



Standard Practice for Sample Preparation for GCCM¹

This standard is issued under the fixed designation D8030/D8030M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This standard practice specifies a set of instructions for preparing samples of geosynthetic cementitious composite mat (GCCM) for index property testing.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026.

1.3.1 For purposes of comparing measured or calculated value(s) with specified limits, the measured or calculated value(s) shall be rounded to the nearest decimal or significant digits in the specified limits.

1.3.2 The procedures used to specify how data are collected/recorded or calculated in this practice are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be measured. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the users objectives; and it is common practice to increase or reduce the significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this practice to consider significant digits used in the analytical methods for engineering design.

1.4 *This standard 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.* Some specific hazards statements are given in Section 7 on Hazards.

2. Referenced Documents

2.1 *ASTM Standards:*²

C191 Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

D4439 Terminology for Geosynthetics

D6026 Practice for Using Significant Digits in Geotechnical Data

3. Terminology

3.1 *Definitions:* For definitions of common technical terms used in this standard, refer to Terminology D4439.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cured, adj*—a description of the state of a GCCM after hydration for a specified period of time under specified conditions, followed by a period of time where the GCCM is kept under a specified environmental condition during which the cementitious matrix continues to crystallize and develop strength.

3.2.2 *curing time, n*—the time subsequent to initial hydration of the GCCM and immediately prior to the testing of the material during which the cementitious material is allowed to harden and form its final structure. The specific process for curing is specified in 9.3.

3.2.3 *dry, adj*—a description of the state of a GCCM before it has been exposed to a hydration source. Typically describes the "as received" dry product after conditioning in prescribed manner.

3.2.4 *geosynthetic cementitious composite mat (GCCM), n*—a factory assembled barrier consisting of a cementitious material contained within layer or layers of geosynthetic materials. The GCCM forms a hardened barrier when properly hydrated and cured.

3.2.5 *hydration, n*—exposure of the GCCM, in this case, to water in prescribed conditions for a prescribed time.

3.2.6 *index property test, n*—in geosynthetics, a standard test that may be used to compare the relative material properties of erosion control products.

¹ This practice is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.05 on Geosynthetic Erosion Control.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2.7 *initial setting time, n*—the time subsequent to initial hydration of the GCCM at which the cementitious gel begins to interlock and form an extended structure. The measurement of initial setting time is prescribed, for instance, in Test Methods C191.

3.2.8 *wet, adj*—a description of the state of a GCCM after it has been exposed to a hydration source for a period of time less than the initial setting time of the cementitious mixture.

4. Summary of Practice

4.1 A representative sample of dry GCCM is either 1) cut into dry specimens or 2) exposed to water under controlled conditions and for a prescribed time, allowed to cure (harden), and then cut into specimens for index testing.

5. Significance and Use

5.1 This practice is intended to create specimens of GCCM products appropriate for testing for the determination of index properties. Cured (hardened) samples are not necessarily intended to represent a field application of GCCM products but would be representative of the correct amount of water applied to a known style of product and provide a basis for consistent and repeatable index property testing.

6. Apparatus

6.1 *Balances*—A balance with 0.01 lb readability is required (excluding the mass of the sample container).

6.2 *Sample Containers*—Suitable containers which are resistant to corrosion and change in mass upon repeated exposure to moisture, materials of varying pH, and cleaning.

6.3 *Die*, of known dimensions.

6.4 *Tile Saw, with diamond tipped blades*—used for cutting cured sample to predetermined dimension using pattern marked on cured specimen with template and markers.

6.5 *Miscellaneous, knives, templates, markers*—as required for marking and cutting specimens to fixed dimensions before measurement of weight. A knife with a “snap off” type blade is recommended for cutting GCCM’s, which can dull blade tips rapidly.

7. Hazards

7.1 *Safety Hazards*—GCCM products can be dusty. Eye protection and a dust mask are recommended to be worn during the procedure.

8. Procedure A – Dry (unhydrated) Specimens

8.1 Obtain a sufficient amount of representative laboratory sample of the GCCM to satisfy 8.2.

8.1.1 The laboratory sample should be in satisfactory condition and representative of the bulk of the product delivered to the facility.

8.1.2 All sample and specimen cutting should be carried out in clean area free of debris and preferentially with a surface covering to collect any loose powder which may come from material during cutting.

8.1.3 The number of test specimens shall be specified in each test method. These specimens shall be cut such that they are representative of the roll width.

8.2 Preparation of Dry Specimens:

8.2.1 Using a die, or template and knife, carefully cut the required number of specimens randomly from the sample, but in a manner that is distributed across the width of the sample.

8.2.2 All samples and specimens shall be cut, whether using die, saw, or knives to the specific dimensions required for the test being performed.

8.2.3 The loss of cement powder from edges of the specimen during the cutting process may have a significant impact on the accuracy of a given test method. This can be a more significant issue for dry or wet samples, as defined under this method. The technician performing this test method should practice cutting specimens from the sample to gain confidence in preparing the sample without significant loss of cement powder.

8.2.4 If using a die to cut the specimen, loss of powder can be minimized by leaving the die in place and removing any remaining sample, including loose powder, from the outside of the die before moving the die. If a base material like cardstock is used with the die when cutting the specimen, the cardstock and die can be used as a temporary container. Transfer the specimen to a sample container with minimal loss of powder.

8.2.5 If using a template and knife to cut the specimen, mark the test specific template on the sample. After cutting the specimen, place the cut specimen into the sample container. Collect any loose powder from the cutting area. Place half of the loose powder into the sample container and discard the remaining half.

8.2.6 The specimen in the sample container, as prepared above, is now conditioned by bringing the specimens to moisture equilibrium in an atmosphere of $21 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ relative humidity. Equilibrium is considered to have been reached when the change in mass of the test specimen in successive weighing, made at intervals of not less than 2 h, does not exceed 0.1 % of the previous mass of the test specimen. After conditioning, the specimens are ready for testing.

9. Procedure B – Wetted (hydrated only or hydrated and hardened) Specimens

9.1 Obtain a sufficient amount of representative sample of the GCCM to satisfy 9.2.

9.1.1 The laboratory sample should be in satisfactory condition and representative of the bulk of the product delivered to the facility.

9.1.2 All sample and specimen cutting should be carried out in clean area free of debris and preferentially with a surface covering to collect any loose powder which may come from material during cutting.

9.1.3 The number of test specimens shall be specified in each test method. These specimens shall be cut such that they are representative of the roll width.

9.2 Preparation of Wet Specimens:

9.2.1 Mark on the dry GCCM lab sample a template that represents the size of the specimens required for the specific



test to be carried out. This is carried out for each specimen or set of specimens required to be cut for the specific test.

9.2.2 Cut using a die or a knife the required number of specimens of the GCCM sample to be tested, but initially cut beyond the marked template, creating a “coupon” which is oversized compared to the tested specimen by at least an inch along the perimeter of the specimen. A coupon may include one or more specimens.

9.2.3 The loss of cement powder from edges of the coupon during the cutting process may have a significant impact on the accuracy of a given test method. This can be a more significant issue for specimens tested dry or wet, rather than cured, as defined under this method. The technician performing this test method should practice cutting coupons from the sample to gain confidence in preparing them without significant loss of cement powder.

9.2.4 Prepare a “hydration” tank of water equilibrated to standard temperature of $21 \pm 2^\circ\text{C}$.

9.2.5 Entirely immerse the coupon(s) in the tank for a period of 20 min.

9.2.6 Remove each coupon from the tank and cut the actual test specimens to the required test dimensions from the oversized coupons using die or template and knife, using same procedure as for dry samples (see 8.2.1) to collect any material that spills from the sides.

9.2.7 Place the specimen and any collected spill into a sample container.

9.2.8 If wet specimens are to be tested, there is no additional conditioning and testing is to proceed within 20 min of being removed from the hydration tank.

9.3 Preparation of Cured Specimens:

9.3.1 For cured specimens, a determination for each set of specimens must be made before testing of the desired curing time.

9.3.2 A laboratory sample of the GCCM sufficient to cut the required number of specimens is prepared for hydration. This sample may involve multiple coupons cut from the product to facilitate the process of hydration. All coupons shall be larger than the required test specimens to allow for post curing cutting.

9.3.3 A hydration tank of sufficient size to lay the coupon flat is supplied with water equilibrated at $21 \pm 2^\circ\text{C}$, of a sufficient depth to fully submerge sample.

9.3.4 The coupon is laid out flat in the hydration tank sandwiched between two flat and sufficiently porous forms, such as porous stones, making sure that the coupons are completely submerged. The coupon is allowed to hydrate for 24 h in the hydration tank. If multiple coupons are being created a thin plastic sheet may be inserted between exposed coupons as a bond breaker. Hydrating the GCCM between the forms assures that the coupon will be flat when it becomes rigid. This may be important for the specific test being carried out.

9.3.5 The coupon is removed from the hydration tank, and the specimens are cut using a saw and template, or die to the required specimen dimension.

9.3.6 The cured specimens do not require a sample container, though sample containers can be used.

9.3.7 The specimens are placed in an atmosphere of $21 \pm 2^\circ\text{C}$ and $65 \pm 5\%$ relative humidity, and remain in this environment for the remainder of their curing time.

10. Keywords

10.1 GCCM; geosynthetic cementitious composite mat; index test; preparation; sampling

APPENDIX

(Nonmandatory Information)

X1. LABORATORY SAMPLE PREPARATION

X1.1 To make the process more clear, one specific process that has been used with one type of GCCM is outlined below with figures to illustrate:

X1.1.1 Assemble a large tub, utility knife, scissors, large steel spatula, approximately 110 kg [50 lb] of concrete sand, four 300- by 300-mm [12- by 12-in.] porous stones and 5 gal of tap water. Distilled, deionized, water may be needed in case of dispute.

X1.1.2 Place the 110 kg [50 lb] of sand in the tub as shown in Fig. X1.1 and level it by tamping.

X1.1.3 Place porous stones to serve as a base of the hydration apparatus as shown in Fig. X1.2. Note that this procedure provides for two coupons to be prepared.

X1.1.4 Cut the GCCM material into 300- by 300-mm [12- by 12-in.] coupons with a template as shown in Fig. X1.3.



FIG. X1.1 Sand Placed in Base of Tub



FIG. X1.2 Porous Stones 300 by 300 mm [12 by 12 in.] Placed on Leveling Sand



FIG. X1.4 Coupons Are Placed on Top of Porous Stones



FIG. X1.3 Coupons 300 by 300 mm [12 by 12 in.] Are Cut from Roll



FIG. X1.5 Additional Porous Stones Are Used as Confining Pressure

Other coupon sizes may be used. Please note that immediately after the samples are taken from the roll the remainder needs to be rewrapped and sealed to minimize any effects of moisture exposure from environment or accidental exposures.

X1.1.5 Place the two coupons on the porous stones as shown in **Fig. X1.4**. Place the nonporous (geomembrane) side down.

X1.1.6 Place additional porous stones (used for confining pressure) on top of the dry coupons as shown in **Fig. X1.5**.

X1.1.7 Pour approximately 5 gal of water, equilibrated to $21 \pm 2^\circ\text{C}$, gently down the inside wall of the tub. It should completely immerse the assembly to the top of the upper porous stone as shown in **Fig. X1.6**.

X1.1.8 Allow the coupons to remain in the hydration chamber for a period as directed by the manufacturer to saturate and cure the GCCM coupons.

X1.1.9 After 24 h remove the upper porous stone. The GCCM may stick to the porous stones if no “bond-breaking” materials are placed between the upper surface of the GCCM and the form. If sticking occurs, the spatula can be used as shown in **Figs. X1.7 and X1.8** to wedge the sample from the porous stone without damaging the coupons. If this cannot be done easily, one will have to use a bond breaker, such as a film to inhibit adhesion between the two surfaces.

NOTE X1.1—It is possible to get curling of GCCM during curing. **Fig. X1.9** contrasts the difference in specimen preparation between a coupon which was freely cured in a water bath and a coupon which was confined by the porous stones during curing.

X1.1.10 Allow the coupons to cure for 24 h in a controlled environment.

X1.1.11 Prepare specific test specimens from the coupon by way of a wet diamond saw as shown in **Fig. X1.10**.



FIG. X1.6 Tub is Flooded and Allowed to Cure for 24 h



FIG. X1.7 With Large Flat Knife Cured Sample is Stripped Away from Porous Stone



**FIG. X1.8 Separate Coupon from Porous Stone
GM Side Does Not Stick GT Side Does**



FIG. X1.9 Comparison of Free Swell and Confined Swell Coupons



FIG. X1.10 Wet Diamond Saw Cutting of Specimen from Coupon

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