
Test Procedure for**SAMPLING SOILS AND BASE MATERIALS**

TxDOT Designation: Tex-100-E

Effective Date: July 2024

1. SCOPE

- 1.1 Use this procedure to sample soils that are used as embankment and non-select backfill materials, sample flexible base from completed stockpiles and roadway windrows, **prepare flexible base from completed stockpiles and roadway windrows** for laboratory testing, **and to sample material from the roadway for reclamation and treatment.**
 - 1.2 This procedure also provides information to develop a soil survey that may be used for the design, location, and construction of a highway.
 - 1.3 *This test procedure does not claim to address the safety concerns associated with its use. It is the responsibility of the user of this test procedure to establish the appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations before use.*
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2. APPARATUS

- 2.1 The type and amount of equipment to be used for sampling will depend on the nature of the terrain, the material, and the depth of material below the surface.
 - 2.1.1 Use small hand tools for materials that are shallow in depth and can be easily dug. Power equipment may be used when the materials are hard. Use of a power drill machine with a core or auger attachment may be necessary for sampling strata located at a considerable depth below the surface.
- 2.2 *Containers, jars or plastic bags, capable of being sealed to maintain moisture content.*
- 2.3 *Hand tools, such as post hole digger, scoop, shovel, anything small to sample material.*
- 2.4 *Measuring tape, steel or plastic.*
- 2.5 *Power drill rig, with core or auger attachments.*
- 2.6 *Ruler, minimum 6 ft.*
- 2.7 *Sample bags or buckets with lids.*
- 2.8 *Sample splitter or quartering cloth*
- 2.9 *Soil Auger - Screw-type, open tubular, or barrel auger types.*
- 2.10 *Square-Tip Shovel.*

3. SAMPLING EMBANKMENT SOIL AND NON-SELECT BACKFILL

- 3.1 Obtain a representative sample from undisturbed or disturbed material in the same proportion as they exist in the embankment soil, non-select backfill, or roadway for reclamation and treatment.
- 3.2 Equipment, method, and tools for obtaining a sample will depend on the location, the quantity of material needed, and the tests to be performed in the laboratory.
- 3.3 Samples should contain only materials of like color and texture. They should not be a composite of materials different in character and properties unless different types of materials are to be uniformly mixed in certain proportions.
- 3.4 When sampling material for treatment (road-mixed), ensure to sample to the depth of treatment as shown on the plans.
- 3.5 When coring, obtain a core of soil from the earth with as little disturbance as possible to the natural density and moisture content.
- 3.5.1 It is impossible to obtain a sample from the earth that is entirely undisturbed, because the removal of the surrounding soil releases the pressure from the specimen, which causes a certain amount of disturbance.
- 3.5.2 A soil core is satisfactory for all practical purposes and can be classified as an undisturbed sample of soil.
- 3.6 Seal and label the sample bags, buckets, containers, or jars, and properly secure for transportation to avoid any loss of material.

4. SAMPLING FLEXIBLE BASE STOCKPILES

- 4.1 Identify four locations around the perimeter of the stockpile that represent the approximate quarter-points of the stockpile.
- 4.1.1 When the locations cannot be obtained from around the entire perimeter due to limited space, use four equally spaced locations.
- 4.2 Clean and level the ground at these four locations to prevent contamination of the sampling pile.
- 4.3 Sample each quarter-point of the stockpile using a front-end loader to cut into each quarter-point.
- 4.4 Cut at the ground level to the top edge of the stockpile until a clean vertical face is exposed that is perpendicular to the top edge of the stockpile. This represents the full height of the stockpile.
- 4.5 Discard this material cut away while exposing the clean face.
- 4.6 Build a sample pad by cutting into the vertical face at the ground level of the full height of the stockpile to obtain material.
- 4.7 Lower the bucket as close as possible to the ground to avoid segregation and empty the entire contents of the bucket onto the ground in one motion.
- 4.8 Using the loader bucket, strike, and level the sample pad at mid-height in the direction the bucket was emptied to create a flat surface for sampling. Back-drag the sampling pad only once.

- 4.9 If material is visually segregated, discard the material and repeat Sections 4.6 – 4.8.
- 4.10 Place clean sample bags or containers near the center of the sampling pad and obtain the sample across the flat area staying more than 1 ft. away from the edges.
- 4.11 Divide the sample pad into four quadrants and sample equal amounts of aggregate evenly across each quadrant.
- 4.12 Fully insert a square-tip shovel as near as vertical as possible and then slowly roll the shovel back and lift slowly to avoid coarse aggregate from rolling off the sides of the shovel.
- 4.12.1 Spade-tip shovels are not allowed for sampling because they will not prevent material from rolling off the side of the shovel.
- 4.13 Obtain additional shovelfuls from different quadrants of the sampling pad, and in areas avoiding previous shovel holes. Remove material from each quadrant to fill one sample bag or container. Minimize loose material falling from the sides of the hole and loss of material from the shovel into the hole or adjacent ground while filling sample bags or containers.
- 4.14 Place the aggregate into the clean sample bags or containers.
- 4.15 Repeat Sections 4.12 – 4.14 until a minimum of 100 lbs. of material is sampled from each sample pad.
- 4.16 Seal and label the sample bags or containers, and properly secure for transportation to avoid any loss of material.
- 4.17 Repeat Sections 4.4 – 4.16 at each stockpile quarter-point to provide a minimum of 400 lbs. of material.
- 4.17.1 The minimum amount of 400 lbs. of sampled material is representative of the entire stockpile. This amount of material is required for a testing laboratory to perform all the required test procedures for stockpile approval.
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5. SAMPLING FLEXIBLE BASE WINDROWS

- 5.1 Sampling material from a windrow for acceptance may only be tested for liquid limit (Tex-104-E) and plastic limit (Tex-105-E) to determine the plasticity index (Tex-106-E), or gradation (Tex-110-E).
- 5.1.1 When testing material for wet ball mill (Tex-116-E) or compressive strength (Tex-117-E) for acceptance, sampling must be from a stockpile in accordance with Section 4.
- 5.2 Choose two locations that are within 500 ft. apart.
- 5.2.1 Avoid sampling from the ends of the windrow section by choosing a location that is more than 10 ft. from the end.
- 5.2.2 Choose locations that appear uniform and not segregated.
- 5.3 Refer to the test procedure for the minimum sample size.
- 5.4 Use a square-tip shovel and remove approximately the top one ft. of material.
- 5.5 Sample material from the top, flattened area of the windrow from each location.
- 5.5.1 Avoid sampling from the sides of the windrow.

- 5.5.2 Avoid any segregated coarser material.
 - 5.6 Seal and label the sample bags or containers, and properly secure for transportation to avoid any loss of material.
 - 5.7 Proceed to Section 6 to prepare the sample for testing.
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6. PREPARING FLEXIBLE BASE SAMPLES FOR TESTING

- 6.1 Allow the material to air dry or oven dry at a maximum temperature of 140°F for a minimum of 4 hr. until the material is sufficiently dry for handling.
 - 6.2 Quarter the material by emptying each container or sample bag onto a clean floor or a clean tarp. Optionally, use a mechanical quartering device or sample splitter to quarter the material and proceed to Section 6.6.
 - 6.3 Thoroughly mix the material using a shovel. When using a tarp, the ends of the tarp may also be used to also mix the material.
 - 6.4 Spread the material into the shape of a circle of uniform thickness and homogenous with no segregation.
 - 6.5 Using a shovel or straightedge, visibly trace lines on top of the material to outline four evenly sized quarters.
 - 6.6 Use a quarter of the sample and proceed to [Tex-101-E](#), Part I to prepare and test the material for the liquid limit ([Tex-104-E](#)) and plastic limit ([Tex-105-E](#)) tests to determine the plasticity index ([Tex-106-E](#)); and for the gradation ([Tex-110-E](#)).
 - 6.6.1 When the specification requires a #200 sieve test, take a sample from this quarter before proceeding to [Tex-101-E](#) to determine the material passing the No. 200 sieve ([Tex-111-E](#)).
 - 6.6.2 Take the sample by quartering or splitting the material to the minimum required sample weight in [Tex-111-E](#).
 - 6.7 Combine the remaining three quarters with any remaining material from Section 6.6 and proceed to [Tex-101-E](#), Part II to prepare the for Moisture-Density curve ([Tex-113-E](#)), wet ball mill ([Tex-116-E](#)), and compressive strength ([Tex-117-E](#)) testing.
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7. SOIL SURVEY

- 7.1 Conduct the survey during the time of sampling to identify and visualize the material taken from different depths.
 - 7.2 Identify the location which may include the highway, station number, mile marker, direction, location within the lane, and distance from the nearest intersection.
 - 7.3 Identify the materials sampled in accordance with [Tex-141-E](#), Manual Procedure for Description Identification of Soils.
 - 7.4 Include at a minimum the following information in the survey documentation.
 - 7.4.1 The depth and location of each type of soil or rock in the subsurface.
 - 7.4.2 The condition of subsoils (moisture and density) upon which embankments will be constructed.
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7.4.3 The location and selection of suitable material for fills, sub-grade treatment and backfill adjacent to structures.

7.4.4 Material properties from laboratory testing, such as gradation ([Tex-110-E](#)), liquid limit ([Tex-104-E](#)), plastic limit ([Tex-105-E](#)), plasticity index ([Tex-106-E](#)), and soil classification ([Tex-142-E](#)).

8. ARCHIVED VERSIONS

8.1 Archived versions are available.