



# Testing aggregates —

## Part 105: Methods for determination of particle shape —

### Section 105.2 Elongation index of coarse aggregate

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# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Cement, Gypsum, Aggregates and Quarry Products Standards Policy Committee (CAB/-) to Technical Committee CAB/2, upon which the following bodies were represented:

Aggregate Concrete Block Association  
 Association of Consulting Engineers  
 Association of Consulting Scientists  
 Association of Lightweight Aggregate Manufacturers  
 Brick Development Association  
 British Aggregate Construction Materials Industries  
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 Sand and Gravel Association Limited  
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# Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
<hr/>	
1 Scope	1
2 Definitions	1
3 Principle	1
4 Sampling	1
5 Apparatus	1
6 Preparation of test portions	1
7 Procedure	1
8 Calculation and expression of results	3
9 Test report	3
<hr/>	
Table 1 — Particulars of test sieves	1
Table 2 — Minimum mass of test portion	1
Table 3 — Data for determination of elongation index	3
<hr/>	
Figure 1 — Metal length gauge	2
<hr/>	
Publications referred to	Inside back cover
<hr/>	

## Foreword

This Section of BS 812, prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Policy Committee, is a revision of 7.4 of BS 812-1:1975 which will be deleted by amendment.

Part 105 comprises two separately published Sections:

105.1 Flakiness index of coarse aggregate

105.2 Elongation index of coarse aggregate

The associated test for angularity number given in the 1975 edition of BS 812-1 is no longer included in this revision because of lack of use. It is intended that BS 812 test methods should be called up by other British Standards as the basis of compliance. Nevertheless, it is not intended that all aggregates should be subjected regularly to all the listed tests. Specifications in other standards will refer only to the relevant test methods.

Some of the tests in other Parts of this standard are of limited application, and advice on the use of simpler tests is given, for example when they can be used for a preliminary sorting of aggregates to see whether more expensive testing is justified.

No data for the precision of this test was available at the time of publication. Precision trials are however being undertaken and precision data will be incorporated by amendment when the trials have been completed and the data assessed.

Reference should be made to BS 812-101 for general guidance on testing aggregates, precision of test methods and variance arising from sampling errors.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This Section of BS 812 describes the method for determining the elongation index of coarse aggregate.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Definitions

For the purposes of this Section of BS 812 the definitions given in BS 812-101 and 102 apply.

## 3 Principle

Aggregate particles are classified as elongated when they have a length (greatest dimension) of more than 1.8 of their mean sieve size, this size being taken as the mean of the limiting sieve apertures used for determining the size fraction in which the particle occurs. The elongation index is found by separating the elongated particles and expressing their mass as a percentage of the mass of sample tested.

The test is not applicable to material passing a 6.30 mm test sieve or retained on a 50.0 mm test sieve.

## 4 Sampling

The sample to be used for the test (the laboratory sample) shall be taken in accordance with the procedures described in clause 5 of BS 812-102:1989.

## 5 Apparatus

**5.1** A *sample divider*, of size appropriate to the maximum particle size to be handled or alternatively a flat shovel and a clean, flat, hard horizontal surface, e.g. a metal tray for use in quartering.

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

**5.2** A *ventilated oven*, thermostatically controlled to maintain a temperature of  $105 \pm 5$  °C.

**5.3** A *balance, or balances*, of suitable capacity accurate to 0.1 % of the mass of the test portion.

NOTE In general two balances, one of approximately 5 kg capacity accurate to 1 g and the other approximately 500 g capacity accurate to 0.1 g will suffice. If aggregate of larger than 28 mm nominal size is to be tested a balance of 50 kg capacity accurate to 10 g will also be required.

**5.4** *Test sieves*, of the sizes and apertures appropriate to the specification of the material being tested, complying with BS 410 for square hole perforated plate and with the appropriate sizes of lids and receivers.

NOTE A set of sieves of sizes and apertures given in Table 1 will cover most applications of the method.

Table 1 — Particulars of test sieves

Nominal aperture sizes (Square hole perforated plate 450 mm or 300 mm diameter)
mm
50.0
37.5
28.0
20.0
14.0
10.0
6.30

**5.5** A *mechanical sieve shaker* (optional)

**5.6** *Trays*, of suitable size, which can be heated in the ventilated oven (5.2) without damage or change in mass.

**5.7** *Metal length gauge*, of pattern shown in Table 1.

NOTE The incorporation of a hardwood base is not mandatory; other durable materials may be used to form a stable base for the metal length gauge.

## 6 Preparation of test portions

Reduce the sample by the procedures described in clause 6 of BS 812-102:1989 to produce a test portion that complies with Table 2 with due allowance for the later rejection of particles retained on a 50.0 mm test sieve and passing a 6.30 mm test sieve. Dry the test portion by heating at a temperature of  $105 \pm 5$  °C to achieve a dry mass which is constant to within 0.1 %. Allow to cool and weigh.

Table 2 — Minimum mass of test portion

Nominal size of material	Minimum mass of test portion after rejection of oversize and undersize particles
mm	kg
40	15
28	5
20	2
14	1
10	0.5

## 7 Procedure

**7.1** Carry out a sieve analysis in accordance with clause 7 of BS 812-103.1:1985 using the test sieves given in Table 3. Discard all the aggregate retained on the 50 mm test sieve and all the aggregate passing the 6.30 mm test sieve.

**7.2** Weigh each of the individual size fractions retained on the test sieves, other than the 50.0 mm test sieve, and store them in separate trays with their size marked on the trays.

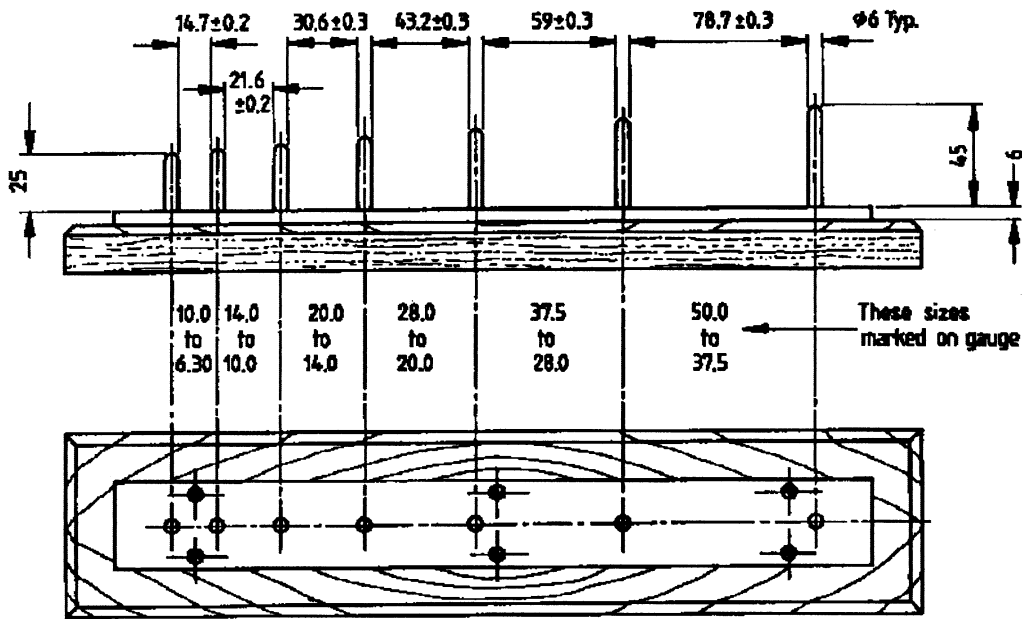
**NOTE** Where the mass of any size fraction exceeds the minimum mass given in Table 3, the fraction may be subdivided by the methods described in clause 6 of BS 812-102:1989, provided the mass of the subdivided fraction is not less than half the minimum mass given in Table 3. Under such circumstances the rest of the procedure should be suitably modified and the appropriate correction factor applied to determine the mass of elongated particles that would have been obtained had the whole of the original size fraction been gauged.

**7.3** From the sums of the masses of the fractions in the trays ( $M_1$ ) calculate the individual percentage retained on each of the various test sieves. Discard any fraction whose mass is 5 % or less of mass  $M_1$ . Record the mass remaining ( $M_2$ ).

**7.4** Gauge each fraction as follows. Select the length gauge appropriate to the size fraction under test (see Table 3) and gauge each particle separately by hand. Elongated particles are those whose greatest dimension prevents them from passing through the gauge, and these are placed to one side.

**7.5** Combine and weigh all the elongated particles ( $M_3$ ).

**NOTE** If required, an elongation index may be determined separately for individual size fractions by recording separately the masses of each of the individual size fractions and the masses of elongated particles in each size fraction.



All dimensions are in mm.

**NOTE.** Tolerances are given on essential dimensions as shown.

Figure 1 — Metal length gauge

Table 3 — Data for determination of elongation index

Aggregate size fraction		Gap between pins of length gauge <sup>a</sup>	Minimum mass for subdivision
Test sieve			
100 % passing	100 % retained		
mm	mm	mm	kg
50.0	37.5	78.7 ± 0.3	35
37.5	28.0	59.0 ± 0.3	15
28.0	20.0	43.2 ± 0.3	5
20.0	14.0	30.6 ± 0.3	2
14.0	10.0	21.6 ± 0.2	1
10.0	6.30	14.7 ± 0.2	0.5

<sup>a</sup> This dimension is equal to 1.8 times the mean test sieve size.

## 8 Calculation and expression of results

The value of the elongation index is calculated from the expression:

$$\text{Elongation index} = \frac{M_3}{M_2} \times 100$$

where

$M_2$  is the sum of the masses of fractions that have a mass greater than 5 % of the total mass.

$M_3$  is the mass of all the elongated particles.

Express the elongation index to the nearest whole number

## 9 Test report

The test report shall affirm that the elongation index was determined in accordance with this Section of BS 812, and whether or not a certificate of sampling is available. If available, a copy of the certificate of sampling shall be provided. The test report shall include the following additional information:

- a) sample identification;
- b) elongation index;
- c) sieve analysis obtained from this test.





## Publications referred to

BS 410, *Specification for test sieves.*

BS 812, *Testing aggregates.*

BS 812-101, *Guide to sampling and testing aggregates.*

BS 812-102, *Methods for sampling.*

BS 812-103, *Methods for determination of particle size distribution.*

BS 812-103.1, *Sieve tests.*

BS 812-105, *Methods for determination of particle shape.*

BS 812-105.1, *Flakiness index.*

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