PUBLISHED DOCUMENT

PD 6682-8:2004

Aggregates —

Part 8: Aggregates for railway ballast — Guidance on the use of BS EN 13450

ICS 91.100.15; 93.100

BSI British Standards

Committees responsible for this Published Document

The preparation of this Published Document was entrusted by Technical Committee B/502, Aggregates, to Subcommittee B/502/4, Hydraulically bound and unbound aggregates, upon which the following bodies were represented:

County Surveyors' Society

Department of Trade and Industry — Represented by Building Research Establishment Limited

Institution of Structural Engineers

Quarry Products Association

UK Steel

Co-opted members

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 16 June 2004

Amendments issued since publication

Amd No.	Date	Comments

The following BSI references relate to the work on this Published Document:

Committee reference B/502/4

ISBN 0 580 43656 X

Contents

Foreword

This Published Document has been prepared under the direction of Subcommittee B/502/4, Aggregates for unbound and hydraulically bound materials. 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 Conflicting British Standards relating to aggregates will be withdrawn in June 2004.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 13450 which specifies requirements for aggregates for railway ballast. BS EN 13450 does not supersede any British Standard, but it does specify requirements that necessitated the reissue of Network Rail's specification for track ballast and stoneblower aggregate (STBSA) [1].

NOTE The STBSA [1] was reissued in 2000 to include Appendix E that gives an updated specification for railway ballast that conforms to BS EN 13450. It is intended that the 2000 edition will be completely revised at a later date to remove all requirements that conflict with BS EN 13450. Users of the STBSA should contact Network Rail for confirmation of revision.[1)]

Attention is drawn to the fact that BS EN 13450 fully takes into account the requirements of the European Commission mandate M125, Aggregates, given under the EU Construction Products Directive (89/106/EEC) [2].

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 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.*[2)]

— *Part 6: Aggregates for unbound and hydraulically bound materials for use in civil engineering works and road construction – Guidance on the use of BS EN 13242.*

— *Part 7: Armourstone — Guidance on the use of BS EN 13383.*

— *Part 9: Guidance on the use of European test method standards.*

This publication does not purport to include all 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 13 and a back cover.

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[1)] Network Rail, 40 Melton Street, London NW1 2EE. Tel.: 020 7557 8000. www.networkrail.co.uk.

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

Introduction

This document provides guidance on the use of BS EN 13450 in the UK. BS EN 13450 specifies requirements for aggregates for railway ballast that necessitated the reissue of Network Rail's specification for track ballast and stoneblower aggregate (STBSA) [1].

NOTE This guide uses the STBSA as a basis against which to compare the requirements of BS EN 13450. This has been done on the premise that the STBSA is:

a) the rail industry's most widely used guidance for the specification of railway ballast; and

b) written in line with the Rail Safety and Standards Board's (RSSB's) Railway Group Standard on track bed and track drainage [3].

However, it is important to note that other guidance documents for railway ballast might be available.

Whilst BS EN 13450 describes aggregates for railway ballast in a different manner to established UK practice and in some cases uses different test methods to evaluate their properties, there is little change to the essential character of the aggregates in actual use in the UK.

BS EN 13450 specifies a range of categories for properties to enable users to select appropriate limiting values for the range of aggregates used in railway ballast. In most instances, provision is also made for producers to identify a declared value for properties when the value is outside indicated categories.

This UK guidance recommends limiting values for aggregate properties within the ranges permitted in BS EN 13450. Where possible, these recommended values are equivalent to those specified in the Network Rail specification for railway ballast.

Specifiers will need to define BS EN 13450 categories for properties that are relevant to the particular end-use of an aggregate. An example specification listing recommended BS EN 13450 aggregate categories for particular properties for aggregates for railway ballast is provided in Annex A.

Railway ballast has long been specified alongside stoneblower aggregate. Stoneblower aggregate is used to pack sleepers by being pneumatically blown under them. It is, as a consequence, much smaller in size than railway ballast. BS EN 13450, however, does not give any guidance on how to specify stoneblower aggregate and as such, no guidance on specifying stoneblower aggregate in accordance with the requirements of BS EN 13450 is included on this guide.

BS EN 13450 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.

1 Scope

This part of PD 6682 gives guidance on the use of BS EN 13450 in the UK. BS EN 13450 specifies the properties of aggregates obtained by processing natural, manufactured or recycled materials for railway ballast.

NOTE Stoneblower aggregate, which is used to pack sleepers by being pneumatically blown under them, is not specified in BS EN 13450. Therefore, no guidance on specifying stoneblower aggregate in accordance with the requirements of BS EN 13450 is included in this guide.

2 Overview of BS EN 13450

2.1 General

UK specifications relating to aggregates for railway ballast, notably the STBSA [1], have specified requirements for the following aggregate properties.

a) Dimensions (grading).

b) Flakiness.

c) Elongation.

d) Aggregate crushing value.

e) Wet attrition value.

BS EN 13450 gives requirements for different properties, including different test methods. These different geometrical, physical (mechanical) and durability properties are listed in **2.2**, **2.3** and **2.4**.

NOTE The STBSA was reissued by Network Rail in 2000 to include Appendix E that gives an updated specification for railway ballast that conforms to BS EN 13450. Network Rail now uses railway ballast that conforms to their updated specification in Appendix E of the STBSA.

2.2 Geometrical requirements

Requirements for the following geometrical properties are specified for railway ballast in BS EN 13450:2002, Clause **6** but did not use to be specified in the STBSA.

a) Fine particles content, measured in accordance with BS EN 933-1.

b) Fines content, measured in accordance with BS EN 933-1.

c) Particle length, measured in accordance with BS EN 13450:2002, **6.7**.

2.3 Physical requirements

The term “mechanical properties” used in British Standards relating to aggregates is replaced in BS EN 13450 by the term “physical properties”. Requirements for the following physical properties are specified for railway ballast in BS EN 13450:2002, Clause **7** but did not use to be specified in the STBSA.

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

b) Resistance to wear, measured by determining the micro-Deval coefficient in accordance with BS EN 1097-1 and the conditions specified in BS EN 13450:2002, Annex E. This test method is derived from a French (AFNOR) test method.

c) Sonnenbrand of basalt, measured in accordance with BS EN 1367-3.

2.4 Durability requirements

Requirements for the following durability properties are specified for railway ballast in BS EN 13450:2002, **7.4** but did not use to be specified in the STBSA.

a) Freeze-thaw resistance:

1) in accordance with BS EN 1367-1, based on a German (DIN) test method, and the conditions specified in BS EN 13450:2002, Annex F; or

2) in accordance with BS EN 1367-2, based on a magnesium sulfate soundness test derived from BS 812-121, and the conditions specified in BS EN 13450:2002, Annex G.

NOTE BS EN 13450:2002, Annex H gives guidance on how to measure the water absorption value, in accordance with BS EN 1097-6, as a screening test for freeze-thaw resistance.

b) Particle density, measured in accordance with BS EN 1097-6.

2.5 Evaluation of conformity

BS EN 13450:2002, Clause **9** requires that producers undertake and on request declare the results from:

a) initial type tests used:

1) to characterize properties for new source aggregates; or

2) when 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 test are identified in BS EN 13450:2002, Annex I.

Guidance on the requirements for attestation of conformity to and compliance with the provisions of the EU Construction Products Directive [2] is given in Clause **4**.

3 Requirements of BS EN 13450

3.1 General

Each clause in BS EN 13450 that specifies aggregate properties, i.e. Clause **6** and Clause **7**, starts with a general subclause which draws attention to the necessity only to specify those properties relevant to the particular aggregate. Where this is the case the wording "when required" is used.

In BS EN 13450, tables of specified requirements allow the user to choose an appropriate "category" for each property. The style of category designation is intended to be self explanatory and related to the specified limiting value. For example, category FI_{35} means that aggregate with a maximum flakiness index value of 35 is required.

An option to use a "no requirement" category is also provided. For example, a resistance to impact category of SZ_{RB}NR is included in BS EN 13450 and it means that there is no specified requirement for impact resistance. A category of $SZ_{RB}22$, on the other hand, would require a maximum impact value of 14 %. 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 railway ballast measured by the Los Angeles coefficient exceeds 24, the producer can state the maximum expected value of "LA_{RB} Declared". Thus if this value were 30, the producer would state LA_{30} and railway ballast users should determine whether this is adequate for their purposes.

3.2 Geometrical requirements

3.2.1 *Railway ballast size (BS EN 13450:2002, 6.2)*

The railway ballast size is described in BS EN 13450 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 a railway ballast should lie between these two values and requirements for this are specified in BS EN 13450:2002, **6.3**.

BS EN 13450:2002, **6.2** only specifies two railway ballast sizes, 31.5/50 and 31.5/63.

In the UK, the established STBSA railway ballast size was 50 mm to 28 mm. Therefore, the recommended equivalent BS EN 13450 size is 31.5/50.

NOTE The sieve sizes used to describe railway ballast sizes in BS EN 13450 are expressed in reverse order to the practice that used to be specified in the STBSA, i.e. the lower sieve size is given before the upper sieve size.

3.2.2 *Grading (BS EN 13450:2002, 6.3)*

BS EN 13450 expresses the grading requirements of a railway ballast in terms of percentages passing specified sieve sizes, including the lower (*d*) and upper (*D*) sieve size.

BS EN 13450:2002, **6.3** specifies the determination of grading in accordance with BS EN 933-1 and lists six different grading categories:

a) three for 31.5/50 ballast (i.e. grading categories A, B and C); and

b) three for 31.5/63 ballast (i.e. grading categories D, E and F).

In the UK, it is recommended that the equivalent BS EN 13450 grading category for a 50 mm to 28 mm STBSA ballast is grading category A.

Table 1 lists the STBSA grading requirements of a 50 mm to 28 mm ballast alongside the grading requirements of a 31.5/50 BS EN 13450 ballast conforming to grading category A.

Table 1 — 50 mm to 28 mm STBSA railway ballast grading and its recommended equivalent 31.5/50 BS EN 13450 ballast conforming to grading category A

50 mm to 28 mm STBSA ballast grading		Recommended equivalent 31.5/50 BS EN 13450 ballast conforming to grading category A	
Sieve size mm	Percentage passing by mass	Sieve size mm	Percentage passing by mass
63	100	63	100
50	97 – 100	50	70 – 99
37.5	35 – 65	40	30 – 65
28	0 – 20	31.5	1 – 25
14	0 – 2	22.4[a]	0 – 3
1.18	0 – 0.8	31.5 – 50	≥ 50

[a] Note 1 to BS EN 13450:2002, Table 1 states that the requirement for passing the 22.4 mm sieve only applies to railway ballast sampled at the place of production.

3.2.3 *Fine particles (BS EN 13450:2002, 6.4)*

Fine particles are defined in BS EN 13450 as the railway ballast particle fraction that passes a 0.5 mm sieve. This used to differ from the STBSA, which defined fine particles as the particle fraction that passes a 1.18 mm sieve.

BS EN 13450:2002, **6.4** specifies the determination of fine particle content in accordance with BS EN 933-1 and lists four different fine particle content categories.

The UK limit for fine particle content in railway ballast was given in the STBSA as 0 – 0.8 %. Therefore, the recommended BS EN 13450 equivalent is "fine particle category A", which sets a maximum fine particle content limit of 0.6 %.

NOTE The note to BS EN 13450:2002, Table 2 states that the fine particle categories only apply to railway ballast sampled at the place of production.

3.2.4 *Fines (BS EN 13450:2002, 6.5)*

Fines are defined in BS EN 13450 as the railway ballast particle fraction that passes a 0.063 mm sieve.

When required by the purchaser BS EN 13450 specifies the determination of fines content in accordance with BS EN 933-1. This fines content test is used particularly to assess the cleanliness of railway ballast. However, it is not considered necessary to perform this test on railway ballast in the UK because cleanliness is maintained by controlling the fine particles content in accordance with **3.2.3**. Therefore, it is not expected that a requirement to test for fines content will be adopted in the UK and the recommended BS EN 13450 fines content category is "fines content category D", which imposes no requirements on fines content.

3.2.5 *Particle shape (BS EN 13450:2002, 6.6)*

BS EN 13450:2002, **6.6** specifies that the shape of railway ballast shall be determined in terms of the flakiness index in accordance with BS EN 933-3. This flakiness index test differs from the equivalent UK test specified in BS 812-105.1 because it is based on different dimensional ratios. Therefore, BS EN 13450 specifies significantly lower limits for flakiness.

In the UK, the maximum flakiness index value was established in the STBSA as 40. It is recommended that the equivalent BS EN 13450 flakiness index category is FI_{35}, which sets a maximum flakiness index value of 35.

An option to use the shape index specified in BS EN 933-4 is given in BS EN 13450. It is not anticipated that it will be widely used in the UK and it is recommended that category SI_{NR} is adopted.

3.2.6 *Particle length (BS EN 13450:2002, 6.7)*

BS EN 13450:2002, **6.7** specifies the determination of particle length in accordance with BS EN 933-4. There is no experience of determining particle length in the UK.

NOTE The STBSA determined the elongation index value of a railway ballast in accordance with BS 812-105.1, however, the results of such testing cannot be compared directly with the particle length results obtained in accordance with BS EN 933-4.

When required by the purchaser it is recommended that BS EN 13450 "particle length category A" is adopted in the UK. BS EN 13450:2002, Table 6 requires that, for particle length category A, the percentage by mass of ballast with length ≥ 100 mm in a sample ≥ 40 kg shall not exceed 4 %.

3.3 Physical requirements

3.3.1 *Resistance to fragmentation (BS EN 13450:2002, 7.2)*

When required by the purchaser BS EN 13450:2002, **7.2** specifies the determination of resistance to fragmentation in terms of the Los Angeles coefficient in accordance with BS EN 1097-2 and the conditions specified in BS EN 13450:2002, Annex C. There is no direct correlation between the test method in BS EN 1097-2 and the existing UK tests for mechanical properties, i.e. the 10 % fines value (TFV) determined in accordance with BS 812-111, the aggregate crushing value (ACV) determined in accordance with BS 812-110 or the aggregate impact value (AIV) determined in accordance with BS 812-112.

In the UK, the STBSA determined resistance to fragmentation in terms of aggregate crushing values (ACVs) measured in accordance with BS 812-110 and requires a maximum ACV of 22. It is recommended that the equivalent BS EN 13450 Los Angeles coefficient category is $LA_{RB}20$, which sets a maximum Los Angeles coefficient value of 20.

Whilst the Los Angeles test is the reference test for resistance to fragmentation, BS EN 13450:2002, **7.2** includes an option to assess resistance to fragmentation by determining the impact value in accordance with BS EN 1097-2, which is based on a DIN test method. This alternative test requires the use of special equipment not available in UK and it is recommended that the category SZ_{RB}NR is adopted.

3.3.2 *Resistance to wear (BS EN 13450:2002, 7.3)*

When required by the purchaser BS EN 13450:2002, **7.3** specifies the determination of resistance to wear in terms of the micro-Deval coefficient in accordance with BS EN 1097-1 and the conditions specified in BS EN 13450:2002, Annex E.

In the UK, the STBSA determined resistance to wear in terms of wet attrition values (WAVs) measured in accordance with BS 812:1951 and requires a maximum WAV of 4.0. It is recommended that the equivalent BS EN 13450 micro-Deval coefficient category is M_{DE}RB7, which sets a maximum micro-Deval coefficient value of 7.

3.3.3 *"Sonnenbrand" of basalt (BS EN 13450:2002, 7.5)*

Sonnenbrand is a type of rock decay that is tested in order to determine the susceptibility of certain types of young basalt aggregates, found in some European countries, to degradation through mineralogical instability. This phenomenon is not experienced in the UK and it is not anticipated that this test will be applied in the UK. It is recommended that no requirements about detecting for signs of Sonnenbrand are made in the UK, although further information should be obtained on the susceptibility of imported basalt aggregates.

3.4 Durability requirements

3.4.1 *Resistance to freezing and thawing (BS EN 13450:2002, 7.4.1)*

BS EN 13450:2002, **7.4.1** provides a means for assessing the durability of railway ballast by determining its freeze-thaw resistance in accordance with either:

a) the BS EN 1367-1 freeze-thaw test, based on a DIN method, and the conditions specified in BS EN 13450:2002, Annex F; or

b) the BS EN 1367-2 magnesium sulfate soundness test, derived from BS 812-121, and the conditions specified in BS EN 13450:2002, Annex G.

There is limited experience of assessing the resistance of railway ballast to freezing and thawing by either method a) or b). However, BS EN 13450:2002, Annex H gives guidance on the applicability of each of the test methods and how to measure the water absorption values in accordance with BS EN 1097-6 as a screening test for freeze-thaw resistance.

Method b) is more familiar in the UK than method a), therefore, when purchasers require the determination of freeze-thaw resistance, it is recommended that method b) is used instead of method a).

3.4.2 *Particle density and water absorption (BS EN 13450:2002, 7.4.2 and 7.4.3)*

When required by the purchaser BS EN 13450 specifies the determination of particle density and water absorption in accordance with BS EN 1097-6. The specification of categories for these properties are not considered appropriate for railway ballast and instead provision is made in BS EN 13450 for suppliers to declare values for these properties.

NOTE BS EN 13450:2002, Annex H gives guidance on how to use water absorption values, obtained in accordance with BS EN 1097-6, as a screening test for freeze-thaw resistance.

3.5 Harmful components (BS EN 13450:2002, Clause 8)

When required by the purchaser BS EN 13450 requires that railway ballast does not contain components or matter that has not been specified in BS EN 13450. It is recommended this requirement is adopted in the UK.

3.6 Evaluation of conformity

3.6.1 *General*

BS EN 13450:2002, Clause **9** contains requirements for the evaluation of conformity necessary for producers to demonstrate that their products conform to BS EN 13450. The procedures described here are called up by BS EN 13450:2002, 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.

3.6.2 ***Initial type test (BS EN 13450:2002, 9.2)***

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. This testing is used to identify the categories specified within BS EN 13450 to which the aggregate conforms.

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.

Where aggregate users require additional data or properties for particular uses of the aggregate, these should be requested prior to ordering, allowing sufficient time for testing.

3.6.3 ***Factory production control (BS EN 13450:2002, 9.3)***

Factory production control is the means by which to define the quality system which producers are required to operate to demonstrate ongoing conformity of their product to the relevant European Standard, in this case BS EN 13450.

3.6.4 ***Designation and description (BS EN 13450:2002, Clause 10)***

Aggregates are identified using the following information.

a) Source and producer. Where an aggregate is rehandled in a depot both the original source and depot should be given.

b) Type of aggregate. Reference is made to BS EN 932-3 and this standard should be consulted for specific guidance. Essentially when a rock or mineral is predominant (more than 50 %), its presence is reflected in the name of the material, e.g. "quartzose" sand, "basaltic" gravel, etc. When no single type is predominant, the material is said to be heterogeneous and its name can include the most frequent types, e.g. heterogeneous "siliceous" gravel, heterogeneous "quartzo-feldspathic" sand, etc. For the UK it is recommended that shortened local versions continue to be adopted and full petrographic descriptions should be available on request from the producer.

c) Aggregate size.

3.7 Marking and labelling (BS EN 13450:2002, Clause 11)

BS EN 13450:2002, Clause **11** specifies the information required to be provided on each delivery ticket.

4 Provisions of the EU Construction Products Directive

BS EN 13450:2002, Annex ZA addresses the provisions of the EU Construction Products Directive [2]. Both BS EN 13450:2002 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 13450 identified in Tables ZA.1a and Table ZA.1b 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 no 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 and fillers for the intended uses indicated in BS EN 13450. However, to meet the provisions of the EU Construction Products Directive [2] 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 13450.

Within the notes in BS EN 13450:2002, Tables ZA.1a and Table ZA.1b, reference is made to the type of compliance requirement, for example:

a) pass/fail threshold value;

b) categories;

c) declared value.

BS EN 13450:2002, Annex AZ also details the allowed levels for attestation of conformity as "2+" or "4". The requirements of the two levels are summarized in Table 2.

In the UK, the level of attestation for aggregates for railway ballast is "4".

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

a) safety when in use; or

b) other performance properties of an installation;

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 not readily flexible to meet specific contract needs. However, wherever possible such additional requirements should follow the same basic format as those in BS EN 13450.

BS EN 13450:2002, 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 marking 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 category or declared value appropriate to the aggregate. The user is responsible for confirming that the declaration of properties on the CE mark complies with the user's particular requirements.

It should also be noted that where aggregates are placed on the market in a European Member State where there is no 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.

Table 2 — Levels of attestation of conformity in accordance with the EU Construction Products Directive and referred to in BS EN 13450

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

5 Annexes of BS EN 13450

5.1 General

BS EN 13450 contains a number of annexes. These annexes are either informative or normative. They give a description of:

a) how to sample railway ballast;

b) how to interpret sampling results;

c) what conditions need to be applied to European aggregate test method standards when used to test railway ballast;

d) how to test the freeze-thaw resistance of railway ballast;

e) factory production control.

Guidance on each of the BS EN 13450 annexes is given in **5.2** to **5.10**.

5.2 Sampling railway ballast at the construction site either from a railway wagon or from the track (BS EN 13450:2002, Annex A)

Occasionally it can be necessary to take a sample of railway ballast from a railway wagon or from a track. BS EN 13450:2002, Annex A is an informative annex which gives guidance on sampling railway ballast from a railway wagon or from the track.

However, it should be noted that BS EN 13450:2002, Annex A states that in order for railway ballast to conform to BS EN 13450, it should be sampled at the place of production in accordance with BS EN 932-1.

5.3 Guidance on interpretation of results when samples of railway ballast have been taken from railway wagon or from track (BS EN 13450:2002, Annex B)

BS EN 13450:2002, Annex B is an informative annex which gives guidance on interpreting results obtained from samples that are taken from railway wagon or track in accordance with BS EN 13450:2002, Annex A. It states that such samples should be subject to the same BS EN 13450 requirements and testing as samples taken at the place of production.

However, BS EN 13450:2002, Annex B states that results from tests on samples taken from railway wagon or from track can only be used:

a) for information purposes to form the basis of discussion between the railway ballast supplier and the purchaser; and/or

b) to assess if degradation during transport is acceptable in accordance with the categories recommended in Table B.1.

NOTE BS EN 13450:2002, Annex B does not recommend which test method to use in the determination of the extent of degradation of railway ballast that has occurred during transport.

5.4 Conditions to be applied to the test procedure specified in BS EN 1097-2 for testing the Los Angeles coefficient of railway ballast (BS EN 13450:2002, Annex C)

BS EN 13450:2002, Annex C is a normative annex which specifies what modifications to the test procedure are needed when determining the Los Angeles coefficient of railway ballast in accordance with BS EN 1097-2.

5.5 Conditions to be applied to the test procedure specified in BS EN 1097-2 for testing the impact value of railway ballast (BS EN 13450:2002, Annex D)

BS EN 13450:2002, Annex D is a normative annex which specifies what modifications to the test procedure are needed when determining the impact value of railway ballast in accordance with BS EN 1097-2. However, it is unlikely that a requirement to determine the impact value of railway ballast will be adopted in the UK.

5.6 Conditions to be applied to the test procedure specified in BS EN 1097-1 for determination of the resistance to wear (micro-Deval) of railway ballast (BS EN 13450:2002, Annex E)

BS EN 13450:2002, Annex E is a normative annex that specifies what modifications to the test procedure are needed when determining the micro-Deval coefficient of railway ballast in accordance with BS EN 1097-1.

5.7 Conditions to be applied to the test procedure specified in BS EN 1367-1 for determination of the resistance to freezing and thawing of railway ballast (BS EN 13450:2002, Annex F)

BS EN 13450:2002, Annex F is a normative annex that specifies what modifications to the test procedure are needed when determining the freezing and thawing resistance of railway ballast in accordance with BS EN 1367-1.

5.8 Conditions to be applied to the test procedure specified in BS EN 1367-2 for determination of the resistance of railway ballast to the magnesium sulphate test (BS EN 13450:2002, Annex G)

BS EN 13450:2002, Annex G is a normative annex that specifies what modifications to the test procedure are needed when determining the magnesium sulphate soundness of railway ballast in accordance with BS EN 1367-2.

5.9 Guidance on the freezing and thawing resistance of railway ballast (BS EN 13450:2002, Annex H)

There is limited experience of assessing the freeze-thaw resistance of railway ballast. Therefore, BS EN 13450:2002, Annex H has been written to give guidance on the use of test methods for determining freeze-thaw resistance, including guidance on the use of water absorption as a screening test for freeze-thaw resistance.

BS EN 13450 does not specify limits for freeze-thaw resistance, however BS EN 13450:2002, Annex H suggests that limits should be established from experience of satisfactory use, using either a magnesium sulfate test in accordance with BS EN 1367-2 or a freeze-thaw test in accordance with BS EN 1367-1.

BS EN 13450:2002, Table H.1 gives a method for categorizing freeze-thaw severity in terms of the climate and environmental conditions at a particular site.

BS EN 13450:2002, Table H.2 gives an example of how to present limits for magnesium sulphate soundness values or freeze/thaw values for a particular freeze-thaw severity category.

5.10 Factory products control (BS EN 13450:2002, Annex I)

BS EN 13450:2002, Annex I is a normative annex which specifies a factory production control system for aggregates for railway ballast to ensure that they conform to BS EN 13450.

Annex A (Informative)
Example specification for railway ballast

An example format of a preferred specification for aggregate for railway ballast is given in Table A.1.

NOTE BS EN 13450 includes "recycled crushed unbound aggregate for use as railway ballast" within its scope. Therefore, it is recommended that, in addition to natural and manufactured railway ballast, recycled railway ballast should also conform to the example specification given in Table A.1.

Table A.1 — Example specification for railway ballast

Property	Category to BS EN 13450
Grading	A
Fine particle content	A
Fines content	D
Particle shape	FI_{35}
Particle length	A
Los Angeles coefficient	$LA_{RB}20$
Micro-Deval	M_{DE}RB7
Magnesium sulfate soundness	See BS EN 13450:2002, Annex H
"Sonnenbrand" of basalt	No requirement
NOTE Where potentially harmful components could be present in the railway ballast, e.g from recycled railway ballast, requirements for fine particle content in accordance with **3.2.3** and harmful components in accordance with **3.5** should be given to ensure the cleanliness of the railway ballast.	

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[3)] Both BS EN 13055-2 and PD 6682-5 are in preparation.

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