Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Bonifacio Drive, Port Area Manila

BAGONG PILIPINAS

097.13 DPWH
05.27.2025

MAY 21 2025

DEPARTMENT ORDER)
)
NO. 93)
Series of 2025 5/27/2025

SUBJECT: Specification on the Use of Concrete Canvas [Geosynthetic Cementitious Composite Mat (GCCM)] for Slope Protection and Lined Canal Applications

In line with the Department's ongoing efforts to enhance construction technology through the adoption of successful research studies, this Department Order hereby authorizes the use of Concrete Canvas [Geosynthetic Cementitious Composite Mat (GCCM)] for slope protection and lined canal applications, subject to the specifications and Certificate of Conditional Approval (CCA) hereto attached.

The CCA has been issued to the concerned proponent, granting approval for the use of said product in DPWH projects from **April 21, 2025** to **April 20, 2030**. Also, the conditional pilot pay item shall be included in the Project and Contract Management Application (PCMA) only during the said validity period.

This Order shall take effect immediately.

Department of Public Works and Highways
Office of the Secretary
WIN5U02152

MANUEL M. BONOAN
Secretary

Encl.: (1) Specification of the Use of Item 526 – Geosynthetic Cementitious Composite Mats (GCCMs)
(2) Certificate of Conditional Approval (CCA)

14.1 JDV/AGC

Specification on the Use of
Item 526 – Geosynthetic Cementitious Composite Mats (GCCMs)

526.1 Description

This work item shall consist of furnishing and installing Geosynthetic Cementitious Composite Mats (GCCMs) for slope protection and lined canal works in accordance with this Specification and in conformity to the requirements as shown on the Plans.

526.2 Material Requirements

526.2.1 Geosynthetic Cementitious Composite Mat (GCCM)

GCCMs shall be either CCT1 or CCT2 conforming to the requirements as shown in Table 526.1.

Table 526.1 Requirements for Geosynthetic Cementitious Composite Mat (GCCM)

Property		Test Method	State of GCCM	Requirement	
				CCT1	CCT2
Thickness, mm, Min.		ASTM D5199	uncured cured 24 hours	5.0	7.5
Mass per unit area, kg/m^2, Min.		ASTM D5993	uncured	6.5	10.5
Density, kg/m^3, Min.		ASTM D5993/D5199	uncured	1250	
Flexural strength	Initial breaking load, N/m, Min.	ASTM D8058	cured 24 hours	625	1500
	Initial flexural strength, MPa, Min.			3.5	
	Final flexural strength, MPa, Min.			4.0	
Compressive strength of cementitious mix, MPa, Min.		ASTM D8329	cured 28 days	45	60
Pyramid puncture, kN, Min.		ASTM D5494, Type B	cured 28 days	3.5	8.0
Abrasion, mm/100 cycles, Max.		ASTM C1353M	cured 28 days	0.2	
Tensile strength, kN/m, Min.	Final	ASTM D6768M	uncured	8.0	8.0
	Initial (1st crack)	ASTM D4885	cured 28 days	6.0	7.0
	Final			12	19

Notes:
GCCM materials are non-isotropic and the values for flexural strength, and initial breaking load are reported as the lower of the material machine production direction (length of roll) or material cross-machine direction (width of roll).
ASTM D5199 - Test Method for Measuring the Nominal Thickness of Geosynthetics
ASTM D5993 - Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners
ASTM D8058 - Test Method for Determining the Flexural Strength of a Geosynthetic Cementitious Composite Mat (GCCM) Using the Three-Point Bending Test
ASTM D8329 - Test Method for Determination of Water/ Cementitious Materials Ratio for Geosynthetic Cementitious Composite Mats (GCCMs) and Measurement of the Compression Strength of the Cementitious Material Contained Within
ASTM D5494 - Test Method for the Determination of Pyramid Puncture Resistance of Unprotected and Protected Geomembranes
ASTM C1353M - Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser
ASTM D6768M - Test Method for Tensile Strength of Geosynthetic Clay Liners

ASTM D4885 - Test Method for Determining Performance Strength of Geomembranes by the Wide Strip Tensile Method

526.2.2 Fasteners and Adhesives

Shingled joints of GCCMs shall be fastened using stainless steel screws or screws with a corrosion-resistant coating, or other acceptable corrosion-resistant fasteners recommended by the GCCM manufacturer. To reduce the permeability of the joint, a continuous bead of adhesive sealant, which shall be compatible with the GCCM, may be used in combination with the fasteners.

526.2.3 Water

Water used in hydrating the GCCM shall conform to the applicable requirements of Item 714, Water.

526.3 Construction Requirements

526.3.1 General

Construction requirements for GCCMs shall conform to the requirements of ASTM D8173, Site Preparation, Layout, Installation, and Hydration of Geosynthetic Cementitious Composite Mats. The manufacturer may also recommend additional requirements to suit site conditions.

526.3.2 Handling and Storing of GCCMs

GCCMs shall be stored sealed under cover in dry conditions away from direct sunlight. Once the manufacturer's original sealed packing is opened, the material shall be deployed shortly thereafter within 24 hours; if there is leftover material, the leftover material shall be returned to a sealed package or other airtight packaging around the roll.

526.3.3 Site Preparation

All surface objects and other protruding obstructions shall be cleared in accordance with Item 100, Clearing and Grubbing.

Designated slope sides shall be excavated to the required dimensions in accordance with Item 103, Structure Excavation. Any voids in the substrate which the GCCM will span across shall be filled prior to installation.

526.3.4 Installation of GCCM Segments

1. GCCM rolls shall be installed in a controlled manner, and shall not be allowed to freewheel or spin under their own weight.

2. GCCM segments shall be oriented and installed such that the hydratable surface layer/top layer is exposed for hydration.

3. Depending upon the length of the slope, roll sizes shall be considered to avoid horizontal jointing on the slope, if possible. For larger rolls, a staging area may be recommended during construction where larger rolls can be cut into desired lengths to accommodate installation.

4. Installation of the GCCM in water conveyance channels shall begin at the lowest elevation, with successive segments installed as installation proceeds upstream.

526.3.5 Jointing of GCCM Segments

1. Manufacturer's recommendations shall be consulted to the applicability of specific jointing options.

2. The jointed GCCM shall be fixed sufficiently to ensure close contact between the two GCCM segments.

3. Layers of GCCM materials shall be shingled to minimize ingress between adjacent layers. Segments shall be placed in a shingled joint either longitudinal or transverse to the direction of the flow, depending on project requirements.

4. All shingled joints shall be positioned from upstream to downstream end, and the angle of grading should be such to avoid pooling of water or other liquids at the slightly raised overlap.

5. Segments shall be secured together by fastening to form continuous contact and to reduce potential vegetation growth.

6. Shingled joints shall be fastened with acceptable materials in Subsection 526.2.2 Fasteners and Adhesives, with a spacing of 100 to 200 mm, or as shown on the Plans.

526.3.6 Anchoring of GCCM Segments

The GCCM shall be sufficiently anchored to the substrate to resist hydraulic forces in water carrying applications, wind loading exposed applications, abrasion, other loads, or combinations thereof. Sufficient frequency, type, centering, and locations of fixings shall be used to satisfactorily secure the GCCM to the substrate. The anchoring shall be used before the GCCM is installed, or installed through the GCCM prior to hydration.

526.3.7 Hydration of GCCM

The minimum water-to-GCCM ratio shall be 0.5 by weight of material. The GCCM shall be hydrated with water until adequately saturated as per manufacturer's recommendations.

526.4 Method of Measurement

The work under this Item shall be measured square meter (m^2) of installed and accepted Geosynthetic Cementitious Composite Mat as indicated on the Plans.

526.5 Basis of Payment

The accepted quantity, measured as prescribed in Section 526.4, Method of Measurement, shall be paid for at the Contract Unit Price which price and payment shall be full compensation for furnishing all materials, including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
526 (1) a	Geosynthetic Cementitious Composite Mat, CCT1	Square Meter
526 (1) b	Geosynthetic Cementitious Composite Mat, CCT2	Square Meter

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
CENTRAL OFFICE
Manila

BAGONG PILIPINAS

CERTIFICATE OF CONDITIONAL APPROVAL

This is to certify that

Concrete Canvas [Geosynthetic Cementitious Composite Mat (GCCM)]

Supplied by

PGA-Earth Structure Solutions, Inc.
4F PGATECH Center, No. 85 Kamuning Road, Quezon City

is duly accredited for use in DPWH infrastructure for Slope Protection and Lined Canal Works subject to its specifications pursuant to the provisions of Department Order No. 189, Series of 2002.

This accreditation shall remain in force until expiry date printed below, subject to compliance with the requirements of the aforementioned Department Order.

Conditional Approval Number	:	**0035**
Date Issued	:	**April 21, 2025**
Valid Until	:	**April 20, 2030**

ADOR G. CANLAS, CESO IV
Undersecretary for Technical Services and
Information Management Service