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# AUSTROADS TECHNICAL SPECIFICATION ATS 4610
## Light Duty Concrete Paving

Austroads

## Contents



# 1. Scope

1.1 This Austroads Technical Specification ATS 4610 sets out the requirements for the construction of light duty concrete paving, which may be used in applications such as footpaths, shared paths, driveways, traffic islands and median infill. It does not cover concrete road pavements.

1.2 It also includes the requirements for patterned concrete paving and the installation of tactile indicators.

1.3 Refer to ATS 2245 Kerb and Channel for the construction of kerb and channel, including kerb ramps.

# 2. Referenced Documents

2.1 The following documents are referenced in this Specification:

| Australian/New Zealand Standards | |
|---|---|
| AS 1289 | Methods of testing soils for engineering purposes |
| Method 5.4.1 | Soil compaction and density tests – Compaction control test – Dry density ratio, moisture variation and moisture ratio |
| Method 5.7.1 | Soil compaction and density tests – Compaction control test – Hilf density ratio and Hilf moisture variation (rapid method) |
| AS 1379 | Specification and supply of concrete |
| AS/NZS 1428.4.1 | Design for access and mobility – Means to assist the orientation of people with vision impairment – Tactile ground surface indicators |
| AS/NZS 2425 | Bar Chairs in Reinforced Concrete – Product Requirements and Test Methods |
| AS 3610.1 | Formwork for concrete – Part 1: Specifications |
| AS 3799 | Liquid membrane-forming curing compounds for concrete |
| AS 3958.1 | Ceramic tiles - Guide to the installation of ceramic tiles |
| AS/NZS 4671 | Steel for the reinforcement of concrete. |
| AS/NZS ISO 9001 | Quality management systems – Requirements |

| Austroads | |
|---|---|
| ATS 2130 | Earthworks |
| ATS 5330 | Supply of Geopolymer Concrete |
| ATS 5335 | Normal Class Concrete |
| ATS 5336 | Fibre Reinforced Concrete |
| ATS 5340 | Cementitious Patch Repair of Concrete |
| ATS 5341 | Repair of Concrete Cracks |
| AGPT04A | Guide to Pavement Technology Part 4A: Granular Base and Subbase Materials |

# 3. Definitions

3.1 The definitions in AS 1379 and AS 3610.1 apply to this Specification.

# 4. Quality System Requirements

4.1 The Contractor must prepare and implement a Quality Plan that includes the documentation in Table 4.1, where applicable to the Works.

**Table 4.1: Quality Plan**

| Clause | Description of Document |
|---|---|
| 6.3 | Proposal use fibre reinforced concrete in lieu of conventional steel reinforcing (where applicable) |
| 10.4 | Details of equipment and methodology for placing concrete by spraying (where applicable) |
| 12.1 | Drawing showing the proposed joint layout and reinforcement details (if not provided by the Principal). |
| 13.1 | Details and procedures for patterned concrete paving (where applicable) |
| 14.1 | Details and procedures for the installation of tactile indicators (where applicable) |

4.2 Refer to ATS 5330 or ATS 5335 (as applicable) for the quality system requirements for the supply of concrete used in concrete paving.

| HOLD POINT 1 | |
|---|---|
| Process Held | Construction of concrete paving. |
| Submission Details | The Quality Plan must be submitted to the Principal at least 10 working days prior to the commencement of the supply of the concrete. |

# 5. Design

5.1 Unless specified otherwise in the Contract documents, the steel reinforcing and concrete paving thickness must comply with Table 5.1.

**Table 5.1: Reinforcing Steel and Paving Thickness**

| Description of Concrete Paving | Reinforcing Steel | Minimum Concrete Thickness (mm) |
|---|---|---|
| Footpaths | SL72 | 125 |
| Bicycle Paths<br>Shared Use Paths (i.e. a path that is shared between pedestrians and cyclists) | SL82 | 150 |
| Median surfacing<br>Bays of footpath adjacent to intersecting kerb and channel | SL72 | 150 |
| Private entrance vehicle crossings and driveways | SL72 | 150 |
| Commercial vehicle crossings and non-residential driveways | SL82 | 170 |

5.2 Additional requirements may be specified in the Contract documents to comply with the requirements of local government.

5.3 The clear cover of steel reinforcement to the nearest concrete surface must not be less than 50 mm, unless shown otherwise on the Drawings.

# 6. Materials

6.1 Unless specified otherwise on the Drawings, the concrete must be either:

a) N32 complying with ATS 5335 or ATS 5336 (as applicable); or

b) 32 MPa Geopolymer Concrete complying with ATS 5330.

6.2 Steel reinforcement must comply with the relevant requirements of AS/NZS 4671. Galvanising of the reinforcement, if specified, must be in accordance with the requirements of AS/NZS 4680.

6.3 The Contractor may submit a proposal in the Quality Plan to use fibre reinforced concrete in lieu of normal class concrete with conventional reinforcing steel. The proposal must include all details, test results, procedures and other quality documentation specified in ATS 5336. The Principal is under no obligation to accept any such proposal.

6.4 Reinforcement must be supported using either concrete blocks or plastic chairs complying with AS/NZS 2425. Wire chairs (with or without plastic tips), bricks or pieces of timber or coarse aggregate must not be used to support steel reinforcement.

6.5 Liquid membrane-forming curing compounds and the application rate must comply with AS 3799. The compound must be an approved product if an applicable Principal's registration or approval scheme is in place.

6.6 Filler for expansion joints must be a proprietary product suitable for use in concrete paving and approved by the Principal, such as bituminous impregnated particle board strip, treated cork or closed cell foam filler.

6.7 Tactile indicator tiles (where applicable) must conform to AS/NZS 1428.4.1 and must be stain, slip, impact and UV resistant. Tactile indicators must have a colour contrast to surrounding surfaces and provide a luminance contrast to the surrounding surfaces of not less than 0.3 (30%) in accordance with Appendix E of AS/NZS 1428.4.1.

6.8 Adhesive or proprietary bedding material (as defined in AS 3958.1) for bedding tactile indicator tiles must be either cement-based adhesive or modified mortar to 'Commercial' performance level. The adhesive must withstand pedestrian and maintenance vehicle traffic loads and not be susceptible to deterioration from water infiltration.

# 7. Earthworks

7.1 This Clause 7 only applies to minor earthworks undertaken solely for the construction of the concrete paving. Refer to ATS 2130 if the earthworks supporting the concrete paving is constructed as part of roadworks or if the cut/fill for the concrete paving exceeds 1.0 m.

7.2 Site preparation, topsoil stripping, excavation and filling must be restricted to the minimum area practicable for construction of the works.

7.3 Prior to the construction of the subbase/concrete paving:

a) Any unsuitable existing material (including vegetation, loose material, rubbish, overwet material, existing structures and/or organic material) must be removed from the area under the concrete paving and managed in an environmentally acceptable manner.

b) If topsoil is present, it must be stripped to a minimum depth of 100 mm, unless an alternative depth is specified in the Contract documents.

c) If filling is not required, the excavated surface of the earthworks must be trimmed and compacted with at least 1 pass of the compaction plant described in Table 9.1.

| WITNESS POINT 1 | |
|---|---|
| Process | Removal of unsuitable material/topsoil and trimming of excavated surface. |
| Notification Period | At least 1 working day (not less than 24 hours) prior to the removal of unsuitable material/topsoil and trimming of excavated surface. |

7.4 If fill material is to be placed under the concrete paving, the material must not contain topsoil, highly plastic clay, soil classified as highly or very highly expansive, overwet material, waste material, peat or any organic material. Fill material must be compacted in accordance with Clause 8.

7.5 The final surface of the earthworks must:

a) be finished so that the minimum thickness of subbase and/or concrete is achieved at all locations; and

b) not deviate from the bottom of a 3 m straight edge laid in any direction by more than 10 mm, except at grade changes.

7.6 If the surface of the adjacent earthworks is sloping and not restrained by retaining walls, the batters must be constructed at a slope which is stable and erosion resistant. Unless specified otherwise, excavated topsoil must be respread on the batters.

7.7 Where it is necessary to excavate an existing pavement, the excavation must not extend more than 150 mm from the edge of the adjacent face. Existing asphalt or bituminous surfacing must be saw cut for a sufficient depth to produce a neat vertical face.

7.8 The Contractor must ensure that:

a) any existing waterway, channel or culvert is not obstructed or diverted unless the prior written approval of the Principal and any relevant waterway authority has been obtained; and

b) water cannot pond on the surface of the earthworks or cause the material to become overwet.

# 8. Subbase

8.1 Unless specified otherwise on the Drawings, the concrete paving must be placed on a granular subbase in accordance with Table 8.1. The subbase must be compacted in accordance with Clause 9.

**Table 8.1: Subbase**

| Paving Type | Subbase | |
|---|---|---|
| | Material Type [1] | Minimum Layer Thickness (mm) |
| Footpaths and residential driveways | Nominal 20 mm Class 3 or Class 4 crushed rock or crushed concrete | 100 |
| All other light duty concrete paving, including Shared Use Paths, non-residential driveways and parking bays | Nominal 20 mm Class 3 crushed rock or crushed concrete | 150 |

***Note:***

*1. As described in AGPT04A. A higher quality material may be used.*

8.2 Immediately before concrete is placed, the bedding must be moist but must have no free water on the surface.

# 9. Compaction of Earthworks and Subbase

9.1 This Clause 9 applies if the requirements for compaction of the earthworks or compaction of the subbase is not specified elsewhere in the Contract documents.

9.2 Unless Clause 9.3 applies, earthworks and subbase using the minimum number of passes specified in Table 9.1. The moisture content of the material being compacted must be with 0.5% of the optimum moisture content of that material.

**Table 9.1: Material Compaction – Method Specification**

| Plant | Min Number of Passes | |
|---|---|---|
| | Material Layer Thickness 50 – 120 mm | Material Layer Thickness > 120 mm |
| Large Vibration Plate (mass ≥ 300 kg) | 3 | 4 |
| Small Twin-Drum Footpath Roller Minimum 1 tonne (e.g. Ingersoll Rand DD 12) | 2 | 3 |
| 3 tonne vibrating roller class VR10 (e.g. Ingersoll Rand DD 22) | 2 | 3 |
| Small Vibration Plate (mass ≥ 90 kg) (1) | 6 | 8 |

***Note:***

*1. A Small Vibration Plate may only be used in areas inaccessible to the other plant listed in Table 9.1.*

9.3 If the Contract documents specify that the subbase and/or earthworks fill material must be tested for dry density ratio, the material compaction must comply with Table 9.3.

**Table 9.3: Material Compaction – Dry Density Ratio**

| Material | Dry Density Ratio – Standard Compaction (1) |
|---|---|
| Subbase layer (where required) | 100% |
| Earthworks – top 150 mm | 98.0% |
| Earthworks Fill Material – Below 150 mm from top of earthworks | 95.0% |
| Fill outside of footpath and bicycle path/shared path<br>Fill at edge of paving and behind kerbs | 95.0% |

***Note:***

*1. Determined by AS 1289.5.4.1 or AS 1289.5.7.1*

# 10. Concrete Placement

10.1 Ducts, pits, stormwater drainage, underground services and any bases for traffic signals, traffic signs, and street light poles within the area to be paved must be installed prior to the commencement of construction of the concrete paving.

10.2 Following setting out, site preparation and placement of the subbase, the Contractor must notify the Principal of the concrete pour.

| WITNESS POINT 2 | |
|---|---|
| Process | Concrete placement. |
| Notification Period | At least 1 working day (not less than 24 hours) prior to the commencement of concrete placement. |

10.3 Placement of concrete must comply with ATS 5335 or ATS 5336 (as applicable). If geopolymer concrete is used, the additional requirements in ATS 5330 also apply.

10.4 If the Contractor proposes to place the concrete by spraying techniques, details of equipment and methodology must be included in the approved Quality Plan. Where spraying is used, the surface underlying the concrete must be dampened with water just prior to the commencement of the spraying the concrete.

# 11. Finishing and Curing

## Profile transitions and matching existing sections

11.1 Where it is necessary to join to an existing section of profile different from that being constructed, the change of profile must be made at a constant rate between 10 and 20 mm per metre. Transitions between different profiles must be made in accordance with the Drawings.

11.2 The appearance of concrete paving placed against existing concrete paving must be as close as practicable to the existing section.

## Surface finish

11.3 Unless a patterned finish is specified (refer Clause 13), the surface finish of the concrete paving must comply with Table 11.3.

**Table 11.3: Surface Finish**

| Surface | Finish |
|---|---|
| Top surface of footpaths, bicycle paths, shared paths, medians, and driveways | Broomed finish in accordance with ATS 5335. |
| Where tactile indicator tiles are installed by bedding with adhesive to hardened concrete, the surface of the paving below the tile | Wood float in accordance with ATS 5335 |
| Top surface of all other concrete paving | Wood float in accordance with ATS 5335 |
| Permanently hidden concrete surface | Class 4 or higher(1) |
| Any other formed surface | Class 3 or higher(1) |

***Note:***

*1. In accordance with AS 3610.*

11.4 A broomed finish or wood float finish must produce a lightly textured non-skid surface. The direction of brooming on a broomed surface must be transverse to the direction of travel.

11.5 The finished paving surface must be uniform in colour and appearance. Any discoloured concrete must be cleaned or replaced by the Contractor. If specified, an additive must be used in accordance with the manufacturer's instructions to colour the concrete paving.

11.6 All edges must be finished with a suitable edging tool to produce bullnoses of regular and of uniform radius. Edges abutting other paving or structures must be neatly rounded to a nominal 5 mm radius. All other edges must be neatly rounded to a nominal 10 mm radius.

11.7 Exposed concrete must be constructed so that water does not pond on the surface. Where median infill is to be constructed between edge sections of the same level, the paving must be crowned to produce a crossfall between 1% and 3% towards the edges.

11.8 Curing of concrete must comply with ATS 5335 or ATS 5336 (as applicable). If geopolymer concrete is used, the additional requirements in ATS 5330 also apply.

# 12. Joints

12.1 If not shown on the Drawings, the Quality Plan must include a drawing showing the proposed joint layout and reinforcement details. The joints must be set out to minimise slabs which have any of the following characteristics:

a) not quadrilateral in shape;

b) the longest side of the slab exceeds the shortest side by more than 50%;

c) the angle between any two adjacent sides of the slab differs from 90° by more than 6°; and/or

d) the transverse joint does not align with those on the adjacent slabs or kerb and channel.

12.2 Transverse joints must be constructed at right angles to the edge of the concrete paving.

**Table 9.3: Joint Details**

| | Expansion Joint | Contraction Joint |
|---|---|---|
| Description | A gap extending for the full width and full depth of the paving. The joint is filled with an approved suitable filler, such as treated cork or bituminous impregnated particle board strip. | A saw cut to a depth of at least 25% of the nominal concrete thickness across the full width of the concrete paving. |
| Nominal width | 15 mm | 5 mm |
| Maximum spacing of the joints | 10 m | 2.5 m |
| Location of mandatory additional joints | Either side of vehicle crossings.<br>At junctions with existing concrete paving.<br>Abutting structures such as drainage pits, bridges, walls, utility pits and power poles.<br>concrete paving placed against the back of kerb and/or channel.(1)<br>Transverse joints positioned opposite joints in adjacent kerb and/or channel (where applicable). | Opposite joints in adjacent kerb and/or channel (where applicable). |

***Note:***

*2. Alternatively, applying bituminous paint to back of the kerb and/or channel may be used to prevent bonding with the concrete paving. This treatment is not required for narrow median infill (less than 2.0 m wide).*

12.3 The filler for expansion joints must be positioned before the concrete is placed and must be held firmly in position while placing of the concrete.

12.4 If specified, dowelled expansion joints must be installed in accordance with the details and locations shown on the Drawings.

12.5 Saw cutting for contraction joints must be undertaken:

a) within 4 hours of placing the concrete where the air temperature measured at the time of placement is between 20°C and 35°C; or

b) within 24 hours of placing the concrete where the air temperature measured at the time of placement is less than 20°C.

# 13. Patterned Concrete Paving

13.1 Where patterned concrete paving is specified in the Contract documents, the Quality Plan must include details of the pattern, colour, class of finish and experience of personnel in producing patterns on concrete paving. The Principal may require a sample panel to be prepared and submitted.

13.2 The patterned finish must be formed by a stencil. The stencil must not be applied until the bleed water has evaporated from the concrete surface. Upon removal of the stencil, the surface must exhibit a well-defined pattern without edge ravelling.

13.3 Unless specified otherwise, multiple coats of a coloured hardener must be applied at a consistent rate to achieve a total thickness of between 3 mm and 4 mm. A suitable sealer to the finished surface must be applied within 24 hours of forming the pattern, followed by a second coat of sealer 3 days later.

# 14. Tactile Indicators

## General

14.1 Where the installation of tactile indicators is shown on the Drawings, the Quality Plan must include details of proposed tactile indicator tiles, associated materials (such as adhesive) and the installation method.

14.2 Movement joints must be installed at locations where:

a) tiles abut restraining surfaces;

b) joints exist in the concrete below the tiles; and

c) a change of plane exists in the tiled surface.

14.3 The base surface of the tactile indicator tiles (refer AS/NZS 1428.4.1 for meaning of ‘base surface’) must be flush with adjacent concrete surfaces.

14.4 Unless specified otherwise in the Contract documents, a tactile indicator may be installed by either cast the tile into plastic concrete or by the use of adhesive fixing.

## Installation by adhesive fixing

14.5 Where adhesive fixing is used to install the tiles, the installation of the tiles must comply with the guidelines in AS 3958.1 Clause 3.3.1.2 (Exterior floors – General applications, using cement-based adhesive or modified mortar).

14.6 If mechanical fixing of tiles is specified, the tiles must be supplied with spigots which are cast into cored holes in the concrete substrate in accordance with the manufacturer’s instructions, prior to application of the adhesive.

14.7 Following completion of curing of the concrete (or a duration recommended by the tile adhesive manufacturer), the concrete surface must be cleaned of dust and any contamination by using high-pressure hydro-blasting, sand/grit blasting or mechanical scabbling.

14.8 The tiles must be installed in accordance with the manufacturer’s instructions and at the recommended spacing so that they are fully bedded, without any voids beneath the tiles. Metal tiles must be thoroughly cleaned with a suitable cleaning agent (e.g. acetone) prior to installation.

14.9 The space between tiles must be packed with grout, and free of all voids and pits and any excess grout, grout film or haze removed. Unless recommended otherwise by the manufacturer, traffic is not permitted over freshly grouted joints until at least 7 days have elapsed since the completion of grouting.

# 15. Conformance and Completion

## Protection of finished concrete

15.1 The Contractor must ensure that concrete that has not yet reached its nominated compressive strength is not damaged by any cause (such as vehicles, pedestrians, vandalism or rain) by implementing suitable protective measures.

15.2 The measures to prevent pedestrian access must remain in place for more than 48 hours after the concrete pour.

15.3 Vehicles are not permitted to travel on a driveway until at least 4 days have elapsed after the completion of casting of the concrete. Vehicles equal to or less than 1.5 tonnes in weight may be permitted after 4 days, vehicles greater than 1.5 tonnes may be permitted after 7 days.

## Adjacent material

15.4 If the treatment of the surface adjacent to the concrete paving is not specified on the Drawings, suitable material must be placed for a width of at least 300 mm adjacent to the edge of the concrete paving and tapered to meet the final surface without creating a tripping hazard for pedestrians. The material must be placed as soon as the concrete has cured sufficiently, but not earlier than 3 days after placing the concrete. If the type of material is not specified, topsoil which is free of perishable matter and lumps be used and firmly compacted in layers not exceeding 150 mm in thickness.

## Non-conforming concrete

15.5 Subject to Clause 15.7, any non-conforming concrete must be removed and replaced with concrete of the same mix design that was used for the adjoining paving. The removal and replacement must extend to the nearest contraction or expansion joints.

15.6 Non-conforming concrete includes concrete not complying with Clause 15.8, a crack with a width greater than 0.2 mm and minor surface imperfections (such as, gouges, porous spots, shallow honeycombing, rough areas and blowholes).

15.7 The Contractor may submit a proposal to the Principal to repair cracks in accordance with ATS 5341 or to repair minor surface imperfections in accordance with ATS 5340. The Principal is under no obligation to accept any such proposal.

## Tolerances

15.8 The difference between the actual position or dimension of the finished concrete paving and the specified position or dimension must not exceed the tolerances in Table 15.8.

**Table 15.8: Tolerances**

| Description | Tolerance |
|---|---|
| Vertical step across the joint or misalignment where the concrete paving abuts an adjacent structure (such as a pit cover, kerbing or vehicle crossing) | ±5 mm |
| Departure of the finished work from specified line or level, subject to achievement of the minimum specified concrete thickness | ±10 mm |
| Maximum rate of change of deviation from line or level | 10 mm in 10 m |
| Deviation of the finished work from a 3 m straightedge (except for curves and shaped areas) | 5 mm |
| Overall width of paving | 0 + 15 mm |

## Reporting

15.9 If not previously provided to the Principal, all test results and reports required under ATS 5335 and ATS 5330 (as applicable) must be submitted to the Principal.

# Annexure A: Summary of Hold Points, Witness Points and Records

The following is a summary of the Witness Points/Hold Points that apply to this Specification and the Records that the Contractor must submit to the Principal to demonstrate compliance with this Specification.

| CLAUSE | HOLD POINT | WITNESS POINT | RECORD |
|---|---|---|---|
| 4.2 | 1. Commencement of concrete paving construction | | Quality Plan |
| 7.3 | | 1. Removal of unsuitable material/topsoil and trimming of excavated surface | |
| 10.2 | | 2. Concrete Placement | |
| 15.9 | | | Reports required under ATS 5335 and ATS 5330 (as applicable) |

# Amendment Record

| Amendment no. | Clauses amended | Action | Date |
|---|---|---|---|
| - | New specification | New | January 2025 |

**Key**

| | |
|---|---|
| Format | Change in format |
| Substitution | Old clause removed and replaced with new clause |
| New | Insertion of new clause |
| Removed | Old clauses removed |