Transport Roads & Maritime Services

QA SPECIFICATION PS341

PAVEMENT INVESTIGATION AND DESIGN

IC-QA-PS341

VERSION FOR: ***Macquarie Park Bus Priority and Capacity Improvement Project - Stage 2***
DATE: ***November 2018 (RFT Issue)***

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CLAUSE PAGE

FOREWORD

RMS COPYRIGHT AND USE OF THIS DOCUMENT

When this document forms part of a contract

This document should be read with all the documents forming the Contract.

PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

(a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.

(b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

RMS SPECIFICATION PS341

PAVEMENT INVESTIGATION AND DESIGN

1 INTRODUCTION

1.1 PROFESSIONAL SERVICES SPECIFICATION

This specification is one of a set of Professional Services Specifications for detailed design. Refer to PS301.

1.2 SCOPE & PROJECT DESCRIPTION

This Specification sets out the requirements for an aspect of detailed design. It requires C72 Panel Deed for Professional Services or equivalent Professional Services Conditions of Contract.

1.2.1 Project Specific Requirements

Refer to Annexure PS341/A for Project Specific Requirements for Pavement Investigation and Design.

1.3 PROJECT INTRODUCTION

Refer to PS301 for Project Introduction details.

1.4 STRUCTURE OF THE SPECIFICATION

1.4.1 Schedules of HOLD POINTS, WITNESS POINTS, DELIVERABLES, MEETINGS AND WORKSHOPS.

The schedules in Annexure PS341/C list the **HOLD POINTS, WITNESS POINTS, DELIVERABLES, MEETINGS AND WORKSHOPS** that must be produced / observed. Refer to specification PS301 - Professional Service Scope and Requirements for definitions of **HOLD POINTS**.

1.4.2 Design Reference Documents and Support Information.

The schedules in Annexure PS341/M list the **DESIGN REFERENCE DOCUMENTS**, **REFERENCE DOCUMENTS** & **SUPPORTING INFORMTION** that apply to this Specification.

Unless otherwise specified the applicable issue of a referenced document, other than a RMS Specification, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

2 DESIGN REQUIREMENTS

2.1 OBJECTIVES

The PSC is:

(i) To review and evaluate the pavement design provided by the RMS and evaluates the pavement options. The options report developed during concept design will be provided, if available.

(ii) To undertake the detailed design and documentation of the preferred pavements which meet the constructability, performance and durability requirements for the project.

2.2 SCOPE

Refer to Annexure PS341/A2 for areas that require pavement design.

2.2.1 Pavement Designer

The pavement design must be undertaken by a designer(s) with the appropriate level of competence to undertake the design.

2.2.2 Pavement Reference Documents

Pavement designs must be carried out and comply with the Pavement Reference Documents which are contained in Annexure PS341/M.

2.2.3 Performance Requirements for Pavements

The performance requirements for pavements on the through carriageway of the project and road connections must:

(i) Incorporate drainage practices that maintain a controlled moisture regime to prevent significant variations in the capacity of the subbase and subgrade to support the pavement.

(ii) Accommodate movements of the subgrade associated with changes in moisture content (particularly near batters).

(iii) Accommodate settlement and deformation of the embankments and subgrade resulting from settlement of foundations.

(iv) Deliver the specified levels of performance of the wearing surface (as per construction specification requirements)

(v) Minimise spray in wet conditions.

(vi) Have adequate surface texture to ensure the safety of road users in wet weather.

(vii) Assist in minimising noise levels.

(viii) Have separate surface and subsurface drainage systems to avoid overloading subsurface systems.

(ix) Post cracking fatigue life of cemented layers must not be considered in the initial 40 year design life of flexible pavements

(x) Where pavement widening is used, the pavement widening is to match the existing pavement composition as a minimum, subject to satisfying the pavement design life requirements. Different pavement types must not be used in adjacent lanes, ***unless RMS approved otherwise***

and interface drainage is provided. Where the existing shoulder or median construction is different from the existing travelling lane, remove the existing shoulder or median before widening, and replace it with the same pavement type as the adjacent travelling lane.

(xi) Where any pavement is used for traffic as part of any Temporary Works or opened to traffic for construction staging and traffic management, prior to the Date of Opening Completion, the traffic volumes specified for those pavements in Annexure PS241/A must be increased by the volumes of traffic that will use the pavements for the period of time prior to the Date of Opening Completion.

(xii) Where the subgrade is soft (CBR <2%) or expansive (CBR test swell >2.5%), or comprises shale or siltstone, use the earthwork treatments shown in RMS Part 2: Pavement Design Supplement.

(xiii) If sections of bicycle paths can be accessed by vehicles (loading in excess of that specified in standard drawing DS 2012/000293), pavement thickness and, pavement and subgrade materials should be designed to withstand the vehicle loadings.

(xiv) The structural pavement and wearing surfaces layers for highway carriageways and ramps must be provided for the full carriageway width, which includes all lanes, auxiliary lanes, shoulders, outside shoulders and median shoulders. In addition, the minimum pavement structural shoulder widths detailed in RMS Part 2: Pavement Design Supplement must be met by the design. The extent of main carriageway pavements at gore areas is detailed in Figure PS341.1

(xv) The extent of rigid and flexible pavements at gore areas is detailed in Figure PS341.1 and Table PS341.1.

(xvi) Longitudinal joints between new pavement and existing pavement must not be located under new wheel paths, but should be located under new lane lines or middle of the new lane (sump line).

(xvii) Where existing rigid pavement is to be widened, the new concrete base thickness must match the existing concrete base thickness as a minimum, subject to satisfying the pavement design life requirements.

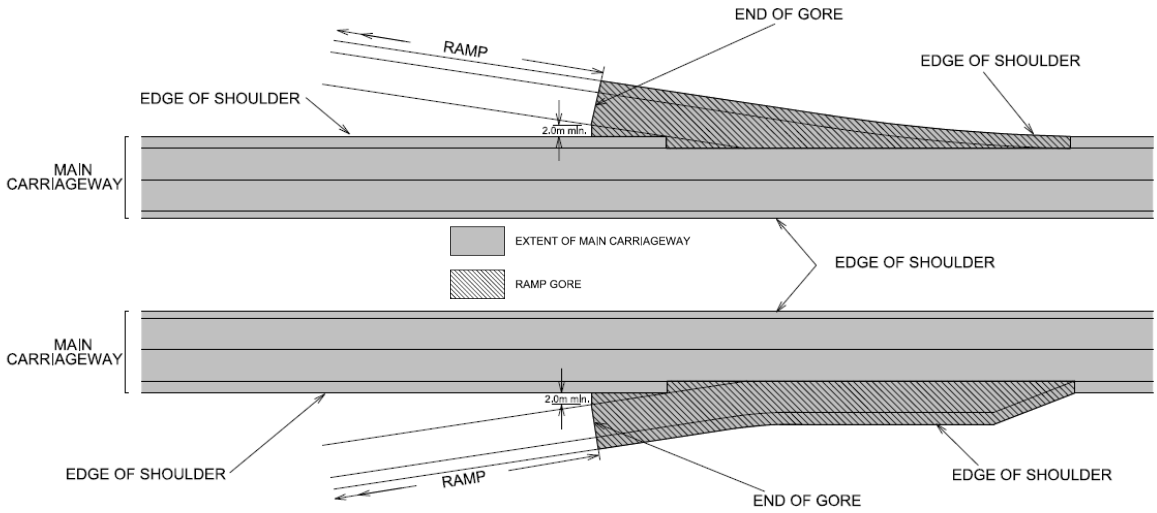

Figure PS341.1 Extent of main carriageway pavement

Table PS341.1 Pavement on ramp gore and main carriageway shoulders

Main Carriageway	Ramp Gore	Main Carriageway Shoulder
Flexible	Flexible	Same as Main Carriageway
PCP	PCP	PCP
CRCP	CRCP or PCP	CRCP or PCP
JRCP	JRCP	JRCP

2.2.4 Pavement Types

Refer to Annexure PS341/A3 for the pavement type options for each carriageway.

2.2.5 Design Traffic

Refer to Annexure PS341/A4 for the minimum traffic data and design life values to be used in the design of the main carriageway and side roads.

The PSC is to use the greater traffic loading data values of:

(i) the input data from the Traffic Impact and Access Assessment report; and

(ii) the minimum traffic data values in Annexure PS341/A4.

2.2.6 Rehabilitation Treatments of Existing Road Pavement

Refer to Annexure PS341/A2 if rehabilitation treatments are to be designed for existing pavements being retained and if deflection testing is to be obtained and utilised.

Where an existing pavement is to be retained, the existing pavement is to be assessed for its structural capacity and remaining life, and pavement rehabilitation treatments (overlays; patching; stabilisation) are to be designed to achieve the specified design life.

2.2.7 Pavement Wearing Surface

(i) Open graded asphalt surfacing must have a minimum thickness of 30 mm. Where a concrete base is provided, it must be continuously reinforced with a protection course of a minimum 25 mm thickness of dense graded asphalt under the open graded asphalt surfacing. Where an asphalt base is provided, the top layer of asphalt base must have a maximum 14 mm nominal aggregate size and a minimum 7 mm bitumen seal immediately beneath the open graded surfacing.

(ii) SMA surfacing must have a minimum thickness of 30 mm and the nominal mix size of the SMA must be 10 mm. Where a concrete base is provided, it must be continuously reinforced concrete. Where an asphalt base is provided, the top layer of asphalt base must have a maximum 14 mm nominal aggregate size.

(iii) Dense graded asphalt must not be provided as the wearing surface on Main Carriageways or Ramps pavements where the posted speed is greater than 80 km/h.

(iv) The binder in asphalt wearing surfaces on the Main Carriageways and Ramps must be an A15E binder complying with RMS 3252 Polymer Modified Binder for Pavements.

(v) Concrete with no asphalt wearing course on the Main Carriageway must be longitudinally tined unless specified in Table PS341.A2. The shoulders may be either longitudinally or transverse tined.

(vi) Concrete roundabouts must be provided with lightly broomed and transverse tined surface texture.

2.2.8 Pavement Surfacing for Noise Sensitive Areas

Refer to Annexure PS341/A7 for pavement to be designed for noise sensitive areas

Pavement surfaces in noise sensitive areas must comply with the following requirements:

(i) Where the speed zoning is above 80 km/h the pavement wearing surface must be stone mastic asphalt (SMA) or open graded asphalt or for concrete wearing surfaces, a low noise diamond grinding (subject to environmental approval).

(ii) Extend for the full width of the structural pavement.

~~2.2.9 Underground Electrical 132kV Cable Line~~

~~Underground Electrical 132kV cable lines are known to be present on this site at shallow depth. Pavement selection is to take into consideration the depth of the cables and restrictions on the construction required by the utility company.~~

2.2.10 Geotechnical Input To Pavement Design

The pavement designer is to utilise all available geotechnical data and support. The geotechnical input on existing pavement formations, from PS331, includes:

(i) Characterisation of existing pavements, their materials, structure and subgrade (from pavement cores and test pits)

(ii) Deflection survey of existing pavement to be retained and rehabilitated. Refer Annexure PS341/A2 if deflection testing is to be undertaken by the PSC or provided by RMS.

(iii) Extent and description of existing pavement failures.

(iv) Evidence of drainage issues.

(v) Establishment of the reasons for any failures of the existing pavement (where applicable) to determine whether the pavement can be incorporated into the proposed work.

(vi) Consideration of drainage issues with identification of any source of water ingress and its possible management. This should include determination of the existing moisture and drainage conditions to allow for widening/overlay of existing road embankments.

The geotechnical input on proposed pavements from PS331, includes:

(i) Determination of appropriate design subgrade CBR values for all required pavements.

(ii) Advice on specific issues relevant to pavement design including drainage requirements, subgrade support, need for bridging layers, specific requirements for fill material (including upper zone of formation), and swell/shrink characteristics of underlying materials.

(iii) An assessment of the impact of expected residual and differential settlement of any supporting foundation and its effect on the pavement choice, design and timing of construction.

(iv) Advice on alternatives, including stabilisation and the effect of high moisture content on the performance of flexible pavements including temporary pavements, tie-in areas etc.

(v) Advice on the suitability of the existing embankment to support the new pavement where existing road formations are to be retained.

(vi) Advice on the suitability of the existing embankment and pavement material for incorporation into other areas of the work.

(vii) Consideration of sources of materials required for the through carriageway of the project upgrade, service, local and temporary roads in view of the demands of adjacent projects.

2.2.11 Subsurface Drainage

This section on subsurface drainage also applies to the City of Ryde Council owned roads.

The subsurface drainage design must ensure that the pavement is maintained in a relatively constant moisture condition to ensure structural adequacy and uniformity. The design must be carried out in accordance with RMS model drawings and design reference documents, and the following criteria:

(i) A subsurface drainage system is to be provided for all pavements.

(ii) All subsurface drainage is to be drained into the stormwater drainage system.

(iii) Intercept ground water and/or springs that were identified from the geotechnical investigations.

The longitudinal and transverse interfaces between existing and new pavements must have ***interface*** subsurface drainage, when the pavements are different in composition (layer types and thicknesses). Where the widening is less than a single lane width and the pavement type for the widening is the same as the existing, the longitudinal joint between the widening and existing pavement is to be constructed such that the ***widening pavement*** layers are 'stepped' ***into the existing pavement by*** 150mm increments and an interface drain will not be required. ***An interface drain must be provided where different pavement types are proposed.***

~~**Where different pavement types are proposed for a widening then an interface drain must be provided.**~~

2.2.12 Value Management Review

Where nominated in Annexure PS341/C3 or where non-quantifiable issues are critical in the pavement selection, a value management review must be undertaken (See PS301 Value Management). This should involve a round table discussion between pavement experts and key members of the project team. Likely issues to be discussed should include:

(i) Differential settlement.

(ii) Works under traffic.

(iii) Scale of works.

(iv) Surfacing.

(v) Future road user costs.

(vi) Maintenance requirements.

(vii) Pavement drainage options.

(viii) Environmental issues (e.g. noise).

(ix) Safety.

(x) Staging of construction/constructability.

2.2.13 Detailed Pavement Design Report

You must review and update the pavement options report that was prepared during concept design as more detail becomes available during the detailed design phase of the project.

The PSC must consider the following design issues as part of their review:

(i) Full consideration to the project objectives and the requirements of this project development services brief.

(ii) All assumptions made, geotechnical input, material values adopted, methodology, sources of data, reference documents etc.

(iii) Full consideration of geotechnical conditions -refer to PS331.

(iv) Consideration of pavement drainage.

(v) Consideration of pavement construction staging requirements.

(vi) The requirements of local Council(s).

(vii) Estimated construction costs and construction times.

(viii) A whole of life analysis comparing each option for each of the pavements required.

(ix) Recommendations for each pavement category.

(x) Full details of alternative pavement options.

(xi) Risk assessment - refer to PS301.

(xii) WHS for design, construction and maintenance - refer to PS301.

(xiii) Consideration to environmental requirements including noise (refer PS311or PS312 as applicable) and any other contributing factors which support the pavement recommendations.

The PSC's detailed pavement designs must be supported by documented design calculations and the adopted design methodology.

2.2.13.1 Table of Contents

The table of contents for the detailed pavement design report should include:

(i) Introduction (including design reference documents).

(ii) Design methodology (including departures from standard)

(iii) Pavement support conditions.

(iv) Pavement drainage issues.

(v) Design traffic.

(vi) Pavement material parameters.

(vii) Pavement options (including pavement layer profiles with interface details).

(viii) Interface treatments between different pavements.

(ix) Pavement drainage options.

(x) Whole of life cost analysis and construction times.

(xi) Typical cross-sections.

(xii) Appendices containing all supporting and relevant information, including design calculations.

HOLD POINT	
Process held:	Pavement drawings
Submission details:	Detailed pavement design report
Release of hold point	The RMS Representative will release the hold point following consideration of the detailed pavement design report, incorporation of RMS comments and obtaining RMS Approval

2.2.14 Pavement Drawings

Pavement detailed design drawings are to be prepared and include, but not be limited to:

(i) Diagrammatic representation of each pavement type with full layer (including inter layer) descriptions. For example, for an asphalt pavement, show the mix type and nominal aggregate sizes and binder type.

(ii) Details of treatments at interface between different pavements and existing pavements.

(iii) Pavement type layout plans.

(iv) Pavement ***subsurface*** drainage layers and structures.

(v) Pavement edge details (including subsurface drains) for each pavement type in cut, fill and shallow embankments for relevant cross falls

(vi) Schedule of edge details by chainage

In addition, the PSC is to undertake CADD compatible design of the pavement layers and extents (to be included in a separate model) for all the various pavements required by the project. The layers are to include upper zone of formation, selected material layers, subbase and base. The pavement layers are to be shown on the cross-sections.

2.2.15 Detailed Design Drawing and Model Requirements

Refer to Annexure PS341/A for detailed design drawing and model requirements for Pavement Design.

ANNEXURE PS341/A – PROJECT SPECIFIC REQUIREMENTS

A1 PROJECT DETAILS

Table PS341.A1 – Project Details

Project Name	***Macquarie Park Bus Priority and Capacity Improvement Project - Stage 2***
Project Number	***P.0023019***
Location	***Epping Road, Herring Road, Waterloo Road and Lane Cove Road, Macquarie Park***
Local Council	***Ryde Council***
Length (size) of the project	***MR 373 Epping Road to MR 162 Lane Cove Road via Herring Road (7486) and Waterloo Road at Macquarie Park and MR 162 Lane Cove Road from Waterloo Road to Epping Road.*** ***Project length approximately 2.8km.***
Project features	• ***Upgrade of the state and local road network in the Macquarie Park precinct to improve travel times and reliability for buses and for other road users*** • ***3 new signalised intersections and upgrades to the existing signalised intersections*** • ***Installation of bus lanes and road widening with improved pedestrian and cyclist crossing facilities at signalised intersections*** • ***Partial (strip) property acquisitions along Herring Rd, Waterloo Road, Byfield St, Khartoum Rd and Lane Cove Rd to enable the road widening and intersection upgrade works*** • ***Service relocations to allow kerb relocation and lane widening***

Refer PS301: Professional Services for Detailed Design Scope and Requirements, Annexure PS301/A for project details, background and project specific requirements.

A2 PAVEMENT DESIGN REQUIREMENTS

Pavement designs are required for the following areas:

Table PS341.A2 – Pavement Design Requirement

Area	Required Y/N
~~Option 1: The PSC is to carry out traffic and transportation studies, refer to Traffic and Transportation Clauses in PS351.~~	***N***

~~Option 2: A Traffic Impact and Access Assessment will be done separate to this Contract. The final assessment report will be provided to the PSC when it becomes available. The PSC is to utilise the traffic and transportation study/report, in order to provide input to the criteria for calculations of design traffic - refer to Austroads Guide to Pavement Technology - Part 2: Pavement Structural Design~~	***N***
~~Pavement deflection survey~~	***N***
Roadway upgrade carriageways	***Y***
Pavement widening	***Y***
Rehabilitation treatments of existing pavement (including overlay; patching; stabilisation)	***Y***
Deflection survey to be provided by RMS	***Y***
Intersections/~~roundabouts.~~	***Y***
Carriageway cross overs	***Y***
Local roads (this includes any road that intersects with the main carriageway upgrade or is affected by the project works).	***Y***
Property accesses (sealed and unsealed).	***Y***
Tie-in's and temporary connections.	***Y***
Temporary pavements off-main carriageway (short & long term duration).	***N***
Temporary pavements on-main carriageway (short & long term duration).	***Y***
Cycle/pedestrian paths.	***Y***
Concrete paving of trafficable roundabout aprons, median infills etc.	***Y***
Emergency cross-overs, bus-bays, rest and truck stopping areas.	***Y***
Wearing surfaces on bridges.	***N***

Note: Subsurface drainage to the City of Ryde Council owned roads must be in accordance with section 2.2.11 of PS341

A3 PAVEMENT TYPES

Pavement types for the Macquarie Park Bus Priority and Capacity Improvement Project - Stage 2 design will be the same or similar to the pavement types in the Macquarie Park Bus Priority and Capacity Improvement Project - Stage 1 – AFC Detailed Design Report, Appendix M Pavement Design Memo.

Proposed pavement types for each road must be submitted to RMS for approval prior commencing the pavement concept design.

Pavement options are to be developed for the carriageways using the pavement types below:

Table PS341.A3 – Pavement Types

Lane Cove Road and Epping Road	Required Y/N	Waterloo Road, Herring Road and all other side roads	Required Y/N
Plain concrete (PCP).	***Y (if existing pavement is PCP)***	Plain concrete (PCP).	***Y (if existing pavement is PCP)***
Continuously reinforced concrete (CRCP).	***N***	Continuously reinforced concrete (CRCP).	***N***
Jointed reinforced concrete (JRCP).	***Y (if existing pavement is JRCP)***	Jointed reinforced concrete (JRCP).	***Y (if existing pavement is JRCP)***
Steel fibre reinforced concrete (SFRC).	**Y**	Steel fibre reinforced concrete (SFRC).	**Y**
Thick asphalt over heavily bound subbase.	**Y**	Thick asphalt over heavily bound subbase.	**Y**
Thick asphalt over lean mix concrete subbase.	**Y**	Thick asphalt over lean mix concrete subbase.	**Y**
Thick asphalt over foamed bitumen subbase.	**N**	Thick asphalt over foamed bitumen subbase.	**N**
Full depth asphalt.	**Y**	Full depth asphalt.	**Y**
Heavy duty granular with sprayed sealed wearing course.	**N**	Heavy duty granular with sprayed sealed wearing course.	**N**
Match existing pavement	**Y**	Match existing pavement	**Y**

A4 DESIGN TRAFFIC

Minimum traffic data values to be used in the design of the main carriageways and side roads are:

In accordance with the Macquarie Park Bus Priority and Capacity Improvement Project - Stage 1 pavement design traffic data. Refer to Appendix M Pavement Design Memo of the Macquarie Park Bus Priority and Capacity Improvement Project - Stage 1 – AFC Detailed Design Report. In particular refer to Appendix C Traffic Loading Calculations of the Memo for details of the design data.

Proposed pavement design data for each road must be submitted to RMS for approval prior commencing the pavement concept design.

Table PS341.A4 – Design Traffic – Herring Road, Waterloo Road, Lane Cove Road, Epping Road and all other side roads

Macquarie Park Bus Priority and Capacity Improvement Project - Stage 1 – AFC Detailed Design Report.

AADT (First year of operation: **2022**)	Derived with traffic data provided by Pavement Design Memo in Appendix M*
Percent heavy vehicles (HV %)	Obtained from Memo in Appendix M
Estimated annual growth rate	Obtained from Memo in Appendix M
Direction Factor (DF)	Obtained from Memo in Appendix M
Design period	40 years for new carriageway pavement 20 years for rehabilitated pavement
Lane distribution factor (LDF)	1.0
Estimated average HVAG per heavy vehicle (N_{HVAG})	N_{HVAG} value must be derived from the proportion of each axle group table provide in Annexure PS341/A5
Traffic load distribution table	Refer to Annexure PS341/A5 for the traffic load distribution table.
Project design reliability	95%

RMS have provided the minimum values to be used here. The PSC can come up with their own values. The PSC will need to provide details of how their values were derived.

~~**Table PS341.A4.1 – Design Traffic – Side Road(s)**~~

~~AADT (First year of operation)~~ ~~Design Year 1 – Insert Year~~	~~Side Road 1~~	~~Number Vehicles per day~~
	~~Side Road 2~~	~~Number Vehicles per day~~
	~~Side Road 3~~	~~Number Vehicles per day~~
~~Percentage heavy vehicles~~	~~Side Road 1~~	~~Insert Number~~
	~~Side Road 2~~	~~Insert Number~~
	~~Side Road 3~~	~~Insert Number~~
~~Estimated annual growth rate~~	~~Insert Number % per annum~~	
~~Estimated average HVAG per heavy vehicle~~	~~Insert Number~~	
~~Design period~~	~~20 years for Side Roads~~	
~~Lane distribution factor~~	~~Refer to Austroads Guide to Pavement Technology – Part 2~~	
~~Estimated ESA/HVAG~~	~~Insert Number~~	
~~Traffic load distribution table~~	~~Refer to Annexure PS241/A5 for the traffic load damage index table.~~	

~~Project design reliability~~	~~Refer to Roads and Maritime Supplement to Austroads Guide to Pavement Technology - Part 2.~~

- ~~RMS have provided the minimum values to be used here. The PSC can come up with their own values. The PSC will need to state the assumptions made and provide details of how their values were derived. .~~

A5 TRAFFIC LOAD DISTRIBUTION TABLE

Roads and Maritime has provided minimum values below. The PSC can derive their own values and provide details of how their values were derived.

Table PS341.A5 – Traffic Load Distribution Table

Axle Group Load (kN)	SAST (%)	SADT (%)	TAST (%)	TADT (%)	TRDT (%)	QADT (%)
10	0.2804	3.4730	0.0354	0.1444	0.0050	0.0000
20	7.8270	8.6960	0.2377	0.5755	0.1568	0.0000
30	15.4600	23.4600	0.2763	0.6242	0.3290	0.0000
40	15.7100	21.9300	0.5755	1.9770	1.3170	0.0000
50	29.9400	16.8000	2.8890	6.4960	4.1670	0.0000
60	23.2900	9.6060	10.2700	9.5110	7.4190	0.0000
70	6.5020	6.5000	16.8100	10.9400	9.7770	0.0000
80	0.7943	4.6230	16.6100	9.7690	8.3380	0.0000
90	0.1087	2.9690	15.9500	7.6110	6.1500	0.0000
100	0.0354	1.3930	14.4200	7.2420	5.0290	0.0000
110	0.0174	0.4098	9.7740	6.2670	3.7010	0.0000
120	0.0174	0.1158	5.9030	5.9520	3.2980	0.0000
130	0.0174	0.0244	2.9430	5.8780	3.1470	0.0000
140	0.0000	0.0000	1.5390	6.5340	3.3610	0.0000
150	0.0000	0.0000	0.8439	8.0300	4.0080	0.0000
160	0.0000	0.0000	0.4279	5.7170	4.1150	0.0000
170	0.0000	0.0000	0.2308	3.5540	4.8190	0.0000
180	0.0000	0.0000	0.1367	1.8630	6.0970	0.0000
190	0.0000	0.0000	0.0723	0.8535	7.7330	0.0000
200	0.0000	0.0000	0.0555	0.3331	8.4330	0.0000
210	0.0000	0.0000	0.0000	0.0801	5.1360	0.0000
220	0.0000	0.0000	0.0000	0.0322	2.3390	0.0000

Axle Group Load (kN)	SAST (%)	SADT (%)	TAST (%)	TADT (%)	TRDT (%)	QADT (%)
230	0.0000	0.0000	0.0000	0.0160	0.7764	0.0000
240	0.0000	0.0000	0.0000	0.0000	0.2503	0.0000
250	0.0000	0.0000	0.0000	0.0000	0.0905	0.0000
260	0.0000	0.0000	0.0000	0.0000	0.0080	0.0000
270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
280	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
290	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
380	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
390	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

The proportion of each axle group (for Table PS341.A5) must be:

SAST	SADT	TAST	TADT	TRDT	QADT
0.3930	0.1910	0.0090	0.2590	0.1480	0.0000

~~**Table PS241.A5.1 Traffic Load Damage Index Main Carriageway**~~

~~Damage Index~~	~~Value~~
~~N_{HVAG}~~	~~#~~
~~ESA/HVAG~~	~~#~~
~~SAR5/ESA~~	~~#~~
~~SAR7/ESA~~	~~#~~
~~SAR12/ESA~~	~~#~~

~~**Table PS241.A5.2 Traffic Load Damage Index Side Roads**~~

~~**Damage Index**~~	~~**Value**~~
~~N_{HVAG}~~	~~#~~
~~ESA/HVAG~~	~~#~~
~~SAR5/ESA~~	~~#~~
~~SAR7/ESA~~	~~#~~
~~SAR12/ESA~~	~~#~~

A6 DETAILED DESIGN DRAWING AND MODEL REQUIREMENTS

Table PS341.A6 - Pavement Detail Requirements

Element	Depicted on the drawings Y/N	Included in the Model Y/N	Element	Depicted on the drawings Y/N	Included in the Model Y/N
Pavement Design					
Pavement profiles (including subgrade conditions)	Y	Y			
Pavement plans	Y	Y			
Edge details (each pavement type for fill, cut, shoulder and embankments)	Y	Y			
Interface drain details	Y	Y	**Pavement maintenance requirements (diaries)**	N	N
Subsurface drainage plan	Y	N			

A7 PAVEMENT TO BE DESIGNED FOR NOISE SENSITIVE AREAS

Table PS341.A7 – Pavement to be designed for noise sensitive areas

Road Name	Chainage from	Chainage to
TBC by PSC		

ANNEXURE PS341/B – PAYMENT

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the **Pay Item(s) in PS301.**

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the work.

ANNEXURE PS341/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS, DELIVERABLES, MEETINGS AND WORKSHOPS

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

The PSC must give the RMS Representative at least five working days written notice prior to reaching any hold point for which a release by the RMS Representative is required. Only items with a **Y** are required for this project.

Table PS341.C1 – Hold Point Requirements

Clause	Type	Description	Required
2.2.13	Hold	Finalisation of the detailed design	Y

C2 SCHEDULE OF DELIVERABLES AND SUBMISSION DETAILS

The PSC must give the RMS Representative at least ten working days to review all deliverables identified in the table below. Only items with an **Y** are required for this project.

Table PS341.C2 – Deliverables and Submission Details

Section	Description of Deliverables	Delivery timeframe	Required Y/N
2.2.13	Detailed Pavement Design Report	To be included in the ~~20%~~ 50%, 80%, 100%, and IFC stages as a component of the Detailed Design Report.	Y
2.2.14	Detailed pavement drawings	To be included in the ~~20%~~ 50%, 80%, 100% and IFC stages as a component of the Detailed Design Drawings Submissions.	Y

C3 SCHEDULE OF MEETINGS REQUIRED

Refer to PS301/A and PS301/C for meeting and workshop requirements

Table PS341.C3 – Meeting Requirements

Clause	Description of Workshops	Required	Location	Expected Duration	Required Y/N
	Refer PS301/A and PS301/C				~~Y~~

C4 SCHEDULE OF WORKSHOPS REQUIRED

Refer to PS301/A and PS301/C for meeting and workshop requirements

Table PS341.C4 – Workshop Requirements (Refer PS301)

Clause	Description of Workshops	Required	Location	Expected Duration	Required Y
	Refer PS301/A and PS301/C				Y

ANNEXURES PS341/D TO PS341/L – NOT USED

ANNEXURE PS341/M – REFERENCE DOCUMENTS & SUPPORTING INFORMATION

M1 DESIGN REFERENCE DOCUMENTS

Refer to clause 1.4.2

RMS Technical Directions and Quality Alerts

All

RMS Design Guides

RMS Austroads Guide Supplement – Austroads Guide to Pavement Technology Part 2: Pavement Structural Design

TP-GDL-012 Concrete Roundabout Pavements – A Guide to their Design and Construction 2004.

P-G-001 Technical Guide – Standard Pavement Subsurface Drainage Details 30 June 2014

P-G-002 Technical Guide – Typical Pavement Profiles

13.371 Guide for design of concrete pavements in areas of settlement July 2013

TD 2006/06 Technical Direction - Surface Friction – Bituminous Specification Options December 2006

RMS Standard Drawings

MD.R83.CC Continuously Reinforced Concrete Pavement - CRCP

MD.R83.CP Series CP - Plain Concrete Pavement – PCP

MD.R83.CJ Jointed Reinforced Concrete Pavement – JRCP

DS2013/001895 Steel Fibre Reinforced Concrete Pavement (SFCP) for Roundabouts

00.PT.0010 to 14 Standard Pavement Subsurface Drainage Details Volumes 1-6

DS2013/001838 Volume MP - Plain Concrete Pavement PCP

DS2014/005043 Volume MC - Continuously Reinforced Concrete Pavement – CRCP

DS2013/001890 Volume MJ - Jointed Reinforced Concrete Pavement – JRCP

DS2012/001329 Asphalt Volume 1 – New Construction

DS2012/001329 Asphalt Volume 2 - Maintenance

DS2013/00067 Typical Pavement Profiles

DS2012/000293 Bicycle Path Design – Sub plan and Details July 2013

RMS Specifications

All

Austroads Guides

Guide to Pavement Technology Part 2; Pavement Structural Design (2012)

Guide to Pavement Technology Part 5; Pavement Evaluation and Treatment Design (2011)

Australian Standards

All relevant

Software Programs

CIRCLY – Computer Program for Analysis of Multiple Complex Circular Loads on Layered Anisotropic media (Wardle, 1977) Geomechanics Computer Program Version 5.0 or later.

City of Ryde Council

All Standard Drawings and Specifications for local roads

M2 REFERENCE DOCUMENTS

Refer to clause 1.4.2

M3 SUPPORTING INFORMATION

Refer to clause 1.4.2