
Concrete —

Part 1:

**Methods of specifying and guidance
for the specifier**

Béton —

*Partie 1: Méthodes de spécification et lignes directrices pour le
spécificateur*
(standards.iteh.ai)

ISO 22965-1:2007

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 22965-1 was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 3, *Concrete production and execution of concrete structures*.

ISO 22965 consists of the following parts, under the general title *Concrete*:

- *Part 1: Methods of specifying and guidance for the specifier*
- *Part 2: Specification of constituent materials, production of concrete and compliance of concrete*

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Introduction

This International Standard is intended for nations that have no national concrete standard and it sets out a framework of principles for nations revising their national standards. To be operable, this International Standard needs a national annex or a reference to the national complementary provisions. This International Standard can also be applied on specific projects where a project specification supplements the standards in lieu of a national annex applicable at the place of use.

This International Standard is applied under various climatic and geographical conditions, various levels of protection and under different established regional traditions and experience. Consequently, this International Standard includes classes for concrete with different properties to cover the most frequent and normal situations. For certain uses of concrete, additional or deviating rules can be necessary. The national provisions, preferably given in a national annex to this International Standard, or the project specification can specify any additional or deviating requirements.

During the development of this International Standard, consideration was given to detailing a performance-related approach to the specification of durability. It was concluded that such an approach is not yet sufficiently developed to be detailed in an International Standard. ISO/TC 71/SC 3 recognizes that some ISO member bodies have developed local tests and criteria for performance-based specifications. This International Standard does not exclude the continuation and development of such practices valid in the place of use of the concrete as an alternative to the prescriptive approach. It is necessary that these requirements be specified in the national annex or national complementary provisions. The Model Code for Service Limit Design (MC-SLD), which was published by *fib* in 2006, is a promising basis for implementation as future International Standards from ISO/TC 71; see Annex B.

This International Standard incorporates rules for the use of constituent materials that are covered by International Standards. For materials for which International Standards have not yet been published, the standards cited in the national annex (often the regional or national standards) apply; see 5.1. In particular, documents in current use for by-products of industrial processes, recycled materials, etc. are based on local experience. Until international specifications for these materials are available, this International Standard does not provide rules for their use, but instead refers to the national annex.

This International Standard defines the two parties involved in the ordering and the supply of concrete, which are hereinafter referred to as specifier and supplier. In practice, there can be several parties specifying requirements at various stages of the design and construction process, e.g. the client, the designer, the quantity surveyor, the constructor and the concreting subconstructor. Each is expected to pass the specified requirements, together with any additional requirements, to the next party in the chain until they reach the supplier. In the terms of this International Standard, this final compilation of requirements is known as the “concrete specification”. In some cases, the specifier and the supplier is the same party (e.g. a constructor doing design, production and execution). In the case of ready-mixed concrete, the purchaser is the specifier.

This part of ISO 22965 also gives rules for the exchange of information between the parties. Contractual matters are not addressed.

This International Standard is intended for use with ISO 22965-2 and with the future ISO 22966, currently under development, which will give the requirements associated with the level of quality specified and the methods to be employed for the execution of concrete structures.

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Concrete —

Part 1: Methods of specifying and guidance for the specifier

1 Scope

This part of ISO 22965 applies to concrete for structures cast *in situ*, pre-cast structures and structural pre-cast products for buildings and civil engineering structures. The concrete can be mixed on site, ready-mixed concrete or produced in a plant for pre-cast concrete products.

This part of ISO 22965 applies to concrete compacted to retain no appreciable amount of entrapped air other than entrained air and to normal-weight, heavy-weight and light-weight concrete.

Other International Standards for specific products, e.g. pre-cast products, or for processes within the field of the scope of this part of ISO 22965, can require or permit deviations from this part of ISO 22965.

This part of ISO 22965 contains requirements for the specification of concrete and guidance for the exchange of information between the specifier and supplier. An informative annex gives general guidance on specification. More specific guidance on specification related to the local conditions can be given in a national annex.

This part of ISO 22965 does not apply to

- concrete with a maximum aggregate size equal to or less than 4 mm or 5 mm (mortar),
- aerated concrete,
- foamed concrete,
- concrete with an open structure (“no-fine aggregate” concrete),
- concrete with a density less than 800 kg/m³,
- refractory concrete.

This part of ISO 22965 does not cover health and safety requirements for the protection of workers during production and delivery of concrete.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 1920-1, *Testing of concrete — Part 1: Sampling of fresh concrete*

ISO 1920-3, *Testing of concrete — Part 3: Making and curing test specimens*

ISO 1920-4, *Testing of concrete — Part 4: Strength of hardened concrete*

ISO 22965-2:2007, *Concrete — Part 2: Specification of constituent materials, production of concrete and compliance of concrete*

3 Terms and definitions

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

3.1 addition
finely divided or ground material used in concrete in order to improve certain properties or to achieve special properties

NOTE This part of ISO 22965 deals with two types of additions:

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

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

3.3 aggregate
granular mineral material suitable for use in concrete

NOTE Aggregates can be natural, artificial or recycled from material previously used in construction, e.g. recycled concrete aggregate.

3.4 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 or quantity of concrete transported in a vehicle

NOTE For testing to be performed at site, the concrete transported as one load in a vehicle can be considered as one batch.

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

3.6 characteristic strength
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

3.7 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

NOTE International Standards for aggregate may define aggregates larger than 4 mm or 5 mm as coarse. In concrete for general-purpose use, the coarse aggregate should normally have a maximum aggregate size of at least 16 mm.

3.8**concrete specification**

all documented technical requirements necessary to produce and deliver the concrete

3.9**compliance test**

test performed to verify that the concrete complies with some aspect of the specification

3.10**delivery**

process of handing over the fresh concrete by the producer

3.11**designed concrete**

concrete for which the minimum characteristic strength, other required properties and additional characteristics are specified to the supplier who is responsible for providing a concrete complying with the specified minimum characteristic strength, any other specified properties and any specified additional characteristics

3.12**effective water content**

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

3.13**entrained air**

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

3.14**entrapped air**

air voids in concrete that are not purposely entrained

3.15**environmental actions**

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

3.16**evaluation of compliance**

systematic examination of the extent to which a product fulfils specified requirements

3.17**fresh concrete**

fully mixed concrete that is still capable of being compacted by the intended method

3.18**general suitability**

suitable for use in some concretes

3.19**hardened concrete**

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

3.20**heavy-weight aggregate**

aggregate having an oven-dry particle density $\geq 3\,000\text{ kg/m}^3$

3.21

heavy-weight concrete

concrete having an oven-dry density greater than 2 600 kg/m³

3.22

identity test

test to determine whether the concrete represented by one or more batches comes from a complying population

3.23

light-weight aggregate

aggregate of mineral origin having an oven-dry particle density $\leq 2\,000$ kg/m³ or a loose oven-dry bulk density $\leq 1\,200$ kg/m³

3.24

light-weight concrete

concrete having an oven-dry density of not less than 800 kg/m³ and not more than 2 000 kg/m³

NOTE It is produced using light-weight aggregate for all or part of the total aggregate.

3.25

maximum aggregate size

largest aggregate size used in the concrete

NOTE The requirements for aggregate size in standards often allow a small percentage to be retained on the upper sieve size.

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3.26

normal-weight aggregate

aggregate with an oven-dry particle density $> 2\,000$ kg/m³ and $< 3\,000$ kg/m³

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3.27

normal-weight concrete

concrete having an oven-dry density greater than 2 000 kg/m³ but not exceeding 2 600 kg/m³

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3.28

pre-cast concrete product

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

3.29

prescribed concrete

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

3.30

producer

person or body producing fresh concrete

NOTE This part of ISO 22965 uses the terms “producer” and “supplier” in order to be able to distinguish between the technical and commercial sides. In the case of ready-mixed concrete, the practices can vary between countries, but in most cases, the producer and the supplier are the same.

3.31

ready-mixed concrete

concrete delivered in a fresh state to the construction site by a supplier to a specifier who is the purchaser

3.32**site****construction site**

area where the construction work is undertaken, including any land immediately adjacent to the construction specifically used for the purpose of setting up a batching plant

3.33**site-mixed concrete**

concrete produced on the construction site

3.34**specific suitability**

suitable for use in the specified concrete

3.35**specifier**

person or body specifying fresh concrete for the execution of a construction or a component

3.36**standardized prescribed concrete**

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

3.37**supplier**

person or body supplying ready-mixed concrete

3.38**user**

person or body using fresh concrete

3.39**total water content**

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

3.40**verification**

confirmation by examination of objective evidence that specified requirements have been fulfilled

3.41**water/cement ratio**

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

4 Symbols and abbreviated terms

D_{\max}	maximum aggregate size
X0	exposure class for no risk of corrosion or attack
XC	exposure classes for risk of corrosion induced by carbonation
XD	exposure classes for risk of corrosion induced by chlorides other than from sea water
XS	exposure classes for risk of corrosion induced by chlorides from sea water
XF	exposure classes for freeze/thaw attack

XA	exposure classes for chemical attack
S1 to S5	consistence classes expressed by slump
F1 to F6	consistence classes expressed by flow diameter
SF1 to SF5	consistence classes expressed by slump flow diameter
B	compressive strength classes for normal and heavy-weight concrete
LB	compressive strength class of light-weight concrete
f_{ck}	characteristic strength of concrete expressed in newtons per square millimetre
f_{cm}	mean of n measurements of the compressive strength of concrete expressed in newtons per square millimetre

5 Specification of concrete

5.1 General

For the use of constituent materials that are covered by International Standards, requirements contained in the International Standards apply. For materials for which there are not yet International Standards, the standards cited in the national annex (often regional or national standards) apply.

All relevant requirements for the concrete shall be given in the concrete specification, including any properties or mix limitations that are necessary for transportation after delivery, placing, compaction, curing or further treatment.

The required properties of concrete in the structure are generally achieved only if the intended and specified execution procedures on the fresh concrete are carried out at the place of use. Therefore, the requirements for transportation, placing, compaction, curing and further treatment should also be taken into account before specifying the concrete (see relevant standard for execution of work). Many of these requirements are often interdependent. If all these requirements are satisfied, any difference in concrete properties between the concrete in the structure and standardized test specimens is adequately covered by the partial safety factor for concrete.

When preparing the concrete specification, the following aspects shall be taken into consideration:

- application of the fresh and hardened concrete;
- curing conditions;
- dimensions of the structure (the heat development);
- environmental actions to which the structure is to be exposed (see Clause A.2);
- any requirements for exposed aggregate or tooled concrete finishes;
- any requirements related to the cover to reinforcement or minimum section width, e.g. maximum aggregate size;
- any restrictions on the use of constituent materials with established suitability, e.g. inappropriate for the identified exposure classes.