SOIL CHARACTERIZATION TERMS OF GRANULARITY AND UNIFORMITY

BRUMAR DRAGOMIR, CIOBOATA MARIUS NICOLAE
University of Craiova, Faculty of Agronomy

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ABSTRACT

The physics-mechanical properties of soils depend on their structure and interaction phase components. Particle size analysis determines the relative proportion of each fraction with well-defined size: coarse elements, gravel, sand, dust and clay. For the characterization of the soil in terms of granularity and uniformity of the soil sample was collected and the specific size analysis was performed using the shaking method.

The results sieve analysis is part of a table, the required calculations being performed in the respective fields.

After the calculations the distribution of the fractions of the granules is plotted on a plot of log (on the abscissa is the particle diameters at a logarithmic scale and on the ordinate are the percentages), a curve of granularity or a histogram, or both representations.

INTRODUCTION

The physics-mechanical properties of soils depend on their structure and interaction phase components. From the quantitative point of view, the structure of the earth is shown by the index expressing the extent to which the geotechnical components are included in the composition of the phases earths; thus of geotechnical indices used to characterize the physics-mechanical properties of soils are part and granularity and uniformity.

Particle size analysis particle size determines the relative proportion of each fraction with well-defined sizes: coarse elements, gravel, sand, dust and clay. Depending on the particle size, particle size analysis can be performed by: sieving, sedimentation, sifting and sedimentation.

The results are plotted on a logarithmic diagram (on the abscissa is a logarithmic scale and the particle diameters are represented on the ordinate the percentages), a curve of grain or a histogram, or both representations.

MATERIALS AND METHODS

For the characterization of the soil in terms of grain and uniformity of the soil sample was collected and the specific size analysis was performed using the shaking method.

Sieving method, which consists in separating the beads by size (the grain fractions), by sieving with sieves and the land site blunt (SR EN 933-1: 2012) can be done by sieving with sieves the granular > 2 mm and sieving the site for the granules of between 2 and 0.63 mm, the length is 10 minutes; a battery using the meshes of increasingly smaller from the top to the bottom; was subjected to sifting an amount of approx. 200 grams of dry material to be weighed quantities remaining on each sieve and the relation to the total.

Sieving is terminated if, shaking each sieve or screen over a map which pass through a sieve or screen for one minute is not more than 1% of the fraction of the sifted material. What possibly through site or screens are added to the next screen or sieve.

After completion of the shaking, granular fractions, remaining on each sieve, sifter or capsules are placed in boxes in the prior bran and each mass is determined by weighing.

If the sum of the masses granular fractions (including the rest of the box) differs by more than 1% to the total mass of the sample taken initial determination is repeated.

In the cases when the material exceeds 10% of the initial total mass of the test sample, the determination is completed, and particle size analysis is done by means of sedimentation.

If the sample was washed initially visible due to the presence of a binder, and if the mass of the binder exceeds 10% of the total mass of the earth analyzed, proceed to the binder sedimentation particle size analysis method.

In the latter case, the rest remained in boxes after the sifting should not represent more than 1% of the sample mass.

The result sieve analysis is included in the table, being carried out calculations required under their respective headings.

After the calculations the distribution of the fractions of the granules is plotted on a plot of log (on the abscissa is the particle diameters at a logarithmic scale and on the ordinate are the percentages), a curve of grain or a histogram, or both representations.

It allows defining the curve grain size uniformity coefficient (Cu), defined by the equation:

$$Cu = d_{60} / d_{10}$$

Where d60 and d10 are known diameters corresponding to the diameters of the percentage and represents the percentages of 10% and 60% of the grain size curve.

Grittiness, that is to say the percentage of granules or particles of earth percentage distribution by their size, which determines the classification and characteristics of the earth, as follows: <0.005 mm clay; powder from 0.005 to 0.05 mm; 0.05 to 2.0 mm sand; from 2.0 to 20.0 mm gravel; 0.5-20 mm ballast; 20-200 mm blocks; > 200 mm blocks.

The coefficient of curvature of the curve of particle size (Cc), a good ground for the construction of embankments must have Cc = 1/3:

$$C_c = (d_{30})^2 / (d_{10} \times d_{60})$$

Wherein d10 = the effective diameter or the diameter corresponding to 10% in the granularity curve; diameter d30 and 30%; diameter d60 and 60%) and the coefficient of unevenness Hazen (A) characterizing the slope of the particle size and on the lands can be very uniform (Un<5) uniform (5<Un<15) or irregular (A >15):

$$U_n = d_{60} / d_{10}$$

RESEARCH RESULTS

Results of the grain of the soil sample by means of sifting are shown in Table 1.

The characterization of the soil in terms of grain and uniformity of particle size was carried out on the basis of the curve and the land histogram analysis.

The grading curve was obtained by joining the coordinates of the points in the system of axes (D, A %), coordinates values in the column results in a sieve and sieves the ground (figure 1).

Table 1

Particle size determination results

Nr. crt.	Ø sieve (mm)	soil retained on the sieve (%)	sieved soil (%)
1.	2,0	0	100
2.	1,0	2	98
3.	0,5	10	88
4.	0,25	30	58
5.	0,10	36	22
6.	0,06	10	12
7.	0,03	12	0

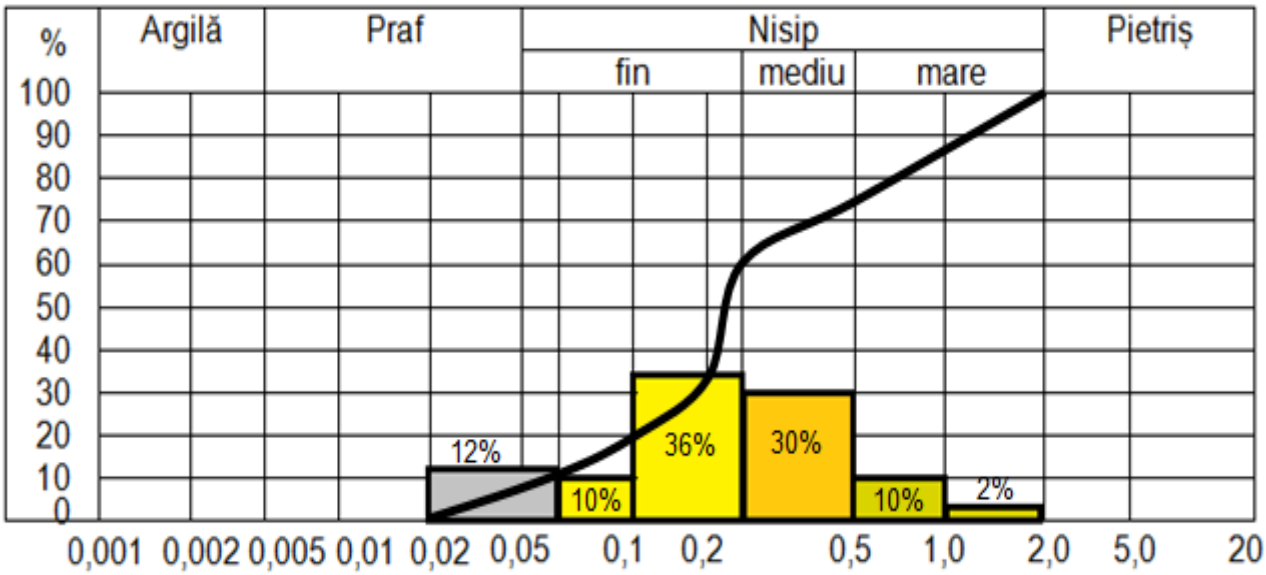

Figure 1 - The grading curve and the histogram

Calculating the histogram of the differences resulting from the consecutive ordinates of the curve points (figure 1). From the bar graph it follows that:

- the percentage for the sand fraction is 88% of the 46% fine sand (0.05-0.1 mm 10% diameter and the 36% diameter 0.1-0.2 mm) 30% medium sand (0.2-0.5 mm diameter), 12% sea sand (0.5-1.0 in diameter and 12 mm, respectively).
- the percentage of the fraction for the powder is 12% to 0.05 mm major diameter.

According to the standard ternary diagram earth are classified as sand dust.

According to the plasticity index, powdery sand has a plasticity index Ip = 0 so it is a non-plastics.

Conventional basic pressure values are determined by graded so dusty sand with tamping category average we p_{conv} = 300 kPa.

Particle size is determined using the curve d_{10}, d_{30} and d_{60} leading to the following values:

- for d_{10} = 0.05 mm
- for d_{30} = 0.15 mm
- for d_{60} = 0.26 mm

The curvature of the curve of particle size coefficient (CC):

$$Cc = d_{30}^2 / (d_{10} \cdot d_{60})$$

$$\text{for } d_{30} = 0{,}15$$

$$\rightarrow Cc = 0{,}15^2/ (0{,}05 \cdot 0{,}26) = 0{,}0225/0{,}013 = 1{,}73$$

The unevenness of the slope is the index curve characteristic particle size:

$$U_n = d_{60} / d_{10} = 0{,}26 / 0{,}05 = 5{,}2$$

In accordance with the unevenness, uniform granularity soil is analyzed.

CONCLUSIONS

In the analyzes results:

- Percentage for the histogram that the sand fraction is of 88% (of which 46% sand, 30% medium sand and coarse sand 12%) and the difference of 12% is powder.
- According to the standard ternary diagram earth are classified as sand dust.
- According to the plasticity index, powdery sand has a plasticity index Ip = 0 so it

is a non-plastics.

- Conventional basic value p_{conv} pressure = 300 kPa.
- The coefficient of particle size curvature of the curve Cc = 1.73
- U_n= 5.2 unevenness soil so analyzed has a uniform granularity size.

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