

1141 FLEXIBLE PAVEMENT BASE AND SUBBASE
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1 GENERAL**1.1 RESPONSIBILITIES****Objectives**

General: Provide flexible pavement base and subbase, including supply, spreading, compaction and trimming as documented.

Authority requirements: [\[complete/delete\]](#)

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- 0136 General requirements (Construction).
- 0152 Schedule of rates – supply projects.
- 0161 Quality (Construction).
- 0167 Integrated management.
- 1101 Control of traffic.
- 1113 Stabilisation.
- 1143 Sprayed bituminous surfacing.

1.3 REFERENCED DOCUMENTS**Standards**

General: The following documents are incorporated into this worksection by reference:

AS 1141	Methods for sampling and testing aggregates
AS 1141.3.1-2012	Sampling - aggregates
AS 1141.14-2007	Particle shape, by proportional calliper
AS 1141.22-2008	Wet/dry strength variation
AS 1141.23-2009	Los Angeles value
AS 1141.52-2008	Unconfined cohesion of compacted pavement materials
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 1289.3.4.1-2008	Soil classification tests - Determination of the linear shrinkage of a soil - Standard method
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 1289.5.1.1-2003	Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort
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 1289.5.3.2-2004	Soil compaction and density tests - Determination of the field dry density of a soil - Sand replacement method using a sand pouring can, with or without a volume displacer
AS 1289.5.4.1-2007	Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.5.7.1-2006	Soil compaction and density tests - Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)
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 mode

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
AS 5101.4-2008	Methods for preparation and testing of stabilized materials – Unconfined compressive strength of compacted materials

Other publications*ARRB*

ARRB Group-2005

Sealed local roads manual – Guidelines to good practice: Design, construction, maintenance and rehabilitation of pavements.

*Specification for Recycled Crushed Glass as an Engineering Material**ARRB Group**AUSTROADS*

AGPT04A-2008

Guide to pavement technology Part 4A: Granular base and subbase materials

AGPT04D-2006

Guide to pavement technology Part 4D: Stabilised materials

RMS Test Methods

T130-2010

Dry density/moisture relationship of road construction materials (blended in the laboratory with cementitious binders).

T171-2010

Modified Texas triaxial compression test pavement materials

*RMS**QA Materials Specification 3051 for Granular Base and Subbase**Materials for Surfaced Road Pavements**QA Roadworks Specification 73 for Construction of Plant Mixed Heavily Bound Pavement Course**IPWEA**Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage**NSW DECCW-2010**Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage – NSW Department of Environment, Climate Change and Water***1.4 INTERPRETATIONS****Abbreviations**

General: For the purposes of this worksection the following abbreviations apply:

- CBR: California bearing ratio.
- CRB: Crushed rock base.
- CRS: Crushed rock subbase.
- NATA: National Association of Testing Authorities.
- NGB: Natural gravel base.
- NGS: Natural gravel subbase.
- RCCB: Recycled crushed concrete base.
- RCCS: Recycled crushed concrete subbase.
- UCS: Unconfined compressive strength.

Definitions

General: For the purposes of this worksection the following definitions apply:

- Base: Layer(s) of material forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Bound material: A granular or subgrade material to which a binder has been added to improve structural stiffness.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Modified material: Granular materials to which small amounts of stabilising agent have been added to improve their performance without causing a significant increase in 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.

- Subbase: Material laid on the subgrade (or selected material), below the base, either for the purpose of making up additional pavement thickness, to prevent intrusion of the subgrade into the base, or to provide a working platform.
- Unbound material: A granular material with no significant capacity to resist tensile stresses.

1.5 HOLD POINTS AND WITNESS POINTS

Approval

Submissions: To the Superintendent's approval.

Notice

General: Give notice so that the documented inspection and submissions may be made to the **HOLD POINTS table** and the **WITNESS POINTS table**.

HOLD POINTS table

Clause title/Item	Requirement	Notice for inspection	Release by
PRE-CONSTRUCTION PLANNING			
Activity plan			
Pavement plan	Prepare and submit pavement plan	4 weeks before commencing site work	<i>Principal Certifying Authority</i>
Design and control of base and subbase materials			
Proposed materials	Prepare and submit schedule detailing material properties including NATA test results	2 weeks before ordering materials	<i>Principal Certifying Authority</i>
Bound or modified materials	Complete and submit Annexure A of 1113 <i>Stabilisation</i>	2 weeks before ordering materials	<i>Principal Certifying Authority</i>
Variations to approved materials	Submit details of changes to approved materials	1 week before use in works	<i>Principal Certifying Authority</i>
Inspection, sampling and testing			
Notification	Written notice for testing times and provide test results	3 working days prior to testing or inspection	<i>Principal Certifying Authority</i>
MATERIALS			
Modified Texas triaxial classification			
Alternative materials	Submit details of alternative material including test results	2 weeks before ordering materials	<i>Principal Certifying Authority</i>
Lime modified base and subbase materials			
Lime modification	Submit proposals to modify materials	2 weeks before placing	<i>Principal Certifying Authority</i>
In-situ lime modification	Submit proposals for the in-situ use of hydrated lime or quicklime	2 weeks before activity	<i>Principal Certifying Authority</i>
EXECUTION			
Spreading			
Underlying layer	Inspection to determine suitability of underlying layer	1 working day before placing next layer	<i>Principal Certifying Authority</i>
Temperature	Submit proposal to proceed outside allowable conditions	1 working day before placement	<i>Principal Certifying Authority</i>

Clause title/Item	Requirement	Notice for inspection	Release by
Trimming, compaction and curing			
Plant	Submit details of proposed hand operated plant	1 week before use	<i>Principal Certifying Authority</i>
Subsequent layers	Submit completed test results of previous layer	1 working day before placing next layer	<i>Principal Certifying Authority</i>
Acceptance of compaction			
Lots for acceptance	Submit compaction test results	1 working day after testing	<i>Principal Certifying Authority</i>
Compaction requirements and acceptance	Submit evidence that compaction is within tolerances	1 working day after test results	<i>Principal Certifying Authority</i>
Acceptance of dimensions and levels			
General	Submit lot survey reports	1 working day before next activity	<i>Principal Certifying Authority</i>
Corrective action - rejected unbound layers	Submit proposal for corrective action	1 working day before next activity	<i>Principal Certifying Authority</i>
Corrective action - rejected bound layers	Submit proposal for corrective action	3 working days before next activity	<i>Principal Certifying Authority</i>
Removal and replacement of rejected courses			
Extent of removal	Submit proposal to remove less than full width	1 working day before next activity	<i>Principal Certifying Authority</i>
Prior to replacement	Give notice for inspection of underlying material	1 working day before next activity	<i>Principal Certifying Authority</i>
Replacement	Submit proposed methods to make good	1 working day before next activity	<i>Principal Certifying Authority</i>
Maintenance before completion of wearing surface			
Pavement condition before primerseal	Dry-back, re-prepare and give notice for inspection	3 working days before next activity	<i>Principal Certifying Authority</i>
Opening bound pavement to traffic	Give notice of proposed opening to traffic	3 working days before proposed opening	<i>Principal Certifying Authority</i>

WITNESS POINTS table

Clause title/Item	Requirement	Notice for inspection
MATERIALS		
Bound base and subbase materials		
In-situ stabilisation	Give notice of proposal to use mobile plant for in-situ stabilisation at site	2 weeks before activity
EXECUTION		
Delivery		
Delivered materials	Give notice for inspection	Progressive
Delivery of modified or bound materials	Give notice of use of vehicles without covers	3 working days before use

Clause title/Item	Requirement	Notice for inspection
Delivery docket bound material	Provide delivery dockets at point of delivery	Progressive
Stockpiling unbound material		
Location	Give notice of proposed alternative locations	2 weeks before stockpiling
Trimming, compaction and curing		
Compaction	Give notice of proposal to use alternative layer thickness	2 weeks before activity
Rework	Give notice for inspection of reworked wetted up layer	Progressive
Curing of bound materials	Give notice of water curing activities	Progressive
Acceptance of compaction		
Nuclear density Meter testing	Give notice of proposal to use Nuclear density meter	1 working day before use
Acceptance of dimensions and levels		
Layer width	Give notice of completion of layer width	Progressive
Subbase surface deviation	Give notice of completed subbase surface	Progressive
Base surface deviation	Give notice of completed base surface	Progressive
Base adjacent to kerb and gutter	Give notice of completed base surface	Progressive
Maintenance before completion of wearing surface		
Primerseal	Give notice of alternative procedure	At time of lot acceptance
Restrictions on movement	Give notice if vehicles are to use unbound pavement before application of primerseal	Progressive

2 PRE-CONSTRUCTION PLANNING

2.1 ACTIVITY PLAN

General

Program: Plan the following activities:

- Allocation of plant and personnel for the contract period.
- Work programming to meet the constraints of **HOLD POINTS** and **WITNESS POINTS**.

Pavement construction plan

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

Include the following:

- A time based program to conform with Contract constraints.
- A drawn sectional plan showing lots and sequence.
- Site availability, assumptions on weather, plant and materials.
- A list of activities requiring approvals or notification 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.

Submission: **HOLD POINT**.

2.2 DESIGN AND CONTROL OF BASE AND SUBBASE MATERIALS

Proposed materials

Traffic category: Conform to the categories in the **Design traffic table**.

Design traffic table

Traffic Category	Traffic Classification	Range in Design ESAs
A	Very heavy	$\geq 10^7$
B	Heavy	$< 10^7$ but $\geq 4 \times 10^6$
C	Medium	$< 4 \times 10^6$ but $\geq 10^6$
D	Light	$< 10^6$

Schedule: Submit a schedule detailing the material properties of the proposed base and subbase, including sources of supply and the proposed type and proportion of any binder. Include test results from a NATA registered laboratory as evidence that material properties conform to the requirements of this worksection.

Submission: **HOLD POINT**.

Bound or modified materials

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

Submission: **HOLD POINT**.

Approved base and subbase

General: Once the proposed materials have been approved, they are known as the approved base and subbase.

Pre-approval: Proposed base or subbase may be pre-approved 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 material properties 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: Submit details of any changes to the approved base and subbase or source of supply.

Submission: **HOLD POINT**.

Non-conformance: Any change to the approved base and subbase, without approval will be considered a non-conforming material and may be rejected.

2.3 INSPECTION, SAMPLING AND TESTING

General

Extent: Inspect, sample and test the base and subbase material before, on delivery, during and after construction, for conformance with this worksection.

Accreditation: Testing by a NATA registered laboratory with appropriate accreditation and suitably qualified personnel.

Notification

Notice: Give notice of when testing is to be carried out and submit copies of all test results.

Submission: **HOLD POINT**.

3 MATERIALS

3.1 UNBOUND BASE AND SUBBASE MATERIALS

General

Standard: To AGPT04A and ARRB - *Sealed local roads manual*.

Sampling and testing: To AS 1289 and AS 1141.

Requirement: Provide unbound granular materials, including blends of two or more different materials, which when compacted develop structural stability and are uniform in grading and physical characteristics.

Production: Materials may be produced by crushing plant or naturally occurring granular materials. Methods and properties to conform to this worksection and additional requirements of Austroads AGPT04A.

*Material selection: Conform to the **Materials selection table**.*

Materials selection table

Traffic Category	Unbound base*	Unbound subbase*
A	DGB20(HD)	DGS20
B	DGB20(HD) or DGB20	DGS20 or DGS40
C	DGB20(HD), DGB20 or R-1	DGS20, DGS40 or R-1
D	DGB20(HD), DGB20, R-1, R-2 or NGB20	DGS20, DGS40, R-1, R-2, NGS20 or NGS40

* or modified in accordance with NSW RMS QA Materials Specification 3051

Crushed rock and recycled material class

Requirement: Provide crushed rock and recycled material as documented, from the following classes:

- Class 1: Pavement base material (with a minimum plasticity index) for unbound pavements requiring a very high standard of surface preparation for a sprayed sealed or thin asphalt surfacing.
- Class 2: Pavement base material (with no minimum plasticity index) for unbound pavements which may not require a very high standard of surface preparation.
- Class 3: Not applicable.
- Class 4: Subbase material for unbound flexible pavements.

Crushed rock *base and subbase*

Designation: Unbound crushed rock materials are designated as follows:

- **DGB20(HD)**: 20 mm nominal sized class 1 crushed rock base.
- **DGB20**: 20 mm nominal sized class 2 crushed rock base.
- **DGS20**: 20 mm nominal sized crushed rock subbase.
- **DGS40**: 40 mm nominal sized crushed rock subbase.

Recycled *base and subbase crushed concrete*

Designation: Recycled ~~crushed concrete~~ materials are designated as follows:

- **R-1**: 20 mm nominal sized class 1 recycled crushed concrete base *and subbase*.
- **R-2**: 20 mm nominal sized class 2 recycled crushed concrete base *and subbase*.
- *Recycled materials meeting RMS 3051 specifications*

Natural gravel

Designation: Unbound natural gravel materials are designated as follows:

- **NGB20**: 20 mm nominal sized natural gravel base.
- **NGS20**: 20 mm nominal sized natural gravel subbase.
- **NGS40**: 40 mm nominal sized natural gravel subbase.

Base material properties

Base materials: Conform to the **Base material properties table**.

Base material properties table

Test method ¹	Description	DGB20 (HD)	DGB20	R-1	R-2	NGB20
AS 1289.3.6.1	Particle size distribution % passing 26.5 mm sieve	100	100	100	100	100

Test method ¹	Description	DGB20 (HD)	DGB20	R-1	R-2	NGB20
	% passing 19.0 mm sieve % passing 13.2 mm sieve % passing 9.5 mm sieve % passing 4.75 mm sieve % passing 2.36 mm sieve % passing 0.425 mm sieve % passing 0.075 mm sieve <i>% passing 0.0135 mm sieve</i>	95-100 78-92 63-83 44-64 33-49 14-23 7-14 3-7	95-100 78-92 63-83 44-64 33-49 14-23 7-14 3-7	95-100 70-90 60-80 40-65 35-55 10-30 5-15	85-100 70-90 60-80 40-65 30-55 10-30 5-15	93-100 — 71-87 47-70 35-56 14-32 6-20
	<i>Retained between AS Sieves (% by mass)</i> <i>19.0mm</i> <i>13.2mm</i> <i>9.5mm</i> <i>4.75mm</i> <i>2.36mm</i> <i>0.425mm</i> <i>0.075mm</i> <i>0.0135mm</i>	<i>7-17</i> <i>8-16</i> <i>14-24</i> <i>8-18</i> <i>14-28</i> <i>6-13</i> <i>3-7</i>	<i>6-18</i> <i>7-17</i> <i>13-25</i> <i>7-19</i> <i>14-30</i> <i>6-13</i> <i>3-8</i>			
AS 1289.3.1.1	Liquid limit <i>Traffic category A</i> <i>Traffic Category B, C and D</i> <i>For recycled materials</i>	<i>max 20</i>	<i>max 23</i>	<i>max 27</i>	<i>max 27</i>	<i>max 25</i>
AS 1289.3.2.1	<i>Plastic limit (if plastic)</i>	<i>max 20</i>	<i>max 20</i>			
AS 1289.3.3.1	Plasticity index: <i>Traffic category A</i> <i>Traffic Category B and C</i> <i>Traffic Category D</i> <i>% passing 0.425mm sieve x PI</i>	<i>max 6</i> <i>min 2</i>	<i>max 6</i> <i>min 2</i> <i>max 8</i>	<i>max 5</i>	<i>max 6</i>	<i>max 6</i>
AS 1289.6.7.2	<i>Permeability</i>	<i>max</i> <i>5 x 10⁻⁸</i> <i>m/sec</i>				
RMS T276	<i>Foreign materials in that fraction of recycled material retained on 4.75 mm sieve - % by mass²:</i> <i>Asbestos</i> <i>Metal, glass and ceramics</i> <i>Plaster, clay lumps and other friable materials</i> <i>Rubber, plastic, bitumen, paper, cloth, paint, wood and other vegetable matter</i>			<i>max 0</i> <i>max 3</i> <i>max 0.2</i> <i>max 0.1</i>	<i>max 0</i> <i>max 5</i> <i>max 0.2</i> <i>max 0.2</i>	

Test method ¹	Description	DGB20 (HD)	DGB20	R-1	R-2	NGB20
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 2)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.0 MPa	min 1.7 MPa
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 2)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.0 MPa	min 1.7 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	max 35%	
AS 1141.22	Aggregate wet strength ³	min 100 kN	min 70 kN	min 70 kN	min 70 kN	
AS 1141.22	Wet/dry strength variation ³ (dry - wet)/dry	max 35%	max 35%	max 35%	max 40%	
AS 1289.6.1.1	4 day soaked CBR (98% modified compaction)			NA	min 60%	min 80%
AS 5101.4	Unconfined compressive strength (UCS)	max 1.0 MPa	max 1.0 MPa	max 1.5 MPa	max 1.5 MPa	
RMS T219	Acid Soluble Sulfate Content in Road Construction Materials	max 0.3%	max 0.3%			
<p>NOTES:</p> <p>¹ As indicated or equivalent RMS Test Method</p> <p>² Groupings in table do not align exactly with those in RMS T276</p> <p>³ All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction, which is at risk of failing, in the opinion of the Superintendent.</p>						

Subbase material properties

Subbase materials: Conform to the **Subbase material properties table**.

Subbase material properties table

Test method	Description	DGS20	DGS40	R-1	R-2	NGS20	NGS40
AS 1289.3.6.1	Particle size distribution						
	% passing 53.0 mm sieve		100				100
	% passing 37.5 mm sieve		95-100				95-100
	% passing 26.5 mm sieve	100	75-95	100	100	100	80-97
	% passing 19.0 mm sieve	95-100	64-90	95-100	85-100	96-100	—
	% passing 13.2 mm sieve	70-90	—	70-90	70-90	—	—
	% passing 9.5 mm sieve	58-80	42-78	60-80	60-80	65-89	48-85
	% passing 4.75 mm sieve	43-65	27-64	40-65	40-65	47-80	35-73
	% passing 2.36 mm sieve	30-55	20-50	35-55	30-55	32-67	25-58
	% passing 0.425 mm sieve	10-30	10-23	10-30	10-30	14-42	10-33
	% passing 0.075 mm sieve	4-17	4-12	5-15	5-15	6-26	3-21
	% passing 0.0135 mm sieve	2-10	2-7				
AS 1289.3.1.1	Liquid limit (if material non-plastic)	max 23	max 23	max 27	max 27	max 35	max 35
	For recycled materials	max 27	max 27				
AS 1289.3.2.1	Plastic limit (if plastic)	max 20	max 20				
AS 1289.3.3.1	Plasticity index:						

Test method	Description	DGS20	DGS40	R-1	R-2	NGS20	NGS40
	Traffic category A Traffic Category B and C Traffic Category D % passing 0.425mm sieve x PI	max 6 max 10 max 12	max 6 max 10 max 12	max 5 max 5 max 120	max 6 max 180	max 12	max 12
RMS T276	Foreign materials in that fraction of recycled material retained on 4.75 mm sieve - % by mass ² : Asbestos Metal, glass and ceramics Plaster, clay lumps and other friable materials Rubber, plastic, bitumen, paper, cloth, paint, wood and other vegetable matter			max 0 max 3 max 0.2 max 0.1	max 0 max 5 max 0.2 max 0.2		
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 2)	min 1.0 MPa	min 1.0 MPa	min 1.7 MPa	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	max 35%		
AS 1141.22	Aggregate wet strength ³ Traffic category A and B Traffic Category C and D	min 70 kN min 50 kN	min 70 kN min 50 kN	min 70 kN min 70 kN	min 70 kN min 70 kN		
AS 1141.22	Wet/dry strength variation ³ (dry - wet)/dry Traffic category A and B Traffic Category C and D	max 35% max 40%	max 35% max 40%	max 35% max 35%	max 40% max 40%		
AS 1289.6.1.1	4 day soaked CBR (98% modified compaction)			NA	min 60%	min 30%	min 30%
RMS T219	Acid Soluble Sulfate Content in Road Construction Materials	max 0.3%	max 0.3%				

NOTES:

¹ As indicated or equivalent RMS Test Method

² Groupings in table do not align exactly with those in RMS T276

³ All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction, which is at risk of failing, in the opinion of the Superintendent.

Stockpiled material

Testing of stockpiled material: To be in accordance with the procedures outlined in the RMS Materials Specification 3051 for DGB20(HD), DGB20, DGS20, DGS40, NGB20 and DGS20/NGS40 unbound materials or the IPWEA Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage for R-1 and R-2 recycled materials.

3.2 MODIFIED TEXAS TRIAXIAL CLASSIFICATION

Alternative materials

Requirement: Submit proposal for the use of any unbound base or subbase material that conforms to the requirements of the **Base material properties table** or **Subbase material properties table**, except for the particle size distribution grading to AS 1289.3.6.1.

Proposed material: Submit details of the proposed material including evidence of modified Texas triaxial classification and associated tests.

Submission: **HOLD POINT**.

Test

Method: RMS T171.

Requirements: To the **Modified Texas triaxial classification number requirements table**.

RMS T171 tested: At 83 - 87% of Optimum Moisture Content and 99 - 101% of Maximum Dry Density as determined by AS 1289.5.1.1.

Modified Texas triaxial classification number requirements table

Material class	Modified Texas triaxial classification number (RMS Test Method T171)
Base	max 2.5
Subbase	max 3.2

3.3 LIME MODIFIED BASE AND SUBBASE MATERIALS

Lime modification

Proposal: Submit details of any proposed addition of hydrated lime, including details of any initial consumption of lime test, to modify unbound base and subbase materials to meet the requirements of **UNBOUND BASE AND SUBBASE MATERIALS**.

Submission: **HOLD POINT**.

Modification: Uniformly mix with hydrated lime, in a stationary mixing plant, at the supplier's quarry.

In-situ lime modification

Alternative: Submit details of any proposed in-situ addition of hydrated lime or quicklime.

Submission: **HOLD POINT**.

Method: To *1113 Stabilisation*.

Material requirements

Before lime treatment: Provide material with no added pozzolanic material.

Lime: Hydrated lime and quicklime to *1113 Stabilisation*.

Proportion of lime: Not less than 1.5% nor more than 4%, by mass, after initial consumption of lime requirements have been met.

CRB20 before treatment with lime: Material to conform to the requirements of CRS20 in the **Subbase material properties table** and the following:

- Aggregate wet strength > 80 kN.

CRB20 material after lime treatment: CBR \geq 80, when tested to AS 1289.6.1.1. Perform sampling within 24 hours of adding the lime and test after 7 days accelerated curing.

Unconfined compressive strength

Testing: UCS < 1.0 MPa, when tested to AS 5101.4. Perform sampling within 24 hours of adding the lime and test after 7 days accelerated curing.

3.4 BOUND BASE AND SUBBASE MATERIALS

General

Requirement: Supply bound material as a crushed rock product with stabilising agent incorporated in a pugmill.

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

Bound base

Base material requirements before stabilisation: To the **Base material properties table**.

Construction: To RMS QA Specification R73.

In situ stabilisation

Alternative: Give notice if in-situ stabilisation of natural or blended gravel by mobile plant at site is proposed.

Proposal: **WITNESS POINT**.

Unconfined compressive strength

Testing: UCS > 3 MPa when tested to AS 5101.4. Perform sampling within 1 hour of adding the stabilising agent and test after 7 days accelerated curing.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

General

Requirement: Conform to 1101 *Control of traffic*.

4.2 DELIVERY

Transport of materials

Delivery vehicles: Provide enclosure to avoid loss of material during transit.

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

Moisture content: Uniformly distributed so that the moisture content is less than the optimum moisture content to AS 1289.5.1.1, AS 1289.5.2.1 or AS 1289.5.7.1. Alternatively, the moisture content may be specified by the Superintendent $\pm 0.5\%$.

Delivered materials

Notice: Give notice of arrival of materials for inspection.

Inspection: **WITNESS POINT**.

Delivery of modified or bound materials

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

Vehicle covers: Use delivery vehicles fitted with fabric covers to prevent loss of moisture during transport.

Alternative: Give notice of the proposed use of any vehicles not fitted with fabric covers.

Proposal: **WITNESS POINT**.

Delivery dockets for bound material

Identification: 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. Provide delivery dockets for inspection at the point of delivery.

Inspection: **WITNESS POINT**.

4.3 STOCKPILING UNBOUND MATERIAL

Location

Stockpile sites: Locate stockpile sites as shown on the drawings or give notice of proposed alternative locations.

Proposal: **WITNESS POINT**.

Preparation

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

Stockpile maintenance

Stockpile height: < 3 m.

Side slopes: Uniform shape with side slopes not steeper than 1.5H:1V or flatter than 3H:1V.

Moisture content: Maintain stockpiled material at a moisture content sufficient to avoid loss of fines.

Contamination of materials: Maintain stockpiles and stockpile sites to make sure materials do not become intermixed, segregated or contaminated with foreign material.

Restoration

Surplus material: Upon completion of the works, clear stockpile sites of all surplus material and leave in a clean and tidy condition.

Sampling

Test: Sample and test stockpiles within 3 days of delivery to AS 1141.3.1 and as directed by the Superintendent.

4.4 SPREADING

General

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

Transverse joints: Locate at a minimum offset of 2 m from any joint in layer below.

Longitudinal joints: Locate along lane marking line or mid-way between lane marking lines. Offset a minimum of 100 mm from any joint in layer below.

Moisture content when spreading: > 85% of the laboratory optimum moisture content, to achieve specified compaction to AS 1289.5.2.1.

Underlying layer

Requirement: Moisture content < 80% of the laboratory optimum moisture content, to AS 1289.5.2.1, and free from rutting or foreign matter.

Quality: Before spreading of base and subbase material, give notice so that inspection may be made of the underlying layer quality including the assessment of required moisture content.

Inspection: **HOLD POINT**.

Non-conforming underlying layer

Correction: If Contractor activities cause the underlying layer to become non-conforming, correct the underlying layer to conform to this worksection.

Alternative: If the underlying layer becomes non-conforming, due to no fault of the Contractor, the Superintendent may require correction of the underlying layer as a variation to the contract.

Temperature

Requirement: Spread material when ambient air temperature is between 5°C and 35°C in the shade.

Outside temperature range: Submit proposals to spread bound materials when temperatures are outside the required ambient air temperature range.

Submission: **HOLD POINT**.

4.5 TRIMMING, COMPACTION AND CURING

Compaction

Process: Spread, shape and compact each layer in uniform thicknesses. Trim layer to conform to the documented thickness.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses. Give notice of the proposed use of any layer thickness outside of this range.

Proposal: **WITNESS POINT**.

Compaction procedure

Conformance: Uniformly compact each layer of the base and subbase courses over their entire area and depth conforming to **ACCEPTANCE OF COMPACTION**.

Moisture content: Maintain at > 85% of the laboratory optimum moisture content during compaction.

One-way crossfall sections: Compact from the low side to the high side.

Crowned sections: Compact from edge to crown on each side of the pavement.

Rollers: Pass parallel to the centreline of the pavement and uniformly overlap each preceding pass.

Sides: Minimum 2 additional passes of roller, for outer 1 m width of pavement on both sides.

Plant

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

Self propelled plant: Use self propelled compaction plant, where practical.

Hand operated plant: Submit details of any hand operated compaction plant proposed for use.

Submission: **HOLD POINT**.

Subsequent layers

Tests: Do not place subsequent layers until all required testing has been completed and the test results for each layer have been submitted.

Submission: **HOLD POINT**.

Rework

Wetted up layers: If an unbound layer becomes wetted up after compaction is complete, dry out and give notice for inspection. If necessary, uniformly re-compact and trim to the documented density requirements and level tolerances.

Inspection: **WITNESS POINT**.

Unstable areas

Rejection criteria: Any unstable areas that develop during rolling or are identified by proof rolling.
 Dry back and replacement: Open up, dry back and re-compact, to the requirements of this worksection. If dry back is not possible, remove the full depth of layer, dispose of and replace with fresh material to conform with **REMOVAL AND REPLACEMENT OF REJECTED COURSES**.

Curing of bound materials

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

Requirement: Keep stabilised work continuously wet or damp to prevent rapid drying out before placement of the subsequent layer or the application of a prime or primerseal.

Procedure: Provide frequent light uniform water spray without significant run off or flooding. Avoid slurring of the surface or leaching of the stabilising agent. Give notice of water curing activities for inspection.

Inspection: **WITNESS POINT**.

4.6 ACCEPTANCE OF COMPACTION**Lots for acceptance**

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

Lots: Nominate lots as follows:

- Extent: A single layer of work, constructed under uniform conditions in a continuous operation, not crossing any transverse construction joints.
- Unbound materials: Equal to a day's output using the same material.

Density testing: Submit results verifying the required relative compaction has been achieved.

Submission: **HOLD POINT**.

Compaction requirements and acceptance

Lot compaction acceptance: Minimum relative compaction for *standard* compactive effort is $\geq 100\%$.

Alternative compaction acceptance: For bound layers any zones with relative compaction $< 100\%$ (*standard* compactive effort) but $\geq 95\%$ may be accepted provided evidence is submitted to show that such zones constitute less than 5% of the lot.

Submission: **HOLD POINT**.

Relative compaction using in-situ dry density

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

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 % = $[(\text{In-situ dry density})/(\text{Comparative dry density})] \times 100$

Comparative dry density: Equal to the following:

- Unbound layers: The maximum dry density (*standard* compactive effort) determined in the laboratory by testing samples to AS 1289.5.2.1.
- Bound layers: The maximum dry density (*standard* compactive effort) determined by testing samples to RMS T130 within two hours of the addition of the stabilising agent to the mix.

In-situ dry density: Test the compacted material to AS 1289.5.3.2.

Nuclear density meter testing

Alternative: A single probe Nuclear Density Meter may be used in the direct transmission mode, to AS 1289.5.8.1, for some or all of the in-situ dry density testing. Give notice of proposal to use Nuclear Density Meter.

Proposal: **WITNESS POINT**.

Corrective action – rejected layers

Unbound layers: Rework lots that have been rejected in regard to compaction and resubmit for compaction assessment.

Bound layers: Remove rejected bound layers.

Removal

Replacement: Remove rejected bound layers and any unbound material which in the opinion of the Superintendent, has become degraded, segregated or otherwise reduced in quality by reworking. Dispose of and replace with fresh material to conform with **REMOVAL AND REPLACEMENT OF REJECTED COURSES**.

4.7 ACCEPTANCE OF DIMENSIONS AND LEVELS

General

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

Lots: Conform to the maximum lot size and minimum test frequencies in *0161 Quality (Construction)*.

Survey reports: Submit survey reports covering line and level for each lot.

Submission: **HOLD POINT**.

Layer width

Tolerance: Zero to + 100 mm of the design widths for both base and subbase, 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. Give notice for inspection of completed layer width.

Inspection: **WITNESS POINT**.

Surface level

Surface: Parallel to the proposed finished wearing surface after final compaction and trimming of both base and subbase layers.

Subbase surface deviation

Tolerance: + 10 mm, - 25 mm from design level, after trimming. Give notice for inspection of completed subbase surface.

Inspection: **WITNESS POINT**.

Base surface deviation

Tolerance: + 10 mm, - 5 mm from design level or ± 5 mm from a 3 m long straightedge laid in any direction, after trimming and immediately prior to sealing. Give notice for inspection of completed base surface.

Inspection: **WITNESS POINT**.

Base adjacent to kerb and gutter

Tolerance: ± 5 mm of the level of the lip of the gutter, minus the design thickness of the wearing surface. Give notice for inspection of completed base surface.

Inspection: **WITNESS POINT**.

Corrective action – rejected unbound layers

Trimming: Submit proposal to correct surface by trimming without filling, to produce a uniform, hard surface.

Submission: **HOLD POINT**.

Corrective action – rejected bound layers

Design level: Corrective action may be approved where:

- The subbase course is lower than the design level with tolerances. Submit proposal to increase the thickness of the base course to make up such deficiency in thickness.
- The subbase course is above the design level with tolerances. Submit proposal to regrade 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.
- The base course is above the design level with tolerances. Submit proposal to regrade the design level of the base course.

Submission: **HOLD POINT**.

Approved corrective regrading: 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 function of the drainage system.
- Existing levels at property boundaries, without increasing or decreasing footpath or footpath crossover levels or grades beyond Council's allowable design limits.
- Clearances.

Removal

Replacement: If corrective action is unachievable, remove and dispose of material and replace with fresh material to conform with **REMOVAL AND REPLACEMENT OF REJECTED COURSES**.

4.8 REMOVAL AND REPLACEMENT OF REJECTED COURSES

Extent of removal

Requirement: Remove rejected material over full length of rejected lot.

Exception: Submit proposal to remove less than the full width, as constructed, if the cause of rejection can be isolated. Form a new longitudinal cold joint located along the centreline of the road pavement. Submission: **HOLD POINT**.

Prior to replacement

Inspection: Give notice of completion of removal of rejected base or subbase, for inspection before commencement of replacement works.

Inspection: **HOLD POINT**.

Replacement

Materials: Provide materials for replacement works, including spreading, compaction, trimming, curing and test the replacement materials, to conform to the requirements of this worksection.

Damage: Submit proposed methods to make good any damage to underlying or abutting layers or structures due to the removal or replacement of rejected courses.

Submission: **HOLD POINT**.

4.9 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE

Dry back

General: Allow material to dry back to 60% to 80% of the optimum moisture content before applying the primerseal or wearing surface

Primerseal

Prepared surface: Maintain the accepted condition of the base course until the wearing surface is completed.

Extent: Within 7 days of acceptance of a lot, cover the base course with a primerseal, over the full width, to *1143 Sprayed bituminous surfacing*. Give notice of any alternative procedure proposed.

Proposal: **WITNESS POINT**.

Pavement condition before primerseal

Restore condition: If the base condition deteriorates before primerseal application and approval to proceed with bitumen surfacing work is withdrawn, dry-back and re-prepare the base. Submit evidence of dry-back being achieved and give notice for inspection.

Inspection: **HOLD POINT**.

Surface drainage

Ponded water: Maintain adequate drainage of the pavement before completion of the wearing surface and remove any ponded water within 12 hours if free drainage is not achievable.

Restrictions on movement

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

Bound pavements: Prevent construction plant and vehicles not involved in current construction or testing activities from using the pavement within 7 days of placement of the base course and before the application of primerseal.

Unbound pavements: Prevent construction plant and vehicles not involved in current construction or testing activities from using the pavement before the application of primerseal. Give notice if this requirement is impractical.

Notification: **WITNESS POINT**.

Opening bound pavement to traffic

Timing: Traffic not permitted to use pavement within 7 days of completion of full pavement depth and application of primerseal. Give notice of proposed opening to traffic.

Notification: **HOLD POINT**.

4.10 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	Clause - subclause
Stockpile sites: Relative compaction	> 95%.	Stockpiling unbound materials - Preparation

Activity	Limits/Tolerances	Clause - subclause
Stockpile height	< 3 m.	Stockpiling unbound materials - Stockpile maintenance
Stockpile batter	1.5H:1V max. 3H:1V min.	Stockpiling unbound materials - Stockpile maintenance
Compacted layer thickness	200 mm max. 100 mm min.	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 92% and 97% provided it represents less than 5% of the area.	Acceptance of compaction - Compaction requirements and acceptance
Layer width	Zero to + 100 mm of dimensions on drawings. Limited to 50 mm per side.	Acceptance of dimensions and levels - Layer width
Subbase surface deviation	+ 10 mm, - 25 mm from design level.	Acceptance of dimensions and levels - Subbase surface deviation
Base surface deviation	+ 10 mm, - 5 mm from design level or ± 5 mm from a 3 m long straightedge placed on surface, immediately prior to sealing.	Acceptance of dimensions and levels - Base surface deviation
Base adjacent to kerb and gutter	± 5 mm from the level of the lip of adjacent gutter minus design thickness of wearing surface.	Acceptance of dimensions and levels - Base adjacent to kerb and gutter

5 MEASUREMENT AND PAYMENT

5.1 MEASUREMENT

General

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

Lump sum prices: Not acceptable.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

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	m ² - 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 all documentation and approvals and: - Supply, spread, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material.
1141.2 Supply, spread and compact base course	m ² - The area is determined by the length and width of work	Take no account of allowable tolerances. All costs associated with:

Pay items	Unit of measurement	Schedule rate scope
	as specified on the drawings or as directed by the Superintendent. - For total relevant thickness shown on the drawings.	- Supply, spread, compaction, trimming, jointing, and testing of the base course, and curing of bound material.