



HDPE AND LLDPE SUPERGRIPNET™ AND HEAT BURNISHED GEOTEXTILE INSTALLATION SPECIFICATION FOR CLOSURE PROJECTS

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This manual is provided only as a guideline and not meant as an
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installation of others.**

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PART 1 - GENERAL

1.01 Summary

A. This specification includes furnishing and installing HDPE and LLDPE SuperGripNet™ with a formulated sheet density of 0.940 g/cc or greater associated with HDPE SuperGripNet™ and a formulated sheet density of 0.939 or less for LLDPE SuperGripNet™ . SuperGripNet™ with smooth and textured surfaces are included.

1.02 References

- A. American Society for Testing and Materials (ASTM):
11. D 4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet SuperGripNet™ .
 13. D 5199, Standard Test Method for Measuring Nominal Thickness of Smooth SuperGripNet™ .
 16. D 5641, Standard Practice for SuperGripNet™ Seam Evaluation by Vacuum Chamber.
 18. D 5820, Test Method for Air Testing.
 20. D 5994, Standard Test Method for Measuring Nominal Thickness of Textured SuperGripNet™
 21. D 6365, Standard Practice for the Nondestructive Testing of SuperGripNet™ Seams using The Spark Test
 22. D5820-95, Pressurized Air Channel Test for Dual Seamed SuperGripNet™
- B. Geosynthetic Research Institute (GRI):
1. GRI GM 9, Cold Weather Seaming of SuperGripNet™
 2. GRI GM 10, The Stress Crack Resistance of HDPE SuperGripNet™ Sheet
 3. GRI GM 13, Test Properties, Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured SuperGripNet™ , latest revision.

4. GRI GM 14, Test Frequencies for Destructive Seam Testing Selecting, variable intervals for taking SuperGripNet™ destructive samples using the method of attributes.
6. GRI GM 17, Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured SuperGripNet™ , latest revision.
7. GRI GM 19, Seam Strength and Related Properties of Thermally Bonded Polyolefin SuperGripNet™

1.03 Submittals

- A. Submit under provisions of Section 01300, Submittals.
- B. Submit the following to the Engineer or Owner, for review and approval, within a reasonable time to expedite shipment or installation of the SuperGripNet™ :
 1. Documentation of manufacturer's qualifications as specified in subsection 1.04A
 2. Manufacturer's Quality Control program manual or descriptive documentation.
 3. A material properties sheet, including at a minimum all properties specified in GRI GM 13 (**Not Included**), including test methods used.
 4. Sample of the material.
 5. Documentation of Installer's qualifications, as specified below and in subsection 1.04B of this Section.
 - a. Submit a list of at least ten completed facilities. For each installation, provide: name and type of facility; its location; the date of installation; name and telephone number of contact at the facility; type and thickness of SuperGripNet™ and; surface area of the installed SuperGripNet™ or similar material. All Agru America materials will acceptable for this qualification.
 - b. Submit resumes or qualifications of the Installation Supervisor, Master Seamer and Technicians to be assigned to this project.
 - c. Quality Control Program.
- C. Shop Drawings
 1. Submit copies of shop drawings for engineer's approval within a reasonable time. Shop drawings shall show the proposed panel layout identifying 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.

2. Placement of SuperGripNet™ should not occur until Owner's Representative has received and approved the shop drawings.

D. Additional Submittals (In-Progress and at Completion)

1. Manufacturer's warranty (refer to subsection 1.07).
2. SuperGripNet™ installation warranty (refer to subsection 1.08).
3. Daily written acceptance of sub grade surface (refer to subsection 3.01.C).
4. Low-temperature seaming procedures if applicable (refer to subsection 3.03.A).
5. Prequalification test seam samples (refer to subsection 3.05.A.6).
6. Field seam non-destructive test results (refer to subsection 3.05.B.1).
7. Field seam destructive test results (refer to subsection 3.05.C.6).
8. Daily field installation reports (refer to subsection 3.05.G).
9. Installation record drawing, as discussed in subsection 3.05.

1.04 Quality Control

A. Installer's Qualifications

1. The SuperGripNet™ Installer shall be an approved Manufacturer's Installer.
2. The SuperGripNet™ Installer shall have at least three years experience in the installation of polyethylene SuperGripNet™ or similar liners. The SuperGripNet™ Installer shall list at least 10 projects totaling 500,000 M² (5,000,000FT²) of polyethylene SuperGripNet™ or similar liner type installed during the last three years.
3. Installation shall be performed under the direction of a Field Installation Supervisor who shall be responsible throughout the SuperGripNet™ installation, for SuperGripNet™ panel layout, seaming, patching, testing, repairs, and all other activities of the SuperGripNet™ Installer. The Field Installation Supervisor shall have installed or supervised the installation and seaming of a minimum of 10 projects involving a total of 500,000 M² (5,000,000 FT²) of SuperGripNet™ or similar product.
4. Seaming shall be performed under the direction of a Master Seamer (who may also be the Field Installation Supervisor or Crew Foreman) who has seamed a minimum of

300,000M² (3,000,000FT²) of SuperGripNet™ or similar product, using the same type of seaming apparatus to be used in the current project. The Field Installation Supervisor and/or Master Seamer shall be present whenever seaming is performed.

5. All seaming, patching, other welding operations, and testing shall be performed by qualified technicians employed by the SuperGripNet™ Installer.

1.05 Delivery, Storage and Handling

A. Each roll of SuperGripNet™ delivered to the site shall be labeled by the manufacturer. The label shall be firmly affixed and shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll dimensions and roll weight.

B. Roll to be marked along upper selvage edge with type, thickness and length every meter.

C. SuperGripNet™ shall be protected from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

D. Rolls shall be stored away from high traffic areas. Continuously and uniformly support rolls on a smooth, level prepared surface. Chocks should be used to secure rolls.

1.06 Project Conditions

A. SuperGripNet™ should not be installed in the presence of standing water, while precipitation is occurring, during excessive winds, or when material temperatures are outside the limits specified in Section 3.03.

1.07 SuperGripNet™ Material Warranty

Material manufacturer shall guarantee material against defects and premature aging from environmental conditions on a pro rata basis for a specified period of time acceptable to owner and manufacturer.

1.08 SuperGripNet™ Installation Warranty

A. The SuperGripNet™ Installer shall guarantee the SuperGripNet™ installation against defects in the installation and workmanship for a time period satisfactory to all parties commencing with the date of final acceptance.

1.09 SuperGripNet™ Pre-Construction Meeting

A. A SuperGripNet™ Pre-Construction Meeting shall be held at the site prior to installation of the SuperGripNet™ . At a minimum, the meeting shall be attended by the SuperGripNet™ Installer, Owner, Owner's representative (Engineer and/or CQA Firm), and the Earthwork Contractor.

B. Topics for this meeting shall include:

1. Health and Safety
2. Lines of authority and communication. Resolution of any project document ambiguity.
3. Methods for documenting, reporting and distributing documents and reports.
4. Procedures for packaging and storing archive samples.
5. Review of time schedule for all installation and testing.
6. Review of panel layout and numbering systems for panels and seams including details for marking on SuperGripNet™ .
7. Procedures and responsibilities for preparation and submission of as-built panel and seam drawings.
8. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable sub grade, SuperGripNet™ , or ambient moisture and temperature conditions for working during liner installation.
9. Sub grade conditions, dewatering responsibilities and sub grade maintenance plan.
10. Deployment techniques including allowable sub grade for the SuperGripNet™ .
11. Plan for controlling expansion/contraction and wrinkling of the SuperGripNet™ .
12. Covering of the SuperGripNet™ and cover soil placement.
13. Measurement and payment schedules.
14. Responsibilities of each party.

C. The meeting shall be documented by a person designated at the beginning of the meeting and minutes shall be transmitted to all parties.

PART 2 - PRODUCTS

2.01 Source Quality Control

A. Manufacturing Quality Control

1. The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above SuperGripNet™ prior to delivery, shall be in accordance with the latest revision of the GRI GM 13 for HDPE SuperGripNet™ or GRI GM 17 for LLDPE SuperGripNet™, or modified as required for project specific conditions.
2. The manufacturer's SuperGripNet™ quality control certifications, including results of quality control testing of the products, as specified in subsection 2.01.A.3, must be supplied to the Owner's Representative to verify that the materials supplied for the project are in compliance with all product and or project specifications. The certification shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers and corresponding shipping information.
3. The Manufacturer will provide Certification that the SuperGripNet™ and welding rod supplied for the project are made from the same material type and are compatible.

2.02 SuperGripNet™ Geosynthetic Material

A. The SuperGripNet™ shall consist of new, 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 SuperGripNet™ rolls shall be seamless, high density polyethylene (HDPE - Formulated Sheet Density $\geq 0.94\text{g/cc}$) or linear low density polyethylene (LLDPE - Formulated Sheet Density $\leq 0.939\text{ g/cc}$) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing. The SuperGripNet™ shall be supplied as a continuous sheet with no factory seams in rolls. The SuperGripNet™ will meet the property requirements as shown in (GRI GM 13 for HDPE) or (GRI GM 17 for LLDPE). To download current GRI GM specifications go to the Geosynthetic Research Institute:

<http://www.geosynthetic-institute.org/specifications.htm>

B. Material conformance testing by the Owner's Representative, if required, will be conducted using in-plant sampling or as specified for the project.

C. The SuperGripNet™ seams shall meet the property requirements as shown in [Section 5](#) or as required by project specifications

D. Geotextile. A superior quality, nonwoven fabric heat burnished on one side 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 fabric will not be susceptible to rot or mildew, be non-biodegradable and resistant to damage from insects and rodents. The synthetic fiber to be stable within a pH range of 2 to 13.

PART 3 - EXECUTION

3.01 Sub grade Preparation

- A. The sub grade shall be prepared in accordance with the project specifications. The sub grade shall be uniform and free of sharp or angular objects that may damage the SuperGripNet™ prior to installation of the SuperGripNet™ .
- B. The SuperGripNet™ Installer and Owner's Representative shall inspect the surface to be covered with the SuperGripNet™ on each day's operations prior to placement of SuperGripNet™ to verify suitability.
- C. The SuperGripNet™ Installer and Owner's Representative shall provide daily written acceptance for the surface to be covered by the SuperGripNet™ . The surface shall be maintained in a manner, during SuperGripNet™ installation, to ensure sub grade suitability.
- D. All sub grade damaged by construction equipment and deemed unsuitable for SuperGripNet™ deployment shall be repaired prior to placement of the SuperGripNet™ . All repairs shall be approved by the Owner's Representative and the SuperGripNet™ Installer. This damage, repair, and the responsibilities of the contractor and SuperGripNet™ Installer shall be defined in the preconstruction meeting.

3.02 SuperGripNet™ Placement

- A. No SuperGripNet™ shall be deployed until the applicable certifications and quality control certificates listed in subsection 1.03 are submitted to and approved by the Owner's Representative within the timeframe specified in the Contract Documents. If the material does not meet project specifications it shall be removed from the work area.
- B. The **SuperGripNet™** shall be installed to the limits shown on the project drawings and essentially as shown on approved Panel Placement Drawings. Changes made to Panel Placement Drawings shall be submitted and approved prior to deployment of liner materials.
- C. No **SuperGripNet™** material shall be unrolled and deployed if the material temperatures are lower than 0 degrees C (32 degrees F) unless otherwise approved by the Owner's Representative. The specified minimum temperature for material deployment may be adjusted by the Owner's Representative. Temperature limitations should be defined in the

preconstruction meeting. Typically, only the quantity of **SuperGripNet™** that will be anchored and seamed together in one day should be deployed.

D. No vehicular traffic shall travel on the **SuperGripNet™** other than an approved low ground pressure vehicle or equivalent. It is suggested that a test pad simulating the methods to be used and showing no damage to the liner will result, be performed prior to implementation of the proposed method.

E. Sand bags or equivalent ballast shall be used as necessary to temporarily hold the **SuperGripNet™** material in position under the foreseeable and reasonably - expected wind conditions. Sand bag material shall be sufficiently close-knit to prevent fines from working through the bags and discharging on the **SuperGripNet™**.

F. **SuperGripNet™** placement shall not be done if moisture prevents proper sub grade preparation, panel placement, or panel seaming. Moisture limitations should be defined in the preconstruction meeting.

G. Damaged panels or portions of the damaged panels which have been rejected shall be marked and their removal from the work area recorded.

H. The **SuperGripNet™** shall not be allowed to "bridge over" voids or low areas in the sub grade. The **SuperGripNet™** shall rest in intimate contact with the sub grade.

I. Wrinkles caused by panel placement or thermal expansion should be minimized in accordance with section 1.09 paragraph B11.

J. Considerations on Site Geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams shall be minimized. Seams shall not be located at low points in the sub grade unless geometry requires seaming at such locations and if approved by the Owner's Representative.

K. Overlapping: The panels shall be overlapped prior to seaming to whatever extent is necessary to affect a good weld and allow for proper testing. In no case shall this overlap be less than 75mm (3 in.).

L. Sharp stones or other hard objects that could potentially damage the membrane should not be within 1" (25mm) of the surface to be lined.

M. Sub-grade should be firm, unyielding and able to support deployment equipment without damage or rutting to the sub-grade.

3.03 Seaming Procedures

- A. Cold weather installations should follow guidelines as outlined in GRI GM9.
- B. No SuperGripNet™ material shall be seamed when liner temperatures are less than 0 degrees C (32 degrees F) unless the following conditions are complied with:
1. Seaming of the SuperGripNet™ when material temperatures are below 0 degrees C (32 degrees F) is allowed if the SuperGripNet™ Installer can demonstrate to the Owner's Representative, using pre-qualification test seams, that field seams comply with the project specifications, the safety of the crew is ensured, and SuperGripNet™ material can be fabricated (i.e. pipe boots, penetrations, repairs. etc.) at sub-freezing temperatures.
 2. The SuperGripNet™ Installer shall submit to the Owner's Representative for approval, detailed procedures for seaming at low temperatures, possibly including the following:
 - a. Preheating of the SuperGripNet™
 - b. The provision of a tent or other device if necessary to prevent heat losses during seaming and rapid heat losses subsequent to seaming.
 - c. Number of test welds to determine appropriate seaming parameters
- C. No SuperGripNet™ material shall be seamed when the sheet temperature is above 75 degrees C (170 degrees F) as measured by an infrared thermometer or surface thermocouple unless otherwise approved by the Owner's Representative. This approval will be based on recommendations by the manufacturer and on a field demonstration by the SuperGripNet™ Installer using prequalification test seams to demonstrate that seams comply with the specification.
- D. Seaming shall primarily be performed using automatic fusion welding equipment and techniques along the smooth edges of the SuperGripNet™. Welding of the dimensional areas of the SuperGripNet™ can be accomplished with either wedge or extrusion welding methods. If a wedge is used it must be designed specifically for use with the dimensional SuperGripNet™ material. Where extrusion welding is used where fusion welding is not

possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams it will be necessary to remove all dimensional studs to allow intimate contact of the areas to be welded.

E. Fish mouths or excessive wrinkles at the seam overlaps shall be minimized and when necessary cut along the ridge of the wrinkles back into the panel so as to effect a flat overlap. The cut shall be terminated with a keyhole cut (nominal 10 mm (1/2 in) diameter hole) so as to minimize crack/tear propagation. The overlay shall subsequently be seamed. The key hole cut shall be patched with an oval or round patch of the same base SuperGripNet™ material extending a minimum of 150 mm (6 in.) beyond the cut in all directions.

F. When extrusion welding 60 mil (1.5mm) or greater HDPE it is advisable to bevel the top portion of the seam in a lengthwise direction to maximize intimate contact of extrudate and improve continuity of weld.

G. Prior to seaming confirm area to be welded is free of moisture, dirt and any foreign matter that can affect the integrity of the weld on an ongoing basis.

H. Take precaution and into account of the well being of the liner technicians, that is extreme heat or cold that can affect the health of the individuals.

I. Seaming should run through the Anchor Trench to terminate at the end of the sheet goods.

3.04 Pipe and Structure Penetration Sealing System

A. Provide penetration sealing system as shown in the Project Drawings.

B. Penetrations shall be constructed from the base SuperGripNet™ material, flat stock, prefabricated boots and accessories as shown on the Project Drawings. In the case of Structured Liners such as SuperGripNet™ or similar materials offered by Agru America, Inc, smooth or textured liner of the same density may be used for such fabrications if approved by owner's representative. The pre-fabricated or field fabricated assembly shall be welded to the SuperGripNet™ as shown on the Project Drawings so as to prevent leakage. This assembly shall be tested as outlined in section 3.05.B. alternatively, where field non destructive testing cannot be performed, attachments will be field spark tested by standard holiday leak detectors in accordance with ASTM 6365

Spark testing should be done in areas where both air pressure testing and vacuum testing is not possible.

1. Equipment for Spark testing shall be comprised of but not limited to: A hand held holiday spark tester and conductive wand that generates a high voltage.
2. The testing activities shall be performed by the SuperGripNet™ Installer by placing an electrically conductive tape or wire beneath the seam prior to welding. A trial seam containing a non welded segment shall be subject to a calibration test to ensure that such a defect (non welded segment) will be identified under the planned machine settings and procedures. Upon completion of the weld, enable the spark tester and hold approximately 25mm (1 in) above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If there is no spark the weld is considered to be leak free.
3. A spark indicates a hole in the seam. The faulty area shall be located, repaired and retested by the SuperGripNet™ Installer.
4. Care should be taken if flammable gases are present in the area to be tested.

3.05 Field Quality Control

The Owner's Representative shall be notified prior to all pre qualification and production welding and testing, or as agreed upon in the pre construction meeting.

A. Prequalification Test Seams

1. Test seams shall prepare and tested by the SuperGripNet™ Installer to verify that seaming parameters (speed, temperature and pressure of welding equipment) are adequate.
2. Test seams shall be made by each welding technician and tested in accordance with ASTM D 4437 at the beginning of each seaming period. Test seaming shall be performed under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 meters (10 feet) long for fusion welding and 1 meter (3 feet) long for extrusion welding with the seam centered lengthwise. At a minimum, one test seam should be made by each technician after seaming 4–6 hours; additional tests may be required with changes in environmental conditions.

3. Two 25 mm (1 in) wide specimens shall be die-cut by the SuperGripNet™ Installer from each end of the test seam. These specimens shall be tested by the SuperGripNet™ Installer using a field tensiometer testing both tracks for peel strength and also for shear strength. Each specimen should fail in the parent material and not in the weld, "Film Tear Bond"(F.T.B. failure). Seam separation equal to or greater than 25% of the track width shall be considered a failing test.

4. The minimum acceptable seam strength values to be obtained for all specimens tested are listed in Tables in section 5. Four specimens out of five shall pass for the test seam to be considered passing.

5. If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming apparatus shall be rejected and not used for production seaming until the deficiencies are corrected and a successful test seam can be produced.

6. A sample from each test seam shall be labeled. The label shall indicate the date, SuperGripNet™ temperature, number of the seaming unit, technician performing the test seam and pass or fail description. The sample shall then be given to the Owner's Representative for archiving.

B. Field Seam Non-destructive Testing

1. All field seams shall be non-destructively tested by the SuperGripNet™ Installer over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester and outcome of all non-destructive testing shall be recorded and submitted to the Owner's Representative.

2. Testing should be done as the seaming work progresses, not at the completion of all field seaming, unless agreed to in advance by the Owner's Representative. All defects found during testing shall be numbered and marked immediately after detection. All defects should be repaired, retested and remarked to indicate acceptable completion of the repair.

3. Non-destructive testing shall be performed using vacuum box, air pressure or spark testing equipment.

4. Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods. The SuperGripNet™ Installer shall demonstrate to the Owner's Representative all test methods to verify the test procedures are valid.

5. Extrusion seams shall be vacuum box tested by the SuperGripNet™ Installer in accordance with ASTM D 4437 and ASTM D 5641 with the following equipment and procedures:

a. Equipment for testing extrusion seams shall be comprised of but not limited to: a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the base, port hole or valve assembly and a vacuum gauge; a vacuum pump assembly equipped with a pressure controller and pipe connections; a rubber pressure/vacuum hose with fittings and connections; a plastic bucket; wide paint brush or mop; and a soapy solution.

b. The vacuum pump shall be charged and the tank pressure adjusted to approximately 35 kPa (5 psig).

c. The SuperGripNet™ Installer shall create a leak tight seal between the gasket and SuperGripNet™ interface by wetting a strip of SuperGripNet™ approximately 0.3m (12 in) by 1.2m (48 in) (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the SuperGripNet™. The SuperGripNet™ Installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa (5 psig) for approximately 3-4 seconds. The SuperGripNet™ should be continuously examined through the viewing window for the presence of soap bubbles, indicating a leak. If no bubbles appear after 3-4 seconds, the area shall be considered leak free. The box shall be depressurized and moved over the next adjoining area with an appropriate overlap and the process repeated.

d. All areas where soap bubbles appear shall be marked, repaired and then retested.

e. At locations where seams cannot be non destructively tested, such as pipe penetrations, alternate nondestructive spark testing (as outlined in section 3.04.B) or equivalent should be substituted.

f. All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

6. Double Fusion seams with an enclosed channel shall be air pressure tested by the SuperGripNet™ Installer in accordance with ASTM D 5820 and ASTM D 4437 and the following equipment and procedures:

a. Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa (30 psig), mounted on a cushion to protect the SuperGripNet™ ; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

b. The Testing activities shall be performed by the SuperGripNet™ Installer. Both ends of the seam to be tested shall be sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa (30 psig), and the valve closed.

Allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for 5 minutes.

If pressure loss does not exceed 28 kPa (4 psig) after this five minute period the seam shall be considered leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feed hole sealed.

c. If loss of pressure exceeds 28 kPa (4 psig) during the testing period or pressure does not stabilize, the faulty area shall be located, repaired and retested by the SuperGripNet™ Installer.

d. Results of the pressure testing shall be recorded on the liner at the seam tested and on a pressure testing record.

e. If release of pressure from opposite end of tested seam does NOT deflate seam, measures will be taken to determine cause and remedies taken to air test 100% of the seam under scrutiny.

C. Destructive Field Seam Testing

1. One destructive test sample per 150 linear m (500 linear ft) seam length or another predetermined length in accordance with GRI GM 14 shall be taken by the SuperGripNet™ Installer from a location specified by the Owner's Representative. The

SuperGripNet™ Installer shall not be informed in advance of the sample location. In order to obtain test results prior to completion of SuperGripNet™ installation, samples shall be cut by the SuperGripNet™ Installer as directed by the Owner's Representative as seaming progresses.

2. All field samples shall be marked with their sample number and seam number. The sample number, date, time, location, and seam number shall be recorded. The SuperGripNet™ Installer shall repair all holes in the SuperGripNet™ resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If a patch cannot be permanently installed over the test location the same day of sample collection, a temporary patch shall be tack welded or hot air welded over the opening until a permanent patch can be affixed.

3. The destructive sample size shall be 300 mm (12 in) wide by 1 m (36 in) long with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the Owner's Representative as an archive sample; one section given to the Owner's Representative for laboratory testing as specified in paragraph 5 below; and one section retained by the SuperGripNet™ Installer for field testing as specified in paragraph 4 below.

4. For field testing, the SuperGripNet™ Installer shall cut 10 identical 25 mm (1 in) wide replicate specimens from his sample. The SuperGripNet™ Installer shall test five specimens for seam shear strength and five for peel strength. Peel tests will be performed on both inside and outside weld tracks. To be acceptable, 4 of 5 test specimens must pass the stated criteria in section 2.02 with less than 25% separation. If 4 of 5 specimens pass, the sample qualifies for testing by the testing laboratory if required.

5. If independent seam testing is required by the specifications it shall be conducted in accordance with ASTM 5820 or ASTM D4437.

6. Reports of the results of examinations and testing shall be prepared and submitted to the Owner's Representative.

7. For field seams, if a laboratory test fails, that shall be considered as an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample.

Additional destructive test portions shall then be taken by the SuperGripNet™ Installer at locations indicated by the Engineer; typically 3 m (10 ft) on either side of the failed

sample and laboratory seam tests shall be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams and all seams represented by the failed destructive test location shall be either resealed or repaired with a cap-strip. All cap-strip seams shall be non-destructively vacuum box tested until adequacy of the seams is achieved. Cap strip seams exceeding 50 M in length (150 FT) shall be destructively tested.

8. Destructive samples should be kept out of critical areas such as in the bottom of ponds and other locations such as slopes and sumps.

D. Identification of Defects

1. Panels and seams shall be inspected by the Installer and Owner's Representative during and after panel deployment to identify all defects, including holes, blisters, undispersed raw materials and signs of contamination by foreign matter.

E. Evaluation of Defects: Each suspect location on the liner (both in seam and non-seam areas) shall be non-destructively tested using one of the methods described in Section 3.05.B. Each location which fails non-destructive testing shall be marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

1. If a destructive sample fails the field or laboratory test, the SuperGripNet™ Installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.

2. Defective seams, tears or holes shall be repaired by reseaming or applying a extrusion welded cap strip.

3. Reseaming may consist of either:

a. Removing the defective weld area and rewelding the parent material using the original welding equipment; or

b. Reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.

c. Cap stripping entire faulty seam.

4. Blisters, larger holes, and contamination by foreign matter shall be repaired by patches and/or extrusion weld beads as required. Each patch shall extend a minimum of 150 mm (6 in) beyond all edges of the defects.

5. All repairs shall be measured, located and recorded.

F. Verification of Repairs on Seams: Each repair shall be non-destructively tested using either vacuum box or spark testing methods. Tests which pass the non-destructive test shall be taken as an indication of a successful repair. Failed tests shall be resealed and retested until a passing test results. The number, date, location, technician and test outcome of each patch shall be recorded.

G. Daily Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Engineer with daily reports for all work accomplished on the previous work day. Reports shall include the following:

1. Total amount and location of SuperGripNet™ placed;
2. Total length and location of seams completed, name of technicians doing seaming and welding unit numbers;
3. Drawings of the previous day's installed SuperGripNet™ showing panel numbers, seam numbers and locations of non-destructive and destructive testing;
4. Results of pre-qualification test seams;
5. Results of non-destructive testing; and
6. Results of vacuum testing of repairs.

H. Destructive test results shall be reported prior to covering of liner.

I. Quality assurance to be performed and completed no more than 72 hours after SuperGripNet™ deployment.

3.06 Liner Acceptance

- A. SuperGripNet™ liner will be accepted by the Owner's Representative when:
1. The entire installation is completed or an agreed upon subsection of the installation is finished.
 2. All Installer's QC documentation is completed and submitted to the owner.
 3. Verification of the adequacy of all field seams and repairs and associated SuperGripNet™ testing is complete.
 4. All submittals are accepted.

3.07 Anchor Trench

- A. Construct as specified on the project drawings.

3.08 Disposal of Scrap Materials

A. On completion of installation, the SuperGripNet™ Installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. No scrap material shall be allowed to remain on the SuperGripNet™ surface.

PART 4 - MEASUREMENT AND PAYMENT

As per project specifications. Must be agreed upon prior to project start up.

PART 5 GEOTEXTILES, GEONETS and GEOCOMPOSITES

5.1 Geotextiles

Geotextiles will be generally aligned with seams parallel to the prevailing slope and HEAT TREATED side of the geotextile to be face down in contact with the SuperGripNet™ and can be seamed by either heat seaming with an approved hand held or self motivated thermal device or by sewing with a stitching approved by the engineer. Whichever stitching method is used the thread should be compatible with the fabric and have similar chemical resistance to the liner that is being used.

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5.4 Repairs

Any holes, tears, or burn throughs 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.

PART 6 - TABLES

"This section shall include the current GRI GM13 (HDPE) or GRI GM17 (LLDPE) manufacturer's specification or a revision of GRI GM13 (HDPE) or GRI GM 17 (LLDPE) specific to the unique project requirements and/or standards, as determined by the owner or owners' agent." TO BE INSERTED BY COMPANY PREPARING SUBMITTALS TO GUARANTEE MOST CURRENT GRI SPECIFICATION.

SEAM STRENGTHS - HDPE and LLDPE GRI GM 19

Table 1- Seam Strength and related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) SuperGripNet™ (English Units)

SuperGripNet™ Nominal Thickness	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams ⁽¹⁾							
shear strength ⁽²⁾ , lb/in.	57	80	100	120	160	200	240
shear elongation at break ⁽³⁾ , %	50	50	50	50	50	50	50
peel strength ⁽²⁾ , lb/in.	45	60	76	91	121	151	181
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams ⁽¹⁾							
shear strength ⁽²⁾ , lb/in.	57	80	100	120	160	200	240
shear elongation at break ⁽³⁾ , %	50	50	50	50	50	50	50
peel strength ⁽²⁾ , lb/in.	39	52	65	78	104	130	156
peel separation, %	25	25	25	25	25	25	25

Notes for Table 1 - Also for hot air and ultrasonic seaming methods

1. Value listed for shear and peel strength are for 4 out of 5 test specimens; the 5th specimen can be low as 80% of the listed values
2. Elongation measurements should be omitted for field testing

Table 2 - Seam Strength and related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) SuperGripNet™ (English Units)

SuperGripNet™ Nominal Thickness	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams ⁽¹⁾							
shear strength ⁽²⁾ , lb/in.	45	60	75	90	120	150	180
shear elongationatbreak ⁽³⁾ , %	50	50	50	50	50	50	50
peel strength ⁽²⁾ , lb/in.	38	50	63	75	100	125	150
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams ⁽¹⁾							
shear strength ⁽²⁾ , lb/in.	45	60	75	90	120	150	180
shear elongation at break ⁽³⁾ %	50	50	50	50	50	50	50
peel strength ⁽²⁾ , lb/in.	34	44	57	66	88	114	136
peel separation, %	25	25	25	25	25	25	25

Notes for Table 2 - Also for hot air and ultrasonic seaming methods

1. Value listed for shear and peel strength are for 4 out of 5 test specimens; the 5th specimen can be low as 80% of the listed values
2. Elongation measurements should be omitted for field testing

Non Destructive Air Channel Test

Table 3 Initial Pressure Schedule

Material	Field Testing	
	Minimum PSI	Maximum PSI
30 mil	15	30
40 mil	20	30
60 mil	24	30
80 mil	24	30
100 mil	24	32

Table 4 Maximum Allowable Pressure Drop

Material Field Test

(after five minutes)

30 mil 4 PSI

40 mil 4 PSI

60 mil 4 PSI

80 mil 4 PSI

100 mil 4 PSI

Note: At all times before heat sealing the end of the seam, the operator should insure that the void or air channel is free of obstruction.

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