



# Section 6: Footpath pavements

Sutherland Shire Public Domain Technical Manual  
Part D: Specification

**SUTHERLANDSHIRE**

## **Sutherland Shire Public Domain Technical Manual Part D: Specification**

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## Section 6: Footpath pavements

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## 6 Footpath pavements

### 6.1 Scope

This section details requirements for works associated with footpath pavements including:

- Unit paving (natural stone units or manufactured units);
- Cast in situ concrete;
- Permeable paving;
- Tactile Ground Surface Indicators (TGSIS);
- Utility covers;
- Garden edging; and
- Paving of stairs, vehicular footpath crossings and ramps;
- Other pedestrian traffic surface finishes in footways;

### 6.2 Standards and guidelines

Unless stated otherwise in the *specification*, the *approved design drawings* or elsewhere in the construction documents, work shall comply with the current, relevant Australian Standards and/or RMS Standards.

The following table indicates the Australian Standards and/or RMS Standards applicable to this section. This table is not exhaustive and may not include all standards which apply to the *work* to be undertaken:

## Section 6: Footpath pavements

AS 1141.26	<i>Methods for sampling and testing aggregates: Secondary minerals content in igneous rocks</i>
AS/NZS 1428.4.1	<i>Means to assist the orientation of people with vision impairment - Tactile ground surface indicators</i>
AS/NZS 3661.2	<i>Slip Resistance of Pedestrian Surfaces – Guide to the reduction of slip hazards</i>
AS/NZS 3700	<i>Masonry structures</i>
AS/NZS 4455	<i>Masonry units, pavers, flags and segmental retaining wall units</i>
AS/NZS 4456	<i>Masonry units, pavers, flags and segmental retaining wall units – Methods of test</i>
AS/NZS 4586	<i>Slip resistance classification of new pedestrian surface materials</i>
AS/NZS 4663	<i>Slip resistance measurement of existing pedestrian surfaces</i>
pA03	<i>Concrete Masonry Association of Australia: Concrete segmental pavements – Specifying Guide.</i>
TBA01 & 02 & 14	<i>Think Brick Australia: Clay Paving Manual</i>
HB198	<i>Guide to the Specification and Testing of Slip Resistance of Pedestrian Surfaces</i>
AS 1379	<i>Specification for supply of concrete</i>
C615/C615M – 11	<i>Standard specification for granite dimension stone</i>
<i>And all current standards &amp; guidelines as recommended by Australian Stone Advisory Association Ltd</i>	

### 6.3 General

#### 6.3.1 Subgrade

The sub-grade is the existing granular material supporting the pavement base.

For all pavement finishes, the *contractor* shall excavate or fill as required to bring the formation to levels that are the full specified pavement depth below finished surface level. The formation shall be thoroughly compacted as outlined below and shall be neatly trimmed true to line, level and cross slope, so as to provide for the full specified thickness of pavement in all places.

The subgrade shall be thoroughly compacted to achieve 95% standard maximum dry density and a minimum CBR of 4%. Refer to Section 2: Earthworks.

### 6.3.2 Slip resistance

All finished public footpaths with grades <7% shall comply with Slip Resistance Classification Category 'P4'. All external ramps and footpaths with grades 7% or greater, must comply with Slip Resistance Classification Category 'P5' as outlined in AS 4663, AS 4586 and HB 198.

Where the *contractor* proposes to use an alternative paver, the *contractor* shall submit Slip Testing certification from a NATA accredited laboratory showing that slip resistance of the sealed paver is in accordance with this specification.

### 6.3.3 Cleaning

All footpath pavements shall be cleaned of foreign material immediately following the completion of paving *works*. The *contractor* shall ensure that all adjacent surfaces are left clean on completion, including adjacent kerbs, pit covers, bitumen paving. Mortar smears shall be removed from adjacent existing surfaces.

Cleaning agents are to be free of hydrochloric acid for all footpath paving.

### 6.3.4 Exposing footpath pavements to pedestrian and vehicular traffic

No footpath element containing cement shall be opened to pedestrian and vehicular traffic until such time that it has achieved its full design strength.

## 6.4 Unit paving

### 6.4.1 General

Unit paving shall include supply and laying of natural stone and manufactured paving units.

### 6.4.2 Natural stone paving units

Natural stone paving includes granite and porphyry paving units.

#### ***Materials***

The material, colour, size, surface finish and laying pattern of stone paving units shall be as indicated in the *approved design drawings*. Exposed surfaces of all natural stone paving units must have a uniform finish and appearance consistent with paver sample approved by *Council's representative*.

**Sources of supply**

Natural stone pavers can be obtained from the suppliers indicated in the Paver Schedule in Part B. *SSC locality drawings*.

Stone from alternative suppliers must be selected to match the colour, pattern, dimensions and quality of the specified paver, and may only be used following approval by *Council's representative*.

**Material performance criteria**

The supplier shall provide written certification that the supplied stone products meet the international *ASTM C615/C615M-11 Standard Specification for Granite Dimension*. Unit paving testing data sheet must be certified by NATA accredited laboratory.

**Tolerances for natural stone paver size and shape**

The following tolerances apply to stone paver size and shape:

<b>Maximum deviation</b>	Deviation from required dimensions for paver face dimensions for items of thickness up to 90mm shall be 1mm.
<b>Squareness</b>	The squareness difference between diagonals shall be no greater than 1.5mm.
<b>Thickness</b>	+/- 2mm
<b>Deviation of paver surface from a flat plane</b>	Honed surfaces: 0.5mm per unit Sawn or sandblasted faces: 1.5mm per unit Natural riven faces: 5mm per unit
<b>Edge Straightness</b>	0.5mm per metre



### 6.4.3 Manufactured paving units

Manufactured paving units includes the following:

- pre-cast concrete unit paver
- interlocking unit paver
- fired clay brick unit paver
- permeable unit paver

#### **Materials**

The materials and manufacture of all masonry paving units shall comply with AS 4455.

Manufactured paving units shall be sound, firm, dense, dimensionally stable and consistent, with a smooth unblemished upper surface and with unbroken square edges. Units that exhibit cracking, "boniness" or are considered by the *PDC* to be excessively porous, brittle or friable shall be rejected.

Paving unit colours shall be uniform and shall match that of approved sample units over the full area of the pavement.

#### **Sources of supply**

Manufactured paving units can be obtained from the suppliers indicated the *locality drawings*. Concrete pavers from alternative suppliers may be used subject to approval by *Council's representative* and must be selected to match the colour, pattern, dimensions and quality of the specified paving unit.

#### **Material performance criteria – Manufactured paving units**

Pavers shall comply with AS/NZS4456 for compressive strength, breaking load, density, water absorption and abrasion resistance. Clay paving units shall comply with the recommended specifications by the Clay Brick Paver Institute.

Where alternative suppliers are proposed to be used, the *contractor* shall provide written certification from the supplier that the supplied pavers comply with the performance criteria set out in the table below:

**Tolerances for manufactured unit pavers**

The following tolerances apply to manufactured unit paver size and shape:

<b>Maximum deviation</b>	Deviation from required dimensions for paver face dimensions for items of thickness up to 90mm shall be 1mm
<b>Squareness</b>	The squareness difference between diagonals shall be no greater than 1.5mm.
<b>Thickness</b>	+/- 3mm
<b>Deviation of paver surface from a flat plane</b>	Honed surfaces: 0.5mm per unit Sawn or sandblasted faces: 1.5mm per unit
<b>Edge Straightness</b>	0.5mm per metre

**6.4.4 Supply of materials**

Prior to placing orders for paving materials, the *contractor* shall obtain test certificates from a NATA accredited laboratory confirming that the constituents of all pavers comply with the requirements of this *specification*.

**6.4.5 Sighting and record of paving samples from alternative suppliers**

Unit pavers from suppliers other than those listed in the PDTM – Part B may be used following approval by *Council’s representative*. Control samples of each type and grade of unit paver type shall be submitted to *Council’s representative* for assessment before an order is placed for stone pavers from alternative suppliers. This action constitutes a *hold point*. The following requirements apply:

- Not less than three quality control samples shall be provided for each paver;
- The samples shall measure not less than 300mm x 300mm or the full paver specified in the project whichever is the smaller;
- The samples shall show the full range of variations of colour, pattern, texture and surface finish; and

- each sample shall be labelled for verification.

#### 6.4.6 Laying tolerances

The following table summarises the Limits & Tolerances for laying unit paving.

Item	Activity	Limits/tolerances
1.	Laying paving  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 specified range shown in the <i>approved design drawings</i>
2.	Completed paving finished surface level	<ul style="list-style-type: none"> <li>— Where longitudinal grades are &gt;1% and less than 2%, plus or minus 2mm.</li> <li>— Where the longitudinal grade is &lt;2%, plus or minus 5mm</li> <li>— Where the longitudinal grade is 5% or greater, the tolerance shall be plus 10mm or minus 10mm. In all cases, variations in level shall not be localised.</li> <li>— Localised low spots where water ponds on the paving surface shall not be accepted.</li> <li>— The top edge of any unit shall not deviate from the adjacent unit by more than <math>\pm 2\text{mm}</math>.</li> <li>— The surface across junctions between adjacent paving surfaces shall not deviate by more than <math>\pm 2\text{mm}</math>.</li> </ul>

#### 6.4.7 Joints

Full-depth expansion joints, 10mm in width, shall be constructed at the interface of paving with structures such as buildings, back of kerb and gutter, around services pits and at changes in paving material.

The expansion joints shall be filled with a silicon sealer installed in accordance with the manufacturer's recommendations. Immediately before introducing the silicone sealant into the groove, any foreign or disturbed material shall be cleaned from the joint and from the top of the joint filler by air jet. Silicon joints shall be no wider than 10mm. The colour of the silicon shall match dominant colour of the adjoining pavers (typically black or grey).

#### 6.4.8 Removal of existing pavers

The *contractor* is responsible for removing existing pavers where necessary.

Where unit pavers are to be reused, pavers are to be removed in such a way as to avoid damage to the pavers. Pavers for reuse shall be stacked, secured to pallets and transported by the *contractor* to a secure storage area where they shall be unloaded by crane truck.

Pavers to be reused on site can be stored on site if a suitable secure location is available, subject to approval by *Council's representative*. Refer to Section 1 Preliminaries for on-site storage requirements.

#### 6.4.9 Storage, cutting and laying of pavers

##### *Storage*

Pavers shall be stored in such a way as to ensure that they are protected from the weather, atmospheric pollution, staining, marking or damage.

##### *Cutting units*

Maintain sharp arises and accurate joints and margins. Pavers cut to suit structures are to be cut accurately to line such that the width of the expansion joint at the structure is no less than 8mm and no greater than 12mm.

### ***Laying pavers***

Perform the necessary cutting and shaping to the required sizes. Cut pavers so as to fit neatly around all penetrations and fixtures including pit covers, lighting and traffic poles, signs and the like. Refer to *SSC standard drawings* for minimum unit lengths, band widths and faceted zones.

Set-out lines and/or grids shall be used where required to control the laying sequence, pattern and edge detailing as shown in the *approved design drawings*.

### ***Cleaning***

Clean the area progressively with hard sponges and clean water before the cement sets without using acid and without damaging the work, as necessary to remove mortar smears, stains, discolouration and the like. Brushes may be necessary to remove marks made by some substances. Fibre brushes are recommended for this purpose.

### ***Protection***

When laying the paving, protect from damage all structures and fixtures including building facades, utility pit covers, lighting and traffic poles, signs and the like.

### ***Noise and dust***

Provide dust-proof screens, tape and draft excluders at doorways and covers to protect existing finishes, adjacent buildings and the immediate environment from dust, noise and debris when cutting pavers. All cutting activities are to be situated away from residences and retail traders. Refer to Section 1 Preliminaries for further requirements relating to noise control and environmental protection.

### ***Dry cutting***

The use of dry methods of cutting pavers on site is not permitted.

### ***Wet cutting***

The use of wet methods of cutting pavers on site is permitted subject to compliance with the requirements of Council and *AS2436-1981*. Prevent slurry run-off from wet cutting operations from marking or tracking across adjacent paved areas. Collect residual water and slurry and divert them to an approved means of disposal. Do not allow slurry to enter grates, gutters or tree pits.

#### 6.4.10 Cleaning and sealing

The following precautions shall be taken during cleaning:

- Prevent run-off from the cleaning operations from marking or tracking across adjacent paved areas.
- Collect residual water and cleaning waste and divert them to an approved means of disposal.
- Prevent run-off and tracking to garden bed and tree pit areas.

##### ***Cleaning method***

Following the completion of paving works for the project or stage in the case of staged paving projects, the paved surface shall thoroughly cleaned and sealed to prevent staining.

Cleaning is to be undertaken, using one or more of the following methods:

- Hydraulic;
- Hydro-air; or
- Steam-water jet.

Chemicals, which may damage the surface or do not comply with the relevant EPA regulations, are not to be used.

##### ***Protective paver sealant***

A protective sealant of Dry Treat™ –Stain Proof Penetrating Sealer or approved equivalent shall be applied to seal the surface of all concrete and natural stone unit paving.

The penetrating sealant shall be applied to the surface immediately following cleaning and prior to opening the area to pedestrian use.

The sealant shall be applied as per the directions in manufacturer's technical data sheet.

Following the completion of paving works, or stage in the case of staged works, the paved works shall be inspected by *Council's representative* following the final seal.

## 6.5 Rigid pavement system

A rigid pavement system shall be installed in locations prescribed in the *approved design drawings*.

### 6.5.1 Basecourse materials

Concrete basecourse shall be in accordance with the *approved design drawings*. The methods of placing and curing concrete shall comply with the requirements set out in Section 4: Concrete works.

### 6.5.2 Bedding materials

Bedding materials shall be either dry sand/cement bedding mix or a wet mortar bedding, in accordance with the *approved design drawings*. All bedding materials shall comply with *AS3700 Masonry Structures*, in particular sections 4, 5 and 10. The minimum compressive strength of the wet mortar mix shall be no less than 3.0MPa and no greater than 5.0MPa at 7 days.

#### *Dry sand/cement bedding*

Dry Sand/Cement Bedding shall be a semi-dry ("earth-dry") mortar bed consisting of 4 parts river sand to 1 part cement. The sand component of the bedding mix shall consist of well-graded sand, consisting of clean, hard, uncoated grains, generally passing a 1.18mm sieve.

#### *Wet mortar bedding*

Wet mortar bedding shall be used in vehicular footpath crossings and other areas likely to be traversed by vehicular traffic. The wet mortar bedding mix should consist of:

- three parts blended washed sand by volume;
- 1 part Portland Type GP Cement by volume; and
- 1 part water/elastiser mix (more than 1 part may be added during mixing to achieve the correct consistency or in accordance with manufacturer's instruction - such that it can be loosely hand shaped into the shape of a cricket ball which will remain whole when released whilst leaving hands slightly moist but not wet).

### ***Bonding slurry***

The bonding slurry shall consist of:

- 1 part fine washed sand by volume;
- 6 parts portland Type GP Cement by volume; and
- sufficient water to form a slurry of workable consistency.

A bonding slurry mix shall be applied at the interface of the insitu concrete base and the bedding material and at the interface of the bedding material and the underside of the paving to increase bond and compressive strength.

### **6.5.3 Joints in concrete basecourse**

In areas where a wet mortar bedding is used, all joints from concrete base shall coincide with planned joints in unit pavers to be laid above.

No contraction joints are required if using dry sand cement bedding.

### **6.5.4 Laying method**

Laying of pavers shall be carried out by an experienced and qualified *contractor*. A qualified Contractor shall submit their paving methodology for Council approval prior commencement of work. Paver laying procedures typically consist of 4 stages as follows:

- Preparation of basecourse & laying surface:
  - Concrete basecourse shall be constructed in accordance with the *approved design drawings*. Allow concrete base to harden sufficiently, 24 hours minimum, before laying pavers.
  - Clean concrete base of any dirt or dust.
  - Moisten concrete base surface with a light spray of water. Pour bonding slurry mix over the concrete base prior to placing bedding mortar.
- Preparation & installation of bedding course:
  - For dry/sand cement bedding, prior to mixing the bedding mortar, check that sand is moist by squeezing a handful and ensuring sand maintains its shape.
  - Mix the wet mortar bedding or dry sand/cement bedding thoroughly in a concrete mixer, ensuring a uniform mix. Only



sufficient bedding mix should be prepared and laid to enable the laying operation to be completed within 45 to 60 minutes.

- Place bedding mix over the slurry coat as required to achieve the design surface levels.
- Preparation of paver course & laying of paver:
- Apply slurry mix to cover area of mortar to be paved to increase bond and compressive strength. The volume of slurry mix made at any one time shall not exceed the amount required to lay the quantity of pavers that can be laid within 45-60 minutes of the initial mixing.
  - Paving units shall be laid in pattern according to the *approved design drawings*. Paving units shall be laid surface dry on the slurry coated mortar bedding course with a joint width as specified in the *approved design drawings*.
  - Tamp down paving units into position ensuring full contact with the mortar bed with minimum deviation between edges of adjacent pavers.
  - Check individual paver units for correct installation and quality control as work proceeds. Where stone pavers do not align properly, are loose, drummy or rock, remove non-compliant pavers, remove mortar bed (full depth) and repeat mortar bed and paver installation procedure.
- Installation of jointing material and completion:
- On completion of the area, cover pavers with hessian sheets and spray with water mist. Allow to remain moist for 12 hours minimum. After a minimum of 12 hours of curing, the joints may be grouted. Where necessary remove residual material from within joints prior to commencing the joint filling operation.
  - Where wet mortar bed is used, it is to achieve its full design strength prior to opening to vehicular traffic
  - Prepare grouting mix.
  - Dampen joints with sponge and pour grout mix into joints ensuring full penetration for the thickness of the paving slab by lightly tamping down a trowel edge into the grouting mix. Use a rubber squeegee to spread grout evenly into all joints until filled flush with the top of the pavers. Remove excess grout with a trowel. Allow initial set and lightly broom off remaining excess perpendicular to joints.

- Wipe pavers clean with a damp sponge continually rinsing the sponge in clean, fresh water. Remove all traces of grout and cement from the surfaces of paver. After 12 hours check for any remaining cement or grout residue and remove using clean water and stiff scrubbing brush.

### 6.5.5 Grouting of paver joints

Grouting of paver joints shall be completed using a dry-bagged, proprietary brand, fine aggregate / cement / admixtures type grout, with high flow and low shrinkage properties, non-staining in the course of its application and of a compressive strength in excess of 20Mpa. Grouting mix shall comply with *AS3700 Masonry Structures*, in particular sections 4, 5 and 10.

## 6.6 Flexible pavement system

A flexible pavement system shall be installed in locations prescribed in the *SSC locality drawings*.

### 6.6.1 Basecourse materials

The COMPACTED ROADBASE supporting the bedding sand shall be recycled concrete road-base complying with the Auspec specification for the Supply of recycled material for pavements, earthwork and drainage. For details on recycled materials requirements refer to Section 7: Roadway pavements.

The base-course thickness shall be as specified in the approved drawings and shall be compacted to 98% Standard Maximum Dry Density to AS 1289.

### 6.6.2 Bedding materials

The bedding sand shall be sand which is suitable for concrete manufacture, free of soluble salts or other contaminants likely to cause efflorescence or lead to reduced skid resistance, and be from a single source or blended to achieve the following grading limits:

Sieve Size (mm)	% Passing
9.52	100
4.75	95 - 100
2.36	80 - 100
1.18	50 - 85
0.600	25 - 60

0.300	10 - 30
0.150	5 - 15
0.075	0 – 10

The sand shall be of uniform moisture content between 4-8% when spread, and shall be protected against rain when stockpiled on site prior to spreading. Saturated sand shall not be used.

### 6.6.3 Jointing sand

The jointing sand shall be suitable for concrete manufacture. The joint filling sand shall be as dry as practicable when spread.

The jointing sand shall comply with the following grading limits:

Sieve Size (mm)	% Passing
2.36	100
1.18	90 - 100
0.600	60 - 90
0.300	30 - 60
0.150	15 - 30
0.07	10 - 15
5	5 - 10

The joint filling sand shall be free of soluble salts or other contaminants likely to cause efflorescence or lead to reduced skid resistance.

### 6.6.4 Laying method

Laying of pavers shall be carried out by an experienced and qualified *contractor*. Paver laying procedures shall be conducted as follows:

- Roadbase basecourse shall be constructed in accordance with the *approved design drawings*.
- The sand bedding shall be spread loose in a layer of uniform thickness screeded in a loose condition to a level such that, after compaction, the pavers shall be at the correct levels and profiles. Nowhere shall the thickness of the bedding sand layer exceed 35mm following compaction. The spread sand shall be carefully maintained in a loose condition and protected against pre- compaction both prior to

and following screeding. Any pre-compacted sand or screeded sand left overnight, shall be loosened and brought back to profile before further paving units are placed.

- Pavers shall be laid in pattern according to the *approved design drawings* with a joint width of 2 to 3mm between adjacent pavers
- The paving units shall be compacted to achieve consolidation of the sand bedding (approximately 10mm settlement), and brought to design levels and profiles by not less than two passes of a high frequency, low amplitude mechanical flat plate vibrator having a plate area sufficient to cover a minimum of 12 paving units.
- Compaction shall proceed as closely as possible following laying and prior to opening the work to traffic of any kind. Compaction should not be attempted within one metre of the laying face. Compaction shall continue until lipping has been eliminated between adjoining units.
- All work to within one metre of the laying face must be left fully compacted at the completion of each days laying.
- Any units that are structurally damaged during compaction shall be immediately removed and replaced.
- Following compaction of the paving and before opening work to traffic, joint filling sand shall be broomed over the surface to fill the joints and the pavement shall be re-compacted to achieve compaction of the joint filling sand. As the work proceeds, joints shall be checked for adequacy of filling and any shortfall shall be made good prior to further compaction taking place. Any excess surface sand shall be removed promptly from the surface of the paving.
- Adjacent to free edges where paving units do not adjoin a hard paved surface, a mass concrete edge restraint shall be provided. The concrete shall be finished at a level 35mm above the base of the paver and shall be a minimum thickness of 100mm and depth of 200mm.
- The adjacent ground shall be graded to meet the top of the paving.

## 6.7 Cast in-situ concrete footpath pavement

### 6.7.1 Materials

Refer Section 4: Concrete works.

### 6.7.2 Decorative finishes

Where decorative concrete surfaces are detailed in the *approved design drawings*, the *contractor* shall provide a 1 square metre sample area for each type of decorative finish for approval by *Council's representative*.

### 6.7.3 Joints

#### *Spacing*

Transverse joints are to be spaced at intervals equal to the width of the paving slabs or as indicated on the *approved drawings*.

#### *Hinged expansion and contraction joints*

A “hinged” joint shall be constructed at all transverse expansion and contraction joints. All hinged joints shall be constructed using a proprietary articulated jointing system or rigid plastic control joint subject to approval by the *Council's representative*.

The proprietary articulated jointing system shall be designed for pedestrian or bicycle traffic pavements to provide an even distribution of weight, lock together the adjoining pathway paving sections and to form transverse joints in concrete pavements that are capable of transferring load while accommodating rotation and contraction or expansion.

Proprietary articulated jointing system shall be installed at hinged joints in accordance with the supplier's recommendations & installation guide.

In particular:

- Hinged joint shall be installed in a vertical plane square to the edge formwork.
- There shall be no concrete under the jointing material. Where the excavation is deeper than the thickness of the proposed footpath, granular material is to be moulded under the jointing material to prevent contact between slabs below the level of the jointing material.

- No edge treatment shall be applied to the length of the hinged joint.
- The surface of the concrete shall be screeded accurately to the top of the proprietary articulated jointing system with no visible tool edge in accordance with Section 6.7.5.

#### ***Joints at vehicular footpath crossings***

Where new vehicular footpath crossings are constructed prior to paved footpath construction, the proprietary articulated jointing system shall be attached to the formwork at the alignment of the proposed or future footpath (footpath allocation).

Where a new footpath is to abut an existing footpath crossing, 100mm deep, 12 mm diameter holes shall be drilled into the edge of the footpath crossing at 300mm spacing with the centre of the first hole 150mm clear of the edge of the proposed footpath. 200mm long, 10mm diameter stainless steel dowels shall be inserted into the holes prior to pouring the footpath adjacent to the footpath crossing. The footpath slab adjacent to the footpath crossing shall be increased in thickness to 100mm and shall be reinforced using SL82 mesh.

#### **6.7.4 Laying method**

The methods of placing and curing concrete shall comply with the requirements set out in Section 4: Concrete Works of the Specification.

#### **6.7.5 Surface finish**

In-situ concrete paving for footpaths, vehicular crossings and kerb ramps shall be tooled before being finished with a light broom finish generally perpendicular to line of travel, with no visible tool edge.

### **6.8 Permeable paving**

Permeable paving includes the following pavements which allow air and water to pass through:

- resin bonded aggregate pavement – around new trees in paved areas;
- resin bonded aggregate pavement – dry laid over existing tree roots; and
- permeable unit paving.

### 6.8.1 Materials

#### *Surface Finish*

Aggregate for resin-bonded aggregate pavement shall be a uniform aggregate, typically 2-5mm in size. Colour shall be in accordance with the *approved design drawings*.

Resin for resin-bonded aggregate pavement shall be a proprietary product and is subject to approval by the *Council's representative*.

Permeable paving units shall be as specified in the *approved design drawings*.

#### *Bedding*

Aggregate bedding shall be used as bedding for permeable unit paving. Aggregate shall be a uniform mix typically 2-5mm in size.

#### *Basecourse*

NO FINES CONCRETE BASE shall be used as a basecourse for resin-bonded aggregate pavement. The no-fines concrete mix shall consist of:

- portland or blended cement;
- a water/cement ratio of 0.3–0.4;
- 10 mm aggregate, and
- an aggregate:cement ratio in the range of 1:6-1:8 (A small amount of sand (10–20% of total aggregate) is seen to improve strength characteristics).

The compressive strength shall be 5–13 MPa.

**Aggregate base** shall be used as a basecourse for permeable unit paving. Aggregate shall be compacted unbound granular material. Geotextile shall be used to separate the aggregate layer from surrounding and underlying granular material.

### 6.8.2 Laying method

#### *Resin-bonded aggregate*

Laying of resin-bonded aggregate shall be carried out by an experienced and qualified *contractor*. Laying shall be conducted as follows:

- Gravel base shall be prepared to the required level in accordance with the *approved design drawings*.
- Mask all surrounding areas with non-porous plastic.
- Apply the resin in two or three light applications.
- Smooth the surface with a trowel.
- Protect the surface from pedestrian traffic for a minimum of 24 hours.

## 6.9 Tactile ground surface indicators (TGSIs)

Tactile ground surface indicators (TGSIs) shall be used in footways to assist pedestrians who are visually impaired.

### 6.9.1 Materials

TGSI Materials shall be in accordance with the *approved design drawings*.

The *contractor* shall ensure that directional tactile indicators comply with slip-resistance requirements in both directions.

### 6.9.2 Installation method

TGSI's shall comply with and be installed and detailed in accordance with AS1428 and the manufacturer's recommendations.

## 6.10 Utility covers

Where the level of the footpath or roadway is altered from its existing level, the contractor shall be responsible for adjusting and reorienting pit covers to suit the finished footpath or road surface.

The *contractor* shall visit the site and confirm the locations, sizes and numbers of existing utility pits prior to the commencement of *works*. It is the *contractor's* responsibility to notify the relevant utility service provider when working around their assets.

Utility covers in footpaths includes:

- grated covers (typically heel grate);
- solid covers with or without paver infills;
- flushing point covers;



Refer to Section 1 Preliminaries / General of this Specification. Utility service providers generally require work on existing and new pits to be completed by subcontractors approved by the utility service provider which owns the asset.

### 6.10.1 Materials

#### *Utility service standards*

All pit covers are to comply with the standards and requirements of the relevant utility service provider.

#### *Loadings*

Pit covers in the footpath use loading Type C, 150kN, unless noted otherwise. Driveway pit lids shall have a Type D.

#### *Paver in-fill covers*

Utility service covers shall be aligned parallel to the paving pattern.

The covers of utility service pits shall be of a type designed to be in-filled with paving units of the depth specified with sufficient bedding depth.

All covers shall be in-filled with the paving material specifically cut to lie flush with the cover edge and surrounding paving. The paving pattern shall continue through the lid. Refer to the *approved design drawings*.

### 6.11 Garden edging

Garden edging includes edging manufactured from granite, pre-cast concrete, or in-situ concrete. The type, size and colour shall be in accordance with the *approved design drawings*.

Mortar for haunch and bedding of stone and precast concrete garden edging shall be the same as the wet bedding mortar for pavers as detailed in Section 6.5.

### 6.12 Quality

#### 6.12.1 Load testing of unit paving

No pavers or stonework are to move or rock under pedestrian, wheel chair, typical delivery trolley or test loading. The *contractor* is to test load each

completed lot (section) of paving to determine the extent of any unbonded, loose or defective pavers.

Test loading method to be as follows:

#### **General Footpath**

- Loading vehicle: Council Footpath Cleaning Machine (2 tonne, gross), fully loaded with cleaning liquid;
- Number of passes: 4 passes; and
- Acceptance criteria: No visible movement in the pavers, cracks, or other forms of failure.

#### **Vehicular footpath crossings**

- Loading vehicle: heaviest vehicle likely to access facility, *PDC* to advise;
- Number of passes: 4 passes; and
- Acceptance criteria: No cracks, visible movement or other forms of failure in pavers.

Rectification to be as follows:

- Less than 10% of lot (section) area fails load test: Remove and relay individual pavers on new mortar bedding. Retest lot (section) area; or
- 10% or more of lot (section) area fails load test: Remove and relay entire lot (section).

#### **6.12.2 In-situ slip resistance testing of new surfaces**

The *contractor* shall test the in-situ slip resistance of the new unit paving according to *AS/NZS 4586*, once the pavement has been sealed. The *contractor* shall test a minimum of five locations for each site condition that is tested. The *contractor* shall seek agreement of specific test locations from *Council's representative* before testing.

All finished public footpaths with grades <7% shall comply with Slip Resistance Classification Category 'P4'. All external ramps and footpaths with grades 7% or greater, must comply with Slip Resistance Classification Category 'P5' as outlined in AS 4663, AS 4586 and HB 198.

### 6.12.3 Tolerances

All surfaces shall be finished in conformity with the lines, grades, thicknesses and cross sections shown in the *approved design drawings* within the following limits:

Item	Activity	Tolerances
1.	<b>Footpath surface level</b>	<ul style="list-style-type: none"> <li>— Where longitudinal grades are &gt;1% and &lt; 2%, plus or minus 2mm.</li> <li>— Where the longitudinal grade is &gt;2% and less than 5%, plus or minus 5mm</li> <li>— Where the longitudinal grade is 5% or greater, the tolerance shall be plus 10mm or minus 10mm. In all cases, variations in level shall not be localised.</li> <li>— Localised low spots where water ponds on the paving surface shall not be accepted.</li> <li>— The grade at any point on the surface shall conform to the design and where no design grade is specified, shall not be less than 0.5%; and</li> <li>— The finished surfaces shall be shaped to shed surface water from the entire area in the direction of the natural slope or towards constructed surface drains.</li> </ul>
2.	<b>Tie-in at features</b> Surface Level	<ul style="list-style-type: none"> <li>— The finished surface shall be shaped to match existing features e.g. pit covers, edgings and driveways, within 2mm.</li> </ul>
3.	<b>Paving alignment</b> Surface level	<ul style="list-style-type: none"> <li>— The alignment of the paving shall not differ from the specified line by more than +/-20mm, provided that the minimum pavement width is achieved at all points throughout the construction.</li> </ul>

Note: Material tolerances are included in Section 6.4.

**6.12.4 Schedule of hold points and check points—footpath pavements**

<b>1. Work Process:</b>	<b>Supply of unit paving from suppliers nominated by Council</b>
<i>Hold point or check point:</i>	<i>Check Point</i>
<i>Required Notice:</i>	NA
<i>Required Action:</i>	The <i>contractor</i> shall provide a copy of the paving supplier's tax invoice.
<b>2. Work Process:</b>	<b>Supply and application of sealer from suppliers nominated by Council</b>
<i>Hold point or check point:</i>	<i>Check Point</i>
<i>Required Notice:</i>	NA
<i>Required Action:</i>	The <i>contractor</i> shall provide a copy of the tax invoice for the supply and application of sealer.

<b>3. Work Process:</b>	<b>Supply of paving materials from suppliers other than those nominated by Council</b>
<i>Hold point or check point:</i>	<i>Hold point – Council’s representative</i>
<i>Required Notice:</i>	At least two (2) day before placing an order for paving materials.
<i>Required Action:</i>	<p>The <i>contractor</i> shall provide samples sealed with Council’s nominated sealer together with NATA accredited laboratory test certificates for the sealed paver to <i>Council’s representative</i>.</p> <p><i>Council’s representative</i> will compare samples with control samples from nominated suppliers, confirm the acceptability or otherwise of sealed pavers and retain approved samples as control samples for the project before authorising the purchase of paving materials.</p>
<b>4. Work Process</b>	<b>Compaction of subgrade</b>
<i>Hold point or check point:</i>	<i>Check point</i>
<i>Required Notice:</i>	NA
<i>Required Action:</i>	NATA registered testing laboratory shall inspect the compacted subgrade and forward results to the <i>PDC</i> . Works may proceed after testing at <i>contractor’s</i> risk. The <i>PDC</i> shall review test results, for compliance with specification and approve or reject. Where compaction is rejected, further testing is to be completed prior to progress of works.

## Section 6: Footpath pavements

<b>5. Work Process</b>	<b>Placement and compaction of recycled concrete basecourse where required for flexible pavements.</b>
<i>Hold point or check point:</i>	<i>Check point</i>
<i>Required Notice:</i>	By arrangement with NATA registered testing laboratory.
<i>Required Action:</i>	NATA registered testing laboratory shall inspect the compacted base and forward results to the <i>PDC</i> . Works may proceed after testing at <i>contractor's</i> risk. The <i>PDC</i> shall review test results for compliance with specification and approve or reject. Where compaction is rejected further testing is to be completed prior to progress of works. The <i>PDC</i> shall document the findings for later submission to Council.
<b>6. Work Process</b>	<b>Installing concrete formwork and reinforcement where required.</b>
<i>Hold point or check point:</i>	<i>Hold point - PDC</i>
<i>Required Notice:</i>	At least two (2) working days prior to installing concrete formwork.
<i>Required Action:</i>	The <i>PDC</i> will inspect the concrete forms for alignment and levels and shall check reinforcement and location of expansion joints and reject non-complying works.

<b>7. Work Process</b>	<b>Preparation of sand or mortar bedding layer</b>
<i>Hold point or check point:</i>	<i>Hold point</i>
<i>Required Notice:</i>	By arrangement with <i>PDC</i>
<i>Required Action:</i>	<i>PDC</i> shall review test results from NATA registered laboratory to confirm compliance with sand grading and mortar strength specification or reject non –complying materials prior to the commencement of paving works.
<b>8. Work Process</b>	<b>Laying of pavers</b>
<i>Hold point or check point:</i>	<i>Hold point</i>
<i>Required Notice:</i>	By arrangement with <i>PDC</i>
<i>Required Action:</i>	<i>PDC</i> shall inspect works on the first day of laying, confirm compliance with specification including levels, bedding thickness, and joint locations and widths and shall document the outcome. Where inspection identifies defective works, ongoing inspections are to be completed at the commencement of paving works on each section of paving.
<b>9. Work Process:</b>	<b>Completion of paving works</b>
<i>Hold point or check point:</i>	<i>Check point</i>
<i>Required Notice:</i>	NA
<i>Required Action:</i>	In-situ slip resistance testing is to be completed by a NATA accredited laboratory to confirm that the slip resistance has been achieved.