British Standard

BRITISH STANDARD

BS 6906-2: 1989

Methods of test for

Geotextiles —

Part 2: Determination of the apparent pore size distribution by dry sieving

UDC 677:666.27:666.9–405.8:666.3.015.4:539.215:620.1

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Textiles and Clothing Standards Committee (TCM/-) to Technical Committee TCM/35, upon which the following bodies were represented:

Association of Consulting Engineers
British Polyolefin Textiles Association
British Railways Board
Chemical Industries Association
Department of Transport (Highways)
Department of Transport (Transport and Road Research Laboratory)
ERA Technology Ltd.
Federation of Civil Engineering Contractors
Institution of Civil Engineers
Man-made Fibres Producers' Committee
Ministry of Agriculture, Fisheries and Food
Ministry of Defence
Textile Research Council

This British Standard, having been prepared under the direction of the Textiles and Clothing Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1989

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Contents

Foreword

This Part of BS 6906 has been prepared under the direction of the Textiles and Clothing Standards Committee.

The method described in this standard is a procedure for rapidly determining a measure of the pore size of a geotextile, which is an important parameter for assessing its soil filtration capability. Consideration is being given to developing a wet sieving method for geotextiles which retain more than 20 % of any grade of the glass beads used.

Other Parts of BS 6906 are as follows.

— *Part 1: Determination of the tensile properties using a wide width strip;*

— *Part 3: Determination of permeability by waterflow*[1)]*;*

— *Part 4: Determination of puncture resistance (CBR puncture test)*[1)].

Information on the accuracy of the test is given in Appendix A.

At the time of publication of this Part of BS 6906 no corresponding International Standards exist

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 6, an inside back cover and 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)] In preparation.

1 Scope

This Part of BS 6906 describes a dry sieving method for determination of the apparent pore size distribution of geotextiles. The test is applicable to most types of geotextile having a pore size greater than approximately 30μm. The test is not applicable to those geotextiles which retain within the fabric more than 20 % of the glass beads used.

NOTE1 Information on the accuracy of the test is given in Appendix A

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Principle

The apparent pore size distribution is determined by sieving dry spherical solid glass beads for a specified time at a specified frequency of vibration and measuring the amount retained. The test is carried out on a range of sizes of glass bead.

3 Definition

For the purposes of this Part of BS 6906 the following definition applies.

apparent pore size
a measure of the pore size of a geotextile determined by the passage of dry spherical solid glass beads through the geotextile under specified conditions

NOTE The pore sizes measured are not actual dimensions of the openings through the geotextile.

4 Apparatus and materials

4.1 *Metal sieve*[2)]*,* having a nominal diameter of 300 mm and a nominal aperture size greater than 10 mm and complete with a transparent lid and pan.

4.2 *Sieve shaker*[2)], capable of imparting a vibration frequency of 50 Hz and of varying vertical amplitude between 0 and 0.75 mm, when loaded with the sieve, specimen and glass beads.

4.3 *Fine soft brush,* for removing glass beads retained on the surface of the specimen.

4.4 *Dry spherical lead glass beads*[2)] for which the following apply.

a) A minimum of six designations of glass bead having mean particle sizes between 50 μm and 500 μm shall be provided.

b) At least 100 g of glass beads of each designation shall be provided.

c) The ratio of the largest to the smallest particle size within any designation shall not exceed 1.5.

d) The ratio of the mean particle size of any designation to that of the next designation of larger particle size shall be not less than 0.7.

NOTE 1 Typical data for a range of glass beads that have been found suitable are given in Appendix B for information.

NOTE 2 The beads should be substantially spherical and stable under the conditions of test. Some guidance on test procedures is given in BS 6088; Photomicroscopy may be used to determine the sphericity of the glass beads.

NOTE 3 Glass beads should be discarded when there is any sign of contamination.

4.5 *Means for conditioning specimens,* in the conditioning atmosphere described in clause **6**.

4.6 *Balance,* capable of weighing to an accuracy of 0.1g.

5 Test specimens

At least three test specimens having dimensions exceeding the dimensions of the sieve shall be tested. If it is necessary to determine the results to within a given confidence interval of the mean, the number of test specimens shall be determined from BS 2846-2.

If the geotextile is likely to fray, the edges of the test specimen shall be heat-sealed or taped to prevent loss of filaments.

6 Conditioning

The test specimens shall be conditioned and the test conducted in the standard temperate atmosphere for testing textiles defined in BS 1051, i.e. at a relative humidity of 65 ± 2 % and a temperature of 20 ± 2 °C, until the change in mass between two successive weighings made at intervals of not less than 2 h does not exceed 0.25 % of the mass of the specimen.

7 Procedure

7.1 Dry the glass beads (**4.4**) at 30 °C until the change in mass between two successive weighings made at intervals of not less than 2 h does not exceed 0.25 % of the mass of the glass beads.

7.2 Determine the mass (in grams) of the conditioned test specimen (M_1), using the balance (**4.6**). Secure the test specimen into the sieve (**4.1**) to which a receiving pan is fixed (see Figure 1).

7.3 Scatter 50 g (M_2) of the coarsest designation of glass beads over the surface of the test specimen.

NOTE The procedure may commence with a less coarse glass bead depending on the pore size of the geotextile.

[2)] For details of suppliers of suitable equipment, contact Enquiry Section, BSI, Linford Wood, Milton Keynes MK 14 6LE, enclosing a stamped addressed envelope for reply.

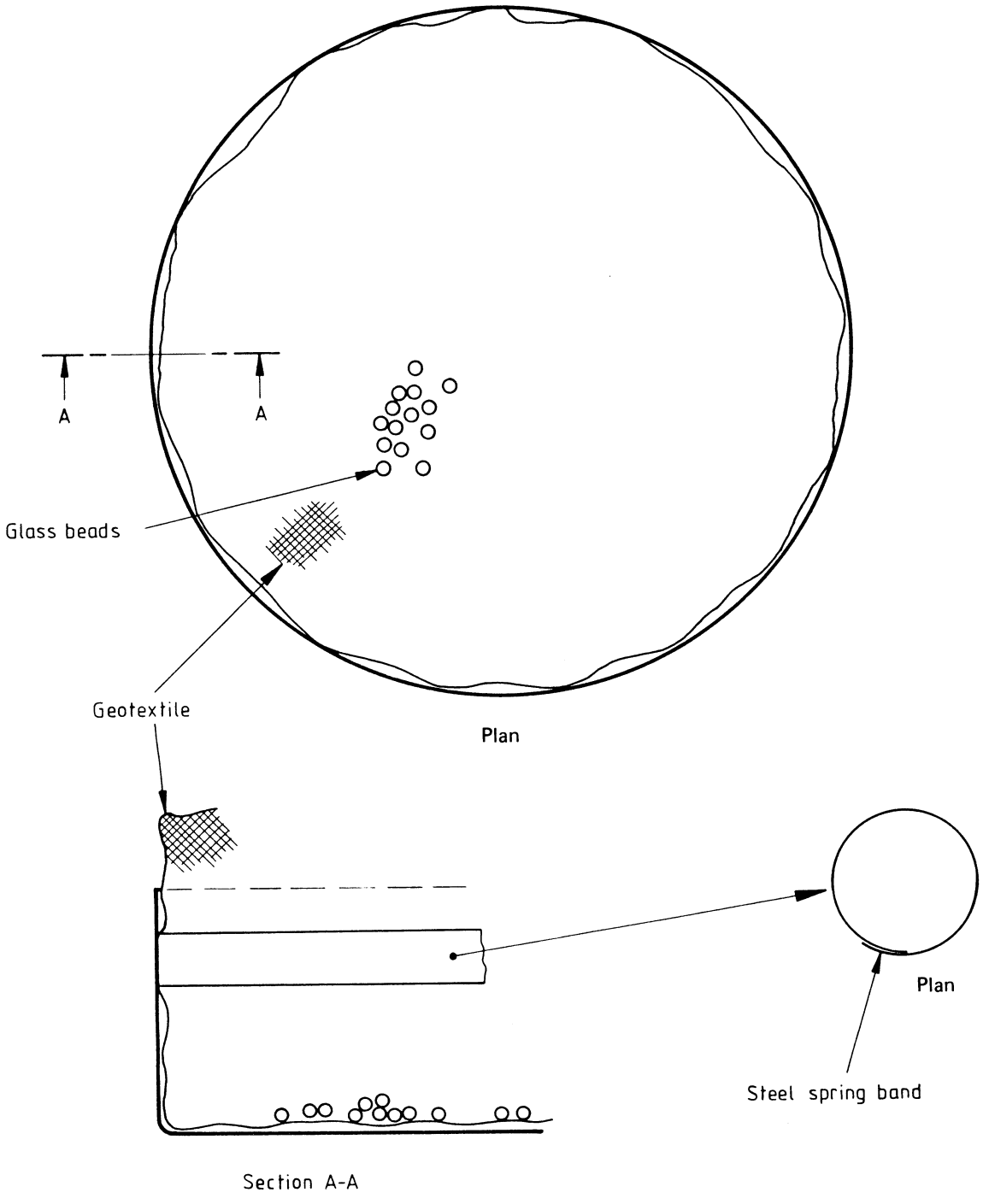


Figure 1 — Mounting of the test specimen in the sieve

7.4 Clamp the sieve, test specimen and receiving pan in place on the sieve shaker (**4.2**). Adjust the amplitude of the shaker so that the glass beads move smoothly over the surface of the test specimen and do not bounce vertically. Shake the specimen for 10 min.

7.5 Carefully transfer the test specimen and glass beads on it to a large preweighed vessel. Weigh the vessel (M_3). Record the mass of the receptacle plus test specimen plus glass beads (M_4).

Calculate the mass of glass beads on and within the test specimen (M_5) from the following equation:

$$M_5 = M_4 - M_1 - M_3$$

7.6 Determine the mass of the glass beads which have passed through the test specimen and which are caught in the receiving pan (M_6). Check whether $M_2 = M_5 + M_6$.

7.7 Thoroughly brush the glass beads off the surface of the test specimen without damaging or distorting the fibres or filaments.

7.8 Record the mass of the cleaned test specimen (M_7). Calculate the mass of glass beads trapped within the test specimen ($M_7 - M_1$).

7.9 Repeat the procedure described in **7.2** to **7.8** on the same test specimen using the next finest designation of glass beads until the designation and mean particle size is reached for which more than 95 % of the beads pass through the test specimen during a 10 min period of shaking.

7.10 Repeat the procedure described in **7.1** to **7.9** on the remaining test specimens.

8 Calculation and expression of results

For each designation of glass bead used, calculate the mass of glass beads retained on and within the specimen (M_5) as a percentage of the total mass of beads used (M_2).

NOTE 1 If the amount of beads retained within the fabric exceeds 20 % of any designation of glass bead used, then the fabric is deemed to be inappropriate for this test.

Determine the mean of the results for each designation of glass bead. Plot on semilogarithmic graph paper the mean percentage of glass beads retained on the surface and within the test specimen against the mean size of the glass beads for each grade.

NOTE 2 Examples of typical results are shown in Figure 2.

Determine the apparent pore size (in μm) for which 90 % of the glass beads are retained on and within the geotextile ($O_{90;}$ see Figure 2).

NOTE 3 The apparent pore size at which other percentages of glass beads are retained on and within the geotextile may be calculated.

NOTE4 Estimates of the apparent pore size for which less than 50 % of the glass beads are retained are less accurate than those for above 50 % retention.

NOTE 5 A greater variation of results may be expected for thicker geotextiles and for geotextiles with low fabric stability, e.g. those containing monofilaments.

9 Test Report

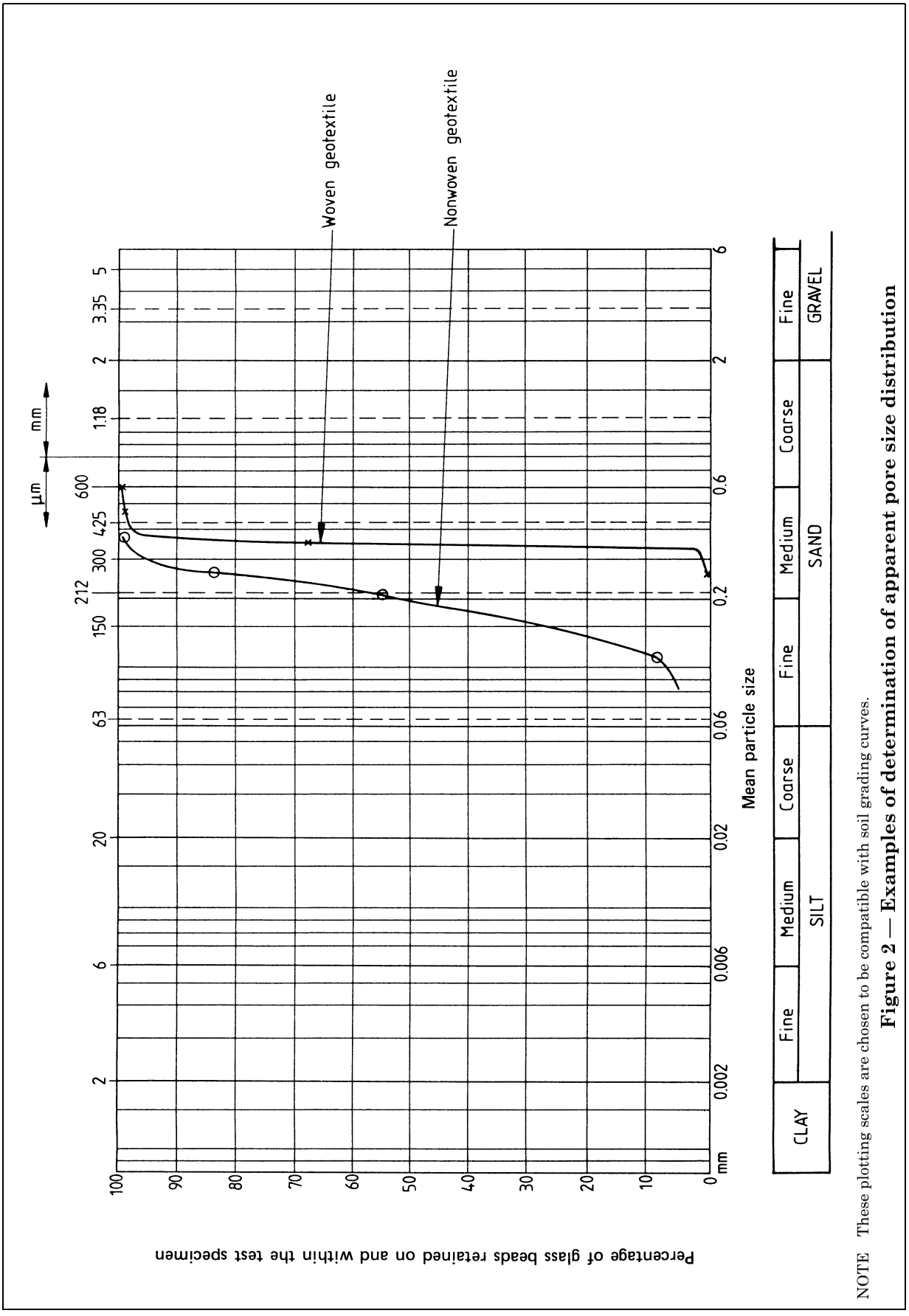
The test report shall include the following information:

a) the number and date of this British Standard, i.e. BS 6906-2:1989;

b) a description of the geotextile tested;

c) the result obtained, expressed as in clause **8**, i.e. the results obtained, a graph and the O_{90} value;

d) details of any deviation from the test procedure.



NOTE These plotting scales are chosen to be compatible with soil grading curves.

Figure 2 — Examples of determination of apparent pore size distribution

Appendix A Accuracy

Based on the results of interlaboratory trials the expected accuracy of the O_{90} value (see clause **8**) should be within ± 20 %.

Appendix B Designations of glass beads

A typical range of particle sizes and the associated mean particle sizes of glass beads are given in Table 1.

Table 1 — Particle size distribution of glass beads

Designation	Range of particle sizes	Mean particle size
	µm	µm
7	545 to 630	588
8	418 to 490	454
9	326 to 385	355
10	260 to 303	275
11	185 to 204	195
12	145 to 162	154
13	110 to 124	117
14	91 to 102	97
15	65 to 91	83
18	53 to 65	59

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Publications referred to

BS 1051, *Glossary of terms relating to the conditioning, testing and mass determination of textiles.*

BS 2846, *Guide to statistical interpretation of data.*

BS 2846-2, *Estimation of the mean: confidence interval.*

BS 6088, *Specification for solid glass beads for use with road marking compounds and for other industrial uses.*

BS 6906, *Methods of test for geotextiles.*

BS 6906-1, *Determination of the tensile properties using a wide width strip*[3)].

BS 6906-3, *Determination of permeability by waterflow*[3)4)].

BS 6906-4, *Determination of puncture resistance (CBR puncture test)*[3)4)].

[3)] Referred to in the foreword only.

[4)] In preparation.

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