Muswellbrook Shire Council

CONSTRUCTION SPECIFICATION

AUS-SPEC (Cot 09)

1141 Flexible Pavements

Version 01

Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
0	No amendment has been made	all	Nil		14 June 2012

Contents

1141 FLEXIBLE PAVEMENTS

1 GENERAL

1.1 RESPONSIBILITIES

Objectives

General: Provide flexible and semi-rigid (bound) pavements comprising supply, spreading, compaction and trimming of base and subbase courses.

Performance

Requirements: Construct pavements to the specification and plan dimensions, levels and thicknesses shown on the drawings.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *0152 Schedule of rates – supply projects.*
- *0161 Quality (Construction) or 0167 Integrated management.*
- *0179 General requirements (Construction).*
- *1101 Control of traffic.*
- *1113 Stabilisation.*
- *1143 Sprayed bituminous surfacing.*

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1141	Methods for sampling and testing aggregates.
AS 1141.3 – 1996	Sampling - aggregates
AS 1141.14-2007	Particle shape, by proportional calliper.
AS 1141.22-2008	Wet/dry strength variation.
AS 1289	Methods of testing soils for engineering purposes.
AS 1289.3.1.1-2009	Soil classification tests - Determination of the liquid limit of a soil - Four point Casagrande method.
AS 1289.3.3.1-2009	Soil classification tests - Calculation of the plasticity index of a soil.
AS 1289.3.6.1-2009	Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving.
AS 1289.3.6.3-2003	Soil classification tests - Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer.
AS 1289.5.2.1-2003	Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort.
AS 1289.5.3.1-2004	Soils compaction and density tests - Determination of the field density of a soil - Sand replacement method using a sand cone pouring apparatus.
AS 1289.5.4.1-2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
AS 1289.5.8.1-2007	Soil compaction and density tests - Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge - Direct transmission model.
AS 1289.6.1.1-1998	Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen.

Other publications

AUSTROADS

Austroads 2008	Glossary of Austroads terms
AGPT03 – 2009	Guide to Pavement Technology Part 3 - Pavement surfacings
AGPT04A – 2008	Guide to Pavement Technology Part 4A: Granular base and subbase materials
AGPT04D – 2006	Guide to Pavement Technology Part 4 D: Stabilised materials
NSW Department of Environment and Climate Change	
Resource NSW 2003	Specification for the supply of recycled materials for pavements, earthworks and drainage.
RTA Test Methods	
T114: 2007	Maximum dry compressive strength of road construction materials.
T116: 2007	Unconfined compressive strength of remoulded road construction materials.
T130: 2007	Dry density - moisture relationship for mixtures of road construction materials (blended in the laboratory with cementitious binders).
T131: 2009	Unconfined compressive strength of road construction (blended in the laboratory with cementitious binders) materials.
T160: 2009	Benkelman beam deflection test – Deflect Measurement (Portable Beam).
T171: 2009	Modified Texas triaxial compression test pavement materials.

1.4 INTERPRETATIONS

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply.

- CBR: California bearing ratio.
- DGB: Densely graded base.
- DGS: Densely graded subbase.
- ESA: Equivalent standard axle.
- GMB: Graded macadam base.
- GMS: Graded macadam subbase.
- NATA: National Association of Testing Authorities.
- NGB: Natural gravel base.
- NGS: Natural gravel subbase.
- UCS: Unconfined compressive strength.

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Base: Materials designated as ‘base’ require the provision of a wearing surface comprising either a sprayed bituminous seal or asphalt up to 50 mm thick.
- Bound material: Bound material incorporates a binder to produce structural stiffness.
- Flexible pavement: A flexible pavement consists of a base and a subbase constructed of unbound materials.
- Modified material: Modified material incorporates small amounts of stabilising binder to improve the properties of the material without significantly affecting structural stiffness.
- Pozzolan: A siliceous or alumino siliceous material, which in itself possesses little or no cementitious value but which in finely divided form may be mixed with lime or Portland cement to form a cementitious material.
- Semi-rigid pavement: A semi-rigid pavement is one where the base and/or the subbase are constructed of bound materials.
- Subbase: Materials designated as ‘subbase’ require a covering course of ‘base’. The subbase may consist of one or more layers.

1.5 SUBMISSIONS

Acceptance criteria

General: All submissions will be subject to the approval of the Superintendent.

Documents

Submit the following for approval:

- Design:

  . Proposed constituents of the base and subbase.
  . Pavement plan include schedule for traffic categories and materials proposed.
- Drawings: Sectional plan showing lots and sequence.
- Calculations: Material components and procedures for blending and survey.
- Execution details:
  . Alternative plant or process.
  . Survey reports.
- Materials:
  . Delivery dockets for constituents and bound material.
  . Proposed NATA test results for constituents of the base and subbase.
  . Moisture content.
  . Finished levels survey.
  . Dry density test results.

1.6 INSPECTION

Notice

General: Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause title/Item	Requirement	Notice for inspection	Release by
PRE-CONSTRUCTION PLANNING			
Activity Plan	Prepare and submit activity plan	4 weeks prior to commencing site work	Superintendent
Design and control of base and subbase materials			
Nominated base and subbase	Prepare and submit schedule of traffic categories and proposed materials	2 weeks before ordering materials	Superintendent
Nominated base and subbase	Details of all constituents including sources, type and proportions	14 days before ordering materials	Superintendent
Nominated base and subbase	Bound materials require Annexure A of *1113 Stabilisation*	14 days before ordering materials	Superintendent
Variations to approved mixes	Any changes to approved materials	5 days prior to use in works	Superintendent
Inspection, sampling and testing			
General	Written notice for testing times and provide test results	3 working days prior to testing or inspection	Superintendent
MATERIALS			
Lime modified base and subbase materials			
Lime modification	Proposals to modify materials	14 days before placing	Superintendent
EXECUTION			
Delivery and stockpiling of pavement material			
Delivery of modified or bound materials	Availability of delivery dockets to Superintendent	Upon delivery before placing	Superintendent
Spreading pavement materials			
Underlying layer quality	Suitability of previous layer for work to proceed	1 working day before placing next layer	Superintendent

Clause title/Item	Requirement	Notice for inspection	Release by
Spreading	Approval to exceed allowable conditions	1 working day before placement	Superintendent
Trimming. compaction and curing			
Compaction procedure	Completion of testing of previous layer	1 working day before next layer	Superintendent
Acceptance of compaction			
Relative compaction using in-situ dry density	Notice of testing and submission of results	1 working day before and after testing	Superintendent
Compaction requirement and acceptance	Acceptance of compaction within the tolerances	1 working day after test results	Superintendent
Compaction requirement and acceptance	Rejected lots identified	1 working day after test results	Superintendent
Reworking of rejected unbound layers	Rejected material identified	Upon reworking	Superintendent
Acceptance of dimensions and levels			
General tolerances	Survey reports for lots, levels and lines	1 working day before next activity	Superintendent
Pavement width	Reject or accept as per tolerances	1 working day before next activity	Superintendent
Surface level and deviation	Reject or accept as per tolerances	1 working day before next activity	Superintendent
Action on rejection – Unbound materials	Approval of removal and replacement	1 working day before next activity	Superintendent
Action on rejection – Bound materials	Proposal to regrade subbbase and/or base coursecourse	3 working days before next activity	Superintendent
Action on rejection – Bound materials	Approval of removal and replacement	1 working day before next activity	Superintendent
Removal and replacement of rejected courses			
Extent to be removed	Inspection to evaluate the minimum extent	1 working day before next activity	Superintendent
Replacement	Present for inspection the underlaying material	1 working day before next activity	Superintendent
Maintenance before completion of wearing surface			
Deterioration of pavement condition before primerseal	Re-prepare and submit for inspection	3 working days before next activity	Superintendent
Opening bound pavement to traffic	Bound pavement not open to traffic for minimum 7 days after completion	3 working days before proposed opening	Superintendent

Summary of WITNESS POINTS – Off-site activities

Clause title/Item	Requirement	Notice for inspection
PRE-CONSTRUCTION PLANNING		
Design and control of base and subbase - Certificates of compliance	NATA Certificate of Compliance	14 days before placing material
MATERIALS		

Clause title/Item	Requirement	Notice for inspection
Unbound base and subbase material - Modified Texas triaxial classification	Submission of additional test data for approval	14 days before ordering material
Bound base and subbase materials - General	Verify product constituents conform to tables prior to stabilisation	7 days before ordering material
Bound base and subbase materials - Semi-rigid pavement base	Alternative stabilisation methods approval	7 days before ordering

Summary of WITNESS POINTS – On-site activities

Clause title/Item	Requirement	Notice for inspection
EXECUTION		
Delivery and stockpiling of pavement material		
Transport of materials	Materials moisture content and quality inspection	Progressive
Delivery of modified or bound materials	Vehicle covers to preserve moisture content.	Progressive
Stockpiling of unbound materials	Approval of location	14 days before stockpiling
Stockpiling of unbound materials	Check stockpiles for segregation or foreign matter	Progressive
Stockpiling of unbound materials	Restore condition of stockpile site at completion of work	Progressive
Stockpiling of unbound materials	Sample stockpiles and NATA compliance certificates	Within 3 working days after stockpiling
Trimming, compaction and curing		
Compaction	Measurement of levels and thickness of pavement	Progressive
Compaction procedure	Approval of alternative compaction method	Progressive
Compaction procedure	Recompaction and trimming of wet layer	Progressive
Curing of bound materials	Method of curing	Progressive
Acceptance of compaction		
Relative compaction using insitu dry density	In-situ dry density test by single probe Nuclear Density meter approval required	1 working day before testing
Benkelman beam testing	Approval to use the Benkelman beam test method	1 working day before testing
Acceptance of dimensions and levels		
Action on rejection – Unbound materials	Approval of further trimming and corrective action	1 working day before trimming
Removal and replacement of rejected courses - Replacement	Protect adjacent work and make good any damage	1 working day before removal
Maintenance before completion of wearing surface		
Primerseal	Cover base course with primer seal	Within 7 days of acceptance
Restrictions on movement	Restrictions on access to construction plant and other	Progressive

Clause title/Item	Requirement	Notice for inspection
	vehicles	

2 PRE-CONSTRUCTION PLANNING

2.1 ACTIVITY PLAN

General

Program: Plan the following activities:

- Provide planning resources to allocate plant and personnel for the contract period.
- Program the work to meet the constraints of **HOLD POINTS** and **WITNESS POINTS**.

Pavement plan

Requirements: Prepare and submit a Pavement plan for the flexible pavement construction consistent with the drawings and subject to direction by the Superintendent. Include the following:

- A time based program to conform with Contract constraints.
- Site availability, assumptions on weather, plant and materials.
- A list of activities requiring approvals of local authorities, statutory bodies, and local residents.
- Off-site storage of plant, personnel and maintenance facilities.
- On-site accommodation of personnel and communication facilities.

This is a **HOLD POINT**.

2.2 TRAFFIC CATEGORY

Pavement material traffic category

Traffic category: As shown on the drawings.

Materials: Pavement materials are specified in terms of the Traffic Categories given in table below for the calculated design traffic of the pavement.

Pavement and material traffic categories table

Pavement material traffic category	Description
1	Roads with design traffic equal to or exceeding 10^7 equivalent standard axle (ESA) repetitions.
2a	Roads with design traffic exceeding 4×10^6 ESAs but less than 10^7 ESAs.
2b	Roads with design traffic exceeding 10^6 ESAs but less than or equal to 4×10^6 ESAs.
2c	Roads with design traffic exceeding 10^5 ESAs but less than or equal to 10^6 ESAs.
2d	Roads with design traffic less than or equal to 10^5 ESAs.

2.3 DESIGN AND CONTROL OF BASE AND SUBBASE MATERIALS

Nominated base and subbase

Schedule: Compile and submit a schedule of traffic categories for each section of the work as shown on the drawings and the nominated materials for approval. This is a **HOLD POINT**.

Nominated materials: Submit for approval at least 14 days before commencement of work, details of all constituents of the proposed base and subbase materials, including sources of supply and the proposed type and proportion of any binder. This is a **HOLD POINT**.

Bound material: If the proposed base or subbase is a bound material, submit a completed Annexure A of *1113 Stabilisation.* This is a **HOLD POINT**.

Certificates of compliance

Tests: Support these details with test results from a NATA registered laboratory confirming that the constituents conform to the requirements of this worksection. This is a **WITNESS POINT**.

Approved base and subbase

Approved base and subbase: Once the Nominated materials has been approved, it is known as the 'approved base and subbase'.

Identical material: To avoid testing the nominated materials, submit results from earlier testing of base and subbase identical with the nominated material for approval.

Prior approval: A nominated base or subbase may be approved due to 'prior approval' under the following conditions;

- If the base or subbase was used in a separate contract within 12 months of proposed works date.
- If full approved details have been previously used.
- If the constituent materials and quality remain unchanged from that previously approved.
- If the in-service performance of the base or subbase incorporating the nominated materials is acceptable.

Variations to approved materials

Written approval required: Any changes to the approved materials or source of supply of constituents, require written approval 5 days prior to delivery of any material. This is a **HOLD POINT**.

Non-conformance: Any change to the approved mix, without prior written approval will be considered a non-conforming material and may become Rejected.

Costs: Borne by the Contractor for compliance testing or non-conformance.

2.4 INSPECTION, SAMPLING AND TESTING

General

Extent: Undertake inspection, sampling and testing of the pavement before, on delivery, during and after the construction of the pavement to conform with this worksection.

Accreditation: All testing to be carried out by a NATA registered laboratory with appropriate accreditation and suitably qualified personnel.

Notice: Provide the Superintendent with written notice when testing is being carried out and copies of all test reports for approval to proceed. This is a **HOLD POINT.**

3 MATERIALS

3.1 UNBOUND BASE AND SUBBASE MATERIALS

General

Standard: To AGPT04A.

Sampling and testing: To AS 1289 and AS 1141.

Granular material

Unbound material: Consists of granular material, it may include blends of two or more granular materials.

Production: Materials may be produced by crushing plant or naturally occurring granular materials. Methods, assessments and properties to conform to this worksection and Austroads AGPT 04A.

Properties: When compacted does not develop significant structural stiffness, is uniform in grading and physical characteristics.

Acceptability: Conform to the following table;

Acceptable pavement material types table

Traffic category	Acceptable base material	Acceptable subbase material
1	DGB20, GMB20	DGS20, DGS40, GMS40
2a	DGB20, GMB20	DGS20, DGS40, GMS40
2b	DGB20, GMB20	DGS20, DGS40, GMS40
2c	DGB20, GMB20, NGB20-2c	DGS20, DGS40, GMS40, NGS20, NGS40
2d	DGB20, GMB20, NGB20-2c, NGB20-2d	DGS20, DGS40, GMS40, NGS20, NGS40

Crushed rock

Designation: Unbound crushed rock materials are designated as follows:

- DGB20: 20 mm nominal sized densely graded base.
- DGS20: 20 mm nominal sized densely graded subbase.
- DGS40: 40 mm nominal sized densely graded subbase.
- GMB20: 20 mm nominal sized graded macadam base.
- GMS40: 40 mm nominal sized graded macadam subbase.

Natural gravel

Designation: Unbound natural gravel materials are designated as follows:

- NGB20-2c: 20 mm nominal sized natural gravel base for Traffic Category 2c.
- NGB20-2d: 20 mm nominal sized natural gravel base for Traffic Category 2d.
- NGS20: 20 mm nominal sized natural gravel subbase.
- NGS40: 40 mm nominal sized natural gravel subbase.

Unbound base material properties

Base materials: Conform to the following table;

Unbound base material properties table

Test method	Description	Base Material Requirements			
		DGB20	**GMB20**	**NGB20-2c**	**NGB20-2d**
AS 1289.3.6.1	Coarse Particle Size Distribution % passing 75.0 mm sieve % passing 53.0 mm sieve % passing 37.5 mm sieve % passing 26.5 mm sieve % passing 19.0 mm sieve % passing 13.2 mm sieve % passing 9.5 mm sieve % passing 6.7 mm sieve % passing 4.75 mm sieve % passing 2.36 mm sieve % passing 0.425 mm sieve % passing 0.075 mm sieve	 — — — 100 95–100 — — 50–70 — 35–55 — —	 — — — 100 95–100 — — 30–55 — 20–30 — —	 — — — 100 93–100 — 71–87 — 47–70 35–56 14–32 6–20	 — — — 100 93–100 — 71–87 — 47–70 35–56 14–32 6–20
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)				
	A. Pass 425 µm sieve %	35–55	30–50	—	—
	B. Pass 75 µm sieve % Pass 425 µm sieve	35–55	30–50	—	—
	C. Pass 13.5 µm sieve % Pass 75µm sieve	35–60	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic) *	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plasticity Index †	max 6	max 6	max 6	max 8
T114	Maximum Dry Compressive Strength on fraction passing 19 mm sieve (only applies if Plasticity Index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper - % misshapen (2 : 1)	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength‡				
	For category 1 or 2a For category 2b or 2c	min 80 min 70	min 150 min 130	— —	— —

Test method	Description	Base Material Requirements			
		DGB20	**GMB20**	**NGB20-2c**	**NGB20-2d**
	For category 2d	min 60	min 100	—	—
AS 1141.22	Wet/Dry Strength Variation‡				
	((Dry—Wet)/Dry) %				
	For category 1 or 2a For category 2b or 2c For category 2d	max 35 max 40 max 45	max 30 max 30 max 30	— — –	— — –
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	Min 100%	Min 100%	Min 80%	Min 60%

NOTES:
Material consisting of rounded river stone to have a minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm.
* The maximum value of the Liquid Limit may be increased to 23 for non-plastic material, provided that the value determined is not influenced by the presence of adverse constituents.
† For category 2d base materials the maximum Plasticity Index is 8.
‡ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need testing unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

Unbound subbase material properties
Subbase materials: Conform to the following table;

Unbound subbase material properties table

Test method	Description	Subbase material requirements				
		DGS20	**DGS40**	**GMS40**	**NGS20**	**NGS40**
AS 1289.3.6.1	Coarse particle size distribution					
	% passing 75.0 mm sieve	—	—	—	—	—
	% passing 53.0 mm sieve	—	100	100	—	100
	% passing 37.5 mm sieve	—	—	—	—	95-100
	% passing 26.5 mm sieve	100	—	—	100	80-97
	% passing 19.0 mm sieve	95–100	50–85	50–75	96–100	—
	% passing 13.2 mm sieve	—	—	—	—	—
	% passing 9.5 mm sieve	—	—	—	65-89	48-85
	% passing 6.7 mm sieve	50-70	30-55	15-35	—	—
	% passing 4.75 mm sieve	—	—	—	47–80	35–73
	% passing 2.36 mm sieve	35–55	25–50	5–15	32–67	25–58
	% passing 0.425 mm sieve	—	—	—	14–42	10–33
	% passing 0.075 mm sieve	—	—	—	6–26	3–21
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)					
	A. Pass 425 µm sieve %	35–55	35–60	25–50	—	—
	B. Pass 75 µm sieve % Pass 425 µm sieve	35–55	35–60	25–50	—	—
	C. Pass 13.5 µm sieve % Pass 75 µm sieve	35–60	35–65	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic)	max 23	max 23	—	max 23	max 23
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	—	max 23	max 23
AS 1289.3.3.1	Plasticity Index	max 12	max 12	max 12	max 12	max 12
T114	Maximum Dry Compressive	min	min	—	1.0 MPa	1.0 MPa

Test method	Description	Subbase material requirements				
		DGS20	**DGS40**	**GMS40**	**NGS20**	**NGS40**
	Strength on fraction passing 19 mm sieve (only applies if Plasticity Index is less than 1)	1.0 MPa	1.0 MPa			
AS 1141.14	Particle Shape by Proportional Calliper - % misshapen (2:1)	max 35	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength*	min 50 kN	min 50 kN	min 130 kN	—	—
AS 1141.22	Wet/Dry Strength Variation*					
	((Dry—Wet)/Dry) %Dry	max 60	max 60	max 30	—	—
AS 1289.6.1.1	4 day Soaked CBR (94% Modified Compaction)	Min 50%	Min 50%	Min 50%	Min 30%	Min 30%

NOTES:
Material consisting of rounded river stone to have a minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm.
* All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need testing unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

Modified Texas triaxial classification

Alternative: The Contractor may propose unbound base or subbase material that conforms to the requirements of the relevant tables above, except the gradings (AS 1289.3.6.1 and AS 1289.3.6.3).
Method: RTA T171 or appropriate documentation from relevant state or local authority.

Requirements: Specified in the relevant **RTA Modified Texas triaxial classification number requirements table** below.

T171 tested: Not less than 85% of Optimum Moisture Content and 98% of Maximum Dry Density as determined by AS 1289.5.2.1.

Proposed material: Submit the proposed material and the proof of modified Texas triaxial classification and tests associated for approval to conform with the **Nominated materials**. This is a **WITNESS POINT**.

RTA Modified Texas triaxial classification number requirements table

Traffic Category	Modified Texas Triaxial Classification Number (Test Method T171)	
	Base	**Subbase**
1	max 2.0	max 2.5
2a	max 2.2	max 2.5
2b	max 2.5	max 3.0
2c	max 3.0	max 3.0
2d	max 3.0	max 3.0

3.2 LIME MODIFIED BASE AND SUBBASE MATERIALS

Lime modification

Approval: Submit for approval a proposal for the addition of hydrated lime or quicklime to modify unbound base and subbase materials to meet the requirements of **Unbound base and subbase**.

This is a **HOLD POINT**.

Modified material: After modification, the material must meet the requirements of **Unbound base and subbase**.

Traffic Categories 1, 2a, 2b: Modify materials by only the use of hydrated lime mixed in a stationary mixing plant at the supplier's quarry.

Traffic Categories 2c, 2d: Modify materials by the use of either hydrated lime through a stationary mixing plant or by hydrated lime or quicklime utilising in-situ operations.

Lime: Material requirements of Hydrated lime and quicklime to *1113 Stabilisation*.

Stationary mixing plant: Incorporate lime through the stationary mixing plant and mix the lime uniformly through the material.

In-situ Operations: Method to 1113 Stabilisation.

Prior to lime treatment: The material must not contain any added pozzolanic material.

Proportion of Lime: Not less than 1.5% nor more than 4% by mass.

Unconfined compressive strength: Lime treated material must yield an UCS < 1.0 MPa, when tested with RTA Test Method T116 (or appropriate documentation from relevant state or local authority). Sampling must be within 24 hours of adding the lime and testing after 7 days accelerated curing.

DGB20 material: Prior to treatment with lime, must conform to the requirements of DGS20 in the **Unbound subbase material properties table** and the following:

- Aggregate wet strength > 80 kN.
- Wet/dry strength variation < 60%.

DGB20 material: Following lime treatment the material must yield a CBR value of not less than 100 when tested to AS 1289.6.1.1. Sampling within 24 hours of adding the lime and testing after 7 days of accelerated curing.

3.3 BOUND BASE AND SUBBASE MATERIALS

General

Material requirements prior to stabilisation: Subbase and base to conform to the requirements of the Unbound subbase (or base as required) material properties table for the appropriate Traffic Category. This is a **WITNESS POINT**.

Stabilising agent: Materials and process to Austroads AGPT04D and *1113 Stabilisation*.

Semi-rigid pavements base

Traffic Categories 1, 2a, 2b: Bound material for base layer supplied as a crushed rock product with stabilising agent incorporated in a stationary mixing plant (pugmill) at the supplier's quarry.

Stabilisation agent: Alternative method for incorporation of stabilising agent must be prior approved. This is a **WITNESS POINT**.

Subbase or base

Traffic Categories 2c, 2d: Supply bound material as a crushed rock product with stabilising agent incorporated in a pugmill or produced by the in-situ stabilisation of natural or blended gravel undertaken by mobile plant at the site.

Unconfined compressive strength

Testing: The UCS of the material must be between 4 MPa and 10 MPa. Sampled within 1 hour of the incorporation of the stabilisation agent and tested to RTA Test Method T131 (or appropriate documentation from relevant state or local authority) after seven days accelerated curing.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

General

Control of traffic: Conform to the following:

- Conform with *1101 Control of traffic*.
- Conform with Traffic Guidance Scheme in *1101 Control of traffic*.

4.2 DELIVERY AND STOCKPILING OF PAVEMENT MATERIAL

Transport of materials

Delivery vehicles: Constructed to ensure that loss of material does not occur.

Condition: Supply materials sufficiently damp to avoid segregation and loss of fines during transit.

Moisture content: Uniformly distributed so that the moisture content is < the optimum moisture content (determined by either RTA T111, RTA T162 or appropriate documentation from relevant state or local authority). Alternatively the moisture content may be specified by the Superintendent ± 0.5%.

Delivery: Inspection of the delivered materials provided for approval. This is a **WITNESS POINT**.

Delivery of modified or bound materials

Vehicle covers: Make deliveries in vehicles fitted with fabric covers to prevent loss of moisture during transport, unless otherwise approved by the Superintendent. This is a **WITNESS POINT**.

Time limit: Program the delay between mixing and delivery by trucks to the site to allow incorporation into the works including trimming and compaction within the nominated field working period.

Delivery dockets: Identify each truck load of bound material by delivery dockets, indicating the time and date of mixing and registration or fleet number of the delivery truck. Submit delivery dockets at the point of delivery. This is a **HOLD POINT**.

Bound materials: To *1113 Stabilisation*.

Stockpiling of unbound materials

Stockpile sites: Locate stockpile sites as shown on the drawings or as approved. This is a **WITNESS POINT.**

Condition: Clear stockpile sites of all vegetation and extraneous matter, and shape to form a crown to drain freely. Compact the whole area to a relative compaction, determined by AS 1289.5.4.1 for standard compactive effort > 95%.

Stockpiles total height: < 4 m.

Shape of batter: Uniform shape with side slopes not steeper than 1.5 horizontal to 1.0 vertical or flatter than 3.0 horizontal to 1.0 vertical.

Segregation of materials: Maintain stockpiles and stockpile sites to ensure stockpiled materials do not become intermixed or contaminated with foreign material. This is a **WITNESS POINT**.

Maintain: The stockpiled material at a moisture content sufficiently damp to avoid loss of fines.

Restoration: At the completion of the works, clear stockpile sites of all surplus material and leave in a clean and tidy condition. This is a **WITNESS POINT**.

Sampling: Sample site stockpiles within 3 days of delivery to AS 1141.3 and as directed by the Superintendent. NATA compliance certificates must be provided for verification. This is a **WITNESS POINT**.

4.3 SPREADING PAVEMENT MATERIALS

Underlying layer quality

Condition: The underlying layer must have a moisture content < 90% of the laboratory optimum moisture content as determined by AS 1289.5.2.1. It must not be rutted or mixed with foreign matter.

Non-conforming underlying layer: The underlying layer will be deemed non conforming if the condition does not conform with the condition above.

Inspection: Prior to any spreading of pavement materials inspect the underlying layer quality with the Superintendent for approval or direction to rectify non-conforming underlying layer or variation to provide an appropriate underlying layer. This is a **HOLD POINT**.

Correction: If the activities of the Contractor cause the underlying layer, constructed by the Contractor or others, to become non-conforming to this worksection, correct the underlying layer to conform to this worksection at the Contractor's cost.

Alternative: A direction may be given by the Superintendent to correct the underlying layer if it was not at the fault of the Flexible pavement Contractor. This would then become a variation to the contract.

Spreading

Joints: At all work boundaries in bound materials provide vertical faces for transverse and longitudinal joints.

Moisture content : Base or subbase materials must be in the range of 60–90% of laboratory optimum moisture content to AS 1289.5.2.1 when spread for compaction.

Ambient air temperature: Do not spread bound materials when the ambient air temperature in shade is either below 5°C or above 35°C unless expressly approved by the Superintendent. This is a **HOLD POINT**.

4.4 TRIMMING, COMPACTION AND CURING

Compaction

Process: Spread, shape and compact through to final finish continuously until completion.

Spread and compact: Each pavement course in uniform thicknesses, after trimming, layer thicknesses specified on the drawings must be achieved.

Thickness of each compacted layer: Must be between 100 mm and 150 mm for all pavement layer types, unless otherwise approved. This is a **WITNESS POINT**.

Conformance: Uniformly compact each layer of the base and subbase courses over its entire area and depth to satisfy the requirements of relative compaction set out in **Relative compaction** and **Compaction requirements and acceptance**.

Compaction procedure

One way crossfall sections: Begin compaction at the low side of the pavement and progress to the high side.

Crowned sections: Begin compaction at the sides of the pavement and progress towards the crown.

Rollers: Make each pass of the rollers parallel with the centreline of the roadway and uniformly overlap each preceding pass.

Sides: For the outer metre of both sides of the pavement, make at least two more passes by the compaction plant than the remainder of the pavement.

Hand operated plant: Where the use of self propelled compaction plant is not practical, compact the pavement material by alternative hand-operated plant approved by the Superintendent. This is a **WITNESS POINT**.

Protection: Do not allow watering and compaction plant to stand on the pavement being compacted.

Tests: Do not place the subsequent layers until the requisite testing has been completed and the test results for each layer have been accepted by the Superintendent. This is a **HOLD POINT**.

Rework: Dry out any unbound material in a layer that has attained the specified relative compaction but subsequently becomes wetted up and, if necessary, uniformly re-compact and trim to the specified density requirements and level tolerances. This is a **WITNESS POINT**.

Unstable areas

Rejection criteria: Any unstable areas that develop during rolling.

Replacement: Remove the rejected material for the full depth of the layer, dispose of and replace it with fresh material to conform with **Removal and replacement of rejected courses.**

Cost: Borne by the Contractor.

Curing of bound materials

Timing: Commence the curing of the surface layer of a lot after compaction is completed.

Water curing: Prevent the rapid drying out of stabilised work by keeping it continuously wet or damp during the period prior to the provision of a subsequent layer or the application of a prime or primer-seal. Frequent light uniform spraying that will not produce significant run off or flooding on sections of the area. Avoid slurrying of the surface or leaching of the stabilising agent. This is a **WITNESS POINT**.

4.5 ACCEPTANCE OF COMPACTION

Lots for acceptance

Lots: Nominated by the Contractor as follows:

- To cover only a single layer of work which has been constructed under uniform conditions in a continuous operation and not crossing any transverse construction joints.
- Unbound materials: To equal a day's output using the same material.

Acceptance of work for compaction: Based on density testing of the work in lots.

Relative compaction using in-situ dry density

Density testing: Submit results for compaction based on in-situ dry density testing for approval. This is a **HOLD POINT**.

Sampling frequency: Ten tests per 5000 sq m with a minimum of 3 tests per lot or as otherwise directed.

Costs: Borne by the Contractor.

Method: Calculate the relative compaction of pavement material at each location tested for in-situ dry density to AS 1289.5.4.1 as follows:

- Relative Compaction % = [(In-situ dry density)/(Comparative dry density)]×100
- The comparative dry density is the maximum dry density determined in the laboratory.

Maximum dry density: Test the samples of unbound layers to AS 1289.5.2.1 to determine the maximum dry density (modified compactive effort) for the material.

Testing: Test the samples of bound layers within two hours after the addition of stabilising agent to the mix to RTA Test Method T130 or appropriate documentation from relevant state or local authority. Determine the maximum dry density (modified compactive effort) for the material and the optimum moisture content.

In-situ dry density testing: The Superintendent may approve the use of a single probe Nuclear Density Meter in the direct transmission mode in conformance with AS 1289.5.8.1. for some or all of the in-situ dry density testing. This is a **WITNESS POINT**.

Benkelman Beam testing

Alternative: The elastic rebound deflection may be used as an acceptance method where approved. This is a **WITNESS POINT**.

Maximum deflection: The elastic rebound deflection to RTA Test Method T160 or appropriate documentation from relevant state or local authority.

Average maximum deflection: For any lot the average maximum deflection must not to exceed 1.0 mm, and the co-efficient of variation (CV) in recorded deflections not to exceed 30%.

Frequency of testing: Take measurements at the rate of 4 per 1000 square metres, with a minimum of ten measurements per lot.

Submit: Results verifying the relative compaction has been achieved for approval.

Compaction requirements and acceptance

Acceptance: A lot will be accepted for compaction if:

- The minimum relative compaction for modified compactive effort is ≥ 97%.
- For bound layers any zone(s) with relative compaction < 97% (modified compactive effort) but ≥ 93% may be accepted provided such zone(s) constitute less than 5% of the area presented. This is a **HOLD POINT**.

Rejected lots: Pavement lots or areas of pavement not achieving these specified values will be rejected. This is a **HOLD POINT**.

Reworking of rejected unbound layers

Rework: Lots or areas of pavement that have been rejected in regard to compaction and resubmit for compaction assessment.

Rejected material: Material that has become degraded, segregated or otherwise reduced in quality by reworking. This is a **HOLD POINT**.

Replacement: Remove the rejected material, dispose of and replace with fresh material to conform with **Removal and replacement of rejected courses**.

Costs: Borne by the Contractor including rewatering, rerolling, removal and replacement of material, and reworking.

4.6 ACCEPTANCE OF DIMENSIONS AND LEVELS

General tolerances

Acceptable limits: The tolerances stated are the acceptable limits of departure from the dimensions shown on the drawings, which may occur during construction.

Lots: To conform with the maximum lot size and minimum test frequencies in *0161 Quality (Construction)*.

Survey reports: Divide areas for assessment of conformity with tolerance requirements into lots, survey the lines and levels and submit for approval. This is a **HOLD POINT**.

Pavement width

Width of base and subbase layers: zero to + 100 mm to the design widths measured from the design centre line to the edge of the constructed pavement base/subbase layer but limited to 50 mm per side and as shown on the drawings.

Rejected: Nonconforming widths will be rejected. This is a **HOLD POINT**.

Surface level and deviation

Surface: After final compaction and trimming of both base and subbase layers, the pavement surface must be parallel to the proposed finished wearing surface.

Tolerance: Levels must not vary from those shown on the drawing by more than zero to plus 10 mm.

Subbase design level: Determine from the design level shown on the drawings of the finished road surface less the thickness of the base course and the wearing course allowing for any flush seal layer in the pavement design.

Base layer: There must be no abrupt change of levels from the pavement onto fixed structures such as a bridge deck or adverse changes that will affect the surface pavement drainage.

Kerb and gutter: Existing or as constructed, construct the top level of the base course adjacent to the kerb and gutter within ± 5 mm of the lip level of the gutter minus the design thickness of the wearing surface.

Pavement surface deviation: ± 5 mm from a 3 m long straightedge laid in any direction, after trimming and immediately prior to sealing.

Rejected: Nonconforming levels will be rejected. This is a **HOLD POINT**.

Action on rejection – Unbound materials

Corrective action: If corrective action is approved, correct the surface by trimming in a manner that produces a uniform, hard surface achieved by cutting. This is a **WITNESS POINT**.

Removal: Where corrective action is not achievable remove, dispose and replace with fresh material to conform with **Removal and replacement of rejected courses**. This is a **HOLD POINT**.

Costs: Borne by the Contractor including removal of material, disposal and supply and transport of replacement material.

Action on rejection – Bound materials

Corrective action: Corrective action may be approved:

- where the subbase course is lower than the design level with tolerances, the Contractor may increase the thickness of the base course to make up such deficiency in thickness.
- where the subbase course is above the design level with tolerances, the Contractor may propose a regrading of the design level of the base course, to allow for laying of its design thickness, up to a maximum of 20 mm above the original design level.
- where the base course is above the design level with tolerances, the Contractor may propose a regrading of the design level of the base course. This is a **HOLD POINT**.

Corrective regrading: Any regrading works must conform to the following:

- A rate of change of grade from the original finished design surface level of less than 3 mm per metre.
- The proper design functioning of the drainage system, without interference.
- Levels at the property boundary, without increasing or decreasing footpath or footpath crossover levels or grades beyond Council's allowable design limits.
- Clearances, without interference.

Removal: Where corrective action is not achievable remove, dispose and replace with fresh material to conform with **Removal and replacement of rejected courses**. This is a **HOLD POINT**.

Costs: Borne by the Contractor.

4.7 REMOVAL AND REPLACEMENT OF REJECTED COURSES

Extent to be removed

Inspection: Following rejection of pavement for any reason and the direction to remove and replace, inspect the area for direction on the extent of works to be replaced.

Extent: The Superintendent may approve removal for less than the full width as constructed if the cause of the rejection of the work can be isolated transversely. In this case, form and locate the new longitudinal cold joint along the centreline of the road pavement. This is a **HOLD POINT**.

Replacement

Inspection: Before replacement and following the removal of rejected base or subbase course material, present the section for inspection by the Superintendent before replacement work is commenced. This is a **HOLD POINT**.

Replacement material: Materials used as replacement materials, and the subsequent spreading, compaction, trimming, curing and testing of the replacement materials, to conform to the requirements of this worksection.

Damage: Make good by approved methods, any damage to underlying or abutting layers or structures due to removal or replacement of the pavement. This is a **WITNESS POINT**.

Disposal: Remove all materials that can not effectively be reused in the works, to an appropriate disposal location.

Costs: Borne by the Contractor including any extra costs incurred in respect of delays caused by such removals, replacements and corrections.

4.8 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE

Primerseal

Prepared surface: Following the Superintendent's acceptance of any section of the work, maintain the prepared surface of the base in the condition specified for acceptance until the wearing surface is completed.

Extent: Cover the base course of sections of the accepted work with a primerseal over the full width of pavement to *1143 Sprayed bituminous surfacing* within 7 days of the date of the acceptance of such sections, unless otherwise approved by the Superintendent. This is a **WITNESS POINT**.

Deterioration of pavement condition before primerseal

Restore condition: If the pavement condition deteriorates before the application of the primerseal and consent to proceed with the bitumen surfacing work is withdrawn by the Superintendent, re-prepare the pavement and re-present the pavement for inspection for approval. This is a **HOLD POINT**.

Costs: Borne by the Contractor.

Surface drainage

Ponded water: Prior to the completion of the wearing course maintain adequate drainage of the pavement, and remove any ponded water within 12 hours if free drainage is not achievable,.

Restrictions on movement

Unbound pavements: Construction plant and vehicles not involved in the current construction or testing of the work are not permitted to use the pavement until the primerseal has been applied, unless otherwise approved. This is a **WITNESS POINT**.

Bound pavements: Construction plant and vehicles not involved in the current construction or testing of the work are not permitted to use the pavement until the primerseal has been applied and seven days have elapsed since placement of the base.

Limits: Only vehicles registered for legal road usage and loaded within legal limits are allowed to use the pavement.

Opening bound pavement to traffic

Timing: Traffic is not allowed to use the constructed pavement until a minimum of seven days after completion of the full pavement depth and the primerseal. This is a **HOLD POINT**.

4.9 LIMITS AND TOLERANCES

Application

Summary: The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

Summary of limits and tolerances table

Activity	Limits/Tolerances	Worksection clause/subclause
Stockpile sites - Relative compaction	> 95%	**Delivery and stockpiling of pavement material - Stockpiling of unbound materials**
- Stockpile height	< 4 m	
- Stockpile batter	Between 1.5H:1V and 3H:1V	
Compacted layer thickness	≥ 100 mm, ≤ 150 mm	**Trimming, compaction and curing - Compaction**
Compaction acceptance - Minimum value of all calculated relative compaction results	≥ 97% (modified compactive effort) For bound pavements, the Superintendent may accept between 93% and 97% provided it represents less than 5% of the area.	**Acceptance of compaction - Compaction requirements and acceptance**
Width of pavement	0 mm to + 100 mm of	**Acceptance of dimensions and**

Activity	Limits/Tolerances	Worksection clause/subclause
	dimensions on drawings	**levels – Pavement width**
Surface level - Subbase and base surface levels	0 to + 10 mm from design level	**Surface level and deviation**
- Base levels adjacent to Kerb and Gutter	± 5 mm from the lip levels of adjacent gutter minus design thickness of wearing surface.	
- Surface deviation	± 5 mm from a 3 m long straightedge on base surface, immediately prior to sealing	

5 MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

General

Payments made to the Schedule of Rates: To *0152 Schedule of rates – projects*, this worksection, the drawings and Pay items **1141.1 and 1141.2** inclusive.

Lump Sum prices: Not acceptable.

Unpriced items: If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, due allowance is made in the prices of other items for the cost of the activity which has not been priced.

Methodology

The following methodology will be applied for measurement and payment:

- Base course primerseal: In conformance with *1143 Sprayed bituminous surfacing*.

5.2 PAY ITEMS

Pay items	Unit of measurement	Schedule rate scope
1141.1 Supply, spread and compact subbase course	m² - The area is determined by the length and width of work as specified on the drawings or as directed by the Superintendent. - For total relevant thickness shown on the drawings.	Take no account of allowable tolerances. All costs associated with: - Supply, spread, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material.
1141.2 Supply, spread and compact base course	m² - The area is be determined by the length and width of work as specified on the drawings or as directed by the Superintendent. - For total relevant thickness shown on the drawings.	Take no account of allowable tolerances. All costs associated with: - Supply, spread, compaction, trimming, jointing, and testing of the base course, and curing of bound material.