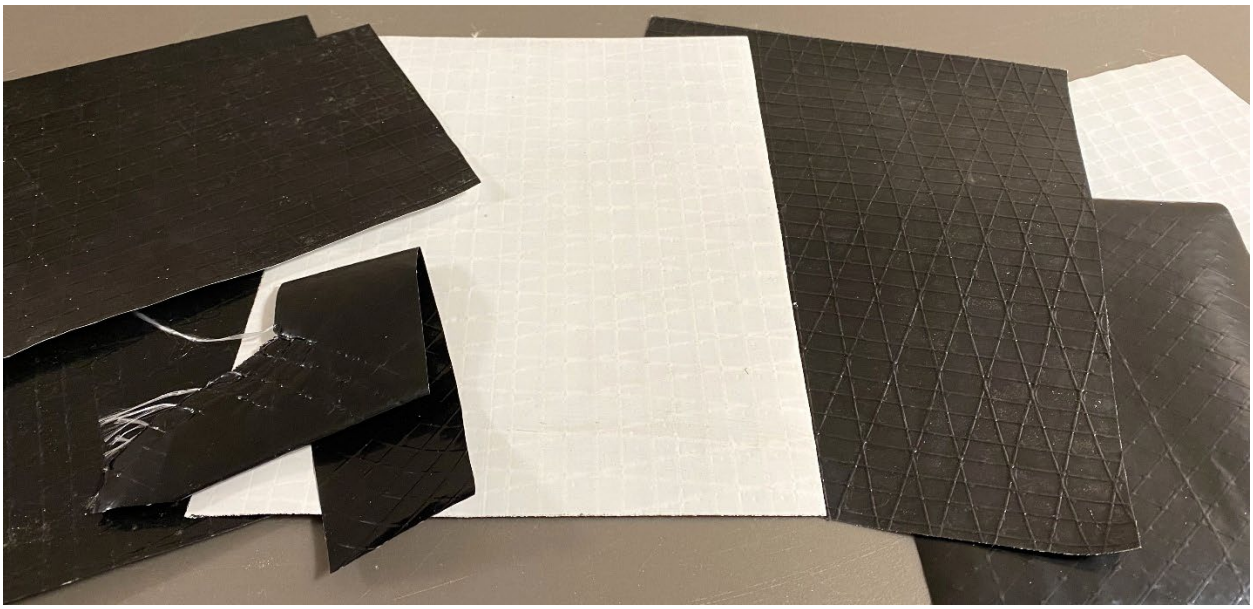

Figure 1 – Photograph of GRI-GM22 PE-R Geomembrane Coupons

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version and is kept current on the Institute's Website at <<geosynthetic-institute.org>>.

1.2 This specification sets forth a set of minimum physical, mechanical and durability properties that must be met, or exceeded by the material being manufactured.

1.3 In the context of quality systems and management, this specification represents manufacturing quality control (MQC).

Note 1: Manufacturing quality control represents those actions taken by a manufacturer to ensure that the product represents the stated objective and properties set forth in this specification; see definitions in Section 3.

1.4 This standard specification is intended to assure good quality and performance of exposed temporary barriers in general applications, but is possibly not adequate for the complete specification in a specific or unique situation. Additional tests, or more restrictive values for the tests indicated, may be necessary under some conditions of a particular application.

1.5 The specification does not cover barrier installation or seaming since these activities are usually performed by contractors and installers independent of the manufacturer. Such activities are considered to be construction quality control (CQC) and construction quality assurance (CQA); see definitions in Section 3.

Note 2: For information on installation and seaming, users of the standard are referred to the literature which is abundant on the subject.

2. Referenced Documents

2.1 ASTM Standards

D 1765 Classification System for Carbon Blacks Used in Rubber Products
D 3786 Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
D 3895 Test Method for Oxidative Inductive Time of Polyolefins by Differential Scanning Calorimetry
D 5721 Practice for Air-Oven Aging of Polyolefin Geomembranes
D 5884 Test Method for Determining Tearing Strength of Internally Reinforced Geomembranes
D 5885 Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry
D 6241 Test Method for the Static Puncture Strength of Geotextiles and Geotextile Related Properties Using a 50-mm Probe
D 7003 Test Method for Strip Tensile Properties of Reinforced Geomembranes
D 7004 Test Method for Grab Tensile Properties of Reinforced Geomembranes
D 7328 Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus
E 96 Test Methods for Water Vapor Transmission of Materials

2.2 GRI Standards

GM 16 Observation of Surface Cracking of Geomembranes

2.3 Other References

U. S. Environmental Protection Agency Technical Guidance Document "Quality Control Assurance and Quality Control for Waste Containment Facilities," EPA/600/R-93/182, September 1993, 305 pages

3. Definitions

3.1 Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications, ref. EPA/600/R-93/182.

3.2 Manufacturing Quality Assurance (MQA) - A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract specifications for the project, ref. EPA/600/R-93/182.

3.3 Construction Quality Control (CQC) - A planned system of inspections that are used to directly monitor and control the quality of a construction project. Construction quality control is normally performed by the geosynthetics manufacturer or installer, or for natural soil materials by the earthwork contractor, and is necessary to achieve quality in the constructed or installed system. Construction quality control (CQC) refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the plans and specifications for the project, ref. EPA/600/R-93/182.

3.4 Construction Quality Assurance (CQA) - A planned system of activities that provide assurance that the facility was constructed as specified in the design. Construction quality assurance includes inspections, verification, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. Construction quality assurance (CQA) refers to measures taken by the CQA organization to assess if the installer or contractor is in compliance with the plans and specifications for a project, ref. EPA.600/R-93/182.

3.5 Formulation, n - The mixture of a unique combination of ingredients identified by type, properties and quantity. For polyethylene geomembranes, a formulation refers to the

exact type and percentages of resin, additives, and (for black geomembranes) carbon black. Thus, it can refer to the supplier of the base polyethylene resin as well as the individual suppliers of other ingredients. The individual suppliers must meet the manufacturer's internal quality control specification.

4. Material Classification and Formulation

4.1 This specification covers scrim reinforced polyethylene barriers with a formulated density of the polyethylene being 0.930 g/cc, or greater.

4.2 The additive package for the polyethylene shall be adequate to pass the endurance testing of the specification. While the specifics are usually proprietary, the manufacturer can be requested to attest that acceptable use of the formulation has been achieved in similar applications.

4.3 For black products, the carbon black must be N-110 or higher specific surface areas per ASTM D1765.

4.4 This specification focuses on scrim reinforced products. As such, the polyethylene plys must be on both sides of the fabric scrim so as to completely encapsulate it and provide enough ply adhesion to resist delamination under field conditions.

4.5 The fabric scrim consists of polymer yarns in an open pattern sufficient to achieve the minimum specification strength and elongation values. The type of yarns often consist of polyester filaments but other polymers have been successfully used in the past, e.g., nylon. The actual identification can be requested by the purchaser/owner, if desired.

4.6 The specification addresses three serviceability categories; severe, moderate, and gentle. The serviceability categories are qualitative and if unknown for a particular application one should use the more robust and stronger material.

4.7 Post-consumer plastics which has seen previous use cannot be used for either the material plies or the fabric scrim.

5. Physical, Mechanical and Durability Property Requirements

5.1 The finished product shall conform to the test property requirements in either Table 1(a) or 1(b). Table 1(a) is in US (English) units and Table 1(b) is in SI (Metric) units. The conversion of units from US-to-SI units is "soft".

Note 3: There are many ASTM test methods which have been revised from their original and this specification requires the most recent version.

Note 4: There is one GRI test currently included in this standard. This is necessary since the topic is not covered by current ASTM or ISO standards. It is GRI GM16, "Observation of Surface Cracking".

5.2 The properties of the barrier material shall be tested at the minimum frequencies shown in Table 1. If the specific manufacturer's quality control guide is more stringent and is certified accordingly, it must be followed in like manner.

Note 5: This specification is focused on manufacturing quality control (MQC). Conformance testing and manufacturing quality assurance (MQA) testing are at the discretion of the purchaser and/or quality assurance organization, respectively; see definitions.

6. Workmanship and Appearance

6.1 The finished product shall have consistently good appearance. It shall be free from defects including cracking and crazing that would affect the specified properties of the barrier material.

6.2 The scrim reinforced products shall generally have a uniformly undulating surface appearance. It shall be free from defects including delamination and blisters that would affect the specified properties of the product.

6.3 General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

7. MQC Sampling

7.1 Sampling shall be in accordance with the specific test methods listed in Table 1. If no sampling protocol is stipulated in the particular test method, then test specimens shall be taken evenly spaced across the entire roll width.

7.2 The number of tests conducted shall be in accordance with the appropriate test methods listed in Table 1.

7.3 The average of the test results should be calculated per the particular standard cited and compared to the minimum (or maximum) value listed in these tables, hence the values listed are generally the minimum average values and are designated as "min. ave."

8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality control guide and/or documents.

9. Packaging and Storage

9.1 The finished product shall be rolled in the machine direction onto a stable core for

handling storage and shipment. The roll is to be protected by an outer wrapping or plastic bag. The manufacturers identification label should be clearly visible on the core and in a manner consistent with established policy of the manufacturer.

9.2 Handling of the rolls shall be by forklift stinger, or by dedicated slings consistent with the weight of the rolls. Handling shall be performed in a manner that does not result in physical damage to the product or core.

9.3 The rolls shall be stored at the manufacturer's facility in a neat and orderly fashion until shipment to the field site.

10. Certification

10.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.

11. Warranty

11.1 Upon request of the purchaser, a manufacturer's warranty covering the quality of the material shall be furnished at the completion of the terms of the contract.

Note 6: If a warranty is required for the installation of the barrier material, it is to be developed between the installation contractor and the party requesting such a document.

US (English) Units

Table 1(a) – Specification Values for Scrim Reinforced Polyethylene Barriers

Property and Units[1]	ASTM or GRI Test Methods	Category 1 – Severe[2] (20 mil – nominal)	Category 2 – Moderate[2] (12 mil – nominal)	Category 3 – Gentle[2] (8 mil – nominal)	Testing Frequency
Thickness[3] (mils)	ASTM D751	17	10	6	per roll
Weight, (lb/1000 ft^2)	ASTM D751	94	53	34	20,000 lb
Grab Tensile Strength[4] (lb)	ASTM D7004	114	76	59	20,000 lb
Grab Tensile Elongation[4] (%)	ASTM D7004	14	14	14	20,000 lb
Tongue Tear (lb)	ASTM D5884	53	40	15	20,000 lb
CBR Puncture (lb)	ASTM D6241	320	220	150	45,000 lb
Bursting Strength[5] (lb/$in.^2$)	ASTM D3786	130	85	60	45,000 lb
Water Vapor Transmission (WVT) (g/m^2-day)[7]	ASTM E96	0.4	0.7	1.2	200,000 lb
Oxidative Induction Time (OIT) (a) Standard OIT (min.) (b) High Pressure OIT (min.)	 ASTM D3895 ASTM D5885	 (6) 1000	 (6) 1000	 (6) 1000	 per each formulation
UV Resistance (fluorescent light method) (a) Strength and Elongation retained after 10,000 light hours (b) Response to bending	ASTM D7238 ASTM D7003 GRI GM16	 50% no cracking	 50% no cracking	 50% no cracking	 per each formulation

Notes

(1) All values are minimum, or minimum average, except WVT which is a maximum value.
(2) The categories refer to the type of subgrade, manner of installation, anchorage/tie downs, and site-specific conditions.
(3) The thickness value is measured in the valleys created by the scrim reinforcement, i.e., ply to ply thickness between scrim should be measured.
(4) If the reinforcement is aligned in any direction other than the machine and transverse directions, specimen shall be cut such that reinforcing yarns are oriented parallel to the central axis of the tension testing machine.
(5) Test should be conducted on an ASTM D3786 Mullen Burst type device with a diaphragm under the product. In addition, the center of the circular test specimen should be equidistant between sets of parallel yarns.
(6) Not recommended since the high temperatures of the STD-OIT test produces an unrealistic result for some of the antioxidants used in these materials.
(7) Performed at 23° ± 0.5°C temperature and 50% ± 5% relative humidity.

SI (Metric) Units

Table 1(b) – Specification Values for Scrim Reinforced Polyethylene Barriers

Property and Units[1]	ASTM or GRI Test Methods	Category 1 – Severe[2] (0.50 mm – nominal)	Category 2 – Moderate[2] (0.30 mm – nominal)	Category 3 – Gentle[2] (0.20 mm – nominal)	Testing Frequency
Thickness[3] (mm)	ASTM D751	0.43	0.25	0.15	per roll
Weight, (kg/1000 m^2)	ASTM D751	0.50	0.28	0.18	9,000 kg
Grab Tensile Strength[4] (N)	ASTM D7004	510	340	260	9,000 kg
Grab Tensile Elongation[4] (%)	ASTM D7004	14	14	14	9,000 kg
Tongue Tear (N)	ASTM D5884	235	180	65	9,000 kg
CBR Puncture (N)	ASTM D6241	1420	980	670	20,000 kg
Bursting Strength[5] (kPa)	ASTM D3786	900	590	410	20,000 kg
Water Vapor Transmission (WVT) (g/m^2-day)[7]	ASTM E96	0.4	0.7	1.2	200,000 kg
Oxidative Induction Time (OIT)					
(a) Standard OIT (min.)	ASTM D3895	(6)	(6)	(6)	per each
(b) High Pressure OIT (min.)	ASTM D5885	1000	1000	1000	formulation
UV Resistance (fluorescent light method)	ASTM D7238				
(a) Strength and Elongation retained after 10,000 light hours	ASTM D7003	50%	50%	50%	per each
(b) Response to bending	GRI GM16	no cracking	no cracking	no cracking	formulation

Notes

(1) All values are minimum, or minimum average, except WVT which is a maximum value.

(2) The categories refer to the type of subgrade, manner of installation, anchorage/tie downs, and site-specific conditions.

(3) The thickness value is measured in the valleys created by the scrim reinforcement, i.e., ply to ply thickness between scrim should be measured.

(4) If the reinforcement is aligned in any direction other than the machine and transverse directions, specimen shall be cut such that reinforcing yarns are oriented parallel to the central axis of the tension testing machine.

(5) Test should be conducted on an ASTM D3786 Mullen Burst type device with a diaphragm under the product. In addition, the center of the circular test specimen should be equidistant between sets of parallel yarns.

(6) Not recommended since the high temperatures of the STD-OIT test produces an unrealistic result for some of the antioxidants used in these materials.

(7) Performed at 23° ± 0.5°C temperature and 50% ± 5% relative humidity.

APPENDIX

"Seam Strength and Related Properties of Scrim Reinforced Polyethylene Barriers (PE-R) Covered Under GRI-GM 22 Specification" SM

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification addresses the required strength and related properties of thermally bonded reinforced polyethylene Barrier (PE-R).

Note 1: The distinction between geomembranes and barriers is very subjective at present. One possible distinction is based on thickness since the U.S. EPA requires a minimum thickness of 30 mils (0.75 mm) for waste containment in its RCRA regulations. Barriers would then consist of thicknesses less than 30 mils (0.75 mm).

Note 2: The reinforcement component of geomembranes and barriers is usually polymeric textiles in various forms. Woven multifilament yarns and woven monofilaments of various percent open areas are relatively common. Such fabric reinforcement is also referred to as "scrim" reinforcement.

1.2 It must be clearly stated that the geomembrane installer is responsible for seam requirements contained within the appendix to this specification. Furthermore, there are no implications or impacts towards the geomembrane manufacturer as a result of this appendix.

1.3 Numeric values of seam strength and related properties are specified in both shear and peel modes per ASTM D7747.

Note 3: This specification does not address the test method details or specific testing procedures. It refers to the relevant ASTM test method in this regard, i.e., ASTM D7747.

1.4 The thermal bonding methods focused upon are hot wedge (single and dual track) and hot air. Other acceptable, but less frequently used, methods of seaming are extrusion fillet, and ultrasonic methods.

1.5 This specification does not suggest a specific distance between destructive seam samples to

be taken in the field, i.e., the sampling interval. Two separate GRI Standard Practices are focused on this issue, see GRI-GM14 and GRI-GM20.

1.6 This specification is only applicable to laboratory testing of geomembrane/barrier seams.

Note 4: Field trial seams, or test strip seams, can also utilize this specification but acceptance depends on the construction quality assurance plan and/or parties involved.

1.7 This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards

D76 Standard Specification for Tensile Testing Machines for Textiles
D751 Standard Test Method for Coated Fabrics
D5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
D7747 Standard Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Strip Tensile Method
E4 Standard Practice for Force Verification of Testing Machines

2.2 Other References

EPA 600/2.88/052 (NTIS PB-89-129670)
Lining of Waste Containment and Other Containment Facilities

2.3 GRI Standards

GM22 Test Methods, Required Properties, and Testing Frequencies for Scrim Reinforced Polyethylene (PE-R) Barriers Used in Exposed Temporary Applications
GM14 Guide for Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes

3.Definitions

3.1 Geomembrane, n – An essentially impermeable geosynthetic composed of one or more synthetic sheets used for the purpose of liquid, gas or solid containment.

3.2 Hot Wedge Seaming – A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a hot metal wedge between them. Pressure is applied to

the top or bottom geomembrane, or both, to form a continuous bond. Seams can be made single (solid wedge) or double (split wedge) tracked. Seams of the double track type can be made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual hot wedge seams or double-track seams with an air channel between the two tracks.

3.3 Hot Air Seaming – This seaming technique introduces high-temperature air or gas between two geomembrane surfaces to facilitate localized surface melting. Pressure is applied to the top or bottom geomembrane, forcing together the two surfaces to form a continuous bond.

3.4 Ultrasonic Seaming - A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a ultrasonically vibrated metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Some seams of this type are made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual-track seams or double-track seams.

3.5 Extrusion Fillet Seaming – This seaming technique involves extruding molten resin at the edge of overlapped geomembranes to form a continuous bond. A depreciated method called "extrusion flat" seaming extrudes the molten resin between the two overlapped sheets. In all types of extrusion seaming the surfaces upon which the molten resin is applied must be suitably roughened, usually by a slight grinding or buffing.

3.6 Sewn Seams - Some very thin reinforced barriers can be made by sewing. Depending upon conditions and the parties involved this can be acceptable.

3.7 U.S. EPA (1991) - Resource Conservation and Recovery Act (RCRA), Title 40, Code of Federal Regulations (CFR), Part 261 (40 CFR 261), Subpart D and Subpart C.

4. Significance and Use

4.1 The various test methods of seamed polyolefin geomembrane/barriers in shear and peel are covered in existing ASTM standards mentioned in the referenced document section. For example, D6392 is for nonreinforced and D7747 is for reinforced seams. What is not covered in those documents are the numeric values of shear and peel strength and related properties that the completed seam must meet, or exceed. This specification provides this information insofar as minimum test values are concerned after the field fabricated seams are sampled and laboratory tested in shear and peel. Such results must meet or exceed the values given in the attached tables for the respective types of geomembranes/barriers.

5. Apparatus

5.1 Tensile Testing Machine - A constant rate of extension (CRE) device meeting the requirements of ASTM Specification D76. The load cell shall be accurate to within ± 1% of the applied force and verified per ASTM E4. The drive mechanism shall be able to control the rate of extension to within ± 1% of the targeted rate. The maximum allowable error in

recorded grip displacement shall be ± 1% of the recorded values. The maximum allowable variation in nominal gage length on repeated return of the grips to their starting position shall be less than 0.01 in. (0.25 mm).

5.2 Grip Faces - The clamping mechanism and clamp surfaces shall hold the specimen firmly without causing damage.

5.2.1 Clamp faces shall be a minimum of 1.0 in. (25 mm) in the dimension parallel to direction of test and wide enough to grip full width of the specimen.

Note 5: Test specimens failing at the grip faces or within the grips shall be discarded, i.e., failure must be within the test specimen's gage length.

6. Sample and Specimen Preparation

6.1 The spacings for taking field seam samples for destructive testing can be a fixed or variable interval, or can be statistically related as provided in GRI-GM14 and GRI-GM20. These statistical processes describe a progression from the most restrictive interval of 1 per 500 feet (1 per 150 m) to the complete use and reliance of the electrical leak location survey (ELLS) methods. Intermediate between these extremes are variations depending upon the inspectors' requirements and the installers experience and performance. The project-specific sampling spacing is decided upon by the design engineer or CQA organization.

6.2 The size of field seam samples is to be according to the referenced test method, e.g., ASTM D7747 or site-specific CQA plan.

6.3 The individual test specimens taken from the field seam samples are to be tested according to ASTM D7747. The specimens are to be conditioned prior to testing according to this same test method and evaluated accordingly.

7. Assessment of Seam Test Results

7.1 The tables to follow are for specific type of barrier under consideration and use ASTM D7747 as the test protocol. As such, the seam test specimens are 1.0 in. (25 mm) in width with the seamed area central to the opposing grip faces. The orientation of the specimens should be indicated accordingly. For each seam sample there will be five replicate tests conducted in shear and an adjacent five replicate tests conducted in peel. All ten test specimens must meet or exceed the values given in the respective tables to follow.

7.2 Polyethylene reinforced (PE-R) barrier seams - For PE-R seams (following the PE-R sheet material specification of GRI-GM22, the strength of all five-out-of-five strip tensile shear tests and five-out-of-five peel tests should meet or exceed the values given in Tables 2(a) or 2(b). See ASTM D7747 for procedures in conducting the shear and peel tests.

7.3 Regarding the locus-of-break patterns of the different seams in shear and peel, the following are unacceptable break codes;

AD and or AD-BRK > 25%

Furthermore, five out of five specimens shall result in acceptable break patterns of BRK, SE1 or SE2. In addition, SIP (SIPR, SIPCI and SIPCO) are acceptable break patterns if the shear and peel strengths meet or exceed the values given in Tables 2(a) and 2(b).

U.S. Standard Units

Table 2(a) - Seam Strength of Thermally Bonded Polyethylene Reinforced (PE-R) Barrier Seams Made According to GRI-GM22(2)

Property	Test Method	Minimum Value	Minimum Value	Minimum Value
Sheet Thickness • nominal (mils)	D751	 8.0	 12.0	 20.0
Hot Wedge/Air Seams(1) • shear strength (lb) • peel strength (lb)	D7747	 12 6	 18 7	 24 9

(1) Also for other possible seaming methods, e.g., ultrasonic
(2) Values are based on 1.0 in. (25 mm) wide strip tensile strength per D7747 for laboratory tested specimens

SI (Metric) Units

Table 2(b) - Seam Strength of Thermally Bonded Polyethylene Reinforced (PE-R) Barrier Seams Made According to GRI-GM22(2)

Property	Test Method	Minimum Value	Minimum Value	Minimum Value
Sheet Thickness • nominal (mm)	D751	 0.20	 0.30	 0.50
Hot Wedge/Air Seams(1) • shear strength (N) • peel strength (N)	D7747	 53 27	 80 31	 107 40

(1) Also for other possible seaming methods, e.g., ultrasonic
(2) Values are based on 25 mm (1.0 in.) wide strip tensile strength per D7747 for laboratory tested specimens

Adoption and Revision Schedule for PE-R Specification GRI-GM22

"Test Methods, Required Properties and Testing Frequencies for Scrim Reinforced Polyethylene Barriers (PE-R) Used in Exposed Temporary Applications"

Original: November 9, 2006

Revision 1: October 16, 2009. Changed hydrostatic resistance and clarified that testing per ASTM D3786 is intended. Numeric values remain the same since this was the method used in the original testing.

Revision 2: December 17, 2012: Replaced GRI-GM11 with ASTM D7238 and editorial changes.

Revision 3: December 16, 2015: Changed UV Resistance Strength and Elongation determination in Table 1(a) and 1(b) from ASTM D7004 (Grab) to ASTM D7003 (Strip) tensile.

Revision 4: February 18, 2016: Modified title, strength and elongation properties and eliminated strip tensile in body of table. Note that ASTM D7003 remains for UV testing determination of strength and elongation.

Revision 5: June 12, 2025: Added PE-R Seam Specification to Appendix in lieu of GRI-GM19b