
Supplemental Technical Specification for

Geocomposite Wall Drain

SCDOT Designation: SC-M-802-1 (07/18)

1.0 DESCRIPTION

1.1 A geocomposite wall drain is a prefabricated drain system that is used to provide drainage behind Earth Retaining Structures (ERSs) or abutment backwalls. The geocomposite drain consists of a flexible plastic drainage core bonded to a non-woven geotextile.

1.2 Place geocomposite wall drains continuously along the back of ERSs as shown in the plans unless otherwise directed by the Resident Construction Engineer (RCE) in consultation with the Geotechnical Engineer-of-Record (GEOR). Furnish all necessary labor, equipment, and materials and perform all operations necessary for the installation of geocomposite wall drains in accordance with the details shown on the plans and the requirements of this Supplemental Technical Specification (STS).

2.0 TESTING STANDARDS

2.1 Use the latest edition of the testing standards indicated in this STS. Substitution of standards requires the prior written approval of the Materials and Research Engineer (MRE) with concurrence of the GEOR. The Contractor is to provide copies of all substituted standards to the RCE. The RCE will provide the copies to the MRE and GEOR for acceptance.

2.2 **References:** The evaluation of this work will be based on, but not limited to, the following references:

2.2.1 American Association of State Highway and Transportation Officials, (2017), Standard Specification for Transportation Materials and Methods of Sampling and Testing and AASHTO Provisional Standards, American Association of State Highway and Transportation Officials, Washington, D.C.

2.2.1.1 M-288 – *Standard Specification for Geosynthetic Specification for Highway Applications*,

2.2.2 Holtz, R. D., Christopher, B. R., and Berg, R. R., (2008), Geosynthetic Design and Construction Guidelines, (FHWA-NHI-07-092), U.S. Department of Transportation, National Highway Institute, Federal Highway Administration, Washington, D.C.

2.2.3 South Carolina Department of Transportation, Geotechnical Design Manual (GDM), Latest Version, see the SCDOT website.

3.0 MATERIALS

3.1 **General:** Ensure that the geocomposite wall drains are prefabricated of newly manufactured materials and consist of a continuous polymeric drainage core and nonwoven geotextile filter fabric (jacket). Ensure that the jacket allows free passage of pore water to the

core without loss of soil material or piping. Ensure that the core provides continuous vertical drainage. Ensure that the jacket material and polymeric drainage core are bonded at intervals not exceeding 1.5 inches. Ensure that the geocomposite wall drain is solid backed allowing drainage of water on only 1 side (i.e., the face) and that the reverse side without the jacket (i.e., the back) consists of a smooth surface on the core. This smooth surface will facilitate better bonding to the ERS or abutment backwall face. Ensure that the jacket is thermal (heat) bonded or fungicide glue bonded to the core. Ensure that the geocomposite product sheets or rolls have a minimum width of 3 feet with a minimum coverage area of 40 square feet.

3.2 Ensure that the geocomposite wall drains meets the following geocomposite system properties in addition to the individual component properties of the jacket and core materials. Perform all tests in accordance with the methods referenced in this STS. Sample lots in accordance with ASTM D4354 – *Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing*.

3.3 Jacket Materials: Ensure that the jacket components conform to the following:

- 3.3.1 Be a synthetic nonwoven polymeric geotextile meeting the criteria listed in Table 1.
- 3.3.2 Ensure that the jacket material is not subject to localized damage (e.g., punching through the filter by sand/gravel particles).
- 3.3.3 Ensure that the jacket material is rigid enough to withstand lateral earth pressures due to embedment and surcharge so that the vertical flow capacity through the core will not be adversely affected.
- 3.3.4 Ensure that the jacket material does not undergo cracking and peeling during placement of backfill behind the ERS or abutment backwall.

Table 1 – Jacket Material Properties¹

PROPERTY ²	TEST METHODS	UNITS	REQUIREMENTS
Mass	ASTM D5261	oz./yd ²	≥ 4.0
Grab Elongation	ASTM D4632	%	≥ 50
Grab Strength ³	ASTM D4632	lbs.	≥ 130
Tear Strength	ASTM D4533	lbs.	≥ 60
Permittivity	ASTM D4491	sec. ⁻¹	≥ 0.5
AOS ⁴	ASTM D4751	Sieve Size (mm)	#70 (≤ 0.15)
Ultraviolet Stability (Retained Strength)	ASTM D4355	%	≥ 50 after 500 hrs. of exposure

Notes:

¹This Table only applies to the testing of jacket materials prior to bonding the jacket and core materials.

²All numeric values represent Minimum Average Roll Value (MARV) per ASTM D4759 – *Standard Practice for Determining the Specification Conformance of Geosynthetics* in the weaker principal direction. Provide nonwoven geotextiles whose average test results from any roll sampled in a lot for conformance or quality assurance testing meets or exceeds minimum values provided in this Table.

³Conduct grab tensile strength tests on the assembled drain using ASTM D4595 – *Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method*.

⁴Apparent Opening Size, numeric value shown is the Minimum Average Roll Value (MARV) per ASTM D4759 – *Standard Practice for Determining the Specification Conformance of Geosynthetics*.

3.4 Core Materials: Ensure that the core materials conform to the following:

- 3.4.1 Use a 3-dimensional surface on the drainage side of the core to allow free flow of water along this face of the wall drain. Ensure that the reverse side of the core is either smooth or covered with a light-weight woven geotextile. Ensure that the core meets the requirements of Table 2.
- 3.4.2 Use either high impact polystyrene (HIPS) or polypropylene for the core material. The HIPS core material shall meet the requirements of ASTM D4549 – *Standard Classification System and Basis for Specification for Polystyrene and Rubber-Modified Polystyrene Molding and Extrusion Materials (PS)*, designation PS0222C04A01011. The polypropylene core material shall meet the requirements of ASTM D4101 – *Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials*, designation PP0114L04A14520.

Table 2 – Core Material Properties¹

PROPERTY	TEST METHODS	UNITS	REQUIREMENTS
Thickness	ASTM D5199	inches	0.3125 (5/16) minimum to 0.5000 (1/2) maximum
Compressive Strength At 20% Deformation	ASTM D1621	psf	≥ 10,000

¹This Table only applies to the testing of core materials prior to bonding the jacket and core materials.

3.5 Geocomposite Wall Drain Assembly

- 3.5.1 Ensure that labeling, shipment, and storage of the geocomposite wall drain materials follows ASTM D4873 – *Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples*. Label or tag the assembled geocomposite wall drains in such a manner that the information for sample identification and other quality control purposes can be read from the label. At a minimum, identify each roll of assembled geocomposite wall drain by the manufacturer as to lot or control numbers, individual roll number, date of manufacture, manufacturer, and product identification of the jacket and core. Ensure that the assembled geocomposite wall drains are resistant against wet rot, mildew, bacterial action, insects, dissolved salts, acids, alkalis, solvents, and other ingredients in the site ground water.
- 3.5.2 Use only a single type of assembled geocomposite wall on the project. Provide an assembled geocomposite wall drain that meets the properties indicated in Table 3.

Table 3 – Assembled Geocomposite Wall Drain Properties

PROPERTY	TEST METHODS	UNITS	REQUIREMENTS
Thickness	ASTM D5199	inches	≤ 2.0
Transmissivity	ASTM D4716	gal/min/ft	5 (gradient = 0.1 and pressure = 5 psi) minimum
			10 (gradient = 1.0 and pressure = 14.5 psi) maximum

- 3.5.3 During shipment and storage, wrap the geocomposite wall drains in burlap or similar heavy duty protective covering. Protect the geocomposite wall drains from sunlight, mud, dirt, dust, debris, and other detrimental substances during shipping and on-site storage. Ensure that the geocomposite wall drains are free of defects, rips, holes, and/or flaws. Material which is damaged during shipment, unloading, storage, or handling, or which does not meet the requirements of the drain material will be rejected by the RCE.
- 3.5.4 Ensure that a geotextile flap is provided along all drainage core edges and that this flap is of sufficient width for sealing the geocomposite drain edge to prevent soil intrusion into the drainage core during and after installation. Ensure that the geotextile covers the full length of the drainage core.

3.6 Acceptance Criteria

- 3.6.1 For products currently listed on the AASHTO National Transportation Product Evaluation Program (NTPEP) Geosynthetics (GTX and REGEO) list, base the submittal package on the posted independent product line evaluation report (see www.ntpep.org). Provide the data from NTPEP to the RCE prior to placing the material.
- 3.6.2 For products that are not currently listed by NTPEP, supply to the RCE, prior to placing the material, certified test results of those tests specified herein from an AASHTO accredited laboratory. Acceptance will be based on the test results meeting the geocomposite system properties, drainage core properties, and geotextile properties stated in this STS. The RCE will submit the certified test results to the MRE and the GEOR for acceptance. Ensure that test data is no more than 1 year old at the time it is furnished to the Department.
- 3.6.3 Regardless of the material certification provided to SCDOT, do not install geocomposite wall drains until the material certification is received and accepted by the MRE and GEOR. The Department reserves the right to sample and test any of the materials used in the geocomposite wall drain system.

4.0 CONSTRUCTION REQUIREMENTS

4.1 Check the geocomposite wall drain upon delivery to ensure that the proper material has been received. Protect the geocomposite wall drain during shipment and storage at the construction site from temperatures greater than 160° F, mud, dirt, debris, and any other environmental condition that may damage the material's physical property values. Protect the geocomposite wall drain from direct sunlight in accordance with the manufacturer's recommendations.

4.2 The geocomposite wall drain will be rejected at the time of installation if it has defects, tears, punctures, flaws, deterioration, or damage incurred during manufacture, shipment, or storage. Remove or repair torn or punctured sections as directed by the RCE. Replace any geocomposite wall drain damaged during manufacture, shipment, or storage at no additional cost to the Department.

4.3 If at any time the RCE in consultation with the GEOR determines that the method of installation does not produce a satisfactory wall drainage system, alter either the method and/or equipment as necessary to comply with this STS.

4.4 Install the geocomposite wall drain in accordance with the plans and specifications. Ensure that the surface that the geocomposite drain will be placed against is cleaned by removing all soil, debris, and irregularities that will prevent intimate contact between the surface and the geocomposite drain. Secure the geocomposite wall drain to the wall using metal stick clips, adhesives, or as recommended by the manufacturer. Install the geocomposite wall drain to allow weep holes, as shown in the plans, to drain water from the drainage core and underdrain pipes.

4.5 Form all joints by peeling or trimming the geotextile off the attached section to expose 3 inches of the drainage core. Overlap the drainage core of the second section over the first drainage core by 2 inches. Cover the joint by reattaching the geotextile flap and securely fastening it to the lower geotextile by means of a continuous strip of 3 inch wide waterproof plastic tape. Ensure that each overlapping course is shingled in the direction of water flow. If joints cannot be formed by interlocking the drainage grooves, then butt the drainage core together and cover with continuous, 6 inch wide geotextile. Center the geotextile fabric over the joint and securely fasten to the two geocomposite drains with 3 inch wide waterproof plastic tape.

4.6 Ensure that the nonwoven geotextile used to repair or replace damaged jacket material or used to cover joints in the geocomposite wall drain or to overlap the edges of the geocomposite wall drain shall meet the criteria contained in Table 1.

4.7 Cover all exposed edges of the geocomposite wall drain with geotextile by tucking and securing a minimum of 4 inches of geotextile behind the drainage core. This may be done by using the geotextile flaps at the edges or using a 12 inch wide continuous strip in the same manner, taping it to the exposed fabric 4 inches in from the edge with a continuous strip of 3 inch wide waterproof plastic tape, and folding the remaining geotextile and tucking it behind the drainage core edge.

4.8 If the geotextile is torn, perforated, or ripped during installation, patch or replace as directed by the RCE. Cut out the damaged section and replace it completely or repair it by placing a piece of geotextile over the damaged area and providing a minimum of 4 inches of overlap on all sides over the damaged area and secure the repair patch with 3 inch wide waterproof plastic tape. Discard and replace damaged drainage core sections. Replace or repair any geocomposite wall drain damaged during installation at no additional cost to the Department.

4.9 Place the underdrain pipes and free draining aggregate as shown in the plans or as directed by the RCE in consultation with the GEOR. Provide and maintain a positive outlet for the water in the geocomposite wall drain at all locations. Ensure that weep holes are not sealed or made ineffective by the wall drain material. This may involve making a hole in the drainage core at the weep hole location. Tuck the geotextile drainage filtration fabric used to envelop the underdrain system 6 inches behind the geocomposite drain and overlapped over the geocomposite drain a distance of 12 inches and continuously secured with 3 inch wide waterproof plastic tape.

4.10 Place backfill immediately over the geocomposite wall drain in a manner that does not damage the geocomposite drainage system. Take care to avoid excessive settlement of the backfill material. Do not expose the geocomposite wall drain for more than 7 days prior to backfilling. Replace and repair any geocomposite drainage system component that is damaged during the backfilling operation as directed by the RCE in consultation with the GEOR.

5.0 METHOD OF MEASUREMENT

5.1 Furnish all supervision, materials, equipment, mobilization, crews, tools, and other equipment and materials as necessary to properly execute the work.

5.2 Measure the area of acceptably installed geocomposite wall drain to the nearest 1/2 square foot. Payment will not be made for geocomposite wall drains that are damaged or not properly attached to either the wall of drainage system as shown in the plans, unless previously approved by the GEOR and the RCE in writing.

6.0 BASIS OF PAYMENT

6.1 Payment will be based on the total area of all acceptably installed geocomposite wall drains.

6.2 No payment will be made for geocomposite wall drains, or for any delays or expenses incurred through changes necessitated by improper material, installation or equipment.

6.3 Payments will be made under:

Item No.	Pay Item	Pay Unit
8023010	Geocomposite Wall Drain	SF