

Policy 11: Land Development Guidelines

SS7

Specification for Unbound Pavements

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1.0 General

- 1.1 This specification applies to the construction or reconstruction of all pavements involving crushed rock and soil aggregate paving materials.
- 1.2 The work shall consist of processing, supplying, hauling, spreading, incorporating water, and compacting the relevant pavement materials in one or more courses on a prepared sub-grade or previously placed pavement in accordance with this specification and in conformity with the alignment, grades, type cross-sections and thickness shown on the drawings, or to such dimensions as directed by the Superintendent.

2.0 Acts, Regulations, Local Laws

- 2.1 The Contractor shall comply with all Acts, Local Laws and Regulations having jurisdiction over work under the contract and shall be fully responsible for any breaches thereof.

3.0 Materials Sources and Classes

- 3.1 The pavement materials shall only be sourced from quarries that have provided to Council, a certificate confirming that pavement materials (including replacement sub-grade material) do not contain soluble sulphate in excess of 500 mg/kg SO₄ and/or total sulphate after oxidation by peroxide of 5000 mg/kg SO₄.

The certification shall be renewed every three (3) months and submitted to Council.

3.2 Crushed Rock (CR): Class 1A, 1B and 2 Materials

This material shall be selected, crushed and processed to conform with the requirements specified herein.

The grading of CR shall conform with **Table 1** herein.

3.3 Soil Aggregate (SA): Class 1A, 1B, 2 and 3 Materials

Soil Aggregate materials shall be processed where necessary to meet the requirements specified herein.

4.0 Material Classes and Locations

- 4.1 Classes of pavement material for use shall be as follows:

i) Class 1A Base Course

Placed under bitumen seal, asphalt surfacing, or pavers on Major Traffic Routes and Industrial and Commercial Streets. Sealed with Moisture Content not more than 65% Optimum Moisture Content (OMC).

ii) Class 1B Base Course

Placed under bitumen seal, asphalt surfacing or pavers on Residential and Rural Residential Streets. Sealed with Moisture Content not more than 65% OMC.

iii) Class 2 Sub-Base

Placed under 1A or 1B material.

iv) Class 3 Sub-Grade Replacement or Under Sub-Base Material

Placed under Class 1A, 1B and 2 materials.

Table 1 Grading Envelopes for Material Classes

AS. Sieve Size	Percentage Passing Sieve (by Weight)				
	Crushed Rock	Soil Aggregate			
	Grading A	Grading B	Grading C	Grading D	Grading E
75mm					100
53mm		100			
37.5mm	100	85 – 100	100		85 – 100
26.5mm	85 – 100				
19.0mm	75 – 100	55 – 90	80 – 100	100	
9.5mm	58 – 80	40 – 70	55 – 90	80 – 100	40 – 100
4.75mm	45 – 62	28 – 55	40 – 70	55 – 90	
2.36mm	33 – 45	20 – 45	30 – 55	40 – 70	20 – 100
425µm	14 – 22	10 – 25	12 – 30	20 – 40	10 – 80
75µm	5 – 10	4 – 15	5 – 20	8 – 25	4 – 30
Acceptable Gravel Classes	1A, 1B, 2	1A, 1B, 2, 3	1A, 1B, 2, 3	2, 3	3

Notes:

- 1** *The grading curve for all materials shall be reasonably smooth and free from sharp irregularities. For Class 1A and 1B Base Course and Class 2 Sub-base materials, the percentage of material by weight passing the 75µm sieve shall be less than two-thirds of the percentage by weight passing the 425µm sieve.*
- 2** *For Grading curves A to D, the grading curve shall be smooth, and shall not move from one outer third of the limits range on any sieve into the opposite outer third of the limits range on the next lower sieve listed. No abrupt discontinuity in grading (even within these limits) which is associated with difficulty obtaining the specified compaction in place shall be permissible.*
- 3** *For Class 3 materials, grading curves shall be smooth and free from abrupt irregularities.*
- 4** *The Contractor shall nominate for the Superintendent's approval the grading category proposed and shall consistently meet this requirement.*

4.2 Material Properties and CBR Values

Pavement material shall conform to the properties set out in **Table 2** herein or, where applicable, may be substituted as follows for:

- i) Class 1A QDMR MRS 11.05 – subtype 2.1
- ii) Class 2 QDMR MRS 11.05 – subtype 2.3
- iii) Class 3 QDMR MRS 11.05 – subtype 2.5

Soaked CBR testing shall be performed at 100% Standard compaction and OMC and tested using a 4.5kg surcharge weight.

Table 2 Properties and CBR Values

Material Property	Pavement Material Class			
	Class 1A	Class 1B	Class 2	Class 3
4 Day Soaked CBR Value	80%	60%	45%	15%
Material Source (refer Clause 3)	CR SA	CR SA	CR SA	SA
Grading (refer Table 1)	A, B, C	A, B, C	A, B, C, D	B, C, D, E
Maximum Aggregate Crushing Value	30%	30%	40%	40%
Maximum Los Angeles Abrasion	30%	30%	40%	40%
Maximum Sodium Sulphate Soundness	12%	15%	15%	15%
Maximum Liquid Limit	25	25	28	40
Maximum PI (Plasticity Index)	6	8	8	14
Minimum PI (Plasticity Index)	2	4	4	-
Maximum PI x (% Passing 425µm Sieve)	150	200	200	-
Maximum LS (Linear Shrinkage)	3.5	4.5	4.5	7.5
Maximum LS x (% Passing 425µm Sieve)	85	110	110	-

Note: CBR = California Bearing Ratio

5.0 Preparation of Sub-Grade

- 5.1 Prior to placing the pavement material, the sub-grade shall be trimmed to the correct line and level and shall be compacted to a minimum density ratio of 98% Standard for cohesive material or a minimum density index of 80% for non-cohesive material to a depth of 0.3 metres.
- 5.2 The Contractor shall notify the Superintendent twenty-four (24) hours in advance of when the sub-grade will be ready for the Superintendent's inspection. Pavement material shall not be placed until the Superintendent has inspected and approved the sub-grade preparation.
- 5.3 Prior to the placement of pavement materials the sub-grade is to be proof rolled with a smooth steel wheeled roller, pneumatic tyred roller or highway truck ballasted to comply with the following:
 - a) Steel Wheeled – used without vibration and which has a minimum applied load intensity of 4t/m width of the wheels or drum being considered.
 - b) Pneumatic Tyred – not less than 3t per tyre with tyres inflated to 550kPa.
 - c) Highway Truck – with rear axle or axles loaded not less than 8t each with tyres inflated to 550kPa.

In areas where any visible deformation or springing occurs the sub-grade material shall be rectified or replaced with material which has a CBR of 15 or greater and represented for proof rolling.

6.0 Construction

- 6.1 If required by the Superintendent the Contractor shall carry out on a section of the area to be paved (not exceeding 400m in length and 10m in width) trials with the plant the Contractor proposes to use to place and compact the paving materials. The trials shall be continued until at least 9 out of every 10 consecutive tests taken have a density at least equal to that specified in **Clause 4.0** herein. All costs in connection with conducting the trials and the testing associated therewith shall be borne by the Contractor.
- 6.2 If the processed material does not conform to the specified requirements the Superintendent may require the Contractor to propose an alternative method of supply and processing for further trial and approval. If the Superintendent determines that processing on-Site is unsatisfactory, the Contractor shall supply and place only material processed elsewhere and conforming to the specified requirements.

Notwithstanding the above requirements it shall be the Contractor's responsibility to maintain the supply and production of pavement materials to the specified requirements.
- 6.3 Unless otherwise approved by the Superintendent each course of pavement material shall not exceed 150mm compacted thickness except that where the required compacted thickness of any pavement course is 200mm or less, the paving material shall be spread and compacted in one layer.

Where the compacted thickness of any pavement course is more than 200mm, the paving material shall be compacted in two or more layers each of not less than 100mm compacted thickness.

The surface of any previously compacted layer shall be lightly scarified before placing the succeeding layer.
- 6.4 On existing work when pavement resheeting is required and the designated compacted thickness of the additional pavement material is less than 75mm, the existing pavement shall be scarified to such a depth that the total thickness of loose material, including the new material, is not less than 75mm.
- 6.5 When two or more separate types of materials are mixed to produce a paving material conforming with this specification the separate materials (including any necessary water) may be mixed at source by an approved process. Alternatively the materials may be uniformly mixed in place on the sub-grade with approved equipment provided this process results in a finished material conforming with the requirement specified herein.

- 6.6 Water shall be uniformly mixed to the full depth of each layer to be compacted to bring the material to the optimum moisture content or within the range of moisture contents required to achieve the specified compaction. The material shall then be bladed, shaped and compacted to conform with the lines and level and profiles indicated on the drawings, within the specified tolerances and compaction requirements. All areas of segregated or non-uniform materials shall be corrected or removed and replaced with a well-graded material as directed by the Superintendent.

7.0 Compaction

- 7.1 Each course of the paving material shall be compacted to a minimum density ratio of 95% Modified. For heavily loaded roads (major traffic routes and industrial / commercial streets defined by **Standard Drawings 03-02-002** and **03-02-400**) the base course shall be compacted to a minimum density ratio of 98% Modified. Sufficient watering and rolling shall be carried out on the pavement to produce the degree of compaction specified. This specification permits the use of assigned values for maximum dry density (MDD) and optimum moisture content (OMC) and the determination of MDD and OMC values for uncompacted materials.
- 7.2 After compaction of the pavement, the whole of the surface shall be graded, trimmed and finished to give a hard, tight, dense, even surface, free of lenses and caking, in accordance with the tolerances specified herein.
- 7.3 Asphalt surfacing or bitumen sealing shall not proceed until the profile, surface, compaction, quality and finish of the pavement has been approved by the Superintendent. Should the pavement (due to any reason or cause) lose the required quality, stability, density or finish before the surfacing is complete, it shall be recompacted and finished at the sole expense of the Contractor.

8.0 Tolerances on Alignments, Grades and Levels

- 8.1 The surface at the centreline of the finished sub-grade shall be graded to within the tolerances and in accordance with the levels and grade line shown on the drawings, or calculated from data given on the drawings with due allowance for the thickness of any pavement and surfacing required.
- 8.2 The alignment of the finished pavement shall be such that the dimension measured at right angles from the designated centreline to either edge of the pavement is nowhere less than the dimension shown on the drawings.
- 8.3 The level at the centreline of the finished pavement shall not vary by more than +15 mm, -0mm from the level shown provided the mean rate of deviation from the design grade shall not exceed 1.5 mm per metre over any 25 m length, and further provided that at all times the pavement thickness as determined by the Superintendent is maintained.
- 8.4 The deviation of the pavement surface from a 3 metre long straight edge laid on the pavement surface shall nowhere exceed 10 mm.
- 8.5 The cross falls of the surface of the finished pavement shall not deviate from the cross falls shown on the drawings by more than ± 0.20 percent. A template and spirit level to be used for checking the cross profile shall be kept on-Site and made available to the Superintendent when requested.
- 8.6 The thickness of each layer of paving material when compacted shall be not less than that specified and/or shown on the drawings unless varied in writing by the Superintendent.

9.0 Testing

- 9.1 Unless otherwise specified the cost of all sampling and testing (including compaction control) shall be borne by the Contractor. The Contractor shall arrange for material qualities and compaction control testing of all pavement materials, to be performed by a NATA accredited testing authority approved by the Superintendent. Testing shall be carried out in accordance with the appropriate test methods, sourced from either the **Australian Standard AS1289** or **Queensland Department of Main Roads, Materials Testing Manual**. The selection/application of test methods shall be made on a consistent basis. Inter-related tests shall be performed by the methods from the same Standard/Testing Manual. Testing requirements of placed and compacted material shall consist of:
- a) One materials quality test for each 150m length (per material subtype used) of roadworks or 1000m² for carparks and one determination of the dry density ratio for each 50m of two (2) lane roadworks or 1000m² for carparks (per pavement course), with a minimum of one materials quality test (per material subtype) and three (3) determinations of dry density ratio (per pavement course) per street or carpark.
 - b) A materials quality test shall consist of the following as a minimum:
 - Particle size distribution
 - 4 day Soaked CBR Value
 - Liquid Limit
 - Plasticity Index (PI)
 - PI x % Passing 425µm Sieve
 - Linear Shrinkage (LS)
 - LS x % Passing 425µm Sieve
- 9.2 The minimum tests specified herein do not include normal job control tests carried out by the Contractor and the cost of all other tests required by the Contract shall be borne by the Contractor.
- 9.3 The testing basis of a lot is on a 'not one to fail' criteria. In the event that any test fails to satisfy the requirements specified herein then two further satisfactory tests, at the Contractor's expense, will be required as evidence that the failed work has been rectified and meets the requirements specified.

10.0 Measurement and Payment

- 10.1 Unless otherwise specified, pavement quantities shown in any Bill of Quantities (if part of the Contract) are nett compacted quantities calculated on the basis of the dimension and information shown on the drawings.
- 10.2 Payment for pavement shall include all material, plant, labour, expenses and control necessary to complete the items as specified, including watering, compaction and trimming.

11.0 Standards and Codes

- 11.1 This specification makes reference to the following Australian Standards and Queensland Department of Main Roads documents:
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| AS1289 | Methods of Testing Soils for Engineering Purposes |
| QDMR | Materials Testing Manual, Volumes 1 – 4. Third Edition 1978, including Amendment Sheet No. 26, June 1996 |
| QDMR | Standard Specifications Roads |
- 11.2 In this specification Australian Standards are referred to only by their allocated AS number. The latest available edition at the date of close of Tenders shall be deemed to apply.