

Testing aggregates

Method for determination of alkali–silica reactivity.

Concrete prism method

Committees responsible for this Draft for Development

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- British Aggregate Construction Materials Industries
- British Civil Engineering Test Equipment Manufacturers' Association
- British Steel Industry
- County Surveyors' Society
- Department of the Environment (Building Research Establishment)
- Department of Trade and Industry (National Measurement Accreditation Service)
- Department of Transport
- Sand and Gravel Association Ltd.
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Foreword

This Draft for Development has been prepared under the direction of Technical Committee B/502, Aggregates. It describes a method for the measurement of expansion of concrete produced by alkali-silica reaction involving specific aggregate combinations and is based on the measurement of the length change of concrete prisms containing a high level of alkali and made with the aggregate under test.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because no guidance on the interpretation of results of this method can be given until a relationship between the results of laboratory tests and expansion in structural concrete of normal mix proportions in normal exposure conditions is established. Research is underway to establish such a relationship. At present therefore, the method should not be quoted in any specification for aggregate. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than 2 years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development, will be made in the appropriate issue of *BSI News*.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of BSI Technical Committee B/502/6 at the BSI London address shown on the back cover.

Method

1 Scope

This Draft for Development describes a method of measuring the expansion of concrete produced by alkali-silica reaction involving specific combinations of aggregates.

The method is designed as an accelerated laboratory test for a specific combination of aggregates and should not be considered to be a performance test for concrete.

NOTE. Aggregates are usually tested in the combination to be used on the job. However, when the aggregate combination to be used is not decided, the test sample of aggregate is tested in combination with both an inert aggregate and an aggregate geologically similar to itself in proportions specified in the method. This procedure provides a generally satisfactory assessment of the aggregate by accommodating any pessimum value which it may possess.

2 References

2.1 Normative references

This Draft for Development incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate points in the text and the publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Draft for Development only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Draft for Development refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this Draft for Development are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Draft for Development, the definitions given in BS 812 : Part 100, Part 101 and Part 102 apply.

4 Principle

Concrete test prisms are prepared from the aggregate combination under test and stored for a period of 52 weeks in conditions which would promote any potential alkali-silica reaction. During this time measurements are made at intervals to determine whether any expansion has occurred.

In order to promote the development of any expansive forces and to ensure that slowly reacting aggregates are detected in the 52 week period, the test is accelerated by formulating the concrete to possess a higher than average cement and alkali content and by storing the prisms at high humidity and a comparatively high temperature (38 °C) to increase the rate of the chemical reaction.

NOTE. If expansion exceeding an agreed or specified limit is recorded in the test, or atypical expansion is obtained in routine monitoring of an aggregate source, the individual test specimen exhibiting the highest expansion may be examined to confirm that alkali-silica reaction is the main cause of that expansion. Suitable procedures are to be found in the publication *The Diagnosis of Alkali-Silica Reaction* [1].

5 Sampling

The samples of coarse and fine aggregate used for the test (the laboratory samples) shall be taken in accordance with the procedure described in clause 5 of BS 812 : Part 102 : 1989.

NOTE. The recommendations given in BS 812 : Part 102 are primarily intended for sampling from a stockpile of aggregate. Where aggregate is being sampled from a quarry it is important to ensure that the samples obtained for use in the test are satisfactorily representative of the sources concerned.

6 Apparatus

NOTE. All apparatus should conform to the general requirements of BS 812 : Part 100.

6.1 Sample divider, of size appropriate to the maximum particle size to be handled, or alternatively, a flat shovel and a clean, flat, hard surface (e.g. a metal tray), for use in quartering.

NOTE. A suitable divider is the riffle box illustrated in BS 812 : Part 102 : 1989.

6.2 Test sieves, conforming to BS 410, of the size and apertures appropriate to the nominal size of aggregates to be tested.

6.3 Balance, of minimum capacity 5 kg, readable to 2 g.

6.4 Balance, of minimum capacity 100 g, readable to 0.01 g.

6.5 Four steel moulds, with cavities suitable for casting concrete prisms of lengths (250 ± 50) mm. No two cavities shall differ in length by more than 5 mm and the cross sections shall be (75 ± 2) mm by (75 ± 2) mm. The moulds shall have facility for casting stainless steel reference studs into the mid-points of the end faces of the prisms.

The reference studs shall be mounted inside the mould before casting the prisms. The studs shall either have smooth conical recesses into which a 6 mm ball may be located, as shown in figure 1, or shall provide a 3 mm radius hemispherical bearing, as shown in figure 2.

NOTE. The use of stainless steel grade 316 S11 as specified in BS 970 : Part 1 : 1991, or a grade of similar quality, is recommended for the manufacture of reference studs.

