

Testing aggregates —

Part 105: Methods for determination of particle shape —

Section 105.2 Elongation index of coarse aggregate

UDC [625.07+691.22]:620.168.36

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
 British Cement Association
 British Ceramic Research Ltd.
 British Civil Engineering Test Equipment Manufacturers' Association
 British Geological Sciences
 British Precast Concrete Federation Ltd.
 British Ready Mixed Concrete Association
 British Steel Industry
 Building Employers' Confederation
 Calcium Silicate Brick Association Limited
 Chartered Institute of Building
 Concrete Society
 County Surveyors' Society
 Department of the Environment (Building Research Establishment)
 Department of the Environment (Property Services Agency)
 Department of Transport
 Department of Transport (Transport and Road Research Laboratory)
 Electricity Supply Industry in England and Wales
 Federation of Civil Engineering Contractors
 Institute of Concrete Technology
 Institution of Civil Engineers
 Institution of Highways and Transportation
 Institution of Structural Engineers
 Institution of Water and Environmental Management (IWEM)
 Mortar Producers' Association Limited
 Sand and Gravel Association Limited
 Society of Chemical Industry

This British Standard, having been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 June 1990

© BSI 12-1998

The following BSI references relate to the work on this standard:
 Committee reference CAB/2
 Draft for comment 86/10160 DC

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 18351 3

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.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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 ± 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 ± 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.

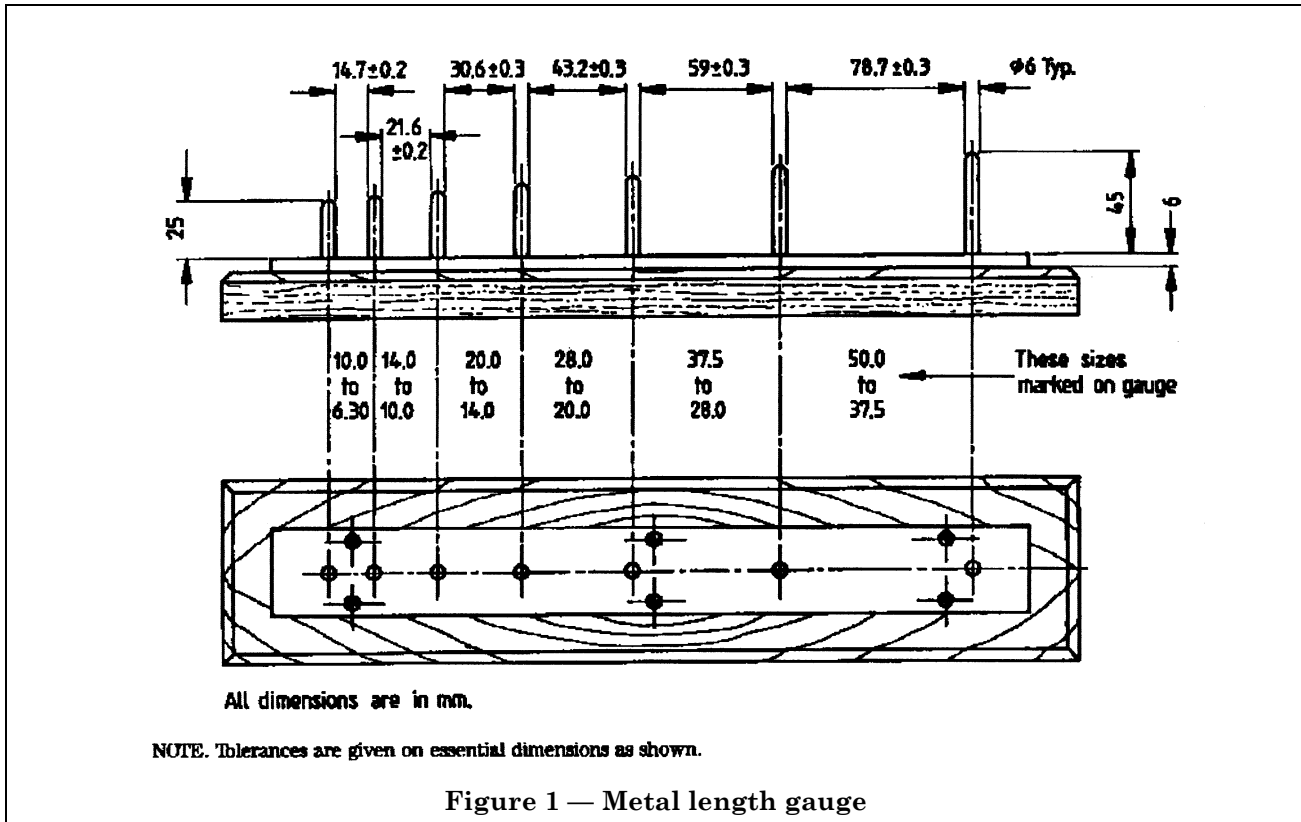


Table 3 — Data for determination of elongation index

Aggregate size fraction		Gap between pins of length gauge ^a	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

^a 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.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager. Tel: 020 8996 7070.