

Engineering Construction Specification C33 Pathways and Cycleways (Construction)

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1 General

1.1 Responsibilities

1.1.1 General

Requirement: Provide pavements for pathways and/or cycleways, as documented.

1.2 Cross references

1.2.1 General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- *C01 General Requirements (Construction).*
- *C02 Quality management (Construction).*
- *C03 Control of traffic.*
- *C04 Control of erosion and sedimentation (Construction).*
- *C11 Kerbs and channels (gutters).*
- *C13 Road openings and restoration.*
- *C14 Subsurface drainage (Construction).*
- *C22 Public lighting.*
- *C29 Landscape - road reserve and street trees.*

1.3 Standards

1.3.1 General

Standard: To AS 3727.1.

1.4 Interpretations

1.4.1 Definitions

General: For the purposes of this worksection the definitions given in Austroads AP-C87 and the following apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Base: One or more layers of material, forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Elapsed delivery time: Time between the wetting of the concrete mix and the discharge of the concrete mix at the site.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Lippage: Height deviation between adjacent units.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Rigid pavement: A pavement composed of concrete or having a concrete base course.
- Subbase: Material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform.

1.5 Tolerances

1.5.1 Base and subbase

Flexible pavement subbase:

- Absolute level tolerance: ± 15 mm.
- Relative level tolerance: 10 mm.

Flexible pavement base:

- Absolute level tolerance: ± 10 mm.
- Relative level tolerance: 10 mm.

Rigid pavement subbase:

- Absolute level tolerance: + 0 mm to - 10 mm.

1.5.2 Concrete base

Surface:

- Absolute level tolerance: + 10 mm, - 0 mm.
- Relative level tolerance: 5 mm.

Horizontal position of outer concrete edge: 30 mm from documented position.

1.5.3 Asphalt wearing surface

Surface tolerances: 10 mm.

Shape and roughness tolerances: To AS 2150 Tables 15 and 16.

1.5.4 Segmental paving

Surface:

- Absolute level tolerance: ± 8 mm.
- Relative level tolerance: 8 mm.

Lippage: 2 mm or less.

1.6 Submissions

1.6.1 Execution details

Requirement: Submit the following:

- Proposed construction method.
- Proposed equipment, including slip forms and compaction equipment.

1.6.2 Products and materials

Requirement: Submit details of source and type of construction materials, 2 weeks before ordering.

Proprietary products: Submit the manufacturer's technical data.

1.6.3 Records

Work-as-executed: Submit drawings including the following:

- Plan dimensions, levels, cross falls and gradients.
- Material and thickness of subbase, base and wearing surface.
- Details and locations of joints, reinforcement and kerbs.
- Details of the junctions to any existing paving, existing structures or new structures.
- Support details/footings for street furniture, light poles, signs, drainage pits, grates and any other elements associated with the pavements.

1.6.4 Variations

Requirement: Submit any proposed changes to approved drawings, materials or execution, 5 days before the related construction activity.

1.6.5 Tests

Results: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

1.7 Inspections

1.7.1 Notice

General: Give notice so that inspection may be made of the following:

- Compaction of subgrade: Prepared subgrade surface after compaction.
- Compaction of subbase: Prepared subbase surface after compaction.
- Compaction of base: Prepared base surface after compaction.
- No subbase for pavement: Installation of membrane or film underlay.
- Installation of reinforcement: Installation before placing concrete.
- Installation of cores, fixings and embedded items: Installation before placing concrete.
- Installation of joints: Installation in concrete base.
- Completion of asphalt wearing surface: Evaluation of finish and reinstatement of adjacent surfaces.
- Completion of segmental pavement: Evaluation of finish and reinstatement of adjacent surfaces.

2 Materials

2.1 Subgrade

2.1.1 Fill materials

Standard: To AS 3798 Section 4.

Description: Clean, stable, free of perishable material and capable of compaction to the documented density.

Re-use of excavated material: Only re-use suitable material to AS 3798 clause 4.4.

2.2 Subbase

2.2.1 General

Description: Unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

2.2.2 Subbase for rigid pavement (placed under a concrete base)

General: To the **Subbase material properties and test methods table**.

2.2.3 Subbase for flexible pavement (placed under a granular base)

General: Provide the subbase material for flexible pavements to the **Subbase material properties and test methods table**.

- Crushed rock: Provide 40 mm nominal crushed rock for subbase.
- Recycled materials: Provide recycled materials as follows:

- Base and subbase: Conform to the **Limits on use of recycled and manufactured materials as constituent materials table** and the **Undesirable material properties table**.
- Natural gravel: Provide 20 mm nominal subbase for unbound natural gravel materials.

2.2.4 Subbase material properties and test method table

Property and test method	Differentiating criteria	Material requirements	
		Crushed rock	Natural gravel
Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1	Sieve size (mm)	—	—
	53.0	100	100
	37.5		
	26.5		
	19.0		—
	13.2	—	—
	9.5	42 - 66	48 - 85
	4.75	28 - 50	35 - 73
	2.36	20 - 39	25 - 58
	0.425	8 - 21	10 - 33
	0.075	3 - 11	3 - 21
Liquid limit (wL) to AS 1289.3.1.1	—	max 25%	max 25%
Plasticity index (PI) to AS 1289.3.3.1	Rainfall	—	—
	Areas with annual rainfall > 500 mm	max 15%	max 15%
	Areas with annual rainfall < 500 mm	max 15%	max 15%
Linear shrinkage (LS) to AS 1289.3.4.1	Rainfall	—	—
	Areas with annual rainfall > 500 mm	max 4.5%	max 4.5%
	Areas with annual rainfall < 500 mm	max 6.0%	max 6.0%
Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52	—	min 1.0 MPa	min 1.0 MPa
4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1	—	min 30%	min 30%
*Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.			

2.2.5 Limits on use of recycled and manufactured materials as a constituent materials table

Recycled material	Unbound or modified base and subbase	Bound base and subbase
Iron and steel slag	100%	100%
Crushed concrete	100%	100%
Brick	20%	10%
RAP	40%	40%
Fly ash	10%	10%
Furnace bottom ash	10%	10%
Crushed glass fines	10%	10%

2.2.6 Undesirable material properties table

Property and test method	Differentiating criteria	Material requirements		
		Crushed rock	Recycled material	Natural gravel
Undesirable constituent materials (% retained on a 4.75 mm sieve) to RMS T276	Material type	—	—	—
	Type I - Metal, glass, stone, ceramics and slag	—	max 2.0 %	—
	Type II - Plaster, clay lumps and other friable material	—	max 0.5%	—
	Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter	—	max 0.1%	—

2.3 Granular base

2.3.1 Flexible pavements

Description: Unbound granular base materials, including blends of two or more different materials which when compacted develop structural stability and are uniform in grading and physical characteristics.

2.3.2 Base for rigid pavement

General: To the **Base material properties and test methods table**.

2.3.3 Base for flexible pavement

General: Provide the base material for flexible pavements to the **Base material properties and test methods table**.

- Crushed rock: Provide 20 mm nominal crushed rock for base.
- Recycled materials: Provide recycled materials as follows:
 - Base and subbase: Conform to the Limits on use of recycled and manufactured materials as constituent materials table and the Undesirable material properties table.
- Natural gravel: Provide 20 mm nominal base for unbound natural gravel materials.

2.3.4 Base material properties and test methods table

Property and test method	Differentiating criteria	Material requirements					
		Crushed rock for rigid pavements	Crushed rock for flexible pavements	Recycled material for rigid pavements	Recycled material for flexible pavements	Natural gravel for rigid pavements	Natural gravel for flexible pavements
Particle size distribution or grading (% passing through sieve) AS 1289.3.6.1	Sieve size (mm)		—		—		—
	26.5	100	100	100	100	100	100
	19.0		95 - 100		95 - 100		93 - 100
	13.2		77 - 93		77 - 93		—
	9.5	63 - 83	63 - 83	63 - 83	63 - 83		71 - 87
	4.75	44 - 64	44 - 64	44 - 64	44 - 64	47 - 70	47 - 70
	2.36	29 - 49	29 - 49	29 - 49	30 - 48	35 - 56	35 - 56
	0.425	13 - 23	13 - 23	13 - 23	13 - 21	14 - 32	14 - 32
	0.075	5 - 11	5 - 11	5 - 11	5 - 9	6 - 20	6 - 20
Liquid limit (wL) to AS 1289.3.1.1	—		max 25%		max 30%		max 25%
Plasticity index (IP) to AS 1289.3.3.1	Rainfall		—		—		—
	All areas		—		—		—
	Areas with annual rainfall > 500 mm	max 12%	max 6%	max 12%	max 6%	max 12%	max 6%
	Areas with annual rainfall < 500 mm	max 15%	max 10%	max 15%	max 10%	max 15%	max 10%
Linear shrinkage (LS) to AS 1289.3.4.1	Rainfall		—		—		—
	All areas		—		—		—
	Areas with annual rainfall > 500 mm	max 3.0%	max 2.0%	max 3.0%	max 2.0%	max 3.0%	max 2.0%
	Areas with annual rainfall < 500 mm	max 6.0%	max 4.0%	max 6.0%	max 4.0%	max 6.0%	max 4.0%
For materials with plasticity index less than 1: Maximum dry compressive strength to AS 1141.52	—		min 1.7 MPa		min 1.7 MPa		min 1.7 MPa
Particle shape	—		max 35%		max 35%		—

Property and	Differentiating	Material requirements					
by proportional caliper (% misshapen for 2:1 caliper ratio) to AS 1141.14							
Aggregate wet strength* to AS 1141.22	—		min 80 kN		min 80 kN		—
Wet/dry strength variation* to AS 1141.22	—		max 35%		max 35%		—
Los Angeles value (% loss or abrasion) to AS 1141.23	—		max 35%		max 40%		—
CBR (98% modified compaction) to AS 1289.6.1.1	—		min 30%		min 30%		min 30%
Unconfined compressive strength to AS 5101.4	—		max 1.0 MPa		max 1.0 MPa		—
NOTES:							
*Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.							

2.4 Concrete base

2.4.1 General

Standard: AS 3727.1 clause 5.

Concrete mix and assessment of concrete test results: To AS 1379.

Assessment method of test results: Production assessment to AS 1379.

Design properties: To AS 3600.

2.4.2 Concrete properties

Concrete strength: To the **Concrete strength requirements table** or as documented.

2.4.3 Concrete strength requirements table

Use	MPa	Minimum cement content GP (GB)	Coarse aggregate nominal size	Cylinder strength required	
				7 days	28

Use	MPa	Minimum cement content GP (GB)	Coarse aggregate nominal size	Cylinder strength required	
		Kg/m ³		mm	MPa
Footpaths and miscellaneous minor concrete work	20	270 (330)	20	9	20

2.4.4 Concrete constituents

Aggregates: To AS 2758.1.

Cement: To AS 3972.

Water: To AS 1379.

Supplementary cementitious materials:

- Fly ash: To AS/NZS 3582.1.
- Slag: To AS 3582.2.
- Amorphous silica: To AS/NZS 3582.3.

Chemical admixtures: To AS 1478.1.

Curing compounds: To AS 3799.

2.4.5 Reinforcement

Steel bars or mesh reinforcement: To AS/NZS 4671.

Surface condition: Free of rust, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Fibre reinforcement: To AS 3600 Section 16 and CIA CPN35.

Dowels: Galvanised to AS/NZS 4680 or epoxy coated.

Bar chairs: Proprietary concrete or plastic bar chairs to AS/NZS 2425 and as follows:

- To withstand construction loads and maintain the concrete cover until the concrete has hardened.
- With a protective coating if they are used with galvanized reinforcement.

Tie wire: Annealed steel, minimum 1.25 mm diameter.

2.4.6 Side forms

Depth: Equal to the edge thickness of the slab.

Timber forms: Seasoned and dressed timber planks, free of warps, bends or kinks.

Slip forms: Conform to the manufacturer's recommendations for minimum side clearance requirements.

2.4.7 Polyethylene sheeting

Minimum thickness: 200 µm.

2.4.8 Blinding layer of sand

Minimum thickness: 20 mm.

Maximum content of silt and clay: 5%.

2.5 Asphalt wearing surface

2.5.1 Aggregate properties

Description: Clean, sound, hard, angular, of uniform quality, free from deleterious matter in conformance with the **Aggregate properties table**.

Standard: To AS 2758.5.

Mineral filler: To AS 2150 clause 4.2.

2.5.2 Aggregate properties table

Property	Test method	Value
Particle shape (calliper ratio 2:1)	AS 1141.14	≤ 35%
Wet strength	AS 1141.22	≥ 100 kN
Wet/dry strength variation	-	≤ 35%

2.5.3 Bituminous materials

Hot mix asphalt: To AS 2150.

Medium cut back bitumen: To AS 2157.

Bitumen emulsion: To AS 1160.

2.5.4 Mix design

Design: To AS/NZS 2891.5 and AS 2150.

2.5.5 Mix property table

Mix property	Maximum variation from job mix value
Aggregate passing 4.75 mm sieve or larger	± 7% by mass
Aggregate passing 2.36 mm to 300 µm sieves	± 5% by mass
Aggregate passing 150 µm sieve	± 2.5% by mass
Aggregate passing 75 µm sieve	± 1.5% by mass
Bitumen content	± 0.3% by mass
Added filler content	± 0.3% by mass
Mixing temperature	± 10°C

2.6 Concrete and clay segmental pavers

2.6.1 General

Standard: To AS 3727.1 Section 6 and AS/NZS 4455.2.

Permeable interlocking concrete pavers: To the recommendations of CMAA PE01 Section 7.

Slip resistance classification: To AS 4586.

Proprietary product: Conform to the **ANNEXURE– PAVER SCHEDULE**.

2.7 Sand

2.7.1 General

Description: Well-graded, clean, hard sand, with uncoated grains of uniform quality and free of soluble salts or other contaminants which may cause efflorescence.

Storage: Protect from rain.

Cement: Do not use cement bound material.

2.7.2 Bedding sand

Grading: Obtain material from a single source or blend.

Fines: Do not use single-sized, gap-graded or excessive fine material.

Moisture content: 4 to 8% and uniform when spread.

2.7.3 Bedding sand grading table

AS sieve	% passing
9.52 mm	100
4.75 mm	95–100
2.36 mm	80–100
1.18 mm	50–85
600 µm	25–60
300 µm	10–30
150 µm	5–15
75 µm	0–10

2.7.4 Joint filling sand

Moisture content: Dry when spread.

2.7.5 Joint filling sand grading table

AS sieve	% passing
2.36 mm	100
1.18 mm	90–100
600 µm	60–90
300 µm	30–60
150 µm	15–30
75 µm	5–10

2.8 Granular material

2.8.1 Permeable pavement

Description: Well-graded, clean aggregate of uniform quality.

Grading: Bedding and jointing material to the recommendations of CMAA PE01 Table 2.

Bedding and jointing course material: 2 to 5 mm uniform size of aggregate.

2.8.2 Joint filling material grading table

AS sieve	% passing
9.5 mm	100
4.75 mm	85–100
2.36 mm	10–40
1.18 mm	0–10
0.3 mm	0–5

2.8.3 Concrete edge restraint

Properties: To AS 1379 clause 1.5.3.

Compressive strength: 20 MPa.

Slump: 60 mm.

2.9 Other materials

2.9.1 Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

2.9.2 Testing

2.9.3 Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Quality verification: If material/product quality verification can be obtained from the supplier, documented tests need not be repeated.

3 Execution

3.1 Preparation of subgrade

3.1.1 General

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs.

Existing services: Before commencing earthworks, locate and mark existing underground services in the areas affected by the earthworks operations.

3.1.2 Clearing and excavations

Clearing: Remove all the topsoil, vegetation, debris and any existing pavements.

Bulk excavations/levelling: Excavate to correct levels and profiles as the basis for the pavement, filling and landscaping. Make allowance for compaction, settlement or heaving.

Rock: If rock is encountered, do not use explosives. If essential follow appropriate safety procedures.

Existing footings: If excavation is required within the zone of influence of an existing footing, construct temporary shoring or underpinning, as documented, to maintain the support of the footing and prevent damage to the structure and finishes supported by the footing.

Removal of unsuitable material: Remove any soft, weak, saturated or organic material within the top 300 mm of the subgrade and replace with good quality fill.

Stockpiling: If stockpiling is permitted along the line of the trench excavation, do not put excavated material against tree trunks, buildings, fences or obstruct the free flow of water along gutters.

Disposal of excess excavated material: Remove excess material not required or unsuitable for fill from the site, to AS 3798 clause 6.1.8.

3.1.3 Filling

Requirement: Place fill in near-horizontal layers of uniform thickness. Bring the fill to optimum moisture content by watering. Compact each layer with suitable roller.

3.1.4 Compaction of subgrade

Requirement: Uniformly compact the subgrade to the documented density.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Protection of adjacent structures: Do not use compacting equipment against concrete retaining walls or detention tank walls until the concrete has been in place for 28 days, unless the walls are back propped.

3.1.5 Permeable pavements with segmental pavers

Requirement: To the recommendations of CMAA PE01 clause 7.1.2 and the following:

- Compaction: 92 to 96% standard MDD.
- Cohesive subgrades: Install filter fabric under base course as documented.
- Contaminated, saline or expansive subgrade: Install an impermeable membrane and run up the sides of the pavement, as documented.

3.2 Preparation of base and subbase

3.2.1 Surface preparation

Before laying the subbase: Inspect the subgrade for soft spots or surfaces weakened by moisture and remove as unsuitable material.

3.2.2 Placing

Spreading: Spread the material in uniform layers, without segregation.

Maximum thickness of layers: 150 mm.

Trimming: Trim the subbase to the cross falls as documented.

3.2.3 Compaction of subbase

Density and thickness: Uniformly compact the subbase as documented.

3.2.4 Base and subbase for flexible pavement

Required moisture content: Maintain by adding water to the entire surface of the layer after spreading.

3.2.5 Subbase for rigid pavement

Extent of the subbase: Conform to the following:

- At kerbs: Extend the subbase at its full depth to at least the back of kerbs.
- Along edges without kerbs: Extend the subbase at least 300 mm beyond each side of the pathway.

3.2.6 No subbase for pavement

Requirement: Lay polyethylene sheeting and/or a blinding layer of sand, if no subbase.

Polyethylene sheeting: Provide minimum 200 mm taped laps.

Subsurface drainage: Provide subsurface drainage, as documented.

3.2.7 Permeable pavement

Construction: To the recommendations of CMAA PE01 clause 7.1.2 and the following for trafficable areas:

- Unbound subbase: Compact to 95% modified MDD.
- Unbound base: Compact to 98% modified MDD.
- Cement-stabilised materials: Compact to 96% modified MDD.
- Construction vehicles trafficking mud onto the base course for permeable paving: If unavoidable, increase documented base thickness by 50 mm, scalp off and immediately discard before installing the bedding course.

3.2.8 Surface level

Finished surface: Free draining and evenly graded between level points.

3.3 Concrete base

3.3.1 Installation of side forms

Preparation: Clean and recoat the forms before using. Apply a release agent to the interior of the formwork.

Fixed forms: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Slip forms: Allow side clearance for slip form operation.

3.3.2 Installation of reinforcement

In accordance with Council's Standard Drawings.

3.3.3 Installation of cores, fixings and embedded items

Requirement: Provide cores, fixings and embedded items as documented.

Installation: Fix into position to prevent movement during concrete placement. If clashing with reinforcement, reposition reinforcement and maintain cover. Do not cut reinforcement.

3.3.4 Concrete mix supply

Standard: To AS 1379.

Pre-mixed supply: Do not add water on site.

Weather: Provide special protection measures if placing concrete during rainy weather or at temperatures above 30°C or below 10°C.

3.3.5 Elapsed delivery time table

Concrete temperature at time of discharge (°C)	Maximum elapsed time (minutes)
5 – 24	120
24 – 27	90
27 – 30	60
30 – 35	45

3.3.6 On-site slump test

Frequency: To AS 1379 clause 5.2.

Test method: To AS 1012.3.1.

Acceptance criteria:

- Fixed form with manual operated vibration: 50 - 60 mm.
- Slip form with no side forms: 30 - 50 mm.

3.3.7 Concrete placing

Preparation:

- Wet weather: Remove any water ponding on the subbase/subgrade.
- Dry weather: If there is no polyethylene sheeting or sand blinding layer directly under the concrete base, dampen the subbase/subgrade.

Placing: Place concrete uniformly over the width of the pavement so that the face is generally vertical and normal to the direction of placing.

Hand spreading:

- Method: Use shovels.
- Placing sequence: Start from one corner (usually the lowest point) and proceed continuously out from that point.

3.3.8 Compaction of concrete base

Slab thickness 100 mm or less: Compact throughout placing, screeding and finishing processes. If required, use a hand-held screed vibrator at the surface. Do not use immersion vibrators.

Slab thickness more than 100 mm and downturns: Use an immersion vibrator.

3.3.9 Concrete placing records

Log book: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.

- The portion of work.
- Volume placed.

3.3.10 Concrete finish

Initial finishing: Screed the concrete to the level of formwork, bull float and leave to set.

Final finishing: After all the bleed water has evaporated from the surface, start the operations to achieve the documented finish.

Finish: Provide one of the following non-slip finishes, as documented:

- Steel Cove: After machine floating, use steel cove steel float to produce the final consolidated finish free of float marks and uniform in texture and appearance.
- Wood float finish: After machine floating, use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.
- Broom finish: After machine floating and steel trowelling, draw a broom or hessian belt across the surface to produce a coarse even-textured transverse-scored surface.

3.3.11 Concrete curing

Requirement: Start curing immediately after finishing and continue for a minimum period of 3 days.

Curing method: Choose from the following:

- Cover sheet method: Cover concrete surface with plastic sheets. Overlap at least 150 mm and anchor down to prevent displacement.
- Moisture application method: Spray constantly with water in form of fog or mist.
- Curing compound method: Apply curing compound to the manufacturer's recommendations.

Coloured concrete: Do not cure by covering with plastic sheeting, damp sand or wet hessian.

3.3.12 Installation of joints

In accordance with Council's Standard Drawings.

3.3.13 Joint sealing

Requirement: Fill with joint sealer as documented.

Preparation: Make sure the joint space is dry, clean and free from loose material.

Sealant type: Silicone sealant to the manufacturer's recommendations.

3.3.14 Completion

Protection: During the curing period, protect the paving surfaces from traffic and construction plant.

Adjacent surfaces: Remove side forms and reinstate surfaces adjacent to the new pavement.

3.4 Asphalt wearing surface

3.4.1 General

Standard: To AS 3727.1 Section 7 and AS 2150.

Weather conditions: Place asphalt surfacing in dry weather.

3.4.2 Placing

Spreading: Spread the mix in a uniform layer covering the full width of the pavement.

Trimming: Trim to cross falls, levels and grades as documented. Trim edges to a straight line.

Compaction: Uniformly compact the pavement surface to documented thickness.

3.4.3 Joints

Standard: To AS 2150 clause 12.6.

Requirement: Minimise the number of joints and make joints that are well bonded and sealed with a smooth riding surface across the joint.

Transverse joints: If the operation is stopped for more than 20 minutes or the pavement temperature falls below 90°C, construct transverse joint to a straight vertical face for the full depth of the layer, and offset in adjoining spreader runs and layer to layer by at least 1 m.

Edges: Form exposed edges of each paver run while hot, to a straight line with a dense face inclined between vertical and 45°.

Cold joints: Tack coat the surface of cold joints before placing the adjoining asphalt.

3.4.4 Completion of asphalt wearing surface

Adjacent surfaces: Reinstate surfaces next to new pavements and associated elements.

3.5 Segmental pavers

3.5.1 Concrete edging or kerb

Construction: Fixed form, extrusion or slip forms to AS 2876.

Perimeter: Construct edge restraints to bedding and units, where not provided by other structures.

Drainage: Position edge restraint and pavers so that the top of the pavers are slightly above the front edge of the edge restraint.

Edge restraint shape: Make sure the edge restraint has a vertical or near vertical side abutting the pavers.

Edging: Place in a shallow trench between timber forms. Wood float finish flush with the adjacent finished grass level.

Control joints: Provide 20 mm deep contraction joints at 3 m maximum spacing, as documented.

Timing: Carry out concrete edge restraints before bedding course. Allow concrete edge restraints to harden before vibration of the surface course.

3.5.2 Geotextile

Position: Place fabric over prepared base course before laying the bedding course.

Requirement: Cover within 48 hours of being placed, rectify any punctures or tears prior to covering.

Overlap 500 mm where deformations are expected.

3.5.3 Bedding course

Screeding: Spread the bedding course in a single uniform layer and screed in a loose condition to the nominated design profile and levels.

Sand bedding course thickness: 20 mm to 30 mm following final compaction of the paving.

Progressive screeding: Do not screed more than 2 m in advance of the laying face at the completion of work on any day.

Depressions: Before laying pavers, loosen, rake and re-screed any depressions exceeding 5 mm.

Remediation: If screeded sand left overnight is subject to rain, check for level and re-screed where necessary before placing pavers.

3.5.4 Permeable pavement

Granular bedding course thickness: 20 to 40 mm, following final compaction of the paving or as documented.

Sand: Do not use.

3.5.5 Laying pavers

Placement: Uniformly place pavers on the screeded bedding to the documented laying pattern. Lay the pattern at either 90° or 45° to the line of edge restraints.

Joint width: Lay pavers with a joint range after bedding compaction and joint filling operations as follows:

- Pavers generally: 2 to 5 mm.
- Permeable type A pavers: 2 to 5 mm.
- Permeable type B pavers: 2 to 5 mm or less than 13 mm.
- Permeable type C pavers: Less than 13 mm.

Colour variation: Mix the pavers between pallets to evenly distribute colour variation over the whole paved area.

Cut courses: Cut pavers with a 50 mm minimum plan dimension. On footpaths and other linear elements, use at least two cut courses and maintain symmetry.

Control: Control alignment and laying pattern by stringlines or chalked stringlines every 5 m intervals.

Variable width areas: Include in situ concrete infill strips to make a straight area for paving and take up the variable width.

Control joints: If there is a concrete base, provide paving control joints:

- Located over concrete base control joints.
- 10 mm wide and filled with bitumen impregnated fibreboard.

Laying around obstacles: Finish public utility access pits, drainage inlets and other penetrations in the paving with a concrete surround:

- Make sure the outside dimensions of the pit are square or rectangular and make a smooth connection with the laying pattern of the pavers.
- Drainage inlets: Position the top of the drainage inlet slightly below the top of the pavers.

3.5.6 Compaction of bedding

Compaction: Compact the sand bedding after laying paving units using a vibrating plate compactor and appropriate hand methods, and continue until lipping between adjoining units is eliminated.

Progressive compaction: Arrange the paving operations to allow the following:

- Compactor proceeds progressively behind the laying face without undue delay.
- Compaction is completed before stopping work on any day.
- No compaction within 1 m of the laying face except on completion of the pavement against an edge restraint.

Joint filling: Compact all paving units to design levels before the commencement of joint filling.

3.5.7 Joint filling

Filling: Spread dry sand or granular material over the paving units and fill the joints by brooming. Undertake one or more passes with the vibrating plate compactor and refill the joints with joint filling material. Repeat the process until the joints are completely filled.

Timing: As soon as compaction is carried out, fill gaps with jointing material.

3.5.8 Completion of segmental pavement

Protection: Prevent all vehicular and pedestrian traffic from using the pavement until all compaction and joint filling is completed and all edge restraints are in place.

Conformance: Test for levelness, flatness and lippage tolerances:

Cleaning: Leave pavements clean on completion.

Reinstating adjacent surfaces: Reinstating surfaces next to new pavements and associated elements.



3.6 Landscaping

3.6.1 Protection from landscaping

Please refer to councils Street Tree Implementation Plan for more details and compliance.
All existing landscape is to be protected in accordance with AS 4970-2009.

4 Annexures

4.1 Annexure - Summary of hold and witness points

Reference No:	Clause and description	Type	Submission/Inspection details	Submission/Notice timing	Process held
C33-HP01	INSPECTIONS, Notice Compaction of subgrade	H	Prepared subgrade after compaction	1 day before proceeding with base	For development inspections book through "MyInspect".
C33-WP02	INSPECTIONS, Notice Compaction of subbase	W	Prepared subbase after compaction	1 day before completing compaction	-
C33-HP03	INSPECTIONS, Notice Compaction of base	H	Prepared base after compaction	1 day before completing compaction	For development inspections book through "MyInspect"
C33-WP04	INSPECTIONS, Notice No subbase for pavement	W	Installation of membrane and/or blinding layer of sand	1 day before installing reinforcement	-
C33-HP05	INSPECTIONS, Notice Installation of reinforcement	H	Completed installation of reinforcement	2 days before pouring concrete	For development inspections book through "MyInspect"
C33-WP06	INSPECTIONS, Notice Installation of cores, fixings and embedded items	W	Completed installation of cores, fixings and embedded items	2 days before pouring concrete	-
C33-WP07	INSPECTIONS, Notice Installation of joints	W	Installed expansion, contraction, isolation or construction joints	Progressive	-
C33-HP08	INSPECTIONS, Notice Completion of asphalt wearing surface	H	Evaluation of finish and reinstatement of adjacent surfaces.	2 days before opening pavement to traffic	Opening pavement to public For development inspections book through "MyInspect"

Reference No:	Clause and description	Type	Submission/Inspection details	Submission/Notice timing	Process held
C33-HP09	INSPECTIONS, Notice Completion of segmental pavement	H	Evaluation of finish and reinstatement of adjacent surfaces.	2 days before opening pavement to traffic	Opening pavement to public For development inspections book through "MyInspect"
C33-HP10	SUBMISSION Work as Executed Drawings and Road Asset Attribute Schedules	H	Submit certified drawings and schedules	2 weeks after completion of works	Prior to Subdivision Certificate/Occupation Certificate

4.2 Annexure – Maximum lot sizes and minimum test frequencies

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Subgrade	Compaction	1000 Lin. m or 1000 m ²	1 per 200 Lin. m or 200 m ²	AS 1289.5.4.1
Subbase/granular base placement	Compaction	1 day's placement	1 per 100 Lin. m or 100 m ²	AS 1289.5.4.1
	Geometry	1 day's placement	1 per 25 Lin. m	3 m straight edge
Steel supply	Material quality – Supplier's documentary evidence and certification	1 delivery	1 per production batch	AS/NZS 4671
Concrete supply	Ready-mixed concrete production and supply - Supplier's documentary evidence and certification	1 delivery	1 per production batch	AS 1379
	Consistency – Slump	15 m ³	1 per load	AS 1012.3.1
	Compressive strength (28 days)	15 m ³	2 pairs per 15 m ³	AS 1012.1 AS 1012.8.1 AS 1012.9
Concrete placement	Finished levels	15 m ³	1 cross section per 15 m	Survey and 3 m straightedge
	Surface dimensions	Single fabrication	As required to confirm design dimensions	Measure

4.3 Annexure - Pay items

Pay items	Unit of measurement	Schedule rate inclusions
Pay items for concrete		
0282.1 Excavation	m ³ , measured in bank volume of excavation	This pay item applies to works included in pay items 0282.2 and 0282.3 . Include in the rate for excavation: <ul style="list-style-type: none"> Excavation and backfilling of all types of materials, with no separate rates for earth and rock. The disposal of surplus material The control of stormwater runoff. Do not include: <ul style="list-style-type: none"> Drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.
0282.2 Footpaths, driveways, median toppings and works of similar nature	m ² , measured as the horizontal surface area of the concrete footpath, driveways, median topping, or similar as constructed	Include all operations involved in the forming and compaction of foundations, subbase, concreting, finishing, curing and backfilling. Where documented, include the supply and placement of reinforcing steel.
Pay items for asphalt		
0282.3 Mix design	Ls	All costs associated with mix design and control. (For example quality, binder, aggregate grading and binder content, mix properties)
0282.4 Supply and install asphalt measured by mass unless otherwise	Tonnes <ul style="list-style-type: none"> Determine the mass in tonnes from docket supplied by the Contractor and issued at a certified weighing system by batch weights using certified scales. 	All costs associated with supply, install and finishing of asphalt.
Pay items for segmental paving		
0282.5 Edge strips	Lin. m, measured along the length of the edge strip	All costs associated with the following: <ul style="list-style-type: none"> Excavation, forming,

Pay items	Unit of measurement	Schedule rate inclusions
		concreting, contraction joints, backfilling and compaction adjacent to the completed edge strip.
0282.6 Segmental pavers	m ² The surface area of segmental paving for pavements calculated from the width and length.	All costs associated with the following: <ul style="list-style-type: none"> • Supply, laying and compaction of segmental paving units, bedding and joint filling material. • Cutting of units. • Concrete surrounds or aprons around surface penetrations.

4.4 Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1012		Methods of testing concrete
AS 1012.1	2014	Sampling of concrete
AS 1012.3.1	2014	Determination of properties related to the consistency of concrete - Slump test
AS 1012.8.1	2014	Method for making and curing concrete - Compression and indirect tensile test specimens
AS 1012.9	2014	Compressive strength tests - Concrete, mortar and grout specimens
AS 1141		Methods for sampling and testing aggregates
AS 1141.14	2007	Particle shape, by proportional caliper
AS 1141.22	2008	Wet/dry strength variation
AS 1141.23	2009	Los Angeles value
AS 1141.52	2008	Unconfined cohesion of compacted pavement materials
AS 1160	1996	Bitumen emulsions for construction and maintenance of pavements
AS 1289		Methods of testing soils for engineering purposes
AS 1289.3.1.1	2009	Soil classification tests - Determination of the liquid limit of a soil - Four point Casagrande method
AS 1289.3.3.1	2009	Soil classification tests - Calculation of the plasticity index of a soil
AS 1289.3.4.1	2008	Soil classification tests - Determination of the linear shrinkage of a soil - Standard method
AS 1289.3.6.1	2009	Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving
AS 1289.5.4.1	2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.6.1.1	2014	Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen
AS 1379	2007	Specification and supply of concrete
AS 1428		Design for access and mobility
AS/NZS 1428.4.1	2009	Means to assist the orientation of people with vision impairment - Tactile ground surface indicators
AS 1478		Chemical admixtures for concrete, mortar and grout
AS 1478.1	2000	Admixtures for concrete
AS 2150	2005	Hot mix asphalt - a guide to good practice
AS 2157	1997	Cutback bitumen
AS/NZS 2425	2015	Bar chairs in reinforced concrete - Product requirements and test methods
AS 2758		Aggregates and rock for engineering purposes
AS 2758.1	2014	Concrete aggregates
AS 2758.5	2009	Coarse asphalt aggregates
AS 2876	2000	Concrete kerbs and channels (gutters) - Manually or machine placed (withdrawn)
AS/NZS 2891		Methods of sampling and testing asphalt
AS/NZS 2891.5	2015	Compaction of asphalt by Marshall method and determination of stability and flow - Marshall procedure

AS/NZS 3582		Supplementary cementitious materials
AS/NZS 3582.1	2016	Fly ash
AS 3582.2	2016	Slag - Ground granulated blast-furnace
AS/NZS 3582.3	2016	Amorphous silica
AS 3600	2018	Concrete structures
AS 3727		Pavements
AS 3727.1	2016	Residential
AS 3798	2007	Guidelines on earthworks for commercial and residential developments
AS 3799	1998	Liquid membrane-forming curing compounds for concrete
AS 3972	2010	General purpose and blended cements
AS/NZS 4455		Masonry units, pavers, flags and segmental retaining wall units
AS/NZS 4455.2	2010	Pavers and flags
AS 4586	2013	Slip resistance classification of new pedestrian surface materials
AS/NZS 4671	2001	Steel reinforcing materials
AS/NZS 4680	2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 5101		Methods for preparation and testing of stabilized materials
AS 5101.4	2008	Unconfined compressive strength of compacted materials
Austrroads AP-C87	2015	Austrroads glossary of terms. 2015 edition.
CIA CPN35	2003	Fibres in concrete
CMAA PE01	2010	Permeable interlocking concrete pavements - Design and construction guide
RMS T276	2012	Foreign materials content of recycled crushed concrete