

# SVENSK STANDARD

## SS 137003:2015



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### **Betong – Användning av EN 206 i Sverige**

### **Concrete – Application of EN 206 in Sweden**

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## SS 137003:2015 (Eng)

### Introduction

This standard supplements SS-EN 206:2013 and is intended to be used in combination with that standard. The concrete standard SS-EN 206:2013 is the result of an extensive and complex process. For the standard to be applicable throughout Europe, it contains options for certain items, and in some cases, references to "provisions valid in the place of use". Each country therefore needs to specify the level/class/value according to SS-EN 206:2013 that is appropriate to ensure that the concrete fulfils the requirements on construction works in the country, and also to provide more detailed or supplementary specifications. Annex M of SS-EN 206:2013 lists all clauses of the standard that contain the concept "Provisions valid at the place of use". It is however possible to make precisions and supplementary specifications in other clauses passages of the standard than those listed in Annex M.

Such choices and supplementary specifications are specified in this standard, SS 137003, which follows the structure of SS-EN 206:2013. Where Swedish options and supplementary specifications appear, in a certain clause or annex, all overarching headings have been included. Titles of clauses in SS-EN 206:2013 that are not dealt with in this standard have not been included. The numbering of tables does not follow SS-EN 206:2013 but is made in a numerical sequence which is specific for this standard. This standard also introduces national annexes which do not exist in SS-EN 206:2013, namely annexes N, O, P and Q.

The main changes in relation to edition 4 are:

- Clause 2, Normative references, has been updated;
- Clause 5.1.2 has been updated with regard to changes in the cement standard SS-EN 197-1, SS 134202, SS 134203 and SS 134204;
- The table listing approved cements in Clause 5.1.2 has been deleted;
- The requirements on aggregates have been updated to edition SS-EN 12620+A1:2008 of the aggregate standard (Clause 5.1.3, Table 3);
- Introduction of requirements for two types of recycled aggregate (A and B) and their use in concrete (Clause 5.3.2.4 and Tables 3 and 6);
- Introduction of a possibility to demonstrate the freeze/thaw resistance of coarse aggregate by testing when the water absorption is higher than 1 % (Table 3);
- Clarification of the requirements on and the specification of test methods to be used to investigate the alkali-silica reactivity of the aggregate, for concrete to be used in humid and alkaline environments (Table 3). The requirements on the concrete regarding this aspect have been moved to Clause 5.2.3.5;
- Clauses 5.1.6 (2) and 5.2.5.2.3 have been updated to a new version of the silica fume standard SS-EN 13263-1;
- Introduction of a possibility to test the alkali-silica reactivity of the concrete as an alternative to testing the alkali-silica reactivity of the aggregate, and a reference to the new Annex Q (Clause 5.2.3.5);
- Clarification regarding the frequency of tests needed for increased k-value for fly ash and slag in Clauses 5.2.5.2.2 and 5.2.5.2.4;
- The text about k-values in connection with CEM II/A has been deleted as this is dealt with in SS-EN 206:2013 (Clauses 5.2.5.2.2 and 5.2.5.2.3);
- Introduction of the possibility to apply the equivalent performance of combinations concept in Clause 5.2.5.4 with reference to Annexes O and P;

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- Revision of Table 8 in Clause 5.3.2. Besides the editorial changes, such as splitting the former table into two tables, Tables 8a and 8b, the changes primarily consist in expanding the allowed cement types and amounts of additions in exposure classes X0, XD and XS;
- Introduction of a minimum area to be freeze/thaw tested in Clause 8.1(2);
- Tolerance requirements for air content, when the freeze/thaw resistance is determined by freeze/thaw testing, have been specified in Clause 8.2.3.3;
- The competence requirements for the production of concrete have been moved from SS 137006:2012 to Clause 9.6.1;
- The requirements on batching equipment have been deleted as these are dealt with in SS-EN 206:2013;
- A new normative Annex O on the application of the equivalent performance of combinations concept (EPCC);
- A new informative Annex P, providing examples of how the equivalent performance of combinations concept (EPCC) can be applied;
- A new normative Annex Q for characterisation of the environment of the concrete with regard to the risk for alkali-silica reactions;
- A new informative Annex R provides guidance on admixtures that are not covered by SS-EN 934-2.

## SS 137003:2015 (Eng)

### 1 Scope

This standard

- provides supplementary Swedish requirements, advice and recommendations, where such are required or permitted according to SS-EN 206-1, and also what is permitted according to SS-EN 450-1, SS-EN 12620 and SS-EN 13055-1;
- provides instructions concerning the application of the informative annexes in SS-EN 206:2013;
- provides non-contradictory supplementary information aimed at facilitating the application of SS-EN 206:2013 in Sweden.

### 2 Normative references

This standard refers to the following documents that are indispensable for the application of this standard. For dated references, only the specified edition applies. For undated references, the latest edition of the document (including any amendments) applies.

SS-EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

SS-EN 206:2013, *Concrete — Part 1: Specification performance, production and conformity*

SS-EN 450-1, *Fly ash for concrete — Part 1: Definition, specifications and conformity criteria*

SS-EN 450-2, *Fly ash for concrete — Part 2: Conformity evaluation*

SS-EN 933-10, *Geometrical properties. Tests for general properties of aggregates*

SS-EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures - Definitions, requirements, conformity, marking and labelling*

SS-EN 1744-1, *Tests for chemical properties of aggregates — Part 1: Chemical analysis*

EN 12390-4, *Testing hardened concrete — Part 4: Compressive strength - Specification for testing machines*

EN 12620+A1:2008, *Aggregates for concrete*

EN 13055-1:2003, *Lightweight aggregates — Part 1: Lightweight aggregates for concrete, mortar and grout*

EN 13263-1, *Silica fume for concrete — Part 1: Definitions, requirements and conformity criteria*

SS-EN 1367-6, *Aggregate -Durability requirements - Part 6: Determination of frost resistance by freeze-thaw testing with salt solution (NaCl)*

EN 15167-1, *Ground granulated blast furnace slag for use in concrete, mortar and grout — Part 1: Definitions, specifications and conformity criteria*

EN 15167-2, *Ground granulated blast furnace slag for use in concrete, mortar and grout — Part 2: Conformity evaluation*

SS 134202, *Cement - Composition and requirements for cement with moderate heat of hydration*

SS 134203 *Cement - Composition and requirements for low alkali cements*

SS 134204 *Cement - Composition and requirements for national sulphate resisting ordinary cements*



SS 137002 *Standardized prescribed concrete*

SS 137244 *Concrete testing - Hardened concrete - Scaling at freezing*

*CBI report 4:92, Björn Lagerblad, Jan Trägårdh, 1992, "Alkalisilikareaktioner i svensk betong"*

### **3 Terms, definitions, symbols and abbreviations**

For the purposes of this document, the terms, definitions, symbols and abbreviations given in SS-EN 206:2013 apply.

## **4 Classification**

### **4.1 Exposure classes related to environmental actions**

(1)

NOTE to NOTE 1. Guidance on determining appropriate exposure classes for concrete structures is given in "Betongrapport no. 11" [1].

(2)

NOTE 1 to (2) and to NOTE 3. Examples of exposure environments where chemical attacks can occur, which cannot be related to the classes in Table 1 are: biological treatment plants, biogas and composting plants, industrial plants, timber drying plants, sewage pipes, certain agricultural appliances, chimneys, parts of wastewater treatment plants.

NOTE 2 to (2) and to NOTE 3. When a special investigation is to be conducted, certain data may be obtained from "Betonghandboken Material" [2]. The investigation should be carried out by an expert with long experience within this area.

### **4.3 Classes for properties of hardened concrete**

#### **4.3.1 Classes for compressive strength**

(1)

NOTE to NOTE The intermediate compressive strength classes set out in Table 1 can be used, see SS-EN 206:2013 Annex L, row 2. They are adapted to structural design according to Swedish practice.

**Table 1 – Intermediate compressive strength classes**

<b>Compressive strength class</b>	<b>Minimum characteristic cylinder strength <i>f<sub>ck, cyl</sub></i> MPa</b>	<b>Minimum characteristic * cube strength <i>f<sub>ck, cube</sub></i> MPa</b>
C28/35	28	35
C32/40	32	40
C54/65	54	65
C58/70	58	70

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### 5 Requirements for concrete and methods of verification

#### 5.1 Basic requirements for constituents

##### 5.1.1 General

NOTE 1 to (2). The requirements for constituents with a demonstrated suitability are contained in Clauses 5.1.2 to 5.1.7.

##### 5.1.2 Cement

(1) General suitability is established for cements conforming to SS-EN 197-1. Cements in SS-EN 197-1 which have a demonstrated suitability for different exposure classes according to this standard are listed in Table 8b. Cements under SS-EN 197-1 which also fulfil the requirements of the national standards SS 134202, SS 134203 and SS 134204 may be used in accordance with this standard.

NOTE 1 to (1). Recommendations regarding investigations and evaluations of cement types, for which a demonstrated suitability for the exposure class in question have not been established, are listed in Annex N.

(2) Cement with a total aluminate ( $Al_2O_3$ ) content of more than a mass fraction of 25 %, for example calcium aluminate cement according to SS-EN 14547, shall not be used as binder in concrete for load-bearing structures according to this standard.

##### 5.1.3 Aggregates

(1) and (2)

Aggregates shall fulfil the requirements under SS-EN 12620+A1 and the requirements in Table 3.

The petrographic description of an aggregate in accordance with SS-EN 12620 should contain a statement on the aggregate's suitability as a concrete aggregate. It is therefore recommended that RILEM AAR 1 [3], or an equivalent method, is used for the petrographic analysis instead of SS-EN 932-3 [4]. See also Clause 5.7.3 of Table 3.

NOTE RILEM AAR 1 is developed especially for aggregate for mortar and concrete.

Lightweight aggregate must also fulfil the requirements under EN 13055-1 and the requirements in Table 4.

Table 3 – Requirements for aggregate and recycled aggregate<sup>a)</sup> according to SS-EN 12620+A1:2008.

Clause in EN 12620 +A1:2008	Property	Need for information on performance in the declaration of performance (DoP) <sup>b)</sup>	Performance requirements <sup>e)</sup>	Note
4.2	Aggregate sizes	Yes		
4.3	Grading	Yes, based on dry sieving after washing.		
4.4	Shape of coarse aggregate - Flakiness index ( <i>FI</i> ) and <i>LT</i> -index	Yes, for recycled aggregate <sup>d)</sup> . <i>FI</i> shall be declared. Not for other aggregate types.	For recycled aggregate of Type B, the flakiness index shall be $\leq FI_{40}$ .	For certain applications, requirements as to the flakiness index and the <i>LT</i> - index may be added.
4.5	Shell content of coarse aggregate	Yes, if the origin of the aggregate is such that it can be presumed to contain hard shells; for example aggregates from marine sources.	In such cases the shell content shall not exceed class $SC_{10}$	Declaration is normally not necessary for aggregate of Swedish primary rock material; i.e. $NPD$ or $SC_{NR}$ may be used.
4.6	Fines content	Yes, based on dry sieving after washing.		
4.7	Fines quality	This property is not included among those which shall or can be declared in the DoP according to Annex ZA.	All-in aggregate or natural graded aggregate 0/8 with more than 3 % fine material should only be used if documented good experiences of the aggregate exist or if it has been shown in an initial test that the properties of the concrete is not adversely affected.	Since there is little experience of sand equivalent value and methylene blue test on fine aggregate in Sweden, no limit values for these parameters can be given.
5.2	Resistance to fragmentation of coarse aggregate	No		For certain applications, requirements on Los Angeles coefficients may be added. In Sweden there is no experience with impact values.