

BS 8500-1:2023



BSI Standards Publication

Concrete – Complementary British Standard to BS EN 206

Part 1: Method of specifying and guidance for the specifier



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Foreword

Publishing information

This part of BS 8500 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 November 2023. It was prepared by Working Group B/517/1/WG20, *Specification drafting*, under the authority of Subcommittee B/517/1, *Concrete production and testing*, and Technical Committee B/517, *Concrete and related products*. A list of organizations represented on this committee can be obtained on request to the committee manager.

Supersession

This part of BS 8500 supersedes BS 8500-1:2015+A2:2019, which is withdrawn.

Relationship with other publications

BS 8500 contains additional United Kingdom provisions to be used in conjunction with BS EN 206:2013+A2:2021. Together they form a complete package for the specification, production and conformity of concrete.

BS 8500 is published in the following parts:

- Part 1: *Method of specifying and guidance for the specifier*; and
- Part 2: *Specification for constituent materials and concrete*.

Information about this document

This new edition of BS 8500-1 incorporates technical changes only. It does not represent a full review or revision of the document, which will be undertaken in due course. The principal changes are:

- the inclusion of BS EN 197-5 cements and their equivalent combinations as general purpose cements;
- the introduction of the combined performance category for cements and combinations, which categorizes these by their resistance to sulfate attack and chloride ingress;
- the removal of minimum cement content and water/cement ratio as limiting values for resistance to corrosion of reinforcement due to carbonation;
- the removal of strength as a limiting value for resistance to corrosion of reinforcement due to chloride ingress;
- a revision of [Table A.6](#) to allow easier specification of the increased number of cements and combinations for durability;
- improved guidance on identity testing;
- the identity testing strength criteria for lower strength concrete to align with BS EN 13791;
- improved guidance on consistence retention;
- guidance on digital monitoring and measurement;
- indicative strengths from cements and combinations;
- corrections and minor clarifications; and
- all references have been updated.

The changes are predominantly concerned with the increased range of cementitious materials, their durability and categorization. The 2021 edition of BS EN 197-5 introduced multi-component cements

with a lower proportion of clinker than that allowable by BS EN 197-1. Concretes containing varying proportions of Portland cement clinker, ggbs and limestone fines; and Portland cement clinker, pfa and limestone fines were tested for carbonation, chloride ingress, resistance to sulfate attack, ASR, dimensional stability and freeze/thaw. The results were compared to reference CEM I, CEM II/B-V and CEM III/A concretes and the performance of the cements or combinations associated with the tested proportions categorized accordingly.

The introduction of combined performance categories which group cements and their equivalent combinations by resistance to sulfate attack and by chloride migration coefficient allows easier comparison between familiar cements and those introduced in this part of BS 8500 when specifying concrete. This concept also gives a route for the acceptance of new cements and combinations that are not currently included and means that their introduction can be through a relatively simple amendment to the standard and not a full revision.

It has been accepted that the compressive strength of concrete is not a limiting factor for the durability of reinforced concrete when exposed to chlorides, and so the recommended strength class has been removed for concrete in XD and XS exposure conditions. As these strength classes were being used by specifiers as a guide to the strength that might be expected from a minimum cement content or water/cement ratio, new guidance has been provided.

It is acknowledged that for a particular cement or combination, the factor that controls the rate of carbonation is water/cement ratio. This is problematic when trying to set limiting values for a wide range of cements and combinations. It was noted and agreed that compressive strength is a good proxy for resistance to carbonation and so strength for all cements and combinations is the only limiting value for resistance to corrosion through carbonation so simplifying specification.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at bsigroup.com/standards, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Hazard warning

WARNING. Where skin is in contact with fresh concrete, skin irritations are likely to occur owing to the alkaline nature of cement. The abrasive effects of sand and aggregate in the concrete can aggravate the condition. Potential effects range from dry skin, irritant contact dermatitis, to – in cases of prolonged exposure – severe burns. Take precautions to avoid dry cement entering the eyes, mouth and nose when mixing mortar or concrete by wearing suitable protective clothing. Take care to prevent fresh concrete from entering boots and use working methods that do not require personnel to kneel in fresh concrete. Unlike heat burns, cement burns might not be felt until some time after contact with fresh concrete, so there might be no warning of damage occurring. If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately. Barrier creams can be used to supplement protective clothing but are not an alternative means of protection.

Use of this document

It has been assumed in the preparation of this part of BS 8500 that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

The requirement for third-party certification has been approved by the Standards Policy and Strategy Committee.

Presentational conventions

The provisions of this document are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

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This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

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Compliance with a British Standard cannot confer immunity from legal obligations.

Introduction

There are five approaches to the specification of concrete. Within each approach to drafting the specification, there are a number of instances in which the specifier selects from the various options given in this part of BS 8500.

The Foreword to BS EN 206 sets out the context in which BS EN 206 operates in the context of European Standards. As BS 8500 is the UK complementary Standard to BS EN 206, the context in which BS 8500 operates is the same when BS 8500 is used within a suite of European Standards.

a) *Designated concretes*

For many common applications, the simplest approach is to specify a designated concrete. Designated concretes were developed to make the specification of designed concretes simpler, complete and more reliable. While they do not cover every application nor do they permit the use of every potential concreting material, they are suitable for a wide range of housing, structural and other construction applications.

An essential part of the designated concrete concept is the requirement for the producer to hold an appropriate level of product conformity certification. Although it is not usual practice for a British Standard to state that a legitimate claim of compliance is dependent on third-party conformity assessment, it is recognized that there is an identified market need for third-party conformity assessment of concrete. This is particularly true for construction works such as housing and building, where the user might not have any expertise in concrete specification and prefers to order on the basis of its application rather than specifying limiting values or prescribing composition. Where designated concrete is specified, it is on an elected basis, and having elected to specify a designated concrete then all its requirements, including those for third-party product conformity certification, are expected to be met. The inclusion of the requirement for third-party product conformity certification in this manner has been approved by the BSI Standards Policy and Strategy Committee.

Where designated concrete is not the approach selected, the method of specification given in b), c), d) or e) is used.

It is stressed that the reference to third-party certification does not make such a method of specification obligatory: it has been included with the support of industry bodies wishing to maintain the progress which has been achieved in quality levels as a result of such certification.

The environments to which the concrete is to be exposed are identified from [A.2](#) onwards. Guidance on the selection of designated concrete is given in [A.4](#) and the specification is drafted in accordance with [4.2](#).

b) *Designed concretes*

Designed concretes are suitable for almost all applications. They can be used as an alternative to designated concrete and where the requirements are outside of those covered by designated concretes, for example:

- where special cements or combinations are required, e.g. low heat of hydration;
- where the concrete is to be exposed to one of the chloride (XD) or sea water (XS) exposure classes;
- where lightweight or heavy-weight concrete is required;
- where a strength class is required other than those covered by designated concrete; and

- where strength is a requirement for the concrete and product conformity certification is not required.

NOTE Product conformity certification is recommended for all concrete, including designed concrete, although it is not obligatory.

The environments to which the concrete is to be exposed are identified in [A.2](#). Using the intended working life and the minimum cover to reinforcement, the limiting values of composition are determined for each of the identified exposure classes using the guidance in [A.4](#). The requirements for the concrete are selected from this composite of limiting values plus structural and fire considerations, and the specification is then drafted in accordance with [4.3](#).

c) *Prescribed concretes*

This approach allows the specifier to prescribe the exact composition and constituents of the concrete. It is not permitted to include requirements on concrete strength, and so this approach has only limited applicability.

Where a prescribed concrete is specified, the specifier is responsible for any initial testing to determine that the proportions achieve the intended performance in the fresh and hardened states with an adequate margin. According to BS EN 206:2013+A2:2021, the specifier is also responsible for ensuring that the proportions do not result in damaging alkali-silica reaction (ASR) but see [A.8.1](#) for an alternative approach.

In general, it is better to specify using one of the performance approaches (designated or designed concrete), but there are a few situations where the prescribed concrete method of specification is appropriate; for example, with exposed aggregate finishes, uniformity of appearance is a key requirement. Having completed trial mixes to confirm that the finished surface is as required and the mix satisfies the other required properties, e.g. strength, maximum w/c ratio, with an adequate margin, the concrete can then be specified as a prescribed concrete using the sources and proportions of constituent materials used in the approved trial mix.

The specification is drafted in accordance with [4.4](#).

d) *Standardized prescribed concretes*

Standardized prescribed concretes are applicable for housing and similar construction where concrete is site-batched on a small site or obtained from a ready-mixed concrete producer who does not have product conformity certification. Guidance on the selection of standardized prescribed concrete is given in [A.4.7](#) and the specification is drafted in accordance with [4.5](#).

Standardized prescribed concrete can be used as an alternative to the GEN series of designated concretes. As the concrete producer is unlikely to be known at the time of specification, the best approach in these situations is to specify a suitable designated concrete and the equivalent standardized prescribed concrete as alternatives.

e) *Proprietary concretes*

This approach is appropriate where it is required that the concrete achieves a specific performance, using defined test methods. The proprietary concrete is selected in consultation with the concrete producer and the specification is drafted in accordance with [4.6](#).

NOTE This method of specification might not be suitable for initial use in public procurement contracts if the specification, in effect, determines the concrete producer. BSI has not substantiated any claimed performance made for proprietary concrete by any producer.

The producer is not required to disclose full details of the mix constituents or composition to the specifier. Where the concrete is produced under product conformity certification, the producer is required to substantiate to their third-party certification body that their proprietary concrete

satisfies any performance requirements and limiting values that are specified or declared. Where the concrete is not under product conformity certification, the producer is required to confirm that any performance requirements and limiting values that are specified or declared were satisfied and, on request, supply the relevant test data.

1 Scope

This part of BS 8500 describes methods of specifying concrete and gives guidance for the specifier.

[Annex A](#) of this part of BS 8500 provides guidance on the concrete quality to be specified for selected exposure classes, intended working life and nominal cover to reinforcing steel. It does not give guidance on the use of stainless steel and non-metallic reinforcement. Guidance on nominal cover to reinforcement for structural and fire consideration is available in other publications, e.g. structural design codes of practice.

NOTE To avoid any confusion between “steel” and “stainless steel” with respect to concrete cover and the risk of corrosion to reinforcement, the term “carbon reinforcing steel” is used in this document.

This part of BS 8500 complements BS EN 206. It provides United Kingdom national provisions where required or permitted by BS EN 206. It also covers materials, methods of testing and procedures that are outside the scope of BS EN 206, but within national experience.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM C173, *Standard test method for air content of freshly mixed concrete by the volumetric method*²⁾

BS 8500-2:2023, *Concrete – Complementary British Standard to BS EN 206 – Part 2: Specification for constituent materials and concrete*

[BS EN 206:2013+A2:2021](#), *Concrete – Specification, performance, production and conformity*

[BS EN 12350-1](#), *Testing fresh concrete – Part 1: Sampling and common apparatus*

[BS EN 12350-2](#), *Testing fresh concrete – Part 2: Slump test*

[BS EN 12350-5](#), *Testing fresh concrete – Part 5: Flow table test*

[BS EN 12350-6](#), *Testing fresh concrete – Part 6: Density*

[BS EN 12350-7](#), *Testing fresh concrete – Part 7: Air content – Pressure methods*

[BS EN 12350-8](#), *Testing fresh concrete – Part 8: Self-compacting concrete – Slump-flow test*

[BS EN 12390-7](#), *Testing hardened concrete – Part 7: Density of hardened concrete*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this part of BS 8500, the terms and definitions given in BS EN 206:2013+A2:2021 and the following apply.

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

²⁾ Available from ASTM, www.astm.org.

3.1.1 alkali content of concrete

value calculated from the mix proportions and the determined alkali contents of each of the constituents

NOTE This value is used for verifying that the alkali content of concrete does not exceed the specified limit.

3.1.2 cement or combination content

mass of cement or combination contained in a cubic metre of fresh, fully compacted concrete, expressed in kilograms per cubic metre (kg/m³)

3.1.3 cement-bound concrete

concrete suitable for vibrating plate compaction or roller compaction to a target density

NOTE Cement-bound concrete that conforms to this part of BS 8500 is concrete comprised of any cement or combination listed in BS 8500-2:2023, Table 8, which has a D_{max} of 20 mm or 40 mm, and where the aggregate conforms to the grading shown in BS 8500-2:2023, Table 9.

3.1.4 combination

restricted range of cements and additions which, having been combined in the concrete mixer, count fully towards the cement content and water/cement ratio in concrete

NOTE The procedure in BS 8500-2:2023 for establishing the suitability of combinations conforms to the principles of the Equivalent Performance of Combinations Concept (EPCC) in BS EN 206:2013+A2:2021.

3.1.5 combined performance category (of cements and combinations)

alphanumeric categorization of the resistance of cements and combinations to sulfate attack of concrete and the resistance of concrete to chloride ingress

NOTE Guidance on the combined performance categories of cements and combinations is given in [4.4.2](#) and the Commentary on [Table A.6](#).

3.1.6 compressive strength class

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

NOTE Compressive strength classes are specified by a dual classification comprising the characteristic strength of 150 mm diameter by 300 mm length cylinders followed by the characteristic strength of 150 mm cubes, e.g. C20/25. BS 8500 treats the strength of concrete measured on 100 mm and 150 mm cubes as being identical and hence, in the UK, the dual classification applies also to 100 mm cubes.

3.1.7 consistence retention time

specified time period at which there is a specified consistence class or target value of slump, flow or slump-flow

NOTE The time period may be specified from the time of loading, arrival on site or final placement in works. Guidance for measuring consistence retention is given in [B.8.2](#).

3.1.8 crushed concrete aggregate (CCA)

aggregate obtained from crushed concrete

3.1.9 declared mean alkali content

alkali content of cement or addition, expressed as the sodium oxide equivalent (Na₂O eq.), as declared by the cement or addition manufacturer and not exceeded without prior notice

NOTE It is a certified average alkali content plus a margin that reflects the manufacturer's variability of production. See BS 8500-2:2023, C.1.

3.1.10 design chemical class (DC-class)

designation used to describe a concrete quality capable of resisting the selected aggressive chemical environment for the concrete, provided that any specified additional protective measures (APMs) are correctly applied to the structure

NOTE See A.4.5 and BRE Special Digest 1 [1].

3.1.11 digital monitoring and measurement (of fresh concrete properties)

real-time measurement and recording of the fresh concrete properties such as temperature, air content and consistence by calibrated systems installed on the delivery vehicle, after the time of loading and before discharge on site

NOTE 1 Digital monitoring and measurement systems might also be capable of adjusting concrete properties, such as the addition of water to correct consistence

NOTE 2 Although digital monitoring and measurement systems might link to other factory production records, the term "digital monitoring and measurement" in this part of BS 8500 refers only to the system installed on the delivery vehicle (see A.10.3).

3.1.12 equivalent combination

combination of cement and one or more additions that is an equivalent to a common cement

NOTE 1 A common cement is one conforming to BS EN 197-1, BS EN 197-5 or BS EN 14216 using the EPCC concept.

NOTE 2 These are differentiated from factory-produced cements by their nomenclature (see BS 8500-2:2023, 4.2.2.2 and 4.2.4).

NOTE 3 BS EN 197-1 categorizes limestone fines as L or LL defined by limits on total organic carbon (TOC) by mass. As LL conforms to the requirements of L, only L is used by this part of BS 8500 as the nomenclature for limestone fines.

3.1.13 hydraulic gradient

difference in the hydrostatic head of water on opposite sides of a concrete element, in metres, divided by the section thickness, in metres

3.1.14 maximum aggregate size

declared value of the coarsest fraction of aggregates actually used in the concrete

NOTE The requirements for aggregate size in BS EN 12620 allow a small percentage to be retained on the upper sieve size.

3.1.15 minimum cover

depth of cover to reinforcement assumed for the purposes of durability design

3.1.16 nominal cover

depth of cover to reinforcement shown on the drawings comprising the minimum cover plus an allowance in design for deviation, Δc , to accommodate fixing precision

NOTE This allowance is typically in the range 5 mm to 15 mm for surfaces cast against formwork.

3.1.17 product conformity certification

certification, based on product testing and surveillance, and approved by an accredited third-party certification body in accordance with a documented quality system

NOTE 1 Users of this part of BS 8500 are advised to consider the desirability of quality system assessment and registration against BS EN ISO 9001 by an accredited third-party certification body. Many certification bodies have this as a requirement of their product conformity certification.

NOTE 2 Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

NOTE 3 Attention is drawn to the Department for Business, Energy and Industrial Strategy (BEIS) policy document, Conformity assessment and accreditation policy in the United Kingdom [2].

3.1.18 proprietary concrete

concrete for which the producer assures the performance subject to good practice in placing, compacting and curing and for which the producer is not required to declare the composition

3.1.19 recycled aggregate (RA)

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

3.1.20 sodium oxide equivalent (Na₂O eq.)

alkali content, as a percentage, calculated as: %Na₂O eq. = %Na₂O + 0.658%K₂O

3.1.21 time of loading

time of first contact between cement and aggregates or, where the aggregates are surface dry, between cement and added water

3.2 Symbols and abbreviations

For the purposes of this part of BS 8500, the symbols and abbreviations given in BS EN 206:2013+A2:2021 and the following apply.

NOTE 1 The abbreviations used to denote cements and combinations are given in Table A.6 and BS 8500-2:2023, Table 1.

NOTE 2 Δc is the same as Δc_{dev} used in BS EN 1992-1-1.

ACEC	aggressive chemical environment for concrete (see Table A.2 for its determination)
APM	additional protective measure (see Table A.11 for the options)
BS EN	European Standard published by BSI containing a national foreword and, where appropriate, national annexes
BS EN ISO	International Standard that has been adopted as a European Standard published by BSI containing a national foreword and, where appropriate, national annexes
CB (strength class)	designation used for a series of designated cement-bound concretes used for foundations, pavements, hardstandings and reinstatement of openings in highways
CCA	crushed concrete aggregate
DC-(number)	design chemical class used to classify the resistance of concrete to chemical attack
f_{ci}	individual test result for compressive strength of concrete
f_{ck}	characteristic compressive strength of concrete
f_{cm}	mean compressive strength of concrete
FND (number of the DC-class)	designation used for a series of designated concretes that are used in foundation applications

GEN (number)	designation used for a series of designated concretes that are used for housing and similar applications
ggbs	ground granulated blastfurnace slag
PAV (number)	designation used for a series of designated concretes that are used in paving applications
RA	recycled aggregate
RC (strength class)	designation used for a series of designated concretes that are used in reinforced and prestressed concrete applications
w/c	water/(cement or combination)
Δc	allowance in design for deviation of the cover to reinforcement
$\Delta c_{dur,y}$	additive safety element (for prestressing steel) given in the appropriate design code

4 Method of specifying

4.1 General

The specification shall include all the relevant requirements for concrete properties, including properties needed for transportation after delivery, placing, compaction, curing or further treatment. The specification shall also include any special requirements.

NOTE 1 Special requirements might be, for example, for obtaining an architectural finish (see the Concrete Society's Technical Report 52 [3] for further information).

The specification shall take account of:

- the application of the fresh and hardened concrete;
- the method of placing;
- the method of compaction;
- the curing conditions;
- the dimensions of the element (in respect of the heat development);
- the environmental conditions to which the element is to be exposed;
- 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; and
- any further restrictions on the use of constituent materials with established suitability.

Concrete shall be specified either as:

- designated concrete conforming to BS 8500-2:2023 (see 4.2); or
- designed concrete conforming to BS 8500-2:2023 (see 4.3); or
- prescribed concrete conforming to BS 8500-2:2023 (see 4.4); or
- standardized prescribed concrete conforming to BS 8500-2:2023 (see 4.5); or
- proprietary concrete conforming to BS 8500-2:2023 (see 4.6).

NOTE 2 The requirement for the concrete to conform to the appropriate clauses in BS 8500-2:2023 invokes many general requirements for constituent materials, production and conformity, and also requires the concrete to conform to the relevant requirements in BS EN 206:2013+A2:2021 and the producer to comply with the relevant

requirements in BS EN 206:2013+A2:2021. Consequently, conformity to BS 8500-2:2023 includes conformity to BS EN 206:2013+A2:2021.

NOTE 3 The specification of a designated concrete includes the normative requirement for the producer to have product conformity certification with specified minimum requirements as set out in BS 8500-2:2023, Clause 6. Where such certification is not required, or where certification without minimum requirements is preferred, then the specifier has the option of specifying a designed, prescribed, standardized prescribed or proprietary concrete together with whatever level of product conformity certification is considered appropriate.

Where identity testing is specified, it shall be carried out in accordance with:

- 1) [Annex B](#) of this part of BS 8500 for slump, flow, slump-flow, air content and density of fresh concrete;
- 2) [Annex B](#) of this part of BS 8500 for density of hardened concrete specimens; and
- 3) BS EN 206:2013+A2:2021, Annex B and [B.7](#) of this part of BS 8500 for compressive strength.

4.2 Specification for designated concrete

4.2.1 General

The specification for designated concrete shall contain:

- a) the basic requirements given in [4.2.2](#); and
- b) the additional requirements given in [4.2.3](#), where required.

NOTE 1 An appropriate designated concrete may be selected from the exposure class and intended working life given in [Table A.3](#), [Table A.9a](#), [Table A.9b](#) and [Table A.10](#). For housing and similar applications, an appropriate designated concrete may be selected by identifying from [Table A.14](#) the application for which the concrete is to be used, or the application which most closely resembles it. [Table A.15](#) and [Table A.16](#) may be used to check that the associated strength class is adequate for structural purposes.

For non-typical applications or to satisfy particular structural or other reasons, the designated concrete may be selected in accordance with the limiting values specified in BS 8500-2:2023, Clause 6.

NOTE 2 Identity testing by the specifier or user is not necessary for designated concrete, as the producer is required to hold current product conformity certification and the certification body audits the producer's conformity control. Nevertheless, identity testing is not precluded.

NOTE 3 Where the producer is required to inform the specifier and user of a non-conformity (see BS EN 206:2013+A2:2021, [8.4](#)), the product conformity certification body checks that this action has been taken.

4.2.2 Basic requirements

The specification for designated concrete shall contain:

- a) a requirement to conform to BS 8500-2:2023;
- b) an appropriate concrete designation;
- c) the specified largest value of the coarsest fraction of aggregate (D_{upper}) size when other than 20 mm; and
- d) the class of consistence when other than CB concretes are required: S3 for the GEN, FND and RC concretes; S3 for PAV2; or S2 for PAV1 [see Note 3 and [Table A.14](#), footnote H)].

NOTE 1 The specification of the designated concrete by its designation, e.g. GEN3, is an instruction to the producer to conform to BS 8500-2:2023, as appropriate.

NOTE 2 GEN concrete with relatively low cement or combination content might not be suitable for obtaining satisfactory cast and direct finished surfaces, nor for methods of placing, such as pumping. The suitability of such concrete should be discussed with the producer.

NOTE 3 The user of the concrete should select the required consistence class and inform the specifier for inclusion into the specification.

4.2.3 Additional requirements

In addition to the basic requirements (see [4.2.2](#)), the specification for designated concrete shall contain any of the following additional requirements and provisions that are deemed to be necessary:

- a) any restriction or relaxation on the permitted range of cements and combinations;

NOTE 1 All the cements and combinations given in BS 8500-2:2023, Table 7 have the potential to provide adequate durability if the appropriate designated concrete is specified and the concrete is placed, compacted and cured correctly. However, in a few instances, there might be an advantage in selecting a particular type of permitted cement or combination, e.g. in massive sections to control heat development; in hot or cold weather (see [4.9](#)). Some designated concretes, cements and combinations are subject to specific permission being given in the product specification.

- b) any special requirements for the aggregates;

NOTE 2 For example, the smallest value of D for the coarsest fraction of aggregate in the concrete, D_{lower} .

- c) where RC20/25 to RC40/50 is specified, permission to use coarse RA, permission to use coarse CCA at more than a mass fraction of 20% of coarse aggregate or the exclusion of these aggregates from the specification;

- d) accelerated or retarded set;

- e) colour;

- f) generic type and dosage of fibres, where required;

- g) any requirement for a different chloride class, i.e. where the following classes are not appropriate:

- Cl 1,00 for the GEN and CB series of designated concrete;
- Cl 0,40 for other designated concretes for all cements and combinations except CEM I-SR 0 or 3;
- Cl 0,20 for CEM I-SR 0 or 3; and

- h) any requirement for higher minimum air content, e.g. to allow for the effects of pumping.

NOTE 3 The minimum air content given in [Table A.9a](#) is based on the assumption that differences in the air content between the point of delivery and the point of placing are small. Where the distance between the point of discharge and the point of placing is large or if the concrete is being pumped, it might be necessary to undertake site trials to verify that the required minimum air content can be achieved at the point of placing and, where necessary, the minimum air content at the point of delivery should be specified accordingly.

4.3 Specification for designed concrete

4.3.1 General

The specification for designed concrete shall contain:

- a) the basic requirements given in [4.3.2](#); and
- b) the additional requirements given in [4.3.3](#), where required.

NOTE Guidance on the specification of designed concrete to resist identified exposure classes is given in [4.4](#).

4.3.2 Basic requirements

The specification for designed concrete shall contain (see Note 2 and Note 3):

- a) a requirement to conform to BS 8500-2:2023;
- b) the compressive strength class;
- c) the limiting values of composition, e.g. maximum w/c ratio, minimum cement content or the DC-class where appropriate;

NOTE 1 Combinations conforming to BS 8500-2:2023, Annex B count fully towards the minimum cement content.

- d) where the DC-class has not been specified, the permitted cements and combinations (see Note 3);
- e) the maximum aggregate size where a value other than 20 mm is required;
- f) the chloride class where a class other than Cl 0,40 is required;
- g) for lightweight concrete, the density class or target density;
- h) for heavy-weight concrete, the target density; and
- i) the class of consistence or, in special cases, a target value for consistence.

NOTE 2 BS EN 206:2013+A2:2021 requires the exposure class or classes to be specified as a description for a set of concrete requirements given in national provisions. This part of BS 8500 requires the specification of designed concrete to contain limiting values or the DC-class, for the following reasons.

- *Specification by exposure class is not appropriate where trade-off between cover to reinforcement and concrete quality is applied.*
- *Specification by exposure class is not suitable where the intended working life is other than “at least 50 years”, e.g. at least 100 years.*
- *Where there are multiple exposure classes, there can be a range of suitable concretes, e.g. one with air-entrainment and one without, and it is the specifier’s responsibility to select from these options.*
- *In chemically aggressive environments, the determination of the exposure class (ACEC-class) is only the first step in determining the concrete specification.*

NOTE 3 The specifier may choose one or more groups using the broad designations given in [Table A.6](#), select specific cements and combinations from BS 8500-2:2023, Table 1 or choose other cements and combinations not listed in these tables. With designed concrete it is not normally necessary to specify the cement strength class, but where this is needed, it may be specified. Where the specification for a designed concrete does not state the cements and combinations to be used, the producer is required to select from those listed in BS 8500-2:2023, Table 1.

4.3.3 Additional requirements

In addition to the basic requirements (see [4.3.2](#)), the specification for designed concrete shall contain any of the following additional requirements and provisions that are deemed to be necessary, specifying performance requirements and test methods as appropriate:

- a) conformity assessment, e.g. product conformity certification;

NOTE 1 Conformity assessment is a demonstration that what is being supplied meets the requirements specified or claimed. Conformity may be assessed by a body that is independent of any party interested in the outcome of the assessment (i.e. third-party conformity assessment), or may be carried out by any party interested in the outcome. Conformity assessment includes activities such as testing, inspection and certification. Product conformity certification is a form of conformity assessment carried out by an accredited third-party conformity assessment body.

- b) special types or classes of aggregate, e.g. for wear resistance or freeze-thaw resistance;

NOTE 2 In these cases, BS EN 206:2013+A2:2021, 6.2.3 suggests that concrete composition to minimize damaging alkali-silica reaction is the responsibility of the specifier. However, BS 8500-2:2023, 5.1 requires the producer to take appropriate action in these cases (see A.8.1 for an explanation).

- c) where the use of coarse RA is deemed acceptable, a statement that coarse RA is permitted and a requirement for the RA to conform to BS 8500-2:2023, 4.3.6, and at least the following additional requirements specific to the type of RA:
 - maximum acid-soluble sulfate;
 - method for determination of the chloride content;
 - classification with respect to alkali-aggregate reactivity;
 - method for determination of the alkali content; and
 - any limitations on use in concrete, e.g. compressive strength classes, exposure classes;

- d) restrictions on the use of certain aggregates;
- e) generic type and dosage of fibres;
- f) characteristics required to resist freeze-thaw attack, e.g. air content;

NOTE 3 The minimum air content given in Table A.9a is based on the assumption that differences in air content between the point of delivery and the point of placing are small. Where the distance between the point of discharge and the point of placing is large or if the concrete is being pumped, it might be necessary to undertake site trials to verify that the required minimum air content can be achieved at the point of placing and where necessary the minimum air content at the point of delivery should be specified accordingly.

- g) requirements for the temperature of the fresh concrete, where different from the lower limit in BS EN 206:2013+A2:2021, 5.2.9 or the upper limit in BS 8500-2:2023, 5.3;
- h) strength development;
- i) heat development during hydration;
- j) consistence retention time;
- k) resistance to water penetration;
- l) resistance to abrasion;
- m) tensile splitting strength;
- n) other technical requirements, e.g. requirements related to the achievement of a particular finish or special method of placing; and
- o) any “concerning effects”, such as where concreting on the site is done under widely divergent temperature conditions, or if heat treatment is applied, the producer shall be informed about this, so that they can consider the concerning effects on the properties of the concrete and the need for any additional tests and the acceptability criteria.

4.4 Specification for prescribed concrete

4.4.1 General

The data linking the specified proportions to the intended performance shall be recorded. Where necessary, these data shall be obtained by initial testing.

The specification shall contain either proportions such that the risk of damaging alkali-silica reaction is minimized or a requirement for the producer to minimize the risk of damaging alkali-silica reaction (see A.8.1).

The specification for prescribed concrete shall contain:

- a) the basic requirements given in [4.4.2](#); and
- b) the additional requirements given in [4.4.3](#), where required.

4.4.2 Basic requirements

The specification for prescribed concrete shall contain (see Note 1 and Note 2):

- a) a requirement to conform to BS 8500-2:2023;
- b) the cements or combinations and standard strength class;
- c) the cement or combination content;
- d) the class of consistence or, in special cases, a target consistence;
- e) the type and categories of the aggregate;
- f) the maximum aggregate size and any limitations for grading;
- g) in the case of lightweight or heavy-weight concrete, the target density of the concrete or the maximum or minimum density of aggregate as appropriate;
- h) the chloride class for the concrete or the maximum chloride content of the aggregate;
- i) the type and quantity of admixture or addition, if any; and
- j) for characteristics that cannot be defined by other means, the sources of the constituents (see Note 3).

NOTE 1 Consideration should be given to specifying a requirement for the producer to hold product conformity certification.

NOTE 2 The content of constituent materials should be given in terms of kilograms per cubic metre (kg/m³). The use of nominal proportions, e.g. 1:2:4, is deprecated. [Annex C](#) gives guidance on the cement contents to expect where nominal proportions have been used.

NOTE 3 Generally, only the generic types of constituent material need be specified.

4.4.3 Additional requirements

In addition to the basic requirements (see [4.4.2](#)), the specification for prescribed concrete shall contain any of the following additional requirements and provisions that are deemed to be necessary:

- a) a requirement to conform to BS 8500-2:2023, **5.1**;
- b) the sources of some, or all, concrete constituents;
- c) additional requirements for aggregates, e.g. proportion of fine aggregate;
- d) requirements for the temperature of the fresh concrete where different from the lower limit in BS EN 206:2013+A2:2021, **5.2.9** or the upper limit in BS 8500-2:2023, **5.3**;
- e) the target w/c ratio; and
- f) other technical requirements.

NOTE The specified value of the (target) w/c ratio should be 0.02 less than any required maximum value, e.g. 0.53 should be specified where 0.55 is required.

4.5 Specification for standardized prescribed concrete

4.5.1 General

The specification for standardized prescribed concrete shall contain:

- a) the basic requirements given in [4.5.2](#); and
- b) the additional requirements given in [4.5.3](#), where required.

NOTE 1 The concrete may be selected using the guidance in [4.4.7](#).

The materials and the mix proportions given in BS 8500-2:2023, Clause 9 shall be examined to determine whether restriction of the specification is necessary.

NOTE 2 The assessment of the concrete proportions by the concrete producer forms an essential part of the conformity requirements.

NOTE 3 Equivalent designated concretes should be specified as an alternative or accepted if offered by the producer. Guidance on the specification of designated concretes equivalent to standardized prescribed concretes is given in [Table A.14](#).

4.5.2 Basic requirements

The specification for standardized prescribed concrete shall contain:

- a) a requirement to conform to BS 8500-2:2023;
- b) the description of the standardized prescribed concrete required, e.g. ST2;
- c) the maximum aggregate size; and
- d) the slump class.

4.5.3 Additional requirements

In addition to the basic requirements (see [4.5.2](#)), the specification for standardized prescribed concrete shall contain any of the following additional requirements and provisions that are deemed to be necessary:

- a) any restrictions on the cements or combinations permitted in BS 8500-2:2023, **9.2**; and
- b) any restrictions on the aggregates permitted in BS 8500-2:2023, **9.2**.

4.6 Specification for proprietary concrete

4.6.1 General

The specification for proprietary concrete shall contain:

- a) the basic requirements given in [4.6.2](#); and
- b) the additional requirements given in [4.6.3](#), where required.

NOTE For specifying self-compacting concrete, see [4.5](#).

4.6.2 Basic requirements

The specification for proprietary concrete shall contain:

- a) a requirement to conform to BS 8500-2:2023; and
- b) the name of the proprietary concrete and any other identification.

4.6.3 Additional requirements

In addition to the basic requirements (see [4.6.2](#)), the specification for proprietary concrete shall contain any of the following additional requirements or provisions that are deemed to be necessary:

- a) if options are provided by the producer of the proprietary concrete, the required option;
- b) a requirement for the producer to declare that the proprietary concrete conforms to any other requirements specified for the concrete; and

NOTE Where any such declaration is not supported by accredited third-party certification, the specification should contain a requirement to provide evidence to justify such claims.

- c) any other requirements.

5 Exchange of information

5.1 Information from the specifier or user of the concrete to the producer

In addition to the information required to be provided by BS EN 206:2013+A2:2021, **7.1**, the following information shall be given to the producer with the specification:

- a) the intended method of placing and finishing the concrete;
- b) where identity testing is not restricted to cases of doubt or random spot checks (see [A.10](#)), the type of test to be carried out, the volume of concrete in the assessment and the number of tests to be carried out on this volume of concrete;
- c) whether a non-accredited laboratory is to be used for identity testing; and
- d) where appropriate, permission to transport the concrete to the point of delivery in a non-agitating vehicle.

NOTE The criteria for identity testing for slump, flow, slump-flow, air content and density are given in [Annex B](#). The criteria for identity testing for strength are given in BS EN 206:2013+A2:2021, Annex B, and [Annex B](#) of this part of BS 8500.

5.2 Information from the producer of the concrete to the specifier or user

In addition to the information required to be provided in accordance with BS EN 206:2013+A2:2021, **7.2**, the specifier shall request from the producer whichever of the following information is deemed to be necessary:

NOTE 1 The producer is expected to provide this information on request.

- a) the method used to minimize damaging alkali-silica reaction and, as appropriate:
 - details of service record;
 - verification of conformity; and
 - alkali content of concrete in accordance with BS 8500-2:2023, Annex C;
- b) the type, composition and standard strength class of combination;

NOTE 2 The provision of information covered by BS EN 206:2013+A2:2021, **7.2** with respect to additions, applies where the addition is being used under the *k*-value concept. Where used in a combination, the equivalent combination is declared on the delivery ticket.

- c) where porous flint aggregates are to be used in concrete requiring freeze-thaw resisting aggregates, a track record showing successful use for not less than 10 years in conditions of freezing and thawing;
- d) the method of determination of the water absorption of fine lightweight aggregate;

- e) where RA is to be incorporated into the concrete, its acid-soluble sulfate content, chloride content and alkali content;
- f) where CCA or RA is to be incorporated into the concrete, the type of material and proportion to be used;
- g) where CCA is to be used in exposure classes other than those given in BS 8500-2:2023, Table 3, evidence that the resulting concrete is suitable for the intended environment;
- h) where the equivalent concrete performance concept is to be used, the producer's proposals for determining equivalence and verifying conformity;
- i) where using one or more admixtures in addition to an air-entraining admixture, evidence of no adverse interactions, e.g. as required by BS 8500-2:2023, **4.4.3**;
- j) where proprietary concrete is to be supplied, relevant information on the performance of the concrete; and
- k) where the concrete is not under product conformity certification, the test data on which the declaration of conformity was based.

*NOTE 3 Where the concrete is not under product conformity certification, the producer is required to confirm that the concrete was in conformity for the period of supply and, on request, supply the test data on which this confirmation was based (see BS 8500-2:2023, **A.4.1**).*

Annex A (informative)

Guidance for the specifier

A.1 General

This annex provides guidance on the factors that should be taken into account prior to the selection of the method of specifying and the specification of requirements. The factors that are covered are:

- exposure classes related to environmental conditions (see [A.2](#));
- cover to reinforcement (see [A.3](#));
- resistance to identified exposure classes (see [A.4](#));
- selection of consistence (see [A.5](#));
- density (see [A.6](#));
- aggregate classes (see [A.7](#));
- internal degradation of concrete (see [A.8](#));
- concrete placing (see [A.9](#));
- conformity, identity testing and digital monitoring and measurement (see [A.10](#));
- concrete for geotechnical works (see [A.11](#)); and
- segregation and bleeding (see [A.12](#)).

BS EN 206:2013+A2:2021 defines the term “specification of concrete” as the “final compilation of documented technical requirements given to the producer in terms of performance or composition”. It also recognizes that this specification can contain requirements for a number of different persons or bodies, e.g. architects, structural designers, contractors. The architect and/or the structural designer compile the majority of the specification, but there are important aspects that have to be added by the user, e.g. a consistence that is suitable for the intended method of placing and finishing the concrete.

There can be occasions where it is advantageous for economic or technical reasons for the producer or user to propose changes to the specification. In such cases, the proposer of the amendment needs to obtain approval from the specifier who might, in turn, seek the approval of the body responsible for the specific technical requirement, e.g. the designer.

Where designed concrete is specified in accordance with this part of BS 8500, the guidance on specification is given for defined materials with an established or accepted adequate performance in United Kingdom conditions. Some European Standards, e.g. BS EN 197-1 and BS EN 197-5, encompass a wide range of products, including several for which there is little experience of use in the United Kingdom. Until experience is gained, their use should be by agreement between the producer and specifier on a case-by-case basis.

The guidance in this Annex is largely based on empirical evidence together with a limited amount of testing to identify those materials, and combinations of materials, most suitable for particular applications or the identified exposure classes related to environmental conditions (see [A.2](#)). This guidance is deemed to be sufficient for the majority of civil engineering and building works.

For particular applications, reference to alternate standards or specialist literature is desirable. For example, for concrete pavements, reference can be made to BS EN 13877-1 and BS EN 13877-2, and for cement bound granular mixtures (CBGM) for roads, airfields and other trafficked areas then