

SEGMENTAL PAVING

**DEVELOPMENT
CONSTRUCTION
SPECIFICATION**

C254

SEGMENTAL PAVING

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Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
EXAMPLE 1	<i>Provision for acceptance of nonconformance with deduction in Payment</i>	XYZ.00	AP	KP	2/6/97

SEGMENTAL PAVING

GENERAL

C254.01 SCOPE

1. This Specification covers the construction of segmental paving for road pavements, medians, traffic islands, driveways, cycleways, footpaths and other pedestrian areas.
2. The work to be executed under this Specification consists of the supply, placement and compaction of segmental paving units including the provision of a sand bedding course and joint filling sand, over bound or unbound base and/or subbase layer/s.
3. This Specification should be read in conjunction with the appropriate Specifications for the construction of the base and subbase layers beneath the segmental paving, ie. FLEXIBLE PAVEMENTS, MASS CONCRETE SUBBASE.

C254.02 TERMINOLOGY

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| <ol style="list-style-type: none"> 1. Concrete segmental paving units are units of not more than 0.10 square metres in gross plan area, manufactured from concrete, with plain or dentated sides, with top and bottom faces parallel and with or without chamfered edges. | <i>Size</i> |
| <ol style="list-style-type: none"> 2. Concrete paving units are identified by shape as being one of the following types: | <i>Concrete Pavers</i> |

Shape Type A

Dentated chamfered units which key into each other on four sides, are capable of being laid in herringbone bond, and by their plan geometry, when interlocked, resist the spread of joints parallel to both the longitudinal and transverse axes of the units.

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| <ol style="list-style-type: none"> 3. Clay pavers shall only be used where specifically approved in the Notification of Determination of Development Consent. | <i>Clay Pavers</i> |
| <ol style="list-style-type: none"> 4. Clay pavers are manufactured from clay, shale or argillaceous materials which may be mixed with additives. Clay pavers may have square, bevelled (chamfered), rounded or rumbled edges. They are generally rectangular in shape, with the length twice the width, plus 2mm. | |
| <ol style="list-style-type: none"> 5. Clay pavers shall be Class 4. | <i>Classification</i> |

6. Unless otherwise approved by the Principal Certifying Authority the laying pattern of segmental paving units shall be Herringbone pattern. ***Pattern***

C254.03 CHOICE OF PAVER TYPE, SHAPE, CLASS AND LAYING PATTERN

1. Unless otherwise approved by the Principal Certifying Authority, paving units for road pavements shall be Shape Type A concrete paving units, 80mm thick, and placed in Herringbone laying pattern. ***Thickness***
2. If not otherwise approved by the Principal Certifying Authority, clay pavers shall be Class 4, minimum 65mm nominal thickness, and placed in a herringbone laying pattern.

C254.04 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. ***Documents
Standards
Test Methods***

a. Council Specifications

- C213 - Earthworks
- C224 - Open Drains including Kerb and Gutter
- C241 - Stabilisation
- C242 - Flexible Pavements
- C247 - Mass Concrete Subbase
- C271 - Minor Concrete Works

b. Australian Standards

- AS 1141.11 - Particle size distribution by dry sieving.
- AS/NZS 4455 - Masonry units and segmental pavers..

c. Concrete Masonry Association of Australia Specifications

- MA20 - Specification for Concrete Segmental Paving Units.

d. Clay Brick and Paver Institute Specifications

- Paver Note 1 - Specifying and Laying Clay Pavers

MATERIALS

C254.05 GENERAL

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| 1. | The Contractor shall submit details of all proposed segmental paving materials, including bedding sand and joint filling sand. These details shall be submitted to the Principal Certifying Authority for approval supported with test results from a nominated NATA registered laboratory, confirming that the constituents comply with the requirements of this Specification. | <i>Details
Required</i> |
| 2. | No material shall be delivered until the Principal Certifying Authority has approved the sources of supply. Such approval shall not relieve the Contractor of any responsibility for supplying materials that comply with this Specification. | <i>Superintendent's
Approval</i> |

C254.06 CONCRETE SEGMENTAL PAVING UNITS

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| 1. | Concrete segmental paving units shall comply with the requirements of MA20 - Specification for Concrete Segmental Paving Units and with the requirements of AS/NZS 4455. The category of paver shall be as shown on the Drawings. | <i>Specification</i> |
| 2. | Unless otherwise approved by the Principal Certifying Authority, concrete paving units shall be 80mm thick with a minimum 28 day characteristic compressive strength of 45MPa, as determined in accordance with MA20. | <i>Strength</i> |
| 3. | The abrasion resistance, tested in accordance with MA20 - Appendix D, shall conform to the recommended minimum abrasion indices contained in MA20. | <i>Abrasion
Resistance</i> |

C254.07 CLAY SEGMENTAL PAVING UNITS

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| 1. | Clay segmental pavers shall comply with the requirements of Part 1 - Specifying Clay Pavers of Paver Note 1 - 'Specifying and Laying Clay Pavers' and with the requirements of AS/NZS 4455. | <i>Specification</i> |
| 2. | The abrasion resistance as determined by the SCC Abrasion Test (Paver Note1) shall conform to the recommended characteristic abrasion losses contained in Paver Note 1. | <i>Abrasion
Resistance</i> |

C254.08 BEDDING SAND

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| 1. | The bedding sand shall be a well-graded sand, consisting of clean, hard, uncoated grains uniform in quality, generally passing a 4.75mm sieve. | <i>Grading</i> |
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The bedding sand shall be from a single source or blended to achieve, when tested in accordance with AS 1141.11, the following grading:

<u>AS Sieve</u>	<u>% Passing</u>
9.52mm	100
4.75	95 – 100
2.36	80 – 100
1.18	50 – 85
600mm	25 – 60
300	10 – 30
150	5 – 15
75	0 – 10

2. The sand shall be of uniform moisture content when spread. It shall be covered when stored on site to protect it from rain penetration. **Protection**
3. The bedding sand shall be free of deleterious soluble salts or other contaminants which may cause, or contribute to, efflorescence. **Cleanliness**

C254.09 JOINT FILLING SAND

1. The joint filling sand shall be well graded passing a 2.36mm sieve, and when tested in accordance with AS 1141.11, having the following grading: **Grading**

<u>AS Sieve</u>	<u>% Passing</u>
2.36mm	100
1.18	90 - 100
600mm	60 - 90
300	30 - 60
150	15 - 30
75	5 – 10

2. The sand shall be dry when spread. It shall be covered when stored on site to protect it from rain penetration. **Protection**
3. The sand shall be free of deleterious soluble salts or other contaminants. **Cleanliness**
4. Sand used for bedding is not suitable for joint filling.

C254.10 CONCRETE FOR EDGE RESTRAINTS

1. Concrete supplied and placed for the construction of edge strips shall comply with the Specification for MINOR CONCRETE WORKS. **Specification**

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| 2. | Unless otherwise indicated on the Drawings, or where the edge restraint is provided by kerb and/or gutter, the concrete used for edge restraints shall have a minimum 28-day characteristic compressive strength of 32MPa for edge restraints to paving units on road pavements and trafficable areas and 25MPa for edge restraints elsewhere. | <i>Strength</i> |
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CONSTRUCTION

C254.11 SUBGRADE PREPARATION

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| 1. | The subgrade shall be formed to the required depth below finished surface level as shown on the Drawings in accordance with the Specification for EARTHWORKS. | <i>Levels</i> |
| 2. | The finished subgrade foundation for the provision of subbase and/or base shall be subject to the approval of the Principal Certifying Authority. | <i>Superintendent's Approval</i> |

C254.12 SUBBASE

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| 1. | Where shown on the Drawings a subbase or working platform shall be constructed in accordance with the relevant Specification for STABILISATION, FLEXIBLE PAVEMENTS, or MASS CONCRETE SUBBASE. | <i>Specifications</i> |
| 2. | The subbase shall be constructed to the specified thickness, compaction and depth below finished surface level and to the design grade and crossfalls of the finished surface. | <i>Levels</i> |
| 3. | The finished subbase shall be subject to the approval of the Principal Certifying Authority. | <i>Superintendent's Approval</i> |

C254.13 BASE

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| 1. | The base shall be constructed to the specified thickness and depth below finished surface level, and to the design grade and crossfalls of the finished surface, as shown on the Drawings in accordance with the Specification for CONCRETE BASE. | <i>Levels</i> |
| 2. | The base course shall extend in width to at least the rear face of all new edge restraints. | <i>Extent</i> |

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| 3. | The finished surface of the base course for road pavements to be overlain with segmental paving shall be trimmed to within + 10mm or - 0mm of design levels. The deviation from a 3m long straight edge placed anywhere and laid in any direction on the top surface of the base course for all segmental paving shall not exceed 5 mm. Sand bedding material shall not be used as a levelling material to compensate for base finishing outside the above tolerances. | <i>Tolerances</i> |
| 4. | The finished surface of the base shall drain freely without ponding. | <i>Free Drainage</i> |
| 5. | The finished base shall be subject to the approval of the Principal Certifying Authority. | <i>Superintendent's Approval</i> |

C254.14 EDGE RESTRAINTS

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| 1. | Edge restraints in the form of Kerb and/or Gutter or Edge Strips shall be constructed along the perimeter of all segmental paving as shown on the Drawings. Concrete Kerb and/or Gutter and Edge Strips shall be constructed in accordance with the Specifications for OPEN DRAINS INCLUDING KERB AND GUTTER and MINOR CONCRETE WORKS. | <i>Requirements</i> |
| 2. | Faces of edge restraints abutting paving units shall be vertical. Alternatively a silicone joint filler complying with Clause 248.42 (e)(iii) shall be applied between the paving unit and edge restraint. | |
| 3. | Edge restraints shall be supported on compacted base and/or subbase of the thickness as shown on the Drawings. Where not otherwise specified or indicated, the minimum thickness of compacted base beneath the edge restraints shall be 100mm adjacent to road pavements and medians, and 50mm adjacent to footpaths, cycleways and driveways. | <i>Support</i> |
| 4. | Unless otherwise shown on the Drawings, contraction joints, 20mm depth shall be formed every 5m of edge restraint length. | <i>Joints</i> |
| 5. | After the concrete has hardened but not less than three days after placing the spaces at the back of the edge restraint shall be backfilled with earth, compacted in layers not greater than 150mm thick, then topsoiled to meet surrounding of design levels. | <i>Back Filling</i> |

C254.15 SAND BEDDING COURSE

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| 1. | The sand bedding course shall be spread in a single uniform layer and screeded in a loose condition to the nominated design profile and levels plus that necessary to achieve a uniformly thick nominal 20-25mm layer following final compaction of the segmental paving. | <i>Allowance Levels</i> |
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| 2. | Any depressions in the screeding sand exceeding 5mm shall be loosened, raked and rescreeded before laying paving units. | <i>Depressions</i> |
| 3. | For the manual placing of paving units, the bedding sand shall be maintained at a uniform loose density. For mechanised laying, the bedding sand shall be uniformly and firmly, but not fully, compacted. | <i>Compaction</i> |
| 4. | Screeded sand left overnight or subject to rain shall be checked for level and rescreeded where necessary before paving units are placed. The sand shall not be screeded more than two metres in advance of the laying face at the completion of work on any day. | <i>Screeding</i> |

C254.16 LAYING PAVING UNITS

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| 1. | Paving units shall be uniformly placed on the screeded sand bedding to the nominated laying pattern. Paving units shall be placed so that they are not in direct contact with each other and shall have uniform 3mm nominal joint widths. | <i>Joints</i> |
| 2. | The first row shall be located next to an edge restraint or an established straight line, and laid at a suitable angle to achieve the required orientation of paving units in the completed pavement. | <i>Sequence</i> |
| 3. | In each row, full units shall be laid first. Edge or closer units shall be neatly cut using a paver scour, or mechanical or hydraulic guillotine, and fitted subsequently. Cut pieces of paving units which are smaller in size than one quarter of a full block shall not be used. | <i>Odd Shapes</i> |
| 4. | Access chambers, drainage gullies and similar penetrations through the pavement shall be finished against the paving with a concrete surround or apron designed to suit and fit the laying pattern, otherwise complying with the requirements for edge restraints. | <i>Penetrations</i> |
| 5. | Where pavers are placed over an isolation, contraction or expansion joint in an underlying concrete pavement, a joint is to be provided in the pavers. The joint shall consist of 10mm thick preformed jointing material of bituminous fibreboard. | <i>Formed Joints</i> |
| 6. | Any foot or barrow traffic shall use boards overlaying paving to prevent disturbance of units prior to compaction. No other construction traffic shall be allowed on the pavement prior to compaction and provision of joint filling sand. | <i>Construction Traffic</i> |
| 7. | On completion of subsequent bedding compaction and joint filling operations, no more than 10 per cent of joints along any 10 metre line along a major axis of the laying pattern shall have widths outside the range 2-4mm. | <i>Tolerance</i> |

C254.17 BEDDING COMPACTION

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| 1. | After laying the paving units the sand bedding shall be fully compacted and the surface brought to design levels and surface profiles by not less than two passes of a high frequency low amplitude plate compactor which covers at least 12 units. Compaction shall continue until lipping between adjoining units has been eliminated. | <i>Compaction</i> |
| 2. | Any units which are structurally damaged during bedding compaction shall be removed and replaced. The pavement shall then be re-compacted for at least one metre surrounding each replacement unit. | <i>Damage</i> |
| 3. | The paving operations shall be arranged so that the use of the plate compactor proceeds progressively behind the laying face without undue delay, and such that compaction is completed prior to cessation of construction activity on any day. Compaction shall not be attempted within one metre of the laying face except on completion of the pavement against an edge restraint. | <i>Progressive Compaction</i> |
| 4. | The finished surface level shall not vary from the design level at any point laid in any direction, by more than 5mm. Notwithstanding this, the finished surface of the segmental paving, including where the paving abuts an edge restraint other than a drainage inlet, shall not deviate from the bottom of a 3m straight edge laid in any direction, except at grade changes, by more than 5 mm. | <i>Finished Levels</i> |
| 5. | All compaction shall be complete and the pavement shall be brought to design profiles before spreading or placing sand filling in the joints. | <i>Joint Filling</i> |

C254.18 FILLING JOINTS

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| 1. | As soon as practicable after bedding compaction, and in any case prior to termination of work on any day, dry sand for joint filling shall be spread over the pavement and the joints filled by brooming. | <i>Timing</i> |
| 2. | To ensure complete filling of the joints, both the filling sand and paving units shall be as dry as practicable when sand is spread and broomed into the joints. | <i>Condition</i> |
| 3. | The pavement shall then receive one or more passes of a plate compactor and the joints then refilled with sand, with the process then repeated sufficiently to ensure that the joints are completely filled. | <i>Process</i> |

C254.19 PROTECTION OF WORK

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| 1. | Other than wheeled trolleys, forklifts and cluster-clamp vehicles, construction and other traffic shall not use the pavement until bedding | <i>Restricted Use</i> |
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compaction and joint filling operations have been completed.

C254.20 OPENING TO TRAFFIC

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| 1. | As soon as practicable after the filling of joints, construction vehicles may use the pavement, and should be encouraged to traverse the greatest possible area of pavement to assist in the development of 'lock-up'. | <i>No Tracking</i> |
| 2. | Excess joint filling sand shall be removed prior to opening to traffic. | <i>Excess Sand</i> |
| 3. | The pavement shall then be inspected by the Contractor at regular intervals up until the expiration of the Defects Liability Period to ensure that all joints remain completely filled. | <i>Inspections</i> |

LIMITS AND TOLERANCES

C254.21 SUMMARY OF LIMITS AND TOLERANCES

Item	Activity	Tolerances	Spec Clause
1.	Base		
	a. Surface Level	Finished level of base for road pavements to be within +10mm or -0mm of design levels.	C254.13
		Finished level of base other than for road pavements, to be within ± 10 mm of design levels.	C254.13
		The top surface of the base for all segmental paving shall not deviate from a 3m straight edge, laid in any direction, by more than 5 mm.	C254.13
2.	Laying Paving Units		
	a. Joint widths	No more than 10% of joints along any 10 metre line of joints along a major axis of the laying pattern shall have widths outside the range 2 -4mm.	C254.16
3.	Completed Segmental Paving		
	a. Surface level	Finished surface level of pavers shall not vary from design levels by more than ± 5 mm.	C254.17
		Finished surface of pavers shall not deviate from a 3m straight edge, laid in any direction, by more than 5mm.	C254.17

Table C254.1 - Summary of Limits and Tolerances