

## Colorado Procedure 24-16

*Standard Practice for*

### Soil Surveys of Constructed Roadbeds

#### 1. SCOPE

1.1 This procedure provides the substantiation for the cover placed and the data required to justify changes from plan cover. A soil survey of the constructed roadbed consists of the following:

1.1.1 Obtaining representative samples of all soil types, the determination of soil profiles, and the significant soil layers to a depth of two feet (600 mm) below any aggregate base or sub-base.

1.1.2 The classification and extent of each soil type.

#### 2. EQUIPMENT

2.1 The amount and type of equipment required for making a survey depends on the type of material in the roadbed. Refer to the Soil Survey / Preliminary Soil Profile Section within Chapter 200 for additional information.

#### 3. SUB-GRADE INVESTIGATION

3.1 Soil identification, sampling, and testing provide the fundamental framework of the complete survey. This emphasizes the necessity of using care in identifying and sampling soils. Laboratory tests are of little or no value if the samples selected are not representative of the materials to be considered.

3.2 Make a sufficient number of investigations to assure all significant variations in soil types are determined. A minimum of one investigation per 1,000 linear ft. (300 m) is required. Make all investigations to a depth of at least two feet (600 mm) below the finished sub-grade elevation. Number the investigations consecutively as the survey moves progressively forward. For vertical changes in the same test hole use suffixes A, B, etc. Take a new sample for every change in soil type. An investigation may include referencing a sample to one previously taken. Referencing samples should be done by those who are thoroughly experienced in soils technology. Show the limits of all investigations consecutively with no breaks except for bridges. In areas where several

soil types are so intermixed that no limits can be determined, show the various tests with separate numbers, with no suffixes, and show the limits for this area. Stabilization will be based on the least desirable soil in the area.

3.2.1 When the Pavement Stabilization is based on a design R Value that equals 5; the Region Materials Engineer in cooperation with the Resident Engineer and the Staff Soils Engineer may elect to eliminate the requirement for the Final Soil Survey of the Constructed Roadbed. This decision should be evaluated and documented on a project-by-project basis.

3.3 Place the soil sample for laboratory analysis in tightly woven sacks. A minimum of 25 lbs. (10 to 12 kg) of minus No. 4 material is required for classification, stabilometer and expansion pressure tests. Additional material, in the approximate amount of the plus No. 4 material contained in the sample, is required when a soil rock mixture is sampled. For field laboratory gradation and Atterberg limits, approximately 15 lbs. (10 kg) of minus No. 4 material is required.

#### 4. COVER DETERMINATIONS

4.1 The field laboratory will conduct gradation and Atterberg Limits to classify soils for the substantiation of cover placed. Keep graded material segregated until it is determined there are no significant variations in the material from the preliminary soil survey. If significant variations of the material from the preliminary soil survey are determined, the segregated material should be sent with the Form #564 to either the Central or Region Laboratory for R-value tests.

4.2 The Central Laboratory or Region Laboratory will determine the R-Value on soils submitted for cover determinations. Use the R-Value as instructed in the current CDOT Pavement Design Manual. When available, Structural Coefficients should be taken from the pavement stabilization plan contained in the plan sheets. In the field, soils may be referenced to samples of similar soils from the same or adjacent projects.

4.3 Reference R-Values on soil by comparing the classification, Atterberg Limits, and the "as

run" gradation reported on CDOT Form #555 with the field sample which has been mathematically "scalped" on the same sieve as the laboratory sample. Only experienced materials personnel should attempt to reference soil to determine R-Values.

## 5. REPORTING

5.1 Report the Soil Survey on CDOT Form #219. Leave Sample No. blank. No serial number is required. Date and project number are sufficient for identification. A CDOT Form #219 will not be required for overlay projects or projects where there has not been any change in the top two feet (600 mm) of sub-grade as shown by the preliminary soil survey.

5.2 Document on CDOT Form #219 any significant variation from the cover required by the as-constructed soil survey. Areas, which contain mixtures of soil types, shall have sufficient cover to satisfy the lowest R-Value of the material in the area.

5.3 Submit a CDOT Form #219 on all newly completed roadbeds and roadbeds that are modified resulting in soil changes in the top two feet (600 mm).

5.3.1 Main-line roadbed includes each side of the median on divided highways.

5.3.2 All service roads and interchanges.

5.3.3 Widening (each side if applicable).

5.3.4 All work sections of old roadbeds.

5.3.5 Identify and report each of the above separately on CDOT Form #219. See Chapter 200 for an example of CDOT Form #219.

5.4 When change orders are required to document changes in cover requirements, support them with a CDOT Form #219 for the portion affected. Route the change orders through the Region Materials Engineer's office so the supporting data on CDOT Form #219 may be checked.

## 6. RECORD

6.1 CDOT Form #555, Preliminary Soil Survey.

6.2 CDOT Form #219, Soil Survey of the Completed Roadbed.