



WESTERN AUSTRALIA SPECIFICATION

242

FLEXIBLE PAVEMENTS

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
1	Acceptable pavement material types	Table 242.2	A	AW	July 2002
2	Sub-base Material	Table 242.4	O	AW	July 2002
3	Unbound Base and Sub-base	242.08 (2) (4) (5) (6)	O, M	AW	July 2002
4	Ferricrete	242.10a	A	AW	July 2002
5	Bitumen Emulsion Stabilised Limestone	242.10b	A	AW	July 2002
6	Compaction Requirements and Acceptance	242.20 (a),(b), (c)	M, O	AW	July 2002
7	Summary of limits and tolerances				

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SPECIFICATION 242 : FLEXIBLE PAVEMENTS

GENERAL

242.01 SCOPE

1. The work to be executed under this Specification consists of the supply, spreading, compaction and trimming of base and subbase courses of flexible and semi-rigid (bound) pavements to the specified levels and thicknesses as shown on the Drawings.

2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part of Quality Requirements.

Quality

242.02 TERMINOLOGY

(a) Materials designated as 'base' require the provision of a wearing surface comprising either a sprayed bituminous seal or asphalt up to 50mm thick.

Definitions

(b) Materials designated as 'subbase' require a covering course of 'base'. The subbase may consist of one or more layers.

(c) A flexible pavement consists of a base and a subbase constructed of unbound materials. For the purpose of this Specification it also includes "semi-rigid" pavements.

(d) A semi-rigid pavement is one where the base and/or the subbase are constructed of bound materials.

(e) Bound material incorporates a binder to produce structural stiffness.

(f) Modified material incorporates small amounts of stabilising binder to improve the properties of the material without significantly affecting structural stiffness.

242.03 REFERENCE DOCUMENTS

1. Documents referenced in this Specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated.

*Documents
Standards Test
Methods*

(a) Council Specifications

- | | | |
|-----|---|------------------------------|
| 241 | - | Stabilisation |
| 244 | - | Sprayed Bituminous Surfacing |

(b) Australian Standards

- | | | |
|---------------|---|--|
| AS 1141.14 | - | Particle shape, by proportional calliper. |
| AS 1141.22 | - | Wet/dry strength variation. |
| AS 1289.3.1.1 | - | Determination of the liquid limit of a soil - Four point Casagrande method. |
| AS 1289.3.3.1 | - | Calculation of the plasticity index of a soil. |
| AS 1289.3.6.1 | - | Determination of the particle size distribution of a soil - Standard method of analysis by sieving. |
| AS 1289.3.6.3 | - | Determination of the particle size distribution of a soil - Standard method of fine analysis using a hydrometer. |
| AS 1289.5.2.1 | - | Determination of the dry density/moisture content relation of |

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- a soil using modified compactive effort.
- AS 1289.5.3.1 - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus.
 - AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
 - AS 1289.5.8.1 - 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 - Determination of the California bearing ratio of a soil - Standard laboratory method for a remoulded specimen.

(c) NSW RTA Test Methods

- T116 - Unconfined Compressive Strength - Remoulded Material
- T131 - Unconfined Compressive Strength

(d) MRWA Test Methods

- WA132.1 - Dry Density/Moisture Content Relationship: Standard Compaction Fine and Medium Grained Soils - February 1994
- WA132.2 - Dry Density/Moisture Content Relationship: Standard Standard Compaction Coarse Grained Soils - February 1994
- WA133.1 - Dry Density/Moisture Content Relationship: Modified Compaction Fine and Medium Grained Soils - February 1994
- WA133.2 - Dry Density/Moisture Content Relationship: Modified Compaction Coarse Grained Soils - February 1994
- WA140.1 - Maximum Dry Compressive Strength - September 1982
- WA220.1 - Los Angeles Abrasion Value
- WA326.1 - Pavement Deflection and Curvature: Benkelman Beam Test - January 1996
- WA915.1 - Calcium Carbonate Content

242.04 PAVEMENT STRUCTURES

1. Flexible or semi-rigid pavement material types and layer thicknesses shall be as shown on the Drawings.

***Material Types
and Layer
Thickness***

242.05 INSPECTION, SAMPLING AND TESTING

1. Inspection, sampling and testing of the pavement shall be undertaken by the Contractor in accordance with the requirements of this Specification before, during and after the construction of the pavement. Testing shall be carried out by a NATA registered laboratory with appropriate accreditation and suitably qualified personnel.

***Contractor's
Responsibility***

2. The Contractor shall provide the Superintendent with written notice when testing is being carried out and copies of all test reports for approval to proceed.

Written Notice

3. Field density tests shall be carried out in accordance with AS 1289.5.3.1, or, with the Superintendent's concurrence, with a Nuclear Density Meter in accordance with Clause 242.19.

Density Tests

MATERIALS

242.06 GENERAL

1. The Contractor shall submit details of all constituents of the proposed base and subbase materials, including sources of supply and the proposed type and proportion of any binder. These details shall be submitted to the Superintendent, supported with test results from a nominated NATA registered laboratory confirming that the constituents comply with the requirements of this Specification. If the proposed base or subbase is a bound material, the Contractor shall submit a completed Annexure 241A contained in the Specification for STABILISATION.

Details of Proposed Base and Subbase to be Submitted

2. No material shall be delivered until the Superintendent has approved the source of supply.

Source of Supply

3. If, after the Contractor's proposals have been approved, the Contractor wishes to make changes in any of the material constituents the Contractor shall inform the Superintendent in writing of the proposed changes. No delivery of material produced under the altered proposal shall take place without the approval of the Superintendent. The cost of testing associated with any altered proposal shall be borne by the Contractor.

Variations by Contractor

Contractor's Cost

4. At least fourteen days before placement of the material on site, the Contractor shall submit a Certificate from a laboratory with appropriate NATA registration demonstrating and stating that the unbound material or the mix and its constituents comply with the requirements of this Specification.

NATA Certificate

5. Ongoing testing of materials during delivery and construction shall be undertaken on samples taken from the site.

Sampling on-site

242.07 TRAFFIC CATEGORY

1. Pavement materials are specified in terms of the Traffic Categories given in Table 242.1 for the calculated design traffic of the pavement.

Pavement Material Traffic Category Drawings

2. The Traffic Category (or Design Traffic) for the pavement materials shall be as shown on the Drawings.

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.

Table 242.1 - Pavement Material Traffic Categories

242.08 UNBOUND BASE AND SUBBASE

1. Unbound materials, including blends of two or more different materials, shall consist of granular material which does not develop significant structural stiffness when compacted. Material produced by blending shall be uniform in grading and physical characteristics. **Granular Material**

2. Unbound crushed rock materials are designated as follows: **Crushed Rock**
 - DGB20 20mm nominal sized densely graded base
 - DGS20 20mm nominal sized densely graded subbase
 - DGS40 40mm nominal sized densely graded subbase
 - GMB20 20mm nominal sized graded macadam base
 - GMS40 40mm nominal sized graded macadam subbase
 - GLS20 20mm nominal sized graded limestone subbase
 - GLS40 40mm nominal sized graded limestone subbase

3. Unbound natural gravel materials are designated as follows: **Natural Gravel**
 - NGB20-2c 20mm nominal sized natural gravel base for Traffic Category 2c
 - NGB20-2d 20mm nominal sized natural gravel base for Traffic Category 2d
 - NGS20 20mm nominal sized natural gravel subbase
 - NGS40 40mm nominal sized natural gravel subbase

4. The acceptable material types for each Traffic Category are given in Table 242.2. **Material Types**

Traffic Category	Acceptable Base Material	Acceptable Subbase Material
1	DGB20, ESL	DGS20, DGS40, GLS20, GLS40
2a	DGB20, ESL	DGS20, DGS40, GLS20, GLS40
2b	DGB20, ESL	DGS20, DGS40, GLS20, GLS40
2c	DGB20, Ferricrete, NGB20-2c	DGS20, DGS40, GLS20, GLS40, NGS20, NGS40
2d	DGB20, NGB20-2c, NGB20-2d	DGS20, DGS40, GLS20, GLS40, NGS20, NGS40

Note: ESL – Bitumen Emulsion Stabilised Limestone

Table 242.2 - Acceptable Pavement Material Types

5. Base materials shall comply with the requirements of Table 242.3.

Base

Test Method	Description	Base Material Requirements		
		DGB20	NGB20-2c	NGB20-2d
AS 1289.3.6.1	Coarse Particle Size Distribution % passing 75.0mm sieve % passing 53.0mm sieve % passing 37.5mm sieve % passing 26.5mm sieve % passing 19.0mm sieve % passing 13.2mm sieve % passing 9.5mm sieve % passing 6.7mm sieve % passing 4.75mm sieve % passing 2.36mm sieve % passing 0.425mm sieve % passing 0.075mm sieve	- - - 100 95-100 - - 50-70 - 35-55 - -	- - - 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 2.36mm sieve) A. Pass 425mm sieve % B. Pass 75µm sieve % Pass 425µm sieve C. Pass 13.5µm sieve % Pass 75µm sieve	35-55 35-55 35-60	- - -	- - -
AS 1289.3.1.1	Liquid Limit (if non plastic) ▼	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20
AS 1289.3.3.1	Plasticity Index ■	max 6	max 6	max 8
WA 140.1	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if Plasticity Index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper % mis-shapen (2 : 1)	max 35	-	-
AS 1141.22	Aggregate Wet Strength ◇ For category 1 or 2a For category 2b or 2c For category 2d	min 80 min 70 min 60	- - -	- - -
AS 1141.22	Wet/Dry Strength Variation ◇ $\frac{\text{Dry} - \text{Wet}}{\text{Dry}} \%$ For category 1 or 2a For category 2b or 2c For category 2d	max 35 max 40 max 45	- - -	- - -
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	-	80	60

Table 242.3 - Unbound Base Material Properties

NOTES ON TABLE 242.3:

Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75 per cent of the particles larger than 6.70mm.

- ✓ 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 shall be 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 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested 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.

6. Subbase materials shall comply with the requirements of Table 242.4

Subbase

Test Method	Description	Subbase Material Requirements					
		DGS20	DGS40	NGS20	NGS40	GLS20	GLS40
AS 1289.3.6.1	Coarse Particle Size Distribution % passing 75.0mm sieve % passing 53.0mm sieve % passing 37.5mm sieve % passing 26.5mm sieve % passing 19.0mm sieve % passing 13.2mm sieve % passing 9.5mm sieve % passing 6.7mm sieve % passing 4.75mm sieve % passing 2.36mm sieve % passing 1.18mm sieve % passing 0.425mm sieve % passing 0.075mm sieve	- - - 100 95-100 - - 50-70 - 35-55 - -	- 100 - - 50-85 - - 30-55 - 25-50 - -	- - - 100 96-100 - 65-89 - 47-80 32-67 - 14-42 6-26	- 100 - 80-97 - - - 35-73 25-58 - 10-33 3-21	100 - - - 90-100 - - 60-90 - 35-75 -	100 - - - 55-85- - - - - 35-65 - -
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36mm sieve) A. Pass 425µm sieve % B. Pass 75µm sieve % Pass 425µm sieve C. Pass 13.5µm sieve % Pass 75µm sieve	35-55 35-55 35-60	35-60 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	-	-
WA 140.1	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if Plasticity Index is less than 1)	min 1.0 MPa	min 1.0 MPa	1.0 MPa	1.0 MPa	-	-
AS 1141.14	Particle Shape by Proportional Calliper % mis-shapen (2 : 1)	max 35	max 35	-	-	-	-
AS 1141.22	Aggregate Wet Strength ♦	min 50kN	min 50kN	-	-	-	-
AS 1141.22	Wet/Dry Strength Variation ♦ Dry - Wet % Dry	max 60	max 60	-	-	-	-
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	-	-	30	30	-	-
AS 1289.5.2.1	Maximum Dry Density	-	-	-	-	min 95%	min 95%
WA 915.1	CaCO ₃ by Mass	-	-	-	-	min 60%	min 60%
WA 220.1	LA Abrasion Value	-	-	-	-	20-60%	20-60%

Table 242.4 - Unbound Subbase Material Properties

NOTES ON TABLE 242.4:

Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75 per cent of the particles larger than 6.70mm.

- ◆ 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 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested 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.

7. Where the proposed unbound base or subbase material complies with all of the requirements of Table 242.3 or Table 242.4 as appropriate except gradings (AS1289.3.6.1 and AS1289.3.6.3), the Contractor may propose the use of the material, subject to approval of the Superintendent.

242.09 LIME MODIFIED BASE AND SUBBASE MATERIALS

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| 1. Modification of unbound base and subbase materials to meet the requirements of Clause 242.08 by the addition of hydrated lime or quicklime shall be subject to approval by the Superintendent and to the additional requirements of this clause. After modification, the material shall meet the requirements of Clause 242.08. | Lime
Modification |
| 2. Modification of materials for Traffic Categories 1, 2a and 2b shall only be by use of hydrated lime mixed in a stationary mixing plant at the supplier's quarry. | Traffic
Categories 1,
2a, 2b |
| 3. Modification of materials for Traffic Categories 2c and 2d may be by the use of either hydrated lime through a stationary mixing plant or by hydrated lime or quicklime utilising in-situ operations. | Traffic
Categories 2c,
2d |
| 4. Material requirements of hydrated lime and quicklime shall be in accordance with the Specification for STABILISATION. | Lime |
| 5. The method of incorporating lime through the stationary mixing plant shall ensure that the lime is mixed uniformly through the material. | Incorporation |
| 6. In-situ operations shall be in accordance with the Specification for STABILISATION. | In-situ
Operations |
| 7. The proportion of lime shall be not less than 1.5 per cent nor more than 4 per cent by mass. The material prior to lime treatment shall not contain any added pozzolanic material. | Proportion |
| 8. The lime treated material shall yield an unconfined compressive strength not exceeding 1.0 MPa, when tested in accordance with Test Method T116 where sampling is undertaken within 24 hours of adding the lime and testing is after 7 days accelerated curing. | Unconfined
Compressive
Strength |
| 9. For DGB20 material, prior to being treated with lime, the material shall comply with the requirements of DGS20 in Table 242.4, except that the aggregate wet strength shall not be less than 80kN and the wet/dry strength variation shall not exceed 60 per cent. | DGB20 |
| 10. For DGB20, the lime treated material shall yield a CBR value of not less than 100 when tested in accordance with AS 1289.6.1.1, where sampling is undertaken within 24 hours of adding the lime and testing is after 7 days of accelerated curing. | CBR Value |

242.10 BOUND BASE AND SUBBASE MATERIALS

- | | |
|--|--|
| <p>1. Bound materials utilised in semi-rigid pavements as a base layer for Traffic Categories 1, 2a and 2b shall be supplied as a crushed rock product with stabilising agent incorporated in a stationary mixing plant (pugmill) at the supplier's quarry unless prior written approval is obtained from the Superintendent.</p> | <p>Traffic Categories 1, 2a, 2b</p> |
| <p>2. Bound material to be used as subbase generally or base layer for Traffic Categories 2c and 2d may be supplied as a crushed rock product with stabilising agent incorporated in a pugmill or may be produced by the in-situ stabilisation of natural or blended gravel where stabilisation is undertaken by mobile plant at the site.</p> | <p>Traffic Categories 2c, 2d</p> |
| <p>3. Prior to stabilisation, the base layer material shall meet the requirements of Table 242.4 for subbase material for the appropriate Traffic Category.</p> | <p>Material Requirements Prior to Stabilisation</p> |
| <p>4. Material requirements for the stabilising agent shall be in accordance with the Specification for STABILISATION.</p> | <p>Stabilising Agent</p> |
| <p>5. The stabilisation process shall meet the requirements of the Specification for STABILISATION.</p> | |
| <p>6. The unconfined compressive strength (UCS) of the material after seven days accelerated curing as determined by RTA Test Method T131 shall be not less than 4MPa nor more than 10MPa. Sampling and test specimen compaction of the material shall be undertaken within one hour of the incorporation of the stabilising agent.</p> | <p>Unconfined Compressive Strength</p> |

242.10a. FERRICRETE

1. The road base material known as ferricrete shall consist of a blend of crushed massive ferricrete and natural ferricrete gravel conforming with the requirements of this specification. The proportion of crushed material shall be not less than 60%.

The source rock shall be massive ferricrete meeting the following requirements:

Los Angeles Abrasion = 45 or less

Or

Point Load Index I₅₀ = Average of tests on 20 samples to be not less than 0.5Mpa

Source rock shall be durable material, which does not break-up when alternately wetted and dried.

The portion of sample passing a 0.425mm sieve shall conform to the following requirements:

Liquid Limit = 30 or less
 Plasticity Index = 6 or less
 Linear Shrinkage = 3% or less

The ratio of the percentage passing a 0.075mm sieve to the percentage passing a 0.425mm sieve shall fall within the range 0.4 and 0.6.

242.10B BITUMEN EMULSION STABILISED LIMESTONE

1. The material specification for the limestone shall be as per section 242.08
2. The bitumen emulsion shall be of an approved slow breaking anionic type and shall contain only water, emulsifying agents and class 50 bitumen. No other materials shall be present. The bitumen content shall be a minimum of 60%. **Bitumen Emulsion**
3. The bitumen stabilised limestone shall be supplied from an approved source and shall be a thoroughly mixed and homogenous mixture when delivered to the site. The mixture shall contain a minimum of 2% residual bitumen by weight of the limestone. **Bitumen Stabilised Limestone**

The product shall conform to the following requirements:

- Maximum Dry Density (Modified ASSHO) – 1750 kg/cubic metre minimum.
- Maximum Dry Compressive Strength (unconfined, cured 1 day and oven dried for 16 hours) – 10.5kPa minimum.

The stabilised material shall be mixed for such a length of time to ensure even dispersion of the bitumen emulsion.

DELIVERY, STOCKPILING AND PROCESSING OF PAVEMENT MATERIAL

242.11 DELIVERY TO SITE

1. Materials shall be supplied sufficiently damp to avoid segregation and loss of fines during transit. **Damp Condition**

242.12 STOCKPILING OF UNBOUND MATERIALS

1. Stockpile sites shall be located as shown on the Drawings or as approved by the Superintendent. **Stockpile Sites**
2. Stockpile sites, which shall be cleared of all vegetation and extraneous matter, shall be shaped to form a crown so as to be free draining and compacted over the whole area to provide a relative compaction, determined by AS1289.5.4.1 for standard compactive effort, of not less than 95 per cent. **Compacted and Free Draining**
3. Stockpiles and stockpile sites shall be maintained so as to prevent the stockpiled materials from becoming intermixed or contaminated with foreign material. **Stockpile Requirements**
4. The total height of any stockpile shall not exceed 3m. **Height**
5. Stockpiles shall be of uniform shape with side slopes neither steeper than 1.5h to 1v nor flatter than 3h to 1v. **Shape**
6. The worked face of any stockpile shall be the full face of the stockpile. The stockpiled material shall be maintained at a moisture content sufficiently damp to avoid loss of fines. **Maintained Damp**
7. At the completion of the works, stockpile sites shall be cleared of all surplus material and left in a clean and tidy condition. **Completion of Work**

242.13 DELIVERY OF MODIFIED OR BOUND MATERIALS

- | | |
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| <p>1. Modified or bound materials shall be delivered in vehicles fitted with covers of canvas or other suitable material to prevent loss of moisture during transport, unless otherwise approved by the Superintendent.</p> | <p>Vehicle Deliveries</p> |
| <p>2. The time between mixing and conveyance by delivery trucks to the site, shall be such as to allow incorporation into the works including trimming and compaction within the nominated field working period.</p> | <p>Time Limit</p> |
| <p>3. Each truck load of bound material shall be identified by delivery dockets, indicating the time and date of mixing and registration or fleet number of the delivery truck, and such dockets shall be made available to the Superintendent at the point of delivery.</p> | <p>Delivery Dockets</p> |
| <p>4. Bound materials shall comply with the requirements of the Specification for STABILISATION.</p> | |

SPREADING OF PAVEMENT MATERIAL

242.14 SPREADING PAVEMENT MATERIALS

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| <p>1. Unbound materials shall not be spread upon an underlying pavement layer which has a moisture content exceeding 90 per cent of the laboratory optimum moisture content as determined by AS 1289.5.2.1 or which has become rutted or mixed with foreign matter. The underlying layer shall be corrected to comply with this Specification before spreading of the next layer of pavement.</p> | <p>Underlying Layer Quality</p> |
| <p>2. Where the underlying layer was constructed by the Contractor, or where the Contractor's activities caused the underlying layer constructed by others to become non-complying with this Specification, the cost of correcting the underlying layer to comply shall be borne by the Contractor.</p> | <p>Contractor's Costs</p> |
| <p>3. Each layer of material shall be deposited and spread in a concurrent operation and, after compaction, the finished surface levels on the base and subbase courses shall be within the permitted tolerances stated in Clause 242.22(c) without subsequent addition of material. The thickness of each compacted layer shall be neither less than 100mm nor more than 200mm for all pavement layer types, unless otherwise approved by the Superintendent.</p> | <p>Tolerances</p> |
| <p>4. At all work boundaries in bound materials the Contractor shall provide vertical faces to provide for transverse and longitudinal joints.</p> | <p>Joints</p> |
| <p>5. When spread for compaction processes the moisture content of the base or subbase materials shall be in the range of 60-90 per cent of laboratory optimum moisture content in accordance with AS1289.5.2.1.</p> | |
| <p>6. Bound materials shall not be spread when the ambient air temperature in shade is either below 5°C or above 35°C unless expressly approved by the Superintendent.</p> | |

TRIMMING AND COMPACTION

242.15 GENERAL REQUIREMENTS

- | | |
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| <p>1. Each layer of the base and subbase courses shall be uniformly compacted over its entire area and depth to satisfy the requirements of relative compaction set out in</p> | <p>Uniform Compaction</p> |
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FLEXIBLE PAVEMENTS

Clauses 242.19 and 242.20.

2. On sections of pavement with one-way crossfall, compaction shall begin at the low side of the pavement and progress to the high side. On crowned sections, compaction shall begin at the sides of the pavement and progress towards the crown. Each pass of the rollers shall be parallel with the centreline of the roadway and uniformly overlap each preceding pass. The outer metre of both sides of the pavement shall receive at least two more passes by the compaction plant than the remainder of the pavement.

***Compaction
Procedure***

3. At locations where it would be impracticable to use self propelled compaction plant, the pavement material shall be compacted by alternative hand-operated plant approved by the Superintendent.

***Hand Operated
Plant***

4. Watering and compaction plant shall not be allowed to stand on the pavement being compacted.

***Plant
Movement
Restrictions***

5. If any unstable areas develop during rolling, the unstable material shall be rejected. The rejected material shall be removed for the full depth of the layer, disposed of and replaced with fresh material in accordance with Clause 242.24. This operation will be at cost to the Contractor.

***Unstable
Areas
Contractor's
Cost***

6. The placement of subsequent layers shall not be allowed until the requisite testing has been completed and the test results for each layer have been accepted by the Superintendent.

***Placing
Subsequent
Layers***

7. Any unbound material in a layer that has attained the specified relative compaction but subsequently becomes wetted up shall be dried out and, if necessary, uniformly recompacted and trimmed to meet the specified density requirements and level tolerances.

***Excessive
Moisture
Content***

242.16 CURING OF BOUND MATERIALS

1. The curing of the surface layer of a lot shall commence after compaction is completed.

***Commence-
ment Time***

2. The stabilised work shall be protected against rapid drying out 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.

Water Curing

3. Water curing shall consist of frequent light uniform spraying that will not produce significant run off or flooding on sections of the area. Slurrying of the surface or leaching of the stabilising agent shall be avoided.

Caution

ACCEPTANCE OF COMPACTED LAYERS

242.17 LOTS FOR ACCEPTANCE

1. Acceptance of work, as far as compaction is concerned, shall be based on density testing of the work in lots. A lot shall be nominated by the Contractor, but shall conform to the following:

***Lot
Requirements***

- (a) 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;

- (b) for unbound materials it may equal a day's output using the same material.

242.18 COMPACTION ASSESSMENT

- | | |
|--|--------------------------------------|
| <p>1. The Superintendent shall assess compaction for each lot based on random sampling of test locations for in-situ dry density testing.</p> | <p>Density Testing</p> |
| <p>2. The Contractor shall arrange for testing to assess compaction on the basis of ten tests per 5000 sq m with a minimum of three (3) tests per lot, and present the results to the Superintendent for approval. Sampling frequency may only be varied with prior written approval of the Superintendent.</p> | <p>Sampling</p> |
| <p>3. The cost of all testing for compaction assessment of any layer in an area of pavement shall be borne by the Contractor.</p> | <p>Contractor's Costs</p> |
| <p>4. Alternatively, when agreed by the Principal, acceptance of lots may be determined according to the elastic rebound deflection. The elastic rebound deflection shall be taken as the maximum deflection in accordance with Test Method WA326.1 utilising the Benkelman Beam or equivalent. The average maximum deflection for any lot shall not exceed 1.0mm, and the co-efficient of variation (CV) in recorded deflections shall not exceed 30 per cent. Measurements shall be taken at the rate of 4 per 1000 square metres, with a minimum of ten measurements per lot.</p> | <p>Benkelman Beam Testing</p> |

242.19 RELATIVE COMPACTION

- | | |
|---|---------------------------|
| <p>1. The relative compaction of pavement material at each location tested for in-situ dry density shall be calculated in accordance with AS 1289.5.4.1 as follows:</p> | <p>Calculation</p> |
|---|---------------------------|

$$\text{Relative Compaction (per cent)} = \frac{\text{In-situ dry density}}{\text{Comparative dry density}} \times 100$$

NOTE: The comparative dry density shall be the maximum dry density determined in the laboratory.

- | | |
|--|---|
| <p>2. The Superintendent may approve some or all of the in-situ dry density testing to be carried out with a single probe Nuclear Density Meter in the direct transmission mode in accordance with AS 1289.5.8.1.</p> | <p>In-Situ Dry Density Testing</p> |
| <p>3. Each day that material is produced for placement in a layer or layers, a sample of the material shall be taken by the Contractor for maximum dry density testing to represent that day's production.</p> | <p>Daily Samples</p> |
| <p>4. For unbound layers, the sample shall be tested in accordance with AS 1289.5.2.1 to determine the maximum dry density (modified compactive effort) for the material.</p> | <p>Maximum Dry Density</p> |
| <p>5. For bound layers the sample shall be tested within two hours after the addition of stabilising agent to the mix in accordance with Test Methods WA132.1, WA132.2, WA133.1 and WA133.2 to determine the maximum dry density (modified compactive effort) for the material. These test methods shall also be used to determine the optimum moisture content.</p> | <p>Time for Testing</p> |
| <p>6. The maximum dry density so determined shall be used as the comparative dry density in relative compaction calculations for all like material from that lot or day's production placed in a single layer of work, whichever is the lesser.</p> | <p>Comparative Dry Density</p> |

242.20 COMPACTION REQUIREMENTS AND ACCEPTANCE

- 1. A lot shall be accepted for compaction if:
 - (a) The minimum value of all calculated relative compaction for modified compactive effort is not less than the following values within the lot or the area of pavement being assessed.

Base course	98%
Subbase	95%

- 2. Lots or areas of pavement not achieving these specified values shall be rejected. Unbound layers may be reworked as provided by Clause 242.21, but the bound materials in rejected layers/courses shall be removed and replaced with fresh materials in accordance with Clause 242.24 unless an alternative disposition is approved by the Superintendent. **Rejection of Lots**
- 3. Basecourse shall only be accepted for application of primer, primerbinder or binder seal when testing has confirmed dry back to the extent indicated in Annexure 242A. **Dry Back**

242.21 REWORKING OF REJECTED UNBOUND LAYERS

- 1. Lots or areas of pavement that have been rejected in regard to compaction shall be reworked before resubmission for compaction assessment. **Reworking**
- 2. Material that has become degraded, segregated or otherwise reduced in quality by reworking shall be rejected. The rejected material shall be removed, disposed of and replaced with fresh material complying with this Specification in accordance with Clause 242.24. When a lot or area of pavement is resubmitted for compaction assessment, testing shall be carried out in accordance with Clauses 242.18 and 242.19. **Rejected Material**
- 3. All costs associated with corrective work carried out before the resubmission of a lot for compaction assessment, including rewatering, rerolling, removal and replacement of material as well as reworking shall be borne by the Contractor. **Contractor's Costs**

242.22 TOLERANCES

(a) General

- 1. The tolerances stated are the acceptable limits of departure from the dimensions shown on the Drawings, which may occur during construction. **Tolerances**
- 2. Areas for assessment of conformity with tolerance requirements shall be divided into lots and presented to the Superintendent together with survey reports covering line and level. **Lots for Assessment of Conformity**

(b) Width

- 1. At any cross section without kerb, and for pavement layers extending under the kerb, the horizontal dimension measured from the design centre line to the edge of the constructed pavement surface shall be neither less than 50mm less than the dimension nor more than 300mm greater than the dimension shown on the Drawings. **Horizontal Dimensions**
- 2. The average width of the layer determined from measurements at three sites selected at random by the Superintendent over any 200 metre road length, or part **Average Width**

thereof, shall be not less than the specified width.

(c) Levels and Surface Trim

- | | |
|--|---------------------------------------|
| <p>1. The levels of the finished surface of the top of the unbound subbase course shall not vary from the design levels by more than $\pm 10\text{mm}$.</p> | <p>Subbase Surface Level</p> |
| <p>2. Level tolerances at the top of the unbound base course shall not exceed those stated above for subbase. In addition, where kerb exists or is being constructed, the level of the top of the base course adjacent to the kerb shall not vary by more than $\pm 5\text{mm}$ from the finished surface design level minus the design thickness of the wearing surface.</p> | <p>Base Surface Level</p> |
| <p>3. The design level of the top of the subbase course shall be determined from the design level of the finished road surface less the thickness of the base course and the wearing course, including an allowance for any flush seal layer in the pavement design.</p> | <p>Subbase Design Level</p> |
| <p>4. The pavement surface after trimming and immediately prior to sealing shall be of a quality such that the deviation under a 3 metre straight edge placed in any direction does not exceed 12mm. Measurements for conformance shall be taken in accordance with the maximum lot size and minimum test frequencies in the Specification Part for Quality Requirements.</p> | <p>Straight Edge Deviation</p> |

242.23 ACTION ON REJECTION

(a) Unbound Materials

- | | |
|---|----------------------------------|
| <p>1. A lot that has not complied with the requirements for width or level tolerance as set out in Clauses 242.22(b) and 242.22(c) respectively shall be rejected except as otherwise provided in this Clause. Rejected lots shall be removed, disposed of and replaced with fresh material in accordance with Clause 242.24.</p> | <p>Rejection Criteria</p> |
| <p>2. Notwithstanding the above, where the rejected lot can be corrected by further trimming, the Superintendent may allow the surface to be corrected without complete removal and replacement with fresh material. Such trimming shall be undertaken in a manner that produces a uniform, hard surface and shall be achieved by cutting only without filling. After any such cutting, the level tolerances in Clause 242.22(c) shall apply.</p> | <p>Corrective Action</p> |
| <p>3. The cost of surface correction or replacement work ordered in accordance with this Clause including removal of material, disposal and supply and transport of replacement material, shall be borne by the Contractor.</p> | <p>Contractor's Costs</p> |

(b) Bound Materials

- | | |
|--|---|
| <p>1. An area of bound material that has not complied with the requirements for width or level tolerance as set out in Clauses 242.22(b) and 242.22(c) respectively shall be rejected except as otherwise provided for in this Clause. Rejected areas shall be removed, disposed of and replaced with fresh material in accordance with Clause 242.24.</p> | <p>Rejection Criteria</p> |
| <p>2. The cost of removal and disposal of rejected material and its replacement with fresh material shall be borne by the Contractor.</p> | <p>Contractor's Costs</p> |
| <p>3. Notwithstanding the above, the Superintendent may allow the Contractor to rectify the area in the following cases:</p> <p>(i) Where the cause for rejection is under Clause 242.22(c), the course is a subbase course and rejection is due to departures from design level being too far below the design level, the Contractor may increase the thickness of the base course to make up such deficiency in thickness.</p> | <p>Corrective Action Circumstances</p> |

FLEXIBLE PAVEMENTS

- (ii) Where the cause for rejection is under Clause 242.22(c), the course is a subbase course and rejection is due to departures from design level being too far above the design level, the Contractor may propose a regrading of the design level of the base course, to allow for its design thickness to be laid, up to a maximum of 20mm above the original design level. Approval by the Superintendent shall be subject to the following requirements:
- The rate of change of grade from the original finished design surface level shall be less than 3mm per metre.
 - The regrading shall not interfere with the proper design functioning of the drainage system.
 - The regrading shall not interfere with levels at the property boundary, or increase or decrease footpath or footpath crossover levels or grades beyond Council's allowable design limits.
 - The regrading shall not interfere with clearances.
- (iii) Where the cause for rejection is under Clause 242.22(c), the course is a base course and rejection is due to departures from design level being too far above the design level, the Contractor may propose a regrading of the design level of the base course. Approval by the Superintendent shall be subject to the requirements of this Clause in (ii) above.

The cost associated with surface level corrections required in this Clause shall be borne by the Contractor.

***Contractor's
Costs***

242.24 REMOVAL AND REPLACEMENT OF REJECTED COURSES

1. Sections of the work that have been rejected shall be removed from the work and replaced with fresh material. Rejected material shall be removed from site.
2. In rejected sections the material shall be removed over the full length of the rejected lot, except that a minimum length of 50m of pavement layer shall be removed and replaced. Any damage to underlying or abutting layers or structures shall be made good by the Contractor using methods approved by the Superintendent.
3. 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 to the Superintendent's satisfaction. In this case, the new longitudinal cold joint shall be formed and located along the centreline of the road pavement.
4. After removal of rejected base or subbase course material, the section shall be presented for inspection by the Superintendent before replacement work is commenced.
5. Materials used as replacement materials, and the subsequent spreading, compaction, trimming, curing and testing of the replacement materials, shall comply with the requirements of this Specification.
6. All costs associated with removals, replacements and corrections of base and subbase courses required under this Clause and the extra costs incurred by the Contractor in respect of delays caused by such removals, replacements and corrections shall be borne by the Contractor.

***Rejected
Material***

***Length to be
Removed***

***Superinten-
dent's
Discretion***

***Inspection
Before
Replacement***

***Replacement
Material***

***Contractor's
Costs***

242.25 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE

1. Following the Superintendent's acceptance of any section of the work, the

Primerseal

Contractor shall maintain the prepared surface of the base in the condition specified for acceptance until the wearing surface is completed. The base course of sections of the accepted work shall be covered with a primerseal over the full width of pavement in accordance with the Specification for SPRAYED BITUMINOUS SURFACING within seven days of the date of the acceptance of such sections, unless otherwise approved by the Superintendent.

2. Should the pavement condition deteriorate before the application of the primerseal and consent to proceed with the bitumen surfacing work is withdrawn by the Superintendent, the Contractor shall re-prepare the pavement and re-present the pavement for inspection by the Superintendent. Approval by the Superintendent is required for release of the HOLD POINT.

HP

3. The cost of re-preparing areas of the deteriorated pavement shall be borne by the Contractor.

Contractor's Cost

4. The Contractor shall maintain adequate drainage of the pavement, and remove any ponded water within 12 hours of its creation if free drainage cannot be achieved, prior to the completion of the wearing course.

Surface Drainage

OPENING PAVEMENT TO TRAFFIC

242.26 GENERAL REQUIREMENTS

1. For unbound pavements, construction plant and vehicles not involved in the current construction or testing of the work shall not be permitted to use the pavement until the primerseal has been applied, unless otherwise approved by the Superintendent.

Restrictions on Movement

2. For bound pavements, construction plant and vehicles not involved in the current construction or testing of the work shall not be permitted to use the pavement until the primerseal has been applied and seven days have elapsed since placement of the base. In any case only vehicles registered for legal road usage and loaded within legal limits will be allowed to use the pavement.

Restrictions on Movement of Construction Traffic

3. For bound pavements, traffic shall not be allowed to use the constructed pavement until a minimum of seven days after completion of the full pavement depth and the primerseal.

Open to Traffic Bound Pavement

SPECIAL REQUIREMENTS

242.27 RESERVED

242.28 RESERVED

242.29 RESERVED

242.30 RESERVED

LIMITS AND TOLERANCES

242.31 SUMMARY OF LIMITS AND TOLERANCES

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 242.5 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Stockpile Sites	(i) Relative Compaction > 95%	242.12
		(ii) Stockpile height < 3m	242.12
		(iii) Stockpile batter < 1.5:1 and > 3:1	
2.	Spreading Pavement Materials		
	(i) Compacted Layer Thickness	≥ 100mm, ≤ 200mm	242.14
3.	Compaction Acceptance		
	Minimum value of all calculated relative compaction results	≥ 98% (modified compactive effort) for basecourse ≥ 95% (modified compactive effort) for sub-base	242.20
4.	Width of Pavement		
	(i) Design centre-line to edge of constructed pavement	-50mm to +300mm of dimensions on Drawings	242.22(b)
	(ii) Average Width	The average width determined from 3 random sites over any 200m road length, or part thereof, shall be not less than the specified width.	242.22(b)
5.	Surface Level		
	(i) Subbase levels	<± 10mm from design level	242.22(c)
	(ii) Base levels	<± 10mm from design level	242.22(c)
	(iii) Base levels adjacent to Kerb	<±5mm from the finished surface design level minus design thickness of wearing surface.	242.22(c)
	(iv) Shape	Deviation from a 3m long straightedge on base surface immediately prior to sealing shall be less than 12mm	242.22(c)

Table 242.5 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**242.32 PAY ITEMS**

1. Payment shall be made for the activities associated with completing the work detailed in this Specification in accordance with Pay Items 242(a) to 242(b) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Base course primerseal is measured and paid in accordance with the Specification for SPRAYED BITUMINOUS SURFACING.

Pay Item 242(a) SUPPLY, SPREAD AND COMPACT SUBBASE COURSE

1. The unit of measurement shall be the square metre.
2. The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.
3. No account shall be taken of allowable tolerances.
4. The schedule rate under this Pay Item shall include all the activities associated with the supply, spread, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material.

Pay Item 242(b) SUPPLY, SPREAD AND COMPACT BASE COURSE

1. The unit of measurement shall be the square metre.
2. The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.
3. No account shall be taken of the allowable tolerances.
4. The schedule rate under this Pay Item shall include all the activities associated with the supply, spread, compaction, trimming, jointing, and testing of the base course, and curing of bound material.

**ANNEXURE 242A
DRY BACK REQUIREMENTS FOR BASECOURSE**

As specified in Clause C242.20 basecourse materials shall be tested on a construction lot basis to confirm moisture contents compliant with the following table:

Base Material Type	Satisfactory Dry Back Moisture Content (% of Optimum Moisture Content)
Eg. Bitumen modified crushed limestone	