

SVENSK STANDARD

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Markundersökningar – Mätning av aggregerade jordpartiklar utsatta för inverkan av vatten (ISO 10930:2012)

Soil quality – Measurement of the stability of soil aggregates subjected to the action of water (ISO 10930:2012)



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EUROPEAN STANDARD

EN ISO 10930

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2013

ICS 13.080.05

English Version

Soil quality - Measurement of the stability of soil aggregates subjected to the action of water (ISO 10930:2012)

Qualité du sol - Mesure de la stabilité d'agrégats de sols
soumis à l'action de l'eau (ISO 10930:2012)

Bodenbeschaffenheit - Messung der Stabilität von
Bodenaggregaten gegen Wasserbewegung (ISO
10930:2012)

This European Standard was approved by CEN on 5 February 2013.

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Foreword

The text of ISO 10930:2012 has been prepared by Technical Committee ISO/TC 190 "Soil quality" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 10930:2013 by Technical Committee CEN/TC 345 "Characterization of soils" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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Endorsement notice

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Introduction

The purpose of the method specified in this International Standard is to provide a realistic analysis of the structural stability of soil aggregates when subjected to the action of weather, cultivation, etc. and to enable the soils to be classified on the basis of the stability of their aggregates.

The methodology is, to a great extent, based on Hénin and Combeau's structural stability test (1958)^[1]. However, it also includes certain aspects of other methods [Yoder (1936)^[2], Emerson (1954)^[3], Grieve (1980)^[4], Kemper and Rosenau (1986)^[5], Matkin and Smart (1987)^[6]], as well as the results from Le Bissonnais (1988)^[7], Le Bissonnais *et al.* (1989)^[8], Le Bissonnais and Le Souder (1995)^[9], and Le Bissonnais (1996)^[10].

The aim of the set of three treatments specified in this International Standard is to provide a means of predicting the behaviour of soil, with respect to its structural stability, for different conditions of soil wetting by water, which simulate different climatic, hydraulic and mechanical conditions that might be encountered in the field. It is therefore recommended that the three treatments be used in order to provide scientific information on the different mechanisms which can destroy soil aggregates. However, the use of the fast wetting test only, which is less time-consuming, can prove sufficient for a simple sample comparison.

The treatments were chosen for the following purposes:

- to distinguish between the various mechanisms;
- to distinguish between the disaggregation phase and the measurement of the result of the disaggregation;
- to express the results in a form that can be easily interpreted by comparison with physical soil behaviour *in situ*.

Following the method proposed in Reference [1], this method recommends the use of ethyl alcohol to ensure that disaggregation is well controlled on the one hand and, on the other hand, to limit the reaggregation of the particles on drying.

Soil quality — Measurement of the stability of soil aggregates subjected to the action of water

1 Scope

This International Standard specifies the treatments for the measurement of the stability of soil aggregates. It can be applied to a wide range of materials originating mainly from the tilled horizons of cultivated soils. It can, however, also apply to any soil profile horizon, whether it is cultivated or not. Aggregates ranging from 3 mm to 5 mm are measured.

However, the presence of gravel in the 2 mm to 5 mm fraction can distort the results. If the percentage of gravel is between 10 % and 40 %, the > 2 mm fraction of the gravel obtained from the tests should be washed and a mean weighted diameter (MWD, see 6.1) calculated with and without gravel. If the percentage of gravel is > 40 %, the structural stability tests are not significant. The method does not apply to unstructured materials, as they are not sufficiently cohesive to form millimetric aggregates.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 3310-1:2000, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

3 Terms and definitions

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

3.1

aggregate

semi-permanent structural unit comprising small particles and associated matter bonded together

3.2

mean weighted diameter

MWD

sum of the product of the mean diameter multiplied by the percentage by mass of the particles in each of the seven size classes (according to 6.1) divided by 100

NOTE This diameter is expressed in millimetres.

4 Reagent and equipment required for stability tests

4.1 Ethyl alcohol [95 % (V/V) ethanol].

4.2 Sieving device producing a helical movement.

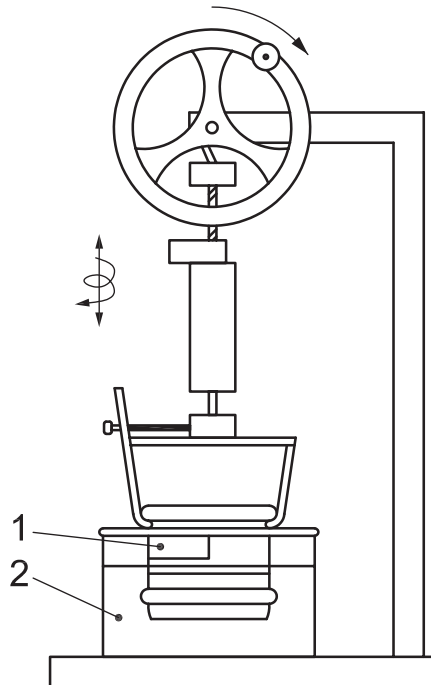
- Diameter of the vessel: 200 mm.
- Height of the vessel: 90 mm.
- Diameter of the sieve: 100 mm.
- Rotation about the centre line: horizontal rotation angle = 0° to 180°.

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— Rinse and fall: 45 mm vertically.

Hénin-Féodoroff's device is recommended for this purpose.

Figure 1 shows an example of a sieving device.



Key

- 1 50 µm sieve
- 2 vessel filled with ethyl alcohol

Figure 1 — Example of a sieving device

4.3 Balance, with an accuracy of 1 mg.

4.4 Oven.

4.5 Beakers, nominal volume 250 ml.

4.6 Erlenmeyer flasks with stoppers, nominal volume 250 ml.

4.7 Evaporation dishes, nominal volume 60 ml.

4.8 Sieves, stainless steel, square mesh, 100 mm in diameter, 45 mm high, sizes (mm): 5,0, 3,0, 2,0, 1,0, 0,5, 0,2, 0,1, 0,05, respectively, in accordance with ISO 3310-1.

NOTE A 3,15 mm sieve can be used instead of a 3,0 mm sieve.

4.9 Sieve, stainless steel, 0,05 mm square mesh, 100 mm in diameter, 60 mm high, in accordance with ISO 3310-1.

4.10 Plastic angled-spout wash bottles, nominal volume 500 ml.

4.11 Vessel, with a capacity of approximately 3 l, used for sieving in ethyl alcohol.

4.12 Flat vessel, approximately 8 cm high with a capacity of approximately 8 l, which is able to contain the permeable plastic block (4.14).

4.13 Pipette, nominal volume 50 ml, and inherent soft plastic-like rubber pear-shaped bulb.

4.14 Permeable plastic block, 30 mm thick, sufficient in area and shape to almost cover the bottom of the flat vessel (4.12) (e.g. synthetic foam, 30 kg/m³).

NOTE If no suitable plastic block is available, a 30-mm-thick bed of fine or medium sand may be used.

4.15 Filter papers, with a retention capacity of 2 µm.

4.16 Rigid plastic or metal containers, for the field samples.

4.17 Sampling tools: shovel or spade.

5 Procedures

5.1 General

The sequence of operations is illustrated in Annex A.

5.2 Field sampling

Take a sample of approximately 1 kg of soil from the layer of soil to be analysed, if possible under moderately humid conditions (between the field moisture capacity and the wilting point), for example in the case of cultivated soils, the conditions under which seed beds can be prepared or a maximum yield of aggregates obtained from the sample (yield = ratio between a 3 mm to 5 mm mass of aggregates and an initial sample of soil). In the event of crusting or litter on the surface of the soil, take the sample from below. The soil's structural stability may vary cyclically throughout the year. It is therefore recommended that soil samples always be taken at the same time of year to ensure better comparison. Samples shall be transported from the field to the laboratory in such a way that no significant damage occurs to the aggregates. In most cases, a rigid container is required.

Samples shall be restrained from movement within their containers.

5.3 Preparation of the soil sample

Prepare the aggregates as soon as possible after sampling, otherwise some changes may occur during the process, affecting the stability. Immediately after samples reach the laboratory, they shall be spread out in flat containers in a temperate (about 20 °C) well-ventilated atmosphere to be air-dried. If this is not possible, store the boxes in a fridge at 4 °C to minimize biologic activity and avoid changes in temperature.

If necessary, samples may at this stage be reduced in size using any recognized method to produce a representative subsample for the test.

During the drying period, oversize aggregates shall be manually broken under optimum humid conditions until the whole sample, except for stones, passes through a 5 mm sieve. The mass of stones rejected shall be recorded. Care shall be taken that excessive diminution of the aggregates does not occur.

After all of the aggregates have been passed through a 5 mm sieve, undersized aggregates and other materials shall be separated by use of a 3 mm sieve. The dry mass of the undersized material shall be recorded. Aggregates passing through a 5 mm sieve and retained by a 3 mm sieve shall be retained for further testing. Immediately before testing, the aggregates shall be oven-dried at 40 °C for 24 h and cooled in a desiccator, so that, as far as possible, the aggregates are always subjected to the same treatment (5.4).