



## AUS-SPEC

### Infrastructure Specifications

#### 1141 Flexible pavement base and subbase

**1141 FLEXIBLE PAVEMENT BASE AND SUBBASE**

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the Cessnock City Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) Cessnock City Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown **in brown text like this**.
- Where content is deleted or excluded from the main body of the document, it is to be shown ~~struck through like this~~. Such clauses are to have no effect.

Where there is a conflict between main body text and Cessnock City Council specific clauses, Council's specific clauses shall prevail.

**1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide flexible pavement base and subbase, as documented.

**1.2 CROSS REFERENCES****General**

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- 0136 *General requirements (Construction)*.
- 0152 *Schedule of rates (Construction)*.
- 0161 *Quality management (Construction)*.
- 1101 *Traffic management*.
- 1113 *Subgrade and formation stabilisation*.
- 1143 *Sprayed bituminous surfacing*.

**1.3 INTERPRETATION****Abbreviations**

General: For the purposes of this worksection the following abbreviations apply:

- CBR: California bearing ratio.
- **DGB** **Densely Graded Base**.
- **DGS** **Densely Graded Subbase**.
- CRB: Crushed rock base.
- CRS: Crushed rock subbase.
- NGB: Natural gravel base.
- NGS: Natural gravel subbase.
- OMC: Optimum moisture content.
- CCB: Crushed concrete base.
- CCS: Crushed concrete subbase.
- RCMB: Recycled material base
- RCMS: Recycled material subbase
- UCS: Unconfined compressive strength.

**Definitions**

General: For the purposes of this worksection the definitions in Austroads AP-C87 and the following apply:

- Base/based course: One or more layers of material forming the uppermost structural element of a pavement and on which the surfacing may be placed. It may be composed of fine crushed rock, natural gravel, broken stone, stabilised material, asphalt or Portland cement concrete. Usually designated as Dense graded base (DGB), NGB, CRB, CCB or RCMB.
- Blended material: A material formed by the combination and mixing of materials obtained from different sources or rock types or recycled materials, in order to obtain a product with improved properties.
- Bound material: A granular or subgrade material to which a binder has been added to improve structural stiffness.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Modified material: Granular materials to which small amounts of stabilising agent have been added to improve their performance (e.g. adjusting plasticity) without causing a significant increase in structural stiffness.
- Pozzolan: A siliceous or aluminous siliceous material, which in itself possesses little or no cementitious value but which in finely divided form may be mixed with lime or Portland cement to form a cementitious material.
- Recycled materials: Materials manufactured from recycled material such as crushed concrete, bricks, terracotta tiles or glass or reclaimed asphalt pavement (RAP).
- Subbase: Material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform. Usually designated as Dense graded base (DGS), NGS 40mm gravel, CRS, CCS or RCMS.
- Unbound base: A base comprising granular or mechanically stabilised materials and without the capacity to resist significant tensile stresses.
- Unbound material: Materials that are natural, manufactured or recycled mineral blends of graded particles which have not been modified or bound.
- Windrows: A shallow ridge of material formed by the action of a grader (or other) blade during in situ cutting or mixing operations.
- Working time: The duration at which the contractor has to mix a binder, compact and trim stabilised material before the material loses its intended strength. An unconfined compressive strength (UCS) test is used for the establishment of working time.

**1.4 TOLERANCES****Layer width**

Width of pavement: -50 mm to +300 mm of design dimension when the horizontal dimension measured from the design centre line to the edge of the constructed pavement base/subbase layer. Conform to the following, measured from the centreline to the edge of the pavement:

- Base: 0 to +100 mm, with maximum 50 mm each side.
- Subbase: 0 to +150 mm, with maximum 75 mm each side.

**Subbase layer**

Level: 0 mm to -10 mm from design level.

Thickness:  $\pm 10$  mm from design thickness.

**Base layer**

Level: 0 mm to +10 mm from design level.

Level adjacent to kerb and channel: +5 to -0 mm.

Thickness: 0 mm to +20 mm from design thickness.

Shape: Less than 5 mm deviation from a 3 m straightedge laid in any direction after trimming and immediately before sealing.

## 1.5 SUBMISSIONS

### Execution details

Trial section verification: Submit the following:

- Compaction test results: From a NATA accredited laboratory confirming the required relative compaction has been achieved.
- Survey reports: Covering line, level and thickness.
- Record data of straightedge test.

Delivery: Submit the following:

- Delivery vehicles not fitted with fabric covers: If proposed for the delivery of modified or bound materials, details of vehicle.
- Bound materials: Delivery dockets for each truck load of bound materials, indicating the time and date of mixing, and registration or fleet number of the delivery truck.

Alternative stockpile sites: If proposed, submit details of locations not documented on drawings.

Placing: Submit placing details if the following are proposed or required:

- Placing and compacting pavement layers outside the required layer thickness range.
- Placing bound materials outside the required ambient air temperature range.

Trimming, compaction and curing: Submit details of hand operated compaction plant required where self-propelling compaction plant is not practical.

### Products and materials

Unbound base and subbase materials: Submit details for each proposed constituent material including the following:

- Source of supply.
- Blend proportions for blended materials.

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Test results for proposed base and subbase materials.

Test results for a sample of the proposed recycled constituent material to verify the limits of undesirable material to **Base/Subbase material properties and test methods tables**.

- Test results from a NATA accredited laboratory.

Alternative unbound base and subbase materials: If proposed, submit details of the following:

- Test results from a NATA accredited laboratory.
- Evidence of conformance to the **Shear strength table**.

### Records

Survey of completed pavement layer: Submit survey reports covering line, level and thickness for each layer before placing the next layer.

Record of roll tests for observation of any movement of each layer tested with the 3 point dead weight roller.

**Ride quality: Test records to be submitted in accordance with Clause M4.**

### Tests

Results: Submit results of testing to **ANNEXURE – MAXIMUM LOT SIZE AND MINIMUM TEST FREQUENCIES**.

### Variations

Variation to approved materials: Submit details of proposed changes to the approved base and subbase materials or source of supply. Obtain the approval of the variation prior to any material being delivered to site

## 1.6 INSPECTIONS

### Notice

General: Give notice so that inspection may be made of the following:

- Materials at delivery: Subbase, base, modified and bound materials upon their delivery to the site.
- Underlying layer properties: Assess layer condition properties, including required moisture content before placing base and subbase material.
- Trial section construction: Completed trial base and subbase section.

- Non-conforming trial section: If the original trial section is deemed non-conforming, completed new trial section.
- Non-conforming lot: Completed base or subbase removal before replacement.

Lot package closure certificate confirming works completed as specified.

- Wearing surface: Prepared base surface before applying prime or initial seal.

Roll test: Conduct visual inspection of subgrade, base, subbase and wearing course as specified in the Councils development works standards by selecting the line of the roller and walking behind or beside the roller to detect any movement of the pavement by observation.

- ~~Use 3-point deadweight 7.5 tonne dead weight roller or as agreed and guided by Councils specified standards~~ Preferred testing method: perform the roll test with 10T fully laden water-cart.

## 2 MATERIALS

### 2.1 UNBOUND BASE AND SUBBASE MATERIALS

#### Granular material properties and production

Material properties: Provide unbound granular materials, including blends of two or more different materials, which develops structural stability and are uniform in grading and physical properties when compacted.

Material production: Materials produced by crushing plant or naturally occurring granular materials.

Moisture content of base/subbase materials: 60 to 90% of laboratory OMC to AS 1289.5.2.1 (2017), after spreading and before compaction.

#### Traffic loading and material selection

Design traffic: As documented on drawings.

Pavement materials: Select base and subbase material based on the traffic category in the **Traffic loading and pavement materials table**.

#### Traffic loading and pavement materials table

| Traffic classification | Design traffic ESA (N)                          | Acceptable base material                          | Acceptable subbase material            |
|------------------------|---|---|--|
| Medium (M)             | $10^6 \leq N < 4 \times 10^6$<br>(ie Collector) | CRB20-1 *DGB20-1                                  | CRS20, CRS40<br>*DGS20, *DGS40         |
| Light (L)              | $N \leq 10^6$<br>$N < 10^6$                     | **CRB20-1, CRB20-2,<br>CCB20-1, CCS20-2,<br>NGB20 | **CRS20, CRS40,<br>CCS20, NGS20, NGS40 |

\*DGB and DGS to RMS 3051- Granular Base and Subbase Materials for Surfaced Road Pavements (2014).

\*\*CRB/CRS & NGB/NGS used for local roads only

CCB/CCS & RCMB/RCMS are not permitted in Cessnock City Council.

#### ~~Classes of crushed rock~~

Material: Provide from the following classes:

- Class 1: Pavement base material with a minimum plasticity index for unbound pavements requiring a very high standard of surface preparation for a sprayed sealed or thin asphalt surfacing.
- Class 2: Pavement base material with no minimum plasticity index for unbound pavements which may not requiring a very high standard of surface preparation. Use of recycled material is permitted.
- Class 3: Pavement subbase material requiring minimum permeability to provide positive drainage to the subsurface drains for medium traffic. Pavement base material for light traffic pavements provided the material produces sufficient cohesive fines during compaction. Use of recycled material is permitted.
- Class 4: Subbase material for unbound flexible pavements. Use of recycled material is permitted.

**Crushed rock**

Crushed rock materials: Select from the following based on the **Base/Subbase material properties and test methods tables**:

- CRB20-1: 20 mm nominal crushed rock base.
- ~~CRB20-2: 20 mm nominal crushed rock base.~~
- CRS20-3: 20 mm nominal crushed rock subbase.
- CRS40-4: 40 mm nominal crushed rock subbase.

**Crushed concrete**

Crushed rock materials: Select from the following based on the **Base/Subbase material properties and test methods tables**:

- CCB20-1: 20 mm crushed concrete base.
- CCB20-2: 20 mm crushed concrete base.
- CCS20: 20 mm crushed concrete subbase.

**Recycled materials**

Recycled Materials to be accepted on a case by case basis.

Guidance:

Refer to. ARRB Best Practice A, ARRB Best Practice A, and factsheets available from [www.arrb.com.au](http://www.arrb.com.au).

IPWEA (NSW) Roads and Transport Directorate- Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage (2010)

Requirements: To Austroads AGPT04E (2022). Select individual recycled or manufactured material and blend with virgin materials or other recycled materials to the **Limits on use of recycled and manufactured materials as constituents table**. Properties for RCMB and RCMS are based on the **Base/Subbase material properties and test methods tables**.

— ~~RCMB: Recycled material base.~~

— ~~RCMS: Recycled material subbase.~~

**Limits on use of recycled and manufactured materials as constituent materials table**

| Recycled material <sup>d</sup>   | Unbound or modified base and subbase | Bound base and subbase |
|----------------------------------|--------------------------------------|------------------------|
| Iron and steel slag              | 100%                                 | 100%                   |
| Crushed concrete <sup>a</sup>    | 100%                                 | 100%                   |
| Brick                            | 20%                                  | 10%                    |
| RAP                              | 40%                                  | 40%                    |
| Fly ash <sup>b</sup>             | 10%                                  | 10%                    |
| Furnace bottom ash               | 10%                                  | 10%                    |
| Reclaimed asphalt profilings     | 30%                                  | 30%                    |
| Crushed glass fines <sup>c</sup> | 10%                                  | 10%                    |

a. For pavements using high percentages of crushed concrete, consider the amount of available cement which will rehydrate when subjected to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking.

b. For pavements using fly ash, consider the possibility of hydration and binding when subject to moisture to create rigid or semi-rigid pavement and result in subsequent shrinkage cracking.

c. Crushed glass fines refer to clean glass, which has been processed to produce an aggregate product for which an exemption has been issued. Refer to Austroads ATS 3050 (2022) for the supply of recycled crushed glass and TfNSW Recycled crushed glass (RCG) in asphalt guide available from [roads-waterways.transport.nsw.gov.au](http://roads-waterways.transport.nsw.gov.au).

d. For the use of recycled material, refer to *LGNSW (2020) Guide to recycled materials in roads and pavements* and *Vic Gov Recycled Products (2015) - Recycled products in pavement construction by Sustainability Victoria*

**Locally available materials**

General: Fit-for-purpose locally available materials to Austroads AP-T352 (2020) and Austroads AP-T353 (2020).

**Natural gravel**

Unbound natural gravel materials: Select from the following based on the **Base/subbase material properties and test methods tables**:

- NGB20: 20 mm natural gravel base.
- NGS20: 20 mm natural gravel subbase.
- NGS40: 40 mm natural gravel subbase.

**Base material properties and test methods table**

| Property and test method  | Differentiating criteria                                 | Material requirements |          |          |          |          |          |
|---|--|-----------------------|----------|----------|----------|----------|----------|
|   |  | CRB20-1               | CRB20-2  | CCB20-1  | CCB20-2  | RCMB     | NGB20    |
| Particle size distribution or grading (% passing through sieve)<br>AS 1289.3.6.1 (2009) | <b>Sieve size (mm)</b>                                   | —                     | —        | —        | —        |          | —        |
|   | 26.5   | 100                   | 100      | 100      | 100      | 100      | 100      |
|   | 19.0   | 95 - 100              | 95 - 100 | 95 - 100 | 95 - 100 | 95-100   | 93 - 100 |
|   | 13.2   | 77 - 93               | 77 - 93  | 78 - 92  | 78 - 92  | 70-90    | —        |
|   | 9.5  | 63 - 83               | 63 - 83  | 63 - 83  | 63 - 83  | 60-80    | 71 - 87  |
|   | 4.75   | 44 - 64               | 44 - 64  | 44 - 64  | 44 - 64  | 40-65    | 47 - 70  |
|   | 2.36   | 29 - 49               | 29 - 49  | 30 - 48  | 30 - 48  | 35-55    | 35 - 56  |
|   | 0.425  | 13 - 23               | 13 - 23  | 13 - 21  | 13 - 21  | 10-30    | 14 - 32  |
| 0.075   | 5 - 11   | 5 - 11                | 5 - 9    | 5 - 9    | 5-15     | 6 - 20   |          |
| Liquid limit ( $w_L$ ) to AS 1289.3.1.1 (2009)  | —  | max 25%               | max 25%  | max 30%  | max 30%  | max 27%  | max 25%  |
| Plasticity index ( $I_p$ ) to AS 1289.3.3.1 (2009)                                      | <b>Rainfall</b>  | —                     | —        | —        | —        |          | —        |
|   | All areas  | min 2%                | —        | min 2%   | —        |          | —        |
|   | Areas with annual rainfall > 500 mm                      | max 6%                | max 6%   | max 6%   | max 6%   | max 6%   | max 6%   |
|   | Areas with annual rainfall < 500 mm                      | max 10%               | max 10%  | max 10%  | max 10%  | max 10%  | max 10%  |
| Linear shrinkage ( $LS$ ) to AS 1289.3.4.1 (2008)                                       | <b>Rainfall</b>  | —                     | —        | —        | —        |          | —        |
|   | All areas  | min 0.7%              | —        | min 0.7% | —        |          | —        |
|   | Areas with annual rainfall > 500 mm                      | max 2.0%              | max 2.0% | max 2.0% | max 2.0% | max 2.0% | max 2.0% |
|   | Areas with annual rainfall < 500 mm                      | max 4.0%              | max 4.0% | max 4.0% | max 4.0% | max 4.0% | max 4.0% |
| Undesirable constituent materials (% retained on a 4.75 mm sieve) to RMS T276 (2012)    | <b>Material type</b>                                     | —                     | —        | —        | —        |          | —        |
|   | Type I - Metal, glass, stone, ceramics and slag          | —                     | —        | max 2.0  | max 2.0  | max 2.0  | —        |
|   | Type II - Plaster, clay lumps and other friable material | —                     | —        | max 0.5  | max 0.5  | max 0.5  | —        |
|   | Type III - Rubber, plastic, paper, cloth,                | —                     | —        | max 0.1  | max 0.1  | max 0.1  | —        |

|  |  |             |             |             |             |             |             |
|--|--|-------------|-------------|-------------|-------------|-------------|-------------|
|  | paint, wood and other vegetable matter |             |             |             |             |             |             |
| For materials with plasticity index less than 1: Maximum dry compressive strength on fraction passing 19 mm sieve to AS 1141.52 (2019)   | —                                      | min 1.7 MPa | min 1.7 MPa | min 1.7 MPa | min 1.7 MPa | min 1.7 MPa | min 1.7 MPa |
| Particle shape by proportional caliper (% misshapen for 2:1 caliper ratio) to AS 1141.14 (2007)  | —                                      | max 35%     | max 35%     | max 35%     | max 35%     | max 35%     | —           |
| Aggregate wet strength <sup>a</sup> to AS 1141.22 (2019)   | —                                      | min 100 kN  | min 80 kN   | min 100 kN  | min 80 kN   | Min 70kN    | —           |
| Wet/dry strength variation <sup>a</sup> (dry - wet)/dry to AS 1141.22 (2019)   | —                                      | max 35%     | max 35%     | max 35%     | max 35%     | max 35%     | —           |
| Los Angeles value (% loss or abrasion) to AS 1141.23 (2021)  | —                                      | max 35%     | max 35%     | max 40%     | max 40%     | max 40%     | —           |
| 4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1 (2014)   | —                                      | min 80%     | min 80%     | min 80%     | min 80%     | —           | min 80%     |
| Unconfined compressive strength to AS 5101.4 (2008)  | —                                      | max 1.0 MPa | max 1.0 MPa | max 1.0 MPa | max 1.0 MPa | max 1.0 MPa | —           |
| <p>a. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.</p> <p>b. <b>DGB to RMS 3051- Granular Base and Subbase Materials for Surfaced Road Pavements (2014).</b></p> |  |             |             |             |             |             |             |

**Subbase material properties and test methods table**

| Property and test method  | Differentiating criteria | Material requirements |          |          |         |          |          |
|---|--------------------------|-----------------------|----------|----------|---------|----------|----------|
|   |                          | CRS20-3               | CRS40-4  | CCS20    | RCMS    | NGS20    | NGS40    |
| Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1 (2009) | <b>Sieve size (mm)</b>   | —                     | —        | —        | —       | —        | —        |
|   | 53.0 mm                  | —                     | 100      | —        | —       | —        | 100      |
|   | 37.5                     | —                     | 90 - 100 | —        | —       | —        | 95 - 100 |
|   | 26.5                     | 100                   | 74 - 96  | 100      | 100     | 100      | 80 - 97  |
|   | 19.0                     | 90 - 100              | 62 - 86  | 95 - 100 | 85-100  | 96 - 100 | —        |
|   | 13.2                     | 74 - 96               | —        | 75 - 95  | 70-90   | —        | —        |
|   | 9.5                      | 61 - 85               | 42 - 66  | 60 - 90  | 60-80   | 65 - 89  | 48 - 85  |
|   | 4.75                     | 42 - 66               | 28 - 50  | 42 - 76  | 40-65   | 47 - 80  | 35 - 73  |
|   | 2.36                     | 28 - 50               | 20 - 39  | 28 - 60  | 30-55   | 32 - 67  | 25 - 58  |
|   | 0.425                    | 11 - 27               | 8 - 21   | 10 - 28  | 10-30   | 14 - 42  | 10 - 33  |
|   | 0.075                    | 4 - 14                | 3 - 11   | 2 - 10   | 5-15    | 6 - 26   | 3 - 21   |
| Liquid limit (w <sub>L</sub> ) to AS 1289.3.1.1 (2009)                                  | —                        | max 25%               | max 25%  | max 30%  | max 27% | max 25%  | max 25%  |
|   | <b>Rainfall</b>          | —                     | —        | —        | —       | —        | —        |



| Property and test method   | Differentiating criteria   | Material requirements |             |             |             |             |             |
|--|--|-----------------------|-------------|-------------|-------------|-------------|-------------|
|  |  | CRS20-3               | CRS40-4     | CCS20       | RCMS        | NGS20       | NGS40       |
| Plasticity index ( <i>I<sub>p</sub></i> ) to AS 1289.3.3.1 (2009)  | Areas with annual rainfall > 500 mm  | max 12%               | max 12%     | max 12%     | max 6%      | max 12%     | max 12%     |
|  | Areas with annual rainfall < 500 mm  | max 12%               | max 12%     | max 12%     | max 12%     | max 12%     | max 12%     |
| Linear shrinkage ( <i>LS</i> ) to AS 1289.3.4.1 (2008)   | <b>Rainfall</b>  | —                     | —           | —           | —           | —           | —           |
|  | Areas with annual rainfall > 500 mm  | max 4.5%              | max 4.5%    | max 4.5%    | max 4.5%    | max 4.5%    | max 4.5%    |
|  | Areas with annual rainfall < 500 mm  | max 6.0%              | max 6.0%    | max 6.0%    | max 6.0%    | max 6.0%    | max 6.0%    |
| Undesirable constituent materials (% retained on the 4.75 mm sieve) to RMS T276 (2012)   | Type I - Metal, glass, stone, ceramics and slag                                  | —                     | —           | max 3.0     | max 3.0     | —           | —           |
|  | Type II - Plaster, clay lumps and other friable material                         | —                     | —           | max 0.2     | max 0.2     | —           | —           |
|  | Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter | —                     | —           | max 0.2     | max 0.2     | —           | —           |
| Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52 (2019)  | —  | min 1.0 MPa           | min 1.0 MPa | min 1.0 MPa | min 1.0 MPa | min 1.0 MPa | min 1.0 MPa |
| Particle shape by proportional calliper - % misshapen (2:1) to AS 1141.14 (2007)   | —  | max 35%               | max 35%     | max 35%     | max 35%     | —           | —           |
| Aggregate wet strength <sup>a</sup> to AS 1141.22 (2019)   | —  | min 50 kN             | min 50 kN   | min 50 kN   | min 70 kN   | —           | —           |
| Wet/dry strength variation <sup>a</sup> (dry - wet)/dry to AS 1141.22 (2019)   | —  | max 40%               | max 40%     | max 40%     | max 40%     | —           | —           |
| Los Angeles value to AS 1141.23 (2021)   | —  | max 40%               | max 40%     | max 40%     | max 40%     | —           | —           |
| 4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1 (2014)   | —  | min 30%               | min 30%     | min 30%     | min 60%     | min 30%     | min 30%     |
| <p>a. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing.</p> <p>b. <b>DGS to RMS 3051- Granular Base and Subbase Materials for Surfaced Road Pavements (2014).</b></p> |  |                       |             |             |             |             |             |

## 2.2 ALTERNATIVE UNBOUND BASE AND SUBBASE MATERIALS

### Shear strength

Requirement: If proposed materials conform to the **Base/subbase material and test method table** except for particle size distribution (grading), conform to **Shear strength table**.

### Shear strength table

| Material layer | Modified Texas Triaxial Classification number (Test method T171) |
|----------------|--|
| Base           | Maximum 2.5  |
| Subbase        | Maximum 3.2  |

## 2.3 STABILISED MATERIALS

### Material properties and production

Stabilised materials: Conform to *1113 Subgrade and formation stabilisation*, *1161 In situ pavement stabilisation using cementitious binders*, *1162 In situ pavement stabilisation using bituminous binders*, *1163 Ex situ (plant mix) pavement stabilisation* or *1164 In situ pavement stabilisation of unsealed roads*, as appropriate, for:

- Modified base and subbase.
- Bound base and subbase.
- Wearing course with mechanical different gravels blending.

Material production: To *1113 Subgrade and formation stabilisation* using one of following stabilisation method, as appropriate:

- In situ stabilisation: To *1161 In situ pavement stabilisation using cementitious binders*, *1162 In situ pavement stabilisation using bituminous binders* or *1164 In situ pavement stabilisation of unsealed roads*.
- Stationary mixing plant: *1163 Ex situ (plant mix) pavement stabilisation*.

## 2.4 MODIFIED BASE AND SUBBASE MATERIALS

### Material properties

Materials after stabilisation: Conform to **UNBOUND BASE AND SUBBASE MATERIALS**.

CRB20 material before stabilisation: Conform to the requirements for CRS20 in the **Subbase material properties and test methods table** and the following:

- Aggregate wet strength: > 80 kN.

CRB20 material after stabilisation:

- CBR:  $\geq 80$ .
- UCS: < 1.0 MPa.

Testing period: Sample within 24 hours of adding stabilisation binder and test after 7 days accelerated curing.

## 2.5 BOUND BASE AND SUBBASE MATERIALS

### Material type

Requirement: Lightly bound or bound.

### Properties

Material UCS after bound stabilisation:

- Lightly bound material: 1 to 2 MPa.
- Bound material: > 2 MPa.

Testing period: Sample within 1 hour of adding stabilisation binder and test after 7 days accelerated curing.

## 2.6 TESTING

### Quality

Requirement: Test for all characteristics in conformance with **ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

Quality verification: If material/product quality verification can be obtained from the supplier, documented tests need not be repeated.

### 3 EXECUTION

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#### 3.1 DELIVERY

##### **Material transportation from a pugmill mixer**

Delivery vehicles: Use delivery trucks with tipping bodies including semi-trailers and dog trailers. Cover the body to prevent moisture loss during transit.

Material condition at delivery: Handle materials as little as possible to minimise segregation, moisture loss and loss of fines during transit.

Material moisture content at delivery: Uniformly distributed and within - 2% and 0% of the OMC.

##### **Modified or bound materials**

Allowable working time: Allow for mixing, delivery and incorporation into the works, including trimming and compaction, to the **Maximum allowable working time table** in 1113 *Subgrade and formation stabilisation*, 1161 *In situ pavement stabilisation using cementitious binders*, 1162 *In situ pavement stabilisation using bituminous binders*, 1163 *Ex situ (plant mix) pavement stabilisation* or 1164 *In situ pavement stabilisation of unsealed roads* as appropriate.

#### 3.2 STOCKPILING UNBOUND MATERIALS

##### **Stockpile locations**

Locations: Locate each stockpile on a firm level ground, as shown on drawings.

Clearances: Allow adequate clearance between machinery and overhead power lines.

Stockpile site preparation: Clear sites of all vegetation and extraneous matter, and shape to form a crown so that the area drains freely. Compact the area to 95% minimum relative compaction, tested to AS 1289.5.4.1 (2007).

##### **Stockpile and maintenance**

Stockpiled material: Sample to AS 1141.3.1 (2021) within 3 days of delivery.

Stockpile height: < 3 m.

Stockpile shape and slopes: Uniform shape with side slopes not steeper than 1.5H:1V or flatter than 3H:1V.

Stockpile material moisture content: Maintain at a level sufficient to prevent loss of fines. Spray the stockpile with waterproofing material to prevent wet weather damage to the gravel.

Contamination of materials: Make sure stockpile materials do not become intermixed, segregated or contaminated with foreign material.

Surplus materials: At completion of the Works, clear stockpile sites of all surplus material and leave in a clean and tidy condition.

#### 3.3 BASE AND SUBBASE PAVING TRIAL

##### **Trial section**

Extent: Construct trial section as follows:

- So that it may be incorporated in the finished work.
- Length: 50 m.
- Width: Same as that required for the pavement.

Materials and methods: Use the same materials, equipment and methods as that required for the pavement works.

Compaction requirements: To **TRIMMING, COMPACTION AND CURING** and **ACCEPTANCE OF COMPACTION**.

Line, level and thickness: To **TOLERANCES**.

##### **Non-conforming trial section**

Requirement: If the trial concrete subbase is deemed non-conforming remove the non-conforming subbase, rectify any damage caused by the removal, and construct the new trial subbase in conformance with **REMOVAL AND REPLACEMENT OF NON-CONFORMING LOT**.

### 3.4 UNDERLYING LAYER

#### Layer condition

Compaction, shape and levels: Before constructing unbound granular pavement, compact the underlying layer so that there are:

- No soft spots that can cause premature failure of the pavement.
- No significant high spots that can reduce the pavement below the required thickness.

#### Layer preparation before constructing pavement

Subgrade: Prepare layer in conformance with *1112 Earthworks (Road reserve)*.

Subbase: Prepare layer to the following:

- **UNBOUND BASE AND SUBBASE MATERIALS** and this subsection.
- Moisture content: Less than 80% of the OMC.
- Layer condition: Free from rutting and foreign matter.

### 3.5 PLACING

#### Spreading

Plant: Use the following for the placing of base and subbase:

- Grader.
- Mechanical spreader.

Ambient air temperature for spreading bound materials: 5 to 35°C in the shade.

Levels adjacent to kerb and channel: Where pavement is to be constructed to the lip level of kerb and channel, construct flush with the lip of the channel.

#### Grader-placed layers

Placing: Place base or subbase in stages as follows:

- Dumping: Upon delivery, tip the material into uniform windrows across the pavement.
- Amount of material dumped: Not more than that which can be placed and compacted in one day.
- Spreading: Provide an even distribution of material over the whole pavement, as follows:
- Windrows: Respread across the formation or subbase in a continuous cycle and at a speed that allows for proper control.
- Spread material: To the required depth, crossfall and grade ready for compaction.
- Mixing and watering: Undertake concurrently with spreading.
- Low spots: Cut to fill without lensing or laminating occurring.
- Moisture content: If necessary, add water or remix material to achieve the required moisture content.
- Mixing passes: 3 to 6.

Turning over of materials: Minimise turning by grader to avoid segregation.

#### Mechanical spreaders

Spreader: Use self-propelling spreader with automated level control.

Rate of material delivery: Allow for the spreader to operate in continuous process, so that surface irregularities do not occur from spreader stop-start action.

Layer thickness: Set screed to the required layer thickness so that the compactive effort is even throughout.

#### Joints

Number of joints: Minimise.

Transverse joints: Locate at minimum 2 m offset from any joint in the layer below.

Longitudinal joints: Locate along lane linemarkings or midway between linemarkings. Offset minimum 100 mm from any joint in the layer below.

Bound materials work boundaries: Provide vertical faces for transverse and longitudinal joints.

### 3.6 TRIMMING, COMPACTION AND CURING

#### Plant

Compaction: Use self-propelling compaction plant where practical.

Plant movement restrictions: Do not stand watering and compaction plant on the pavement being compacted.

### Compaction procedure

Process: Uniformly compact the entire area to **ACCEPTANCE OF COMPACTION**. Trim compacted layer to the required thickness.

One-way crossfall sections: Compact from the low to the high side.

Crowned sections: Compact from edge to crown on each side of the pavement.

Rolling: Pass rollers parallel to the centreline of the pavement and uniformly overlap each preceding pass.

Compacting sides: Allow minimum 2 additional passes of roller to the outer 1 m width on both sides of the pavement.

### Subsequent layers

Placing subsequent layers: Do not place until testing has been completed and the test results for each layer has been approved.

### Excessive moisture content

Wetted layers: If an unbound layer becomes wet after completing compaction, allow to dry out. If required, uniformly re-compact and trim to the required density and level tolerances.

### Unstable areas

Rejection criteria: Any area that becomes unstable during rolling or is identified by proof rolling.

Replacement: Open up, dry back and re-compact. If dry back is not possible, remove the full depth of the layer and replace with fresh material to **REMOVAL AND REPLACEMENT OF NON-CONFORMING COURSES**.

### Curing of bound materials

Curing time: Start curing the surface layer of a lot immediately after completing compaction.

Water curing: Before placing subsequent layer or applying a prime or initial seal, keep stabilised work continuously wet or damp during the curing period to prevent rapid drying out.

Water curing procedure: Provide frequent light uniform water spray without significant run-off or flooding. Avoid slurring of the surface or leaching of the stabilising agent.

## 3.7 ACCEPTANCE OF COMPACTION

### Acceptance criteria for lots

Acceptance of work: Based on density testing of the work in lots.

Lots: Nominate lots as follows:

- Extent generally: A single layer of work, constructed under uniform conditions in continuous operation, not crossing any transverse construction joint.
- Extent for unbound materials: A day's output using the same material.

Lot dimensions and levels: To **TOLERANCES**.

### Lot acceptance criteria for compaction of unbound layers table

| Traffic classification | Characteristic value of density ratio (%) |         | Mean value <sup>a</sup> of density ratio (%) |         | Assessment |
|------------------------|---|---------|--|---------|------------|
|                        | Base                                      | Subbase | Base   | Subbase |            |
| Medium (M)             | ≥ 98                                      | ≥ 97    | -  | -       | Accept lot |
| Light (L)              | -   | -       | ≥ 100  | ≥ 98    | Accept lot |

<sup>a</sup> Allow for minimum 3 tests per lot.

### Lot acceptance criteria for compaction of bound layers

Requirement: Any zones with relative compaction of 93 to 97% (modified compactive effort) may be accepted if there is evidence that the zone forms less than 5% of the lot.

Layers thicker than 250 mm: Conform to the following relative compaction requirement:

- Top 150 mm: 93 to 97% (modified).
- Below 150 mm from the top: ≥ 92% (modified).

**Relative compaction determination**

Calculation: Calculate the relative compaction of pavement material, at each location tested for field dry density, as follows:

- Relative compaction % = [(Field dry density\*)/(Laboratory maximum dry density)] x 100.

\*Field dry density: Calculate to AS 1289.5.4.1 (2007).

**3.8 TESTING****Quality**

Requirement: Test for all characteristics in conformance with **ANNEXURE – MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**.

**Moisture content testing**

Underlying layer site testing: To AS 1289.5.2.1 (2017).

**Density testing**

Laboratory density: Test as follows:

- Unbound layers: Test to AS 1289.5.2.1 (2017).
- Bound layers: Test to RMS T130 (2012) within two hours of adding stabilisation binder to the mix.

Field dry density testing: The following methods can be used:

- Sand replacement method: Test the compacted material to AS 1289.5.3.1 (2004), AS 1289.5.3.2 (2004) or AS 1289.5.3.5 (1997).
- Nuclear density meter: Test compacted material to AS 1289.5.8.1 (2007).

**3.9 NON-CONFORMANCE****Unbound**

Density and compaction: If lot or area has been assessed as non-conforming, rework the area and allow for compaction reassessment.

Width, shape and level tolerance: If the lot can be corrected by further trimming, obtain approval for trimming.

- Trimming: Trim layer to produce a uniform, hard surface by cutting without filling, with corrected surface conforming to **TOLERANCES**.

Removal and replacement: If lot or area has become degraded, segregated or reduced in quality from reworking, remove and replace layer/course with fresh material to **REMOVAL AND REPLACEMENT OF NON-CONFORMING LOT** before placing next layer.

**Bound materials**

Subbase course is lower than the design level: Increase the base course thickness to make up the thickness deficiency.

Subbase course is above the design level: Obtain approval for regrading, to increase the base course level by maximum 20 mm above the original design level without decreasing the base course thickness.

Base course is above the design level: Obtain approval to regrade the base course level.

Corrective regrading of base course level: Approval may be granted for regrading subject to the following:

- The rate of change of grade from the original finished design surface level is less than 3 mm/m.
- Regrading will not interfere with the proper functioning of the drainage system.
- Regrading will not affect levels at property boundaries and will not increase or decrease the footpath or footpath crossover levels and the levels are within the Council's allowable design limits.

Removal and replacement: Lots that cannot be corrected by trimming or regrading.

**3.10 REMOVAL AND REPLACEMENT OF NON-CONFORMING LOT****Extent of removal**

Extent: Non-conforming material over the full length and width of the lot with the following exceptions:

- Exceptions from removing full length of lot: If the minimum length of pavement layer to be removed is 50 m and the cause of non-conformance can be isolated.
- Exception from removing full width of lot: If the cause of non-conformance can be isolated transversely and the new longitudinal cold joint is formed along the centreline of the road pavement.

**Replacement of base/subbase**

Replacement material: Replace with fresh material. Make sure material used, and the subsequent spreading, compaction, trimming, curing and testing of the replacement materials, conforms to the requirements of this worksection.

Damage to abutting or underlying layers or structures: Rectify to match existing.

**3.11 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE****Surface condition and protection**

Prepared surface: Maintain the approved condition of the base course until the initial seal is completed.

Pavement surfacing: Within 7 days of lot approval, cover the full width of base course with prime or initial seal to *1143 Sprayed bituminous surfacing*.

**Pavement condition before pavement surfacing**

Dry back: Allow material to dry to 60 to 80% of the OMC before applying the prime, initial seal or wearing surface.

Embedment test: Before starting any spray seal surface treatments, perform embedment test as follows:

- Method: To Austroads AG:PT/T251 (2010).
- Timing of test: Within 48 hours before applying sprayed seal.
- Embedment value allowance: Maximum 3 mm.

**Deteriorated pavement condition**

Requirement: If the base condition deteriorates before applying the prime or initial seal, and approval to proceed with bitumen surfacing work is withdrawn, re-prepare the base.

**Surface drainage**

Ponded water: Maintain adequate drainage of the pavement before completion of the wearing surface. Remove any ponded water within 12 hours if free drainage is not achievable.

**Restrictions on movement**

Bound pavements: Prevent construction plant and vehicles not involved in current construction or testing activities from using the pavement before applying the initial seal and within 7 days of placing the base course.

Unbound pavements: Prevent construction plant and vehicles not involved in current construction or testing activities from using the pavement before applying the initial seal.

**Opening to traffic**

Traffic restriction: Do not permit traffic on bound pavements within 7 days after completing the full pavement depth and initial seal.

**4 ANNEXURE A****4.1 ANNEXURE - SCHEDULES****Authority requirements schedule**

| Property/Requirement | A | B | C |
|----------------------|---|---|---|
|                      |   |   |   |
|                      |   |   |   |
|                      |   |   |   |

A, B, C: These designate each instance or type or location of the pavement scheduled. Edit to align with the project's codes or tags.

Edit codes in the **Schedule** to match those on drawings.

**4.2 ANNEXURE - SUMMARY OF HOLD AND WITNESS POINTS**

For private developments, certain Hold and Witness Points where specifically noted below require representatives of both the Superintendent and the Principal Certifier (e.g. Council) to authorise release.

| Clause and description  | Type                                       | Submission/Inspection  | Submission/Notice details                                       | Process held                              |
|---|--|--|---|---|
| SUBMISSIONS, Products and materials<br><br>Unbound base and subbase materials             | H  | Test results from NATA accredited laboratory as evidence of material conformance   | Minimum 10 days before material delivery                        | Material delivery                         |
| SUBMISSIONS, Products and materials<br><br>Alternative unbound base and subbase materials | H – Superintendent and Principal Certifier | Test results from a NATA accredited laboratory as evidence of material conformance of alternative materials.   | Minimum 10 days before material delivery                        | Material delivery                         |
| SUBMISSIONS, Variations<br><br>Variations to approved materials                           | H – Superintendent and Principal Certifier | Details of any changes to the approved base and subbase or source of supply.   | Minimum 10 days before material delivery                        | Material delivery                         |
| SUBMISSIONS, Execution details<br><br>Trial section                                       | H  | Compaction test results from a NATA accredited laboratory for the subbase and base layer of trial section.<br>Survey report covering line, level and thickness for the subbase and base layer of trial section.<br>Record data of straightedge test. | Minimum 2 days before commencement of remaining pavement works. | Commencement of remaining pavement works. |
| SUBMISSIONS, Execution details<br><br>Delivery vehicles                                   | H  | Use of vehicles not fitted with fabric covers for the delivery of modified or bound materials.   | Minimum 2 days before delivery.                                 | Material delivery.                        |
| SUBMISSION, Execution details<br><br>Delivery of bound materials                          | W  | Delivery dockets of bound materials indicating time and date of mixing and registration or fleet number of delivery truck.   | Upon delivery   | -   |
| SUBMISSION, Execution details<br><br>Placing outside temperature range                    | H  | Proposal to place bound materials when temperatures are outside the required ambient air temperature.  | Minimum 2 days before spreading.                                | Spreading of bound materials.             |
| SUBMISSIONS, Execution details  | H – Superintendent and Principal Certifier | Proposal to place and compact layer outside the required thickness range.  | Minimum 2 days before spreading.                                | Spreading of pavement materials.          |



| Clause and description   | Type  | Submission/Inspection   | Submission/Notice details   | Process held                                  |
|--|---|---|---|---|
| Placing outside layer thickness range  |   |   |   |   |
| SUBMISSIONS, Execution details<br><br>Trimming, compaction and curing  | H   | Details of any hand operated compaction plant as to where and why hand equipment is to be used.   | Minimum 2 days before use of hand operated compaction plant.        | Use of hand operated compaction plant.        |
| SUBMISSIONS, Execution details<br><br>Trimming, compaction and curing<br>Record of roll test for each layer of pavement. | H –<br>Superintendent and Principal Certifier | Compaction test results from a NATA accredited laboratory authority for the completed pavement layer. Survey report covering line, level and thickness for the completed pavement layer. Record data of straightedge test. Records of roll tests for identification of any movement under 3 point 7.5 tonne roller by visual observation by Council Superintendent. | Minimum 2 days before placement of next layer.                      | Placement of next layer.                      |
| SUBMISSIONS, Execution details<br><br>Non-conformance  | H –<br>Superintendent and Principal Certifier | Disposition of non-conforming lot.  | Minimum 5 days before corrective action or removal and replacement. | Corrective action or removal and replacement. |
| INSPECTIONS, Notice<br><br>Materials   | W   | Unbound, modified and bound materials.  | Upon delivery.  | -   |
| INSPECTIONS, Notice<br><br>Underlying layer  | H –<br>Superintendent and Principal Certifier | Quality of underlying layer including assessment of required moisture content.  | Minimum 2 days before placing.                                      | Placing.                                      |
| INSPECTIONS, Notice<br><br>Removal and replacement of non-conforming lot   | H   | Inspection of completion of removal of non-conforming base or subbase.  | Minimum 1 day before inspection.                                    | Replacement of non-conforming lot.            |
| INSPECTIONS, Notice<br><br>Maintenance before completion of wearing surface  | H –<br>Superintendent and Principal Certifier | Inspection of the condition of prepared base course. Submission by the contractor of the lot closure certificates confirming the pavement works have been completed and prepared for seal as specified.   | Minimum 2 days before prime or initial seal.                        | Prime or initial seal.                        |

| Clause and description                  | Type | Submission/Inspection | Submission/Notice details | Process held |
|---|------|-----------------------|---------------------------|--------------|
| Note: H = Hold Point, W = Witness Point |      |                       |                           |              |

#### 4.3 ANNEXURE - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

##### Flexible pavement base and subbase table

| Activity                                | Key quality verification requirements                                | Maximum lot size  | Minimum test frequency   | Test method   |
|---|--|---|--|---|
| Base and subbase supply                 | Material quality – Supplier's documentary evidence and certification | 1 contract  |  |   |
|   | Particle size distribution   |   | 1 per 1,000 t  | AS 1289.3.6.1 (2009)  |
|   | Liquid limit   |   | 1 per 1,000 t  | AS 1289.3.1.1 (2009)  |
|   | Plasticity index   |   | 1 per 1,000 t  | AS 1289.3.3.1 (2009)  |
|   | Linear shrinkage   |   | 1 per 1,000 t  | AS 1289.3.4.1 (2008)  |
|   | Undesirable constituent material                                     |   | 1 per 1000 t   | RMS T276 (2012)   |
|   | Maximum dry compressive strength                                     |   | 1 per 5,000 t  | AS 1141.52 (2019)   |
|   | Particle shape   |   | 1 per 1,000 t  | AS 1141.14 (2007)   |
|   | Aggregate wet strength   |   | 1 per 5,000 t  | AS 1141.22 (2019)   |
|   | Wet/dry strength variation   |   | 1 per 5,000 t  | AS 1141.22 (2019)   |
|   | Los Angeles value  |   | 1 per 1,000 t  | AS 1141.23 (2021)   |
|   | CBR  |   | 1 per 5,000 t  | AS 1289.6.1.1 (2014)  |
|   | Modified Texas Triaxial Class  |   | 1 per contract   | RMS T171 (2012)   |
|   | Unconfined compressive strength                                      |   | 1 per 5,000 t  | AS 5101.4 (2008)  |
| Unconfined compressive strength (bound) | 1 Contract   | 1 per mix design  | AS 5101.4 (2008)   |   |
| Placement                               | Geometry: Alignment and level<br>Width and surface trim              | One layer<br>2,000 m <sup>2</sup> or<br>max. 1 day's<br>placement | 1 cross<br>section per<br>15 m<br>10 per<br>selected 200<br>lin. m                 | Survey<br>Measure and deviation<br>from a 3 m straightedge  |
|   | Compaction/moisture content/ dry density testing                     | One layer<br>5,000 m <sup>2</sup> or<br>max 1 day's<br>placement  | 10 per<br>5,000 m <sup>2</sup><br>layer or<br>3 per lot<br>whichever is<br>greater | RMS T130 (2012)<br>AS 1289.5.2.1 (2017)<br>AS 1289.5.3.1 (2004)<br>AS 1289.5.3.2 (2004)<br>AS 1289.5.3.5 (1997)<br>AS 1289.5.4.1 (2007)<br>AS 1289.5.8.1 (2007) |

#### 4.4 ANNEXURE - PAY ITEMS

| Pay items  | Unit of measurement   | Schedule rate inclusions   |
|--|---|--|
| <b>1141.1 Supply, place and compact subbase course</b> | m <sup>3</sup> volume compacted<br>Determine quantity by the length and width of work for total relevant thickness. | Do not account for allowable tolerances.<br>All costs associated with all documentation and approvals and:<br>Supplying, placing, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material. |

| Pay items   | Unit of measurement   | Schedule rate inclusions   |
|---|---|--|
| <b>1141.2 Supply, place and compact base course</b> | m <sup>3</sup> volume compacted<br>Determine quantity by the length and width of work for total relevant thickness. | Do not account of allowable tolerances.<br>All costs associated with:<br>Supplying, placing, compaction, trimming, jointing, and testing of the base course, and curing of bound material. |
| <b>Traffic management</b>                           | Lump sum.   | To 1101 Traffic management.  |

#### 4.5 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

|                       |      |   |
|-----------------------|------|---|
| AS 1141               |      | Methods for sampling and testing aggregates   |
| AS 1141.3.1           | 2021 | Sampling - Aggregates   |
| AS 1141.14            | 2007 | Particle shape, by proportional caliper   |
| AS 1141.22            | 2019 | Wet/dry strength variation  |
| AS 1141.23            | 2021 | Los Angeles value   |
| AS 1141.52            | 2019 | Unconfined cohesion of compacted pavement materials   |
| AS 1289               |      | Methods of testing soils for engineering purposes   |
| AS 1289.3.1.1         | 2009 | Soil classification tests - Determination of the liquid limit of a soil - Four point Casagrande method  |
| AS 1289.3.3.1         | 2009 | Soil classification tests - Calculation of the plasticity index of a soil   |
| AS 1289.3.4.1         | 2008 | Soil classification tests - Determination of the linear shrinkage of a soil - Standard method   |
| AS 1289.3.6.1         | 2009 | Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving  |
| AS 1289.5.2.1         | 2017 | Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort   |
| AS 1289.5.3.1         | 2004 | Soil compaction and density tests - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus                                      |
| AS 1289.5.3.2         | 2004 | Soil compaction and density tests - Determination of the field dry density of a soil - Sand replacement method using a sand pouring can, with or without a volume displacer         |
| AS 1289.5.3.5         | 1997 | Soil compaction and density tests - Determination of the field dry density of a soil - Water replacement method   |
| AS 1289.5.4.1         | 2007 | Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio  |
| AS 1289.5.8.1         | 2007 | 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 mode |
| AS 1289.6.1.1         | 2014 | Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen                               |
| AS 5101               |      | Methods for preparation and testing of stabilized materials   |
| AS 5101.4             | 2008 | Unconfined compressive strength of compacted materials  |
| Austrroads AGPT       |      | Guide to pavement technology  |
| Austrroads AGPT04E    | 2022 | Recycled materials  |
| Austrroads AG:PT/T251 | 2010 | Ball penetration test   |
| Austrroads AP-T352    | 2020 | Sustainable Roads through fit-for-purpose use of available materials: Technical basis   |
| Austrroads AP-T353    | 2020 | Sustainable Roads through fit-for-purpose use of available materials: Evaluation tool and users guide   |
| Austrroads ATS        |      | Austrroads technical specifications   |
| Austrroads ATS 3050   | 2022 | Supply of recycled crushed glass sand   |
| LGNSW Guide           | 2020 | Recycled materials in roads and pavements - A Guide for local councils  |

|                           |             |  |
|---------------------------|-------------|--|
| RMS T130                  | 2012        | Dry density/moisture relationship of road construction materials (blended in the laboratory with cementitious binders)                                     |
| RMS T171                  | 2012        | Modified Texas triaxial compression test for pavement materials  |
| RMS T276                  | 2012        | Foreign materials content of recycled crushed concrete   |
| <b>RMS 3051</b>           | <b>2014</b> | <b>Granular Base and Subbase Materials for Surfaced Road Pavements</b>   |
| TfNSW RCG Asphalt         | 2020        | Recycled crushed glass (RCG) in asphalt  |
| Vic Gov Recycled Products | 2015        | Recycled products in pavement construction: A business case for councils to use local recycled products in pavement construction (Sustainability Victoria) |
| EN 15804                  | 2012        | Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products                   |
| ISO 14025                 | 2006        | Environmental labels and declarations - Type III environmental declarations - Principles and procedures  |
| ISO 21930                 | 2017        | Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services          |
| ARRB Best Practice A      | 2022        | Best practice expert advice on the use of recycled materials in road and rail infrastructure: Part A technical review and assessment                       |
| ARRB Best Practice B      | 2022        | Best practice expert advice on the use of recycled materials in road and rail infrastructure: Part B sustainability impacts report                         |

## 5 ANNEXURE M – CESSNOCK CITY COUNCIL SPECIFIC CLAUSES

|     |  |                            |
|-----|--|----------------------------|
| M1. | Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's <i>Development Engineering Handbook</i> . Acceptance is to be obtained in writing from:<br><br>an authorised representative of Council's Director of Infrastructure and Engineering Services.   | <b>Variation procedure</b> |
| M2. | This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.   | <b>DA Conditions</b>       |
| M3. | Refer to the Cessnock City Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.  | <b>Completion</b>          |
| M4. | Test methods for ride quality: To TfNSW TS 02795.41 (NAASRA roughness), TS 02795.45 or TS 02795.46 (International Roughness Index).<br><br>Surface courses on new roads: Provide roughness measurement test results for review after trimming and before sealing. Results are to conform to the relevant RMS specification for the surface course material: <ul style="list-style-type: none"> <li>• Unbound and Modified Base Courses (with or without Sprayed Bituminous Seal): To Table R71/B.3.</li> <li>• Concrete Base Courses: To Table R83/27.</li> <li>• Asphalt Course: To <b>1144 Asphalt (Roadways)</b> worksection Clause 4.7. RMS specifications R116, R117, R118, R119, R121, R123 or R126, as applicable to the type of asphalt used, are supplementary reference material.</li> </ul> <p>Note: Test results generally less than or equal to 1.56m/km/lane (International Roughness Index) comply, and higher values may be acceptable in accordance with the RMS specifications. However, if specified under the Contract, an incentive payment or deduction amount is to be applied in line with the RMS values given.</p> | <b>Ride quality</b>        |

|                  | <p>Guidance on threshold levels for maintenance intervention: Refer to ARRB Sealed and Unsealed Roads Best Practice Guides.</p> <p>Amendments: This clause is used in worksections <i>1113 Stabilisation</i>, <i>1133 Plain and reinforced concrete base</i>, <i>1141 Flexible pavement base and subbase</i>, and <i>1144 Asphalt (Roadways)</i>.</p>  |  |  |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |
|------------------|--|--|--|--|--|--------------|-------------------|-----|-----|----------------|-------------------|-----|-----|------------------|-------------------|-----|-----|------------|-------------------|-----|------|--|
| M5.              | <p>Prior to sealing, pavement assessment shall be undertaken according to the elastic rebound deflection test, in conformance with RMS Test Method T160 utilising the Benkelman Beam or an equivalent method. The average maximum deflection for any lot shall not exceed the values in the table below. The co-efficient of variation (CV) in recorded deflections shall not exceed 30%. Frequency of testing shall be on alternate wheel paths at generally 15 metres (maximum) intervals.</p> <table border="1"> <thead> <tr> <th>Road Type</th> <th>ESA's</th> <th>Characteristic Deflection Unbound Pavement</th> <th>Characteristic Deflection Bound Pavement</th> </tr> </thead> <tbody> <tr> <td>Local Street</td> <td>3x10<sup>5</sup></td> <td>1.1</td> <td>0.6</td> </tr> <tr> <td>Collector Road</td> <td>1x10<sup>6</sup></td> <td>1.0</td> <td>0.5</td> </tr> <tr> <td>Distributor Road</td> <td>2x10<sup>6</sup></td> <td>0.9</td> <td>0.5</td> </tr> <tr> <td>Industrial</td> <td>5x10<sup>6</sup></td> <td>0.8</td> <td>0.45</td> </tr> </tbody> </table> | Road Type                                  | ESA's                                    | Characteristic Deflection Unbound Pavement | Characteristic Deflection Bound Pavement | Local Street | 3x10 <sup>5</sup> | 1.1 | 0.6 | Collector Road | 1x10 <sup>6</sup> | 1.0 | 0.5 | Distributor Road | 2x10 <sup>6</sup> | 0.9 | 0.5 | Industrial | 5x10 <sup>6</sup> | 0.8 | 0.45 |  |
| Road Type        | ESA's  | Characteristic Deflection Unbound Pavement | Characteristic Deflection Bound Pavement |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |
| Local Street     | 3x10 <sup>5</sup>  | 1.1  | 0.6                                      |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |
| Collector Road   | 1x10 <sup>6</sup>  | 1.0  | 0.5                                      |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |
| Distributor Road | 2x10 <sup>6</sup>  | 0.9  | 0.5                                      |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |
| Industrial       | 5x10 <sup>6</sup>  | 0.8  | 0.45                                     |  |  |              |                   |     |     |                |                   |     |     |                  |                   |     |     |            |                   |     |      |  |

## 6 AMENDMENT HISTORY

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|---|------------|-----------------|
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