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Kamen za obloge pri vodnih zgradbah in drugih gradbenih delih - 2. del: Dopolnilni podatki in preskusne metode

Armourstone - Part 2: Complementary information and test methods

Wasserbausteine - Teil 2: Ergänzende Informationen und Prüfverfahren

Enrochements - Partie 2 : Informations complémentaires et méthodes d'essai

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Armourstone - Part 2: Complementary information and test methods

Enrochements - Partie 2 : Informations complémentaires et méthodes d'essai

Wasserbausteine - Teil 2: Ergänzende Informationen und Prüfverfahren

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 154.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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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 13383-2:2021) has been prepared by Technical Committee CEN/TC 154 “Aggregates”, the secretariat of which is held by BSI.

This document is currently submitted to CEN Enquiry.

This document will supersede EN 13383-2:2019.

In comparison with the previous edition, the following changes have been made:

— a new Clause Symbols and abbreviations has been added;

— a new clause for product characteristics – additional information has been added, including subclauses for classes, grouted armourstone, colour, impurities and water soluble constituents;

— the clause for determination of the percentage of pieces of armourstone with a length-to-thickness ratio greater than 3 has been renamed to clause for determination of the shape of armourstone and supplements for determination of crushed or broken surfaces have been added;

— the minimum required number of pieces of armourstone for determination of density was added;

— the procedure for determining resistance to freezing and thawing has been supplemented;

— a new clause for determining the resistance to salt crystallization has been added;

— the preparation of test portions for visual examination for signs of “Sonnenbrand” and for determination of loss of mass of a piece of steel slag after boiling has been supplemented;

— a new clause for marking,labelling and packaging has been added,

— new informative annexes for Guidance on gradings, Guidance on block integrity, Guidance on the resistance of armourstone to freezing and thawing and to salt crystallization and additional explanatory information.

The prEN 13383 *Armourstone* series consists of the following parts:

— *Part 1: Characteristics*;

— *Part 2: Complementary information and test methods*.

1 Scope

This document specifies sampling and test methods for natural, manufactured and recycled aggregates for use as armourstone. This document specifies the reference methods to be used for type testing and in case of dispute where an alternative method has been used. For other purposes, in particular factory production control, it allows for other methods to be used provided that an appropriate working relationship with the test method has been established. This document provides non-contradictory complementary information that can be of use when producing or purchasing armourstone produced according to harmonised standard prEN 13383-1:2021.

NOTE prEN 13383-1:2021 is also intended to be read in conjunction with the Construction Products Regulations.

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 932-1:1996, *Tests for general properties of aggregates — Part 1: Methods for sampling*

prEN 932-3:2020, *Tests for general properties of aggregates — Part 3: Procedure and terminology for simplified petrographic description*

EN 932-5:2012, *Tests for general properties of aggregates — Part 5: Common equipment and calibration*

EN 933-1:2012, *Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method*

EN 933-2:2020, *Tests for geometrical properties of aggregates — Part 2: Determination of particle size distribution — Test sieves, nominal size of apertures*

EN 933-3:2012, *Tests for geometrical properties of aggregates — Part 3: Determination of particle shape — Flakiness index*

EN 1097-1:2011, *Tests for mechanical and physical properties of aggregates — Part 1: Determination of the resistance to wear (micro-Deval)*

EN 1097-5:2008, *Tests for mechanical and physical properties of aggregates — Part 5: Determination of the water content by drying in a ventilated oven*

EN 1367-2:2009, *Tests for thermal and weathering properties of aggregates — Part 2: Magnesium sulfate test*

EN 1744-3:2002, *Tests for chemical properties of aggregates — Part 3: Preparation of eluates by leaching of aggregates*

ISO 3310-2:2013, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

3 Terms, definitions, symbols and abbreviations

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

3.1 Terms and definitions

3.1.1
armourstone grading
armourstone designation with a nominal lower and upper limit

Note 1 to entry: This designation accepts the presence of undersize and oversize pieces of armourstone.

3.1.2
nominal lower limit
mass or sieve size in a grading below which the armourstone pieces are considered to be undersized

3.1.3
nominal upper limit
mass or sieve size in a grading above which the armourstone pieces are considered to be oversized

3.1.4
coarse grading
designation of grading with a nominal upper limit defined by a sieve size ≥ 90 mm and ≤ 250 mm

3.1.5
light grading
designation of grading with a nominal upper limit defined by a mass ≥ 40 and ≤ 300 kg

3.1.6
heavy grading
designation of grading with a nominal upper limit defined by a mass > 300 kg

3.1.7
fragment
aggregate pieces in the finest fraction of coarse gradings or the lightest fraction of light and heavy gradings for which the particle size distribution or mass distribution requirements apply

Note 1 to entry: For further information on grading, see pr EN 13383-1:2021, 4.1.1.

3.1.8
batch
production quantity, delivery quantity, partial delivery quantity (railway wagon-load, lorry-load, ship's cargo) or a stockpile produced at one time under conditions that are presumed uniform

3.1.9
sampling plan
procedure of allocation, withdrawal and preparation of a sample or samples from a material to yield the required information

3.1.10
sampling increment
quantity of material taken from a batch by one operation of the sampling apparatus

3.1.11
bulk sample
aggregation of the sampling increments

3.1.12
representative sample
sample created by taking sampling increments according to sampling plan, which makes it likely that the quality of this sample corresponds to that of the batch

3.1.13
subsample
sample obtained from sampling increments or a bulk sample by means of a sample reduction procedure

3.1.14
sampler
individual or a number of individuals working as a team, or an organisation, taking samples on a routine basis

3.1.15
length
L
maximum dimension of a piece of armourstone as defined by the greatest distance apart of two parallel planes tangential to the stone's surface

3.1.16
thickness
T
minimum dimension of a piece of armourstone as defined by the least distance apart of two parallel planes tangential to the stone's surface

3.1.17
constant mass
successive weighings after drying at least 24 h apart not differing by more than 0,1 %

Note 1 to entry: In many cases, constant mass can be achieved after a test portion has been dried for a pre-determined period in a specified oven at (110 ± 5) °C. Test laboratories can determine the time required to achieve constant mass for specific types and sizes of sample dependent upon the drying capacity of the oven used.

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply:

Symbol/Acronym	**Meaning:**
AVCP	Assessment for Verification of Constancy of Performance
FPC	Factory Production Control
ELL	Extreme Lower Limit
EUL	Extreme Upper Limit
NLL	Nominal Lower Limit
NUL	Nominal Upper Limit
FT	The percentage loss in mass of the test portion after freeze–thaw cycling
L	Maximum length
T	Minimum thickness

Symbol/Acronym	Meaning:
L/T	Length to thickness ratio
W_{as}	Average water absorption
ρ	Average particle density
ρ_{min}	Minimum particle density

4 Product characteristics – additional information

4.1 Classes

Where compliance with a class is based on a value of a characteristic being less than or equal to a given value, compliance with a more severe class (lower value) automatically confers compliance with all less severe classes (higher values). Similarly for classes based on the value of a characteristic being greater than or equal to a given value, compliance with a more severe (higher value) automatically confers compliance with all less severe classes (lower values).

When the performance of a characteristic *XX* does not comply with even the least severe class in the class table included in prEN 13383-1:2021, the manufacturer can declare an appropriate limiting value in the XX_{Stated} class.

The particle size distribution of coarse gradings shall be determined in accordance with Clause 6 or as declared by the manufacturer for class CP_{Stated}.

The mass distribution of light gradings shall be determined in accordance with Clause 7 or as determined in accordance with Annex H (informative) and declared by the manufacturer for class LMA_{Stated} or $\text{LMB}_{\text{Stated}}$.

The mass distribution of heavy gradings shall be determined in accordance with Clause 7 or as determined in accordance with Annex H (informative) and declared by the manufacturer for class HMA_{Stated} or $\text{HMB}_{\text{Stated}}$.

4.2 Grouted Armourstone

Armourstone intended for use in a layer to be grouted with bituminous or cement mortar shall not be coated with observable clayey or other adhesive soil.

4.3 Colour

Natural variation in colour supplied from a quarry (or distinct part of a quarry) with an established pattern of supply shall not be grounds for rejection of any material. Any preference for a particular general colour for the armourstone might be advised.

4.4 Impurities

Armourstone shall not contain any foreign matter such as scrap metal, wood and plastic in a quantity that will cause damage to the structure or the environment in which it is used.

4.5 Water soluble constituents

For the determination of water soluble constituents, an eluate shall be prepared from a representative sample of armourstone as specified in EN 1744-3:2002. Where suitable aggregate representative of the armourstone is not available, the test portion shall be obtained by crushing, using a laboratory jaw

crusher, at least six separate pieces of armourstone for which the masses do not differ by more than 25 %.

5 Methods for sampling

5.1 General

This clause describes methods for obtaining samples of armourstone from preparation and processing plants including stocks and from silos, stockpiles and deliveries.

NOTE 1 It is preferable for armourstone to be sampled at the quarry or during the loading for transport (or unloading).

NOTE 2 Guidance on sampling for testing is given in Annex L.

The aim of sampling is to obtain samples that are representative of the average properties of the batch.

The methods described are also suitable for obtaining sampling increments, which are to be tested separately.

Methods to be used for sample reduction are also given.

5.2 Principles of sampling

Proper and careful sampling and sample transport is a prerequisite for an analysis that will give reliable results. The correct use of the specified apparatus and methods helps to avoid biased sampling inclusive the possibility of human bias introduced by visual selection. Sampling variation caused by the heterogeneity of the batch shall be reduced to an acceptable level by taking an adequate number of sampling increments.

NOTE For guidance on numbers and sizes of samples and test portions for testing armourstone as specified in this document, see Annex G.

Sampling increments are selected at random from all parts of the batch that the samples are to represent. Armourstone from which no sampling increment can be taken (because it is not accessible, or for some other practical reason) shall not be considered to be part of the batch that is represented by the samples. For example, if sampling increments are taken from armourstone discharged from a silo, the samples represent the armourstone that has been discharged, not the armourstone remaining in the silo.

The sampler shall be informed of the aim of the sampling.

5.3 Sampling plan

A sampling plan shall be prepared, prior to sampling, taking into account the grading type, the nature and size of the batch, the local circumstances and the purposes of sampling. It shall include:

a) the type of the armourstone;

b) the aim of the sampling including a list of the properties to be tested;

c) the identification of the sampling points;

d) the mass or number of stones of sampling increments;

e) the number of sampling increments;

f) the sampling apparatus to be used;

g) the methods of sampling and sample reduction with reference to the clauses of this document;

h) the relevant marking, packaging and dispatch of the samples.

5.4 Apparatus

5.4.1 Apparatus for sampling

5.4.1.1 **Grab**, fitted to either a crane or a hydraulic machine.

5.4.1.2 **Bucket or fork**, fitted to a wheeled loader or a hydraulic machine.

5.4.1.3 **Truck**, for receiving and/or transport of samples.

5.4.1.4 **Lifting equipment and lifting aids**, for stones that cannot be moved manually.

5.4.2 Apparatus for sample reduction and transport

5.4.2.1 **A floor area**, upon which samples can be deposited and tested. The floor shall be sufficiently clean and close-textured to be able to distinguish and recover the material of the sample from the floor material.

5.4.2.2 **Shovels**.

5.4.2.3 **Rectangular sampling buckets**, of sufficient size and of width not less than three times the nominal upper grading limit.

5.4.2.4 **Suitable plates and wires**, for sample reduction.

5.4.2.5 **Containers for transport**, such as bags, buckets or other suitable containers.

5.5 Sampling methods

5.5.1 General

Regulations for safety and ergonomics are expected to be followed.

WARNING Some sampling methods will inevitably involve the samplers working close to processing plant and moving vehicles. Those involved in the planning and execution of sampling should work closely with the operational management to ensure safe working practices.

Mechanically selected gradings should preferably be sampled from a stationary conveyor belt or from the stream of material. Sampling increments should be taken at regular intervals throughout the period the batch is in motion. Gradings of which the pieces of armourstone are individually handled may be sampled at the most convenient location.

Sampling from static batches should be avoided wherever possible since it is difficult to satisfy the principle of taking sampling increments at random from all parts of the batch, and hence segregation is likely to cause the sampling to produce biased results.

During sampling, grabs or other extraction equipment shall be filled to a minimum such that the degree of filling does not adversely affect the representative nature of the sample or sampling increment.

5.5.2 Sampling, for the determination of particle size distribution, mass distribution and shape characteristics

5.5.2.1 Sampling of material in bucket conveyors, bucket loaders, or grabs

Each sampling increment shall consist of the entire contents of a grab or bucket.

When this gives too large a sampling increment, it should be reduced by one of the methods described in 5.6.

5.5.2.2 Sampling at belt and chute discharge points

The period during which the sampling is to be done shall be divided into a number of equal intervals, and a sampling increment shall be taken in the middle of each interval.

A sample increment shall be taken by catching the discharge stream in a loader bucket, making sure that the complete cross-section of the stream of material is intercepted. At the beginning and the ending of the sampling, the edge of the bucket shall pass the cross-section of the stream as fast as possible.

Where appropriate, sampling should only be started after a preliminary run to ensure that possible irregularities in the pass do not lead to unrepresentative samples.

Samples may also be taken at the discharge from a screen by the same method.

5.5.2.3 Sampling from stationary conveyor belts

Sampling should only be started after a preliminary run to ensure that possible irregularities in the pass do not lead to unrepresentative samples.

All sampling increments shall be taken at the same sampling point. In every sampling increment, all material between two cross-sections shall be taken. The distance between the cross-sections shall be determined by the required quantity of the sampling increment.

5.5.2.4 Sampling from a silo

Sampling at a silo outlet shall be carried out in accordance with 5.5.2.2.

During filling of a silo the material segregates and as a result the finer material tends to be found in the centre of the silo with the coarser material along the wall sides. Alternating loading and discharging of a silo leads to a complex segregation pattern in the silo and this segregation causes variations in the particle size distribution of the discharged material. The number of sampling increments should be related to this variation.

5.5.2.5 Sampling from stockpiles

When sampling from a segregated stockpile, from which material is being collected for transporting, a sampling increment shall be taken from the material which is being taken from the stockpile. For this purpose, the contents of one or more loader buckets, grabs, lorries or any other means of handling or transport shall be taken. The period during which the sampling is done shall be divided into a number of equal intervals and a sampling increment shall be taken in the middle of each interval.

If at the time of sampling no material of a segregated stockpile is undergoing routine removal, the removal of material shall be simulated so as not to distort the representativity of the sampling increment with the segregation effects associated with the initiation of stockpile extraction. The sampling increments shall be taken at random or at equal distances around the stockpile or part thereof to be sampled.

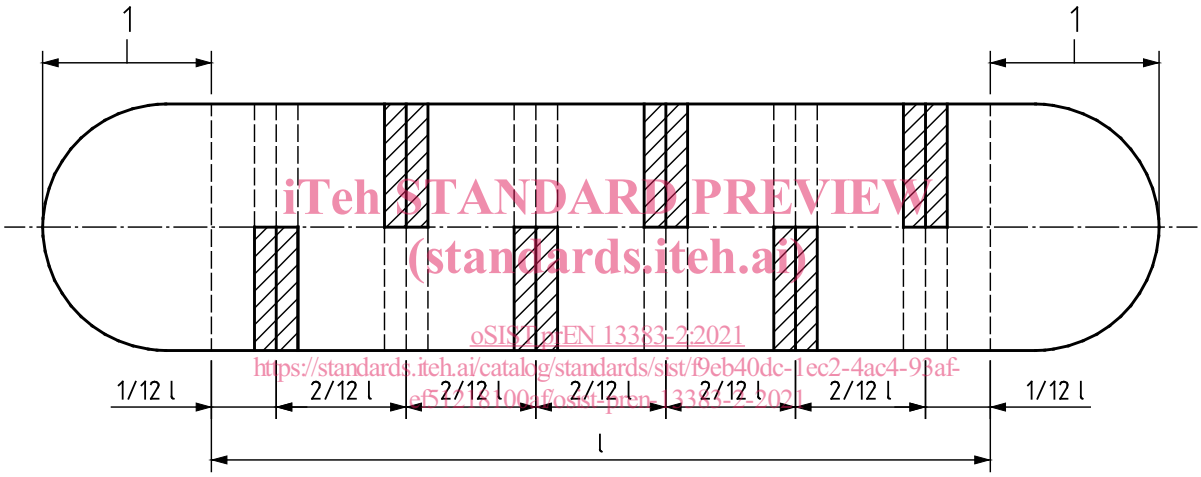
When sampling from a non-segregated stockpile, a sampling increment shall be taken as indicated for a segregated stockpile or by taking a quantity of material from a random location which is easily reached with the equipment available.

5.5.2.6 Sampling from floating equipment

When sampling cannot be performed during loading or unloading, sampling from floating equipment should be performed with reference to Scheme 1 or Scheme 2 of Annex G.

5.5.2.7 Sampling from wheeled transport

Discharge the contents of the vehicle partially or completely in a manner, which produces an evenly distributed longitudinal pile of material. Sampling increments shall be taken from across the pile by removing, at random or at equally distributed locations, adequate quantities of material whilst avoiding the possibly segregated material at the start and finish of the pile (see Figure 1). Take the material in strips over the full width of the pile or in equal numbers of half strips from the left and right hand side of the centre line of the pile.



Dimensions are approximate

Key

1 potential segregation area

Figure 1 — Sampling locations in a spread-discharged load

When a batch to be sampled consists of more than one load, the sampling increments shall be taken from randomly selected loads using the method described above or taking each selected load as a whole as an increment.

When one load contains insufficient material for one sample to be tested, several loads shall be taken.

5.5.3 Sampling for the determination of physical, chemical, durability and other properties

For the determination of physical, chemical, durability and other properties individual pieces of armourstone excluding fragments shall be taken randomly as sampling increments, forming together a bulk sample. For properties for which testing of aggregate is permitted, sampling shall be carried out in accordance with EN 932-1:1996.

Sampling increments consisting of individual pieces of armourstone shall be taken from the batch to be tested and may be taken from the samples which have been taken for the determination of the particle size or mass distribution.