

Pavements constructed with clay, natural stone or concrete pavers —

Part 3: Code of practice for laying precast concrete paving blocks and clay pavers for flexible pavements

ICS 93.080.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee B/507, Paving units, kerbs, screeds and in situ floorings, upon which the following bodies were represented:

Brick Development Association
CERAM Research Limited
British Precast Concrete Federation Limited
Cementitious Slag Makers Association
Concrete Society
County Surveyors' Society
Department of Transport (Highways Agency)
Institution of Civil Engineers
Institution of Structural Engineers
Interlay (Association of Block Paving Contractors)
Interpave (Precast Concrete Paving and Kerb Association)
Landscape Institute
Society of Chemical Industry
Society of Chief Officers of Transportation in Scotland
TRL Limited
Co-opted members

The following bodies were also represented in the drafting of the standard, through subcommittees.

Department of Trade and Industry (Building Research Establishment Limited)
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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Structure of pavement	3
5 Construction of pavement	3
6 Construction in adverse weather conditions	10
7 Additional work after early trafficking	10
Annex A (normative) Procedure for constructing a pavement	11
Annex B (normative) Tolerance of the surface levels of the different layers of a pavement and the surface regularity of the surface course	12
Annex C (informative) Typical details around structures within pavements	13
Annex D (normative) Pavement materials	17
Annex E (informative) Laying patterns	20
Annex F (normative) Plate compactor details	23
Annex G (normative) Conditions to be applied to the test procedure specified in BS EN 1097-1 for determination of the resistance to wear (micro-Deval) of laying course material	24
Bibliography	25
Figure 1 — Typical cross-section of pavement	3
Figure A.1 — Flow chart of the procedure for constructing a pavement	11
Figure C.1 — Typical restraint details	13
Figure C.2 — Detail at ironwork	15
Figure C.3 — Typical detail around drainage channels	16
Figure E.1 — Laying patterns	20
Figure E.2 — Laying patterns at edges	21
Figure E.3 — Laying patterns that incorporate complimentary fittings	22
Figure E.4 — Laying patterns that incorporate inboard cutting at edges	23
Table B.1 — Tolerance of surface levels	12
Table B.2 — Surface regularity of the surface course	12
Table D.1 — Laying course application	17
Table D.2 — Grading for laying course material for conventional pavements: [BS EN 12620:2002 G _F 85 0/4 (<i>MP</i>) fine aggregate]	17
Table D.3 — Fines content of laying course material for conventional pavements	18
Table D.4 — Grading for jointing material for conventional pavements [BS EN 12620:2002 G _F 85 0/1 (<i>FP</i>) fine aggregate]	18
Table D.5 — Grading for sub-base material for permeable pavements [BS EN 12620:2002 G _C 90/15 4/40 and 4/20 coarse aggregate]	19
Table D.6 — Grading for laying course material for permeable pavements [BS EN 12620:2002 G _C 85/20 2/6.3 coarse aggregate]	19
Table F.1 — Compactor details	23

Foreword

This part of BS 7533 has been prepared by Technical Committee B/507. It supersedes BS 7533-3:1997, which is withdrawn.

This British Standard has been revised to incorporate the latest practices involved in the laying of pavements and to include guidance on the laying of permeable pavements. Guidance on the reinstatement of pavements has been moved to BS 7533-11.

The start and finish of text introduced or altered by Amendment(s) No. 1 is indicated in the text by tags **A1** **A1**.

BS 7533 consists of the following parts:

- *Part 1: Guide for the structural design of heavy duty pavements constructed of clay pavers or precast concrete paving blocks;*
- *Part 2: Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks;*
- *Part 3: Code of practice for laying precast concrete paving blocks and clay pavers for flexible pavements;*
- *Part 4: Code of practice for the construction of pavements of precast concrete flags or natural stone slabs;*
- *Part 5: Guide for the design of pavements (other than structural aspects);¹⁾*
- *Part 6: Code of practice for laying natural stone, precast concrete and clay kerb units;*
- *Part 7: Code of practice for the construction of pavements of natural stone setts and cobbles;*
- *Part 8: Guide for the structural design of lightly trafficked pavements of precast concrete paving flags and natural stone slabs;*
- *Part 9: Code of practice for the construction of rigid pavements of clay pavers;¹⁾*
- *Part 10: Guide for the structural design of trafficked pavements constructed of natural stone setts;*
- *Part 11: Code of practice for the opening, maintenance and reinstatement of pavements of concrete, clay and natural stone;*
- *Part 12: Guide for the structural design of trafficked pavements constructed of concrete paving flags and natural stone slabs.¹⁾*

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 to ii, pages 1 to 25 and a back cover.

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¹⁾ In preparation.

1 Scope

This part of BS 7533 gives recommendations for the laying of conventional and permeable pavements using precast concrete paving blocks conforming to BS EN 1338 and clay pavers conforming to BS EN 1344.

This standard is intended for flexible pavements for roads, industrial areas and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic.

The principles given apply to all shapes and sizes of paving units covered by BS EN 1338 and BS EN 1344.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 6100-2, *Glossary of building and civil engineering terms — Part 2: Civil engineering*.

BS 7533-1, *Pavements constructed with clay, natural stone or concrete pavers — Part 1: Guide for the structural design of heavy duty pavements constructed of clay pavers or precast concrete paving blocks*.

BS 7533-2, *Pavements constructed with clay, natural stone or concrete pavers — Part 2: Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks*.

BS 7533-7:2002, *Pavements constructed with clay, natural stone or concrete pavers — Part 7: Code of practice for the construction of pavements of natural stone setts and cobbles*.

BS 7533-11, *Pavements constructed with clay, natural stone or concrete pavers — Part 11: Code of practice for the opening, maintenance and reinstatement of pavements of concrete, clay and natural stone*.

BS EN 206-1:2000, *Concrete — Part 1: Specification, performance, production and conformity*.

BS EN 932-2, *Tests for general properties of aggregates — Part 2: Methods for reducing laboratory samples*.

BS EN 1097-1:1996, *Tests for mechanical and physical properties of aggregates — Part 1: Determination of the resistance to wear (micro-Deval)*. ^[A1]

BS EN 1338, *Concrete paving blocks — Requirements and test methods*.

BS EN 1344, *Clay pavers — Requirements and test methods*.

BS EN 12620:2002, *Aggregates for concrete*.

HIGHWAYS AGENCY, *Manual of Contract Documents for Highway Works, Volume 1: Specification for Highway Works*, London: The Stationery Office.

3 Terms and definitions

For the purposes of this part of BS 7533, the terms and definitions given in BS EN 1338, BS EN 1344, BS 6100-2 and the following apply.

3.1

paving unit

either a concrete paving block or clay paver

3.2

restraint

device that serves to prevent lateral movement of paving units and to prevent loss of the laying course material

3.3

edge restraint

restraint used at the edges of an area being paved

3.4

intermediate restraint

restraint used at intervals along an area being paved

NOTE Intermediate restraints are generally used when steeply sloped areas are being paved.

3.5

temporary restraint

restraint used when a partially paved area is to be trafficked or when it is necessary to preserve the integrity of the laying face at the end of a working period

3.6

interlock

effect of frictional forces between paving units which prevents them moving in relation to each other

3.7

laying course

layer of material on which paving units are bedded

3.8

laying face

working edge of the surface course to which paving units are being placed

3.9

roadbase

one or more layers of material placed above the sub-base that constitutes a structural element of a flexible or composite pavement

3.10

sub-base

one or more layers of material placed immediately above the subgrade

3.11

subgrade

part of the soil, natural or constructed, that supports the loads transmitted by the overlying pavement

3.12

capping layer

layer of granular or stabilized material at the top of the subgrade to provide a working surface and an improved foundation for the pavement

3.13

surface course

layer of interlocked paving units that acts as a wearing surface and forms part of the structure of the pavement

3.14

inboard cut

paving unit that is cut to one quarter or more of its original length

NOTE Inboard cuts are used in favour of paving units cut smaller than one quarter of their original length because they are better at ensuring that the integrity of the surface course is maintained.

3.15

laying pattern

arrangement of paving units either for structural requirements or for visual effects

3.16

jointing material

material applied to fill the joints between paving units

3.17

joint width

distance between adjacent paving units or units and restraint

3.18**void**

gap between adjacent paving units, or units and restraint, formed by virtue of the shape of the units and how they fit together

NOTE Voids are incorporated into the design of a permeable pavement to facilitate drainage.

3.19**conventional pavement**

pavement consisting of a surface course of paving units laid with narrow joints and filled with jointing material that has a low permeability

3.20**permeable pavement**

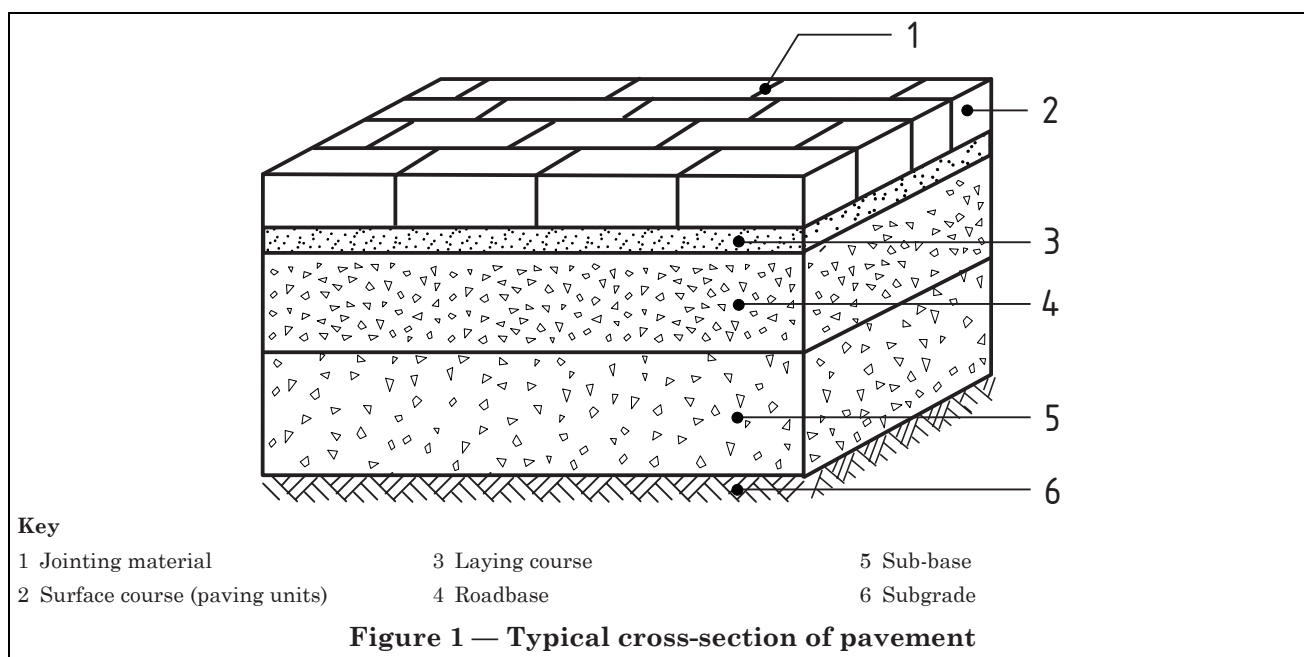
pavement consisting of a surface course of paving units laid with wide joints, voids or openings, that allow water to pass through into the pavement construction

3.21**mechanical laying**

laying of clusters or formations of paving units by mechanical means

4 Structure of pavement

A typical cross-section of a pavement is shown in Figure 1.

**5 Construction of pavement**

NOTE The general procedure for constructing a pavement is represented as a flow chart in Figure A.1. The flow chart shows a sequence of operations that reflects the content of 5.1, 5.2, 5.3 and 5.4.

5.1 Subgrade, sub-base and roadbase**5.1.1 Conventional pavements**

The sub-base and roadbase (if present) should be designed in accordance with BS 7533-1 or BS 7533-2.

Preparation of the subgrade and the construction and type of the sub-base and roadbase (if present) should generally be in accordance with relevant current practice as described in the Highways Agency's *Specification for Highway Works* except for reinstatements where reference should be made to BS 7533-11.

NOTE The sub-base layer can be used as the roadbase in a flexible pavement.

The subgrade, sub-base and roadbase (if present) should be presented such that:

- a) the surface levels of the sub-base and roadbase (if present) are within the tolerances given in **B.1**;
- b) the longitudinal falls and the cross falls of the completed pavement are introduced into the pavement at the subgrade level and allow the water to run off, thus avoiding ponding;

NOTE A minimum longitudinal fall of 1.25 % and a minimum cross fall of 2.5 % are recommended for carriageways using paving units as a channel. For other areas, 1 % longitudinal and 1.25 % cross falls are recommended. For carriageways using proprietary drainage systems, a 2.5 % cross fall is recommended with a longitudinal fall as recommended by the supplier.

- c) the surface of the sub-base and roadbase (if present) is tight and dense enough to prevent laying course material being lost into it during construction and use;
- d) the extent of the site preparation includes enough room to provide adequate foundations and backing for any edge restraint.

5.1.2 Permeable pavements

The sub-base should be constructed from material that conforms to **D.2.1**.

NOTE Guidance on the design of a sub-base for permeable pavements can be found in Interpave's guide to permeable pavements [1].

Preparation of the subgrade, the construction of the sub-base and the construction and type of roadbase (if present) should generally be in accordance with relevant current practice as described in the Highways Agency's *Specification for Highway Works* except for reinstatements where reference should be made to BS 7533-11.

The subgrade, sub-base and roadbase (if present) should be presented such that:

- a) the surface levels of the sub-base and roadbase (if present) are within the tolerances given in **B.1**;
- b) falls are built into permeable pavements that are laid on sloping sites but there is no need for falls on flat sites;
- c) the surface of the sub-base and roadbase (if present) is open and porous;
- d) any necessary measures are taken to prevent migration of the laying course material into the sub-base, e.g. by using a geotextile or by using compatible gradings of laying course and sub-base material.

NOTE Further guidance on ensuring that the gradings of laying course and sub-base material are compatible can be obtained from the paving unit manufacturer.

5.2 Restraint

5.2.1 Edge restraint

Edge restraints need to be sufficiently robust to withstand override by any anticipated traffic, to withstand thermal expansion and to prevent loss of laying course material.

The edge restraint should present a vertical face down to the level of the underside of the laying course.

The paving units laid adjacent to an edge restraint should not be compacted into the laying course with a plate vibrator in accordance with **5.4.5** until the edge restraints and/or the method with which it is being fixed into place has gained sufficient strength.

At junctions between different materials, for example between a paving unit and bitumen bound material, an edge restraint should be used.

NOTE Examples of typical restraints are shown in Annex C.

5.2.2 Intermediate restraint

In certain applications, for instance at junctions between different materials, intermediate restraints might be required. An example is shown in Figure C.1e).

5.2.3 *Temporary restraint*

Temporary restraints might need to be used to prevent paving units moving during construction and are particularly important if a partially completed pavement is to be trafficked or when it is necessary to preserve the integrity of the laying face at the end of the working period.

For areas of pavement that cannot be completed for some time and that might be subjected to trafficking near the edge of the pavement, it might be necessary to construct temporary restraints to prevent the movement of the laid paving units.

During full compaction of the pavement, temporary restraints should be constructed to resist lateral movement of the pavement.

5.3 Laying course

5.3.1 *Material*

5.3.1.1 *General*

The laying course should contain no material which acts as a binder and could detract from the flexible nature of the pavement, e.g. cement or lime.

5.3.1.2 *Conventional pavements*

The laying course material for conventional pavements should be naturally occurring sand from the quaternary geological series or sea-dredged sands. It should conform to **D.1.1** for all categories of pavement application given in Table D.1.

Recycled aggregate may be used as laying course material for categories of pavement application II, III and IV, as given in Table D.1, provided that the recycled aggregate conforms to **D.1.1**.

5.3.1.3 *Permeable pavements*

The laying course material for permeable pavements should be either a naturally occurring aggregate or recycled aggregate. It should conform to **D.2.2**.

NOTE 1 Experience has shown that angular shaped particles perform better than rounded particles in a permeable pavement.

NOTE 2 It is essential that recycled aggregates used in the laying course of a permeable pavement do not contain harmful substances that could enter the drainage system. The recycled aggregate supplier will know if this is the case.

5.3.2 *Moisture content*

5.3.2.1 *Conventional pavements*

When preparing the laying course, the material should be moist without being saturated. It should show no free water and should bind together when the material is squeezed in the hand and the pressure released.

If the prepared laying course becomes saturated prior to laying the paving units, it may be removed and replaced, or allowed to dry to an acceptable moisture content. To control the moisture content of a stockpile, covers may be used.

5.3.2.2 *Permeable pavements*

It is not necessary to assess the moisture content of material used in the preparation of the laying course of a permeable pavement.

5.3.3 *Preparation of laying course*

5.3.3.1 *General*

The laying course should be laid on the roadbase or, if there is no roadbase, the sub-base.

The laying course material should not be used as a regulating course or to achieve falls.