CONTRACT No. 1695006

SCHEDULE OF RATES PANEL CONTRACT FOR ROAD PAVEMENT RESTORATION WORKS

PART 3 OF 4

SPECIFICATION

CONTRACT SERVICES

Cabonne Shire Council is seeking tenders from appropriately qualified contractors to complete works associated with Contract 1695006 – Road Pavement Restoration Works in Cabonne Shire.

The Contract works will be provided in accordance with the tendered Schedule of Rates as submitted in *Attachment 2 Pricing Schedule and Attachment 3 Schedule of Rates for Additional Works*.

Contract 1695006 – Road Pavement Restoration Works will be for a Panel of Contractors. The panel arrangement will operate for the period required to enable delivery of approved disaster recovery works. An additional extension option at the completion of the disaster recovery works of up to one 12 month period may be available solely at Council's discretion.

Tenderers attention is drawn to the requirements of clause 1.1 Panel Contract and Schedule of Rates in the Contract Specific Clauses regarding the operation of the panel.

CONTRACT SPECIFIC CLAUSES

SECTION 1 - GENERAL

1.1 PANEL CONTRACT AND SCHEDULE OF RATES

The Contractor shall note that the basis of the Contract is a panel operating under a schedule of rates. Acceptance onto the panel does not constitute a guarantee of work. When seeking to engage a Contractor from the panel to undertake work, the Superintendent will seek the panel contractor who represents the best overall value for money to complete the work.

Despite the provision of a tendered Schedule of Rates, the Superintendent's Representative will seek quotes, based on the tendered Schedule of Rates, to undertake the requested works. The provision of quotes will assist to identify the Contractor who represents the best value for money to complete the specified work.

1.2 SCOPE OF WORK

General

General works across all sites include but are not limited to the following work method requirements.

- Development, implementation and management of site specific Temporary Traffic Management Plans.
- Development, implementation and management of site specific Safe Work Method Statements.
- Site establishment.
- Management and maintenance of the worksite.
- Site disestablishment and clean up.

ST6 – Insitu Stabilisation

In accordance with the requirements of the Victorian Government Disaster Funding Arrangements Treatment Guidelines ST6, insitu stabilisation works include but are not limited to the following work method requirements.

- Pulverisation of existing road surface.
- Removal of material not suitable for stabilisation.
- Importation and spreading of unbound granular material to replace unsuitable material.
- Pulverisation.
- Supply and spreading of stabilising agents.
- Stabilisation of granular material at a rate of 2% by mass of stabilised material.
- Compaction, trimming and curing of stabilised granular material; and.
- Two coat bitumen seal.

ST9 – Patch Repair

In accordance with the requirements of the Victorian Government Disaster Funding Arrangements Treatment Guidelines ST9, patch repair works include but are not limited to the following work method requirements.

- Removal and reconstruction of isolated pavement failures.
- Removal of failed pavement material.
- Reasonable allowance for replacement of unsuitable subgrade material.
- Compaction of subgrade.
- Importation of granular material.
- Placement, compaction and trimming of unbound granular material in layers to match adjoining; and.
- Two coat bitumen seal.

1.3 EXTENT OF WORKS

The works to be completed under the panel contract arrangement are specifically designed to address damaged caused to road infrastructure as a result of natural disasters. The extent of work is based on approvals provided by Cabonne Shire Council and Transport for New South Wales.

Contractors shall note that as restoration works are approved for completion they will be released for quotation in packages of sufficient size to allow for significant bodies of work to be completed along with economies of scale achieved by the appointed contractor.

1.4 WORK TO BE DONE BY OTHERS

The Contractor shall note that amongst other activities, Cabonne Shire Council has awarded term routine maintenance contracts for road work. Cabonne Shire Council also employs its own maintenance crews who also maintain the road network. The Contractor may from time to time be required to share use of the worksite and stack sites with other contractors and/or Council work crews.

The Contractor shall ensure it does not delay or hinder the works of others and works collaboratively with other contractors and Council personnel to enable all works to be delivered in a safe and efficient manner.

1.5 ACCESS TO SITE

Access to relevant roads will be granted upon formal acceptance of work package quotes by Cabonne Shire Council.

1.6 UTILITY SERVICES

The Contractor shall be responsible for identifying any special requirements the various utility service authorities have concerning works in the vicinity of their assets.

The Contractor shall take account of any identified restrictions to the works when pricing work packages. Any costs associated with complying with the identified restrictions shall be included in the quotes for the relevant work package and identified as a separate cost.

1.7 RESTRICTION ON WORKS

The Contractor shall be restricted in the works to be performed under this Contract as follows:

- Roads shall be returned to normal traffic operation outside of working hours and/or during any time that the Contractor is not undertaking works at the site;
- Access to properties shall be maintained at all times throughout the period of the Contract. The Contractor shall give a minimum of 48 hours notice to landowners of any works that will affect the owner's access. Work on the notified owner's access shall not commence prior to the minimum 48 hours notice, unless the Contractor has written permission from the owner;
- Claims for extra payment arising from these restrictions and any other restriction outlined in the Specification will not be considered.
- No works on the roads shall occur between Saturday 14 December 2024 and Sunday 5 January 2025 inclusive. All works shall be sealed and safe to use for the travelling public during the holiday period without the need for ongoing monitoring by Council or the Contractor's personnel.
- No works on the roads shall occur over the Easter period between Thursday 17 April 2025 and Tuesday 22 April 2025 inclusive. All works shall be sealed and safe to use for the travelling public during the holiday period without the need for ongoing monitoring by Council or the Contractor's personnel.

1.8 TEMPORARY TRAFFIC MANAGEMENT

The Contractor shall ensure that the worksite shall be left safe for traffic overnight and when the site is unattended. Any hazards shall be clearly signposted and appropriate traffic management provided.

The Contractor shall ensure that all excess materials from its works are removed from the road surface and disposed of in a suitable manner to the satisfaction of the Superintendent's Representative.

1.9 ROAD CLOSURES

If the Contractor wishes to close a road to facilitate the works, application to the appropriate authority, under Section 138 of the NSW Roads Act 1993, must be made. Applications to close a road shall only be made following written approval from the Superintendent to submit a closure application.

1.10 WORK TIMEFRAMES

The Superintendent will nominate timeframes for the completion of work packages based on a reasonable assessment of the total scope of work and the Contractor's likely progress completing the work.

Notwithstanding the requirements of Clause 39.2 Contractor's Default Parts c) and d) the Contractor shall ensure that all works are completed in a timely manner to enable overall road restoration timeframes to be met.

1.11 PAVEMENT AND MATERIALS TESTING

Notwithstanding the requirements of Sections 1141 Flexible Pavement Base and Subbase, 1143 Sprayed Bituminous Surfacing and 1161 Insitu Pavement Stabilisation Using Cementitious Binders, the Superintendent's Representative may at any time request the testing of materials or pavement compaction in accordance with the requirements of these Sections. For the avoidance of doubt the Superintendent will not automatically require the testing of materials and compaction in accordance with the identified sections.

Where such a request is made the Contractor shall make the site available to testing personnel to complete their work in a safe manner. The contractor shall also ensure that no further work, that impacts on the tested areas or materials, is undertaken until the results are known and approval to proceed is granted by the Superintendent's Representative.

Costs associated with testing will be borne by the Principal, however, the Contractor shall be responsible for all costs associated with rework or replacement of sub-standard materials where test results do not meet the specified limits.

1.12 BINDER APPLICATION RATE

In some locations the Superintendent's Representative may request for the cementitious binder application rate to be changed to suit local conditions or the nature of the work and insitu materials. Where a change to the binder rate is instructed the Contractor shall apply the unit rate tendered in Attachment 2 – Pricing Schedule Item 3.3.5 to the unit area rate for the nominated works.

The Contractor shall note that the application rate may be increased as well as decreased from the default rate of 2% by mass. The increased value of the works associated with the amended binder rate will be paid for using Provisional Sum Item 1.1 Dayworks.

1.13 MOBILISATION AND DEMOBILISATION

The Contractor will be required to mobilise its resources to site at the commencement of works on an awarded package. The Contractor will be required to demobilise its resources from site at the completion of works on the awarded package.

Costs associated with mobilisation and demobilisation for awarded work packages are deemed to be included in the tendered unit rates supplied in Attachment 2 - Pricing Schedule.

From time to time the Principal may seek to complete additional works outside the scope of the disaster recovery works. Costs associated with mobilisation and demobilisation for these additional works are deemed to be included in the in the tendered unit rates supplied in Attachment 2 - Pricing Schedule.

The Superintendent will endeavour, wherever possible, to structure work packages so all work sites within the package are located in close proximity to each other. For example, a work package may consist of:

- Work sites on only one road; or
- Work sites on several roads in the same area.

In situations where a work package contains one or more outlying sites, located away from all other work sites, the Principal will pay mobilisation and demobilisation costs to enable the Contractor to shift its resources from one area to another. In these situations the Principal will pay one mobilisation and demobilisation expense (detailed in Attachment 2 Provisional Quantity Item 2.4 Mobilisation to site and Item 2.5 Demobilisation from site) for each move between sites within a work package. To qualify for payment of the mobilisation and demobilisation rates the distance between the main body of work and the small number of outlying sites shall be greater than 30 kilometres.

The Superintendent will advise the Contractor when work packages are released for pricing, as to whether additional mobilisation and demobilisation costs can be claimed. The Superintendent will identify the site or sites for which the additional mobilisation and demobilisation rates can apply.

For clarity, the mobilisation and demobilisation rates are intended to compensate the Contractor for the cost of shifting its resources long distances to complete a small quantity of outlying work within a work package. The mobilisation and demobilisation rates are not intended to compensate the Contractor for the relocation of its resources between two large bodies of work which happen to be greater than the minimum specified distance for the requirements of these rates to apply.

1.14 ELECTRONIC DATA CAPTURE AND REPORTING

The Contractor shall note that the Superintendent is required to provide reports internally and externally to other agencies on the progress of Contract works. To facilitate the reporting requirements and data capture, use of specific software and mobile apps for phones and tablets will be required by site personnel. The Contractor shall ensure it provides the appropriate resources to site personnel to enable them to assist in capturing details of the completed works and reporting on progress.

All licencing (if required) and training will be provided by the Principal and Superintendent's Representative.

1.15 RISE AND FALL IN PRICES

The tendered prices may be subject to rise and fall adjustment on an annual basis. The first adjustment is eligible for application at the first anniversary of the contract award date.

Tendered prices may be adjusted to reflect changes in the Australian Bureau of Statistics (ABS) 6427 Producer Price Index for the preceding four quarterly periods.

Requests for the rise and fall adjustment to the Contract Rates is the responsibility of the Contractor. The Contractor shall submit a written request to the Superintendent, to apply rise and fall to the tendered rates at the Contract anniversary date. The Contractor shall include in the application, all supporting documentation required to justify the requested adjustment to the tendered rates.

Rise and fall adjustments to the tendered rates, if approved, will be applied to works undertaken from the date of the written request, provided the request is dated on or after the annual Contract anniversary date.

Anniversary date – The date 12 months after the date of Contract Award by the Principal.

Base index – the ABS most recent quarterly index published at the Contract Award date.

ABS Index – 6427.0 Producer Price Index Table 17 Construction Industry – Index 3101 Road and bridge construction New South Wales

Calculation

Change – the change in the index to be applied to the tendered Schedule of Rates

Base Index – ABS index value at time of contract award

Current Index – ABS index value at time of rise and fall assessment

$$Change = \frac{Current\ Index - Base\ Index}{Base\ Index}$$

The calculated change using the above formula is applied to the tendered rates.

SECTION 2 - FORMATION CONSTRUCTION

2.1 UNSUITABLE SUBGRADE MATERIAL

The Contractor may encounter patches where the road subgrade material is unsuitable for pavement restoration works to occur upon. Where directed by the Superintendent's Representative the Contractor shall remove unsuitable subgrade material to an agreed depth. The Contractor shall seek approval from the Superintendent's Representative prior to replacement of subgrade material as to the suitability of the excavation subgrade.

The Contractor shall supply and place approved geotextile material prior to back filling the removed subgrade material with approved granular pavement material. The Contractor shall place and compact, at optimum moisture level, all materials in layers not greater than 100mm compacted depth.

Payment for work associated with unsuitable material will be made in accordance with the requirements of the Contract using tendered Provisional Quantity rates.

2.2 SUBGRADE MATERIAL REHABILITATION

The Contractor may encounter patches where the road subgrade material is initially unsuitable for rehabilitation works to occur upon but does not require removal. Where directed by the Superintendent's Representative the Contractor shall rehabilitate unsuitable subgrade material to an agreed depth.

The Contractor shall treat identified subgrade areas with the specified 70/30 fly ash/cement treatment at a rate of 2% by mass of stabilised material, approved by the Superintendent's Representative. Following treatment the subgrade shall be compacted to the satisfaction of the Superintendent's Representative.

The Contractor shall seek approval from the Superintendent's Representative prior to replacement of pavement material as to the suitability of the treated subgrade for construction to occur upon.

Payment for work associated with treatment of unsuitable subgrade material will be made in accordance with the requirements of the Contract using tendered Provisional Quantity rates.

SECTION 3 - FLEXIBLE PAVEMENT CONSTRUCTION

3.1 UNSUITABLE PAVEMENT MATERIAL – ST9 PATCH REPAIR

For patch repair work the road pavement material has been identified as unsuitable for restoration works to occur upon. The Contractor shall remove unsuitable pavement material to the specified depth. The Contractor shall seek approval from the Superintendent's Representative prior to replacement of pavement material as to the suitability of the excavation subgrade.

The Contractor shall supply, place and compact approved pavement material at optimum moisture level. All pavement materials shall be placed in layers not greater than 100mm compacted depth.

Granular pavement material removed from the road pavement and deemed unsuitable for reuse shall be removed from site and disposed of by the Contractor in an approved manner at the Contractor's expense.

Payment for work associated with unsuitable material will be made in accordance with the requirements of the Contract using tendered rates.

3.2 PATCH EXCAVATION – ST9 PATCH REPAIR

The Contractor shall saw cut all sealed wearing course edges prior to the removal of or stabilisation of pavement materials to ensure only straight edges are present across the final treatment area.

The Contractor shall ensure that were wearing course and pavement layers are broken out and removed to facilitate replacement of pavement material, that clean vertical edges to the area to be restored are created.

3.3 CEMINTIOUS PAVEMENT MATERIAL ADDITIVES – ST6 INSITU STABILISATION

When specified by the Superintendents' Representative the Contractor shall stabilise nominated patches with 70/30 fly ash/cement blend to the specified depth. The rate of cementitious binder incorporation shall be 2% by mass of the stabilised material. Rehabilitation and stabilisation works shall include compaction of the granular pavement material.

Insitu pavement stabilisation works shall include the importation and placement of additional pavement material, if required. The additional pavement material imported to site shall be provided to ensure a safe and smooth wearing course surface is achieved with no significant deviations to the overall existing road longitudinal and horizontal road geometry. The Contractor shall allow a maximum compacted depth of additional imported material of up to 50mm in the tendered rate for ST6 Insitu Stabilisation.

Density testing of the compacted pavement material may be requested by the Superintendent's Representative at the Principals cost.

Payment for work associated with insitu stabilisation will be made in accordance with the requirements of the Contract using tendered rates.

3.4 PATCH LAYOUT AND CORNERS

The Contractor shall, in consultation with the Superintendents Representative, seek to minimise the number of corners, particularly corners with an internal angle of 90 degrees or less, within a treatment area.

Corners require particular attention throughout the works to ensure they provide a robust waterproof seal to the pavement following completion of the work on site. This attention to detail seeks to protest the long term integrity of both the rehabilitated and existing pavement.

SECTION 4 - SURFACE TREATMENTS

4.1 FINISHED SURFACE

The finished surface shall be applied such that at completion of pavement restoration and wearing course replacement works:

- The surface of the treated area provides a smooth and safe interface with the driving surface of the adjacent roadway.
- The Contractor shall ensure that the finished road surface is free draining with no ponding.
- The Contractor shall ensure that the finished pavement levels match all driveways and accesses to property.
- The type of surfacing and quality of surface finish shall match the existing surfacing or provide improved performance in terms of water and skid resistance.
- The finished surface of the sealed pavement repairs match the longitudinal grade and superelevation or crossfall of the surrounding pavement.

4.2 SEALING WORKS

The Contractor's sealing works shall be undertaken by a Transport for New South Wales prequalified contractor and is registered with Transport for New South Wales.

Wearing courses specified to be sealed with a bitumen spray seal shall be sealed using a double/double 20/10 seal treatment in accordance with the requirements of Section 1143 Sprayed Bituminous Surfacing.

SECTION 5 - INCIDENTAL WORKS

5.1 PAINTED PAVEMENT MARKINGS

The Contractor shall reinstate all removed or damaged painted pavement markings resulting from the pavement restoration works.

All painted pavement markings shall be reinstated with an initial coat of paint within seven days and a final second coat of paint six weeks after the initial coat of paint.

Pavement markings shall be installed in accordance with Section 1191Pavement Markings.

5.2 RAISED REFLECTIVE PAVEMENT MARKINGS

The Contractor shall notify the Superintendent's Representative of all existing raised reflective pavement markings that are removed or damaged, as a result of asphalting and rehabilitation works, within 24 hours of the completion of the works.

5.3 GEOTEXTILE MATERIAL

The Contractor shall supply and place geotextile material in locations identified by the Superintendent's Representative. The Contractor shall use, upon approval of the Superintendent's Representative, Tensar TriAx TX-G geotextile material or a similar product that meets the same specification requirements.

5.4 GUIDE POSTS

The Contractor may need to remove and replace guideposts to complete the specified pavement restoration works safely and effectively. Guideposts requiring removal and replacement shall be agreed in advance with the Superintendent's Representative.

The Contractor shall ensure that the method of removal and replacement used is done so in a manner that does not inflict any damage onto the post. If the Contractor identifies damaged and/or missing posts they will contact the Superintendent's Representative to notify of the need for replacement posts to be installed.

Payment for work associated with the installation and/or removal of guideposts will be made in accordance with the requirements of the Contract using tendered Provisional Quantity rates.

5.5 MAJOR TRAFFIC CONTROL DEVICES – TRAFFIC LIGHTS

The Contractor shall supply, operate and maintain, when instructed to do so by the Superintendent's Representative, major traffic control devices including portable traffic lights.

Traffic lights may be required to safely control traffic through the worksite both during and after working hours. The Superintendent's Representative will agree in advance with the Contractor the details of the requirements for the provision of traffic lights at each site.

The Contractor shall seek approval from the Superintendent's Representative prior to the implementation of major traffic control devices on worksites.

Payment for the use major traffic control devices and traffic lights will be made using Provisional Sum Item 1.1 Dayworks at the tendered rate provided in Attachment 2 – Pricing Schedule Item 3.4.2.

5.6 VARIABLE MESSAGE BOARDS

The Contractor shall supply, operate and maintain, when instructed to do so by the Superintendent's Representative, major traffic control devices including variable message signage and/or portable traffic lights.

The VMS boards may be required to provide information to the travelling public about the works and their possible impact along with general road safety or warning messages. The Superintendent's Representative will provide and/or agree with the Contractor with the necessary messaging required.

The Contractor shall seek approval from the Superintendent's Representative prior to the implementation of major traffic control devices on worksites.

Payment for the use of traffic lights will be made using Provisional Sum Item 1.1 Dayworks at the tendered rate provided in Attachment 2 – Pricing Schedule Item 3.4.3.

SECTION 6 - MEASUREMENT AND PAYMENT

6.1 GENERAL

This section covers the requirements for measurement and computation to be used in the determination of quantities of materials furnished and work performed under the Contract and provides the basis for payment.

Except for the specific items listed in this section, or unless otherwise specified, lengths and areas will be measured in the horizontal plane.

Where payment is made at rate per unit, payment will be made at the relevant tendered rate for the measured quantities of materials supplied and work performed in accordance with the requirements of the Contract.

6.2 PREPARATION AND MAINTENANCE OF MANAGEMENT SYSTEMS

No separate payment shall be made for the costs of work associated with planning, establishing, implementing and maintaining Contract Management Systems. All costs associated with planning, establishing, implementing and maintaining Contract Management Systems will be deemed to be included in the Contract Rates.

6.3 JOINT MEASUREMENT

Unless otherwise specified, a joint measure shall be undertaken to confirm final quantities of all works completed under the Contract.

The Contractor shall notify the Superintendent in sufficient time and at such appropriate time to enable a joint assessment by the Superintendent and the Contractor.

6.4 MEASUREMENT BY MASS

Where material is to be measured by mass it shall be measured in tonnes. The Contractor shall measure and document the mass of all materials supplied under the Contract in accordance with the Specification and the Contractor's Quality Plan.

Further, the Contractor shall provide, on request by the Superintendent, objective evidence to the ongoing verification of the accuracy of any weighing devices to assure Cabonne Shire Council of the accuracy of the measured mass of material delivered.

6.5 PAYMENT REDUCTION

Work which fails to fully satisfy the specified standards but is acceptable on reduced payment, will be valued in accordance with the percentage reduction stated in the relevant clause or table. The reduced payment will be based on rates submitted in the Schedules or where no rate is provided, on the value or rate for the work as agreed between the Superintendent and the Contractor. Where no agreement can be reached the work will be valued by the Superintendent.

6.6 VARIATIONS – ALLOWANCES FOR ONSITE OVERHEADS, OFFSITE OVERHEADS AND PROFIT

The maximum allowance for onsite overheads, offsite overheads and profit (no design costs) that shall apply to variations directed by the Superintendent in accordance with Clause 36 Variations shall be 10%.

6.7 MEASUREMENT AND PAYMENT FOR GENERAL ITEMS – ATTACHMENT 2

Measurement for general items in Attachment 2 – Pricing Schedule, will be deemed to include all costs associated with the completion of the Works as specified. The Contractor shall note the quantities provided in Attachment 2 are provided only for the purpose of tender assessment and do not reflect actual panel contract quantities.

Before commencing work under the Contract, the Contractor shall submit for approval the form of statement and associated requirements for measurement to be submitted each month for progress payment purposes.

6.8 MEASUREMENT AND PAYMENT OF PROVISIONAL SUMS AND QUANTITIES – ATTACHMENT 2

(a) Dayworks - Provisional Sum Item 1.1

The Contract includes a provisional sum amount of $100,000.00 for Dayworks that may undertaken with the Superintendent's approval. The specified Dayworks amount is a sum total for each individual work package as defined by the Superintendent.

Payment will be made at the rates detailed in Attachment 2 – Pricing Schedule or Attachment 3 – Additional Works or using rates agreed in advance with the Superintendent.

Payment at the rates listed in Attachments 2 and 3 will include payment for all labour, material, plant, equipment, overheads and any other costs incurred, and will be made under Provisional Sum Item 1.1 – Daywork in Attachment 2.

(b) Removal and replacement of unsuitable subgrade material – Provisional Quantity Item 2.1

The Contract includes a provisional quantity allowance for the removal and replacement of unsuitable subgrade material. Expenditure of this Provisional Quantity item shall only occur with Superintendent approval.

Measurement of subgrade material shall be based on the volume of unsuitable material excavated in solid cubic meters.

Payment for the volume of material removed and replaced will be made using Provisional Quantity Item 2.1 and will include full compensation for materials, traffic management, labour, plant and any other costs associated with completing the work.

(c) Removal and replacement of unsuitable pavement material – Provisional Quantity Item 2.2

The Contract includes a provisional quantity allowance for the removal and replacement of unsuitable pavement material. Expenditure of this Provisional Quantity item shall only occur with Superintendent approval.

Measurement of pavement material shall be based on the volume of unsuitable material excavated in solid cubic meters.

Payment for the volume of material removed and replaced will be made using Provisional Quantity Item 2.2 and will include full compensation for materials, traffic management, labour, plant and any other costs associated with completing the work.

(d) Insitu subgrade rehabilitation – Provisional Quantity Item 2.3

The Contract includes a provisional quantity allowance for the rehabilitation of unsuitable subgrade material. Expenditure of this Provisional Quantity item shall only occur with Superintendent approval.

Measurement of subgrade material treated shall be based on the area of unsuitable material rehabilitated in square meters.

Payment for the area of material rehabilitated will be made using Provisional Quantity Item 2.3 and will include full compensation for materials, traffic management, labour, plant and any other costs associated with completing the work.

(e) Mobilisation to site – Provisional Quantity Item 2.4

The Contract includes a provisional quantity allowance for the mobilisation of the Contractor's resources to site. Expenditure of this Provisional Quantity item shall only occur with Superintendent approval.

Measurement of mobilisation to site shall be based on the movement of the Contractor's plant, personnel and materials as a singular operation and a singular item.

Payment for mobilisation to site will be made using Provisional Quantity Item 2.4 and will include full compensation for all costs associated with moving plant, personnel and materials onto site to allow work to commence.

(f) Demobilisation from site – Provisional Quantity Item 2.5

The Contract includes a provisional quantity allowance for the demobilisation of the Contractor's resources from site. Expenditure of this Provisional Quantity item shall only occur with Superintendent approval.

Measurement of demobilisation from site shall be based on the movement of the Contractor's plant, personnel and materials as a singular operation and a singular item.

Payment for demobilisation from site will be made using Provisional Quantity Item 2.5 and will include full compensation for all costs associated with moving plant, personnel and materials off site at the completion of work and ensuring the site is left in a safe and tidy manner.

6.9 MEASUREMENT AND PAYMENT OF SCHEDULE OF RATES ITEMS – ATTACHMENT 2

Measurement for Schedule of Rates Item 3 in Attachment 2 – Pricing Schedule, will be made using the units denoted in the schedule of rates table against the applicable item. The Contractor shall note the quantities provided in all parts of Attachment 2 are provided only for the purpose of tender assessment and do not reflect actual contract quantities.

Payment for Schedule of Rates Item 3 in Attachment 2 – Pricing Schedule, will be made using the tendered rate in the schedule of rates table. All rates shall include full compensation for the supply of all labour, materials, plant, overheads and any other costs incurred in completing the specified work associated with the work covered by the item.

Before commencing work under the Contract, the Contractor shall submit for approval the form of statement and associated requirements for measurement to be submitted each month for progress payment purposes.

6.10 MEASUREMENT AND PAYMENT OF PLANT AND PERSONNEL – ATTACHMENT 3

Where relevant rates are listed in Attachment 3, these shall be used as the basis of payment. Where no such rate exists the value of Dayworks shall be determined in accordance with Clause 36 of the General Conditions of Contract. Payment will be made under the provisional sum, Item 1.1 - Dayworks in Attachment 2.

No payments will be made for standby or plant, equipment and personnel.

6.11 PAYMENTS TO CONTRACTOR

All payments due to the Contractor for works, supplies or services provided under this Contract will be made by Electronic Funds Transfer (EFT).

Within 14 days of award of the Contract, the Contractor shall submit the following details to the Superintendent:

name and address of a financial institution participating in the Direct Entry System to which payment is to be made;

- relevant Bank State Branch code or participating financial institution number (BSB);
- account name; and
- account number.

The Contractor shall within seven days of any change to the above details inform the Superintendent in writing of that change. Cabonne Shire Council shall not be responsible for any delay in transmission of funds arising from incorrect or out-of-date information supplied by the Contractor.

Payments to the Contractor shall be deemed to have been made by Cabonne Shire Council within 24 hours from the date Cabonne Shire Council has:

(a) correctly entered all necessary information; and

(b) sent; and

(c) had processed under a processing date;

all relevant debits online into the Electronic Funds Transfer System.

Cabonne Shire Council shall not be responsible for any delays or failures in transmission of funds arising from or relating to system failure, temporary system constraints or other functional transfer problems in the EFT direct entry system.

AUS-SPEC STANDARD SECTIONS

0161 Quality Management (Construction)

General

Responsibilities

General

Requirement: Provide a project quality management system (QMS) as documented.

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)*.

Standards

General

Standard: To AS/NZS ISO 9001 (2016), Austroads AGPD03 (2022), Austroads AGPD05 (2018) and Austroads ATS 1120 (2021).

Interpretation

Abbreviations

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

- CAR: Corrective action request.
- ITP: Inspection and test plan.
- NATA: National Association of Testing Authorities.
- NCR: Non-conformance report.
- NNC: Notice of non-conformance.
- QA: Quality assurance.
- QAR: Quality assurance representative (principal).
- QMR: Quality management representative (contractor).
- QMS: Quality management system.
- WAE: Work-as-executed.

Definitions

For the purpose of this worksection, the definitions given in AS/NZS ISO 9000 (2016) and the following apply:

- Accredited Testing Laboratory:
  - An organisation accredited by the National Association of Testing Authorities (NATA) to undertake the relevant tests; or
  - An organisation outside Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement; or
  - An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.
  - An organisation accredited for compliance with ISO/IEC 17025 (2017) to undertake the relevant tests.
- As-built drawings: Copies of the design drawings with as-built changes (including repaired defects) marked up to scale with references to the relevant design change notices:
  - Interim as-built drawings are the as-built drawings at the stage of closure of the lot package.

. Final as-built drawings are the as-built drawings incorporating the changes for all lot packages and are generally submitted before final completion of the project.

- Asset: A physical component of a road system or network. Typical assets include sections of pavements, bridges, culverts, traffic signals, signs, road furniture, road reserves, etc.
- Certification: A written assertion of facts.
- Construction records: All lot records, non-conformance reports, design change notices, site instructions, photographs and interim as-built drawings applicable to a lot package.
- Corrective action request: A formal advice/instruction to the contractor requesting action to eliminate the cause of a detected nonconformity.
- Defect: A work lot non-conformance which continues to exist.
- Defect register: A register of all defects maintained by the contractor. Recorded as either OPEN or CLOSED.
- Disposition: Action taken to resolve non-conformance (Lot specific).
- Hold point: A mandatory verification position in the contract beyond which work cannot proceed without the designated authorisation.
- Inspection and test plan: The document identifying the required inspections and tests of the works. It includes verification check points designated as Hold point, Witness point and Review point.
- Lot: Any part of the works that has been constructed/manufactured under a continuous operation of uniform conditions and is homogeneous with respect to material quality and general appearance.
- Lot-package: One or more work lots of the same work kind collated under the same inspection and test plan.
- Non-conformance report: A mandatory (standard format) submission by the contractor that details the non-conforming work and the contractor's proposed disposition of the non-conformance.
- Notice of non-conformance: Formal instruction to the contractor of product non-conformance to documented requirements. It automatically creates a Hold Point and requires a non-conformance report (NCR) from the contractor.
- Performance audit (Process audit, technical procedure audit, methods audit): An evaluation of whether nominated methods and procedures are being adhered to in practice.
- Principal: The asset owner. Does not include agents such as the Superintendent or Independent certifier.
- Product audit (Conformance audit, Service audit): An assessment of the conformity of the product with the specified technical requirements.
- Qualified registered surveyor: A surveyor who is eligible for membership of the Surveying and Spatial Sciences Institute as a registered surveyor.
- Quality assurance (QA): The systematic action necessary to give confidence of satisfactory quality. An element of QA is quality control.
- Quality assurance representative: Appointed by the principal for a specific project and responsible for the auditing, review and surveillance of procedures and documentation required by the contractor's approved Quality plan.
- Quality checklists: Forms completed during the manufacture/construction process verifying key steps, and records required for the Quality register. Checklists apply to each identified lot of work.
- Quality management representative (QMR): Also known as Project quality representative, appointed by the contractor for a specific project with the authority and responsibility for the implementation and operation of the Quality plan, so that QMS requirements are not subordinated to design and productivity.
- quality plan: A management plan prepared by a contractor for a specific project, complying with relevant standards, setting out policies, management responsibilities, procedures and systems that will be used to ensure and demonstrate achievement of specified project requirements.
- Quality register: The files containing all quality control records including test results, completed check lists, certificates of compliance and consignment dockets for materials procured.
- Quality management system: The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.
- Quality management system requirements: The administrative activities affecting quality that will be implemented and controlled so that the product or a service meets documented quality requirements.

- Review point: Other check points other than hold points and witness points requiring verification of requirements and collection of records.
- Special processes: Those processes, the results of which cannot be directly examined to establish full conformance. Assurance of satisfactory conformance depends on evidence generated during the process.
- System audit: An examination of the documented quality management system represented by the quality manual, quality plan and quality register to evaluate their effectiveness in meeting the requirements of Australian Standards and the contract documents.
- Validation: Confirmation, through the provision of objective evidence, that requirements for a specific intended use or application have been fulfilled.
- Witness point: A nominated position, in the different stages of the Contract, where the option of attendance may be exercised by the Superintendent, after notification of the requirement.
- Works: All labour, plant, equipment and materials required to complete a project in conformance with the contract documents.

Project Quality Management System

General requirements

Conformance

Work on-site and off-site: Conform to the QMS described within the Quality plan including products and services for all works under the contract.

Contract documents: The QMS does not pre-empt, preclude or otherwise negate the requirements of any part of the contract documents.

Responsibility: QMS requirements do not relieve the contractor of the responsibility to conform with the contract documents. The Contractor is responsible for correcting all non conformances.

System requirements

QMS: Plan, develop, implement and maintain a documented QMS conforming to this worksection, and AS/NZS ISO 9001 (2016), with the following purpose:

- Proposed work methods consistent with documented requirements.
- Adequate and complete ITPs and checklists.
- Implementation of approved work methods.
- Adherence to Hold and Witness Points.
- Appointment of QMR and QAR.

Format: If the format of the QMS documents differ from the format of AS/NZS ISO 9001 (2016), provide a matrix outlining how the documented requirements are addressed by the QMS.

Documentation requirements

General

QMS documentation requirements: Include the following:

- Quality policy and objectives.
- Procedure documents.
- Work instructions.
- Forms.
- Quality plan(s).
- Specification(s).
- Relevant external documents.
- Records.

Changes: Immediately implement changes to the project Quality plan and QMS if the following occurs:

- Specification requirements are not adequately addressed.
- Non-conformity resulting from the Quality plan or QMS.
- Audit initiates changes to the QMS.
- Practices have changed.

Records: Provide copies of any quality records within 14 days of request.

Project Quality plan

Requirement: Plan, develop, implement and maintain a Quality plan to AS/NZS ISO 9001 (2016) and AS ISO 10005 (2018). Include the following:

- Progressive documentation of new procedures as the work types become evident.
- Planning and control systems: Description of critical processes and activities, including verification for product control.
- Coordination with the contractor's corporate Quality manual.
- Project specific quality system: Information and direction for personnel about the specific quality practices, resources, sequence of activities, controls and checks that must be implemented during the works.
- Controlled conditions: Documentation to explain how each work process will be carried out.
- Organisation structure: Details of the specific responsibilities and authorities of the key personnel nominated for the management of the project.
- QMR: Qualifications and technical experience, together with responsibilities and authorities to resolve quality matters.
- Details of the personnel or contracted testing organisations who will be conducting each type of conformance inspection and testing of completed works, their experience, qualification and responsibilities.
- Details of the person authorised to change construction processes on site.
- ITPs and checklists to verify the works conform with the contract documents.
- Purchasing quality requirements:
  - Critical characteristics of purchased products that affect the quality of the final product.
  - Method of communication with suppliers.
  - Methods used to evaluate, select and control suppliers.
  - The facilities and services that will be outsourced.
  - Material samples: The approved sample is the quality benchmark.
- Purchasing quality verification.
- Procedure for corrective action to AS/NZS ISO 9001 (2016) clause 10.2.
- Registered testing authority: Terms of registration and current signatories for the organisation providing testing and test reports.
- End-of-contract review procedures.

Control of documents

Requirement: To AS/NZS ISO 9001 (2016) clauses 7.5.3 and AS ISO 10005 (2018) clauses 5.6 and 5.7.

Register: Maintain a register of each part of the Quality plan. Register the number, date and recipient(s). Reissue to all registered recipient(s) when the Quality plan is changed, superseded or recalled, as required.

Requirement: Document in the Quality plan the method of keeping quality registers, tracking and handling of NCR's, NNC's and site correspondence.

Quality register: Implement and maintain systematic records, indexed and filed so that the records are retrievable and accessible to the Superintendent or an appointed quality auditor within one working day of request.

Register of method statements: Provide a register listing all method statements (both standard and job specific) including the title, identifier and revision status.

Construction records: Certify the completeness and compliance of construction records as each section of the work is completed.

Location: State in the quality plan where records are to be located.

WAE: Keep records of any amendments to design details for inclusion in WAE drawings.

Quality audit schedule: Include a quality audit schedule with the project quality plan in conformance with AS/NZS ISO 19011 (2019).

Audit reports: Provide copies to the Superintendent as requested.

Resource management

General

Requirement: To AS/NZS ISO 9001 (2016) clause 7.1 and AS ISO 10005 (2018) Section 5.8.

Provision of resources: Determine and provide resources for the successful implementation of the project Quality plan.

Limited availability: If a resource has limited availability, identify how demand from other projects/contracts will be satisfied.

Human resources: Provide personnel with the appropriate education, training, skills and experience for the project.

Infrastructure: Identify, provide and maintain the infrastructure required to achieve product conformity.

Work environment: Establish and manage the work environment to achieve product conformity.

Product realisation

Planning and design

Planning: To AS/NZS ISO 9001 (2016) clause 8.3 and AS ISO 10005 (2018) clause 5.11. Include the following:

- Quality objectives and requirements for the product.
- Processes and documents specific to the product.
- Required verification, validation, monitoring, measurement, inspection, test activities and the criteria for acceptance of the product.
- Records required as evidence that the realisation processes and resulting products conform.

Design: Verify the following, for conformance with the documented requirements and AS/NZS ISO 9001 (2016):

- Temporary structures.
- Checking of permanent structures for construction loadings.
- Lifting devices for manufactured items.
- Alternative permanent structures or structural components proposed.
- Concrete mixes for structures and pavements and asphalt mixes for permanent works.
- Traffic control, temporary roadways and detours.
- Permanent works where design is nominated in the contract.

Construction and service provision

Control

Method statements: Detail the construction processes for all activities scheduled in **Construction activities schedule**.

Content: Include the following:

- Sequence of operations.
- Documented procedures and work instructions.
- Types of equipment required, capability, maintenance and calibration.
- Any special working environment requirements.
- Personnel competency and skills required.
- Criteria for workmanship and tolerances.
- Materials required.
- Safety requirements.
- Reference documents.
- Records produced.
- Planning.
- Verification measures.
- Inspection, test and control points.
- Monitoring of continuous suitability.
- Responsibility for implementing and monitoring work process controls and rectifying any deficiencies.

Checklist: Provide a checklist, including the relevant inspection and test points, surveying control points, Hold Points, Witness Points and the officer responsible to verify each check point.

System audit: Audit each Method statement during operation of the process.

Absence of a Method statement: If a Method statement for a particular activity is required and none is submitted, this is a Hold Point.

Lot identification

Lots: Divide all items of work into lots as follows:

- Limits: Before sampling, choose lots within the limits given in the relevant worksection.
- Lot size: Not exceeding one day's output for each work process being tested.
- Lot numbering: Allocate unique lot numbers compatible with the construction program. Use lot numbers as identifiers on all QMS data.
- Field identification: Physically identify each lot and clearly identify lot boundaries. Maintain identification until the lot has achieved the specified quality.

Work on a lot: Do not start work before the field identification is established.

Lot boundaries: When boundaries of a lot change, update the quality register.

Lot identification system: Make sure all site records and sample numbering systems allow easy identification of all test results and the materials incorporated in the works.

Traceability

General: Provide and maintain records of components for audit. Traceability is required as follows:

- Concrete: Start the trace at the batch plant and finish at the location where the concrete is incorporated in the works.
- Asphalt: Start the trace at the batch plant and finish at the location where the asphalt is incorporated in the works.

- Stabilised material: Start the trace at the batch plant and finish at the location where the material is incorporated in the works.
- Steel: Start the trace at the steelworks and finish at the location where the steel is incorporated in the works. Record the steel heat number, testing details and final location of installation.

Batch details: Record all batch quantities, mix and dispatch time, testing details and location of placement.

Control of monitoring and measuring equipment

Equipment accuracy: Maintain inspection, testing and measuring equipment able to produce the degree of accuracy required by the referenced test methods.

Records: Demonstrate accuracy with regular records of calibration.

Monitoring, measurement and analysis

General

Requirement: Demonstrate conformance of the works by systematic inspection and tests.

Testing and sampling: Conduct testing by a registered testing authority accredited for the documented test methods and sampling procedures. Include the latest NATA advice of the terms of registration and current signatories within the quality plan.

Sampling personnel: From the registered testing authority and supervised by the approved signatory.

Sampling locations: Propose sampling locations for approval before proceeding.

Lots: All conformance inspections and tests are based on lots. In all cases the samples are considered representative of the lot and test results are required to meet the appropriate lot tolerances.

Test results: Provide a registered testing authority report on test results, including certification that correct sampling procedures have been followed.

In-process and conformance inspections: Review the results for each lot to confirm that all tests have been carried out to verify conformance.

Verification: Certification by the QMR.

Reinstatement: Reinstate all core holes, test holes, excavations and any other disturbance resulting from any testing activity to the standard in the relevant worksection.

Frequency of testing

Minimum frequency of testing: Not less than that stated in the relevant worksection.

Request for reduced frequency of testing: Submit a proposal with supporting statistical analysis, verifying consistent conformance to the quality requirements.

Random sampling

Requirement: Use random sampling techniques for each lot for the control of compaction of continuous layer of earthworks, selected subgrade zone, flexible pavement layers and asphalt layers.

Test locations: Determine test locations for random sampling in conformance with AS 1289.1.4.1 (1998).

Location restrictions: Do not restrict sampling to locations dimensioned or otherwise defined for setting out the works in the drawings or specification.

Inspection and test plans

ITP: Establish and progressively maintain a system to demonstrate inspection and testing in conformance with AS/NZS ISO 9001 (2016) clause 9.1 and AS ISO 10005 (2018) clause 5.18.

Minimum information for ITP (or ITP forms): Include the following:

- Person responsible for carrying out in-progress and final inspections or testing.
- Proposed inspection or test methods and recording of results.
- Acceptance criteria and frequency of inspection and testing.
- Specification tolerances.
- Person responsible for reviewing inspection and test results, evaluating whether work conforms, determining future action when work does not conform and closing out work lots.
- Measures to control non-conformity.
- When statistical analysis of test results is required.
- Person responsible for performing the final review of results to confirm that all inspections and tests have been carried out to verify complete conformity for each lot.
- Time limits for testing, submission, Hold Points and Witness Points that are nominated in the specifications.
- Identification of Hold Points or Witness Points.
- Checklist for each lot.

Submission of ITPs: Submit the ITPs, construction procedures and **Construction activities schedule** 10 working days prior to commencing any construction activities.

Register of ITPs: Include it in the Quality Plan.

Test register

Lot identification register: Include the following information:

- Three dimensional surveyed location of each lot, including the chainage of the start and finish points, lateral location and layer location and/or the particular structure (e.g. pier or abutment number, concrete placement number).
- Indication of conformance or non-conformance.
- Summary of test results.
- Location of test sites including test identification numbers.
- For non-conforming lots, allocate a new number to the resubmitted/subdivided lot(s), with reference to the original lot number.

Inspection and test status: Show either on the ITP records or physically mark in the field the conformance status for each lot.

Hold points

Notice of inspection: Give notice in advance of a Hold Point being reached.

Requirements for approval to proceed: Provide the following:

- Information required by the specification or relevant worksection.
- Certification that the particular lot/process is conforming.
- Certification that all underlying and adjacent lots affected by the lot in question are conforming.
- The appropriate form (checklist, NCR or NNC) at least 24 hours before the proposed placement/construction of the next lot.

Witness point: If the Hold Point has resulted from an NCR or NNC, approval may be conditional on a Witness Point being included.

Release of Hold Points: The Contractor is responsible for the release of Hold Points subject to audit by the QMR and QAR from time to time.

Survey control

Requirements

Survey control: Establish and maintain a system, for measurement, calculation and recording procedures appropriate to the following:

- Set-out of the works.

- Verification of conformance with the drawings and specification in relation to dimensions, tolerances and three dimensional position.

Determination of lengths, areas or volumes of materials or products, where required for measurement of work.

Method statement: Describe the control parameters for special processes which cannot be fully verified by inspection and testing. Address all potential errors that may be introduced by survey methods.

Surveyor qualifications: Appoint qualified surveyors or survey technicians to supervise and take responsibility for all surveying control.

Equipment and procedures: Capable of attaining the documented tolerances.

Survey locations: Surveying for conformance verification is not restricted to the locations used to set out the works.

Conformance verification surveys: Perform verification surveys not later than one working day after the lot or component has become accessible for survey.

Control of documents

Survey conformance report: Submit a survey conformance report for each lot or component where design levels, position and/or tolerances have been specified. Reference the relevant field book page numbers.

Information required: Indicate the difference between actual and documented values for position and level (defined by co-ordinates or chainage and offset) and provide certification by the qualified surveyor responsible for the verification survey.

Survey records: Provide all survey records including equipment calibration records and non-conformity registers.

Field book pages: Include the following, clear labels, date and signature by the surveyor, cross indexed references to equipment used and lot/component identification.

Recorded data: Retain any automatically recorded data used for verification surveys, including a printout of both raw (field) data and reduced data.

Audit trail: Prepare procedures to describe the records system, including the method of storing and indexing of electronic records and the computer software used for the reduction of survey measurements and calculations.

Risk assessment

Reliability of the QA System

Reliability assessment: Conform to the following:

- Provide construction documentation, recording compliance with construction procedures and inspection and test plans.
- Assessment criteria and ratings to Austroads AGPD05 (2018) Table 6.2.
- Monitoring frequency to Austroads AGPD05 (2018) Table 6.3.

Control of Non-conforming works

General

Detection and reporting: Report any works that depart from the documented requirements on a NCR form within two working days of detection, including the proposed disposition.

Proposed disposition: Include any of the following:

- Proposed additional works to bring the lot up to the documented standard.
- Proposed replacement of all or part of the lot to bring it up to the documented standard.
- A request to use the lot for a reduced level of service, if allowed by the documented requirements.

- For incidental defects, a request that the Superintendent accept the lot without alteration, as an exception with or without alteration to the respective unit rates.

Monitoring and measuring

NCR: A Hold Point until non-conformance is rectified and Hold point is released.

Progress: Do not cover up non-conforming works until a disposition has been accepted/approved and implemented.

Reworking: If the non-conformance can be rectified by reworking the lot with the original process, an NCR is not required. Maintain a record of the non-conformance to aid continual improvement.

Conformance: Verify that reworked/replaced lots conform to the documented requirements.

Discrepancy: If there is any discrepancy in test results, the Superintendent's test results will prevail.

Control of documents

CAR: Review and improve the QMS to eliminate the cause of identified non-conformance.

NCR: Submit an NCR based on the proforma in the **ANNEXURE** including the following:

- Details of non-conformance.
- Proposed disposition.
- Provision for attachments.
- QAR comment/approval/rejection.
- Completion of disposition.
- Release of Hold Point.
- Corrective action to improve quality.
- Close-out of NCR.

Authorised representative: Sign off all actions by authorised representatives of the contractor and superintendent as appropriate.

Register: Implement and maintain a numbering and registration system for all NCRs and NNCs, including cross referencing as required.

Corrective action

Requirement: Review and improve the Quality plan to eliminate the causes of the non-conformance to prevent recurrence.

Proposed corrective action: Indicate the corrective action appropriate on the NCR form.

Completion

Finalisation

Quality register: Submit a copy within one month of the date of practical completion. If requested, also provide a copy of all quality records and the **Construction records schedule**.

Record management: Provide a digital copy of the design and construction records of final completion in a format to archive the records in the principals asset management system.

Defects liability period: Resolve and close-out all quality non-conformance before the end of the defects liability period.

Review

Requirement: Organise meeting(s) to review the quality system and technical issues met on the project, and identify the lessons to be learned for future projects, including the following:

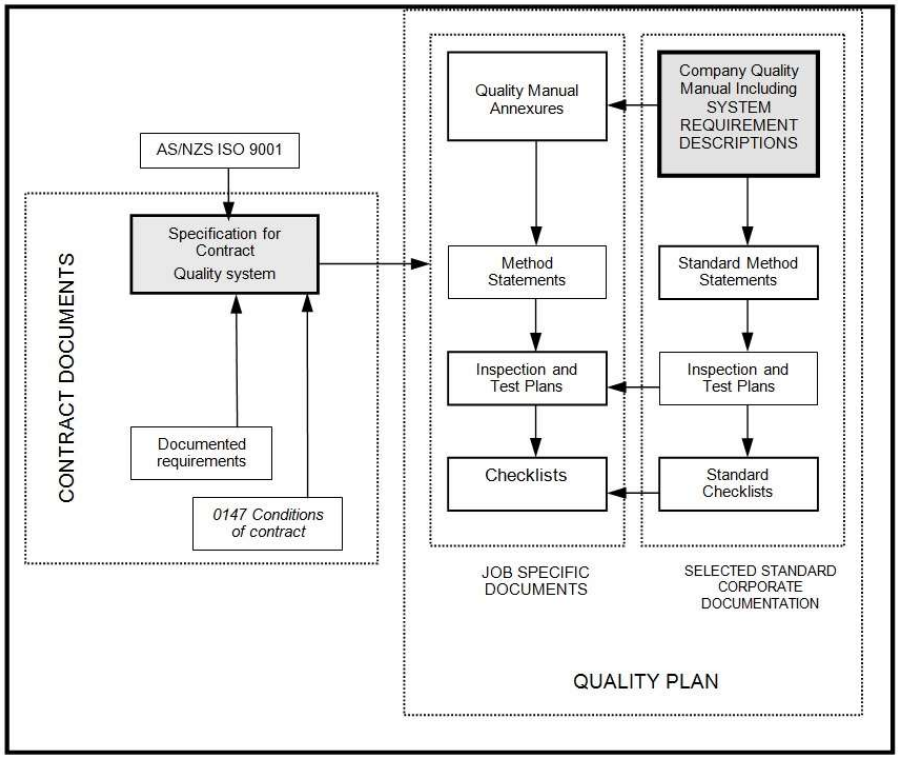
- Identification of non-conformances and the implementation of corrective action.
- Issues arising from inspections and audits.

- Contract documentation issues.
- Design and technical issues.
- Safety issues.

Timing: Hold meeting(s) before the date for practical completion so that key personnel are still available to participate in review process.

Annexures

Annexure – Project QMS documentation flow chart



Annexure – Proforma Non-conformance report (NCR)

NON-CONFORMANCE REPORT	**NCR No**: Date:
CONTRACT: PRODUCT OR SERVICE: SUBCONTRACTOR (if appropriate): INSPECTION & TEST PLAN (ITP) No:	
LOT No AND DESCRIPTION/LOCATION:	
NON-CONFORMANCE REPORT DETAILS:	

CORRECTIVE ACTION REQUEST:	
DISPOSITION:	
IS A SUPPLEMENTARY REPORT ATTACHED?:	YES ☐ No ☐
PRINCIPAL:	APPROVED ☐ REJECTED ☐
COMMENT:	
PRINCIPAL SIGNATURE:	DATE:
DISPOSITION COMPLETED (Contractor):	DATE:
RELEASE OF HOLD POINT (Superintendent):	DATE:
CLOSE OUT OF NON-CONFORMANCE REPORT (Contractor QMR):	DATE:

Annexure - schedules

Construction activities schedule

Worksection	**Activity requiring a method statement**
1101 Traffic Management	Temporary traffic management plan implementation, maintenance and removal
1102 Control of erosion and sedimentation	Erosion and sedimentation control design, implementation, maintenance and removal
1141 Flexible pavement base and subbase	Incorporation of additional pavement material to achieve a homogeneous pavement makeup
1143 Sprayed bituminous sealing	Seal design, placement of seal and rolling
1161 In-situ pavement stabilisation using cementitious binders	Cementitious binder incorporation, conditioning and compaction process

Construction records schedule

Construction records	**Reporting variables (Worksections)**
ITPs including list of Hold points and Witness points	
Test sampling register	
Construction records traced to the lot register	
As-built drawings	No applicable
Notice of non-conformance register	
Defects register - OPEN	
Defects register - CLOSED	

Annexure – Pay items

Pay items	Unit of measurement	Schedule rate scope
0161.1 Quality system documents and records	Lump sum	All costs associated with the preparation and submission of the Quality plan, the provision of the QMR on site and the maintenance of the quality records during the course of the contract.

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1289		Methods of testing soils for engineering purposes
AS 1289.1.4.1	1998	Sampling and preparation of soils - Selection of sampling or test sites - Random number method
AS/NZS ISO 9000	2016	Quality management systems - Fundamentals and vocabulary
AS/NZS ISO 9001	2016	Quality management systems - Requirements
AS ISO 10005	2018	Quality management systems - Guidelines for quality plans
AS/NZS ISO 19011	2019	Guidelines for auditing management systems
Austroads AGPD		Guide to project delivery
Austroads AGPD03	2022	Contract management
Austroads AGPD05	2018	Road construction quality assurance
Austroads ATS		Austroads technical specifications
Austroads ATS 1120	2021	Quality management requirements
ISO/IEC 17025	2017	General requirements for the competence of testing and calibration laboratories

0173 Environmental management (AUS-SPEC)

General

Responsibilities

General

Requirement: Provide environmental management system, as documented.

Management and control plans

Implementation: To approved management plans.

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)*.
- *1102 Control of erosion and sedimentation (Construction)*.

Interpretation

Abbreviations

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

- EIA: Environmental impact assessment.
- EMP: Environmental management plan.

Definitions

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

- Clearances: A formal certificate, approval or condition issued by a statutory authority allowing work in a particular area.
- Contamination of land: The presence of a substance in, on or under the land that is designated hazardous material and/or is at a concentration above that which is normally found in that locality, and presents a risk of harm to human health or to the environment.
- Environment: The physical factors of the surroundings of human beings including the land, waters, atmosphere, climate, sound, odours, tastes; and the biological factors of animals; and plants and the social factor of aesthetics.
- Environmental audit: A review of environmental management practices, in particular the evaluation of a site for environmental liability.
- Environmental impact assessment (EIA): A method for predicting environmental impacts of a proposed development including strategies for minimising identified impacts.
- Environmental management plan (EMP): A project or site specific plan describing the management of the environmental issues and considerations for the activity being undertaken. This applies to the design, construction and operation of the buildings, external works and infrastructure.
- Organic waste: Includes all food wastes, vegetative wastes from land clearing and pruning operations, biosolids produced from the treatment of liquid wastes, garden wastes and forestry waste (bark and saw dust) and paper and cardboard products.
- Pollution incident: An incident or set of circumstances during or as a consequence of which there is, or is likely to be, a leak, spill or other escape of a substance as a result of which pollution has occurred, is occurring or is likely to occur.
- Urban green infrastructure elements: Individual components of an urban green infrastructure network, for example grasslands, green walls, green facades, green roofs, raingardens, bioswales, tree pits, street trees, vegetated verge and medians, recreation reserves and public parks.
- Weed: An invasive plant that degrades natural areas, reduces the sustainability or affects the health of people and animals.

Submissions

Plan

Requirement: Submit the following:

- Environmental management plan.
- Control plans: Erosion and Sediment and Control Plan

Subcontractors

Weed management personnel: Submit details of the following:

- Subcontractors: Names and contact details for proposed subcontractors and evidence of experience in treatment of weed infestations.
- Chemical treatments: Name and qualifications of handlers and treatment type and application date.

Inspections

Notice

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

- Unexpected finds.
- Non-conforming items.
- Completed removal or rectification of non-conforming items.

Environmental administration, monitoring and reporting

Procedural and personnel

Community liaison

General: Notify residents of construction activities that will affect access to, or disrupt the use of, their properties.

Notice: Minimum 5 working days, unless the work is of an urgent nature with safety implications.

Notification content:

- Description of the work.
- Reason for the work.
- Expected duration.
- Changes to traffic arrangements and property access.
- 24-hour contact number of the representative responsible.

Emergency response

Emergency response personnel: Provide staff names and contact details.

Response procedure: The Contractor shall undertake the following actions in emergency situations.

Evacuate all site personnel to a safe location.

Notify the relevant emergency services of the situation.

If relevant, provide first aid to any injured people.

Take appropriate action to prevent members of the public from entering the impacted area.

Report the emergency situation to the Superintendent's Representative.

If notifiable injuries exist report the incident and its details to WorkSafe NSW.

Provide any requested assistance to emergency service personnel if safe and qualified to do so.

Provide a written report to the Superintendent detailing the situation and circumstances relating to the incident.

Response time: Immediate to within 24 hours depending on the severity of the situation.

Complaints

Reporting: Within 1 working day of receiving a complaint about an environmental impact, including pollution incidents, submit a written report detailing the complaint and remedial action taken.

Register: Keep a register of all complaints and action taken.

Unexpected finds

Requirement: Give notice and close off affected site area with barrier tapes and warning signs to prevent access. Unexpected finds include asbestos and other hazardous or volatile contaminants, archaeological finds and items of heritage value.

Monitoring

Internal monitoring

Approval authority: Superintendent's Representative

Monitoring and measurement: Monitor and measure on a regular basis the operations that may have a significant environmental impact.

Documentation: Provide descriptions of the following:

- Environmental monitoring: Implementation and recording procedures.
- For all control measures to be implemented: Non-conformance control and corrective action procedures.

Conformance: Maintain procedures for periodically evaluating conformance with legal requirements.

Records: Maintain records of results of environmental monitoring, including the effectiveness of any remedial action taken.

Internal monitoring personnel: Provide staff names and contact details.

Machinery and equipment: Provide details of proposed plant.

Review timing: Undertake reviews of the EMP and control measures at the following stages:

- When there is a change in the project, e.g. scope.
- Following significant environmental impacts or pollution incidents.
- When improved performance is required to reduce a specific environmental impact.
- At completion of environmental audits.
- At the end of the project.

Control of records: Maintain procedures for identification, storage, protection, retrieval, retention and disposal of records.

Internal audit: Maintain procedures for periodic EMS audits and as follows:

- Determine if the EMS conforms to the planned EMS, including the requirements of the AS/NZS ISO 14001 (2016), and has properly implemented and maintained.
- Provide information on the results of the audits to the superintendent.

Reporting

General

Requirement: Prepare environmental management reports that record the progress of the following:

- Performance against statutory requirements.
- Performance against the EMP, environmental objective and policy, and ecologically sustainable development outcomes and targets.
- Summary of monitoring, inspection and audits.
- Summary of reports required to meet the statutory requirements.

- Summary of environmental impacts, pollution incidents, non-conformance and complaints.
- Summary of corrective actions where required.
- Unexpected finds.

Reporting frequency: Monthly with payment claims

Control of Non-conforming works

Non-conformance

Non-conformity, corrective and preventive action: Maintain procedures for dealing with actual and potential non-conformities by taking corrective and preventive action. Implement and record any changes in the documented procedures resulting from corrective and prevention action.

Detection and reporting: Report any works that depart from the documented requirements.

Progress: Do not cover up non-conforming works until corrective action has been accepted/approved and implemented.

Conformance: Verify that reworked/replaced works conform to the documented requirements.

Environmental management

Environmental management plan

Control plan

EMP: Prepare an environmental management plan with the following details:

- Project description, including site location, construction activities, and project schedule.
- EMP context, describing how the EMP fits into the overall project planning process.
- EMP objective and environmental policy.
- Risk assessment.
- Assignment of responsibility for environmental controls, including hierarchy of management.
- Conditions of approvals, licences and permits to meet statutory requirements.
- Reporting requirements.
- Environmental training plan and procedures: Include in the plan, a program to familiarise staff with the EMP and/or management controls, environmentally sensitive areas and responsibilities.
- Environmental audit program and corrective action procedures.
- Emergency response procedures including response time.
- Control plans, as required.
- Details of operational control measures to reduce risk of environmental impacts on the following:
  - Heritage.
  - Visual values.
  - Endangered species.
  - Habitat.
- Locations of, and environmental controls for, environmentally sensitive areas.
- Details of environmental protection for each activity.
- Details of urban green infrastructure elements and specific targets to SA HB 214 (2023).
- Communication procedures.
- Other items necessary to protect the surrounding environment.

Activities staging: Address the phases of activity, as appropriate:

- Before construction and site establishment.
- During construction.
- After construction, including rehabilitation activities and site and landscaping maintenance.

Erosion and sedimentation

Control plan

Requirement: To *1102 Control of erosion and sedimentation (Construction)*.

Waste management

Control plan

Plan: Prepare a waste management plan and identify major waste streams that will be generated during the contract, including the following:

- Organic waste.
- Construction waste, including:
  - Spoil.
  - Demolition waste.
  - Asphalt or bitumen.
  - Concrete.
  - Metal.
- For each waste stream indicate:
  - How and where the waste will be re-used, recycled, stockpiled or disposed of.
  - How the waste will be transported between the site and point of re-use, recycling, stockpiling, treating or disposal and who will be responsible.

Waste stream: Submit details of location, labelling and protection of stock piles for the identified waste stream.

Control measures

Requirement: Minimise solid waste generated by construction activities and dispose of the solid waste.

Major waste streams that will be generated during the works:

- Vegetation waste.
- Construction waste, including:
  - Spoil.
  - Demolition waste.
  - Asphalt or bitumen.
  - Concrete.

Location of each waste stream: Roads being worked upon.

Disposal method for organic waste: In accordance with Cabonne Shire Council waste management policies and state legislative requirements.

Disposal method for construction waste: In accordance with Cabonne Shire Council waste management policies and state legislative requirements.

Transport method between the site and point of re-use, recycling, stockpiling, treatment or disposal: Via contractors trucks.

Covers: Use tarpaulins to prevent the loss of materials onto public roads.

Waste storage: Waste materials to be stored only at approved stack site locations with advance approval of the Superintendent's Representative.

Storage method: Provide details of location, labelling and protection of separate skips for the identified waste stream.

Disposal of materials

Spoil: Remove cleared and grubbed material from the site and dispose of legally.

Waste storage: Waste materials to be stored only at approved stack site locations with advance approval of the Superintendent's Representative.

Surplus material: Removed from site and disposed of at the Contractor's expense.

Mulch

Seed free aerial vegetative matter: Using a chipper, reduce to pieces not larger than 75 x 50 x 15 mm and stockpile for re-use as mulch.

Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow and noxious weeds.

Mulching cleared vegetation: Submit details of provisions.

Weed management

Control plan

Plan: Prepare a weed management control plan with the following details:

- Weed species.
- Weed infestation zones within the work site and the investigation period.
- Treatment of infestation, including treatment type and application rate.
- Cleaning methods for vehicles and machinery, including cleaning bay location and treatment date.
- Subcontractors: Names and contact details for proposed subcontractors and evidence of experience in treatment of weed infestations and name and qualifications of chemical treatment handlers.

Control measures

Requirement: Prevent the growth and spread of weeds.

Weed species: Will be provided by Cabonne Shire Council if works will be undertaken in any known areas containing weed infestations.

Weed infestation zones: Will be provided by Cabonne Shire Council if works will be undertaken in any known areas containing weed infestations.

Treatment of infestation: Treatment requirements will be provided to the Contractor if relevant.

Cleaning methods for vehicles and machinery: Cleaning methods to be provided depending on relevant weed type.

Air quality

Control plan

Plan: Prepare an air quality control plan to protect adjoining owners, residents and the public from emissions of dust and exhaust gases. Include the following details:

- Dust control.
- Exhaust gases emission control.

Control measures

Requirement: Protect adjoining owners, residents and the public from emissions of dust and exhaust gases.

Dust control measures: Provision of water cart and regular wetting of unsealed surfaces required to prevent dust.

Prohibition: Do not light fires.

Water quality

Control plan

Plan: Prepare a water quality control plan to keep earthworks free of water and to reduce impacts on groundwater and surface water. Include the following details:

- Dewatering system.
- Washout prevention.
- Cross connection prevention to public sewerage system.

- Water disposal.

Control measures

Requirement: Keep earthworks free of water and reduce impacts on groundwater and surface water and as follows:

- Provide and maintain slopes, crowns and drains for excavations and embankments, to make sure there is free drainage.
- Construct, including placing of fill, masonry, concrete and services, on ground where free water has been removed.
- Prevent water flow over freshly laid work.

Washout: Prevent washout from entering waterways or stormwater drains.

Cross connection: Prevent cross connections between stormwater and the public sewerage system.

Water disposal: Dispose off-site.

Noise control and vibration

Control plan

Plan: Prepare a noise and vibration control plan to protect adjoining owners, residents and the public from noise and vibration impacts. Include the following details:

- Noise control and vibration: To the recommendations of AS 2436 (2010).
- Maximum noise level at the site boundary.
- Noise control.
- Vibration assessment.
- Vibration control.

Control measures

Requirement: Protect adjoining owners, residents and the public from noise and vibration impacts.

Noise control and vibration: To the recommendations of AS 2436 (2010).

Noise levels: Avoid excessive noise and long periods of elevated noise that is reasonably anticipated to annoy or adversely affect the adjacent community.

Noise suppression: Minimise noise nuisance with measures including the following:

- Noisy equipment enclosure.
- Noise attenuation screens.
- Maintain plant in good working order.
- Effective residential class silencers to all engine exhausts.
- Fit engine covers to all plant.

Limits on ground vibration: Make sure ground vibration levels transmitted from operating items of plant near buildings do not exceed levels that are close to the lower level of human perception inside the premises or cause structural damage to the buildings and other structures.

Monitoring: Provide the following:

- Baseline condition measurements before commencement of the works.
- Progressive monitoring during the works to confirm conformance with approval conditions.

Flora and fauna

Control plan

Plan: Prepare a flora and fauna control plan to protect native flora and fauna on site and prevent introduction of pest species. Include the following details:

- Native flora and fauna assessment.
- Pest species assessment.
- Tree pruning.
- Habitat provision.

Control measures

Requirement: Protect native flora and fauna on site and prevent introduction of pest species.

Flora and fauna to be protected: All native vegetation and any significant introduced species including but not limited to Avenue of Honour type trees and/or vegetation.

Trees to be removed: Inspect to establish if nesting native fauna are present. If present, give notice.

Tree pruning: To AS 4373 (2007).

Provision of alternative habitat:

- Material: Felled trees and excavated rocks.

Site control and protection measures

Vehicular and equipment contamination precautions

Covers: Use tarpaulins to prevent the dropping of materials on public roads.

Washing: Wash the underside of all vehicles leaving the site as follows:

- Mud: Do not carry onto other areas, including adjacent paved streets.
- Weeds: If those designated by the local authority are present on the site, make sure seeds are not carried onto other areas, including adjacent paved streets.

Cultural and Aboriginal heritage

Control plan

Plan: Prepare a cultural heritage management plan to protect and prevent damage or loss of items of cultural heritage or Aboriginal sites and artefacts. Include the following details:

- Cultural heritage assessment.
- Aboriginal heritage assessment.
- Unexpected finds.
- Training.

Control measures

Requirement: Protect and prevent damage or loss of items of cultural heritage or Aboriginal sites and artefacts.

Known cultural heritage site/areas: Contractor to be notified of any areas or sites if relevant.

Training: Make sure all personnel working on the site receive training on their responsibilities regarding cultural heritage and are made aware of any sites/areas that must be avoided. Provide a site map showing heritage sites/areas and make available to relevant personnel during the works.

Notice: If any item is suspected to be an artefact of heritage value, relic or material which is Aboriginal or belonging to early settlement, give notice.

Action: Stop construction work that might affect the item and protect the item from damage or disturbance.

Annexures

Annexure - Summary of hold and witness points

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS Control plans Environmental management	H	Approval of EMP	10 days before site commencement	Site commence-ment
INSPECTIONS Notice Unexpected finds	H	Unexpected finds	3 days	Removal
INSPECTIONS Notice Non-conformance	H	Non-conforming items	2 days	Removal
INSPECTIONS Notice Non-conformance	W	Completion of removal or rectification	2 days	-
Note: H = Hold Point, W = Witness Point				

Annexure – Pay items

Pay items	Unit of measurement	Schedule rate scope
0173.1 Environmental management system documents and records	Lump Sum	All costs associated with the preparation and submission of the environmental management plan and the maintenance of the records during the course of the contract.
0173.2 Environmental management verification and control	Lump Sum	All costs for inspections, conformance surveys and testing required to verify that all aspects of the works conform to the Environmental management provisions of the contract.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS 2436	2010	Guide to noise and vibration control on construction, demolition and maintenance sites
AS 4373	2007	Pruning of amenity trees
AS/NZS ISO 14001	2016	Environmental management systems - Requirements with guidance for use
SA HB 214	2023	Urban green infrastructure — Planning and decision framework

1101 Traffic management

General

Responsibilities

General

Traffic management: Provide management for the safe movement of traffic and the protection of persons or property through and/or around the work site. Construct the Works with the least possible obstruction to traffic.

Authority requirements: This worksection does not override any applicable State or Local Government legislation and is to be read in conjunction with AS 1742.3 (2019) and the applicable State Road Authority traffic management specification.

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)*.
- *1102 Control of erosion and sedimentation (Construction)*.
- *1111 Clearing and grubbing*.
- *1112 Earthworks (Road reserve)*.
- *1121 Open drains*.
- *1141 Flexible pavement base and subbase*.
- *1143 Sprayed bituminous surfacing*.
- *1144 Asphalt (Roadways)*.
- *1194 Non-rigid road safety barrier systems*.
- *1195 Rigid concrete safety barrier systems*.
- *1351 Stormwater drainage (Construction)*.
- *1352 Pipe drainage*.
- *1354 Drainage structures*.

Standards

General

Traffic control: To AS 1742.3 (2019) for works on or adjacent to roads.

Traffic management: To the Austroads AGTM series.

Temporary traffic management: To the Austroads AGTTM series.

Road management: To Austroads AGTM05 (2020).

Interpretation

Definitions

General: For the purposes of this worksection the definitions in AS 1742.3 (2019) and the following definitions apply:

- Competent person: A person who has, through a combination of training, qualification and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

- Mobile work: Work that entails vehicles moving progressively along the roadway at speeds significantly lower than other traffic, with all traffic control devices being either vehicle mounted or regularly moved along the road.
- Road safety barrier system: A physical barrier separating the work area and the travelled path, designed to resist penetration by an out of control vehicle and as far as reasonably practicable, to redirect out of control vehicles back into the travelled path.
- Traffic control plan (TCP): Traffic guidance scheme (TGS): An arrangement of temporary traffic control devices to warn traffic and guide it around through or past a worksite or temporary hazard.
- Traffic controller: A competent person whose duty is to control traffic at a work site.
- Traffic management plan (TMP): A document describing all essential traffic management matters associated with roadworks or works on roads. This includes risk assessment, traffic demand and accommodation, traffic routing and control and provision for vulnerable road users and special vehicles such as buses, trams or over-dimensional vehicles.
- Vehicle movement plan (VMP): A drawing showing the preferred travel paths for vehicles associated with a work site entering, leaving or crossing the through traffic stream.

Submissions

Authority approvals

Requirement: Submit details of all authority approvals before commencing the works for which the approval is granted, including the following:

- Plan(s): Submit evidence of approvals from Councils and other authorities for temporary traffic arrangements.
- Vehicle size and load restrictions for temporary traffic arrangements. Also inform the appropriate authority after the restrictions have been removed to allow all traffic to resume use of the roadway.

Temporary speed zoning: Submit evidence of approval of temporary speed zoning requirements from the Local Traffic Committee and/or State road authority.

Execution details

Plan(s): Submit the plan(s) as required in **ANNEXURE – PROJECT PLAN REQUIREMENTS** conforming to the following:

- Plan requirements: Conform to **PRE-CONSTRUCTION PLANNING**, as appropriate.
- Access: Include proposal of alternative access to roads and properties for vehicles and pedestrians for work affecting side roads and existing accesses.
- Construction under traffic: If required, include traffic arrangements details and methods for traffic control.

Records

Traffic controllers: Submit names of proposed traffic control personnel with a signed declaration that they are appropriately trained in the traffic control duties to Austroads AGTTM07 (2021) or state or territory specifications.

Daily routine and work site: Submit and maintain records to Austroads AGTTM06 (2021) Section 7.

Inspections

Notice

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

- Temporary roadways and detours: Completed stormwater drainage, wearing surface and linemarkings, and street lighting.
- Traffic control signs and devices: Completed installation including signals, safety barriers and containment fences.
- Plant delineation: If plant encroaches on traffic travel paths, completed installation of warning devices.
- Access: Completed alternative access for vehicles and pedestrians.

- Opening temporary roadways and detours to traffic: Completed roadway/detour and associated control measures.
- Opening completed work: Reinstatement of the area affected by the Works.

Pre-construction planning

Traffic management

Traffic management plan (TMP)

Plan components: Prepare a TMP with the following:

- Traffic staging plan: If required, include details of the traffic staging arrangement and the time periods when each stage is in operation.
- Identify level of management provisions.
- Risk assessment: Identify and address risks associated with road safety, traffic management and road network issues specific to the site.
- Traffic control plan(s).
- Vehicle movement plan(s) showing travel paths for vehicles including for delivery, personnel and contractor's vehicles.
- Provisions for access to adjoining properties affected by the Works.
- Safe passage measures for workers/personnel, pedestrians and cyclists.
- Temporary speed zoning changes.
- Design drawings for temporary roadways and detours, including alignment and surface levels, pavement width and cross section, wearing surface and drainage details.
- Names and contact details of personnel responsible for the maintenance of traffic control devices and temporary roadways outside normal working hours. Include evidence that these details have been provided to the local police.

Plan preparation: Use a competent person to prepare the TMP.

Site copy: Keep a copy of the approved TMP on-site at all times. Use the plan for maintaining traffic control devices and to check traffic arrangement.

Level of management provisions

Requirement: Conform to one of the following levels of provisions to Austroads AGTTM02 (2021) or state or territory specifications:

- Short-term and mobile works not involving full or part road closure.
- Works involving relatively simple part-roadway closures.
- Works involving complex traffic arrangements or staged works or both.

Traffic control plan (TCP)/Traffic guidance scheme (TGS)

Requirement: Prepare a TCP showing the following, as appropriate:

- Types and locations of permanent regulatory and advisory signs.
- Types and locations of temporary signs, including advance warning signs, detour signs and speed zone signs.
- Pavement marking details, including types of delineation required, turning arrows, stop/holding lines and other road markings, types and positions of raised pavement markers and other delineation devices.
- Locations of permanent and temporary traffic signals.
- Locations and lengths of tapers and buffer zones.
- Locations of traffic controllers.
- Locations of entry and exit gates to the working areas, individually numbered and signposted.
- Pedestrians and cyclists paths including temporary footpaths and pedestrian crossing.
- Details of side roads and access for adjoining properties and parking.
- Locations of safety barriers, barrier systems and end terminals.
- Locations of temporary lighting.

Road authority delegation: Ensure that persons preparing and approving a TCP have Road Authority delegation.

Signage

Signage application/function: In the TCP, provide signs for the following:

- Protection of workers.
- To adequately warn of changes in surface condition and the presence of personnel or plant engaged in work on the road.
- For safely guiding road users through, around or past the work site.

Signage devices: Selection and use to AS 1742.3 (2019) clause 4.2.

Safety barriers

Location: To AS 1742.3 (2019) clauses 4.2.7 and 4.10.2, and at temporary embankments where the vertical height between the edge of the shoulder and the intersection of the embankment slope and natural surface exceeds 2 m.

Temporary embankment barriers: Corrugated steel or precast concrete safety barriers.

Road safety audit

Safety audits: If required, arrange for a commencement meeting, with the road safety auditor present, before implementing any traffic control measure to determine inspection points for auditing.

Audit report: After auditing of the TMP/TCP and receipt of the audit report, obtain directions for amending the plan documents. If amendment is required, obtain approval of revised documents before implementing control measures.

Emergency works

Contingencies: Prepare a set of procedures for the control of traffic in the event of an emergency to Austroads AGTTM10 (2021) Section 5.

Temporary roadway design

Design standards

Requirement: If temporary roadways and detours or adjustments to existing lane configurations and devices are required, design roadways conforming to the following:

- Design parameters: To **ANNEXURE – TEMPORARY ROADWAYS** and the recommendations of Austroads AGRD03 (2016) for alignment and grading.
- Intersections, interchanges and crossings: To the recommendations of Austroads AGTM06 (2020).
- Adjustment of existing devices: To AS 1742.3 (2019) clause 4.2.5.

Stormwater drainage

Design frequency: Provide drainage system to prevent run-off water overflowing on the road surface in any storm of intensity less than 1 in 5 year occurrence. Make sure the drainage system does not cause water ponding at any point.

Pavement drainage: Provide pavements with wearing surface and/or shoulders which will not pond water. Make sure temporary formations do not dam water.

Wearing surface

Wearing surface properties: Firm, even and skid resistant under all weather conditions and remain structurally sound during use.

Jointing to existing work: Extend wearing surface to the connecting roadway so that the finish is flush with existing roadway.

Design drawings

Requirement: Prepare drawings showing the following:

- Alignment and grading at a horizontal scale of 1:2000 for rural roads and 1:500 for urban roads, extending 100 m beyond the limits of the temporary roadway/detour.
- A sight distance diagram if opposing traffic is to use a single carriageway.
- Intersections, and other locations where traffic may be required to make turning, merging or diverging movements, at a scale of 1:500.
- Pavement type, including wearing surface, base and subbase details.
- Details of pavement markings, signposting, safety barrier and traffic control devices at a scale of 1:500.
- Sufficient cross-sections to indicate the feasibility of making connections between various parts of the Works.
- Sufficient dimensions, especially lane widths, showing clearly the geometry and clearances of the Works.
- Roadside furniture.
- Stormwater drainage, including culverts and pits.
- Street lighting details, as appropriate.
- Areas of the road where there are vehicle size and load restrictions during the duration of the temporary works.

Materials

Signs

Standards

Sign selection: To AS 1742.3 (2019).

Manufacturing of signs: To AS 1743 (2018).

Details of each letter: To the figures in AS 1744 (2015).

Retroreflective materials: Class 1 material conforming to AS 1906.1 (2017).

Sign size: To AS 1742.3 (2019) Tables 4.1 and 4.14, the figures in AS 1743 (2018) and **ANNEXURE** – **SUPPLEMENTARY TEMPORARY WARNING SIGNS**.

Signs for night work: If work area is outside of the car headlight beams, provide floodlighting to AS 1742.3 (2019) clause 4.2.4.

Flashing arrow signs: To AS 4192 (2022) and installed to AS 1742.3 (2019) clause 4.14.

Dynamic message and road weather information: To SA TS 5719 (2017).

Other work site approach/departure signs

Signs supplementary (ST/SW) to those in AS 1742.3 (2019) and AS 1743 (2018): To **ANNEXUE – SUPPLEMENTARY TEMPORARY WARNING SIGNS**.

Application: Provide warning signs as follows:

- Heavy machinery crossing: SW5-22.
- Cycle hazard grooved road: T1-10 to AS 1743 (2018) if the road is grooved and is a hazard to cyclists.
- Tar spraying possible short delay: T3-11 to AS 1743 (2018) for bituminous surfacing works.
- Changed traffic conditions ahead: T1-1, T1-6, T1-23, T2-6 and T2-23 to 25 to AS 1743 (2018) on long-term works, side tracks and detours.
- Vehicle height and mass restrictions: To AS 1742.3 (2019) clause 4.19.

Barriers and fencing

Barrier boards

Size, placement, material/colour: To AS 1742.3 (2019) clause 4.10.

Trestle supports:

- Material: Timber, metal or other suitable material.
- Colour: Yellow.
- Stability: Keep trestle in place with concrete blocks or sandbags.
- Bases: Keep the bases of trestles within the ends of the barrier boards.

Warning lamps: Provide barrier boards or trestles which allow for the mounting of traffic warning lamps.

High visibility flexible mesh fencing

Plastic mesh fencing: To AS 1742.3 (2019) clause 4.12.

Application: fencing for pedestrian containment or containment of workers.

Support: Fastened to steel star pickets/posts with cable ties or drawstring.

Location: As documented in the TCP.

Safety barriers

Road safety barrier systems: To AS/NZS 3845.1 (2015) and Austroads AGRD06 (2022).

Selection of road barrier systems: To Austroads AGRD06 (2022).

Temporary delineators

Material and erection: To AS 1742.3 (2019) clause 4.11.1.

Location: Erect parallel to and in close proximity to traffic, as documented.

Boom barriers

Type and location: As documented.

Cones and bollards

Requirement: To AS 1742.3 (2019) clause 4.11.1.

Spacing: To AS 1742.3 (2019) Table 4.7.

Conditions of use: Unless cones are firmly fixed in position, use only while work is in progress or in locations where an employee is present to re-instate cones dislodged by traffic. Otherwise, use bollards or barriers.

Cones and bollards used under night conditions: Provide cones and bollards with retroreflective bands conforming to AS 1742.3 (2019).

Linemarking

General

Existing linemarking: To AS 1742.3 (2019) clause 4.11.4 (a) and (b) for the period of work.

Temporary linemarking: To AS 1742.3 (2019) clause 4.11.4 (c), (d) and (e).

Superseded raised pavement markers: Remove immediately to AS 1742.3 (2019) clause 4.11.5.

Edge lining: Where the adjoining roadway is edge lined, edge line temporary roadway to match.

Temporary linemarking

Type: If temporary marking is required on the final wearing surface, use pavement marking tape.

Maintenance:

- Generally: If the pavement linemarking is deemed ineffective, re-mark within 48 hours.
- Raised pavement markers: If markers are deemed ineffective, replace within 24 hours.

Arrows

Single carriageway: If opened adjacent to or is used in lieu of an existing dual carriageway length, place pavement arrows showing the direction of traffic flow spaced at 500 m maximum.

Remove arrows: Remove arrows when the section is reincorporated as a dual carriageway.

Traffic signals

Portable traffic signals

Signal system: To AS 4191 (2015).

Application, installation and operation: To AS 1742.3 (2019) clause 4.7.4.

Temporary fixed traffic signals

Design and installation of signal system: To AS 1742.14 (2014).

Application: Longer term shuttle operations or for non-shuttle control of intersecting traffic flows.

Traffic warning lamps

Application: To AS 1742.3 (2019) clause 4.13.

Lamp maintenance: Clean lamps and make sure they are in good working order, and correctly aligned and positioned for the direction of traffic flow each night, before leaving the site.

Execution

General

Traffic management

Requirement: Provide the following, as documented:

- Personnel, plant and traffic control devices.
- Temporary roadways and detours.
- Arrangement for traffic.

Safety: Provide traffic control measures with minimal safety risk and inconvenience to the workers and road users at all times, including pedestrians and cyclists.

Work site safety: Responsibility for safety to AS 1742.3 (2019) clause 1.4

Delineation requirements: To AS 1742.3 (2019) clause 4.2.3

Road safety audits

Construction phase auditing: If safety audits are required, obtain agreement for inspections and arrange for a road safety auditor to inspect the traffic control measures during daytime and night time conditions at the inspections points. If the measures are ineffective, revise the TMP and implement the appropriate measure.

Managing and implementing: To Austroads AGRS06 (2022).

Revisions to the TMP: Obtain agreement for amendments/decisions, and document and implement the amendments.

Side roads and property accesses

Access

Requirement: Provide safe and convenient passage for vehicles, pedestrians and stock to and from side roads and property accesses connecting to the roadway.

Notice to property owners

Vehicular access: Where access is required, due to particular construction activities, conform to the following:

- Obtain approval.
- Advise the property owners with a letter drop at least 24 hours before the interruption.
- Repeat this advice verbally to the property owner in a courteous manner.
- Keep interruptions to a minimum.

Personnel

Traffic controllers

Application, equipment and position: To Austroads AGTTM07 (2021) or state or territory specifications.

Recognition marks: Controllers to wear a distinguishing mark on their outer garment indicating their authority.

Location of traffic controllers: Place to Austroads AGTTM07 (2021) or state or territory specifications and as follows:

- One traffic controller at the head of each traffic queue whilst it is halted.
- An additional traffic controller at the tail end of the queue where there is restricted sight distance and the possibility of approaching traffic colliding with the tail of the queue.

Where both ends of the work are not intervisible: Provide the traffic controller at each end with a two-way radio. Where this is not possible, station an intermediate traffic controller at a location where the extremities of the work is visible to provide cues to both controllers.

Night work control: In conjunction with a STOP/SLOW hand bat, use an illuminated red cone wand (torch) with a minimum capacity of 30,000 candela.

Night time lighting of traffic controller and work area: If floodlighting of the traffic controller and the work area adjacent is required, position floodlights above the work area, directed downwards and inclined slightly to illuminate the face of the STOP/SLOW bat.

- Floodlighting and glare: Make sure lights do not create glare for approaching drivers.
- Effects on neighbouring properties: Make sure high lighting levels do not adversely affect neighbouring residential property.

Approved clothing for work personnel

Clothing and use: To AS 1742.3 (2019) clause 4.21.

Potentially flammable clothing: Do not wear close to work likely to generate flame or hot splatter/molten metal.

Plant and control devices

Plant delineation

Plant and equipment: Where plant and equipment encroaches on traffic travel paths, direct traffic around encroachment as follows:

- In daylight conditions: Attach a fluorescent red flag to the outer end of the projection.
- In night or poor light conditions: Provide an additional traffic controller with an illuminated red wand.

Night time clearance: If traffic is permitted to use the whole or part of the existing road, remove all plant items and similar obstructions from the normal vehicle path to provide minimum 6 m lateral clearance where practicable, with minimum 1.2 m clearance of other dimensions.

Warning lamps: Light plant and equipment within 6 m of the normal vehicle path with minimum two yellow steady lamps suspended vertically from the point of obstruction nearest

to a traffic lane, and one lamp at each end of the obstruction on the side furthest away from the traffic lane.

Traffic control signs and devices

Arrangement and placement of traffic control devices: To the approved Traffic control plan.

Signs no longer required: Cover and/or remove temporary control devices no longer required without delay to maintain unambiguous safe guidance to traffic.

Control device pre-installation: Individual signs, multi-message sign panels and all other devices examined and checked to AS 1742.3 (2019) clause 4.3.

Control device maintenance: Maintain control devices so that they are in good working order and in the correct positions day and night. Maintain signs so that they are neat, clean, clear and legible.

Non-conforming signs and devices: Repair or replace to Austroads AGTTM06 (2021) Section 4.5 or state or territory specifications.

Sign mounting: To AS 1742.3 (2019) clause 4.5.

Sign installation: To Austroads AGTTM06 (2021) Section 2.1 and
Austroads AGTTM03 (2021) clause 2.5.3 or state or territory specifications.

Temporary speed zoning

Requirement: If temporary speed limit has been approved by the Local Council Traffic Committee or State Road Authority, provide temporary speed zoning signs complete with posts and fittings.

Speed limit: To AS 1742.3 (2019) Table 4.2(E) and the applicable State Road Authority specification.

Temporary speed zoning signs: Erect signs, cover the signs when the speed zone is not in use, and remove the signs when the speed zone is no longer required.

Operation diary: Keep a diary recording operation times of the speed zone.

Temporary roadways and detours

Stormwater drainage

Requirement: Construct drainage system, as appropriate for the approved temporary roadway design, conforming to the following worksections:

- *1121 Open drains*.
- *1351 Stormwater drainage (Construction)*.
- *1352 Pipe drainage*.
- *1354 Drainage structures*.

Temporary roadways

Requirement: Construct temporary roadways conforming to the following worksections:

- *1102 Control of erosion and sedimentation (Construction)*.
- *1111 Clearing and grubbing*.
- *1112 Earthworks (Road reserve)*.
- *1141 Flexible pavement base and subbase*.

Temporary kerbing: If required for long-term works as temporary medians, traffic islands or pavement edges, provide kerbing conforming to the following:

- Height: Maximum 150 mm.
- Securely fastened to the pavement.
- Clearly delineated.
- As seen by the approaching traffic is a 150 mm wide continuous line.

- Kerb and channel (gutter) in *1121 Open drains*.

Wearing surface

Requirement: Construct surfacing, as appropriate for the approved temporary roadway design, conforming to one of the following:

- *1143 Sprayed bituminous surfacing*.
- *1144 Asphalt (Roadways)*.

Width of the wearing surface: As documented or the width of the traffic lanes plus the width of each shoulder.

Road safety barrier

Location: As documented on the TCP.

Corrugated steel or precast concrete safety barriers: If required, install conforming to the following worksections, as appropriate:

- *1194 Non-rigid road safety barrier systems*.
- *1195 Rigid concrete safety barrier systems*.

Water-filled plastic barriers: Use in locations where rigid barriers are not allowed, such as at corners or intersections:

- Buffer zone: Provide the manufacturer's recommended buffer zone on the approach side of water-filled barriers.
- Water level: Maintain the required level for all water ballasted safety barriers at all times.

Opening temporary roadways and detours to traffic

Requirement: Complete all signposting, pavement marking, safety barriers and portable or temporary traffic signals before opening the temporary roadways to traffic.

Short-term and low impact works: To Austroads AGTTM05 (2021) or to the state or territory specifications.

Traffic switch: Traffic switch to a temporary roadway or detour is only permitted if the usual workforce will be on site for two days minimum thereafter.

Retaining existing roadway: Arrange the opening of temporary roadways so that sections of the existing roadway being replaced are not disturbed for minimum 48 hours so that traffic can be redirected back onto the existing roadway in the event of temporary roadway failure.

Approval to open roadway: Do not open temporary roadways and detours (including portable or temporary traffic signals sites) to traffic without written approval.

Maintenance during construction: Maintain road surface of temporary roadways and detours and any local roads used by the construction traffic so that it is safe for traffic, including:

- Maintaining existing pavement linemarkings, kerb and gutters, road shoulders and verges, drainage, signage and vegetation.
- Repairing potholes, surface drainage blockages or other failures without delay.
- Removing debris without delay.

Removal and restoration: Upon completion of the Works, remove the temporary roadways and/or detour arrangement and restore the area affected by the Works to a condition equivalent to that before commencement.

Construction under traffic

Arrangement for traffic

Permission to construct under traffic: If a temporary roadway or a detour is not provided or available, construction under traffic may be permitted, if the following is provided:

- Through traffic on a two lane roadway: Minimum 3.5 m lane width.
- Multilane roads: Minimum 3.5 m lane width in both directions.

Notification: Give minimum 5 working days' notice before carrying out work.

Carriageway restoration: Restore carriageway to a safe and trafficable state for through traffic before ceasing work each day.

Opening to traffic

Opening completed work

Notice: Provide at least 10 working days' written notice of the date of opening the Works to traffic. Obtain agreement for the procedure for opening including with the local Police.

Permanent signs and markings: Complete all permanent signposting, pavement markings, safety barriers and traffic signals required to complete the Works before opening to traffic.

Removal of temporary traffic control devices: Remove all temporary control devices no longer required for the safety of traffic, when part or all of the Works are opened to traffic.

Restoration: Restore the area to a condition equivalent to that at commencement.

Annexures

Annexure – Project plan requirements

Plan type	**Required?**
Traffic management plan (TMP)	Yes □
Traffic control plan (TCP)/Traffic guidance scheme (TGS)	Yes □
Traffic staging plan	Yes □
Road safety audit of TMP/TCP	Yes □
Vehicle movement plan (VMP)	Yes □
Note: Check the box applicable for the project.	

Annexure – Temporary roadways

Roadways design parameters schedule

Property	**Minimum value/required?**
Design travel speed (km/hr)	
Traffic lane width (m)	
Shoulder width (m)	
Shoulder seal	Yes □
Note: Check the box applicable for the project.	

Roadways materials schedule

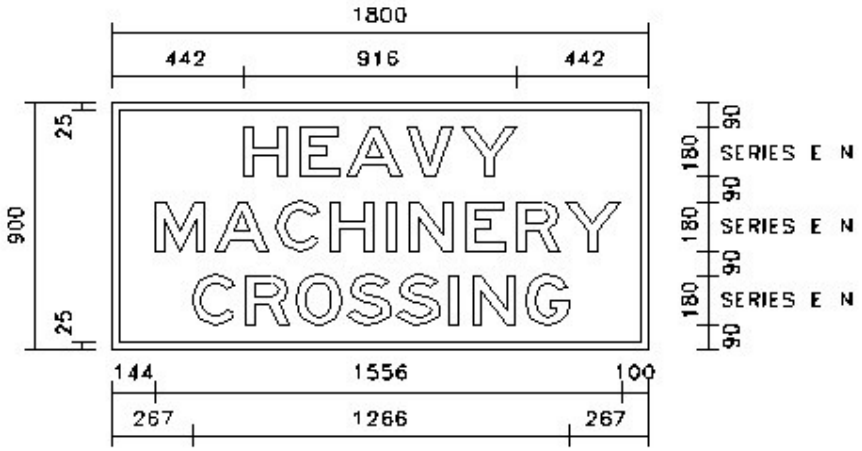
Pavement layer	**Type/material**	**Minimum thickness (mm)**
Wearing surface		
Base		
Subbase		

Annexure – Supplementary temporary warning signs

Sign SW5-22

Dimensions: mm.

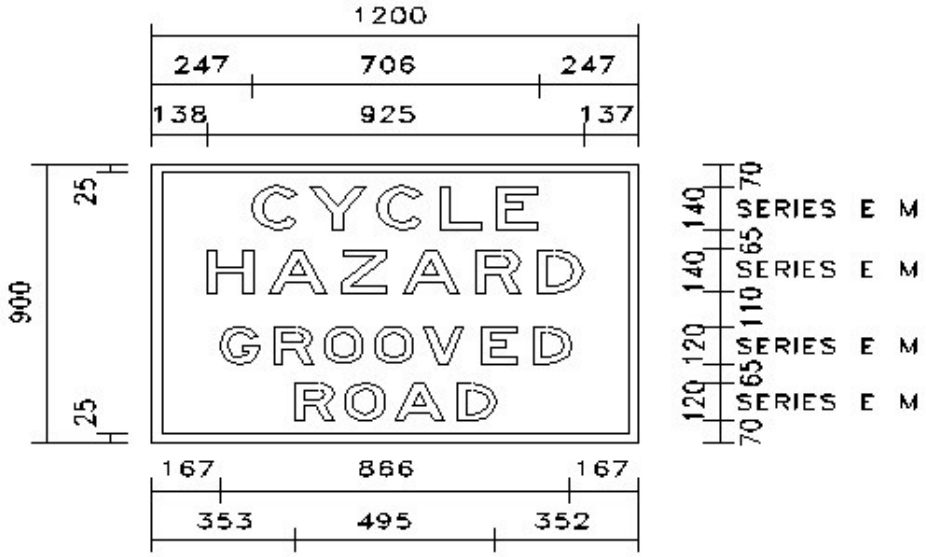
Colours: Black letters and border on yellow retroreflective background.



Sign ST1-10

Dimensions: mm.

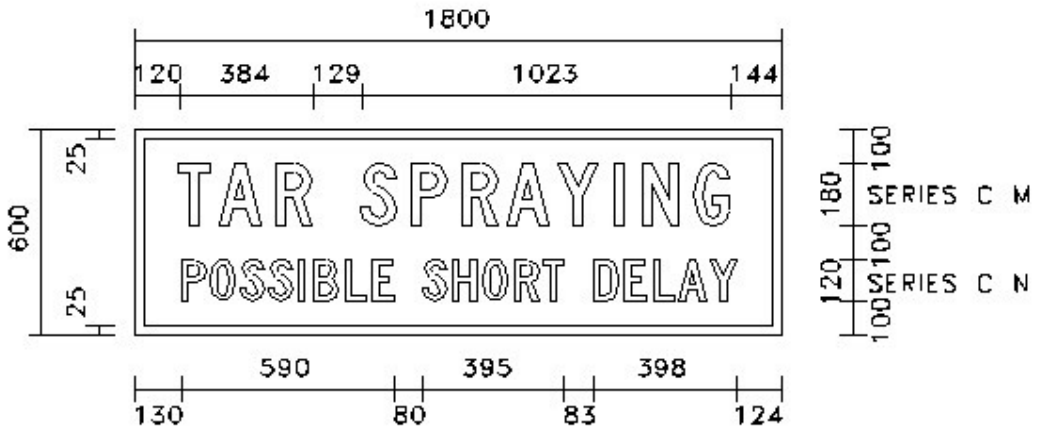
Colours: Black letters and border on yellow retroreflective background.



Sign ST3-1

Dimensions: mm.

Colours: Black letters and border on yellow retroreflective background.



Annexure – Summary of hold and witness points

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS, Execution details Plan(s)	H	Plans and documents of the TMP.	2 weeks if pavement/ drainage works is not required. 4 weeks if pavement/ drainage works is required.	Commencement.
SUBMISSIONS, Authority approvals Plan(s)	H	Evidence of approvals for temporary traffic arrangements.	4 weeks before commencement.	Commencement.
SUBMISSIONS, Authority approvals Temporary speed zoning	H	Evidence of approvals for changes to speed zoning.	5 weeks before implementation.	Implementation of speed zoning.
INSPECTIONS, Notice Temporary roadways and detours	W	Completed roadway/detour construction.	3 days before installing control signs and devices.	-
INSPECTIONS, Notice Traffic control signs and devices	W	Completed installation of signs and devices.	1 day before opening to traffic.	-
INSPECTIONS, Notice Access	W	Completed alternative access.	1 day before opening to traffic.	-
INSPECTIONS, Notice Plant delineation	W	Completed warning devices installation.	1 day before opening to traffic.	-
INSPECTIONS, Notice	H	Completed roadway/detour.	3 days before opening to traffic.	Opening to traffic.

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
Temporary roadways and detours				
INSPECTIONS, Notice Opening completed work	H	Reinstated area affected by the Works.	2 days before switching traffic.	Opening of completed work to traffic.
Note: H = Hold Point, W = Witness Point				

Annexure – Pay items

Pay items	Unit of measurement	Schedule rate inclusions
1101.1 Traffic management	Lump sum	All costs associated with the documentation and approvals of: - The design of temporary roadways and detours, traffic switching operations, the provision of traffic controllers, signposting, roadmarkings, raised pavement markers, lights, barriers. - Other traffic control devices required for the safe movement of traffic and the protection of persons and property. - Progress payments work done under this item is to be made on a pro-rata basis, as appropriate for the duration of the Contract.
Temporary roadways and detours – Drainage	Per m^2 for clearing and grubbing Per m^2 for subgrade preparation Per m^2 for earthworks Per m^2 solid for subbase and base pavement For temporary roadworks refer to the worksections	To the following worksections: - *1121 Open drains.* - *1351 Stormwater drainage (Construction).* - *1352 Pipe drainage.* - *1354 Drainage structures.*
Temporary roadways and detours – Temporary roadways	Per m^2 for bitumen seal	To the following worksections: - *1102 Control of erosion and sedimentation (Construction).* - *1111 Clearing and grubbing.* - *1112 Earthworks (Road reserve).* - *1141 Flexible pavement base and subbase.*
Temporary roadways and detours – Wearing surface	Refer to the worksections	To one of the following worksections: - *1143 Sprayed bituminous surfacing.* - *1144 Asphalt (Roadways).*
Temporary roadways and detours – Road safety barriers		To the following worksections: - *1194 Non-rigid road safety barrier systems.* - *1195 Rigid concrete safety barrier systems.*

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1742 Manual of uniform traffic control devices

AS 1742.3	2019	Traffic control for works on roads
AS 1742.14	2014	Traffic signals
AS 1743	2018	Road signs - Specifications
AS 1744	2015	Standard alphabets for road signs
AS 1906		Retroreflective materials and devices for road traffic control purposes
AS 1906.1	2017	Retroreflective sheeting
AS/NZS 3845		Road safety barrier systems and devices
AS/NZS 3845.1	2015	Road safety barrier systems
AS 4191	2015	Portable traffic signal systems
AS 4192	2022	Illuminated flashing arrow signs
SA TS 5719	2017	Communications protocol for dynamic message signs and road weather information systems
Austroads AGRD		Guide to road design
Austroads AGRD03	2016	Geometric design
Austroads AGRD06	2022	Roadside design, safety and barriers
Austroads AGRS		Guide to road safety
Austroads AGRS06	2022	Road safety audit
Austroads AGTM		Guide to traffic management - Set
Austroads AGTM05	2020	Link management
Austroads AGTM06	2020	Intersections, interchanges and crossings management
Austroads AGTTM		Guide to temporary traffic management
Austroads AGTTM series		Guide to temporary traffic management
Austroads AGTTM02	2021	Traffic management planning
Austroads AGTTM03	2021	Static worksites
Austroads AGTTM05	2021	Short term low impact worksites
Austroads AGTTM06	2021	Field staff - Implementation and operation
Austroads AGTTM07	2021	Traffic controllers
Austroads AGTTM10	2021	Supporting guidance

1102 Control of erosion and sedimentation (Construction)

General

Responsibilities

General

Requirement: Provide temporary and permanent measures to control erosion and sedimentation to the requirements of **Erosion and sedimentation control plan (ESCP)** in *0022 Control of erosion and sedimentation (Design)* and, as documented.

ESCP prepared by the contractor

Implementation: To control plans documented in **PRE-CONSTRUCTION PLANNING**.

Erosion and sedimentation control measures by principal/consultant

Implementation: To control measures documented in **EXECUTION**.

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)*.
- *0022 Control of erosion and sedimentation (Design)*.
- *0152 Schedule of rates (Construction)*.
- *0161 Quality management (Construction)*.
- *0173 Environmental management (AUS-SPEC)*.
- *0257 Landscape - road reserve and street trees*.
- *1101 Traffic management*.
- *1111 Clearing and grubbing*.
- *1112 Earthworks (Road reserve)*.
- *1121 Open drains*.
- [complete/delete]

Standards

General

Standards: To IECA Principles (2012), IECA Book 5 (2017) and IECA Book 6 (2010).

Turf installation: To AS 5181 (2017).

- Documents: Managing Urban Stormwater: Soils and Construction

Interpretation

Abbreviations

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

- ARI: Average Recurrence Interval.
- ESCP: Erosion and sediment control plan.
- NTU: Nephelometric Turbidity Units.

Definitions

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

- Erosion: The wearing away of land by the action of rainfall, running water, wind, moving ice or gravitational creep. Soil detachment (erosion) occurs when the erosive forces exceed the soil's resistance, causing the soil particles to move.
- NTU: A measure of water turbidity or the optical clarity of a liquid.
- Sediment: Sediment is the result of erosion, and consists of small detached soil particles. Sedimentation occurs when the transportation of detached soil particles ceases or slows and the soil particles then settle or fall out of suspension.
- Site sections: The site divided into sections based on the catchment area draining to each permanent drainage structure in the works, including the following:
  - Access and haulage tracks.
  - Borrow pits and stockpile areas.
  - Compound areas, including Contractor's facilities and concrete batching areas.
- Waterway works licence: This licence is required for:
  - Construction, alteration, operation, removal or decommissioning of any works on a waterway or groundwater bore.
  - Works to deviate a waterway or private dam, and covers all domestic and stock dams that are built on waterways. This approval is not required for farm dams that are not on a waterway.
- Waterway: Include the bed and banks of the following:
  - A river, creek, stream or other natural channel in which water flows (continuously or intermittently);
  - The stormwater system;
  - A lake, pond, lagoon or marsh in which water collects (continuously or intermittently).

Submissions

ESCP prepared by the contractor

Design documentation: Submit the following documents, if control plans are prepared or revised by the contractor:

- Erosion and Soil Sedimentation control plan (ESCP).
- Survey of embankments.
- Waterway Works Licence, if required.

Calculations: Submit calculations and references supporting the design and maintenance requirements.

Execution details

Section plans: Before disturbing the natural surface of a particular site section, submit an ESCP only for that site section consistent with the previously approved ESCP.

Personnel: Submit staff names and contact details for installation, monitoring, upkeep and removal.

Working in a waterways and floodplains: Submit a reinstatement plan if work in a stream is planned or the structure of a waterway will be altered including a copy of a Waterway Works Licence.

Drop inlet sediment control: Submit details of proposed alternative methods.

Reports

Work method statement: Submit detailed Environmental Work Method Statements.

Inspections

Notice

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

- General: Initial installation of sediment controls.

- Stockpile sites: Stockpiles are protected by approved erosion and contamination measures in the ESCP.
- Access and exit areas: Decontamination of vehicles.
- Areas not approved for clearing: Fencing and protection of areas.
- Diversion and catch drains: Construction and lining.
- Temporary sediment control: Temporary sediment traps and batter protection.
- Removal: Removal of temporary erosion and sedimentation works.
- Cleaning: Completion of cleaning.

Pre-construction planning

ESCP prepared by the contractor

General

Requirement: To *0022 Control of erosion and sedimentation (Design)*.

Schedules

Content requirement: Conform to the following:

- Work schedules for multiple contractors co-ordinated to avoid delays so that disturbed land does not remain unstabilised.
- Schedules for the construction of structures and the implementation of measures to control erosion and sedimentation programmed where possible to avoid seasonal intense rain storms.
- A work sequence with construction and stabilisation of culverts and surface drainage works at the earliest practical stage.

Execution

Site control and protection

Dewatering

Requirement: Make sure that dewatering operations do not result in turbid water entering natural waterways and conform to the following:

- Treat contaminated water if turbidity exceeds 30 NTU.
- Only pump water into natural waterways if it is under safe limits to the regulatory water quality standards.
- Pump water to vegetated areas of sufficient width to remove suspended soil, or to sediment control structures.
- If discharge is to a natural waterway or a drainage system discharging to a natural waterway, monitor turbidity hourly.

Dust control

Requirement: Install measures for minimising health risk or loss of amenity due to emission of dust to the environment. and incorporate the following, if required:

- Suppression of dust by watering.
- Installation of wind fences.

Management of stockpiles and batters

Requirement: Manage soil stockpiles to minimise dust and sediment in run-off and conform to the following:

- Minimise the number and area of stockpiles and the time stockpiles are exposed.
- Keep topsoil and underburden stockpiles separate.
- Construct other protective measures including upstream diversion works and downstream sediment trapping devices.
- Height: < 2.5 m.
- Stockpiles and batters slopes: No steeper than 2H:1V.

- Stockpiles and batters bare for more than 28 days: Stabilise by covering with mulch, anchored fabrics or seeding with sterile grass.
- Install sediment controls around unstabilised stockpiles and batters.
- Suppress dust on stockpiles and batters, as required.
- Stockpile protection: Install the following at the end of each working day:
  . Sandbags: Placed on downslope of stockpile to prevent movement:
  . Waterproof cover: Placed over stockpile material.
  . Sandbags, filter bags or fibre sausages: Locate to divert upslope flow of stormwater into grassed areas of the site and away from stockpiled material.
- Exclude timber and rubbish from stockpiles.

Access and exit areas

Decontamination measure: Decontaminate vehicles entering/exiting the site using shake-down or other approved methods.

Working in waterways and floodplains

Requirement: Minimise stress on aquatic communities and do not increase sediment load when working in waterways. Conform to the following:

- Plan in-stream works to minimise contact time.
- Establish special practices to minimise impacts on the waterway and disturbance of the banks.
- Stabilise the banks and the in-stream structures.
- Maintain minimum flows to make sure the viability of aquatic communities and do not limit the passage of fish up and downstream.
- Construct in-stream crossing during low flows, that are stable under expected vehicle loads and flow regimes.

Erosion and sedimentation control measures

General

Initial installation of sediment control: Prepare and present the works for inspection.

Control measures

Land clearance: Minimise in areas with highly erodible soils and steep slopes liable to water and wind erosion.

Runoff: Decontaminate in conformance with safe limits of regulatory waterway standards before dispersing. Disperse clean runoff to stable areas or natural watercourses

Drainage lines: Provide drainage to convey water through the works to minimise erosion generation. Identify drainage lines and install measures to control predicted stormwater and sediment loads generated in the mini catchment.

Limiting areas or erodible material exposed at any time: Limit to areas being actively worked.

Protection of areas not approved for clearing or disturbance: Clearly mark and fence off.

Clearing and grubbing: To *1111 Clearing and grubbing*.

Control measures: Install and maintain for the duration of the contract, control measures including the following:

- Permanent drainage structures: Install before the removal of topsoil and commencement of earthworks within the catchment area of each structure.
- Permanent and temporary drainage works: Complete promptly to minimise exposure period of disturbed areas.
- Diversion and catch drains: Construct to prevent uncontaminated runoff from passing through the site and mixing with contaminated water. Construct and line catch drains before the adjacent ground is disturbed and before excavation.
- Contour and diversion drains: Install across exposed areas before, during and immediately after the clearing. Re-establish and maintain these drains during soil removal and earthworks operations.

- Cut off or intercept drains: Establish cut-off or intercept drains to redirect stormwater away from cleared areas, and sloping to stable (vegetated) areas or effective treatment installations.
- Sediment filtering or sediment traps: Install before and in conjunction with earthworks operations, to prevent contaminated water leaving the site.
- Berms: Construct along the edge of the formation leading to temporary batter flumes and short-term sediment traps, to minimise loss of sediment during construction of embankments during fill placement.
- Progressive revegetation of site: To *0257 Landscape - road reserve and street trees* as each site section is complete.

Maintenance

Maintenance of controls: Make sure each disturbed area has adequate means of containment of contaminated water. Restore and replace control measures as required.

Access areas: Provide and maintain access from within the road reserve, or from other acceptable locations, for cleaning out sedimentation control works.

Monitoring site performance

General: Maintain slopes, crowns and drains on all excavations and embankments, and make sure there is satisfactory drainage at all times. Do not allow water to pond on the works, unless ponding is part of an approved ESCP.

Ripped material remaining in cuttings and material placed on embankments: Seal off by adequate compaction to a smooth, tight finish.

Inspection: Inspect all erosion and sedimentation control measure as follows:

- At least daily when rain is occurring on site.
- At least weekly (even if work is not occurring on site).
- Within 24 hours prior to expected rainfall.
- Within 18 hours of a rainfall event of sufficient intensity and duration to cause on site runoff.

Rectification: Immediately rectify any defects revealed during inspection and revise ESCP, if required.

Temporary erosion and sedimentation control measures

General

Requirement: Install temporary erosion and sedimentation control measures to areas where the natural surface is disturbed by construction, including roads, depot and stockpile sites.

Temporary drainage control

Temporary drains: Control runoff from exposed areas with temporary contour drains and/or temporary diversion drains. Progressively implement and, if required, alter as the work progresses.

Contour drains: Construct across the natural slope at approximately the same elevation as follows:

- Timing: Immediately after site is cleared, intercept and divert runoff from the site to nearby stable areas at non-erosive velocities.
- Form: Channel with a ridge on the lower side.
- Grade: 1% to 1.5%.
- Spacing intervals: 20 m to 50 m, depending on the erodibility of the exposed soil, as documented.

Diversion drains: Construct diversion drains across haul roads and access tracks when there is an erosion risk, due to steepness, soil erodibility or potential for concentrating runoff flow, as follows:

- Form: Channel with a ridge on the lower side to intercept and divert runoff from the road or track to stable outlets.
- Spacing: Not greater than that required to maintain runoff at non-erosive velocities.

Temporary sediment control

Temporary sediment traps: Construct devices to remove sediment from sediment-laden runoff flowing from areas of 0.5 ha or more before the runoff enters the stormwater drainage systems, natural watercourses or adjacent land.

Waste barriers: Construct and maintain to prevent debris from entering natural watercourses.

Batter protection: Minimise scour of newly-formed fill batters during and after embankment construction by diverting runoff from the formation away from the batter until vegetation is established.

Drop inlet sediment control

General: Construct drop inlet sediment traps and inlet control banks on completion of gully pits, as documented.

Functional requirement: Construct the inlet control banks, as required, to prevent the surface flows bypassing gully pits. Make sure the sediment traps remove sediment from the surface flow before it enters the drainage system.

Sediment traps and control banks: Conform to the following:

- Construct the drop inlet sediment traps and associated inlet control banks consisting of at least two courses of sandbags, containing a 10:1 sand/cement mix, as documented.
- Key the bags at least 25 mm into the surface, dampen and make sure cement is sufficiently hydrated, and tamp lightly to achieve a mechanical interlock between adjacent bags.

Removal

General: Remove all measures when revegetation is established on formerly exposed areas. Remove from the site, and dispose of, all materials and components used for the temporary erosion and sedimentation control works, as documented and in conformance with regulatory authorities' requirements.

Permanent erosion and sediment control measures - Earthworks

Erosion and sedimentation control basins

Planned levels: Construct earthworks for permanent erosion and sedimentation control basins to the documented levels and dimensions.

Site preparation: Clear the entire storage and embankment foundation area of permanent erosion and sedimentation control basins in conformance with *1111 Clearing and grubbing*. Strip topsoil and any unsuitable material under embankments in conformance with *1112 Earthworks (Road reserve)*.

Embankments: To *1112 Earthworks (Road reserve)*.

Permanent inlets, spillways and low flow outlets

Sedimentation control basins and sediment traps

Rock mattresses: Construct inlets and spillways using rock filled woven galvanized steel mattresses and geotextile. Install the rock filled mattresses to *1121 Open drains* and *0294 Gabion walls and rock filled mattresses*.

Plastic pipe outlet: Install a 150 mm diameter plastic pipe low flow outlet in locations, as documented.

Cleaning

Sedimentation control structures

Progressive cleaning: Clean out, when accumulated sediment reduces the structure capacity of the control measure to 50% or less, or when sediment has built up to a point where it is less than 300 mm below the spillway crest and conform to the following:

- Removal of accumulated sediment: Use methods which will not damage the structures.
- Sediment disposal: Remove sediment to a nominated soil stockpile site or dispose in locations that sediments will not be conveyed back into the construction areas or into watercourses.
- Access: Maintain suitable access to allow cleaning out in all weather conditions.

Completion

Requirement: Clean, before Practical Completion of the Works.

Reinstatement: Reinstate surfaces including areas previously occupied by stockpiles and conform to the following:

- Within areas of permanent works: As documented.
- Areas outside permanent works: Reinstate to condition at commencement of contract.

Annexures

Annexure – Selections

Property	Details/Required?
Contact details: Installation Monitoring Upkeep Removal	
Site hazard/risk assessment: Low General risk site High risk site	
Site water quality monitoring (high risk site)	Yes ☐
Drainage control measures	
Erosion control measures	
Sediment control measures	
Note: Check the box applicable for the project.	

Annexure - Summary of hold and witness points

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Erosion and sedimentation control plan (ESCP)	3 days before disturbance of natural surface	Disturbance of natural surface
SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Survey of embankments	7 days before disturbance of natural surface	Disturbance of natural surface
SUBMISSIONS ESCP prepared by the contractor Design documentation	H	Waterway works licence Approval letter with conditions from statutory organisation controlling access to a waterway	7 days before disturbance of waterway if applicable	Statutory approval for works in a waterway and/or floodplain

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
SUBMISSIONS Execution details Section plans	H	Scale diagrams showing the following: - Features of the site including contours and drainage paths. - Relevant construction details of all erosion and sedimentation control structures. - All permanent and temporary erosion and sedimentation control measures, including the control measure to be implemented in advance of, or in conjunction with clearing and grubbing operations.	7 days before disturbance of natural surface	Disturbance of natural surface
SUBMISSIONS Execution details Working in waterways and floodplains	H	Reinstatement plan for works in a stream including a copy of Waterway Works Licence	7 days before works in waterways and flood plains	Work in waterways and flood plains. Reinstatement plan
INSPECTIONS Notice General	H	Initial installation of sediment controls	3 days before commencement of bulk earthworks	Commencement of bulk earthworks
INSPECTIONS Notice Stockpile sites	W	Approved protection measures are in place	2 days	
INSPECTIONS Notice Access and exit areas	W	Decontamination of vehicles	2 days before site disturbance	
INSPECTIONS Notice Areas not approved for clearing	W	Fencing and protection of areas	3 days	
INSPECTIONS Notice Diversion and catch drains	W	Construction and lining	2 days before site disturbance	
INSPECTIONS Notice Temporary sediment control	W	Temporary sediment traps and batter protection	2 days before site disturbance	
INSPECTIONS Notice Removal	W	Removal of temporary erosion and sedimentation works	3 days	
INSPECTIONS Notice Cleaning	W	Completion of cleaning	2 days	
Note: H = Hold Point, W = Witness Point				

Annexure – Pay items

Pay items	Unit of measurement	Schedule rate inclusions
1102.1 Temporary erosion and sedimentation control measures	Lump sum	All costs associated with the installation, maintenance, inspection and removal of the temporary erosion and sedimentation control measures in conformance with **TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES**. All costs associated with Drop inlet sediment control, including inlet control bank constructed in conformance with **Drop inlet sediment control**.
1102.2 Permanent erosion and sediment control - Earthworks	m³ The volume will be determined by calculation using the end area method.	All costs associated with compacted embankment constructed in conformance with **PERMANENT EROSION SEDIMENTATION CONTROL MEASURES - EARTHWORKS**, **Erosion and sedimentation control basins**. The schedule rate to cover the excavation of material from within the sedimentation control basin and embankment construction required under **erosion and sedimentation control** basins and will be an average rate for all types of materials. The cost of excavating and transporting material for embankment construction and obtained from within cuttings or from borrow will be included in the schedule rate for General earthworks in *1112 Earthworks (Road reserve)*.
1102.3 Permanent inlets, spillways and low flow outlets	m² of horizontal surface area	All costs associated with the rock filled mattress constructed in conformance with **PERMANENT INLETS, SPILLWAYS AND LOW FLOW OUTLETS**, **Sedimentation control basins and sediment traps**.
1102.4 Cleaning	m³ of in-place sediment	All costs associated with sediment removal from the structure in conformance with **CLEANING**, **Sedimentation control structures**. The volume of sediment removed will be determined by survey The schedule quantity is a provisional quantity.
Clearing and grubbing		To *1111 Clearing and grubbing*.
Landscaping		To *0257 Landscape - road reserve and street trees*.
Topsoil stripping and placement in storage stockpile	m³ solid bank	To *1112 Earthworks (Road reserve)*.
Topsoil replacement from storage stockpiles to restore grassed areas	m³ solid bank	To *1112 Earthworks (Road reserve)*.

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 5181	2017	Use and installation of turf as an erosion, nutrient and sediment control measure
IECA Book 5	2017	Best practice erosion and sediment control - A field guide for construction site managers
IECA Book 6	2010	Best practice erosion and sediment control - Standard drawings
IECA Principles	2012	Principles of construction site erosion and sediment control - A training tool for the construction industry

1141 Flexible pavement base and subbase

General

Responsibilities

General

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

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*.

Interpretation

Abbreviations

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

- CBR: California bearing ratio.
- 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.

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: ±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.

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.

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.

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

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.

Materials

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)	$10^6 \leq N < 4 \times 10^6$	CRB20-1	CRS20, CRS40
Light (L)	$N \leq 10^6$	CRB20-1, CRB20-2, CCB20-1, CCS20-2, NGB20	CRS20, CRS40, CCS20, NGS20, NGS40

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

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[d]	**Unbound or modified base and subbase**	**Bound base and subbase**
Iron and steel slag	100%	100%
Crushed concrete [a]	100%	100%
Brick	20%	10%
RAP	40%	40%
Fly ash [b]	10%	10%
Furnace bottom ash	10%	10%
Reclaimed asphalt profilings	30%	30%
Crushed glass fines [c]	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.
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) AS 1289.3.6.1 (2009)	**Sieve size (mm)**	—	—	—	—		—
	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	—

Property and test method	Differentiating criteria	Material requirements					
		CRB20-1	CRB20-2	CCB20-1	CCB20-2	RCMB	NGB20
	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)	**Rainfall**	—	—	—	—		—
	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)	**Rainfall**	—	—	—	—		—
	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)	**Material type**	—	—	—	—		—
	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, paint, wood and other vegetable matter	—	—	max 0.1	max 0.1	max 0.1	—
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%	—

Property and test method	Differentiating criteria	Material requirements					
		CRB20-1	CRB20-2	CCB20-1	CCB20-2	RCMB	NGB20
Aggregate wet strength[a] to AS 1141.22 (2019)	—	min 100 kN	min 80 kN	min 100 kN	min 80 kN	Min 70kN	—
Wet/dry strength variation[a] (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	—
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.							

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)	**Sieve size (mm)**	—	—	—		—	—
	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_L) to AS 1289.3.1.1 (2009)	—	max 25%	max 25%	max 30%	max 27%	max 25%	max 25%
Plasticity index (I_P) to AS 1289.3.3.1 (2009)	**Rainfall**	—	—	—		—	—
	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 (*LS*) to AS 1289.3.4.1 (2008)	**Rainfall**	—	—	—		—	—
	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%

Property and test method	Differentiating criteria	Material requirements					
		CRS20-3	CRS40-4	CCS20	RCMS	NGS20	NGS40
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[a] to AS 1141.22 (2019)	—	min 50 kN	min 50 kN	min 50 kN	min 70 kN	—	—
Wet/dry strength variation[a] (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%
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.							

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

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.*

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: ≥ 80.
- UCS: < 1.0 MPa.

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

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.

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.

Execution

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.

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.

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.

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.

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.

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 slurrying of the surface or leaching of the stabilising agent.

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[a] of density ratio (%)**		**Assessment**
	Base	**Subbase**	**Base**	**Subbase**	
Medium (M)	≥ 98	≥ 97	-	-	Accept lot
Light (L)	-	-	≥ 100	≥ 98	Accept lot
[a] 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).

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).

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.

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.

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.

Annexures

Annexure - schedules

Authority requirements schedule

Property/Requirement	A	B	C

Annexure - Summary of hold and witness points

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
SUBMISSIONS, Products and materials 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	H	Test results from a NATA accredited laboratory as evidence of material	Minimum 10 days before material delivery	Material delivery

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
Alternative unbound base and subbase materials		conformance of alternative materials.		
SUBMISSIONS, Variations Variations to approved materials	H	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 Trial section	H	Compaction test results from a NATA accredited laboratory for the subbase and base layer of trial section. Survey report covering line, level and thickness for the subbase and base layer of trial section. Record data of straightedge test.	Minimum 2 days before commencement of remaining pavement works.	Commencement of remaining pavement works.
SUBMISSIONS, Execution details 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 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 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 Placing outside layer thickness range	H	Proposal to place and compact layer outside the required thickness range.	Minimum 2 days before spreading.	Spreading of pavement materials.
SUBMISSIONS, Execution details 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 Trimming, compaction and curing Record of roll test for each layer of pavement.	H	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	Minimum 2 days before placement of next layer.	Placement of next layer.

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
		visual observation by Council Superintendant.		
SUBMISSIONS, Execution details Non-conformance	H	Disposition of non-conforming lot.	Minimum 5 days before corrective action or removal and replacement.	Corrective action or removal and replacment.
INSPECTIONS, Notice Materials	W	Unbound, modified and bound materials.	Upon delivery.	-
INSPECTIONS, Notice Underlying layer	H	Quality of underlying layer including assessment of required moisture content.	Minimum 2 days before placing.	Placing.
INSPECTIONS, Notice 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 Maintenance before completion of wearing surface	H	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.
Note: H = Hold Point, W = Witness Point				

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)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	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 Width and surface trim	One layer 2,000 m² or max. 1 day's placement	1 cross section per 15 m 10 per selected 200 lin. m	Survey Measure and deviation from a 3 m straightedge
	Compaction/moisture content/ dry density testing	One layer 5,000 m² or max 1 day's placement	10 per 5,000 m² layer or 3 per lot whichever is greater	RMS T130 (2012) AS 1289.5.2.1 (2017) AS 1289.5.3.1 (2004) AS 1289.5.3.2 (2004) AS 1289.5.3.5 (1997) AS 1289.5.4.1 (2007) AS 1289.5.8.1 (2007)

Annexure - Pay items

Pay items	Unit of measurement	Schedule rate inclusions
1141.1 Supply, place and compact subbase course	m^3 volume compacted Determine quantity by the length and width of work for total relevant thickness.	Do not account for allowable tolerances. All costs associated with all documentation and approvals and: Supplying, placing, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material.
1141.2 Supply, place and compact base course	m^3 volume compacted Determine quantity by the length and width of work for total relevant thickness.	Do not account of allowable tolerances. All costs associated with: Supplying, placing, compaction, trimming, jointing, and testing of the base course, and curing of bound material.
Traffic management	Lump sum.	To *1101 Traffic management*.

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
Austroads AGPT		Guide to pavement technology
Austroads AGPT04E	2022	Recycled materials
Austroads AG:PT/T251	2010	Ball penetration test
Austroads AP-T352	2020	Sustainable Roads through fit-for-purpose use of available materials: Technical basis
Austroads AP-T353	2020	Sustainable Roads through fit-for-purpose use of available materials: Evaluation tool and users guide
Austroads ATS		Austroads technical specifications
Austroads 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
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

1143 Sprayed bituminous surfacing

General

Responsibilities

General

Requirement: Provide sprayed bituminous surfacing for roads and related applications, as documented.

Precedence

General

Schedule of job details: If there are conflicts between the requirements of this worksection and the **ANNEXURE – SCHEDULE OF JOB DETAILS**, the requirements of the **ANNEXURE – SCHEDULE OF JOB DETAILS** apply.

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*.
- *1141 Flexible pavement base and subbase*.

Interpretation

Abbreviations

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

- ALD: Average least dimension.
- PMB: Polymer modified bitumen.
- v/l/d: Vehicle/lane/day.

Definitions

General: For the purposes of this worksection the definitions in Austroads AP-C87 (2015), Austroads AGPT04K (2018) and those given below apply:

- Adhesion agent: A substance for promoting adhesion between binder and aggregates, normally in the presence of water.
- Average least dimension: The smallest dimension of an aggregate particle when placed on a horizontal surface.
- Binder: A bituminous material used for waterproofing the surface and holding an aggregate layer to the base.
- Cutter: A light petroleum distillate (e.g. kerosene or similar) added to bitumen to temporarily reduce its viscosity (cutback bitumen).
- Cutback bitumen: Bitumen to which cutter oil (kerosene or similar) has been added to achieve a temporary reduction in viscosity.
- Double/double seal (D/D): A seal applied by spraying a layer of binder, spreading the large-sized aggregate and, after suitable rolling and sweeping, spraying another lower application of binder followed by the spreading of a layer of smaller aggregate.
- Flaky aggregate: Is defined as an aggregate particle with a least dimension (thickness) less than 0.6 of the mean of the smallest sieve size through which the particle passes and the largest sieve size on which the particle is retained.

- Flakiness index: Is defined as the percentage by mass of stones in an aggregate having an ALD of less than 0.6 times their average dimension.
- Geotextile reinforced seal: An application of a bituminous binder into which both aggregate and geotextile are incorporated to provide a durable wearing surface. A layer of binder is applied first, followed by a layer of geotextile fabric, then a second coat of binder, followed by the aggregate.
- High stress seal or reseal (HSS): A bituminous seal or reseal treatment which may be a single/single or double/double seal, but with a polymer modified binder (PMB) to improve seal performance in areas of high traffic loading and stress.
- Initial seal: An application of a sprayed seal to a prepared basecourse which has not been primed. It is intended to adhere to the base, whilst providing a temporary wearing course for traffic.
- Initial treatment: An application of a primer to a prepared base, without cover aggregate, to provide penetration of the surface, temporary waterproofing and to obtain a bond between the pavement and the subsequent seal or asphalt. It is a preliminary treatment to a more permanent bituminous surfacing.
- Primerbinder: A material, more viscous than a primer, and required to act both as a primer and binder, and used in initial sealing.
- Reseal: A sprayed seal applied to an existing sealed, or asphalt surface.
- Residual binder: A binder that remains in services after any volatiles have evaporated.
- Retreatment: An application of a sprayed bituminous treatment on an existing bituminous surfacing.
- Secondary treatment: An application of a sprayed bituminous treatment on an initial treatment.
- Seal: A thin surface layer of bituminous binder into which aggregate is incorporated. A sprayed seal may incorporate more than one application of binder and aggregate and may also be combined with a layer of geotextile fabric.
- Single/double seal: A seal consisting of a single application of binder followed by a double application of aggregate.
- Single/single seal (S/S): A seal consisting of a single application of binder followed by a single application of aggregate.
- Strain alleviating membrane (SAM): A sprayed seal with the binder containing a relatively large concentration of rubber or polymer modifier. It is used to absorb strains that occur in a road pavement and thereby reduce reflection cracking.
- Strain alleviating membrane interlayer (SAMI): The application of a polymer modified binder into which aggregate is incorporated. A SAMI is used as an interlayer between an asphalt wearing course and underlying layers to provide alleviation from tensile strains developed beneath it.

Submissions

Execution details

Sprayed seal design: Submit evidence that the seal design conforms to Austroads AGPT04K (2018) clause 4 for the following:

- Seal type and grade selection.
- Binder application rates and aggregate spread rate for the required seal treatment type.

Products and materials

General: Submit details of the following:

- Nominal size: Type and source of constituent materials: Including for aggregates and binders.
- Materials used: Including binders, bituminous emulsion content, adhesion agents, cutters, crumb rubber, etc.).
- The aggregate particle size distribution as a single grading.
- Application rate litres/m^2 of sealed road surface at minimum 15˚C.
- Test certificates: Submit evidence of conformance from a NATA accredited laboratory (for the required test method) for each constituent material.

Sprayed seal treatment type: Submit evidence of conformity to **ANNEXURE – SCHEDULE OF JOB DETAILS** or drawings.

Bituminous materials: Submit evidence of conformance to **MATERIALS**.

- Evidence of previous satisfactory performance, if applicable.

Aggregates: Submit details of material source and evidence of conformity to AS 2758.2 (2021) or an equivalent standard.

Bitumen binder: Submit proportion of cutter oil content used (as required) for the prevailing weather conditions and in line with standard industry practice.

Records

Machinery and equipment: Submit evidence that sprayer is calibrated.

Ambient condition before spraying: Submit record of temperature and weather conditions during the course of the work.

Drawings: Submit spray sheets detailing location information and other documents with details of the extent and condition of final works.

Spraying details: Submit the following:

- Sprayer certificate.
- Binder spraying temperature.
- Work record for each sprayer run.

Tests

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

Inspections

Notice

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

- Surface preparation: Completed surface preparation, including repair of surface defects.
- Spraying rate.
- Spreading: Completed surfacing.
- Non-conforming sections: Completed replacement and rectification of non-conforming sections.

Pre-construction planning

General

Sealing treatment

General: To the **Categorisation of sealing treatments table** and Austroads AGPT04K (2018) Table 4.7 for a preliminary seal selection.

Initial treatment	**Secondary treatment**
Prime S/S S/D D/D HSS Graded Seal	S/S S/D D/D SAM SAMI Inverted seal Coloured Surface Treatment High Friction Surface Treatments (HFST)[1] Multiple Layer Applications (bleeding in wheel tracks) High Stress Seals (polymer modified binders) Aggregate Retention Seal Fibre Reinforced Seals Geotextile Reinforced Seal Salt Affected Treatments Surface rejuvenation[2]

Initial treatment	Secondary treatment
	Surface enrichment[2]
Notes: For High friction surface treatment refer to *ARRB High friction surface guide to good practice (2018)*. For surface rejuvenation and surface enrichment, refer to *1147 Sprayed preservation surfacing* worksection and NATSPEC TECHnote GEN 025 for preservation surfacing treatments. Source: Austroads AP-T310 (2016).	

Design of sprayed seals

Seal design: To Austroads AP-T310 (2016), Austroads AGPT04K (2018) Section 5 and 6 and Austroads ATS 3460 (2020).

Plant

Registration and insurance: Register and insure all plant for use on a public road, as appropriate.

Operation: Conform to statutory environmental regulations.

Environmental risk

Risk assessment

Requirement: Assess and manage the risk of environmental damage from prime or primerbinder being washed into adjacent drains and open watercourses from rain on uncured materials.

Priming and initial seal risk assessment table

Weather conditions[b]	**Risk of wash-off in the event of rain within the stipulated periods after spraying[a]**			
	0 – 12 hours	**12 – 24 hours**	**24 – 48 hours**	**Over 48 hours**
(a) Cutback bitumen				
Fine, sunny, warm/hot	Moderate	Moderate	Low	Low
Fine, overcast, cool/warm	High	Moderate	Low	Low
Damp, overcast, warm	High	High	Moderate	Moderate
Damp, overcast, cool	Unacceptable	High	High	Moderate
Wet, overcast, warm	Unacceptable	Unacceptable	High	High
Wet, overcast, cool	Unacceptable	Unacceptable	Unacceptable	Unacceptable
(b) Bitumen emulsions				
Fine, sunny, warm/hot	Moderate	Low	Low	Low
Fine, overcast, cool/warm	Moderate	Low	Low	Low
Damp, overcast, warm	High	Moderate	Low	Low
Damp, overcast, cool	High	Moderate	Moderate	Moderate
Wet, overcast, warm	Unacceptable	High	High	Moderate
Wet, overcast, cool	Unacceptable	Unacceptable	Unacceptable	High

Weather conditions[b]	Risk of wash-off in the event of rain within the stipulated periods after spraying[a]			
	0 – 12 hours	12 – 24 hours	24 – 48 hours	Over 48 hours
(a) Cutback bitumen				

a. The risk levels reflect the likelihood of a wash-off from granular pavements on moderate grades with typical crossfall. For roads on steep grades, or with abnormal crossfall, or with low porosity base course, the risk of wash-off is higher than that documented.
b. Typical temperatures associated with different weather conditions are: Hot = 25°C, Warm = 15 to > 25°C, Cool = 15°C.
Notes:
1. If risk is classified as unacceptable, delay application until conditions improve.
2. If risk is classified as high, delay application or supervise application and curing continuously until dry. Precautionary measures include blocking of stormwater entry points, placing of spill response equipment, regular weather checks and frequent inspections.
3. If risk is classified as moderate, inspections must be frequent enough to respond to rain events. Stormwater entry points should be blocked and spill response equipment available on site.
4. If risk is classified as low, inspections may be less frequent but weather should be monitored to make sure prompt response to rain events.

Materials

Bituminous surfacing

Types

Requirement: Use the following types of sprayed bituminous surfacing:

- Prime.
- Initial seal.
- Seal.

Bituminous materials

Bitumen

Classification and properties and testing of bitumen and bituminous binders: To AS 2008 (2013) and Austroads AGPT04F (2017) Section 4.6.

Multigrade bitumen: To AS 2008 (2013).

Cutback bitumen

Standard grades of cutback bitumen: To AS 2157 (1997) and Austroads AGPT04F (2017) Section 5 and Austroads AGPT04K (2018).

Field preparation: If required, prepare cutback bitumen by blending bitumen and cutter oil in proportions for the particular application.

Proprietary grades of cutback bitumen: To the manufacturer's specification.

Polymer modified binders

Binder properties, classification and testing: To Austroads AGPT/T190 (2019) Table 5.1, Austroads ATS 3110 (2023) Table 8.1 and Table 9.1, and Austroads AGPT04F (2017) Section 6 and Austroads AGPT04K (2018) Section 4.6.3.

Supply of polymer modified binders: to Austroads ATS 3110 (2023).

Bitumen emulsion

Standard: To AS 1160 (1996).

Type, grade and testing: To Austroads AGPT04F (2017) Section 7 and Austroads AGPT04K (2018) Section 4.6.4.

Proprietary grades of bitumen emulsion: To the manufacturer's specification.

Adhesion agent

Addition to bituminous binder or aggregate precoating material: Provide agent type and proportion depending on the following:

- Previous documented conformance and performance with the proposed combination of binder, aggregate source and precoating material based on trials or previous use.
- Materials selected are approved by the road authority.

Cutter oil

Standard: To AS 3568 (2020) and Austroads AP-T344 (2019).

Aggregate precoating materials

Materials: Cutback bitumen, proprietary bitumen emulsion or other proprietary products. Proprietary products may be used subject to previous satisfactory field performance as an aggregate precoating material.

Approved adhesion agent content in precoating material: Minimum 1%.

Rejuvenation and enrichment treatment

Materials: To *1147 Sprayed preservation surfacing*.

Aggregates

Properties

Source: Use aggregates from a nominated location.

Supply of aggregates: To Austroads ATS 3120 (2021).

Aggregates: To AS 2758.2 (2021) and the following:

- Conformance to **ANNEXURE – SCHEDULE OF JOB DETAILS** for aggregate class, polishing resistance, method of determination of aggregate shape, and combination of hardness and durability test measures.
- Apply only one method of aggregate shape determination and one combination of hardness and durability.
- If no aggregate details are documented in **ANNEXURE –SCHEDULE OF JOB DETAILS**, select the aggregate class, polishing resistance and test methods combination based on the service conditions and customary test procedures used in the state where the works are located.

Aggregate size

Selection of aggregate size: Select the appropriate aggregate size based on traffic, pavement life expectancy and climate conditions To Austroads AGPT04K (2018) Table 4.3.

- For lower traffic volume roads: Provide 7 mm aggregate.
- For higher traffic volume: Provide 10 mm, 14 mm or larger aggregate.

Selection of aggregate size combinations

For single/single seals: Conform to the following:

- Provide 7 mm aggregate for low traffic applications.
- Provide 10mm aggregates for higher traffic applications. Do not use for high-stress traffic movements, extreme heat, or predominantly wet conditions.
- Provide 14 mm aggregates for single seals as a suitable reseal option for low traffic and rural conditions. Use only when high viscosity binder is required to retain the aggregate and provide adequate bonding with the binder.

For double/double initial seals:

- Double/ double initial seals, or single/single initial seals: Conform to the following:
  . Incorporate scatter coat, for high traffic and high stress sites.

. Use aggregate size combinations with double/double seals such as 10/5, 10/7, 14/7 mm or other agreed combinations.

Aggregate dimensions (ALD)

For double/double or single/single seals: Provide ALD for second application to be half the ALD of the aggregate in the first application.

Sampling and testing: Apply appropriate sampling techniques and testing procedures for ALD to ensure correct aggregate design spread rates and accurate design binder application rates.

Flaky aggregate

Flakiness index: To AS 1141.15 (1999).

Selecting a sprayed seal

General

Sprayed seal selection: Select sprayed seal to Austroads AGPT04K (2018) Table 4.7, based on the design traffic (v/l/day), equivalent heavy vehicles, air and road temperatures, stress locations such as sharp corners, roundabouts, turning lanes, intersections and steep grades. Cracked pavements will require special treatments. Obtain specialist advice to manage variations based on local conditions.

Design of a sprayed seal

Design of single/single seals

Design principles: To Austroads AGPT04K (2018) Section 5.1 .

Design traffic

General: Details for traffic design, traffic data and distribution of traffic to Austroads AGPT04K (2018) Section 5.2.

Procedure for determining design traffic

Single carriageway - two way road: Apportion traffic to each lane for single carriageway in rural areas and estimate design traffic to Austroads AGPT04K (2018) Table 5.1.

Dual carriageway - one way road: Apportion half the traffic count to each lane and estimate design traffic to Austroads AGPT04K (2018) Table 5.2.

Equivalent heavy vehicles (EHV %): For the effects of heavy vehicles and for adjustments to the basic voids factor to cater for this extra loading factor to Austroads AGPT04K (2018) Clause 5.2.5.

Short-term traffic variations: Make provisions for events such as grain harvests, show days, seasonal tourists, school holidays especially if they coincide with seasonal wet weather events.

Access roads to sites such as quarries and mining locations: To Austroads AGPT04K (2018) Section 5.2.7.

Selecting binders for maximum permissible vertical road gradients

Selection of binders: To the **Recommended maximum permissible gradients for various binders table**.

Recommended maximum permissible gradients for various binders table

Surfacing binder type	**Maximum gradient (%)[a]**
Hot bitumen	12
Hot cutback bitumen	10
Polymer modified binder	>12 [b]
Bitumen emulsion	8 [c]

Surfacing binder type	Maximum gradient (%)[a]
Multigrade (M500)	12
a. The gradient will also depend to some extent on the existing surface texture and surface temperatures. b. Depends on the PMB type and concentration. c. Depends on the percentage of residual bitumen content, with higher residual bitumen content or polymer modified emulsions preferred for steeper grades.	

Design of a double/double seal

General: For double/double seal design to Austroads AGPT04K (2018) Figure 5.3 and Section 5.5.2.

Surface texture allowance: If the second seal is delayed about 3 months and up to 24 months then assess the surface texture allowance to **Double/double seal design surface texture allowance and time between seals table**.

Double/double seal design surface texture allowance and time between seals table

Time between seal applications	Surface texture allowance – as a percentage of the standard allowance
Less than 3 months	30%
Between 3 and 6 months	30 to 50%
Between 6 and 12 months	50 to 75%
12 months to 24 months	75 to 100%
Source: Austroads Part 4K Table 5.3	

Initial treatment

General: Design of primes To **Guide to grades and application rates for primer table**.

Grades and application rates of primer table

Pavement types	Grade AS 2157 (1997)	Primer application rates
Tightly bonded (impervious)	AMC 00	0.6 to 1.1
Medium porosity	AMC 0	0.8 to 1.1
Porous	AMC 1	0.9 to 1.3
Very porous (limestone and sandstone)	AMC 1	2 application rates: 1st@ 0.7 to 0.9 2nd@ 0.5 to 0.7
Hill gravels, granitic sands	AMC 0	0.8 to 1.1
Stabilised	AMC 00[a]	0.5 to 0.8
Concrete	AMC 00[a]	0.2 to 0.4
a. Can also consider using proprietary materials, or additional cutter in these cases.		

Trials (if required): Conduct small scale trials on pavement materials in situ test and compare the appropriateness of the prime grade and the application rate.

Design of initial seals

Initial seals: For the design of initial seals conform to the following:

- Determine binder application rate.
- Adjust the application rate and apply allowances for:
  - Surface texture.
  - Binder absorption.
  - Aggregate embedment To Austroads AGPT04K (2018) Section 5.5.

Other seals

General: To Austroads AGPT04K (2018) Section 5.5.4.

SAMI treatments: Conform to the following:

- Use highly modified binders applied at a high rate of application.
- Overlay with asphalt within 1 day after construction.
- For effective crack sealing performance provide 1.8 L/ m^2 minimum design binder rate.

Geotextile reinforced seals

General: To Austroads AGPT04K (2018) and Austroads AP-T37 (2005) and to the **Geotextile reinforced seals table**.

Type: Non-woven, needle punched fabrics with a melting point of 165˚C and a minimum fabric mass of 135 g/m^2 for 10 mm aggregate.

Fibre reinforced seals (FRS)

General: Conform to Austroads AGPT04K (2018) Section 5.5.4 and the following:

- Design of FRS based on single/single design procedures.
- Include allowances for polymer and bitumen emulsion and coating glass fibres.
- Use a scatter coat of 5 or 7 mm aggregate over a 14 mm seal and 5 mm aggregate on a 10 mm seal.

Seal design input parameters

Basic voids factor Vf

Basic voids factor Vf for single/single seals: To Austroads AGPT04K (2018) Figure 6.1 and 6.2.

Basic voids factor Vf for double/double seals: To Austroads AGPT04K (2018) Figure 6.3 and 6.4.

Adjustments to voids factor Va and Vt: To Austroads AGPT04K (2018) Table 6.1 for aggregate shape (Va) and Table 6.2 for traffic effects (Vt).

Design voids factor VF

Design voids factor: Determine by using the following:
VF =Vf + Va +Vt
Where Vf = basic voids factor
Va = adjustment for aggregate shape
Vt = adjustment for traffic effects

Basic binder application rate (Bb)

Binder application rate Bb: Determine the binder application rate for the proposed seal by using the formula:

- Bb =VF x ALD(L/m^2) where VF is the design voids factor and ALD is the average least dimension of aggregate.

Allowance applied to the basic binder application rate

General: Make allowances for:

- Surface texture of existing surface to Austroads AGPT04K (2018) Table 6.3 and Section 6.2.2 for asphalt, microsurfacing, concrete, timber and primed surfaces.
- Potential aggregate embedment into the existing surface.
- Embedment of aggregate in initial treatments over a soft base or primed surfaces to Austroads AGPT04K (2018) Figure 6.5.
- Potential binder absorption allowance into the existing pavement to Austroads AGPT04K (2018) Section 6.2.4 for:

  - Initial seals for each type of pavements, granular unbound, cementitious binders, bitumen stabilised, with chemical binders ranging from -0.1 to +0.2 L/m^2 allowance factor.
  - Reseals will seldom be a problem unless the surface is visibly open and porous.
- Potential binder absorption into the sealing aggregate for porous e.g. sandstone or rhyolite, or vesicular e.g. scoria and slags.

Binder factors

Binder factors for single/single seals: To Austroads AGPT04K (2018) Table 6.4.

Binder factors for double/double seals: To Austroads AGPT04K (2018) Table 6.5.

Design binder application rate (Bd)

General: Determine to Austroads AGPT04K (2018) Section 6.4 and Section 6.2.2.

- Design binder application rate, Bd = Bbm + allowances.
- Where Bbm = modified basic binder application rate (rounded to the nearest 0.1 L/m^2)
- Allowances = any applicable allowances.

Geotextile reinforced seals (GRS)

General: Use a minimum fabric mass of 130 g/m^2 and 10 mm aggregate maximum size to reduce potential to puncture the fabric. Use 14 mm aggregate for heavier fabric to Austroads AGPT04K (2018) Section 5.5.4.

Binder fabric retention allowance: To the Geotextile reinforced seals table.

Geotextile reinforced seals table

Geotextile grade	**Application**	**Retention allowance (L/m^2)**
130 – 140 g/m^2	Resealing	0.9 to 1.0
175 – 200 g/m^2	Initial seal on low quality base material	1.1 to 1.3
Source: Austroads AGPT04K (2018) Table 6.6.		

Bond coat

Application of bond coat: Conform to the following:

- Apply the bond coat to the existing surface as a proportion of the binder fabric retention allowance. Add the balance of the fabric retention allowance to the seal coat on top of the fabric.
- Make sure the bond coat is sufficient to hold the fabric in place, without bleeding through the fabric and adhering to the tyres of the fabric spreading and rolling equipment.
- Bond coat application rate: 0.4 - 0.8 L/m^2 .

Fibre reinforced seals (FRS)

Binder application rate: Use similar procedures as for conventional sprayed seals.

Binder allowance for glass fibres: To Austroads AGPT04K (2018) Table 6.7.

Aggregate spread rate

General: The aggregate spread rate is influenced by ALD and design traffic.

- Make sure the binder application rate fills the voids in the aggregate to a depth of about two-thirds up the aggregate.
- The aggregate spread rate for low traffic roads (less than 200 v/l/d) is 5% heavier than that that for heavier trafficked roads.
- When ordering aggregate for works, make an additional allowance for stockpile wastage.

Single/single seals aggregate spread rates

Aggregate spread rates: To the **Aggregates rates for single/single seals table**.

Aggregate rates to the single/single seals table

Binder	Aggregate spread rate (m^2/m^3)
C170, C240, C320, Multigrade bitumen, PMB	900/ALD
Emulsion, AMC4 and AMC5 cutback binders	800/ALD
Application	
Scatter coat	400
SAMI	1000/ALD to 1100/ALD
Source: Austroads AGPT04K (2018) Table 6.8, 6.9 and 6.10.	

Double/double seals aggregate spread rates

Aggregate spread rates for first application: To the **Aggregates rates for double/double seal first application table**.

Aggregates rates for double/double seal first application table

Binder	Aggregate spread rate (m^2/m^3)
C170, C240, C320, Multigrade bitumen, PMB	950/ALD
Emulsion, AMC4 and AMC5 cutback binders	850/ALD
Note: As for single/single seals, the design aggregate spread rate is based on ALD, but the first layer of aggregate is reduced by about 10% to provide a slightly more open mosaic to allow the second application of aggregate to firmly interlock.	
Source: Austroads AGPT04K (2018) Table 6.11.	

Aggregate spread rates for first application: To the **Aggregate rates for double/double seal second application table**. If the second application for the double/double seal is delayed use **Aggregate rates to the single/single seals table** to determine aggregate spread rates.

Aggregates rates for double/double seal second application table

Binder	Aggregate size mm	Aggregate spread rate (m^2/m^3)
All binder types	10, 7	900/ALD
	5 (No ALD)	225
Note: For the second aggregate application the design spread rate is 20% less than for single/single seal design based on the spread rate of the first application.		
Source: Austroads AGPT04K (2018) Table 6.12.		

Testing

Quality

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

Pavement surface preparation: To the ball penetration test Austroads AG:PT/T251 (2010).

Execution

Storage and handling of raw materials

Aggregates

Aggregate stockpile: Arrange and manage as follows:

- Lot size: As per accepted inspection and test plan (ITP) requirements.

- Stockpile location: Locate each stockpile on firm levelled ground that sheds water away from the stockpile. Separate stockpiles to prevent cross-contamination and interfering with loading and/or precoating operations.
- Stockpiles clearances: Allow adequate clearance between machinery and overhead power lines.
- Stockpile management: Prevent environmental damage from dust or bituminous material run-off.
- Signpost: Show stockpile quantity and material type at all times.
- Contamination prevention: If necessary, cover stockpiles to reduce contamination by dust or water.
- Recovery from stockpiles: Avoid contaminating aggregates.
- Contamination: Observe effect of weathering and dust causing a reduction in effectiveness of precoat of aggregates in stockpiles: Rectify or replace stockpile.

Binder

Heating of binder at time of application: Conform to the following:

- Heating temperature: ≤ 200°C and to the manufacturer's recommendations.
- Do not use overheated bituminous material.
- If there are no manufacturer's recommendations, adopt the temperature guidelines in AfPA Advisory Note 7 (2019).

Storage and handling: Store and handle binder to Austroads AGPT08 (2019) Section 10.3.2 and as follows:

- Time and temperature: To the manufacturer's recommendation.
- Procedures: Flush binders with liquids or other materials to prevent segregation and contamination.
- Straining devices: Use at all times for transferring binders into sprayers to eliminate hardened bituminous material particles or other contaminants that may block spraying jets.

Pavement surface condition for spraying

Surface condition assessment

Flexible pavement base and subbase: Assess for conformance to *1141 Flexible pavement base and subbase*. Obtain all as-constructed granular pavement results including moisture content, dryback and compaction before spraying.

Pavement surface hardness: Before any spray seal surface treatments, perform embedment test as follows:

- Method: To Austroads AG:PT/T251 (2010).
- Time of testing: Within 48 hours before application of sprayed seal.
- Embedment value allowance: To Austroads AGPT04K (2018) clause 6.2.3.

Defective pavement surface

Rectification: Do not start sprayed sealing work until defects in the pavement surface have been rectified.

Defects requiring rectification: Before starting sprayed sealing work, inspect for pavement defects that may adversely affect the quality of the finished work including the following:

- Excessive moisture in unbound granular base requiring priming or initial sealing.
- Loose, poorly bonded, or inadequately compacted materials in the surface of unbound granular base requiring priming or initial seal.
- Poorly shaped unbound granular base requiring priming or initial seal.
- Soft, fatty or bleeding patches in pavements requiring resealing.
- Uncured patching materials.
- For rectification of crack sealing conform to Austroads ATS 3470 (2022).
- Porous patches in surface requiring resealing.
- Significant variations in surface texture requiring corrective treatment before resealing.
- Inadequate repair of weak or cracked pavements.
- Inadequate curing of primed surfaces before sealing.

- Inadequate curing of initial seal pavements before resealing. Generally allow minimum 12 months curing for cutback bitumen primerbinders.

Preparation of pavement surface

Surface preparation: Conform to the following:

- Before the application of primer, primerbinder or binder, sweep pavement surface with a rotary road broom or suction broom to provide a uniformly clean surface.
- If necessary, carry out further sweeping by hand, using stiff brooms.
- Extend sweeping at least 300 mm beyond the edge of each spraying area.
- If sealing work is carried out on localised areas and/or half pavement widths, remove any remaining loose material from the pavement surface immediately adjacent to the swept areas.
- Remove adherent patches of foreign material from the surface of the pavement.
- Remove raised pavement markers and replace with temporary markers.

Pavement temperature and weather conditions

Measure and record pavement temperatures: At regular intervals during the course of the work, using appropriate equipment and measurement procedures.

Pavement is partly in sun and partly in shade: Record the temperatures for both conditions. Use the lower recorded temperature as a basis for spraying and selection of cutter oil proportions requirements.

Binders: Spray only if the pavement temperature, one hour before start of spraying and during the spraying period, conforms to **Pavement temperature table**.

Ambient temperatures: Do not spray below that recommended unless the risk of poor bitumen adhesion can be adequately managed through suitable type and proportion of cutter oil, traffic control, speed of aggregate covering, rolling and aftercare of completed work.

Pavement temperature table

Binder type	**Minimum pavement temperature (°C)**	
	with cutter oil	**without cutter oil**
Hot bitumen	15	35
Polymer modified binder[a]	20	45[b]
Crumb rubber bitumen	20	45[b]
Bitumen emulsion	-	5
a. Does not apply to SAMI seals. b. This will vary by binder type and could be as high as 65°C in some cases.		

Surface condition

Wet pavement: Do not carry out spraying on a wet pavement, if rain appears imminent or during strong winds or dust storms.

Surfaces for priming: Surface dry, and no more than damp to the depth of pavement penetration.

Surfaces for initial sealing: Damp, but not wet. If necessary, lightly water the pavement surface shortly before applying the primerbinder.

Surfaces for sealing: Dry and free of loose material.

Preparation of aggregates

Precoating of aggregate

Requirement: Precoat aggregate to provide a complete, light, uniform, effective cover of all aggregate particles at the time of spreading.

Precoating for stockpile: Precoat at the quarry, or on site as follows:

- Bitumen based materials: Use a bitumen, cutter oil and adhesion agent mixture or bitumen emulsion formulated for precoating aggregate materials so that a thin film of bitumen adheres to the aggregate.
- Curing period for bitumen mixtures: As per accepted local practice.
- Precoated aggregates stockpiled for more than one month: Re-assess precoating effectiveness and determine if rejuvenation is required before use.
- Protection of stockpiles: Cover stockpiles to prevent dust settlement, moisture penetration or drying out of aggregate precoating.

Precoating for immediate use: Precoat on site as follows:

- Use bitumen cutter oil mixture, cutter oil or bitumen emulsion specifically formulated for use as aggregate precoating material.
- Adhesion agent: Add 1% (by volume) of agent to oil based precoating materials if aggregates are damp or when the weather conditions are unfavourable, humid conditions or if rain is imminent.
- Field precoating of aggregates for immediate use: Do not carry out when rain is imminent. If aggregates have been precoated and rain appears imminent, adequately cover the aggregates to prevent the fresh precoating material being washed from the aggregate particles.

Application rate of precoating agent: Conform to the following:

- Application rate: Determine rate based on the **Typical precoating rates table**.
- Porous aggregates: Increase rates by up to 2 L/m^3 from the values in the **Typical precoating rates table**.
- Smooth, hard aggregates: Reduce by up to 2 L/m^3 from the values in the **Typical precoating rates table**.

Typical precoating rates table

Aggregate condition	**Precoating material (L/m^3)**	
	Bitumen based, including bitumen emulsions	**Oil based**
Clean	6 to 12	4 to 10
Dirty	8 to 14	6 to 12

Preparation of bitumen binder

Adding cutter oil

Requirement: If cutter oil is required, add to binder in conformance with the following:

- Oil content:
  - Class 170 or 320 bitumen, polymer modified binders: To the **Basic cutting practice guide for bitumen and modified binder table** and adjust as required to establish local conditions and practice.
- Temperature of binder when adding cutter oil: To the **Binder temperature table**.
- Moisture contamination: Make sure materials added to hot binder are free of moisture. Check materials considered at risk from moisture contamination, with a water-finding paste before use, for example, drummed materials stored in the open.
- Standard bitumen binders: Place hot binder into the sprayer followed by the cutter oil.
- Polymer modified bitumen binders, including crumb rubber binders: Place hot binder into the sprayer followed by the cutter oil.
- Circulating sprayer load: Circulate the sprayer load of cutback bitumen at a rate of not less than 700 litres/min (approximately 350 rpm) for minimum 20 minutes before spraying.

Returned cutback bitumen: If part of a sprayer load is not used on the day of mixing and needs to be returned to the heater tanks, place it in a tank reserved for that purpose. Do not add bitumen or cutter oil to the returned bitumen unless the tank is fitted with an effective circulation system. When the returned bitumen is subsequently used as part of a sprayer

load, make allowance for the cutter oil contained in the returned cutback bitumen mix to be used the next day.

Spraying temperature: To the **Cutback bitumen spraying temperature table.** Interpolate spraying temperatures for proportions of cutter oil between those shown in the table.

Basic cutting practice guide for bitumen and modified binders table

Pavement Temperature (°C)	**Traffic (vehicles/lane/day)[a]**					
	Unmodified C170, C240, C320		**Low modified S10E, S15E, S35E, S10R**		**High Modified S20E, S25E, S45R, S15RF, S18RF**	
	< 500	**> 500**	**< 500**	**> 500**	**< 500**	**> 500**
14–20	4	2	5	3	6	4
21 - 27	2	0	3	2	4	2
28–34	0	0	2	0	2	0
>35	0	0	0	0	0	0
a. Where local specifications differ from the above table it is advisable to mutually agree with the client the contractual requirements. Note: This provides a basic guide of the amount of cutter to be added as a percentage by volume of the total binder measured at 15°C. Refer to Austroads AGPT04K (2018) Table E1. Source AfPA Work Tip No. 14 (2010).						

Binder temperature table

Binder type	**Temperatures for adding cutter oil (°C)**
Bitumen Class 170, Multigrade 600/170	160 - 180
Bitumen Class 320	170 - 190
PMB	Within a range of 10°C below the maximum recommended application temperature.

Cutback bitumen spraying temperature table

AS grade (if applicable)	**Viscosity at 60°C(Pa.s)**	**Equivalent cutter oil content (%)**	**Temperature range (°C)**
AMC 00	0.008-0.016	56	ambient
AMC 0	0.025-0.05	44	35 – 55
AMC 1	0.06-0.12	34	60 – 80
AMC 2	0.22-0.44	27	75 – 100
AMC 3	0.55-1.1	21	95 – 115
AMC 4	2.0-4.0	16	110 – 135
AMC 5	5.5-11	11	120 – 150
		9	130 – 155
AMC 6	13.0-26.0	7	135 – 160
		5	145 – 170
AMC 7	43.0-86.0	3	150 – 175
		2	155 – 180

Adding bitumen adhesion agent

Requirement: If bitumen adhesion agent is required, add oil to bitumen in conformance with the following:

- Circulating sprayer load: Add adhesion agent to the bitumen in the sprayer after adding the last component. Circulate the mixture at a rate of not less than 700 litres/min for 20 minutes, , before spraying.
- Bitumen containing adhesion agent: If not used within 8 hours of mixing agent with hot bitumen, disregard the active contribution of adhesion agent in subsequent use of the bitumen material. Make allowance for the oil component of the adhesion agent in the returned bitumen.

Application of prime, primerbinder and binder

Prime and primerbinder

Class and grade of prime and primerbinder: To **ANNEXURE – SCHEDULE OF JOB DETAILS**.

Application rate of primerbinder: To Austroads AGPT04K (2018) Table 4.3.

Temperature at mixing and spraying: Measure application rates and quantities of primer and primerbinder applied to the mixture at 15°C, including cutter oil or water content of the bitumen emulsion.

Prime drying period: At least 72 hours after applying primer. If required, allow additional time for the prime to dry completely before applying binder for seals.

Traffic restrictions: Conform to the following:

- Keep all traffic off the primed surface.
- If limited traffic access is required to the primed surface, apply a light layer of sand on the surface to avoid pickup. Do not apply gritting until a substantial proportion of the primer has been absorbed into the pavement.

Binder

Class or type of bitumen: To the **ANNEXURE – SCHEDULE OF JOB DETAILS**, including for modified bitumen, cutback bitumen or bitumen emulsion.

Application rate and binder quantity: Allow as follows:

- Base rates on bitumen volume measured at 15°C, not including adhesion agent, cutter oil or water content of emulsions.
- If adhesion agent and/or cutter oil has been added to the binder, adjust the binder application rate at 15°C to suit the adhesion agent and oil content in the mixture.

Forward speed of bitumen sprayer: Determine speed based on either of the following:

- Hot application rate of total binder: Including adhesion agent and/or cutter oil.
- Temperature and adhesion agent and cutter oil content, measured at 15°C.

Volume correction factors: Convert the volume of bituminous binders from 15°C to elevated temperatures, or from elevated temperatures back to 15°C to the **Volume conversion for bitumen* table** or **Volume conversion table for bitumen emulsion**.

Application of sprayed bituminous surfacing

Plant and equipment

Spraying: Use a mechanical sprayer to apply prime, primerbinder and binder.

- Use a mechanical sprayer to apply prime, primerbinder and binder.
- A current sprayer certificate issued by a registered testing authority.

Spray nozzles: Use nozzles which conform to the following:

- Make and type endorsed on the sprayer certificate.
- Nozzles types used on the spray bar of the sprayer: Compatible with the nature of the binder type to be sprayed and its application rate.
- Replace damaged, or unduly worn or defective nozzles.

Aggregate spreading equipment: Use mechanical spreader capable of achieving a uniform spread rate.

Rollers: Use rollers that conform to the following:

- Pneumatic tyred multi-wheel rollers: With a minimum mass of 7 tonnes mass, smooth tyres and a minimum tyre pressure of 550 kPa.
- Combination rollers: With a rubber coated, vibratory drum on one axle and pneumatic tyres on the other.
- Capable of achieving effective incorporation of incorporating aggregates into the binder without breaking breakdown or crushing of the cover aggregates.

Non-conforming plant: Remove plant or equipment not fully operational or not capable of carrying out the works in conformance with this worksection.

Spraying area

Extent of spray run: Limit the spraying area to that can be covered with aggregates within 15 minutes of spraying.

Adjacent longitudinal spray runs

Where overlap is not required: Use special type end nozzles or intermediate nozzles set with a jig as end nozzles.

Where an overlap is required: Provide the following overlaps between adjacent longitudinal runs:

- Overlap of spray between adjacent longitudinal runs: 50 mm For special type end nozzles or jig set intermediate nozzles: 50 mm.
- Overlap of adjacent longitudinal sprays if For intermediate nozzles set in the normal manner: 300 mm.

Spraying operation

Procedure: Spray prime, primerbinder or binder onto surface as follows:

- Start of spraying: Start spraying for each sprayer run on a protective strip of heavy paper laid across and held securely to the pavement surface.
- Sprayer movement: Start moving the sprayer at a sufficient distance in advance of the protective strip to attain the road speed for correct application.
- Road speed: Maintain a constant road speed throughout the length of each sprayer run.
- End of sprayer run: Terminate each spraying run on protective paper laid across and held securely to the pavement surface beforehand.
- Hand spraying: If required, use hand spray equipment attached to the sprayer for small areas or areas of irregular shape.
- After each sprayer run: Check the quantity of binder sprayed against the area covered. If the actual application rate is not within the required limits, make adjustments to achieve the target required application rate in subsequent runs.

Defective equipment: Cease spraying immediately if any defect develops in the spraying equipment. Rectify the fault before further spraying.

Blockages: If any nozzle blockages occurs, cease spraying immediately. Do not recommence spraying until the cause of the blockage is identified and rectified.

Non-conforming sprayed areas: Areas not within 5% of the required application rate (except for small runs less than 1000 m).

Temperature

Bituminous material temperature: If the temperature is below the lower limits in the **Binder temperature table** or **Cutback bitumen spraying temperature table,** heat the bituminous material to Austroads AP-G41 (2015) Section 7.

Geotextile

Placing geotextile: If required in the **ANNEXURE – SCHEDULE OF JOB DETAILS**, place geotextile as follows:

- Use a purpose-built geotextile fabric spreading device.
- Fix the geotextile to the pavement smoothly and without wrinkles.
- Rate of application of Tack coat: Included in, and not additional to, the overall design binder application rate for the geotextile reinforced seal (including allowances for surface texture and absorption by the fabric).

Joints: Overlap minimum 200 mm or as recommended.

Longitudinal joints: Do not place in wheel paths.

Aggregate spreading and rolling

Spreading

Spreading time: Spread aggregates as soon as practicable after binder spraying has commenced and complete within 15 minutes of spraying.

Spreader calibration: Calibrate spreader to Austroads AP-PWT34 (2014) as follows:

- To Austroads AG:PT/T537 (2005), for-using aggregates from the stockpile for the works.
- Calibrate off-road.
- Calibration site: With sufficient length to allow the aggregate spreader to reach normal operational speed before applying the aggregates.
- Calibrate the total width of the aggregate spreader.
- Spreading process: Spread aggregate as follows:
  - Application: Apply the required sized aggregates for the desired application rate.
  - Aggregate quantity: Make sure there are sufficiently loaded trucks at the site to provide full cover for the sprayed area.
  - Coverage: Spread the aggregates over the sprayed area uniformly with a mechanical spreader.
  - Bare or insufficiently covered areas: Re-run with a mechanical spreader or cover by hand to provide uniform and complete coverage.
  - Localised excess aggregates: Remove any local excess of aggregate before rolling.

Rolling

Rolling process: Roll areas covered with aggregates as follows:

- Rollers and rolling area: Supply sufficient pneumatic tyred multi-wheel rollers to cover the sprayed areas to the **Area that can be effectively rolled table**.
- Rolling time: Schedule rolling times. Allow adequate time at the end of the day's work so that the last materials spread for each day receives the same amount of rolling as that placed earlier in the day.
- Initial rolling: Carry out after the aggregates are applied to each work section with one or more rollers. Continue initial rolling until the aggregates firmly adhere to the primerbinder or binder.
- Rolling period: Reduce the amount of rolling while the aggregate is wet, but resume normal rolling as soon as aggregate dries. Avoid trafficking during this period, or keep to a minimum speed, until aggregate has dried sufficiently.
- Unevenly distributed aggregate: If the aggregates are not evenly distributed over the pavement surface, traverse the surface with a light drag broom after the initial rolling, without dislodging aggregate particles bedded in the primerbinder or binder.
- If drag brooming is not used: Substitute with light hand brooming.
- Carry out backrolling until the total sprayed area achieves the roller hours to the **Area that can be effectively rolled table**.
- After adhesion: After the aggregates have been evenly distributed and are adhered to the binder, remove any remaining loose aggregate particles from the pavement.

Area that can be effectively rolled table

Aggregate size (mm)	**Traffic Volume (vehicles per lane per day)**		
	< 300 v/l/d[a]	**300 – 1200 v/l/d[a]**	**> 1200 v/l/d[a]**
	Rolling rate (m^2/roller hour)		
7 or smaller	4500 – 5000	5000 – 5500	5500 – 6000

Aggregate size (mm)	Traffic Volume (vehicles per lane per day)		
	< 300 v/l/d[a]	300 – 1200 v/l/d[a]	> 1200 v/l/d[a]
	Rolling rate (m^2/roller hour)		
10	3000 – 3500	3500 – 4000	4500 – 5000
14	2500 – 3000	3000 – 3500	3500 – 4000
a. Traffic volume. Note: Area that can be rolled, per hour, with each pneumatic tyred multi-wheel roller.			

Spreading and rolling variations for different seal types

Single/single seals: Apply a single application of aggregates on a single application of binder, roll the seal and, if required, light hand or drag broom.

Single/double seals: Apply the second application of aggregates after initial rolling of the first application, and before final rolling and trafficking.

Double/double seals:

- Binder and aggregates are applied on the same day: Complete the first application as a single/single seal. Reduce the aggregate application by 10% of that required for a single/single seal. Apply the second application of binder, followed by a second aggregate application, at a rate required to fill the voids. Roll and remove any remaining loose aggregates.
- Bitumen emulsion as the binder in the first application: Do not apply the second binder until the binder in the first coat is completely broken to form a stable seal.
- Trafficking the first application: Allow trafficking for a period not exceeding several weeks. Complete the first application as a single/single seal and reduce the aggregates in the second application by 30% to fill the voids from the first application.
- Second application applied after a significant period of trafficking: Complete both applications as single/single seals.

Performance

Bituminous surfaces

Completed surface: Make sure the complete surface conforms to Austroads AGPT04K (2018) and the following:

- Generally: The work has clean, straight edges and no obvious defects related to poorly constructed longitudinal or transverse joints, blocked spray nozzles or any other fault related to spray seal workmanship.
- Cured primes: Have a uniform appearance.
- Primerseals and single/single seals with maximum 7 mm aggregates: Have a uniform surface and retains a matrix of aggregates.
- Single/single seals with minimum 10 mm aggregates: Have a uniform, single retained layer of aggregate.
- Single/double seals: Have a uniform layer of retained aggregate with both sizes fitting together to produce a uniform surface texture.
- Double/double seals: Have uniform double retained layers of aggregate with the second layer of aggregate fitting inside the texture of the aggregate used in the first layer.

Testing

Quality

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

Laboratory testing

Requirements: Test the properties required by the worksection as follows:

- Perform in a NATA accredited laboratory (for the required test method) in conformance with procedures required by the relevant Austroads Test Method or Australian Standard.
- If there is no applicable Australian Standard or Austroads Test Method or if the Standard or Test Method provides a choice of procedures, adopt a procedure endorsed by the state road authority where the work is undertaken.

Exceptions: Requirements for NATA accredited laboratories do not apply to field tests such as surface texture measurements or aggregate spreader calibration. These may be completed by competent, trained personnel.

Removal of loose aggregates

Loose aggregate particles removal

Surface of seals with minimum 10 mm aggregates: After final sweeping and before the removal of speed restriction and warning signs, make sure the number of loose aggregate particles remaining on the surface do not to exceed the values in the **Limits for loose stone particles remaining after sweeping table**.

Aggregate windrows: Remove any windrows on the sealed surface or shoulder that may be a traffic hazard. If required, remove all surplus aggregates.

Timing: Complete the removal from the trafficked pavement to the **Time limit guide for removal of loose aggregate table**.

Limits for loose stone particles remaining after sweeping table

Road type	**Maximum loose stones (particles/m^2)**
Urban areas	20
Other medium to high traffic (> 250 v/l/d)	30
Low traffic (< 250 v/l/d)	40

Time limit guide for removal of loose aggregates table

Traffic volume	**Maximum time limit**
> 2000 and all freeways	Within 8 hours of sealing
1000 to 2000	Within 24 hours of sealing
250 to 1000	Within 48 hours of sealing
< 250	Within 5 days of sealing

Safety and protection

Newly completed surfacing

Warning signs: Provide signage to protect the public as follows:

- Provide signs and temporary raised pavement markers to warn the public of loose stones and absence of linemarkings.
- Maintain signs until loose aggregates have been removed and linemarkings are reinstated.

Services and fixtures adjacent to the surfacing area

Protection: Take precautions to prevent the prime, primerbinder, binder, aggregates or other materials used on the work from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridges, culvert decks and other road fixtures.

Cleaning: Immediately after spreading aggregates, clean off or remove any sprayed material on the services and/or road fixtures. Leave in a condition equivalent to that before spraying.

Defects liability period

Responsibility: Protect the new work and correction of any defects occurring within the defects liability period with the exception of damage caused by accident and other events outside the control of the contractor.

Removal of surplus and waste materials

Final cleaning

Completion: Before leaving the work site, uncover and clean all services. Remove from site all waste from the sprayed sealing operations, including paper. Clean the stockpile sites and store any excess material in a tidy heap or remove, if required.

Disposal

Special requirements: For disposal of surplus aggregate at stockpile sites specify additional requirements or include in the **ANNEXURE - SCHEDULE OF JOB DETAILS**.

Non-conformance

General

Non-conforming works: Provide remedial treatment as directed to provide the required level of service. Annexures

Annexures

Annexure – project requirements

Definition of project requirements

Take the following actions to prepare the **ANNEXURE - SCHEDULE OF JOB DETAILS** and schedule of rates:

- Define scope of work. In addition to a description of location, the limits of work should also be clearly marked on the road pavement.
- Define type of sprayed seal treatment.
- Define aggregate class and minimum PSV or PAFV, if required.
- Define binder type or grade.
- Include details of traffic for design purposes.
- Include any special design requirements, if applicable.
- Prepare and insert special clauses for submission of sprayed seal design details in advance of sprayed sealing work, if applicable.
- Prepare price schedule based on the scope of work and method of measurement and payment.
- Prepare a schedule for sites available for the stockpiling of aggregates, if applicable.
- Prepare and insert special clauses for removal of loose aggregate by suction broom, if applicable.
- Prepare and insert special clauses for reinstatement of line marking, if applicable.
- Prepare and insert clauses for any other special job requirements, if applicable.

Annexure – Schedule of job details

Item	Road name	Location			Approx. length (m)	Approx. width (m)	Approx. area (m^2)	Treatment			Aggregate			Traffic		Estimated rates of application		Other requirements[k]
		Map ref.[a]	Chainage	Distance				Type[b]	Description[c]	Application[d]	Size(s)	Min. class[e]	Min. PSV/PAFV[f]	v/l/d[g]	Heavy veh. (%)[h]	Binder (L/m^2)[i]	Aggregates (L/m^2/m^3)[j]	
20mm	Various									D/D	20/10	B	48		20%			Bottom layer
10mm	Various									D/D	20/10	B	48		20%			Top layer

Notes:

a. Map references: Nominate directory used.

b. Treatment type: Prime only (PO), Primerseal (PS), Prime and seal (P&S), Reseal (R).

c. Treatment description: Strain alleviating membrane (SAM), Strain alleviating membrane interlayer (SAMI), Geotextile reinforced seal (GRS), Surface enrichment (SE).

d. Number of applications: Single/single (S/S), Single/double (S/D), Double/double (both immediate) $(D/D)_i$, Double/double (delayed second) $(D/D)_d$.

e. Aggregate Class: A, B or C (AS 2758.2 (2021)).

f. Aggregates PSV or PAFV: Generally 48 for Class A aggregates.

g. Vehicle/lane/day (v/l/d): Use design traffic calculation methods included in Austroads AGPT04K (2018 2019) or Austroads AP-T310 (2016).

h. % Heavy vehicles: Percentage of AADT that are counted as heavy vehicles.

i. Estimated binder application rate: For tendering purposes only, actual rates to be determined after measuring surface and aggregate properties.

j. Estimated aggregate spread rate: For tendering purposes only, actual rates to be determined after measuring of aggregate ALD.

k. Other requirements: May include job specific requirements such as binder type or surface pretreatment

Annexure - Volume conversion tables

Volume conversion for bitumen table

Multiply by "A" to reduce volume at T°C to volume at 15°C Multiply by "B" to increase volume at 15°C to volume at T°C					
A	**Temp. (T °C)**	**B**	**A**	**Temp. (T °C)**	**B**
0.9856	38	1.0146	**0.9356**	**120**	**1.0688**
0.9844	**40**	**1.0158**	0.9344	122	1.0702
0.9831	42	1.0172	0.9332	124	1.0716
0.9819	44	1.0184	0.9320	126	1.0730
0.9806	46	1.0198	0.9308	128	1.0743
0.9794	48	1.0210	**0.9296**	**130**	**1.0757**
0.9782	**50**	**1.0223**	0.9284	132	1.0771
0.9769	52	1.0236	0.9272	134	1.0785
0.9757	54	1.0249	0.9260	136	1.0799
0.9745	56	1.0262	0.9249	138	1.0812
0.9732	58	1.0275	**0.9237**	**140**	**1.0826**
0.9720	**60**	**1.0288**	0.9225	142	1.0840
0.9708	62	1.0301	0.9213	144	1.0854
0.9695	64	1.0315	0.9201	146	1.0868
0.9683	66	1.0327	0.9189	148	1.0883
0.9671	68	1.0340	**0.9178**	**150**	**1.0896**
0.9659	**70**	**1.0353**	0.9166	152	1.0910
0.9646	72	1.0367	0.9154	154	1.0924
0.9634	74	1.0380	0.9142	156	1.0939
0.9622	76	1.0393	0.9130	158	1.0953
0.9610	78	1.0406	**0.9119**	**160**	**1.0966**
0.9597	**80**	**1.0420**	0.9107	162	1.0981
0.9585	82	1.0433	0.9095	164	1.0995
0.9573	84	1.0446	0.9084	166	1.1009
0.9561	86	1.0459	0.9072	168	1.1023
0.9549	88	1.0472	**0.9060**	**170**	**1.1038**
0.9537	**90**	**1.0486**	0.9049	172	1.1051
0.9524	92	1.0500	0.9037	174	1.1066
0.9512	94	1.0513	0.9025	176	1.1080
0.9500	96	1.0526	0.9014	178	1.1094
0.9488	98	1.0540	**0.9002**	**180**	**1.1109**
0.9476	**100**	**1.0553**	0.8990	182	1.1123
0.9464	102	1.0566	0.8979	184	1.1137
0.9452	104	1.0580	0.8967	186	1.1152
0.9440	106	1.0593	0.8956	188	1.1166
0.9428	108	1.0607	**0.8944**	**190**	**1.1181**
0.9416	**110**	**1.0620**	0.8933	192	1.1195
0.9404	112	1.0634	0.8921	194	1.1209
0.9392	114	1.0647	0.8909	196	1.1224
0.9380	116	1.0661	0.8898	198	1.1239
0.9368	118	1.0675	**0.8886**	**200**	**1.1253**
Note: Including for cutback bitumen					

Volume conversion table for bitumen emulsion

Hot litres x A = Cold litres (at 15°C) Cold litres x B = Hot litres (T°C)								
60% bitumen emulsion			**70% bitumen emulsion**			**80% bitumen emulsion**		
A	**Temp. (T°C)**	**B**	**A**	**Temp. (T°C)**	**B**	**A**	**Temp. (T°C)**	**B**
1.0000	15	1.0000	1.0000	15	1.0000	1.0000	15	1.0000

Hot litres x A = Cold litres (at 15°C) Cold litres x B = Hot litres (T°C)								
60% bitumen emulsion			**70% bitumen emulsion**			**80% bitumen emulsion**		
A	**Temp. (T°C)**	**B**	**A**	**Temp. (T°C)**	**B**	**A**	**Temp. (T°C)**	**B**
0.9998	16	1.0002	**0.9977**	**20**	**1.0023**	**0.9974**	**20**	**1.0026**
0.9989	18	1.0011	0.9951	25	1.0049	0.9948	25	1.0052
0.9980	**20**	**1.0020**	**0.9924**	**30**	**1.0076**	**0.9921**	**30**	**1.0079**
0.9971	22	1.0029	0.9899	35	1.0102	0.9895	35	1.0106
0.9962	24	1.0038	0.9872	40	1.0129	0.9868	40	1.0134
0.9953	26	1.0047	0.9840	46	1.0162	0.9837	46	1.0166
0.9944	28	1.0056	0.9830	48	1.0172	0.9826	48	1.0177
0.9935	**30**	**1.0065**	**0.9819**	**50**	**1.0184**	**0.9816**	**50**	**1.0187**
0.9926	32	1.0074	0.9809	52	1.0194	0.9805	52	1.0199
0.9917	34	1.0083	0.9798	54	1.0206	0.9794	54	1.0210
0.9908	36	1.0092	0.9788	56	1.0216	0.9783	56	1.0222
0.9899	38	1.0102	0.9777	58	1.0228	0.9773	58	1.0232
0.9890	**40**	**1.0111**	**0.9767**	**60**	**1.0238**	**0.9762**	**60**	**1.0244**
0.9881	42	1.0120	0.9752	62	1.0254	0.9751	62	1.0255
0.9872	44	1.0129	0.9746	64	1.0260	0.9740	64	1.0267
0.9863	46	1.0138	0.9736	66	1.0271	0.9730	66	1.0277
0.9854	48	1.0148	0.9725	68	1.0282	0.9719	68	1.0289
0.9845	**50**	**1.0157**	**0.9715**	**70**	**1.0293**	**0.9709**	**70**	**1.0300**
0.9836	52	1.0166	0.9704	72	1.0305	0.9698	72	1.0311
0.9827	54	1.0176	0.9693	74	1.0316	0.9687	74	1.0323
0.9818	56	1.0185	0.9683	76	1.0327	0.9677	76	1.0334
0.9809	58	1.0194	0.9672	78	1.0339	0.9667	78	1.0344
0.9800	**60**	**1.0204**	**0.9662**	**80**	**1.0349**	**0.9656**	**80**	**1.0356**
0.9791	62	1.0213	0.9651	82	1.0361	0.9643	82	1.0370
0.9782	64	1.0222	0.9640	84	1.0373	0.9630	84	1.0384
0.9773	66	1.0232	0.9630	86	1.0384	0.9616	86	1.0399
0.9764	68	1.0241	0.9619	88	1.0396	0.9603	88	1.0413
0.9755	**70**	**1.0251**	**0.9608**	**90**	**1.0407**	**0.9590**	**90**	**1.0427**

Annexure – Summary of hold and witness points

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS, Products and materials Mix design – Type and source of constituent materials; Test certificates	H	Documentation on material type, source and test certificates as evidence of conformance for each constituent	3 weeks before commencement	Spray sealing
SUBMISSIONS, Execution details Sprayed seal design	H	Sprayed seal design details	2 weeks before commencement	Spray sealing
SUBMISSIONS, Records Plant and equipment	H	Sprayer calibration certificate and Proof of insurances	2 weeks before using plant	Spray sealing
INSPECTIONS, Notice Surface preparation	H	Completed preparation and rectification of pavement surface defects.	2 days before spraying surfacing	Spraying of primer, primerbinder or binder

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
	W for dried back moisture	Contractor supplied test certificates for dried back moisture % prior to sealing.		
INSPECTIONS, Notice Prime/binder application	H	Complete sprayed surface plan	2 days before spreading aggregate	Aggregate spreading
INSPECTIONS, Notice Aggregate spreading and rolling	H	Completed rolled surface with linemarkings, services fixtures and warning signs cleaned and in place	1 day before inspection	Opening to traffic
INSPECTIONS, Notice Non-conforming sections	W	Completed remedial treatment of non-conforming sections	1 day before the inspection	Linemarking application and opening to traffic
SUBMISSIONS, Records Work-as-executed documentation (WAE)	-	Documents of final completed works. Contractor to provide **Schedule of Job details** of WAE.	On completion	Materials actually used.
Note: H = Hold Point, W = Witness Point				

Annexure – Maximum lot sizes and minimum test frequencies

Sprayed bituminous surfacing table

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	**Material quality – Supplier's documentary evidence and certification of**			
	Standard classes of bitumen	1 tanker load	1 per tanker load	AS 2008 (2013)
	Multigrade bitumen	1 tanker load	1 per tanker load	AS 2008 (2013)
	Polymer modified binder	1 tanker load	1 per tanker load	Austroads AGPT/T190 (2019)
	Bitumen emulsion	1 tanker load	1 per tanker load	AS 1160 (1996)
	Cutback bitumen	1 tanker load	1 per tanker load	AS 2157 (1997)
	Adhesion agent	1 delivery	1 per delivery	
	Cutter oil	1 delivery/ tanker	1 per delivery/tanker	AS 3568 (2020) and Austroads AP-T344 (2019).
	Aggregate precoating material	1 delivery/ tanker	1 per delivery/ tanker	
	Aggregate	1 contract	As per ITP	AS 2758.2 (2021)
	Protective paper	1 contract	1 per sprayer run	
	Flakiness index			AS 1141.15 (1999)

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	ALD for 5 mm and 7 mm aggregate			AS 1141.20.2 (2000)
	ALD for 10 mm or larger aggregate			AS 1141.20.1 (2000)
	- Geotextile	1 contract	As per Austroads AGPT04K (2018)	Austroads AP-T37 (2005)
Pavement surface hardness	Embedment value allowance	2,000 m²	As per Austroads AGPT04K (2018)	Austroads AG:PT/T251 (2010)
Application rates	Binder	1 day's operation	Calculate per spray run	
	Aggregates	1 day's operation	Calculate per spray run	
Note: or part thereof, per lot				

Annexure – Pay items

The two options of measurement by area or length or measurement of actual quantities are used.

Measurement by area or length table

Pay Items	Unit of measurement	Schedule rate scope
1143.1 Priming, primersealing or sealing	Area - m²	No deductions for openings not exceeding 1 m² each. All costs associated with priming, initial sealing or sealing.
1143.2 Removal and disposal of existing raised pavement markers	Measured by length in kilometres	
1143.3 Traffic management	As per agreed contract	To *1101 Traffic management*.

Measurement by quantity of material supplied table

Pay items	Unit of measurement	Schedule rate scope
1143.4 Supply and spray prime or primer binder (including preparation of surface) at 15°C	Litres Determine the quantities (in litres) by either: - Multiplying the target application rate of the combined primer or primerbinder mixture of primer or primerbinder (including any cutter oil) at 15°C (in litres/m²) by the area of road surface sprayed for each sprayer run (in m²); or - Measurement of actual volume (at 15°C) of materials used.	All reasonable costs associated with the surface preparation and supply and spray of prime or primebinder
1143.5 Supply and spray binder (including adhesion agent where required, and surface preparation at 15°C	Litres Determine the quantities (in litres) by either: - Multiplying the target application rate of the residual (excluding any cutter oil) at 15°C (in litres/m²) by the area of road surface sprayed for each sprayer run (in m²); or - Measurement of actual volume (at 15°C) of materials used.	All costs associated with the supply and spray of binder.

Pay items	Unit of measurement	Schedule rate scope
1143.6 Supply, incorporate and spray cutter oil and adhesion agent in binder at ambient temperature or 15°C	Litre Determine the quantities from either: - The target proportion of cutter, oil or adhesion agent added to the binder; or - Measurement of actual volume of materials used.	All costs associated with the supply of cutter oil and adhesion agent in the binder.
1143.7 Supply, precoat, apply aggregates	m^3 or as per Schedule of rates Volume. Determine the quantity of aggregates (in m^3) by dividing the area of road surface covered by each sprayer run (in m^2) by the target application rate (in m^2/m^3)	All costs associated with the supply, precoat and application of aggregates
1143.8 Roll and incorporate aggregates	m^2	All costs associated with the rolling of aggregates
1143.9 Supply and place geotextile	m^2 Pavement area covered - m^2	All costs associated with the supply and placement of geotextile to exclude laps and application of binder and aggregates.
1143.10 Sweeping	m^2	All costs associated with sweeping before and after sealing

Non-conformance

Requirement: Apply the following if the work or materials supplied are not within the documented requirements:

- Offset the reduced service life arising from the non-conformance by reducing payment for the non-conforming portion of work or material by the method defined in **ANNEXURE – SCHEDULE OF JOB DETAILS**.
- Any other remedial treatment that is expected to provide the required level of service.

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1141		Methods for sampling and testing aggregates
AS 1141.15	1999	Flakiness index
AS 1141.20.1	2000	Average least dimension - Direct measurement (nominal size 10 mm and greater)
AS 1141.20.2	2000	Average least dimension - Direct measurement (nominal sizes 5 mm and 7 mm)
AS 1160	1996	Bitumen emulsions for the construction and maintenance of pavements
AS 2008	2013	Bitumen for pavements
AS 2157	1997	Cutback bitumen
AS 2758		Aggregates and rock for engineering purposes
AS 2758.2	2021	Specification for sealing aggregate
AS 3568	2020	Oils for reducing the viscosity of bituminous binders for pavements
AfPA Advisory Note 7	2019	Guide to the heating and storage of binders for sprayed sealing
AfPA Work Tip No. 14	2010	Sprayed seal cutting practice
ARRB HFS Guide	2018	High friction surface guide to good practice
Austroads AGPT		Guide to pavement technology
Austroads AGPT04F	2017	Bituminous binders
Austroads AGPT04K	2018	Selection and design of sprayed seal
Austroads AGPT08	2019	Pavement Construction
Austroads AGPT/T190	2019	Specification framework for polymer modified binders
Austroads AG:PT/T251	2010	Ball penetration test
Austroads AG:PT/T537	2005	Field spread rate of cover aggregate
Austroads AP-C87	2015	Austroads glossary of terms

Austroads AP-G41	2015	Bituminous materials safety guide
Austroads AP-PWT34	2014	Sprayed Sealing: Calibration of Bitumen Sprayers
Austroads AP-T37	2005	Geotextile reinforced seals
Austroads AP-T310	2016	Selection and design of initial treatments for sprayed seal surfacings
Austroads AP-T344	2019	Relationships between cutter oil properties and sprayed seal performance
Austroads ATS		Austroads technical specifications
Austroads ATS 3110	2023	Technical specification for the supply of polymer modified binders
Austroads ATS 3120	2021	Supply of aggregate for sprayed seals
Austroads ATS 3460	2020	Sprayed bituminous surfacing
Austroads ATS 3470	2022	Bituminous pavement crack sealing
NATSPEC GEN 025		Sprayed preservation surfacing treatments
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

1161 In situ pavement stabilisation using cementitious binders

General

Responsibilities

General

Requirement: Provide in situ stabilisation of pavement courses, as documented.

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*.
- *1112 Earthworks (Road reserve)*.
- *1113 Subgrade and formation stabilisation.*
- *1141 Flexible pavement base and subbase*.

Standards

General

Standard: To Austroads AGPT04D (2019).

Interpretation

Abbreviations

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

- CBR: California bearing ratio.
- OMC: Optimum moisture content.
- PI: Plasticity index.
- SMDD: Standard maximum dry density.
- UCS: Unconfined compressive strength.

Definitions

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

- Allowable working time: Measured from the commencement of incorporating/mixing the first application of the stabilisation binder into the unstabilised pavement materials to the completion of trimming.
- Binder: A binder is any material mixed/added to the pavement for improvement in pavement qualities.
- Bulking: The increase in volume of a layer designated for stabilisation resulting from preliminary pulverisation and/or incorporation of stabilisation binder.
- Pozzolan: A siliceous or alumino 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.
- Spreader: A truck-mounted mechanised spreader equipped with calibrated load cells and capable of uniformly spreading powdered binders at controlled application rates.
- Stabilisation: The process by which the intrinsic properties of a pavement material are permanently altered by the addition of a stabilisation binder and/or granular material to meet performance expectations in its operating, geological and climatic environment.

- Stabilisation binders: Materials that are used for the purpose of improving the properties of a pavement material. They are categorised in terms of their main constituents.
- Stabilised material: Any material that has been stabilised by the controlled application of a binder or granular material to improve the load carrying capacity of a pavement layer (usually the basecourse).
- Stabiliser: A specialised plant/machine with a centrally mounted mixing chamber, that can be connected to a watercart for moisture control and allows uniformity of mixing and depth control during the stabilisation process.

Tolerances

Cementitious blends

Mass of components of the nominated cementitious blend: ±3% from the blend percentages in the nominated mix.

In-situ application of stabilisation binder

Spread rate tolerances: ±10% from nominated rate.

Width

Minimum width measured at any point of the stabilised layer: Not less than the documented width by more than 50 mm.

Levels

Surface levels: Conform to the following:

- Base and subbase: –5 mm, +10 mm of design levels.

Surface quality

Maximum deviation from a 3 m straightedge: 10 mm, after secondary trimming and immediately before sealing.

Layer thickness

Base and subbase: Within -5 mm and +15 mm of the documented layer thickness.

Submissions

Certification

Stabilisation mix(es): Submit details and certification from a laboratory accredited by NATA for the relevant test methods as evidence of conformity of the mix and its constituent materials to the nominated mix design.

- Materials proposed: Submit details of source and certificates of compliance from a NATA accredited laboratory as evidence that the materials conform to documented requirements.

Execution details

Proposal for construction: Submit details of proposed method, equipment and procedures.

Trial section: Submit documentation demonstrating conformity of the trial section including:

- Record data of actual spread rate to verify conformance to the nominal rates.
- Compaction test results from a NATA accredited laboratory verifying the required relative compaction has been achieved for the trial section.
- Depth check records showing thickness of stabilised layer.
- Survey report of finished levels (only where survey is required as part of the project).
- Record data of straightedge test.

Joints: Submit details of location and types of construction joints.

Records

In situ application of stabilisation binder:

- Spread rate: Submit record data from tray/mat tests or on-board load cells for spread of stabilisation binder.

- Daily record sheet.

In situ mixing:

- Stabilised layer depth: Submit record data of stabilised layer depth.

Trimming:

- Survey report of finished levels (only where survey is required as part of the project).
- Survey report of compacted thickness for stationary plant mixed pavements (only where survey is required as part of the project).

Completion:

- Surface quality: Submit record data of straightedge test.

Tests

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

Variations

Nominated mix design: Submit details if the source, nature or type of any constituent material, or the proportion of any constituent materials is varied from the nominated mix design for correction or adjustment.

Inspections

Notice

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

- Trial section: Location, materials, methods, equipment, procedures and joint construction.

Materials

Cement

General

Standard: To AS 3972 (2010).

Storage and transport

Storage period: Re-test cement that has been stored for a period in excess of three months from the time of manufacture.

Transport: Transport cement in water tight packaging and protect from moisture until used. Do not use caked or lumpy cement.

Quicklime

General

Standard: To AS 1672.1 (1997).

Properties

Available lime - calcium oxide: Not less than 85%.

Active slaking time: Not greater than twenty minutes.

Temperature rise on slaking: Not less than 40°C in six minutes.

Particle size distribution of quicklime table

AS sieve size (mm)	% passing
13.2	100
9.5	96–100
4.75	70–100
2.36	0–90

Hydrated lime

General

Standard: To AS 1672.1 (1997).

Properties

Available lime - calcium hydroxide: Not less than 80%.

Form: Dry powder.

Residue on a 300 µm sieve: Not more than 2%.

Ground granulated blast furnace slag

General

Standard: To AS 3582.2 (2016).

Fly ash

General

Standard: To AS/NZS 3582.1 (2016).

Cementitious blends

General

Requirement: Conform to the blend proportion and constituents in the nominated mix design in the **ANNEXURE – STABILISATION SCHEDULES.**

Handling and storage

Requirements: Conform to the supplier's handling and storage recommendations.

Granular material additive

General

Additional granular material: To **ANNEXURE – STABILISATION SCHEDULES, Granular stabilisation schedule.**

Granular stabilised material: To **Unbound base and subbase materials** in *1141 Flexible pavement base and subbase*.

Water

General

Requirement: Use clean water, free from harmful amounts of materials such as oil, salt, acid, alkali and organic or vegetable matter. Potable water will not require testing for conformity.

Content: Provide water with less than the following:

- 600 parts per million of chloride ion.
- 400 parts per million of sulfate ion.
- 1% by mass of undissolved solids.

Testing

Quality

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

Execution

General

Weather conditions

Moisture content: Do not proceed with the stabilisation of pavement materials during wet weather or if rain is likely to occur during any stage of the stabilisation process to significantly change the resultant moisture content and its uniformity in the mix.

Wind: Do not proceed with spreading during windy conditions which may cause loss of stabilisation binder, or cause nuisance or danger to people or property.

Stabilisation: Do not carry out stabilisation when the temperature of the material to be stabilised (at a depth of 50 mm in the pavement for in situ stabilisation) is below 5°C or above 45°C.

Allowable working time

General

Requirement: Incorporate/mix the stabilisation binder into the pavement material to be stabilised, trim and shape the surface to level and fully compact the layer to the required density ratio within the maximum allowable working time, as documented.

Maximum allowable working time table

Binder	**Maximum allowable working time (hours)**
Slow setting	
Slag/lime blends	10
Medium setting	
Type GB Cements Cementitious blends[a]	4 As documented
Rapid setting	
Type GP Cement	2
[a] Cementitious blends allowable working time: Conform to **ANNEXURE - STABILISATION SCHEDULES.**	

Trial section

General

Trial section: If required, construct no less than 100 m long trial section for the width of the proposed works and incorporate in the finished works.

Materials and methods: Construct the trial stabilisation using the materials, equipment and methods for placing and finishing the same as would be used for the entire stabilisation works.

In situ application rate of stabilising agent: **To ANNEXURE – STABILISATION SCHEDULES**.

Compaction requirement: To **COMPACTION**.

Width, level, shape and layer thickness requirement: To **TOLERANCES, Width/Level/Shape/Layer thickness.**

Joints: Demonstrate the methods proposed for the construction of joints to conform the documented requirements.

Non-conformance: Assess the non-conforming trial section for fitness for purpose and determine appropriate disposition.

In situ stabilisation – initial surface preparation

Pavement stabilisation

Pre-milling: If asphalt will be placed as a wearing course and the finished surface levels are to match existing kerb and gutter, pre-mill using a profiler to remove the required thickness which will allow for the new wearing surface to be placed later. Alternatively use a profiler to pre-pulverise to

the design thickness (minus 50 mm) and simultaneously remove blended material equivalent to the quantity required to accommodate the final wearing course. The advantage of this process is the incorporation of the existing wearing course into the pavement prior to stabilisation. If asphalt patches are in the existing pavement, pre-mill and cross blend and remove excess material or material not suitable for stabilisation from site.

Pavements with asphalt and cement treated patches: If preliminary sampling and pavement design allow for the incorporation of asphalt and cement treated patches, incorporate in the pavement by pre-milling and cross blending materials uniformly across the full pavement.

Pre-pulverisation of existing material: Pulverise the material to be stabilised with an approved stabiliser or profiler to 50 mm less than the design depth of the stabilised layer. Control the depth of mixing during the initial pulverising pass so that this thin layer of the existing material remains for recycling in the second stabilising pass. Add water so that the material can be compacted and levels cut to provide the stabiliser with the correct surface shape for the second stabilising pass.

Timing of pre-pulverisation:

- After the removal and replacement of material identified as material not suitable for stabilisation.
- Before the addition of shape correction material, if required.
- Before the application of binder.
- Before the application of supplementary binder, if required in stabilisation using foamed bitumen.

Any additional material not suitable for stabilisation that is identified during pre-pulverisation: Remove or pulverise lumps which would otherwise be retained in a 75 mm sieve. Replace the volume of any large size material removed from the site with an equivalent volume of suitable granular material.

Additional granular material: Supply and spread to improve existing pavement material or to correct pavement levels as required.

Surface condition before in situ application of stabilisation binder: Shape, compact and trim the existing surface to facilitate stabilisation, compaction and trimming to the documented alignment, levels and shape.

In situ spreading of stabilisation binders

General

Construction traffic restrictions: Do not allow construction traffic or equipment, except for the centrally mounted mixer and watercart, to pass over the spread binder until incorporated into the pavement.

Cement and cementitious blends

Spreading: Use an approved load calibrated mechanical spreader from a rear or centrally calibrated drop chute capable of recording the output rate at which the binder is applied. Do not use agricultural or tipper-style spreaders. Use spreaders capable of spreading a varying widths through mechanically or manually controlled doors.

Spread rate: Spread stabilisation binder at the nominated spread rate up to a maximum per single spreading pass of 20 kg/m^2.

Record: Document the spread rate.

In situ mixing

General

Rate of work: Complete lane by lane or full width of carriageway in the one day operation.

Pavement bulking: Take into account the degree of bulking to meet documented pavement thickness and finished levels.

Minimum mixing passes: 2.

Additional mixing: If required, carry out additional passes by the mixing equipment to improve visual uniformity of the mix and/or the moisture content.

Stabilised layer: Uniform over the full depth without lenses, pockets, lumps or granules of stabilisation binder.

Mixing equipment: Conform to the following:

- Centrally mounted mixing drum with moisture control.
- Capable of mixing to the documented depth for the layer to be stabilised.
- Minimum power capability: 300 kW (400 hp) for adequate mixing of materials.
- Capable of mixing the stabilising agent uniformly through the full depth and over the whole area of the layer to be stabilised.
- Capable of supplying a calibrated amount of water to the area being agitated by the mixer to provide a uniformly moist mix to the documented moisture content.
- As mixing tools wear, replace to maintain mixing efficiency consistent with that demonstrated during the trial section.
- Do not use tractor or skid steer mounted plant, profilers or graders for mixing of stabilisation binders or moisture addition.

Mixing procedure: Conform to the following:

- In the first pass, mix the binder into the material to 50 mm less than the nominated depth.
- Carry out mixing of the second or final pass to the full documented pavement depth, whilst adding water through the stabiliser.
- Where required, add water after mixing to shape, compact and trim within the allowable working time.

Compaction

General

Requirement: Compact the stabilised layer over the entire area and depth not less than the minimum density requirements as a percentage of the SMDD:

- Cementitious pavement stabilisation: 100%.
- Moisture content of material for compaction: 70% to 90% of OMC.

Timing:

- Start compaction after mixing.
- Complete compaction within the allowable working time.
- Carry out compaction and trimming in a continuous method.

Compacted surface: Keep compacted layer moist, free from contamination and in good condition, until an overlying layer is constructed.

Trimming

General

Primary trimming: After mixing, trim and compact the layer to produce a tight dense surface parallel with the finished wearing surface levels.

Secondary trimming: Trim the layer to meet shape and level requirements in preparation for the overlying layer. Do not use surface slurrying or methods which lead to laminations in the pavement.

Trimmed material: Use trimmed material cut to waste as fill or spoil.

Surface quality: Provide finished surface as follows:

- True to line and level without any loose pockets, holes, bumps and flakes.
- Crowned pavements adjacent to gutter: Straight uniform profile from the crown of the pavement to the lip of the gutter.
- Stabilised road shoulders only: Finished profile that is straight and uniform in crossfall from the edge of the existing pavement to the outer edge of the new pavement.

Levels and thickness control methods

General: Provide controls so that the pavement layer thickness is not reduced during secondary trimming and that the pavement levels are within the documented tolerance.

Level and thickness control methods during construction: Determine levels using either survey or stringline measurements from survey pegs taken at close intervals to reduce longitudinal roughness.

Straightedge test

General: Undertake immediately before sealing or before the agreed practical completion of any work component.

Joints

General

Requirement: Conform to the following:

- Form all joints by cutting back into the previously stabilised and compacted sections.
- Remove cut off material and keep joint area clean.
- Maintain cut face of the previous run in a damp condition.
- When compacting the fresh mix, support the roller partly on the previously compacted run.
- Level and shape of the joints: Within the documented limits.

Longitudinal joints

General: Minimise the need for longitudinal joints. If required, demonstrate that joints are unavoidable. If compaction of adjoining runs cannot be achieved within two hours of incorporating stabilisation binder, form a longitudinal joint between runs.

- Locate along lane marking line or midway between lane marking lines.
- Minimum longitudinal overlap of mixing runs: 150 mm.

Transverse joints

General: Form joints under the following circumstances:

- Before start of the day's stabilising process.
- After any delay in excess of 2 hours in the continuity of the stabilisation process.
- Minimum overlap of transverse joints: 1.5 m.
- Remix the material disturbed during cutting back at full depth and incorporate into the new work.

Curing

General

Traffic: Protect from heavy traffic until cured or the next pavement layer is laid.

Drainage: Maintain drainage for water run-off.

Curing method

Requirement: Cure stabilised material using one of the following methods:

- Water curing: Protect the stabilised work against rapid drying out by keeping it continuously damp during the period before the provision of a subsequent layer or the application of a prime or initial seal. Provide frequent light uniform spray that does not produce significant run off or flooding on sections of the area. Avoid slurrying of the surface or leaching of the stabilising agent.
- Bituminous surfacing.
- Constructing the next layer.

Curing period: As documented, but no longer than 6 calendar days.

Testing

Quality

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

Site tests

In situ spread rate testing: Test spread rate using either of the following methods:

- Weigh the contents of a suitable 4-sided tray placed on the pavement and between the wheels of the mechanical spreader. Calculate the rate of stabilising agent spread by dividing the mass collected (kg) by the area of the tray (m^2). Take into account the mass of the tray/s.
- Weigh the contents of a 1 x 1 m mat placed on the pavement and between the wheels of the mechanical spreader. The mass weighed will be the result in kg/m^2. Take into account the mass of the mat.
- If spreading vehicles are fitted with load cells, ascertain the average spreading rate of the stabilising agent by dividing the mass of the stabilising agent spread per run by the area of the run.

In situ mixing: Measure stabilised layer depth using either of the following methods:

- By measuring the depth of cutting adjacent to an existing pavement in two areas within the lot and measure to nearest 5 mm. Use a stringline to assess the depth of stabilised layer as the difference between finish surface level and the bottom of stabilised layer.
- Survey.

Compaction tests: Conform to the following:

- Test method: Sample and test the lots for true relative compaction assessments within the nominated allowable working time.
- Laboratory density:
- Unbound and modified layers: Test samples to determine maximum dry density (modified compactive effort) in a laboratory to AS 1289.5.2.1 (2017).
- Bound layers: Test samples to determine the maximum dry density (modified or standard compactive effort) to the relevant test method within two hours of adding stabilisation binder to the mix.
- Field density testing: Use either of the following methods:
- Sand replacement method: Test the compacted material to AS 1289.5.3.1 (2004) or 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).
- Relative compaction: To AS 1289.5.7.1 (2006).

Completion tests

Straightedge test: Take measurements with a 3 m straightedge at a minimum of 10 randomly selected stations so as to represent each 200 m lane length or part thereof.

Annexures

Annexure - Stabilisation schedules

General

Requirement: Include the appropriate schedule(s) required for the works.

In situ stabilised pavements using cementitious binders schedule

	A	**B**	**C**
Target depth (mm)	150mm		
Nominated granular material (type)	Natural gravel		
Source of granular material	Gravel pit		
Type of stabilisation binder	Fly ash/Cement		
Blend constituent no. 1	Fly ash – 70%		
Blend constituent no. 2	Cement – 30%		
Blend constituent no. 3	NA		

	A	B	C
Nominated stabilisation binder content (% by mass)	3%		
Minimum unconfined compressive strength of stabilised material (MPa)			
Allowable working time (hours)	Max working time table		
Curing method	Water		
Curing period	48 hours		
Trial section	NA		

Annexure - Summary of hold and witness points

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
SUBMISSIONS, Certification Stabilisation mix(es) and its constituents	H	Details and certification of stabilisation mix(es) and its constituents	14 working days before commencement of works	Stabilisation mix design
SUBMISSIONS, Certification Materials proposed	H	Evidence of material conformance	14 working days before commencement of works	Ordering of materials
SUBMISSIONS, Variations Nominated mix design	H	Details and certification of new stabilisation mix(es) and its constituents.	14 working days before commencement of works	Stabilisation mix design
SUBMISSIONS, Execution details Trial section	H	- Record data of actual spread rate. - Compaction test results from a NATA accredited laboratory. - Survey report of finished levels (where required). - Depth check records showing compacted thickness of stabilised layer. - Record data of straightedge test.	2 working days before commencement of remaining stabilisation works	Commencement of remaining stabilisation works
SUBMISSIONS, Execution details Joints	H	Details of location and types	2 working days before construction of joints	Construction of joints
SUBMISSIONS, Execution details Compaction	H	Test results from a NATA accredited laboratory	2 working days before placement of subsequent layers or bituminous surfacing	Placement of subsequent layer; Bituminous surfacing
SUBMISSIONS, Execution details Trimming	H	- Survey report of finished levels (where required). - Depth check records showing compacted thickness of stabilised layer for in situ stabilisation.	2 working days before placement of subsequent layers or bituminous surfacing	Placement of subsequent layer; Bituminous surfacing

Clause and description	Type	Submission/Inspection	Submission/Notice details	Process held
		- Record data of straightedge test.		
INSPECTIONS, Notice Trial Section	H	Location, materials, equipment, methods and joint construction	2 working days before construction of trial section	Construction of trial section
Note: H = Hold Point, W = Witness Point				

Annexure - Maximum lot sizes and minimum test frequencies

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Material supply	Material quality – Supplier's documentary evidence and certification of:			
	Cement	1 contract	1 per 100 t	AS 3972 (2010) AS 2350 (various)
	Particle size distribution	1 contract	1 per contract	AS 1141.11.1 (2020)
	Hydrated lime			
	Available lime ($Ca(OH)_2$)	1 contract	1 per 100 t	AS 4489.6.1 (1997)
	Residue on sieving	1 contract	1 per contract	AS 4489.2.1 (1997)
	Ground blast furnace slag	1 contract	1 per month	AS 3582.2 (2016)
	Fly ash	1 contract	1 per month	AS/NZS 3582.1 (2016)
	Cementitious blends	1 contract	1 per 100 t	TfNSW QA Spec 3211 (2020) part of R75/M
	Blend proportion	1 contract	1 per mix	TfNSW QA Spec 3211 (2020) part of R75/M
	Water			
	Chloride ion content Maximum 600 parts per million	1 contract	1 per contract per source of water	AS 3583.13 (1991) RMS T1004 (2012) TfNSW R75 (2020)
	Sulfate ion content Maximum 400 parts per million	1 contract	1 per contract per source of water	AS 1289.4.2.1 (2020) RMS T1014 (2012) TfNSW R75 (2020)
	Undissolved solids Maximum 1% by mass	1 contract	1 per contract per source of water	TfNSW R75 (2020)
Mix design	Certification of NATA accredited laboratory – Supplier's documentary evidence and certification	1 mix	1 per mix	Austroads AGPT04D (2019)
In situ spreading	Spread rate	1 day's placement	1 per spreading run	Tray test or mat test
	Binder uniformity	1 day's placement	1 per spreading run	Visual
Mixing	Stabilised depth	1 day's placement	1 per mixing run	Survey or Test hole

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Trimming and compaction	Finished levels	1 day's placement	One cross section per 25 m	Survey
	Surface quality	1 day's placement	10 per lot	3 m straightedge
	Average layer thickness	1 day's placement	1 per lot	Measure/survey (In situ stabilisation).
	Average width	1 day's placement	1 per 50 lineal m.	Measure/survey
	Relative compaction/moisture content	1 day's placement	1 per 500 m², minimum 3 per lot	AS 1289.5.7.1 (2006) AS 1289.5.8.1 (2007) AS 1289.5.3.1 (2004) AS 1289.5.3.2 (2004) AS 1289.5.3.5 (1997)

Annexure - Pay items

Pay items	Unit of measurement	Schedule rate scope
1161.1 Development of mix design	Per test	Unit cost
1161.2 Pre-pulverisation of existing material	m²	All costs associated with pre-pulverisation of existing material including asphalt areas of maximum 50 mm thickness.
1161.3 Supply and spread of additional granular material	Tonne	All costs associated with supply and spread of additional granular material.
1161.4 Supply and delivery of binder	m²	All costs associated with supply and delivery of binder.
1161.5 Spread and mix binder	m²	All costs associated with spreading and mixing binder to the documented thickness with a purpose built mixer.
1161.6 Compacting, trimming and jointing	m²	All costs associated with compacting and trimming to specified levels of density and strength. All costs associated with jointing is also included.
1161.7 Density testing	Per test	All costs associated with collection of samples, delivery, laboratory testing and submitting results.
1161.8 Traffic management	Per shift	To *1101 Traffic management*.

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1141		Methods for sampling and testing aggregates
AS 1141.11.1	2020	Particle size distribution - Sieving method
AS 1289		Methods of testing soils for engineering purposes
AS 1289.4.2.1	2020	Soil chemical tests - Determination of the sulfate content of a natural soil and the sulfate content of the groundwater - Normal method

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 1289.5.7.1	2006	Soil compaction and density tests - Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method)
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 1672		Limes and limestones
AS 1672.1	1997	Limes for building
AS 2350		Methods of testing portland, blended and masonry cements
AS/NZS 3582		Supplementary cementitious materials
AS/NZS 3582.1	2016	Fly ash
AS 3582.2	2016	Slag - Ground granulated blast-furnace
AS 3583		Methods of test for supplementary cementitious materials for use with portland cement
AS 3583.13	1991	Determination of chloride ion content
AS 3972	2010	General purpose and blended cements
AS 4489		Test methods for limes and limestones
AS 4489.2.1	1997	Fineness - Wet sieving
AS 4489.6.1	1997	Lime index - Available lime
Austroads AGPT		Guide to pavement technology
Austroads AGPT04D	2019	Stabilised materials
RMS T1004	2012	Quantitative determination of chloride ion in water
RMS T1014	2012	Quantitative determination of sulfate ion in water
TfNSW QA Spec 3211	2020	Cementitious materials, binders and fillers
TfNSW R75	2020	Insitu pavement stabilisation using slow setting binders

1191 Pavement markings

General

Responsibilities

General

Requirement: Provide pavement markings, as documented.

Authority requirements: This worksection does not override any applicable State or Local Government legislation and is to be read in conjunction with AS 1742.3 (2019) and the applicable State Road Authority pavement marking specification.

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*.
- 1143 Sprayed bituminous surfacing

Standards

General

Pavement markings: To AS 1742.2 (2022).

Harmonisation of pavement markings: To Austroads AP-R578 (2018).

Longitudinal pavement marking: To Austroads ATS 4110 (2021).

Interpretation

Definitions

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

- Anti-skid media: Is white crushed quartz, crushed glass, calcite bauxite aggregates to provide or improve skid resistance of 45BPN or equivalent.
- Longitudinal linemarking: All lines that are generally parallel to the traffic flow, such as centre, lane, edge, turn, continuity and transition lines and outline markings.
- Other markings: All diagonal and chevron markings on the pavement including symbols, words, numerals and arrows, kerb markings and markings for parking.
- Paint: In this worksection implies pavement marking paint.
- Pavement marking: All longitudinal linemarking, transverse lines, raised pavement markers and other markings placed on the road to control traffic movement or parking.
- Thermoplastic material: In this worksection implies thermoplastic pavement marking material. It consists of aggregate, pigment, binder, glass beads and extenders capable of being softened by heating and hardened by cooling.
- Transverse lines: All lines that are marked at right angles to the general traffic flow, such as Stop/Give way lines and pedestrian crosswalk lines.

Tolerances

Marking tolerances table

Marking type and dimension	New installation	Maintenance
Spotting		

Marking type and dimension	New installation	Maintenance
All markings: Documented location	±50 mm	-
Arrows, chevrons, painted medians, painted left turn islands and speed markings: Each dimension	±50 mm	±50 mm of existing marking
Longitudinal linemarkings		
Width	±5 mm	Width of existing marking ±10 mm
Width of gap between adjacent lines	±10 mm	±10 mm
Length	±50 mm	Length of existing marking ±100 mm
Distance between centreline of new and existing	-	< 15 mm
Transverse lines and other markings		
Width	±10 mm	Width of existing marking ±10 mm
Length	±10 mm	Width of existing marking ±10 mm
Raised pavement markers		
Documented location: Transverse	±25 mm	-
Documented location: Longitudinal	±100 mm	
From other markers in the same line for a distance of 1.5 m	±25 mm	-
Documented direction	±4°	-

Submissions

Execution details

Methods of application: Submit method of application of materials and methods to protect the work from premature trafficking.

Removal of redundant markings: Submit details of method for removing redundant pavement markings.

Products and materials

Material properties: Submit test reports from a registered laboratory verifying material property conformance, including for paint, glass beads, raised pavement markers and thermoplastic material.

- Test currency: Not older than 3 years.

Samples

Permanent pavement marking tape: If marking tape is required, submit samples and product details for approval.

Tests

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

Warranties

Manufacturer's warranty: Submit the manufacturer's published product warranties for all materials and components.

Inspections

Notice

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

- Setting out: Completion of pavement marking set-out.
- Surface preparation: Completes surface preparation, before applying pavement markings.
- Completion: Completed pavement marking.

Materials

Pavement marking paint

General

Road pavement marking: For longitudinal lines, conform to the following:

- White and/or yellow road marking paint.
- White and/or yellow thermoplastic or cold applied plastic material.

Type

Waterborne paint: To AS 4049.3 (2005).

Solvent-borne paint: Do not use without prior approval conform to AS 4049.1 (2005).

Anti-skid pavement markings

Properties

Anti-skid materials: Angular, polishing resistant particles which provide skid resistance. Apply anti-skid media, if the skid resistance on the existing is less than 45 BPN or equivalent.

- Colour: Compatible with marking colour.

Particle size:

- For transverse lines and other markings: 0.4 to 0.7 mm.
- For longitudinal linemarking: 0 to 2.0 mm.

Thermoplastic material

Standard

Thermoplastic marking: To AS 4049.2 (2005).

Non-profile thermoplastic pavement marking material

Longitudinal linemarkings: Sprayed or extruded thermoplastics applied uniformly.

Transverse lines and other markings: Screeded or preformed thermoplastic.

Two-part cold applied plastic pavement marking material

Properties

Skid resistance: To AS 4049.2 (2005) Appendix L.

Grip test: To DPTI TP343 (2015).

Luminance: To AS 4049.2 (2005) Appendix G. Luminance factor > 75%

Reflectivity: To AS 4049.2 (2005) Appendix M.

Degree of wear: AS 4049.2 (2005) Appendix N.

Lead content: Not greater than 0.25% to ASTM D3335 (1985).

No-pick-up time: Measured at 23°C and to AS/NZS 1580.401.8 (1997), as follows:

- For trowel or screed applied material (containing intermix glass beads): Maximum 20 minutes for 2.0 ±0.25 mm applied film thickness.
- For spray material (not containing glass beads): Maximum 5 minutes for 0.200 ±0.025 mm applied film thickness.

For light colour pavement surface luminance factor: Not less than 80% as delivered.

Abrasion resistance: Loss in mass not exceeding 0.3 g for 500 cycles to AS 4049.2 (2005) Appendix G.

Longitudinal linemarking: Sprayed material.

Transverse lines and other markings: Trowelled, screeded, sprayed or extruded material.

Reflective glass beads

Properties

Glass beads for pavement marking: To AS/NZS 2009 (2006).

Glass bead proportion: Incorporate glass beads in thermoplastic material as follows:

- In the proportion of a minimum 20% of the total mass.
- As part of the aggregate constituent and conforming to AS/NZS 2009 (2006).

Glass beads: Conform to the following:

- Bead type: B-HR, C-HR or D-HR.
- Type D-HR for use with thermoplastic applications: Provide with a proprietary adhesive coating and in clearly labelled packaging.

Pavement marking tape

Type

Temporary markings: Strippable tape.

Raised pavement markers

Classification type

Markers: Reflective and non-reflective markers to AS/NZS 1906.3 (2017), to the documented dimensions.

Adhesive to wearing surface: Hot melt bitumen adhesive.

Tests

Sampling: To AS/NZS 1906.3 (2017).

Testing

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.

Execution

General

Protection of work

Protection of markings: Protect markings until the material has hardened sufficiently so that traffic will not cause damage.

Material application

Pavement marking paint: Provide in conformance with the following:

- Permanent markings: To all wearing surfaces.
- Temporary markings: To surfaces other than final wearing surfaces.

Thermoplastic pavement marking material: Install where permanent markings are required.

Pavement marking tape: Use where temporary markings on final wearing surfaces are required.

Reflective glass beads: Apply to all painted and thermoplastic markings.

Raised pavement markers: Install as permanent and temporary markings, as documented.

Cold applied plastics: Install to the manufacturer's recommendations.

Pavement marking finish

Pavement marking appearance: Straight or with smooth, even curves, where applicable.

Edges: Clean, sharp cut off.

Faulty application beyond defined edge: Remove and leave a neat and smooth marking on the wearing surface of the pavement.

Establishment

Colour

All pavement marking materials: White Y35 to AS 2700 (2011) with a luminance factor not less than 80% to AS 4049.3 (2005).

Anti-skid materials: White, equivalent to or whiter than Y35, Off White to AS 2700 (2011).

Setting out

Locations: Place all markings as documented.

Surface preparation

Application surface: Apply to clean dry surfaces only. Clean the surface, make sure there is a satisfactory bond between the markings and wearing surface of the pavement.

Existing material: If the existing surface is flaking, chipping or in a condition where adhesion of new material to the road surface cannot be guaranteed for the required life of the marking, obtain approval for the proposed extent and method of surface preparation.

Curing compound applied to new rigid concrete pavement surface: Remove by physical abrasion such as grinding or blasting.

Wet weather: Do not carry out pavement marking during wet weather or if rain is likely to fall during the process.

Raised markers on concrete wearing surface: Lightly scabble the full area under each marker to remove fine mortar material (laitance).

Paint marking

General

Glass bead application: Apply to a smooth surface.

Mixing of paint

Requirement: Thoroughly mix all paint in its original container before use to produce a smooth uniform product, consistent with the freshly manufactured product.

Application of paint and beads

Paint thickness excluding surface applied beads: Apply uniformly and at the following minimum dry film thickness:

- Type B beads for transverse lines and other markings: 0.20 mm.
- Type D-HR beads for longitudinal linemarkings: 0.30 mm.

Ambient conditions for applying paint with glass beads: For optimum performance and durability, incorporate glass beads under the following conditions:

- Air and pavement temperature: > 15°C.

- Relative humidity: > 70%.
- Air movement: 10 km/hr (reasonable air movement).
- Protection of markings from traffic during the drying process.

Hand spraying: Hand spraying with the use of templates to control the pattern and shape is permitted for transverse lines, symbols, legends, arrows and chevrons.

Longitudinal lines

Paint application: Spray lines in conformance with the following:

- With a self-propelling machine.
- Two sets of lines forming a one-way or two-way barrier line pattern: Spray concurrently.

Glass bead application rate: Conform to the following:

- Type D-HR beads: Apply to the surface of all longitudinal lines at a minimum application rate of 0.50 kg/m2 immediately after applying the paint.
- Actual application rate: Set to overcome any loss of beads between the bead dispenser and the sprayed line.

Other markings

Dimensions: Conform to local or state requirements for the following:

- Arrows.
- Chevrons.
- Painted medians.
- Painted left turn islands.
- Speed markings.

Thickness of non-profile markings: Maximum 6 mm.

Arrows and speed markings: Place square with the centreline of the traffic lane.

Glass bead application: Apply as for other paint markings at the following rate:

- Type B glass beads: Minimum 0.30 kg/m^2, immediately after applying paint.
- Type D-HR glass beads: Minimum 0.5 kg/m^2.

Field measurement of spherical glass bead application rate

Requirement: Measure spherical glass bead application rate onto wet paint or thermoplastic surfaces as follows:

- Turn off the paint or thermoplastic supply valves and operate the glass bead dispenser for 10 seconds, allowing glass beads to run into a plastic bag or tray.
- Pour the glass beads from the bag or tray into a suitable measuring cylinder calibrated in mL to measure the volume of glass beads collected. Level, but do not compact, the glass beads in the cylinder.
- Compare the volume of glass beads collected with that in **Volume of glass beads (mL) required in 10 seconds of operation table**.

Volume required for 0.50 kg/m^2: For the calibration of application rates to suit type D-HR beads, alter the **Volume of glass beads (mL) required in 10 seconds of operation table** to 0.50 kg/m^2.

Volume of glass beads (mL) required in 10 seconds of operation table

Road speed (km/h)	**Line widths**				
	80 mm	**100 mm**	**120 mm**	**150 mm**	**200 mm**
8	396	495	594	742	990
13	643	804	965	1207	1698
16	791	990	1188	1484	1484
Notes: 1. These figures are calculated for an actual application rate of 0.34 kg/m^2 and are used for calibrating the machine because there is a loss of beads between the bead dispenser and the marked line and the volume is measured with beads not compacted.					

Road speed (km/h)	Line widths				
	80 mm	100 mm	120 mm	150 mm	200 mm
2. Tolerance of +10% is permissible when measuring these volumes. 3. If using two or more glass bead dispensers, check each dispenser separately to make up the required totals. 4. Glass beads weigh approximately 1.53 g/mL.					

Anti-skid material

Surface application: Apply anti-skid material before applying glass beads.

Anti-skid material application rates for transverse lines and other markings

Material stirred into paint before application: Minimum 500 g/L.

Material surface applied: Minimum 200 g/m².

Thermoplastic (non-profile) marking

General

Arrows and speed markings: Place square with the centreline of the traffic lane.

Application of thermoplastic materials and beads: Uniformly apply the thermoplastic material.

Preparation of thermoplastic material on site

Heating: Immediately before application, uniformly heat the thermoplastic material in a suitable kettle to the temperature recommended by the manufacturer without overheating.

Molten pot life: Maximum 6 hours for hydrocarbon resins and 4 hours for wood and gum resins.

Discard: Over-heated resin and/or expired molten materials.

Tack coat

Requirement: Apply where wearing surface of the pavement is smooth or polished.

Application: To the thermoplastic and tack coat manufacturer's recommendations.

Timing: Immediately before applying the thermoplastic material.

Anti-skid materials and glass beads

Bead application: Apply materials conforming to the following:

- Generally: Uniformly apply after application of thermoplastic material to pavement, whilst material is molten.
- Longitudinal lines: Separate bead applications, use application methods which retains bead in the materials.
- Type B glass beads: For lines other than longitudinal lines, apply to screeded markings using an approved method.

Bead application rate: Conform to the following:

- Type B glass beads: Minimum 0.30 kg/m^2.
  . Rate retained in the surface for transverse lines and other markings: Minimum 0.30 kg/m^2.
- Type D-HR glass beads: Minimum 0.50 kg/m^2.
  . Rate retained in the surface for longitudinal lines: Minimum 0.40 kg/m2.

Anti-skid material application rate: Minimum 0.20 k/m^2.

Longitudinal lines

Applying thermoplastic material: Spray lines in conformance with the following:

- With a self-propelling machine.
- Two sets of lines forming a one-way or two-way barrier line: Spray concurrently.
- Application: Apply uniformly with minimum cold film thickness of 1.8 mm.

Bead application: Conform to the following:

- Type B glass beads: Apply by air propulsion or gravity feed to the surface of all lines immediately after application of thermoplastic material.
  - Actual application rate: Set to overcome any loss of beads between the bead dispenser and the sprayed line.
- Application rate: Conform to Anti-skid materials and glass beads.

Transverse lines and other markings

Other marking dimensions: Conform to local or state requirements for the following:

- Arrows.
- Chevrons.
- Painted medians.
- Painted left turn islands.
- Speed markings.

Thickness: 3 mm ±1 mm.

Screeded markings: If required, screed thermoplastic material using a mobile applicator and templates to control the pattern.

Field testing

Thermoplastic material: Verify the cold film thickness applied to the road pavement.

Test method: Use a vernier or suitable dry film thickness gauge to measure the thickness of thermoplastic material applied to a metal test plate. Take the mean of at least 6 readings distributed over the test area.

Field measurement of spherical glass bead application rate

Requirement: Measure to **PAINT MARKING**, **Field measurement of spherical glass bead application rate**.

Two-part cold applied plastic pavement marking

General

Primer: Apply if the surface is concrete, smooth or polished, or where recommended by the manufacturer. Apply to the manufacturer's recommendations.

Anti-skid material and glass beads: Uniformly apply onto the two-part cold applied material while fluid and immediately after it has been applied to the pavement.

Longitudinal lines

Bead applications: Separate bead application. Use methods which retain beads in the material.

Application rates for two-part cold applied pavement materials and glass beads table

Material	**Longitudinal linemarking**	**Transverse lines and other markings**	
	Sprayed application	**Trowelled, screeded or extruded**	**Sprayed**
Cold applied material thickness (excluding surface applied beads)	0.5 ±0.05 mm (wet)	2.0 ±0.2 mm (dry)	1.00 ±0.1 mm (wet)
Completed marking thickness	-	-	2.0 ±0.2 mm
Surface applied glass beads[a]:			
Type (AS/NZS 2009 (2006))	Type D-HR (adhesive coated)	Type B	Type B
Rate retained in the painted surface	≥ 400 g/m^2	≥ 300 g/m^2	≥ 300 g/m^2
Anti-skid material	≥ 200 g/m^2	≥ 200 g/m^2	≥ 200 g/m^2

Material	Longitudinal linemarking	Transverse lines and other markings	
	Sprayed application	Trowelled, screeded or extruded	Sprayed
a. Glass beads coated with a compatible coupling agent for an improved adhesive bond with thermoplastic or two-part cold applied road marking material.			

Pavement marking tape

General

Application: To the manufacturer's recommendations.

Removal: If required, remove to the manufacturer's recommendations.

Raised pavement markers

Installation

Adhesive preparation: Freshly heat and mix the adhesive to the manufacturer's recommendations. Do not allow the adhesive to cool and do not reheat before use.

Application of adhesive: Spread the adhesive uniformly over the underside of the marker to a depth of approximately 10 mm.

Fixing marker to pavement: Conform to the following:

- Press marker onto the pavement surface in its correct position and rotate slightly until the adhesive is squeezed out around all edges of the marker.
- Do not disturb the marker until the adhesive has set.

Rough surfaces

Locations: Newly laid coarse sprayed bituminous seals.

Fixing marker to pavement: Conform to the following:

- Apply an initial pad of adhesive 20 mm larger than the diameter of the base of marker.
- Apply adhesive to fill irregularities in the pavement surface to produce a flat, smooth surface, flush with the upper stone level.
- Allow the adhesive pad to set.
- Apply additional adhesive to the pavement in conformance with **Installation** and press down marker onto the adhesive pad on the pavement surface. Make sure there is good adhesion.

Removal of redundant markings

General

Remove or mask immediately before or after placement of new markings. Make sure the surface is clean, undamaged with surface texture, reflectivity characteristics and colour comparable to the adjacent pavement surface. For temporary masking use black non-reflective masking tapes with skid resistance properties.

Removal method

Requirement: Remove marking from wearing surface of pavement as follows:

- Without significant damage to the pavement structure, surface or texture.
- Remove all markings in rectangular areas or blocks.
- Black out markings only as a temporary measure and make sure it has skid resistance properties.
- Use suitable methods of removal by grinding, plane and reseal, sandblasting or high pressure water spraying.
- Repair any damage caused by removal of pavement markings
- Remove redundant pavement marking within 48 hours of application as a temporary measure. Where existing pavement markings are to be removed and replaced, do not remove the pavement marking until the complete installation of the replacement marking has been done.

- Dispose removed marking material in conformance to the EPA guidelines.

Maintenance of pavement markings

General

Requirement: Maintain and replace, if necessary, all raised pavement markers and pavement marking during the contract period and the contract defects liability period.

Level of service: Provide minimum level of service in conformance with the **Performance criteria**.

Performance criteria for longitudinal lines

Dry retroreflectivity

Requirement: To Austroads AG:AM/T017 (2016).

For white longitudinal pavement marking: Conform to the following:

- First 30 days after opening to traffic: 350 mcd/lx/m^2.
- 12 months after opening to traffic: 200 mcd/lx/m^2.
- Intervention level when remarking is required: 150 mcd/lx/m^2.

For yellow longitudinal pavement marking: Conform to the following:

- First 30 days after opening to traffic: 200 mcd/lx/m^2.
- 12 months after opening to traffic: 150 mcd/lx/m^2.
- Intervention level when remarking is required: 100 mcd/lx/m^2.

Wet retroreflectivity

Requirement: To Austroads AG:AM/T017 (2016).

Minimum wet retroreflectivity after application: 80 mcd/lx/m^2.

Colour

Requirement: To AS 4049.4 (2006) Appendix F.

White markings: Whiter than ‘Y35 Off White’ to AS 2700 (2011).

Yellow markings: Equivalent to ‘Y12 Wattle’ or ‘Y15 Golden Yellow’ to AS 2700 (2011).

Non-white colour pavement marking: To AS 4049.4 (2006) Appendix G.

Luminance

Requirement: To AS 4049.4 (2006) Appendix H Method 2.

Luminance factor: Conform to the following:

- For white markings: 80%.
- For yellow markings: 45-50%.
- Minimum retroreflectivity: 100 mcd/lx/m^2.

Skid resistance

Requirement: To AS 4049.4 (2006) Appendix J.

Average skid resistance value (SRV): ≥ 45 BPN or equivalent.

Degree of wear

Requirement: To AS 4049.4 (2006) Appendix L or Appendix M.

Thickness

Requirement: Provide maximum thickness of pavement marking material as 5 mm.

Testing

General: To Austroads AGPT/T800 (2021) for field assessment of pavement marking retroreflectivity.

Requirement: As a minimum perform field testing of dry retroreflectivity within first 30 days after opening to traffic and at the end of the maintenance liability period.

Replacement of markings

Requirement: Replace all longitudinal lines within a 300 m segment where length of the defective line exceeds:

- 36 m continuous or 25% of total on any 300 m lane length on curves and barrier lines or
- 72 m continuous or 50% of total on any 300 m lane length on straights.

Testing

Quality

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

Annexures

Annexure – Summary of hold and witness points

Clause and description	Type	Submission/Inspection details	Submission/Notice times	Process held
SUBMISSIONS, Execution details Removal of redundant markings	H	Removal method of redundant markings.	24 hours before commencement	Removal of markings
SUBMISSIONS, Samples Permanent pavement marking tape	H	Samples and product details.	5 days before commencement	Material ordering and delivery
SUBMISSIONS, Products and materials Type tests, material properties	H	Tests reports verifying material properties.	5 days before commencement	Material ordering and delivery
INSPECTION, Notice Setting out	H	Pavement marking set-out.	5 days before marking application	Marking application
INSPECTION, Notice Surface preparation	H	Completed surface preparation.	1 day before marking application	Marking application
INSPECTION, Notice Completion	W	Completed marking.	1 day before inspection	-
Note: H = Hold Point, W = Witness Point				

Annexure – Maximum lot sizes and minimum test frequencies

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
Materials supply	Material quality – supplier's documentary evidence of:			

Activity	Key quality verification requirements	Maximum lot size	Minimum test frequency	Test method
	Paint	1 contract	1 per contract or change in material	AS 4049.3 (2005)
	Glass beads	1 contract	1 per contract or change in material	AS/NZS 2009 (2006)
	-Thermoplastic material	1 contract	1 per contract or change in material	AS 4049.2 (2005)
	-Raised pavement markers	1 contract	1 per contract or change in material	AS/NZS 1906.3 (2017)
Paint application	Paint marking wet film thickness	1 contract	1 per site visit or change in pressure settings	AS/NZS 1580.107.3 (1997) Method B, comb gauge
	Application rate of glass beads	1 contract	1 per site visit or change in pressure settings	To **PAINT MARKING**, **Field measurement of spherical glass bead application rate**
Thermoplastic application	Cold film thickness	1 contract	1 per site visit or change in pressure settings	Measure by micrometre
	Unbeaded material thickness applied to road pavement	1 contract	1 per contract or change in material	RMS T841 (2001)
	Application rate of glass beads	1 contract	1 per site visit or change in pressure settings	To **THERMOPLASTIC (NON-PROFILE) MARKING**, **Field testing**
Two-part cold applied material application	Lead content	1 contract	1 per contract or change in material	ASTM D3335 (1985)
	No-pick-up time	1 contract	1 per contract or change in material	AS/NZS 1580.401.8 (1997)
	Abrasion resistance	1 contract	1 per contract or change in material	AS 4049.2 (2005) Appendix G

Annexure – Pay items

Pay items	Unit of measurement	Schedule rate inclusions
1191.1 Pavement marking paint – longitudinal lines	Line pattern km (including any gaps). Calculate the area from the specified width (excluding tolerances) and the actual application length measured along the centreline of the longitudinal line.	All costs associated with the setting out of the work, paint and beads and traffic control.
1191.2 Pavement marking paint – Transverse lines, symbols,		Determine the extent of the painted surface by directly measuring the applied markings.

Pay items	Unit of measurement	Schedule rate inclusions
legends, arrows, chevrons, traffic islands and kerbs		All costs associated with the setting out of the work, all material, supply and application and traffic control.
1191.2(1) Transverse lines	Linear metres	
1191.2(2) Arrow	Each	
1191.2(3) Symbols	Each	
1191.2(4) Chevrons	m²	
1191.2(5) Kerbs	Linear metres	
1191.2(6) Traffic Islands	m²	
1191.2(7) Legends	Each or m²	
1191.3 Thermoplastic (or cold Applied Plastics) pavement marking material – longitudinal lines	Line pattern km (including any gaps). Calculate the area from the specified width (excluding tolerances) and the actual application length measured along the centre line of the longitudinal line.	All costs associated with the setting out of the work, tack coating, supply and application of thermoplastic material and beads and provision for traffic.
1191.4 Thermoplastic (or cold Applied Plastics) pavement marking material – transverse lines, symbols, legends and arrows		Determine the extent of the thermoplastic material applied by directly measuring the applied markings. All costs associated with the setting out of the work, tack coating, supply and installation of all material and the provision for traffic.
1191.4(1) Transverse lines	Linear metres	
1191.4(2) Arrow	Each	
1191.4(3) Symbols	Each	
1191.4(4) Chevrons	m²	
1191.4(5) Kerbs	Linear metres	
1191.4(6) Traffic Islands	m²	
1191.4(7) Legends	Each or m²	
1191.5 Raised pavement markers (all applications)	Each marker installed.	All costs associated with the setting out of the work, supply and installation of all material and provision for traffic.
1191.6 Removal of pavement markings	m²	All costs associated with removal and disposal.
Traffic management	Lump sum.	To *1101 Traffic management*.

Annexure - Referenced documents

The following documents are incorporated into this worksection by reference:

AS 1580		Paints and related materials - Methods of test
AS/NZS 1580.107.3	1997	Determination of wet film thickness by gauge
AS/NZS 1580.401.8	1997	No-pick-up time of road marking paints
AS 1742		Manual of uniform traffic control devices
AS 1742.2	2022	Traffic control devices for general use
AS 1742.3	2019	Traffic control for works on roads
AS 1906		Retroreflective materials and devices for road traffic control purposes
AS/NZS 1906.3	2017	Raised pavement markers (retroreflective and non-retroreflective)
AS/NZS 2009	2006	Glass beads for pavement-marking materials

AS 2700	2011	Colour standards for general purposes
AS 4049		Paints and related materials - Pavement marking materials
AS 4049.1	2005	Solvent-borne paint - For use with surface applied glass beads
AS 4049.2	2005	Thermoplastic pavement marking materials - For use with surface applied glass beads
AS 4049.3	2005	Waterborne paint - For use with surface applied glass beads
AS 4049.4	2006	High performance pavement marking systems
Austroads AG:AM/T017	2016	Pavement data collection with a Traffic Speed Deflectometer (TSD) device
Austroads AGPT/T800	2021	Assessment of retroreflectivity of pavement markings
Austroads AP-R578	2018	Harmonisation of pavement markings and national pavement marking specification
Austroads ATS		Austroads technical specifications
Austroads ATS 4110	2021	Longitudinal pavement marking
RMS T841	2001	Field measurement of wet film thickness of road marking paint
SA DPTI TP343	2015	Determination of skid resistance with the micro Griptester
ASTM D3335	1985	Standard test method for low concentrations of lead, cadmium, and cobalt in paint by atomic absorption spectroscopy

Appendix A – Statutory Declaration – Payment of Subcontractors

Appendix B – Statutory Declaration – Payment of Workers

Appendix C – Victorian Standard Treatment Guidelines August 2022

Statutory Declaration – Payment of Subcontractors

Oaths Act 1900 (NSW)

I	Insert full name of Declarant
of	Insert address
do solemnly and sincerely declare that:	
1. I am a representative of ..... ("Contractor")	Insert name of Contractor, and ACN if applicable
A.C.N. ..... in the Office Bearer capacity of	Insert position title of Declarant
2. I personally know the facts that I have set out in this declaration and the exhibit thereto and that they are true and correct in every particular.	
3. The Contractor has a Contract with the Cabonne Shire Council for:	
.....	Insert Contract description and Contract No.
.....	
..... ("Contract") No.	
4. All Subcontractors have been paid by the due date all moneys that have been claimed by them in respect of work or services performed by them in connection with the Contract apart from the Subcontractors listed in the attached "Schedule of Unpaid Subcontractors", who remain unpaid for the respective amounts shown in that Schedule. The Schedule (Exhibit A to this Declaration) consisting of _____ pages also shows the description of the work or services of each such Subcontractor and the Contractor's reasons that the claimed amount(s) is not due and payable in full, or, if due and payable, the reasons why not paid. In this declaration "Subcontractors" includes suppliers, plant and equipment hirers, consultants and other service providers engaged by or contracted to the Contractor in connection with the work under the Contract.	Include in the Schedule names and addresses of the unpaid Subcontractors, the amounts unpaid and whether in respect of materials supplied, work performed, etc. and reasons for non payment. Include number of pages of Exhibit "A".

5. The Contractor has complied with the provisions of the Contract relating to the terms of engagement of Subcontractors of the Contractor.

And I make this solemn declaration conscientiously believing the same to be true and correct in every particular and by virtue of the provisions of the Oaths Act 1900 (NSW) and in the belief that a person making a false declaration is liable to the penalties of perjury.

SIGNATURE OF PERSON MAKING DECLARATION	

Declared at .....in the State of NSW

Insert Place where the declaration is made

On ..... day of ..... , ...

Insert Date of the declaration

Before me:		
	SIGNATURE	
	PRINT NAME	
	ADDRESS	
	QUALIFICATION	Person legally authorised to take a statutory declaration under the Oaths Act 1900 (NSW) or where the declaration is sworn outside the State of New South Wales, any person having authority to administer an oath in that place.

Exhibit "A"

Schedule of Unpaid Subcontractors
Page ……. of ……

Item No.	Subcontractors Name and Address	Works/Services/Goods Supplied	Amount Unpaid	Reasons why claimed amount is not due and payable in full, or if amount claimed is due and payable, reasons why not paid

This is the Exhibit marked "A" referred to in the Statutory Declaration of

_____

(Name of Person making the declaration)

sworn on _____ (date) Before me

(Person legally authorised to take statutory declaration)

Statutory Declaration – Payment of Workers

Oaths Act 1900 (NSW)

I	Insert full name of Declarant
of	Insert address
do solemnly and sincerely declare that:	
1. I am a representative of ..... ("Contractor")	Insert name of Contractor, and ACN if applicable
A.C.N. ..... in the Office Bearer capacity of	Insert position title of Declarant
2. I personally know the facts that I have set out in this declaration and the exhibit thereto and that they are true and correct in every particular.	
3. The Contractor has a Contract with the Roads Corporation for:	
.....	Insert Contract description and Contract No.
.....	
..... ("Contract") No.	
4. All workers engaged by the Contractor in connection with the work under the Contract have, in respect of their employment on work under the Contract:	Include in the Schedule names and addresses of the unpaid workers, the benefits not paid or received or accrued, the amounts unpaid and the reasons for non-payment.
(a) been paid all moneys which at the date of this declaration are due and payable to them; and	
(b) otherwise received or had accrued to their account all benefits to which they are entitled as at the date of this declaration pursuant to any award, enterprise agreement, act or regulation apart from the workers listed in the "Schedule of Unpaid Workers" which list has been anonymised, de-identified and individually coded (but which is capable of re-identification by the Contractor) consisting of _____ pages and attached as Exhibit "A" for the respective amounts and benefits shown in this Schedule. The Schedule also shows the description of the amount or benefit not received or accrued e.g. wages, holiday pay, allowances or superannuation.	Include number of pages of Exhibit "A".

And I make this solemn declaration conscientiously believing the same to be true and correct in every particular and by virtue of the provisions of the Oaths Act 1900 (NSW) and in the belief that a person making a false declaration is liable to the penalties of perjury.

SIGNATURE OF PERSON MAKING DECLARATION	

Declared at .....in the State of New South Wales — Insert Place where the declaration is made

On ..... day of ..... , ... — Insert Date of the declaration

Before me:

SIGNATURE	
PRINT NAME	
ADDRESS	
QUALIFICATION	Person legally authorised to take a statutory declaration under the Oaths Act 1900 (NSW) or where the declaration is sworn outside the State of New South Wales, any person having authority to administer an oath in that place.

Exhibit "A" Schedule of Unpaid Workers Page …… of ……

Contractor's Identification Code for Unpaid Worker	Type of Entitlement / Benefit Unpaid	Amount of Each Entitlement / Benefit Unpaid

This is the Exhibit marked "A" referred to in the Statutory Declaration of

_____ Sworn on _____ (Date)

(Name of person making the declaration)

Before me

(Person legally authorised to take statutory declaration)