



# **Construction Specification for Civil Works**

## **C242 – Flexible Pavements**

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**ORIGIN OF DOCUMENT, COPYRIGHT**

This document was originally based on AUS-SPEC - Development Construction Specification C242 - Flexible Pavements. Substantial parts of the original AUS-SPEC document have been deleted and replaced in the production of this Tamworth Regional Council Specification for Civil Works. The parts of the AUS-SPEC document that remain are still subject to the original copyright.

This document has been developed for use with the construction of civil works within the Tamworth Regional Council local government area.

This is not a controlled document. A full copy of the latest version of this document can be found on the Tamworth Regional Council Internet website: [http://www.tamworth.nsw.gov.au/construction\\_specifications](http://www.tamworth.nsw.gov.au/construction_specifications)

**REVISIONS: C242 – FLEXIBLE PAVEMENTS**

REVISIONS	CLAUSES AMENDED	AMENDMENT DETAILS	DATE
1		Original Issue	20/05/2019
2	C242.15 ANNEXURE C242A	Corrected beam tolerances Corrected formulas	01/05/2023

## GENERAL

### C242.01 SCOPE

This Specification is for 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 approved design drawings.

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in *CQC-Quality Control Requirements Sub-Annexure B5*.

**Quality**

### C242.02 DEFINITIONS

**The Works** – Defined as follows:

**The Works**

- **Developer Infrastructure Works** - work includes subdivisions and any public infrastructure work associated with an approved Development in the TRC local government area requiring a construction certificate.
- **Contracted Works** – infrastructure work undertaken by a Principal Contractor or subcontractor formally appointed by TRC and supervised by TRC.
- **Internal Works** - infrastructure work undertaken by TRC's day labour workforce.

**Constructor** – Defined as the organisation responsible for construction of the Works and the Principal Contractor as defined in the *Work Health and Safety Act 2011*.

**Constructor**

**TRC Representative** – Defined as follows:

**TRC Representative**

- **Developer Infrastructure Works** – Nominated TRC officer(s) for the approved Development.
- **For Contracted Works** – the Superintendent.
- **For Internal Works** – TRC Asset Owner

**Constructor's Representative** – Defined as follows:

**Constructor's Representative**

- **Contracted Works** – the Principal Contractor's nominated representative as per the relevant contract.
- **Internal Works** – TRC officer responsible for delivery.

**Developer's Representative**– Defined as the person or organisation appointed by the Developer to administer the Constructor responsible for the delivery of **Developer Infrastructure Works**.

**Developer's Representative**

### C242.03 REFERENCES

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**

Where not otherwise specified in the relevant Tamworth Regional Council (TRC) Specifications or the approved design drawings, the Constructor shall use the latest versions of the Reference documentation, including amendments and supplements, listed in the Specifications at the time of the Works approval.

**Currency**

#### (a) Tamworth Regional Council (TRC) Specifications

*C213 – Earthworks.*

*C241 – Stabilisation.*

*CQC – Quality Control Requirements*

#### (b) Transport for NSW (TfNSW) Specifications

TfNSW 3051 – Granular Base and Subbase Materials.

**(c) Transport for NSW (TfNSW) Test Methods**

- TfNSW T114 - Maximum Dry Compressive Strength of Road Materials.
- TfNSWT116 - Unconfined Compressive Strength - Remoulded Material.
- TfNSW T130 - Dry Density Moisture Relations for Mixtures of Road Materials and Cement.
- TfNSW T160 - Benkelman Beam Deflection Test.
- TfNSWT171 - Modified Texas Triaxial Compression Test.

**(d) Australian Standards**

References in this Specification or on the approved design drawings to Australian Standards are noted by their prefix AS or AS/NZS.

- 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 1289.5.1.1 Determination of the dry density/moisture content relation of a soil using standard 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 1289.6.1.1 Determination of the California bearing ratio of a soil - Standard laboratory method for a remoulded specimen.

**(e) Other Publications**

Austrroads Guide to Pavement Technology.

**(f) TRC Standard Drawings Applicable to this Section**

- RD001 Typical Rural Cross Section
- RD002 Typical Urban Cross Section

TRC Standard Drawings shall take precedence over ALL other drawings related to the Works.

Where any TRC Standard Drawings conflicts with this Specification, the requirements of this Specification shall take precedence. Proposals to deviate from this Specification shall constitute a **HOLD POINT**.

**HOLD POINT**

All proposed deviations from the approved design drawings, TRC Standard Drawings, this Specification or the documents referenced within it, shall be submitted for approval to the TRC Representative with supporting evidence at least five (5) working days prior to the work being undertaken.

**PROCESS HELD:** The lot or element affected by the proposed deviation.

**Hold Point**

#### **C242.04 PAVEMENT STRUCTURES**

Preliminary flexible or semi-rigid pavement material types and layer thicknesses shall be as shown on the approved design drawings.

***Material Types  
and Layer  
Thickness***

#### **C242.05 INSPECTION, SAMPLING AND TESTING**

Inspection, sampling and testing of the pavement shall be undertaken by the Constructor 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.

***Constructor's  
Responsibility***

Field density tests shall be carried out in accordance with AS 1289.5.3.1 or AS 1289.5.8.1 in accordance with Clause C242.16.

***Density Test***

Before the commencement of the relevant stages of road construction, reports shall be submitted by a suitably qualified and experienced consultant demonstrating to the satisfaction of the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) that the:

- Pavement materials comply with this specification or the current version of TfNSW QA Specification 3051, as applicable.
- Subgrade under the subject pavement has been prepared and compacted in accordance with *C213 - Earthworks*.

Sections C242.15 to C242.18 sets out testing frequency, relative compaction, acceptance/rejection criteria, and actions to follow tests which reveal non-conformance.

***Testing  
Frequency***

## **MATERIALS**

#### **C242.06 GENERAL**

The Constructor 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 TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works), supported with test results from a 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 Constructor shall conform to the requirements of *C241 - Stabilisation*.

***Details of  
Proposed Base  
and Subbase to  
be Submitted***

No pavement material shall be delivered until the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) has released the associated Hold Point.

***Source of Supply***

The TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) can only release the hold point if the materials are found to conform to all the requirements of this Specification.

If, after the Constructor's proposals have been approved, the Constructor wishes to make changes in any of the material constituents the Constructor shall inform the TRC Representative in writing of the proposed changes. No delivery of material produced under the altered proposal shall take place without the approval of the TRC Representative.

***Variations by  
Constructor***

The cost of testing associated with any altered proposal shall be borne by the Constructor.

***Constructor's  
Cost***

At least ten (10) working days before placement of the material on the Works site, the Constructor 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***

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

**Sampling on Works site**

**Hold Point**

A Certificate of Conformance, including all relevant test records, for all pavement materials shall be submitted to the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) at least ten (10) working days prior to the delivery of pavement materials to the Works site.

**Hold Point**

**Process Held:** Delivery of Pavement Materials.

**C242.07 TRAFFIC CATEGORY**

Pavement materials are specified in terms of the Traffic Categories given in Table C242.1 for the calculated design traffic of the pavement.

**Pavement Material Traffic Category**

The Traffic Category (or Design Traffic) for the pavement materials shall be as shown on the approved design drawings.

**Design Drawings**

Road Hierarchy	Description
Arterial	Highest Order Road whose primary function is to provide links between urban centres.
Sub-Arterial	Roads whose main function is to provide a link between arterial roads or to arterial roads from rural centres, or other major traffic generating developments.
Collector	Road who carry traffic between the arterial and sub-arterial roads or from local and access road to sub-arterial roads.
Local and Access	Lowest order roads consisting of local streets and access streets. They generally provide no strategic link from one region to another.

**Table C242.1 - Traffic Categories**

**C242.08 UNBOUND BASE AND SUBBASE**

Unbound materials, including blends of 2 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**

Crushed rock materials are designated as follows:

**Crushed Rock**

- DGB20 (HD) 20mm nominal sized densely graded base (heavy duty).
- DGB20 (LD) 20mm nominal sized densely graded base (light duty).
- DGS20 20mm nominal sized densely graded subbase.
- DGS40 40mm nominal sized densely graded subbase.

Base materials shall comply with the requirements of Table C242.4. Subbase materials shall comply with the requirements of Table C242.5

**Base & Subbase Materials**



Test Method	Description	Base Material Requirements	
		DGB20 (HD)	DGB20 (LD)
AS 1289.3.6.1	Coarse Particle Size Distribution: <ul style="list-style-type: none"> <li>• % passing 75.0mm sieve</li> <li>• % passing 53.0mm sieve</li> <li>• % passing 37.5mm sieve</li> <li>• % passing 26.5mm sieve</li> <li>• % passing 19.0mm sieve</li> <li>• % passing 13.2mm sieve</li> <li>• % passing 9.5mm sieve</li> <li>• % passing 6.7mm sieve</li> <li>• % passing 4.75mm sieve</li> <li>• % passing 2.36mm sieve</li> </ul>	- - - 100 95-100 78-92 63-83 50-70 44-64 33-49	- - - 100 95-100 78-92 63-83 50-70 44-64 33-49
AS 1289.3.6.3	<ul style="list-style-type: none"> <li>• % passing 0.425mm sieve</li> <li>• % passing 0.075mm sieve</li> <li>• % passing 0.0135mm sieve</li> </ul>	14-23 7-14 3-7	14-23 7-14 3-7
AS 1289.3.1.1	Liquid Limit (if non plastic)	20 (max)	23 (max)
AS 1289.3.3.1	Plastic Limit (if plastic)	20 (max)	20 (max)
AS 1289.3.3.1	Plasticity Index (PI)	2-6 (max)	2-8 (max)
TfNSW T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if PI is less than 1)	1.7 MPa (min)	1.7 MPa (min)
AS 1141.14	Particle Shape by Proportional Caliper: <ul style="list-style-type: none"> <li>• % misshapen (2:1)</li> </ul>	35 (max)	35 (max)
AS 1141.22	Aggregate Wet Strength	80kN (min)	70kN (min)
AS 1141.22	Wet/Dry Strength Variation: <u>Dry - Wet</u> % Dry	35 (max)	35 (max)
AS 1289.6.1.1	4 day Soaked CBR <ul style="list-style-type: none"> <li>• (100% Standard Compaction)</li> </ul>	80	60

**Table C242.3 - Unbound Base Material Properties**

**Notes on Table C242.3:**

- (i) Material consisting of rounded river stone shall have a minimum of 2 fractured faces on at least 75% of the particles larger than 6.70mm.
- (ii) 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.
- (iii) 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.

Test Method	Description	Subbase Material Requirements	
		DGS20	DGS40
AS 1289.3.6.1	Coarse Particle Size Distribution: <ul style="list-style-type: none"> <li>• % passing 75.0mm sieve</li> <li>• % passing 53.0mm sieve</li> <li>• % passing 37.5mm sieve</li> <li>• % passing 26.5mm sieve</li> <li>• % passing 19.0mm sieve</li> <li>• % passing 13.2mm sieve</li> <li>• % passing 9.5mm sieve</li> <li>• % passing 4.75mm sieve</li> <li>• % passing 2.36mm sieve</li> </ul>	- - - 100 95-100 70-90 58-80 43-65 30-55	- - 100 95-100 64-90 - 42-78 27-64 20-50
AS 1289.3.6.3	<ul style="list-style-type: none"> <li>• % passing 0.425mm sieve</li> <li>• % passing 0.075mm sieve</li> <li>• % passing 0.0135mm sieve</li> </ul>	10-30 4-17 2-10	10-23 4-12 2-7
AS 1289.3.1.1	Liquid Limit (if non plastic)	23 (max)	23 (max)
AS 1289.3.3.1	Plastic Limit (if plastic)	20 (max)	20 (max)
AS 1289.3.3.1	Plasticity Index (PI)	10 (max)	10 (max)
TfNSW T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if PI is less than 1)	1.0 MPa (min)	1.0 MPa (min)
AS 1141.14	Particle Shape by Proportional Caliper: % misshapen (2:1)	35 (max)	35 (max)
AS 1141.22	Aggregate Wet Strength	70kN (min)	70kN (min)
AS 1141.22	Wet/Dry Strength Variation: $\frac{\text{Dry} - \text{Wet}}{\text{Dry}}$ %	35 (max)	35 (max)
AS 289.6.1.1	4 day Soaked CBR <ul style="list-style-type: none"> <li>• (100% Standard Compaction)</li> </ul>	30	30

**Table C242.4 - Unbound Subbase Material Properties.**

**Notes on Table C242.4:**

- (i) Material consisting of rounded river stone shall have a minimum of 2 fractured faces on at least 75% of the particles larger than 6.70mm.
- (ii) 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.
- (iii) 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.

Where the proposed unbound base or subbase material complies with all of the requirements of Table C242.3 or Table C242.4 as appropriate, except gradings (AS 1289.3.6.1 and AS 1289.3.6.3), the Constructor may propose the use of the material, subject to approval of the TRC Representative, if the material complies with the TfNSW Modified Texas Triaxial Classification Number (TfNSW Test Method T171) requirements specified in Table C242.5, (T171 tested at not less than 85% of Optimum Moisture Content and 100% of Maximum Dry Density as determined by AS 1289.5.1.1).

**Modified Texas  
Triaxial  
Classification**

Road Hierarchy	Modified Texas Triaxial Classification Number (TfNSW Test Method T171)	
	Base	Subbase
Arterial	2.0 (max)	2.5 (max)
Sub-Arterial	2.2 (max)	2.5 (max)
Collector	2.5 (max)	3.0 (max)
Local and Access	3.0 (max)	3.0 (max)

**Table C242.5 - TfNSW Modified Texas Triaxial Classification Number Requirements**

### **C242.09 LIME MODIFIED BASE AND SUBBASE MATERIALS**

Modification of unbound base and subbase materials to meet the requirements of Clause C242.08 by the addition of hydrated lime or quicklime shall be subject to approval of the TRC Representative and to the additional requirements of this Clause.

**Lime Modification**

Modification of materials may be by the use of either hydrated lime through a stationary mixing plant or by hydrated lime or quicklime utilising in-situ operations.

Material requirements of hydrated lime and quicklime shall be in accordance with C241 - Stabilisation

**Lime Type**

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

**Incorporation**

In-situ operations shall be in accordance with C241 - Stabilisation

**In-situ  
Operations**

The lime treated material shall yield an unconfined compressive strength not exceeding 1.5 MPa, when tested in accordance with TfNSW 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**

For DGB20 material, prior to being treated with lime, the material shall comply with the requirements of DGS20 in Table C242.4, except that the aggregate wet strength shall not be less than 80kN and the wet/dry strength variation shall not exceed 60%.

**DGB20**

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**

## DELIVERY, STOCKPILING AND PROCESSING OF PAVEMENT MATERIAL

### C242.10 DELIVERY TO WORKS SITE

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

***Damp Condition***

### C242.11 STOCKPILING OF UNBOUND MATERIALS

Stockpile sites shall be located as shown on the approved design drawings plans and/or the approved Erosion and Sediment Control Plan (ESCP) with associated control measures in place.

***Stockpile Sites***

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.

***Free Draining***

Stockpiles and stockpile sites shall be maintained so as to prevent the stockpiled materials from becoming intermixed or contaminated with foreign material. The total height of any stockpile shall not exceed 3m.

***Stockpile Requirements***

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

***Stockpile Slopes***

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***

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

***Completion of Work***

## SPREADING OF PAVEMENT MATERIAL

### C242.12 SPREADING PAVEMENT MATERIALS

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 1289.5.1.1 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.

***Underlying Layer Quality***

Where the underlying layer was constructed by the Constructor, or where the Constructor'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 Constructor.

***Constructor's Costs***

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 C242.19 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.

***Tolerances***

At all work boundaries and tie ins with existing pavement, the Constructor shall provide vertical faces for transverse and longitudinal joints which are keyed in to the existing pavement as shown on TRC Standard Drawing RD002.

***Joints***

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 1289.5.1.1.

***Moisture Content***

### C242.13 GENERAL REQUIREMENTS

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 Clauses C242.16 and C242.17.

***Uniform Compaction***

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 2 more passes by the compaction plant than the remainder of the pavement.

***Compaction Procedure***

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

***Hand Operated Plant***

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

***Plant Movement Restrictions***

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 C242.21. This operation will be at cost to the Constructor.

***Unstable Areas  
Constructor's Cost***

The placement of subsequent layers shall not be allowed until the requisite testing has been completed and the lot is deemed to comply with all requirements.

***Placing Subsequent Layers***

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 recompact and trimmed to meet the specified density requirements and level tolerances.

***Excessive Moisture Content***

## ACCEPTANCE OF COMPACTED LAYERS

### C242.14 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 Constructor, 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.

### C242.15 COMPACTION ASSESSMENT

The Constructor shall undertake the number of tests as prescribed in Table C242.6 below.

**Density Testing Frequency**

Specified Relative Compaction (%)		Minimum Testing Frequency For Lot Area of:				
		>5000m <sup>2</sup>	1000-5000m <sup>2</sup>	500-1000m <sup>2</sup>	50-500m <sup>2</sup>	50m <sup>2</sup>
	90.0	1 per 3000m <sup>2</sup>	1 per 2000m <sup>2</sup> (min 2)	1	1	1
>90.0	95.0	1 per 2000m <sup>2</sup>	1 per 1000m <sup>2</sup> (min 3)	1 per 250m <sup>2</sup> (min 3)	2	1
>95.0	98.0	1 per 2000m <sup>2</sup> (min 6)	5	4	3	1
>98.0	100.0	1 per 2000m <sup>2</sup> (min 6)	5	4	3	1
>100.0		1 per 2000m <sup>2</sup> (min 10)	1 per 500m <sup>2</sup> (min 5)	4	3	1

**Table C242.6 – Minimum Testing Frequency for Relative Compaction**

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

**Constructor's Costs**

In addition to the compaction assessment, acceptance of lots shall be determined according to the elastic rebound deflection. The elastic rebound deflection shall be taken as the maximum deflection in accordance with TfNSW Test Method T160 utilising the Benkelman Beam. The allowable maximum deflection and characteristic deflection for any lot shall not exceed the tolerances as prescribed in Table C242.7, and the co-efficient of variation (CV) in recorded deflections shall not exceed 30%. Measurements shall be taken at the rate of 4 per 1000m<sup>2</sup>, with a minimum of 10 measurements per lot.

**Benkelman Beam Testing**

The characteristic deflection for each lot of road shall be computed as follows:

$$d = Y + 1.65 \times S$$

Where:

d – characteristic deflection (mm)

Y – mean deflection (mm)

S – standard deviation of deflection (mm)

Road Type	Depth Below FSL (mm)	Maximum Deflection (mm)	Characteristic Deflection (mm)
Minor Cul-de-Sac and short through roads (AADT < 500) (less than 15 dwellings)	0	1.2	1.0
	-150	1.4	1.2
Local Access Roads (AADT < 1000) (15 – 100 dwellings)	0	1.2	1.0
	-150	1.4	1.2
Collector (AADT < 4000) (100 – 300 dwellings)	0	1.0	0.85
	-150	1.15	1.0
Distributor (AADT < 10000)	0	0.8	0.65
	-150	0.9	0.8
Industrial	0	0.8	0.65
	-150	0.9	0.8

**Table C242.7 – Allowable Maximum Deflection and Characteristic Deflection**

#### C242.16 RELATIVE COMPACTION

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:

*Calculation*

$$\text{Relative Compaction (\%)} = \frac{\text{In-situ dry density}}{\text{Maximum dry density}} \times 100$$

For unbound layers, the sample shall be tested in accordance with AS 1289.5.1.1 to determine the maximum dry density (standard compactive effort) for the material.

*Maximum Dry Density*

For bound layers, the sample shall be tested within 2 hours after the addition of stabilising agent to the mix in accordance with TfNSW Test Method T130 to determine the maximum dry density (**standard compactive effort**) for the material. This test method shall also be used to determine the optimum moisture content

*Time for Testing*

#### C242.17 COMPACTION REQUIREMENTS AND ACCEPTANCE

A lot shall be accepted for compaction if the characteristic value (Q) for relative compaction for each lot exceeds **102%** for base and **100%** for subbase. Calculation of the characteristic value Q shall be determined in accordance with **Annexure C242A**.

Lots or areas of pavement not achieving these specified values shall be rejected. Unbound layers may be reworked as provided by Clause C242.18, but the bound materials in rejected layers/courses shall be removed and replaced with fresh materials in accordance with Clause C242.21.

*Rejection of Lots*

#### C242.18 REWORKING OF REJECTED UNBOUND LAYERS

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

*Reworking*

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 C242.21. When a lot or area of pavement is resubmitted for compaction assessment, testing shall be carried out in accordance with Clauses C242.16 and C242.17.

***Rejected Material***

All costs associated with corrective work carried out before the resubmission of a lot for compaction assessment, including rewatering, re-rolling, removal and replacement of material as well as reworking shall be borne by the Constructor.

***Constructor's Costs***

**C242.19 TOLERANCES**

**a) General**

The tolerances stated are the acceptable limits of departure from the dimensions shown on the approved design drawings, which may occur during construction.

***Tolerances***

Areas for assessment of conformity with tolerance requirements shall be divided into lots and presented to the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) together with survey reports covering line and level.

***Lots for Assessment of Conformity***

**b) Width**

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 20mm less than the dimension nor more than 60mm greater than the dimension shown on the approved design drawings.

***Horizontal Dimensions***

The average width of the layer determined from measurements at 3 locations selected at random by the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) over any 200m road length, or part thereof, shall be not less than the specified width.

***Average Width***

**c) Levels, Thickness and Surface Trim**

The levels of the finished surface of the top of the unbound subbase course shall not vary by more than  $\pm 15$ mm.

***Subbase Surface Level***

Level tolerances at the top of the unbound base course shall not vary by more than  $\pm 15$ mm. 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 +10mm -0mm from the lip level of the gutter minus the design thickness of the wearing surface.

***Base Surface Level***

The thickness of any layer that shall be achieved in all instances is +30mm and -0mm of the design thickness.

***Thickness of Pavement Layers***

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.

***Subbase Design Level***

The pavement surface after trimming and immediately prior to sealing shall be of a quality such that the deviation under a 3m 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 *CQS-Quality Control Requirements Sub-Annexure B5*.

***Straight Edge Deviation***



**Hold Point**

Notification shall be given to the TRC Representative no less than two (2) working days prior to the top of the pavement layer being available for inspection and Benkelman Beam testing. Records verifying full conformance of the pavement layer with this Specification shall be made available to the TRC Representative.

**Process Held:** Placement of subsequent pavement layers or wearing course.

**Hold Point**

**Hold Point**

The Constructor shall submit to the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) all test results verifying conformity of compaction and moisture content of all areas as defined by Clause C242.17 and C242.19.

**Process Held:** Placement of subsequent pavement layers or wearing course.

**Hold Point**

**C242.20 ACTION ON REJECTION**

**(a) Unbound Materials**

A lot that has not complied with the requirements for width or level tolerance as set out in Clause C242.19 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 C242.18.

**Rejection Criteria**

Notwithstanding the above, where the rejected lot can be corrected by further trimming, the TRC Representative 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 C242.19 shall apply.

**Corrective Action**

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 Constructor.

**Constructor's Costs**

**C242.21 REMOVAL AND REPLACEMENT OF REJECTED COURSES**

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 the Works site.

**Rejected Material**

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 Constructor using methods approved by the TRC Representative.

**Length to be Removed**

The TRC Representative 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 TRC Representative's satisfaction. In this case, the new longitudinal cold joint shall be formed and located along the centreline of the road pavement.

**TRC Representative's Discretion**

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

**Inspection Before Replacement**

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.

**Replacement Material**

All costs associated with removals, replacements and corrections of base and subbase courses required under this Clause and the extra costs incurred by the Constructor in respect of delays caused by such removals, replacements and corrections shall be borne by the Constructor.

**Constructor's Costs**

## **C242.22 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE**

Following the TRC Representative's acceptance of any section of the work, the Constructor 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 *C244 -Sprayed Bituminous Surfacing* within seven (7) days of the date of the acceptance of such sections.

**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 TRC Representative, the Constructor shall re-prepare the pavement and re-present the pavement for inspection by the TRC Representative.

**Constructor's  
Responsibility**

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

**Constructor's Cost**

The Constructor 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 TO TRAFFIC**

### **C242.23 GENERAL REQUIREMENTS**

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.

**Restrictions on  
Movement**

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 (7) 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**

For bound pavements, traffic shall not be allowed to use the constructed pavement until a minimum of seven (7) days after completion of the full pavement depth and the primerseal.

**Open to Traffic  
Bound Pavement**

## LIMITS AND TOLERANCES

### C242.24 SUMMARY OF LIMITS AND TOLERANCES

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C242.8 below:

Item	Activity	Limits/Tolerances	Spec Clause
<b>1</b>	<b>Stockpile Sites</b>		
	Stockpile Sites	(i) Stockpile height <3m	C242.11
		(ii) Stockpile batter <1.5:1 and >3:1	
<b>2</b>	<b>Spreading Pavement Materials</b>		
	Compacted Layer Thickness	>100mm, <200m	C242.12
<b>3</b>	<b>Compaction Acceptance</b>		
	Minimum Characteristic Value: Q	Base: 102% Subbase: 100%	C242.17
<b>4</b>	<b>Width of Pavement</b>		
	(i) Design centre-line to edge of constructed Pavement	-0mm to +60mm of dimensions on the approved design drawings	C242.19(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.	C242.19(b)
<b>5</b>	<b>Surface Level</b>		
	(i) Subbase levels	±15mm	C242.19(c)
	(ii) Base levels	±15mm	C242.19(c)
	(iii) Base levels adjacent to Kerb and Gutter	<+10mm -0mm from the lip levels of adjacent gutter minus design thickness of wearing surface.	C242.19(c)
	(iv) Layer Thickness	Final thickness of layers shall not vary more than +30mm and -0mm of required thickness.	C242.19(c)
	(v) Shape	Deviation from a 3m long straight edge on base surface immediately prior to sealing shall be less than 12mm.	C242.19(c)

**Table C242.8 - Summary of Limits and Tolerances**

**ANNEXURE C242A**  
**STATISTICAL CALCULATION FOR CONFORMITY OF LOTS**

When acceptance criteria, specify a maximum and/or minimum characteristic value of attribute ( Q ),  $Q_U$  and/or  $Q_L$  must be used to determine Q.

The calculation of the characteristic value of attribute ( Q ) for the Lot must be as follows:

(a) Sample Size = 1

$$Q_U = Q_L = \text{Test result}$$

(b) Sample Size = 2

$$Q_U = \text{highest test result}$$

$$Q_L = \text{lowest test result}$$

(c) Sample Size > 2

$$Q_U = \bar{x} + ks$$

$$Q_L = \bar{x} - ks$$

Where  $\bar{x}$  = arithmetic mean of attribute test results for all sub-Lots

S = standard deviation of sub-Lot attribute test results

=

$$\sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

k = acceptance constant from Table Q/L.2 (based on 10% producer's risk)

**Table Q/L.2 – Acceptance Constant k**

Sample Size	3	4	5	6	7	8	9	10 - 14	15 - 19	20 +
<b>k</b>	0.52	0.62	0.67	0.72	0.75	0.78	0.81	0.83	0.90	0.95

A Lot achieves conformity if:

$Q_U$  = the specified upper limit for characteristic value of the attribute; and

$Q_L$  = the specified lower limit for characteristic value of the attribute.

If:  $Q_U$  is more than the specified upper limit for characteristic value; or

$Q_L$  is less than the specified upper/lower limit for characteristic value,

and reworking is subsequently undertaken, the complete Lot must be resampled and retested to verify conformity.

## ANNEXURE C242B ALTERNATIVE PAVEMENT TESTING

The following alternative pavement testing and hold points may be nominated on the ITP where approved by the asset owner.

- In addition to the hold points set out in C213 Earthworks, elastic rebound deflection shall be assessed at the top of subgrade. The elastic rebound deflection shall be taken as the maximum deflection in accordance with TfNSW Test Method T160 utilising the Benkelman Beam. The allowable characteristic deflection for any lot shall not exceed the 1.0mm and the co-efficient of variation (CV) in recorded deflections shall not exceed 30%. Measurements shall be taken at the rate of 1 test every 20 linear meters along alternative wheel paths of each travel lane, with a minimum of 10 measurements per lot.
- Density testing is required as specified in C242.17.
- Proof rolling is required at the top of sub-base and base.

<p style="text-align: center;"><b>Witness Point</b></p> <p>Notification shall be given to the TRC Representative no less than two (2) working days prior to the top of the subgrade being available for inspection and Benkelman Beam testing. Records verifying full conformance of the subgrade layer with this Specification shall be made available to the TRC Representative.</p> <p><b>Process Held:</b> Placement of subsequent pavement layers.</p>	<b>Witness Point</b>
<p style="text-align: center;"><b>Witness Point</b></p> <p>Notification shall be given to the TRC Representative no less than two (2) working days prior to the pavement layers being made available for inspection and proof rolling. Records verifying full conformance as per the requirements of this Specification shall be made available on request.</p>	<b>Witness Point</b>
<p style="text-align: center;"><b>Hold Point</b></p> <p>The Constructor shall submit to the TRC Representative and/or the Developer's Representative (for Developer Infrastructure Works) all test results verifying conformity of compaction and moisture content of all areas as defined by Clause C242.17 and C242.19.</p> <p><b>Process Held:</b> Placement of subsequent pavement layers or wearing course.</p>	<b>Hold Point</b>

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