

## A SERICITIC LIMESTONE

<b>Material Name:</b>	Sericitic limestone
<b>Source:</b>	Excelsior quarry, Capertee, NSW.
<b>Material Description:</b>	Sericitic limestone is a carbonate rich limestone breccia containing approximately 85% calcite/limestone. Other minerals include dolomitic carbonate (1-2%), quartz (1-2%) and sericite (12-15%).
<b>Approval Status:</b>	Approved 12 April 2000

### Overall application details:

Application:	The principal use is in sealed unbound rural pavements. The material has special application to overlays in pavement rehabilitation. Where it is used in an unbound state the pavement should be well drained. Bound material can be produced with a slow setting binder to improve the wet strength of the material. Mix design in accordance with R75 or R73 is required.
Applicable Traffic Category: (3051 Cl. 6.2.1)	B, C & D
Applicable specifications:	3051, R71, R73, R75, M290
Surfacing treatment:	Sprayed seal - Design in accordance with Roads & Maritime practices.
Material type: (3051 Cl. 6.2.5)	Unbound and bound
Particle size distribution: (3051 Cl 8.1)	Refer to Table 1A
Maximum aggregate size:	26.5 mm.
Maximum plasticity	Refer to Table 1A
Maximum permeability	Not applicable for traffic category B, C & D.
Other tests	Table 3051.3 requirements must also be satisfied.

### Construction

Production:	The sericitic limestone is won by blasting. Roadbase is produced by crushing the material through primary and secondary crushers in a single pass with no further processing.
Maximum moisture content:	5.5% at time of placement (unbound). 6.0% at time of placement (bound).
Quality System	Supplier must meet the requirements in 3051 Clause 4.
Construction Specification:	The construction process and end product must meet the relevant construction specification R71, R73, R75 or M290.
Testing	Conformance testing frequency is to be in accordance with Table 3051/L.1, any tests not identified in Table 3051/L.1 are to be undertaken at the same frequency as specified in 3051 for test method T106.

### Material information for pavement design and construction

1. Sericitic limestone roadbase is a carbonate rich limestone breccia containing approximately 85% calcite/limestone. Other minerals include dolomitic carbonate (1-2%), quartz (1-2%) and clay sericite (12-15%). The sericite is a talcose mineral produced during the metamorphic phase of the limestone's genesis. The sericite occurs as veinlets within the limestone. Crushed aggregate contains fine grained sericite which lubricates rock particles and promotes compaction at lower moisture content.
2. The clay sericite provides a solid and stable support to the limestone aggregates under dry conditions however, compacted laboratory specimens of sericitic limestone become unstable when soaked. The material may be stabilised to improve its wet strength. When sericitic limestone is used in an unbound state the pavement should be well drained.
3. The clay sericite acts as a compaction aid reducing the moisture content requirement for compaction to a maximum of 5.5%. Compaction may also be achieved at lower moisture contents with appropriate compaction equipment.
4. Not all limestones meet these guidelines and advice should be sought from Pavement and Geotechnical Section in this matter.
5. These requirements apply to the applications of Sericitic Limestone on Traffic Category B, C and D roads (traffic volumes less than  $10^7$  ESA).
6. The construction procedures for handling this material are as follows:
  - a. A minimum thickness of 300 mm of select material is to be placed under the subbase.
  - b. The moisture content should not exceed 5.5% for unbound material and 6% for bound material. These upper limits on moisture content are appropriate in hot weather. For cooler periods a lower moisture content should be used.
  - c. The material may appear too dry for compaction but the sericite acts as a compaction aid that allows it to be compacted at a lower moisture content. Optimum moisture content is around 7.5% for unbound material and 8% for bound material. The material must not be placed at optimum. Over wetting of the roadbase during compaction will cause it to become unstable and will require a long period of 'dry back' before adequate strength is obtained.
  - d. The interface between multiple layers may not fully bond so stabilised construction is to be limited to a single layer.
  - e. For bound material under specification R73, compaction should be carried out in a single lift of around 200 mm.
  - f. For bound applications 5% by mass of a slow setting binder has generally been incorporated into the roadbase to maintain its retained strength in a wet environment and to minimise the effects of erosion, this proportion of binder is to be confirmed for the relevant binder in accordance with R73 mix design requirements.
  - g. The characteristic relative compaction should be the same as that specified for other unbound or heavily bound pavements as specified in R71, R73 or R75 as appropriate.
  - h. The surface can be slurried to waterproof the surface and this should be done if it is to be left unsealed for a time. The slurry must be removed by grading or heavy steel brooming prior to priming or primer sealing.
  - i. A 10 mm primer seal should be applied as soon as possible after compaction to assist in curing when the layer has been stabilised. (This may avoid the slurring operation.)

7. Where stabilised sericitic limestone is used as a:
- Base - The wearing surface can consist of either a rubber bitumen seal, a geotextile seal or a thin polymer asphalt (maximum 50 mm).
  - Subbase - The base course above should have a minimum thickness of 150 mm. If a granular base is used, an 'upside-down' pavement can result, the base needs to be relatively moisture insensitive with positive drainage by daylighting at the edge of formation and have a full width seal.

**Table 1A Particle size distribution and plasticity for Sericitic Limestone.**

Property	Base	Subbase
<b>RTA T106 &amp; T107: Particle Size Distribution</b> Passing AS Sieve (% by mass)		
26.5 mm	100	100
19 mm	95-100	70-100
13.2 mm	70-95	
9.5 mm	60-85	
4.75 mm	41-68	
2.36 mm	30-55	
425 µm	11-30	
75 µm	5-20	4-23
13.5 µm	2-15	2-17
<b>RTA T106 &amp; T107: Particle Size Distribution</b> Retained between AS Sieve (% by mass)		
26.5 mm		
	0-5	0-5
19 mm		
	7-18	12-23
13.2 mm		
	8-16	
9.5 mm		
	14-24	
4.75 mm		
	8-21	
2.36 mm		
	14-28	
425 µm		
	7-14	6-14
75 µm		
	3 -12	3-8
13.5 µm		
<b>RTA T109: Plasticity Index</b>	Max 8	Max 12

Notes:

- Replaces Table 3051.1 requirements for particle size distribution and Table 3051.2 a) requirement for plasticity index.

## B DENDROBIUM MATRIX BASE

<b>Material Name:</b>	Dendrobium Matrix Base
<b>Source:</b>	Coal washery reject – Dendrobium Coal Mine, Mount Kembla, NSW Fly ash – (for current assessment Eraring Power Station, Eraring, NSW).
<b>Material Description:</b>	A blend of coal wash reject from Dendrobium Coal Washery located within the BlueScope Steel Complex at Port Kembla, NSW and run-of-station fly ash from Origin Energy’s Eraring Power Station blended at the West Cliff Colliery.
<b>Approval Status:</b>	Conditional – Expires 30 June 2016

### Overall application details:

<b>Application:</b>	Sealed overlay base layer (unbound) to a minimum and maximum thickness of 150 mm and 300 mm respectively. Patching - Seek advice from Pavements Section, Engineering Services Branch. Use in unsealed roads needs consideration of how dust will be managed. Further consideration required when material is placed adjacent to kerb and gutter to ensure compaction, prevent water ingress and maintain adequate shear strength.
<b>Applicable Traffic Category:</b> (3051 Cl. 6.2.1)	D (Trials may be conducted on roads at Traffic Category C)
<b>Min. width of sealed shoulders:</b>	500 mm
<b>Applicable specifications:</b>	R71 (not modified), M250 (not modified or bound) and M290 (not modified or bound).
<b>Surfacing treatment:</b>	Sprayed seal – No advice at this stage.
<b>Material type:</b> (3051 Cl. 6.2.5)	Unbound.
<b>Particle size distribution:</b> (3051 Cl 8.1)	Refer to Table 1B
<b>Maximum aggregate size:</b>	53 mm.
<b>Maximum plasticity</b>	Refer to Table 2B
<b>Maximum permeability</b>	Refer to Table 2B
<b>Other tests</b>	Table 3051.3 - T116 and T219 requirements must also be satisfied.
<b>EPA Exemptions:</b>	Component materials must meet relevant EPA exemptions. As at June 2014 both ‘The coal washery rejects general exemption 2009’ and ‘The coal ash exemption 2013’ material requirements and reporting requirements must be satisfied.

## Construction

Layer thickness limits:	150 to 300 mm (Limits specified by StabilCo)
Production:	Blended by stationary pug-mill.
Stockpiles:	Maximum size 4,000 t (blended material).
Maximum moisture content:	8% at time of placement. (Limit specified by StabilCo)
Quality System	Supplier must meet the requirements in 3051 Clause 4.
Project Quality Plan:	Supplier must provide inspection test plans and procedures for the placement of the material, including details for sprayed sealing and compaction of outer edges of the layer.
R71 Specification:	Must meet the end product requirements in Clause 8. Place, compact and trim in accordance with the supplier's recommendations.
Testing	Conformance testing frequency is to be in accordance with Table 3051/L.1, any tests not identified in Table 3051/L.1 are to be undertaken at the same frequency as specified in 3051 for test method T106.

## Material information for pavement design and construction:

1. The coarse aggregates have low wet strength (too low to be determined by standard testing) and further work is required to determine the durability of the material.
2. A construction trial carried out by RMS indicates that potential distress of the material will occur if the moisture content exceeds 8%.
3. Material has low permeability (approximately  $10^{-9}$  m/s).
4. Material has higher fines content than traditional DGB materials achieved by the addition of fly ash. The high fly ash content results in a cohesive material with low plasticity properties. It also requires specific consideration for sealing as the high fines creates adhesion and binder penetration issues for the initial seal treatment.
5. Material assessment is based on coal wash reject from the Dendrobium mine and is not applicable to aggregates from other mines.
6. The elastic modulus of the materials is unknown and further work is required to provide design guidance. A maximum vertical modulus of 250 MPa is to be assumed for pavement structural design.
7. The material relies on a lower relative moisture regime to provide shear resistance than DGB material, requiring particular attention to compaction moisture content and compaction technique.
8. The material has a pozzolanic content and will become bound with the addition of lime. The degree of strength gain will be influenced by the fineness and source of fly ash used and designers need to consider flexible versus bound material design properties where future maintenance work may involve the incorporation of lime as part of a rehabilitation process.

**Table 1B Particle size distribution and tolerances for Dendrobium Matrix Base.**

AS Sieve	% Passing by mass
75.0 mm	–
53.0 mm	100
37.5 mm	98 - 100
26.5 mm	85 - 98
19.0 mm	
13.2 mm	
9.5 mm	
4.75 mm	
2.36 mm	30 – 50
425 µm	
75 µm	13 - 19

Notes:

1. Limits specified by StabilCo.
2. Particle size distribution determined using test methods T106 and T107.
3. Grading limits apply to non pretreated material.
4. Replaces Table 3051.1 requirements.

**Table 2B Particle size distribution and tolerances for Dendrobium Matrix Base.**

Property	Limit	Test Method
Liquid Limit	Max. 28	T108
Plastic Limit	Max 20	T109
Plastic index	Max 8	T109
Linear shrinkage	Max 4%	T113
Permeability (m/s)	Max $5 \times 10^{-8}$	1289.6.7.2

Notes:

1. Limits apply to non pretreated material.
2. Permeability limit applies to material compacted to 100% MDD (standard compaction) in accordance with T112.
3. Replaces Table 3051.2 a) requirements.

## C STABILBASE

**Material Name:** Stabilbase

**Source:** Andesite aggregate – Martin’s Creek Quarry, Martin’s Creek, NSW 2420 (located approximately 28 km north of Maitland). Martin’s Creek Quarry is an andesite deposit quarry which was previously operated and established under RailCorp.  
Fly ash - Bayswater Power Station, 250 km north-west of Sydney.

**Material Description:** The Stabilbase material comprises an andesite derived base with up to 10 % fly ash by mass which is incorporated into the material via mechanical pug-mill. Stabilbase is typically non-plastic and currently fails to meet particle size distribution and particle shape requirements under RMS QA Specification 3051 Ed7 Rev0.

**Approval Status:** Traffic Categories B, C, D - Approved for Use  
Traffic Category A - Conditional Use - Subject to Roads and Maritime acceptance for trial use

### Overall application details:

**Application:** The principal use of this material is for sealed unbound rural road pavements. The material may also be used as a sealed unbound overlay base layer. Placement of material is to be in accordance with RMS R71.

**Applicable Traffic Category:** (3051 Cl. 6.2.1) B, C and D (Traffic Volumes < 10<sup>7</sup> ESA)  
Category A applications (Traffic Volumes > 10<sup>7</sup> ESA) may be accepted on a trial basis and requires prior approval from Roads and Maritime Pavements Unit, Engineering Services Branch.

**Applicable specifications:** R71 (not modified), M250 (not modified or bound) and M290 (not modified or bound).

**Surfacing treatment:** Sprayed Seal - Design in accordance with Roads and Maritime current practises.

**Material type:** (3051 Cl. 6.2.5) Unbound

**Particle size distribution:** (3051 Cl. 8.1) Table 1C requirements must be satisfied.



Other Tests Table 3051.2 and 3051.3 requirements must also be satisfied.  
(with the exception of particle shape)

**Construction:**

Layer thickness:	As per RMS R71
Production:	Fly ash incorporated by the use of a mechanical pug-mill in producing a moisture controlled base material.
Stockpiles:	Maximum size 4000 t
Maximum Moisture Content:	70 % - 80 % of OMC for placement.
Quality System:	Supplier must meet the requirements in 3051 Clause 4.
Project Quality Plan:	Supplier must provide inspection and test plans, and procedures for the placement of the material, compaction and sealing.
R71 Specification:	Must meet end product requirements specified in Clause 8.
Testing	Testing frequency to be carried out in accordance with Table 3051/L.1

**Material information for pavement design and construction:**

1. The material has a higher fines content than typical conforming base materials. This is due to the addition of fly-ash (up to 10 %) to assist in mix workability in the absence of plasticity. Special consideration is to be given to sealing the surface to ensure adhesion during an initial seal treatment. Past successful treatments have included:
  - a) Two coat seal, generally consisting of 14 mm and 7 mm aggregate and conventional binders
  - b) Primer seal with final polymer modified seal after 12 months
  - c) Primer seal followed by asphalt at later stage.Note that cutter content for 7 mm or 10 mm primer seals was generally applied at 5 % and is not to exceed 7 %.
2. Material assessment is based on Stabilbase Material from Martin's Creek Quarry only and this approval does not apply to any other materials from any other quarry sources.
3. For the purposes of pavement structural design, a maximum vertical modulus of 350 MPa should be assigned.



4. The characteristic relative compaction requirement is the same as that for other unbound pavements as specified in R71.
5. The material contains supplementary cementing materials and may become bound with the addition of lime through pozzolanic activity. The degree of strength gain will be influenced by both the source of the fly ash and its fineness. The designer is to consider both flexible and bound material properties for the full life cycle of the pavement where it is expected that future maintenance work may involve the incorporation of lime as part of the rehabilitation process.

**Table 1C- Particle Size Distribution Requirements for Stabilbase**

Property	Base and Subbase
RMS T106 and T107: Particle Size Distribution Passing AS Sieve (% by mass) <sup>1</sup>	
26.5 mm	100
19.0 mm	100
13.2 mm	97-100
9.5 mm	84-95
4.75 mm	54-65
2.36 mm	42-50
425 um	22-27
75 um	13-17

Notes: 1. Replaces RMS QA Specification 3051, Table 3051.1 requirement