ACT Government

PAVEMENT DESIGN

MUNICIPAL INFRASTRUCTURE STANDARDS 03

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Transport Canberra and City Services

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ACKNOWLEDGEMENT OF COUNTRY

Transport Canberra and City Services (TCCS) acknowledge that Aboriginal people are the Traditional Owners of Australia. We acknowledge and pay respect to the Ngunnawal peoples as the custodians of the land and waters that we live and thrive on today here in the ACT.

TCCS acknowledges that Canberra's cultural and natural heritage was maintained by the Ngunnawal people for many generations before colonial settlement on Australian soil. Aboriginal people's management of the land preserved the natural balance of local plants and animals. This knowledge of the environment in which we live is critical to the protection and restoration of our land today.

It is our responsibility to preserve and encourage Ngunnawal, Aboriginal and Torres Strait Islander cultural integrity. When using this document, consider opportunities to incorporate Ngunnawal, Aboriginal and Torres Strait Islander culture into the street planning and design of our suburbs within the ACT. Through incorporating culture in planning and design, Ngunnawal, Aboriginal and Torres Strait Islander culture and community will be present and allow opportunities for all to be united.



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1 PAVEMENT DESIGN

1.1 General

1.1.1 Responsibilities

1.1.1.1 Objectives

General: Design of road pavements to meet the required design life, based on the subgrade strength, traffic loading, climatic conditions, environmental factors, and the selection of appropriate materials for subgrade, subbase, base and wearing surface.

Scope: This Design Standard applies to Municipal roads in the ACT and does not apply to roads classified under the ACT Roads Hierarchy system as arterial or sub-arterial roads or to roads where the design traffic load is greater than 2 x 10^6 ESA.

Pavement types: The pavement types covered by this Design Standard are:

- Flexible granular pavements: Flexible pavements consisting of granular pavement materials with thin bituminous surfacing.
- Stabilised pavements: Flexible pavements that include one or more cementitiously bound layers, created either in situ or in a plant.
- Deep lift DGA pavements: Flexible pavements consisting of predominantly asphaltic concrete layers.
- Segmental block pavements: Flexible pavements with segmental pavers surfacing.
- Concrete pavements: Rigid pavements in Municipal areas such as bus stops.

Trunk roads: Refer to *TRIS 02 Road Design* for the design of arterial or sub-arterial roads and roads where the design traffic load is greater than 2 x 10^6 ESA.

1.1.1.2 Precedence

Requirement: Where any document except legislation or the *Territory Plan* issued in conjunction with this Design Standard includes technical requirements that conflict with this Design Standard the requirements of this Design Standard take precedence.

1.1.2 Cross references

1.1.2.1 ACT Legislation

The following ACT Legislation is relevant to this Standard:

Heavy Vehicle National Law (ACT) Act

Road Transport (General) Act

Road Transport (Safety and Traffic Management) Act

Road Transport (Safety and Traffic Management) Regulation

Public Roads Act

Public Unleased Land Act

Territory Plan and General Codes

Work Health and Safety Act

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1.1.2.3 Design Standards

This Design Standard references the following component Standards:

MIS 04 Subsurface drainage

MIS 05 Active travel facilities design

MIS 07 Driveways

MIS 11 Off-street parking

TRIS 06 Pavement design

1.1.2.4 Specifications

The following Specifications are related to this Standard:

MITS 02 Earthworks

MITS 02B Bulk earthworks

MITS 03H Road Openings and Restorations

MITS 04 Flexible pavement construction

MITS 07 Segmental paving

TRITS 04 Flexible pavements

TRITS 05 Rigid pavement construction

1.1.2.5 TCCS Reference Documents

The following TCCS reference documents are related to this Standard:

Reference document 6 Design Acceptance submissions

Reference document 7 Operational acceptance submissions

Reference document 8 WAE quality records

Reference document 9 Final acceptance submissions

1.1.2.6 Design guides

The following design guides are related to this standard:

Development Control Code for Best Practice Waste Management in the ACT (ACT No Waste)

1.1.3 Referenced documents

1.1.3.1 Other publications

General: The following documents are incorporated into this design Standard by reference:

Australian Standards

AS 1348 Glossary of terms - Roads and traffic engineering

AS 1379 Specification and supply of concrete

AS 4455 Masonry unites, pavers, flags and segmental retaining wall units

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Austroads

AGPT	Austroads Guide to Pavement Technology
AGPT01	Part 1: Introduction to pavement technology
AGPT02	Part 2: Pavement structural design
AGPT03	Part 3: Pavement surfacings.
AGPT04A	Part 4A: Granular base and subbase materials
AGPT04C	Part 4C: Materials for concrete road pavements
AGPT04K	Part 4K: Selection and design of sprayed seals
AGPT05	Part 5: Pavement evaluation and treatment design
AGPT06	Part 6: Unsealed pavements
AGPT07	Part 7: Pavement maintenance
AGPT08	Part 8: Pavement construction
AGRD	Austroads Guide to Road Design
AGRD01	Part 1: Introduction to road design
AGRD02	Part 2: Design considerations
AGRD03	Geometric design
AGRD08	Part 8: Process and documentation
AP-T85	Optimum use of granular bases: material selection for detailed performance evaluation
AP-T68	Update of the Austroads sprayed seal design method

Cement and Concrete Association of Australia

C&CAA-T51 Guide to Residential Streets and Paths

Concrete Masonry Association of Australia

CMAA-PA02 Concrete Segmental Pavements—Design guide for residential access ways and roads

Clay Brick and Paver Institute

CBPI Manual 1 Clay paving design and construction

Techniques 15 Design considerations for clay paved roadways

IPWEA (NSW)

Specification for supply of recycled materials for pavements, earthworks and drainage.

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1.1.4 Standards

1.1.4.1 General

Road design: To *AGRD01 Introduction to road design* and *AGRD02 Design Considerations*

Design considerations: To *AGRD02 Design Considerations Table 3.1*.

Pavement Structural Design: To *AGPT02 Pavement Structural Design*.

Proprietary products: To *TCCS Products previously considered for use list*

1.1.5 Interpretation

1.1.5.1 Abbreviations

General: For the purposes of this Design Standard the following abbreviations apply:

AADT: Average Annual Daily Traffic.

CBR: California Bearing Ratio.

ESA: Equivalent Standard Axles.

HVAG: Heavy vehicle axle groups

LATM: Local Area Traffic Management.

RMS: Roads and Maritime, NSW Government

TCCS: Transport Canberra and City Services, ACT Government and its successors.

1.1.5.2 Definitions

General: For the purpose of this Design Standard, the definitions of terms used to define the components of the road reserve are in conformance with *AS 1348, Glossary of Austroads Terms* and *AGRD03 Geometric design.*

Other definitions that pertain to this Design Standard are outlined below,

Concrete pavements: Rigid pavements in Municipal areas such as bus stops.

Deep lift DGA pavements: Flexible pavements consisting of predominantly asphaltic concrete layers.

Flexible granular pavements: Flexible pavements consisting of granular pavement materials with thin bituminous surfacing.

Gravel pavements: Flexible pavements consisting of granular pavement materials without dust free surfacing.

Municipal road: All roads which become part of the public road system and are supplementary to arterial and sub-arterial roads. Municipal roads include major collector roads, minor collector roads, access streets and rear access lanes. Municipal roads primary function is to provide access to leases/blocks.

Nominal kerb line: Also known as the nominal face of kerb, it is the location on the kerb, kerb and gutter or open concrete invert from which the road carriageway width is measured. Refer to *ACTSD-0101* and *0102 Kerb and Gutter Standard Details* for actual location for each kerb type.

Path: A public access way for the movement of pedestrians, manually propelled vehicles and mobility scooters that is not located within a road.

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Pavement: The portion of a carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic.

Restricted Access Vehicles: Vehicles that exceed a dimension or mass limit under ACT road transport laws.

Restricted Access Vehicle routes: Approved routes for Restricted Access Vehicles which have been provided under ACT road transport laws.

Road reserve: The strip of public land between abutting property boundaries, specifically gazetted for the provision of public right of way. It includes the road carriageway, as well as paths, verges and landscape.

Segmental block pavements: Flexible pavements with segmental pavers surfacing.

Stabilised pavements: Flexible pavements that include one or more cementitiously bound layers, created either in situ or in a plant.

Upper Zone of Formation: The level immediately below the subgrade.

1.2 Pre-design planning

1.2.1 Consultation

1.2.1.1 TCCS and other Authorities

Requirements: Consult with TCCS and other relevant Authorities during the preparation of design. In addition to the requirements of this Design Standard, identify the specific design requirements of these authorities.

1.2.1.2 Utilities services plans

Existing site conditions: Obtain plans from all relevant utilities and other organisations whose services, trees, important ecological habitats or other assets exist within the area of the proposed development. Plot this information on the relevant drawings including the plan and cross-sectional views. As a minimum, designs should refer to 'Dial-before-you-dig' information that is readily available in most areas.

Responsibility: Confirm service plans accuracy with onsite inspection and also potholing if deemed necessary. Protect existing assets to the satisfaction of asset owners.

Proposed new services: Detail any new services proposed or relocated as part of the proposed works.

1.2.1.3 Safety in Design

Requirement: Implement safety in design processes in accordance with the *Work Health and Safety Act*. Include consideration for the following:

- The potential for flooding.
- Traffic management.
- Stockpile location and stability.
- Identification and protection of existing services.
- Maintenance operations including inspections and resurfacing.

1.2.2 Planning

1.2.2.1 Environment

The pavement design should consider relevant environmental factors in assessing the design subgrade strength and the choice of pavement and surfacing materials.

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2 DESIGN CRITERIA

2.1 Pavement

2.1.1 General

Gravel pavements: Flexible pavements consisting of granular pavement materials without dust free surfacing should be considered only for remote rural roads, minor access roads or temporary roads, in each case where access is via an existing unsealed road.

2.1.2 Design variables

All proposed road pavements: Consider the following for Urban and rural roads (refer *AGRD02 Design Considerations*):

- Construction and maintenance considerations.
- Noise requirements (e.g. as specified in approved *Estate Development Plan*).
- Environmental factors such as moisture conditions.
- Subgrade evaluation.
- Pavement and surfacing materials.
- Design traffic.

2.1.3 Construction and maintenance

All proposed road pavements: Consider the following construction and maintenance factors for the type of pavement, choice of base and subbase materials, and the type of surfacing adopted:

- Documentation of joints incorporated in the design.
- Extent and type of drainage.
- Use of boxed or full width construction.
- Available equipment of the Contractor.
- Use of stabilisation.
- Dimensions of segmental paving units and layout of joints.
- Aesthetic, environmental and safety requirements.
- Social considerations including retention of noise performance.
- Construction under traffic.
- Use of staged construction.
- Ongoing and long-term maintenance costs.

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2.2 Subgrade evaluation

2.2.1 Design considerations

General: Subgrade condition and design parameters should be assessed from subsurface investigations. Geotechnical investigations and designs must consider the following factors:

- Sequence of earthworks construction.
- The compaction moisture content and field density specified for construction.
- In situ moisture content at the time of subgrade assessment.
- Moisture changes during service life.
- Susceptibility to flooding.
- Subgrade variability.
- The presence or otherwise of weak layers below the design subgrade level particularly within the first 600mm below the subgrade level.
- Stabilisation requirements.
- Dispersive soils and Swell characteristics.
- Plasticity parameters.
- Salinity.

2.2.2 Geotechnical investigation

General: Subsurface investigations shall be carried out by a suitably experienced Geotechnical Engineer. Refer to **Annexure A – Guide to geotechnical investigations.**

CBR Samples: Unless otherwise directed by the pavement designer, all samples for CBR testing shall be compacted to 100% Standard compaction and at Standard optimum moisture content, and tested after 4-day soaking under a 4.5kg surcharge.

2.2.2.1 CBR considerations for Cut and Fill Design

General: Assessment of the Design CBR shall be based on laboratory soaked CBR values from relevant samples. For cut and fill in greenfield sites, adopt the 10th percentile low value, or if less than five results are available then the minimum of those results. Assessment of the design CBR below existing pavements should also take into account the results of the DCP testing.

Moisture content: The designer shall also consider the effect of potential moisture changes in the pavement and subgrade during the service life. If subsurface drainage is not proposed, if the pavement is likely to be subject to flooding or if the groundwater level is likely to be closer than 1.2 m to the subgrade, the Design CBR for cut and fill must allow for a greater variability in subgrade moisture content over the service life. In these instances the design moisture content shall be above the optimum moisture content.

2.2.2.2 Presentation of results

Submission: Include a summary of all laboratory and field test results and assumptions and/or calculations made in the assessment of the Design CBR for the cut and fill in the Pavement Design Report. Include the geotechnical investigation report in an Appendix.

2.2.2.3 Upper Zone of Formation

Upper Zone of Formation: The subgrade is the level immediately below the pavement structure and the depth immediately below the subgrade level, as given in the Specification or drawings, is the Upper Zone of Formation, refer to *MITS 02 Earthworks.*

Minimum soaked CBR value: The Upper Zone of Formation materials for cut or fill zones for Municipal Roads shall have a soaked CBR value of at least 8%.

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2.3 Materials

General: Select appropriate pavement and surfacing materials, types, layer thicknesses and configurations to ensure that the pavement performs to its design functions and requires minimal maintenance under the anticipated traffic loading for the design life adopted.

2.3.1 Unbound and modified granular materials

General: Unbound granular materials include modified granular materials as defined in *AGPT02*.

Material properties: To *MITS 04 Flexible pavement construction*.

Mechanistic design: If mechanistic design is required, refer to *AGPT02 Table 6.1* for pavement material categories and design characteristics.

Recycled materials: Incorporate recycled materials to *MITS 03H Road Openings and Restorations*.

2.3.2 Cementitiously bound materials

General: Bound materials for Municipal roads are granular materials produced with addition of a binding agent to improve strength. The binding agent should be a slow setting cementitious material from a blend of cement, lime, fly ash or slag.

Bituminous binders: To *TRIS 06 Pavement design*.

Material properties: Design parameters and performance criteria for cementitious stabilised materials are given in *AGPT02*.

2.3.3 Asphalt materials

General: For Municipal road pavements, the binder is usually a standard bitumen product. The bitumen may be modified for special applications by the addition of specific polymers or foaming technologies.

Material designation: Asphalt types used in the ACT are identified as designated in RMS R116, R117, R119 and R121, comprising two or three letters to identify the mix type followed by a number identifying the nominal maximum aggregate size in mm, as follows:

- Dense graded asphalt (e.g. AC14);
- Open graded asphalt (e.g. OG14);
- Stone mastic asphalt (e.g. SMA10); and
- Fine gap graded asphalt (e.g. FGG07).

Dense graded asphalt: Note that both RMS R116 and R117 use the prefix 'AC' for dense graded asphalt mixes. However, the mixes are different. If both mixes are specified for a given project then the drawings must be clear about where each specification applies.

Material properties: Design parameters and performance criteria for asphalt materials are given in *AGPT02*.

Material supply: At the present time only AR450 bitumen is readily available as the unmodified binder for asphalt. Designers should check on binder availability at regular intervals.

Cold weather conditions: The designer shall consult with TCCS on proposed asphalt materials if the design is intended to be placed in winter.

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2.3.4 Concrete materials

General: Concrete in Municipal road applications is generally limited to specific applications such as bus stops or threshold pavements for access roads. These applications do not justify the use of non-standard concrete mixes. For larger concrete applications refer to *TRIS 06 Pavement design.*

Material designation: Use 'N' class concrete as defined by *AS 1379*. A minimum compressive strength of 32MPa should be specified for road pavements that will be trafficked by heavy vehicles.

Material properties: The maximum flexural strength for pavement design with N32 concrete is 4.0MPa, in accordance with *AGPT02*. For higher strength concrete the maximum flexural strength for design is 0.7 times the square root of the compressive strength.

2.3.5 Segmental pavers

Requirement: Segmental pavers to *CMAA PA02, CBPI Manual 1* and *MITS 07 Segmental paving.*

2.3.6 Threshold treatments

General: The use of a paving material other than asphaltic concrete as a treatment to differentiate road function is permitted. A reinforced concrete base will be required in accordance with this Design Standard. Shallow pattern stencilled concrete is preferred over segmental pavers; however, both treatments will be accepted.

2.4 Design traffic

2.4.1 General

Scope: This Design Standard applies only to flexible pavements for Municipal roads designed in accordance with the *Estate Development Code*, having a design traffic load less than or equal to 2×10^6 ESA.

Design methodology: Design traffic values in accordance with **Table 03- 1 Minimum residential design traffic table** shall be applied for standard situations. However, these values do not cater for all situations, such as short term heavy loading or unique vehicle loadings. The designer shall evaluate expected traffic loadings over the design life of the pavement and adopt the relevant design methodology:

- Normal conditions: To Minor road traffic (flexible pavements); or
- Any other conditions: To Other road traffic.

2.4.2 Flexible Pavements

Scope: This section applies only to flexible pavements for Municipal roads designed in accordance not subject to short term heavy loading similar to that described in *AGPT02 Section 12.7.1.*

Residential zones: Adopt **Table 03- 1 Minimum residential design traffic table** for the design of flexible pavements for municipal roads for residential development and CZ5 zones:

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Table 03- 1 Minimum residential design traffic table

Street type	Design traffic for residential development and CZ5 zone (20 years design period) (ESA)
Rear Lanes	as for the connecting street
Access Street Type A	6×10^4
Access Street Type B	3×10^5
Minor Collector Roads (no buses)	5×10^5
Major Collector Roads (with buses)	1×10^6

2.4.3 Other Land use zones

Commercial zones (except Restricted Access Vehicle routes): The design traffic for minor road pavements in commercial zones shall be twice the design traffic listed in **Table 03- 1 Minimum residential design traffic table** for the applicable street type.

Light Industrial zones: The design traffic for minor road pavements in industrial zones shall be evaluated in accordance with the principles described in this Design Standard, but shall not be less than twice the design traffic listed in **Table 03- 1 Minimum residential design traffic table** for the applicable street type.

Restricted Access Vehicle routes and General Industrial zones: The design traffic shall be calculated in accordance with the procedures set out in **Other road traffic.** If the design traffic exceeds 2×10^6 ESA thepavement shall be designed and constructed in accordance with the requirements of *TRIS 06 Pavement design.*

Car parks: Allow for traffic load concentrations within car park areas, such as at entrances/exits. Refer to *MIS 07 Driveways* and *MIS 11 Off Street Parking.*

Paths: Paths shall be designed for at least 1,000 passes of a truck with gross vehicle mass of at least 10 tonnes. At designated vehicle crossings increase the design traffic if applicable. Refer to *ACTSD-0501 Paths Standard Details.*

2.4.4 Other road traffic

2.4.4.1 First-Principle Calculations

Scope: This section applies to all roads which are not arterial or sub-arterial roads and for which Minor road traffic (flexible pavements) does not apply. For these roads the design traffic loads should be evaluated from first principles.

Minimum design traffic: Notwithstanding the requirements of this section, the design traffic loads described in Minor road traffic (flexible pavements) shall be regarded as minimum values unless otherwise approved by TCCS.

Standard: *AGPT02 Section 7* covers detailed considerations of traffic design parameters and *AGPT02 Section 12* covers additional requirements for lightly trafficked pavements.

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2.4.4.2 Minimum pavement design life

Criteria: The minimum design life for pavements is as follows:

- Flexible granular pavements: 20 years.
- Flexible deep lift DGA or stabilised pavements: 25 years.
- Rigid pavements (including concrete bus stops): 40 years.
- Segmental block pavements: 25 years.

In specific cases where directed, (e.g. some commercial or industrial areas), the type of pavement and appropriateness of the selected design life is to be confirmed with a 'whole of life' cost analysis.

2.4.4.3 Existing Traffic

Traffic Data: Existing traffic volumes and percentage heavy vehicles should be assessed from traffic counts if possible. Axle-pair counts from traffic signals can be obtained from Traffic Signals Branch, TCCS. For the purpose of calculation of AADT from peak hour traffic volumes, it should be assumed that average AM + PM peak hour traffic volumes represent between 10% and 12% of AADT.

2.4.4.4 Growth Rates

Criteria: The design growth rates should be selected based on results obtained from a traffic model calibrated for Canberra if applicable, on historical growth rates and on assessment of future demand.

2.4.4.5 Proportion Heavy Vehicles

Criteria: The proportion of heavy vehicles (Austroads vehicle Classes 3 to 12) used for pavement design should be selected based on traffic classification counts on similar roads and assessment of demand. A minimum value of 3% should be adopted unless data is available to indicate a lower value.

2.4.4.6 Design traffic volumes

Heavy vehicle traffic: The design total heavy vehicle traffic for the life of the road pavements should be calculated in accordance with *AGPT02 Section 12.7* (Calculation of design traffic volumes for lightly trafficked roads) and *AGPT02 Section 7* (Calculation of design traffic volumes approaching or exceeding 10^6 ESA). The total heavy vehicle traffic should allow for construction traffic loads for adjacent developments.

AGPT02 Table 7.4 provides the values of cumulative growth factor for a range of annual growth rates and design periods.

2.4.4.7 Design traffic loads - Equivalent Standard Axles (ESA)

Heavy vehicle traffic: The design traffic load shall be calculated by multiplying the design total heavy vehicle traffic by the average ESA per heavy vehicle. The average ESA per heavy vehicle for pavements carrying mixed heavy vehicle traffic shall be not less than the following default values (to be used in the absence of other information):

- for average number of heavy vehicles per lane per day (averaged over the design life) less than 16: 0.7 ESA per heavy vehicle
- for average number of heavy vehicles per lane per day (averaged over the design life) 16 or greater: 1.2 ESA per heavy vehicle

The average ESA per heavy vehicle for pavements carrying predominantly one or two types of commercial or industrial heavy vehicle shall be determined for those vehicle types assuming they are fully loaded.

2.4.4.8 Presentation of results

Submission: Include a summary of all data sources, assumptions and results in the Pavement Design Report, and include the data and calculations in an Appendix.

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2.4.5 Segmental pavements

Segmental pavements: For interlocking concrete segmental pavements, the simplification of replacing ESA's with the number of heavy vehicles exceeding 3 tonne gross mass contained in *CMAA PA02* is acceptable up to a design traffic of 10^6 ESA. Beyond this, calculate the design ESA from first principles as stated above.

2.4.6 Rigid pavements

Rigid pavements: For rigid pavements, calculate the number of heavy vehicle axle groups (HVAG) based on the ESA/HVAG data in *AGPT02 Table 12.2.*

3 PAVEMENT DESIGN

3.1 Pavement structure

3.1.1 General

3.1.1.1 Pavement extent

Pavement extent: The pavement structure (typically the subbase layer) shall extend a minimum of 75 mm behind the rear face of any kerb and/or channel (gutter). If a kerb or gutter is not provided, the pavement shall extend at least 0.5 m outside the edge line.

3.1.1.2 Drainage

Precautions: Make provision for pavement layer drainage on the assumption that during the service life of the pavement ingress of water will occur.

Standard: *MIS 04 Subsurface drainage.*

3.1.2 Surfacing

3.1.2.1 General

Requirement: Streets shall have a bituminous wearing surface as follows except where the pavement is designed for concrete or segmental block surfacing:

- Urban residential streets: Prime coat, plus asphalt.
- Commercial and industrial streets: Prime coat, plus asphalt.
- Maintenance access tracks:
  - Prime coat, plus one or two coat sprayed seal, or
  - Prime coat, plus asphalt.
- Temporary surfaces:
  - Prime, plus one or two coat sprayed seal, or
  - Primerseal.

Temporary protection: Where a primed surface is to be trafficked before the asphalt wearing course is applied, a primerseal shall be applied. Use prime plus seal where the surface is expected to be trafficked for more than 6 months.

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3.1.2.2 Braking and turning zones

Surfacing requirements: For braking and turning zones the surfacing requirements are as follows:

- Roundabouts should have suitable pavements to resist shear loading, i.e., deep strength asphalt or concrete.
- For intersections and roundabouts where the design AADT> 3000, PMB should be used in the asphalt surfacing layer.

3.2 Surface design

3.2.1 Sprayed bituminous seals

Standard: Sprayed bituminous seals, including primerseals, shall be designed in accordance with AP-T68-06, as updated.

Criteria: Primerseals should be specified with the following nominal aggregate sizes:

- 5-7 mm size aggregate for traffic less than or equal to 200 vehicles per lane per day.
- 7-10 mm size aggregate for traffic more than 200 vehicles per lane per day.
- 10 mm aggregate for very hot and/or wet conditions and traffic more than 600 vehicles per lane per day.

Double-double seals, comprising a minimum of two coats binder and two coats of aggregate shall use 10 mm size aggregate for the first coat and 7 or 5 mm size aggregate for the second coat unless otherwise agreed by TCCS.

Single coat sprayed seals shall use 10 mm size aggregate.

Other seal types in accordance with *AP-T68*, as updated, may be used subject to approval by TCCS.

3.2.2 Asphalt

Municipal roads: The following asphalt types shall be used unless specific conditions dictate otherwise:

Table 03- 2 Asphalt surfacing table

Road Category	FGG07	FGG10	AC10*	AC14*	SMA10
Paths 1	1	X	X	X	X
Rear lanes	1	1	1	X	X
Access roads X	X	1	1	X	X
Collector roads	X	X	1	1	X

Note:

1 - indicates acceptable; X - indicates not acceptable; * - indicates construction to R117.

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Requirement: The minimum thickness of asphalt surfacing shall be the largest of:

- 3.0 times the nominal maximum aggregate size of the specified asphalt material, and
- 40mm for major collector roads or 25mm for other Municipal roads.

The designer shall specify the following:

- FGG asphalt with AR450 binder must use a Warm Mix Asphalt technology that gives improved workability in construction and must not be placed when the temperature conditions are less than required by the *MITS 04 Flexible pavement construction*.
- Dense graded asphalt with AR450 or polymer modified binder may use a Warm Mix Asphalt technology that gives improved workability in construction when the temperature conditions are less than required by the *MITS 04 Flexible pavement construction* specification, subject to demonstration that specified compaction levels can be achieved.

Prime or Primerseal coats shall be indicated on the drawings below the asphalt surfacing.

3.2.3 Segmental pavers

Requirement: Segmental pavers for roads or trafficked areas to *AS4455* and *MITS 07 Segmental paving*.

Edge restraint: Design the edges of all paving to be constrained by either kerbing and/or guttering, or by concrete edge strips.

3.3 Pavement thickness design

3.3.1 Flexible pavements

3.3.1.1 Unbound granular flexible pavements – Bituminous surfaced

Low design traffic: Design unbound granular flexible pavements with thin bituminous surfacings, including those with cement or lime modified granular materials, with design traffic up to 10^5 ESA to AGPT02 *Figure 12.2*. For the purpose of the pavement design, FGG asphalt and seals shall not be considered as structural layers.

Moderate design traffic: For design traffic between 10^5 ESA and 10^6 ESA, design using *AGPT02 Figure 8.4*. For design traffic above 10^6 ESA, use *AGPT02 Figure 8.4* (including adjustment for Standard Axle Repetitions and ESA) or mechanistic design in accordance with *AGPT02 Chapter 8.*

High design traffic: Pavements for roads with traffic exceeding 2×10^6 ESA shall be designed in accordance with the requirements of *TRIS 06 Pavement design.*

Mechanistic design: For mechanistic design, granular materials layers above subgrade level shall be sub-layered in accordance with *AGPT02 Section 8.* Granular or stabilised materials used for Upper Zone of Formation materials shall not be sub-layered and shall have a maximum design vertical modulus of 150MPa.

Select fill: Select fill materials, if required, must be specified as part of the Upper Zone of Formation in *MITS 02B Bulk earthworks.*

SUPERSEDED

3.3.1.2 Flexible pavements containing bound layers with asphalt surfacing

Mechanistic design: Design flexible pavements containing one or more bound layers, including cement stabilised layers or thick asphalt layers other than thin asphalt surfacings, using mechanistic design as set out in *AGPT02 Section 8.*

Design criteria: For mechanistic design of Municipal roads, a project reliability of 95% shall be used unless otherwise specified by TCCS. Design shall also take account of the variation in asphalt modulus with heavy vehicle speed as set out *in AGPT02,* using a design speed of 20 km/hr less than the posted speed limit.

Requirement: The pavement thickness indicated on the drawings shall be at least 10 mm greater than the calculated thickness for thick asphalt pavements, or 20 mm greater for pavements containing cemented materials. The additional thickness shall be provided in the most critical layer for the design.

3.3.2 Rigid pavements

Criteria: Design rigid (concrete) pavements with design traffic up to 10^6 HVAG to either *C&CAA-T51* or *AGPT02 Section 12.9.* For design traffic above 10^6 HVAG design to AGPT02 Section 9.

The concrete base thickness indicated on the drawings shall be at least 10 mm greater than the calculated thickness. The designer must detail all joint types and locations on the drawings – refer *C&CAA-T51* or *NSW RMS Standard Drawings.*

Specification: *RMS R83 Jointed Concrete Base* is not considered appropriate for rigid pavements in municipal roads. Construction should be specified in accordance with *MITS 04 Flexible pavement construction*. The designer should include extensive notes on the drawings relating to requirements for joints, surface finishes, tolerances etc.

3.3.3 Segmental pavers

3.3.3.1 Concrete segmental pavements

Criteria: Design concrete segmental pavements with design traffic up to 10^6 estimated heavy vehicles exceeding 3 T gross to *CMAA PA02.*

3.3.3.2 Clay segmental pavements

Criteria: Design clay segmental pavements with design traffic up to 10^6 ESAs to *CBPI Manual 1* and *CBPI Techniques 15.*

3.3.4 Minimum pavement thickness

Requirement: Irrespective of the pavement thickness calculated in Section Unbound granular flexible pavements – Bituminous surfaced, the minimum pavement thickness, including the thickness of surfacings, is as follows:

- Roads with kerb and channel (gutter): 250 mm.
- Uncurbed roads: 200 mm.
- Car parks: 150 mm.
- Paths: 150 mm.

Subbase and base layers: refer to minimum layer thickness in *MITS 04 Flexible pavement construction*.

SUPERSEDED

3.4 Rehabilitation of existing pavements

Requirement: Comply with AGPT05 for investigation of existing sealed pavements and design of pavement treatments.

The surfacing type shall comply with noise requirements to the extent approved by TCCS. Ultra-thin asphalt or microsurfacing shall be acceptable as a resurfacing option subject to approval by TCCS.

4 DOCUMENTATION

Requirements: Comply with *Reference document 6 Design Acceptance Submissions.*

Construction specifications: Pavements designed under this Design Standard shall refer to *MITS 04 Flexible pavement construction* or *TRITS 05 Rigid pavements for construction specifications*. Pavements designed under *TRIS 02 Road design* shall refer to *TRITS 04 Flexible pavements* or *TRITS 05 Rigid pavements for construction* specifications.

Where applicable, the following RMS Specifications include Annexures that must be completed by the pavement designer:

R44	Earthworks (for details regarding Upper Zone of Formation)
R71	Construction of Unbound and Modified Pavement Course
R73	Construction of Plant Mixed Heavily Bound Pavement Course
R75	Insitu Pavement Stabilisation using Slow Setting Binders
R106	Sprayed Bituminous Surfacing (with Cutback Bitumen)
R107	Sprayed Bituminous Surfacing (with Polymer Modified Binder)
R110	Coloured Surface Coatings for Bus Lanes and Cycle ways
R116	Heavy Duty Dense Graded Asphalt
R117	Light Duty Dense Graded Asphalt
R119	Open Graded Asphalt
R121	Stone Mastic Asphalt
IC-QA-3051	Granular Base and Subbase Materials for Surfaced Road Pavements
IC-QA-3071	Selected Material for Formation
IC-QA-3151	Cover Aggregate for Sprayed Bituminous Surfacing
IC-QA-3152	Aggregates for Asphalt

SUPERSEDED

ANNEXURE A – GUIDE TO GEOTECHNICAL INVESTIGATIONS

General

General: The investigation should be designed taking into account the recommendations summarised in **Table 03- 3 Guide to geotechnical investigations** table**.** Note that additional investigation may be requiredfor structures, site classification or other reasons.

Table 03- 3 Guide to geotechnical investigations table

Factors	Greenfield Sites	Existing Pavements
Subsurface investigation method	Backhoe or excavator test pits Large diameter augers (min 300mm)	Diatube coring (asphalt and concrete) Auger (max 300mm diameter) Test pits if directed
Investigation depth(1)	At least 1m below anticipated subgrade level or existing surface, whichever is deeper	At least 1m below existing pavement structure
Investigation spacing	Typically 100m intervals but adjusted for site-specific conditions	
Logging	Log every horizon; include sketch if horizon depth varies significantly	Scrape side of hole clean to measure horizon depths Measure surface thickness to nearest 5mm
In-situ investigations	As directed (e.g., in-situ density)	Dynamic cone penetrometer
Sampling	Bulk samples from likely subgrade or fill materials at every location	Sample granular and subgrade/fill; sample size will depend on investigation method
Sample testing frequency	As agreed between pavement designer and geotechnical engineer, but typically at least 50% of samples; must be sufficient to characterise range of subgrade and fill materials	
Laboratory testing	Soaked CBR Grading (by wet sieving) Atterberg Limits + linear shrinkage Emerson dispersion Other tests as relevant	Atterberg limits + linear shrinkage Moisture content (fill and subgrade) Soaked CBR (if adequate sample size) Aggregate grading (if adequate sample size) Other tests as relevant

Note

1. Investigation may be terminated at shallower depth if refusal on rock encountered; deepen investigation to practical extent while soft or wet conditions are encountered

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