

COFFS HARBOUR CITY COUNCIL



**DEVELOPMENT SPECIFICATION
DESIGN**

1141 Flexible pavements

Version 1 01 January 2009

1141 FLEXIBLE PAVEMENTS

1 SCOPE AND GENERAL

1.1 SCOPE

The work to be executed under this worksection 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.

1.2 REFERENCED DOCUMENTS

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

Worksections

0161 *Quality (Construction)*

1113 *Stabilisation*

1143 *Sprayed bituminous surfacing*

Standards

- AS1141 Methods for sampling and testing aggregates
- AS1141.14 Particle shape, by proportional calliper
- AS1141.22 Wet/dry strength variation
- AS1289 Methods of testing soils for engineering purposes
- AS1289.3.1.1 Soil classification tests—Determination of the liquid limit of a soil—Four point Casagrande method
- AS1289.3.3.1 Soil classification tests—Calculation of the plasticity index of a soil
- AS1289.3.6.1 Soil classification tests—Determination of the particle size distribution of a soil—Standard method of analysis by sieving
- AS1289.3.6.3 Soil classification tests—Determination of the particle size distribution of a soil—Standard method of fine analysis using a hydrometer
- AS1289.5.2.1 Soil compaction and density tests—Determination of the dry density/moisture content relation of a soil using modified compactive effort
- AS1289.5.3.1 Soils compaction and density tests—Determination of the field density of a soil—Sand replacement method using a sand cone pouring apparatus
- AS1289.5.4.1 Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio
- AS1289.5.8.1 Soil compaction and density tests—Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge—Direct transmission model
- AS1289.6.1.1 Soil strength and consolidation tests—Determination of the California Bearing Ratio of a soil—Standard laboratory method for a remoulded specimen

Other publications

RTA Test Methods

- T114 Maximum dry compressive strength of road materials
- T116 Determination of unconfined compressive strength of remoulded road materials which are self cementing
- T130 Dry density - moisture relations for mixtures of road materials stabilised or modified with proportions of cement
- T131 Determination of unconfined compressive strength of road materials stabilised or modified with proportions of cement
- T160 Benkelman beam deflection test
- T171 Modified Texas triaxial compression test for disturbed soils

1.3 TERMINOLOGY

The following definitions shall apply:

- Materials designated as 'base' require the provision of a wearing surface comprising either a sprayed bituminous seal or asphalt up to 50 mm thick.
- Materials designated as 'subbase' require a covering course of 'base'. The subbase may consist of one or more layers.
- A flexible pavement consists of a base and a subbase constructed of unbound materials. For the purpose of this worksection it also includes 'semi-rigid' pavements.
- A semi-rigid pavement is one where the base and/or the subbase are constructed of bound materials.
- Bound material incorporates a binder to produce structural stiffness.
- Modified material incorporates small amounts of stabilising binder to improve the properties of the material without significantly affecting structural stiffness.

1.4 PAVEMENT STRUCTURES

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

1.5 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality(Construction)*.

1.6 INSPECTION, SAMPLING AND TESTING

Contractor's responsibility

Inspection, sampling and testing of the pavement shall be undertaken by the Contractor in accordance with the requirements of this worksection 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.

Written notice

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.

Density tests

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 **Relative compaction**.

2 MATERIALS

2.1 GENERAL

Details of proposed base and subbase to be submitted

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 worksection.

If the proposed base or subbase is a bound material, the Contractor shall submit a completed Annexure A of 1113 *Stabilisation*

Approval of source of supply

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

Variations by Contractor

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.

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

Material types

The acceptable material types for each Traffic Category are given in Table 2.2.

Base

Base materials shall comply with the requirements of Unbound base material properties table.

Subbase

Subbase materials shall comply with the requirements of Unbound subbase material properties table.

Modified Texas Triaxial Classification

Where the proposed unbound base or subbase material complies with all of the requirements Table 2.3 or Table 2.4, as appropriate, except gradings (AS 1289.3.6.1 and AS 1289.3.6.3), the Contractor may propose the use of the material, subject to approval of the Superintendent, if the material complies with the RTA Modified Texas Triaxial Classification Number (T171) requirements specified in Table 2.5, (T171 tested at not less than 85% of Optimum Moisture Content and 98% of Maximum Dry Density as determined by AS 1289.5.2.1).

Table 2.2 Acceptable pavement material types

Traffic category	Acceptable base material	Acceptable subbase material
1	DGB20, GMB20, DGB 40	DGS20, DGS40, GMS40
2a	DGB20, GMB20, DGB 40	DGS20, DGS40, GMS40
2b	DGB20, GMB20, DGB 40	DGS20, DGS40, GMSS40
2c	DGB20, GMB20, DGB 40, NGB20-2c	DGS20, DGS40, GMS40, NGS20, NGS40
2d	DGB20, GMB20, DGB 40, NGB20-2c, NGB20-2d	DGS20, DGS40, GMS40, NGS20, NGS40

Table 2.3 Unbound base material properties

Test method	Description	Base Material Requirements				
		DGB20	DGB40 (DGS40 80 CBR)	GMB20	NGB20-2c	NGB20-2d
AS 1289.3.6.1	Coarse Particle Size Distribution					
	% passing 75.0 mm sieve	—	—	—	—	—
	% passing 53.0 mm sieve	—	100	—	—	—
	% passing 37.5 mm sieve	—	—	—	—	—
	% passing 26.5 mm sieve	100	—	100	100	100
	% passing 19.0 mm sieve	95–100	50-85	95–100	93–100	93–100
	% passing 13.2 mm sieve	—	—	—	—	—
	% passing 9.5 mm sieve	—	—	—	71–87	71–87
	% passing 6.7 mm sieve	50–70	30-55	30–55	—	—
	% passing 4.75 mm sieve	—	—	—	47–70	47–70
	% passing 2.36 mm sieve	35–55	25-50	20–30	35–56	35–56
	% passing 0.425 mm sieve	—	—	—	14–32	14–32
	% passing 0.075 mm sieve	—	—	—	6–20	6–20
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)					

	A. Pass 425 µm sieve %	35–55	35–60	30–50	—	—
	B. Pass 75 µm sieve % Pass 425 µm sieve	35–55	35–60	30–50	—	—
	C. Pass 13.5 µm sieve % Pass 75µm sieve	35–60	35–65	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic) *	max 20	max 23	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plasticity Index †	max 6	max 7	max 6	max 6	max 8
T114	Maximum Dry Compressive Strength on fraction passing 19 mm sieve (only applies if Plasticity Index is less than 1)	min 1.7 MPa	min 1.0 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper - % misshapen (2 : 1)	max 35	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength‡		min 50kN			
	For category 1 or 2a	min 80		min 150	—	—
	For category 2b or 2c	min 70		min 130	—	—
	For category 2d	min 60		min 100	—	—
AS 1141.22	Wet/Dry Strength Variation‡		max 60			
	((Dry—Wet)/Dry) %					
	For category 1 or 2a	max 35		max 30	—	—
	For category 2b or 2c	max 40		max 30	—	—
	For category 2d	max 45		max 30	—	—
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	—	80	—	80	60
<p>NOTES:</p> <p>Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm.</p> <p>* 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.</p> <p>† For category 2c and 2d base materials the maximum Plasticity Index shall be 8.</p> <p>‡ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need 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.</p>						

Table 2.4 Unbound subbase material properties

Test method	Description	Subbase material requirements				
		DGS20	DGS40	GMS40	NGS20	NGS40
AS 1289.3.6.1	Coarse particle size distribution					
	% passing 75.0 mm sieve	—	—	—	—	—
	% passing 53.0 mm sieve	—	100	100	—	100
	% passing 37.5 mm sieve	—	—	—	—	95-100
	% passing 26.5 mm sieve	100	—	—	100	80-97
	% passing 19.0 mm sieve	95–100	50–85	50–75	96–100	—
	% passing 13.2 mm sieve	—	—	—	—	—
	% passing 9.5 mm sieve	—	—	—	65-89	48-85
	% passing 6.7 mm sieve	50-70	30-55	15-35	—	—
	% passing 4.75 mm sieve	—	—	—	47–80	35–73

Test method	Description	Subbase material requirements				
		DGS20	DGS40	GMS40	NGS20	NGS40
	% passing 2.36 mm sieve % passing 0.425 mm sieve % passing 0.075 mm sieve	35–55 — —	25–50 — —	5–15 — —	32–67 14–42 6–26	25–58 10–33 3–21
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)					
	A. Pass 425 µm sieve %	35–55	35–60	25–50	—	—
	B. Pass 75 µm sieve % Pass 425 µm sieve	35–55	35–60	25–50	—	—
	C. Pass 13.5 µm sieve % Pass 75 µm sieve	35–60	35–65	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic)	max 23	max 23	—	max 23	max 23
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	—	max 23	max 23
AS 1289.3.3.1	Plasticity Index	max 12	max 12	max 12	max 12	max 12
T114	Maximum Dry Compressive Strength on fraction passing 19 mm 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 - % misshapen (2:1)	max 35	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength*	min 50 kN	min 50 kN	min 130 kN	—	—
AS 1141.22	Wet/Dry Strength Variation*					
	((Dry—Wet)/Dry) %Dry	max 60	max 60	max 30	—	—
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	—	—	—	30	30
NOTES: Material consisting of rounded river stone shall have a minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm. * All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need 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.						

Table 2.5 RTA Modified Texas triaxial classification number requirements

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

2.4 LIME MODIFIED BASE AND SUBBASE MATERIALS

Lime modification

Modification of unbound base and subbase materials to meet the requirements of **Unbound base and subbase** 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 **Unbound base and subbase**.

Traffic Categories 1, 2a, 2b

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 2c, 2d

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.

Lime

Material requirements of hydrated lime and quicklime shall be in accordance with 1113 *Stabilisation*.

Incorporation

The method of incorporating lime through the stationary mixing plant shall ensure that the lime is mixed uniformly through the material.

In-situ Operations

In-situ operations shall be in accordance with 1113 *Stabilisation*.

Proportion

The proportion of lime shall be not less than 1.5% nor more than 4% by mass. The material prior to lime treatment shall not contain any added pozzolanic material.

Unconfined compressive strength

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.

DGB20

For DGB20 material, prior to being treated with lime, the material shall comply with the requirements of DGS20 in Table 2.4, except that the aggregate wet strength shall not be less than 80 kN and the wet/dry strength variation shall not exceed 60%.

CBR Value

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.

2.5 BOUND BASE AND SUBBASE MATERIALS

Traffic Categories 1, 2a, 2b

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.

Traffic Categories 2c, 2d

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.

Material requirements prior to stabilisation

Prior to stabilisation, the base layer material shall meet the requirements of Table 2.4 for subbase material for the appropriate Traffic Category.

Stabilising agent

Material requirements for the stabilising agent shall be in accordance with 1113 *Stabilisation*.

Stabilisation

The stabilisation process shall meet the requirements of 1113 *Stabilisation*.

Unconfined compressive strength

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 4 MPa nor more than 10 MPa.

Sampling and test specimen compaction of the material shall be undertaken within one hour of the incorporation of the stabilising agent.

3 DELIVERY, STOCKPILING AND PROCESSING OF PAVEMENT MATERIAL**3.1 DELIVERY TO SITE**

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

3.2 STOCKPILING OF UNBOUND MATERIALS**Stockpile sites**

Stockpile sites shall be located as shown on the Drawings or as approved by the Superintendent.

Site requirements

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 AS 1289.5.4.1 for standard compactive effort, of not less than 95%.

Prevent intermixing

Stockpiles and stockpile sites shall be maintained so as to prevent the stockpiled materials from becoming intermixed or contaminated with foreign material.

Stockpile height and shape

The total height of any stockpile shall not exceed 3 m.

Stockpiles shall be of uniform shape with side slopes neither steeper than 1.5h to 1v nor flatter than 3h to 1v.

Maintained damp

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.

Site cleaned at completion of work

At the completion of the works, stockpile sites shall be cleared of all surplus material and left in a clean and tidy condition.

3.3 DELIVERY OF MODIFIED OR BOUND MATERIALS**Vehicle deliveries**

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.

Time limit

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.

Delivery dockets

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.

Bound materials

Bound materials shall comply with 1113 *Stabilisation*.

4 SPREADING OF PAVEMENT MATERIAL

4.1 SPREADING PAVEMENT MATERIALS

Underlying layer quality

Unbound materials shall not be spread upon an underlying pavement layer which has a moisture content exceeding 90% 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 worksection before spreading of the next layer of pavement.

Non-complying underlying layer

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 worksection, the cost of correcting the underlying layer to comply with this worksection shall be borne by the Contractor.

Tolerances

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 **Tolerances** without subsequent addition of material.

The thickness of each compacted layer shall be neither less than 100 mm nor more than 200 mm for all pavement layer types, unless otherwise approved by the Superintendent.

Joints

At all work boundaries in bound materials the Contractor shall provide vertical faces to provide for transverse and longitudinal joints.

Moisture content of the base or subbase materials

When spread for compaction processes the moisture content of the base or subbase materials shall be in the range of 60–90% of laboratory optimum moisture content in accordance with AS 1289.5.2.1.

Ambient air temperature

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.

5 TRIMMING AND COMPACTION

5.1 GENERAL REQUIREMENTS

Uniform compaction

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 **Relative compaction and Compaction requirements and acceptance**.

Compaction procedure

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.

Hand operated plant

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.

Plant movement restrictions

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

Unstable areas

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 **Removal and replacement of rejected courses**. This operation will be at cost to the Contractor.

Placing subsequent layers

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.

Excessive moisture content

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.

5.2 CURING OF BOUND MATERIALS**Commencement time**

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

Water curing

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 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.

6 ACCEPTANCE OF COMPACTED LAYERS

6.1 LOTS FOR ACCEPTANCE

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:

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

6.2 COMPACTION ASSESSMENT**General**

Density testing in conjunction with Benkelman Beam Testing is to be carried out for Road Categories 1, 2a and 2b (Local Sub Arterial, Industrial and Collector Streets)

Density testing in conjunction with Proof Roll Testing is to be carried out for Road Categories 2c and 2d (Local Streets and Access Streets)

Density testing

The Superintendent shall assess compaction for each lot based on random sampling of test locations for in-situ dry density testing.

Sampling

The Contractor shall arrange for testing to assess compaction on the basis of ten tests per 5000 sq m with a minimum of 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.

Costs of testing

The cost of all testing for compaction assessment of any layer in an area of pavement shall be borne by the Contractor.

Benkelman Beam testing

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 RTA Test Method T160 utilising the Benkelman Beam or equivalent.

The average maximum deflection for any lot shall not exceed 1.0 mm, and the co-efficient of variation (CV) in recorded deflections shall not exceed 30%.

Measurements shall be taken at the rate of 4 per 1000 square metres, with a minimum of ten measurements per lot.

6.3 RELATIVE COMPACTION

Calculation

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:

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

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

In-situ dry density testing

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.

Daily samples

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.

Maximum dry density

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.

Time for testing

For bound layers the sample shall be tested within two hours after the addition of stabilising agent to the mix in accordance with RTA Test Method T130 to determine the maximum dry density (modified compactive effort) for the material. This test method shall also be used to determine the optimum moisture content.

Comparative dry density

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.

6.4 COMPACTION REQUIREMENTS AND ACCEPTANCE

Acceptance of lots

A lot shall be accepted for compaction if:

- The minimum value of all calculated relative compaction for modified compactive effort is not less than 97% within the lot or the area of pavement being assessed.
- In the case of bound layers an area of pavement presented for compaction assessment has within that area a zone or zones with relative compaction less than 97% (modified compactive effort) but equal to or greater than 93% may be accepted by the Superintendent provided such zone or zones shall not comprise more than 5% of the area presented.
- In the case of bound layers of target final depth in excess of 250 mm, the top 150 mm shall meet the requirements of paragraph 1(b) in this clause whilst the bottom 150 mm shall have a relative compaction equal to or greater than 92%.

Rejection of lots

Lots or areas of pavement not achieving these specified values shall be rejected. Unbound layers may be reworked as provided by **Reworking of rejected unbound layers**, but the bound materials in rejected layers/courses shall be removed and replaced with fresh materials in accordance with **Removal and replacement of rejected courses** unless an alternative disposition is approved by the Superintendent.

6.5 REWORKING OF REJECTED UNBOUND LAYERS

Reworking

Lots or areas of pavement that have been rejected in regard to compaction shall be reworked before resubmission for compaction assessment.

Rejected material

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 worksection in accordance with **Removal and replacement of rejected courses**. When a lot or area of pavement is resubmitted for compaction assessment, testing shall be carried out in accordance with **Compaction assessment** and **Relative compaction**.

Contractor's costs

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.

6.6 TOLERANCES**General**

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

Lots for assessment of conformity: 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.

Width

Horizontal dimensions: At any cross section without kerb and/or guttering, and for pavement layers extending under the kerb and/or guttering, the horizontal dimension measured from the design centre line to the edge of the constructed pavement surface shall be neither less than 50 mm less than the dimension nor more than 300 mm greater than the dimension shown on the Drawings.

Average width: 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 thereof, shall be not less than the specified width.

Levels and surface trim

Subbase surface level: The levels of the finished surface of the top of the unbound subbase course shall not vary from the design levels by more than ± 10 mm.

Base surface level: Level tolerances at the top of the unbound base course shall not exceed those stated above for subbase.

In addition, where kerb and gutter exists or is being constructed, the level of the top of the base course adjacent to the kerb and gutter shall not vary by more than ± 5 mm from the lip level of the gutter minus the design thickness of the wearing surface.

Subbase design level: 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.

Straight edge deviation: 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 12 mm.

Measurements for conformance shall be taken in accordance with the maximum lot size and minimum test frequencies in 0161 *Quality (Construction)*.

6.7 ACTION ON REJECTION**Unbound materials**

Rejection criteria: A lot that has not complied with the requirements for width or level tolerance as set out in **Tolerances** shall be rejected, except as otherwise.

Rejected lots shall be removed, disposed of and replaced with fresh material in accordance with **Removal and replacement of rejected courses**.

Corrective action: 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 **Tolerances** shall apply.

Costs of correction: 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.

Bound materials

Rejection criteria: An area of bound material that has not complied with the requirements for width or level tolerance as set out in **Tolerances** shall be rejected, except as otherwise.

Rejected areas shall be removed, disposed of and replaced with fresh material in accordance with **Removal and replacement of rejected courses**.

Cost of removal and disposal: The cost of removal and disposal of rejected material and its replacement with fresh material shall be borne by the Contractor.

Corrective action circumstances: Notwithstanding the above, the Superintendent may allow the Contractor to rectify the area in the following cases:

- Where the cause for rejection is under **Tolerances**, 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.
- Where the cause for rejection is under **Tolerances**, 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 20 mm 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 3 mm 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.
- Where the cause for rejection is under **Tolerances**, 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 item b) above.

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

6.8 REMOVAL AND REPLACEMENT OF REJECTED COURSES

Rejected material

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.

Length to be removed

In rejected sections the material shall be removed over the full length of the rejected lot, except that a minimum length of 50 m 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.

Superintendent's discretion

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.

Inspection before replacement

After removal of rejected base or subbase course material, the section shall be presented for inspection by the Superintendent before replacement work is commenced.

Replacement material

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 worksection.

Costs of removal and replacement

All costs associated with removals, replacements and corrections of base and subbase courses required 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.

6.9 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE**Primerseal**

Following the Superintendent's acceptance of any section of the work, the 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 1143 *Sprayed bituminous surfacing* within 7 days of the date of the acceptance of such sections, unless otherwise approved by the Superintendent.

Deterioration of pavement condition before primerseal

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.

Cost of re-preparing areas of the deteriorated pavement

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

Surface drainage

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.

7 OPENING PAVEMENT TO TRAFFIC**7.1 RESTRICTIONS ON MOVEMENT**

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.

7.2 RESTRICTIONS ON MOVEMENT OF CONSTRUCTION TRAFFIC

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.

7.3 OPENING BOUND PAVEMENT TO TRAFFIC

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.

8 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in Table 8.1.

Summary of limits and tolerances

Activity	Limits/Tolerances	Worksection Clause Reference
Stockpile sites	<ul style="list-style-type: none"> . Relative compaction > 95% . Stockpile height < 3 m . Stockpile batter < 1.5:1 and > 3:1 	Stockpiling of unbound materials

Activity	Limits/Tolerances	Worksection Clause Reference
Spreading pavement materials -Compacted layer thickness	$\geq 100 \text{ mm}, \leq 200 \text{ mm}$	Spreading pavement materials
Compaction acceptance Minimum value of all calculated relative compaction results	$\geq 97\%$ (modified compactive effort). For bound pavements may accept between 92% and 97% provided it represents less than 5% of the area.	Compaction requirements and acceptance
Width of pavement -Design centre-line to edge of constructed pavement	-50 mm to +300 mm of dimensions on Drawings	Tolerances
-Average Width	The average width determined from 3 random sites over any 200 m road length, or part thereof, shall be not less than the specified width.	Tolerances
Surface level -Subbase levels -Base levels -Base levels adjacent to Kerb and Gutter -Shape	< ± 10 mm from design level < ± 10 mm from design level < ± 5 mm from the lip levels of adjacent gutter minus design thickness of wearing surface. Deviation from a 3 m long straightedge on base surface immediately prior to sealing shall be less than 12 mm	Tolerances

9 MEASUREMENT AND PAYMENT

9.1 MEASUREMENT

Payment shall be made for the activities associated with completing the work detailed in this worksection in accordance with Pay Items 1141.1 and 1141.2 inclusive.

A lump sum price for any of these items shall not be accepted.

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.

Base course primerseal is measured and paid in accordance with 1143 *Sprayed bituminous surfacing*.

9.2 PAY ITEMS

1141.1 Supply, spread and compact subbase course

The unit of measurement shall be the square metre.

The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.

No account shall be taken of allowable tolerances.

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.

1141.2 Supply, spread and compact base course

The unit of measurement shall be the square metre.

The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.

No account shall be taken of the allowable tolerances.

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.