Designation: D3213 – 13$^{\varepsilon 1}$

Standard Practices for Handling, Storing, and Preparing Soft Intact Marine Soil[1]

This standard is issued under the fixed designation D3213; 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.

ε[1] NOTE—Editorially updated units of measurement statement in April 2018.

1. Scope*

1.1 These practices cover methods for project/cruise reporting, and handling, transporting and storing soft cohesive intact marine soil. Procedures for preparing soil specimens for triaxial strength, and consolidation testing are also presented.

1.2 These practices may include the handling and transporting of sediment specimens contaminated with hazardous materials and samples subject to quarantine regulations.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 *These practices offer a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of these practices may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title means only that the document has been approved through the ASTM consensus process.*

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Sections 1, 2 and 7.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D1587 Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes

D2435 Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedures)

D2850 Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D4186 Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading

D4220 Practices for Preserving and Transporting Soil Samples

D4452 Practice for X-Ray Radiography of Soil Samples

3. Terminology

3.1 *Definitions*—The definitions of terms used in these practices shall be in accordance with Terminology D653.

4. Summary of Practice

4.1 Procedures are presented for handling, transporting, storing, and preparing very soft and soft, fine-grained marine sediment specimens that minimize disturbance to the test

[1] These practices are under the jurisdiction of ASTM Committee D18 on Soil and Rock and are the direct responsibility of Subcommittee D18.02 on Sampling and Related Field Testing for Soil Evaluations.

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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.

***A Summary of Changes section appears at the end of this standard**

specimen from the time it is initially sampled at sea to the time it is placed in a testing device in the laboratory.

5. Significance and Use

5.1 Disturbance imparted to sediments after sampling can significantly affect some geotechnical properties. Careful practices need to be followed to minimize soil fabric changes caused from handling, storing, and preparing sediment specimens for testing.

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection, etc. Users of this standard are cautioned that compliance with Practice D3740 does not in itself assure reliable results. Reliable results depend on may factors; Practice D3740 provides a means of evaluating some of those factors.

5.2 The practices presented in this document should be used with soil that has a very soft or soft shear strength (undrained shear strength less than 25 kPa (3.6 psi)) consistency.

NOTE 2—Some soils that are obtained at or just below the seafloor quickly deform under their own weight if left unsupported. This type of behavior presents special problems for some types of testing. Special handling and preparation procedures are required under those circumstances. Test are sometimes performed at sea to minimize the effect of storage time and handling on soil properties. An undrained shear strength of less than 25 kPa was selected based on Terzaghi and Peck.[3] They defined a very soft saturated clay as having undrained shear strength less than 25 kPa.

5.3 These practices shall apply to specimens of naturally formed marine soil (that may or may not be fragile or highly sensitive) that will be used for density determination, consolidation, permeability testing or shear strength testing with or without stress-strain properties and volume change measurements (see Note 3). In addition, dynamic and cyclic testing can also be performed on the sample.

NOTE 3—To help evaluate disturbance, X-Ray Radiography has proven helpful, refer to Practice D4452.

5.4 These practices apply to fine-grained soils that do not allow the rapid drainage of pore water. Although many of the procedures can apply to coarser-grained soils, drainage may occur rapidly enough to warrant special handling procedures not covered in these practices.

5.5 These practices apply primarily to soil specimens that are obtained in thin-walled or similar coring devices that produce high-quality cores or that are obtained by pushing a thin-walled tube into cores taken with another sampling device.

5.6 These practices can be used in conjunction with soils containing gas, however, more specialized procedures and equipment that are not covered in these practices have been developed for use with such materials.

NOTE 4—For information on handling gas charged sediments, the reader is referred to papers by Johns, et al.,[4] and Lee.[5]

6. Apparatus

6.1 *Coring Device,* capable of obtaining high-quality soil specimens, including related shipboard equipment such as cable and winch. Typical coring devices used in industry are the wireline push or piston samplers.

NOTE 5—Some sampling devices, for example, box corers, obtain samples of a size or shape that are difficult to preserve. Such cores can be subsampled aboard ship by pushing a thin-walled sampler into the larger size core. This method can produce samples from soils obtained near the seafloor. The subsamples can then be handled and stored according to these practices.

6.1.1 *Metal or Plastic Liners or Barrels (Pipe or Thin-Walled Tubes),* the soil will be obtained or stored within, or both. Short sections of the liner, sharpened on one end, may also be used to subsample larger sized cores (see Note 5). It is important to note that liners constructed of cellulose acetate butyrate (CAB) plastic are pervious to water. Polycarbonate is nearly impervious and polyvinyl chloride (PVC) is impervious to water migration.

6.2 *Equipment Required on Board Ship to Seal and Store Soil Samples:*

6.2.1 *Identification Material*—This includes the necessary writing pens, tags, and labels to properly identify the sample(s).

6.2.2 *Caps,* either plastic, rubber, or metal, to be placed over the end of thin-walled tubes, liners and rings, and sealed with tape or wax, or both.

6.2.3 *Packers,* or add wax to top and bottom of core to seal the ends of samples within thin-walled tubes.

NOTE 6—Plastic expandable packers are preferred. Metal expandable packers seal equally well; however, long-term storage using metal expandable packers may cause corrosion problems.

6.2.4 *Filler Material,* used to occupy the voids at the top and bottom of the sediment container. The material must be slightly smaller than the inside dimensions of the container and must be a light-weight, nonabsorbing, nearly incompressible substance. For example, wooden disks of various thicknesses that have been coated with a waterproofing material can be used.

6.2.5 *Tape,* either waterproof electrical or duct tape.

6.2.6 *Cheesecloth or Aluminum Foil,* to be used in conjunction with wax for block sample.

6.2.7 *Sealing Wax,* non-shrinking, non-cracking wax, includes microcrystalline wax, beeswax, ceresine, carnaubawax, or combination thereof.

NOTE 7—The wax must be able to adhere to the container and be ductile enough not to chip or flake off during handling at cold temperatures. Microcrystalline wax alone or in combination with other waxes has been shown to be satisfactory in sealing the ends of cores stored at low temperatures.

6.2.8 *Plastic Wrap,* used to prevent the wax from adhering to other objects and providing additional protection against soil moisture loss.

6.2.9 *Core Storage Boxes.*

[3] Terzaghi, K. and Peck, R. B., *Soil Mechanics in Engineering Practice*, 2nd ed., Wiley, 1967, p. 729.

[4] Johns, M. W., Taylor, E., and Bryant, W. R., "Geotechnical Sampling and Testing of Gas-Charged Marine Sediments at In Situ Pressures," *Geo-Marine Letters*, Vol 2, 1982, pp. 231–236.

[5] Lee, H. J., "State of the Art: Laboratory Determination of the Strength of Marine Soils," *Strength Testing of Marine Sediments*, ASTM STP 883, ASTM, 1985, pp. 181–250.