PDHonline Course C289 (3 PDH)

Sampling from Test Pits, Trenches and Stockpiles

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Chapter F-13 Handling and Storage of Samples and Sampling Records

13-1. Introduction

Frequently, the driller and the inspector are the only people who witness the drilling operations and the material brought to the surface. Both must work closely together to identify, preserve, and record any changes of material and conditions. These records, which include both the preserved soil samples and the written field logs, provide fundamental facts on which all subsequent conclusions are based, such as the need for additional exploration or testing, feasibility of the site, cost and method of construction, and evaluation of structure performance. In addition, these records may also be needed to delineate accurately a change of conditions with the passage of time, to form a part of contract documents, or to serve as a basis for evidence in a court of law.

The inspector is usually assigned the tasks of identifying and labeling the samples, preparing the samples for transport and storage, and maintaining a written record of the materials and conditions encountered. Although the inspector's tasks must necessarily be tailored to the specific investigation, this chapter provides general guidance which can be used by the inspector to ensure that samples are preserved and that a factual, clear, and complete set of records are obtained. It should be noted that for specific sampling operations, such as undisturbed or disturbed sampling operations on land or nearshore, additional information for handling and storage of samples and sampling records has been reported in Chapters 6, 8, 10, 11 and 12.

13-2. Handling and Storage

For the purposes of handling and storage, it is suggested in ASTM D 4220-83 (ASTM 1993) that soil samples can be divided arbitrarily into four groups. Group A samples are obtained for visual classification purposes only. Group B samples are obtained for water content and classification tests. Bulk samples which are obtained for engineering properties tests, such as strength, deformation, and permeability tests, on remolded or reconstituted specimens are also classified as Group B samples. Group C samples include intact, naturally formed, or field-compacted samples which are frequently described as “undisturbed.” Engineering properties tests, similar to those described for Group B soils, can be conducted on these samples. Group D samples are similar to the Group C samples except they are very fragile or highly sensitive. Laboratory tests, similar to the tests for Group C samples, can be conducted on these samples.

Depending upon the type of sampling device and the intended purpose of the samples, similar procedures are required for handling and storage of all groups of samples; the principal difference is the degree of disturbance which is permitted. Because the emphasis of many sampling operations is directed towards obtaining high-quality undisturbed samples, i.e., Group C or Group D samples, the guidance which is presented in this chapter is primarily directed towards undisturbed sampling operations. However, this information is also applicable for Group A or Group B samples, i.e., disturbed samples; the requirements for preventing disturbance to the samples, such as shock or vibration, are simply relaxed.

a. Removal of sample from sampling device. After the sampling device has been withdrawn from the borehole, the sampling tube should be disconnected from the sampler without shocks or blows. The gross length of the sample, which is a good indicator of sample condition, should be determined to the nearest 3 mm (0.01 ft). If the sample is stored in the sampling tube, a small representative sample from the bottom of the sample should be trimmed and placed in a glass jar and sealed. The net length of sample should be determined to the nearest 3 mm (0.01 ft), and the portion of tube to be sealed should be thoroughly cleaned before the sample is sealed. For open-tube samplers, sludge which has accumulated on top of the sample should be removed before the length of the sample is determined. For piston samplers, any space between the piston and sample, or any movement of the piston or piston rod as the clamp is released should be noted. If water or drilling mud is located between the piston and the sample, note the distance between the piston and sample and the volume of water, if possible.

For samples which are extruded from the sampling tube, the sludge and drilling mud should be cleaned from the sampling tube, and the gross length of the sample should be determined before the sample is extruded. After the undisturbed sample has been extruded, the gross length of the sample should again be measured, a small representative sample should be trimmed from the bottom of the sample and placed in a glass jar and sealed, and the net length of the sample should be determined. To minimize or prevent additional disturbance as the sample is extruded from the sampling tube, the barrel should be held horizontally and the sample should be extruded directly onto a half-section tray in the direction that it entered the barrel. A hydraulic-pressure extruder is preferable to a mechanical extruder; a pneumatic-pressure-extruder should not be used. The advantages of extruding the sample from the tube include reusing the sampling tube, avoiding increased adhesion of the sample to the tube with time, minimizing the potential for corrosion of the metal sampling tube and chemical change on the periphery of the sample as a result of contact with the metal tube, minimizing the potential for migration of pore water by separating the sample by material type and by removal of seriously disturbed portions of the sample, and recording more detailed descriptions of soil type and stratigraphy. The disadvantages include the increased potential of sample disturbance as a result of additional handling and drying of the sample. The costs due to extruding and sealing the samples in other containers could be somewhat higher than costs for sealing the samples in the sampling tubes.

b. Identification of soil. One of the responsibilities of the inspector is to identify the soil type and to note when changes of soil or stratigraphy occur. A record of all major changes in the character of the soil, including its classification, color, water content, consistency, etc., must be made. Descriptions of the soil should be based upon the visual examination of samples taken from each stratum and should be consistent with the procedures in Appendix E. For example, a sample may be described as a dense, tan, wet, uniformly-graded, subrounded, medium sand with occasional clay lenses. Most importantly, be consistent with the visual descriptions, even if they do not agree with the soils classifications determined in the laboratory.

If the sample is extruded, the stratigraphy can be based upon a visual examination of the core and the classification of a representative sample; if the sample is not extruded, the stratigraphy of the sample must be based upon a description of the soil at the top and bottom of the tube. Changes that occur in zones not sampled can usually be determined by a conscientious, capable geotechnical driller by the action of the drill rig and bit and changes in the drilling fluid return. When changes are detected, the penetration of the bit should be stopped, the depth should be determined to the nearest 30 mm (0.1 ft), and a sample should be taken. This step ensures that a sample of each stratum is obtained before additional changes are encountered.

c. Labeling samples. As samples are removed from the respective borings, they should be numbered by boring and consecutive order, such as 1, 2, and 3, and by the depth of the respective samples. The depth to the top and the bottom of the sample should be recorded to the nearest 30 mm (0.1 ft). Sectioned liners or jar samples should be identified as a subsample, such as 1a, 1b, 1c, 2a, 2b, and 2c. Care should be exercised to ensure that the correct orientation i.e., top and bottom, of all samples is maintained and that samples are marked accordingly. Sectioned liners should be marked to permit orientation of segments for examination of stratification or for determination of the strike and dip.

Samples should be identified with tags, labels, or other suitable markings, such as writing on the sample tube with paint or permanent marker or etching the sample tube. Label tags should be marked with nonfading, permanent ink and protected with a coating of wax. For disturbed samples such as bulk samples, a waterproof identification tag should be placed inside the container before it is sealed; the sample identification data should also be marked on the outside of the container. For jar samples, labels should be glued to the outside of the container (not the lid). Waterproof, duplicate tags should always be placed inside the sample container. An example of two types of tags (ENG Forms 1742 and 1743) for labeling and identifying soil samples are presented in Figure 13-1.

Regardless of the quality or quantity of samples, samples are worthless if inadequate or conflicting identification and labeling of samples occur. The inspector must ensure that each sample is labeled consistently with the data in the boring logs. Samples should be identified with the following information:

- Project name or number and location.
- Sampling date.
- Boring number, sample number, depth/elevation.
- Soils description.
- Gross and net lengths, sample orientation, and method of sampling.
- Special instructions, problems, observations, or general remarks.

d. Preservation of samples. To ensure the success of the laboratory testing program, preservation of the inherent conditions of the soil samples is critical. In general, the first step towards preserving the sample is to seal it in a sturdy container. Depending upon the proposed use of the soil sample, as indicated by Groups A through D, suitable containers as well as the method for sealing, shipping, and storing the containers should be selected which will prevent the loss of soil moisture, prevent differential movement between the container and the sample, and minimize the potential for chemical change, as indicated by the presence of rust, mold, or fungus on the periphery of the sample. Several methods are suggested in the following paragraphs. Ultimately, however, the procedures or requirements for preserving and/or sealing the soil samples should be defined by a designated responsible person or included in the project specifications.

Group A samples, which are obtained for visual classification purposes, can be preserved and transported in any type of container that meets minimum requirements to prevent sample loss during transport and storage. Small representative samples can be placed in glass or plastic jars; bulk samples can be stored in heavy-duty plastic bags or in tightly woven, mildew-resistant cloth, canvas, or burlap bags.

Group B samples, which are disturbed samples obtained for water content, classification, or engineering tests on reconstituted specimens, must be preserved and transported in sealed, moisture-proof containers. Containers must be of sufficient strength to assure against breakage and meet the minimum requirements of the transporting agency. Suitable containers include plastic bags, glass or plastic jars or buckets, or carton containers. Buckets, jars, and other carton containers should be sealed with lids with rubber-ringed seals, tape, microcrystalline waxes, etc., or combinations thereof; thin-walled sample tubes or liners should be sealed with expandable packers, caps, tape, waxes, etc.; and bulk samples should be sealed in heavy-duty plastic bags or wrapped with alternating layers of cheesecloth and wax.

Group C and Group D samples, which are commonly referred to as undisturbed samples, must be protected from changes of water content, shock, vibration, temperature extremes, and chemical changes. Undisturbed samples can be preserved in sample tubes or liners or can be extruded, coated with wax and/or cheesecloth and wax, and sealed in sturdy containers, such as wooden boxes, carton containers, or glass or plastic jars or buckets. Before the undisturbed sample is sealed in its container, a small representative sample of soil should be removed from the bottom of the sample, placed in a wide mouth jar, and sealed with rubber-ringed lids or lids with a coated paper seal. The soil in the jar sample can be used for preliminary examination and laboratory classification tests without breaking the seal of the undisturbed sample.

If the sample is preserved in the sampling tube or liner, the ends of the tube can be sealed using several different techniques. One of the most common methods consists of mechanically expanding an O-ring which has been placed between metal or plastic disks against the inside wall of the sampling tube. Plastic, rubber, or metal caps can be placed over the end of the thin-walled tube or liner and sealed with waterproof plastic tape, friction tape, duct tape, or wax. Another method consists of placing 25-mm- (1-in.-) thick prewaxed wooden disks or 2-mm- (1/16-in.-) thick metal or plastic disks inside the sampling tube or liner and sealing with wax or caps and tape, or both.

If the sample is extruded from the sampling tube, samples are commonly coated with wax or cheesecloth and wax and placed in sturdy containers. Smaller samples should be painted with several light coats of wax to minimize penetration of the wax into the voids of the specimen and then dipped into liquid wax to obtain a layer of wax approximately 3 mm (0.1 in.) thick. If a thicker/stronger wax coating is needed to protect the sample, cheesecloth can be wrapped around the sample before it is dipped into the liquid wax. For larger or more porous or coarse-grained samples, cheesecloth should be placed on the sample before it is painted with wax; this procedure will help to prevent wax from migrating into the voids of the sample. After the sample has been placed in a sturdy container, the annulus between the sample and the container should be filled with wax or foam packing material for additional protection for the sample.

An alternative procedure for preserving extruded samples is to place the sample in a carton container and fill the annulus between the sample and the container with wax. If this procedure is used, the wax coating may not be as tight as for dipped samples. Furthermore, care is necessary to ensure that voids do not exist between the sample and its container after the sample has been sealed. If the annulus is not filled, the sample is improperly sealed; disturbance could result from a change of water content or structural damage to the sample, a chemical change or growth of mold or fungus on the periphery of the sample, or corrosion and deterioration of the sample container.

Large, undisturbed block samples should initially be covered with cheesecloth and then painted with one or two light coats of wax and then covered with at least two additional alternating layers of cheesecloth and wax. After the sample has been placed in a suitable container, such as a wooden box, the annulus should be filled with wax or other suitable packing material. The top of the box should be attached to the container with screws or hinges and latches; driving nails to attach the top to the box disturbs the sample because of shock and vibrations.

A variety of waxes are available for sealing tubes and containers. The most commonly used waxes include microcrystalline wax, paraffin, beeswax, ceresine, carnaubawax, or combinations thereof. For most applications, a combination of waxes, such as a l to 1 mixture of microcrystalline wax and paraffin, should be used for sealing soil samples. To obtain a seal, the temperature of the wax should be limited to about 10 deg C (18 deg F) above its melting point. If its temperature is too high, the wax will tend to penetrate the pore spaces and cracks of the soil, whereas if its temperature is too low, the wax will congeal before it has filled the annulus between the sample and the container. Qualitatively, an object, such as a pencil, which is inserted in wax at the proper temperature for coating samples will be coated with congealed wax immediately upon its withdrawal; the coating will not bond to the object. However, if the wax is too hot, it will appear clear and bond to the object.

Although wax is commonly used for sealing soil samples, limitations of its use should be recognized. First, the loss of moisture from undisturbed samples is undesirable because the engineering properties and, for certain soils, the classification test results change as a result of a change of water content. Unfortunately, wax seals are not impermeable, and soil samples will therefore tend to lose moisture during prolonged storage. It is sometimes desirable to weigh samples before and after sealing and before the tube is opened for laboratory testing. When the sample tubes are opened, the difference of weights between the measurements obtained in the field and after storage, if any, should be reported to designated responsible laboratory personnel. Other characteristics of waxes include shrinkage as a result of cooling, increased brittleness in cooler weather, and softening and plastic deformation due to the weight of the soil sample in warmer weather. Consequently, the wax seals should be inspected at regular intervals during storage and deficiencies should be corrected.

Corrosion is dependent upon the type of metal in the tube, the salts in the pore fluid, and perhaps the soil constituents. It is increased by the presence of air. The most obvious effects of corrosion include roughness of the walls of the sample tube and adhesion of soil to the sample tube which would increase the difficulty of extruding the sample and cause additional disturbance to the sample. The less obvious effect is the potential change of the chemistry of the pore fluid and the influence of this change on the engineering behavior of test specimens. To minimize the potential for chemical change, as inferred by the presence of corrosion on the sample tube and caps, the tube and the caps for sealing the tube should be made of plastic or noncorrosive metal or coated with a hard, smooth lacquer. The tubes and caps should be of the same metal or electrically inactive metals to avoid electrolysis. If plastic tubes or caps are used, a plastic material should be used which does not contain constituents, such as heavy metals, that could adversely affect the results of a chemical analysis of the soil sample.

e. Transporting samples. Transporting samples to the laboratory may involve transit by a commercial carrier or by a Government-owned vehicle. As a minimum, the samples should be packed in containers which satisfy the requirements of the transporting agency, protect the samples from disturbance due to shock, vibration, or temperature extremes, and prevent loss of samples due to damage or destruction of the container. The transportation of samples is also subject to regulations established by the U.S. Department of Agriculture, Animal and Plant Health Service, Plant Protection and Quarantine Programs, and other federal, state, or local agencies. The length, girth, and weight of the containers for packing and shipping the samples should be considered and preplanned to ensure that the necessary boxes and packaging materials are available. The top of the shipping crate (top of the samples) should be marked “THIS END UP.” Special instructions, descriptions, and labels for containers may also be required when radioactive, chemical, toxic, or other contaminated material is transported; the procedures or requirements should be included in the project specifications or defined by a designated responsible person.

Group A and Group B samples can be transported in almost any type of container and by any available mode of transportation. Samples may be transported without special protection, although it is desirable to pack the samples in shipping containers, such as cardboard or wooden boxes or crates, to meet the minimum requirements of the transporting agency, for ease of handling, and to prevent the loss of sample tags or material.

Group C and Group D samples should be transported under the supervision of personnel from the sampling/testing agency whenever possible. As a minimum requirement, samples should be transported in wood, metal, or other type of reusable container that provides cushioning and insulation for each sample. Samples should fit snugly in each container to prevent rolling, bumping, etc., and should be protected against vibration, shock, and temperature extremes. Sawdust, wood shavings, rubber, polystyrene, urethane foam, plastic bubble wrap, or materials of similar resiliency can be used as cushioning material. The cushioning material should completely encase the sample. Special conditions, such as freezing, controlled drainage, and confinement, should be provided as needed. In addition to the preceding requirements, all modes of transportation, including loading, transporting, and unloading, for Group D samples should be supervised by a qualified person.

Undisturbed samples of cohesive soils must be effectively protected from excessive heat, cold, vibration, and/or shock during shipment, since these phenomena may cause serious sample disturbance. Cohesive samples should be shipped upright with 8 to 15 cm (3 to 6 in.) of cushioning material placed between samples and the bottom and sides of the container or transporting vehicle, and at least 5 cm (2 in.) over the top and between individual samples. This method of packing provides protection from heat in summer and from freezing in winter; however, if samples are in transit more than one day in freezing weather, the vehicle should be stored overnight in a heated building. Samples transported by commercial carriers should be packed in boxes that can withstand considerable handling. Boxes made of 13- to 19-mm- (1/2- to 3/4-in.-) thick marine plywood normally are satisfactory. About 75 mm (3 in.) of cushioning material should be placed between the samples and the walls of the box. Examples of reusable containers are presented in ASTM D 4220-83 (ASTM 1993). Boxes should be marked for careful handling; special arrangements should be made with the transportation company to ensure proper handling.

Free-draining cohesionless samples may be frozen in the tube at the field site and kept in a frozen state until laboratory tests are conducted (see paragraph 6-5). However, samples must be thoroughly drained prior to freezing to prevent disruption of the structure by expansion of water upon freezing. The frozen samples may be transported from the field in insulated containers containing dry ice or in electrically-operated freezers powered by portable generators. Adequate cushioning material must completely surround each sample prior to shipment.

If samples of cohesionless soil were obtained for the principal purpose of density determinations, the sample tubes should be placed horizontally in a cushioned rack after adequate drainage has occurred. After the samples have been secured to prevent rotation, the "top" of each tube should be marked and then struck 50 light blows with a rubber hammer, starting at one end of the tube and working toward the other end and then back again. The blows of the hammer cause the sand to consolidate and thus prevent lateral movement and possible liquefaction of the material in the tube during transportation. Upon arrival at the laboratory, the sample tubes can be sawed into sections; the weight (mass) of soil in each section of tube and the volume of the tube can be used to calculate the density of the soil in the tube at the instant that the sample was recovered.

Before the samples of cohesionless soil obtained for density determination are transported to the laboratory, a thick pad of cushioning material should be placed between the truck bed and the bottom rack of samples. The longitudinal axis of the sample tube should be oriented perpendicular to the direction of travel to minimize soil displacement during acceleration or deceleration of the vehicle or differential elevation between the front and rear of the truck bed.

f. Storage. When samples are received at the laboratory, they should be inventoried, the sealing and marking of each sample should be checked, and the deficiencies should be corrected before they are placed in an upright position in a storage room. Although it is desirable to test samples as soon as possible to prevent further disturbance caused by chemical and physical changes, storage of samples is sometimes required before testing can be conducted and/or completed. If storage is required, samples should be stored in a moist, cool, frost-free environmental room maintained at 100 percent relative humidity. A temperature between 2 and 4 deg C (35 and 40 deg F) is recommended to preserve the samples, unless frozen, and to prevent the growth of mold and other organisms. Ultraviolet light can be used to retard the growth of fungus.

When samples are opened for laboratory testing, the seal should be checked and its condition noted. If the weight of the sample has been obtained in the field, the weight in the laboratory should be obtained for comparison. After the caps have been removed and the sample tube opened, the exposed sample should be checked for migration of water and examined for structural or chemical changes, such as discoloration, pitting, cracks, and hard and soft areas. The empty sample container should be inspected for corrosion and adhesion of soil as well. Observations should be noted and reported to the responsible laboratory personnel.

13-3. Written Record

Because the written record, hereinafter referred to as boring logs, provides fundamental facts on which all subsequent conclusions are based, the necessity of recording the maximum amount of accurate information cannot be overemphasized. Although there is no single procedure for recording the data, the record should reflect all details of the investigation. The location or position of each borehole, test pit, or trench should be clearly located horizontally and vertically with reference to an established coordinate system, datum, or permanent monument. The boring logs should contain information on the materials encountered, the number and type of samples obtained, the depth and length of the samples, the percentage of core recovery or recovery ratio, etc. The logs should also indicate the type of equipment used, such as a drilling bit or auger, whether or not casing was used, the type of drilling fluid, and the size of the borehole. Conditions to be recorded include the following: the properties of the drilling mud, such as weight, viscosity, and filtration characteristics; difficulties in drilling, such as squeezing or caving formations; the date, depth, and rate that any water was lost during drilling operations, including the addition of drilling mud or water; or the date and depth of seepage or water bearing zones and piezometric levels in each hole, boring, or pit; and the equilibrium depth of the water table after drilling was ceased. Maps or sketches with accurate descriptions and photographs are extremely helpful for documenting the record of the site investigation.

Because the field logs form the basis for determining the soil profile and contribute to an estimate of the quality of the samples and the in situ conditions, written records should be accurate, clear, concise, and account for the full depth of the boring. A standardized notebook system is recommended. Notes, including all observations, should be kept in an organized, orderly manner, and should be recorded on the spot and not from memory at a later time. In general, symbols and abbreviations should not be used because of the potential for confusion and misunderstanding. Furthermore, the use of symbols and abbreviations increases the difficulty of reading and understanding the boring logs for those not familiar with the symbols and abbreviations. Figures 13-2 and 13-3 illustrate two forms of boring logs and typical information which must be recorded. An examination of the data which are presented in these figures reveals that undisturbed sampling operations were recorded on the form given as Figure 13-2, whereas disturbed sampling operations were recorded on the form given as Figure 13-3. It should be noted that these forms may be used interchangeably provided that accurate and concise records are maintained. The style of the form is superfluous as compared to its purpose.

A checklist of data which should be included in the field logs follows:

- The name or number of the project and its location.

- The names and positions of members of the field party.

- Borings and/or test pits or trenches should be located by coordinates and referenced by numbers, letters, or names in a detailed map. The ground surface elevation of each boring or test pit should be referenced to an established datum which cannot be affected by construction operations. Include the date(s) of the start and completion of each boring, test pit or trench, or field test.

- Describe the method(s) of advancing the borehole and the methods for stabilizing the borehole, such as the density, viscosity, and filtration characteristics of the drilling mud, or the location of the casing. The penetration resistance(s) and the method(s) used to force the sampler into the soil are useful for estimating the compactness or consistency of soil in situ. A change of strata can frequently be identified by the rate of penetration or the feel of the boring tools.

- Record all major changes of soil strata. Every stratum that is substantially different from the overlying and underlying strata should be located by depth interval, classified, and described in the log. The report should include a description of the soil in each stratum. All lenses, layers, pockets, planes of failure, or other irregularities should be located and described, although thin lenses, i.e., less than 5 mm (0.02 ft), of a relatively uniform stratum do not need to be separately classified on the log. At least one sample should be obtained from each stratum.

- Record the number of the sample and its depth, preferably to the top and to the bottom of the sample. Include information on the type and diameter of the sample, the inside clearance of the cutting edge, the depth of penetration to the nearest 30 mm (0.1 ft), and the gross and net lengths of the sample to the nearest 3 mm (0.01 ft). The depth of penetration should include the initial penetration caused by the weight of the drill rods; the length of the sample should include the downward movement required to engage the core catcher.

- The soil should be described according to the Unified Soil Classification System with definitive adjectives (see Appendix E). Include its natural color as well as the range of colors for moist to dry conditions, its consistency for wet to dry conditions, the grain size and sorting, the structure of the soil mass, the type and degree and type of cementation (if applicable), degree of weathering, etc.

- Note sources of potential disturbance, such as unsuccessful or difficult sampling operations, obstructions or unusual observations, caving or plastic movement of the soil in the borehole, poor sample recovery, and slaking of the soil samples.

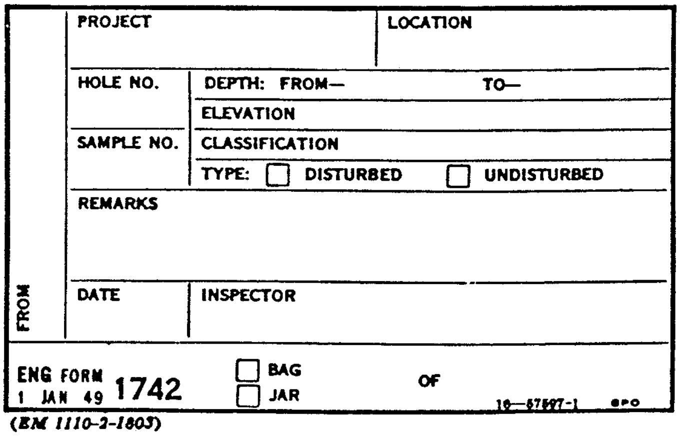
- Note the groundwater conditions, including the depth to the phreatic surface or the depth at which loss or inflow of water occurs. If water loss or inflow occurs, measure the groundwater level, the rate of inflow, the method of control, the number of pumps and the capacity of each, etc.

- In some cases, a color photograph may be beneficial. Include a scale and a color card in the photograph, because the color card will permit a comparison of colors to be made at later date.

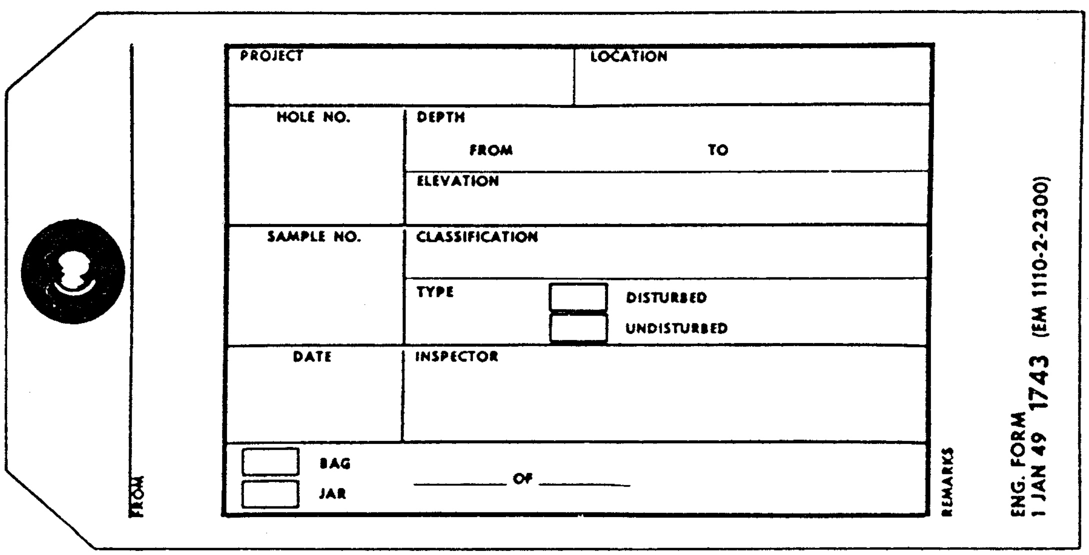
13-4. Precautions

Sampling, preserving, and transporting soil samples may involve contact with hazardous materials, equipment, and operations. This manual does not purport to address the safety problems associated with its use. It is the responsibility of the principals involved in the site investigation to establish appropriate safety and health practices and to determine the applicability of regulatory limitations. Special instructions must accompany any sample of contaminated material. Interstate transportation, storage, and disposal of soil samples may be subject to regulations established by the U.S. Department of Agriculture and other federal, state, or local agencies.

ER 1110-1-5 describes responsibilities and procedures for identification, shipping, storage, testing, and disposal of soil samples (whether disturbed or undisturbed) from areas quarantined by the U.S. Department of Agriculture, or from areas outside the continental limits of the United States. Soil samples taken below a depth of 1.5 m (5 ft) are generally not considered infected and are not subject to handling and treatment prescribed for regulated soil. Entry clearance is required for all soil samples imported from foreign countries and from Hawaii, Guam, Puerto Rico, the Virgin Islands, and the Canal Zone.



PROJECT
LOCATION
HOLE NO.
DEPTH: FROM— TO—
ELEVATION
SAMPLE NO.
CLASSIFICATION
TYPE: ☐ DISTURBED ☐ UNDISTURBED
REMARKS
DATE
INSPECTOR
FROM
ENG FORM 1742
1 JAN 49
☐ BAG
☐ JAR
OF
10—67597-1 GPO
(EM 1110-2-1803)



PROJECT
LOCATION
HOLE NO.
DEPTH
FROM TO
ELEVATION
SAMPLE NO.
CLASSIFICATION
TYPE ☐ DISTURBED ☐ UNDISTURBED
DATE
INSPECTOR
☐ BAG
☐ JAR
______ OF ______
FROM
REMARKS
ENG. FORM 1743 (EM 1110-2-2300)
1 JAN 49

Figure 13-1. ENG Forms 1742 and 1743 for labeling and identifying soil samples

Hole No. MR-1

DRILLING LOG	DIVISION —	INSTALLATION USAE Waterways Exp. Sta.	SHEET 2 OF 8 SHEETS

1. PROJECT Morville Revetment Slide	10. SIZE AND TYPE OF BIT as shown in "g" below
2. LOCATION (Coordinates or Station) Range 2, 400' Riverside of Base line	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY USAEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing Model 1500
4. HOLE NO. (As shown on drawing title and file number) MR-1 — Concordia Levee Dist. Job 7063	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN — DISTURBED 2 — UNDISTURBED 18
5. NAME OF DRILLER Brown	14. TOTAL NUMBER CORE BOXES None
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER —
	16. DATE HOLE — STARTED 16 July 1949 — COMPLETED 20 July 1949
7. THICKNESS OF OVERBURDEN Not determined	17. ELEVATION TOP OF HOLE 57.6 Feet, MSL
8. DEPTH DRILLED INTO ROCK 0.0'	18. TOTAL CORE RECOVERY FOR BORING ____ %
9. TOTAL DEPTH OF HOLE 75.0'	19. SIGNATURE OF INSPECTOR Elliott

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10–12.0		Clay, Silty, Brown, Stiff, CL	12.0		(Boring advanced with baffled fishtail using aquagel and water.) 6" Fishtail bit
	12.0–13.2		Clay, Medium, Gray, CH	13.2	1	5" Shelby tube* (Drive, 2.50'; Sample, 2.50'; gap between Sple. & Piston, 0.00')
	13.2–13.3			13.3	1A	Jar
	13.3–14.4			14.4	2	5" Shelby tube* (*Sample ejected and encased with wax in cardboard tube)
	14.4–14.5			14.5	2A	Jar
	14.5–16.5			16.5		6" Fishtail bit
	16.5–19.0			19.0	3 (tube no. 26)	3" Shelby tube (Drive, 2.48; Sple, 2.42; gap, 0.06') (Mud wt. 70.0 lb/Cu. ft.)
	19.0–20		Sand, Fine, Gray, SP			3½" Fishtail (Mud wt., 71.0 lb/Cu. ft.)

ENG FORM 1836 (1 APR 63) — PREVIOUS EDITIONS MAY BE USED (EM 1110-1-1801) — GPO 1963 : OF—718-078 — PROJECT Morville Revetment Slide — HOLE NO. MR-1

Figure 13-2. ENG Form 1836 for maintaining a record of drilling and undisturbed sampling operations

BORING LOG

Boring No. GS 1
Levee District Concordia
Job No. 7063

FIELD DATA

Project Moreville Revetment Location Range 4, 200' Riverside of BL
Drill Rig W-4048 Inspector Elliott Operator Brown Surface Elev. 54.3 ft MSL
Boring advanced with 5½" folding auger Natural Ground Elev. 54.3 ft MSL

LABORATORY DATA

Date ______ Classified by ______

SAMPLE NUMBER	DATE TAKEN 1949	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER		Sple Container	CLASSIFICATION AND REMARKS	CLASSIFICATION	SYMBOL	NAT WC %	
		FROM	TO	FROM	TO	FROM	TO								
—	6/18	0.0									Clay: silty, stiff, tan CL				
1						4.9	5.4	5½" Auger		Jar	Clay: silty, stiff, tan CL				
			8.4												
—		8.4									Clay: sandy, hard, gray CL				
2						8.6	9.1	5½" Auger		Jar	Clay: sandy, hard, gray CL				
3						14.0	14.5	5½" Auger		Jar	Clay: sandy, hard, gray CL				
			16.7												
—		16.7									Sand: med, gray SP				
4						16.9	17.3	5½" Auger		Jar	Sand: med, gray SP				
			21.5												
—		21.5									Clay: stiff, blue CH				
5						21.8	22.3	5½" Auger		Jar	Clay: stiff, blue CH				
6						27.5	28.0	5½" Auger		Jar	Clay: stiff, blue CH				

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April 1954

Sheet 1 of 3 Sheets

Figure 13-3. Engineering form for keeping a record of disturbed sampling operations