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Date: 15 August 2024

Origin: European

Latest date for receipt of comments: 08 October 2024

Project No. 2024/01489

Responsible committee: B/517/1 Concrete production and testing

Interested committees:

Title: Draft BS EN 206-1 BS Concrete - Specification, performance, production and conformity. Part 1: Performance, requirements, factory production control and assessment criteria for individual values.

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- iii) requires additional national guidance or information

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Full document details: 24/30493230 DC

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Concrete - Specification, performance, production and
conformity - Part 1: Performance, requirements, factory
production control and assessment criteria for individual
values

Béton - Spécification, performances, production et
conformité - Partie 1 : Performances, exigences,
contrôle de la production en usine et critères
d'évaluation des valeurs individuelles

Beton - Festlegung, Eigenschaften, Herstellung und
Konformität - Teil 1: Eigenschaften, Anforderungen,
werkseigene Produktionskontrolle und
Bewertungskriterien für einzelne Werte

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 104.

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.

This draft European Standard was established by CEN 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

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Contents	Page
European foreword	4
0 Introduction.....	5
1 Scope.....	9
2 Normative references.....	9
3 Terms and definitions	11
3.1 General.....	11
3.2 Constituents	15
3.3 Fresh concrete.....	17
3.4 Hardened concrete	19
3.5 Conformity and production control	20
4 Symbols and abbreviations	20
5 Classification.....	22
5.1 Exposure classes related to environmental actions.....	22
5.2 Classes for properties of fresh concrete	22
5.3 Classes for properties of hardened concrete	25
5.4 Classes regarding CO ₂ emissions	27
6 Requirements for concrete and methods of verification	28
6.1 Basic requirements for constituents	28
6.2 Basic requirements for composition of concrete	30
6.3 Requirements related to exposure classes.....	35
6.4 Requirements for fresh concrete	36
6.5 Requirements for hardened concrete	38
7 Specification of concrete	40
7.1 General.....	40
7.2 Specification for designed concrete	41
7.3 Specification for prescribed concrete	42
7.4 Specification of standardized prescribed concrete	43
8 Delivery of fresh concrete.....	43
8.1 Information from the user of the concrete to the producer	43
8.2 Information from the producer of the concrete to the user	43
8.3 Delivery ticket for ready-mixed concrete	44
8.4 Delivery information for site-mixed concrete.....	46
8.5 Mix adjustments after the main mixing process and prior to discharge	46
9 Factory Production control	46
9.1 General.....	46
9.2 Production control systems	47
9.3 Recorded data and other documentation	47
9.4 Testing	48
9.5 Concrete composition and initial type testing	48
9.6 Personnel, equipment and installation.....	49
9.7 Batching of constituents.....	50
9.8 Mixing of concrete	50
9.9 Production control procedures	51

10	Assessment criteria for individual values	58
10.1	Assessment criteria for compressive strength	58
10.2	Assessment criteria for tensile splitting strength	58
10.3	Assessment criteria for properties other than strength	58
11	Designation for designed concrete.....	61
	Annex A (normative) Initial Type Test.....	62
	Annex B (informative) Concrete families.....	65
	Annex C (informative) Exposure classes from EN 1992-1-1.....	67
	Annex D (informative) Guidelines for self-compacting concrete requirements in the fresh state	71
	Annex E (informative) Recommendation for the use of aggregates.....	73
	Annex F (informative) Limiting values of concrete composition	76
	Annex G (informative) Guidance on reference concrete	78
	Bibliography	80

European foreword

This document (prEN 206-1:2024) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by SN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 206:2013+A2:2021.

In particular, the following main items had been subject to revision when preparing prEN 206-1:2024:

- a) Moving all aspects concerning conformity assessment and certification into a separate part EN 206-2;
- b) Annex D on concrete for geotechnical purposes has been moved to a separate part EN 206-3;
- c) Opening for national provisions on exposure resistance classes;
- d) Included new terminology for binder;
- e) Annex M “Guidance on provisions valid in the place of use” moved to Introduction;
- f) Annex L “Additional information for specific clauses” included in main text where appropriate;
- g) Informative content in Clause 5.1 “Exposure classes” moved to informative Annex C;
- h) New Clause 5.4 “Classes regarding CO₂ emissions”;
- i) General updates to align with revised EN 1992-1-1:2023;
- j) General editorial changes.

This document forms part of three European Standards, written by CEN/TC 104 and covering specification, performance, production and conformity of concrete.

- Concrete — Specification, performance, production and conformity — Part 1: Performance, requirements, factory production control and assessment criteria for individual values.
- Concrete — Specification, performance, production and conformity — Part 2: Conformity assessment and certification.
- Concrete — Specification, performance, production and conformity — Part 3: Additional requirements for specification and conformity of concrete for special geotechnical works

0 Introduction

0.1 Introduction to EN 206-1

(1) This document defines tasks for the specifier, producer and user.

(2) If the concrete is in conformity with this document, the concrete in the structure is deemed to satisfy the durability requirements for the intended use in the specific environmental condition, provided:

- the appropriate exposure classes were selected;
- the concrete has the minimum cover to reinforcement in accordance with the relevant design standard required for the specific environmental condition, e.g. EN 1992-1-1;
- the concrete is properly placed, compacted and cured, e.g. in accordance with EN 13670 or other relevant standards;
- the appropriate maintenance is applied during the service life.

(3) Concrete conforming to this document may be assumed to satisfy the basic requirements for materials to be used in all three Execution Classes as defined in EN 13670.

(4) This document also covers the necessary exchange of information between the different parties. Contractual matters are not addressed. Where responsibilities are given for parties involved, these are technical responsibilities.

(5) Further explanations and guidance on the application of this document are given in other documents, such as CEN Technical Reports.

(6) This standard is written in accordance with CEN policy based on the neutrality principle, which requires that all documents to be written in a way such that conformity with the specified requirements can be assessed by a manufacturer or supplier (first party), a user or purchaser (second party), or an independent body (third party). In particular the CEN philosophy of writing 'Product Standards' is adopted in that the standard gives normative requirements on the product, and not on any party involved in the manufacturing, testing or distribution of the product.

(7) Figure 1 illustrates the relationships between EN 206 and standards for design and execution, standards for constituents and test standards.

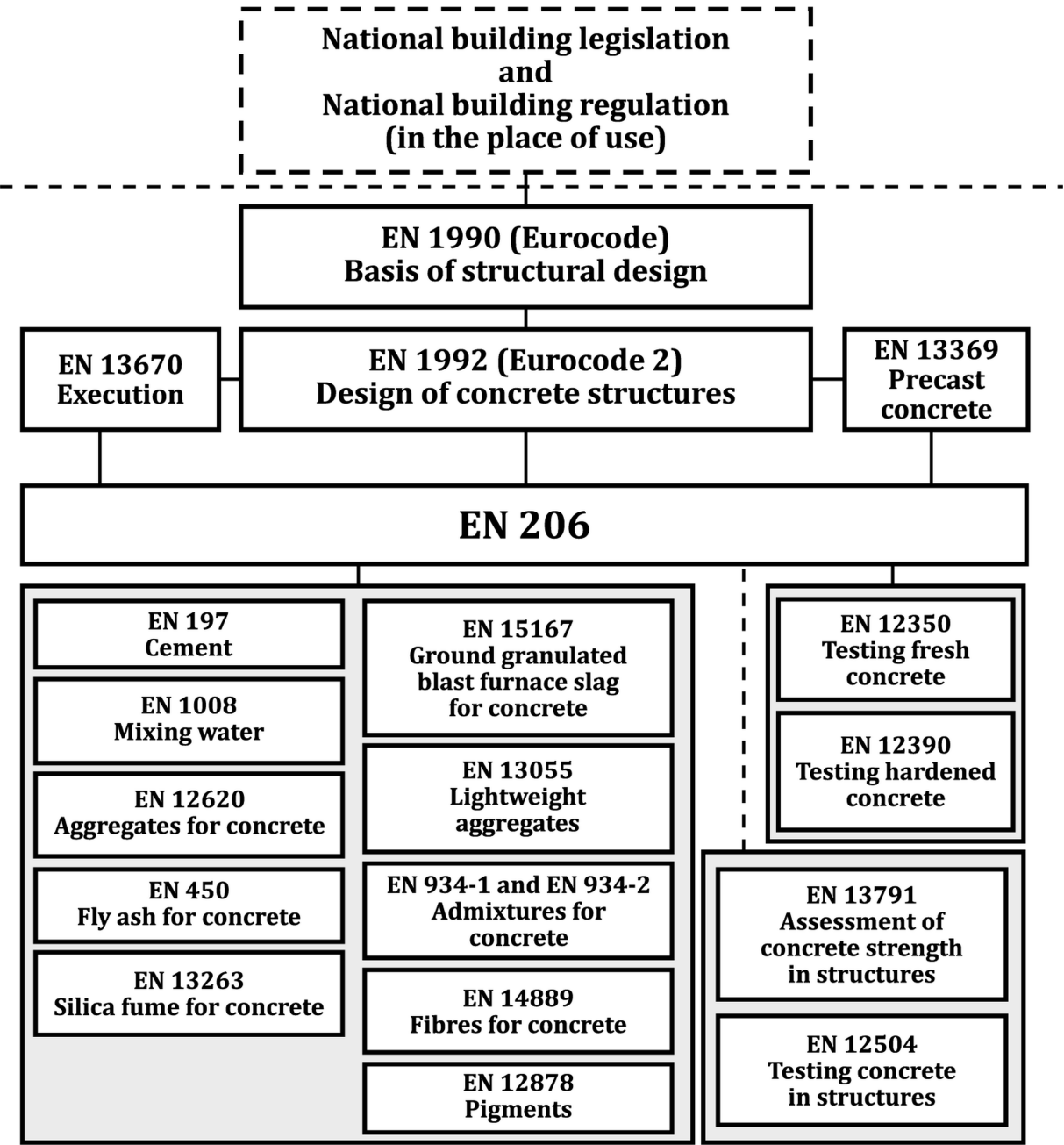


Figure 1 — Relationships between EN 206 and standards for design and execution, standards for constituents and test standards

(8) Figure 2 illustrates the procedure for assessment of concrete in EN 206.

Assessments in EN 206

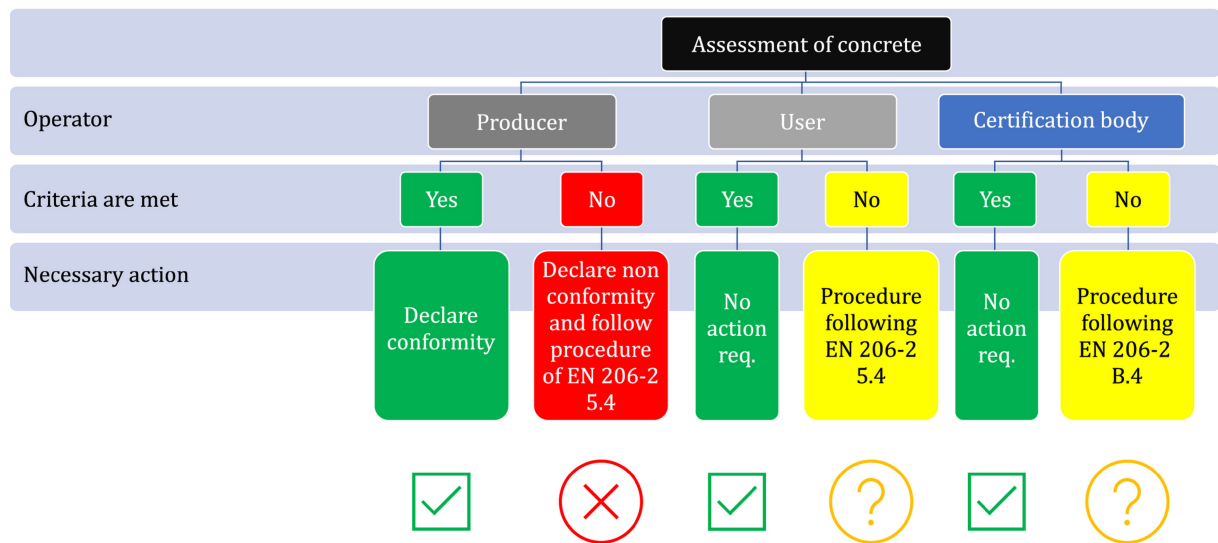


Figure 2 Assessment of concrete in EN 206

(9) Provisions for specific products e.g. precast products are given in other European standards for specific products.

(10) Provisions for specific applications are given in other European Standards, for example:

- concrete to be used in roads and other trafficked areas (e.g. concrete pavements according to EN 13877-1);
- special technologies (e.g. sprayed concrete according to EN 14487).

(11) Supplementing requirements or different testing procedures are given in some member states for specific types of concrete and applications, for example:

- concrete for massive structures (e.g. dams);
- dry mixed concrete;
- concrete with a $D_{\max}$ of 4 mm or less (mortar);
- self-compacting concretes (SCC) containing lightweight or heavy-weight aggregates or fibres;
- concrete with open structure (e.g. pervious concrete for drainage).

0.2 Provisions valid in the place of use for EN 206-1

(1) This document will be applied under different climatic and geographical conditions, different levels of protection and under different, well established, regional traditions and experience. Classes for concrete properties have been introduced to cover these situations. Where such general solutions were not possible, the relevant clauses contain permission for the application of provisions valid in the place of use of the concrete.

(2) National choice is allowed in this document where explicitly stated that provisions valid in the place of use may be given.

(3) The national standard implementing EN 206-1 can have a National Annex or complementary standard containing all national choices to be used in the relevant country.

(4) National choice is allowed in EN 206-1 in the following:

5.3.3 (1)	5.4.1 (2)	5.4.1 (3)	5.4.1 (4)
6.1.1 (2)	6.1.2 (2)	6.1.3 (1)	6.1.3 (2)
6.1.3 (3)	6.1.5 (2)	6.2.1 (2)	6.2.1 (5)
6.2.3.4 (2)	6.2.3.5 (1)	6.2.5.1 (1)	6.2.5.1 (4)
6.2.5.1 (8)	6.2.5.2.3 (5)	6.2.5.2.4 (1)	6.2.5.3 (4)
6.2.8 Table 14 Footnote a	6.2.8 Table 14 Footnote c	6.3.1 (2)	6.3.2 (3)
6.3.3 (2)	6.4.2 (4)	6.5.1.4 (1)	7.1 (3)
7.4 (2)	8.2 (4)	9.4 (2)	9.5 (4)
9.7 (2)	9.9.2 Table 21 Note d	9.9.4 Table 22 Line 3	10.2 Table 25 Note a
A.1 (3)	A.3 (3)		

(5) National choice is allowed in EN 206-1 on the application of the following informative annexes:

Annex B

Annex E

Annex F

NOTE The National Annex can contain, directly or by reference, non-contradictory complementary information for ease of implementation, provided it does not alter any provisions of this document.

1 Scope

(1) This document applies to concrete for structures cast *in situ*, precast structures, and structural precast products for buildings and civil engineering structures.

(2) The concrete under this document can be:

- normal-weight, heavy-weight and lightweight;
- mixed on site, ready-mixed or produced in a plant for precast concrete products;
- compacted or self-compacting to retain no appreciable amount of entrapped air other than entrained air.

(3) This document specifies requirements for:

- the constituents of concrete;
- the properties of fresh and hardened concrete;
- the limitations for concrete composition;
- the specification of concrete;
- the delivery of fresh concrete,
- the production control procedures;
- the assessment criteria for individual values.

(4) This document does not apply to:

- aerated concrete;
- foamed concrete;
- concrete with density less than 800 kg/m³;
- refractory concrete.

(5) This document does not cover health and safety requirements for the protection of workers during production and delivery of concrete.

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

EN 197-5, *Cement - Part 5: Portland-composite cement CEM II/C-M and Composite cement CEM VI*

EN 934-1, *Admixtures for concrete, mortar and grout - Part 1: Common requirements*

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

EN 1008, *Mixing water for concrete - Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1097-3, *Tests for mechanical and physical properties of aggregates - Part 3: Determination of loose bulk density and voids*

EN 1097-6:2022, *Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption*

EN 12350-1, *Testing fresh concrete - Part 1: Sampling and common apparatus*

EN 12350-2, *Testing fresh concrete - Part 2: Slump test*

EN 12350-4, *Testing fresh concrete - Part 4: Degree of compactability*

EN 12350-5, *Testing fresh concrete - Part 5: Flow table test*

EN 12350-6, *Testing fresh concrete - Part 6: Density*

EN 12350-7, *Testing fresh concrete - Part 7: Air content - Pressure methods*

EN 12350-8, *Testing fresh concrete - Part 8: Self-compacting concrete - Slump-flow test*

EN 12350-9, *Testing fresh concrete - Part 9: Self-compacting concrete - V-funnel test*

EN 12350-10, *Testing fresh concrete - Part 10: Self-compacting concrete - L box test*

EN 12350-11, *Testing fresh concrete - Part 11: Self-compacting concrete - Sieve segregation test*

EN 12350-12, *Testing fresh concrete - Part 12: Self-compacting concrete - J-ring test*

EN 12390-1, *Testing hardened concrete - Part 1: Shape, dimensions and other requirements for specimens and moulds*

EN 12390-2, *Testing hardened concrete - Part 2: Making and curing specimens for strength tests*

EN 12390-3, *Testing hardened concrete - Part 3: Compressive strength of test specimens*

EN 12390-6, *Testing hardened concrete - Part 6: Tensile splitting strength of test specimens*

EN 12390-7, *Testing hardened concrete - Part 7: Density of hardened concrete*

EN 12620, *Aggregates for concrete*

EN 12878, *Pigments for the colouring of building materials based on cement and/or lime - Specifications and methods of test*

EN 13055,¹ *Lightweight aggregates*

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

EN 14216, *Cement - Composition, specifications and conformity criteria for very low heat special cements*

¹ Note that the latest version of EN 13055:2016 is non-harmonized.

EN 14488-7, *Testing sprayed concrete - Part 7: Fibre content of fibre reinforced concrete*

EN 14721, *Test method for metallic fibre concrete — Measuring the fibre content in fresh and hardened concrete*

EN 14889-1, *Fibres for concrete - Part 1: Steel fibres - Definitions, specifications and conformity*

EN 14889-2, *Fibres for concrete - Part 2: Polymer fibres - Definitions, specifications and conformity*

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

ASTM C 173, *Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method*

3 Terms and definitions

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

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 General

3.1.1

binder

fr:

de:

cement, or any combination of one or more cement with or without additions that can be accounted for in the calculation of equivalent binder

3.1.2

concrete

fr: béton

de: Beton

material formed by mixing cement, coarse and fine aggregate and water, with or without the incorporation of admixtures, additions or fibres, which develops its properties by hydration

3.1.3

concrete family

fr: famille de bétons

de: Betonfamilie

group of concrete compositions for which a reliable relationship between relevant properties is established and documented

3.1.4

concrete specification

fr: spécification du béton

de: Festlegung

final compilation of documented technical requirements given to the producer in terms of performance or composition

3.1.5

concrete with fibres

fr:

de:

concrete where fibres are introduced as one of the constituents to provide special characteristics, such as post-cracking strength, mitigation of restrained shrinkage-induced cracking, prevention of fire-induced spalling etc

3.1.6

delivery

fr: livraison

de: Lieferung

process of handing over the fresh concrete by the producer

3.1.7

designed concrete

fr: béton à propriétés spécifiées

de: Beton nach Eigenschaften

concrete for which the required properties and additional characteristics if any are specified to the producer who is responsible for providing a concrete conforming to the required properties and additional characteristics

3.1.8

design service life

fr: durée de vie de projet

de: Bemessungslebensdauer

assumed period for which a structure or a part of it is to be used for its intended purpose with anticipated maintenance but without major repair being necessary

3.1.9

document

fr: document

de: Dokument

information and its supporting medium, which can be paper, magnetic, electronic or optical computer disc, photograph or reference sample or a combination thereof

3.1.10

environmental actions

fr: actions dues à l'environnement

de: Umwelteinflüsse

those chemical and physical actions to which the concrete is exposed and which result in effects on the concrete or reinforcement or embedded metal that are not considered as loads in structural design

3.1.11

equivalent binder

fr:

de:

equivalent mass of binder per cubic metre of concrete calculated from the effective mass of the cement and the effective mass of addition using the k-value concept or EPCC (see 5.2.5.2 and 5.2.5.4)

3.1.12**exposure resistance classes****fr: xxx****de: xxx**

classes for defining the resistance of concrete against corrosion induced by carbonation (XRC) or by chlorides (XRDS) and damage caused by freeze/thaw attack (XRF)

[SOURCE: EN 1992-1-1:2023, 3.130]

3.1.13**ERC concrete****fr: xxx****de: xxx**

concrete classified in relation to Exposure Resistance Classes

3.1.14**fibre-reinforced concrete****fr: xxx****de: xxx**

concrete with fibres where fibres are introduced as one of the constituents to provide post-cracking strength that can be considered for structural design

3.1.15**precast element****fr: esista préfabriqué****de: Fertigteil**

concrete element cast and cured in a place other than the final location of use (factory produced or site manufactured)

3.1.16**precast product****fr: produit préfabriqué****de: Fertigteil**

precast element manufactured in compliance with the relevant European product standard

3.1.17**prescribed concrete****fr: béton à composition prescrite****de: Beton nach Zusammensetzung**

concrete for which the composition of the concrete and the constituent materials to be used are specified to the producer who is responsible for providing a concrete with the specified composition

3.1.18**producer****fr: producteur****de: Hersteller**

person or body producing fresh concrete

3.1.19

provisions valid in the place of use

fr: dispositions en vigueur sur le lieu d'utilisation du béton

de: am Ort der Verwendung geltende Regeln

national provisions given in a National Foreword or National Annex to this European Standard, or in a complementary national standard to this European Standard applicable in the place of use of the concrete

3.1.20

ready-mixed concrete

fr: béton prêt à l'emploi

de: Transportbeton

concrete delivered in a fresh state by a person or body who is not the user

Note 1 to entry: In the sense of this document it is also:

- concrete produced off site by the user;
- concrete produced on site, but not by the user.

3.1.21

self-compacting concrete (SCC)

fr: béton auto-plaçant

de: selbstverdichtender Beton

concrete that is able to flow and compact under its own weight, fill the formwork with its reinforcement, ducts, boxouts etc., whilst maintaining homogeneity

3.1.22

site-mixed concrete

fr: béton de chantier

de: Baustellenbeton

concrete produced on the construction site by the user of the concrete

3.1.23

site (construction site)

fr: chantier (chantier de construction)

de: Baustelle

area where the construction work is undertaken

3.1.24

specifier

fr: prescripteur

de: Verfasser der Festlegung

person or body establishing the specification for fresh and hardened concrete

3.1.1.25

standardized prescribed concrete

fr: béton à composition prescrite dans une norme

de: Standardbeton

prescribed concrete for which the composition is given in a standard valid in the place of use of the concrete

3.2.26**total binder****fr:****de:**

cement, or any combination of one or more cement with or without additions

3.2 Constituents**3.2.1****addition****fr: addition****de: Betonzusatzstoff**

finely divided inorganic constituent used in concrete to improve certain properties or to achieve special properties

3.2.2**admixture****fr: adjuvant****de: Betonzusatzmittel**

constituent added during the mixing process in small quantities related to the mass of cement to modify the properties of fresh or hardened concrete

3.2.3**aggregate****fr: granulat****de: Gesteinskörnung**

natural, artificial, reclaimed or recycled granular mineral constituent suitable for use in concrete

3.2.4**all-in aggregate****fr: grave****de: Gesteinskörnungsgemisch**aggregate consisting of a mixture of coarse and fine aggregates with D greater than 4 mm and $d = 0$ **3.2.5****aggregate size****fr: classe granulaire****de: Korngröße**designation of aggregate in terms of lower (d) and upper (D) sieve sizes expressed as d / D **3.2.8****cement****fr: ciment****de: Zement**

finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and processes (see 6.1.2)

3.2.9**finer in concrete****fr: fines du béton****de: Mehlkorn**

sum of solid materials in fresh concrete with particle sizes less than or equal to 0,125 mm

3.2.10

heavy-weight aggregate

fr: granulat lourds

de: schwere Gesteinskörnung

aggregate in the oven-dry condition having a particle density $\geq 3\,000\text{ kg/m}^3$ when determined according to EN 1097-6

3.2.11

lightweight aggregate

fr: granulat légers

de: leichte Gesteinskörnung

aggregate of mineral origin in the oven-dry condition having a particle density $\leq 2\,000\text{ kg/m}^3$ when determined according to EN 1097-6 or a loose oven-dry bulk density $\leq 1\,200\text{ kg/m}^3$ when determined according to EN 1097-3

3.2.12

normal-weight aggregate

fr: granulat courant

de: normale Gesteinskörnung

aggregate in the oven-dry condition with a particle density $> 2\,000\text{ kg/m}^3$ and $< 3\,000\text{ kg/m}^3$, when determined according to EN 1097-6

3.2.13

polymer fibres

fr: fibres polymères

de: Polymerfasern

straight or deformed pieces of extruded, orientated and cut material, which are suitable to be homogeneously mixed into concrete

[SOURCE: EN 14889-2:2006, 3.2]

3.2.14

reclaimed washed aggregate

fr: granulats récupérés par lavage

de: wiedergewonnene gewaschene Gesteinskörnung

aggregates gained by washing fresh concrete

3.2.15

reclaimed crushed aggregate

fr: granulat récupérés par concassage

de: wiedergewonnene gebrochene Gesteinskörnung

aggregate gained by crushing hardened concrete that has not been previously used in construction

3.2.16

recycled aggregate

fr: gravillon recyclé

de: grobe rezyklierte Gesteinskörnung

aggregate resulting from the processing of inorganic material previously used in construction

3.2.17**steel fibres****fr: fibres d'acier****de: Stahlfasern**

straight or deformed pieces of cold-drawn steel wire, straight or deformed cut sheet fibres, melt extracted fibres, shaved cold drawn wire fibres or fibres milled from steel blocks, which are suitable to be homogeneously mixed into concrete

[SOURCE: adopted from EN 14889-1:2006, 3.1]

3.3 Fresh concrete**3.3.1****agitating equipment****fr: cuve agitatrice****de: Rührwerk**

equipment generally mounted on a self-propelled chassis and capable of maintaining fresh concrete in a homogeneous state during transport

3.3.2**batch****fr: gâchée****de: Charge**

quantity of fresh concrete produced in one cycle of operations of a mixer or the quantity discharged during 1 min from a continuous mixer

3.3.3**cubic metre of concrete****fr: mètre cube de béton****de: Kubikmeter Beton**

quantity of fresh concrete which, when compacted in accordance with the procedure given in EN 12350-6, occupies a volume of 1 m³

3.3.4**entrained air****fr: air entraîné****de: künstliche Luftporen**

microscopic air bubbles intentionally incorporated in concrete during mixing, usually by use of a surface active agent; typically between 10 µm and 300 µm in diameter and spherical or nearly so

3.3.5**entrapped air****fr: air occlus****de: Lufteinschlüsse**

air voids in concrete which are not purposely entrained

3.3.6**fresh concrete****fr: béton frais****de: Frischbeton**

concrete which is fully mixed and still in a condition that is capable of being compacted by the chosen method

3.3.7

load

fr: charge

de: Ladung

quantity of concrete transported in a vehicle comprising one or more batches

3.3.8

non-agitating equipment

fr: cuve non agitatrice

de: Ausrüstung ohne Rührwerk

equipment used for transporting concrete without *agitation* (3.3.1)

EXAMPLE dump truck or transport hopper

3.3.9

passing ability

fr: aptitude à l'écoulement

de: Blockierneigung

ability of fresh concrete to flow through tight openings such as spaces between steel reinforcing bars without segregation or blocking

3.3.10

segregation resistance

fr: résistance à la ségrégation

de: Sedimentationsstabilität

ability of fresh concrete to remain homogeneous in composition while in its fresh state

3.3.11

slump

fr:

de:

distance fresh concrete has slumped after demoulding from a standardized slump cone

3.3.12

slump-flow

fr: étalement au cône d'Abrams

de: Setzfließmaß

mean diameter of the spread of fresh concrete from a standardized slump cone

3.3.13

truck mixer

fr: camion malaxeur

de: Fahrmischer

concrete mixer mounted on a self-propelled chassis capable of mixing and delivering a homogeneous concrete

3.3.14

viscosity of concrete

fr: viscosité apparente

de: Viskosität

resistance to flow of fresh concrete once flow has started

3.3.15**water content****fr:****de:**

the effective (free) water content, assumed to be the total water content minus the absorbed water in the aggregate

Note to entry: water content will vary depending on the amount of free water and absorption properties of the aggregate

3.3.16**water/equivalent binder ratio****fr:****de:**

ratio of the water content to equivalent binder content by mass in the fresh concrete using the k-value concept or EPCC (see 5.2.5.2 and 5.2.5.4)

3.3.17**water/ total binder ratio****fr:****de:**

ratio of the water content to total binder content by mass in the fresh concrete using the ERC-concept

3.4 Hardened concrete**3.4.1****lightweight concrete****fr: béton léger****de: Leichtbeton**

concrete in the oven-dry condition having a density of not less than 800 kg/m³ and not more than 2 000 kg/m³

3.4.2**hardened concrete****fr: béton durci****de: Festbeton**

concrete that is in a solid state and which has developed a certain strength

3.4.3**heavy-weight concrete****fr: béton lourd****de: Schwerbeton**

concrete in the oven-dry condition having density greater than 2 600 kg/m³

3.4.4**normal-weight concrete****fr: béton de masse volumique normale****de: Normalbeton**

concrete in the oven-dry condition having a density greater than 2 000 kg/m³ but not exceeding 2 600 kg/m³

3.5 Conformity and production control

3.5.1

characteristic strength

fr: résistance caractéristique

de: charakteristische Festigkeit

value of strength below which 5 % of the population of all possible strength determinations of the volume of concrete under consideration, are expected to fall

3.5.5

compressive strength class

fr: classe de résistance à la compression

de: Druckfestigkeitsklasse

classification comprising the type of concrete (normal-weight and heavy-weight or lightweight), the minimum characteristic cylinder strength (150 mm diameter by 300 mm length)

3.5.6

conformity test

fr: essai de conformité

de: Konformitätsprüfung

test performed to assess conformity of the concrete

3.5.7

factory production control

permanent internal control of production exercised by the producer. It is the means by which the producer ensures that the performance declared is valid

3.5.8

initial type testing

fr: essai initial

de: Erstprüfung

set of tests and other procedures to check before the production starts how a new concrete or concrete family shall be composed in order to meet all the specified requirements in the fresh and hardened states

4 Symbols and abbreviations

For the purposes of this document, the following symbols apply.

X0	Exposure class for no risk of corrosion or attack
XC1 to XC4	Exposure classes for risk of corrosion induced by carbonation
XD1 to XD3	Exposure classes for risk of corrosion induced by chlorides other than from sea water
XS1 to XS3	Exposure classes for risk of corrosion induced by chlorides from sea water
XF1 to XF4	Exposure classes for risk of freeze/thaw attack
XA1 to XA3	Exposure classes for risk of chemical attack
S1 to S5	Consistence classes expressed by slump
C0 to C4	Consistence classes expressed by degree of compactability
F1 to F6	Consistence classes expressed by flow diameter
SF1 to SF3	Consistence classes expressed by slump-flow
VS1, VS2	Viscosity classes for the t500 time

VF1, VF2	Viscosity classes for the V-funnel flow time, t_v
t_{500}	Time in seconds to flow to a diameter of 500 mm in a slump-flow test
t_v	Time in seconds of the flow in a V-funnel test
PL1, PL2	Passing ability classes for the L-box-test
PJ1, PJ2	Passing ability classes for the J-ring-test
SR1, SR2	Segregation resistance classes
C.../...	Compressive strength classes in case of normal-weight and heavy-weight concrete
LC.../...	Compressive strength classes in case of lightweight concrete
SCC	Self-compacting concrete
ECPC	Equivalent concrete performance concept
EPCC	Equivalent performance of combinations concept
ERC	Exposure resistance class
f_{ck}	Characteristic compressive strength of concrete NOTE 1 Where used in this document this applies to both $f_{ck,cyl}$ and $f_{ck,cube}$.
$f_{ck,cyl}$	Characteristic compressive strength of concrete determined by testing cylinders
$f_{c,cyl}$	Compressive strength of concrete determined by testing cylinders
$f_{ck,cube}$	Characteristic compressive strength of concrete determined by testing cubes
$f_{c,cube}$	Compressive strength of concrete determined by testing cubes
f_{cm}	Mean compressive strength of concrete NOTE 2 Where used in this document this applies to both $f_{cm,cyl}$ and $f_{cm,cube}$.
$f_{cm,j}$	Mean compressive strength of concrete at the age of (j) days
f_{ci}	Individual test result for compressive strength of concrete
$f_{ctk,sp}$	Characteristic tensile splitting strength of concrete
$f_{ctm,sp}$	Mean tensile splitting strength of concrete
$f_{cti,sp}$	Individual test result for tensile splitting test of concrete
ggbs	Ground granulated blastfurnace slag
Cl, ...	Chloride class
D1,0 to D2,0	Density classes of lightweight concrete
D	Upper sieve size in an aggregate categorized as d / D NOTE 3 EN 12620 permits a defined percentage by mass of particles to be larger than 'D'.
D_{lower}	Smallest value of D for the coarsest fraction of aggregates in the concrete permitted by the specification of concrete
D_{upper}	Largest value of D for the coarsest fraction of aggregates in the concrete permitted by the specification of concrete
D_{max}	Declared value of D of the coarsest fraction of aggregates actually used in the concrete
CEM...	Cement type according to EN 197-1, EN 197-5 or EN 197-6
b_e	Equivalent binder
b_t	Total binder

w/b_e	Water/equivalent binder
w/b_t	Water/total binder
k	Factor which takes into account the activity of a addition
n	Number
ITT	Initial Type Testing

5 Classification

5.1 Exposure classes related to environmental actions

(1) The environmental exposure conditions are those chemical, physical and biological conditions to which the structure is exposed (additional to the mechanical actions). See Annex C.

5.2 Classes for properties of fresh concrete

5.2.1 Consistence classes

(1) Where concrete is classified with respect to consistence, Tables 1, 2, 3 and 4 apply. In the case of SCC, only the classes in Table 4 apply.

(2) Consistence may also be specified by a target value with tolerances as given in Table 25.

NOTE The classes of consistence in Tables 3 to 6 are not directly related. For earth moist concrete, i.e. concrete with low water content designed to be compacted in special processes, the consistence is not classified.

Table 1 — Slump classes

Class	Slump tested in accordance with EN 12350-2 mm
S1	10 to 40
S2	50 to 90
S3	100 to 150
S4	160 to 210
S5 ^a	≥ 220
^a The range of test sensitivity where EN 12350-2 has adequate sensitivity to confidently determine consistence ≥ 10 mm and ≤ 210 mm. For slump > 220mm, slump-flow might be a more useful method	

Table 2 — Compaction classes

Class	Degree of compactability tested in accordance with EN 12350-4
C0 ^a	≥ 1,46
C1	1,45 to 1,26
C2	1,25 to 1,11
C3	1,10 to 1,04
C4 ^b	< 1,04
^a The range of test sensitivity where EN 12350-4 has adequate sensitivity to confidently determine consistence ≥ 1,46 and < 1,04 ^b C4 applies only to lightweight concrete.	

Table 3 — Flow classes

Class	Flow diameter tested in accordance with EN 12350-5 mm
F1 ^a	≤ 340
F2	350 to 410
F3	420 to 480
F4	490 to 550
F5	560 to 620
F6 ^a	≥ 630

^a The range of test sensitivity where EN 12350-5 has adequate sensitivity to confidently determine consistence > 340 mm and ≤ 620 mm

Table 4 — Slump-flow classes

Class	Slump-flow ^a tested in accordance with EN 12350-8 mm
SF1	550 to 650
SF2	660 to 750
SF3	760 to 850
^a The classification is not applicable to concrete with $D_{\max}$ exceeding 40 mm.	

5.2.2 Classes for additional properties of SCC

(1) Where self-compacting concrete is classified with respect to viscosity, passing ability or sieve segregation resistance, Tables 5 to 9 apply.

(2) Viscosity may also be specified by a target value with tolerances as given in Table 25.

(3) Passing ability may also be specified by a minimum value when determined by the L-box-Test or by a maximum value when determined by the J-Ring-Test.

(4) Sieve segregation may also be specified by a maximum value.

Table 5 — Viscosity classes – t_{500}

Class	t_{500} ^a tested in accordance with EN 12350-8 s
VS1	$< 2,0$
VS2	$\geq 2,0$
^a The classification is not applicable to concrete with $D_{\max}$ exceeding 40 mm.	

Table 6 — Viscosity classes – t_v

Class	t_v a tested in accordance with EN 12350-9 s
VF1	$< 9,0$
VF2	9,0 to 25,0
^a The classification is not applicable to concrete with $D_{\max}$ exceeding 22,4 mm.	

NOTE 1 The classes in Tables 7 and 8 are similar but not exactly correlated.

Table 7 — Passing ability classes – L-box

Class	L-box ratio tested in accordance with EN 12350-10
PL1	$\geq 0,80$ with 2 rebars
PL2	$\geq 0,80$ with 3 rebars