SLOVENSKI STANDARD
SIST EN 17542-1:2022

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Zemeljska dela - Geotehnični laboratorijski preskusi - 1. del: Preskus razgradljivosti

Earthworks - Geotechnical laboratory tests - Part 1: Degradability test standard

Erdarbeiten - Geotechnische Laborversuche - Teil 1: Prüfung der Abbaubarkeit

Terrassements - Essais géotechniques en laboratoire - Partie 1 : Essai de dégradabilité

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Earthworks - Geotechnical laboratory tests - Part 1: Degradability test standard

Terrassements - Essais géotechniques en laboratoire - Partie 1 : Essai de dégradabilité

Erdarbeiten - Geotechnische Laborversuche - Teil 1: Prüfung der Abbaubarkeit

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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 17542-1:2022) has been prepared by Technical Committee CEN/TC 396 “Earthworks”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by December 2022, and conflicting national standards shall be withdrawn at the latest by December 2022.

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Introduction

The degradability coefficient I_{DG} is an identification parameter adopted in the classification of materials for earthworks (EN 16907-2). This document refers to two methods to define the degradability behaviour, designated as French and Spanish methods in EN 16907-2. Those two methods are described as Method A and Method B, respectively.

1 Scope

This document defines the principle and the methods for the determination of the "degradability coefficient" of rocky material.

The degradability coefficient I_{DG} distinguishes the behaviour of certain rocky material and is used to show the change in the geotechnical characteristics (particle size, clay content, plasticity, etc.) in relation to the characteristics seen immediately following excavation.

Changes in the particle size occur due to the combined action of climatic or geohydrological elements (frost, soaking-drying cycles) and mechanical stress to which it is subjected. In the case of degradable rocky material, this leads to a fairly significant and continuous reduction in the mechanical and geometric characteristics of the works in which they are used.

The two methods developed in this document for the determination of I_{DG} are not equivalent. The results obtained by this document refer to the method used.

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 16907-2, *Earthworks — Part 2: Classification of materials*

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

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

EN ISO 17892-4, *Geotechnical investigation and testing — Laboratory testing of soil — Part 4: Determination of particle size distribution*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Symbols and abbreviated terms

I_{DGa}	Degradability coefficient of a rocky material (in percent) obtained by method A (French test)
I_{DGb}	Degradability coefficient of a rocky material (in percent) obtained by method B (Spanish test)
D_{10}	Particle size (in millimeter) below which 10 % of the mass of a grainy material are found
d/D	Ratio reflecting material fraction retained by a sieve of mesh size d over material fraction passed through a sieve of a mesh size D
$D_{10\,bef}$	D_{10} value of the material before the first soaking-drying cycle (in millimeter)
$D_{10\,aft}$	D_{10} value of the material after the soaking-drying cycles (in millimeter)

5 Method A

5.1 Test principle

The test is conducted by estimating changes in the D_{10} value of a sample of a given granularity d/D subjected to four conventional soaking-drying cycles.

The degradability coefficient I_{DG} is expressed as the ratio of the D_{10} values before and after the soaking-drying cycles.

5.2 Equipment and test material

— Test sieves conforming to ISO 3310-1 or ISO 3310-2, together with appropriate receivers. The number of sieves used and their aperture sizes shall be sufficient to ensure that any discontinuities in the grading curve are detected. The inclusion of sieves: 10 mm, 16 mm, 20 mm, 40 mm, 50 mm or 63 mm, and 80 mm is necessary as these represent the boundary sizes of the testing.

— An adjustable thermostat oven with forced air circulation devices capable of maintaining a uniform temperature of (105 ± 5) °C throughout the drying chamber.

— Flat metal tray, minimum dimensions (H × L × W): 0,1 m × 0,3 m × 0,5 m.

— Flat tray, minimum dimensions (H × L × W): 0,25 m × 0,5 m × 0,75 m.

— Balance, with a maximum permissible measurement error less than 0,2 % of the weighed mass.

5.3 Preparing samples

Take a sample that is representative of the nature of the rocky material to be tested either by extracting a core sample, or by using a hydraulic shovel, or by cropping the surface, or by taking the sample directly from the excavation site. Then prepare the d/D fraction to be tested.

The d/D fraction is obtained by crushing the sample with a hammer (if required), then by sifting it through the following sieves :

— 10 mm and 20 mm for material derived from weak clay rocks such as marl, shale, pelite, etc.

— 40 mm and 80 mm for material derived from strong clay rocks such as sedimentary schist, and degraded magmatic and metamorphic rocks.

The oversize particles from the 20 mm and 80 mm sieves which respectively correspond to the dimensions D of the two particle size fractions tested may be returned to the sample after they have been crushed with a hammer and sifted once more through the 10/20 mm and 40/80 mm sieves respectively.

Alternative size fractions are given in Annex C for the preparation of the test sample. Testing other size fractions may produce results different from those obtained using the reference size fractions. The size fraction used and the reference to Annex C should then be given in the test report.

The sample shall weigh at least 2 kg.

5.4 Testing

ln order to draw the initial three point granulometric curve, sift the 10/20 mm or 40/80 mm fraction (prepared earlier) through 16 mm and 50 mm or 63 mm sieves respectively, then weigh and note down the oversize particles from these sieves.

Mix all sample fractions and homogenize the d/D fraction after sifting and spread it over the metal tray. Immerse this tray into the large tray then place it in the oven at (105 ± 5) °C. The soaking-drying cycle is carried out four times in succession.

The 1st cycle starts with a soaking action and the 4th cycle ends with a drying action. The duration of the cycle is:

— 8 h ± 1 h for soaking;

— 16 h ± 1 h for drying.

After each soaking action and before placing the sample in the oven, siphon off the water remaining in the metal tray, taking extreme care of not washing away any solid particles.

At the end of the 4th cycle, dry sift the sample through the appropriate column of sieves, to determine the particles size distribution and the D_{10} values.

The following columns of sieves can be used:

— 1 mm, 2 mm, 5 mm, 10 mm if the tested fraction is a 10 mm/20 mm fraction;

— 5 mm, 10 mm, 20 mm, 40 mm if the tested fraction is a 40 mm/80 mm fraction.

A different set of sieves conforming ISO 3310-1 or ISO 3310-2 can be used, if the sieves above and below D_{10} value have a ratio less or equal to 2,5.

Next, weigh the oversize particles from each sieve.

5.5 Calculation and expression of results

Using the weight values of the oversize particles from the sieves specified earlier, construct the granulometric curves of the tested fraction before and after carrying out the four soaking-drying cycles (see EN ISO 17892-4).

From these curves, determine the respective values of D_{10} of the material before the first soaking-drying cycle and D_{10} after carrying out the four soaking-drying cycles.

Calculate the degradability coefficient I_{DGa} using the following formula:

$$I_{DGa} = \frac{D_{10\ bef}}{D_{10\ aft}}$$

Where:

$D_{10\ bef}$ is the D_{10} value of the material before the first soaking-drying cycles

$D_{10\ aft}$ is the D_{10} value of the material after the fourth soaking-drying cycles

5.6 Test report

The test report shall affirm that the test was carried out in accordance with this document and shall contain the following information:

a) method of test used;

b) identification of the specimen tested, e.g. by borehole number, sample number and sample depth and any other relevant details required, e.g. depth of specimen within a sample, method of sample selection, if relevant (see Table A.1);

c) alternative sieves used, if relevant (see Annex C);

d) visual description of the specimen including any observed features noted after testing, following the principles in EN 16907-2;

e) the test results (see Table A.2), presented as continuous curves of percentage of total dry mass passing on a semi-logarithmic plot, before first and after forth soaking-drying cycle, following the principles in EN ISO 17892-4 (see example given in Annex A: Figure A1);

f) the mean value for the degradability coefficient, rounded to one decimal (see Table A.3);

g) any deviation from the specified test procedure, and any other information that could be important for interpreting the test results (see Table A.4).

An example of test report is given in the model test sheet of Annex A.

6 Method B

6.1 Test principle

The test is conducted to determine the disintegration resistance of aggregates and rock fragments submerged in water.

The method is based on evaluating of the quality of the aggregates that are subjected to the action of atmospheric factors, especially when data on the behaviour of the materials to be used in the climatic conditions existing on the site are not available.

I_{DGb} is the percentage of mass loss of the sample, after been tested, weighed according to the original sample size distribution.

6.2 Equipment and test material

The following equipment should be used in the test:

— A column of sieves with square opening meshes according to EN ISO 17892-4. The required sieves for method B are listed in Table 1:

Table 1 — Sieves required for Method B

FINE AGGREGATES **Sieve opening** mm	**COARSE AGGREGATES** **Sieve opening** mm
0,16	8
0,315	10
0,63	12,5
1,25	16
2,5	20
4	25
5	31,5
-	40
-	50
-	63

— Containers into which the samples of aggregates and rock fragments are immersed in water, in accordance with the procedure described in this method, shall be holed in such a way as to allow the free entry of water so that it can come into contact with the sample, as well as the drainage of the same without loss of particles from the material. The volume of water in which the samples are to be immersed shall be at least five times the volume of the submerged sample.

NOTE Baskets made of wire cloth or perforated sheet metal, with openings appropriate to the size of the fraction to be contained, are very suitable for use in this test.

— A suitable enclosure with devices to regulate the water temperature during the immersion period.

— A balance, with a maximum permissible measurement error less than 0,2 % of the weighed mass.

— An adjustable thermostat oven with forced air circulation devices capable of maintaining a uniform temperature of (105 ± 5) °C throughout the drying chamber.

6.3 Operating procedure

6.3.1 Sample sizes

6.3.1.1 Fine aggregate

The entire fine aggregate sample shall pass through the 10 mm opening sieve described in 6.2 (see Table 1). The size of the sample used in the test should be sufficient to yield each fraction listed in Table 2 in quantity equal or greater than the minimum retention quantity. Every fraction shall be present in a proportion greater than 5 % of the total mass of sample:

Table 2 — Sample size required for fine aggregate

Aggregate fraction size mm	Minimum quantity g
< 10 – 5	100
< 5 – 2,5	100
< 2,5 – 1,25	100
< 1,25 – 0,63	100
< 0,63 – 0,32	100

6.3.1.2 Coarse aggregate

The coarse aggregate sample shall be a material from which all fractions passed through the 5 mm opening sieve described in 6.2 have been removed. These removed sizes are tested according to the procedure described for fine aggregate.

The sample quantity shall be sufficient to obtain, at least, the quantities of each of the fractions listed in Table 3, which shall be present in a proportion greater than 5 % of the total mass of sample: