SLOVENSKI STANDARD
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Zemeljska dela - Geotehnični laboratorijski preskusi - 3. del: Vrednost metilen modro VBS zemljin in kamnin

Earthworks - Geotechnical laboratory tests - Part 3: Methylene blue value VBS on soils and rocks

Erdarbeiten - Geotechnische Laborversuche - Teil 3: Methylenblauwert VBS an Boden und Fels

Terrassements - Essais géotechniques en laboratoire - Partie 3 : Valeur de bleu de méthylène VBS d'un sol ou d'une roche

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17542-3:2020) has been prepared by Technical Committee CEN/TC 396 “Earthworks”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

Introduction

The Methylene blue value V_{BS} on soils and rocks is an identification parameter adopted in the classification of materials for earthworks (EN 16907-2). It is also used for providing some specifications for construction procedures (EN 16907-3).

1 Scope

This document describes the reference method for the determination of the methylene blue value (V_{BS}) in soils and rocks for earthworks.

The test is based on measuring the quantity of methylene blue that can be adsorbed by the material suspended in water. This quantity of absorbed methylene blue is reported by direct proportionality to the 0/50 mm ground. The soil blue value is directly related to the specific surface area of the soil particles or rocky material.

NOTE The V_{BS} test uses common equipment and calibration as the methylene blue test MB for aggregates (EN 933-9), but the test applies to another granular fraction (5 mm for V_{BS} and 2 mm for MB, respectively). Thus, the results obtained between the two tests cannot be compared in the general case.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 17892-1, *Geotechnical investigation and testing — Laboratory testing of soil — Part 1: Determination of water content (ISO 17892-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
subsample
sample obtained by means of a sample reduction procedure

3.2
test portion
sample used as a whole in a single test

3.3
particle fraction
mass percentage of particles in a range of particle sizes with defined lower and upper diameters referring to the total mass of particles in a soil volume or sample

EXAMPLES Sand fraction: mass percentage of particles with particle sizes between 0,063 mm and 2,0 mm

3.4
constant mass
successive weightings after drying at least 1h apart not differing by more than 0,1 %

3.5
D_{max}
maximum dimension of the largest elements contained in the soil

4 Principle of the test

Increments of a solution of methylene blue are added successively to a suspension of the test portion in water. The adsorption of the dye solution by test portion is checked after each addition of solution by carrying out a stain test on filter paper to detect the presence of free dye (dyes are the methylene blue particles here).

When the presence of free dye is confirmed, the methylene blue value is calculated and expressed as grams of dye adsorbed per 100 gram of the 0/50 mm fraction tested.

5 Reagents

5.1 Dye solution

Solution of standard or technical quality methylene blue, (10,0 ± 0,1) g/l.

5.2 Preparation of 10 g/l methylene blue solution

5.2.1 Use methylene blue; ($C_{16}H_{18}ClN_3S$, nH_20 (n = 2 to 3) purity ≥ 98,5 %).

5.2.2 Determine the water content W of the methylene blue powder as follows:

— weigh approximately 5 g of methylene blue powder and record the mass to the nearest 0,01 g as M_h;

— dry this powder at (100 ± 5) °C to constant mass, at least 2 h. Cool in the desiccator, and then weigh immediately after taking out of the desiccator. Record the dry mass to the nearest 0,01 g as M_g.

NOTE At temperatures above 105 °C, the chemical structure of the methylene blue powder can be modified.

— calculate and record the water content W_b to the nearest decimal place from the following equation:

$$W_b = (M_h — M_g)/M_g$$

where

M_h is the mass of the methylene blue powder, in grams;

M_g is the mass of the dried methylene blue powder, in grams.

The powder used to determine the moisture content shall not be reused.

The water content shall be determined for the preparation of every new batch of dye solution.

5.2.3 Take a mass of methylene blue powder of (10 × (1 + W_b) ± 0,01) g (equivalent to 10 g of dry powder).

5.2.4 Warm 500 ml to 700 ml of distilled or demineralized water in a beaker. If warm water is used, the temperature shall not exceed 50 °C.

5.2.5 Agitate the contents of the beaker whilst slowly pouring the methylene blue powder into the water, until complete dissolution of the powder.

5.2.6 Pour into a flask of capacity (1 000 ± 5) ml, rinsing with distilled or demineralized water to ensure complete transfer of all dye into the flask. Make sure that the flask and the water are at a temperature of (20 ± 1) °C to conform with the calibration of the flask and add more distilled or demineralized water to the (1 000 ± 5) ml graduation mark.

5.2.7 Shake the flask to ensure complete dissolution of the powder. Keep the prepared solution in a closed storage bottle (preferably tinted glass) and protected from light.

5.2.8 The following details shall be marked on the conservation baffle:

— Nature of the content: 10 g/I methylene blue solution;

— Date of preparation;

— Use-by date.

5.2.9 Methylene blue solution shall not be used more than 1 month after preparation. The stock of dye solution shall be stared in a dark place.

6 Apparatus

6.1 *Burette and micropipettes*: a dosing device to inject volumes of methylen blue solution in steps of 10 ml, 5 ml and 2 ml and to know the total quantity injected at ± 1 ml.

6.2 *White Filter paper,* surface mass (95 ± 5) g/m²; quantitative and ash-free (<0,010 %); thickness (0,20 ± 0,02) mm; filtration speed (75 ± 10) s; pore size (8 ± 5) µm.

6.3 *Glass rod*, length 300 mm; diameter (8 ± 1) mm.

6.4 *Impeller agitator*: having a rotational speed covering at least the range of (400 ± 40) min^{-1} to (600 ± 100) min^{-1}.with three or four impeller blades of (75 ± 5) mm diameter.

6.5 *Balance*, readable to 0,2 % of the mass to be weighed.

6.6 *Stopwatch or stopclock*, readable to 1 s.

6.7 *Test sieves*, 63 µm, 50 mm and 5 mm aperture, with guard sieve (if necessary).

6.8 *Beaker*, glass or plastic, capacity 3 000 ml minimum and internal diameter (155 ± 10) mm.

6.9 *Flask*, glass, capacity 1 000 ml.

6.10 *Ventilated oven,* thermostatically controlled to maintain a temperature of (100 ± 5) °C.

6.11 *Thermometer*, readable to 1 °C.

6.12 *Spatula*.

6.13 *Desiccator*.

7 Preparation of the test portions

7.1 If D_{max} is greater than 50 mm.

Sampled 10 kg of the fraction 0/50 mm, then apply procedure of 7.2.

7.2 If D_{max} is ranging between 5 mm and 50 mm.

Prepare a mass, m, of wet material such as m > 200 × D_{max} (m in grams, D_{max} in millimetres). Sieve, if necessary by washing, the particle fraction 0/5 mm of the sample.

Washing procedure for materials > 5 mm

Materials concerned: materials that after dry sieving visually present a significant amount of elements less than 5 mm glued on the refusal obtained as a result of this sieving.

Step 1 – Brushing:

The first step is to perform a dry brushing of the refusal obtained to recover the elements less than 5 mm glued or agglomerated. If at the end of this operation, an important amount of elements smaller than 5 mm persists, it is then necessary to carry out a washing.

Step 2 – Washing:

The procedure is:

1/ Soaking the refusal to 5 mm.

2/ Washing (using a brush, a paintbrush or other non-metallic adapted tool) on a 5 mm sieve, using water as least as possible (if possible without adding water after the soaking phase or a quick rinsing with clean water after washing with the water charged with soaking).

3/ Decantation then siphoning (if feasible).

4/ Drying at a temperature not exceeding 50 °C. The materials should not be dried completely.

5/ Blend of the 2 fractions 0/5 mm obtained by the initial sieving and the washing operation.

6/ Homogenization and sampling of the test sample by quartering.

Determine the weight proportion C (%) of the dry fraction 0/5 mm contained in the material (or into the 0/50 mm fraction if D_{max} > 50 mm).

Then apply the procedure of 7.3.

7.3 If D_{max} is smaller or equal at 5 mm.

Prepare a mass, M of wet material such as $M > 200 \times D_{max}$ (M in grams, D_{max} in millimetres).

Homogenize the fraction 0/5 mm to prepare 3 test shots with approximately the same masses and from the order of:

— 30 g to 60 g in case of medium to very high clayed soils;

— > 60 g for the other soils.

The first test subsample, voluntarily reduced by water content specifications, is used to determine the water content of each test sample, according to EN ISO 17892-1. The result of this test is designated as W.

Discard this subsample.

The second test subsample of mass is used for the stain test (see 8.2).

Weigh the test portion of the second subsample as M_0 and determine its dry mass M_1 to the nearest 1 g according to the following:

$M_1 = M_0 / (1 + W)$

The third subsample is kept, in case the test has to be repeated.