TRANSPORT FOR NSW (TfNSW)

SPECIFICATION D&C R54

GENERAL CONCRETE PAVING

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Transport for NSW

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FOREWORD

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This document should be read with all the documents forming the Project Deed.

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BASE SPECIFICATION

This document is based on Specification TfNSW R54 Edition 3 Revision 3.

(TfNSW COPYRIGHT AND USE OF THIS DOCUMENT - Refer to the Foreword after the Table of Contents)

TfNSW SPECIFICATION D&C R54

GENERAL CONCRETE PAVING

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for concrete paving for footpaths (including that behind kerbs and gutters), bicycle paths/shared paths, medians, traffic islands and driveways, including granular subbase under footpaths and bicycle paths/shared paths where required.

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

Kerb and channel, including kerb ramp, is specified in Specification TfNSW D&C R15.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 (Not Used)

1.2.2 (Not Used)

1.2.3 Schedules of HOLD POINTS and Identified Records

The schedule in Annexure R54/C lists the **HOLD POINTS** that must be observed. Refer to Specification TfNSW D&C Q6 for the definition of **HOLD POINTS**.

The records listed in Annexure R54/C are **Identified Records** for the purposes of TfNSW D&C Q6 Annexure Q/E.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure R54/D and must be implemented.

1.2.5 Frequency of Testing

The Inspection and Test Plan must nominate the proposed frequency of testing to verify conformity of the item, which must not be less than the frequency specified in Annexure R54/L. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of TfNSW D&C Q6.

You may propose to the Principal a reduced minimum frequency of testing. The proposal must be supported by a statistical analysis verifying consistent process capability and product characteristics. The Principal may vary or restore the specified minimum frequency of testing, either provisionally or permanently, at any time.

1.2.6 Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure R54/M.

1.3 DEFINITIONS

The terms "**you**" and "**your**" mean "the Contractor" and "the Contractor's" respectively.

A slab is considered to be **odd shaped** if any of the following conditions apply:

(a) It is not a quadrilateral in plan view.

(b) The longest side of the quadrilateral shape exceeds the shortest side by more than 50%.

(c) The angle between any two adjacent sides of the quadrilateral differs from 90° by more than 6°.

Slabs are considered to have **mismatched joints** if the transverse joint(s) in one slab do not align with those on the adjacent slabs.

Top of foundation is the level of the underside of the granular subbase (refer Clause 3.3), or the level of the underside of the concrete paving where no subbase is required.

Shared path is a path that is shared between pedestrians and cyclists.

Patterned concrete paving is concrete paving over which has been placed a patterned stencil.

2 MATERIALS

2.1 GRANULAR MATERIALS

2.1.1 Select Fill Type U

Select Fill Type U must consist of a granular material with a particle size grading of 100% passing the 26.5 mm sieve and a Plasticity Index, determined by Test Method TfNSW T109, of between 2 and 12.

2.1.2 Class 2 DGB

Class 2 DGB must comply with Specification TfNSW D&C 3051.

2.2 CONCRETE AND STEEL REINFORCEMENT

Supply of concrete and steel reinforcement must comply with Specification TfNSW D&C R53.

2.3 TACTILE INDICATORS

2.3.1 Tactile Indicator Tiles

Tactile indicators 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.

2.3.2 Adhesive

Adhesive (i.e. proprietary bedding material, as defined in AS 3958.1) for bedding tactile indicator tiles must be either cement-based adhesive or modified mortar (refer Clause 6.1) which is not susceptible to deterioration from water infiltration and can withstand pedestrian and maintenance vehicle traffic loads.

3 EARTHWORKS AND SUBBASE

3.1 EXCAVATION AND FILLING

3.1.1 General

Excavate or fill to the levels shown on the Design Documentation drawings or as directed by the Principal in accordance with Specification TfNSW D&C R44.

Where possible, use any surplus excavated material to construct embankments as part of the general earthworks at the Site and dispose of any remaining surplus excavated material (including material removed in accordance with Clause 3.2) as spoil, in accordance with TfNSW D&C R44.

3.1.2 Top Up Low Areas

Top up low areas to the required levels using Select Fill Type U complying with Clause 2.1.1.

3.1.3 Filling at Sides of Paving or Behind Kerbs

Unless shown otherwise on the Design Documentation drawings or directed by the Principal, fill the space at the sides of paving or behind kerbs with Select Fill Type U complying with Clause 2.1.1.

3.2 UNSUITABLE MATERIAL

If any area of the foundation which may contain material that is unsuitable to support the proposed pavement, remove and replace this unsuitable material or use some other foundation treatment in accordance with TfNSW D&C R44.

The Hold Point in TfNSW D&C R44 regarding unsuitable material applies.

3.3 GRANULAR SUBBASE

Unless shown otherwise on the Design Documentation drawings, construct a subbase layer comprising Class 2 DGB beneath the concrete paving as follows:

(a) Footpath: 75mm thick;

(b) Bicycle path/shared path: 150 mm thick.

3.4 COMPACTION

Compact the subbase, foundation, etc to achieve the minimum characteristic value of relative compaction specified in Table R54.1.

Table R54.1 – Minimum Characteristic Value of Relative Compaction

Description	Minimum Characteristic Relative Compaction
Under footpath, bicycle path or shared path, and median	
Subbase layer (where required)	100%
Top 150 mm of foundation	98.0%
Filling below a depth of 150 mm from top of foundation	95.0%
Fill outside of footpath and bicycle path/shared path Fill at edge of paving and behind kerbs	95.0%

For driveways, comply with the relevant Council's requirements, unless specified otherwise in the contract documents.

Determine the characteristic value of relative compaction in accordance with TfNSW D&C Q6. Round off the relative compaction value and the characteristic relative compaction value to the nearest 0.1%.

3.5 LEVELS

Construct the top of foundation to the design surface levels, with a tolerance of +5 mm and -10 mm.

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

4 CONCRETE PAVING

4.1 GENERAL

Concrete work, including steel reinforcement, for concrete paving slabs covered by this Specification must comply with TfNSW D&C R53.

4.2 STEEL REINFORCEMENT

4.2.1 General

Provide steel reinforcement for concrete paving slabs as shown on the Design Documentation drawings.

Where the steel reinforcement is not shown on the Design Documentation drawings, provide the reinforcement as specified in Table R54.2.

Table R54.2 – Steel Reinforcement for Concrete Paving Slab

Paving Type	Steel Reinforcement	
	Standard Slab	Odd Shaped Slab (1)
Footpath		
≤ 75 mm thick	Not required	SL62
> 75 mm thick	SL62	SL62
Bicycle path or shared path	SL82	SL82

Note:
(1) Including slabs with mismatched joints.

For driveway slabs, provide steel reinforcement as shown on the relevant Council's standard drawings, unless specified otherwise in the contract documents.

4.2.2 Cover and Position

Provide a minimum cover for the steel reinforcement in accordance with TfNSW D&C R53, unless shown otherwise in the Design Documentation drawings.

For slab of thickness 120 mm and greater, fix the steel mesh within the top half of the slab.

For slabs of thickness less than 120 mm, fix the steel mesh at the mid-depth of the slab. In this case, the minimum cover specified in TfNSW D&C R53 does not apply.

4.3 CONCRETE PLACING

Comply with Clause 3.3 of TfNSW D&C R53.

The Hold Point in TfNSW D&C R53 for placing of concrete applies.

4.4 JOINTS

4.4.1 General

Transverse joints must be constructed at right angles ±6° to the longitudinal edge of the paving slab, otherwise the slab will be treated as odd shaped slabs.

Avoid where possible creating odd shaped and mismatched slabs.

4.4.2 Joint Layout

If not shown on the Design Documentation drawings, submit a drawing showing the proposed joint layout, and including reinforcement details, particularly for odd shaped and mismatched slabs.

HOLD POINT	(If joint layout is not shown on Design Documentation drawings)
Process Held:	Steel reinforcement fixing and concrete placing.
Submission Details:	Drawing showing proposed joint layout and reinforcement details.
Release of Hold Point:	The Nominated Authority will consider the submitted drawing prior to authorising the release of the Hold Point.

4.4.3 Movement Joints

(a) Footpaths and Medians

Provide contraction joints 3 mm wide and 25 mm deep at every 1.5 m length of footpath or median paving.

Provide expansion joints at intervals not exceeding 6 m and at the location of expansion joints in adjacent kerbs.

Provide isolation joints along median paving where the paving abuts against kerbs, gully pits, retaining walls and bridges.

Expansion and isolation joints must be 10 mm in width for the full depth of the paving and filled with a preformed joint filler in accordance with Specification TfNSW D&C 3204.

The top 10 mm of the joint must be sealed with silicone sealant conforming to Specification TfNSW D&C R83.

(b) Bicycle Paths/Shared Paths

Provide movement joints as shown on the Standard Drawings.

(c) Driveways

Provide movement joints in driveways at the locations shown on the relevant Council's standard drawings, unless specified otherwise in the contract documents.

5 FINISHED PAVING SURFACE

5.1 SURFACE FINISH

Provide on the top surface of concrete paving (except patterned concrete paving) the surface finish specified in Table R54.3. The finished paving surface must be uniform in colour and appearance.

Table R54.3 – Surface Finish

Paving Type	Surface Finish
Footpaths, bicycle paths/shared paths and medians	Broomed (1)
Driveways	Broomed (1)
Paving below tactile indicator tiles	Wood float (2)
All other paving	Wood float

Notes:

(1) Direction of brooming must be transverse to the direction of travel.

(2) Applicable only if tactile indicator tiles are installed by bedding with adhesive to set concrete.

All edges, except for those abutting other paving or structures, must be neatly rounded to a radius of 10 mm. Edges abutting other paving or structures must be neatly rounded to 5 mm radius.

5.2 PATTERNED CONCRETE PAVING

5.2.1 General

Construct patterned concrete paving where shown on the Design Documentation drawings.

HOLD POINT

Process Held:	Placing of patterned concrete paving.
Submission Details:	Details of pattern, colour, class of finish and experience of personnel in producing patterns on concrete paving, at least 5 working days prior. The Nominated Authority may require a sample panel to be prepared and submitted.
Release of Hold Point:	The Nominated Authority will consider the submitted documents, and sample panel if required, prior to authorising the release of the Hold Point.

5.2.2 Procedure

When constructing patterned concrete paving, apply the stencil only after the bleed water has evaporated from the concrete surface.

Apply each coat of colour hardener at a consistent rate achieve a total thickness of between 3 mm and 4 mm.

On removal of the stencil, the surface must exhibit a well defined pattern with no edge ravelling.

Apply a suitable sealer to the finished surface within 24 hours of forming the pattern, followed by a second coat of sealer 3 days later.

5.3 FINISHED SURFACE LEVELS

Construct the finished surface of the concrete paving to the design surface levels, with a tolerance of +10 mm and –5 mm.

The finish surface must not deviate from the bottom of a 3 m straight edge laid in any direction, by more than 5 mm, except at grade changes.

Where the concrete paving abuts an adjacent structure, any vertical step across the joint must not exceed 5 mm unless shown otherwise on the Design Documentation drawings.

6 TACTILE INDICATORS

6.1 GENERAL

Install tactile indicators at the locations shown on the Design Documentation drawings.

Performance levels (refer AS 3958.1 for definition) is specified as "Commercial". Comply with the installation guidelines in AS 3958.1 Clause 3.3.1.2 (Exterior floors – General applications, using cement-based adhesive or modified mortar) where applicable.

HOLD POINT

Process Held:	Construction of paving with tactile indicators.
Submission Details:	Details of proposed tactile indicator tiles, associated materials (such as adhesive), and installation method.
Release of Hold Point:	The Nominated Authority will consider the information provided prior to authorising the release of the Hold Point.

6.2 SURFACE PREPARATION

Prior to installing the tiles, allow the concrete to cure for the duration specified in TfNSW D&C R53, or a duration recommended by the tile adhesive manufacturer to suit the adhesive used.

Prior to placing tiles, clean the concrete slab of dust using water jets, and any contamination using where necessary high pressure hydro-blasting, sand/grit blasting or mechanical scabbling.

6.3 INSTALLATION

Install the tiles such that they are fully bedded, without any voids beneath the tiles.

Install the tiles at the tile manufacturer's recommended spacing. Pack the spaces between tiles with grout, and free of all voids and pits. Remove any excess grout, grout film or haze.

Do not allow traffic over freshly grouted joints for at least 7 days, unless recommended otherwise by the manufacturer.

6.4 MOVEMENT JOINTS

Install movement joints at locations where:

(i) tiles abut restraining surfaces;

(ii) joints exist in the concrete below the tiles;

(iii) a change of plane exists in the tiled surface.

6.5 LEVELS

Install the tactile indicator tiles such that the base surface (refer AS/NZS 1428.4.1 for meaning of "base surface") is sitting flush with adjacent concrete surfaces.

The finished surface level of the tiled surface must comply with the requirements of Clause 5.3.

ANNEXURES R54/A TO R54/B – (NOT USED)

ANNEXURE R54/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

Clause	Description
3.2 and R44 Clause 2.4.1	Unsuitable material
4.3 and R53 Clause 3.3	Placing of concrete
4.4.2	Submission of drawing showing proposed joint layout and reinforcement details
5.2.1	Submission of patterned concrete paving details
6.1	Submission of details of proposed tactile indicator tiles, associated materials and installation method

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW D&C Q6 Annexure Q/E.

Clause	Description of Identified Record
4.4.2	Drawing showing the proposed joint layout and reinforcement details
6.1	Details of the proposed tactile indicator tiles, associated materials and installation method

ANNEXURE R54/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. Review the requirements of this Specification and other contract documents to determine any additional documentation requirements.

Clause	Description of Document
4.4.2	Drawing showing the proposed joint layout and reinforcement details
6.1	Details of the proposed tactile indicator tiles, associated materials and installation method

ANNEXURES R54/E TO R54/K – (NOT USED)

ANNEXURE R54/L – MINIMUM FREQUENCY OF TESTING

Clause	Characteristic Analysed	Test Method	Minimum Frequency Of Testing
2.1.1	PI of Select Fill Type U	T109	One per 200 m^3 prior to placement
3.4	Compaction	As per TfNSW D&C R44	As specified in TfNSW D&C Q6 Annexure Q/L

ANNEXURE R54/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

TfNSW Specifications

TfNSW D&C Q6	Quality Management System (Type 6)
TfNSW D&C R44	Earthworks
TfNSW D&C R53	Concrete for General Works
TfNSW D&C R83	Concrete Pavement Base
TfNSW D&C 3051	Granular Pavement Base and Subbase Materials
TfNSW D&C 3204	Preformed Joint Fillers for Concrete Road Pavements and Structures

TfNSW Test Methods

TfNSW T109	Plastic Limit and Plasticity Index of Road Materials

Australian Standards

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 3958.1	Ceramic tiles - Guide to the installation of ceramic tiles