SLOVENSKI STANDARD
SIST EN 13383-1:2013

01-julij-2013

Nadomešča:
SIST EN 13383-1:2002
SIST EN 13383-1:2002/AC:2004

Kamen za obloge pri vodnih zgradbah in drugih gradbenih delih - 1. del: Specifikacija

Armourstone - Part 1: Specification

Wasserbausteine - Teil 1: Anforderungen

Enrochements - Partie 1: Spécifications

Ta slovenski standard je istoveten z: **EN 13383-1:2013**

ICS:

91.100.15	Mineralni materiali in izdelki	Mineral materials and products

SIST EN 13383-1:2013 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13383-1

May 2013

ICS 91.100.15

Supersedes EN 13383-1:2002

English Version

Armourstone - Part 1: Specification

Enrochements - Partie 1: Spécifications

Wasserbausteine - Teil 1: Anforderungen

This European Standard was approved by CEN on 29 July 2011.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 13383-1:2013) has been prepared by Technical Committee CEN /TC 154, "Aggregates", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by February 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13381-1:2002.

The most significant technical changes that have been made include:

— the removal of the previous minimum density requirement and a change in the method of declaring density;

— inclusion of a new coarse grading (32/90mm) and a new light grading (15 kg to 120 kg) and guidance on the declaration of non-standard heavy gradings;

— inclusion of a new category for resistance to wear $M_{DE}15$, to take account of the fact that very few armourstone sources meet the highest quality category $M_{DE}10$;

— requirements for sample preparation for the Micro-Deval test has been moved from EN 13383-1 to EN 13383-2.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Requirements for initial type testing and factory production control (previously specified in a normative annex to this standard) are now given in a new standard EN 16236: on *Evaluation of conformity of aggregates*.

EN 13383 *Armourstone* consists of the following parts:

Part 1: Specifications

Part 2: Test methods

Requirements for other end uses of aggregates are specified in the following European Standards:

EN 12620 Aggregates for concrete
EN 13043 Aggregates for bituminous mixtures and surface dressings for roads, airfields and other trafficked areas
EN 13055 Lightweight aggregates
EN 13139 Aggregates for mortar
EN 13242 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction
EN 13450 Aggregates for railway ballast

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the properties of aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these materials for use as armourstone.

A list of the source materials that have been considered and are within the scope of this European Standard is given in Annex A (normative).

Requirements for the evaluation of conformity of the products to this European Standard are given in EN 16236.

It incorporates a general requirement that armourstone shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination.

Armourstone used in construction should comply with all the requirements of this European Standard. The standard includes specific requirements for natural armourstone, ferrous and steel making slag and recycled armourstone. For materials from some other secondary sources, however, work is ongoing and the requirements are incomplete. In the meantime, such materials, when placed on the market as armourstone, should comply fully with this European Standard but may also be required to conform to specific relevant additional requirements at the place of use. Additional characteristics and requirements may be specified on a case by case basis depending upon experience of use of the product, and defined in specific contractual documents.

Finer aggregates than specified in this European Standard are used in hydraulic structures. For such aggregates European Standards for other end uses of aggregates should be applied.

Requirements for the declaration of the potential of armourstone to release regulated dangerous substances are currently under development. Until such time as these are finalised, attention should be paid to requirements at the place of use.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

EN 1744-1:2009+A1:2012, *Tests for chemical properties of aggregates — Part 1: Chemical analysis*

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

EN 1926:2006, *Natural stone test methods — Determination of uniaxial compressive strength*

EN 13383-2:2013, *Armourstone — Part 2: Test methods*

EN 16236, *Evaluation of conformity of aggregates — Initial Type Testing and Factory Production Control*

3 Terms and definitions

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

3.1
armourstone
coarse aggregates used in hydraulic structures and other civil engineering works

Note 1 to entry: Armourstone can be natural, manufactured or recycled.

3.2
natural armourstone
armourstone from mineral sources which has been subjected to nothing more than mechanical processing

3.3
manufactured armourstone
armourstone of mineral origin resulting from an industrial process involving thermal or other modification excluding concrete armour units

3.4
recycled armourstone
armourstone resulting from the processing of inorganic or mineral material previously used in construction

3.5
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.

3.6
nominal lower limit
mass or sieve size in a grading below which the armourstone pieces are considered to be undersized

3.7
nominal upper limit
mass or sieve size in a grading above which the armourstone pieces are considered to be oversized

3.8
coarse grading
designation of grading with a nominal upper limit defined by a sieve size between and including 90 mm and 250 mm

3.9
light grading
designation of grading with a nominal upper limit defined by a mass between and including 25 kg and 500 kg

3.10
heavy grading
designation of grading with a nominal upper limit defined by a mass of more than 500 kg

3.11
fragment
armourstone piece 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: Fragments are all armourstone pieces falling below the extreme lower limit (see Annex B.1)

3.12
category
level of a property of armourstone expressed as a range of values or a limiting value

Note 1 to entry: There is no relationship between the categories of different properties.

3.13
effective mean mass, M_{em}
average mass of armourstone, excluding fragments

4 Geometrical requirements

4.1 General

The necessity for testing and declaring all properties in this clause is limited according to the particular application at end use or origin of the armourstone. When required, the tests specified in Clause 4 shall be carried out to determine appropriate geometrical properties.

When the value of a property is required but not defined by specified limits the value should be declared by the producer as an $XX_{Declared}$ category, e.g. in Table 7 the percentage by number of pieces of armourstone with less than 50 % crushed or broken surfaces of say 7 corresponds to RO_7.

When a property is not required, a “No requirement” category may be used.

Guidance on selection of appropriate categories for specific applications may be found in national provisions in the place of use of the armourstone.

NOTE Where conformity with a category is based on a value of a property being less than or equal to a given value, conformity with a more severe category (lower value) automatically confers conformity with all less severe categories (higher values). Similarly for categories based on the property being greater than or equal to a given value, conformity with a more severe (higher value) automatically confers conformity with all less severe categories (lower values).

Sampling shall be carried out as specified in EN 13383-2:2013, Clause 4.

4.2 Gradings

4.2.1 Coarse gradings

The particle size distribution of coarse gradings shall be determined in accordance with EN 13383-2:2013, Clause 5. shall conform to:

a) Table 1 for categories $CP_{32/90}$, $CP_{45/125}$, $CP_{63/180}$, $CP_{90/250}$, $CP_{45/180}$, and $CP_{90/180}$; or

b) as declared by the producer for category $CP_{Declared}$.

Table 1 — Requirements for the particle size distribution of standard coarse gradings

Grading mm	**32/90**	**45/125**	**63/180**	**90/250**	**45/180**	**90/180** [c]
Category	$CP_{32/90}$	$CP_{45/125}$	$CP_{63/180}$	$CP_{90/250}$	$CP_{45/180}$	$CP_{90/180}$
Sieve size mm	**Cumulative percentage passing (by mass)**					
360	-	-	-	98 to 100	-	-
250	-	-	98 to 100	90 to 100	98 to 100	98 to 100
180	-	98 to 100	90 to 100	-	90 to 100	80 to 100 [a]
125	98 to 100	90 to 100	-	0 to 50	-	-
90	90 to 100	-	0 to 50	0 to 15	-	0 to 20 [a]
63	-	0 to 50	0 to 15	-	0 to 50	-
45	0 to 50	0 to 15	-	0 to 5 [b]	0 to 15	0 to 5 [b]
31,5	0 to 15	-	0 to 5 [b]	-	-	-
22,4	-	0 to 5 [b]	-	-	0 to 5 [b]	-
16	0 to 5 [b]	-	-	-	-	-

[a] The fraction between the 90 mm and 180 mm sieves of the 90/180 mm grading shall be ≥ 80 % by mass.
[b] Fragments.
[c] See Annex F.

4.2.2 Light gradings

The mass distribution of light gradings shall be determined in accordance with EN 13383-2:2013, Clause 6.

The mass distribution shall conform to:

a) Table 2 for categories $LMA_{15/120}$, $LMA_{5/40}$, $LMA_{10/60}$, $LMA_{40/200}$, $LMA_{60/300}$ and $LMA_{15/300}$; or

b) Table 3 for categories $LMB_{15/120}$, $LMB_{5/40}$, $LMB_{10/60}$, $LMB_{40/200}$, $LMB_{60/300}$ and $LMB_{15/300}$; or

c) the mass distribution and, where appropriate, the average mass (excluding fragments) as declared by the producer for category $LM_{Declared}$.

Table 2 — Requirements for average mass (excluding fragments) and mass distribution of category A standard light gradings

Grading kg	**5 to 40**	**10 to 60**	**15 to 120**	**40 to 200**	**60 to 300**	**15 to 300**
Category	$LMA_{5/40}$	$LMA_{10/60}$	$LMA_{15/120}$	$LMA_{40/200}$	$LMA_{60/300}$	$LMA_{15/300}$
Average mass (excluding fragments), M_{em} kg	10 to 20	20 to 35	35 to 60	80 to 120	120 to 190	45 to 135
Reference mass kg	**Cumulative percentage (by mass) of stones lighter than reference mass**					
450	-	-	-	-	97 to 100	97 to 100
300	-	-	-	97 to 100	70 to 100	70 to 100
200	-	-	97 to 100	70 to 100	-	-
120	-	97 to 100	70 to 100	-	-	-
80	97 to 100	-	-	-	-	-
60	-	70 to 100	-	-	0 to 10	-
40	70 to 100	-	-	0 to 10	-	-
30	-	-	-	-	0 to 2 [a]	-
15	-	-	0 to 10	0 to 2 [a]	-	0 to 10
10	-	0 to 10	-	-	-	-
5	0 to 10	-	0 to 2 [a]	-	-	-
3	-	-	-	-	-	0 to 2 [a]
2	-	0 to 2 [a]	-	-	-	-
1,5	0 to 2 [a]	-	-	-	-	-

[a] Fragments.

Table 3 — Requirements for mass distribution of category B standard light gradings

Grading kg	**5 to 40**	**10 to 60**	**15 to 120**	**40 to 200**	**60 to 300**	**15 to 300**
Category	$LMB_{5/40}$	$LMB_{10/60}$	$LMB_{15/120}$	$LMB_{40/200}$	$LMB_{60/300}$	$LMB_{15/300}$
Reference mass kg	**Cumulative percentage (by mass) of stones lighter than reference mass**					
450	-	-	-	-	97 to 100	97 to 100
300	-	-	-	97 to 100	70 to 100	70 to 100
200	-	-	97 to 100	70 to 100	-	-
120	-	97 to 100	70 to 100	-	-	-
80	97 to 100	-	-	-	-	-
60	-	70 to 100	-	-	0 to 10	-
40	70 to 100	-	-	0 to 10	-	-
30	-	-	-	-	0 to 2 [a]	-
15	-	-	0 to 10	0 to 2 [a]	-	0 to 10
10	-	0 to 10	-	-	-	-
5	0 to 10	-	0 to 2 [a]	-	-	-
3	-	-	-	-	-	0 to 2 [a]
2	-	0 to 2 [a]	-	-	-	-
1,5	0 to 2 [a]	-	-	-	-	-

[a] Fragments.

4.2.3 Heavy gradings

The mass distribution of heavy gradings shall be determined in accordance with EN 13383-2:2013, Clause 6.

The mass distribution shall conform to:

a) Table 4 for categories $HMA_{300/1000}$, $HMA_{1000/3000}$, $HMA_{3000/6000}$, $HMA_{6000/10000}$, and $HMA_{10000/15000}$; or

b) Table 5 for categories $HMB_{300/1000}$, $HMB_{1000/3000}$, $HMB_{3000/6000}$, $HMB_{6000/10000}$, and $HMB_{10000/15000}$; or

c) the mass distribution and, where appropriate, the average mass (excluding fragments) as declared by the producer for category $HM_{Declared}$.

Table 4 — Requirements for average mass (excluding fragments) and mass distribution of category A standard heavy gradings

Grading kg	**300 to 1 000**	**1 000 to 3 000**	**3 000 to 6 000**	**6 000 to 10 000**	**10 000 to 15 000**
Category	$HMA_{300/1000}$	$HMA_{1000/3000}$	$HMA_{3000/6000}$	$HMA_{6000/10000}$	$HMA_{10000/15000}$
Average mass (excluding fragments), M_{em} kg	540 to 690	1 700 to 2 100	4 200 to 4 800	7 500 to 8 500	12 000 to 13 000
Reference mass kg	**Cumulative percentage (by mass) of stones lighter than reference mass**				
22 500	-	-	-	-	97 to 100
15 000	-	-	-	97 to 100	70 to 100
10 000	-	-	-	70 to 100	0 to 10
9 000	-	-	97 to 100	-	-
6 500	-	-	-	-	0 to 5 [a]
6 000	-	-	70 to 100	0 to 10	-
4 500	-	97 to 100	-	-	-
4 000	-	-	-	0 to 5 [a]	-
3 000	-	70 to 100	0 to 10	-	-
2 000	-	-	0 to 5 [a]	-	-
1 500	97 to 100	-	-	-	-
1 000	70 to 100	0 to 10	-	-	-
650	-	0 to 5 [a]	-	-	-
300	0 to 10	-	-	-	-
200	0 to 5 [a]	-	-	-	

[a] Fragments.

Table 5 — Requirements for mass distribution of category B standard heavy gradings

Grading kg	**300 to 1 000**	**1 000 to 3 000**	**3 000 to 6 000**	**6 000 to 10 000**	**10 000 to 15 000**
Category	$HMB_{300/1000}$	$HMB_{1000/3000}$	$HMB_{3000/6000}$	$HMB_{6000/10000}$	$HMB_{10000/15000}$
Reference mass kg	**Cumulative percentage (by mass) of stones lighter than reference mass**				
22 500	-	-	-	-	97 to 100
15 000	-	-	-	97 to 100	70 to 100
10 000	-	-	-	70 to 100	0 to 10
9 000	-	-	97 to 100	-	-
6 500	-	-	-	-	0 to 5 [a]
6 000	-	-	70 to 100	0 to 10	-
4 500	-	97 to 100	-	-	-
4 000	-	-	-	0 to 5 [a]	-
3 000	-	70 to 100	0 to 10	-	-
2 000	-	-	0 to 5 [a]	-	-
1 500	97 to 100	-	-	-	-
1 000	70 to 100	0 to 10	-	-	-
650	-	0 to 5 [a]	-	-	-
300	0 to 10	-	-	-	-
200	0 to 5 [a]	-	-	-	

[a] Fragments.

4.3 Shape

4.3.1 Length-to-thickness ratio

The percentage of pieces of armourstone with a length to thickness ratio greater than 3 shall be determined in accordance with EN 13383-2:2013, Clause 7.

NOTE Guidance on the determination of shape information required for design is given in Annex F.

4.3.2 Coarse gradings

The percentage of pieces of armourstone with a length to thickness ratio greater than 3 shall conform to the relevant requirements (or the producer's declaration for category $LT_{Declared}$) specified in Table 6 for the selected category, when tested as specified in 4.3.1.

4.3.3 Light gradings

The percentage of pieces of armourstone with a length to thickness ratio greater than 3 shall conform to the relevant requirements (or the producer's declaration for category $LT_{Declared}$) specified in Table 6 for the selected category, when tested as specified in 4.3.1.