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Aggregates —

Part 5: Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications — Guidance on the use of BS EN 13055-2

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Contents

Foreword

This Published Document has been prepared under the direction of Subcommittee B/502/5, Lightweight aggregates. 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.

This part of PD 6682 gives guidance on the use of BS EN 13055-2, which specifies requirements for lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications. No British Standards are superseded by BS EN 13055-2.

Attention is drawn to the fact that BS EN 13055-2 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 1: Aggregates for concrete — Guidance on the use of BS EN 12620.*

— *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 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 (all parts).*

— *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 10, an inside back cover and a back cover.

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Introduction

This document provides guidance on the use of BS EN 13055-2.

BS EN 13055-2 specifies no limiting values other than requiring that lightweight aggregate (LWA) has an upper particle density limit of 2 000 kg/m^3 or an upper loose bulk density limit of 1 200 kg/m^3. Tolerances for the declared values of both particle density and loose bulk density are specified in BS EN 13055-2:2004, **4.2**.

Aggregate sizes in BS EN 13055-2 are described in a different manner to that previously used for LWA in the UK. BS EN 13055-2 gives a table of sieve sizes from which upper and lower sieve sizes can be selected to designate the aggregate supplied. The requirement in BS EN 13055-2:2004, **4.4** specifies that particle size distribution shall be determined and declared. This provides purchasers with the necessary information on the gradation of aggregate sizes not otherwise provided by the upper and lower sieve sizes. Tolerances for the declared values of aggregate size are specified in BS EN 13055-2:2004, **4.3**.

Aggregate users should establish any limiting values of chemical properties appropriate to the application. The selection of LWA should be made by considering their combination with other constituents on the basis of values for specific chemical properties. A procedure for converting chemical contents measured by mass to chemical contents by volume, to take account of the lower density of LWA, is given in BS EN 13055-2:2004, Annex D.

BS EN 13055-2 includes recycled aggregates within its scope and indicates that their suitability should be assessed in accordance with the regulations valid in the place of use.

In response to the wide range of regulatory requirements for aggregates found in CEN Member States, BS EN 13055-2 is written in such a way that allows these additional requirements to be invoked only in those Member States where regulatory requirements exist, in addition to when they are appropriate to the end use of the aggregate.

BS EN 13055-2 includes two test methods as annexes. These are BS EN 13055-2:2004, Annex A and Annex B. It is intended that these test methods will be published as separate European Standards when BS EN 13055-2 is revised. All other test methods specified in BS EN 13055-2 are described in separate European test method standards.

1 Scope

This part of PD 6682 gives guidance on the use of BS EN 13055-2 in the UK. BS EN 13055-2 specifies the properties of lightweight aggregates (LWA) and LWA fillers derived thereof obtained by processing natural, manufactured, or recycled materials and mixtures of these aggregates for bituminous mixtures and surface treatments and for unbound and hydraulically bound applications other than concrete, mortar and grout.

BS EN 13055-2 covers LWA of mineral origin having particle densities not exceeding 2 000 kg/m^3 (2.00 Mg/m^3) or loose bulk densities not exceeding 1 200 kg/m^3 (1.20 Mg/m^3), including:

a) natural aggregates;

b) aggregates manufactured from natural materials and/or from by-products of industrial processes;

c) by-products of industrial processes;

d) recycled aggregates.

2 Overview of BS EN 13055-2

2.1 Physical and chemical properties

BS EN 13055-2:2004, Clause **4** specifies requirements for the following physical and chemical properties:

a) loose bulk density;

b) particle density;

c) aggregate size;

d) grading;

e) particle shape;

f) fines;

g) grading of LWA filler;

h) water content;

i) water absorption;

j) bulk crushing resistance;

k) percentage of crushed particles;

l) resistance to disintegration;

m) freezing and thawing resistance;

n) water suction height;

o) compaction and load bearing capacity;

p) resistance to cycle compressive loading;

q) stiffening properties;

r) voids of dry compacted LWA filler;

s) resistance to thermal shock;

t) resistance to polishing;

u) resistance to wear by abrasion from studded tyres of coarse LWA in surface treatments;

v) compatibility between LWA and bitumen;

w) chemical requirements;

1) water solubility;

2) loss on ignition (for ashes only);

3) water-soluble constituents;

x) thermal conductivity.

The properties in a) to x) are only required to be declared when regulatory requirements exist for a particular application in the country of use or when specified by the aggregate user.

In the UK it is expected that requirements to declare loose bulk density, aggregate size and grading will be adopted for aggregates for all end uses. Table 1 lists the relevant BS EN 13055-2 requirements for these physical properties alongside any limiting values. More detailed guidance on the BS EN 13055-2 requirements for loose bulk density, aggregate size and grading is given in **3.2.1**, **3.2.2** and **3.2.3**, respectively.

Table 1 — Values for physical properties to be declared in the UK

Physical property	BS EN 13055-2 subclause	Limiting value
Loose bulk density	**4.2.1**	$\leq 1\,200$ kg/m^3
Aggregate size	**4.3**	—
Grading	**4.4**	—

2.2 Evaluation of conformity

BS EN 13055-2:2004, Clause **6** requires that producers undertake and on request declare the results from:

a) initial type tests to characterize properties for new sources of aggregates or where there is a major change in raw materials or processing which can affect the properties of the aggregates;

b) factory production control to monitor conformity of aggregates with the relevant requirements and the producer's declared values.

Minimum frequencies of tests are specified in BS EN 13055-2:2004, Annex C.

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 13055-2

3.1 General

BS EN 13055-2:2004, Clause **4** specifies aggregate properties and starts with a general subclause that draws attention to the necessity only to specify those properties relevant to the particular aggregate and the end use of the aggregate. This qualification allows the aggregate user to request declared values applicable to the aggregates for specific applications or for which regulatory requirements for the intended applications exist in the place of use.

The determination of the properties referred to in **3.2** to **3.24** is not a regulatory requirement for application in the UK.

3.2 Density (BS EN 13055-2:2004, 4.2)

BS EN 13055-2:2004, **4.2.1** specifies that loose bulk density shall be determined in accordance with BS EN 1097-3 and declared when required by the aggregate user. The loose bulk density is required to be within a range of ±15 % of the declared value, up to a maximum of ±100 kg/m^3.

BS EN 13055-2:2004, **4.2.2** specifies that particle density shall be determined in accordance with BS EN 1097-6:2000, Annex C and declared when required by the aggregate user. The particle density is required to be within a range of ±15 % of the declared value, up to a maximum of ±150 kg/m^3.

3.3 Aggregate size (BS EN 13055-2:2004, 4.3)

BS EN 13055-2:2004, **4.3** specifies that aggregate sizes shall be designated as an upper limiting sieve size and a lower limiting sieve size. The quantity passing the lower sieve (undersize) is limited to 15 % by mass and the quantity retained on the upper sieve (oversize) is limited to 10 % by mass. BS EN 13055-2 also specifies that the sieve size through which 100 % of the aggregate passes shall be declared when required by the aggregate user.

BS EN 13055-2:2004, Table 1 specifies the following three options of sieve size ranges for use in the description of aggregates sizes:

a) basic set;

b) basic set plus set 1;

c) basic set plus set 2.

The convention adopted in the series of European Standards for normal weight aggregates is to express aggregate sizes by giving the lower sieve size before the upper sieve size. It is expected that producers of LWA conforming to BS EN 13055-2 will adopt the same approach. For example, a LWA with a lower limiting sieve size of 4 mm and an upper limiting sieve size of 16 mm is given the designation 4/16.

3.4 Grading (BS EN 13055-2:2004, 4.4)

BS EN 13055-2:2004, **4.4** specifies that the particle size distribution shall be determined and declared using BS EN 933-1 without washing. A note warns that care needs to be taken to avoid degradation of friable aggregates during sieving.

3.5 Particle shape (BS EN 13055-2:2004, 4.5)

LWA has material specific distinctive shapes. BS EN 13055-2:2004, **4.5** specifies that particle shape is described and declared when required by the aggregate user. Shapes are normally conveyed to aggregate users by samples or photographs in product literature. No test methods exist for determining the shape of LWA particles and equivalent test methods for normal weight aggregates are deemed unsuitable for LWA.

3.6 Fines (BS EN 13055-2:2004, 4.6)

BS EN 13055-2:2004, **4.6** specifies the determination of fines content in accordance with BS EN 933-1 when required by the aggregate user. However, it is not envisaged that this characteristic would need to be determined in addition to particle size distribution for applications in the UK. As with grading, a note advises that friable aggregates such as perlite and vermiculite can degrade during sieving if care is not taken.

3.7 Grading of LWA filler (BS EN 13055-2:2004, 4.7)

BS EN 13055-2:2004, **4.7** specifies the determination of the particle size distribution of LWA filler in accordance with the test method in BS EN 933-10 when required by the aggregate user. This test method differs from the BS EN 933-1 method of particle size distribution determination referred to in BS EN 13055-2:2004, **4.4** because the BS EN 933-1 method is used for coarser aggregates.

3.8 Water content (BS EN 13055-2:2004, 4.8)

BS EN 13055-2:2004, **4.8** specifies the determination of water content in accordance with BS EN 1097-5 when required by the aggregate user. However, unless supplied in sealed containers, the water content of LWA at the time of delivery cannot be guaranteed. Therefore, it is not expected that a requirement to test for water content will be adopted in the UK.

3.9 Water absorption (BS EN 13055-2:2004, 4.9)

BS EN 13055-2:2004, **4.9** specifies the determination of a water absorption value in accordance with BS EN 1097-6:2000, Annex C when required by the aggregate user. The value is intended to provide guidance on the water absorption of LWA but it does not take into account the water content at delivery or time of use. Therefore, it is not expected that a requirement to test for water absorption will be adopted in the UK.

3.10 Bulk crushing resistance (BS EN 13055-2:2004, 4.10)

Bulk crushing resistance is used by some producers as a quality control tool. Therefore, BS EN 13055-2:2004, **4.10** specifies the determination of crushing resistance in accordance with BS EN 13055-2:2004, Annex A when required by the aggregate user.

Bulk crushing resistance does not provide a useful guide to the properties of a LWA for any end use covered by BS EN 13055-2, as indicated by the Note to BS EN 13055-2:2004, **4.10**. Therefore, it is not expected that a requirement to test for crushing resistance will be adopted in the UK.

3.11 Percentage of crushed particles (BS EN 13055-2:2004, 4.11)

The proportion of crushed particles can be material specific and for some aggregates, such as pumice, can be 100 %. The proportion of crushed particles can also be related to whether a secondary process has been used to reduce aggregate size.

BS EN 13055-2:2004, **4.11** specifies the determination of the percentage of crushed particles in accordance with BS EN 933-5 when required by the aggregate user. The test method is only applicable to LWA with a loose bulk density of not less than 150 kg/m^3. It is not expected that a requirement to test for the percentage of crushed particles will be adopted in the UK.

3.12 Resistance to disintegration (BS EN 13055-2:2004, 4.12)

Resistance to disintegration is used by some producers to assess the stability of LWA.

BS EN 13055-2:2004, **4.12** specifies the determination of resistance to disintegration in accordance with BS EN 13055-1:2002, Annex B when required by the aggregate user. The test method is only applicable to LWA with a loose bulk density of not less than 150 kg/m^3. It is not expected that a requirement to test for the percentage of crushed particles will be adopted in the UK.

3.13 Freezing and thawing resistance (BS EN 13055-2:2004, 4.13)

BS EN 13055-2:2004, **4.13** specifies the determination of freezing and thawing resistance in accordance with BS EN 13055-2:2004, Annex B when required by the aggregate user. The test method is only applicable to LWA with a particle size of not less than 4 mm and a loose bulk density of not less than 150 kg/m^3. The Note to BS EN 13055-2:2004, **4.13** acknowledges that a satisfactory service record can be used in place of testing to BS EN 13055-2:2004, Annex B.

3.14 Water suction height (BS EN 13055-2:2004, 4.14)

BS EN 13055-2:2004, **4.14** specifies the determination of water suction height in accordance with BS EN 1097-10 when required by the aggregate user.

It is not expected that a requirement to test for water suction height will be adopted in the UK.

3.15 Compaction and load bearing capacity (BS EN 13055-2:2004, 4.15)

BS EN 13055-2:2004, **4.15** specifies the determination of compaction and load bearing capacity in accordance with BS EN 13055-2:2004, Annex A when required by the aggregate user.

The Note to BS EN 13055-2:2004, 4.15 states that the BS EN 13055-2:2004, Annex A test method is only applicable to LWA with a loose bulk density of not less than 150 kg/m^3 and that the test method has not been fully evaluated for all types of LWA. Therefore, it is not expected that a requirement to test for compaction and load bearing capacity will be adopted in the UK.

3.16 Resistance to cyclic compressive loading (BS EN 13055-2:2004, 4.16)

BS EN 13055-2:2004, **4.16** specifies the determination of resistance to cyclic compressive loading in accordance with BS EN 13286-7 when required by the aggregate user. The test method is only applicable to LWA with a loose bulk density of not less than 150 kg/m^3.

The Note to BS EN 13055-2:2004, **4.16** states that the BS EN 13286-7 test method was developed for normal weight aggregates and has not been widely used for LWA. Therefore, it is not expected that a requirement to test for resistance to cyclic compressive loading will be adopted in the UK.

3.17 Stiffening properties (BS EN 13055-2:2004, 4.17)

BS EN 13055-2:2004, **4.17** specifies the determination of stiffening properties of LWA filler in bituminous mixtures in accordance with BS EN 13179-1 when required by the aggregate user.

It is not expected that a requirement to test for stiffening properties will be adopted in the UK.

3.18 Voids of dry compacted LWA filler (BS EN 13055-2:2004, 4.18)

BS EN 13055-2:2004, **4.18** specifies the determination of voids of dry compacted LWA filler in accordance with BS EN 1079-4 when required by the aggregate user.

The Note to BS EN 13055-2:2004, **4.18** states that the BS EN 1079-4 test method was developed for normal weight aggregates and has not been widely used for LWA. Therefore, it is not expected that a requirement to test for voids of dry compacted LWA filler will be adopted in the UK.

3.19 Resistance to thermal shock (BS EN 13055-2:2004, 4.19)

BS EN 13055-2:2004, **4.19** specifies the determination of thermal shock in accordance with BS EN 1367-5 when required by the aggregate user. However, as most LWA is produced by a thermal process it is not anticipated that this test will be carried out in the UK.

3.20 Resistance to polishing (BS EN 13055-2:2004, 4.20)

BS EN 13055-2:2004, **4.20** specifies the determination of resistance to polishing of coarse LWA via the determination of a polished stone value (PSV) in accordance with BS EN 1097-8 when required by the aggregate user.

The Note to BS EN 13055-2:2004, **4.20** states that the BS EN 1097-8 test was developed for normal weight aggregate and has not been widely used for LWA. Therefore, it is not expected that a requirement to test for resistance to polishing will be adopted in the UK.

3.21 Resistance to wear by abrasion from studded tyres of coarse LWA in surface treatments (BS EN 13055-2:2004, 4.21)

BS EN 13055-2:2004, **4.21** specifies the determination of resistance to wear by abrasion from studded tyres of coarse LWA in surface treatments in accordance with BS EN 1097-9 when required by the aggregate user.

The Note to BS EN 13055-2:2004, **4.21** states that the test was developed for normal weight aggregates and has not been widely used for LWA.

Studded tyres are not used in the UK and it is not anticipated that a requirement to determine the resistance to wear by abrasion from studded tyres of coarse LWA in surface treatments will be adopted in the UK.

3.22 Compatibility between LWA and bitumen (BS EN 13055-2:2004, 4.21)

BS EN 13055-2:2004, **4.22** specifies the determination of compatibility between coarse LWA and bitumen in accordance with BS EN 12697-11 when required by the aggregate user.

The Note to BS EN 13055-2, **4.22** states that the test was developed for normal weight aggregates and has not been widely used for LWA. Therefore, it is not expected that a requirement to test for compatibility between coarse LWA and bitumen will be adopted in the UK.

3.23 Chemical requirements (BS EN 13055-2:2004, 4.23)

3.23.1 *General*

The tests specified in BS EN 13055-2:2004, **4.23** to determine the chemical properties of LWA are carried out in accordance with BS EN 1744. These tests give results for the chemical contents of the LWA expressed in terms of mass. Such test values need to be converted to chemical contents by volume, to allow for the density of LWA, before comparison with any regulatory limiting values. A simple procedure and formula for correcting the measurements is specified in BS EN 13055-2:2004, **4.23.1**. Further guidance and a worked example are given in BS EN 13055-2:2004, Annex D.

The selection of LWA should be made by considering their combination with other constituents on the basis of values for specific chemical properties.

3.23.2 *Water solubility (BS EN 13055-2:2004, 4.23.2)*

BS EN 13055-2:2004, **4.23.2** specifies the determination of the water solubility of LWA filler used in bituminous mixtures in accordance with BS EN 1744-1:1998, Clause **16** when required by the aggregate user.

3.23.3 *Loss on ignition (for ashes only) (BS EN 13055-2:2004, 4.23.3)*

BS EN 13055-2:2004, **4.23.3** specifies the determination of loss on ignition in accordance with BS EN 1744-1 when required by the aggregate user.

3.23.4 *Water-soluble constituents (BS EN 13055-2:2004, 4.23.4)*

BS EN 13055-2:2004, **4.23.4** specifies the preparation of eluates in accordance with BS EN 1744-3 when the determination of water-soluble constituents is required by the aggregate user.

3.24 Thermal conductivity (BS EN 13055-2:2004, 4.24)

BS EN 13055-2:2004, **4.24** specifies the determination of thermal conductivity is accordance with BS EN 12664 or BS EN 12667 (for aggregates with a thermal conductivity of less than 0.15 W/mK) when required by the aggregate user.

3.25 Evaluation of conformity (BS EN 13055-2:2004, Clause 6)

3.25.1 *General*

BS EN 13055-2:2004, Clause **6** contains requirements for the evaluation of conformity necessary for producers to demonstrate that their products conform to BS EN 13055-2. The procedures described here are called up by BS EN 13055-2:2004, Annex ZA as part of the procedure for attestation of conformity to be used for demonstrating compliance with the requirements of the EU Construction Products Directive [1].

3.25.2 ***Initial type tests (BS EN 13055-2:2004, 6.2)***

Initial type testing is a series of tests carried out on the aggregate, relevant to its intended end use, before it is first placed on the market.

Initial type testing is required for new sources, if there is a major change in raw materials or when the aggregate is to conform to a new requirement for which it has not previously been tested.

For bituminous mixtures and surface treatments and for unbound and bound applications in the UK initial type testing will normally cover:

a) loose bulk density;

b) aggregate size;

c) grading (or grading of LWA filler).

3.25.3 ***Factory production control (BS EN 13055-2:2004, 6.3)***

Factory production control is the means by which producers demonstrate conformity of their product to the relevant requirements of a European Standard, in this case BS EN 13055-2.

BS EN 13055-2:2004, **6.3** requires that producers operate a factory production control system that conforms to the requirements of BS EN 13055-2:2004, Annex C.

Producers are required to keep records of assessments made of raw materials, production processes and finished products as appropriate.

BS EN 13055-2:2004, Annex C specifies a factory production control system, which producers can use as a model when preparing a scheme tailored to suit their products and processes.

3.26 Designation, supply, marking and labelling (BS EN 13055-2:2004, Clause 7)

BS EN 13055-2:2004, Clause **7** specifies the information required to be provided on each delivery note.

4 Provisions of the EU Construction Products Directive

BS EN 13055-2:2004, Annex ZA addresses the provisions of the EU Construction Products Directive [1]. Both BS EN 13055-2:2004 and its Annex ZA have been produced under a Mandate given by the European Commission and the European Free Trade Association to CEN.

Annex ZA is described as "informative" but its requirements become mandatory to ensure compliance with the Mandate and/or where CE marking is applicable to aggregates.

Clauses in BS EN 13055-2:2004 identified in Table ZA.1a, Table ZA.1b and Table ZA.1c indicate the characteristics that are subject to regulatory requirements for the specified application in one or more European Member States. There is no obligation to determine or declare a value for a characteristic in a Member State where there is not regulatory requirement for that characteristic unless it is subject to a "threshold" value.

Conformity to these identified requirements confers a prescription of fitness of the aggregate for the intended uses indicated in the scope of BS EN 13055-2. However to meet the provisions of the Construction Products Directive [1] fully, aggregates are also required to conform to any transposed European legislation and national laws relating to any dangerous substances referred to in the clauses of BS EN 13055-2.

Within the notes in BS EN 13055-2:2004, Table ZA.1a, Table ZA.1b and Table ZA.1c, reference is made to the type of compliance requirement, for example:

— description;

— declared value.

BS EN 13055-2:2004, Annex ZA also details the allowed levels for attestation of conformity as "2+" or "4". The requirements of the two levels are summarized in Table 2.

Table 2 — Levels of attestation of conformity in accordance with the EU Construction Products Directive and referred to in BS EN 13055-2

Tasks	Conformity attestation EU numbering system	
	2+	4
Tasks for the producer		
Factory production control	Yes	Yes
Further testing of samples taken at a factory according to a prescribed test plan	Yes	No
Initial type testing	Yes	Yes
Tasks for third party notified accreditation body		
Certification of factory production control	Yes	No
Surveillance of factory production control	Yes	No

In the UK, the level of attestation for LWA is "4".

For other applications where the specifier or purchaser has concerns that the integrity of the aggregate will have a major impact on:

a) safety when in use; or

b) other performance properties of an installation (for example applications involving the storage or containment of dangerous substances);

the specifier or purchaser should adopt appropriate contract specific quality assurance procedures or acceptance testing regimes to give the required degree of confidence. It is not appropriate to expect higher attestation of conformity requirements, as these are general national requirements related to the demonstration of fitness to be placed on the market for general use and are not readily flexible to meet specific contracts needs. However, wherever possible such additional requirements should follow the same basic format as those in BS EN 13055-2.

BS EN 13055-2:2004, Annex ZA identifies the requirements for CE marking and labelling.

The UK and two other EU Member States do not currently consider that there is a mandatory requirement to CE mark products. Consequently there is no current legal requirement to CE mark aggregates supplied within the UK or to or from Ireland and Sweden. CE mark will be required for aggregates supplied to or within other Member States translated into the language of the Member State supplied.

If producers voluntarily or otherwise decide to CE mark their aggregates, the producers need to strictly comply with the indicated requirements. Where the CE mark identifies a particular characteristic, the supplier is required to indicate the declared value appropriate to the aggregate.

The user is responsible for confirming that the declaration of properties on the CE mark conforms to their particular requirements.

It should also be noted that, where aggregates are placed on the market in a European Member State where there is not regulatory requirement for a particular characteristic, the supplier is not required to determine the performance for this characteristic. In this case "No performance determined" may be stated in the CE marking information.

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BS EN 933-5:1998, *Tests for geometrical properties of aggregates — Part 5: Determination of percentage of crushed and broken surfaces in coarse aggregate particles.*

BS EN 933-10:2001, *Tests for geometrical properties of aggregate — Part 10: Assessment of fines — Grading of fillers (air-jet sieving).*

BS EN 1097-3:1999, *Tests for mechanical and physical properties of aggregates — Part 3: Determination of loose bulk density and voids.*

BS EN 1097-4:1999, *Tests for mechanical and physical properties of aggregates — Part 4: Determination of the voids of dry compacted filler.*

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BS EN 1097-6:2000, *Tests for mechanical and physical properties of aggregates — Part 6: Determination of particle density and water absorption.*

BS EN 1097-8:2000, *Tests for mechanical and physical properties of aggregates — Part 8: Determination of the polished stone value.*

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BS EN 1744-1:1998, *Tests for chemical properties of aggregates — Part 1: Chemical analysis.*

BS EN 1744-3:2002, *Tests for chemical properties of aggregates — Part 3: Preparation of eluates by leaching of aggregates.*

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BS EN 13383 (all parts), *Armourstone.*

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Other publications

[1] EUROPEAN COMMUNITIES. 89/106/EEC. Council of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products. Luxembourg: Office for Official Publications of the European Communities, 1988, www.publications.eu.int.

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