



Pavements

Part 1: Residential



This Australian Standard® was prepared by Committee BD-098, Pavements. It was approved on behalf of the Council of Standards Australia on 22 November 2016.
This Standard was published on 13 December 2016.

The following are represented on Committee BD-098:

- Australian Asphalt Pavement Association
 - Australian Stabilisation Industry Association
 - Bureau of Steel Manufacturers of Australia
 - Cement Concrete and Aggregates Australia
 - Concrete Institute of Australia
 - Concrete Masonry Association of Australia
 - Engineers Australia
 - Institute of Public Works Engineering Australasia
 - Master Builders Australia
 - Pavement Recycling and Stabilisation Association
 - Queensland Building and Construction Commission
 - Steel Reinforcement Institute of Australia
 - Think Brick Australia
-

This Standard was issued in draft form for comment as DR2 AS 3727.1:2016.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard[®]

Pavements

Part 1: Residential

Originated as AS 3727—1993.
Revised and redesignated as AS 3727.1:2016.

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Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 9781 76035 610 1

PREFACE

This Standard was prepared by the Standards Australia Committee, BD-098, Pavements, to supersede AS 3727—1993, *Guide to residential pavements*.

The objective of this Standard is to provide criteria to ensure that residential pavements are designed and constructed to provide an acceptable level of performance; whether constructed in concrete, segmental and flag pavements or asphalt and bituminous spray-seal pavements.

This Standard represents a significant divergence from the 1993 edition with the following major changes:

- (a) Written in mandatory (normative) terms.
- (b) Adjustment of the Standard designs to allow for low traffic density commercial vehicles with a gross vehicle mass less than 10 t.
- (c) Recognition that the Standard has application beyond residential construction to encompass footpaths, vehicle crossovers, cycleways, etc.
- (d) Identification of design and performance criteria which are common to pavement types.
- (e) Review and update of referenced documents and Bibliography.

The committee proposes the addition of further parts in this series will be forthcoming.

Statements expressed in mandatory terms in notes to Tables and Figures are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendices to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

This Standard (AS 3727.1) has been developed in response to a need to define the performance of light duty, low traffic volume pavements. Poor workmanship, inadequate site preparation, and misuse of basic materials have been cited as common problems within the industry.

While AS 3727—1993 provided good guidance to constructors of pavements, it fell short in the following key areas:

- (a) As a ‘guide’ it lacked the authority of a normative document.
- (b) The limitations on vehicle mass were confusing and reduced its application even in strictly residential pavements where heavier vehicles may occasionally need access.
- (c) There was confusion as to the target audience. Some details were quite simplistic whereas other requirements demanded a complex knowledge of test procedures and methods.

This Standard seeks to address these issues in the following ways:

- (i) The Standard has been written in normative terms.
- (ii) The allowable gross vehicle mass for light volume traffic pavements has been retained at 10 t but with clarification. As standard designs are available for this vehicle mass, pavements designed and constructed using this Standard could accommodate delivery vehicles on driveways and crossovers; service vehicles on cycleways in parks and gardens; and light plant and equipment on other recreational pavements.
- (iii) The Standard recognizes that the typical user of this Standard may not have access to sophisticated testing to establish compaction and material quality. Where possible the test requirements have been replaced by ‘deemed to comply’ statements, which rely on observation and strict adherence to known procedures.

NOTE: Normative references to other Standards and documents have been kept to a minimum.

The committee recognizes that a Standard cannot address all eventualities. When pavements are to be constructed on problem or reactive clay sites, greater engineering input is required. The site limitations expressed in the 1993 edition have been retained.

The committee also recognizes that site conditions change over time and levels of maintenance, landscaping and drainage can affect the long-term performance of all pavements. These issues have been considered in the acceptance criteria.

STANDARDS AUSTRALIA

Australian Standard
Pavements

Part 1: Residential

SECTION 1 SCOPE AND GENERAL**1.1 SCOPE**

This Standard specifies the design and construction of pavements for light usage, low speed, non-commercial applications for vehicles with a gross vehicle mass not exceeding 10 t. This includes patios, paths, driveways, vehicle crossovers and recreational pavements such as cycleways.

This Standard excludes the following:

- (a) Concrete pavements using fibres as the sole means of reinforcement.
- (b) Roads and industrial pavements.
- (c) Class H1, H2, E and P sites (see Table 1.5).

1.2 LIMITATIONS

Pavement design requirements in this Standard shall be based on the prerequisite of adequate subgrades on well-drained sites (see Clauses 4.2 and 4.1 respectively). Engineering design shall be applied to pavements on sites that do not conform with these conditions.

This Standard does not apply to permeable and porous pavements.

The pavement designs specified in this Standard do not apply where brittle surfacing layers exceeding 16 m² are used.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS	
1289	Methods of testing soils for engineering purposes (series)
1379	Specification and supply of concrete
2008	Bitumen for pavements
2150	Hot mix asphalt—A guide to good practice
2870	Residential slabs and footings
3600	Concrete structures
AS/NZS	
2425	Bar chairs in reinforced concrete—Product requirements and test methods
4455	Masonry units, pavers, flags and segmental retaining wall units
4455.2	Part 2: Pavers and flags

AS/NZS

4456 Masonry units, segmental pavers and flags—Methods of test (series)

4671 Steel reinforcing materials

Austroroads

AP-PWT21-00 Sprayed Sealing—Uniformity and Neatness

1.4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.4.1 Asphalt

A plant-mixed combination of bitumen and graded stone aggregate, fine aggregate and filler.

1.4.2 Base

The main structural element.

NOTE: In a bituminous or segmental pavement, it is the layer immediately supporting the surfacing layer. In a concrete pavement, the concrete acts as both a surfacing layer and base.

1.4.3 Bedding sand

A layer of sand upon which pavers and flags are laid.

1.4.4 Bituminous spray-seal

A surfacing produced by the application of a continuous spray coat of hot bitumen or emulsion followed by the application of stone aggregate.

1.4.5 Clay

Fine grained soil with plastic properties when wet. It includes sandy clays and silty clays.

1.4.6 Commercial vehicle (CV)

Vehicles having a gross vehicle mass of 3 t or more (up to 10 t for the purpose of this Standard) and which conform in Australia with State or Commonwealth legislation for the axle loads, tyre pressures and dimensions of vehicles permitted on public roads and streets.

1.4.7 Concrete strength grade

The specified value of the characteristic compressive strength of the concrete at 28 days.

1.4.8 Construction joint

A joint which divides a concrete pavement into suitable lengths and widths for construction purposes.

1.4.9 Control joint

A joint used to control drying shrinkage cracking in a pavement.

1.4.10 Controlled fill

Fill required to support structures or associated pavements, or for which engineering properties are to be controlled.

1.4.11 Edge restraint

An existing or constructed element forming a boundary to the paved area that prevents lateral movement of the paving units and any loss of material from the bedding sand.

1.4.12 Expansion joint

A joint used to allow thermal movement of a concrete pavement.

1.4.13 Flag

Large format solid (non-cored) paving unit, each with a gross plan area exceeding 0.08 m² used in combination with bedding sand to form a surfacing layer.

1.4.14 Formation

The prepared surface of the subgrade.

1.4.15 Foundation

The natural soil or built-up formation which is supporting the pavement.

1.4.16 Isolation joint

A joint which isolates the pavement from other structures.

1.4.17 Lean-mix concrete

Concrete having a minimum in-situ compressive strength of 5 MPa.

1.4.18 Light vehicle (LV)

A vehicle, which when fully loaded, has a gross vehicle mass less than 3 t.

NOTE: This category includes cars, utilities, delivery vans and some light two-axle trucks.

1.4.19 Pavement

A structure which transfers loads from the traffic to the subgrade.

NOTE: The pavement consists of one or more layers of material referred to as surfacing layer, base and sub-base (see Figure 1.4.19).

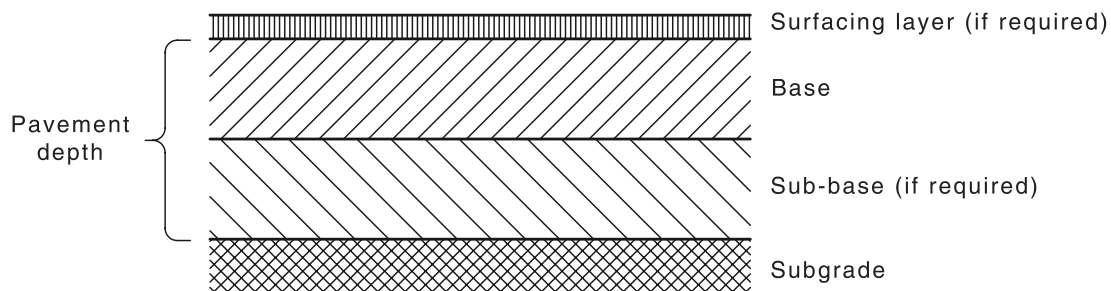


FIGURE 1.4.19 EXAMPLE OF THE LAYERS IN A PAVEMENT

1.4.20 Paver

A small format, solid, non-cored paving unit having a gross plan area less than, or equal to, 0.08 m² used in combination with bedding sand to form a surfacing layer.

1.4.21 Random crack

A crack which does not occur at a planned location.

1.4.22 Reactive site

Site consisting of a clay soil which swells on wetting and shrinks on drying.

1.4.23 Site classification

Classification of a site based mainly on the attributes of the natural soil and its expected surface settlement or heave in accordance with AS 2870.

1.4.24 Sub-base

A secondary layer of the pavement which, if required, underlies the base.

1.4.25 Subgrade

The natural soil or fill underlying the pavement.

1.4.26 Surfacing layer

A layer which may be placed over the base, e.g. tiles, pavers, topping.

1.4.27 Vehicle crossover

A pavement which carries traffic from a road pavement to the property boundary.

1.5 SITE CLASSIFICATION

Sites shall be classified in accordance with AS 2870 and Table 1.5.

TABLE 1.5
SITE CLASSIFICATION

Foundation/Subgrade	Class
Most sand and rock sites	A
Most silt and some clay sites	S
Moderately reactive clay sites	M
Highly reactive clay sites	H1, H2
Extremely reactive clay sites	E
Sites which include— (a) soft soils, (e.g. soft clays or silts or loose sands); (b) landslip; (c) mine subsidence; (d) collapsing soils; or (e) soils subject to erosion.	P

SECTION 2 DESIGN

2.1 DESIGN OBJECTIVES

The pavement systems specified in this Standard are the minimum necessary for providing an acceptable level of serviceability.

2.2 ACCEPTANCE CRITERIA

The criteria for acceptable performance for all pavements shall be according to Table 2.2 for a period of one year after construction of the pavement.

NOTE: The one year period has been adopted as being long enough for an adequately maintained pavement to be subjected to in-service conditions prior to undue influence of changing environmental conditions.

TABLE 2.2
ACCEPTANCE CRITERIA

Condition	Measure	Limit
Random cracking	Crack width	≤1 mm
Design profile	Variation between actual surface profile and design profile	≤15 mm
Flatness	Maximum deviation from a 3 m straight edge (see Note 1)	≤15 mm
Stepping	Relative surface level of adjacent paving elements within the expanse of the main pavement (see Note 2)	≤5 mm
Subsidence	Offset under 1.5 m length of the design profile (see Note 3)	≤5 mm

NOTES:

- 1 The flatness condition shall apply only to that part of a pavement in which its surface has been intended to be designed in the one plane, and that plane is greater than 3 m in diameter.
- 2 The stepping criterion applies only to steps within the surface of the main pavement that are deemed to be in the same plane. It shall not apply where the main pavement abuts other structures such as edging, drainage pits, service pits, minor pavements (such as a pathway adjacent to a driveway) and pavements constructed with material of a different type.
- 3 The design profile shall be centred over the defect and supported at its ends by equal height spacers. The change in offset shall be then measured relative to this design profile.

S E C T I O N 3 M A T E R I A L S G E N E R A L

3.1 SURFACING MATERIALS

The surfacing layer shall comprise of one of the following:

- (a) Concrete in accordance with the requirements of Section 5.
- (b) Segmental or flag pavers in accordance with the requirements of Section 6.
- (c) Asphalt in accordance with the requirements of Section 7.
- (d) Bituminous spray-seal in accordance with the requirements of Section 8.

3.2 BASE MATERIALS

The base shall comprise of one of the following:

- (a) Concrete in accordance with the requirements of Section 5.
- (b) Concrete or granular base in accordance with the requirements of Section 6 for segmental pavers.
- (c) Asphalt or granular base in accordance with the requirements of Section 7 for asphalt.
- (d) Granular base in accordance with the requirements of Section 8 for bituminous spray seal.

3.3 SUB-BASE MATERIALS

The sub-base shall comprise of one of the following:

- (a) Well-graded granular material, such as road base or crushed rock.
- (b) Lean mix concrete.

3.4 SUBGRADE MATERIALS

The subgrade shall comprise of one of the following:

- (a) Natural soil.
- (b) Controlled fill in accordance with AS 2870.

SECTION 4 CONSTRUCTION GENERAL

4.1 DRAINAGE

The minimum surface crossfall shall be 2.5% (1 in 40 or 25 mm in every 1 m) to ensure surface drainage. In covered areas or pedestrian only areas, a lesser grade may be appropriate provided the aspects of drainage have been assessed.

Where necessary, surface run-off shall be collected in appropriate channels and drains and conveyed to discharge points.

The finished surface level of any pavement abutting a wall shall be below the wall damp-proofing course, shall not obscure any weep holes or drainage openings, and shall be graded away from the building and not obscure any required inspection zones for termite barrier systems.

NOTES:

- 1 Drainage is an important consideration for preventing softening of subgrades, deterioration of surfacing layers and efflorescence.
- 2 On poorly drained sites it may be necessary to protect the subgrade from the effects of water. Sub-surface drains of pervious granular material and/or slotted or pervious pipes may be required under or beside the pavement. Geotextile mesh may be provided as a separation or drainage layer.
- 3 Typical drainage details of the bedding sands for segmental and flag pavers are given in Appendix A.

4.2 SUBGRADE

The following conditions shall apply for subgrade:

- (a) Loose soil or soil containing organic materials shall be removed.
- (b) Formation shall be trimmed to within +0, -25 mm of the design level and compacted if necessary.
- (c) Any fill shall be well compacted.
- (d) Local soft spots shall be rectified to achieve levels of strength and stiffness similar to the remainder of the subgrade.
- (e) Backfill for service trenches shall be compacted in layers no greater than 200 mm to provide levels of strength and stiffness similar to the subgrade.
- (f) Any stormwater and sewer pipes and other services below the area on which the pavement is to rest shall be protected from damage during required preparation of the subgrade.
- (g) Moisture content of the subgrade and fill shall be adjusted to ensure adequate compaction.

4.3 SUB-BASE

The sub-base shall be prepared in accordance with the following:

- (a) Granular sub-base material shall be spread uniformly and adequately compacted in appropriate layer thicknesses and with an appropriate moisture content.

NOTE: The sub-base compaction requirement may be achieved by compacting in layers of 100 mm maximum with at least three passes of a vibrating plate compactor or equivalent.

- (b) For lean mix concrete sub-bases, concrete shall be placed and compacted.
- (c) The sub-base shall be finished to within ± 10 mm of the design level.

