



SLOVENSKI STANDARD

SIST EN 206-1:2003

01-februar-2003

Beton - 1.del: Specifikacija, lastnosti, proizvodnja in skladnost

Concrete - Part 1: Specification, performance, production and conformity

Beton - Teil 1: Festlegung, Eigenschaften, Herstellung und Konformität

Béton - Partie 1: Spécification, performances, production et conformité

Ta slovenski standard je istoveten z: **EN 206-1:2000**

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ICS:

91.100.30	Beton in betonski izdelki	Concrete and concrete products
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English version

Concrete - Part 1: Specification, performance, production and conformity

Béton - Partie 1: Spécification, performances, production et conformité

Beton - Teil 1: Festlegung, Eigenschaften, Herstellung und Konformität

This European Standard was approved by CEN on 12 May 2000.

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 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 Management Centre has the same status as the official versions.

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", the secretariat of which is held by DIN.

This European Standard supersedes ENV 206:1990.

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of an identical text or by endorsement, at the latest by June 2001, and conflicting national standards shall be withdrawn at the latest by December 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom

This Standard together with parts of ENV 13670-1 (Execution of concrete structures) supersedes the European Pre-standard ENV 206 : 1990 "Concrete - Performance, production, placing and compliance criteria" which was the basis for the preparation of this standard.

In particular, the following items were subject to revision when preparing this standard:

- extension of the classification system for concrete especially with respect to environmental conditions;
- requirements for durability;
- extension of strength classes;
- strength classes for light-weight concrete;
- consideration of additions in the determination of the w/c ratio and the cement content;
- identification of division of technical responsibility between the specifier, producer and user;
- reconsideration of accuracy of weighing equipment;
- reconsideration of curing requirements;
- provisions for conformity control, conformity criteria and identity testing;
- provisions for the evaluation of conformity.

Aspects relating to the execution have, in general, been moved to ENV 13670-1 or other relevant standards.

The context in which this Standard functions is illustrated in Figure 1.

This Standard is only operable with product standards or equivalent specifications for constituent materials (i. e. cement, aggregates, additions, admixtures and mixing water) and related test methods for concrete. Product standards and test method standards are under preparation by CEN but they will not all be available as European Standards at the date of publication of this Standard. For this reason, the latest date of withdrawal of national standards (dow) conflicting with this Standard will be the date when all standards listed below, together with the related standards for test methods, are available and implemented as European Standards or ISO Standards where appropriate or have the status required by this Standard.

EN 197-1

Cement - Composition, specifications and conformity criteria - Part 1: Common cements

EN 12620

Aggregates for concrete including those for use in roads and pavements

EN 13055-1

Light-weight aggregates - Part 1: Light-weight aggregates for concrete and mortar

EN 1008

Mixing water for concrete - Specifications for sampling, testing and assessing the suitability of water, including wash water from recycling installations in the concrete industry, as mixing water for concrete

EN 934-2

Admixtures for concrete, mortar and grout - Part 2: Concrete admixtures - Definitions and requirements

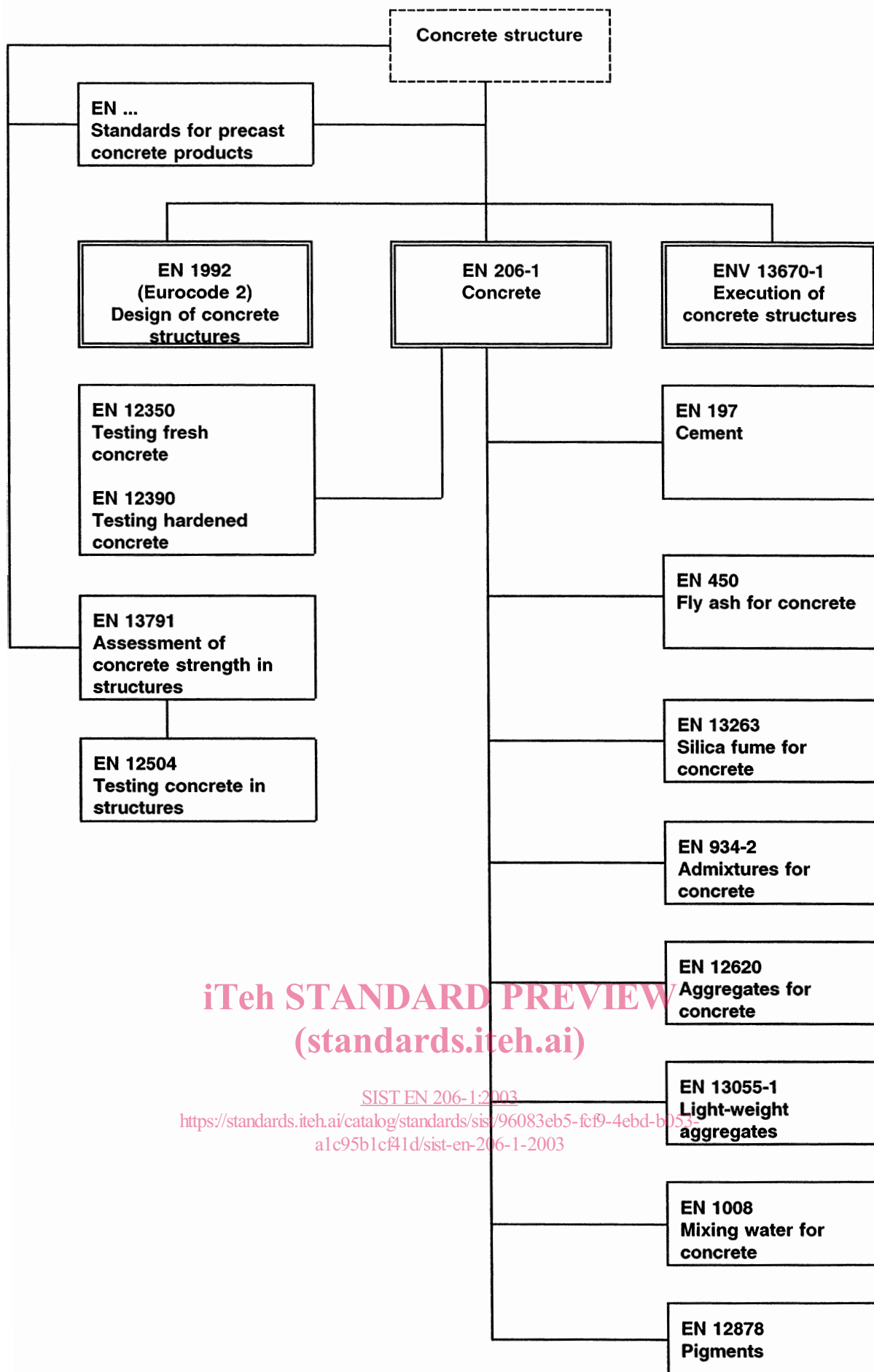
EN 450

Fly ash for concrete - Definitions, requirements and quality control

EN 13263

Silica fume for concrete - Definitions, requirements and conformity control

The annexes A, B and C are normative. The annexes D, E, F, G, H, J and K are informative.



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Figure 1 - Relationships between EN 206-1 and standards for design and execution, standards for constituent materials and test standards

Introduction

This European Standard will be applied in Europe 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 national standards or provisions valid in the place of use of the concrete.

During the development of this European Standard, consideration was given to detailing a performance-related approach to the specification of durability. For this, a review of performance-related design and test methods has been undertaken. However, CEN/TC 104 concluded that these methods are not yet sufficiently developed for them to be detailed in this standard, but CEN/TC 104 recognised that some CEN Members have developed confidence in local tests and criteria. Therefore this standard permits the continuation and development of such practices valid in the place of use of the concrete as an alternative to the prescriptive approach. CEN/TC 104 will continue to develop performance-related methods for assessing durability at the European level.

This European Standard incorporates rules for the use of constituent materials that are covered by European standards. Other by-products of industrial processes, recycled materials etc. are in current use based on local experience. Until European specifications for these materials are available, this standard will not provide rules for their use, but instead refers to national standards or provisions valid in the place of use of the concrete.

This European Standard defines tasks for the specifier, producer and user. For example, the specifier is responsible for the specification of concrete, clause 6, and the producer is responsible for conformity and production control, clauses 8 and 9. The user is responsible for placing the concrete in the structure. In practice there may be several different parties specifying requirements at various stages of the design and construction process e.g. the client, the designer, the contractor, the concreting sub-contractor. Each is responsible for passing the specified requirements, together with any additional requirements, to the next party in the chain until they reach the producer. In the terms of this European Standard, this final compilation is known as the "specification". Conversely, the specifier, producer and user may be the same party (e.g. a contractor doing design and build). In the case of ready mixed concrete, the purchaser of the fresh concrete is the specifier and has to give the specification to the producer. This standard 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.

Notes and footnotes in tables of this standard are normative unless stated otherwise; other notes and footnotes are informative.

Further explanations and guidance on the application of this standard are given in other documents, such as CEN Reports.

1 Scope

This European Standard applies to concrete for structures cast in situ, precast structures, and structural precast products for buildings and civil engineering structures.

The concrete may be mixed on site, ready-mixed concrete or produced in a plant for precast concrete products.

This standard specifies requirements for:

- the constituent materials of concrete; [SIST EN 206-1:2003](https://standards.iteh.ai/catalog/standards/sist/96083eb5-fcf9-4ebd-b053-af05510411d/sist-en-206-1-2003)
- the properties of fresh and hardened concrete and their verification;
- the limitations for concrete composition;
- the specification of concrete;
- the delivery of fresh concrete;
- the production control procedures;
- the conformity criteria and evaluation of conformity.

This European Standard applies to concrete compacted to retain no appreciable amount of entrapped air other than entrained air. This standard applies to normal-weight, heavy-weight and light-weight concrete.

Other European Standards for specific products e.g. precast products or for processes within the field of the scope of this standard may require or permit deviations from this standard.

Additional or different requirements may be given in further parts of this standard or in other specific European standards, for example:

- concrete to be used in roads and other trafficked areas;
- concrete using other materials (e.g. fibres) or constituent materials not covered by 5.1;
- concrete with an upper aggregate size of 4 mm or less (mortar);
- special technologies (e.g. sprayed concrete);
- concrete for disposal of liquids and gaseous waste;
- concrete for vessels for storage of polluting substances;
- concrete for massive structures (e.g. dams);
- dry mixed concrete.

NOTE As long as these standards are not available, provisions valid in the place of use of the concrete may apply. European standards are under preparation for:

- concrete to be used in roads and other trafficked areas;
- sprayed concrete.

• This standard does not apply to:

- aerated concrete;
- foamed concrete;
- concrete with open structure ("no-fines" concrete);
- concrete with density less than 800 kg/m³;
- refractory concrete.

This standard does not cover health and safety requirements for the protection of workers during production and delivery of concrete.

• 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

In the case of reference to European draft standards, provisions valid in the place of use of the concrete may be applied until the European Standard is available.

EN 196-2 , *Methods of testing cement - Part 2: Chemical analysis of cement*

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

EN 450, *Fly ash for concrete - Definitions, requirements and quality control*

- EN 933-1, *Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method*
- EN 934-2, *Admixtures for concrete, mortar and grout - Part 2: Concrete admixtures - Definitions and requirements*
- prEN 1008:1997, *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, *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*
- EN 12350-2, *Testing fresh concrete - Part 2: Slump test*
- EN 12350-3, *Testing fresh concrete - Part 3: Vebe 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 of fresh concrete - Pressure methods*
- EN 12390-1, *Testing hardened concrete - Part 1: Shape, dimensions and other requirements for test specimens and moulds*
- EN 12390-2, *Testing hardened concrete - Part 2: Making and curing specimens for strength tests*
- prEN 12390-3:1999, *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*
- prEN 12620:2000, *Aggregates for concrete*
- EN 12878, *Pigments for colouring of building materials based on cement and/or lime - Specifications and methods of test*
- prEN 13055-1:1997, *Lightweight aggregates - Part 1: Lightweight aggregates for concrete and mortar*
- prEN 13263:1998, *Silica fume for concrete - Definitions, requirements and conformity control*
- prEN 13577:1999, *Water quality - Determination of aggressive carbon dioxide content*
- EN 45501:1992, *Metrological aspects of non-automatic weighing instruments*
- ISO 2859-1:1999, *Sampling schemes for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*
- ISO 3951:1994, *Sampling procedures and charts for inspection by variables by percent nonconforming*
- ISO 4316, *Surface active agents - Determination of pH of aqueous solutions - Potentiometric method*
- ISO 7150-1, *Water quality - Determination of ammonium - Part 1: Manual spectrometric method*
- ISO 7150-2, *Water quality - Determination of ammonium - Part 2: Automated spectrometric method*
- ISO 7980, *Water quality - Determination of calcium and magnesium - Atomic absorption spectrometric method*
- DIN 4030-2, *Assessment of water, soil and gases for their aggressiveness to concrete - Part 2: Collection and examination of water and soil samples*
- ASTM C 173, *Test method for air content of freshly mixed concrete by the volumetric method*
- OIML R 117, *Measuring systems for liquids (Organisation Internationale de Métrologie Légale)*
- Directive 90/384/EEC, *Directive of the Council of 20 June 1990 for the harmonisation of the regulations of the Member States concerning non-automatic weighing equipment*

3 Definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

3.1.1

concrete

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

3.1.2

fresh concrete

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

3.1.3

hardened concrete

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

3.1.4

site-mixed concrete

concrete produced on the construction site by the user of the concrete for his own use

3.1.5

ready-mixed concrete

concrete delivered in a fresh state by a person or body who is not the user. Ready-mixed concrete in the sense of this standard is also:

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

3.1.6

precast concrete product

concrete product cast and cured in a place other than the final location of use

3.1.7

normal-weight concrete

concrete having an oven-dry density greater than 2000 kg/m³ but not exceeding 2600 kg/m³

3.1.8

light-weight concrete

concrete having an oven-dry density of not less than 800 kg/m³ and not more than 2000 kg/m³. It is produced using light-weight aggregate for all or part of the total aggregate

3.1.9

heavy-weight concrete

concrete having an oven-dry density greater than 2600 kg/m³

3.1.10

high strength concrete

concrete with a compressive strength class higher than C50/60 in the cases of normal-weight or heavy-weight concrete and LC50/55 in the case of light-weight concrete

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3.1.11

designed concrete

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

3.1.12

prescribed concrete

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

3.1.13

standardized prescribed concrete

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

3.1.14

concrete family

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

3.1.15

cubic metre of concrete

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

3.1.16

truck mixer

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

3.1.17

agitating equipment

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

3.1.18

non-agitating equipment

equipment used for transporting concrete without agitation in the sense of definition 3.1.17, e.g. dump truck or transport hopper

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3.1.19

batch

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

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3.1.20

load

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

3.1.21

delivery

the process of handing over the fresh concrete by the producer

**3.1.22
admixture**

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

**3.1.23
addition**

finely divided material used in concrete in order to improve certain properties or to achieve special properties. This standard deals with two types of inorganic additions:

- nearly inert additions (type I);
- pozzolanic or latent hydraulic additions (type II).

**3.1.24
aggregate**

granular mineral material suitable for use in concrete. Aggregates may be natural, artificial or recycled from material previously used in construction

**3.1.25
normal-weight aggregate**

aggregate with an oven-dry particle density $> 2000 \text{ kg/m}^3$ and $< 3000 \text{ kg/m}^3$, when determined according to EN 1097-6.

**3.1.26
light-weight aggregate**

aggregate of mineral origin having an oven-dry particle density $\leq 2000 \text{ kg/m}^3$ when determined according to EN 1097-6 or a loose oven-dry bulk density $\leq 1200 \text{ kg/m}^3$ when determined according to EN 1097-3

**3.1.27
heavy-weight aggregate**

aggregate having an oven-dry particle density $\geq 3000 \text{ kg/m}^3$ when determined according to EN 1097-6.

**3.1.28
cement (hydraulic binder)**

a finely ground inorganic material which, when mixed with water, forms a paste that sets and hardens by means of hydration reactions and processes and which, after hardening, retains its strength and stability even under water

**3.1.29
total water content**

the added water plus water already contained in the aggregates and on the surface of the aggregates plus water in the admixtures and in additions used in the form of a slurry and water resulting from any added ice or steam heating

**3.1.30
effective water content**

the difference between the total water present in the fresh concrete and the water absorbed by the aggregates

**3.1.31
water/cement ratio**

ratio of the effective water content to cement content by mass in the fresh concrete

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3.1.32

characteristic strength

the 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

3.1.33 entrained air

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

3.1.34

entrapped air

air voids in concrete which are not purposely entrained

3.1.35

site (construction site)

area where the construction work is undertaken

3.1.36

specification

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

3.1.37

specifier

person or body establishing the specification for the fresh and hardened concrete

3.1.38

producer

person or body producing fresh concrete

3.1.39

user

person or body using fresh concrete in the execution of a construction or a component

3.1.40

working life

the period of time during which the performance of the concrete in the structure will be kept at a level compatible with the fulfilment of the performance requirements of the structure, provided it is properly maintained

3.1.41

initial test

test or tests 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

3.1.42

identity test

test to determine whether selected batches or loads come from a conforming population

3.1.43

conformity test

test performed by the producer to assess conformity of the concrete