

B5 Footways Construction



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5.1 SCOPE

This Technical Specification provides guidance for the construction of footway pavements, from the supply, quality and placement of various pavement materials and finishes to the alignment, dimensions, cross-sections and levels shown on the construction documents or as directed by the City's Representative.

5.2 STANDARDS AND GUIDELINES

Unless stated otherwise in the Technical Specification, the approved drawings or elsewhere in the construction documents, the Works shall comply with the current and relevant Australian Standards and/or RMS Standards.

Any variations or ambiguity between the Technical Specification, the approved drawings or other construction documents and Australian Standards shall be referred to the City's Representative for decision before proceeding with the Works.

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

- AS 1141.26 Methods for sampling and testing aggregates: Secondary minerals content in igneous rocks
- AS 2150 Hot mix asphalt – A guide to good practice
- AS/NZS 1428.4.1 Means to assist the orientation of people with vision impairment – Tactile ground surface indicators
- AS/NZS 4455 Masonry units and segmental pavers
- AS/NZS 4456 Masonry units and segmental pavers – Methods of test
- AS/NZS 4456.10 Determining resistance to salt attack
- AS/NZS 4456.5 Determining breaking load of segmental paving units
- AS/NZS 4456.9 Determining abrasion resistance
- AS/NZS 4663:2002 Slip resistance measurement of existing pedestrian surfaces
- AS/NZS 4586:1999 Slip resistance classification of new pedestrian surface materials
- Guide to the specification and testing of slip resistance of pedestrian surfaces - (Table 3B)
- ASTM C615/C615M – 11 Standard specification for granite dimension stone
- AUSPEC 1144 Asphalt (Roadways)
- CBPI Clay Paving Design and Construction
- CCMA Concrete Flag Pavements Design and Construction Guide.

5.3 MATERIALS

5.3.1 STONE PAVER REQUIREMENTS

All stone shall be natural, uniform quality and free of defects liable to affect its strength, appearance, durability or proper functioning under the intended conditions of use. Examples of defects are vents, cracks, fissures, seams, porous inclusions, foreign material, loose surface material striations, stains and discoloration.

Stone pavers may be available from suppliers that are currently approved by the City (list supplied on request) or procured from the following quarries only:

- Black Hill SA for Austral 'Black' granite
- Fraser Range Norseman WA for Austral 'Verde' granite
- Deer Park VIC for Bluestone.

Other suppliers may be used subject to approval by the City's Representative. Stone from alternative suppliers must be selected to match colour, pattern, dimensions and quality of the specified paver.

Stone paver types:

- Austral 'Black' and Austral 'Verde' granite pavers with flame exfoliated finish
- Deer Park Bluestone (Basalt) pavers with sawn finish (generally used for maintenance purposes only).

The nominated paver thickness for all footways and driveways is 50mm except for distinctive places such as George Street, Martin Place and Pitt Street Mall which shall be 60mm. The nominated thickness for infill service lids is 30mm unless specified otherwise. Refer to standard details for paver sizes and layout pattern.

The supplier shall provide written certification that the supplied granite stone products meet the international *ASTM C615/C615M – 11 Standard Specification for Granite Dimension Stone* for the following quality criteria:

AUSTRAL BLACK

| Property | Test Standard | Performance Criteria |
|--|---------------------------|---|
| Compression strength (dry and soaked) | ASTM C170/C170M | > 185MPa (soaked) |
| Water absorption | ASTM C97/C97M | < 0.1% by weight |
| Bulk density | ASTM C97/C97M | > 2900kg/m ³ |
| Flexural strength (dry and soaked) | ASTM C880/C880M | > 14MPa (soaked) |
| Resistance to salt attack | AS/NZS 4456.10A | Durability Class A |
| Coefficient of thermal expansion | ASTM E831 | < 0.000005 mm/mm/°C |
| Abrasion resistance | ASTM C1353 | > 113 Ha |
| Slip Resistance Classification of new pedestrian surfaces | | |
| Wet pendulum test method at manufacture and completion of construction | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 P4 for slopes under 1:14 |
| Dimensional stability | Draft SAA method | < 0.1% (Wet-dry, hot-cold) |
| Secondary minerals content (petrographic) | AS 1141.26 | < 2% |

AUSTRAL VERDE

| Property | Test Standard | Performance Criteria |
|--|---------------------------|---------------------------------|
| Compression strength (dry and saturated) | ASTM C170/C170M | > 140MPa (soaked) |
| Water absorption | ASTM C97/C97M | < 0.1% by weight |
| Bulk density | ASTM C97/C97M | > 2560kg/m ³ |
| Flexural strength (dry and saturated) | ASTM C880/C880M | > 12MPa (soaked) |
| Resistance to salt attack | AS/NZS 4456.10A | Durability Class A |
| Coefficient of thermal expansion | ASTM E831 | N/A |
| Abrasion resistance | ASTM C1353 | > 54 Ha |
| Slip Resistance Classification of new pedestrian surfaces | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 |
| Wet pendulum test method at manufacture and completion of construction | | P4 for slopes under 1:14 |
| Dimensional stability | Draft SAA method | < 0.1% (Wet-dry, hot-cold) |
| Secondary minerals content (petrographic) | AS 1141.26 | < 2% |

BLUESTONE

| Property | Test Standard | Performance Criteria |
|--|---------------------------|---------------------------------|
| Compression strength (dry/saturated) | ASTM C170/C170M | > 100MPa (soaked) |
| Water absorption | ASTM C97/C97M | < 1.8% by weight |
| Bulk density | ASTM C97/C97M | > 2500kg/m ³ |
| Flexural strength (dry and saturated) | ASTM C880/C880M | > 14MPa (soaked) |
| Resistance to salt attack | AS/NZS 4456.10A | Durability Class A |
| Coefficient of thermal expansion | ASTM E831 | < 0.000064 mm/mm/°C |
| Abrasion resistance | ASTM C1353 | > 19 Ha |
| Slip Resistance Classification of new pedestrian surfaces | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 |
| Wet pendulum test method at manufacture and completion of construction | | P4 for slopes under 1:14 |
| Dimensional stability | Draft SAA method | < 0.1% (Wet-dry, hot-cold) |
| Secondary minerals content (petrographic) | AS 1141.26 | < 2% |

The testing authority shall be AMDEL or NATA-approved.

The following tolerances apply to stone paver size and shape:

| | |
|--|---|
| Maximum deviation | Deviation from required dimensions for paver face dimensions for items of thickness up to 90mm shall be 1mm |
| Squareness | The squareness difference between diagonals shall be no greater than 1.5mm |
| Thickness | +/- 2mm |
| Flatness | Honed surfaces: 0.5mm per metre Sawn or sandblasted faces: 1.5mm per metre |
| Edge straightness | 0.5mm per metre |
| Maximum deviation of paver face from plane | Finishes: 1.5mm in 1200mm Natural riven faces: 10mm in 1200mm |

5.3.2 CONCRETE UNIT PAVER REQUIREMENTS

The materials and manufacture of concrete paving units shall comply with *AS 4455 Masonry units and segmental pavers* unless specified otherwise in the Technical Specification or the approved construction documents.

Concrete paving units shall be sound, firm, dense, dimensionally stable and consistent, with a smooth unblemished upper surface and with unrumpled units having unbroken square edges evenly all round. Units that exhibit cracking, 'boniness' or are considered by the City's Representative to be excessively porous, brittle or friable shall be liable to rejection.

Paving unit colours shall be uniform and shall match that of approved sample units over the full area of the pavement. The nominated paver unit thickness for all footways and driveways is 50mm, unless specified otherwise. Refer to the standard details for paver sizes and layout pattern.

Concrete Unit Pavers can be obtained from Pebblecrete Insitu Pty Ltd. Other suppliers may be used subject to approval by the City's Representative. Pavers from alternative suppliers must be selected to match the colour, pattern, dimensions and quality of the specified paver.

The supplier shall provide written certification that the supplied pavers comply with the following:

Colour and type: Pebble Crete PPX 1201: 120D or similar to be approved by the City's representative

Surface finish: Honed – 150

Chamfer: The paver shall have square edges with no chamfers, unless otherwise specified in the approved construction documents.

| Property | Test standard | Performance criteria |
|--|---------------------------|---|
| Unconfined compressive strength | AS/NZS 4456.4 | > 25 MPa Dry > 20 MPa Saturated |
| Sample conditioning prior to test: Dry | | |
| Slip Resistance Classification of new pedestrian surfaces | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 P4 for slopes under 1:14 |
| Wet pendulum test method at manufacture and completion of construction | | |
| Breaking load of segmental paving units | AS/NZS 4456.5 | Breaking load > 9.4 kN Modulus of rupture > 7.7 mpa |
| Ambient density | AS/NZS 4456.8 and 14 | > 2260 daN kg/m ³ |
| Water absorption | AS/NZS 4456.8 and 14 | < 4.9 wi |
| Abrasion resistance | AS/NZS 4456.9 | Mean abrasion index of 3.5 |

The following tolerances apply to the concrete unit paver size and shape:

| | |
|---|---|
| Maximum deviation | Deviation from required dimensions for paver face dimensions for items of thickness up to 90mm shall be 1mm |
| Squareness | The squareness difference between diagonals shall be no greater than 1.5mm. |
| Thickness | +/- 3mm |
| Flatness | Honed surfaces: 0.5mm per metre Sawn or sandblasted faces: 1.5mm per metre. |
| Edge straightness | 0.5mm per metre |
| Maximum deviation of paver face from plane | Finishes: 1.5mm in 1200mm Natural-riven faces: 10mm in 1200mm |

5.3.3 BRICK PAVER REQUIREMENTS

Clay bricks and pavers shall be made from naturally occurring minerals that are kiln-fired to lock in their colour and strength for life.

Clay paving units shall be sound, firm, dense, free of distortion, dimensionally stable and consistent, with a smooth upper surface and with unrumpled units having unbroken edges as specified evenly all round. Units which exhibit cracking, bloating or are considered by the City's Representative to be excessively porous, brittle or friable shall be liable to rejection.

Clay brick pavers are to be supplied in the following colour mix, unless otherwise specified in the approved construction documents:

- Chestnut 40%; Brahman Granite 30%; and Maple 30% – Austral Bowral colours or equivalent.

Brick pavers shall have a thickness of 65mm and comply with the recommended specifications by the CBPI.

| Property | Test Standard | Performance Criteria |
|--|---------------------------|---------------------------------|
| Minimum characteristic breaking load | AS/NZS 4456.5 | > 5 kN |
| Slip Resistance Classification of new pedestrian surfaces | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 |
| Wet pendulum test method at manufacture and completion of construction | | P4 for slopes under 1:14 |
| Mean abrasion resistance | AS/NZS 4456.9 | 3.5 cm ³ |
| Dimensional deviation | | DPA2 ¹ |

Notes:

1. CCMM Concrete Segmental Pavements Guide to Specifying

5.3.4 QUALITY CONTROL SAMPLES FOR PAVERS

Upon request, control samples of each type and grade of stone and other paver type shall be supplied. The following requirements apply:

- Not less than three (3) quality control samples of each product shall be provided
- Full-size pieces of the smallest units
- The expected range shown of variations of colour pattern, texture and surface finish in the pavers to be supplied
- Each sample labelled for verification.

Prior to confirmation of any order, the paver supplier shall supply certified test results for the supplied pavers from an agency with NATA or AMDEL accreditation. The test report shall confirm that all paving, infill pit lids, setts and any other footpath products have achieved a minimum surface class of P4 or P5 when wet in accordance to *HB 198:2014 (Table 3B) – Guide to the specification and testing of slip resistance of pedestrian surfaces*.

A stain resistance test may be conducted by the City’s Representative to check a sample against reaction to acidic products such as Coca-Cola and other food items.

5.3.5 MORTAR BED AND SLURRY MATERIALS

Trial mixes of mortar bedding material must be carried out and tested before the commencement of the Works to adequately select a mix that meets the strength requirement. Strength-testing reports shall be available on request to the City’s Representative for approval.

All mortar for the pavers is to comply with *AS 3700 Masonry Structures*, in particular Sections 4, 5 and 10, and is to be a 3:1 (river sand) cement. A slurry mix is to be applied on top of this bedding, with a latex additive before laying of pavers to increase bond and compressive strength. The mortar minimum thickness shall be 25 mm and the maximum 30 mm. The amount of mix shall not exceed the quantity required to lay pavers within 45 to 60 minutes, depending on climate conditions.

All components shall be measured by means of calibrated containers. The minimum compressive strength of the mortar mix shall be no less than 10 MPa at seven (7) days. Also refer to Subsection 5.4.7

The bonding slurry shall consist of one (1) part fine-washed sand and six (6) parts Portland Type A cement by volume mixed by hand or mixer while adding water to ensure a smooth, homogenous consistency, free of lumps.

Bonding slurry with latex additive shall be applied to concrete base and on top of mortar mix or underside of paver.

5.3.6 BEDDING SAND

Bedding sand shall be well-graded sand that can pass through a 4.75mm sieve and be suitable for concrete manufacture. The sand shall be of uniform moisture content between 4 per cent and 8 per cent when spread, and shall be protected against rain when stockpiled on site prior to spreading. Saturated sand shall not be used.

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

5.3.7 ASPHALT

Asphalt concrete pavement of AC10 and AC5 shall be supplied in accordance with *AS 2150 Hot Mix Asphalt – a Guide to Good Practice*.

Modified asphalt concrete with a polymer additive to significantly increase the softening point to resist point loads may be approved by the City's Representative for use in outdoor dining areas where specified.

The City encourages the use of warm-mix asphalt technologies where possible. It is the responsibility of the Service Provider to manufacture the warm mix with the aid of appropriate additives so that the workability and durability of the asphalt mix remains intact. The quality of the warm mix asphalt must meet *AS 2150 - Hot Mix Asphalt – a Guide to Good Practice*.

5.3.8 CONCRETE

Concrete, the material and methods of mixing, placing and curing shall comply with the requirements set out in B3: Concrete Works Construction.

5.3.9 BASECOURSE MATERIALS

DGB20 materials shall comply with *AS 1289.3.6.1. Recycled materials* where possible. Refer to B6: Roadways Construction for details on recycled materials requirements.

5.3.10 STRUCTURAL SOILS

Structural soils such as Gap Graded or Bimodal Support soils shall be used where specified in hard surfaced areas for planting street trees.

All sampling shall be carried out in accordance with the methods described in *AS 1141.3 (1986) Methods for sampling and testing aggregates*. Three samples per 1000m³ are taken. Each sample must consist of a minimum of 10 increments. Samples are to be thoroughly blended and labelled. For projects requiring less than 1000m³, one sample is required.

Samples are tested by an approved laboratory to the above minimum specification.

5.3.11 STRUCTURAL CELLS

Structural cells or structural support cells may be used under the footpaths. The cells may be only used around the tree to provide room for root growth. Size, depth, materials and installation scope shall be submitted to the City for approval in the design stage of the projects.

5.4 CONSTRUCTION

5.4.1 GENERAL

Footways shall be constructed according to the following, depending on the paving type as specified:

- Stone and concrete unit pavers shall be laid with a 30mm thick 3:1 mortar bed as specified on a 110mm 32MPa concrete base with SL72 reinforcing mesh. Pavers shall be laid with a 3mm gap between pavers. The concrete base thickness for driveways varies from 150mm to 250mm as indicated on the standard details.
- Clay brick pavers shall be laid with a 25mm to 30mm sand-bedding layer on a 150mm DGB20 flexible base course with sand joints between pavers
- Asphalt footway pavements shall consist of either:
 - Flexible pavement – 15mm AC5 DG wearing course, 35mm AC10 DG intermediate course and a 100mm DGB20 base course
 - Rigid pavement – 25mm AC5 DG on a 110mm 32MPa concrete base with SL72 reinforcing mesh, where specified.
- In situ concrete footway pavements shall consist of a 110mm 32MPa concrete base with SL72 reinforcing mesh on a 100mm DGB20 base.

5.4.2 EXCAVATION OF EXISTING PAVERS

The Service Provider is responsible for excavating existing pavers where necessary.

Pavers are to be excavated and removed by the Service Provider with great care, to avoid damage to the paver. Pavers, free of other excavated material, are to be transported by the Service Provider to the City's stone storage yard and unloaded and stacked, by crane truck if necessary, as directed by the City's Representative.

Pavers to be re-used on site can be stored on site if a suitable secure location is available, subject to approval by the City's Representative. Refer to B1: Preliminaries and General Construction for on-site storage requirements.

5.4.3 CUTTING AND PREPARATION OF PAVERS

- Storage:** Store pavers so that they are protected from the weather and atmospheric pollution, and in conditions that avoid staining, marking or damage to the pavers.
- Cutting units:** Maintain sharp arises and accurate joints and margins.
- Laying pavers:** Perform the necessary cutting and shaping to the required sizes. Cut pavers to fit neatly around all penetrations and fixtures including pit covers, lighting and traffic poles, signs and the like. Refer to the standard drawings for minimum unit lengths, band widths and faceted zones.
- Protection:** When laying the paving, protect all fixtures from damage, including pit covers, lighting and traffic poles, signs and the like.
- Noise and dust:** Refer to B1: Preliminaries and General Construction for requirements for noise control and environmental protection.
- Requirement:** When cutting pavers, provide dustproof screens and covers to protect existing finishes, adjacent buildings and the immediate environment from dust, noise and debris. All cutting activities are to be situated away from residences and retail traders.
- 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 the City and *AS 2436-1981 Guide to noise control on construction*. Prevent slurry runoff 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.

5.4.4 SUBGRADE

The Service Provider shall excavate or fill as may be required to bring the pavement bed to the full specified depth below the finished pavement level. All formation shall be thoroughly compacted as below and shall be neatly trimmed true to line, level and cross-slope, to provide for the full specified thickness of pavement in all places.

Any soft or damp patches shall be removed and replaced with suitable imported fill material and shall be thoroughly compacted to achieve a standard maximum dry density of 95 per cent when tested in accordance with *AS 1289 Methods of testing soils for engineering purposes* and a minimum CBR shear strength of 4 per cent. Refer to B2: Earthworks.

If the required strength and compaction is not able to be achieved then the Service Provider shall replace and compact the top 75mm layer with DGB20 to meet the required compaction.

The subgrade shall be formed to the required profile as detailed in the standard details.

A subsoil drainage system shall be installed where specified.

5.4.5 BASECOURSES

The basecourse shall be specified flexible or rigid as follows:

Flexible base shall consist of a 100mm to 150mm thick layer of DGB20 compacted to not less than 98% Standard Maximum Dry Density to *AS 1289 - Methods of testing soils for engineering purposes*.

Rigid base shall consist of a 110mm 32 MPa concrete base with SL72 reinforcing mesh for asphalt wearing course and pavers. A heavy broom finish shall be applied to the slab surface, parallel with the fall of the slab for drainage and bonding purposes. Allow concrete base to harden sufficiently, generally overnight, before laying pavers or applying asphalt course. The concrete base for driveways varies from 150mm to 250mm in thickness as indicated on the standard details.

Refer to the standard drawings for details.

5.4.6 STRUCTURAL CELLS

The excavation for structural cells shall be a minimum 400mm wider than the actual cells at the base of the excavation. This allows for adequate compaction of the fill material around the structural cells.

Construction methodology and procedures including but not limited to type of soil, drainage and compaction ratio shall be approved by the City prior to commencement of the construction.

5.4.7 METHOD OF LAYING STONE AND CONCRETE UNIT PAVERS

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

- Clean concrete base of any dirt or dust.
- Moisten concrete base surface with a light spray of water. Pour a 1:1 cement and fine sand: water slurry mix (bond coat) over the concrete base prior to placing bedding mortar.
- Mix thoroughly 3:1 sand:cement by volume as a semi-dry mix mortar, ensuring a uniform mix and sufficient strength (min 10 MPa at seven (7) days). Prior to mixing, check sand is moist by squeezing a handful and ensuring the sand maintains its shape. Water may be added in the specified proportions to impart to the mix with sufficient consistency. Only sufficient bedding mix should be prepared and laid to enable the laying operation to be completed within a reasonable time. Refer to 5.3.5 for more details on mortar and slurry material.
- Place semi-dry mix mortar over the slurry coat. Installation of mortar mix to be 10 per cent to 15 per cent higher than required levels (or higher as necessary) prior to compaction of stone pavers.
- Apply pre-mixed 1:1 cement and fine sand:water slurry mix to cover area of mortar to be paved. No delay in laying of pavers after application of the cement slurry.
- Paving units shall be laid surface dry on the slurry coated mortar bedding course with a joint width of 1-3mm between adjacent pavers.
- 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 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 again.

5.4.8 METHOD OF LAYING BRICK PAVERS

Brick pavers shall be placed on the uncompacted screeded sand bed to the nominated laying pattern, with care being taken to maintain the specified bond throughout the Works. Paving units shall be placed such that all joints are correctly aligned.

Sand bedding

- The sand bedding shall be spread loose in a uniform layer screeded in a loose condition to a level such that, after compaction, the pavers shall be at the correct levels and profiles.
- 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 before further paving units are placed. The sand bed shall not be screeded in advance of the laying face to an extent to which paving will not be completed on that day.
- Screeded sand must be fully protected against accidental pre-compaction, including compaction by rain or dew. Any screeded sand which is pre-compacted prior to laying of units shall be removed and brought back to profile in a loose condition.

Compaction

- 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 (2) 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 the application of any traffic.
- 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 day's laying.
- Any units that are structurally damaged during compaction shall be immediately removed and replaced.

Filling joints

- After compaction of the paving blocks and prior to the termination of work on that day and prior to the application of any construction traffic, sand for joint filling shall be spread over the pavement.
- The joint-filling sand shall be well-graded sand passing a 2.36mm sieve and be suitable for concrete manufacture. The joint-filling sand shall be as dry as practical when spread.
- The joint-filling 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 |
| 0.075 | 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.

- The filling sand shall be broomed to fill the joints and the pavement recompact to achieve compaction of the joint-filling sand. As the Works proceed, 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 blocks.

5.4.9 LAYING ARRANGEMENTS

Stone and concrete unit pavers shall be laid with a joint width of 3mm between adjacent pavers as shown in the standard details, unless specified otherwise. The expansion joint shall run parallel to the kerb and gutter. Refer to the standard drawings for make-p and faceted zones.

Brick pavers shall be laid with a joint width of 3mm between adjacent pavers in a 45 degree herringbone pattern unless specified otherwise.

5.4.10 EXPANSION AND CONTRACTION JOINTS

Refer to 5.4.13: IN SITU CONCRETE PAVING.

5.4.11 EDGE RESTRAINT FOR BRICK 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.

5.4.12 LAYING OF ASPHALT PAVING

Asphalt concrete footways shall be laid in accordance *AS 2150 Hot mix asphalt – A guide to good practice*.

Asphalt shall be compacted only with static (non-vibratory), self-propelled, steel-wheeled rollers with a mass of rollers of 2t to 3t. Compaction by hand methods with tampers or vibrating plates shall be limited to small areas inaccessible to rollers where approved by the City's Representative. Maximum layer thickness should be limited to those that will enable the specified density to be achieved.

5.4.13 IN SITU CONCRETE PAVING

The Service Provider shall construct in situ concrete paving as shown on the standard details and as detailed in this Technical Specification.

In situ concrete paving for footpaths, vehicular crossings and kerb ramps shall be finished with a medium broom.

In situ concrete footpaths shall be a 110mm 32MPa concrete base with SL72 reinforcing mesh, typically placed on a 100mm thick DGB20 base.

All in situ concrete paving slabs shall have isolation joints along the building line, kerb line, any rigid structure, drainage pits, and at any penetrations. Expansions joints 10mm thick with an approved self-expanding joint filler shall typically be provided at 12m maximum spacings. Contraction joints comprising a 25mm deep or 1/3 to 1/4 slab thickness sawcut or dummy (tooled) joint shall be provided at the lesser of 6m or 1.5 times the pavement width spacings

Concrete footpaths shall be typically 1.8m wide unless directed otherwise by the City's Representative.

5.4.14 CLEANING

Cleaning should be as follows:

General

- Leave clean on completion.
- Clean area progressively with hard sponges and clean water as the work proceeds without using acid and without damage to the work, as necessary to remove mortar smears, stains, discolouration and the like.
- Ensure that all adjacent surfaces are left clean on completion, including adjacent kerbs, pit covers, bitumen paving.
- Remove mortar smears from adjacent surfaces.

Precautions

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

Requirements

- Cleaning is to be undertaken, using one or more of the following methods:
 - Hydraulic
 - Hydro-air
 - Steam-water jet.
- Brushes may be necessary to remove certain surface impurities and fibre brushes are recommended for this purpose.
- Chemicals, which may damage the surface or do not comply with the relevant EPA regulations, are not to be used.

The Service Provider is required to handover the paving to the City's Representative at Practical Completion in a clean condition. If the general public has been allowed access onto the paving during the construction period, the Service Provider must clean the paving to be ready for Practical Completion.

5.4.15 PROTECTIVE SEALANT

A protective sealant shall be applied to seal the surface of all concrete, brick and stone unit paving. The sealant shall be a penetrating type and protect the pavers from staining, ease cleaning and lower the frequency of maintenance. The sealant shall not affect the paver's colour or reduce its slip resistance.

The penetrating sealant shall be applied to the surface including over any joint filler material as soon as possible after being laid, and prior to opening the area to pedestrian use.

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

When protective sealing is completed, the following are to be provided:

- The full specification and information for the protective sealant (e.g. it may be protective sealant similar to DuPont StoneTech Professional Heavy Duty Exterior Sealer or an approved equivalent)
- A guarantee for heavy, medium and light foot and road traffic.

5.5 VEHICULAR CROSSINGS (DRIVEWAYS), KERB RAMPS AND STAIRS

5.5.1 REMOVAL

Where required and approved, driveways and kerb ramps shall be removed by excavating and removing any existing kerb and gutter and/or layback and constructing new kerb and gutter across the kerb opening prior to reconstruction of the footway and roadway.

The kerb, gutter and footway shall be constructed from material matching the kerb, gutter and footway adjacent to the opening unless specified otherwise. The reconstructed areas must finish flush with all adjacent surfaces.

5.5.2 CONSTRUCTION

Areas are to be excavated to the required depth below finished levels and the subgrade compacted to form a uniform working platform. Refer to B2: Earthworks Construction for details.

Formwork is to be solidly set to enable the concrete base to be poured true to the required line and level.

The bases of vehicular crossings or kerb ramps are to be separated from the concrete base of the surrounding footway, or building line or kerb stones by a layer of 10mm thick expansion joint filler as shown in the standard details.

5.5.2.1 VEHICULAR CROSSINGS (DRIVEWAYS)

Vehicular crossings (driveways) shall be constructed as shown in the standard details.

During the construction of any vehicular crossing, the Service Provider may be required to undertake road restoration or reconstruct sections of footpath in the vicinity of the crossing and layback.

5.5.2.2 KERB RAMPS

Kerb ramps shall be constructed in conjunction with the construction of the kerb and gutter. The ramps shall be constructed according to the standard details and the Technical Specification and in the positions shown on the approved drawings or as otherwise directed by the City's Representative.

5.5.2.3 REINFORCED CONCRETE STAIRS

Concrete steps shall be constructed as specified in the approved plans. The concrete shall be placed in one course to the full depth of the riser as shown in the approved plans and according to Technical Specification B3: Concrete Works Construction. Expansion joints shall extend the full depth of the slab in locations as shown on the plans. The edges of such joints shall be finished with an edging tool having a 6mm radius.

5.5.3 SURFACE FINISH

Concrete shall be finished with a heavy broom finish applied to the slab surface, parallel with the fall of the slab for drainage and bonding with the asphalt finish.

Concrete laid as the final surface shall be finished with a medium broom finish generally perpendicular to the line of travel and edged.

5.6 TACTILE GROUND SURFACE INDICATORS (TGSIs)

Where required, TGSIs shall comply and be installed as specified in the approved plans in accordance with AS 1428. *Means to assist the orientation of people with vision impairment.* Discrete Stainless Steel Hazard and Directional Tactile Ground Surface Indicators shall be used unless specified otherwise.

The service provider shall ensure that directional tactile indicators comply with slip-resistance requirements in both directions, and the design and arrangement of all TGSIs shall be comply with AS 1428.4.1 - *Means to assist the orientation of people with vision impairment.*

Indicators shall be installed to the manufacturer's recommendations.

5.7 HANDRAILS

Where required, handrails shall comply and be installed as specified in the approved plans in accordance with AS 1428. - *Means to assist the orientation of people with vision impairment.*

5.8 UTILITY COVERS

5.8.1 GENERAL

The Service Provider shall visit the site and confirm the locations, sizes and numbers of the existing utility pits.

All covers shall be recessed and in-filled with paving material specifically cut to lie flush with the cover edge and surrounding paving. The pattern shall continue through the lid, perpendicular to the frame where possible. Infill lids in granite shall be constructed as per the standard drawings.

It is the Service Provider's responsibility to notify the relevant Service Authority when working around their respective infrastructure.

5.8.2 ADJUSTMENT AND RELOCATION

Where the level of the footpath or roadway is altered from its existing level, the Service Provider shall adjust and relocate all the existing pit frames and covers that are to be retained so as to finish flush with the adjacent finished footpath or road surface.

The Service Provider shall ensure that the existing pit frames and pit covers that are to be re-used are free from rust and from twists and warps, which would result in uneven seating of the pit covers when relocated.

Where granite paving is to be installed, metal lids are to remain and all infill lids are to be granite infill as per the standard drawings.

All Utility Authorities should be contacted regarding realignment of utility covers and activity coordinated prior to the commencement of the Works.

5.8.3 AUTHORITY STANDARDS

All pit covers are to comply with the standards and requirements of the relevant Service Authority.

Refer to Technical Specification B1: Preliminaries and General Construction. All work on existing and new pits typically requires only the use of subcontractors who are approved by the asset owner.

5.8.4 LOADINGS

For pit covers in the footpath, loading Class C, 150kN shall be used unless noted otherwise. Driveway pit lids shall have higher load-carrying capacity and comply with Class D loading of the pit lids. They shall be installed as per relevant Service Authority requirements. Refer to the standard details.

5.9 QUALITY

5.9.1 LOAD TESTING

No pavers or stonework are to move or rock under pedestrians, wheelchairs, typical delivery trolleys or test loading. The Service Provider is to test load each completed lot (section) of paving to determine the extent of any unbonded, loose or defective pavers.

The test loading method shall be as follows:

General Footpath

- Loading vehicle: Johnston CN201 Sweeper (five (5) tonne, gross) or equivalent, fully loaded with cleaning liquid
- Number of passes: Four (4)
- Acceptance criteria: No visible movement in the pavers, cracks or other forms of failure.

Driveways

- Loading vehicle: Eight (8) tonne (gross) truck, fully loaded
- Number of passes: Four (4)
- Acceptance criteria: No visible movement in the pavers, cracks or other forms of failure.

Rectification shall be as follows:

- If less than 10 per cent of the lot (section) area fails the load test: Remove and relay individual pavers on new mortar bedding. Retest the lot (section) area.
- If 10 per cent or more of the lot (section) area fails the load test: Remove and relay the entire lot (section).

5.9.2 IN SITU SLIP RESISTANCE TESTING OF NEW SURFACES

The Service Provider shall test the in situ slip resistance of the new unit paving according to *Guide to specification and testing of slip resistance of pedestrian surfaces - (Table 3B)*, once the pavement has been sealed. The Service Provider shall test a minimum of five (5) locations for each site condition that is tested. The Service Provider shall seek agreement of specific test locations from the City's Representative before testing.

The following minimum slip resistance shall be achieved for new surface and jointing material:

| Property | Test Standard | Performance Criteria |
|--|---------------------------|---|
| Slip Resistance Classification of new pedestrian surfaces | SA HB 198:2014 (Table 3B) | P5 for slopes steeper than 1:14 P4 for slopes under 1:14 |
| Wet pendulum test method at manufacture and completion of construction | | |

Pavements that do not meet the above minimum slip resistance shall be reground and rectified at the Service Provider’s own expense.

5.9.3 INSPECTIONS

At least two working days’ notice shall be given for all inspections.

5.9.3.1 HOLD AND WITNESS POINTS

| Construct New Paved Footway | |
|-----------------------------|--|
| 1. Process Held: | Set-out and excavation complete (Section 5.4.2) |
| Submission Details: | At least two (2) working days before commencing excavation |
| Release of Hold Point: | The City’s Representative will inspect the excavation, prior to authorising the release of the Hold Point |
| 2. Process Held: | Compaction of Subgrade (Section 5.4.4) |
| Submission Details: | At least two (2) working days prior to compaction of subgrade |
| Release of Witness Point: | The City’s Representative will inspect the compacted subgrade, prior to authorising the release of the Witness Point unless advised otherwise |
| 3. Process Held: | Placement and compaction of DGB Basecourses where required for flexible pavements (Section 5.4.5) |
| Submission Details: | At least two (2) working days prior to placing and compaction of DGB base |
| Release of Witness Point: | The City’s Representative will inspect the compacted DGB Base, prior to authorising the release of the Witness Point unless advised otherwise |
| 4. Process Held: | Installing concrete formwork and reinforcements where required. (Section 5.4.12) |
| Submission Details: | At least two (2) working days prior to installing concrete formwork |
| Release of Hold Point: | The City’s Representative will inspect the concrete forms and reinforcements shall be made, prior to authorising the release of the Hold Point |

| Construct New Paved Footway | |
|-----------------------------|--|
| 5. Process Held: | Placement of concrete (Section 5.4.12) |
| Submission Details: | At least two (2) working days prior to placing concrete |
| Release of Witness Point: | The City's Representative will inspect concrete finish levels and expansion joints, prior to authorising the release of the Witness Point unless advised otherwise |
| 6. Process Held: | Preparation of sand or mortar bedding layer (Section 5.9.1) |
| Submission Details: | At least two (2) working days prior to placing pavers |
| Release of Witness Point: | The City's Representative will inspect mortar strength tests or sand bedding thickness, prior to authorising the release of the Witness Point unless advised otherwise |
| 7. Process Held: | Laying of pavers (Section 5.4.10 and 5.4.11) |
| Submission Details: | At least two (2) working days prior to laying of pavers. |
| Release of Hold Point: | The City's Representative will inspect the finish including levels, joints and sealant, prior to authorising the release of the Hold Point |

5.9.3.2 TOLERANCES

All surfaces shall be finished in conformity with the lines, grades, thicknesses and cross-sections shown on the drawings or specified or directed by the City's Representative within the following limits:

| Item | Activity | Tolerances |
|------|---|--|
| 1. | Footpath a. Surface Level | <ul style="list-style-type: none"> The deviation of the finished work from line or level shall not exceed 20mm in 10m No steps in the footpath or between any two adjacent pavers shall be more than 2mm On curves or in shaped areas, the deviation of the finished work from a 3m straight edge shall not exceed 15mm at any point The slope at any point on the surface shall not be less than 1 per cent and not exceed 3 per cent Unless otherwise specified or directed, the finished surfaces shall be shaped to shed surface water from the entire area in the directions of the natural slope or towards the constructed surface drains. |
| 2. | Tie-in at features a. Surface Level | The finished surface shall be shaped to match existing features, e.g. pit covers, edgings and driveways, within 2 mm |
| 3. | Paving Alignment a. Surface level | The alignment of the paving shall not differ from the specified line by more than +/-50mm, provided that the minimum pavement width is achieved at all points throughout the construction. |

Note: Material tolerances are included in Section 5.3: Materials of this Technical Specification.