

Aggregates —

Part 1: Aggregates for concrete — Guidance on the use of BS EN 12620

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- County Surveyors' Society
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Foreword

This Published Document has been prepared under the direction of Subcommittee B/502/2, Aggregates for concrete including those for use in roads and other pavements. It is one of nine parts that give guidance on the use and application of a series of European Standards for aggregates. These European Standards were prepared by CEN/TC 154, Aggregates, and have been adopted as British Standards. Conflicting British Standards relating to aggregates will be withdrawn in June 2004.

This part of PD 6682 gives guidance on the use of BS EN 12620 which specifies requirements for aggregates for concrete. BS EN 12620 supersedes BS 882:1992 and BS 1047:1983 which will be withdrawn in June 2004.

NOTE Users of BS 882:1992 and BS 1047:1983 should contact BSI Customer Services for confirmation of withdrawal.

Attention is drawn to the fact that BS EN 12620 fully takes into account the requirements of the European Commission mandate M125, Aggregates, given under the EU Construction Products Directive (89/106/EEC) [1].

Guidance on the other European Standards in the series is given in the following parts of PD 6682.

- *Part 2: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas — Guidance on the use of BS EN 13043.*
- *Part 3: Aggregates for mortar — Guidance on the use of BS EN 13139.*
- *Part 4: Lightweight aggregates for concrete, mortar and grout — Guidance on the use of BS EN 13055-1.*
- *Part 5: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications excluding concrete, mortar and grout — Guidance on the use of BS EN 13055-2.¹⁾*
- *Part 6: Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction — Guidance on the use of BS EN 13242.*
- *Part 7: Armourstone — Guidance on the use of BS EN 13383.*
- *Part 8: Aggregates for railway track ballast — Guidance on the use of BS EN 13450.*
- *Part 9: Guidance on the use of European test method standards.*

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

This Published Document is not to be regarded as a British Standard.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 17 and a back cover.

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¹⁾ Both BS EN 13055-2 and PD 6682-5 are in preparation.

Introduction

This document provides guidance on the use of BS EN 12620 in the UK. BS EN 12620 supersedes the corresponding conflicting British Standards for concreting aggregates, BS 882:1992 and BS 1047:1983. However, whilst BS EN 12620 describes concreting aggregates in a different manner to established UK practice and in some cases uses different test methods to evaluate their properties, there is no change to the essential character of the aggregates in actual use in the UK.

This UK guidance recommends limiting values for aggregate properties within the ranges permitted in BS EN 12620. Where possible, these recommended values are equivalent to those specified in BS 882:1992 and BS 1047:1983.

BS EN 12620 covers aggregates with an oven dried particle density greater than 2.00 Mg/m^3 ($2\,000 \text{ kg/m}^3$) for all concrete, including concrete conforming to BS EN 206-1. It is intended that BS EN 206-1 be used in conjunction with its complementary British Standard, BS 8500, which gives national provisions where they are permitted in BS EN 206-1. BS 8500 draws attention to the recommendations given in this national guidance, PD 6682.

An example specification listing recommended BS EN 12620 aggregate designations for particular properties is provided in Annex A. It can be applied to most general uses of aggregates in concrete. For particular aggregate sources and/or end uses, specifiers may need to give requirements for additional properties. Some recommended BS EN 12620 aggregate designations for particular aggregate sources and/or end uses in the UK are given in Annex B. Where requirements vary dependent on the particular end use, appropriate values should be inserted for the particular properties.

BS EN 12620 includes recycled aggregates within its scope and indicates that their suitability should be assessed in accordance with the regulatory requirements in the place of use. For concrete conforming to BS EN 206-1, there is further guidance in BS 8500 on the use of recycled aggregates. BS 8500 contains requirements, where permitted by BS EN 206-1, for both the use and testing of recycled concrete aggregates (RCA) and recycled aggregates (RA).

The grading of coarse and fine aggregates in BS EN 12620 is based on different principles to BS 882. BS EN 12620 specifies grades in terms of the consistency of the coarse aggregate with the supplier declaring the typical grading for the aggregate and working to tolerances given in BS EN 12620. These tolerances are restricted by BS EN 12620 to given values.

1 Scope

This part of PD 6682 gives guidance on the use of BS EN 12620 which specifies the properties of aggregates and filler aggregates obtained by processing natural, manufactured or recycled materials and mixtures of these aggregates for use in concrete. BS EN 12620 covers aggregates having an oven dried particle density greater than $2\,000 \text{ kg/m}^3$ for all concrete, including concrete conforming to BS EN 206-1 and concrete used in roads and other pavements and for use in precast concrete products.

NOTE Lightweight aggregates for concrete are covered by BS EN 13055-1.

2 Overview of BS EN 12620

2.1 General requirements

2.1.1 General

BS 882 specifies quality requirements for the following properties:

- flakiness;
- shell content;
- fines content;
- mechanical properties in terms of either the 10 % fines value or the aggregate impact value.

BS 882 also requires, when requested by the purchaser, the provision of data on other aggregate properties, e.g. carbonate content, acid-soluble sulfate content, chloride ion content and drying shrinkage, but without limiting values.

Compared to BS 882, BS EN 12620 gives requirements for different properties, including different test methods. The physical (mechanical) and chemical requirements that appear in BS EN 12620, but not in BS 882, are listed in 2.1.2 and 2.1.3. Detailed guidance on geometrical properties is given in 3.2.

2.1.2 Physical requirements

The term “mechanical properties” used in BS 882 is replaced in BS EN 12620 by the term “physical properties”. Requirements for the following physical properties are specified in BS EN 12620:2002, Clause 5 but not in BS 882.

- a) Resistance to fragmentation, measured by the Los Angeles test method as specified in BS EN 1097-2.

NOTE When requested by the purchaser, BS EN 12620 also requires the declaration of an impact value determined in accordance with BS EN 1097-2. This test method is different to the BS 812-112 test method specified in BS 882. It is derived from a German (DIN) test method that may be used where a correlation exists to the reference Los Angeles test method. The impact value is determined using specialist equipment that is not currently available in the UK.

- b) Resistance to wear of coarse aggregate, measured by determining the micro-Deval coefficient in accordance with BS EN 1097-1. This test method is derived from a French (AFNOR) test method.
- c) Resistance to polishing of coarse aggregate to be used for surface courses, measured in accordance with BS EN 1097-8. This test method is derived from BS 812-114.
- d) Resistance to surface abrasion, measured in accordance with BS EN 1097-8. It is derived from BS 812-113.
- e) Freeze-thaw resistance, determined in accordance with BS EN 1367-1 derived from a German (DIN) test method or BS EN 1367-2 specifying a magnesium sulfate soundness test derived from BS 812-121.
- f) Particle density, water absorption and bulk density, declared on request.

2.1.3 Chemical requirements

Requirements are specified for the following chemical properties in BS EN 12620:2002, Clause 6 but not in BS 882.

- a) Water-soluble chloride content, declared on request.
- b) Total sulfur and acid-soluble sulfate content.
- c) Constituents which alter the rate of setting and hardening of concrete, measured by their effect on stiffening time and compressive strength in accordance with BS EN 1744-1.
- d) Constituents which affect the volume stability of air-cooled blast-furnace slag, measured in accordance with BS EN 12620 which supersedes the equivalent British Standard, BS 1047.
- e) Carbonate content of fine aggregates for use in concrete surface courses.

2.2 Evaluation of conformity

BS EN 12620:2002, Clause 7 requires that producers undertake and on request declare the results from:

- a) initial type tests used:
 - i) to characterize properties for new sources of aggregates;
 - ii) where there is a major change in raw materials or processing which can effect the properties of the aggregates;
- b) factory production control to monitor conformity of the aggregates with the relevant requirements and the producer's declared values.

Minimum frequencies of tests are specified in BS EN 12620:2002, Annex H.

Guidance on the requirements for attestation of conformity and compliance with the provisions of the EU Construction Products Directive [1] is given in Clause 4.

3 Requirements of BS EN 12620

3.1 General

Each clause in BS EN 12620 that specifies aggregate properties, i.e. Clause 4, Clause 5 and Clause 6, starts with a general subclause which draws attention to the necessity only to specify those properties relevant to the particular aggregate and the end use of the aggregate. Where this is the case the wording “when required” is used.

In BS EN 12620, tables of specified requirements allow the user to choose an appropriate “category” for each property. The style of the category designation is intended to be self-explanatory and related to the specified limiting value. For example, category FI_{25} means that aggregates having a flakiness index with a maximum value of 25 are required. The style becomes more complex in the case of grading and a careful understanding of BS EN 12620:2002, Table 2 is necessary. For example, $G_C85/20$ is the grading designation for a coarse aggregate with a minimum 85 % passing the D size sieve and a maximum of 20 % passing the d size sieve.

NOTE Whilst aggregate descriptions are identified as d/D in BS EN 12620, 4.2 the d and D values appear in the grading categories in the reverse order giving the percentage passing D before giving the percentage passing d , e.g. a 10/20 aggregate with a grading category of $G_C85/20$.

An option to use a “no requirement” category is also provided. For example, a fines content category of f_{NR} is included in BS EN 12620 and it means that there is no specified requirement for fines content. A category f_3 , on the other hand, would require a limiting value of 3 % by mass passing a 0.063 mm sieve. A different approach is normally adopted in the UK.

When the value obtained for a particular property is outside the indicated limit or categories the producer can provide a declared value. For example, if the resistance to fragmentation of coarse aggregate measured by the Los Angeles coefficient exceeds 50, the producer can state the maximum value of $LA_{Declared}$. Thus if the value were 55 the producer would state LA_{55} and the aggregate users should determine whether this is adequate for their purposes.

3.2 Geometrical requirements

3.2.1 Aggregate sizes (BS EN 12620:2002, 4.2)

BS EN 12620:2002, Table 1 specifies the following three options for sieve size ranges for use in the description of aggregate sizes:

- a) basic set;
- b) basic set plus set 1;
- c) basic set plus set 2.

In the UK, aggregates will generally be supplied to the basic set plus set 2.

The aggregate size is described in BS EN 12620 in millimetres with the designation d/D , where d is the lower limiting sieve size and D is the upper limiting sieve size. The majority of the particle size distribution of an aggregate should lie between these two values and requirements for this are specified in BS EN 12620:2002, 4.3.

Aggregate sizes in BS EN 12620 are specified in a different manner to current practice described in BS 882. The fine aggregate fraction described in BS EN 12620 is linked to a 4 mm size or less, although with a greater oversize tolerance there will generally be little actual change in gradings in practice.

The sieve sizes used to describe aggregate sizes in BS EN 12620 are expressed in reverse order to BS 882, i.e. the lower sieve size is given before the upper sieve size. For example, the equivalent BS EN 12620 aggregate to a (20 to 5) mm graded aggregate conforming to BS 882 is given the designation 4/20 and the equivalent BS EN 12620 aggregate to a 20 mm single sized aggregate conforming to BS 882 is given the designation 10/20. Table 1 lists established British Standard aggregates for concrete descriptions alongside their equivalent BS EN 12620 designations.