



Victoria

AUS-SPEC #2

COUNCIL SPECIFICATION SERIES

CONSTRUCTION

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REVISION C June 2015**

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INTRODUCTION

This Specification series has been developed by the City of Greater Dandenong for use by Council Engineering Staff when undertaking Civic Construction Contracts. The Specifications are generally based on the Aus-Spec model and have been tailored to meet the specific requirements of the City of Greater Dandenong.

These documents may be used as the basis for contracts entered into by Council with Contractors or as the standard requirements of the City.

These documents shall not be used for Developer managed contracts.

REVISION C JUNE 2015

AMNENDMENT IS –

SUPPLY OF RECYCLED MATERIAL FOR ROADWORKS SECTION 257

REVISION B OCTOBER 2007

AMNENDMENT IS –

AUS-SPEC #2 section 261.10 Materials to read:

1. Paint shall comply with the requirements of AS 4049.3 or AS 4049.4 as directed by the Superintendent. In this Specification, the term 'paint' shall mean 'pavement marking paint'.

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CITY OF GREATER DANDENONG

SPECIFICATION

QS

**QUALITY SYSTEM
REQUIREMENTS**

SPECIFICATION QS - CONTRACT QUALITY SYSTEM REQUIREMENTS

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SPECIFICATION QS : CONTRACT QUALITY SYSTEM REQUIREMENTS**GENERAL****QS1 SCOPE**

1. This Specification covers the contractual requirements for the Quality System documentation and operation.

QS2 PREAMBLE

1. The Contractor shall establish, implement and maintain a Quality System in accordance with this Specification and the requirements of AS/NZS 3905.2 and AS/NZS ISO 9002. The Contractor's Quality System shall be accredited by the Civil Contractors Federation or shall be able to achieve accreditation within the next 12 months. For small contracts accreditation to the Civil Contractors Federation scrim level shall be acceptable.

Standards

2. The Quality System as expressed in the Quality Plan shall be used throughout the course of the Contract to ensure that the quality of the Contractor's and any sub-contractor's work complies with the requirements of the Contract Documents. This shall apply to all work under the Contract, both on site and off site.

Applicable to Work On and Off Site

3. Notwithstanding any statements to the contrary in the Contractor's Quality Manual or Quality Plan, no part of the Quality System shall be used to pre-empt, preclude or otherwise negate the requirements of any part of the Contract Documents. Quality System elements shall be used as an aid in achieving compliance with the Contract Documents and documenting such compliance. In no way shall they relieve the Contractor of its responsibility to comply with the Contract Documents.

Compliance with Contract Documents**QS3 REFERENCE DOCUMENTS**

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

Documents Standards Test Methods

AS/NZS 3905.2	Guide to AS/NZS ISO 9001, AS/NZS ISO 9002 and AS/NZS ISO 9003 for construction.
AS/NZS 3913	Quality manuals - Guide to preparation.
AS/NZS ISO 8402	Quality management and quality assurance - Vocabulary.
AS/NZS ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing.
AS/NZS ISO 10013	Guidelines for developing quality manuals.
SAA QS5	Guide to assessment and auditing of quality management systems.

QS4 DEFINITIONS**Synonym or Abbreviation**

1. For the purpose of this Specification, the definitions as in AS/NZS 3905.2 and AS/NZS ISO 8402 and those below apply:

Corrective Action

Measures, including preventative measures, taken to rectify conditions which have caused or might cause nonconformity.

Corrective Action

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Corrective Action Request

A formal advice/instruction from the Superintendent regarding departures from the Quality System or Methods as approved in the Quality Plan. Unless specifically noted, it will not require raising of a Nonconformance Report.

CAR

Disposition

Action to be taken to resolve nonconformance. (Lot Specific)

Rectification

Hold Point

A defined position in the construction/manufacturing stages of the Contract beyond which work shall not proceed without mandatory verification and acceptance by the Superintendent.

HP

The issue of a Nonconformance Report (NCR) or a Notice of Nonconformance (NNC) automatically creates a Hold Point.

Inspection and Test Plan

The working document which identifies the specific inspections and tests to be carried out for works required by the Contract.

ITP

Lot

A lot consists of any part of the works which has been constructed/manufactured under essentially uniform conditions and is essentially homogeneous with respect to material and general appearance.

The whole of the work included in a lot shall be of a uniform quality without obvious changes in attribute values.

Method Statement

A document that specifies the key steps and sequence in the manufacture/construction for an activity; what, how and by whom it shall be done; what materials and equipment shall be used to achieve the required quality standards.

**Procedures
Technical
Procedures Process
Descriptions Specific
Procedures**

Nonconformance Report

A mandatory (standard format) report submitted by the Contractor that details the nonconforming work and the Contractor's proposed disposition of the nonconformance.

NCR

Notice of Nonconformance

Formal instruction from the Superintendent regarding product nonconformance from that specified. It automatically creates a Hold Point and requires a Nonconformance Report from the Contractor.

NNC

Performance Audit

An examination to evaluate whether established methods and procedures are being adhered to in practice.

**· Process
Audit
· Technical
Procedure
Audit**

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· **Methods
Audit**

Product Audit

An assessment of the conformity of the product with the specified technical requirements.

· **Conformance
Audit**
· **Service Audit**

Quality Assurance

The management actions covering planning, quality control testing, inspection and verification procedures integrated with production to provide a product fit for the purpose.

QA

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.

QAR

Quality Check Lists

Forms completed during the manufacture/construction process verifying key steps, and records required for the Quality Register. Check lists apply to each identified lot of work.

Quality Control

The operational techniques and activities that are used to fulfil the requirements of quality.

QC

Quality Management Representative

Appointed by the Contractor for a specific project with the authority and responsibility for the implementation and operation of the Quality Plan, to ensure that Quality System requirements are not subordinated to design and productivity.

QMR

Quality Manual

A document setting out the general quality policies, procedures and practices of an organisation.

QM

Quality Plan

The Quality Assurance documentation specific to a Contract which comprises of the Corporate Quality Manual with its job specific annexures, method statements, inspection and test plans and check lists.

QP

Quality Register

The files containing all quality control records such as test results, completed check lists, certificates of compliance, consignment dockets for materials procured.

QR

Quality System

The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.

QS

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Quality System Elements

The administrative activities affecting quality that need to be implemented and controlled to ensure that the product or a service meets specified quality requirements.

- **System Element**
- **Quality Management Element**

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 System represented by the Quality Manual, Quality Plan and Quality Register to evaluate their effectiveness in meeting the requirements of Australian Standards and the Specification.

Traceability

The ability to trace the history, application or location of an item or activity, or similar items or activities, by means of recorded identification.

Witness Point

A nominated position in the manufacture/construction stages of the Contract where the option of attendance may be exercised by the Superintendent, after notification of the requirement.

WP

Work Instruction

A document that provides detailed guidance for the execution of a particular task.

QS5 ABBREVIATIONS

1. Abbreviations used in this Specification are:

CAR	-	Corrective Action Request
CQS	-	Contract Quality System
HP	-	Hold Point
ITP	-	Inspection and Test Plan
NATA	-	National Association of Testing Authorities
NCR	-	Nonconformance Report
NNC	-	Notice of Nonconformance
QA	-	Quality Assurance
QAR	-	Quality Assurance Representative (Principal)
QM	-	Quality Manual
QMR	-	Quality Management Representative (Contractor)
QP	-	Quality Plan
QR	-	Quality Register
SED	-	System Element Description
WP	-	Witness Point
CQS	-	Contract Quality System

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QUALITY MANUAL AND QUALITY PLAN**QS6 QUALITY MANUAL**

1. The Company Quality Manual shall cover and include the requirements as specified in the Quality System Documentation section of AS/NZS 3905.2 with guidance to preparation by AS/NZS 3913 and AS/NZS ISO 10013.

2. It shall incorporate all applicable System Element Descriptions with reasons for those not regarded as applicable. Additionally it should include standard Method Statements and Inspection and Test Plans for the activities usually undertaken by the Contractor. It would be normal to have these in separate volumes.

SEDS**QS7 QUALITY PLAN**

1. The Quality System shall be incorporated in the Project Quality Plan. The Company Quality Manual with its System Element Descriptions, standard Method Statements and Check Lists and the project specific components make up the Quality Plan. This is illustrated conceptionally in Figure QS1.

Content of QP

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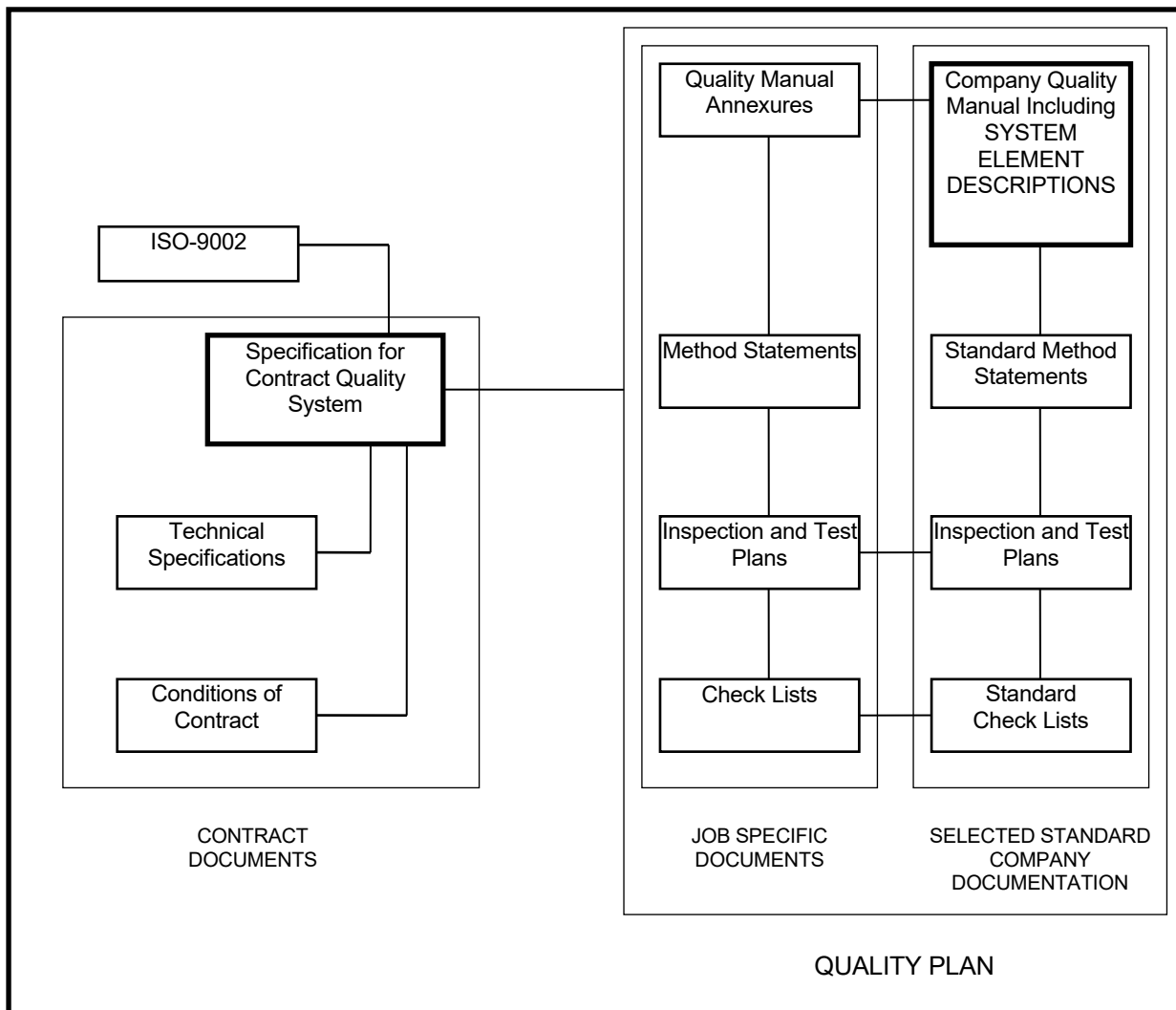


Figure QS1 - Project Quality System Documentation

QS8 ANNEXURES TO QUALITY MANUAL

The following details shall be provided by appropriate annexures to the Company Quality Manual:

QS8.1 Organisation Structure

- The organisation structure for the management of the project with details of the specific responsibilities and authorities of the nominated key personnel. **Structure**
- The Quality Management Representative (QMR) including this person's qualifications, technical experience and present position together with responsibilities and authorities to resolve quality matters. **QMR**
- The personnel or contracted testing organisations who will be conducting each type of compliance inspection of testing of completed works, their experience, qualification and responsibilities. **Personnel**
- The person authorised to change construction processes on site. **Authority for Changes**

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QS8.2 Addenda to System Element Descriptions

The System Element Descriptions in the Company Quality Manual shall be augmented with suitable addenda to satisfy the requirements of this Specification.

***Additional
SEDs***

QS8.3 Register of Method Statements

A Register of Method Statements giving the title, identifier and revision status, shall be provided. This Register shall list all Method Statements that are to be included in the Quality Plan for the Contract and shall include any suitable Method Statements already incorporated in the Company Quality Manual.

Content

JOB SPECIFIC REQUIREMENTS**QS9 GENERAL**

1. In the Quality Plan, the System Element Descriptions in the Company Quality Manual will need augmentation to cover the requirements of AS/NZS ISO 9002, AS/NZS 3905.2 and this Specification. This shall be provided in the form of suitable Annexures or where applicable included in the Method Statements or Inspection and Test Plans.

2. Clause references shown on the right margin (key word column) relate to AS/NZS ISO 9002 and are referenced in AS/NZS 3905.2 unless otherwise stated.

QS10 PROCESS CONTROL - METHOD STATEMENTS

Clause 4.9

1. Method Statements describing in detail how construction processes are to be carried out shall be provided for all activities scheduled in Annexure QS-B. This requirement applies to both contract and subcontracted work. The documentation shall cover, as applicable, planning, methods, verification and control.

Documentation

2. Method Statements shall include, as applicable, the following:

Content

- Responsibilities
- Sequence of operations
- Work methods
- Characteristics and tolerances to be met
- Types of equipment
- Materials
- Safety requirements
- Reference documents
- Records produced

3. The presentation of Method Statements may be either descriptive, in the form of flow charts or a combination of both. In either case it must be accompanied by a Check List which shall include the relevant inspection and test points, surveying control points and Hold Points and the officer responsible to verify each check point.

Presentation

4. A system audit of each Method Statement shall be carried out by the Contractor whilst the process is in effect.

System Audit

5. The absence of a Method Statement for activities where it has been specified will automatically create a **Hold Point**.

Requirement

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QS11 DOCUMENT AND DATA CONTROL

Clause 4.5

1. In addition to the requirements of AS/NZS ISO 9002 and AS/NZS 3905.2, the Quality Plan shall specify the method of keeping Quality Registers, tracking and handling of NCRs and NNCs and site correspondence.

Records

2. A copy of AS/NZS 3905.2 and AS/NZS ISO 9002 shall be kept on site.

AS on Site

QS12 CONTROL OF INSPECTION, MEASURING AND TESTING EQUIPMENT

Clause 4.11

1. The Quality Plan shall include the latest NATA advice of the terms of registration and current signatories for the laboratories which will be providing the compliance test reports.

**NATA
Registration**

2. Inspection, testing and measuring equipment shall be capable of producing the precision and/or degree of accuracy specified in the referenced Test Methods and this shall be demonstrable by records of calibration.

**Equipment
Accuracy**

QS13 PURCHASING

Clause 4.6

1. Except where the contract documents already stipulate another quality system standard for specific products or services, the quality assurance provisions detailed in this Specification shall apply to all subcontracted products or services which constitute work under the Contract.

**QS to Cover
All Work**

2. The Contractor shall ensure that the requirements of AS/NZS ISO 9002, AS/NZS 3905.2 and the requirements of this clause are included in all such subcontracts.

Subcontracts

QS14 INSPECTION AND TESTING

Clause 4.10

QS14.1 Documentation

1. The Quality Plan shall include all inspections, tests and documentation necessary to ensure that the Works comply with Contract Documents.

**General
Inclusions**

QS14.2 Sampling and Testing

1. All compliance inspections and tests shall be based on lots.

Lots

2. The Inspection and Test Plans shall include details of the sampling methods. Sampling shall not be restricted to locations dimensioned or otherwise defined for setting out the Works in the Drawings or Specification, but shall be undertaken in a random or unbiased manner, as approved by the Superintendent, at any location within the Works to demonstrate its compliance with the Specification.

**Random
Sampling**

3. The maximum lot sizes and minimum testing frequencies are listed in the Annexures to the relevant Specifications and/or in Annexure QS-C to this Specification. Where no minimum frequency of testing, or maximum lot size is stated in the Specification, the Inspection and Test Plan(s) shall nominate appropriate frequencies for the Superintendent's approval.

**Lot Sizes
Frequency of
Testing**

4. The Inspection and Test Plans shall also uphold any time limits for testing which may be imposed by the Technical Specifications.

Time Limits

5. Where Test Methods are nominated in the Technical Specifications, sampling and testing shall be carried out by a NATA registered laboratory accredited for those test methods and sampling procedures. Sampling shall be conducted by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and shall be supervised by the approved signatory from that laboratory. Test results shall be

**Sampling and
Testing**

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reported on NATA endorsed test documentation which shall include a statement by the approved signatory certifying that the correct sampling procedures have been followed.

6. In special circumstances the Principal may accredit a laboratory that is not NATA registered for specific tests or inspection procedures.

Special Accreditation

7. Every testing agency or person providing written test reports for any and all testing undertaken shall use unique consecutive project specific serial numbering of the reports for identification and auditing purposes.

Consecutive Numbering

8. The Contractor shall reinstate all core holes, test holes, excavations and any other disturbance resulting from any testing activity. The reinstatement shall be to a standard which is at least equal to the specified requirements for the particular work.

Reinstatement

9. The responsibility for completion of inspections, tests and documentation shall be stated in the Quality Plan.

Testing Responsibility

QS14.3 Hold Points

1. To assure compliance with the specified standards and requirements, mandatory Hold Points shall apply. Hold Points are those stages during the construction/manufacturing process where the Technical Specifications require "approval by the Superintendent" or where a NCR or NNC has been issued. The Contractor shall not proceed past the HP until approval has been received from the Superintendent to proceed. For ease of identification Hold Points may also be annotated on the margins of Technical Specifications.

Superintendent's Approval to Proceed

2. To obtain the approval to proceed from the Superintendent, the Contractor shall:

Requirements for Approval to Proceed

- provide the information required by the Technical Specifications
- ensure and certify that the particular lot/process is conforming;
- ensure and certify that all underlying and adjacent lots affected by the lot in question are conforming;
- submit the appropriate form (Check List, NCR or NNC) at least 24 hours prior to the time the Contractor wishes to proceed with the placement/construction of the next lot, unless some alternative arrangements have been agreed with the Superintendent.

3. If the HP has resulted from a NCR or NNC, the Superintendent's approval may be conditional on a Witness Point being included.

Witness Point

QS14.4 Content

1. An Inspection and Test Plan (ITP) shall break down into distinct activities the process with which it is dealing and for each of those activities identify what inspections or tests, or both, are to be carried out.

Activities

2. As a minimum, the ITP shall contain the following information:

Information to be Provided

- item number/lot type reference(s)
- activity description
- who is responsible for carrying out the inspection/test
- specification requirements or where impractical: specification reference
- specification tolerances
- sampling method
- test method
- test frequency

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- identification of Hold or Witness Points

3. An ITP shall have a Check List for completion for each particular lot.

Check List for Each Lot

QS15 INSPECTIONS

1. Incoming inspections shall be required for deliveries of materials that will be subsequently included in one or more lots. When completing Check Lists for particular Lots the inspection status shall be cited.

Clause 4.10.2

2. In-process and compliance inspections shall be completed by a responsible officer nominated in the Check List and certified by the Contractor's QMR that the work has been completed in accordance with the Contract Documents.

Clauses 4.10.3

3. The Contractor shall establish and maintain a system to ensure and demonstrate that all products or parts of products requiring inspection and/or testing are so inspected and/or tested.

Clause 4.10.3

4. The Contractor shall also establish and maintain a system for identifying the inspection status for all lots of work.

Clause 4.10.4

QS16 PRODUCT IDENTIFICATION

Clause 4.8

QS16.1 Lots

1. All items of work shall be subdivided into lots.

2. Lots shall be chosen by the Contractor but shall be within the limits given in Annexure QS-C. In general, the size of the lot shall not exceed one day's output for each work process designated for lot testing.

Lot Size

3. Lot numbers shall be used as identifiers on all Quality System data.

Lot Numbers

4. The Contractor shall determine the bounds of each lot before sampling and shall physically identify each lot clearly. The physical identification of a lot shall be maintained until the Contractor has ensured that the lot has achieved the specified quality.

Lot Identification

QS16.2 Lot Numbering

1. Each lot shall be given a unique lot number. The allocation of lot numbers shall be carried out by the Contractor to suit the circumstances, provided the lot numbering system complies with the following requirements:

Numbering System

- details of the numbering system are given in the Quality Plan
- the system shall be compatible with any numbering system used in the Contractor's construction programme so that lots are easily identified
- the lot number shall be entered in the Quality Register which shall provide at least the following information:
 - three dimensional surveyed location of the lot (chainage of the start and finish points, lateral location and layer location) and/or the particular structure (eg. pier or abutment number, pour number)
 - indication of conformance or nonconformance

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- summary of test results (eg. characteristic value)
and
- location of test sites, test identification numbers
and test results

- for nonconforming lots a new number, or numbers, shall be allocated to the resubmitted/subdivided lot(s), but reference shall be maintained to the original lot number.

Nonconforming Lots

QS16.3 Lot Identification

1. To ensure all site personnel can readily identify where the particular lots are in the field, the Contractor shall implement a field identification system which will clearly identify the bounds of each lot and the lot number. This identification system shall be detailed in the Quality Plan and shall be maintained during all stages of construction of the lot.
2. Work on a lot shall not commence until the field identification has been established.
3. The boundaries of a lot may be changed if subsequent events cause the original lot to be no longer essentially homogeneous. This will require appropriate notation in the Quality Register by the QMR.

Field Identification

Lot Boundaries

QS17 TRACEABILITY

Clause 4.8

1. The lot identification system, site records and sample numbering system shall allow test results to be positively identified with material incorporated in the works.
2. Traceability is required for concrete loads, asphalt loads and steel plate as follows:
 - (a) Concrete used in bridge components, cast-in-place box culverts, retaining walls, road pavement subbase and base. Asphalt used in wearing courses, intermediate courses and drainage layers.

The trace shall start at the batch plant and finish at the location where the concrete or asphalt is incorporated in the Works. Records shall be kept of the batch quantities, mix and dispatch time, testing details and location of placement.
 - (b) Steel plate in bridge girders and bridge columns.

The trace shall start at the steelworks and finish at the location of the plate in the girder or column. Records shall be kept of the steel heat number, testing details and location of the plate in the girder or column.

Materials for Traceability

QS18 SURVEYING CONTROL

1. Surveying Control shall be treated as a separate System Element and shall include all measurement, calculation and record procedures necessary to:
 - (a) set out the Works
 - (b) verify conformance to the Drawings and Specification in relation to dimensions, tolerances and three dimensional position,
 - (c) determine lengths, areas or volumes of materials or products, where required for measurement of work.

Requirements

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2. The Method Statements for Surveying Control shall address the process control parameters in AS/NZS 3905.2 for special processes which cannot be fully verified by subsequent inspection and test. **Clause 4.9**
3. The Contractor shall appoint qualified surveyors who are eligible for membership of the Institution of Surveyors, Australia or the Institution of Engineering and Mining Surveyors, Australia to supervise and take responsibility for all Surveying Control. **Surveyor Qualifications**
4. The procedures and equipment used must be capable of attaining the tolerances nominated in the Specification. **Equipment**
5. Sampling for conformance verification purposes shall not be restricted to the locations used to set out the Works. **Sampling Locations**
6. Conformance verification survey for concrete base, concrete subbase and bound pavement layers shall be performed as soon as practicable, but in any event not later than one working day after the lot or component has become accessible for survey. **Conformance Surveys**
7. The Contractor shall submit a Survey Conformance Report for each lot or component where design levels, position and/or tolerances have been specified. The Survey Conformance Report shall show 'specified vs actual' for position (defined by coordinates or chainage and offset), level and tolerance as appropriate and shall be certified by the qualified surveyor responsible for the verification survey. **Conformance Report**
8. Where work is to be covered up after conformance has been achieved, a **HOLD POINT** shall apply until the Survey Conformance Report has been submitted. **Submission of Report**
9. All survey records shall be included in the Quality Records and recorded in the Quality Register. Verification field book pages shall be clearly labelled, dated and signed by the surveyor with cross indexed references to equipment used, lot/component identification and associated Survey Conformance Reports. Where automatic data recording systems are used for verification surveys, a printout of both raw (field) data and reduced data shall be retained in a similar manner as conventional field books. **Quality Register**
- QS19 CONTROL OF QUALITY RECORDS** **Clause 4.16**
1. The Contractor shall keep and maintain all Quality System records as required by AS/NZS ISO 9002, AS/NZS 3905.2 and this Specification. They shall be systematically recorded, indexed and filed so as to be retrievable and accessible to the Superintendent or an appointed Quality Auditor on a job basis within one working day of requisition. **Quality Register**
2. Conformance records shall be stored and maintained such that they are readily retrievable and in facilities that provide a suitable environment to minimise deterioration or damage and to prevent loss. **Storage**
3. The Contractor shall make the quality records available to the Superintendent at all reasonable times. If requested by the Superintendent, the Contractor shall provide copies of the records or test results at no cost to the Principal. **Contractor's Cost**
4. Within one month from the date of Practical Completion, the Contractor shall provide the Superintendent with a copy of the Quality Register. The Register shall contain ??? **Finalisation**
- QS20 NONCONFORMANCE** **Clause 4.13**
1. All nonconforming works detected by the Contractor's Quality System shall be reported to the Superintendent via a Nonconformance Report within one working day of being detected. Nonconformance Reports shall be submitted with all records which indicate a departure from the requirements of the Contract Documents. The NCR shall **NCR Within One Day**

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indicate the proposed disposition.

2. If the disposition of the nonconformance cannot be determined within one working day, the Contractor shall submit a partially completed NCR identifying the nonconformance.

3. The nonconforming product shall not be covered up unless a disposition has been accepted/approved by the Superintendent and implemented by the Contractor.

Disposition

4. Where nonconformance can be overcome by simply reworking the lot with the original process, a NCR will be required but a Hold Point will not apply.

Reworking

5. With the exception of circumstances described in paragraph 4 above, a NCR will automatically create a HOLD POINT which shall apply until conformance has been achieved and the Superintendent has signed the Authorisation to Proceed.

Authorisation to Proceed

6. The Superintendent will issue a Corrective Action Request (CAR) when he detects nonconformance to the Contractors Quality System or Methods. Unless specifically stated, this will not create a Hold Point.

CARs

7. Where the Superintendent's inspections, surveillance or audits detect product nonconformance, he will issue a Notice of Nonconformance (NNC). This will immediately create a Hold Point and the Contractor is required to submit a NCR in accordance with this Clause.

NNCs

8. In instances where there is a discrepancy between the test results obtained by the Superintendent and those provided by the Contractor, the results from the Superintendent shall prevail except where the Superintendent may determine a specific audit test procedure to resolve the discrepancy.

9. Where required by the Superintendent, a Hold Point shall apply until the Superintendent has inspected the approved rectification work.

Inspection of Rectification

10. The Contractor shall prepare a standard form for use as a NCR. This shall include:

Standard Form

- details of nonconformance
- 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

All actions shall be signed off by authorised representatives of the Contractor and Superintendent as applicable.

11. The Principal retains the right to determine that an alternative NCR form shall be utilised by the Contractor. An example of a NCR form is appended as Annexure QS-D.

Alternative Form

12. The Contractor shall establish a suitable numbering and registration system for all NCRs and NNCs, including cross referencing as required.

Register of NCRs & NNCs

13. The Contractor shall nominate a proposed disposition for any nonconformance within five working days or shall show cause to the Superintendent for any further delay. Under no circumstances will the deliberation on disposition of a nonconformance justify an extension of time to the Contract period.

Disposition in 5 Days

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QS21 DISPOSITION OF NONCONFORMANCE**Clause 4.13.2**

1. The Contractor shall advise the Superintendent in the NCR of the proposed disposition of the particular nonconformance. This proposed disposition will constitute corrective action for the lot or lots referred to in the NCR and may comprise one of the following:

Proposed Disposition

- (a) propose additional works to bring the lot up to the specified standard; or
- (b) replace all or part of the lot to bring it up to the specified standard; or
- (c) request utilisation of a lot for a reduced level of service if such a clause exists in the relevant Technical Specification; or
- (d) for incidental defects, request that the Superintendent accept the lot without alteration as an exception with or without alteration to the respective unit rates.

2. Any proposed disposition shall be subject to the approval of the Superintendent. Reworked/replaced lots shall be verified to conform to the specified requirements.

QS22 CORRECTIVE ACTION**Clause 4.14.2**

1. The Contractor will be required to indicate on the NCR corrective action appropriate to ensure that the Quality Plan is effective in avoiding recurrence of the nonconformance and continues to be effective.

QP Corrective Action**QS23 STATISTICAL TECHNIQUES****Clause 4.20**

1. Statistical evaluation techniques shall be used for the control of compaction of each continuous layer of earthworks, flexible pavement and asphalt.

Activities for Statistical Analyses

2. Annexure QS-A defines the method to be used for random sampling and calculations for the characteristic value for a lot.

Random Sampling

3. Annexure QS-C lists the maximum lot sizes and minimum test frequencies for the specified activities.

Lot Sizes Test Frequencies**QS24 QUALITY AUDITS****Clause 4.17**

1. The Contractor's Quality Audit Schedule shall be included in the project Quality Plan. Guidance for the requirements of the auditing process is given in SAA QS5.

Audit Schedule

2. The Superintendent may require copies of the Audit Reports to be provided.

Audit Reports**SPECIAL REQUIREMENTS****MEASUREMENT AND PAYMENT****QS25 PAY ITEMS**

1. Payment shall be made for all activities associated with the planning, establishment, implementation, operation and maintenance of the Quality System for the project. These costs shall include all investigation, inspections, testing, rectification and maintenance of the Quality Register.

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2. Cost adjustments, if applicable, will apply the same as to any other Pay Item in the Schedule.

Pay Item QP1 QUALITY SYSTEM DOCUMENTS AND RECORDS

1. A lump sum for this item shall be provided for 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.

2. Progress payments shall be calculated on the basis of 30% of the L.S. when the complete Quality Plan is available and the remainder on pro rata based on the monthly value of work done.

Pay Item QP2 QUALITY VERIFICATION AND CONTROL

1. The Lump Sum for this item shall include all costs for inspections, conformance surveys and testing required to verify that all aspects of the work under the Contract comply with the Quality Assurance provisions of the Contract.

2. Payments shall be made pro rata on the monthly value of work done.

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**ANNEXURE QS-A
RANDOM SAMPLING AND STATISTICAL ANALYSIS**

QS-A1 GENERAL

1. Statistical techniques shall be used to control relative compaction of each:

- (i) continuous layer of earthworks
- (ii) selected subgrade zone
- (iii) flexible pavement layers
- (iv) asphalt layers
- (v) coring in concrete pavements
- (vi) RESERVED
- (vii) RESERVED

which are generally rectangular in area.

QS-A2 SAMPLING RATES

1. The number of samples (n) shall be as indicated in the specific Specification Parts which are summarised in the Sub-Annexures to this Quality Requirements Specification.

QS-A3 RANDOM SAMPLING LOCATIONS

1. Sampling locations within a lot shall be determined as follows:

- (i) Representing the lot as a rectangle, sub-divide the lot lengthwise into equi-area sub-lots in accordance with the number of samples selected (n);
- (ii) Establish six grid lines within the lot, as illustrated in Figure QS-A2;
- (iii) Throw a die to select a number between 1 and 6. This determines which grid line to use for the sample location in sub-lot 1;
- (iv) Throw die to select a group (1-6) in Table QS-A1;
- (v) Throw die twice to select two random numbers (between 1 and 6) for row and column in Table QS -A1 and obtain random fraction R;
- (vi) Length co-ordinate for sample location in Sub-lot 1 = RL/n ;
- (vii) For sample location in next sub-lot:-

Add L/n to previous length co-ordinate.
Add 1 (on a cycle of 6) to previous grid line.

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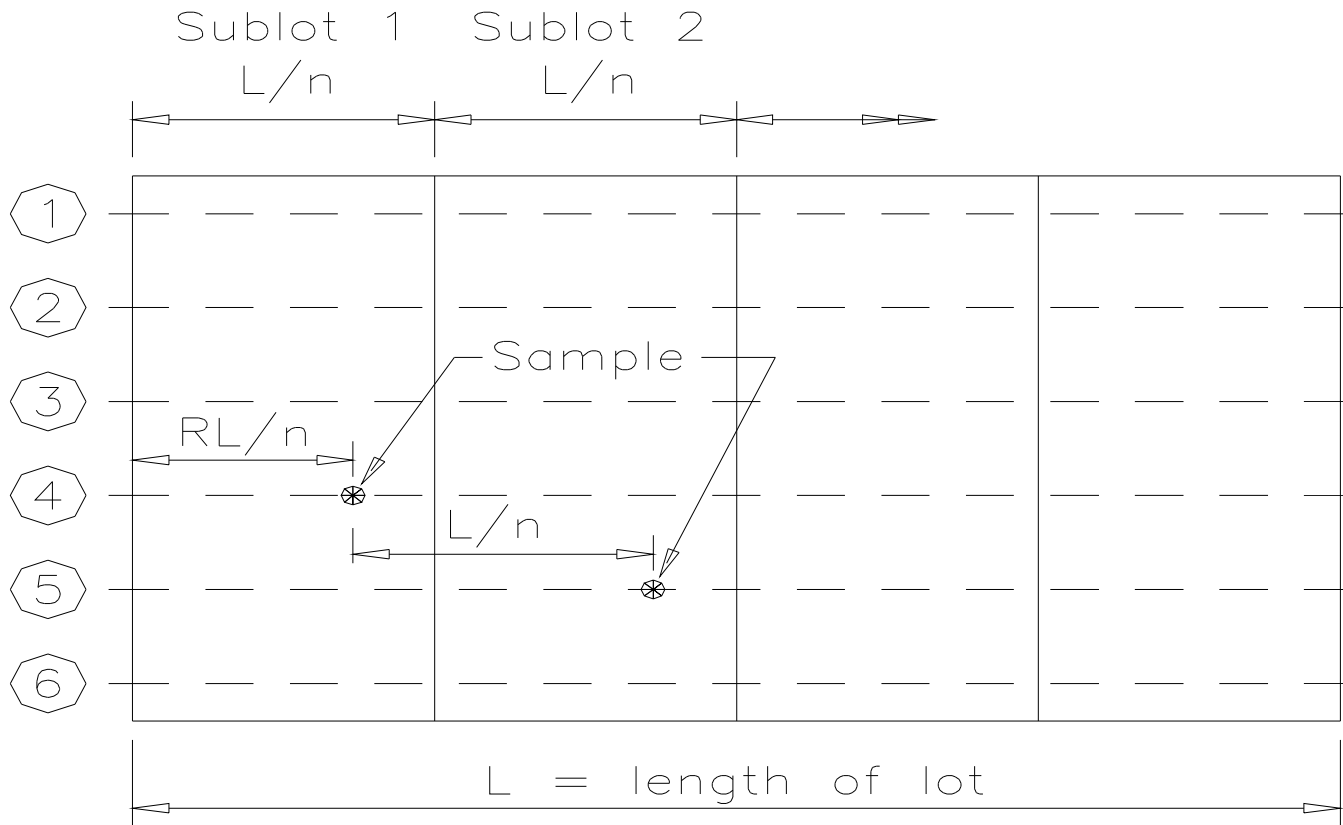


Figure QS-A2 - Sampling Locations for Rectangular Lot

Add L/n to previous length co-ordinate.
 Add 1 (on a cycle of 6) to previous grid line.

GROUP	ROW	COLUMN					
		(1)	(2)	(3)	(4)	(5)	(6)
(1)	(1)	0.78178	0.45467	0.00347	0.27296	0.00020	0.36517
	(2)	0.59678	0.67931	0.25434	0.59054	0.32444	0.41504
	(3)	0.14464	0.17269	0.61154	0.18291	0.83242	0.50776
	(4)	0.89010	0.44764	0.07451	0.20428	0.49513	0.91440
	(5)	0.91941	0.47726	0.33160	0.30670	0.65114	0.36852
	(6)	0.51085	0.38148	0.22169	0.66578	0.67050	0.69559
(2)	(1)	0.81891	0.48626	0.88892	0.82994	0.16941	0.81528
	(2)	0.37410	0.60232	0.12070	0.79017	0.32981	0.34908
	(3)	0.45921	0.15648	0.58052	0.37413	0.08124	0.97145
	(4)	0.86614	0.94719	0.78872	0.91972	0.45149	0.15107
	(5)	0.26590	0.41140	0.95477	0.81267	0.24018	0.07324
	(6)	0.95205	0.39438	0.73697	0.59427	0.71146	0.00575
(3)	(1)	0.18694	0.36502	0.17828	0.84312	0.57003	0.58583
	(2)	0.91211	0.86936	0.43030	0.27672	0.47393	0.10342
	(3)	0.80714	0.34295	0.00775	0.90855	0.33368	0.21842
	(4)	0.67579	0.92686	0.18005	0.00645	0.11256	0.05278
	(5)	0.03184	0.69876	0.16676	0.43346	0.86992	0.03275
	(6)	0.15623	0.02905	0.72763	0.19095	0.80847	0.39729
(4)	(1)	0.72109	0.17970	0.22505	0.35561	0.98935	0.27818
	(2)	0.37348	0.19381	0.43331	0.75033	0.99963	0.42232
	(3)	0.12129	0.32386	0.56705	0.87165	0.84460	0.92955
	(4)	0.54948	0.08844	0.47061	0.78419	0.18731	0.93485
	(5)	0.15097	0.44967	0.48759	0.84161	0.19212	0.05146
	(6)	0.32360	0.66850	0.99382	0.94050	0.96449	0.96217
(5)	(1)	0.68091	0.54191	0.10910	0.94237	0.23161	0.15167
	(2)	0.97121	0.83626	0.70896	0.45296	0.69475	0.11264
	(3)	0.19723	0.98260	0.57429	0.94789	0.64457	0.20809
	(4)	0.84036	0.14095	0.29451	0.40256	0.34521	0.64924
	(5)	0.97500	0.98056	0.82276	0.97130	0.77329	0.89855
	(6)	0.83244	0.30828	0.06882	0.68471	0.71081	0.91649
(6)	(1)	0.75892	0.29685	0.70044	0.91238	0.53356	0.45239
	(2)	0.13229	0.19701	0.36074	0.32254	0.62045	0.26691
	(3)	0.34789	0.22179	0.91891	0.87651	0.91011	0.97469
	(4)	0.97211	0.68943	0.12831	0.50006	0.20793	0.61151
	(5)	0.24954	0.17809	0.56093	0.51524	0.69135	0.68967
	(6)	0.10062	0.11852	0.47089	0.64765	0.44644	0.35548

Table QS-A1 - Table of Random Fractions

QS-A4 CALCULATION FOR STATISTICAL CONFORMANCE OF A LOT

1. The calculation of the characteristic value of attribute (Q) for the lot shall be as follows:

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

where \bar{x} = arithmetic mean of attribute test results for all sub-lots

s = standard deviation of sub-lot attribute test results

$$= \left(\frac{\text{sum of } (x - \bar{x})^2}{n - 1} \right)^{1/2}$$

k = acceptance constant from Table QS-A2
(based on 10% producer's risk)

A lot achieves conformance if Q is equal to or greater than the specified lower limit for characteristic value of the attribute.

If Q is less than the specified lower limit for characteristic value and reworking is subsequently undertaken, the complete lot shall be resampled and retested to verify conformance.

Sample Size	3	4	5	6	7	8	9	10	15	20
k	0.52	0.62	0.67	0.72	0.75	0.78	0.81	0.83	0.90	0.95

Table QS-A2 - Acceptance Constant k

**ANNEXURE QS-B
METHOD STATEMENT REQUIREMENTS**

QS-B1 GENERAL

1. Method Statements are required to describe the key steps and sequence in the construction activities, how and by whom each step shall be undertaken and what materials and equipment shall be used. Method Statements may include a flow chart to clarify the sequence of key steps. One or more Method Statements may address a Construction Activity.
2. Each Method Statement will be supported by a Check List which shall identify relevant inspections, test points, materials requirements and Hold Points. Each requirement on the Check List will have an officer responsible identified and will require the nominated officer to sign off the requirement so indicating its satisfactory execution.
3. Method Statements and Check Lists shall be compatible with the appropriate Inspection and Test Plan. Check Lists will be completed for each lot of work during construction and compiled with other documents to comprise the Quality Register.
4. The Contractor shall submit Method Statements and Check Lists to describe the key steps in those Construction Activities listed below that are identified with a preceding asterisk (*).

Table QS-B1 - Construction Activities

Item	Enter * here if required	Activity	Specification Number
1		Control of Traffic	201
2		Temporary Roadways and Detours	201
3		Control of Erosion and Sedimentation	211
4		Clearing and Grubbing	212
5		Earthworks - Cut	213
6		Earthworks - Blasting	213
7		Earthworks - Unsuitable Material	213
8		Earthworks - Embankment	213
9		Earthworks - Compaction and Quality Control	213
10		Siting, Excavation, Bedding, Backfilling and Compaction of Stormwater Drainage	220
11		Installation of Pipe Culverts	221
12		Installation of Precast Box Culverts	222
13		Siting and Installation of Drainage Structures	223
14		Installation of Lined Open Drains including Kerb and Channel	224
15		Kerb and Channel Replacement	229
16		Provision of Subsurface Drainage as subsoil drains, pavement drains or free draining layer	230-233
17		Stabilisation of Pavement or Subgrade Materials	241
18		Construction of Stabilised Pavement Layers	241, 242

Item	Enter * here if required	Activity	Specification Number
19		Trimming of Subgrade and Pavement Layers	242
20		Bituminous Cold Mix	243
21		Sprayed Bituminous Surfacing	244
22		Construction of Asphalt Pavement Layers	245
23		Construction of Concrete Pavement Layers	246-250
24		Cold Milling of Asphalt and Base Course	251
25		Segmental Paving	254
26		Bituminous Micro surfacing	255
27		Pavement Markings	261
28		Signposting	262
29		Guide Posts	263
30		Guardfence	264
31		Boundary Fencing	265
32		Installation of Concrete Safety Barrier	267
33		Minor Concrete Works	271
34		Landscaping	273
35		Construction of Masonry Walls	274
36		Construction of Crib Retaining Walls	276
37		Installation of Service Conduits	303
38		Trenchless Conduit Installation	305
39		Road Openings and Restorations	306

**ANNEXURE QS-C
SUB ANNEXURES**

(NOT INCLUDED IN THIS FILE, FIND ON FILE QSC)

CITY OF GREATER DANDENONG

SPECIFICATION

QC

**QUALITY CONTROL
REQUIREMENTS**

SPECIFICATION QC - CONTRACT CONTROL REQUIREMENTS

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QC4	SURVEYING	32
QC5	RECORDS	32
MEASUREMENT AND PAYMENT		33
QC6	PAY ITEMS	33
 ANNEXURES		
QC-A	RANDOM SAMPLING	
QC-B	MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES	

**SPECIFICATION QC
QUALITY CONTROL REQUIREMENTS**

GENERAL**QC1 SCOPE**

1. This Specification covers the contractual requirements for the quality control testing and survey by the Contractor; including the minimum test frequencies to be employed to demonstrate conformance to the requirements of the technical specifications.

Testing and Survey**QC2 LOTS**

1. All items of work shall be subdivided into lots. Each lot shall be given a unique lot number.

2. Lots shall be chosen by the Contractor but shall be within the limits given in Annexure QC-B. In general, the size of the lot shall not exceed one day's output for each work process designated for lot testing.

Lot Size

3. The lot numbers shall be used as identifiers on all surveys and test results.

Lot Numbers

4. The Contractor shall determine the bounds of each lot before sampling and shall identify each lot clearly.

Lot Identification

5. The boundaries of a lot may be changed if subsequent events cause the original lot to be no longer essentially homogeneous.

Lot Boundaries

6. The lot identification system and sample numbering system shall allow test results to be positively identified with material incorporated in the works.

Test Results**QC3 SAMPLING AND TESTING**

1. All compliance inspections and tests shall be based on lots.

Lots

2. The maximum lot sizes and minimum testing frequencies are listed in the Annexures to the relevant Specifications and/or in Annexure QC-B to this Specification. Where no minimum frequency of testing, or maximum lot size is stated in the Specification, the Contractor shall nominate appropriate frequencies for the Superintendent's approval.

**Lot Sizes
Frequency of
Testing**

3. Sampling shall not be restricted to locations dimensioned or otherwise defined for setting out the Works in the Drawings or Specification, but shall be undertaken in a random or unbiased manner, as approved by the Superintendent, at any location within the Works to demonstrate its compliance with the Specification.

**Sampling
Locations**

4. Where Test Methods are nominated in the Technical Specifications, sampling and testing shall be carried out by a NATA registered laboratory accredited for those test methods and sampling procedures. Sampling shall be conducted by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and shall be supervised by the approved signatory from that laboratory. Test results shall be reported on NATA endorsed test documentation which shall include a statement by the approved signatory certifying that the correct sampling procedures have been followed.

**Sampling and
Testing**

5. In special circumstances the Principal may accredit a laboratory that is not NATA registered for specific tests or inspection procedures.

**Special
Accreditation**

6. The Contractor shall reinstate all core holes, test holes, excavations and any

Reinstatement

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other disturbance resulting from any testing activity. The reinstatement shall be to a standard which is at least equal to the specified requirements for the particular work.

7. Random sampling techniques shall be used for each lot for the control of compaction of each continuous layer of earthworks, flexible pavement and asphalt. Annexure QC-A defines the method to be used for determining test locations of random sampling in each lot. **Random Sampling**
8. For quality control of processes other than compaction of layers of earthworks, flexible pavement and asphalt, the sampling locations will be proposed by the Contractor and will require the approval of the Superintendent. **Sampling Locations**
9. In all cases the samples shall be each considered to be representative of the lot and all test results will be required to meet the appropriate tolerances for the lot. **All Test Results to Meet Tolerances**

QC4 SURVEYING

1. Surveying Control shall include all measurement, calculation and record procedures necessary to: **Requirements**
- (a) set out the Works
 - (b) verify conformance to the Drawings and Specification in relation to dimensions, tolerances and three dimensional position
 - (c) determine lengths, areas or volumes of materials or products, where required for measurement of work.
2. The Contractor shall appoint qualified surveyors who are eligible for membership of the Institution of Surveyors, Australia or the Institution of Engineering and Mining Surveyors, Australia to supervise and take responsibility for all Surveying Control. **Surveyor Qualifications**
3. The procedures and equipment used must be capable of attaining the tolerances nominated in the Specification. **Equipment**
4. Sampling for conformance verification purposes shall not be restricted to the locations used to set out the Works. **Sampling Locations**
5. The Contractor shall submit a Survey Conformance Report to the Superintendent for each lot or component where design levels, position and/or tolerances have been specified. The Survey Conformance Report shall show 'specified vs actual' for position (defined by co-ordinates or chainage and offset), level and tolerance as appropriate and shall be certified by the qualified surveyor responsible for the verification survey. **Conformance Report**

QC5 RECORDS

1. Conformance records shall be stored and maintained such that they are readily retrievable and in facilities that provide a suitable environment to minimise deterioration or damage and to prevent loss. **Storage**

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2. The Contractor shall submit all conformance records to the Superintendent for inspection and approval. If requested by the Superintendent, the Contractor shall provide copies of the records or test results at no cost to the Principal.

**Copies of
Records
Contractor's
Cost**

MEASUREMENT AND PAYMENT

QC6 PAY ITEMS

1. Payment shall be made for all activities associated with testing, survey and supplier's documentation required to demonstrate conformance to the specification requirements.

2. Cost adjustments, if applicable, will apply the same as to any other Pay Item in the Schedule.

Pay Item QCP1 QUALITY VERIFICATION AND CONTROL

1. The Lump Sum for this item shall include all costs for inspections, conformance surveys and testing required to verify that all aspects of the work under the Contract comply with the quality requirements of the Contract, including the ongoing compilation of quality records.

2. Payments shall be made pro rata on the monthly value of work done.

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ANNEXURE QC-A RANDOM SAMPLING

QC-A1 GENERAL

1. Random sampling of test locations shall be used to control relative compaction of each layer of:

- (i) earthworks
- (ii) selected material zone
- (iii) flexible pavement
- (iv) asphalt
- (v)
- (vi)
- (vii)

which are generally rectangular in area.

QC-A2 SAMPLING RATES

1. The number of samples (n) per lot shall be as indicated in the specific Specification Parts which are summarised in the Sub-Annexures to this Quality Requirements Specification.

QC-A3 RANDOM SAMPLING LOCATIONS

1. Sampling locations within a lot for the control of relative compaction shall be determined as follows:

- (i) Representing the lot as a rectangle, sub-divide the lot lengthwise into equi-area sub-lots in accordance with the number of samples selected (n);
- (ii) Establish six grid lines within the lot, as illustrated in Figure QC-A2;
- (iii) Throw a die to select a number between 1 and 6. This determines which grid line to use for the sample location in sub-lot 1;
- (iv) Throw die to select a group (1-6) in Table QC-A1;
- (v) Throw die twice to select two random numbers (between 1 and 6) for row and column in Table QC-A1 and obtain random fraction R;
- (vi) Length co-ordinate for sample location in Sub-lot 1 = RL/n ;
- (vii) For sample location in next sub-lot:-
Add L/n to previous length co-ordinate.
Add 1 (on a cycle of 6) to previous grid line.

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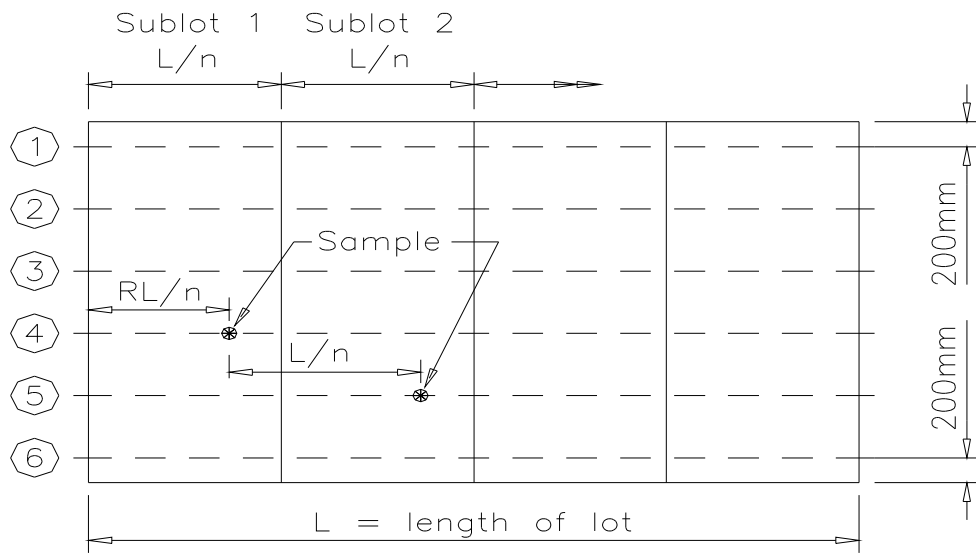


Figure QC-A2 - Sampling Locations for Rectangular Lot

GROUP	ROW	COLUMN					
		(1)	(2)	(3)	(4)	(5)	(6)
(1)	(1)	0.78178	0.45467	0.00347	0.27296	0.00020	0.36517
	(2)	0.59678	0.67931	0.25434	0.59054	0.32444	0.41504
	(3)	0.14464	0.17269	0.61154	0.18291	0.83242	0.50776
	(4)	0.89010	0.44764	0.07451	0.20428	0.49513	0.91440
	(5)	0.91941	0.47726	0.33160	0.30670	0.65114	0.36852
	(6)	0.51085	0.38148	0.22169	0.66578	0.67050	0.69559
(2)	(1)	0.81891	0.48626	0.88892	0.82994	0.16941	0.81528
	(2)	0.37410	0.60232	0.12070	0.79017	0.32981	0.34908
	(3)	0.45921	0.15648	0.58052	0.37413	0.08124	0.97145
	(4)	0.86614	0.94719	0.78872	0.91972	0.45149	0.15107
	(5)	0.26590	0.41140	0.95477	0.81267	0.24018	0.07324
	(6)	0.95205	0.39438	0.73697	0.59427	0.71146	0.00575
(3)	(1)	0.18694	0.36502	0.17828	0.84312	0.57003	0.58583
	(2)	0.91211	0.86936	0.43030	0.27672	0.47393	0.10342
	(3)	0.80714	0.34295	0.00775	0.90855	0.33368	0.21842
	(4)	0.67579	0.92686	0.18005	0.00645	0.11256	0.05278
	(5)	0.03184	0.69876	0.16676	0.43346	0.86992	0.03275
	(6)	0.15623	0.02905	0.72763	0.19095	0.80847	0.39729
(4)	(1)	0.72109	0.17970	0.22505	0.35561	0.98935	0.27818
	(2)	0.37348	0.19381	0.43331	0.75033	0.99963	0.42232
	(3)	0.12129	0.32386	0.56705	0.87165	0.84460	0.92955
	(4)	0.54948	0.08844	0.47061	0.78419	0.18731	0.93485
	(5)	0.15097	0.44967	0.48759	0.84161	0.19212	0.05146
	(6)	0.32360	0.66850	0.99382	0.94050	0.96449	0.96217
(5)	(1)	0.68091	0.54191	0.10910	0.94237	0.23161	0.15167
	(2)	0.97121	0.83626	0.70896	0.45296	0.69475	0.11264
	(3)	0.19723	0.98260	0.57429	0.94789	0.64457	0.20809
	(4)	0.84036	0.14095	0.29451	0.40256	0.34521	0.64924
	(5)	0.97500	0.98056	0.82276	0.97130	0.77329	0.89855
	(6)	0.83244	0.30828	0.06882	0.68471	0.71081	0.91649
(6)	(1)	0.75892	0.29685	0.70044	0.91238	0.53356	0.45239
	(2)	0.13229	0.19701	0.36074	0.32254	0.62045	0.26691
	(3)	0.34789	0.22179	0.91891	0.87651	0.91011	0.97469
	(4)	0.97211	0.68943	0.12831	0.50006	0.20793	0.61151
	(5)	0.24954	0.17809	0.56093	0.51524	0.69135	0.68967
	(6)	0.10062	0.11852	0.47089	0.64765	0.44644	0.35548

Table QC-A1 - Table of Random Fractions

**ANNEXURE QC-B
MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES**

GENERAL

1. The maximum lot sizes and minimum test frequencies are separately specified for all major activities covered by the Technical Specifications as listed hereunder.
2. The requirements applicable to this Contract are identified with an asterisk indicating that only these details are attached in this Annexure.
3. Where material/product quality certification can be obtained from the supplier, tests listed per contract/separable part need not be repeated.

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Item	Sub-Annexure	Required (*) for this Contract	Reference Specification	Sub-Annexure Heading
1	B1		213	Earthworks
2	B2		220 221 222 223 224 229	Stormwater Drainage - Pipe Drainage, Precast Box Culverts, Drainage Structures, Open Drains including Kerb and Channel, Kerb and Channel Replacement
3	B3		230 231 232 233	Subsurface Drainage - Subsoil and Foundation Drains, Pavement Drains, Drainage Mats
4	B4		241	Stabilisation
5	B5		242	Flexible Pavements
6			243	Bituminous Cold Mix
7	B7		244	Sprayed Bituminous Surfacing
8	B8		245	Asphalt
9			246	Rolled Concrete Subbase
10			247	Mass Concrete Subbase
11			248	Plain or Reinforced Concrete Base
12			249	Steel Fibre Reinforced Concrete Base
13	B13		250	Continuously Reinforced Concrete Base
14	B14		246, 247, 248 249, 250, 271	Ready Mixed Concrete Production and Supply
15	B15		254	Segmental Paving
16	B16		255	Bituminous Microsurfacing
17	B17		261	Pavement Markings

Item	Sub-Annexure	Required (*) for this Contract	Reference Specification	Sub-Annexure Heading
18	B18		262	Signposting
19	B19		271	Minor Concrete Works
20			273	Landscaping
21			274	Masonry Walls
22			276	Crib Retaining Walls

**Sub-Annexure B1
EARTHWORKS (Specification 213)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Excavation	Geometry	10,000m ²	1 Cross Section per 25m	Survey
Floor of Cuttings	Material Quality - CBR	5,000m ²	1 per 1,000m ² *	AS 1289.6.1.1
	Compaction	10,000m ²	1 per 500m ²	AS 1289.5.4.1
Blasting	Ground Vibration/Noise Control	1 day's blasting	Continuous monitoring	
Foundation Embankments	for Compaction	5,000m ²	1 per 500m ²	AS 1289.5.4.1
Embankments - General	Geometry	One layer 10,000m ²	1 Cross Section per 25m	Survey
	Material Quality - CBR	One layer 5,000m ²	1 per 800m ³	AS 1289.6.1.1
	Compaction/Moisture Content	One layer 5,000m ²	1 per 250m ³	AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
Embankments - Select Zone	Geometry	One layer 10,000m ²	1 Cross Section per 25m	Survey
	Material Quality - Particle Size Distribution	10,000m ²	1 per 1,000m ³ *	AS 1289.6.1.1 AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
	- CBR	10,000m ²	1 per 500m ³ *	
Compaction/Moisture Content	One layer 5,000m ²	1 per 250m ³ *		
Fill Adjacent to Bridges, Wingwalls, Retaining Walls and Culverts	Material Quality			
	- Particle Size Distribution	1 Structure	1 per 200m ³ *	AS 1289.3.3.1 AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1
	- Plasticity Index	1 Structure	1 per 200m ³ *	
Compaction/Moisture Content	1 Structure	1 per layer		

* Note: or part thereof, per lot

Sub-Annexure B2**STORMWATER DRAINAGE - PIPE DRAINAGE, PRECAST BOX CULVERTS, DRAINAGE STRUCTURES, OPEN DRAINS INCLUDING KERB AND CHANNEL, KERB AND CHANNEL REPLACEMENT
(Specifications 220, 221, 222, 223, 224, 229)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Siting and Excavation	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Excavation by Blasting	Peak Particle Velocity	1 drainage line/structure	1 per drainage line/structure	Measure
Foundation	Compaction	1 drainage line/structure	1 per 20 lin m *	AS 1289.5.4.1
Material surrounding Steel Structures	Material Quality - pH/Electrical Resistivity	1 drainage line/structure	1 per material	AS 1289.4.3.1 AS 1289.4.4.1
Bedding	Material Quality - Particle Size Distribution	1 contract	1 per 200m ³ *	AS 1141.11
	Compaction/Moisture Content	1 drainage line/structure	1 per layer, per 50 lin m	AS 1289.5.4.1 AS 1289.5.7.1
Concrete Bedding or Lining	Geometry		1 Cross Section per 25m	Survey and 3m Straight Edge
Installation of Precast Units	Geometry	1 drainage line/structure	1 per drainage line/structure	Survey
Selected Backfill	Material Quality: - Maximum Particle Size	1 contract	1 per 100m ³ *	AS 1289.3.3.1
	- Plasticity Index	1 contract	1 per 100m ³ *	
	Compaction/Moisture Content	1 drainage line/structure	1 per 2 layers per 50m ²	AS 1289.5.4.1 AS 1289.5.7.1
Rock Fill for Gabions/ Wire Mattresses	Material Quality: - Wet Strength	1 contract	1 per contract	AS 1141.22
	- Wet/Dry Strength Variation	1 contract	1 per contract	AS 1141.22
Kerb and Channel	Geometry	1 contract	1 Cross Section per 25m	Survey and 3m Straight Edge
Pipe Inspection	No visible cracking	All	All	By closed circuit television (CCTV)

* Note: or part thereof, per lot

Sub-Annexure B3**SUBSURFACE DRAINAGE - SUBSOIL AND FOUNDATION DRAINS, PAVEMENT DRAINS, DRAINAGE MATS****(Specifications 230, 231, 232, 233)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Material Supply	Material Quality - Supplier's documentary evidence and certification.			
Excavation - Trench Base	Line and Grade	1 drainage line	1 per 200 lin m	Survey
	Compaction	1 drainage line	1 per 200 lin m*	AS 1289.5.4.1
Bedding and Backfill	- Filter Material	1 drainage line	1 per drainage line	AS 1289.5.4.1
	- Selected Backfill	1 drainage line	1 per 200lin m*	AS 1289.5.4.1
	- Earth Backfill	1 drainage line	1 per 200lin m*	AS 1289.5.4.1
Drainage Mat	Geometry	2000m ²	1 Cross Section per 25m	Survey

* Note: or part thereof, per lot

**Sub-Annexure B4
STABILISATION (Specification 241)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Material Supply	Material Quality - Supplier's documentary evidence and certification.			
Mix Design	NATA certification - Supplier's documentary evidence and certification	1 mix	1 per mix	
Stationary Mixing Plant	Application rate of stabilising agent Compressive strength of product	1 day's production 1 day's production	1 per 100t 1 per 100t	AS1289.6.1.1
In-Situ Spreading	Spread rate	1 layer 1,000m ²	1 per lot or 1 per 500m ²	
	Mix Uniformity	1 layer 1,000m ²	1 per 500m ²	Visual
Trimming and Compaction	Geometry Surface Quality Average Layer thickness Average Width Relative Compaction/Moisture Content	1 layer 2,000m ² , max 1 day's placement " " " "	One cross section per 25m 10 per 200m lane length * 1 per lot 1 per lot 3 per lot	Survey 3m Straight Edge Measure/Survey AS1289.5.7.1 AS1289.5.8.1

* Note: or part thereof, per lot

**Sub-Annexure B5
FLEXIBLE PAVEMENTS (Specification 242)**

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		
Placement	Geometry: Alignment & Level Width & Surface Trim Deflection Control - Benkelman Beam Compaction/Moisture Content / Dry Density Testing	One layer 2,000m ² or max 1 day's placement One layer 5,000m ² or max 1 day's placement One layer 5,000m ² or max 1 day's placement	1 Cross Section per 15m 10 per selected 200 lin.m 4 per 1,000m ² , minimum 10 per lot 10 per 5,000m ² layer or 3 per lot if less	Survey Measure & 3m Straight Edge T160 T130 AS 1289.5.2.1 AS 1289.5.4.1 AS 1289.5.8.1

Sub-Annexure B7
SPRAYED BITUMINOUS SURFACING (Specification 244)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Suppliers documentary evidence and certification of:			
Application Rates	Binder	1 day's operation	Calculate per spray run	
	Aggregate	1 day's operation	Calculate per spray run	

* Note: or part thereof, per lot

**Sub-Annexure B8
ASPHALT (Specification 245)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Mix Design Nominated Mix	Approval of mix and NATA certification. Supplier's documentary evidence and certification	1 mix per contract	1 per mix	
Production Mix	Temperature Moisture Content Grading Binder Content	245.7 from Spec 245 Asphaltic Concrete as included as separate table below. Additionally, max lot size one 12 hr shift's production.	1 per truck load	Measure AS2891.10 AS2891.3.3 AS2891.3.1
	Resistance to Stripping	1 production mix	1 per mix per 5000t or once per month (whichever is the most frequent)	T640
Laying and Compaction	Temperature Levels Shape Relative Compaction/Layer Thickness	1 day's laying per site 1 day's laying per site 1 day's laying 1 day's laying	1 per truck load 1 cross section per 25m 10 per 200m* 6 cores per lot 10 nuclear density tests per lot	Measure Survey 3m Straight Edge AS2891.9.3 or Nuclear Density Meter

* Note: or part thereof, per lot

Quantity of Asphalt in production lot	Minimum Frequency of Testing
Less than 100 tonnes	One per 50 tonnes or part thereof
101 to 300 tonnes	One per 100 tonnes or part thereof
301 to 600 tonnes	One per 150 tonnes or part thereof
Over 600 tonnes	One per 200 tonnes or part thereof

Table 245.7 Minimum Testing Frequencies for Asphalt Production

Sub-Annexure B14
READY-MIXED CONCRETE PRODUCTION & SUPPLY
(Specifications 246, 247, 248, 249, 250, 271)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Raw Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Mix Design	Compressive Strength	1 contract mix	1 per mix per contract	AS1012.9
	Aggregate Moisture Content	1 contract mix	1 per mix per contract	
	Consistency - Slump	1 contract mix	1 per mix per contract	AS1012.3.1
	Air Content	1 contract mix	1 per mix per contract	AS 1012.4 Method 2
	Shrinkage	1 contract mix	1 per mix per contract	AS 1012.13

* Note: or part thereof, per lot

Sub-Annexure B15
SEGMENTAL PAVING (Specification 254)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Base	Geometry	One layer 5000m ² , max 1 day's placement	One cross section per 25m	Survey
	Surface Quality	"	10 per 200m ² or lot	3m Straight Edge
Edge Restraints	Refer 'Minor Concrete Works'	1 day's placement	1 per 10 lin m	Measure/Survey
Laying Paver Units	Joint Width	1 day's placement	All joints	Measure
	Geometry	1 day's placement	One cross section per 15m	Survey
	Surface Quality	1 day's placement	10 per 200m ² or lot	3m Straight Edge

Sub-Annexure B16
BITUMINOUS MICROSURFACING (Specification 255)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Mix Design Nominated Mix	- Approval of mix and NATA certification - Supplier's documentary evidence and certification	1 contract	1 per mix	
Mix Properties	Wear Loss Traffic Time Adhesion	1 contract 1 contract 1 contract	1 per mix 1 per mix 1 per mix	ISSA TB 100 ISSA TB 139 ISSA TB 114 or ISSA TB 144
Production Mix	Grading Residual Binder Content	1 day's prod'n or 50m ³ (whichever is the lesser)	2 per 50m ³ * 2 per 50m ³ *	AS2891.3.1 AS2891.3.1
Laying	Levels Surface Quality	1 layer, max 200m ³ 1 layer, max 200m ³	1 cross section per 15m 10 per 100m* lane length	Survey 3m Straight Edge

* Note: or part thereof, per lot

Sub-Annexure B17
PAVEMENT MARKINGS (Specification 261)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Paint Application	Wet Film Thickness	1 contract	1 per site visit or change in pressure settings	AS1580.107.3
	Application Rate of Glass Beads	1 contract	1 per site visit or change in pressure settings	Annexure 261A
Thermoplastic Application	Cold Film Thickness	1 contract	1 per site visit or change in pressure settings	Measure by micrometer
	Application Rate of Glass Beads	1 contract	1 per site visit or change in pressure settings	Annexure 261A

**Sub-Annexure B18
SIGNPOSTING (Specification 262)**

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Materials Supply	Material Quality - Supplier's documentary evidence and certification.			
Concrete Foundations	Refer 'Minor Concrete Works'			

Sub-Annexure B19
MINOR CONCRETE WORKS (Specification 271)

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
Subgrade	Compaction	1000 lin m or 1000m ²	1 per 200 lin m or 200m ²	AS 1289.5.4.1
Gravel Subbase Construction	Compaction	1 day's placement	1 per 100 lin m or 100m ²	AS 1289.5.4.1
	Subbase Geometry	1 day's placement	1 per 25 lin m	3m Straight Edge
Steel Supply	Material Quality - Suppliers documentary evidence and certification	1 delivery	1 per production batch	
Concrete Supply	Refer Sub-Annexure B14: Ready-Mixed Concrete Production and Supply			
	Consistency - Slump	15m ³	1 per load	AS 1012.3.1
	Compressive Strength (7 and 28 day)	15m ³	2 pairs per 15m ³	AS 1012.1 AS 1012.8 AS 1012.9
Concrete Placement	Finished Levels	15m ³	1 cross section per 15m	Survey and 3m Straight Edge
	Surface Dimensions	Single Fabrication	As required to confirm design dimensions	Measure
Backfilling	Material Quality			
	- Maximum particle size	1 contract/ material type	1 per 200m ³ or lot	
	- Plasticity Index	1 contract/ material type	1 per 200m ³ or lot	AS1289.3.3.1
	Compaction	1 day's work or max 200m ²	1 per 200m ² or lot	AS 1289.5.4.1
Sprayed Concrete	Test Panels and Cores	1 contract	3 test panels and 4 cores per mix design	AS1012.4, AS1012.9 AS1012.14
	Compressive Strength Cores	15m ³	2 per 15m ³	AS1012.4, AS1012.9 AS1012.14
	Curing Material Quality - Supplier's documentary evidence and certification	1 contract	1 per production batch	

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CITY OF GREATER DANDENONG
SPECIFICATION

101

GENERAL

SPECIFICATION 101 - GENERAL

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SPECIFICATION 101 : GENERAL

PROJECT SPECIFIC INFORMATION

101.01 LOCATION AND DESCRIPTION OF PROJECT

EXAMPLE (TO BE COMPLETED BY COMPILER)

- | | | |
|----|---------------------------------------------------------------------|--------------------|
| 1. | <i>The Works are located</i> | Location |
| 2. | <i>The Works comprise of the construction of</i> | Description |
| 3. | <i>Access to site shall be from (Contractor's and Public)</i> | Site Access |
| 4. | <i>Possession of site shall be given</i> | Possession |

101.02 EXTENT OF WORK

1. Works under this Contract comprise the supply of labour, materials and plant to construct the Works. It includes but is not limited to the following items of construction which shall be carried out in their entirety in strict accordance with and to the true intent and purpose of, the Conditions of Contract, these Technical Specifications, the Drawings listed herein, and under the supervision of the Superintendent.

EXAMPLE (TO BE COMPLETED BY COMPILER)**(a) General**

- *Provision for control, protection and safety of traffic during construction including notifications to and obtaining approvals from Authorities.*
- *Notification of all appropriate property owners adjoining the Works.*
- *Setting out the Works.*
- *Erosion and sedimentation control of the Works, including stockpile areas.*
- *Site clearing and grubbing. Topsoil to stockpile.*
- *Topsoil and hydromulch to disturbed areas.*

(b) Roadworks

- *Provide provisions for traffic in accordance with the concept illustrated in Reference Drawings, including:*
 - *New Jersey type barriers at lead ins to the working area in each direction.*
 - *Plastic mesh fencing and warning lamps over the entire working length.*
- *Clearing and grubbing sufficient to allow Works to be undertaken.*

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- *Stripping of topsoil.*
- *Excavation to windrow.*
- *Construction of embankment from excavated material and borrow stockpiles.*
- *Construction of 5MPa mass concrete subbase.*
- *Construction of 200mm 32MPa concrete base.*
- *Backfill and topsoiling.*
- *Hydromulching restored areas.*
- *Disposal of any excess material remaining in borrow stockpiles.*

101.03 WORK BY OTHERS

1. The excluded work will be the responsibility of the Principal and Utility Authorities. Attention is drawn to the Conditions of Contract regarding the obligation of the Contractor to co-ordinate the Works with any simultaneous and/or adjacent work by others. The Contractor shall liaise with these Contractors and Authorities to avoid disruption, delays and possible conflict. **Liaison**

EXAMPLE (TO BE COMPLETED BY COMPILER)

2. *The borrow material required to complete the Works will be stockpiled by others prior to commencement of this Contract.* **Borrow**

3. *The construction of the bridge within this Contract length will be undertaken concurrently by others. This includes the construction of bridge approach slabs and completion of the guardfence over the length of the approach slabs to join to the bridge.* **Bridge Construction**

4. *Utility adjustments and relocations by Water and Electricity Authorities.* **Utilities**

101.04 CONSTRUCTION SEQUENCE AND STAGING

EXAMPLE (TO BE COMPLETED BY COMPILER)

1. *The Contractor's programme shall allow to complete Separable Parts of the Works by the times stated in Annexure Part A to the General Conditions of Contract, taking into account and clearly indicating the restrictions imposed by utility relocation.* **Separable Parts**

2. *Refer to the Specification part for UTILITIES AND AUTHORITIES for timing of utility works.*

101.05 SUBSURFACE CONDITIONS

EXAMPLE (TO BE COMPLETED BY COMPILER)

1. *No geotechnical investigations have been carried out.*

2. *The Contractor's attention is drawn to the General Conditions of Contract Clause "Site Conditions". The Contractor should make an assessment of the in-situ moisture content likely to be encountered at the actual time work is to be carried out.* **Contractor to Make Assessment**

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101.06 OTHER PROJECT SPECIFIC ITEMS**EXAMPLE** (TO BE COMPLETED BY COMPILER)

- Historic Buildings
- Archaeological Sites (Aboriginal and European)
- Provision for Public Transport
- Local Water/Material Sources.

GENERAL REQUIREMENTS**101.07 DRAWINGS**

1. The Drawings which form part of the Contract Documents are bound in a separate volume.

101.08 STANDARDS AND TEST METHODS

1. Unless otherwise specified in the Contract, and where applicable, materials, workmanship and test methods shall be in accordance with the relevant standard of the Standards Association of Australia. **Australian Standards**
2. A standard applicable to the Works shall be the edition last published 14 days prior to the closing date for tenders unless otherwise specified. **Applicable Edition**
3. Overseas standards and other standard documents named in the Specification shall be applicable in the same manner as Australian Standards to relevant materials and workmanship. **Overseas Standards**
4. Copies of any standards quoted or referred to in the Specification shall be kept on the site if so specified. **Copies to be kept on Site**
5. Test Methods, other than Australian Standards, specified in the Technical Specifications shall refer to the issue dates current at 14 days prior to the closing date for tenders unless otherwise specified. **Test Methods other than AS**

101.09 TESTING AND SURVEY

1. All testing and survey as required by the Technical Specifications shall be arranged and carried out by the Contractor after approval to proceed with testing and survey is obtained from the Superintendent. **Test Results**
2. All test results and survey records shall be made available to the Superintendent if requested to do so. The cost of all such testing and survey shall be borne by the Contractor. **Contractor's Cost**
3. The minimum frequency of testing and survey shall be in accordance with either the Specification for QUALITY SYSTEM REQUIREMENTS or QUALITY CONTROL REQUIREMENTS as appropriate for quality assurance or quality control contracts respectively. The appropriate requirements for this Contract are cited on the Form of Tender. **Minimum Frequency**

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101.10 WORKING AREAS

1. Where the Drawings indicate construction working areas and areas for temporary site facilities such as the storing of materials, use of plant and erection of sheds, work shall not be performed nor the site occupied outside of these areas. **Designated Sites**
2. The Principal will not be responsible for the safe-keeping of any of the Contractor's plant, equipment, tools, materials or other property. The Contractor may provide, and pay for, any security fencing considered necessary around any office, workshop or storage area, subject to the Superintendent's approval. **Security**
3. If existing fencing on the Principal's property is cut or altered by the Contractor, or if there is no existing site fencing, the Contractor shall provide and maintain temporary fencing to the satisfaction of the Superintendent during the Contract to prevent unauthorised entry into the Principal's property, and shall reinstate the fencing and remove temporary fencing on completion of the work. **Temporary Fencing**
4. For fencing of temporary site facilities, refer to Clause 101.38.
5. The Contractor shall erect appropriate regulatory, hazard, emergency information and fire signs, in accordance with AS1319 Safety signs for the occupational environment, at prominent locations around the working areas and temporary site facilities. Signs shall include, but are not limited to: mandatory signs for personal protective equipment such as eye, head and foot protection, and DANGER signs such as "DANGER, Construction Site. No Unauthorised Access". All words on word-message signs shall be approved by the Superintendent prior to sign manufacture or purchase. **Safety Signs**

101.11 SMOOTH JUNCTIONS

1. Construction work carried out under this Contract adjacent to or adjoining existing works shall make smooth junctions with the existing work.

101.12 SETTING OUT THE WORKS

1. The Superintendent will provide Permanent Marks as shown on the Drawings. The Superintendent will also establish bench marks related to the level datum. **Provision of Marks**
2. Before any of the given survey marks on the base lines or the various control lines are affected by the Works, the Contractor shall transfer such survey marks to side positions clear of operations and shall note, and inform the Superintendent in writing, of the extent of such movement. **Transfer of Marks**
3. The Contractor shall give the Superintendent not less than two full working days' notice of the intention to perform any portion of the relocation of survey control, establishment of recovery pegs, or setting out or levelling, so that suitable arrangements can be made for checking of the work by the Superintendent. If no such notification is given and a control mark is disturbed or destroyed, then the cost of re-establishing the control shall be borne by the Contractor. **Notice for Relocation**
Contractor's Cost
4. The Contractor shall provide and fix adequate recovery pegs in suitable locations adjacent to the elements of work to enable location and construction to be checked. **Recovery Pegs**
5. All pegs and profiles placed by the Contractor shall be removed on completion of work unless otherwise directed by the Superintendent. **Removal**

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101.13 SITE MEETINGS

1. Regular site meetings will be held for the purpose of discussion of the progress and co-ordination of the Work under the Contract and any matters of doubt regarding the intent or interpretation of the Drawings or the Specification. The Contractor shall arrange for relevant sub-contractors or their responsible representatives to be present at these meetings. The meetings will be held at a time nominated by the Superintendent.

Representation

2. The Superintendent or Superintendent's Representative shall chair site meetings, keep minutes of the proceedings and shall provide copies of the minutes for the Contractor, all present at the meeting and others concerned with the matters discussed.

Responsibility for Minutes**101.14 ALTERNATIVE CONSTRUCTION**

1. Should a tender based on the use of alternative material, design or method of construction be accepted, the Contractor shall prepare and submit detailed Working Drawings, design calculations and specifications for the alternative, together with details of necessary alterations to this Specification.

Detailed Working Drawings

2. The design and construction documents required shall be prepared under the supervision of, and be certified by a Professional Engineer experienced in that type of design. Documents shall be submitted to the Superintendent at least four weeks before construction of the relevant part of the work is scheduled to commence and no work shall commence on that part until written authority to proceed has been issued by the Superintendent.

Preparation and Submission

3. All costs incurred in the preparation of Working Drawings, design calculations, specifications and any variations or supplementary submissions required by the Superintendent shall be borne by the Contractor.

Contractor's Cost**101.15 WORKING DRAWINGS**

1. Where the Contractor is required to provide Working Drawings, two sets of such drawings, together with two sets of supporting calculations, shall be prepared and submitted to the Superintendent not less than the minimum time specified prior to scheduled commencement of the work concerned.

Submission to Superintendent

2. Drawings submitted shall be of a standard of draftsmanship and legibility acceptable to the Superintendent. The Working Drawings and calculations shall be altered or supplemented promptly if so required by the Superintendent and the aforesaid number of sets of revised drawings and calculations shall be resubmitted.

Standards

3. The work concerned shall not be initiated until a set of Working Drawings has been returned to the Contractor together with written authorisation to proceed. Upon receipt of this authorisation the Contractor shall revise the Working Drawings to incorporate any conditions attached to such authorisation and shall forward to the Superintendent four additional sets of such revised Working Drawings.

Approval to Proceed

4. The Superintendent's written authorisation to proceed shall not relieve the Contractor of the responsibilities for the design (where applicable) and construction of the Works in accordance with the Contract.

Contractor's Responsibility

5. After the Superintendent's authorisation to proceed has been issued, variations to the Working Drawings shall be made only after obtaining a specific written authorisation for the variation from the Superintendent. Four sets of such revised Working Drawings shall then be submitted to the Superintendent.

Authorised Variations

6. Costs incurred in the preparation and supply of Working Drawings, supporting calculations and other documents and any variations or supplementary submissions

Contractor's Cost

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required by the Superintendent shall be borne by the Contractor and shall be considered as incidental to the relevant items of work.

101.16 WORK-AS-CONSTRUCTED DRAWINGS

1. The Contractor shall supply the Superintendent with fully marked-up and certified Work-as-Constructed Drawings for the whole of the Contract prior to issue of the Final Certificate. Prints or reproducibles of the Contract Drawings will be supplied by the Principal free of charge for this purpose. **Submission**
2. Work-as-Constructed Drawings for Roadworks shall show in red ink all changes to the Contract Drawings and actual values of all levels shown on the Drawings. The Drawings shall be signed by a Surveyor and certified by the Contractor. **Roadworks**
3. Work-as-Constructed Drawings for Bridgeworks shall show in red ink all changes to the Contract Drawings, including variations to levels, dimensions, concrete, reinforcement, prestressing and other materials, all non-conformances accepted without rectification, suppliers and model numbers of bearings and proprietary joints and type of barrier railings installed where both steel and aluminium alternatives are detailed. The Drawings shall be certified by the Contractor. **Bridgeworks**

101.17 ITEMS TO BE SUPPLIED BY THE PRINCIPAL

1. Items listed in Annexure 101A - Schedule of Items to be supplied by the Principal (TBS Items) will be supplied, delivered and unloaded by the Principal free of cost to the Contractor at points to be nominated. The Contractor shall give the Superintendent notice of the time delivery of TBS Items are required in accordance with the Requirements of the Technical Specification or as specified below. **Delivered Free of Cost**
2. If any TBS Item is found to be damaged or defective the Contractor shall so inform the Superintendent within 2 days of taking delivery of such item. If the Contractor does not report damage or defect, it shall be deemed that the TBS Item was free from damage or defect when received. The Contractor shall then be responsible for any replacement or making good as may be directed by the Superintendent in the case of a Quality Control Contract, or in accordance with the Disposition of Nonconformance requirements in the Specification for QUALITY SYSTEM REQUIREMENTS in the case of a Quality Assured Contract. **Damaged or Defective**
3. The Contractor shall be responsible for the storage, protection and insurance of all TBS Items received.
4. In the case of pipe culverts the Contractor shall give the Superintendent 30 days notice of the time delivery is required.
5. The Principal shall supply the pipe culverts at no cost to the Contractor for the actual length laid of pipe culvert required under the contract.
6. Any pipe culverts in addition to the above quantity shall be the responsibility of the Contractor to supply at no cost to the Principal.

ENVIRONMENTAL REQUIREMENTS

101.18 PROTECTION OF THE ENVIRONMENT

1. All work shall be carried out in such a manner as to avoid nuisance and/or damage to the environment. The Contractor shall comply with the requirements of any Environmental Impact Statement and Assessment Report or Review of Environmental Factors for the project, the conditions of approval imposed by the Environment Protection Act, 1970, the Country Fire Authority Act, 1958 and any other local government **Conformance to Acts**

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requirements and environmental acts relevant to the project. No variation in costs or extensions of time will be considered due to these requirements.

2. The Contractor shall plan and carry out the Works to avoid erosion, contamination and sedimentation of the site and its surroundings in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION. **Erosion Control**
3. Herbicides and other toxic chemicals shall not be used on the site without the prior written approval of the Superintendent. **No Toxic Chemicals**
4. No noise or smoke or other nuisance, which in the opinion of the Superintendent is unnecessary or excessive shall be permitted by the Contractor in the performance of the Works under this Contract. Should work outside customary working hours be approved, the Contractor shall not use, during such period, any plant, machinery or equipment which in the opinion of the Superintendent is causing or is likely to cause a nuisance to the public. No noisy works and/or works likely to disturb nearby residents shall be undertaken during the hours precluding such activity as specified in Clause 101.21. **Noise and Smoke**
5. The Contractor shall ensure that fugitive dust from disturbed areas is minimised by a method approved by the Superintendent. Details of dust control are to be submitted in writing to the Superintendent two (2) weeks prior to commencing excavation/earthworks operations. **Dust Control**

101.19 DRAINAGE OF WORKS

1. The control and management of stormwater drainage through the site will be important during construction of the Works. **Stormwater Control**
2. The Contractor shall provide for the effectual diversion of surface water from the Works and provide and ensure proper flushing for storm and subsoil water across and beyond the Works at all times. The flow of stormwater and drainage along existing gutters and water tables shall not be interrupted. **Stormwater Diversion**
3. The Contractor shall keep trenches and excavations dewatered at all times during construction, and if directed by the Superintendent, shall maintain efficient pumping equipment on site. **Pumping**
4. All permanent retarding basins, and temporary erosion and sedimentation control to be completed prior to commencement of earthworks.

101.20 BLASTING

1. Blasting shall not be permitted, unless otherwise approved by the Superintendent. If such approval is given then blasting shall be carried out in accordance with the Specification for EARTHWORKS.

101.21 LIMITS ON NOISE

1. The Contractor shall only use plant that have effective residential class silencers fitted to all engine exhausts, have engine covers fitted, and are maintained in good order. **Plant with Silencers**
2. Operational hours of plant, including the entry and/or departure of heavy vehicles, shall be restricted to 7am to 5pm Monday to Saturday and at no times on Sundays or Public Holidays. Work outside of the hours specified shall not be undertaken without the prior approval of the Superintendent. **Working Hours**
3. Noise emanating from the construction site when measured at noise sensitive locations shall be as determined by the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade No. N1). The intent of this requirement is to **Maximum Noise Levels**

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avoid excessive noise and long periods of elevated noise that is reasonably anticipated to annoy or adversely effect the adjacent community.

4. The Contractor will be responsible for any damage and compensation payments as a result of non observance of the above requirements. No claim by the Contractor arising out of these requirements will be considered by the Principal. **Responsibility for Damage**

101.22 LIMITS ON GROUND VIBRATION

1. It is the intent of this Specification that ground vibration levels, transmitted from operating items of plant in the vicinity of residential premises, shall not exceed levels that are close to the lower level of human perception inside the premise nor will cause structural damage to the building. Practices and vibration thresholds acceptable shall be determined in accordance with the current Statutory Regulation. Where such regulation is not available, or jurisdiction is disputed, the criteria given in paragraphs 2 and 3 shall apply. **Levels**

2. Vibration (RMS Z-Axis) generated by construction works shall not exceed **Limits**
 Curve 4 - for the period of 1 month or less
 Curve 2 - for the period of more than 1 month

as defined in British Standard BS6472 "Evaluation of Human Exposure to Vibration in Buildings (1 HZ to 80 HZ)" when measured inside nearby residential premises.

3. Ground vibrations generated by construction works shall not exceed a peak particle velocity (V_R max) limit of 5 mm/sec when measured within one metre of any residential premise. **Peak Particle Velocity**
4. The Contractor shall be responsible for any damage and compensation payments as a result of non-observance of the above requirements. No claim by the Contractor will be considered by the Principal. **Responsibility for Damage**

101.23 OTHER PROJECT SPECIFIC ENVIRONMENTAL REQUIREMENTS

(TO BE COMPLETED BY COMPILER)

UTILITIES AND AUTHORITIES

101.24 GENERAL

1. This section includes the location and protection of utilities and services, programming of the work by other Authorities and the Contractor, and an outline of utility adjustments required during the construction of the Works

101.25 RELATIONS WITH UTILITY AUTHORITIES AND OTHER AGENCIES

1. The Superintendent will arrange for all necessary adjustments to utilities required to conform to the Drawings unless specified otherwise or noted on the Drawings. The Superintendent will make every endeavour to arrange for such adjustments to be performed expeditiously and with a minimum of inconvenience to the Contractor. Work shall comply with the Streets Opening Conference's Information Bulletin on Codes and Practices. **Principal to Adjust**
2. Before proceeding with excavation or other work in any area, the Contractor shall liaise with the utility authorities to ascertain the presence of any utility services and check that all necessary utility relocations have been completed. **Check on Presence**
3. The utility authorities contact person/position, telephone and facsimile numbers,

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(correct at time of advertising of tender) are listed below: *(TO BE COMPLETED BY THE COMPILER)*

(a) **Water and Sewerage**

Name..... PH:..... FAX:.....
Position.....

(b) **Electricity**

Name..... PH:..... FAX:.....
Position.....

(c) **Gas**

Name..... PH:..... FAX:.....
Position.....

(d) **Telephone**

i) **Telstra**

Name..... PH:..... FAX:.....
Position.....

ii) **Optus**

Name..... PH:..... FAX:.....
Position.....

(e) **Other** (as required)

Name..... PH:..... FAX:.....
Position.....

4. Where the Contractor's method of working results in additional adjustments to their plant being deemed necessary by any other Authority the Contractor will arrange for and bear all costs relevant to those additional adjustments. This applies regardless of any approval to the method of working by the Superintendent.

Additional Adjustments

5. The Contractor shall conduct the operations so as to interfere as little as possible with the operations of other Authorities or their contractors on or near the site of the works. The Principal reserves the right to permit other Authorities and others to work on or near the Works being constructed under the Contract.

Minimum Interference

6. The Contractor will not be responsible for the maintenance of any facilities installed or constructed by the various Authorities or structures and other facilities constructed by others (except where such structures and facilities form part of the Contract), but will be responsible for the protection of such facilities and structures during the Contract period.

Responsibility for Protection

7. In certain instances the Contractor may be required to provide the various Authorities the opportunity to remove, relocate, or work on their facilities before the Contractor proceeds with succeeding construction operations. Should the Contractor suffer any delay in excess of the times set out in this Specification owing to the moving of any such services, or the operations of any Authority controlling such services, the Contractor may apply to the Superintendent for an extension of time in accordance with the Conditions of Contract.

Delays

8. The Contractor shall have no right to monetary compensation or to any claim for damages because of any loss owing to such delays, nor shall the Contractor stop the

No Compensation

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Works without the express permission in writing of the Superintendent because of any operation by other Authorities.

101.26 LOCATION AND PROTECTION OF SERVICES AND UTILITIES

1. Prior to the commencement of any excavation the Contractor shall verify the location and depth of all Public Utility Mains and Consumer Services and shall be responsible for any damage caused, the repair of the damage, and payment of all charges associated therewith. **Contractor to Verify Locations**
2. During the excavation of Works, the Contractor shall take every precaution that is necessary, in the opinion of the Superintendent, to secure existing gas, water or drainage pipes, sewers, electric conduits or other existing works, wherever met with both underground and overhead, or that are adjacent to these Works, from injury and shall maintain the same until in the opinion of the Superintendent, the backfilling of excavation and the general progress of the Works render further precautions unnecessary. The Contractor shall comply with the Statutory Requirements for maintaining safe working clearance to overhead electrical services. **Precautions**
Statutory Requirements
3. Damage to existing water, gas or drainage pipes, sewers, electric conduit or other existing works or services, shall be repaired by the Contractor to the satisfaction of the Superintendent and the relevant Authority at the Contractor's cost. **Repairs Contractor's Cost**
4. Where it is found necessary to remove, divert or cut into any existing sewer, drainage pipe, gas or water main, service pipes, electric conduits or other existing works, the Contractor shall give at least 3 days notice of the Contractor's requirements to the Superintendent, who will advise what arrangements should be made for the alteration of such existing works. **Notice**
5. Where the installation of service mains, pits and consumer service connections is to be carried out by the various Utility Authorities the Contractor shall liaise and co-ordinate with the relevant Authorities for the installation to coincide with the construction work of this Contract. The Contractor shall be responsible to programme the installation such that all work is completed by the relevant Authorities so as not to hinder or delay the progress of the construction work of this Contract. **Liaison**
6. Attention is directed to the possible existence of vibration and other working limitations in the vicinity of underground and overhead facilities. The extent of these limitations are liable to the absolute discretion of the Authority concerned. The Contractor shall be deemed to have included consideration of these potential limitations in the method of construction as proposed for approval by the Superintendent in accordance with the provisions of this Specification. The cost of such limitations on working methods shall be determined in accordance with the Conditions of Contract. **Limitations**
7. Information shown on the Drawings concerning utility services has been compiled from information obtained from various Utility Authorities and is not guaranteed correct or complete. Services may exist which are not shown on the Drawings, or which are at locations or elevations different than those shown on the Drawings. **Disclaimer**

101.27 PROGRAMMING AND DURATION OF UTILITY ADJUSTMENTS

1. The Contractor shall give the Superintendent 21 days' notice in writing of the expected date of completion of each of the necessary parts of the Works required before each of the utility services listed in this Specification can be relocated. No final trimming or subsequent parts of the Work shall proceed in any area of the Work until the adjustment of all utilities within that area is complete. **Notice**
2. The Contractor shall allow in the programming of the Works for the utility adjustments specified in the following clauses. The finish dates given are approximate only. The Contractor shall be entitled to extensions of time if the utilities have not been relocated by these dates and this causes delay to the Contract. The Contractor shall **Allowance for Adjustments**

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have no right to monetary compensation or to any claim for damages because of any loss attributable to such delays.

101.28 STREET LIGHTING

1. *SITE SPECIFIC (TO BE COMPLETED BY COMPILER)*

101.29 UTILITY RELOCATIONS

1. *SITE SPECIFIC (TO BE COMPLETED BY COMPILER)*

SITE FACILITIES

101.30 GENERAL

1. This section includes the provision, maintenance and removal or restoration on completion of the Work of temporary site facilities for personnel, including the office for the Superintendent, and the necessary temporary utility services required on the site.

101.31 WORKERS' FACILITIES

1. The Contractor shall provide, equip and maintain temporary ablution facilities, dressing rooms, tool houses and the like required by any Industrial Ordinance, Award or Agreement for use of workers employed by the Contractor, or the Contractor's sub-contractors, and shall remove them on completion of the Contract.

***Facilities
Provided***

2. The Contractor shall provide temporary latrine accommodation for use of the workers which shall be suitably enclosed and screened and in accordance with the requirements of the Local Authority, making a temporary connection to an existing sewer where one is available. The Contractor shall maintain such accommodation in a clean condition, pay all relevant fees and remove it on completion of the Work, capping off any temporary sewer connection.

Latrines

101.32 OFFICE FOR SUPERINTENDENT

1. The Contractor shall provide, equip, maintain and remove at the completion of the Works an office, including toilet facilities, for the sole use of the Superintendent and Superintendent's staff.

The office shall be comprised of:

(a) Building

1. A structure of prefabricated construction with minimum inside dimensions of 6m x 3m x 2.4m high exclusive of toilet facilities, weatherproof, adequately insulated and well ventilated.
2. The office shall contain 2 opening type windows fitted with insect-proof screens and an external door fitted with a cylinder night lock with 2 keys.
3. The floor area shall be covered with an approved vinyl flooring and the walls and ceiling painted to the approval of the Superintendent.

(b) Furniture and Fittings

1. The office shall contain:
 - i) One reference table of minimum size 1.5m x 0.9m.

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- ii) One desk, with lockable drawers, of minimum size 1.5m x 0.9m.
- iii) Three office chairs and one stool all with padded seats, swivel base and adjustable height.
- iv) Two 1.2m square pin boards fixed to the walls.
- v) One 0.75 kw reverse cycle air conditioner.

(c) Toilet Facilities

1. The toilet facilities shall consist of a prefabricated structure, weatherproof and well ventilated, and connected to the temporary sewerage system and containing:

- i) One, minimum, partitioned w.c. cubicle with door and latch.
- ii) Separate wash area with one, minimum, wash basin connected with hot and cold running water.
- iii) Lockable external door with 2 keys.

(d) Electricity

1. The office, including toilet facilities, shall be supplied with adequate electric lighting and the office with 2 double power points.

(e) Telephone

1. Two telephone lines shall be connected to the office with one line fitted with a telephone hand set. The second line shall be for a facsimile machine supplied by the Superintendent.

(f) Charges

1. The Contractor shall pay all charges resulting from the supply, erection, installation, maintenance, cleaning and removal of the office, toilet facilities, electricity and telephone services.

101.33 ALTERNATIVE SITE FACILITIES

1. The Contractor may propose alternative site facilities in existing buildings adjacent to, or in close proximity to, the site of the Works.

2. Full details of such alternative facilities shall be submitted for consideration by the Superintendent, however, the requirements detailed in Clause 101.32 shall be taken as the minimum acceptable.

101.34 WATER SUPPLY

1. The Contractor shall provide any temporary water supply required for site facilities and for carrying out the Work under the Contract.

Water Supply

2. The Contractor shall pay all fees and obtain all approvals in respect of the temporary service and shall pay any charges for the water used. On completion of the Contract the temporary water supply service, except that to the Superintendent's office, shall be removed by the Contractor.

Fees and Charges

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101.35 ELECTRICAL SERVICE

1. The Contractor shall provide any temporary electricity supply required for site facilities and for carrying out the Work under the Contract. **Electricity Supply**
2. The Contractor shall pay all fees and charges and shall obtain all approvals in respect of the temporary electricity supply. The temporary electrical installation and the electrical reticulation shall fully comply with and conform to the Service Rules, Regulations and Requirements of the Statutory Authority having jurisdiction. The Contractor shall pay for all electricity consumed. **Fees and Charges**
3. The temporary electricity service, reticulation and lighting, except that to the Superintendent's office, shall be removed by the Contractor on completion of the Contract. **Removal**

101.36 TELEPHONE

1. The Contractor shall arrange for installation of a temporary site telephone for the Contractor's and Sub-contractor's use and shall maintain the installation for the period of the Contract. **Provision**
2. All charges for installation, rental, calls and removal on completion shall be borne by the Contractor. **Charges**

101.37 FIRST AID

1. The Contractor shall provide, equip and maintain an adequate First Aid Treatment Centre on the site and shall have an experienced First Aid person available at all times when work is in progress. The First Aid facilities shall be clearly marked and readily accessible to all personnel at all times. The minimum provisions under this Clause shall satisfy the current statutory requirements. **First Aid Room**

101.38 CHAIN WIRE FENCE

1. The Contractor shall provide a 1.83m high galvanised chain wire mesh perimeter fence, in accordance with the requirements of the Specification BOUNDARY FENCING, together with a galvanised tubular steel vehicular access gate, for the temporary site facilities as shown on the Drawings or as directed by the Superintendent. **Standard**
2. The mesh fence shall be covered with a suitable hessian or shade cloth screen for its full height. **Hessian Covering**
3. The galvanised fence, screen material and gate shall be removed by the Contractor on completion of the Contract. **Removal**
4. If a fence, in accordance with Paragraphs 1, 2 and 3 above, is not required, the Working area including the site facilities shall be fenced off from the public to the satisfaction of the Superintendent and in accordance with any relevant regulations.

SPECIAL REQUIREMENTS**MEASUREMENT AND PAYMENT****101.39 DEDUCTIONS FOR NONCONFORMING WORK**

1. Where deductions for nonconforming work are given in the Technical Specifications, the nominated deductions shall be applied to the rates given in the Pay

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Items for that item of work.

101.40 PAY ITEMS

1. No separate measurement and payment shall be made for compliance with the requirements of this General Specification except as specified in the pay item below.

Pay Item 101 (a) OFFICE FOR SUPERINTENDENT

1. The unit of measurement shall be lump sum and shall include provision of all facilities detailed in Clause 101.32.

ANNEXURE 101A**SCHEDULE OF ITEMS TO BE SUPPLIED BY PRINCIPAL**

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CITY OF GREATER DANDENONG

SPECIFICATION

201

CONTROL OF TRAFFIC

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SPECIFICATION 201 : CONTROL OF TRAFFIC**GENERAL****201.01 SCOPE**

1. The work to be executed under this Specification consists of all work necessary to provide for the safe movement of traffic and the protection of persons and property through and/or around the work site.

2. The extent of work includes the design, construction, maintenance and removal of temporary roadways including side-tracks and divided road crossovers and detours, the provision of traffic controllers, signposting, roadmarkings, raised pavement markers, lights, barriers and any other items required. All temporary traffic arrangements required by works under this Contract are included under this Specification except where specified otherwise.

**Works
Included**

3. Control of traffic shall be in accordance with AS 1742.3, SAA HB81, this Specification, and the Drawings.

Standards

4. Wherever the word 'should' occurs in AS 1742.3 the word 'shall' applies and the required action is the Contractor's responsibility.

**Contractor's
Responsibility**

201.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

211	-	Erosion & Sedimentation Control
212	-	Clearing & Grubbing
213	-	Earthworks
220	-	Stormwater Drainage - General
221	-	Pipe Drainage
223	-	Drainage Structures
224	-	Open Drains, including Kerb and Channel
242	-	Flexible Pavements
244	-	Sprayed Bituminous Surfacing
245	-	Asphaltic Concrete
264	-	Non-Rigid Road Safety Barrier System (Public Domain)
267	-	Rigid Concrete Road Safety Barrier Systems (Public Domain)

(b) Australian Standards

AS 1165	-	Traffic hazard warning lamps
AS 1742.3	-	Traffic control devices for works on roads
AS 1742.14	-	Traffic signals
AS 1743	-	Road signs specifications
AS 1744	-	Standard alphabets for road signs
AS/NZS 1906	-	Retro reflective materials and devices for road traffic control purposes
AS/NZS 1906.1	-	Retroreflective materials.
AS 4191	-	Portable traffic signal systems
AS/NZS 4192	-	Illuminated flashing arrow signs
AS/NZS 4602	-	High visibility safety garments

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SAA HB81 - Field guides for traffic control at works on roads

(c) AUSTRROADS Publications

AUSTRROADS - Guide to Traffic Engineering Practice - Part 5, Intersections at Grade

AUSTRROADS - Guide to the Geometric Design of Rural Roads.

201.03 TRAFFIC MANAGEMENT PLAN

1. The Contractor shall construct the work with the least possible obstruction to traffic.

**Minimise
Obstruction**

2. Two weeks before undertaking work which would involve any obstruction whatsoever to traffic the Contractor shall submit, for the Superintendent's approval, a Traffic Management Plan in accordance with AS 1742.3. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted Traffic Management Plan is required prior to the release of the hold point.

**Traffic
Management
Plan**

HP

3. Where the Traffic Management Plan involves Regulatory Traffic Control Signs or Devices and/or where in the opinion of the Superintendent the disruption to local traffic is significant, the prior approval of the Council Local Traffic Committee will be sought and obtained prior to the release of the hold point. In such cases the period of notice shall be increased to five weeks in accordance with Clause 201.24.

**Additional
Notice**

4. The Traffic Management Plan shall include:-

**Traffic
Management
Plan Contents**

(a) design drawings for any temporary roadways and detours in accordance with Clause 201.11 showing pavement, wearing surface and drainage details,

(b) details of arrangements for construction under traffic in accordance with SAA HB81, and

(c) a signpost layout plan showing:

(i) location, size and legend of all temporary signs

(ii) temporary regulatory signs and temporary speed zones, and

(iii) all traffic control devices such as temporary traffic signals, linemarking, pavement reflectors, guideposts, guardfence and barrier boards.

(d) working times when traffic control measures are in place to minimise disruption to traffic during periods of peak flows.

5. The Traffic Management Plan shall be in accordance with the requirements of this Specification and the Drawings.

6. Special consideration to the safety of pedestrians and workers shall be given in the preparation of the Traffic Management Plan. Particular care shall be taken when requiring reversal of traffic flows or the separation of unidirectional flow by medians or other physical separation.

Safety

7. A copy of the approved Traffic Management Plan shall be kept on site at all times and used to check the arrangement and maintenance of traffic control devices in accordance with Clauses 201.21 and 201.22.

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201.04 SIDE ROADS AND PROPERTY ACCESSES

1. The Contractor shall provide safe and convenient passage for vehicles, pedestrians and stock to and from side roads and property accesses connecting to the roadway. Work which affects the use of side roads and existing accesses shall not be undertaken without providing adequate alternative provisions to the prior satisfaction of the Superintendent. **Access**

2. With the prior approval of the Superintendent, vehicular access may need to be denied due to particular construction activities. The Contractor is to keep these interruptions to an absolute minimum and must advise the property owners of such occurrences by way of letter drop at least 24 hours prior to such an interruption. The Contractor shall repeat this advice verbally to the property owner in a courteous manner. **Notice to Property Owners**

201.05 TRAFFIC CONTROLLERS

1. Traffic controllers are to be appropriately trained in the duties of traffic controllers in accordance with AS 1742.3 and SAA HB81. **Trained Traffic Controllers**

2. **Traffic controllers must wear appropriate vest (Day/Night) zipped up and always conduct traffic management activities with Stop/Go Batten.** **Recognition**

3. In addition to the requirements of AS 1742.3 and SAA HB81, a traffic controller shall remain at the head of each traffic queue while it is halted. If there is the possibility of approaching vehicles colliding with the tail of the queue because of restricted sight distance, or of drivers queue jumping because they cannot see the traffic controller at the head of the queue, then an additional traffic controller shall be placed at the tail end of the queue. **Location of Traffic Controllers**

4. Where both ends of the work are not intervisible, the traffic controller at each end shall, if practicable, be provided with two-way radio. Where radios are not used, an intermediate traffic controller, from whom both other traffic controllers shall take their cue, shall be stationed where he can see both extremities of the work. **Supplementary Control Measures**

5. At night, and in poor light, the traffic controller shall use an illuminated red cone wand (torch) with a minimum capacity of 30,000 candela to control traffic. **Night Work Control**

6. At night, and in poor light, the Superintendent may direct that the traffic controller and the work area adjacent be illuminated by flood lighting. The flood lighting shall be positioned above the work area and shall be directed downwards and slightly inclined to illuminate the face of the STOP/SLOW bat. The cost of providing flood lighting shall be borne by the Contractor. **Flood Lighting Contractor's Cost**

201.06 APPROVED CLOTHING FOR WORK PERSONNEL

1. In addition to the requirements of AS 1742.3 and SAA HB81, all personnel shall wear a garment or garments of the classification appropriate for the time of work execution in accordance with AS/NZS 4602 as follows: **Safety Clothing**

- (a) Class D - garments for daytime use only
- (b) Class N - garments for night-time use only
- (c) Class D/N - garments for both day and night use.

2. For Class D and D/N garments, the colour of the material shall be either red-orange or yellow or as otherwise approved by the Superintendent.

3. For Class N garments, the colour of the background material is unspecified,

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however, the retroreflective strips shall be white or yellow or as otherwise approved by the Superintendent.

201.07 TEMPORARY SPEED ZONING

1. Where a temporary speed limit has been approved by the Council or VicRoads, the Contractor shall arrange for the supply of appropriate temporary speed zoning signs, including posts and fittings, for erection. Where and when directed by the Superintendent, the Contractor shall erect these signs, cover the signs when the speed zone is not in use and remove the signs when the speed zone is no longer required as part of the provision for traffic. A diary recording operation times of the speed zone shall be kept by the Contractor and made available to the Superintendent when requested.

**Speed Zone
Signs**

2. Approval for temporary speed zoning shall be obtained through the Superintendent from the Local Traffic Committee after submission of an explicit written application 5 weeks in advance of action to employ such zoning.

3. All costs associated with temporary speed zoning signposting shall be borne by the Contractor.

**Contractor's
Cost**

201.08 PLANT AND EQUIPMENT

1. During the day plant and equipment working in a position adjacent to traffic and having a projection beyond the normal width of the item, for example, a grader blade, shall have a fluorescent red flag attached to the outer end of the projection. During poor light conditions or at night, an additional traffic controller with an illuminated red wand shall direct traffic around such plant and equipment.

**Plant
Delineation**

2. At night, where traffic is permitted to use the whole or portion of the existing road, all plant items and similar obstructions shall be removed from the normal path of vehicles to provide a lateral clearance of at least 6m where practicable, with a minimum clearance of 1.2m.

**Night Time
Clearance**

3. Plant and equipment, within 6m of the normal path of vehicles, shall be lit by not less than two yellow steady lamps suspended vertically from the point of the obstruction nearest to a traffic lane and one yellow steady lamp at each end of the obstruction on the side furthest away from the traffic lane.

**Warning
Lamps**

TEMPORARY ROADWAYS AND DETOURS

201.09 APPROVAL

1. The Contractor shall submit for the Superintendent's approval the design of all proposed temporary roadways, including side-tracks and divided road crossovers, and detours.

**Temporary
Roads**

201.10 DESIGN STANDARDS

1. The standard of alignment and grading adopted shall be in accordance with specific provisions of this Specification and shall otherwise be in accordance with the AUSTRROADS publication 'Guide to the Geometric Design of Rural Roads'.

**Alignment &
Grading**

2. Intersections shall be designed in accordance with the AUSTRROADS publication 'Guide to Traffic Engineering Practice - Part 5, Intersections at Grade'.

Intersections

3. Minimum geometric design standards, design speed, wearing surface type and pavement design shall be as shown in Annexure 201A.

**Minimum
Standards**

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201.11 DESIGN DRAWINGS

1. Design drawings submitted for approval shall show: **Contents**
- (a) Alignment and grading at a horizontal scale of 1:2000 for rural roads and 1:500 for urban roads. Where the temporary road rejoins the existing road, levels showing the full cross section shall be extended along the existing road for a minimum length of 200m.
 - (b) A sight distance diagram if opposing traffic is to use a single carriageway.
 - (c) Intersections, and any other locations where traffic may be required to make turning, merging or diverging movements, at a scale of 1:500.
 - (d) Pavement marking details.
 - (e) Pavement design details.
 - (f) Sufficient cross-sections to indicate the feasibility of making connections between various parts of the work.
 - (g) Sufficient dimensions, especially lane widths, to make clear the geometry and clearances of the proposed Works.
 - (h) A north point or some other location method to orientate the plan.

201.12 DRAINAGE

1. Drainage structures and drains shall be constructed in accordance with the following Specifications: **Standard**
- 220 - Stormwater Drainage - General
 - 221 - Pipe Drainage
 - 223 - Drainage Structures
 - 224 - Open Drains, including Kerb and Channel
2. Drainage proposed in accordance with Clause 201.03 shall be able to cope with upstream rainfall run-off resulting from all rainfall intensities up to that expected for a once in five year frequency, without overflow over the road. **Design Frequency**
3. Pavements shall be designed and constructed to not pond water on the wearing surface or shoulders. Temporary formations to be constructed shall not dam water. **Pavement Drainage**

201.13 CONSTRUCTION OF EARTHWORKS AND PAVEMENT

1. Temporary roadways shall be constructed in accordance with the following Specifications: **Temporary Roadways**
- 211 - Control of Erosion and Sedimentation
 - 212 - Clearing And Grubbing
 - 213 - Earthworks
 - 242 - Flexible Pavements

201.14 SURFACING

1. The wearing surface width shall extend across the full width of the traffic lanes plus the width shown in Annexure 201A for each shoulder, or as shown on the Drawings. **Wearing Surface**
2. The wearing surface shall be carried onto any existing connecting roadway so as **Tie-in to**

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to finish square to the existing roadway centreline.

existing work

3. Surfacing shall be constructed in accordance with the Specifications:

Standards

- 244 - Sprayed Bituminous Surfacing and/or
- 245 - Asphalt

201.15 ROAD SAFETY BARRIER

1. W beam or precast concrete safety barrier shall be erected on all temporary embankments where the vertical height between the edge of the shoulder and the intersection of the embankment slope and natural surface exceeds 2m and as otherwise shown on the Drawings.

Warrant

2. Corrugated steel or precast safety barrier shall be erected in accordance with the Specifications:

Erection

- 264 - Non-Rigid Road Safety Barrier Systems (Public Domain)
- 267 - Rigid Concrete Road Safety Barrier Systems (Public Domain)

201.16 OPENING TO TRAFFIC

1. Temporary roadways and detours (including portable or temporary traffic signals sites) shall not be open to traffic until they have been inspected and approved. This action constitutes a **HOLD POINT**. Approval in writing by the Superintendent is required prior to the release of the hold point.

Approval to use

HP

2. All signposting, pavement marking, guardfence and portable or temporary traffic signals shall be completed before the opening of temporary roadways to traffic.

Signposting

3. Unless otherwise approved by the Superintendent, the opening of temporary roadways shall be arranged so that sections of existing roadway being replaced are not disturbed for a minimum of forty-eight hours in the event of temporary roadway failure and there is a warrant to redirect traffic back onto the existing roadway. The determination to redirect traffic shall be by the Superintendent.

Existing Roadway Retained

4. The costs associated with the redirection of traffic back onto the existing roadway shall be borne by the Contractor.

Contractor's Cost

5. Unless otherwise approved by the Superintendent, traffic shall be switched to a temporary roadway or detour only where the Contractor's usual workforce will be on site for a minimum of two days thereafter.

Traffic Switch

6. The use of the completed Works or part of the Works in providing for traffic shall not be considered as full opening to traffic and shall not be a reason for issuing of a Certificate of Practical Completion for the section so used.

Use of Work

201.17 MAINTENANCE

1. The Contractor shall be responsible for the maintenance of temporary roadways and detours and shall ensure the road surface is kept safe for traffic. Any potholes or other failures shall be repaired without delay.

Contractor's Responsibility

201.18 REMOVAL

1. Upon completion of the Work the temporary roadways and/or detour arrangements shall be removed and the area restored to a condition equivalent to that

Restoration

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which existed prior to the commencement of the work.

ARRANGEMENTS FOR TRAFFIC

201.19 CONSTRUCTION UNDER TRAFFIC

1. Where a temporary roadway or a detour is not provided or available then, subject to the approval of the Superintendent, construction under traffic may be permitted provided a minimum of 3.5m lane width is available for through traffic on a two lane roadway and where 3.5m lanes are available in both directions for through traffic when working on multilane roads. **Lane Width**
2. The carriageway/s shall be restored to a safe and trafficable state for through traffic prior to cessation of work each day in accordance with the approved Traffic Management Plan. **Carriageway Restoration**
3. At least five working days before undertaking any work which would involve construction under traffic, the Contractor shall notify the Superintendent of the arrangements and methods for traffic control in accordance with the approved Traffic Management Plan. **Prior Notice of Work**

201.20 OPENING COMPLETED WORK

1. The Contractor shall give the Superintendent at least five working days written notice confirming the date of opening completed work to traffic. The procedure for opening shall be determined through consultation between the Superintendent, the Contractor and the Police. **Written Notice**
2. The Contractor shall be responsible for the removal of all temporary traffic control devices no longer required for the safety of traffic, when the Works or part thereof are opened to traffic. **Contractor's Responsibility**
3. All permanent signposting, pavement markings, guardfence and traffic signals relevant to the completed work under the Contract shall be completed prior to opening completed work to traffic. **Permanent Signs and Markings**

TRAFFIC CONTROL DEVICES

201.21 ARRANGEMENT OF TRAFFIC CONTROL DEVICES

1. The arrangement and placement of traffic control devices shall be carried out in accordance with the approved Traffic Management Plan, AS 1742.3 and SAA HB81. The arrangement diagrams illustrate the more common examples of the arrangement of traffic control devices and set out the minimum requirements. The traffic control devices shall be identified in the Traffic Management Plan. **Arrangement Diagrams**
2. All temporary traffic control devices when no longer required shall be covered and/or removed without delay in order to maintain unambiguous safe guidance to traffic. **Unnecessary Signs**

201.22 MAINTENANCE OF TRAFFIC CONTROL DEVICES

1. All traffic control devices shall be maintained in accordance with AS 1742.3 so that they are in good order and in the correct positions day and night. They shall be neat and clean, and signs shall be clear and legible at all times. **Contractor's Responsibility**
2. The Contractor may need to be contacted outside normal working hours to arrange for adjustments or maintenance of traffic control devices. The Contractor shall notify the Superintendent and the local Police, in writing, the names, addresses, and **Out of Hours Contact**

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means of communicating with personnel nominated for this purpose.

201.23 ADEQUATE TRAFFIC CONTROL DEVICES

1. Where the Contractor fails to provide and maintain adequate traffic control devices specified in this Specification, the Superintendent shall arrange to have such items provided and maintained. **Default by Contractor**

2. The cost of providing and maintaining adequate traffic control devices arranged by the Superintendent shall be borne by the Contractor. **Contractor's Cost**

201.24 REGULATORY TRAFFIC CONTROL SIGNS AND DEVICES

1. A Regulatory Traffic Control Sign or Device shall be in accordance with AS 1742.3, and shall require approval by the Council's delegated officer. **Prior Approval**

201.25 SIGNS

1. Signs shall be designed and manufactured in accordance with AS 1743. Details of each letter shall be as shown in AS 1744. **Specifications**

2. The reflective material used on signs shall be Class 2 material complying with AS 1906.1 except where otherwise specified. **Reflective Material**

3. The minimum size of sign and the class of reflective sheeting are shown in Annexure 201A. **Sign Size**

4. Signs required for planned nightwork shall have Class 1 retroreflective backgrounds or shall be floodlit as directed by the Superintendent in accordance with the requirements for night conditions in AS 1742.3. **Signs for Night Work**

201.26 SUPPLEMENTARY SIGNS

1. Signs supplementary to AS 1742.3 are shown in Annexure 201B. These signs may be used in lieu of or in addition to those shown in AS 1742.3 as follows:

(a) Heavy Machinery Crossing

This temporary sign, shown as Sign SW5-22 shall be used in lieu of W5-22, trucks entering.

(b) Cycle Hazard Grooved Road

This temporary sign, shown as Sign ST1-10, shall be used in addition to T1-10 of AS 1742.3 where the road is grooved and is a hazard to cyclists.

(c) Tar Spraying Possible Short Delay

This temporary sign, shown as Sign ST3-1, shall be used in addition to T3-1 for bituminous surfacing works.

(d) Changed Traffic Conditions Ahead

This temporary sign, shown as Sign ST1-6, shall be used in addition to T1-1, T1-6, T2-6 and T2-21 on long term works, sidetracks and detours.

201.27 FLASHING ARROW SIGNS

1. Flashing arrow signs shall comply with the requirements of AS/NZS 4192 and be installed in accordance with AS 1742.3 and SAA HB81. **Standard**

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201.28 BARRIER BOARDS

1. Barrier boards shall comply with the requirements of AS1742.3. **Standard**
2. Retroreflective sheeting on the rails shall be minimum Class 2 in accordance with AS/NZS 1906.1.
3. Trestles supporting the barrier boards may be manufactured of timber, metal or other suitable material and shall be yellow. The trestles shall provide firm supports for the barrier board and be kept in place by concrete blocks, sandbags or other devices approved by the Superintendent. The bases of the trestles shall not protrude beyond the ends of the boards. **Trestle Support**
4. Barrier boards or trestles shall enable mounting of traffic warning lamps.

201.29 HIGH VISIBILITY MESH FENCING

1. High visibility mesh fencing shall be constructed where shown on the Drawings, Traffic Management Plan or as directed by the Superintendent.
2. High visibility mesh fencing shall be constructed in accordance with AS 1742.3, Containment fences.
3. The mesh fencing shall be approximately 1m in height and of a red-orange coloured flexible material as approved by the Superintendent.

201.30 TEMPORARY POST-MOUNTED DELINEATORS

1. In addition to the requirements of AS 1742.3, temporary post mounted delineators shall be provided in conjunction with high visibility mesh fencing which is erected parallel to and in close proximity to traffic.

201.31 CONES AND BOLLARDS

1. Traffic cones and bollards shall comply with the requirements of AS1742.3 and be placed in accordance with the arrangement diagrams in SAA HB81. **Standard and Placement**
2. Unless cones are firmly fixed in position they shall be used only while work is in progress, or in locations where there is an employee in attendance who shall reinstate any of the cones which have been dislodged by traffic. Otherwise they shall be removed and bollards or barriers substituted. **Conditions of Use**
3. Cones and bollards used under night conditions shall be reflectorised in accordance with AS1742.3. **Reflectorised for Night Work**

201.32 TRAFFIC WARNING LAMPS

1. Traffic warning lamps shall comply with AS 1165 and shall be installed in accordance with AS 1742.3. The Contractor shall ensure that warning lamps are in good working order, correctly aligned and positioned with respect to the direction of traffic flow each night, before the site is left unattended. **Standards and Positioning**

210.33 TEMPORARY PAVEMENT MARKINGS

1. All pavement markings shall be reflectorised and consist of painted lines, roadmarking tape and/or raised pavement markers in accordance with the relevant Australian Standards or as otherwise approved by the Superintendent and shall be provided in accordance with AS 1742.3. **Reflectorised Markings**

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2. Where the adjoining roadway is edgeline, temporary roadways shall be similarly edgeline. **Adjoining Work**

201.34 TEMPORARY LINEMARKING

1. Where temporary linemarking is required on the final wearing surface, only pavement marking tape shall be used. **On Final Surface**

2. Where the pavement linemarking has become ineffective in the opinion of the Superintendent, remarking shall be undertaken within forty-eight hours of direction by the Superintendent. The cost of remarking the pavement lines shall be borne by the Contractor. **Contractor's Cost**

3. Where a single carriageway is opened adjacent to or used in lieu of an existing dual carriageway length, pavement arrows indicating the direction of flow of traffic shall be placed at not more than 500m or at a spacing nominated by the Superintendent. The arrows shall be removed if the section is then reincorporated as dual carriageway. **Pavement Arrows**

4. Immediately before or after placement of new markings all superseded pavement markings shall be obliterated or removed to the satisfaction of the Superintendent. **Old Markings Removed**

5. On a final surface, obliteration by painting shall not be permitted.

201.35 RAISED PAVEMENT MARKERS

1. Where raised pavement markers have become ineffective in the opinion of the Superintendent, they shall be replaced within twenty four hours of direction by the Superintendent. **Ineffective Markers**

2. The cost of replacing ineffective pavement markers shall be borne by the Contractor. **Contractor's Cost**

3. All superseded raised pavement markers shall be immediately removed from the pavement by the Contractor. **Removal of Superseded Markers**

201.36 BOOM BARRIERS

1. Where the Contractor proposes to use boom barriers to control traffic they shall be of a type and at locations approved by the Superintendent. **Type and Location**

201.37 TRAFFIC SIGNALS

1. Traffic Signals may be either portable or temporary as shown in AS 1742.3. **Portable or Temporary**

(a) Portable Traffic Signals

1. Portable traffic signals may be used for shuttle control where a single lane has to be used alternately by traffic from opposite directions or at road crossings or intersections. They are intended for relatively short term applications. **Warrant for Use**

2. Where the Contractor proposes to use portable traffic signals they shall be in accordance with AS 4191.

3. Approval of the Local Traffic Committee shall be sought prior to implementation. Written application is required through the Superintendent 5 weeks in advance of action to employ such traffic signals. **Approval**

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(b) Temporary Fixed Traffic Signals

1. Temporary fixed traffic signals may be used in accordance with AS 1742.3 for longer term shuttle operations or for non-shuttle control of intersecting traffic flows. **Warrant for Use**
2. Where the Contractor proposes to use temporary fixed traffic signals they shall be designed and installed in accordance with AS 1742.14.
3. Approval of the Local Traffic Committee shall be sought prior to implementation. Written application is required through the Superintendent 5 weeks in advance of action to employ such traffic signals. **Approval**

SPECIAL REQUIREMENTS**MEASUREMENT AND PAYMENT****201.38 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification and shown on the Drawings in accordance with Pay Item 201(a).
2. All activities for the construction, maintenance and removal of temporary roadways, including side-tracks and divided road crossovers, and detours detailed in this Specification, to the requirements of specific activity Specifications parts, are measured and paid in accordance with those Specifications parts.

Pay Item 201(a) CONTROL OF TRAFFIC

1. This shall be a Lump Sum item.
2. The Lump Sum shall include the design of temporary roadways and detours, traffic switching operations, the provision of traffic controllers (as specified), signposting, roadmarkings, raised pavement markers, lights, barriers and any other traffic control devices required for the safe movement of traffic and the protection of persons and property in accordance with this Specification.
3. Progress payments shall be made on a pro-rata basis of work done under this item, having due regard to the duration of the Contract.

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**ANNEXURE 201A
DESIGN STANDARDS AND SIGN REQUIREMENTS**

(i) DESIGN STANDARDS *(To be completed by Compiler)*

DESIGN TRAVEL SPEED.....	60 kilometres per hour
MINIMUM WIDTHS OF TRAFFIC LANES	3.5 metres
MINIMUM WIDTHS OF SHOULDERS	0.6 metres
MINIMUM WIDTH OF SHOULDER SEAL	0.0 metres
MINIMUM SURFACE TYPE.....	10mm Primer Seal
MINIMUM THICKNESS.....	(Nominal 10mm) millimetres
BASE TYPE	DGB 20
MINIMUM THICKNESS.....	100 millimetres
SUB-BASE TYPE	DGS 20
MINIMUM THICKNESS.....	200 millimetres

(ii) SIGNS *(To be completed by Compiler)***SIZE OF SIGNS**

Where AS 1742.3 lists more than one size, the size used in these works shall be ..B...* size except for Signs T1-5 and T1-13 where their size shall be ..B...# size. The special signs for night work shall be ...B...* size.

CLASS OF REFLECTIVE SHEETING

Where the class of reflectorised sheeting is not specified on the Drawings it shall be Class..2...**

Note

Principal to enter:

* A or B as appropriate for the Works

B or C as appropriate for the Works

** 1 or 2 as appropriate for the Works

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CITY OF GREATER DANDENONG

SPECIFICATION

211

**CONTROL OF EROSION AND
SEDIMENTATION**

SPECIFICATION 211 - CONTROL OF EROSION AND SEDIMENTATION

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**SPECIFICATION 211
CONTROL OF EROSION AND SEDIMENTATION**

GENERAL**211.01 SCOPE**

1. The work to be executed under this Specification consists of the construction of structures and the implementation of measures to control erosion and sedimentation. These may be temporary or permanent.
2. The Contractor shall plan and carry out the whole of the Works in accordance with an Environmental Management Plan to avoid erosion and sedimentation of the site, surrounding country, watercourses, waterbodies and wetlands in compliance with the requirements of the Environmental Protection Act and Council's adopted policies where available.
3. All measures for erosion and sedimentation control shall be designed, installed and maintained by the Contractor in such a manner so as not to present a potential hazard to any person or property.

211.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- | | | |
|-----|---|-----------------------------------------|
| 212 | - | Clearing and Grubbing |
| 213 | - | Earthworks |
| 224 | - | Open drains, Including Kerb and Channel |
| 273 | - | Landscaping |

(b) Victorian State Legislation

Environmental Protection Act, 1970
Water Act, 1989

(c) Other

Victorian Department of Natural Resources and Environment (DNRE)
Institute of Public Works Engineering Australia (IPWEA) - Local Government
Salinity Management Handbook (Draft, July 2001).
Kingston City Council and Melbourne Water:2003 – Keeping our Stormwater
Clean – A Guide for Building Sites

211.03 EROSION AND SEDIMENTATION CONTROL PLAN

1. For consideration of erosion and sedimentation control measures, the site shall be divided into sections based on the catchment area draining to each permanent drainage structure in the works. In addition to the area bounded by the road reserve, the sections shall include:

Site Sections

- (a) access and haulage tracks,
- (b) borrow pits, stockpile areas and

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- (c) compound areas, such as Contractor's facilities and concrete batching areas.

2. At least seven days before the natural surface is disturbed on each of these sections, the Contractor shall submit to the Superintendent an Erosion and Sedimentation Control Plan for that section. This Plan shall be superimposed on half-sized drainage drawings of the works and shall be detailed for each catchment area of the works. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted Erosion and Sedimentation Control Plan is required prior to the release of the hold point.

Section Plan

HP

3. The Plan shall consist of scale diagrams indicating:

Plan Inclusions

- (a) features of the site including contours and drainage paths,
- (b) relevant construction details of all erosion and sedimentation control structures,
- (c) all permanent and temporary erosion and sedimentation control measures, including the control measures to be implemented in advance of, or in conjunction with, clearing and grubbing operations as required under the Specification for CLEARING AND GRUBBING.
- (d) an order of works based upon construction and stabilisation of all culverts and surface drainage works at the earliest practical stage, and
- (e) proposed time schedules for construction of structures and implementation of measures to control erosion and sedimentation.

4. In known salt affected areas, the Contractor shall seek advice from the relevant land and water resource authority to ensure that its Erosion and Sedimentation Control Plan conforms with the current salinity prevention measures outlined in the IPWEA publication, Local Government Salinity Management Handbook.

Salinity Prevention

5. Release of the hold point approving the Erosion and Sedimentation Control Plan as submitted shall not relieve the Contractor of the full responsibility to provide whatever measures are required for effective erosion and sedimentation control at all times.

Contractor's Responsibility

6. The Contractor shall adhere to the approved Erosion and Sedimentation Control Plan. The Contractor shall submit a revised Erosion and Sedimentation Control Plan for approval by the Superintendent seven days in advance of an intended variation from the approved plan.

Adherence to Plan

7. The cost of preparing, submitting and revising the Erosion and Sedimentation Control Plan shall be borne by the Contractor.

Contractor's Cost

211.04 EROSION AND SEDIMENTATION CONTROL MEASURES

1. Erosion and sedimentation control measures shall include, but shall not be limited to, the following:

Scope

- (a) The installation of permanent drainage structures before the removal of topsoil and commencement of earthworks for formation within the catchment area of each structure.
- (b) The prompt completion of all permanent and temporary drainage works, once commenced, to minimise the period of exposure of disturbed areas.
- (c) The stabilisation of diversion and catch drains to divert uncontaminated runoff from outside the site, clear of the site. Catch drains shall be installed and lined, as approved by the Superintendent, before the

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- adjacent ground is disturbed and the excavation is commenced.
- (d) The passage of uncontaminated water through the site without mixing with contaminated runoff from the site.
 - (e) The provision of contour and diversion drains across exposed areas before, during and immediately after clearing and the re-establishment and maintenance of these drains during soil removal and earthworks operations.
 - (f) The provision of sediment filtering or sediment traps, in advance of and in conjunction with earthworks operations, to prevent contaminated water leaving the site.
 - (g) The restoration of the above drainage and sedimentation control works on a day to day basis to ensure that no disturbed area is left without adequate means of containment and treatment of contaminated water.
 - (h) The limitation of areas of erodible material exposed at any time to those areas being actively worked. Any area that is not approved by the Superintendent for clearing or disturbance by the Contractor's activities shall be clearly marked, fenced off or otherwise appropriately protected against any such disturbance.
 - (i) The minimisation of sediment loss during construction of embankments by means such as temporary or reverse superelevations during fill placement, constructing berms along the edge of the formation leading to temporary batter flumes and short term sediment traps.
 - (j) The progressive revegetation of the site, in accordance with the Specification for LANDSCAPING, as work proceeds.
 - (k) All stockpile sites shall be situated in areas approved for such use by the Superintendent. A 5m buffer zone shall exist between stockpile sites and any stream or flow path. All stockpiles shall be adequately protected from erosion and contamination of the surrounding area by use of the measures approved in the Erosion and Sedimentation Control Plan
 - (l) Access and exit areas shall include shake-down or other methods approved by the Superintendent for the removal of soil materials from motor vehicles.

2. All permanent and temporary erosion and sedimentation control measures shall be constructed in accordance with the construction details in the Erosion and Sedimentation Control Plan and the details as shown on the Drawings.

PERMANENT EROSION AND SEDIMENTATION CONTROL

211.05 EARTHWORKS FOR PERMANENT EROSION AND SEDIMENTATION CONTROL BASINS

- 1. Earthworks for permanent erosion and sedimentation control basins shall be constructed to the planned levels and dimensions shown on the Drawings. ***Planned Levels***
- 2. The entire storage and embankment foundation area of permanent erosion and sedimentation control basins shall be cleared in accordance with the Specification for CLEARING AND GRUBBING and shall be stripped of topsoil and any unsuitable material under embankments removed in accordance with the Specification for EARTHWORKS. ***Site Preparation***
- 3. The embankments shall be constructed in accordance with the Specification for EARTHWORKS. ***Compaction Requirements***
- 4. Where payment for embankment construction is on a Schedule of Rates basis, at least three days before construction of the embankment the Contractor shall provide the ***Contractor to Provide***

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Superintendent with survey information which will be sufficient to subsequently measure the volume of the constructed embankment.

**Survey
Information**

211.06 INLETS, SPILLWAYS AND LOW FLOW OUTLETS FOR SEDIMENTATION CONTROL BASINS AND SEDIMENT TRAPS

1. Inlets and spillways shall be constructed using rock filled woven galvanised steel mattresses and geotextile, as shown on the Drawings or as directed by the Superintendent. The rock filled mattresses shall be installed in accordance with the requirements for rock filled wire mattress and geotextile in the Specification for OPEN DRAINS, INCLUDING KERB AND CHANNEL.

**Rock
Mattresses**

2. A low flow outlet consisting of a 150mm diameter plastic pipe shall be installed as shown in the Drawings. No extra payment shall be made for this work which shall be regarded as part of the construction of the sedimentation control basin.

**Plastic Pipe
Outlet**

211.07 DROP INLET SEDIMENT CONTROL

1. Permanent drop inlet sediment traps and inlet control banks shall be constructed on completion of gully pits as indicated on the Drawings. These permanent drop inlet sediment traps and inlet control banks are additional to the temporary sedimentation control measures that may be required under Clause 211.10 during construction of the gully pits.

**Permanent
Traps**

2. The drop inlet sediment traps are intended to remove sediment from the surface flow before it enters the drainage system. The inlet control banks shall be constructed as required to prevent the surface flows bypassing the gully pits.

Purpose

3. The drop inlet sediment traps shall be constructed as shown on the Drawings. The associated inlet control banks shall consist of at least two courses of sandbags containing a 10:1 sand/cement mix. The bags shall be keyed at least 25mm into the surface, dampened sufficiently to ensure hydration of the cement and tamped lightly to provide mechanical interlock between adjacent bags.

Control Banks

211.08 CLEANING SEDIMENTATION CONTROL STRUCTURES

1. The Contractor shall clean out permanent sedimentation control structures, cleaning out whenever the accumulated sediment has reduced the capacity of the structure by 50 per cent or more, or whenever the sediment has built up to a point where it is less than 300mm below the spillway crest. All permanent sedimentation control structures shall be cleaned out by the Contractor prior to Practical Completion of the Works.

**Contractor's
Responsibility**

2. Accumulated sediment shall be removed from permanent sedimentation control structures in such a manner as not to damage the structures. The sediment removed shall be removed to a nominated soil stockpile site or disposed of in such locations that the sediment will not be conveyed back into the construction areas or into watercourses. The Contractor shall provide and maintain suitable access to permanent sedimentation control structures to allow cleaning out in all weather conditions.

**Removal of
Sediment**

TEMPORARY EROSION AND SEDIMENTATION CONTROL

211.09 GENERAL

1. The Contractor shall ensure that effective erosion and sedimentation control is provided at all times during the Contract.

**Contractor's
Responsibility**

2. Runoff from all areas where the natural surface is disturbed by construction, including access roads, depot and stockpile sites, shall be free of pollutants before it is

Pollutant Free

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either dispersed to stable areas or directed to natural watercourses. The Contractor shall be responsible for all temporary erosion and sedimentation control measures required for this purpose.

3. The Contractor shall provide and maintain slopes, crowns and drains on all excavations and embankments to ensure satisfactory drainage at all times. Water shall not be allowed to pond on the works unless such ponding is part of an approved Erosion and Sedimentation Control Plan.

***Maintenance
by Contractor***

211.10 TEMPORARY DRAINS

1. Runoff from areas exposed during the work shall be controlled by construction of temporary contour drains and/or temporary diversion drains. Generally, a temporary contour drain or temporary diversion drain takes the form of a channel constructed across a slope with a ridge on its lower side. They may require progressive implementation and frequent alteration as the work progresses.

***Control of
Runoff***

2. Contour drains, which follow points on the natural surface of approximately the same elevation, shall be provided immediately after a construction site is cleared to intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. Contour drains shall be formed with a grade of neither less than 1 per cent nor more than 1.5 per cent and shall be spaced at intervals of neither less than 20m nor more than 50m, depending on the erodibility of the exposed soil. Contour drains shall be constructed as shown on the Drawings.

***Contour
Drains***

3. Diversion drains shall be provided across haul roads and access tracks when such roads and access tracks are identified as constituting an erosion hazard due to their steepness, soil erodibility or potential for concentrating runoff flow. Diversion drains shall be formed to intercept and divert runoff from the road or track to stable outlets. Spacing of diversion drains shall not be greater than that required to maintain runoff at non-erosive velocities.

***Diversion
Drains***

211.11 TEMPORARY SEDIMENT TRAPS

1. Temporary sediment-trapping devices shall be provided during construction to remove sediment from sediment-laden runoff flowing from areas of 0.5 hectares or more before the runoff enters stormwater drainage systems, natural watercourses or adjacent land.

***Sediment
Traps***

211.12 BATTER PROTECTION

1. The Contractor shall take all necessary action to protect batters from erosion during the Contract.

***Contractor's
Responsibility***

2. Scour of newly-formed fill batters during and after embankment construction shall be minimised by diverting runoff from the formation away from the batter until vegetation is established.

Scour Control

211.13 MAINTENANCE AND INSPECTION

1. The Contractor shall inspect all temporary erosion and sedimentation control works after each rain period and during periods of prolonged rainfall. Any defects revealed by such inspections shall be rectified immediately and these works shall be cleaned, repaired and augmented as required, to ensure effective erosion and sedimentation control thereafter.

***Contractor's
Responsibility***

2. The Contractor shall provide and maintain access from within the road reserve or from other locations acceptable to the Superintendent, for cleaning out sedimentation control works.

Access

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211.14 REMOVAL

1. All temporary erosion and sedimentation control works shall be removed by the Contractor when revegetation is established on formerly exposed areas before the end of the Contract. All materials used for the temporary erosion and sedimentation control works shall be removed from the site or otherwise disposed by the Contractor to the satisfaction of the Superintendent.

**Contractor's
Responsibility**

SPECIAL REQUIREMENTS**MEASUREMENT AND PAYMENT****211.15 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis, in accordance with Pay Items 211 (a) to (e) inclusive.
2. A lump sum for any item other than Pay Item 211(a) shall not be accepted.
3. If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in other items for the cost of the activity which has not been priced.
4. Clearing and grubbing is measured and paid in accordance with the Specification for CLEARING AND GRUBBING.
5. Landscaping works are measured and paid in accordance with the Specification for LANDSCAPING.
6. Topsoil stripping and removal of unsuitable material are measured and paid in accordance with the Specification for EARTHWORKS.

Pay Item 211(a) TEMPORARY EROSION AND SEDIMENTATION CONTROL

1. The unit of measurement shall be a lump sum for the installation, maintenance, inspection and removal of the temporary erosion and sedimentation control measures in accordance with Clauses 211.09 to 211.14 inclusive and the Drawings.

Pay Item 211(b) EARTHWORKS FOR PERMANENT EROSION AND SEDIMENTATION CONTROL BASINS

1. The unit of measurement shall be the cubic metre of compacted volume of embankment constructed in accordance with Clause 211.05 and the Drawings.
2. The volume shall be determined by calculation using the end area method.
3. The schedule rate shall cover the excavation of material from within the sedimentation control basin and embankment construction required under Clause 211.05 and shall be an average rate for all types of materials.
4. The cost of excavating and transporting material for embankment construction and obtained from within cuttings or from borrow shall be included in the schedule rate for General Excavation in the Specification for EARTHWORKS.

Pay Item 211(c) INLETS, SPILLWAYS AND LOW FLOW OUTLETS FOR SEDIMENTATION CONTROL BASINS

1. The unit of measurement shall be the square metre of horizontal surface area of rock filled mattress constructed in accordance with Clause 211.06 and the Drawings.

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Pay Item 211(d) DROP INLET SEDIMENT TRAPS AND INLET CONTROL BANKS

1. The unit of measurement shall be 'each' drop inlet sediment trap including inlet control bank constructed in accordance with Clause 211.07 and the Drawings.

Pay Item 211(e) CLEANING OF PERMANENT SEDIMENTATION STRUCTURES

1. The unit of measurement shall be the in-place cubic metre of sediment removed from the structure in accordance with Clause 211.08.

2. The volume of sediment removed shall be determined by survey or by methods approved by the Superintendent.

The schedule quantity is a provisional quantity.

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SPECIFICATION

212

CLEARING AND GRUBBING

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SPECIFICATION 212: CLEARING AND GRUBBING

GENERAL

212.01 SCOPE

1. The work to be executed under this Specification consists of the clearing of all vegetation, both living and dead, all minor structures (such as fences and livestock yards), all rubbish and other materials which, in the opinion of the Superintendent, are unsuitable for use in the Works, the chipping of the crowns of trees and the branches of shrubs and the grubbing of trees and stumps from the area defined in Clause 212.02. The work also includes the disposal, in accordance with Clause 212.05 and 212.06, of all materials that have been cleared and grubbed. All natural landscape features, including natural rock outcrops, natural vegetation, soil and watercourses are to remain undisturbed except where affected by the Works as approved by the Superintendent

Extent of Work

2. In advance of or in conjunction with clearing and grubbing operations, effective erosion and sedimentation control measures shall be implemented in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

Erosion Control

3. The clearing and grubbing required for boundary fencing is included in the Specification for BOUNDARY FENCING and does not form part of the work under this Specification.

Boundary Fence Line

4. Explosives shall not be permitted to be used in clearing, grubbing or other demolition activities without the prior written approval of the Superintendent.

Blasting

CONSTRUCTION

212.02 LIMITS OF CLEARING

1. Unless otherwise shown on the Drawings or directed by the Superintendent, the area to be cleared is that which will be occupied by the completed Works, erosion and sedimentation measures, stockpile sites and borrow areas, plus a clearance of 4m beyond tops of cuts and toes of embankments where the natural fall of the ground is towards the roadway and 2m beyond the tops of cuts and toes of embankments where the natural fall of the ground either slopes away from the roadway or is level. The Contractor shall ensure that only the absolute minimum area for construction is cleared.

Limits of Clearing

2. The Contractor shall peg out the limits of clearing and present this for approval 7 days prior to any commencement of work. This action constitutes a **HOLD POINT**. The Superintendent shall inspect the proposed area for clearing to confirm the clearing perimeters and, with Council's Tree Preservation Officer, shall mark with ribbon markers, or indicate to the Contractor, the trees that shall be preserved. Upon the Tree Preservation Officer's approval of the limits of clearing, and agreement from the Contractor to tree preservation and removal requirements, the Superintendent will proceed to release the hold point.

HP

212.03 CLEARING OPERATIONS

1. The area within the limits of clearing shall be cleared of all vegetation, both living and dead, all minor structures (such as fences and livestock yards), all redundant kerb and gutter, bitumen surfacing, footpaths and driveways, and all rubbish and other materials which, in the opinion of the Superintendent, are unsuitable for use in the Works. The Contractor shall plan clearing operations such that wherever possible, clearing is carried out progressively and only the minimum area of land is left disturbed at any time

Extent

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- 2. Trees that shall be preserved shall be protected during site works by the erection of solid barricades, as shown on the Drawings and, generally at a distance of 4m from the trunk of the tree, unless otherwise authorised by the Superintendent.

Trees to be Preserved
- 3. If any tree, which is to be preserved, is found to be within the area to be covered by embankment, the circumstances shall be brought to the notice of the Superintendent who shall decide whether the tree is to be removed or protected as directed by the Superintendent and as approved by Council's Tree Preservation Officer. Such protective measures shall be paid for as a Variation to the Contract.

Trees to be preserved, Embankment Areas
- 4. The Contractor shall take all measures to prevent damage to existing underground and overhead utility services.

Utility Services
- 5. The erection of structures, excavation and filling, changes to soil profiles, stockpiling of spoil, storage of other materials and driving or parking of any vehicle or machinery within 4m of the trunks of trees to be retained shall not be permitted unless part of the Works as approved by the Superintendent.

Disturbance Near Trees
- 6. Damage to trees shall also include damage to bark and root systems. No tree roots are to be cut without the prior approval of the Superintendent. If excavation works are to be carried out within 4m of the trunk of any tree, the Contractor shall develop appropriate work methods to avoid damage to the tree and its roots system. This action constitutes a **HOLD POINT**. The Superintendent's and Council's Tree Preservation Officer's approval of the work methods is required prior to the release of the hold point.

HP
- 7. The Contractor shall plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified or directed by the Superintendent. No growing trees shall be destroyed or damaged by the Contractor other than those specified and those indicated by the Superintendent.

Trees outside Limits of Work
- 8. Any tree remaining within the road reserve but outside the limits of clearing which is, in the opinion of the Superintendent, unsound and likely to fall upon the roadway shall be cleared and disposed of in accordance with Clause 212.05, subject to prior approval of Council's Tree Preservation Officer.

Unsound trees in Road Reserve
- 9. If directed by the Superintendent, any branch, which overhangs the road formation, shall be cut back to within 0.5m of the tree trunk and disposed of in accordance with Clause 212.05.

Overhanging branches
- 10. Every precaution shall be taken to prevent timber from falling on private property and the Contractor shall dispose of any timber so fallen, or produce to the Superintendent the written consent of the property owner to its remaining there. The cost of disposal of such fallen timber shall be borne by the Contractor. Prior to entering private property, the Contractor shall obtain consent from the Superintendent and the property owner.

Falling Timber Contractor's Cost
- 11. Damage of any kind, including damage to trees, fencing, occurring during clearing operations and construction shall be made good by the Contractor. The cost of making good such damage shall be borne by the Contractor.

Damage - Contractor's Cost

212.04 GRUBBING

- 1. All trees and stumps, on or within the limits of clearing, unable to be felled and removed by the clearing methods used by the Contractor shall be removed by grubbing.

Extent
- 2. Grubbing operations shall be carried out to a depth of 0.5m below the natural surface or 1.5m below the finished surface level, whichever is the lower.

Depth
- 3. Holes remaining after trees and stumps have been grubbed shall be backfilled promptly with sound material to prevent the infiltration and ponding of water. The backfilling material shall be compacted to at least the relative density of the material

Backfill holes

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existing in the adjacent ground.

212.05 CHIPPING OF CLEARED VEGETATION

1. The Contractor shall produce a wood-chip mulch derived from crowns of trees and branches of shrubs cleared under this Specification. The wood-chip mulch produced shall be stockpiled for subsequent use in accordance with the Specification for LANDSCAPING or for use at other locations by the Principal as appropriate.

***Wood-chip
Mulch***

2. The wood-chip mulch shall be produced from branches having a maximum diameter of 100mm and the chipped material produced shall not have two orthogonal dimensions exceeding 75mm and 50mm.

Dimensions

212.06 DISPOSAL OF MATERIALS

1. Unless otherwise specified elsewhere, all materials cleared and grubbed in accordance with this Specification shall become the property of the Contractor and shall be removed from the site and disposed of legally.

***Removal from
Site***

2. Disposal of timber and other combustible materials by burning shall not be permitted.

***Burning of
Material***

3. Any burning off shall be carried out in such a manner that no damage is done to any trees outside the limits of clearing. Smoke resulting from such burning off shall not cause a traffic hazard.

***Burning
Hazards***

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**212.07 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed under this Specification on a schedule of rates basis in accordance with Pay Items 212(a), 212(b) and 212(c).
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
5. Clearing and grubbing for boundary fencing is measured and paid in accordance with the Specification for BOUNDARY FENCING.

Pay Item 212(a) CLEARING AND GRUBBING

1. The unit of measurement shall be the hectare of plan area bounded by the limits of clearing specified in Clause 212.02.

Pay Item 212(b) REMOVAL OF TREES OUTSIDE LIMITS OF CLEARING

1. The unit of measurement shall be "each" tree outside the area bounded by the limits of clearing specified in Clause 212.02.

The schedule quantity is a provisional quantity.

Pay Item 212(c) WOOD-CHIPPING

1. The unit of measurement shall be "cubic metre" in stockpile.

The schedule quantity is a provisional quantity.

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SPECIFICATION

213

EARTHWORKS

SPECIFICATION 213 - EARTHWORKS

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ANNEXURES

213A EARTHWORKS - SUPPLEMENTARY INFORMATION

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SPECIFICATION 213 : EARTHWORKS**GENERAL****213.01 SCOPE**

1. The work to be executed under this Specification consists of:-
 - (a) removal of topsoil
 - (b) all activities and quality requirements associated with site regrading, the excavation of cuttings, the haulage of material and the construction of embankments to the extent defined in the Drawings and Specification.
 - (c) removal and replacement of any unsuitable material,
 - (d) any spoil or borrow activities associated with earthworks, and
 - (e) any additional processing of selected material for the selected material zone.

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

Quality**213.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

- | | | |
|-----|---|--------------------------------------|
| 201 | - | Control of Traffic |
| 211 | - | Control of Erosion and Sedimentation |
| 212 | - | Clearing and Grubbing |
| 221 | - | Pipe Drainage |
| 223 | - | Drainage Structures |
| 241 | - | Stabilisation |
| 273 | - | Landscaping |

(b) Australian Standards

- | | | |
|---------------|--------|----------------------------------------------------------------------------------------------------------------|
| AS 1289.6.1.1 | - | Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen. |
| AS 1289.3.3.1 | - | Calculation of the plasticity index of a soil. |
| AS 1289.5.1.1 | - | Determination of the dry density/moisture content relation of a soil using standard compactive effort. |
| AS 1289.5.4.1 | - | Compaction control test - Dry density ratio, moisture variation and moisture ratio. |
| AS 1289.5.7.1 | - | Compaction Control Test (Rapid Method). |
| AS 2187 | - | Explosives Storage, Transport and Use (SAA Explosives Code). |
| | Part 1 | Storage. |
| | Part 2 | Use of Explosives. |

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(c) Other

- AUSTROADS - Explosives in Roadworks, Users Guide 1982.
 EPA - State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade No. N1), Occupational Health and Safety (Noise), Regulations and Code of Practice for Noise.
 National Road Transport Commission/Federal Office of Road Safety, Joint Publication - Australian Code for the Transport of Explosives by Road and Rail.

213.03 NATURAL SURFACE AND EARTHWORKS MATERIALS**(a) Natural Surface**

1. The Contractor shall submit details of the Contractor's proposed survey system to the Superintendent for approval, within 14 days of possession of site being granted and in any case prior to commencement of clearing and grubbing or earthworks.

**Contractor's
Survey System**

2. Computer generated road design data files in the format of the approved software containing the ground model may be supplied to the Contractor, as advised prior to commencement of the Contract. If desired, the Contractor may verify the accuracy of the model by field surveys. If the Contractor considers any areas of the model not to be representative, or submitted plans to be inaccurate, the Contractor shall give not less than seven (7) days notice, prior to commencement of Works, to the Superintendent to allow checking. If the subsequent check survey reveals the ground model and plans to be correct, then the Contractor shall bear the cost of the check survey.

**Verify
Accuracy of
Ground Model**

(b) Earthworks Materials

1. The Contractor shall be responsible for any assumptions made by the Contractor in relation to the nature and types of the materials encountered in excavations and the bulking and compaction characteristics of materials incorporated in embankments.

**Material
Characteristics**

2. The estimated quantity for general earthworks at any cutting includes all types of materials which may be encountered in the cutting.

3. Where material from excavations is acceptable for use in embankments, but the Contractor elects to:-

**Embankment
Material
Deficiency**

- (a) Spoil it, or
- (b) Use it for the Contractor's own purposes, or
- (c) Use it as a source of pavement materials, or
- (d) Construct embankments with dimensions in excess of those specified.

and a deficiency of material for embankment construction is thereby created, the Contractor shall make good that deficiency from sources of material meeting the quality requirements specified in Clause 213.23. The cost of making good such deficiency of material shall be borne by the Contractor.

**Contractor's
Cost**

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213.04 PROTECTION OF EARTHWORKS

1. The Contractor's responsibility for care of the Works shall include the protection of earthworks. **Contractor's Responsibility**
2. The Contractor shall install effective erosion and sedimentation control measures in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION, prior to commencing earthworks, and shall maintain these control measures for the duration of the contract. **Erosion and Sedimentation Control**
3. Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure run-off of water without ponding, except where ponding forms part of an approved erosion and sedimentation control system. In salt affected areas, the Contractor shall take adequate precautions to minimise ingress of surface water into the groundwater table. **Drainage of Working Areas/Salinity Prevention**
4. When rain is likely or when work is not proposed to continue in a working area on the following day, precautions shall be taken to minimise ingress of any excess water into earthworks material. Ripped material remaining in cuttings and material placed on embankments shall be sealed off by adequate compaction to provide a smooth tight surface. **Wet Weather Precautions**
5. Should insitu or stockpiled material become over wet as a result of the Contractor not providing adequate protection of earthworks, the Contractor shall be responsible for replacing and/or drying out the material and for any consequent delays to the operations. **Wet Material**

213.05 SETTING OUT OF EARTHWORKS

1. Before earthworks operations commence and after survey controls are in place, batter profiles shall be established by the Contractor and the necessary pegs driven at 25m intervals or at each cross section shown on the Drawings, whichever is the lesser. The chainage/station, offset from control line and slope distance to finished surface level, shall be clearly marked on each peg. **Batter Profiles**
2. The batter profiles shall be repositioned by the Contractor at each change in the slope of the batter and at intervals of not more than 5m of vertical height. **Profile Location**
3. All pegs and batter profiles shall be maintained in their correct positions. They shall be removed by the Contractor on completion of the contract or separable part. **Retention and Removal of Pegs**
4. The foregoing shall be the minimum requirement. Additional pegs and profiles may be required to suit the Contractor. These shall not be painted with the same colours used for the specified setting out pegs and stakes. **Additional Pegs**
5. The position and extent of all transitions from cuttings to embankments and foundations for shallow embankments shall be marked with clearly labelled stakes in accordance with Clauses 213.15 and 213.24. **Transitions Cuttings/ Embankments**

213.06 STOCKPILE SITES

1. The Contractor shall obtain the written consent of the Superintendent to the use of any stockpile site which is not shown on the Drawings. Proposals in this regard shall be submitted at least three working days before stockpiling is due to commence and shall specify the maximum dimensions of the proposed stockpile. **Additional Stockpile Sites**

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2. Any clearing and grubbing required for these sites shall be carried out in accordance with the Specification for CLEARING AND GRUBBING. Temporary erosion and sedimentation control measures shall be taken in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

Clearing and Grubbing

3. Restoration of stockpile sites following completion of the work shall be carried out in accordance with the Specification for LANDSCAPING.

Restoration

REMOVAL OF TOPSOIL

213.07 SCOPE

1. Topsoil is surface soil which is reasonably free from subsoil, refuse, clay lumps and stones.

Definition

2. Removal of topsoil from any section of the Works shall only commence after erosion and sedimentation controls have been implemented and when clearing, grubbing and disposal of materials have been completed on that section of the Works in accordance with the Specifications for CONTROL OF EROSION AND SEDIMENTATION and CLEARING AND GRUBBING.

Prerequisites

3. Topsoil throughout the length of the Work shall be removed and stockpiled separately clear of the Work with care taken to avoid contamination by other materials. The work shall include the following:-

Extent of Work

(a) Cuttings

Removal of the topsoil to a depth quoted in Annexure 213A or as directed by the Superintendent.

WP

(b) Embankments

Removal of topsoil over the base of embankments up to the depth below the natural surface quoted in Annexure 213A, or as directed by the Superintendent. For those embankments or sections of embankment where the height of embankment from natural surface to underside of pavement is less than two metres, topsoil which is deeper than the depth quoted in Annexure 213A shall be removed to its full depth as directed by the Superintendent.

WP

(c) Other Locations

Removal of topsoil as directed by the Superintendent.

WP

213.08 SURVEY AFTER REMOVAL OF TOPSOIL

1. Where payment is on a 'Schedule of Rates' basis, and unless alternative arrangements have been made by the Superintendent, after removing the topsoil, the Contractor shall determine the surface levels in each cutting and embankment at sufficient locations to determine the volume of excavation for general earthworks and the volume of compacted fill.

Establish Surface Level

2. A schedule of these surface levels shall be submitted to the Superintendent for approval at least three working days before commencement of any work which will alter the ground surface as surveyed. This action constitutes a **HOLD POINT**. The Superintendent's approval to the submitted schedule of surface levels is required prior to the release of the hold point.

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213.09 TOPSOIL STOCKPILES

1. Where payment is on a 'Schedule of Rates' basis, at least three working days before stockpiling of topsoil at any site, the Contractor shall submit, for the approval of the Superintendent, a site survey which will be sufficient to subsequently measure the volume placed in stockpile. **Site Survey**
2. The maximum height of stockpiles shall not exceed 2.5m and the maximum batter slope shall not exceed 2h:1v. **Height and Batter**
3. Topsoil stockpiles shall not contain any timber or other rubbish and shall be trimmed to a regular shape. **Stockpiles Trimmed**
4. To minimise erosion, stockpile batters shall be track rolled or stabilised by other means acceptable to the Superintendent. **Erosion Control**
- WP**
5. Where seeding of stockpiles to encourage vegetation cover is specified, such work shall be carried out in accordance with the Specification for LANDSCAPING. **Seeding Stockpile**

CUTTINGS**213.10 SCOPE**

1. Construction of cuttings shall include all operations associated with the excavation of material within the limits of the batters including benching, treatment of cutting floors and transition from cut to fill. **Extent of Work**

213.11 EXCAVATION

1. Materials encountered in cuttings shall be loosened and broken down as required so that they are acceptable for incorporation in the Works. In this regard, the Contractor's attention is drawn to Clauses 213.21, 213.22 and 213.23.
2. Cuttings shall have batter slopes as shown on the Drawings or as redetermined by the Superintendent on the basis of site inspection and investigation during the excavation. **Batter Slopes**
- WP**
3. The tops of cuttings shall be neatly rounded to the dimensions shown on the Drawings.
4. In all cuttings, undulations in the general plane of the batter shall not be permitted except that batters may require progressive flattening at the ends of cuttings due to the presence of less stable material. **Batters to be Even**
5. Cut faces shall be cleaned of loose or unstable material progressively as the excavation proceeds. **Unstable Material**
6. Where, after the removal of topsoil as specified in Clause 213.07, material of variable quality or moisture content is encountered, the Contractor shall adjust his excavation methods to ensure blending of the materials, to obtain material meeting the requirements of Clause 213.23. **Blending Material**
7. Where the Superintendent redetermines the batter slope of any section of a cutting after it has been completed in accordance with this Clause, the Superintendent shall order a Variation to the Contract for the resetting out, removal of additional material and retrimming of the batter. This Variation shall include all additional costs incurred by **Variation for Batter Slopes**

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the Contractor who shall not have any further claim upon the Principal as a result of the redetermination of the batter slope.

213.12 BATTER TOLERANCES

1. The tolerances for the excavation of batters are given in Table 213.1.

**Batter
Tolerances**

Location	Tolerance (mm)	
	Slope 1:1 or flatter	Steeper than 1:1
Toe of batter and level of table drain	+ 0 - 150	+ 0 - 200
2m above table drain and higher	+ 300 - 300	+ 300 - 600
Between level of table drain and 2m above table drain	pro rata basis	pro rata basis

Table 213.1 - Excavation Tolerances for Batters

2. If the Contractor excavates the batter beyond the batter slope line and the tolerance applicable thereto, the Superintendent may authorise a minor change in the general slope of the batter to suit the convenience of the Contractor, but such a change shall not be regarded as a redetermination of the batter slope under Clause 213.11. The cost of any increase in excavation quantities resulting from such change in batter slope shall be borne by the Contractor. Alternatively the Contractor shall submit details of the material and/or methods proposed to restore the specified slope and stability of the batter for the Superintendent's approval.

**Excavation
beyond Batter
Line**

**Contractor's
Cost**

3. For batters steeper than 1:1, if any section of the batter up to a height of 3m above the table drain level has been over excavated beyond the tolerance limit specified, the Superintendent may direct that the batter be restored to the average batter slope using randomly mortared stone. The stone shall be similar to the sound rock in the cutting and the mortar shall be coloured to match the colour of the rock.

**Restoration of
Batter Slope**

4. The cost of restoring batters shall be borne by the Contractor.

**Contractor's
Cost**

213.13 BENCHING IN CUTTINGS

1. Cut batters shall be benched as shown on the Drawings to provide drainage and erosion control. Notwithstanding the tolerances permitted under Clause 213.12, bench widths shall not be less than shown on the Drawings.

**Bench
Construction**

2. Benches shall be maintained and cleaned of loose stones and boulders regularly throughout the Contract period. The cost of such maintenance and cleaning of benches shall be borne by the Contractor.

**Bench
Maintenance
Contractor's
Cost**

213.14 TREATMENT OF FLOORS OF CUTTINGS

1. The floors of cuttings shall be excavated, parallel to the designed grade line, to a designed floor level which shall be at the underside of the selected material zone or where there is no selected material zone, to the underside of the pavement subbase. The floors shall then be trimmed to a level of not more than 50mm above or below the

**Excavation
Level**

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designed floor level. Where the Superintendent considers that any underlying material is unsuitable for pavement support, the Superintendent may direct that it be removed in accordance with Clause 213.21.

WP

2. The Contractor shall rip or loosen all material in the floor to a minimum depth of 200mm below the designed floor level for the width of the selected material zone (or subbase layer, where no selected material zone). The maximum dimension of any particles in the ripped or loosened zone shall not exceed 150mm.

Floor Material Ripped

3. Prior to ripping or loosening the cutting floor the Contractor shall determine the CBR of the material in the floor by AS 1289.6.1.1. Sufficient tests shall be taken to represent all the various materials which may exist in the cutting floor. If material in the floors of cuttings has a CBR value less than the value quoted in Annexure 213A, the Superintendent will direct the action to be taken.

CBR Testing

4. Ripped or loosened material shall be made available for inspection by the Superintendent before recompaction commences. This action constitutes a **HOLD POINT**. The Superintendent's approval of the ripped or loosened material is required prior to the release of the hold point

Inspection by Superintendent

HP

5. Ripped or loosened material shall be recompacted in accordance with Clause 213.36. No account shall be taken of the volume involved in loosening when measuring the volume of excavations.

6. After recompaction, the floors of cuttings shall be re-trimmed parallel with the finished wearing surface. The tolerances for the trimmed levels are given in Annexure 213A.

Level Tolerances

7. Prior to placing any subsequent layers over the completed cutting floor, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of this Specification. This action shall constitute a **HOLD POINT**. The Superintendent's approval of the completed cutting floor is required prior to the release of the hold point.

HP

213.15 TRANSITION FROM CUT TO FILL

1. After the removal of topsoil and before the excavation of any cutting commences the Contractor shall survey and mark the position of the intersection line between cutting and embankment occurring at the underside of the selected material zone or pavement subbase.

Intersection Line

2. Following excavation to the cutting floor, a terrace shall be excavated for the width of the selected material zone (or subbase layer, where no selected material zone) to a depth of 900mm below and parallel to the cutting floor, as shown in Figure 213.1, unless otherwise approved by the Superintendent.

Terrace Construction

3. The terrace shall extend into the cut to the point where the cutting floor is 900mm below the original stripped surface, or a distance of 20 metres, whichever is the lesser.

Extent of Terrace

4. The material excavated shall be either incorporated in the embankments or spoiled as directed by the Superintendent. Material incorporated in embankments shall be included in the excavated volume for General Earthworks and material spoiled shall be included in the excavated volume of Unsuitable Material to Spoil.

Excavated Quantity

5. The material placed above the terrace shall satisfy the requirements of Clause 213.23 and shall be compacted in accordance with Clause 213.36.

Quality and Compaction

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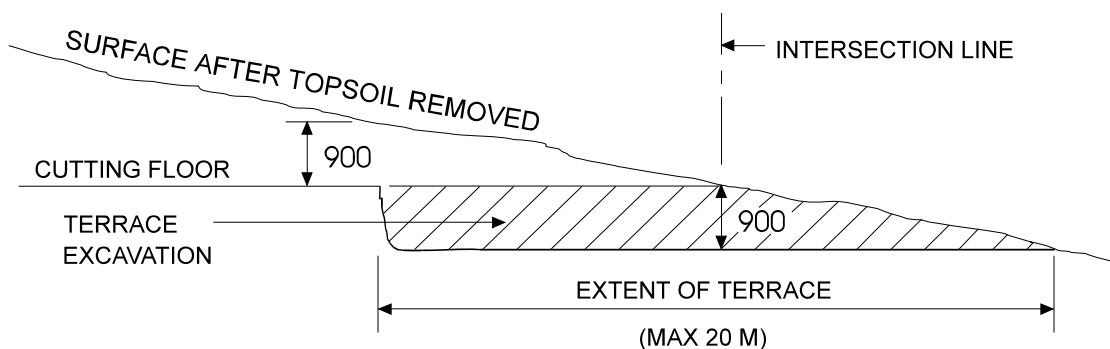


Figure 213.1 - Transition from Cut to Fill

BLASTING

213.16 GENERAL

1. When explosives are permitted by the Superintendent to be used the Contractor shall obtain all necessary licences from the appropriate authorities, and shall comply with all Government and Council regulations relating to transport, storage, handling and the use of explosives and also to the rules set out in AS2187, Parts 1 and 2. The transport of explosives shall be in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Contractor to obtain Licences

HP

2. The Contractor shall be liable for any accident, damage or injury to any person, property or thing, resulting from the use of explosives.

Contractor's Responsibility

3. Before the start of blasting operations, the Contractor, in the presence of the Superintendent, shall conduct a survey to determine and record the existing condition of all structures likely to be affected by any blast.

Pre-blast Survey

4. Structures shall include public utilities. The survey shall include all structures within 500m of any blast but shall be extended where the maximum instantaneous charge proposed is likely to produce peak particle velocities greater than allowable at structures more remote from a blast site. A written report of the survey, supported by photographs where necessary, together with a list of any existing defects in the structures, shall be submitted to the owner of each structure and to the Superintendent before blasting commences.

Amendment to Extent of Survey

5. The Contractor shall advise the Superintendent of the proposed maximum instantaneous charge and the Contractor's validation of the adequacy of the proposed structural survey at least three working days before the survey is due to commence. The Superintendent may direct amendments to the scope of the survey as a result of blast monitoring during the work. All costs associated with the surveys and reports shall be borne by the Contractor.

Extent of Survey

Contractor's Cost

6. Before each blasting operation, the Contractor shall submit to the Superintendent written details of the proposed blasting procedure including the quantity and type of explosive to be detonated, the blasting pattern to be used and measures proposed to limit noise and to ensure that vibration from blasting does not adversely affect nearby structures. This action constitutes a **HOLD POINT**. The Superintendent's sighting of the necessary licences and approval to the submitted details of blasting operations is required prior to the release of the hold point. Release of the hold point does not in any way reduce the Contractor's responsibility set out in paragraph 2 of this Clause.

Proposed Blasting Procedure

HP

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7. Ground vibration caused by blasting shall not exceed the values of peak particle velocity listed in Table 213.2:

**Ground
Vibration**

Point of Potential Damage (within 1km of blasting site)	Peak Particle Velocity
Completed and cured bridge structures or sub-structures (eg completed abutment)	25 mm/sec
Bridgeworks and structural retaining walls under construction	20 mm/sec
Residential premises, schools, hospitals and other buildings	5 mm/sec (with 10% not to exceed 10 mm/sec)
Buildings or monuments of historical significance	2 mm/sec

Table 213.2 - Limiting Peak Particle Velocity

8. The Contractor shall advise all residents within a radius of 1km, by letter drop before blasting operations commence, of the likely times, frequency and duration of blasting and precautions being taken to ensure that damage to property will not result.

**Advice to
Residents**

9. Unless otherwise approved, blasting operations shall be confined to the periods Mondays to Fridays (excluding public holidays), 9am to 3pm.

Time Limits

10. When blasting operations are being carried out, precautions shall be taken relating to the safety of persons and animals and the road shall be closed to traffic and the appropriate signs erected in accordance with the Specification for CONTROL OF TRAFFIC. A standard warning procedure such as that given in the AUSTRROADS Explosives in Roadworks, Users Guide 1982, shall be established and observed at all times.

**Safety
Precautions**

213.17 PRESPLITTING

1. Where presplitting is carried out the spacing of presplit drill holes shall not exceed 750mm centre to centre.

Presplitting

213.18 BLASTING RECORDS

1. The Contractor shall maintain accurate records of each blast showing the details listed below:-

**Records to be
kept**

Date and time of blast

Location, number and diameter of holes loaded

Depth of each hole loaded

Inclination of holes

Maximum and minimum burden

Types of explosives used

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- Charge distribution in each hole
- Maximum instantaneous charge
- Delay periods and sequence
- Total amount of charges in the blast
- Length and type of stemming in each hole

2. The records shall be prepared as holes are loaded and signed by the Powderman. A copy shall be provided to the Superintendent on the day of the blast.

Record Preparation

213.19 CONTROL OF AIR BLAST OVER-PRESSURE

1. This Clause shall apply only where a noise sensitive location exists within 1km of the blasting site.

Incidence

2. The Contractor's attention is drawn to the recommendations given in the State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade No. N1), Occupational Health and Safety (Noise) Regulations and Code of Practice for Noise for the reduction of air blast over-pressure.

Noise Control Manual

3. The noise emanating from blasting operations shall not exceed an over-pressure level of 115 decibels (linear peak) at any noise sensitive location (such as residential premises, schools or hospitals). Up to 10 per cent of the total number of blasts may exceed this value provided a level of 120 decibels is not exceeded at any time.

Noise Limitations

4. The Contractor shall arrange for the monitoring of air blast over-pressure to ensure compliance with the specified limits. All monitoring shall be carried out by personnel possessing current NATA registration for such monitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this Specification. In general, a monitoring location will be near the perimeter of the noise sensitive location at the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

Monitoring of Air Blast Over-pressure

5. In the event that the measured air blast over-pressure exceeds the specified limits, the Contractor shall suspend further blasting work and shall submit to the Superintendent proposals detailing any additional steps and precautions the Contractor shall take to ensure that for any future blast, the limiting over-pressure shall not be exceeded. The Contractor shall not resume any blasting until such proposals have been submitted.

Excessive Air Blast Over-pressure

213.20 CONTROL OF GROUND VIBRATION

1. The Contractor shall arrange for the monitoring of ground vibrations to ensure compliance with the peak particle velocity limits shown in Table 213.2. All monitoring shall be carried out by personnel possessing current NATA registration for such monitoring. All test results shall be reported on NATA endorsed test certificates which shall include a clear statement as to compliance or non-compliance with the requirements of this Part of the Specification. In general a monitoring location shall be near the perimeter of the structure or building at the point closest to the maximum charge. The Contractor shall submit a copy of the monitoring record to the Superintendent.

Monitoring Vibrations

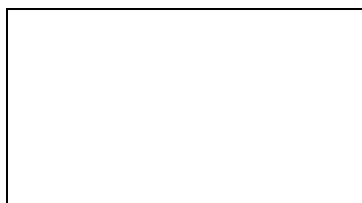
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2. To minimise the risk of peak particle velocity limits being exceeded, the Contractor shall develop a blasting site relationship between peak particle velocity, distance and blasting charge.

Blasting Site Relationship

3. For the first blast, monitors shall be set up at not less than five points at varying distances away from the blasting site. The Maximum Instantaneous Charge for the first blast shall not exceed that calculated from the following formula:

Maximum Instantaneous Charge



where MIC = Maximum Instantaneous Charge in kilograms

D = Distance in metres from charge to the point of potential damage

PPV = limiting peak particle velocity from Table 213.2

4. A log-log (base 10) graph of measured peak particle velocity (vertical axis) versus Scaled Distance (horizontal axis) shall be plotted, where

$$\text{Scaled Distance} = \frac{D}{\sqrt{MIC}}$$

The mean regression line shall be obtained by the least squares method.

5. For subsequent blasts, the MIC and other aspects of blast design may be adjusted provided that further ground vibration monitoring is undertaken and the mean regression line redetermined to demonstrate that peak particle velocity limits are not exceeded. The Contractor shall make the regression line plots available to the Superintendent, if so requested.

Adjustment of Blast Design

UNSUITABLE MATERIAL

213.21 GENERAL

1. Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth for stripping topsoil beneath embankments, which the Superintendent deems to be unsuitable for embankment or pavement support in its present position.

Definition

2. Such material shall be excavated to the extent directed by the Superintendent. Material removed as unsuitable, as directed by the Superintendent, shall be spoiled in accordance with Clause 213.34.

Extent of Excavation

3. After removal of the unsuitable material, the floor of the excavation shall be represented to the Superintendent for inspection, prior to backfilling with replacement material, to determine whether a sufficient depth of unsuitable material has been removed. This action constitutes a **HOLD POINT**. The Superintendent's approval to the floor of the excavation is required prior to the release of the hold point.

Floor Inspection



4. Prior to placing replacement material the excavated surface shall be compacted in accordance with Clause 213.36.

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5. The unsuitable material which has been removed shall be replaced with material from cuttings, or with material borrowed in accordance with Clause 213.35, of the quality specified in Clause 213.23. Replacement material is deemed to form part of embankment construction. It shall be placed in accordance with Clause 213.26 and compacted in accordance with Clause 213.36.

Replacement Material

6. All costs associated with reworking or replacing any material which the Superintendent deems to have become unsuitable because of inappropriate construction activities shall be borne by the Contractor.

Contractor's Costs

EMBANKMENT CONSTRUCTION

213.22 SCOPE

1. Embankment construction includes all operations associated with the preparation of the foundation areas on which fill material is to be placed, the placing and compacting of approved material within areas from which unsuitable material has been removed in accordance with Clause 213.21, the placing and compacting of fill material and of materials of specified quality in nominated zones throughout the Works and all other activities required to produce embankments as specified to the alignment, grading and dimensions shown on the Drawings. It also includes any pretreatment such as breaking down or blending material or drying out material containing excess moisture.

Extent of Work

213.23 EMBANKMENT MATERIAL

1. Material for embankment construction shall be obtained from the cuttings within the Works in accordance with Clause 213.11, supplemented by borrow in accordance with Clause 213.35 and from other sources as approved by the Superintendent if necessary. The material shall be free of tree stumps and roots, clay, topsoil, steel, organic material and other contaminants and shall be capable of being compacted in accordance with Clause 213.36.

Location and Quality

2. The work shall be programmed so that material of the quality specified in Clause 213.26 and 213.30 for the upper zones of the formation is available when required.

Selection of Material

213.24 FOUNDATIONS FOR EMBANKMENTS

1. Following removal of topsoil in accordance with Clause 213.07, the embankment foundation area shall be made available for inspection by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval to the embankment foundation is required prior to the release of the hold point.

Inspection

HP

2. Where the Superintendent considers that any underlying material is unsuitable, the Superintendent may direct that it be removed and replaced in accordance with Clause 213.21.

Unsuitable Material

(a) Foundations for Shallow Embankments

1. Shallow embankments are those embankments of a depth less than 1.5 metres from the top of pavement to natural surface. After removal of topsoil the Contractor shall survey and work out the extent of the area of shallow embankments.

Shallow Embankments

2. Material in the foundations for shallow embankments which does not meet the requirements specified in Annexure 213A, shall be deemed unsuitable in accordance with Clause 213.21 and shall be replaced by material of the specified quality.

Unsuitable Material

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3. Foundations for shallow embankments shall be prepared for embankment construction after removing topsoil and unsuitable material, by loosening the material exposed to a depth of 200mm, adjusting the moisture content of the loosened material and compacting as specified in Clause 213.36. The Contractor shall use equipment and techniques to minimise surface heaving or other foundation damage.

Preparation of Foundations

(b) Other Embankments

1. For all other embankments the foundation shall be prepared by grading and levelling the general area, adjusting the moisture content where necessary and compacting the top 200mm as specified in Clause 213.36.

Preparation

2. Where a bridging layer has been specified as a foundation treatment in the Contract documents, it shall be supplied and placed as part of General Earthworks. The bridging layer shall consist of free-draining granular material with or without geotextile interlayer as specified on the Drawings. The granular material shall be end-dumped and spread in a single layer and in sufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Clause 213.36 shall not apply to the bridging layer. Where it is necessary to import suitable material from off site and no suitable borrow source is available as provided in Clause 213.35, the supply and placing of the bridging layer shall be treated as a Variation to the Contract.

Bridging Layer

3. A bridging layer may also be employed, subject to the approval of the Superintendent, where ground water or seepage is encountered in the foundation area or where the Contractor demonstrates that it is impracticable to achieve the degree of compaction specified for the foundation in Clause 213.36. A bridging layer shall not be acceptable if its proximity to the pavement is likely to affect the pavement design.

Seepage from Foundations

4. As an alternative to a bridging layer, the Superintendent may approve of a working platform created by the chemical stabilisation of in situ material in accordance with the Specification for STABILISATION.

Working Platform

213.25 HILLSIDE EMBANKMENTS

1. Where embankments are to be constructed on or against any natural slopes or the batters of existing embankments, the existing slope or batter, if it is steeper than 4 horizontal to 1 vertical in any direction shall be cut in the form of horizontal terraces over the whole area to be covered by new filling. The existing slope or batter shall be stepped in successive terraces, each at least 1 metre in width, the terraces to be cut progressively as the embankment is placed. Wherever possible terraces shall coincide with natural discontinuities. Subsoil drainage may be required in some instances. Material thus excavated shall be compacted as part of the new embankment material.

Horizontal Terraces

2. No account shall be taken of the material removed in terracing when determining the General Earthworks excavated volume.

Excavated Volume

213.26 PLACING FILL FOR EMBANKMENT CONSTRUCTION

1. The methods of excavation, transport, depositing and spreading of the fill material shall be selected so as to ensure that the placed material is uniformly mixed.

Uniformity of Material

2. The embankment shall be constructed so as to derive its stability from the adequate compaction of the fine material embedding the large rock pieces rather than mechanical interlock of the rock pieces. The fine material shall be compacted to meet the requirements of Clause 213.36.

Embankment Stability

3. Fill material for embankment construction shall be placed in layers parallel to the grade line and compacted in accordance with Clause 213.36. The layers shall be of uniform compacted thickness not exceeding 200mm, except that where more than 25 per

Layer Thickness

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cent by volume of the filling consists of rock with any dimension larger than 150mm, the Superintendent may approve an increase in the compacted layer thickness to 300mm, provided that the relative compaction specified in Clause 213.36 is attained.

4. The maximum dimension, measured in any direction, of rock pieces in the fill material for embankment construction shall not exceed two-thirds of the approved compacted layer thickness. Any larger rock pieces shall be reduced in size for incorporation in the embankment layers.

**Maximum Size
Rock Pieces**

5. Rock material shall be broken down and evenly distributed through the fill material, and sufficient fine material shall be placed around the larger material as it is deposited to fill the voids and produce a dense, compact embankment. Where the Superintendent considers insufficient fine material is present to fill the voids, additional fine material shall be obtained from other places in the work or by a change in the method of winning fill material.

**Grading of Fill
Material**

6. Stony patches with insufficient fine material to fill the voids shall be reworked with additional fine material being blended in to achieve a dense, compact layer. The cost of any reworking shall be borne by the Contractor.

**Reworking
Stony Patches
Contractor's
Cost**

7. In placing embankment layers, the Contractor shall use equipment and techniques to avoid surface heaving or other damage to the foundations and underlying embankment layers.

**Equipment
Selection for
Placement**

8. After compaction, embankment material in the zone(s) below the selected material zone (or subbase layer, where no selected material zone) shall have a CBR value not less than that quoted in Annexure 213A for the depth(s) specified in Annexure 213A.

CBR Value

9. For the purpose of this Clause, the CBR value of the material shall be determined by Test Method AS 1289.6.1.1

Test Method

10. The Contractor shall be responsible for determining suitable sources of material and for any processing to satisfy these quality requirements.

**Contractor's
Responsibility**

213.27 EMBANKMENT BATTERS

1. The batter slopes shown on the Drawings represent the estimated requirements for the expected types of materials, and may be subject to redetermination by the Superintendent according to the Superintendent's assessment of the materials encountered.

Batter Slopes

2. When completed, the average planes of the batters of embankments shall conform to those shown on the Drawings or as determined by the Superintendent.

**Slope
Tolerances**

(a) For a vertical distance to 1m below the shoulder, no point on the completed batter shall vary from the specified slope line by more than 150mm when measured at right angles to the slope line.

(b) At distances greater than 1m vertically below the shoulder, no point on the completed batter shall vary from the specified slope line by more than 300mm when measured at right angles to the slope.

However, in no case shall the edge of the formation at the underside of the pavement be nearer to the roadway than shown on the Drawings.

3. Undulations in the general plane of the batter shall not be permitted.

**Slope
Undulations**

4. Where the Superintendent redetermines the slope of any section of an

Slope Redeter-

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embankment batter which has been completed in accordance with this Clause the Superintendent shall order a Variation to the contract for the resetting out and removal or addition of fill material and retrimming of the batter.

mination

213.28 ROCK FACING OF EMBANKMENTS

1. Where shown on the Drawings, embankment batters (including embankments at bridge abutments) shall be provided with a facing of clean, hard, durable rock.

Extent

2. The rock facing shall be built up in layers ahead of each layer of filling. Rock may be placed by hand or plant but shall be placed in such a manner that its least dimension is vertical and that mechanical interlock between the larger stones occurs. Any rock deposited in the rock facing which has an excess of fine material surrounding it shall be removed together with the excess fine material and replaced.

Mechanical Interlock

3. The Contractor shall adjust its working methods and programme the work so as to obtain hard and durable rock of the specified dimensions as it is required. The space between larger batter rocks shall be filled with progressively smaller rocks to form a 'graded filter' which prevents the leaching out of fines from the fill material but which does not overflow the voids between larger rocks, or cause the larger rocks to lose contact with one another. Fine material shall not cover the outside of the rocks on the face of the batter.

Graded Filter

4. Where shown on the Drawings, or approved by the Superintendent, an appropriate geotextile may be used to prevent the leaching out of fines from the fill material.

Geotextile

5. The Contractor shall exercise extreme caution whilst placing the rock facing. Where embankment material is placed above other roads in use the outer rock layer shall be placed in such a manner as to prevent spillage down the batter and onto the roadway. The Contractor shall ensure that, under no circumstances, could any rock be dislodged and roll onto any adjacent roadway or track in use.

Caution in Placement

213.29 TRIMMING TOPS OF EMBANKMENTS

1. The tops of embankments shall be trimmed parallel to the designed grade line at levels equal to the finished surface level less the thicknesses of pavement courses and the selected material zone if applicable.

Levels

2. The tops of embankments at these levels shall be compacted to meet the requirements of Clause 213.36 and trimmed so that they do not vary more than 10mm above or 40mm below the levels as calculated above.

Tolerances

3. Prior to placing any subsequent pavement layers over the completed top of embankment filling, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the completed top of the embankment is required prior to the release of the hold point.

HP

213.30 SELECTED MATERIAL ZONE

1. A selected material zone may be indicated on the Drawings as a zone below the subbase layer and the following quality requirements:

Dimension and Quality

(a) It shall be free from stone larger than 100mm maximum dimension

(b) The fraction passing 19.0mm AS sieve shall have a CBR value of not less than that quoted in Annexure 213A.

2. When chemical stabilisation is specified these requirements shall apply to the

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selected material immediately prior to incorporating the stabilising agent.

3. The selected material shall be obtained from cuttings excavated under the Contract or from borrow areas as specified in Clause 213.35. If necessary, the Contractor shall use working methods to yield material for the selected material zone by breaking down oversize rock or by other means, including processing through a crusher, to ensure that the resulting material conforms to the requirements of this Clause.

Winning Material

4. The Contractor shall ensure that any material encountered of the quality specified for the selected material zone shall be either placed directly in the selected material zone or stockpiled at locations approved by the Superintendent for future use by the Contractor in the selected material zone until at least sufficient material is reserved to complete the selected material zone over the whole work. Should the Contractor fail to conserve material of the specified quality, the Superintendent may direct that material of equivalent quality be provided. The cost of providing such extra material shall be borne by the Contractor.

Selection of Material Contractor's Cost

5. The Contractor shall have no right to monetary compensation or a claim for damages in respect of any loss the Contractor may claim to have suffered by reason of the Contractor's failure to reserve sufficient selected material or by reason of stockpiling material for the selected material zone.

Cost of Handling

6. The selected material zone shall be placed and compacted in layers with the compacted thickness of each layer not exceeding 150mm. Compaction shall be as specified in Clause 213.36.

Layer Thickness

7. After placement the selected material shall be homogeneous and free from patches containing segregated stone or excess fines. There shall be no areas containing material which does not comply with the specified requirements of this Clause.

Homogeneous Layers

8. The top of the selected material zone shall be compacted and trimmed parallel with the designed grade line at a level equal to the finished surface level minus the thickness of pavement layers adopted. The tolerances for the trimmed levels are given in Annexure 213A.

Compact and Trim

9. Prior to placing any subsequent pavement layers over the completed select material zone surface, the Contractor shall present the completed surface to the Superintendent for inspection. The Contractor shall verify as part of the quality system that the completed surface has achieved full conformance with all respects of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval to the compacted and trimmed top of selected material zone is required prior to the release of the hold point.

HP

213.31 FILL ADJACENT TO STRUCTURES

1. Supply and placement of fill adjacent to structures shall be deemed to be part of General Earthworks.

Payment

2. For the purpose of this Clause, structures shall include bridges, precast and cast-in-place box culverts and retaining walls. Fill adjacent to other culverts and drainage structures shall be provided in accordance with the Specifications for PIPE DRAINAGE and DRAINAGE STRUCTURES as appropriate.

Structure Types

3. No filling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts to the satisfaction of the Superintendent, or when the Contractor can demonstrate that 85 per cent of the design strength of the concrete has been achieved.

Time of Placement
HP

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213.32 TREATMENT AT WEEPHOLES

1. Drainage adjacent to weepholes shall be provided by either a layer of broken stone or river gravel consisting of clean, hard, durable particles graded from 50mm to 10mm such that: **Grading**

- (a) The maximum particle dimension shall not exceed 50mm
- (b) No more than 5 per cent by mass shall pass the 9.5mm A.S. sieve.

2. The broken stone or river gravel shall be continuous in the line of the weepholes, extend at least 300mm horizontally into the fill and extend at least 450mm vertically above the level of the weepholes. **Extent**

3. Alternatively the Contractor may provide a synthetic membrane of equivalent drainage characteristics at no extra cost to the Principal. It shall be stored and installed in accordance with Manufacturer's instructions. The use of a synthetic membrane shall be subject to the Superintendent's approval. **Synthetic Membrane**

213.33 SELECTED BACKFILL

1. Selected backfill shall be placed adjacent to structures in accordance with Table 213.3. The selected backfill shall consist of a granular material having a maximum dimension not exceeding 50mm and a Plasticity Index, determined by AS 1289.3.3.1, neither less than 2 nor more than 12. **Quality**

Structure Type	Selected Backfill	
	Width	Height
Bridge Abutments	2m	H
Cast-in-place Box Culverts	H/3	H + 300mm
Corrugated Steel Pipes and Arches	0.5m	H + 500mm
Retaining Walls	H/3	H

(Where H = height of structure)

Table 213.3 - Selected Backfill, Width and Height

2. The selected backfill shall be placed in layers, with a maximum compacted thickness of 150mm. Layers shall be placed simultaneously on both sides of box culverts and other drainage structures to avoid differential loading. Compaction shall start at the wall and proceed away from it, and shall meet the requirements of Clause 213.36. **Placement in Layers**

3. The existing embankment slope behind the structure shall be cut in the form of successive horizontal terraces, each terrace being at least 1m in width, and the selected backfill shall be placed in accordance with Clause 213.26. **Horizontal Terraces**

4. No selected backfilling shall be placed against structures, retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts to the satisfaction of the Superintendent, or when the Contractor can demonstrate that 85 per cent of the design strength of the concrete has been achieved. **Time of Placement**

5. Where a bridge deck is being concreted adjacent to an abutment, no filling shall be placed against the abutment within twenty-one days after placing concrete in the bridge deck, unless approved by the Superintendent.

***Adjacent to
Concrete Deck***

6. In the case of spill-through abutments, rocks shall not be dumped against the columns or retaining walls but shall be built up evenly by individual placement around or against such structures.

***Spill through
Abutments***

7. In the case of framed structures, embankments at both ends of the structure shall be brought up simultaneously, the difference between the levels of the embankments at the respective abutments, shall not exceed 500mm.

***Framed
Structures***

213.34 SPOIL

1. Spoil is surplus material from excavations under the Contract which is not required to complete the Works as specified or material from excavations under the Contract whose quality the Superintendent deems to be unacceptable for incorporation in the Works. The Contractor shall bear all costs associated with the acquisition of planning approval by Council's Town Planning Manager should this be determined as necessary by the Superintendent.

Definition

***Contractor's
Cost***

2. Where there is surplus material the Superintendent may direct that flatter batter slopes be provided on embankments which have not been commenced, and/or direct that the excess material be used in the uniform widening of embankments, the surface of which shall be shaped so as to provide a tidy appearance and effective drainage. The surplus material shall be spread and compacted as specified in Clauses 213.26 and 213.36 for material in embankments.

***Use in
Embankments***

3. Alternatively, spoil shall be disposed of in the manner and at locations approved by the Superintendent. Surplus material so deposited shall be compacted as specified in Clause 213.36 for material in embankments or to such lesser extent as may be approved by the Superintendent. Disposal of spoil up to five kilometres from the point of excavation shall be deemed to be included in General Earthworks. Where haulage exceeds five kilometres, payment shall be made at the rate nominated in Annexure 213A for haulage of spoil.

***Disposal of
Spoil***

213.35 BORROW

1. Unless provided by the Contract, borrow will only be authorised by the Superintendent if, in constructing cuttings and embankments to the batter slopes specified or directed by the Superintendent or in providing materials of the quality specified, and not by reason of excess widening of embankments or wastage by the Contractor of material of the quality specified in Clauses 213.23, 213.28, 213.29 or 213.31, there is an overall deficiency in either the quantity or the quality of material required to complete the Works.

***Borrow to be
Authorized***

2. Where borrow material is required to complete the Works as specified, the location of borrow sites shall be as approved by the Superintendent, and the quality of material shall be acceptable to the Superintendent in accordance with Clauses 213.23, 213.28 or 213.31 as appropriate. The Contractor shall bear all costs associated with the acquisition of Planning approval by Council's Town Planning Manager should this be determined as necessary by the Superintendent. The edges of borrow sites shall be no closer than 3m from any fence line, road reserve boundary or edge of excavation or embankment. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have drainage outlets acceptable to the Superintendent, cut batter slopes not steeper than 4h to 1v, and shall be left by the Contractor in a tidy and safe condition.

***Borrow Site
Characteristics***

***Contractor's
Cost***

3. For borrow within the defined working area for the Works as specified, site preparation shall be in accordance with the Specification for CLEARING AND

Site Preparation and

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GRUBBING and Clause 213.07. Restoration of borrow sites shall be carried out in accordance with the Specification for LANDSCAPING.

Restoration

4. If borrow material is obtained by uniformly widening a cutting, the requirements of Clauses 213.11, 213.12 and 213.14 as to the redetermination of batter slopes, the trimming of batters and the compaction of floors of cuttings respectively shall apply to the borrow area.

Widening of Cutting

5. Borrow from within the specified working area shall be deemed to be part of General Earthworks except that additional payment for haulage will be made at the rate nominated in Annexure 213A for haulage of borrow where the authorised borrow sites are more than five kilometres from the point of delivery.

Payment

6. If the Superintendent accepts that borrow must to be obtained from locations outside the specified working area for the Works, such work shall be treated as a Variation to the Contract. The Contractor shall be responsible for obtaining any permits required for entry on land and for the payment of any royalty for such borrow material. The Contractor shall also comply with any requirements of the Environment Protection Act, the Department of Natural Resources and Environment, the Local Council, landowners and the Land Conservation Council as appropriate.

Contractor Responsibility

COMPACTION AND QUALITY CONTROL

213.36 COMPACTION AND MOISTURE REQUIREMENTS

1. In areas listed below, all layers shall be uniformly compacted to not less than the relative compaction specified before the next layer is commenced. Each layer of material shall be trimmed prior to and during compaction to avoid bridging over low areas. A smooth surface shall be presented at the top of each layer.

Trimming and Compaction

2. The following areas shall be compacted to provide a relative compaction, determined by AS 1289.5.7.1 or AS 1289.5.4.1 for modified compactive effort, of not less than 92 per cent.

92% Compaction Requirements

- Each layer of material replacing unsuitable material as detailed in Clause 213.21.
- Each layer of material placed in embankments, up to 1.5 metres from the top of the pavement.
- Fill placed adjacent to structures up to 1.5 metres from the top of pavement.
- Material in unsealed verges and within medians up to the level at which topsoil is placed.
- Spoil (excluding unsuitable material)
- All other areas except those where higher relative compaction is specified.

3. Unsuitable material shall be stockpiled as directed by the Superintendent and compacted by track rolling.

Unsuitable Material

4. The following areas shall be compacted to provide a relative compaction of not less than 97 per cent as determined by AS 1289.5.7.1 or AS 1289.5.4.1 for modified compactive effort:

97% Compaction Requirements

- Foundations for shallow embankments.

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- The whole area on the floor of cuttings.
- Each layer of the embankment within 1.5 metres from the top of pavement.
- Each layer of the selected material zone as specified in Clause 213.30.
- Any areas of material of specified quality which may be shown on the Drawings or specified elsewhere behind kerbs and/or gutters or adjacent to rigid pavements.
- The fill material placed adjacent to structures as specified in Clauses 213.31 and 213.33 in each layer within 1.5 metres from the top of the pavement.

5. Where the vertical alignment design is such that a substantial portion of the road is required to be built at or close to natural surface, the prepared subgrade shall be considered to be in shallow cutting. Shallow cutting is defined as cutting to a depth below natural surface of less than 0.5 metres. The floor of shallow cutting shall be treated as specified in Clauses 213.14 and 213.15 and shall be compacted to provide a relative compaction determined by AS 1289.5.7.1 or AS 1289.5.4.1, for modified compactive effort, of not less than 97 per cent for a depth of 200mm.

***Shallow
Cutting
Definition***

6. When shallow cutting conditions occur and with written approval of the Superintendent the requirements specified for transition from cut to fill (Clause 213.15) may be modified such that the depth of terrace excavation at the transition from cut to fill is reduced from 900mm to 250mm.

***Cut-Fill
Transition***

7. Sections of the works where the ripping or loosening of the cutting floor is not required and/or where provision of "proof-rolling" to the Superintendent's satisfaction is required are indicated in Annexure 213A. Proof rolling shall be in accordance with Clause 213.38.

Proof Rolling

8. At the time of compaction the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is within the range set out in Annexure 213A of the optimum moisture content as determined by AS 1289.5.1.1 or AS 1289.5.7.1. Material which becomes wetted up after placement shall not be compacted until it has dried out so that the moisture content is within this range. The drying process may be assisted by aeration, or where approved by the Superintendent, by the use of hydrated or quick lime at the Contractor's cost. Alternatively the Contractor may transport the wet material to a stockpile site for drying out and later use as fill material. The cost of transport to stockpile for drying out and later use shall be borne by the Contractor. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. The added water shall be applied uniformly and thoroughly mixed with the material until a homogeneous mixture is obtained. The costs of such wetting or drying the material to be compacted shall be borne by the Contractor.

***Moisture
Content***

***Contractor's
Cost for
Drying and
Wetting***

9. Compaction shall be undertaken to obtain the specified relative compaction for the full depth of each layer in embankments and for the full width of the formation over the entire length of the work. Compaction shall be completed promptly to minimise the possibility of rain damage.

***Prompt
Compaction***

10. Any material placed by the Contractor that has attained the specified relative compaction but subsequently becomes wetted up so that the moisture content is greater than the apparent optimum, determined by AS 1289.5.7.1, shall be dried out and uniformly recompacted to the required relative compaction in accordance with this Clause before the next layer of material is placed. Alternatively, the Contractor may remove the layer of wetted material to a stockpile site for drying and later re-use. The cost of the removal to stockpile, drying out and reincorporation of the wet material shall be borne by the Contractor.

***Moisture
Content above
Optimum
Contractor's
Cost***

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213.37 PROCEDURES FOR DETERMINING TEST LOCATIONS

- 1. Sampling locations for testing shall be determined as described in the Specification Part for Quality Requirements **Test Locations**
- 2. The specified compaction and moisture tests shall be taken at the determined locations. Prior to testing the Contractor shall work the lot to ensure uniform moisture content and compaction of all material within the lot. **Contractor to Prepare Area**
- 3. The test/s then taken shall be considered to represent the total volume of material placed within the lot. **Test Representation**
- 4. Where the Superintendent considers that the material which is present has not achieved uniformity required by this Clause or Clause 213.26, the Superintendent may take or direct further testing. The Superintendent shall nominate the area represented by the additional testing. **Further Testing**
- 5. If such testing confirms that material not conforming to the Specification is present, the cost of such tests shall be borne by the Contractor. The Contractor shall carry out remedial work as necessary to achieve conformance to the requirements of Clause 213.36. **Contractor's Cost**

213.38 DEFLECTION MONITORING OR PROOF ROLLING

- 1. Following completion of the formation to the underside of the selected material zone in accordance with Clause 213.24 and 213.26, and completion of the selected material zone in accordance with Clause 213.30, the Contractor shall make the work available in lots, for the Superintendent to carry out deflection monitoring or proof rolling. This action constitutes a **HOLD POINT**. The Superintendent's approval to the completed formation following deflection monitoring or proof rolling is required prior to the release of the hold point. **Formation Complete**

HP
- 2. A lot for deflection testing shall consist of a continuous length of formation of at least 300m, or lesser length as approved by the Superintendent, and a single carriageway width which is generally homogeneous with respect to material and appearance. The Contractor shall identify the boundaries of each lot with stakes clearly labelled to the satisfaction of the Superintendent. The cost of preparing the surface for deflection monitoring or proof rolling is deemed to be included in the rate for General Earthworks. **Lot Size**

213.39 WIDENING OF FORMATION

- 1. Road shoulders and formation shall be widened to accommodate footpaths, guardfence, streetlight plinths, emergency telephone bays and vehicle standing areas as shown on the Drawings. **Provision for Services**

213.40 MEDIAN AREAS

- 1. The batter slopes for median areas shall conform to those shown on the Drawings and undulations in the general plane of the batter slope shall not be permitted. **Batter Slope**
- 2. For a horizontal distance of 2m from the edge of the shoulder, no point on the completed batter shall vary from the specified slope line by more than 50mm when measured at right angles to the slope line within 24 hours after compaction. At distances greater than 2m horizontally from the edge of the shoulder, no point on the completed batter shall vary from the specified slope line by more than 100mm when measured at right angles to the slope line within 24 hours after compaction. **Batter Tolerances**
- 3. The medians shall be graded so as not to pond water. **Free Draining**

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SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**213.41 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 213.4 below.

Item	Activity	Frequency	Limits/Tolerances	Spec Clause
1.	Batter Slopes			
	a) Excavation	At toe of batter and level of table drain	Batter $\leq 1:1, +0; -150\text{mm}$ Batter $> 1:1, +0; -200\text{mm}$	213.12
		2m above table drain and higher	Batter $\leq 1:1, \pm 300\text{mm}$ Batter $> 1:1, +300; -600\text{mm}$	213.12
		Between level of table drain and 2m above table drain	Pro-rata basis	213.12
	b) Embankment	1m below shoulder	$\pm 150\text{mm}$	213.27
		At +1m below shoulder	$\pm 300\text{mm}$	213.27
	c) Median Areas	At 2m from edge of shoulder	$\pm 50\text{mm}$	213.40
		At distances greater than 2m from edge of shoulder	$\pm 100\text{mm}$	213.40
NOTE: Plus (+) is towards the roadway/surface and minus (-) is away from the roadway/surface. Tolerances are measured at right angles to the slope line.				
2.	Floors			
	a) Floor of Cutting	As completed	Annexure 213A	213.14
3.	Tops of Embankments			
	Trimming tops of Embankments	At completion of embankment construction	Parallel to the designed grade line, +10mm or -40mm of the levels specified	213.29
4.	Selected Material	As completed	Annexure 213A	213.30
5.	Selected Backfill	Adjacent to Structures	Plasticity Index $>2, <12$	213.33

Table 213.4 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**213.42 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items (a) to (f) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Control measures for erosion and sedimentation are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
5. Clearing and grubbing of stockpile sites and borrow areas is measured and paid in accordance with the Specification for CLEARING AND GRUBBING.
6. Seeding and restoration of stockpile sites and borrow areas is measured and paid in accordance with the Specification for LANDSCAPING.
7. Traffic control for blasting operations is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
8. Fill adjacent to culverts, other than box culverts, and drainage structures is measured and paid in accordance with the STORMWATER Specifications for PIPE DRAINAGE and DRAINAGE STRUCTURES as appropriate.
9. Selected backfilling to box culverts is measured and paid in accordance with the STORMWATER Specification for PRECAST BOX CULVERTS.
10. Working platforms created by chemical stabilisation are measured and paid in accordance with the Specification for STABILISATION.

Pay Item 213(a) REMOVAL AND STOCKPILING OF TOPSOIL

1. The unit of measurement shall be cubic metre as bank volume.
2. The volume shall be the sum of:-
 - (i) The volume removed from cuttings calculated by multiplying the area of cutting to be stripped as calculated from the plans of natural surface or accepted Ground Model by the depth of topsoil directed to be removed by the Superintendent, plus;
 - (ii) The volume removed from under embankments calculated by multiplying the area to be stripped as calculated from the plans of natural surface or accepted Ground Model by the depth of topsoil stripping as nominated in Annexure 213A, plus;
 - (iii) The additional volume of topsoil removed from shallow embankments below the depth nominated in Annexure 213A and calculated on the basis of plan area multiplied by the directed depth of excavation, or as directed.
3. The schedule rate under this Pay Item includes all activities associated with stripping topsoil, carting and placing into stockpile, then stabilising and trimming the stockpiles.

Pay Item 213(b) GENERAL EARTHWORKS

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1. The unit of measurement shall be the cubic metre measured as bank volume of excavation.
2. The schedule rate for this Pay Item shall be an average rate to cover all types of material encountered during excavation and placed in embankments or spoil stockpiles, including both earth and rock.
3. Payment for General Earthworks shall include all activities associated with the excavation of material and the construction of embankments, stockpiling of spoil, the haulage of material and any pretreatment such as breaking down or blending material or drying out material containing excess moisture, except that:
 - removal of unsuitable material to spoil shall be paid under Pay Item 213(c)
 - extra costs in processing selected material shall be paid under Pay Item 213(d)
 - overhaul of spoil or borrow shall be paid under Pay Items 213(e) and 213(f) respectively.
4. The base of the excavation shall be the designed floor level in accordance with Clause 213.14 and no account shall be taken of level tolerances.
5. The volume of earthworks in cuttings shall be determined by the surface to surface triangulation method, calculating the volume between the plans of natural surface or accepted Ground Model, the designed batter lines and the base of the excavation; from which shall be deducted the volume of topsoil as calculated under Pay Item 213(a). No account shall be taken of the allowable batter tolerances or stepping of batters for topsoiling.
6. Where unsuitable material from the foundations of shallow cuttings or material from cut to fill transitions is excavated and placed into embankments the volume shall be calculated from joint surveys carried out immediately prior to, and after subsequent removal of the unsuitable material, or by other methods which may be approved by the Superintendent.

Pay Item 213(c) UNSUITABLE MATERIAL TO SPOIL

1. The unit of measurement shall be the cubic metre measured as bank volume of excavation.
2. This pay item refers only to unsuitable material as defined in Clause 213.21 which is removed to spoil stockpile.
3. If the material is such that the bank volume of excavation cannot be measured, the Superintendent shall determine the conversion factors to be applied to the loose volumes measured in haulage units or to the measured stockpile volumes.
4. The schedule rate(s) under this Pay Item shall include all operations involved in the excavation, haulage, drying out, compaction or other activity required under Clause 213.21 for its disposal as spoil in accordance with Clause 213.34.
5. When this Pay Item provides for ranges of provisional quantities, the rates shall be applied successively, but not cumulatively, as the volume of unsuitable material increases from one provisional quantity range to the next higher range.
6. Each rate shall be applied as the sole payment due for all unsuitable material removed within each quantity range, irrespective of the nature or quantity of the material removed.

Pay Item 213(d) SELECTED MATERIAL

1. The unit of measurement shall be the cubic metre measured as embankment volume in place in the selected material zone. The volume shall be determined by multiplying the theoretical plan area of the top of the selected material zone with its nominated thickness.
2. This pay item covers any extra costs involved in stockpiling, processing, placing, compaction and trimming of material, including surface preparation for deflection monitoring in the selected material zone over and above those costs allowed for under Pay Item 213(b).

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3. The width and depth shall be taken as shown on the Drawings or as directed by the Superintendent. No account shall be taken of level tolerances.

Pay Item 213(e)HAULAGE OF SPOIL

1. Where an approved location for spoil disposal is more than five kilometres by road from the point of excavation of material being spoiled, payment shall be made for haulage at the rate nominated in Annexure 213A per bank cubic metre for each kilometre or part thereof in excess of five kilometres.

Pay Item 213(f) HAULAGE OF BORROW

1. Where an authorised borrow site that was not nominated in the Contract, is more than five kilometres by road from the point of delivery of borrow material to the Works, payment shall be made for haulage at the rate nominated in Annexure 213A per bank cubic metre for each kilometre or part thereof in excess of five kilometres.

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ANNEXURE 213A

EARTHWORKS - SUPPLEMENTARY INFORMATION

CLAUSE	DESCRIPTION	VALUE
213.07	The depth below natural surface up to which the removal and measurement of top soil shall apply:	
	a) Cutting areas	_____ mm
	b) Embankment areas	_____ mm
213.14	Minimum CBR value in cutting floors used for design of pavement	_____ %
213.14	Construction tolerances, of the designated grade and crossfall, for floors of cuttings after recompaction	+ _____ mm - _____ mm
213.24	Requirements of material in foundations for shallow embankments: Moisture Content - within the range of _____ % to _____ % of optimum.	
213.26 and 213.30	Upper Zones of Formation Selected Material Zone	
	Material within each zone shall have a CBR value of not less than the following, under the nominated test conditions:	

	Location	Minimum CBR Value	Depth	Nominated Soaking Period (Days)
	a) Selected Material Zone			
	b) Material below Selected Material Zone to 1.5 metre from top of pavement.			
213.30	Construction tolerances of the designed grade and cross fall for Selected Material Zone			+ _____ mm + _____ mm
213.34	Haulage of spoil under Pay Item 213(e) shall be payable at the rate of \$____.____ per bank cubic metre per kilometre in excess of 5 kilometres.			
213.35	Haulage of borrow under Pay Item 213(f) shall be payable at the rate of \$____.____ per bank cubic metre per kilometre in excess of 5 kilometres.			
213.36	Moisture Content of material placed in embankments:			
	a) Material in upper zones of formation:-		within the range of _____ % to _____ % of optimum	
	b) All other embankment material:-		within the range of _____ % to _____ % of optimum	
	Shallow cuttings:			
	c) Sections of work nominated to be in shallow cutting: _____			
	d) Ripping or loosening [is / is not] required in shallow cutting.			
	e) Proof rolling of subgrade [is / is not] required.			

CITY OF GREATER DANDENONG

SPECIFICATION

220

**STORMWATER DRAINAGE
GENERAL**

SPECIFICATION 220 - STORMWATER DRAINAGE – GENERAL

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SPECIFICATION 220 : STORMWATER DRAINAGE - GENERAL**GENERAL****220.01 INTRODUCTION**

1. Drainage works shall form a complete system carrying water through and away from the Works. **Purpose**
2. This is the general Specification common and applicable to all types of drainage lines, open drains, kerb and channel, and drainage structures and shall be read in conjunction with drainage Specifications:

221	Pipe Drainage
222	Precast Box Culverts
223	Drainage Structures
224	Open Drains, including Kerb and Channel

as applicable to particular Contracts.

220.02 SCOPE

1. The work to be executed under this Specification consists of:
- (a) preparation for stormwater drainage construction,
 - (b) temporary drainage during construction,
 - (c) siting of pipes, pipe arches and box culverts,
 - (d) all activities and quality requirements associated with excavation and backfilling,
 - (e) all concrete work associated with stormwater drainage,
 - (f) demolition and removal of existing redundant pipes and drainage structures.
2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. **Quality**

220.03 EXTENT OF WORK

1. Details of the work are shown on the Drawings. The requirements of this Contract for stormwater drainage are summarised as follows:

EXAMPLE (TO BE COMPLETED BY COMPILER)

- (a) *pipe culvert stormwater drainage,*
- (b) *precast box culvert stormwater drainage,*
- (c) *drainage pits, headwalls, wingwalls and aprons,*
- (d) *kerb and channel,*
- (e) *open concrete dish drains,*
- (f) *scour protection of open drains at outlets to drainage structures,*
- (g) *demolition and removal of existing redundant pipe culverts, headwalls and pits.*

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220.04 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 211 - Control of Erosion and Sedimentation
- 213 - Earthworks
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1289.5.7.1 - Compaction control test (Rapid Method)

CONSTRUCTION

220.05 TEMPORARY DRAINAGE DURING CONSTRUCTION

1. All drainage works carried out by the Contractor shall comply with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

Control

2. The Contractor shall make adequate provision for runoff flows at drainage works under construction to avoid damage or nuisance due to scour, sedimentation, soil erosion, flooding, diversion of flow, damming, undermining, seepage, slumping or other adverse effects to the Works or surrounding areas and structures as a result of the Contractor's activities.

**Contractor's
Responsibility**

3. The Contractor shall not implement any proposals to dam up or divert existing watercourses (either temporarily or permanently) without the prior approval of the Superintendent.

Limitations

4. The Contractor's material and equipment shall be located clear of watercourses or secured so that they will not cause danger or damage in the event of large runoff flows.

**Location of
Equipment**

220.06 SITING OF CULVERTS

1. Before commencing construction of any culvert, the Contractor shall set out on site the culvert inlet and outlet positions to the location and levels shown on the Drawings, and shall present this set-out for inspection by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval to the set-out is required prior to the release of the hold point.

Set-out



2. The Superintendent may amend the inlet or outlet locations or designed levels or the culvert length to suit actual site conditions. Any activity resulting from such amendments by the Superintendent shall be deemed to be included as part of the work covered by the Schedule of Rates or Bill of Quantities as appropriate. Should the Superintendent require a change to the culvert strength or the conditions of installation an appropriate variation shall be ordered.

**Amendments
to planned
work**

3. Should the Contractor propose changes to the culvert location, length, designed levels, culvert strength, conditions of installation or cover to suit the construction procedures, the Contractor shall present the proposed culvert set-out in addition to the designed set-out for consideration by the Superintendent. No changes shall be made

**Proposed
Changes by
Contractor**

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unless the prior written approval of the Superintendent is obtained. All costs associated with such changes shall be borne by the Contractor.

Contractor's Cost

220.07 EXCAVATION

1. Before undertaking stormwater drainage excavation, topsoil shall be removed in accordance with the Specification for EARTHWORKS.

Topsoil

2. In undertaking trench excavation the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.

Safety

3. Where public utilities exist in the vicinity of stormwater drainage works the Contractor shall obtain the approval of the relevant authority to the method of excavation before commencing excavation.

Approval by Public Utility Authorities

4. Excavation by blasting, if permitted by the Superintendent, shall be carried out to ensure that the peak particle velocity measured on the ground adjacent to any previously installed culvert or drainage structure does not exceed 25 millimetres per second. The Contractor shall comply with other requirements concerning blasting operations in the Specification for EARTHWORKS.

Blasting Operation

5. As indicated on the Drawings, existing redundant pipes and drainage structures shall be excavated and removed. The resulting excavation shall be backfilled in accordance with Clause 220.08.

Redundant Pipes and Structures

6. Trench or foundation excavation for stormwater drainage works shall be undertaken to the planned level for the bottom of the specified bedding or foundation level or such other depth as directed by the Superintendent. All loose material shall be removed by the Contractor. This action constitutes a **HOLD POINT**. The Superintendent's approval of the trench or foundation level and foundation material condition is required prior to the release of the hold point.

Excavation Level

HP

7. Any material at the bottom of the trench or at foundation level which the Superintendent deems to be unsuitable shall be removed and disposed in accordance with the Specification for EARTHWORKS by the Contractor and replaced with backfill material in accordance with the requirements of this Specification and the Specifications for particular culvert types. The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be parallel with the specified level and slope of the culvert.

Unsuitable Material

8. The excavated earth and rock material shall be used in the construction of embankments backfilling or spoiled in accordance with the Specification for EARTHWORKS.

Spoil

9. Any excavated redundant pipes and drainage structures shall be removed off site and legally disposed of by the Contractor.

220.08 BACKFILLING

1. Backfilling shall be carried out in accordance with the requirements of the relevant culverts or drainage structures Specifications and to the compaction requirements specified below.

220.09 COMPACTION

1. Foundations, bedding (other than for pipe drainage) and backfilling shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort.

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Relative
Compaction

Foundations or trench base to a depth of 150mm below foundation levels	95%
Material replacing unsuitable material	95%
Bedding material (other than for pipe drainage)	95%
Selected backfill and ordinary backfill material	
• below 1.5m of finished surface	95%
• within 1.5m of finished surface	100%
Backfill material within the selected material zone	100%

Compaction requirements adjacent to pipe drainage for concrete, steel or UPVC pipes are set out in the Specification for PIPE DRAINAGE.

2. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced.

Layers

3. At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (standard compaction).

Moisture Content

4. When compacting adjacent to culverts or drainage structures, the Contractor shall adopt compaction methods which will not cause damage or misalignment to any culvert or drainage structure. Any damage caused shall be rectified, and all costs of such rectification shall be borne by the Contractor.

Precautions

Contractor's Cost

220.10 CONCRETE WORK

1. For all concrete work, the Contractor shall comply with the Specification for MINOR CONCRETE WORKS in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection.

Specification

220.11 SPRAYED CONCRETE

1. If sprayed concrete has been specified, shown on the Drawings or directed by the Superintendent, it shall comply with requirements in the Specification for MINOR CONCRETE WORKS.

Standard

SPECIAL REQUIREMENTS

LIMITS AND TOLERANCES**220.12 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 220.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Excavation by Blasting		
	peak particle velocity	≤25mm/sec	220.07
2.	Relative Compaction (Standard)		
	(a) Foundations or trench base to a depth of 150mm below foundation levels	95%	220.09
	(b) Material replacing unsuitable material	95%	220.09
	(c) Bedding material	95%	220.09
	(d) Selected backfill and ordinary backfill material:		220.09
	• below 1.5m of finished surface	95%	
	• within 1.5m of finished surface	100%	
	(e) Backfill material within the selected material zone	100%	220.09
3.	Backfill		
	(a) Layers	≤ 150mm	220.09
	(b) Moisture Content	>60%, <95%	220.09

Table 220.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**220.13 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification and the associated activity specific specifications on a schedule of rates basis in accordance with Pay Item 220(a).
2. The Pay Items applicable to particular activities are listed in the Specifications for these activities.
3. Common to culverts and drainage structures is Excavation and payment for this shall be made under this Specification.
4. A lump sum price for this item shall not be accepted.
5. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
6. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
7. Topsoil removal is measured and paid in accordance with the Specification for EARTHWORKS.
8. Concrete work is measured and paid in accordance with the Specification for the particular drainage activities and not in the Specification for MINOR CONCRETE WORKS.
9. Sprayed concrete work is measured and paid in accordance with the Specification for MINOR CONCRETE WORKS.
10. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.
11. Excavation and replacement of unsuitable material is measured and paid in accordance with this Specification and not in the Specification for EARTHWORKS.

Pay Item 220(a) EXCAVATION FOR STORMWATER DRAINAGE CULVERTS AND STRUCTURES

1. The unit of measurement shall be cubic metre measured as bank volume of excavation.
2. The schedule rate for this Pay Item shall be an average rate to cover all types of material encountered during excavation. Separate rates shall not be included for earth and rock.
3. The rate is deemed to include:
 - Setting out and associated survey
 - Excavation, including excavation and replacement of unsuitable material.
 - Replacement for over-excavation for any reason
 - Excavation, removal and disposal of redundant pipes and drainage structures, and backfilling of the resulting excavations.
4. The volumes of excavation for payment shall be computed as follows:

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(i) Reinforced Concrete and Fibre Reinforced Cement Pipes

- Positive Projection (if excavation required)

Width:

- single cell: external pipe diameter + 1m.
- multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1m.

Depth:

- in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.
- in embankment: average actual depth or 500mm above top of pipe to underside of specified bedding, whichever is lesser.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

- Wide Trench

Width:

- single cell: external pipe diameter + 1m.
- multi cell: sum of external diameters + sum of spacings between pipes measured square to the line of the culvert + 1m.

Depth:

- in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.
- in embankment: maximum 500mm above top of pipe to underside of specified bedding.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

- Normal Trench

Width: 1.4 times external pipe diameter or external pipe diameter +300mm on each side, whichever is the greater..

Depth:

- in natural ground: average actual depth from topsoil stripped ground surface to underside of specified bedding.
- in embankment: maximum 500mm above top of pipe to underside of specified bedding.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

(ii) Steel Pipes and Pipe Arches

Width:

- wide trench: external pipe diameter or span + 2 x external pipe diameter or span.
- normal trench: external pipe diameter or span + 600mm on each side.

Depth: as for RC and FRC pipes.

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Length: actual excavation length.

(iii) **UPVC Pipes**

Width: For pipes of:-

Ext. dia at collar $\geq 75 \leq 150$ external diameter of pipe plus 200mm

Ext. dia at collar $> 150 \leq 300$ external diameter of pipe plus 300mm

Ext. dia at collar $> 300 \leq 450$ external diameter of pipe plus 400mm

Depth: average actual depth excavated.

Length: actual excavation length, centre to centre of pits or centre of pit to face of headwall.

(iv) **Box Culverts**

The plan area for payment shall be the area calculated from the outside dimensions of the base slab plus 300mm and wingwalls as shown on the Drawings. The depth for payment shall be the average actual depth below ground surface stripped of topsoil to the bottom of the specified bedding.

(v) **Other Drainage Structures**

The plan area for payment shall be the area calculated from the outside dimensions of the structure as shown on the Drawings. The depth shall be determined from the actual site measurement of the surface at the time of excavation to the underside of the bedding.

(vi) **Unsuitable Material under Culverts and Drainage Structures**

The volume for payment of material which the Superintendent deems unsuitable shall be calculated from the actual plan area of material removed and the average actual depth below the bottom of bedding. It shall be replaced with ordinary backfill material either from drainage excavations or from Earthworks.

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SPECIFICATION

221

PIPE DRAINAGE

SPECIFICATION 221 - PIPE DRAINAGE

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SPECIFICATION 221 : PIPE DRAINAGE**GENERAL****221.01 SCOPE**

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 1. This Specification covers the supply and installation of pipe culverts and pipe arches for stormwater drainage. | Scope |
| 2. This Specification should be read in conjunction with the specification for STORMWATER DRAINAGE - GENERAL. | Associated Specifications |
| 3. The work to be executed under this Specification consists of supply of pipes and pipe arches, bedding, installation and backfilling. | Extent of Work |
| 4. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. | Quality |

221.02 REFERENCE DOCUMENTS

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

(a) Council Specifications

- | | | |
|-----|---|-------------------------------|
| 213 | - | Earthworks |
| 220 | - | Stormwater Drainage - General |
| 223 | - | Drainage Structures |
| 230 | - | Subsurface Drainage - General |
| 271 | - | Minor Concrete Works |

(b) Australian Standards

- | | | |
|---------------|---|---------------------------------------------------------------------------------------|
| AS 1141.11 | - | Particle size distribution by dry sieving. |
| AS 1141.51 | - | Unconfined compressive strength of compacted materials. |
| AS 1254 | - | Unplasticized PVC (UPVC) pipes and fittings for storm or surface water applications. |
| AS 1289.3.3.1 | - | Calculation of the plasticity index of a soil. |
| AS 1289.5.4.1 | - | Compaction control test - Dry density ratio, moisture variation and moisture ratio |
| AS 1289.4.3.1 | - | Determination of the pH value of a soil - Electrometric method. |
| AS 1289.4.4.1 | - | Determination of the electrical resistivity of a soil - Sands and granular materials. |
| AS 1289.E6.1 | - | Compaction control test - Density index method for a cohesionless material. |
| AS 1397 | - | Steel sheet and strip - Hot dipped zinc coated or aluminium/zinc coated. |
| AS 1646 | - | Elastomeric seals for waterworks purposes. |
| AS 1761 | - | Helical lock-seam corrugated steel pipes. |
| AS 1762 | - | Helical lock-seam corrugated steel pipes - Design and installation. |
| AS 2032 | - | Code of practice for installation of UPVC pipe systems. |
| AS 2041 | - | Buried corrugated metal structures. |
| AS/NZS 2566.1 | - | Buried flexible pipelines, structural design |
| AS 3725 | - | Loads on buried concrete pipes |
| AS/NZS 3750.9 | - | Organic zinc-rich primer. |

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- AS/NZS 3750.15 Inorganic zinc silicate paint.
- AS 3887 - Paints for steel structures - Coal tar epoxy.
- AS 4058 - Precast concrete pipes (pressure and non-pressure).
- AS 4139 - Fibre reinforced concrete pipes and fittings.
- AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.
- AS/NZS ISO 9002 Quality systems - Model for quality assurance in production, installation and servicing.

(c) AASHTO Standard

- M190 Bituminous coated corrugated metal culvert pipe and pipe arches.

COMMON REQUIREMENTS

221.03 GENERAL

1. Pipes and/or pipe arches shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent that the pipes and/or pipe arches conform to the requirements of the Drawings and this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence complying with the Manufacturer's Quality Plan and AS/NZS ISO 9002 is required prior to the release of the hold point.

Conformance

HP

2. Where a Contractor wishes to use drainage pipe other than the pipes described in clauses 221.04 to 221.22 inclusive, the Contractor shall submit, for approval by the Superintendent, full details in accordance with AS/NZS 2566.1 of the characteristics of the pipe materials and embedment and design loads together with certification from the manufacturer of its suitability and quality for use in each particular application. Certification of the suitability of any pipe will address the deflection, strength, buckling and any other considerations appropriate to the particular application. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Buried Flexible Pipes, Submit for Approval

HP

3. The Contractor shall take all necessary steps to drain the excavation to allow the foundation, the bedding and any backfilling to be compacted to the specified relative compaction.

Excavation Drainage

4. Culverts shall be installed within 10mm of the grade line and within 10mm of the horizontal alignment specified on the Drawings or directed by the Superintendent. The Contractor shall relay any culvert which is not within these tolerances.

Tolerances

5. At the discharge end of culverts terminating at pits and headwalls a 3m length of 100mm diameter subsurface drain shall be laid in the trench 100mm above the invert level of the culvert and discharging through the wall of the pit or headwall at 100mm above the invert level of the culvert or headwall. The subsurface drainage pipe shall be sealed at the upstream end and shall be enclosed in a seamless tubular filter fabric in accordance with the Specification for SUBSURFACE DRAINAGE - GENERAL.

Subsurface Drain

6. Excavation and backfilling for culverts shall be undertaken in a safe manner and in accordance with all statutory requirements.

Safety

7. Where the Contractor proposes to travel construction plant in excess of 5 tonnes gross mass over culverts, the Contractor shall design and provide adequate protective measures for the crossings and shall submit the proposals to the Superintendent for prior approval. This action constitutes a **HOLD POINT**. The Superintendent's approval of the protective measures is required prior to the release of the hold point.

Construction Plant Movement

HP

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PRECAST REINFORCED CONCRETE AND FIBRE REINFORCED CONCRETE PIPES

221.04 PIPES

1. Precast reinforced concrete pipes shall comply with AS 4058 and shall be of the class and size as shown on the Drawings.

Precast Reinforced Concrete Pipes

2. Fibre reinforced concrete drainage pipes shall comply with AS 4139 and shall be of the class and size as shown on the Drawings.

Fibre Reinforced Pipes

3. Unless specified otherwise, joints shall be of the flexible type and the pipes shall have special sockets incorporating rubber ring joints complying with AS 1646 and as recommended by the manufacturer.

Joints

221.05 EXCAVATION

1. Unless otherwise indicated on the Drawings or approved by the Superintendent, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition.

Formation to Subgrade Level

2. For normal trench conditions, the pipe shall be laid in an excavated trench with bedding as specified in Clause 221.06. The trench shall be excavated to a width 1.4 times the external diameter of the pipe, or to the external diameter of the pipe plus 300mm on each side, whichever is the greater.

Normal Trench Conditions

3. Care is necessary to avoid laying pipe drainage in trenches excavated to excessive width. Pipes laid in wide trench conditions will be deemed to be in embankment conditions (positive projection). Wide trench conditions apply when, for a single pipe, the width of trench, $W \geq D + 0.6$ metre where D is the pipe diameter. For multi-cell pipes wide trench conditions apply when the width of trench, $W \geq \Sigma D + \Sigma S + 0.6$ metre where S is the square spacing between the pipelines. This definition of wide trench conditions as equivalent to embankment conditions relates to the size and geometry of the excavation utilised at construction. Pipes shown on the Drawings to require trench conditions shall not be placed under embankment conditions until the Contractor has produced documentary evidence of a design check confirming compliance of the pipe strength in accordance with AS3725. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

Wide Trench Conditions

Design Check

HP

221.06 BEDDING

1. Bedding shall be in accordance with this Specification, AS3725 and AS3725 Supplement 1 for the pipe support types and as shown on the appropriate Council standard drawings. Where the pipe support type is not shown on the Drawings, the support type shall be HS3 within road reserves and H2 elsewhere.

Pipe Support Type

221.07 INSTALLATION

(a) General

1. Pipes shall be laid with the socket end placed upstream. Pipes which have marks indicating the crown or invert of the pipes shall be laid strictly in accordance with the markings. Unless specified, no individual length of pipe shall be shorter than 1.2m.

Positioning of Pipes

2. In the case of pipes 1,200mm or more in diameter, laid in situations where

Stiffening of

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embankments are to be more than 3m high, measured above the invert of the pipe, pipes shall be stiffened temporarily by the Contractor by interior timber struts, erected before filling is placed. Struts shall be of hardwood measuring at least 100mm by 100mm or 125mm diameter. One strut shall be placed in a vertical position at each pipe joint, thence at a spacing not greater than 1,200mm. Struts shall bear against a sill laid along the invert of the pipe and a cap bearing against the crown of the pipe. Both the sill and the cap shall be continuous throughout the length of the pipe and they shall be of sawn hardwood, of cross section not less than 100mm by 100mm. Struts shall be made to bear tightly by the use of wedges between the top of the struts and the cap. Struts, sills and caps shall be removed on completion of the embankment, unless removal is ordered earlier.

Culverts

Removal of Struts

3. Lifting holes in all pipes shall be sealed with plastic preformed plugs approved by the Superintendent, or a 3:1 sand:cement mortar, before the commencement of backfilling.

Seal Lifting Holes

4. Bulkheads shall be constructed in accordance with the Specification for DRAINAGE STRUCTURES on all lines where the pipe gradient exceeds 5 per cent.

Bulkheads

5. The Contractor shall present the laid and jointed pipes for inspection by the Superintendent prior to commencement of trench backfilling. This action constitutes a **HOLD POINT**. The Superintendent's approval to the laid and jointed pipes is required prior to the release of the hold point.

HP

(b) Joints in Reinforced Concrete Pipes

(i) Rubber Ringed Joints

1. Before making the joint, the spigot and socket and the rubber ring shall be clean and dry.

Clean and Dry Material

2. The rubber ring shall be stretched on to the spigot end of the pipe, square with the axis and as near as possible to the end, care being taken that it is not twisted. The spigot end of the pipe shall then be pushed up to contact the socket of the pipe with which it is to join, and be concentric with it. The spigot end shall then be entered into the socket of the already laid pipe and forced home by means of a bar, lever and chain, or other method approved by the Superintendent.

Procedure for Rolling Rubber Rings

3. The joint shall be tested to ensure that the rubber ring has rolled evenly into place.

Joint Test

4. Where wedge shaped "skid" rubber rings are prescribed the Manufacturer's instructions, which include the use of lubricants, shall be followed.

"Skid" Rings

(ii) Flush or Butt Joints

1. Flush or butt joints shall be used only where required to extend existing culverts. If pipes with flush or butt joints are required, the ends of the pipes shall be butted together.

Jointing

2. The joints shall be sealed with proprietary rubber sleeves, supplied and installed in accordance with the manufacturer's recommendations, or other alternative method approved by the Superintendent.

Sealing

(c) Joints in Fibre-Reinforced Cement Pipes

(i) New Pipes

1. Joints shall be of a flexible type. Rubber rings shall be used to seal joints in both rebated and spigot and socket jointed pipes in the manner specified in Clause 221.07(b). Alternatively, a jointing compound comprising plasticised butyl rubber and inert fillers may

Procedure

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be used to seal such pipes in accordance with the manufacturer's instructions.

(ii) Direct Side Connections to Other Pipes

1. Direct side connections to other pipes shall be as detailed on the Drawings.

221.08 BACKFILL

1. Select fill material to the side zones for pipe support type HS shall be compacted to the requirements shown in Table 221.3 when tested in accordance with AS 1289.5.4.1 for standard compactive effort.

Type HS Pipe Support

2. Ordinary fill to the side zones, for all pipe support types except type HS, and overlay zones, for all pipe support types, shall consist of Selected Backfill as defined in the Specification for EARTHWORKS. It shall be placed around the pipe to the dimensions shown in Figure 221.1.

Other Pipe Support Types

3. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced.

Layers

4. At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (standard compaction).

Moisture Content

5. The remainder of the trench to the underside of the subgrade, or selected material zone as specified in the Specification for EARTHWORKS, shall be backfilled with material satisfying the requirements for embankment material as defined in the Specification for EARTHWORKS. Where excavation is approved through the selected material zone, the section of trench within the select material zone shall be backfilled with selected material as defined in the Specification for EARTHWORKS.

Trench Backfill

6. When compacted adjacent to culverts or drainage structures, the Contractor shall adopt compaction methods which will not cause damage or misalignment to any culvert or drainage structure. Any damage caused shall be rectified, and all costs of such rectification shall be borne by the Contractor. Backfilling and compaction shall commence at the pipe or wall so as to confine remaining uncompacted material at commencement.

Precautions

Contractor's Cost

UPVC PIPES

221.09 CULVERT MATERIALS

1. Unplasticised PVC (UPVC) Pipes and Fittings shall be manufactured in accordance with AS 1254 and shall be of the type and size as shown on the Drawings.

Specification

2. Embedment material in the bedding, side support and overlay zones shall be in accordance with bed and haunch zone material in Clause 221.06.

3. Trench backfill material shall satisfy the requirements for embankment material as defined in the Specification for EARTHWORKS.

221.10 EXCAVATION AND BEDDING

1. Unless otherwise indicated on the standard Drawings or approved by the Superintendent, the formation shall be completed to subgrade level and the pipes then installed in the normal trench condition.

Formation to Subgrade Level

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221.11 INSTALLATION

1. Embedment of the UPVC pipe shall be in accordance with the requirements of AS/NZS 2566.1 and to the dimensions shown in the standard drawings.

2. Pipe laying shall be in accordance with Part 7 of AS 2032 and solvent-cement pipe jointing shall be in accordance with Part 3 of AS 2032. Jointing may be performed with the pipes either in the trench or at ground level. All pipes, or jointed pipelines, shall be lowered into the trench without being dropped. Pipelines shall be placed so that joints are not strained.

Laying and Jointing

3. Bedding zone material compaction and pipeline placement prior to backfill constitutes a **HOLD POINT**. The Superintendent's approval of the bedding, positioned and jointed pipeline is required prior to the release of the hold point.

HP

221.12 BACKFILL

1. Compaction of the material in the side support and overlay zones shall comply with the requirements of clause 221.06 except that the required relative compaction in the side support and overlay zones shall be 95 per cent (AS 1289.5.4.1 standard compaction).

Embedment Compaction

2. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the next layer is commenced.

Layers

3. At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content, which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (standard compaction).

Moisture Content

4. The remainder of the trench to the underside of the subgrade, or selected material zone as specified in the Specification for EARTHWORKS, shall be backfilled with material satisfying the requirements for embankment material as defined in the Specification for EARTHWORKS. Where excavation is approved through the selected material zone, the section of trench within the select material zone shall be backfilled with selected material as defined in the Specification for EARTHWORKS.

Trench Backfill

SPECIAL REQUIREMENTS

INSTRUCTION FOR DOCUMENT COMPILATION
(Delete this box before printing)

Particular situations may be documented during the design of Council projects for the use of buried flexible pipes instead of the pipes specified routinely in this Specification for PIPE DRAINAGE.

In such cases, Council's Designer shall have selected the flexible pipe type appropriate for the particular application and shall prepare the relevant technical specification clauses for supply and construction with reference to AS/NZS 2566.1, Buried flexible pipelines Part 1: Structural design. These clauses shall be inserted here.

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LIMITS AND TOLERANCES**221.13 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances for materials and product performance related to the various clauses in this Specification are summarised in Table 221.5 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Culvert Position		
	(a) Grade Line	± 10mm	221.03
	(b) Horizontal Alignment	± 10mm	221.03
2.	Bedding		
	(a) Bed and Haunch Zone Compaction	Table 221.3	221.06
3.	Backfill - Concrete Pipes		
	(a) Side and Overlay Zone Compaction	Table 221.3	221.08
4.	Sprayed Concrete		
	(a) Over crest of corrugations over bottom third of pipe circumference	> 100mm	221.18
5.	Bedding Zone Compaction	≥95%	221.20
6.	Backfill - UPVC Pipes		
	(a) Side and Overlay Zone Compaction	≥95%	221.21

Table 221.5 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**221.14 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a Schedule of Rates basis in accordance with Pay Item 221(a).
2. A lump sum price for this item shall not be accepted.
3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Subsoil drains at pits and headwalls are measured and paid in accordance with this Specification and not in the Specification for SUBSURFACE DRAINAGE - GENERAL.
5. Selected material around pipes, trench backfill in embankment material to the underside of the selected material zone and selected material backfill within the selected material zone where approved, is measured and paid in accordance with this Specification and not in the Specification for EARTHWORKS.
6. Sprayed concrete invert protection is measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
7. Miscellaneous minor concrete work not included in the pay items in this specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.
8. Bulkheads are measured and paid in accordance with the Specification for DRAINAGE STRUCTURES.

Pay Item 221(a) PIPE CULVERTS

1. The unit of measurement shall be the linear metre measured along the centreline of each particular type, class and size of stormwater drainage pipe culvert and shall be the plan length between centres of gully pits or faces of headwalls.
2. The schedule rate shall include:
 - Supply
 - Survey and setting out
 - Bedding
 - Jointing (including connections)
 - Subsoil drains at pits and headwalls
 - Temporary bracing and strutting
 - Bituminous painting
 - Sprayed concrete lining and other protective measures
 - Selected material backfilling
 - Embankment material trench backfilling

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CITY OF GREATER DANDENONG
SPECIFICATION

222

PRECAST BOX CULVERTS

SPECIFICATION 222 - PRECAST BOX CULVERTS

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SPECIFICATION 222 : PRECAST BOX CULVERTS**GENERAL****222.01 SCOPE**

1. This Specification covers the installation of precast concrete box culverts and should be read in conjunction with the Specification for STORMWATER DRAINAGE - GENERAL.

2. The work to be executed under this Specification consists of:

Extent of Work

- (a) preparation of foundations;
- (b) provision of bedding;
- (c) construction of base slabs;
- (d) installation of precast culvert units;
- (e) headwalls and wingwalls;
- (f) backfilling against structures;
- (g) provision and removal of coffer dams;
- (h) excavation of inlet and outlet channels.

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

Quality**222.02 REFERENCE DOCUMENTS**

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

***Documents
Standards
Test Methods*****(a) Council Specifications**

- 213 - Earthworks
- 220 - Stormwater Drainage - General
- 224 - Open Drains, including Kerb and Channel
- 230 - Subsurface Drainage - General
- 231 - Subsoil and Foundation Drains
- 242 - Flexible Pavements
- 271 - Minor Concrete Works

(b) Australian Standards

- AS1597.1 - Precast reinforced concrete box culverts - Small culverts
- AS1597.2 - Precast reinforced concrete box culverts - Large culverts
- AS/NZS ISO 9002 Quality Systems - Model for Quality Assurance in Production, Installation and Servicing.

(c) Other

- AUSTROADS - Guide to Geotextiles

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MATERIALS**222.03 CULVERT UNITS, LINK AND BASE SLABS**

1. The supply and testing of precast reinforced concrete box culvert units, link and base slabs shall be in accordance with AS 1597.1 for small culverts not exceeding 1200mm width and 900mm depth and AS 1597.2 for large culverts from 1500mm span and up to and including 4200mm span and 4200mm height with the following alterations or additional requirements:

Supply

- (a) Proof load testing shall be arranged by the Contractor in batches as specified in either AS 1597.1 or AS1597.2 as appropriate.
- (b) Lifting holes, galvanised lifting points or steel lifting eyes shall be provided in the culvert units, link and base slabs.
- (c) The end units shall have factory installed starter bars for headwall and wingwall construction.
- (d) Delivery and unloading shall be the Contractor's responsibility.

2. The Supplier shall implement and maintain a Quality System in accordance with ISO 9002 to ensure materials, manufacture and proof load testing conform to the requirements of AS 1597.1 or AS 1597.2 as appropriate.

3. A conformance certificate, to AS 1597.1 or AS 1597.2, for the box culvert units shall be submitted at least 3 working days prior to despatch. This action constitutes a **HOLD POINT**. The Superintendent's approval of the conformance certificate is required prior to the release of the hold point.

HP

4. Each unit shall be marked at time of manufacture with:

- (a) Type and size
- (b) Casting date
- (c) Manufacturer's name
- (d) Inspection pass and date.

222.04 CONCRETE

1. The concrete and reinforcement for cast-in-situ base slabs shall comply with the Specification for MINOR CONCRETE WORKS.

Quality**222.05 SELECTED BACKFILL**

1. The quality of selected backfill shall comply with the requirements in AS 1597.2.

Quality**222.06 ORDINARY BACKFILL**

1. Ordinary backfill is material obtained from culvert excavations, cuttings and/or borrow areas which is in accordance with the requirements for the upper 1.5m of embankment construction as detailed in the Specification for EARTHWORKS.

Quality

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CONSTRUCTION**222.07 COFFER DAMS**

1. At some sites it may be expedient for the Contractor to construct a coffer dam. All costs associated with the construction of coffer dams shall be borne by the Contractor. **Contractor's Costs**
2. Coffers shall be sufficiently watertight to prevent damage of the concrete by percolation or seepage through the sides, and shall be taken sufficiently below the level of the foundations to prevent loosening of the foundation materials by water rising through the bottom of the excavation. Coffers shall be adequately braced and shall be so constructed that removal will not weaken or damage the structure. **Construction**
3. A coffer dam may be constructed to the actual size of the reinforced concrete invert slab and used as side forms for the concrete. The details of the coffer dam and formwork, and the clearances proposed shall be subject to the approval of the Superintendent, but the Contractor shall be responsible for the successful construction of the work. **Contractor's Responsibility**
4. Coffers which have tilted or have moved laterally during sinking, shall be righted or enlarged to provide clearances specified. This work will be at the Contractor's expense. **Specified Clearances**
5. No timber or bracing shall be left in the concrete or in the backfill of the finished structure. Coffers, including temporary piles, shall be removed at least to the level of the invert after completion of the structure. **Removal**

222.08 EXCAVATION

1. Excavation shall be carried out in accordance with the provisions in the Specification for STORMWATER DRAINAGE - GENERAL. **Specification**
2. The trench width shall be the width of the base slab plus 150mm minimum each side. **Trench Width**

222.09 FOUNDATIONS

1. Rock foundations shall be neatly excavated to the underside of the mass concrete or selected fill bedding shown on the Drawings. All minor fissures shall be thoroughly cleaned out and refilled with concrete, mortar or grout. All loose material shall be removed. **Rock Foundations**
2. Where rock is encountered over part of the foundation only, or lies within 300mm below the underside of the mass concrete or selected fill, all rock shall be removed to a depth of 300mm below the mass concrete or selected fill for the full width of the foundation over the length where the rock is encountered. This additional excavation shall be backfilled with ordinary backfill material as specified in Clause 222.06. **Additional Excavation**
3. Over-excavation or uneven surfaces shall be corrected with mass concrete so as to provide a uniform surface at least 50mm above the highest points of rock. **Uniform Surface**
4. Earth foundations shall be finished to line and level to the underside of bedding shown on the Drawings. Care shall be taken to avoid disturbing material below this level. **Line and Level**
5. All soft, yielding or unsuitable material shall be removed and replaced with ordinary backfill material as directed by the Superintendent and backfilled in accordance with the Specification for STORMWATER DRAINAGE - GENERAL. **Unsuitable Material**

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6. All bedding shall be in accordance with the standard drawings.

222.10 INSTALLATION OF PRECAST UNITS

1. Precast units shall not be installed until the base slab has attained a minimum compressive strength of 20MPa.

Minimum Strength

2. Precast crown units shall be placed on a bed of mortar in the recesses in the base slab. Any gaps between the side walls and the sides of the recesses shall be packed with cement mortar. Lifting holes and butt joints between the ends of units shall be packed or sealed with cement mortar or grout of a consistency that ensures filling of the void.

Mortar Bed in Recess

3. Before placement of top slabs on U-shaped units or link slabs on adjacent crown units, the bearing areas of the supports shall be thoroughly cleaned and covered with a bed of mortar of minimum thickness 5mm after placement of precast unit.

Mortar Bed on Supports

4. Steel lifting hooks shall be cut flush with the surface of the concrete, cleaned to bright metal and coated with two coats of coal tar epoxy or equivalent approved by the Superintendent. Alternatively, they shall be cut off 12mm below the surface of the unit and the recess sealed with epoxy mortar.

Lifting Hooks

5. In the case of multi-cell culverts, the gap as shown on the Drawings, typically 15mm, shall be provided between adjacent cells. This gap shall be filled with cement mortar or grout.

Gap Between Cells

6. All mortar joints shall be protected from the sun and cured in an approved manner for not less than 48 hours.

Curing of Joints

7. All external surfaces of joints between precast crown units, both laterally and longitudinally, shall be covered full length, and minimum 250mm width, with strips of non-woven geotextile of minimum mass 270 grams per square metre in accordance with AUSTROADS Guide to Geotextiles.

Joint Covering

222.11 BACKFILL

1. All bracing and formwork shall be removed prior to backfilling.

Removal of Formwork

2. Selected backfill shall be placed in the side zones of the box culverts and wingwalls, and to a depth of 300mm in the overlay zone of the culverts, in layers with a maximum compacted thickness of 150mm in accordance with the backfilling and compaction requirements of AS 1597.2. The remainder of the excavation shall be backfilled with ordinary embankment fill in accordance with the Specification for EARTHWORKS.

Selected Backfill

3. No backfill shall be placed against wingwalls until 21 days after casting.

Wingwalls

4. A subsoil drain shall be installed at the outer walls of the precast crown sections and at wingwalls as shown on the Drawings and in accordance with the Specification for SUBSOIL AND FOUNDATION DRAINS. The subsoil drain shall be enclosed in a seamless tubular filter fabric in accordance with the Specification for SUBSURFACE DRAINAGE - GENERAL.

Subsoil Drain

5. Backfill layers shall be placed simultaneously on both sides of the culvert with a maximum 600mm level difference to avoid differential loading. Backfilling and compaction shall commence at the wall and proceed away from it.

Sequence

6. Where the slopes bounding the excavation are steeper than 4:1, they shall be cut in the form of successive horizontal terraces of at least 1m width before the backfill is

Horizontal Terraces

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placed.

222.12 EXCAVATION OF INLET AND OUTLET CHANNELS

1. Excavation of inlet and outlet channels shall be carried out as shown on the Drawings and shall extend to join the existing stream bed in a regular manner as detailed in the Specification for OPEN DRAINS INCLUDING KERB AND CHANNEL. **Extent**

222.13 CONSTRUCTION LOADING ON CULVERTS

1. Construction vehicles and plant shall not pass over the culvert until 28 days after the casting of the base slab or until the cylinder compressive strength of the base slab concrete has reached 32MPa. **Traffic Over Culvert**

2. Construction vehicle loads on culverts for various design fill heights shall be in accordance with AS 1597.2. **Loading Restrictions**

SPECIAL REQUIREMENTS

LIMITS AND TOLERANCES

222.14 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 222.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Mass Concrete Correction		
	a) Over highest points of rock	≥50mm	222.09
2.	Mass Concrete Bedding		
	a) Level	± 10mm	222.10
	b) Line	± 5mm	222.10
3.	Culvert Location		
	a) Invert Level	±10mm	222.11
	b) Grade	5mm in 2.5m (1 in 500)	222.11
	c) Plan Position	±50mm	222.11

Table 222.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT

222.15 DEDUCTIONS

1. Payment for in-situ concrete work shall be made at the scheduled rates provided the concrete meets the strength requirements specified in the Specification for MINOR CONCRETE WORKS.

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2. Where any concrete does not reach the strength specified, the scheduled rate of payment shall be reduced by 2% for each 1%, or fraction thereof, by which the strength of the specimen fails to reach the specified strength, up to a maximum deficiency of 10%.

3. If the deficiency in strength exceeds 10%, the concrete represented by the specimens may be rejected, in which case no payment will be made.

222.16 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 222(a) and 222(b).

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Excavation for box culverts is measured and paid in accordance with the Specification for STORMWATER DRAINAGE - GENERAL.

5. Excavation for inlet and outlet channels is measured and paid in accordance with the Specification for OPEN DRAINS INCLUDING KERB AND CHANNEL.

6. Base slab bedding using crushed rock is measured and paid in accordance with this Specification and not in the Specification for FLEXIBLE PAVEMENTS.

7. Cast-in-situ base slabs are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.

8. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.

9. Ordinary embankment backfill is measured and paid in accordance with the Specification for EARTHWORKS.

10. Cast-in-situ headwalls and wingwalls are measured and paid in accordance with the Specification for DRAINAGE STRUCTURES.

11. Subsoil drains are measured and paid in accordance with the Specification for SUBSOIL AND FOUNDATION DRAINS

Pay Item 222(a) IN-SITU BASE SLAB

1. The unit of measurement shall be the cubic metre of reinforced concrete in place (excluding the mass concrete bedding layer).

2. The width, length and depth of the slab shall be as specified on the Drawings or as directed by the Superintendent.

3. The schedule rate shall include foundation preparation, bedding and all activities associated with the construction of the base slab.

4. The schedule rate does not include excavation.

Pay Item 222(b) PRECAST CONCRETE BOX CULVERTS

1. The unit of measurement shall be linear metre of the actual length installed for each size of box culvert as shown on the Drawings.

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2. The Schedule Rate shall include supply, installation and jointing of the precast units, selected backfilling and testing of the units.

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CITY OF GREATER DANDENONG
SPECIFICATION

223

DRAINAGE STRUCTURES

SPECIFICATION 223 - DRAINAGE STRUCTURES

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SPECIFICATION 223 : DRAINAGE STRUCTURES**GENERAL****223.01 SCOPE**

1. This Specification covers the construction of drainage structures and shall be read in conjunction with the Specification for STORMWATER DRAINAGE - GENERAL and other drainage Specifications as applicable:

Associated Specifications

- 221 - Pipe Drainage
- 222 - Precast Box Culverts
- 224 - Open Drains, including Kerb and Channel

2. The work to be executed under this Specification consists of the construction of headwalls, wingwalls, pits, side entry pits, inspection pits, junction boxes/pits, drop structures, inlet and outlet structures, energy dissipators, batter drains and other supplementary structures as shown on the Drawings.

Extent of Work

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

Quality

223.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 213 - Earthworks
 - 220 - Stormwater Drainage - General
 - 221 - Pipe Drainage
 - 222 - Precast Box Culverts
 - 224 - Open Drains, including Kerb and Channel
 - 271 - Minor Concrete Works
- Council Standard Drawings

(b) Australian Standards

- AS 3996 - Metal Access Covers, Road Grates and Frames

MATERIALS**223.03 GENERAL**

1. Drainage structures shall be constructed in concrete and in accordance with the Specification for MINOR CONCRETE WORKS.

Concrete Work

2. All structures shall be constructed as soon as practicable and shall be completed not later than 28 days after the construction of the associated culverts, unless otherwise approved by the Superintendent.

Time for Completion

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223.04 PRECAST UNITS

1. Where precast units, including kerb inlet lintels, are provided in the design they shall be handled and installed in accordance with the manufacturer's instructions.
2. If the Contractor proposes to use precast units in place of cast-in-situ units, detailed drawings and complete details of installation procedures shall be submitted for the approval of the Superintendent.
3. Unless otherwise approved by the Superintendent, precast units shall not be delivered to the site before satisfactory documentary evidence has been submitted to the Superintendent that quality tests have been carried out. This action constitutes a **HOLD POINT**. The Superintendent's approval to the quality test documentation is required prior to the release of the hold point.

Manufacturer's Instructions**Approval****Delivery****HP****CONSTRUCTION****223.05 ALIGNMENT**

1. Unless otherwise shown on the Drawings, headwalls and pits shall be constructed parallel to the road centreline and wingwalls at 135° to the headwall.
2. Where the culvert is laid skew to the road, the wingwalls and headwalls shall be splayed so that the front edge of the wing bisects the angle between the centreline of the culvert and the headwall.
3. Energy dissipators shall be constructed in accordance with the Drawings and with centreline on the axis of the culvert.

Skew Angle**Energy Dissipators****223.06 HEADWALLS AND WINGWALLS**

1. The wingwalls shall be constructed to retain the batters effectively. Where the dimensioned drawings do not satisfy this requirement the Superintendent shall be notified before the headwalls and wingwalls are constructed. The Superintendent shall direct the Contractor as to the action to be taken.
2. Where rock is encountered at the bottom of excavations for wingwalls and headwalls, and after approval is given by the superintendent, the depth of cut-off walls in uniform rock over the full width of the foundations may be reduced to less than that shown in the Drawings, but must be not less than 150mm into sound rock.

Batter Retention**Rock Foundations****223.07 PITS**

1. All new pits, including access covers, grated pits and frame, complying with AS 3996, shall be constructed to the details shown on the Drawings. Modification of existing pits is only to be carried out if such is shown on the Drawings.
2. Where the full depth of the excavation is in sound rock, and the Superintendent approves, part of the concrete lining of side entry pits and sumps may be omitted, provided that a neatly formed pit of the required dimensions is constructed. In all such cases the wall of the pit adjacent to and parallel to the road shall be constructed of concrete.
3. Step irons shall be installed in accordance with the Drawings.

Construction**Full Depth Rock Excavation****Step Irons**

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4. Step irons shall be either fixed firmly in the formwork prior to pouring the concrete for the pit walls or by using blockout formers to make recesses in the concrete to receive the arms of the step irons or alternatively, installed at a later date by drilling the pit wall. Holes may only be drilled using a rotary masonry bit or similar. Percussion tools shall not be used to form the hole for the step iron.

Fixing Methods

5. Where the step irons are installed in recesses or drill holes after the concrete wall is poured, the step irons shall be fixed in position by using an epoxy resin in accordance with the step iron and epoxy resin manufacturer's instructions and specifications. The Contractor shall ensure that no movement of the step irons occurs until the epoxy resin has reached the specified strength.

Epoxy Fixing

6. Inlet and outlet pipes shall be integrally cast into the pit at the time of pouring the concrete for the pit walls.

Casting-in Pipes

7. A subsoil drain shall be installed into the pit or headwall in accordance with the general requirements in the Specification for PIPE DRAINAGE.

Subsoil Drain

223.08 BULKHEADS

1. Concrete bulkheads shall be constructed on all pipe stormwater drainage lines where the pipe gradient of the line exceeds 5 per cent.

Gradient >5%

2. Bulkheads shall be constructed at the spacings and to the details shown on the Drawings.

Spacings and Details

223.09 JOINTING

1. Where drainage structures abut concrete paving, kerb and channel or other concrete structures, a 10mm wide joint shall be provided between the structure and paving or kerb and channel or other concrete structure. The joint shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

Preformed Jointing Material

223.10 FOUNDATION FOR CONCRETE BASES

1. Mass concrete bedding for reinforced concrete bases shall not be placed on earth or rock foundations until the foundations have been inspected and approved by the Superintendent. Following such approval, the surface of the foundation shall be dampened and a layer of concrete not less than 50mm thick, shall be placed over the excavated surface and shall be finished to a smooth even surface. Foundation preparation constitutes a **HOLD POINT**. The Superintendent's approval of the foundation is required prior to the release of the hold point.

Mass Concrete Base Foundation Inspection

HP

2. Unreinforced concrete bases may be cast on earth or rock foundations without the mass concrete bedding. Foundation preparation constitutes a **HOLD POINT**. The Superintendent's approval of the foundation is required prior to the release of the hold point.

Unreinforced Concrete Base

HP

223.11 BACKFILL

1. Backfilling shall not commence until the compressive strength of concrete has reached at least 15 MPa unless otherwise approved by the Superintendent.

Commencement

2. Selected backfill shall be placed against the full height of the vertical faces of structures for a horizontal distance equal to one-third the height of the structure.

Selected Backfill

3. Selected backfill shall consist of a granular material in accordance with the

Composition

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requirements in the Specification for EARTHWORKS.

4. Special care shall be exercised to prevent wedge action against vertical surfaces during the backfilling. Where the sides of the excavation are steeper than 4 horizontally to 1 vertically they shall be cut in the form of successive horizontal terraces at least 600mm in width, as the backfill is placed.

**Horizontal
Terraces**

5. Backfill on both sides of the structure shall be carried up to level alternately in layers so as to avoid wedge action or excessive horizontal forces. Backfilling and compaction shall commence at the wall. Compaction shall be in accordance with the Specification for STORMWATER DRAINAGE - GENERAL.

Procedure

SPECIAL REQUIREMENTS

LIMITS AND TOLERANCES

223.12 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 223.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Cut-off Walls Depth into sound rock	>150mm	223.06
2.	Mass Concrete Bedding	>50mm	223.10

Table 223.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**223.13 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis, in accordance with the Pay Items 223(a) to 223(c).
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in other items for the cost of the activity which has not been priced.
4. Excavation is measured and paid in accordance with the Specification for STORMWATER DRAINAGE - GENERAL.
5. Backfill is measured and paid in accordance with this Specification and not with the Specification for EARTHWORKS.
6. Drainage structures are measured and paid in accordance with this Specification and not with the Specification for MINOR CONCRETE WORKS.
7. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.

Pay Item 223(a) CONCRETE HEADWALLS AND WINGWALLS

1. The unit of measurement shall be cubic metre of concrete as calculated from the dimensions on the Drawings.
2. The Schedule Rate shall include formwork, supply and fixing of steel reinforcement, supply, placing and curing of concrete, stripping, finishing and backfilling.

Pay Item 223(b) PITS, DISSIPATORS, CHANNEL BASINS AND OTHER SUPPLEMENTARY STRUCTURES

1. The unit of measurement shall be "each" for the completed structures as scheduled.
2. The rate shall include all activities and materials required to complete the structures as shown on the Drawings, including the supply and installation of all cast in metalwork, frames, grates, lintels and lids, finishing and backfilling.

Pay Item 223(c) BULKHEADS

1. The unit of measurement shall be "each" bulkhead completed.
2. The rate shall include all activities and materials required to complete the bulkhead structures as shown on the Drawings, including formwork, supply and fixing of steel reinforcement, supply, placing and curing of concrete, stripping and selected backfilling.

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CITY OF GREATER DANDENONG

SPECIFICATION

224

**OPEN DRAINS,
INCLUDING KERB & CHANNEL**

SPECIFICATION 224 - OPEN DRAINS, INCLUDING KERB & CHANNEL

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**SPECIFICATION 224
OPEN DRAINS, INCLUDING KERB AND CHANNEL**

GENERAL**224.01 SCOPE**

1. The work to be executed under this Specification consists of the construction, lining and protection of all types of open drains, including the construction of kerb and/or channel and the construction of rock filled wire mattresses and gabions.

2. This Specification should be read in conjunction with the Specification for STORMWATER DRAINAGE - GENERAL and other drainage Specifications as applicable:

- 221 - Pipe Drainage
- 222 - Precast Box Culverts
- 223 - Drainage Structures

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

Quality**224.02 DEFINITION**

1. Open drains are all drains other than pipe and box culverts and include catch drains, contour drains, diversion drains, table drains, batter drains, swales, channels, grated drains, channels and kerbs and channels.

Definition**224.03 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

- 211 - Control of Erosion and Sedimentation
- 220 - Stormwater Drainage - General
- 221 - Pipe Drainage
- 222 - Precast Box Culverts
- 223 - Drainage Structures
- 271 - Minor Concrete Works
- 273 - Landscaping

(b) Australian Standards

- AS 1141.22 - Wet/dry strength variation.
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1289.5.7.1 - Compaction Control test (Rapid method)
- AS 2758.4 - Aggregate for gabion baskets and wire mattresses.
- AS 2876 - Concrete kerbs and channels - Manually or machine placed.
- AS/NZS 4534 - Zinc and zinc/aluminium-alloy coatings on steel wire.

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(c) Other

AUSTROADS - Guide to Geotextiles

UNLINED OPEN DRAINS**224.04 GENERAL**

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 1. Unless shown otherwise on the Drawings, drains shall be vee shaped or of trapezoidal cross section and shall not be less than 300mm deep and have a minimum waterway area of 0.2 square metres. | Shape |
| 2. Open drains shall be graded to ensure free flow of water and, unless shown on the Drawings or directed otherwise by the Superintendent, shall not have a grade of less than 1 per cent. | Grade |
| 3. Where trees marked for preservation or rock outcrops occur in the line of a drain, the drain may be neatly diverted if approved by the Superintendent. | Trees and Rock Outcrops |
| 4. Open drains shall be extended as necessary to lead the water clear of the work to natural drainage depressions, culverts, or pits connected to underground drainage systems. The drains shall follow existing watercourses and depressions in the natural surface, unless other locations are shown on the Drawings or directed by the Superintendent. | Open Drains |
| 5. Open drains shall be located and constructed so as to avoid recharging groundwater encouraging a shallow water table and creating or worsening salinity degradation of adjacent land. | Salinity Prevention |
| 6. All work shall be undertaken in accordance with the requirements of the Specification for CONTROL OF EROSION AND SEDIMENTATION. | Control of Erosion |

224.05 TYPES

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| 1. Catch drains shall be provided above the tops of cuttings or along the toes of embankments where shown on the Drawings or as directed by the Superintendent before construction of the adjacent roadway. The edges of catchdrains shall be positioned not less than 2m from the tops of cuttings or the toes of embankments nor more than is necessary to maintain the fall of the drains unless otherwise approved by the Superintendent. | Catch Drains |
| 2. Minor diversion and contour drains shall be constructed where shown on the Drawings or directed by the Superintendent. Minor diversion drains shall have the same capacity as the nearest pipe culvert on the line of the drain. | Diversion & Contour Drains |
| 3. Table drains, swales and depressed medians shall be constructed to the line and level shown or calculated from the Drawings. Their construction is deemed to be part of earthworks. | Table Drains |
| 4. Inlet, outlet and diversion channels shall be excavated as shown on the Drawings and, unless indicated otherwise, shall extend to join the existing stream bed in a regular manner, avoiding disturbance in stream flow. The channel shall be excavated to the full width of the structure but the existing stream bed shall be preserved as far as possible outside the limits of the excavation. | Channels |

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224.06 CONSTRUCTION

1. Material excavated from drains shall be placed on the lower sides of the drains and formed as banks with side slopes not steeper than 4h:1v on the cross section of the bank to increase the capacity of the drains. This material shall be compacted in accordance with AS 1289.5.4.1 and shall be not less than 95 per cent for standard compactive effort. **Excavated Material**
2. The Contractor shall ensure that none of the activities associated with the work disturbs any watercourse outside the site. Any excavation below the level of the natural channel shall be backfilled with suitable material compacted to a density equal to and compatible with that existing naturally. **Contractor's Responsibility**
3. Any excess material shall be disposed of by the Contractor at locations and in a manner approved by the Superintendent. **Excess Material**
4. Unlined drains and areas adjacent to open drains shall be revegetated immediately after the drains are complete, in accordance with the Specification for LANDSCAPING. **Revegetation**

LINED OPEN DRAINS**224.07 GENERAL**

1. Lined open drains shall be formed as for unlined open drains with the inclusion of a lined invert in accordance with the Drawings, or as directed by the Superintendent. **Shape**
2. Lining shall conform to the profile of the drain and shall be provided as soon as possible after forming the drain. **Profile**
3. Before placing any lining material, the foundation material shall be shaped and compacted to form a firm base for the lining. The relative compaction, as determined by AS 1289.5.7.1 or AS 1289.5.4.1 shall not be less than 95 per cent for standard compactive effort. **Compaction of Foundations**

224.08 CONCRETE LINING

1. Concrete lining for open drains shall be cast-in-situ or sprayed concrete supplied and placed in accordance with the Specification for MINOR CONCRETE WORKS. Weepholes shall be provided in the concrete at intervals of 2m or as determined by the Superintendent. **Method**
2. The top of the finished lining shall be true to line and of uniform width, free from humps, sags or other irregularities. **Finish**
3. The level at any point on the surface of the lining shall be within ± 20 mm of design levels. When a straight edge 3m long is laid on top of the lining parallel to the direction of flow, the surface shall not vary more than 10mm from the edge of the straight edge. **Tolerances**
4. Unless shown otherwise on the Drawings, contraction joints shall be formed every 3m of lining length for a minimum of 50 per cent of cross sectional area. The joint shall be tooled a minimum of 20mm in depth to form a neat groove of 5mm minimum width. **Contraction Joints**

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5. Unless shown otherwise on the Drawings, expansion joints, 15mm in width for the full depth of the concrete lining, shall be constructed at intervals not exceeding 15m. Expansion joints shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

Expansion Joints

224.09 STONE PITCHING

1. Stone Pitching shall consist of sound durable rock not less than 100mm thick, properly bedded on approved loam or sand and mortared to present a uniform surface. The exposed surface of each stone or block shall be approximately flat and not less than 0.05 square metres in area. Spaces between adjacent stones or blocks shall not exceed 20mm in width.

Rock Quality and Placing

224.10 BATTER DRAINS

1. Batter drains shall be constructed using either half round steel pipes or precast nestable concrete units as shown and detailed on the Drawings.

Type

2. The units shall be installed in carefully excavated and template controlled trench to produce an even top edge of batter drain of +0mm to -50mm from the batter line at the underside of topsoil.

Installation

3. Any over excavation and undulations in the batter line shall be backfilled and both sides of the drain compacted over the full length to form a firm shoulder against the top edge of the batter drain.

Compaction

4. When topsoil is placed it shall be tapered over a width of 1m to zero thickness at the rim of the drain. Both sides of the drain shall then be turfed for minimum width of 600mm and pinned down as provided in the Specification for LANDSCAPING.

Topsoil and Turfing

224.11 PROPRIETARY PRODUCTS

1. Unless shown on the Drawings, proprietary products may only be used with the approval of the Superintendent. Where specified, they must be used strictly in accordance with the manufacturer's instructions.

Manufacturer's Instructions

KERB AND CHANNEL

224.12 GENERAL

1. Kerb and channel includes all forms of concrete channels, dish drains, grated drains, and mountable median and barrier kerbing.

2. Before placing any kerb and/or channel, the foundation material shall be shaped and compacted to form a firm base. Other than for kerb and channel constructed on pavement courses, the relative compaction, shall be in accordance with the requirements of AS 2876. Where placed on pavement courses, the foundation shall be compacted to the requirements of the respective pavement course. The foundation material in all cases will be subject to the Superintendent's approval. This action constitutes a **HOLD POINT**. The Superintendent's approval of the foundation materials and its condition is required prior to release of the hold point.

Compaction of Foundations

HP

224.13 CONSTRUCTION

1. Kerb and/or channels may be constructed in fixed forms, by extrusion or by slip forming in accordance with AS 2876.

Method

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2. The foundation, concrete quality, curing and testing details shall be in accordance with AS 2876. **Construction Details**
3. The top and face of the finished kerb and/or channel shall be true to line and the top surface shall be of uniform width, free from humps, sags or other irregularities. Kerb and channel shall have a steel float finish. **Finish**
4. The level at any point on the surface of the channels shall be within ± 10 mm of design levels. When a straight edge 3m long is laid on top of or along the face of the kerb or on the surface of channels, the surface shall not vary more than 5mm from the edge of the straight edge, except at kerb laybacks, grade changes or curves or at side entry pits requiring channel depression. **Tolerances**
5. Unless shown otherwise on the Drawings, contraction joints shall be formed every 3m of channel length for a minimum of 50 per cent of cross sectional area. The joint shall be tooled 20mm in depth to form a neat groove of 5mm minimum width. **Contraction Joints**
6. Unless shown otherwise on the Drawings, expansion joints, 15mm in width for the full depth of the kerb and channel shall be constructed at intervals not exceeding 15m and where the channel abuts against pits, retaining walls, overbridges, and at both sides of kerb laybacks for vehicular or pedestrian access. Expansion joints shall consist of preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent. **Expansion Joints**
7. Where kerbs and/or channels are cast adjacent with a concrete pavement the same type of contraction, construction and expansion joints specified in the concrete base shall be continued across the kerb and/or channel. **Adjacent Concrete Pavement**
8. All house stormwater outlets shall be provided and/or extended, to match the existing type and size of pipe, through the kerb as shown on the Drawings. Pipework shall be in accordance with the requirements for UPVC pipes in the Specification for PIPE DRAINAGE, or as directed by the Superintendent for other types of pipe. **Stormwater Outlets**
9. Opposite all driveways, where shown on the Drawings or where directed by the Superintendent, barrier kerb shall be discontinued to provide for vehicular or pedestrian access. At such locations, kerb laybacks shall be constructed in accordance with the Drawings. Footpath crossovers shall be constructed to meet the laybacks as shown on the Drawings, or reinstated to match existing materials where not otherwise shown. **Vehicular or Pedestrian Access**
10. After the new kerb and channel has been constructed and not earlier than three days after placing, the spaces on both sides of the kerb and/or channels shall be backfilled and reinstated in accordance with the Drawings, or as instructed by the Superintendent. **Backfill Timing**
11. Backfill material behind the kerb shall consist of granular material, free of organic material, clay and rock in excess of 50mm diameter, or material as approved by the Superintendent. **Backfill Material**
12. Backfill material behind the kerb shall be compacted in layers not greater than 150mm thick, to a relative compaction of 95 per cent when tested in accordance with AS 1289.5.4.1, for standard compactive effort. The whole of the work shall be finished in a neat and workmanlike manner, free draining and free from surface undulations and trip hazards. **Behind Kerb**
13. Pavement material adjacent to new channel shall be backfilled in accordance with the Drawings or as directed by the Superintendent. **Pavement**

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ROCK FILLED WIRE MATTRESSES AND GABIONS

224.14 GENERAL

1. Rock-filled wire mattresses and gabions shall be placed at the locations shown on the Drawings. Installation shall be in accordance with the manufacturer's instructions. A geotextile, as shown on the Drawings, shall be placed between the wire cage and the material being protected.

**Location and
Geotextile**

2. Before installation of rock-filled wire mattresses, the foundation material shall be excavated such that the mattresses finish flush with the surrounding ground. Where mattresses are used to line open drains, the foundation material shall be shaped and compacted, in accordance with AS 1289.5.4.1 and shall not be less than 95 per cent for standard compactive effort, to form a uniform channel cross-section prior to installation of mattresses.

**Foundation
Material**

224.15 MATERIALS

1. For Wire mattresses and Gabions, the galvanising requirements for wire of circular cross section cited in this clause as 'heavily galvanised' shall comply with the coating mass requirements for round wire, Class W10, in AS/NZS 4534.

(a) Wire Mattresses

1. Unless otherwise specified or shown on the Drawings, the wire mattresses shall be supplied in units having dimensions of 6m x 2m x 230mm, and shall be cut to suit areas as shown on the Drawings. The mattresses shall be divided by diaphragms into cells of length not exceeding 600mm. Unless otherwise specified, they shall be fabricated of woven heavily galvanised wire and PVC coated where specified on the Drawings.

**Mattress
Dimension**

2. Mattresses shall have a mesh size of 60mm x 80mm and body wire shall be a minimum diameter of 2.0mm heavily galvanised with an additional minimum thickness of 0.4mm PVC coating where specified on the drawings. The minimum core diameters of heavily galvanised selvedge wire and lacing wire shall be 2.7mm and 2.2mm respectively.

**Wire
Dimensions**

(b) Gabions

1. The gabions shall be of the sizes shown on the Drawings and fabricated of woven heavily galvanised wire mesh and PVC coated where specified on the drawings. Each gabion shall be divided by diaphragms into cells whose length shall not be greater than the width of the gabions plus 100mm.

**Gabion
Dimensions**

2. Gabions shall have a nominal mesh size of 80mm x 100mm and body wire shall be a minimum diameter of 2.7mm heavily galvanised with an additional thickness of 0.4mm PVC coating where specified on the drawings. The minimum core diameters of heavily galvanised selvedge wire and lacing wire shall be 3.4mm and 2.2mm respectively.

**Wire
Dimensions**

(c) Geotextile

1. A chemically and biologically stable geotextile with a minimum strength rating (G) of 1350 and minimum mass of 180 grams per square metre, in accordance with AUSTRROADS Guide to Geotextiles, shall be used.

Type

2. Samples, manufacturer's specification and instructions on installation shall be submitted to the Superintendent seven days before the intended use of geotextile. This action shall constitute a **HOLD POINT**. The Superintendent's approval to the quality test

Sample

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documentation and procedure is required prior to the release of the hold point.

<i>HP</i>

(d) Rock Fill Material

1. The rock fill shall consist of clean hard rock complying with the requirements of AS 2758.4.

Rock Quality

2. Rock fill for wire mattresses shall have particle sizes between 75mm and two-thirds of the mattress thickness, or 250mm, whichever is the lesser. When the mattress is on a slope, rock fill material shall be placed into the units starting from the low end. Units shall be filled slightly overfull by 25mm to 50mm to allow for settlement and to provide an even tight and smooth surface of the required contour.

***For Wire
Mattresses***

3. Rock fill for gabions shall have particle sizes between 100mm and 250mm and preferably not greater than 200mm. Rock fill material may be placed by hand or suitable mechanical device to ensure fill is tightly packed with a minimum of voids. Fill material shall be levelled off 25mm to 50mm above the top of the mesh to allow for settlement.

For Gabions

224.16 ASSEMBLY AND ERECTION

1. Before laying out the wire mattresses or gabions, geotextile shall be placed on the founding material. The edges of wire mattresses shall be firmly tied to galvanised star pickets driven a minimum of 900mm into the surrounding ground at 1m maximum intervals and the star pickets cut off level with the top of the mattress. The upstream edge of wire mattresses shall be folded down into a trench of minimum depth 300mm and filled with rock fill. This edge shall be tied to star pickets.

Procedure

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**224.17 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 224.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Unlined Open Drains		
	(a) Grading	Grade >1%	224.04
	(b) Depth	>300mm	224.04
	(c) Waterway Area	>0.2 sq m	224.04
	(d) Catch Drain Location	>2m from top of cuttings or toes of embankments	224.05
	(e) Compaction	> 95% (standard compaction)	224.06
2.	Lined Open Drains		
	(a) Compaction of Foundation	>95% (standard compaction)	224.07
	(b) Level of lining surface	Level $\leq \pm 20$ mm of design level	224.08
	(c) Surface uniformity	Deviation lining surface from 3m straight edge ≤ 10 mm	224.08
3.	Kerb and Channel		
	(a) Compaction of Foundation	to AS2876	224.12
	(b) Level of channel surface	Level $\leq \pm 10$ mm of design level	224.13
	(c) Surface uniformity	Deviation kerb and channel surface from 3m straight edge ≤ 5 mm	224.13
	(d) Contraction Joints		
	(i) Area	$\geq 50\%$ of CS area	224.13
	(ii) Groove Width	≥ 5 mm	224.13
	(e) Expansion Joint Interval	≤ 15 m	224.13
	(f) Backfill behind kerb		
	(i) Layer thickness	≤ 150 mm	224.13
	(ii) Compaction	>95% (standard compaction)	224.13

Item	Activity	Limits/Tolerances	Spec Clause
4.	Rock Fill for Gabions and Wire Mattresses		
	(a) Compaction of Foundation	>95% (standard compaction)	224.14
	(b) Wet Strength	>100kN	224.15d
	(c) Wet/Dry Strength variation	<45%	224.15d
	(d) Particle size for Wire Mattresses	>75mm <150mm	224.15d
	(e) Particle size for Gabions	>100mm <250mm	224.15d
	(f) Gabion fill Level	>25mm <50mm above top of mesh	224.15d
5.	Erection of Wire Mattresses		
	(a) Star pickets for ties	Depth in ground >900mm Spacing <1m	224.16
	(b) Trench depth for upstream edge	>300mm	224.16

Table 224.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**224.18 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a Schedule of Rates basis in accordance with Pay Items 224(a) to 224(h) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
5. Sprayed concrete lining of open drains is measured and paid in accordance with the Specification for MINOR CONCRETE WORKS.
6. Cast-in-situ concrete or other lining of open drains is measured and paid in accordance with this Specification and not with the Specification for MINOR CONCRETE WORKS.
7. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.
8. Topsoiling and turfing to sides of batter drains are measured and paid in accordance with the Specification for LANDSCAPING.

Pay Item 224(a) EXCAVATION - CATCH, CONTOUR AND MINOR DIVERSION DRAINS

1. The unit of measurement shall be the linear metre measured along the invert of the drain.
2. The placement and compaction of material excavated from the drains on the lower sides of the drains to form banks shall be included in the excavation rates.
3. The schedule rate for excavation shall allow for excavation of all types of material. Separate rates shall not be included for earth and rock.
4. Any temporary measures for the control of stormwater runoff shall be included in the rate for excavation.

Pay Item 224(b) EXCAVATION - INLET, OUTLET AND DIVERSION CHANNELS

1. The unit of measurement shall be the cubic metre measured from cross sections on the drawings using the end area method, or as "each" where minor work is involved.
2. The disposal of surplus material shall be included in the excavation rates.
3. The schedule rate for excavation shall allow for excavation of all types of material. Separate rates shall not be included for earth and rock.
4. Any temporary measures for the control of stormwater runoff shall be included in the rate for excavation.

Pay Item 224(c) CONCRETE LINING OF OPEN DRAINS

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1. The unit of measurement shall be the square metre of concrete in place.
2. The schedule rate under this Pay Item shall include all the operations involved in the surface preparation, supply and placing of concrete, jointing and curing.

Pay Item 224(d) STONE PITCHING OF OPEN DRAINS

1. The unit of measurement shall be the square metre of stone pitching in place.
2. The schedule rate under this Pay Item shall include all the operations in the surface preparation, supply of stone, placing, final trimming and mortar jointing.

Pay Item 224(e) BATTER DRAINS

1. The unit of measurement shall be linear metre along the length of the drain formed by batter drain units.
2. The schedule rate shall include supply of the units, excavation, installation, backfilling and compaction.

Pay Item 224(f) ROCK FILLED GABIONS

1. The unit of measurement shall be the cubic metre of rock filling.
2. The volume shall be taken from the Drawings with appropriate adjustments being made for any authorised changes.
3. The schedule rate shall include the supply and placement of geotextile material behind the gabions, the supply and assembly of the gabions, the supply and placing of the rock fill in the gabions.

Pay Item 224(g) ROCK FILLED WIRE MATTRESSES

1. The unit of measurement shall be the square metre of rock filled mattress complete.
2. The area shall be determined from the actual completed work and shall include the area folded into the trench.
3. The schedule rate shall include the supply and placement of geotextile material, star pickets and ties as specified, together with the supply and assembly of the wire mattresses and the supply and placing of the rock fill.

Pay Item 224(h) KERB AND/OR CHANNEL

1. The unit of measurement shall be the linear metre measured along the length of the kerb and/or channel including kerb laybacks and perambulator ramps.
2. The schedule rate shall include all operations involved in the forming, compaction of foundations, concreting, expansion and contraction joints, backfilling and compaction adjacent to the completed kerb.
3. Separate pay items shall be included for each type of kerb and/or channel specified.

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SPECIFICATION

229

**KERB & CHANNEL
REPLACEMENT**

SPECIFICATION 229 - KERB & CHANNEL REPLACEMENT

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SPECIFICATION 229 : KERB AND CHANNEL REPLACEMENT**GENERAL****229.01 SCOPE**

1. The work to be executed under this Specification consists of the removal and disposal of existing kerb and channel and the construction of new kerb and channel and associated works.

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

Quality**229.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

- 201 - Control of Traffic
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 2876 - Concrete kerbs and channels - Manually or machine placed
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio

229.03 PROVISION FOR TRAFFIC

1. The Contractor shall construct the Works with the least possible obstruction to traffic, both vehicular and pedestrian.

2. The Contractor shall submit a Traffic Management Plan and carry out all activities for controlling traffic, both vehicular and pedestrian, in accordance with the Specification for CONTROL OF TRAFFIC.

229.04 PROPRIETARY PRODUCTS

1. Unless shown on the Drawings, proprietary products may only be used with the approval of the Superintendent. Where specified, they must be used strictly in accordance with the manufacturer's instructions.

**Manufacturer's
Instructions****CONSTRUCTION****229.05 FOOTPATH AND ROAD PAVEMENT PREPARATION**

1. Prior to the excavation and removal of existing kerb and channel, the footpath, driveways and road pavement shall be saw-cut where shown on the Drawings or as directed by the Superintendent to provide a neat, straight, clean cut so as to minimise damage and disturbance to the remainder of the footpath and road pavement

Saw-cutting

2. Damage or disturbance to the footpath, driveways and/or road pavement resulting from the work shall be restored by the Contractor to the pre-construction condition to the satisfaction of the Superintendent. All costs associated with any

**Contractor's
Cost**

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restoration work shall be borne by the Contractor.

229.06 REMOVAL AND DISPOSAL

1. The Contractor shall demolish and remove the existing redundant kerb and channel and excavate to the level shown on the drawings in accordance with the Specification for MINOR CONCRETE WORKS. **Excavation**

2. Care shall be exercised in the removal of kerb and channel so as to prevent damage to any existing services, including existing house stormwater drainage pipes which discharge into the channel. Damage occurring to stormwater drainage pipes and/or other services shall be restored to the pre-construction condition to the satisfaction of the Superintendent. All costs associated with the restoration work shall be borne by the Contractor. **Services Contractor's Cost**

3. All excavated material and demolished kerb and channel shall be removed from site and legally disposed of by the Contractor to a site approved by the Superintendent. **Disposal of Material**

4. Under no circumstances shall excavated material be disposed of privately to any person or to any site not authorised by the Superintendent **Unauthorised Disposal**

229.07 FOUNDATION

1. Before placing any kerb and/or channel, the foundation material shall be shaped and compacted to a firm base. Other than kerb and channel constructed on pavement courses, the relative compaction shall be in accordance with the requirements of AS 2876. Where placed on pavement courses, the foundation shall be compacted to the requirements of the respective pavement course. The foundation material in all cases will be subject to Superintendent's approval. This action constitutes a **HOLD POINT**. The Superintendent's approval of the foundation material is required prior to the release of the hold point. **Compaction and Foundations**

HP

229.08 KERB AND CHANNEL

1. Kerb and/or channels may be constructed in fixed forms, by extrusion or by slip forming in accordance with AS 2876. **Method**

2. The foundation, concrete quality, curing and testing details shall be in accordance with AS 2876. **Construction Details**

3. The top and face of the finished kerb and/or channel shall be true to line and the top surface shall be of uniform width, free from humps, sags or other irregularities. Kerb and channel shall have a steel float finish. **Finish**

4. The level at any point on the surface of the channels shall be within ±10mm of design levels. When a straight edge 3m long is laid on top of or along the face of the kerb or on the surface of channels, the surface shall not vary more than 5mm from the edge of the straight edge, except at kerb laybacks, grade changes or curves or at side entry pits requiring channel depression. **Tolerances**

5. Unless shown otherwise on the Drawings, contraction joints, shall be formed every 3m of channel length for a minimum of 50 per cent of cross sectional area. The joint shall be tooled 20mm in depth to form a neat groove of 5mm minimum width. **Contraction Joints**

6. Unless shown otherwise on the Drawings, expansion joints, 15mm in width for the full depth of the kerb and channel, shall be constructed at intervals not exceeding 15m and where the channel abuts against pits, retaining walls, overbridges and at both sides of kerb laybacks for vehicular or pedestrian access. Expansion joints shall consist of a preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent. **Expansion Joints**

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7. Where kerbs and/or channels are cast adjacent with a concrete pavement the same type of contraction, construction and expansion joints specified in the concrete base shall be continued across the kerb and/or channel. **Adjacent Concrete Pavement**
8. All existing house stormwater outlets shall be reconnected and extended, to match the existing type and size of pipe, where necessary through the new kerb as shown on the Drawings. Pipework shall be in accordance with the requirements for UPVC pipes in the Specification for PIPE DRAINAGE, or as directed by the Superintendent for other types of pipe. **Stormwater Outlets**
9. Opposite all driveways, where shown on the Drawings or where directed by the Superintendent, barrier kerb shall be discontinued to provide for vehicular or pedestrian access. At such locations, kerb laybacks shall be constructed in accordance with the Drawings. Footpath crossovers shall be constructed to meet laybacks as shown on the Drawings, or reinstated to match existing materials where not otherwise shown. **Vehicular or Pedestrian Access**
10. Where applicable the top of side entry pits shall be reconstructed, or precast units adjusted, to suit new kerb and channel profile in accordance with Specification for MINOR CONCRETE WORKS. **Side Entry Pits**

229.09 BACKFILLING AND RESTORATION

1. Backfill material behind the kerb shall consist of granular material, free of organic material, clay and rock in excess of 50mm diameter, or material as approved by the Superintendent. **Backfill Material**
2. After the new kerb and channel has been constructed and not earlier than three days after placing, the spaces on both sides of the kerb and/or channels shall be backfilled and reinstated in accordance with the Drawings, or as instructed by the Superintendent. **Backfill Timing**
3. Backfill material behind the kerb shall be compacted in layers not greater than 150mm thick, to a relative compaction of 95 per cent when tested in accordance with AS 1289.5.4.1, for standard compactive effort. The whole of the work shall be finished in a neat and workmanlike manner, free draining and free from surface undulations and trip hazards and in accordance with any surface treatment shown on the Drawings. **Behind Kerb**
4. Pavement material adjacent to new channel shall be backfilled in accordance with the Drawings or as directed by the Superintendent. **Pavement**

229.10 ADJUSTMENT TO SIDE ENTRY PITS

1. In the event that adjustment of line or level of the kerb and channel requires adjustments in side entry pits the Contractor shall undertake any necessary partial demolition and shall re-construct such sections of the side entry pits as are necessary to match the design standard of the existing side entry pit. **Design Standard**
2. Any new wall sections in concrete or brick shall be securely fixed to the retained wall section. The procedure shall be outlined in writing for Superintendent's approval 24 hours prior to commencement of demolition work. **Superintendent's Approval**
3. In all cases the hydraulic capacity of the original side entry pit shall be retained or improved. Cavity shapes shall be regular and oriented so as not to impede flow into and out of the pit. **Hydraulic Capacity**

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SPECIAL REQUIREMENTS**LIMITS AND TOLERANCES****229.11 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 229.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Kerb and Channel		
	(a) Compaction of Foundation	to AS 2876	229.07
	(b) Level of channel surface	Level $\leq \pm 10\text{mm}$ of design level	229.08
	(c) Surface uniformity	Deviation kerb and channel surface from 3m straight edge $\leq 5\text{mm}$	229.08
	(d) Contraction Joints		
	(i) Area	$\geq 50\%$ of CS area	229.08
	(ii) Groove Width	$\geq 5\text{mm}$	229.08
	(e) Expansion Joint Interval	$\leq 15\text{m}$	229.08
2.	Backfill behind Kerb		
	(a) Layer thickness	$\leq 150\text{mm}$	229.09
	(b) Compaction	$> 95\%$ (standard compaction)	229.09

Table 229.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**229.12 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a Schedule of Rates basis in accordance with Pay Items 229(a) and 229(b).
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Excavation, removal and disposal of existing kerb and channel and the reconstruction of drainage structures is measured and paid in this Specification and not in the Specification for MINOR CONCRETE WORKS.
5. Control of pedestrian and vehicular traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.

Pay Item 229(a) KERB AND CHANNEL

1. The unit of measurement shall be the linear metre measured along the length of the kerb and channel including kerb laybacks and perambulator ramps.
2. The schedule rate shall include all operations involved in the removal and disposal of existing kerb and channel, excavation, forming, compaction of foundations, provision of base, concreting, expansion and contraction joints, backfilling and compaction adjacent to the completed kerb, and making good adjacent surfaces as shown on the Drawings.
3. Separate pay items shall be included for each type of kerb and channel specified.

Pay Item 229 (b) ADJUSTMENTS TO SIDE ENTRY PITS

1. The unit of measurement shall be "each" for the drainage structures scheduled.
2. The schedule rate shall include all operations involved in cutting back, adjustment, concreting and backfilling.

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CITY OF GREATER DANDENONG

SPECIFICATION

230

**SUBSURFACE DRAINAGE
GENERAL**

SPECIFICATION 230 - SUBSURFACE DRAINAGE-GENERAL

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- 230A SLOTTING DETAILS FOR THICK WALLED UNPLASTICISED PVC PLASTIC PIPE.
- 230B SLOTTED PIPES FITTED WITH SEAMLESS TUBULAR FILTER FABRIC.

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SPECIFICATION 230 : SUBSURFACE DRAINAGE - GENERAL**GENERAL****230.01 INTRODUCTION**

1. This is the general Specification common and applicable to all types of subsurface drainage and shall be read in conjunction with subsurface drainage specifications: **Purpose**

- | | | |
|-----|---|-------------------------------|
| 231 | - | Subsoil and Foundation Drains |
| 232 | - | Pavement Drains |
| 233 | - | Drainage Mats |

as applicable to particular contracts.

230.02 SCOPE

1. The work to be executed under this Specification consists of:
- (a) preparation for subsurface drainage construction;
 - (b) siting of subsurface drainage facilities;
 - (c) the supply of all materials associated with the provision of the subsurface drainage system;
 - (d) all activities and quality requirements associated with the supply, placement and compaction of filter material;
 - (e) the provision of a detailed record of all subsurface drain installations;
 - (f) the marking on the ground of the location of all subsurface drains.

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

230.03 EXTENT OF WORK

1. Details of the work are shown on the Drawings. The requirements of this Contract are summarised as follows:- *(TO BE COMPLETED BY COMPILER)*

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)

230.04 REFERENCE DOCUMENTS

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

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Test Methods**(a) Council Specifications**

- 211 - Control of Erosion and Sedimentation
- 213 - Earthworks
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 1141.11 - Particle size distribution by dry sieving
- AS 1141.22 - Wet/dry strength variation
- AS 1289.E5.1 - Determination of minimum and maximum dry density of a cohesionless material
- AS 1477 - Unplasticised PVC (UPVC) pipes and fittings for pressure applications
- AS 2439.1 - Perforated drainage pipe and associated fittings
- AS 2758.1 - Concrete aggregates
- AS 3705 - Geotextiles - Identification, marking and general data
- AS 3706 - Geotextiles - Methods of test
- AS 3706.11 - Determination of durability - Resistance to degradation by light and heat

(c) Other

- AUSTROADS - Guide to Geotextiles.
- ASTM-D2434-68 Test method for permeability of granular soils (Constant Head)

MATERIALS**230.05 SUBSURFACE DRAINAGE PIPES**

1. Pipes shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent that the pipes conform to the requirements of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

Conformance**HP****(a) Corrugated Circular Plastic Pipe**

1. Corrugated circular plastic pipe shall comply with AS 2439.1 and shall be Class 1000 of 65mm or 100mm diameter as shown on the Drawings. All pipe shall be slotted except where shown on the Drawings.

Specification

2. Joints, couplings, elbows, tees and caps shall also comply with AS 2439.1 and only the manufacturer's recommended fittings shall be used.

Fittings

3. The Contractor shall obtain from the supplier a Test Certificate demonstrating compliance with AS 2439.1.

Certificate of Compliance**(b) Corrugated Flat Plastic Pipe**

1. Corrugated flat plastic pipe shall be of the 'Stripdrain' or 'Megaflo' type or equivalent as approved by the Superintendent of size as shown on the Drawings and shall be supplied already enclosed in geofabric or seamless tubular filter fabric. The Superintendent's approval shall be subject to provision of information as set out in Clause 230.06.

Type

2. Only the manufacturer's recommended fittings shall be used.

Fittings

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(c) Thick Walled Unplasticised PVC Pipe

- 1. Thick walled unplasticised PVC pressure pipe shall comply with AS 1477 and shall have a nominal diameter of 58 mm and a minimum wall thickness of 6.5mm. **Specification**
- 2. All pipe shall be slotted except where shown on the Drawings. Details of slot sizes and spacings shall be in accordance with Annexure 230A. **Slot size**
- 3. Thick walled unplasticised PVC pressure pipe shall have square ends and shall be butt jointed. **Joints**
- 4. The Contractor shall obtain from the supplier a Test Certificate demonstrating compliance with AS 1477. **Certificate of Compliance**

230.06 OTHER TYPES OF SUBSURFACE DRAINAGE PIPES

- 1. Where a Contractor wishes to use a subsurface drainage pipe other than the pipes described in Clause 230.05, the Contractor shall submit, for approval by the Superintendent, full details of the type of pipe, certification from the manufacturer of its suitability and quality for use in each particular application. Certification of the suitability of any pipe will address the crushing strength, flexural strength, jointing system and slotting details. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point. **Submit for Approval**

HP

230.07 FILTER MATERIAL

(a) General

- 1. The types of filter material covered by this Specification shall include: **Types**
 - (i) Type A filter material for use in trench drains and Type B drainage mats.
 - (ii) Type B filter material for use in trench drains and Type B drainage mats.
 - (iii) Type C filter material comprising crushed rock for use in Type A drainage mats.
 - (iv) Type D filter material comprising uncrushed river gravel for use in Type A and Type B drainage mats.
- 2. All filter material shall consist of clean, hard, tough, durable particles.

(b) Type A Filter Material

- 1. Type A filter material shall be crushed rock or granular material complying with the following requirements: **Grading**

Test Method	Property	Requirement
AS 1141.11	Material passing AS sieve	Per cent by mass
	6.7 mm	100
	4.75 mm	85 to 100
	2.36 mm	0 to 40
	1.18 mm	0 to 5
	425 um	0 to 2

Table 230.1 - Type A Filter Material

(c) Type B Filter Material

1. Type B filter material shall be granular material complying with the following grading requirements: **Grading**

Test Method	Property	Requirement
AS 1141.11	Material passing AS sieve	Per cent by mass
	4.75 mm	100
	2.36 mm	95 to 100
	425 um	20 to 80
	300 um	0 to 30
	150 um	0 to 2
	75 um	0 to 0.1

Table 230.2 - Type B Filter Material

2. In addition to the above grading requirements, Type B filter material shall have a coefficient of saturated permeability, when compacted to its maximum dry density as determined by AS 1289.E5.1 and then tested in accordance with Test Method ASTM-D2434-68, of at least 8 metres per day after three hours of flow. **Coefficient of Saturated Permeability**

3. Type B filter material shall not vary from its original grading as a result of compaction processes by more than the following amounts: **Grading Variation**

AS Sieve	Variation From Grading Before Treatment (per cent of mass)
2.36mm	± 3
1.18mm	± 1
425um	± 1
300um	± 1
150um	± 0.5
75um	± 0.1

Table 230.3 - Type B Filter Material Variation

(d) Type C Filter Material

Grading

Test Method	Property	Requirement
AS 1141.11	Maximum particle size	37.5mm
	Maximum passing the 9.5mm AS Sieve	5% by mass
	Maximum (D90:D10)*	3
AS 1141.22	Minimum wet strength	100kN
	Maximum 10% fines wet/dry variation	30%
<p>NOTE: The D90 value shall be determined by sieving the material using 75mm, 53mm, 37.5mm, 26.5mm, 19mm, 13.2mm and 9.5mm AS sieves, as appropriate, and then plotting the results on a graph of AS sieve size v percentage passing. The plotted points shall be joined by straight lines and the D90 value shall be determined as the theoretical sieve size corresponding to 90 per cent passing.</p> <p>D10 denotes the theoretical size of a sieve through which 10 per cent of the material would pass and shall be determined from the same graph used to determine the D90 value.</p>		

Table 230.4 - Type C Filter Material

(e) Type D Filter Material

Grading

1. Type D filter material shall be uncrushed river gravel complying with the description of rounded aggregate in Table B1, Appendix B of AS2758.1 and the following requirements:

Test Method	Property	Requirement
AS 1141.11	Maximum particle size	75mm
	Maximum passing the 9.5mm AS sieve	5% by mass
	Maximum (D90 : D10)	3
AS 1141.22	Minimum wet strength	100kN
	Maximum 10% fines wet/dry variation	30%

Table 230.5 - Type D Filter Material

230.08 GEOTEXTILE

1. Geotextiles shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent that the geotextile and installation process conforms to the requirements of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

Conformance

HP

(a) General

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1. The geotextile, other than seamless tubular filter fabric, shall consist of either a woven or a non-woven type which shall be manufactured from synthetic materials other than polyamide. Rolls of geotextile shall be marked with product identification and supplied with data sheets and information in accordance with the requirements of AS 3705.

Properties and Labelling

2. The geotextile shall be bio-stable and resistant to attack by alkalis, acids, dry heat, steam, moisture, brine, mineral oil, petrol, diesel and detergents when tested in accordance with the appropriate parts of AS 3706.

3. The geotextile shall be resistant to ultra-violet light. No geotextile shall be left exposed to sunlight during storage and construction for a period longer than a total of twenty-one days. If exposure in excess of twenty-one days does occur, the geotextile shall be tested in accordance with AS 3706.11 and if its characteristics have deteriorated to or below 90 per cent of the characteristics claimed by the manufacturer or the characteristics determined on unexposed geotextile, whichever is the better, it shall be removed and replaced with a geotextile complying with this Specification.

Ultra Violet Light Resistant

4. The geotextile material type, strength rating "G", and minimum mass requirements shall be as shown on the Drawings.

5. The type, properties, functions, design and construction requirements for a particular application of geotextile installation shall be compatible with recommendations provided by the AUSTROADS Guide to Geotextiles as well as requirements indicated on the drawings.

6. In addition to the abovementioned requirements, geotextiles for curtain drains shall consist of either polyester, polypropylene or polyethylene. When subjected to a pressure of 200 kPa applied at right angles to the plane of the fabric and to a constant head of water no greater than 50mm applied to the top edge of the fabric, geotextiles for curtain drains shall have a rate of water transmission not less than 20 litres per hour per metre width of fabric through a 300mm length of the fabric.

Water Transmission Rate

(b) Seamless Tubular Filter Fabric

1. Seamless knitted tubular filter fabric shall be manufactured from either polypropylene or polyester and shall be used to enclose slotted pipe of 65mm or 100mm diameter.

Material

2. The fabric shall be free of imperfections in weave or yarn and have abrasion resistant and weave stability qualities such that it shall not form holes, ladder, deweave, tear or unravel more than 5mm from a cut end.

Qualities

3. The representative large opening size of the fabric shall be between 200 and 500 microns.

Opening size

4. Fitting of the seamless tubular filter fabric shall be in accordance with the requirements of Annexure 230B. Filter fabric that is excessively stretched, torn or otherwise damaged during fitting of the fabric, storage, transportation or pipe laying will be removed and replaced so as to eliminate any damaged lengths.

Fitting

CONSTRUCTION

230.09 TEMPORARY DRAINAGE DURING CONSTRUCTION

1. All drainage works carried out by the Contractor shall comply with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

Erosion Control

2. The Contractor shall make adequate provision for runoff flows at subsurface

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drainage works under construction to avoid damage or nuisance due to scour, sedimentation, soil erosion, flooding, diversion of flow, damming, undermining, seepage, slumping or other adverse effects to the Works or surrounding areas and structures as a result of the Contractor's activities.

Responsibility

3. The Contractor's material and equipment shall be located clear of watercourses or secured so that they will not cause danger or damage in the event of large runoff flows.

Location of Equipment

230.10 SITING OF WORK

1. Before commencing construction of any subsurface drainage activity, the Contractor shall set out on site the position of the work to the location and levels shown on the standard Drawings, and shall present this set-out for inspection by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval to the set-out is required prior to the release of the hold point.

Set-out

HP

2. The Superintendent may amend the locations or designed levels or the lengths to suit actual site conditions. Any activity resulting from such amendments by the Superintendent shall be deemed to be included as part of the work covered by the Schedule of Rates. Should the Superintendent require a change to the conditions of installation an appropriate variation shall be ordered.

Amendments to Planned Work

3. Should the Contractor propose changes to the location, length, designed levels, conditions of installation or cover to suit the Contractor's construction procedures, the Contractor shall present the proposed set-out in addition to the designed set-out for consideration by the Superintendent. No changes shall be made unless the prior written approval of the Superintendent is obtained.

Proposed Changes by Contractor

230.11 EXCAVATION

1. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements.

Safety

2. Where public utilities exist in the vicinity of drainage works the Contractor shall obtain the approval of the relevant authority to the method of excavation before commencing excavation.

Approval by Public Utility Authorities

3. Excavation by blasting, if permitted, shall be carried out to ensure that the peak particle velocity measured on the ground adjacent to any previously installed drainage structure does not exceed 25 millimetres per second. The Contractor shall comply with other requirements concerning blasting operations in the Specification for EARTHWORKS.

Blasting Operation

4. Trenches shall be excavated to the line, grade, width and depth shown on the Drawings or as directed by the Superintendent. The bottom of the trench shall be constructed so that no localised ponding can occur. All loose material shall be removed by the Contractor. This action constitutes a **HOLD POINT**. The Superintendent's approval to the trench level is required prior to the release of the hold point.

Excavation Level

HP

5. Any material at the bottom of the trench or at foundation level which the Superintendent deems to be unsuitable shall be removed and disposed of in accordance with the Specification for EARTHWORKS by the Contractor and replaced with backfill material in accordance with the requirements of this Specification. The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be parallel with the specified level and slope of the work.

Unsuitable Material

6. The excavated material shall be used in the construction of embankments, backfilling or spoiled in accordance with the Specification for EARTHWORKS.

Excavated Material

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230.12 BACKFILLING

1. Backfilling shall be carried out in accordance with the requirements of the relevant subsurface drainage Specifications with materials as specified in this specification and materials to the requirements of the Specification for EARTHWORKS. The bedding material shall be approved by the Delegated Officer.

Requirements

230.13 OUTLET STRUCTURES FOR SUBSURFACE DRAINAGE PIPES

1. Subsurface drainage pipes shall be connected to discharge into drainage pits or to outlet structures as shown on the Drawings or as directed by the Superintendent. As a salinity prevention measure, and where practicable, discharge shall be on the downhill side of the embankment or in the cut-fill area so as to reduce the risk of recharge to the subsurface water table.

Discharge, Salinity Prevention

2. Outlets shall be spaced at an absolute maximum interval of 150m.

Spacing

3. Outlets, including those discharging into drainage pits, shall be made rodent proof using galvanised wire netting in accordance with the Drawings.

Rodent Proof

4. The outlet shall be located so that erosion of the adjacent areas does not occur or shall be protected by the placement of selected stone or similar treatment together with a marker post to indicate location and assist maintenance.

Erosion Control

5. Outlet pipes from curtain drains shall be unslotted. At no point shall an outlet pipe be higher than the pipe at the end of the curtain drain.

Outlet Pipe

6. All concrete used in the construction of outlet structures shall conform to the requirements of the Specification for MINOR CONCRETE WORKS.

Concrete Specification

230.14 RECORDING OF SUBSURFACE DRAINAGE INFORMATION

1 The Contractor shall keep a detailed record of all subsurface drainage pipes and the completed subsurface drainage systems shall be shown on the work-as-constructed plans to be returned to the Superintendent upon completion of the Contract.

Work As Constructed Plans

2 In addition, the Contractor shall prepare a subsurface drainage information sheet or sheets at the completion of construction of each drain or drainage system and shall submit the subsurface drainage sheet or sheets to the Superintendent within five working days of the completion of the drain or drainage system.

Information Sheet

3. The information to be included in the subsurface drainage information sheets shall include:

Date of completion of drain construction:

Drain Number:

Type of Drain:

Pipe Size:

Pipe Type:

Filter Type:

Grade of Drain:

Locations of Flushout Risers:

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Locations of Outlets:

Geotextile-

Sheet	Yes/No
Seamless Tubular Filter Fabric	Yes/No

Response Time:

NOTE: Response Time shall be the time taken for water to travel from the inlet end of a drain or from a cleanout leading to a drain to the outlet end of the drain.

4. The costs associated with preparation of Subsurface Drainage Sheets shall be borne by the Contractor.

**Contractor's
Costs**

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**230.15 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 230.6 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Filter Material		
	(a) Type A	Table 230.1	230.07
	(b) Type B	Tables 230.2 and 230.3	230.07
	(c) Type C	Table 230.4	230.07
	(d) Type D	Table 230.5	230.07
2.	Geotextile		
	(a) Exposure to sunlight	<21 days If >21 days deterioration not to exceed 10% of claimed characteristics	230.08
	(b) Curtain Drains Water Transmission	>20 litres/hr/m	230.08
3.	Excavation by Blasting		
	Peak particle velocity	≤25mm/sec	230.11
4.	Outlets		
	Spacing	Max 150m	230.13

Table 230.6 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**230.16 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification and the associated activity specific specifications on a schedule of rates basis in accordance with Pay Items 230(a) to (e) inclusive.
2. Pay Items applicable to particular activities are listed in the Specifications for these activities.
3. Common to subsurface drainage works are Filter Material and Outlet Structures and payment for these items shall be made under this Specification.
4. A Lump Sum price for any of these items shall not be accepted.
5. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
6. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
7. Excavation and geotextile material are measured and paid in accordance with the Specification applicable to the particular activity.
8. Unsuitable material removal is measured and paid in accordance with the Specification for EARTHWORKS.
9. Concrete work for outlet structures is measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
10. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.

Pay Item 230(a) FILTER MATERIAL TYPE 'A' BACKFILL

1. The unit of measurement shall be the compacted cubic metre.
2. The volume shall be computed from the actual length and depth of the trench or mat up to the level of the filter material multiplied by the design width of the trench.
3. The rate shall include the supply, placement and compaction of filter material and the "capping" of the trench where shown on the Drawings.
4. The schedule quantity is a provisional quantity.

Pay Item 230(b) FILTER MATERIAL TYPE 'B' BACKFILL

1. The unit of measurement shall be the compacted cubic metre.
2. The volume shall be computed from the actual length and depth of the trench or mat up to the level of the filter material multiplied by the design width of the trench or mat.
3. The rate shall include the supply, placement and compaction of filter material and the "capping" of the trench where shown on the Drawings.
4. The schedule quantity is a provisional quantity.

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Pay Item 230(c) FILTER MATERIAL TYPE 'C' BACKFILL

1. The unit of measurement shall be the compacted cubic metre.
2. The volume shall be computed from the actual length and depth of the mat multiplied by the design width of the mat.
3. The rate shall include the supply, placement and compaction of filter material.
4. The schedule rate is a provisional quantity.

Pay Item 230(d) FILTER MATERIAL TYPE 'D' BACKFILL

1. The unit of measurement shall be the compacted cubic metre.
2. The volume shall be computed from the actual length and depth of the mat multiplied by the design width of the mat.
3. The rate shall include the supply, placement and compaction of filter material.
4. The schedule quantity is a provisional quantity.

Pay Item 230 (e) OUTLET STRUCTURES FOR SUBSURFACE DRAINAGE PIPES

1. The unit of measurement shall be "each" outlet structure, excluding outlets into pits, provided in accordance with this Specification.
2. The schedule rate under this Pay Item shall include all the operations involved in the construction of the outlet including the forming of the structure, supply of concrete and, where directed by the Superintendent, the provision of erosion control measures.
3. The schedule quantity is a provisional quantity.

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ANNEXURE 230A

SLOTING DETAILS FOR THICK WALLED UNPLASTICISED PVC PLASTIC PIPE



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**ANNEXURE 230B
SLOTTED PIPES FITTED WITH SEAMLESS TUBULAR FILTER FABRIC**

1. PROCEDURE FOR FITTING SEAMLESS TUBULAR FILTER FABRIC TO SLOTTED PIPE

Seamless tubular filter fabric may be fitted to slotted pipe on site immediately before the slotted pipe is to be laid in its final position in the work.

The filter fabric shall be initially pulled over and onto a short length of smooth pipe of internal diameter between 20mm and 30mm greater than the external diameter of the slotted pipe to be enclosed by filter fabric. The short, larger diameter pipe shall be referred to as the 'mandrel'.

The pipe to be enclosed by the filter fabric shall be passed through the mandrel. The filter fabric shall be slipped on to the pipe as the pipe emerges from the mandrel leaving enough overhang of the filter fabric to make a suitable joint with the filter fabric on the adjacent pipe. The filter fabric shall be firmly held to the forward end of the pipe so that it can not slip back along the pipe.

The pipe shall be pulled right through the mandrel allowing the filter fabric to progressively slip over the pipe. The filter fabric shall be restrained from easily slipping off the mandrel thus ensuring the filter fabric is stretch fitted onto the pipe.

When the end of the pipe emerges from the mandrel, the filter fabric shall be clamped to that end of the pipe so that the filter fabric can not slip down the pipe. The filter fabric shall remain clamped to each end of the pipe to ensure the filter fabric remains stretch fitted onto the pipe when the pipe is placed in its final position in the drain. The filter fabric shall be cut cleanly leaving enough overhang off the end of the pipe to make a fully covered joint with the filter fabric on the adjacent pipe when the pipes are installed in the drain.

2. PRECAUTIONS TO BE TAKEN WHEN USING SLOTTED PIPE FITTED WITH SEAMLESS TUBULAR FILTER FABRIC

Slotted pipe fitted with seamless tubular filter fabric shall not be dragged over the ground. If carried, the pipe shall be lifted clear of the ground and the filter fabric shall be protected from damage at all times.

Seamless tubular filter fabric which has been so damaged as to affect its filtering properties shall be removed from the pipe and replaced with undamaged filter fabric.

If at any time during the installation of a slotted pipe it is found that the enclosed filter fabric has become loose on the pipe it shall be restretched to its correct position. If restretching causes any damage to the filter fabric, the damaged filter fabric shall be removed from the pipe and replaced with undamaged filter fabric.

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CITY OF GREATER DANDENONG

SPECIFICATION

231

**SUBSOIL AND
FOUNDATION DRAINS**

SPECIFICATION 231 - SUBSOIL AND FOUNDATION DRAINS

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SPECIFICATION 231 : SUBSOIL AND FOUNDATION DRAINS**GENERAL****231.01 SCOPE**

1. The work to be executed under this Specification covers the excavation, bedding, installation and backfilling of subsoil and foundation drains.
2. Subsoil and foundation drains shall be constructed where and as shown on the Drawings or as directed by the Superintendent. **Location**
3. This Specification should be read in conjunction with the Specification for SUBSURFACE DRAINAGE - GENERAL. **Associated Specification**
4. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. **Quality**

231.02 TERMINOLOGY

1. The subsoil drains are intended for the drainage of ground water and/or the pavement in cuttings. **Subsoil Drains**
2. Foundation drains are required for the drainage of seepage, springs and wet areas within and adjacent to the foundations. **Foundation Drains**

231.03 REFERENCE DOCUMENTS

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

(a) Council Specifications

- 213 - Earthworks
- 230 - Subsurface Drainage - General

(b) Australian Standards

- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.

231.04 ORDER OF CONSTRUCTION**(a) Subsoil Drains**

1. Subsoil drains shall be constructed as soon as possible after necessary earthworks are completed in the area of the drain. Where stabilisation of the subgrade is required, subsoil drains shall be constructed after completion of stabilisation except that, where excessive ground water is encountered, they may be constructed prior to stabilisation of the subgrade. **Timing of Work**

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2. Where a Selected Material Zone is specified and excessive ground water is encountered, subsoil drains may be installed in two stages as follows:

Two Stage Construction

Stage 1: Standard subsoil drains installed below the base of the cutting prior to placement of select material in the Selected Material Zone.

Stage 2: Extension of subsoil drain to top of the Selected Material Zone after placement of selected material.

(b) Foundation Drains

1. Foundation drains shall be constructed after completion of clearing and stripping operations, and preceding the commencement of embankment construction.

Timing of Construction

CONSTRUCTION

231.05 SUBSOIL DRAINS

(a) Excavation

1. Excavation shall be undertaken in accordance with the requirement of the Specification for SUBSURFACE DRAINAGE - GENERAL.

Associated Specification

2. The bottom of the trench shall be excavated to the same grade as the design pavement surface in the direction of the trench except where the grade of the design pavement surface in the direction of the trench is less than 0.5 per cent. In which case the trench depth shall be increased to provide a minimum grade of fall in the trench of 0.5 per cent. The bottom of the trench shall be excavated so that no localised ponding of water occurs.

Minimum Grade

3. If at any location the trench is excavated below the specified floor level, the trench shall be backfilled with non-porous subgrade material so that when the subgrade material is compacted to a relative compaction, determined by AS 1289.5.4.1, of at least 95 per cent (Standard compaction), the bottom of the trench shall be at the specified floor level.

Over-excavation

4. Where a subsoil drain is constructed in two stages, the excavation for Stage 2 shall be carried out after placement and compaction of the selected material zone or the stabilised subgrade layer. The Stage 2 trench shall be excavated to the same line and width as the Stage 1 trench and to a depth to provide a clean, full contact with the filter material placed in Stage 1. All excavated material shall be disposed to waste or incorporated into fills.

Two Stage Construction

(b) Laying of Pipe

1. A bed of filter material 50 mm in compacted thickness and shall be laid to the required line and grade. This action constitutes a **HOLD POINT**. The Superintendent's approval of the compacted bedding is required prior to the release of the hold point.

HP

2. The type of filter material shall be as shown on the Drawings or as directed by the Superintendent.

Filter Material

3. The 100mm diameter corrugated slotted plastic piping, or the corrugated flat plastic piping, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the compacted bed to the specified line and level. The pipe shall not deviate from the specified line by more than 100mm at any point.

Bedding

4. Joints in the pipeline shall be kept to the minimum number and, where required,

Joints and

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shall be made using a suitable external joint coupling. The inlet end of the pipe shall be fitted with a PVC cap. **Capping**

(c) Backfilling

1. The trench shall be backfilled with filter material to the level specified. The type of filter material shall be as shown on the Drawings or as directed by the Superintendent. The filter material shall be placed and compacted in layers with a maximum compacted thickness of 300mm. Tamping around and over the pipe shall be done in such a manner as to avoid damage or disturbance to the pipe. **Filter Material**

2. The filter material shall be compacted for its full depth to a relative compaction of not less than 100 per cent (Standard compaction) as determined by AS 1289.5.4.1. **Compaction of Filter Material**

3. The upper section of the trench, above the level specified for filter material backfill, shall be backfilled with selected free draining backfill material, conforming to the requirements of the Specification for EARTHWORKS, compacted for its full depth to a relative compaction of not less than 100 per cent (Standard compaction) as determined by AS 1289.5.4.1. **Select Material**

4. Where shown on the Drawings or as directed by the Superintendent, a geotextile conforming with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be provided at the interface between the filter material and adjoining materials. Laps of 500mm shall be provided at joints in the fabric. **Geotextile**

(d) Outlets

1. Outlets are to be provided as shown on the Drawings or at maximum intervals of 150m. Subsoil drains shall discharge into side entry pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the targeted subsurface water catchment. An outlet structure in accordance with the Drawings shall be constructed at the discharge end. **Pipes and Structures**

(e) Flushout Risers

1. Flushout risers shall be provided at the commencement of each run of subsoil drain line and at intervals of approximately 60m or as shown on the Drawings. **Location**

2. Details of the required riser construction are shown on the Drawings. **Details**

231.06 FOUNDATION DRAINS

(a) Excavation

1. Excavation shall be undertaken in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL and Clause 231.05 of this Specification. **Associated Specification**

(b) Laying of Pipe

1. A bed of filter material 50 mm in compacted thickness and shall be laid to the required line and grade. This action constitutes a **HOLD POINT**. The Superintendent's approval of the compacted bedding is required prior to the release of the hold point. **HP**

2. The type of filter material shall be as shown on the Drawings or as directed by the Superintendent. **Filter Material**

3. The 100mm diameter corrugated slotted plastic piping, or the corrugated flat plastic piping, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the compacted bed. **Bedding**

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4. Joints in the pipeline shall be kept to the minimum number and, where required, shall be made using a suitable external joint coupling. The inlet end of the pipe shall be fitted with a PVC cap.

Jointing of Pipe

(c) Backfilling

1. The trench shall be backfilled with filter material in accordance with the provisions of Clause 231.05(c).

Filter Material

2. The upper section of the trench, above the level specified for filter material backfill, shall be backfilled with suitable earth free draining backfill material, compacted for its full depth to a relative compaction of not less than 95 per cent (Standard compaction) as determined by AS 1289.5.4.1

Earth Backfill

3. Where shown on the Drawings or as directed by the Superintendent, a geotextile, conforming with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be provided at the interface between the filter material and adjoining materials. Laps of 500mm shall be provided at joints in the geotextile.

Geotextile

(d) Outlets

1. An outlet structure in accordance with the detail shown on the Drawings and the Specification for SUBSURFACE DRAINAGE - GENERAL shall be constructed at the discharge end. The outlet shall be located so that erosion of the adjacent area does not occur or shall be protected by the placement of selected stone in the splash zone of the outlet.

Construction Detail

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**231.07 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 231.1 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Excavation		
	(a) Trench Grade	≥0.5%	231.05(a)
	(b) Compaction	>95% (Standard compaction)	231.05(a)
2.	Laying of Pipe		
	Alignment	Deviation <100mm from specified line at any point	231.05(b)
3.	Subsoil Drain Backfill		
	(a) Layer thickness	300mm max	231.05(c)
	(b) Compaction (Relative) Filter and Backfill material	100% (Standard compaction)	231.05(c)
4.	Outlet Spacing	150m max	231.05(d)
5.	Flushout Riser Spacing	60m approx	231.05(e)
6.	Foundation Drain Backfill		
	(a) Layer thickness	300mm max	231.05(c)
	(b) Compaction (Relative) Filter material	100% (Standard compaction)	231.05(c)
	Backfill material	>95% (Standard compaction)	231.06(c)

Table 231.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**231.08 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed under this Specification on a schedule of rates basis in accordance with Pay Items 231(a) to 231(f) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Filter material and outlet structures are measured and paid in accordance with the Specification for SUBSURFACE DRAINAGE - GENERAL.
5. Backfill material (other than filter material) is measured and paid in accordance with this Specification and not in the Specification for EARTHWORKS.

Pay Item 231(a) EXCAVATION FOR SUBSOIL AND FOUNDATION DRAINS

1. The unit of measurement shall be the cubic metre measured as bank volume of excavation.
2. The volume of excavation shall be determined by multiplying the width, depth and length of the trench. The width of trench shall be as shown on the Drawings or as directed by the Superintendent. The depth and length of excavation shall be based on the Superintendent's instructions and shall be determined at the time of excavation. The sides of the trench shall be taken as vertical.
3. The schedule rate shall cover all types of material and separate rates shall not be included for earth or rock. The rate is deemed to include:
 - setting out and associated survey work;
 - replacement for overexcavation for any reason;
 - control of stormwater run-off, temporary drainage and erosion and sedimentation control.
4. The disposal of material from drain excavation shall be included in the schedule rate for excavation.
5. The schedule quantity is a provisional quantity.

Pay Item 231 (b) SUBSOIL DRAIN PIPE — 100MM DIA SLOTTED CORRUGATED PLASTIC PIPE.

1. The unit of measurement shall be the linear metre measured along the length of the pipe.
2. The schedule rate shall cover the supply and laying of the subsoil pipe.
3. The rate shall include connections, markers, fittings and seamless tubular filter fabric where specified.
4. The schedule quantity is a provisional quantity.

Pay Item 231(c) SUBSOIL DRAIN PIPE - CORRUGATED FLAT PLASTIC PIPE

1. The unit of measurement shall be the linear metre measured along the length of the pipe.
2. The schedule rate shall cover the supply and laying of the subsoil pipe.

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3. The rate shall include connections, markers, fittings and seamless tubular filter fabric where specified.
4. The schedule quantity is a provisional quantity.

Pay Item 231(d) SUPPLY, PLACEMENT AND COMPACTION OF BACKFILL MATERIAL (OTHER THAN FILTER MATERIAL) FOR SUBSOIL AND FOUNDATION DRAINS.

1. The unit of measurement shall be the cubic metre of compacted backfill material.
2. The volume of backfill material shall be determined by multiplying the width, depth and length of backfill material in the trench. The width of the trench shall be as shown on the Drawings or as directed by the Superintendent. The depth and length of backfill material in the trench shall be based on the Superintendent's instructions and shall be determined on site. The sides of the trench shall be taken as vertical.
3. The schedule of quantity is a provisional quantity.

Pay Item 231(e) SUPPLY AND PLACEMENT OF GEOTEXTILE

1. The unit of measurement shall be the square metre of area covered by geotextile as measured on site.
2. The schedule rate shall cover the supply placing and securing of the geotextile material.
3. No additional payment shall be made for additional geotextile used in lap joints.
4. The schedule quantity is a provisional quantity.

Pay Item 231(f) FLUSHOUT RISER STRUCTURES

1. The unit of measurement shall be "each" riser structure constructed in accordance with the Drawings.
2. The schedule rate shall cover the supply and installation of standard cast iron lids and the recording of cleanout locations in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL.
3. The schedule quantity is a provisional quantity.

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SPECIFICATION

232

PAVEMENT DRAINS

SPECIFICATION 232 - PAVEMENT DRAINS

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SPECIFICATION 232 : PAVEMENT DRAINS**GENERAL****232.01 SCOPE**

1. This Specification covers the installation of Sub-Pavement Drains, Intra-Pavement Drains and Edge Drains.
2. Pavement drains shall be constructed where and as shown on the Drawings or as directed by the Superintendent. **Location**
3. This Specification should be read in conjunction with the Specification for SUBSURFACE DRAINAGE - GENERAL. **Associated Specification**
4. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. **Quality**

232.02 TERMINOLOGY

1. Sub-Pavement Drains are intended for the drainage of the pavement layers where the subbase is not a macadam crushed rock. **Sub-Pavement Drains**
2. Intra-Pavement Drains are intended for the drainage of the pavement layers of a flexible pavement where the subbase material is a macadam crushed rock or open graded asphalt. **Intra-Pavement Drains**
3. Edge Drains are intended for the drainage of rigid pavements. **Edge Drains**

232.03 REFERENCE DOCUMENTS

1. Documents referenced in this specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. **Documents Standards Test Methods**

(a) Council Specifications

- 213 - Earthworks
- 230 - Subsurface Drainage - General
- 242 - Flexible Pavements
- 245 - Asphalt

(b) Australian Standards

- AS 1289.3.3.1 - Calculation of the plasticity index of a soil
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.

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232.04 ORDER OF CONSTRUCTION

(a) Sub-Pavement Drains

1. Sub-pavement drains shall be constructed as soon as possible after necessary earthworks are completed in the area of the drain. Where stabilisation of the subgrade is required, sub-pavement drain shall be constructed after completion of stabilisation except that where excessive ground water is encountered, sub-pavement drains may be constructed prior to stabilisation of the subgrade.

Timing of Construction

2. Where a Selected Material Zone is specified and excessive ground water is encountered, sub-pavement drains may be installed in two stages as follows:

Stage Construction

Stage 1: Standard sub-pavement drains installed below the base of the cutting prior to placement of select material in the Selected Material Zone.

Stage 2: Extension of sub-pavement drain to top of the Selected Material Zone after placement of selected material.

(b) Intra-Pavement Drains

1. Intra-Pavement Drains shall be constructed after the completion of the layer below the crushed rock Macadam or 40mm open graded asphaltic concrete subbase and preceding the construction of the subsequent layers.

Timing of Construction

(c) Edge Drains

1. Edge Drains shall be constructed after the construction of the rigid pavement and before the placement and compaction of verge material.

Timing of Construction

CONSTRUCTION

232.05 SUB-PAVEMENT DRAINS

(a) Excavation

1. Trenches 300mm wide shall be trimmed to the required line and to a depth of 600mm below the bottom of the subbase or below the base of the cutting where two stage construction of the Sub-Pavement Drain is required.

Trench Dimensions

2. The bottom of the trench shall be to the same grade as the design pavement surface except where the grade of the roadway is less than 0.5 per cent, in which case the depth of the trench shall be increased to provide a grade of 0.5 per cent in the trench. The bottom of the trench shall be excavated so that no localised ponding of water occurs.

Trench Grade

3. Where two stage construction of the sub-pavement is required, excavation for Stage 2 shall be carried out after placement and compaction of the Selected Material Zone. The Stage 2 trench shall be to the same line and width as Stage 1 and to a depth sufficient to provide a clean, full contact with the previously placed filter material. All excavated material shall be disposed to waste or incorporated into fills.

Two-Stage Construction

(b) Laying of Pipe

1. A bed of filter material 50mm in compacted thickness and shall be laid to the required line and grade. This action constitutes a **HOLD POINT**. The Superintendent's approval to the compacted bedding is required prior to the release of the hold point.

HP

2. The type of filter materials shall be as shown on the Drawings or as directed by

Filter Material

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the Superintendent.

3. The 100mm diameter corrugated slotted plastic piping, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the compacted bed to the specified line and level. The pipe shall not deviate from the specified line by more than 100mm at any point. **Filter Bed**

4. Joints in the pipeline shall be kept to the minimum number and, where required, shall be made using a suitable external joint coupling. The inlet end of the pipe shall be fitted with a PVC cap. **Joins and Capping**

(c) Backfilling

1. The trench shall be backfilled with filter material to the level specified. The type of filter material shall be as shown on the Drawings or as directed by the Superintendent. The filter material shall be placed and compacted in layers with a maximum compacted thickness not exceeding 300mm. Tamping around and over the pipe shall be done in such a manner as to avoid damage or disturbance of the pipe. **Filter Material**

2. The filter material shall be compacted for its full depth to a relative compaction of not less than 100 per cent (Standard compaction) as determined by AS 1289.5.4.1. **Compaction**

3. On the outlet section of pipes discharging through the fill batters the trench shall be backfilled with the nominated filter material to a depth of 50mm above the pipe. The balance of trench shall be backfilled with earth backfill material of maximum particle size of 50mm and shall be compacted for the full depth to a relative compaction of 95 per cent (Standard compaction) as determined by AS 1289.5.4.1. **Pipe Outlet**

4. In the case of sub-pavement drains of two stage construction, when it is not practical to place the Pavement Layers or the Selected Material Zone immediately after the construction of Stage 1, the filter material placed to the top of Stage 1 shall be protected from scour and/or contamination by covering with a 50mm thick plug of compacted select fill material having a maximum particle size of 25mm and Plasticity Index of not more than twelve as determined by AS 1289.3.3.1. This plug, any contaminated filter material and any select material covering shall be removed and replaced with the nominated filter material and compacted immediately ahead of the placement of the pavement layer. All excavated material shall be disposed to waste or incorporated in fills. **Temporary Plug over Filter Material**

(d) Flushout Risers

1. Flushout risers are to be provided at the commencement of each run of sub-pavement drain line and at intervals of approximately 60m or as shown on the Drawings. **Location**

2. Details of the required riser construction are shown on the Drawings. **Details**

(e) Outlets

1. Outlets are to be provided as shown on the Drawings or at maximum intervals of 150m. Sub-pavement drains shall discharge into drainage pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the Drawings shall be constructed at the discharge end. **Location**

2. The outlet shall be made rodent proof in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL. **Rodent Proof**

3. The outlet shall be located so that erosion of the adjacent area does not occur, or shall be protected by the placement of selected stone in the splash zone of the outlet. **Erosion Control**

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232.06 INTRA-PAVEMENT DRAINS

(a) Excavation

1. A 'V' shaped trench approximately 50mm deep shall be cut to the required line in the pavement layer immediately below the crushed rock Macadam pavement layer. No excavation is required below a 40mm open graded asphaltic concrete subbase layer.

Trench Dimensions

2. The bottom of the trench is to be to the same grade as the roadway. The bottom of the trench shall be constructed so that localised ponding of water does not occur.

Trench Grade

3. Where the pipe is to discharge through the fill batter a trench shall be constructed on a grade suitable for the pipe to discharge its contents without scour. After laying the pipe the trench shall be backfilled with fill material and compacted for the full depth to a relative compaction of not less than 95 per cent (Standard compaction) as determined by AS 1289.5.4.1

Discharge Pipe

(b) Laying of Pipe

1. Thick walled unplasticised PVC pressure pipe, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL shall be used with:

UPVC Pressure Pipe

- (i) Crushed rock subbases having not more than 10 per cent of material passing the 9.5mm AS sieve and having layer thicknesses neither less than 150mm nor more than 200mm.
- (ii) Open graded asphalt subbases having layer thicknesses neither less than 80mm nor greater than 100mm.

2. Where crushed rock subbases require pavement drains and have a depth exceeding 200mm, the type of pavement drain will need to be certified to have adequate crushing strength and written approval of the Superintendent to the proposed pavement drain type and specification will be required. Similar proposal and Superintendent's approval is required for pavement drain in asphalt subbases greater than 100mm in depth.

Subbases >200mm Pipe Crushing Strength

3. The pipe shall be laid to the specified line and level. The pipe shall not deviate from the specified line by more than 100mm at any point

Level

4. All pipes shall be securely held to the layer under the free-draining subbase to prevent movement of the pipes during placement and compaction of the free-draining subbase. At least seven days before commencement of pipe laying, the Contractor shall submit details of the proposed method of securing the pipes to the layer under the free-draining subbase for the approval of the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Pipe Anchorage

HP

5. Notwithstanding the Superintendent's approval to the use of a method of securing the pipes to the layer under the free draining subbase, if such securing method allows movement of the pipes, the method shall be discontinued and the Contractor shall propose an alternative securing method for approval by the Superintendent.

Alternative Securing Method

6. Any additional costs resulting from the use of the alternative method of securing the pipes shall be borne by the Contractor.

Contractor's Costs

7. The inlet end of the pipe shall be fitted with a cap complying with the Specification for SUBSURFACE DRAINAGE - GENERAL.

Inlet Cap

8. The outlet length of pipe from the outside edge of the free-draining subbase to an

Outlet Length

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outlet structure in the embankment batter shall be unslotted and the pipe joints in this length of pipe shall be sealed with suitable couplings or mastic.

(c) Backfilling

1. Subbase material shall be spread, compacted and trimmed, where appropriate, as follows:
 - (i) For crushed rock Macadam subbase, in accordance with the Specification for FLEXIBLE PAVEMENTS.
 - (ii) For open graded asphalt subbase, in accordance with the Specification for ASPHALT.
2. Tipping, spreading and compaction of the subbase shall be undertaken in such a manner as not to damage the intra-pavement drain pipes. If any pipes are damaged as a result of the tipping, spreading and compaction of the subbase, the Contractor shall remove and replace the damaged pipes.
3. The cost of the removal and replacement of such damaged pipes shall be borne by the Contractor.
4. The thickness of the layer of subbase material enclosing the pipe shall be within the limits specified in Clause 232.06(b) for the type of pipe used in the intra-pavement drain.

(d) Outlets

1. Outlets are to be provided as shown on the Drawings or at maximum intervals of 150m. Intra-pavement drains shall discharge into gully pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the Drawings shall be constructed at the discharge end.
2. The outlet shall be made rodent proof in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL.
3. The outlet shall be located so that erosion of the adjacent area does not occur, or shall be protected by the placement of selected stone in the splash zone of the outlet.

232.07 EDGE DRAINS

(a) Excavation

1. The verge material shall be trimmed to subgrade level and to the minimum width shown on the Drawings. The bottom of the trench is to be constructed at the same grade as the roadway and in such a manner that localised ponding of water does not occur.
2. Where the grade of the roadway is less than 0.5 per cent the trench shall be excavated to provide a minimum grade of 0.5 per cent.
3. When the pipe is to discharge through the fill batter a suitable trench shall be excavated to provide the required grade.

(b) Laying of Pipe

1. Generally, 65mm diameter slotted corrugated plastic pipe enclosed in seamless tubular filter fabric, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be used for edge drains unless shown otherwise on the Drawings or as directed by the Superintendent.
2. Where any part of a shoulder consists of material other than concrete, slotted

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thick walled unplasticised PVC pressure pipe, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL shall be used. **Pressure Pipe**

3. All pipes shall be securely held against the vertical face of the rigid pavement. At least seven days before commencement of pipe laying, the Contractor shall submit details of the proposed method of securing the pipes against the rigid pavement for the approval of the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point. **HP**

4. The pipe shall be laid on a prepared bed to the specified line and level. The pipe shall not deviate from the specified line by more than 100mm at any point. **Prepared Bed**

5. Joints in the pipe shall be kept to a minimum number and shall be made using an external joint coupling approved by the Superintendent. **Jointing**

6. The inlet end of the pipe shall be fitted with a cap complying with the Specification for SUBSURFACE DRAINAGE - GENERAL. **Inlet Cap**

7. The outlet section of a pipe from the vertical face of the rigid pavement to an outlet in the embankment batter shall be unslotted and the pipe joints in this length of pipe shall be sealed with mastic. **Outlet Pipe**

(c) Backfilling

1. The pipe shall be covered with Type B filter material, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, to the dimensions shown on the Drawings. **Filter Material**

2. Mechanical compaction of this filter material is not required, however after placement of the filter material it shall be soaked with water. Where necessary additional filter material shall be added and soaked to provide the final dimensions shown on the Drawings. **Soaking of Filter Material**

3. Backfilling over the edge drain shall be done in such a manner as to avoid damage or disturbance of the pipe. Backfill material shall be selected material as required for verges and in accordance with the requirements of the Specification for EARTHWORKS. Backfilling shall be compacted to a relative compaction of not less than 100 per cent (Standard compaction) as determined by AS 1289.5.4.1. **Procedure and Compaction**

(d) Flushout Risers

1. Flushout risers shall be provided at the commencement of each run of edge drain line and at intervals of approximately 60m or as shown on the Drawings. **Location**

2. Details of the required riser construction are shown on the Drawings. The standard CI caps as shown on the Drawings shall be supplied by the Contractor. **Construction Details**

(e) Outlets

1. Outlets are to be provided as shown on the Drawings or at maximum intervals of 150m. Edge drains shall discharge into side entry pits and other stormwater drainage structures. Outlets shall be constructed of unslotted plastic pipe of the same diameter as the main run when outside the pavement area. An outlet structure in accordance with the Drawings shall be constructed at the discharge end. **Location**

2. The outlet shall be made rodent proof in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL. **Rodent Proof**

3. The outlet shall be located so that erosion of the adjacent area does not occur, or shall be protected by the placement of selected stone in the splash zone of the outlet. **Erosion Control**

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SPECIAL REQUIREMENTS**LIMITS AND TOLERANCES****232.08 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 232.1 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Excavation Trench Grade	≥0.5%	232.05(a) 232.07(a)
2.	Sub-Pavement Drain Laying of Pipe Alignment	Deviation <100mm from specified line at any point.	232.05(b)
	Backfill (a) Layer thickness	300mm max	232.05(c)
	(b) Compaction (Relative) Filter material	100% (Standard compaction)	232.05(c)
	Backfill material	>95% (Standard compaction)	232.05(c)
3.	Flushout Riser Spacing	60m approx	232.05(d) 232.07(d)
4.	Outlet Spacing	150m max	232.05(e) 232.06(d) 232.07(e)
5.	Intra-Pavement Drain (a) Backfill	>95% (Standard compaction)	232.06(a)
	(b) Alignment	Deviation <100mm from specified line at any point.	232.06(b)
6.	Edge Drains (a) Alignment	Deviation <100mm from specified line at any point.	232.07(b)
	(b) Compaction (Relative) Backfill material	100% (Standard compaction)	232.07(c)

Table 232.1 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**232.09 PAY ITEMS**

1. Pay Items shall be made for all the activities associated with completing the work detailed under this Specification on a schedule of rates basis in accordance with Pay Items 232(a), 232(b) and 232(c).
2. A Lump Sum price for any of these items will not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Filter material and outlet structures are measured and paid in accordance with the Specification for SUBSURFACE DRAINAGE - GENERAL.
5. Subbase material, including spreading, compacting and trimming, is measured and paid in accordance with the Specification for either FLEXIBLE PAVEMENTS or ASPHALT as appropriate.
6. Selected material backfill to edge drains is measured and paid in accordance with the Specification for EARTHWORKS.

Pay Item 232(a) EXCAVATION

1. The unit of measurement shall be the cubic metre measured as bank volume of excavation.
2. The width of trench shall be as shown on the Drawings or as directed by the Superintendent. The depth and length of excavation shall be based on the Superintendent's instructions and shall be determined at the time of excavation.
3. The schedule rate shall cover all types of material and separate rates shall not be included for earth or rock. The rate is deemed to include:
 - setting out and associated survey work;
 - replacement for overexcavation for any reason;
 - control of stormwater run-off, temporary drainage and erosion and sedimentation control.
4. The disposal of material from drain excavation shall be included in the schedule rate for excavation.
5. The schedule quantity is a provisional quantity.

Pay Item 232(b) SUBSOIL DRAIN PIPE

232(b)(i)	100mm dia slotted corrugated plastic pipe.
232(b)(ii)	58mm dia thick walled unplasticised PVC pressure pipe.
232(b)(iii)	65mm dia slotted corrugated plastic pipe.

1. The unit of measurement for Pay Items 232(b)(i), 232(b)(ii) and 232(b)(iii) shall be the linear metre measured along the length of the pipe. Any unslotted pipe required for outlets shall be included in the length.
2. The schedule rate shall cover the supply, laying and securing of the subsoil pipe.
3. The rate shall include connections, fittings and seamless tubular filter fabric where specified.
4. The schedule quantity is a provisional quantity.

Pay Item 232(c) FLUSHOUT RISER STRUCTURES

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1. The unit of measurement shall be 'each' flushout riser structure constructed in accordance with the Drawings.
2. The schedule rate shall include the supply and installation of lids and the recording of flushout riser locations in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL.
3. The schedule quantity is a provisional quantity.

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CITY OF GREATER DANDENONG
SPECIFICATION

233

DRAINAGE MATS

SPECIFICATION 233 - DRAINAGE MATS

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SPECIFICATION 233 : DRAINAGE MATS**GENERAL****233.01 SCOPE**

1. The work to be executed under this Specification covers the installation of Drainage Mats (Blankets).
2. Drainage mats shall be constructed where and as shown on the Drawings or as directed by the Superintendent. **Location**
3. This Specification should be read in conjunction with the Specification for SUBSURFACE DRAINAGE - GENERAL. **Associated Specification**
4. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. **Quality**

233.02 TERMINOLOGY

1. Type A drainage mats are intended to ensure continuity of a sheet flow of water under fills, to collect surface seepage from a wet seepage area or for protection of vegetation or habitat downstream of the road reserve where a fill would otherwise cut the flow of water. **Type A Mats**
2. Type B drainage mats are constructed to intercept water which would otherwise enter pavements by capillary action or by other means on fills and to intercept and control seepage water and springs in the floors of cuttings. **Type B Mats**

233.03 REFERENCE DOCUMENTS

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

(a) Council Specifications

230 - Subsurface Drainage - General

(b) Australian Standards

AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.

233.04 ORDER OF CONSTRUCTION

1. Type A drainage mats shall be constructed after the site has been cleared and grubbed and before commencement of embankment construction. **Type A Mats**
2. Type B drainage mats shall be constructed after completion of the subgrade construction and before construction of the pavement. **Type B Mats**

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CONSTRUCTION**233.05 TYPE A MATS**

1. Type A drainage mats shall be constructed under embankments as and where shown on the Drawings or as directed by the Superintendent. **Location**
2. After the embankment foundation has been trimmed and any necessary trench drains installed, a geotextile complying with the requirement of the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the embankment foundation. The area of geotextile laid shall be sufficient to cover the area of the Type A drainage mat and an additional amount for enclosing the sides of the drainage mat after the filter material has been placed. Laps of minimum width of 500mm shall be provided at each join in the geotextile. **Placing of Geotextile**
3. Type C filter material or Type D filter material, as shown on the Drawings or as determined by the Superintendent, shall be placed on the geotextile and compacted to the satisfaction of the Superintendent. The minimum thickness of the compacted filter material shall be 300mm plus an allowance for the expected consolidation of the embankment foundation under the embankment load or 500mm if the amount of the expected total consolidation of the embankment foundation is not known. The filter material shall be placed in two or more layers so that no layer, when compacted, has a thickness greater than 250mm. **Placing of Filter Material**
4. After completion of placement and compaction of the filter material, geotextile shall be placed on top of and around the sides of the filter material so that the filter material is completely enclosed by geotextile. The geotextile shall be secured in such a manner as to prevent movement of the geotextile by wind or by construction plant placing subsequent layers of filter material or earth filling over the drainage mat. **Securing of Geotextile**
5. An additional layer of geotextile shall be placed on the drainage mat under the base of any rock facing which may be placed as part of the embankment construction. The additional layer of geotextile shall extend beyond the outside and inside faces of the bottom layer of rock. **Geotextile under Rock Facing**
6. Care shall be taken not to damage the geotextile during the construction of the drainage mat or during placement of subsequent layers of filter material, earth filling or rock facing. Any geotextile so damaged shall be repaired or replaced by the Contractor to the satisfaction of the Superintendent. The cost of repairing or replacing such damaged geotextile shall be borne by the Contractor. **Damaged Geotextile**
Contractor's Cost
7. Type A drainage mats shall extend 2m beyond the toes of embankments and such extensions shall be covered by a 300mm thick layer of Type C filter material or Type D filter material, as determined by the Superintendent. This protective layer shall be placed immediately after completion of construction of each drainage mat. **Protective Layer**
8. Outlets from Type A drainage mats may be surface outlets at the toes of embankments or piped outlets connected to other drainage systems. Where piped outlets are constructed they shall conform to the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL. **Outlets**

233.06 TYPE B MATS

1. Type B drainage mats shall be constructed in cuttings as and where shown on the Drawings or as directed by the Superintendent. Type B drainage mats shall be constructed for the full width of cuttings and for the pavement width in other locations. **Location and Width**

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2. After the subgrade material has been compacted and trimmed, a geotextile complying with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the subgrade. Laps of minimum width of 500mm shall be provided at each join in the geotextile. **Placing of Geotextile**
3. Thick walled unplasticised PVC pressure Pipe, complying with the Specification for SUBSURFACE DRAINAGE - GENERAL, shall be laid on the geotextile at a distance of 200mm from and parallel to the longitudinal edges of the drainage blanket as shown in the Drawings. **UPVC Pressure Pipe**
4. Type A filter material shall be placed on the geotextile and compacted to achieve a relative compaction, determined by AS 1289.5.4.1, of at least 100 per cent (Standard compaction). Alternatively, the Superintendent may approve the use of a coarser Type D filter material having a maximum particle size of 75mm and a maximum D90/D10 ratio of three. **Placing of Filter Material**
5. The thickness of the compacted filter material shall be as shown on the Drawings or as directed by the Superintendent. If the required thickness of compacted filter material is greater than 250mm, the filter material shall be placed in two or more layers so that no layer, when compacted, has a thickness greater than 250mm. **Thickness of Filter Material**
6. After completion of placement and compaction of the filter material, geotextile shall be placed on top of and around the sides of the filter material so that the filter material is completely enclosed by geotextile. The geotextile shall be secured in such a manner as to prevent movement of the geotextile by wind or by construction plant placing pavement layers over the drainage mat. **Securing of Geotextile**
7. Care shall be taken not to damage the geotextile during the construction of the drainage mat or during placement of subsequent pavement layers. Any geotextile so damaged shall be repaired or replaced by the Contractor to the satisfaction of the Superintendent. The cost of repairing or replacing such damaged geotextile shall be borne by the Contractor. **Damaged Geotextile Contractor's Cost**
8. The surface of the completed drainage mat shall be at the design level for the top of the drainage mat with a tolerance of plus zero and minus 40mm. **Surface Level Tolerance**
9. Outlet structures where specified, or where directed by the Superintendent, shall be in accordance with the requirements of the Specification for SUBSURFACE DRAINAGE - GENERAL.

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**233.07 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 233.1 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Filter Material		
	(a) Layer thickness	250mm max	233.05 233.06
	(b) Compaction (Relative) Type A filter material	100% (Standard compaction)	233.06
2.	Type B Mats		
	(a) Design level at top of mat	+0, -40mm	233.06

Table 233.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**233.08 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 233(a) and 233(b).
2. A lump sum price for any of these activities shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Filter material and outlet structures are measured and paid in accordance with the Specification for SUBSURFACE DRAINAGE - GENERAL.
5. Thick walled unplasticised PVC pressure pipe is measured and paid in accordance with this Specification and not in the Specification for SUBSURFACE DRAINAGE - GENERAL.

Pay Item 233(a) SUPPLY AND PLACEMENT OF GEOTEXTILE

1. The unit of measurement shall be the square metre of area covered by geotextile as measured on site.
2. No additional payment shall be made for additional geotextile used in lap joints.
3. For Type A drainage mats, the additional layer of geotextile placed under rock facing shall be measured and included as an additional quantity for payment under this item.
4. The schedule rate shall cover the supply, placing and securing of the geotextile material.
5. The schedule quantity is a provisional quantity.

Pay Item 233(b) DRAINAGE MAT OUTLET PIPE

1. The unit of measurement shall be the linear metre of pipe laid.
2. The distance shall be measured along the centreline of the pipe and shall be the actual length laid including pipe leading to outlet structures.
3. The schedule rate shall cover the supply and laying of the pipe.
4. The schedule quantity is a provisional quantity.

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SPECIFICATION

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STABILISATION

SPECIFICATION 241 – STABILISATION

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ANNEXURE

241A STABILISATION MIX DESIGN

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SPECIFICATION 241: STABILISATION

GENERAL

241.01 SCOPE

1. This Specification defines the materials requirements for stabilised materials provided by stationary plant production as well as materials and process requirements for in-situ stabilisation.
2. The work to be executed under this Specification consists of the supply and incorporation of stabilising binders with material in a nominated pavement course or subgrade layer (including materials for the selected material zone and selected backfill) at specified locations in the work and the spreading, compaction, trimming and curing of such materials.
3. This Specification provides the requirements for stabilisation of the types of pavement courses and subgrade zones or layers as shown in Table 241.1.

Pavement Course Or Subgrade Zone Or Layer	Stabilising Binder
PAVEMENT COURSE Base and Subbase	Cement Blended Stabilising Agent Hydrated Lime (pugmill) Quicklime (in-situ)
SUBGRADE ZONE OR LAYER Selected Material Zone Other Subgrade Layers	Cement Blended Stabilising Agent Quicklime (in-situ) Hydrated Lime (pugmill) Cement Blended Stabilising Agent Quicklime (in-situ) Hydrated Lime (pugmill)
Selected Backfill Zone	Cement Hydrated Lime (pugmill)

Table 241.1
Types Of Pavement Courses, Subgrade Zones
Or Layers And Stabilising Binder

4. The pavement course or subgrade zone or layer to be stabilised shall be as specified in the Specifications for FLEXIBLE PAVEMENTS, or as indicated on the Drawings.
5. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Associated Specifications

Quality

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241.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

201	-	Control of Traffic
213	-	Earthworks
242	-	Flexible Pavements
220	-	Stormwater Drainage - General

(b) Australian Standards

AS 1141.11	-	Particle size distribution by dry sieving.
AS 1289.5.7.1	-	Compaction control test (Rapid method)
AS 1289.5.8.1	-	Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge - Direct transmission mode.
AS 1289.4.2.1	-	Determination of the sulphate content of a natural soil and the sulphate content of the ground water - Normal method.
AS1289.6.1.1	-	Determination of the California bearing ratio of a soil - Standard laboratory method for a remoulded specimen.
AS 2350.4	-	Setting time of Portland and blended cements.
AS 2350.9	-	Fineness of Portland fly ash cement.
AS 3582.1	-	Fly ash.
AS 3582.2	-	Slag - Ground granulated iron blastfurnace.
AS 3583.3	-	Determination of loss on ignition.
AS 3583.6	-	Determination of relative water requirement and relative strength.
AS 3583.12	-	Determination of available alkali.
AS 3583.13	-	Determination of chloride ion content.
AS 3583.14	-	Determination of insoluble residue content.
AS 3972	-	Portland and blended cements

(c) NSW RTA Test Methods

T432	-	Rate of Slaking of Quicklime
------	---	------------------------------

241.03 CONTROL OF TRAFFIC

1. The Contractor shall provide for traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC while undertaking the work and shall take all necessary precautions to protect the work from damage until such time as the new work has developed sufficient strength to carry normal traffic without damage.

**Contractor's
Responsibility**

2. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work. Where adequate detours or side tracks are included in the contract or are otherwise available, traffic shall be temporarily diverted while the work is in progress.

**Minimise
Traffic Delays**

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INSPECTION, SAMPLING AND TESTING**241.04 MATERIALS PROPOSED FOR USE IN THE WORK**

1. The Contractor shall provide a certificate from a laboratory with appropriate NATA registration stating that the stabilisation mix(s) submitted and the mix constituents comply with the mix nominated in Annexure 241A and that the stabilised material meets the requirements of the Specification for FLEXIBLE PAVEMENTS if incorporated into the works as a pavement layer or alternatively the Specification for EARTHWORKS or STORMWATER DRAINAGE GENERAL.

***Contractor's
Responsibility*****241.05 MATERIALS USED IN THE WORK**

1. Regular inspection, sampling and testing of pavement and subgrade materials shall be undertaken by the Contractor while stabilisation is in progress in accordance with this Specification.

***Sampling and
Testing*****MATERIALS****241.06 CEMENT**

1. The type of cement used as the stabilising agent or a constituent in a blended stabilising agent shall comply with AS 3972.

Type

2. The Contractor shall nominate the brand and source of all cementitious materials.

***Nominated
Brand and
Source***

3. Documentary evidence of the quality and source of the cement shall be furnished by the Contractor to the Superintendent upon request at any time.

***Proof of
Quality***

4. If the Contractor proposes to use cement which has been stored for a period in excess of three months from the time of manufacture, the Contractor shall arrange a re-test, to ensure the cement still complies with AS3972, before the cement is used in the work. The cost of retesting cement, which has been stored for a period in excess of three months, shall be borne by the Contractor. Test results shall be forwarded to the Superintendent for approval at least 2 days in advance of usage of the material.

***Storage in
Excess of 3
months*****241.07 QUICKLIME**

1. Quicklime, consisting essentially of calcium oxide in a highly reactive form, shall have the following properties at the point of spread:

Properties

- | | | |
|------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (i) | Available Lime | The content of calcium oxide, determined by AS 3583.12, shall not be less than 85 per cent. |
| (ii) | Slaking Rate | The active slaking time shall not be greater than twenty minutes and the temperature rise on slaking, determined from the average of four samples tested in accordance with Test Method T432, shall not be less than 40°C in six minutes. |

2. The particle size distribution of the quick lime determined by AS 1141.11 shall comply with the following requirements in Table 241.2.

Particle Size

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AS Sieve	Per Cent Passing
13.2mm	100
9.5mm	96 - 100
4.75mm	70 - 100
2.36mm	0 - 90

Table 241.2
Particle Size Distribution of Quicklime

241.08 HYDRATED LIME

1. Hydrated lime, consisting essentially of calcium hydroxide, whether used as the sole stabilising agent or blended with other additives, shall have the following properties:

Properties

- | | | |
|-------|---------------------------------------|-------------------------------------------------------------------------------------------------|
| (I) | Available Lime | The content of calcium hydroxide, determined by AS 3583.12, shall not be less than 80 per cent. |
| (ii) | Form | The material shall be in powder form. |
| (iii) | Residue on Sieving
(Particle Size) | The residue on a 300 micron sieve, determined by AS 3583.14, shall not exceed 2 per cent. |

2. The properties which characterise the particular hydrated lime to be used in the stabilising agent submitted as part of the mix design are:

- | | |
|-----|------------------------------------------------------------------------|
| (a) | Percentage of calcium hydroxide |
| (b) | Fineness - Percentage by mass passing the 45 micron sieve (AS 2350.9). |
| (c) | Source. |

241.09 GROUND GRANULATED BLAST FURNACE SLAG

1. The ground granulated blast furnace slag shall conform to AS3582.2.

2. The properties which characterise the particular ground blast furnace slag to be used in the stabilising agent submitted as part of the mix design are:

Properties

- | | |
|-----|------------------------------------------------------------------------|
| (a) | Fineness - percentage by mass passing the 45 micron sieve (AS 2350.9). |
| (b) | Relative strength (28 days) (AS 3583.6). |
| (c) | Source. |

241.10 FLYASH

1. Flyash shall conform to AS3582.1.

2. The properties which characterise the particular flyash to be used in the stabilising agent submitted as part of the mix design are: **Properties**

- (a) Fineness - percentage by mass passing the 45 micron sieve (AS 2350.9).
- (b) Loss on ignition (AS 3583.3).
- (c) Source.

241.11 BLENDED STABILISING AGENTS

1. The Contractor may utilise a blended stabilising agent. The Contractor shall obtain mill and batch information which will make the blended stabilising agent traceable to the supplier's test results. Handling and storage requirements of the Supplier shall be complied with by the Contractor who shall also arrange for sampling of the agent as required by the Superintendent. **Requirements**

2. The mass of components of the nominated blended stabilising agent shall not vary by more than ± 3 per cent from the blend percentages nominated in the mix design described in Annexure 241A.

3. When a blended stabilising agent is produced from a combined grinding of components the following properties will characterise the particular stabilising agent blend: **Properties**

- (a) Source of each component.
- (b) Fineness - percentage by mass passing the 45 micron sieve (AS 2350.9).
- (c) Setting time (AS2350.4).

241.12 WATER

1. Water shall be free from harmful amounts of materials such as oils, salts, acids, alkalis and vegetable substances. The water shall not contain more than: **Quality**

- (a) 600 parts per million of chloride ion, determined by AS 3583.13.
- (b) 400 parts per million of sulphate ion, determined by AS 1289.4.2.1.
- (c) 1 per cent by mass of undissolved solids.

2. Water accepted as potable and fit for human consumption will not require testing to confirm suitability. **Potable**

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STABILISATION PROCESSES

241.13 GENERAL

1. The Contractor shall submit details of the proposed equipment (including the mixing plant) and stabilisation procedures to be used in the work 14 days prior to commencement of the work. This submission, hereafter called the Work Plan, will nominate the sequence of operations, widths of stabilisation passes and provision for traffic if appropriate. Submission of a Work Plan constitutes a **HOLD POINT**. Superintendent's inspection of the Work Plan and approval is required to release the hold point.

**Proposed
Equipment
and
Procedures**

HP

2. Notwithstanding submission to the Superintendent of the Contractor's equipment and stabilisation procedures, the work shall meet all the Specification requirements and Statutory Requirements for Occupational Health and Safety and the Contractor shall perform such tests as specified as the work proceeds, to ensure compliance. Costs of such tests shall be borne by the Contractor.

**Compliance
Contractor's
Cost**

3. Stabilisation of pavement materials shall not proceed during wet weather or if rain is imminent and likely to occur during any stage of the stabilisation process so as to significantly influence the resultant moisture content and uniformity of moisture content in the mix.

**Weather
Conditions**

241.14 APPLICATION OF STABILISING AGENT

(a) Stationary Mixing Plant

1. Application rate of stabilising agent shall be monitored at the pug mill or equivalent plant utilised as approved by the Superintendent.

**Application
Rate**

2. Application rate measured in kilograms per tonne of product shall be monitored and recorded for every 100 tonnes of production.

Measurement

3. The achieved accuracy of application rate shall be ± 10 per cent of the rate nominated in Annexure 241A.

4. The application rate shall not be allowed to exceed the nominated rate by more than 10 per cent. The stabilising agent incorporated in excess of the nominated rate shall be at no cost to the Principal.

**Excessive
Application
Contractor's
Cost**

(b) In-Situ

1. The incorporation of stabilising agent is to follow a process where stabilising agent is spread on the pavement in advance of the specialist mixing equipment. Where special processes are proposed by the Contractor involving supply of stabilising agent within the mixing bowl of equipment, the approval of the Superintendent is required and a demonstration of the process at the Contractor's expense may be requested.

**Application
Process**

2. Spreading shall be carried out using the mechanical spreader nominated in the Work Plan and subsequently approved by the Superintendent. Annexure 241A nominates the spread rate.

**Spreading
Rate**

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3. The actual spread rate shall be within ± 10 per cent of the nominated rate. The Contractor shall verify this by testing the spread rate for each lot or 500m² of pavement treated (whichever is less) in each application of binder. Spread rate testing shall be performed by weighing the contents of a suitable 4 sided tray placed on the pavement and between the wheels of the mechanical spreader. The rate of stabilising agent spread shall be calculated by dividing the mass collected (kg) by the area of the tray (m²). **Tolerances**
4. Where spreading vehicles are fitted with load cells, the Contractor shall 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. The Contractor shall record this data for each run and make it available to the Superintendent promptly. Such action will not cancel the Contractor's obligation to undertake prescribed testing of spread rate if required by the Superintendent. **Load Cells**
5. The actual spread rate shall not exceed the nominated rate by more than 10 per cent. The stabilising agent spread in excess of the nominated rate shall be at no cost to the Principal. **Over Spread Contractor's Cost**
6. Spreading shall not proceed during windy conditions which may cause loss of stabilising agent or cause nuisance or danger to people or property. **Wind**
7. Traffic or equipment not involved in spreading or mixing of the stabilising agent shall not pass over the spread material until it has been mixed into the layer to be stabilised. **Construction Traffic**
8. Any spillage of the stabilising agent on site or at any loading location related to the site shall be removed as soon as possible and within the same work shift of such spillage. **Spillage**

241.15 MIXING

(a) Stationary Mixing Plant

1. The stationary mixing plant shall be purpose built for the process of mixing road making materials. All equipment shall be maintained and calibrated so as to provide a uniformly mixed product without segregation of the aggregate material. **Equipment**
2. The plant shall provide for the controlled and metered inclusion of water into the mix. **Control of Water**
3. The stationary mixing equipment shall incorporate a delivery system for mix materials capable of producing a uniform mixture to design requirements. This performance shall be confirmed by monitoring of unconfined compressive strength of production, in accordance with AS 1289.6.1.1, with a pair of test specimens tested for each 100 tonnes of production and at full cost to the Contractor. **Uniform Mixture Contractor's Cost**

(b) In-situ

1. Mixing equipment shall be purpose built for the process of in-situ mixing of road making materials. It shall be capable of mixing to the depth specified for the layer to be stabilised and of distributing the stabilising agent uniformly through the full depth and over the whole area of the layer to be stabilised. A minimum of 2 passes of the mixing equipment is required. As mixing blades or tynes wear they shall be replaced so as to maintain mixing efficiency consistent with that demonstrated during the trial section. The mixing equipment will be capable of supplying a calibrated amount of water to the mixing bowl in a such manner as to provide a uniformly moist mix to a target moisture content. **Equipment**

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2. The resultant mix shall be uniform over the full depth so that there are no lenses, pockets, lumps or granules of stabilising agent present in the layer or adjacent to it. **Uniform Mixture**
3. The procedure nominated in the Work Plan shall minimise disturbance of the distribution of stabilising agent spread in advance of the mixing process. **Disturbance**
4. The Contractor shall carry out visual inspections during mixing to ensure uniform mixing is being achieved in the layer. Inspection results shall be recorded as cited in the Specification Part for Quality Requirements. The Superintendent may require that additional passes by the mixing equipment be carried out to improve the visual uniformity of the mix and/or the moisture content. Such additional work shall be carried out at no cost to the Principal. **Additional Mixing Contractor's Cost**

241.16 FIELD WORKING PERIOD

1. The time period from addition of water during the mixing process until the completion of compaction is nominated as the Field Working Period. This period may vary significantly with variations in the type of stabilising agent. **Definition**
2. The nominated Field Working Period shall be provided in Annexure 241A for the stabilising agent approved for the works. The Nominated Field Working Period shall be based on laboratory tests determining the time from mixing until such time as the calculated Wet Density for modified compaction procedures decreases by more than 2 percentage points. This testing shall be undertaken utilising AS 1289.5.7.1 and samples of the materials representative of those to be utilised in the works. **Based on Laboratory Tests**
3. The Contractor will complete the compaction process within the Nominated Field Working Period unless specific approval is provided by the Superintendent to an adjustment for site and seasonal conditions. **Compaction within Field Working Period**

241.17 TRIMMING AND COMPACTION

1. After mixing the layer shall be trimmed and compacted in accordance with the Specification for FLEXIBLE PAVEMENTS to produce a tight dense surface parallel with the finished wearing surface so that the levels do not vary from the design levels beyond the tolerance for primary trimming specified in Clause 241.19(a). **Level Tolerance**
2. Subsequent secondary trimming may be undertaken on one or more occasions in preparation for primer seal and with the objective of meeting shape and level requirements. Secondary trimming shall involve cutting to waste. Work methods that lead to the development of laminations in the pavement will not be allowed and surface slurring will not be accepted. The Contractor's survey control methods as stated in the Work Plan will be adequate to ensure that the pavement layer thickness is not reduced during secondary trimming to an extent such that it fails to comply with the requirement for layer thickness in accordance with the tolerance specified in Clause 241.19(b). When required by the Superintendent survey results shall be provided to confirm that the pavement layer thickness remains within tolerance after secondary trimming. This survey will be at no cost to the Principal. **Secondary Trimming Contractor's Cost**
3. All trimmed material having been cut to waste shall be used as fill or spoiled as directed by the Superintendent. The material shall be owned by the Principal. **Trimmed Material**
4. Measurements with a 3 metre straight edge shall be taken at a minimum of 10 randomly selected stations so as to represent each 200 metre lane length or part thereof. Deviation of the surface from the bottom of a 3 metre straight edge placed in any direction will meet the tolerance shown in Clause 241.19(a). This testing will be undertaken immediately prior to sealing or prior to agreed practical completion for any work component. **Straight Edge Test**

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5. The stabilised layer shall be compacted over the entire area and depth so that the relative compaction determined by AS 1289.5.7.1 is not less than as detailed in the Specification for FLEXIBLE PAVEMENTS, EARTHWORKS or STORMWATER DRAINAGE - GENERAL as appropriate. **Compaction**

6. To provide true relative compaction assessments the lots shall be sampled and tested within the nominated field working period in accordance with AS 1289.5.7.1. **Test Method**

7. The maximum wet density (modified compaction) will be determined by sampling immediately after the determination of field density and testing will be undertaken within 2 hours of sampling. A determination of maximum wet density (modified compaction) representing the full layer depth is required for each sampling location when calculation of relative compaction is undertaken. **Wet Density**

8. The field density may be determined by in-situ sand replacement testing or by single probe Nuclear Density Meter in direct transmission mode in accordance with AS 1289.5.8.1. **In-Situ Dry Density**

241.18 JOINTS

1. Joints are defined in this Specification to comprise interfaces between work episodes that are separated in time by more than the nominal field working period for the nominated stabilisation mix design. A longitudinal joint shall be considered to be a joint generally parallel to the road centreline. A transverse joint occurs when a length of work is terminated and extended at a later time after a period which exceeds the nominated field working period. **Joint Type**

2. All longitudinal and transverse joints shall be formed by cutting back into the previously stabilised and fully compacted sections. A minimum longitudinal overlap of mixing runs shall be 75mm. Transverse joints shall be overlapped by a minimum of 2 metres. The material disturbed during cutting back shall be remixed at full depth and incorporated into the new work. No longitudinal joints shall be allowed within 0.5 metre of the centreline of a typical wheelpath. **Cutting Back**

3. The level and shape of the joints shall be within the limits specified in Clause 241.19. **Finish**

241.19 TOLERANCES

(a) Levels and Surface Trim

1. The surface level after primary trimming shall be within a tolerance of +30mm and +10mm of the levels shown on the Drawings. **Primary Trimming**

2. The surface level after secondary trimming shall be within a tolerance of +15mm and -15mm of the levels shown on the Drawings. **Secondary Trimming**

3. The pavement surface after secondary trimming and immediately prior to sealing shall be of a quality such that deviation under a 3 metre straight edge does not exceed 12mm.

(b) Layer Thickness

1. The final thickness of the stabilised layer at any point shall be within a tolerance of +20mm and -10mm of the nominated layer thickness. **Minimum Thickness**

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2. The average thickness of the layer in a lot shall be determined from measurements of six randomly selected locations over any 200m length of a lot. The average thickness shall not be less than that required to meet the specified final thickness tolerances after trimming.

**Average
Thickness**

3. The layer thickness shall be measured at the edges of the stabilising run before compaction commences. The layer thickness shall be measured relative to the finished design level.

**Method of
Measurement**

(c) Width

1. The width measured at any point of the stabilised layer shall be not less than the specified width as shown in the Drawings by more than 50mm.

**Minimum
Width**

2. The average width of the layer shall be determined from measurements at 3 sites selected at random by the Superintendent over any 200m length of a lot and shall be not less than the specified width.

Average Width

241.20 CURING

1. The Contractor shall submit to the Superintendent details of the proposed method of curing as part of the Work Plan.

Notice

2. The stabilised work shall be protected against rapid drying out by keeping it continuously wet or damp during the period prior to the provision of a subsequent layer or the application of a prime or primer-seal.

Water Curing

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

Caution

4. Under this Specification provision for curing up to the period indicated in Annexure 241A shall be the responsibility of the Contractor at cost to the Contractor

Curing Period

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**241.21 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses of this Specification are summarised in Table 241.3 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Quicklime		
	a) Available Lime	>85% Calcium Oxide content	241.07
	b) Slaking Rate	Active Slaking time < twenty minutes, and temperature rise on slaking not less than 40°C in six minutes (for an average of four samples).	241.07
	c) Particle Distribution	Fraction passing AS Sieve: 100% for 13.2mm Sieve 96-100% for 9.5mm Sieve 70-100% for 4.75mm Sieve 0-90% for 2.36mm Sieve	241.07
2.	Hydrated Lime		
	a) Available Lime	>80% Calcium Hydroxide	241.08
	b) Particle Size	<2% residue on a 300 micron Sieve	241.08
3.	Blended Stabilising Agents	Blend percentages shall not vary by more than $\pm 3\%$ from those nominated in Annexure 241A	241.11
4.	Water		
	a) Chloride ion content	<600 PPM Chloride ion	241.12
	b) Sulphate ion content	<400 PPM Sulphate ion	241.12
	c) Undissolved solids	<1 percent by mass of undissolved solids	241.12
5.	Application of Stabilising Agent		
	a) Spread Rate or Incorporation Rate for in-situ plant.	Actual spread rate shall be within $\pm 10\%$ of the nominated rate	241.14

Item	Activity	Limits/Tolerances	Spec Clause
6.	Trimming and Compaction		
	a) Surface Level	After primary trimming be within +30mm and +10mm of levels shown on Drawings	241.17 241.19(a)
		After secondary trimming be within ± 15 mm of levels shown on Drawings	
	b) Layer Thickness	Final thickness of layers shall not vary more than +20mm and -10mm of required thickness	241.17 241.19(b)
	c) Shape	Shall not deviate more than 12mm under a 3m straight edge immediately prior to first sealing	241.17 241.19(a)
7.	Joints		
	a) Longitudinal Overlap	> 75mm overlap of mixing runs	241.18
	b) Transverse Overlap	> 2m overlap of transverse joints	241.18
	c) Longitudinal Joints	Shall not be allowed within 0.5m of the centreline of a typical wheelpath	241.18
8.	Width		
	a) Width of Stabilised Layer	At any point, the width shall be not less than 50mm short of the width shown on the Drawings with an average width always greater than that shown on the Drawings	241.19(c)

Table 241.3 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**241.22 PAY ITEMS**

1. Payment shall be made for the activities associated with completing the work detailed in this Specification for on-site stabilisation in accordance with Pay Items 241(a) to 241(b) inclusive. Except that where stabilisation is provided by use of stationary plant the supply of the material including the stabilisation service and stabilising agent is measured and paid in accordance with Specification for FLEXIBLE PAVEMENTS or EARTHWORKS as appropriate for supply of the material as a pre-mix product. Supply in these circumstances includes all testing.
2. A lump sum price for any of these items shall not be accepted.
3. Supply, spread and compact subbase, or base material is measured and paid in accordance with the Specification of FLEXIBLE PAVEMENTS.
4. Supply, spread and compact select material is measured and paid in accordance with the Specification for EARTHWORKS.
5. Control of traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
6. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

Pay Item 241(a) SUPPLY AND SPREAD STABILISING AGENT (IN SITU MIXING ONLY)

1. The unit of measurement shall be the square metre.
2. The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.
3. No account shall be taken of allowable tolerances.
4. The schedule rate under this Pay Item shall include all the activities associated with the supply, delivery and spreading of the stabilising agent including testing in accordance with this Specification.

Pay Item 241(b) MIXING OF STABILISING AGENT

1. The unit of measurement shall be the square metre.
2. The area shall be determined by the length and width of work as specified on the Drawings or as directed by the Superintendent.
3. No account shall be taken of the allowable tolerances.
4. The schedule rate under this Pay Item shall include all the activities associated with the mixing of the stabilising agent with the designated materials in-situ and to the nominated depth in accordance with this Specification.

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ANNEXURE 241A
STABILISATION MIX DESIGN

Type of Stabilising Agent

Nominal Percentage of Stabilising Agent by Mass %

Spread Rate of Stabilising Agent for contractual purposes (kg/m²)

Depth of Compacted Layer to be Stabilised (mm)

Nominated Field Working Period (hrs)

Nominated Target Unconfined Compressive Strength (UCS) (7 day accelerated curing) MPa

Nominated Target CBR Value (4 day soaked) for stabilised modified subgrade %

Period for Contractor's Curing(days)

Nominated Granular Material(s)(type)

Source of Nominated Granular Material

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CITY OF GREATER DANDENONG

SPECIFICATION

242

FLEXIBLE PAVEMENTS

SPECIFICATION 242 - FLEXIBLE PAVEMENTS

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SPECIFICATION 242 : FLEXIBLE PAVEMENTS

GENERAL

242.01 SCOPE

1. The work to be executed under this Specification consists of the supply, spreading, compaction and trimming of base and subbase courses of flexible and semi-rigid (bound) pavements to the specified levels and thicknesses as shown on the Drawings.
2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality

242.02 TERMINOLOGY

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

Definitions

242.03 REFERENCE DOCUMENTS

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

**Documents
Standards Test
Methods**

(a) Council Specifications

- 241 - Stabilisation
- 244 - Sprayed Bituminous Surfacing

(b) Australian Standards

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

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- AS 1289.5.3.1 - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus.
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1289.5.8.1 - Determination of field density and field moisture content of a soil using a nuclear surface moisture - density gauge - Direct transmission mode.
- AS 1289.6.1.1 - Determination of the California bearing ratio of a soil - Standard laboratory method for a remoulded specimen.

(c) NSW RTA Test Methods

- T114 - Maximum Dry Compressive Strength of Road Materials
- T116 - Unconfined Compressive Strength - Remoulded Material
- T130 - Dry Density Moisture Relations for Mixtures of Road Materials and Cement.
- T131 - Unconfined Compressive Strength
- T160 - Benkelman Beam Deflection Test
- T171 - Modified Texas Triaxial Compression Test

242.04 PAVEMENT STRUCTURES

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

Material Types and Layer Thickness

242.05 INSPECTION, SAMPLING AND TESTING

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

Contractor's Responsibility

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

Written Notice

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

Density Tests

MATERIALS

242.06 GENERAL

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

Details of Proposed Base and Subbase to be Submitted

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

Source of Supply

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

Variations by Contractor

Contractor's

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

Cost

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

**NATA
Certificate**

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

Sampling on-site

242.07 TRAFFIC CATEGORY

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

**Pavement
Material Traffic
Category
Drawings**

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

Pavement Material Traffic Category	Description
1	Roads with design traffic equal to or exceeding 10 ⁷ equivalent standard axle (ESA) repetitions.
2a	Roads with design traffic exceeding 4 x 10 ⁶ ESAs but less than 10 ⁷ ESAs.
2b	Roads with design traffic exceeding 10 ⁶ ESAs but less than or equal to 4 x 10 ⁶ ESAs.
2c	Roads with design traffic exceeding 10 ⁵ ESAs but less than or equal to 10 ⁶ ESAs.
2d	Roads with design traffic less than or equal to 10 ⁵ ESAs.

Table 242.1 - Pavement Material Traffic Categories

242.08 UNBOUND BASE AND SUBBASE

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

**Granular
Material**

2. Unbound crushed rock materials are designated as follows:

Crushed Rock

- DGB20 20mm nominal sized densely graded base
- DGS20 20mm nominal sized densely graded subbase
- DGS40 40mm nominal sized densely graded subbase
- GMB20 20mm nominal sized graded macadam base
- GMS40 40mm nominal sized graded macadam subbase

3. Unbound natural gravel materials are designated as follows:

Natural Gravel

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

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

Material Types

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Traffic Category	Acceptable Base Material	Acceptable Subbase Material
1	DGB20, GMB20	DGS20, DGS40, GMS40
2a	DGB20, GMB20	DGS20, DGS40, GMS40
2b	DGB20, GMB20	DGS20, DGS40, GMSS40
2c	DGB20, GMB20, NGB20-2c	DGS20, DGS40, GMS40, NGS20, NGS40
2d	DGB20, GMB20, NGB20-2c, NGB20-2d	DGS20, DGS40, GMS40, NGS20, NGS40

Table 242.2 - Acceptable Pavement Material Types

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

Base

Test Method	Description	Base Material Requirements			
		DGB20	GMB20	NGB20-2c	NGB20-2d
AS1289.3.6.1	Coarse Particle Size Distribution % passing 75.0mm sieve % passing 53.0mm sieve % passing 37.5mm sieve % passing 26.5mm sieve % passing 19.0mm sieve % passing 13.2mm sieve % passing 9.5mm sieve % passing 6.7mm sieve % passing 4.75mm sieve % passing 2.36mm sieve % passing 0.425mm sieve % passing 0.075mm sieve	- - - 100 95-100 - - 50-70 - 35-55 - -	- - - 100 95-100 - - 30-55 - 20-30 - -	- - - 100 93-100 - 71-87 - 47-70 35-56 14-32 6-20	- - - 100 93-100 - 71-87 - 47-70 35-56 14-32 6-20
AS1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36mm sieve) A. Pass 425µm sieve % B. Pass 75µm sieve % Pass 425µm sieve C. Pass 13.5µm sieve % Pass 75µm sieve	35-55 35-55 35-60	30-50 30-50 -	- - -	- - -
AS1289.3.1.1	Liquid Limit (if non plastic) ∇	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plasticity Index ■	max 6	max 6	max 6	max 8
T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if Plasticity Index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper % misshapen (2 : 1)	max 35	max 35	-	-
AS 1141.22	Aggregate Wet Strength ◇ For category 1 or 2a For category 2b or 2c For category 2d	min 80 min 70 min 60	min 150 min 130 min 100	- - -	- - -
AS 1141.22	Wet/Dry Strength Variation ◇ $\frac{\text{Dry} - \text{Wet}}{\text{Dry}} \%$ For category 1 or 2a For category 2b or 2c For category 2d	max 35 max 40 max 45	max 30 max 30 max 30	- - -	- - -
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	-	-	80	60

Table 242.3 - Unbound Base Material Properties

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NOTES ON TABLE 242.3:

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

- ▼ The maximum value of the Liquid Limit may be increased to 23 for non-plastic material, provided that the value determined is not influenced by the presence of adverse constituents.
- For category 2d base materials the maximum Plasticity Index shall be 8.
- ◇ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

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

Subbase

Test Method	Description	Subbase Material Requirements				
		DGS20	DGS40	GMS40	NGS20	NGS40
AS1289.3.6.1	Coarse Particle Size Distribution % passing 75.0mm sieve % passing 53.0mm sieve % passing 37.5mm sieve % passing 26.5mm sieve % passing 19.0mm sieve % passing 13.2mm sieve % passing 9.5mm sieve % passing 6.7mm sieve % passing 4.75mm sieve % passing 2.36mm sieve % passing 0.425mm sieve % passing 0.075mm sieve	- - - 100 95-100 - - 50-70 - 35-55 - -	- 100 - - 50-85 - - 30-55 - 25-50 - -	- 100 - - 50-75 - - 15-35 - 5-15 - -	- - - 100 96-100 - 65-89 - 47-80 32-67 14-42 6-26	- 100 95-100 80-97 - - 48-85 - 35-73 25-58 10-33 3-21
AS1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36mm sieve) A. Pass 425µm sieve % B. Pass 75µm sieve % Pass 425µm sieve C. Pass 13.5µm sieve % Pass 75µm sieve	35-55 35-55 35-60	35-60 35-60 35-65	25-50 25-50 -	- - -	- - -
AS1289.3.1.1	Liquid Limit (if non plastic)	max 23	max 23	-	max 23	max 23
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	-	max 23	max 23
AS 1289.3.3.1	Plasticity Index	max 12	max 12	max 12	max 12	max 12
T114	Maximum Dry Compressive Strength on fraction passing 19mm sieve (only applies if Plasticity Index is less than 1)	min 1.0 MPa	min 1.0 MPa	-	1.0 MPa	1.0 MPa
AS 1141.14	Particle Shape by Proportional Calliper % misshapen (2 : 1)	max 35	max 35	max 35	-	-
AS 1141.22	Aggregate Wet Strength ♦	min 50kN	min 50kN	min 130kN	-	-
AS 1141.22	Wet/Dry Strength Variation ♦ Dry - Wet % Dry	max 60	max 60	max 30	-	-
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	-	-	-	30	30

Table 242.4 - Unbound Subbase Material Properties

NOTES ON TABLE 242.4:

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

- ◆ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0mm to 13.2mm and 6.7mm to 4.75mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

7. Where the proposed unbound base or subbase material complies with all of the requirements of Table 242.3 or Table 242.4 as appropriate except gradings (AS1289.3.6.1 and AS1289.3.6.3), the Contractor may propose the use of the material, subject to approval of the Superintendent, if the material complies with the RTA Modified Texas Triaxial Classification Number (T171) requirements specified in Table 242.5, (T171 tested at not less than 85 per cent of Optimum Moisture Content and 98 per cent of Maximum Dry Density as determined by AS1289.5.2.1).

**Modified
Texas Triaxial
Classification**

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

Table 242.5 - RTA Modified Texas Triaxial Classification Number Requirements

242.09 LIME MODIFIED BASE AND SUBBASE MATERIALS

1. Modification of unbound base and subbase materials to meet the requirements of Clause 242.08 by the addition of hydrated lime or quicklime shall be subject to approval by the Superintendent and to the additional requirements of this clause. After modification, the material shall meet the requirements of Clause 242.08.

**Lime
Modification**

2. Modification of materials for Traffic Categories 1, 2a and 2b shall only be by use of hydrated lime mixed in a stationary mixing plant at the supplier's quarry.

**Traffic
Categories 1,
2a, 2b**

3. Modification of materials for Traffic Categories 2c and 2d may be by the use of either hydrated lime through a stationary mixing plant or by hydrated lime or quicklime utilising in-situ operations.

**Traffic
Categories 2c,
2d**

4. Material requirements of hydrated lime and quicklime shall be in accordance with the Specification for STABILISATION.

Lime

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

Incorporation

6. In-situ operations shall be in accordance with the Specification for STABILISATION. ***In-situ Operations***
7. The proportion of lime shall be not less than 1.5 per cent nor more than 4 per cent by mass. The material prior to lime treatment shall not contain any added pozzolanic material. ***Proportion***
8. The lime treated material shall yield an unconfined compressive strength not exceeding 1.0 MPa, when tested in accordance with Test Method T116 where sampling is undertaken within 24 hours of adding the lime and testing is after 7 days accelerated curing. ***Unconfined Compressive Strength***
9. For DGB20 material, prior to being treated with lime, the material shall comply with the requirements of DGS20 in Table 242.4, except that the aggregate wet strength shall not be less than 80kN and the wet/dry strength variation shall not exceed 60 per cent. ***DGB20***
10. For DGB20, the lime treated material shall yield a CBR value of not less than 100 when tested in accordance with AS 1289.6.1.1, where sampling is undertaken within 24 hours of adding the lime and testing is after 7 days of accelerated curing. ***CBR Value***

242.10 BOUND BASE AND SUBBASE MATERIALS

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

DELIVERY, STOCKPILING AND PROCESSING OF PAVEMENT MATERIAL

242.11 DELIVERY TO SITE

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

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242.12 STOCKPILING OF UNBOUND MATERIALS

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

242.13 DELIVERY OF MODIFIED OR BOUND MATERIALS

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

SPREADING OF PAVEMENT MATERIAL**242.14 SPREADING PAVEMENT MATERIALS**

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 1. Unbound materials shall not be spread upon an underlying pavement layer which has a moisture content exceeding 90 per cent of the laboratory optimum moisture content as determined by AS 1289.5.2.1 or which has become rutted or mixed with foreign matter. The underlying layer shall be corrected to comply with this Specification before spreading of the next layer of pavement. | Underlying Layer Quality |
| 2. Where the underlying layer was constructed by the Contractor, or where the Contractor's activities caused the underlying layer constructed by others to become non-complying with this Specification, the cost of correcting the underlying layer to comply shall be borne by the Contractor. | Contractor's Costs |

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3. Each layer of material shall be deposited and spread in a concurrent operation and, after compaction, the finished surface levels on the base and subbase courses shall be within the permitted tolerances stated in Clause 242.22(c) without subsequent addition of material. The thickness of each compacted layer shall be neither less than 100mm nor more than 200mm for all pavement layer types, unless otherwise approved by the Superintendent.

Tolerances

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

Joints

5. When spread for compaction processes the moisture content of the base or subbase materials shall be in the range of 60-90 per cent of laboratory optimum moisture content in accordance with AS1289.5.2.1.

6. Bound materials shall not be spread when the ambient air temperature in shade is either below 5°C or above 35°C unless expressly approved by the Superintendent.

TRIMMING AND COMPACTION

242.15 GENERAL REQUIREMENTS

1. Each layer of the base and subbase courses shall be uniformly compacted over its entire area and depth to satisfy the requirements of relative compaction set out in Clauses 242.19 and 242.20.

**Uniform
Compaction**

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

**Compaction
Procedure**

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

**Hand Operated
Plant**

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

**Plant
Movement
Restrictions**

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

**Unstable
Areas
Contractor's
Cost**

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

**Placing
Subsequent
Layers**

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

**Excessive
Moisture
Content**

242.16 CURING OF BOUND MATERIALS

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

Commence-

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completed.

ment Time

2. The stabilised work shall be protected against rapid drying out by keeping it continuously wet or damp during the period prior to the provision of a subsequent layer or the application of a prime or primer-seal.

Water Curing

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

Caution

ACCEPTANCE OF COMPACTED LAYERS

242.17 LOTS FOR ACCEPTANCE

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

Lot Requirements

- (a) cover only a single layer of work which has been constructed under uniform conditions in a continuous operation and not crossing any transverse construction joints;
- (b) for unbound materials it may equal a day's output using the same material.

242.18 COMPACTION ASSESSMENT

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

Density Testing

2. The Contractor shall arrange for testing to assess compaction on the basis of ten tests per 5000 sq m with a minimum of three (3) tests per lot, and present the results to the Superintendent for approval. Sampling frequency may only be varied with prior written approval of the Superintendent.

Sampling

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

Contractor's Costs

4. Alternatively, when agreed by the Principal, acceptance of lots may be determined according to the elastic rebound deflection. The elastic rebound deflection shall be taken as the maximum deflection in accordance with RTA Test Method T160 utilising the Benkelman Beam or equivalent. The average maximum deflection for any lot shall not exceed 1.0mm, and the co-efficient of variation (CV) in recorded deflections shall not exceed 30 per cent. Measurements shall be taken at the rate of 4 per 1000 square metres, with a minimum of ten measurements per lot.

Benkelman Beam Testing

242.19 RELATIVE COMPACTION

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

Calculation

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

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

2. The Superintendent may approve some or all of the in-situ dry density testing to be carried out with a single probe Nuclear Density Meter in the direct transmission mode

In-Situ Dry Density

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in accordance with AS 1289.5.8.1.

Testing

3. Each day that material is produced for placement in a layer or layers, a sample of the material shall be taken by the Contractor for maximum dry density testing to represent that day's production.

Daily Samples

4. For unbound layers, the sample shall be tested in accordance with AS 1289.5.2.1 to determine the maximum dry density (modified compactive effort) for the material.

Maximum Dry Density

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

Time for Testing

6. The maximum dry density so determined shall be used as the comparative dry density in relative compaction calculations for all like material from that lot or day's production placed in a single layer of work, whichever is the lesser.

Comparative Dry Density

242.20 COMPACTION REQUIREMENTS AND ACCEPTANCE

1. A lot shall be accepted for compaction if:

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

2. Lots or areas of pavement not achieving these specified values shall be rejected. Unbound layers may be reworked as provided by Clause 242.21, but the bound materials in rejected layers/courses shall be removed and replaced with fresh materials in accordance with Clause 242.24 unless an alternative disposition is approved by the Superintendent.

Rejection of Lots

242.21 REWORKING OF REJECTED UNBOUND LAYERS

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

Reworking

2. Material that has become degraded, segregated or otherwise reduced in quality by reworking shall be rejected. The rejected material shall be removed, disposed of and replaced with fresh material complying with this Specification in accordance with Clause 242.24. When a lot or area of pavement is resubmitted for compaction assessment, testing shall be carried out in accordance with Clauses 242.18 and 242.19.

Rejected Material

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

Contractor's Costs

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242.22 TOLERANCES**(a) General**

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

Tolerances

2. Areas for assessment of conformity with tolerance requirements shall be divided into lots and presented to the Superintendent together with survey reports covering line and level.

Lots for Assessment of Conformity**(b) Width**

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

Horizontal Dimensions

2. The average width of the layer determined from measurements at three sites selected at random by the Superintendent over any 200 metre road length, or part thereof, shall be not less than the specified width.

Average Width**(c) Levels and Surface Trim**

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

Subbase Surface Level

2. Level tolerances at the top of the unbound base course shall not exceed those stated above for subbase. In addition, where kerb and channel exists or is being constructed, the level of the top of the base course adjacent to the kerb and channel shall not vary by more than ± 5 mm from the lip level of the channel minus the design thickness of the wearing surface.

Base Surface Level

3. The design level of the top of the subbase course shall be determined from the design level of the finished road surface less the thickness of the base course and the wearing course, including an allowance for any flush seal layer in the pavement design.

Subbase Design Level

4. The pavement surface after trimming and immediately prior to sealing shall be of a quality such that the deviation under a 3 metre straight edge placed in any direction does not exceed 12mm. Measurements for conformance shall be taken in accordance with the maximum lot size and minimum test frequencies in the Specification Part for Quality Requirements.

Straight Edge Deviation**242.23 ACTION ON REJECTION****(a) Unbound Materials**

1. A lot that has not complied with the requirements for width or level tolerance as set out in Clauses 242.22(b) and 242.22(c) respectively shall be rejected except as otherwise provided in this Clause. Rejected lots shall be removed, disposed of and replaced with fresh material in accordance with Clause 242.24.

Rejection Criteria

2. Notwithstanding the above, where the rejected lot can be corrected by further trimming, the Superintendent may allow the surface to be corrected without complete removal and replacement with fresh material. Such trimming shall be undertaken in a manner that produces a uniform, hard surface and shall be achieved by cutting only without filling. After any such cutting, the level tolerances in Clause 242.22(c) shall apply.

Corrective Action

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3. The cost of surface correction or replacement work ordered in accordance with this Clause including removal of material, disposal and supply and transport of replacement material, shall be borne by the Contractor.

Contractor's Costs

(b) Bound Materials

1. An area of bound material that has not complied with the requirements for width or level tolerance as set out in Clauses 242.22(b) and 242.22(c) respectively shall be rejected except as otherwise provided for in this Clause. Rejected areas shall be removed, disposed of and replaced with fresh material in accordance with Clause 242.24.

Rejection Criteria

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

Contractor's Costs

3. Notwithstanding the above, the Superintendent may allow the Contractor to rectify the area in the following cases:

Corrective Action Circumstances

(i) Where the cause for rejection is under Clause 242.22(c), the course is a subbase course and rejection is due to departures from design level being too far below the design level, the Contractor may increase the thickness of the base course to make up such deficiency in thickness.

(ii) Where the cause for rejection is under Clause 242.22(c), the course is a subbase course and rejection is due to departures from design level being too far above the design level, the Contractor may propose a regrading of the design level of the base course, to allow for its design thickness to be laid, up to a maximum of 20mm above the original design level. Approval by the Superintendent shall be subject to the following requirements:

- The rate of change of grade from the original finished design surface level shall be less than 3mm per metre.
- The regrading shall not interfere with the proper design functioning of the drainage system.
- The regrading shall not interfere with levels at the property boundary, or increase or decrease footpath or footpath crossover levels or grades beyond Council's allowable design limits.
- The regrading shall not interfere with clearances.

(iii) Where the cause for rejection is under Clause 242.22(c), the course is a base course and rejection is due to departures from design level being too far above the design level, the Contractor may propose a regrading of the design level of the base course. Approval by the Superintendent shall be subject to the requirements of this Clause in (ii) above.

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

Contractor's Costs

242.24 REMOVAL AND REPLACEMENT OF REJECTED COURSES

1. Sections of the work that have been rejected shall be removed from the work and replaced with fresh material. Rejected material shall be removed from site.

Rejected Material

2. In rejected sections the material shall be removed over the full length of the rejected lot, except that a minimum length of 50m of pavement layer shall be removed and replaced. Any damage to underlying or abutting layers or structures shall be made good by the Contractor using methods approved by the Superintendent.

Length to be Removed

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3. The Superintendent may approve removal for less than the full width as constructed if the cause of the rejection of the work can be isolated transversely to the Superintendent's satisfaction. In this case, the new longitudinal cold joint shall be formed and located along the centreline of the road pavement.

Superintendent's Discretion

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

Inspection Before Replacement

5. Materials used as replacement materials, and the subsequent spreading, compaction, trimming, curing and testing of the replacement materials, shall comply with the requirements of this Specification.

Replacement Material

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

Contractor's Costs

242.25 MAINTENANCE BEFORE COMPLETION OF WEARING SURFACE

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

Primerseal

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

HP

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

Contractor's Cost

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

Surface Drainage

OPENING PAVEMENT TO TRAFFIC

242.26 GENERAL REQUIREMENTS

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

Restrictions on Movement

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

Restrictions on Movement of Construction Traffic

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

Open to Traffic Bound Pavement

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

***Surface
Drainage***

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**242.27 SUMMARY OF LIMITS AND TOLERANCES**

The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 242.6 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Stockpile Sites	(i) Relative Compaction > 95% (ii) Stockpile height < 3m (iii) Stockpile batter < 1.5:1 and > 3:1	242.12 242.12
2.	Spreading Pavement Materials		
	(i) Compacted Layer Thickness	≥ 100mm, ≤ 200mm	242.14
3.	Compaction Acceptance		
	Minimum value of all calculated relative compaction results	≥ 97 per cent (modified compactive effort). For bound pavements may accept between 92% and 97% provided it represents less than 5% of the area.	242.20
4.	Width of Pavement		
	(i) Design centre-line to edge of constructed pavement	-50mm to +300mm of dimensions on Drawings	242.22(b)
	(ii) Average Width	The average width determined from 3 random sites over any 200m road length, or part thereof, shall be not less than the specified width.	242.22(b)
5.	Surface Level		
	(i) Subbase levels	<± 10mm from design level	242.22(c)
	(ii) Base levels	<± 10mm from design level	242.22(c)
	(iii) Base levels adjacent to Kerb and Channel	<±5mm from the lip levels of adjacent gutter minus design thickness of wearing surface.	242.22(c)
	(iv) Shape	Deviation from a 3m long straightedge on base surface immediately prior to sealing shall be less than 12mm	242.22(c)

Table 242.6 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**242.28 PAY ITEMS**

1. Payment shall be made for the activities associated with completing the work detailed in this Specification in accordance with Pay Items 242(a) to 242(b) inclusive.

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

3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Base course primerseal is measured and paid in accordance with the Specification for SPRAYED BITUMINOUS SURFACING.

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

1. The unit of measurement shall be the square metre.

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

3. No account shall be taken of allowable tolerances.

4. The schedule rate under this Pay Item shall include all the activities associated with the supply, spread, compaction, trimming, jointing, and testing of the subbase course, and curing of bound material.

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

1. The unit of measurement shall be the square metre.

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

3. No account shall be taken of the allowable tolerances.

4. The schedule rate under this Pay Item shall include all the activities associated with the supply, spread, compaction, trimming, jointing, and testing of the base course, and curing of bound material.

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CITY OF GREATER DANDENONG
SPECIFICATION

243

BITUMINOUS COLD MIX

SPECIFICATION 243 - BITUMINOUS COLD MIX

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SPECIFICATION 243 : BITUMINOUS COLD MIX**GENERAL****243.01 SCOPE**

1. The work to be executed under this Specification consists of design, production and delivery of "hot mixed - cold laid plant mix" (hereinafter referred to as "cold mix") and includes supply of materials, sampling, testing and any other operations necessary to provide the conforming product. This specification unless amended applies to dense graded cold mix of nominal sizes 7, 10 or 14mm.

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

Quality**243.02 REFERENCE DOCUMENTS**

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

(a) Australian Standards

AS 1141.11	-	Particle size distribution by sieving.
AS 1141.15	-	Flakiness index.
AS 1141.18	-	Crushed particles in coarse aggregate derived from gravel.
AS 1141.22	-	Wet/dry strength variation
AS 2008	-	Residual bitumen for pavements.
AS 2157	-	Cutback bitumen.
AS 2357	-	Mineral fillers for asphalt.
AS 2758.5	-	Asphalt aggregates.
AS 2891.3.1	-	Bitumen content and aggregate grading, Reflux method
AS 3568	-	Oil for reducing the viscosity of residual bitumen for pavements.
AS 4283	-	Cold mix asphalt for maintenance patching.

MATERIALS**243.03 AGGREGATES**

1. Aggregates shall be of uniform quality and grading. Aggregates complying with the requirements of this Clause when combined with the mineral filler shall be capable of achieving the properties required by this Specification.

Uniformity**(a) Coarse Aggregate**

1. Coarse aggregate comprises all mineral matter retained on the 4.75mm AS sieve. Coarse aggregate shall consist of clean, dry, hard, tough and sound crushed rock, metallurgical slag or gravel, be of uniform quality and be free from dust, clay, dirt or other matter deleterious to asphalt. All coarse aggregate shall comply with AS 2758.5.

Quality

2. The grading of the coarse aggregate used in the work shall be determined in accordance with AS 1141.11.

Grading

3. When submitting details of the nominated mix the Contractor shall submit to the Superintendent NATA Certified Laboratory Test Reports on the quality and grading of the coarse aggregate proposed to be used. Such test results shall be less than 12 months old and representative of current aggregate supply. The grading shall be known as the

NATA Reports

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"Proposed Grading".

4. If the Contractor proposes to blend two or more coarse aggregates to provide the Proposed Grading then test reports for each constituent material shall be submitted separately and the Superintendent advised of the proportions in which the various sizes and constituents are to be combined. The coarse aggregate from each source shall comply with the following requirements:

Test Requirements

(a) Wet Strength - AS 1141.22

Shall be not less than 100kN for any source except the wet strength required for any fraction of open graded asphalt shall not be less than 150kN.

(b) Wet/Dry Strength Variation - AS 1141.22

Shall not exceed 35 per cent for any fraction or constituent.

(c) Flakiness Index - AS 1141.15

The flakiness index of the aggregate shall not exceed 35.

(d) Fractured Faces - AS 1141.18

The fraction of aggregate retained on a 4.75mm A5 Sieve shall comprise at least 75% by weight of particles with at least two fractured faces.

(b) Fine Aggregate

1. Fine aggregate comprises all mineral matter (other than filler) passing the 4.75mm AS sieve. It shall consist of clean, hard, tough and sound grains, free of coatings or loose particles of clay, silt or other matter deleterious to asphalt. The fine aggregate shall consist of natural sand or a mixture of natural sand and material derived from the crushing of sound stone or gravel.

Quality

2. The grading of the fine aggregate used in the work shall be determined in accordance with AS1141.11.

Grading

3. When submitting details of the nominated mix the Contractor shall submit to the Superintendent a NATA Certified Laboratory Test Report on the quality and grading of the fine aggregate proposed to be used. Such test results shall be less than 12 months old and representative of current aggregate supply. The grading shall be known as the "Proposed Grading".

NATA Reports

4. If the Contractor proposes to blend two or more fine aggregates to provide the Proposed Grading then test reports for each constituent material shall be submitted separately and the Superintendent advised of the proportions in which the various sizes and constituents are to be combined.

Test Requirements

243.04 MINERAL FILLER

1. Mineral filler may consist of hydrated lime, fly ash, portland cement, flue dust from the manufacture of portland cement, asphalt plant baghouse fines or other material approved by the Superintendent.

Constituents

2. The mineral filler shall comply in all other respects with the requirements of AS 2357.

Voids

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243.05 BINDER

1. The binder shall be Class 170 or Class 320 bitumen. The residual bitumen shall be homogeneous, contain no inorganic mineral matter other than that naturally occurring.
2. The bitumen used in the works shall comply with AS 2008.
3. Subsequent to the introduction of fluxing oil or cutting oil all cutback bitumen shall comply with the requirements of AS 2157.

Bitumen**243.06 FLUX OIL AND CUTTER OIL**

1. The flux oil and cutter oil to be used for reducing the viscosity of the binder and retaining the cold mix in a workable condition shall conform to AS 3568 in addition to the following requirements.
 - (a) It shall be clean and free from water.
 - (b) When one part by volume of oil is mixed with four parts by volume of bitumen at a temperature of 177°C the mixture shall be homogeneous and shall not foam.

243.07 BITUMEN ADHESION AGENT

1. A bitumen adhesion agent shall be added, if required, to the binder at one per cent by mass when nominated by the Superintendent based on experience with asphalts incorporating aggregates from the same source. Details of the proposed bitumen adhesion agent shall be submitted for the Superintendent's approval in accordance with Clause 243.08. The bitumen adhesion agent shall be used in a manner compatible with the manufacturer's recommendations.

Use and Test Requirements**MIX DESIGN****243.08 NOMINATED MIX**

1. The Contractor shall design the mix, henceforth called the "nominated mix", within the limits shown in Table 243.1 unless otherwise approved by the Superintendent.
2. The Contractor shall provide a Certificate from a laboratory with appropriate NATA registration stating that each nominated mix and its constituents meet the requirements of this Specification. All relevant test results shall accompany the Certificate. All phases of any particular test must be performed at one laboratory unless otherwise approved by the Superintendent. The Certificate shall confirm that the required testing has been carried out within the twelve month period before the date of submission to the Superintendent.
3. Details of the nominated mix shall be submitted to the Superintendent at least twenty one days before first delivery of the cold mix. The nominated mix information shall include combined aggregate grading and binder content, proportions of constituent materials used (including adhesion agent), gradings of aggregate and filler, and type and sources of aggregates, filler, binder and adhesion agent.
4. If any revision is necessary, then the costs associated with revision of the nominated mix and testing of the revised nominated mix in accordance with Clause 243.08 shall be borne by the Contractor.

Nominated Mix***Details******Revised Mix***

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Property AS Sieve	Requirement for nominal mix size Aggregate % by mass passing			Test Method
	7mm	10mm	14mm	
19.0mm	100	100	100	AS 1141.11
13.2 mm	100	100	95-100	
9.50 mm	100	90-100	70-85	
6.70 mm	90-100	70-85	57-74	
4.75 mm	70-90	55-70	45-65	
2.36 mm	45-60	35-50	28-45	
1.18 mm	26-45	22-38	15-30	
600 µm	15-30	12-27	10-23	
300 µm	10-20	6-16	5-17	
150 µm	4-14	4-11	3-11	
75 µm	3-8	2-6	2-5	
Filler	0.5-1.0	0.5-1.0	0.5-1.0	
Binder content (% by mass of total mix)*	4.5-6.0	4.0-5.5	4.0-5.0	
Medium Flux oil (%) in binder	10-20	10-20	10-20	

NOTE: * Some increase beyond these ranges of binder may be permitted for aggregates having unusually high absorption characteristic. Such departures will require Superintendent's approval.

Table 243.1 - Limits for Design of Nominated Mix

243.09 APPROVED MIX

1. When a nominated mix has been approved by the Superintendent it shall be known as the "Approved Mix". Work shall not commence until cold mix design has been approved. Superintendent's approval of specific nominated mixes or previously approved mixes (Clause 243.09 para 3) constitutes a **HOLD POINT** for use of those mixes. The Superintendent will recognise AS 4283 as a reference in determining approval of the nominated mix.

Approval**HP**

2. The Contractor shall not make any changes to the Approved Mix, or constituent materials without the prior written approval of the Superintendent. If any such change is proposed, then the Contractor shall provide details of the nominated mix and materials, in accordance with Clause 243.08.

**Contractor's
Responsibility**

3. If the Contractor's nominated mix has received prior approval under a separate contract with the Principal within twelve months before the proposed date of initial delivery under this contract, then provided that:

Prior Approval

- (a) the Contractor produces documentary evidence and full details of the previously approved mix supplied under a specification which required the same standard of materials and product as this Specification;
- (b) the constituent materials and their quality remain unchanged from that previously approved; and

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- (c) the in-service performance of the asphalt incorporating the nominated mix has proved acceptable to the Principal;

the Superintendent may approve the nominated mix without requiring the prior-testing of samples by the Contractor at a NATA registered laboratory, but may require samples to be tested in accordance with Clause 243.08 at any time during the course of the contract.

4. Notwithstanding any approval given by the Superintendent to a proposed asphalt mix, the Contractor shall be responsible for producing the cold mix which satisfies all requirements of the Specification.

**Contractor's
Responsibility**

243.10 REQUIREMENTS OF PRODUCTION MIX

1. The cold mix produced in the plant and delivered to the site shall be known as the 'production mix'.

2. Fluxing shall be carried out prior to the addition of the binder to the mix by adding the required amount of cold flux oil and cutter oil to the hot bitumen.

Fluxing

3. The amount of flux oil and cutter oil added shall be varied according to the season as agreed between the Contractor and the Superintendent based on local experience..

Flux oil

4. The grading of the total mineral aggregate in the mix produced shall not vary from the approved mix design figures by more than the following amounts:-

**Grading
Variations**

Sieve Size	Allowable variation from nominated mix gradings (% Passing)
4.75mm and larger	± 7%
1.18mm and 2.36mm	± 5%
0.600 and 0.300mm	± 4%
Other sizes	± 2.5%

5. The binder content shall not vary from the approved mix by more than ± 0.3%.

**Binder
Variation**

243.11 NON-COMPLYING PRODUCTION COLD MIX

1. Mixes not complying with this Specification may be rejected. Consideration may be given by the Superintendent to the acceptance of the material at an agreed reduced payment..

243.12 MIXING PROCEDURE

(a) Plant

1. Mixing, shall be undertaken in a suitable plant nominated at tender and approved by the Superintendent, capable of uniformly mixing the coarse and fine aggregate and binder to meet the specified requirements.

Plant

(b) Mixing Time and Temperature

1. Mixing time and temperature shall be such that all particles of the mineral aggregate are uniformly coated with binder.

Time

(c) Storage of Mix

1. If stored by the contractor prior to delivery, the mix shall be stored under cover from the weather and on a concrete or asphalt slab.

Storage

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2. The stockpile site shall be in a free draining area not susceptible to ponding of water due to precipitation.

3. Stockpiles shall be constructed in such a manner that no compaction, other than by the weight of the material itself, will result. No equipment of any kind shall be run over the surface of the stockpile. All stockpiles are to remain covered and protected from precipitation and excess evaporation of incorporated oils.

Stockpiling

4. Storage of the mix by the Contractor prior to delivery is limited to a period of 2 weeks.

243.13 SAMPLING AND TESTING OF PRODUCTION MIX

(a) Responsibility for Sampling

1. The Contractor shall be responsible for taking samples and shall supply all facilities, equipment and labour for that purpose. The costs associated with taking samples of production mix shall be borne by the Contractor.

**Contractor's
Responsibility**

(b) Frequency of Sampling

1. For the purpose of testing production mix, samples shall be taken at the rate of one sample for each production lot or days production whichever is the lesser. Sampling shall be in accordance with AS 2891.1.

Frequency

(c) Testing of Mix

1. The Contractor shall maintain and operate a testing laboratory with appropriate NATA registration at, or near, the mixing plant so as to ensure complete control over the mixture produced. Conformance reports shall be provided promptly to the Superintendent, if requested. The cost of testing shall be borne by the Contractor.

Testing**Costs**

243.14 PERFORMANCE PROPERTIES OF THE MIX

1. The manufactured material shall be cohesive and capable of being compacted readily into a semi-dense mass which is resistant to the destructive action of traffic. When compacted, visual examination of the compacted material shall indicate good mechanical interlock of particles which are fully coated with binder.

**Mix
Requirements**

243.15 TRANSPORT

1. The bodies of haulage trucks shall be kept clean and coated with a thin film of an approved release agent to prevent asphalt sticking to the body of the truck. Any surplus release agent shall be removed before loading.

Release Agent

2. Unless other means of measurement are approved by the Superintendent, the mass of all truck-loads of cold mix shall be measured on a registered weighbridge.

Weighbridge

243.16 DELIVERY

1. Unless otherwise specially requested, deliveries shall reach the site of the work between the hours of 7.30am and 3.30pm Mondays to Fridays inclusive. As much preliminary notice as possible will be given before the first deliveries are required, and thereafter advice of delivery requirements for particular locations will be given not later than 10.00am on the day preceding the delivery. The Contractor shall comply with all reasonable delivery instructions meeting these guidelines.

Times

2. The Principal reserves the right to cancel deliveries other than loads premixed actually being mixed or in transit.

Cancellation

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SPECIAL REQUIREMENTS**MEASUREMENT AND PAYMENT****243.17 PAY ITEMS**

1. Payment shall be made for all activities associated with completing the work detailed in this Specification in accordance with Pay Items 243(a) and 243(b) inclusive.

2. The quantities shown in the Schedule of Rates are estimated total requirements and are not to be taken as actual or correct for the period of contract.

Pay Item 243(a) SUPPLY COLD MIX (EX BINS)

1. The unit of measurement shall be the tonne.

2. The quantity shall be determined from weighbridge docketts at the plant, unless an alternative measurement is approved by the Superintendent.

Pay Item 243(b) SUPPLY AND DELIVER COLD MIX

243(b)(1) (Depot Site 1)
 243(b)(2) (Depot Site 2)
 243(b)(3) _____ (job site)

1. The unit of measurement shall be the tonne.

2. The quantity shall be determined from weighbridge docketts.

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CITY OF GREATER DANDENONG

SPECIFICATION

244

**SPRAYED
BITUMINOUS SURFACING**

SPECIFICATION 244 - SPRAYED BITUMINOUS SURFACING

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ANNEXURES

244.A DETAILS OF WORK

244.B BINDER DETAILS

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SPECIFICATION 244 : SPRAYED BITUMINOUS SURFACING**GENERAL****244.01 SCOPE**

1. The work to be executed under this Specification consists of the supply of all materials and the application of any or all of the following types of sprayed bituminous surfacing as required under the Contract:

(a) Prime

The application of a primer of field or refinery prepared cutback bitumen without aggregate to provide penetration of the surface (preferably from 5 to 10 mm) and waterproofing.

(b) Primerseal

The application of a primerbinder of field or refinery prepared cutback bitumen to provide surface penetration (preferably from 2mm to 5mm) and incorporation of a light cover of aggregate to provide a temporary wearing surface.

(c) Seal or Reseal

The application of a bituminous binder into which aggregate is incorporated to provide a durable wearing surface.

NOTE: This Specification does not include bituminous emulsion seals or polymer-modified seals.

2. The locations and required types of sprayed bituminous surfacings, including types of binders and aggregate sizes, shall be as shown on the Drawings and/or as detailed in Annexure 244.A.

3. For multiple application treatments, the binder and aggregate may be required to be laid in one or more separate applications indicated in Annexure 244.A.

4. Requirements for adhesion agent in the bitumen and tolerances for binder application rates are set out in Annexure 244.B.

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

Quality**244.02 REFERENCE DOCUMENTS**

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

**Documents
Standard Test
Methods****(a) Council Specifications**

201 - Control of Traffic

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(b) Australian Standards

- AS 1160 - Bituminous emulsion for the construction and maintenance of pavements.
- AS 2008 - Residual bitumen for pavements.
- AS 2157 - Cutback bitumen.
- AS 2758.2 - Aggregate for sprayed bituminous surfacing.
- AS 3568 - Oils for reducing the viscosity of bitumen for pavements.

(c) Victorian State Legislation

Country Fire Authority Act, 1958
Local Government Act, 1989

(d) Other

AUSTROADS - Design of Sprayed Seals (1990)
AUSTROADS - Bitumen Sealing Safety Guide (1996)

244.03 CONTROL OF TRAFFIC

1. The Contractor shall provide for control of traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC while undertaking the work and shall take all necessary precautions to protect the work from damage until such time as the new seal coat has developed sufficient strength to carry normal traffic without disturbance of the aggregate.

**Contractor's
Responsibility**

2. Where early use of the new seal is required to facilitate the movement of traffic, vehicles may be allowed to run on the work after initial rolling has taken place provided that vehicles are controlled to such slow speeds that no lateral displacement of aggregate occurs. Where necessary, the Contractor shall use patrol vehicles to ensure that traffic travels at an acceptable speed.

Speed Control

3. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work. Where adequate detours or side tracks are included in the Contract or are otherwise available, traffic shall be temporarily diverted while the work is in progress.

**Minimise
Traffic Delays**

4. If facilities for the diversion of traffic are not available, the Contractor may spray part width of the pavement in the one operation and make available to traffic the adjacent strip of roadway, except during the actual spraying operation when all traffic movement through the work shall cease. Traffic shall not be permitted to encroach upon the edge of the sprayed bituminous material until such time as it is covered with aggregate.

**Part Width
Spraying**

MATERIALS**244.04 SAMPLING AND TESTING OF MATERIALS**

1. Sampling and testing of materials shall be arranged by the Contractor and carried out by a laboratory with appropriate NATA registration in accordance with the relevant material specifications cited in this Specification.

**NATA
Registration**

244.05 BITUMINOUS MATERIALS AND ADDITIVES**(a) Bituminous Materials**

1. Bitumen shall conform to AS2008 - Residual Bitumen for Pavements. The binder

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for seals and reseals shall be Class 170 or class 320 bitumen.

(b) Refinery Cutback Bitumen

1. Refinery cutback bitumen shall conform to AS2157.

***Cutback
Bitumen***

(c) Bituminous Emulsions

1. Bituminous emulsion shall conform to AS 1160.

Emulsion

244.06 AGGREGATE PRECOATING AGENT AND BITUMEN ADHESION AGENT

1. Aggregate precoating agents shall be approved by the Superintendent prior to use.
2. Bitumen adhesion agents shall be approved by the Superintendent prior to use.

***Precoating
Agent***

***Adhesion
Agent***

244.07 OILS FOR REDUCING VISCOSITY OF BITUMEN

(a) Cutter Oil

1. Cutter oil shall conform to the requirements of AS 3568, displaying an Abel flash point of not less than 38°C and a viscosity at 40°C not greater than 2.0 millipascal seconds, with the following qualifications to the properties for its classification as set down in AS 3568 Table 1:

***Cutter
Specification***

- (i) Either "Aniline point" or "Aromatic content" is acceptable.
- (ii) There shall be no "Density" requirement.
- (iii) The presence of water, assessed visually as an immiscible phase in any sample of the material, shall be grounds for its rejection.
- (iv) If the viscosity is calculated by the equation given in Table 1, Note 3 of AS 3568, "f" shall be taken to be 0.0009 per °C.

2. Delivery and storage procedures for cutter oil delivered in drums or in bulk shall ensure that all containers are free from any deleterious material prior to filling with cutter oil, and all drums are stored so as to ensure that entry of water through seals or welds in the drums is prevented.

***Delivery &
Storage***

244.08 AGGREGATE

1. Aggregate shall conform to AS2758.2.
2. The Contractor shall obtain test results for each lot/stockpile of aggregate and certification of compliance with AS2758.2 from a laboratory with appropriate NATA accreditation, before aggregate from the lot is incorporated in the Works.

Specification

***Test
Requirements***

DESIGN OF BITUMINOUS SURFACING

244.09 GENERAL

1. At least 15 days before commencing sprayed bituminous surfacing work, the Contractor shall submit to the Superintendent for approval, details of the proposed bituminous surfacing design for the work together with a certification that the nominated materials for the work meet the requirements of the Specification.

***Proposed
Design***

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2. The Contractor's design rates of application of binder and aggregate for bituminous surfacing shall be in accordance with the AUSTROADS design procedure for Sprayed Seals and shall submit these design details to the Superintendent. Design application rates shall be known as "nominated application rates" and materials as "nominated materials".

**AUSTROADS
Design
Procedure**

3. The following additional details are required to be submitted with the proposed bituminous surfacing design.

**Additional
Information
Sought**

- (a) Test results for all nominated materials.
- (b) Aggregates - source, geological type, nominated grading, average least dimension (ALD)
- (c) Precoating agent and bitumen adhesion agent - types, proportions and manufacturer (if applicable).
- (d) Bitumen - refinery source and certification of compliance with AS 2008.
- (e) Cutback bitumen - refinery source of bitumen, type of cutter, source of cutter, cutter oil fraction, certification of compliance with AS 2157.
- (f) Bitumen emulsion - refinery source of bitumen and proprietary product description in conjunction with certification of compliance with AS 1160 and nominated of type and grade (eg CRS).

4. Submission of the aforementioned documentation by Contractor shall constitute a **HOLD POINT**. Approval of details shall be granted by the Superintendent prior to release of the hold point.

HP

PRECOATING OF AGGREGATE

244.10 GENERAL

1. The aggregate precoating agent shall be applied to the aggregate in a manner and at a rate and time which will provide a complete, light, uniform, effective cover of all aggregate particles at the time of spreading.

Application

2. Precoating of aggregate shall not be carried out when rain is imminent. If aggregate has been precoated and rain appears imminent, the aggregate shall be adequately covered to prevent the precoating material being washed from the aggregate particles.

**Weather
Conditions**

3. The Contractor shall take precautions, such as covering stockpiles, to prevent settlement of dust, penetration of moisture or drying out of the precoating agent on the stockpiled aggregate.

**Cover for
Stockpiles**

4. Stockpiles precoated more than 7 days in advance of use shall be retreated unless otherwise approved by the Superintendent.

**Age of
Precoating**

APPLICATION OF SPRAYED BITUMINOUS SURFACING

244.11 GENERAL

1. The Contractor shall carry out sprayed bituminous surfacing so as to:

Work Quality

- (a) provide a uniform application of binder with adequate adhesion to the underlying surface;

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- (b) provide a complete cover of interlocking aggregate particles, and
- (c) achieve effective bond between binder and aggregate.

2. Details of equipment and methods to be used for sprayed bituminous surfacing shall be submitted to the Superintendent for approval prior to their use on the Works.

**Equipment
and Methods**

244.12 PLANT

1. A mechanical sprayer shall be used to apply primer, primerbinder and binder. The sprayer shall have a current certification approved by the relevant State VicRoads.

**Sprayer
Certification**

2. The spray nozzles shall be of the make and type endorsed on the Sprayer Certificate. Any nozzles which may be damaged or become unduly worn or defective shall be replaced by satisfactory nozzles of similar type. A sufficient number of nozzles for this purpose shall be available at all times.

Spray Nozzles

3. Mechanical spreading equipment shall be used to spread aggregate and shall be capable of achieving a uniform and accurate spreading rate.

**Aggregate
Spreader**

4. Rollers shall be utilised in accordance with Clause 244.19.

Rollers

5. The Contractor shall remove from the site any plant or equipment considered by the Superintendent to be not fully operational or not in a satisfactory condition for carrying out work in accordance with this Specification.

**Faulty
Equipment**

244.13 PREPARATION OF PAVEMENT SURFACE

1. Before the application of primer, primerbinder or binder, the pavement surface shall be swept by the use of a mechanically-operated rotary road broom or suction broom to provide a uniformly clean surface. If necessary, additional sweeping shall be done by hand, using stiff brooms. Sweeping shall, where possible, extend at least 300 mm beyond each edge of the area to be sprayed.

**Pavement
Sweeping**

2. Adherent patches of foreign material shall be removed from the surface of the pavement.

**Foreign Matter
on Pavement**

3. For the spraying of primer or primerbinder, the pavement surface shall be slightly damp so as to impede dust interfering with initial adhesion except where explicit instructions are provided with the seal design or issued by the Superintendent.

**Damp
Pavement**

244.14 REVIEW OF NOMINATED APPLICATION RATES

1. The Contractor shall select the locations where each lot of aggregate is to be incorporated in the Works.

**Aggregate
Lots**

2. The Contractor shall review the bituminous surfacing design at each location based on the actual average least dimension (ALD) test result for the lot of aggregate instead of the nominated ALD value of the aggregate adopted at design submission. The revised application rates shall be known as "target application rates".

**Target
Application
Rates**

3. The Contractor shall give the Superintendent at least five working days notice of the Contractor's intention to commence sprayed bituminous surfacing. This notice shall confirm spray rates, aggregate size and ALD. This action constitutes a **HOLD POINT**. The Superintendent's approval to proceed shall be required for release of this hold point.

HP

244.15 BITUMEN TEMPERATURE REQUIREMENTS

1. Bituminous products shall be handled in accordance with the AUSTROADS "Bitumen Sealing Safety Guide". Precautions set out in the following paragraphs are

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provided for ready reference however, all procedures shall follow the guidelines set out in the "Bitumen Sealing Safety Guide".

2. Bitumen shall be within the temperature range shown in Table 244.1 when mixed with cutter oil.

***Incorporated
with Cutter Oil***

Class	Temperature Range (°C)
170	160 - 190
320	170 - 200

Table 244.1 - Bitumen Temperatures

3. Refinery cutback bitumen shall be within the temperature range shown in Table 244.2 at the time of spraying.

***Spraying
Temperature***

Grade	Temperature Range (°C)
AMC 00	10 - 35
AMC 0	35 - 55
AMC 1	60 - 80
AMC 2	75 - 100
AMC 3	95 - 115
AMC 4	110 - 135
AMC 5	120 - 150
AMC 6	135 - 160
AMC 7	150 - 175

Table 244.2 - Cutback Bitumen Spraying Temperatures

4. The Contractor shall measure and record the temperature of the binder, using a thermometer, which is accurate to within 2.5 per cent of the correct temperature.

***Measurement
of
Temperature***

5. If the temperature of the bituminous material is below the applicable lower limit from Table 244.1 or Table 244.2, the bituminous material may be heated provided safe heating practices are adopted. Burners shall not be used unless the level of the material in the heating tank is at least 250mm above the tops of the heating tubes. The Contractor shall comply with the statutory requirements of the Country Fire Authority and the Local Government Acts. Two or more suitable fully-charged pressurised chemical fire extinguishers shall be placed conveniently to the heaters at all times while heating is in progress.

***Safe Heating
Practices***

6. During heating, the temperature of the bituminous material shall not exceed the applicable upper limit from Table 244.1 or Table 244.2. The temperature of the bituminous material just above the heating tubes shall be checked at regular intervals to ensure that there is no local overheating.

Heating Limits

7. Bituminous materials shall not be held at temperatures within the ranges shown in Tables 244.1 and 244.2 for periods in excess of ten hours.

***Temperature
Retention***

8. Any bituminous material which has been overheated or stored in temperatures in Tables 244.1 and 244.2 for more than 10 hours shall not be used in the work unless sampled, retested and confirmed to be within the conformance requirements of AS 2008 to the Superintendent's satisfaction. Non-conforming bituminous material shall be disposed of legally and responsibly.

***Overheated
Bitumen***

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244.16 PAVEMENT TEMPERATURE AND WEATHER CONDITIONS

1. The Contractor shall measure and record pavement temperatures at regular intervals during the course of the work. For this purpose, a spirit or mercury-in-glass thermometer or other suitable type of thermometer shall be placed in direct contact with the pavement and allowed to remain in position until the reading becomes steady. When a spirit or mercury-in-glass thermometer is used to measure pavement temperature, the bulb of the thermometer shall be covered from direct sunlight with a small heap of grit or similar material. Suitably calibrated infra-red thermometers may be used if approved by the Superintendent. **Measurement and Recording**
2. If the pavement is partly in sun and partly in shade, the temperatures for both conditions shall be taken and recorded. **Sun and Shade Conditions**
3. Spraying primers, primerbinders and binders shall be undertaken only if the pavement temperature has been at or above 10°C for spraying for at least one hour before commencement of spraying and does not fall below 10°C for spraying during the period of spraying. **Minimum Pavement Temperature**
4. Spraying shall not be carried out on a wet pavement, while rain appears imminent or during high winds or dust storms. **Spraying Conditions**

244.17 INCORPORATION OF CUTTER OIL, FLUX OIL AND ADHESION AGENT**(a) Cutting Back Bitumen**

1. The Contractor shall determine and record the proportion of cutter oil added to each sprayer load based on the measured air temperature in accordance with VicRoads Standard Specification for Roadworks and Bridgeworks Section 408 unless otherwise approved by the Superintendent. **Contractor's Responsibility**
2. The cutter oil, without being previously heated, shall be pumped into the sprayer, followed by the hot bitumen. The full sprayer load of cutback bitumen shall be circulated at a rate of at least 700 litres per minute for twenty minutes to ensure that the mixture is homogeneous. **Mixing Cutter Oil**
3. If a part sprayer load of field cutback bitumen is unused on the date of mixing, and needs to be returned to the heater tanks, it shall be placed in an empty tank reserved for that purpose. No bitumen or cutter shall be added to the returned cutback bitumen unless the tank is fitted with an effective mechanical mixing system. When the returned cutback bitumen is subsequently used as part of a sprayer load, allowance shall be made for the cutter oil contained in the returned cutback bitumen. **Unused Cutback Bitumen**

(b) Fluxing Bitumen

1. Where flux oil is to be included, it shall be added to the bitumen in the sprayer and the mixture circulated at a rate of at least 700 litres per minute for at least twenty minutes before spraying. **Mixing Flux Oil**

(c) Bitumen Adhesion Agent

1. Where bitumen adhesion agent is to be included, it shall be added to the bitumen in the sprayer and the mixture circulated at a rate of at least 700 litres per minute for at least twenty minutes before spraying. **Mixing Adhesion Agent**

244.18 APPLICATION OF PRIMER, PRIMERBINDER AND BINDER**(a) General**

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1. The area to be sprayed with primerbinder or binder shall be limited to the area which can be covered with aggregate at the target application rate within fifteen minutes of spraying bitumen or cutback bitumen. **Limit on Spray Area**

(b) Primer and Primerbinder

1. Nominated and target application rates and quantities of primer and primerbinder shall apply to the whole material, including cutter oil, measured at 15°C. Primer, Primerbinder and Binder application rates outside the tolerances indicated in Annexure 244.B constitute a non-conformance. **Application Rates**

2. After application of a primer, a period of at least forty-eight hours, or such longer period as determined to be necessary for the primer to become completely dry, shall elapse before the binder for a seal is applied. All traffic shall be kept off the primed surface. **Curing Time for Primer**

3. After application of a primerbinder, a period of at least fourteen days shall elapse before the binder for a seal is applied. **Curing time for Primer Binder**

(c) Binder

1. The class of bitumen or grade of cutback bitumen shall be as specified in Annexure 244A. **Class of Bitumen**

2. Nominated and target application rates and quantities of binder shall be based on the volumes of bitumen measured at a temperature of 15°C and shall not include any bitumen adhesion agent and/or cutter oil. If flux oil has been added to the bitumen, the quantity of flux oil shall be included as part of the binder. Binder application rates outside the tolerances provided in Annexure 244B shall constitute a non-conformance. **Nominated and Target Rates**

3. Where bitumen adhesion agent and/or cutter oil have been added to the binder, the application rate of the total binder at 15°C shall be adjusted to allow for the quantities of bitumen adhesion agent and/or cutter oil in the mixture. **Adjustment of Application Rate**

4. The Contractor shall determine the hot application rate of total binder, including bitumen adhesion agent and/or cutter oil, using methods set out in VicRoads Standard Specification for Roadworks and Bridgeworks Section 408. **Calculation of Hot Application**

5. Where refinery cutback bitumen is used as the binder, the target application rate of binder shall be increased by the Contractor to allow for the cutter oil in the mixture. **Refinery Cut-back Bitumen Variation**

(d) Operation of the Sprayer

1. Where the longitudinal edges of spray runs are not required to overlap, special type end nozzles must be used. Where an overlap is required, the overlap of spray between adjacent longitudinal runs shall be in the range 50-100mm for special type end nozzles. If intermediate nozzles are to be used to overlap adjacent longitudinal sprays the nozzles shall be set in the normal manner for intermediate nozzles and the overlap shall be in the range 250-350mm. **Spray Overlap**

2. The spraying of primer, primerbinder or binder for each run of the sprayer shall commence on a protective strip of heavy paper weighing not less than 215 grams per square metre laid across and held securely to the pavement surface beforehand by addition of cover aggregate. The sprayer shall commence moving at a sufficient distance in advance of the protective strip to ensure that the road speed for correct application and correct alignment is attained at the commencement of spraying. **Protective Paper Strip**

3. The sprayer shall maintain a uniform rate of application throughout the length of each sprayer run. **Rate of Application**

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4. The spraying for each run shall terminate on a protective strip of paper laid across and held securely to the pavement surface beforehand. The width of paper at the commencement and/or termination of each run shall not be less than that endorsed on the Sprayer Certificate. **Terminating Paper Strip**
5. Spraying shall cease immediately if any defect develops in the spraying equipment and spraying shall not recommence until the fault has been rectified. **Equipment Defects**
6. Where any blockage or partial blockage of nozzles occurs, spraying shall cease immediately. If the blockage is due to the condition of the binder being sprayed and is likely to re-occur, that load together with any binder from the same bulk tanker or supply unit shall not be used in the Works. **Nozzle Blockage**
7. Where a mechanical sprayer is not able to satisfactorily spray small areas or areas of irregular shape, such areas shall be sprayed by means of the hand spray equipment attached to the sprayer. The work shall be planned so as to minimise the area sprayed by hand spray equipment. **Hand Spraying**
8. After each sprayer run, the quantity of binder sprayed shall be checked against the area covered and any necessary adjustments shall be made to ensure that the target application rate is achieved in subsequent runs. If the actual application rate of binder after three runs differs by more than 5 per cent from the target application rate, the sprayer shall not be used until a new Sprayer Certificate has been obtained. **Application Rate Checks**
9. Areas not within 5 per cent of the target application rate of primer, primerbinder or binder shall constitute a 'nonconformance' under the Contract. **Nonconformance Application Rate**

244.19 APPLICATION AND ROLLING OF AGGREGATE

1. The application of aggregate shall proceed immediately after spraying is commenced and shall be completed within fifteen minutes of spraying bitumen or cutback bitumen. **Time for Completion**
2. Wet aggregate shall not be used. **Wet Aggregate**
3. The Contractor shall apply the aggregate of the specified nominal size and at the target aggregate application rate. Sufficient loaded and measured trucks of dry aggregate shall be at the site to provide full cover for the area sprayed. **Planning**
4. The aggregate shall be spread uniformly over the sprayed surface by means of suitable mechanical spreading equipment. **Uniform Application**
5. Any bare or insufficiently covered areas shall be re-run by the mechanical spreader or covered by hand as necessary to give a uniform and complete coverage. Any aggregate spread in excess of the target aggregate application rate shall be removed before rolling is commenced if it is localised and can be efficiently removed by hand brooming. **Deficient or Excess Aggregate**
6. After the aggregate has been applied to each section of the work, initial rolling shall be carried out with two or more dual axle smooth pneumatic tyred multi-wheel rollers of minimum load of one tonne per tyre and minimum tyre pressure of 550 kPa. A roller with a rubber surfaced drum providing equivalent compactive effort may be used in lieu of a multi-wheeled roller. Initial rolling shall continue until the aggregate is firmly embedded in the primerbinder or binder. Roller speed shall be 15-25km/h subject to safe working conditions. **Initial Rolling**
7. If the aggregate is not evenly distributed over the surface of the pavement, the surface shall be traversed with a light drag broom after the initial rolling. If the broom has any tendency to dislodge aggregate particles bedded in the primerbinder or binder, the Contractor shall defer or eliminate the drag brooming. Where drag brooming is **Brooming of Surface**

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eliminated, the Contractor shall substitute light hand brooming.

8. Backrolling shall then be carried out for a minimum period of one hour per 1000 square metres sprayed for roads having a traffic volume of less than 500 vehicles per lane per day and one hour per 1500 square metres sprayed for other roads, up to a maximum of twenty-four hours after the aggregate has been applied.

Backrolling

9. Where a bituminous surfacing is specified with separate applications of coarse and fine aggregate on a single application of binder, the coarse aggregate shall be applied first, rolled and any necessary brooming carried out as described above, before application of the fine aggregate and its subsequent rolling and brooming. In this case, the time limits for incorporation of aggregate shall apply only to the application of the coarse aggregate.

***Two
Aggregate
Application***

10. When the aggregate has been evenly spread and embedded in the binder, any remaining loose particles of aggregate shall be removed from the pavement and disposed of responsibly by the Contractor.

***Removal of
Loose
Particles***

244.20 WORK RECORDS

1. Particulars of the work performed shall be recorded by the Contractor on a bituminous surfacing daily record form. Details of primer, primerbinder, binder and aggregate applied shall be recorded immediately after every sprayer run. Each form shall be signed by the Contractor's representative as a true record of the work performed. The Contractor shall supply to the Superintendent a copy of each completed form.

***Sprayer Run
Records***

244.21 PROTECTION OF SERVICES AND ROAD FIXTURES

1. The Contractor shall take all necessary precautions to prevent primer, primerbinder, binder, aggregate or other material used on the work from entering or adhering to gratings, hydrants or valve boxes, access chamber covers, bridge or culvert decks and other road fixtures.

***Contractor's
Responsibility***

2. Immediately after aggregate has been spread over the binder, the Contractor shall clean off or remove any sprayed surfacing material and leave the services and road fixtures in a condition equivalent to that existing when the Contractor commenced the sprayed surfacing work.

***Services and
Road Fixtures***

NONCONFORMANCE OF MATERIALS AND WORK

244.22 GENERAL

1. If any materials supplied fail to conform to the requirements of the Contract or if any section of sprayed bituminous surfacing work fails to conform to the requirements of this Contract - whether failure of the work is due to bad workmanship, defective materials supplied by the Contractor or materials made defective by the method of operation adopted or any other cause, then such failure or failures shall constitute a 'nonconformance' under the Contract.

Conditions

2. If the nonconformance is not acceptable to the Principal, the nonconforming material shall be replaced or the nonconforming section of sprayed bituminous surfacing work shall be either replaced or corrected as proposed by the Contractor, subject to the approval of the Superintendent being attained.

***Replace or
Correct***

3. The cost of rectifying nonconformances, including any restoration work to any underlying or adjacent surface or structure, which becomes necessary as a result of such replacement or correction, shall be borne by the Contractor. Materials removed from the site by the Contractor shall be replaced with materials which conform to this Specification.

***Contractor's
Cost***

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244.23 ACCEPTANCE OF NONCONFORMANCES

1. Nonconformances of materials and work may be accepted at the absolute discretion of the Superintendent subject to deductions to the scheduled rate of the Pay Items applicable to the quantity of work incorporating the nonconforming material and work in accordance with the Clause "DEDUCTIONS". All nonconformances not listed within the deductions clause shall be rectified to comply with this Specification as a cost to the Contractor.

**Superinten-
dent's
Authority**

2. Nonconformance related to the achieved application rates for primer, primerbinder or binder as determined from the bituminous surfacing daily record shall be dealt with by the Superintendent strictly on the basis set out below:

- Variations will be considered as departures from the design target application rates after allowing for adjustments due to adhesion agent, cutting oil, flux oil and temperature. Adjustments made on site due to surface condition and stockpile ALD dimension will also be allowed for, subject to a record of their prior approval by the Superintendent being available.
- Variations up to ± 5 per cent of the adjusted design target application rate shall be deemed as conforming being within Tolerance Threshold, T1.
- Variations greater than Tolerance Threshold T1 and less than the Tolerance Threshold, T2 indicated in Annexure 244.B shall result in payment with deductions applied in accordance with Clause 244.30. Application rates outside Tolerance Threshold T2 shall be rejected.

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**244.24 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 244.3 below:

Item	ActivityLimits/Tolerances	Spec	Clause
1.	Design of Bituminous Surfacing	Contractor to provide details of design to Superintendent at least 15 days before proposed commencement of work	244.09
2.	Commencement of Work	Contractor to give 5 days notice to the Superintendent of intention to commence work	244.11
3.	Sweeping of Pavement Surface	Sweeping shall extend at least 300mm beyond each edge of the area to be sprayed	244.13
4.	Bitumen Heating		
	(a) Bitumen Temperature	When incorporated with cutter oil, bitumen shall be in temperature ranges as per Table 244.1.	244.15
	(b) Refinery Cutback Bitumen Temperature	At the time of spraying shall be in temperature range as per Table 244.2.	244.15
	(c) Retention of Temperature	Bituminous materials shall not be held at temperatures within the ranges of Tables 244.1 or 244.2 for periods in excess of 10 hours.	244.15
5.	Spraying Temperature		
	(a) Pavement Temperature	Bituminous surfacing shall not be undertaken if the pavement temperature has not been at or above 10°C for at least one hour before commencement of spraying or if the pavement temperature falls below 10°C during the period of spraying.	244.16
Item	ActivityLimits/Tolerances	Spec Clause	
6.	Cutting Back Bitumen	Circulation of hot bitumen and cutter oil mixture in the sprayer shall be at the rate of at least 700 litres per minute for 20 minutes.	244.17
7.	Fluxing Bitumen or adding Bituminous Adhesion Agent	Circulation of fluxing oil or bituminous adhesion agent with hot bitumen shall be at the rate of at least 700 litres per minute for 20 minutes.	244.17
8.	Application of Bituminous Material		
	(a) Spray Area	Area to be sprayed shall be limited to area which can be covered by aggregate at target application rate within 15 minutes of spraying.	244.18
	(b) Application Rates	Application rates and quantities shall apply to a temperature of 15°C and have T1 tolerances of ±5% as set out in Clause 244.23 and T2 tolerances as set out in Annexure 244.B.	244.18
	(c) Primer	At least a 48 hour period shall elapse after	244.18
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			spraying of primer before binder for a seal is applied.	
	(d) Primerbinder		At least a 14 day period shall elapse after spraying of primerbinder before application of binder.	244.18
9.	Application of Aggregate			
	(a) Spreading Time		Application of aggregate shall be completed within 15 minutes of spraying bitumen or cutback bitumen on each section.	244.19
10.	Rolling			
	(a) Roller Numbers and Type		Initial rolling shall be carried out with two or more dual axle smooth pneumatic tyred multi-wheeled rollers. Minimum load of one tonne per tyre and minimum tyre pressure 550KPa.	244.19
	(b) Backrolling		(i) For traffic volume of <500 vehicles per lane per day, backrolling for minimum of one hour per 1000 square metres sprayed.	244.19
			(ii) For traffic volume >500 vehicles per lane per day, backrolling for minimum of one hour per 1500 square metres sprayed.	244.19
Item	Activity	Limits/Tolerances	Spec Clause	
11.	Nonconformance			
	(a) Bitumen		(i) Bitumen with viscosity at 60°C within the specified limits, but with other properties outside the limits specified in AS 2008, shall incur deductions.	244.30
			(ii) For Class 170 bitumen or Class 320 bitumen having a viscosity at 60°C outside the limits specified in AS 2008, deductions shall apply.	244.30
	(b) Refinery Bitumen	Cutback	(i) Cutback bitumen with viscosity at 60°C within the specified range according to Table 1 of AS 2157, but having any property outside the range specified by AS2157, shall incur deductions.	244.30
			(ii) For cutback bitumen having a viscosity at 60°C outside the range specified in Table 1 of AS 2157, deductions shall apply.	244.30

Table 244.3 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**244.25 DEDUCTIONS**

1. Nonconformances of materials and work may be accepted at the absolute discretion of the Superintendent subject to deductions to the scheduled rate of the Pay Items applicable to the quantity of work incorporating the nonconforming material.

Superintendent's Authority

(a) Bitumen

1. In the case of bitumen having a viscosity at 60°C within the specified limits, but having any other property outside the limits specified in AS 2008, a deduction of 2 per cent of the schedule rate for Pay Items 244(a), 244(b) and/or 244(c) shall apply.

Deductions other than Viscosity

2. In the case of Class 170 bitumen or Class 320 bitumen having a viscosity at 60°C outside the limits specified in AS 2008, the deductions shown in Table 244.4 shall apply to Pay Items 244(a), 244(b) and/or 244(c).

Viscosity Variation Deductions

Class 170	Class 320	Deduction (Per cent of Scheduled Rate)
Under 120	Under 220	50
120 - 124	220 - 229	25
125 - 129	230 - 239	10
130 - 134	240 - 249	5
135 - 139	250 - 259	2
140 - 200	260 - 380	Nil
201 - 210	381 - 400	2
211 - 220	401 - 420	5
221 - 230	421 - 440	10
231 - 240	441 - 460	25
Over 240	Over 460	50

Viscosity shall be calculated to the nearest whole number.

Table 244.4 - Deduction for Actual Viscosity at 60°C (Pa.s)

(b) Refinery Cutback Bitumen

1. In the case of a cutback bitumen having a dynamic viscosity at 60°C within the specified range according to Table 1 of AS 2157 but having any property (other than viscosity at 60°C) outside the range specified by AS 2157, 2 percent of the schedule rate for Pay Items 244(a), 244(b) and/or 244(c) shall apply.

Deductions other than Viscosity

2. In the case of cutback bitumen having a dynamic viscosity at 60°C outside the range specified in Table 1 of AS 2157, the deductions shown below shall apply to Pay Items 244(a), 244(b) and/or 244(c):

**Viscosity
Variation
Deductions**

Viscosity in range of next adjoining grade	-	deduction 10% of scheduled rate
Viscosity in range of next but one adjoining	-	deduction 25% of scheduled rate
Viscosity beyond next but one adjoining grade	-	deduction 50% of scheduled rate

3. The dynamic viscosity as determined by any method allowed by AS 2157 shall be rounded to two significant figures in the direction favouring the Contractor. The range allowed in Table 1 includes an allowance for the repeatability of the test. No attempt shall be made to include another allowance for repeatability.

**Viscosity
Determination**

4. In the case of nonconforming application rates for prime, primerbinder or binder, the deductions for variations outside the T1 Tolerance Threshold but within the T2 Tolerance Thresholds indicated in Annexure 244.B shall be applied to Pay Item 244(a), (b) and/or (c) as appropriate at 20 per cent of schedule rate.

244.26 PAY ITEMS

1. Payment shall be made for all activities associated with completing the work detailed in this Specification in accordance with Pay Items 244(a) to 244(f) inclusive.

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

3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. The quantities shown in the Schedule of Rates are based on estimated quantities and are not to be taken as actual or correct quantities of work to be carried out.

5. Deductions to Scheduled Rates shall be applied in accordance with Clause 244.30.

6. Control of traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
Pay Item 244(a) Supply and Spray Primer, Primerbinder (Including Preparation of Surface)

1. The unit of measurement shall be the litre measured at 15°C.

2. The quantities (in litres) shall be determined by multiplying the target application rate of the above materials (less field incorporated cutter and flux) at 15°C (in litres per square metre) by the area of road surface sprayed for each sprayer run (in square metres).

3. Payment shall be made on the target application rate exclusive of tolerances.

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4. A separate scheduled rate is to be given for each type of primer and primerbinder, as nominated in the project specific Annexure 244.A:

244(a).1	AMCOO
244(a).2	AMCO
244(a).3	AMC1
244(a).4	AMC2
244(a).5	AMC3
244(a).6	AMC4
244(a).7	AMC5
244(a).8	AMC6
244(a).9	AMC7
244(a).10	Field Cutback Bitumen
	(Nett Bitumen)

Pay Item 244(b) Supply and Spray Binder - Class 170 Bitumen (Including Adhesion Agent where required and Preparation of Surface)

- The unit of measurement shall be the litre of Class 170 bitumen at 15°C.
- The quantities (in litres) shall be determined by multiplying the target application rate of Class 170 bitumen at 15°C (in litres per square metre) by the area of road surface sprayed for each sprayer run (in square metres).

Pay Item 244(c) Supply and Spray Binder - Class 320 Bitumen (Including Adhesion Agent where required and Preparation of Surface)

- The unit of measurement shall be the litre of Class 320 bitumen at 15°C.
- The quantities (in litres) shall be determined by multiplying the target application rate of Class 320 bitumen at 15°C (in litres per square metre) by the area of road surface sprayed for each sprayer run (in square metres).

Pay Item 244(d) Supply, Incorporate and Spray Cutter Oil in Primer, Primerbinder Or Binder

- The unit of measurement shall be litres of cutter oil at 15°C.
- The quantity (in cold litres) shall be determined from the actual percentage of cutter oil to be added in the field to produce the primer, primerbinder or binder for each sprayer run and applied to the road.

Pay Item 244(e) Supply, Incorporate and Spray Flux Oil

- The unit of measurement shall be litres of flux oil at 15°C.
- The quantity (in cold litres) shall be determined from the nominated percentage of flux oil to be added in the field to the primer, primerbinder or binder and applied to the surface.

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Pay Item 244(f) Supply, Precoat, Apply and Incorporate Aggregate

- 244(f).1 5mm Aggregate
- 244(f).2 7mm Aggregate (precoated)
- 244(f).3 10mm Aggregate (precoated)
- 244(f).4 14mm Aggregate (precoated)
- 244(f).5 20mm Aggregate (precoated)

1. The unit of measurement shall be the cubic metre.
2. The quantity (in cubic metres) shall be determined by dividing the target application rate (in square metres per cubic metre [m^2/m^3]) by the area of road surface covered for each sprayer run (in square metres).
3. A separate unit rate shall be given for each nominal size of aggregate precoated as specified.

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ANNEXURE 244.A - DETAILS OF WORK

Section Road Name From To	Prime Binder Type	Primer Seal		Seal or Reseal	
		Binder Type	Aggregate Nom. Size	Binder Type	Aggregate Nom. Size

Note: Prime and Primer Seal Binder Type shall be indicated in this Annexure using the descriptive terms as follows:

- Very Light Prime or Primer - equivalent cut back bitumen to grade AMCOO.
- Light/Medium Prime or Primer - equivalent cutback bitumen to grade AMCO or AMC1.
- Heavy Prime or Primer - equivalent cut back bitumen to grade AMC1 or AMC2.

ANNEXURE 244.B - BINDER DETAILS

BINDER TYPE	ADHESION AGENT (At 0.5% of binder) (YES/NO)

**Primer, Primerbinder and Binder Application Tolerance Thresholds T2
(Refer to Clause 244.23)**

Nominal Aggregate Size (mm)	Tolerance Thresholds T2 expressed as ± percentages
0mm Prime	

CITY OF GREATER DANDENONG
SPECIFICATION

251

**COLD MILLING OF
ASPHALT AND BASE COURSE**

SPECIFICATION 251 - COLD MILLING OF ASPHALT AND BASE COURSE

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ANNEXURE

251.A LOCATION OF STOCKPILE SITES FOR MILLINGS

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**SPECIFICATION 251
COLD MILLING OF ASPHALT AND BASE COURSE**

GENERAL**251.01 SCOPE**

1. The work to be executed under this Specification consists of the removal of asphalt and basecourse by cold milling to a specified depth, the hauling of the cold milled material to designated stockpiles and disposal areas and the sweeping of the pavement.

251.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specification

101	-	General
201	-	Control of Traffic
243	-	Bituminous Cold Mix

(b) Australian Standards

AS 1742.3	-	Traffic control devices for work on roads
SAA HB81	-	Field guides for traffic control at works on roads

251.03 CONTROL OF TRAFFIC

1. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work. When adequate detours or side-tracks are included in the contract, or are otherwise available, traffic shall be temporarily diverted while the work is in progress.

**Minimise
Delays**

2. If facilities for the diversion of traffic are not available, the Contractor shall arrange the work to provide for the flow of traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC.

**Work Under
Traffic**

3. In addition, on the approaches to the work and at intervals shown in AS 1742.3 for the appropriate speed zone, temporary reflectorised signs 'Cycle Hazard Grooved Road', Type ST 1-10 shall be clearly displayed.

**Minimum
Signage**

4. Notwithstanding the previous paragraph (3) all temporary signage shall comply with the site specific requirements of AS 1742.3 and SAA HB81.

**Signage
Standards**

5. All traffic control personnel are to possess valid state drivers licences and relevant certification in accordance with the Specification for CONTROL OF TRAFFIC.

**Licensing and
Qualification**

6. Documentation denoting the names of traffic control personnel and their respective traffic control certification are to be forwarded to the Superintendent for inspection prior to the commencement of work.

**Qualification
Submission**

7. Notwithstanding the previous clause, inspection of the credentials of traffic control personnel does not place the Superintendent as the guarantor of such documentation.

**Licence
Validity**

8. Responsibility pertaining to the qualifications of Traffic Control personnel shall be

Contractor's

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borne by the Contractors.

Responsibility

9. All costs occurring as a result of obtaining equipment, personnel or services to provide traffic control to comply with the requirements of this Specification shall be borne by the Contractor.

Contractor's Costs

251.04 CONTROL OF WORK

1. The Superintendent may direct the depth, width, length, alignment and section of road to be cold milled at any time.

Variations

2. The Superintendent may order work to cease temporarily on account of dust nuisance, excessive windrows or loose material, excessive roughness of the cold milled surface or any circumstances which the Superintendent considers may adversely affect the work or public safety.

Public Safety

251.05 COLD MILLING OPERATION

1. The operation of the cold milling machine shall be controlled either by levelling beam or stringline and automatic sensors unless otherwise approved by the Superintendent.

Control of Levels

2. The nominated depth(s) of cut of the cold milling machine shall be as directed by the Superintendent. The cut shall be automatically controlled, with the control set such that the maximum difference in levels between adjacent runs shall not exceed 5mm. The average depth of cut measured across the cut from the adjacent surfaces to the top of the milled surface and at intervals along the work shall not vary by more than 5mm from the specified thickness. When stringline and automatic sensors are used the top of the milled surface shall not vary by more than 5mm from the specified depth below the stringline.

Variations in Cuts

3. Prior to milling operations the Contractor shall determine, using appropriate equipment such as metal detectors etc, the location of any hidden utilities or buried objects that may be damaged by milling operations. The onus of locating such structures and determining their susceptibility to damage by operations are the sole responsibility of the Contractor.

Utility Location

4. The Contractor shall liaise with the relevant Authorities for all underground utility services within the site of the works. The utility Authorities' contact persons are shown in the Specification, GENERAL.

5. If in the opinion of the Superintendent, the milled floor contains material that is deemed unsuitable, that material shall be milled to a depth as directed by the Superintendent. Additional payment shall be based upon a square meter rate commensurable with the remainder of the works quoted.

Unsuitable Material

6. When milling near access chambers or other similar structures the cold milling machine shall be operated as close as possible to the structure without causing damage to it. The remaining asphalt and base course shall be removed by hand or other method approved by the Superintendent. A ramp using coldmix or asphalt shall be formed and compacted around the structure. The ramp shall have a minimum taper length of 1.0m for each 50mm thickness of asphalt and base course removed or part thereof. This work shall not constitute a variation of contract.

Obstructions

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7. At the end of the day's work, or whenever the milled pavement is left unattended and reopened to traffic, the work shall be arranged so that no longitudinal or transverse edges of milled asphalt and base course, which can affect traffic, are left unattended. Prior to reopening the milled pavement to unrestricted use by traffic and at the end of the day's work, the final milled lane shall be bevelled such that the maximum lip between the milled run and the unmilled run does not exceed 10mm. When bevelling is not possible, the fall off in levels shall be ramped with coldmix material complying with the Specification for BITUMINOUS COLD MIX.

Temporary Ramps

8. The ramp area covered by coldmix shall be tack coated with bitumen emulsion prior to placing of the coldmix. All coldmix shall be compacted.

Temporary Cold Mix

9. Longitudinal and transverse ramps, used to tie the milled surface into the existing road levels, shall have a minimum taper length of 1.0m for each 50mm variation in levels or part thereof. Where the speed limit exceeds 60km/h transverse ramps shall have a taper length of 2.5m for each 50mm.

Length of Ramps

10. Any material not removed by the cold milling machine adjacent to concrete medians, kerb and gutter or drainage structures such as pit grates shall be removed by hand or other means approved by the Superintendent. When necessary for traffic safety or where directed by the Superintendent, coldmix or asphalt ramps shall be placed by the Contractor.

Hand Work

11. Any weakened planes of asphalt and basecourse which are not removed by the milling operation but in the opinion of the Superintendent will break up under traffic shall be removed either by an additional pass of the cold milling machine or by other means to the satisfaction of the Superintendent.

Additional Cuts

12. Following the cold milling operation all loose material shall be removed from the road pavement, gully pits and median areas. The pavement shall be swept and the site left in a clean and tidy state to the satisfaction of the Superintendent. All cold milled material shall be removed from the site and transported to stockpile site(s) or otherwise removed from the site to the satisfaction of the Superintendent.

Loose Material

13. If sub-surface utilities or structures are damaged by milling operations, the Contractor shall notify the relevant Authority and arrange for the damage to be rectified to reinstate the utility or structure to pre-construction condition. All costs associated with such rectification works shall be borne by the Contractor.

Damage, Contractor's Costs

14. Prior to covering the milled surface, the Contractor shall arrange to inspect the surface with the Superintendent prior to the removal of milling equipment from site.

Inspection

251.06 TRANSPORT

1. The Contractor shall supply sufficient trucks to enable a continuous output to be achieved by the cold milling machine with minimal delay.

Capacity of Trucks

2. When loading by elevator, the trucks shall back up and maintain a similar speed to the cold milling machine. The driver shall distribute the load of milled material uniformly over the truck body. The Contractor shall comply with all regulations regarding the covering and securing of loads where applicable. The cover shall overlap the truck body by at least 250mm and be tied down securely.

Loading and Covering of Trucks

251.07 DISPOSAL OF MILLINGS

1. Proposed stockpile site(s) shall be nominated by the Superintendent in Annexure 250(a).

Superintendent's Stockpiles

2. The cold milled material shall be tipped in orderly stockpiles and not isolated

Levelling of

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heaps. When measurement is by volume, the stockpiles shall be levelled to a height of 2 metres and be uniform in shape.

Stockpiles

3. Where the Superintendent does not wish to keep the millings, the Contractor will be fully responsible for their disposal.

Disposal by Contractor**SPECIAL REQUIREMENTS****LIMITS AND TOLERANCES****251.08 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 251.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Cuts of Cold Milling Machine		
	(a) Difference in levels between adjacent runs.	< 5mm	251.05
	(b) Average depth of cut from specified depth.	< 5mm	251.05
	(c) Variation of top of milled surface below stringline and automatic sensor for specified depth.	< 5mm	251.05
2.	Ramp at Structure		
	(a) Taper length of asphalt or cold mix around structure.	> 1.0 metres for each 50mm thickness of asphalt and base course removed (or part thereof).	251.05
3.	Longitudinal Edge		
	(a) Maximum lip between milled run and unmilled run.	< 10mm	251.05
4.	Ramp Milled Surface to Existing Road		
	(a) At end of each day, where traffic is to use surface, minimum taper of ramp.	1.0 metres for each 50mm variation in levels or part thereof.	251.05

Table 251.1 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**251.09 PAY ITEM**

1. Payment shall be made for the activities associated with completing the work detailed in this Specification in accordance with Pay Item 251(a).
2. A lump sum price shall not be accepted.
3. Control of traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
Pay Item 251(a) REMOVAL OF MATERIAL BY COLD MILLING

251(a)(i)	Up to 40mm in depth.
251(a)(ii)	>40mm.

1. The unit of measurement shall be the square metre for up to 40mm in depth and square metres/10mm depth for >40mm..
2. The width, length and thickness shall be taken as specified on the Drawings or as approved by the Superintendent.
3. Payment will be made by cumulatively considering both unit rates depending on the depth of milling.
4. The schedule rate shall cover all costs associated with the milling operation including transporting and stockpiling of material and the sweeping and cleaning of the pavement.

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ANNEXURE 251.A

Location of Stockpile Sites for millings

Clause 251.07

- (i)
- (ii)
- (iii)
- (iv)
- (v)

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SPECIFICATION

254

SEGMENTAL PAVING

SPECIFICATION 254 - SEGMENTAL PAVING

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254.22 PAY ITEMS.....331

ANNEXURES

254-A LAYING PATTERNS

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SPECIFICATION 254 : SEGMENTAL PAVING

GENERAL

254.01 SCOPE

1. This Specification covers the construction of both clay and concrete segmental paving for road pavements, medians, traffic islands, driveways, cycleways, footpaths and other pedestrian areas.
2. The work to be executed under this Specification consists of the supply, placement and compaction of segmental pavers including the provision of a sand bedding course and joint filling sand, over mass concrete subbase, bound or unbound base and/or subbase layer/s.
3. This Specification should be read in conjunction with the appropriate Specifications for the construction of the base and subbase layers beneath the segmental paving, ie. STABILISATION, FLEXIBLE PAVEMENTS, MASS CONCRETE SUBBASE.
4. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality

254.02 TERMINOLOGY

1. Concrete segmental pavers are units of not more than 0.10 square metres in gross plan area, manufactured from concrete, with plain or dentated sides, with top and bottom faces parallel and with or without chamfered edges.
2. Concrete pavers are identified by shape as being one of the following types:

Size

Concrete Pavers

Shape Type A

Dentated chamfered units which key into each other on four sides, are capable of being laid in herringbone bond, and by their plan geometry, when interlocked, resist the spread of joints parallel to both the longitudinal and transverse axes of the units.

Shape Type B

Dentated units which key into each other on two sides, are not (usually) laid in herringbone bond, and by their plan geometry, when keyed together, resist the spread of joints parallel to the longitudinal axes of the units and rely on their dimensional accuracy and accuracy of laying to interlock on the other faces.

Shape Type C

Units which do not key together and which rely on their dimensional accuracy and accuracy of laying to develop interlock.

3. Clay pavers are manufactured from clay, shale or argillaceous materials which may be mixed with additives. Clay pavers may have square, bevelled (chamfered), rounded or rumbled edges. They are generally rectangular in shape, with the length twice the width, plus 2mm.

Clay Pavers

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4. Clay pavers are classified as either Class 1, 2, 3 or 4 according to their intended application, with increasing performance requirements (and thickness) from Class 1 to Class 4.

5. Laying patterns of pavers are identified as being either Herringbone, Basket-weave, or Stretcher as shown in Annexure 254-A. Each of these may be laid at either 90° or 45° to the line of edge restraints. A variation of Stretcher is the Zig Zag Running Bond, also shown in Annexure 254-A.

Pattern

254.03 CHOICE OF PAVER TYPE, SHAPE, CLASS AND LAYING PATTERN

1. The choice of concrete or clay segmental pavers, the paver class (for clay pavers), shape type (for concrete pavers), shape name, colour, thickness and laying pattern shall be as shown on the Drawings for each area of application.

Type

2. Unless otherwise specified, concrete pavers for road pavements shall be placed in herringbone laying pattern and shall be in accordance with the requirements for the appropriate road application shown in Table 254.1.

Concrete

3. Unless otherwise specified, clay pavers for road pavements shall be Class 4, minimum 65 millimetres nominal thickness, and placed in a herringbone laying pattern.

Clay

254.04 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

213	-	Earthworks
224	-	Open Drains, including Kerb and Channel
241	-	Stabilisation
242	-	Flexible Pavements
247	-	Mass Concrete Subbase
271	-	Minor Concrete Works

(b) Australian Standards

AS 1141.11	-	Particle size distribution by dry sieving.
AS/NZS 4455	-	Masonry units and segmental pavers.
AS/NZS 4456.0	-	Masonry units and segmental pavers - Methods of test - General introduction and list of methods.
AS/NZS 4456.3	-	Determining dimensions.
AS/NZS 4456.5	-	Determining breaking load of segmental paving units.
AS/NZS 4456.9	-	Determining abrasion resistance.
AS/NZS 4586	-	Slip resistance classification of new pedestrian surface materials.

(c) Concrete Masonry Association of Australia Specifications

T44	-	Concrete Segmental Pavements - Guide to Specifying.
T45	-	Concrete Segmental Pavements - Design Guide for Residential Access Ways and Roads.
T46	-	Concrete Segmental Pavements - Detailing Guide.

(d) Clay Brick and Paver Institute Specifications

Paver Note 1	-	Specifying and Laying Clay Pavers
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MATERIALS

254.05 GENERAL

1. The Contractor shall submit details of all proposed segmental paving materials, including bedding sand and joint filling sand. These details shall be submitted to the Superintendent for approval, supported with test results from a nominated NATA registered laboratory, confirming that the constituents comply with the requirements of this Specification.

**Details
Required**

2. No pavers shall be delivered until the Superintendent has approved the type and quality of the pavers and noted the source of supply as compliant to the requirements of this Specification. All pavers shall have suitable "slip resistance" for pedestrian traffic and vehicular traffic with a classification "W" according to AS/NZS 4586 for the Wet Pendulum Test. Where specific localities or levels of usage require a higher slip resistance classification, this classification shall be indicated on the Drawings. This action constitutes a **HOLD POINT**. The Superintendent's approval of the pavers' sources of supply is required prior to the release of the hold point. Such approval shall not relieve the Contractor of any responsibility for supplying materials that comply with this Specification.

Slip Resistance

HP

254.06 CONCRETE SEGMENTAL PAVERS

1. Concrete segmental pavers shall comply with the requirements of T44, T45, T46 and AS/NZS 4455 for each area of application.

Specification

2. The material requirements for concrete pavers for each application, derived from T44, are shown in Table 254.1.

Requirements

Application	Characteristic breaking load ³ (kN)	Characteristic flexural strength ³ (MPa)	Minimum Thickness (mm)	Shape ⁴ (type)	Dimensional deviations (Category - AS 4455)	Abrasion resistance (mean abrasion index)
Residential Driveways	3	2	No limit	Any	DPA1 or DPB1	7
Light Traffic	5	3	No limit	Any	DPA1 or DPB1	7
Medium Traffic ¹						
Public Footpaths						
Low Volume	5	3	No limit	Any	DPB2	5
High Volume and Pedestrian Malls ¹	5	3	No limit	Any	DPB2	3.5
Roads ⁴						
Minor	5	3	60	Any	DPB2	5
Local and Collector	5	3	80	Any	DPB2	5
Distributor	5	3	80	A	DPB2	5
Industrial Pavements ²	10	4	80	A	DPB3	7

**Table 254.1
Material Requirements for Concrete Segmental Pavers**

- Notes:
1. Capable of taking occasional 8.2-t axle loads.
 2. The resultant joint width is a combination of paver dimensional deviation and laying procedures.
 3. At 28 days.
 4. Interlocking shapes offer superior performance in road applications.

3. The pavers shall meet the requirements for the relevant application given in Table 254.1 when tested in accordance with the following test methods: **Test Methods**

- characteristic breaking load AS/NZS 4456.5
- characteristic flexural strength AS/NZS 4456.5
- Minimum thickness Not Applicable
- Shape type Not Applicable
- Dimensional deviations AS/NZS 4456.3
- Abrasion resistance AS/NZS 4456.9

254.07 CLAY SEGMENTAL PAVERS

1. Clay segmental pavers shall comply with the requirements of Part 1 - Specifying Clay Pavers, of Paver Note 1 and with the requirements of AS/NZS 4455. **Specification**

2. Clay pavers shall be classified as Class 1, 2, 3 or 4 in accordance with Paver Note 1. **Class**

3. Unless otherwise indicated, Class 4 pavers shall be used for all road and driveway pavements, medians and traffic islands. **Roadway Class**

4. Class 2 or 3 pavers may be used for footpaths, cycleways, and other pedestrian areas, except where they are subject to vehicular traffic with axle loads greater than 2.7 tonnes, in which case Class 4 pavers shall be used. Class 1 pavers shall only be permitted for low-volume pedestrian applications not subject to any vehicular traffic. **Footpath Class**

5. The abrasion resistance as determined by the SCC Abrasion Test (Paver Note 1) shall conform to the recommended characteristic abrasion losses contained in Paver Note 1. **Abrasion Resistance**

254.08 BEDDING SAND

1. The bedding sand shall be a well-graded sand, consisting of clean, hard, uncoated grains uniform in quality, generally passing a 4.75 millimetre sieve. The bedding sand shall be from a single source or blended to achieve, when tested in accordance with AS 1141.11, the following grading: **Grading**

AS Sieve % Passing	
9.52mm	100
4.75	95 - 100
2.36	80 - 100
1.18	50 - 85
600µm	25 - 60
300	10 - 30
150	5 - 15
75	0 - 10

2. The sand shall be of uniform moisture content when spread. It shall be covered when stored on site to protect it from rain penetration. **Protection**

3. The bedding sand shall be free of deleterious soluble salts or other contaminants which may cause, or contribute to, efflorescence. **Cleanliness**

254.09 JOINT FILLING SAND

1. The joint filling sand shall be well graded passing a 2.36mm sieve, and when tested in accordance with AS 1141.11, having the following grading: **Grading**

AS Sieve % Passing

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2.36mm	100
1.18	90 - 100
600µm	60 - 90
300	30 - 60
150	15 - 30
75	5 - 10

- 2. The sand shall be dry when spread. It shall be covered when stored on site to protect it from rain penetration. **Protection**
- 3. The joint filling shall be free of deleterious soluble salts or other contaminants. **Cleanliness**
- 4. Sand used for bedding is not suitable for joint filling.

254.10 CONCRETE FOR EDGE RESTRAINTS

- 1. Concrete supplied and placed for the construction of edge strips shall comply with the Specification for MINOR CONCRETE WORKS. **Specification**
- 2. Unless otherwise indicated on the Drawings, or where the edge restraint is provided by kerb and/or gutter (channel), the concrete used for edge restraints shall have a minimum 28-day characteristic compressive strength of 32MPa for edge restraints for pavers on road pavements and 25MPa for edge restraints for pavers on footpaths, cycleways, medians and driveways. **Strength**

CONSTRUCTION

254.11 SUBGRADE PREPARATION

- 1. The subgrade shall be formed to the required depth below finished surface level as shown on the Drawings or as directed by the Superintendent in accordance with the Specification for EARTHWORKS. **Levels**
- 2. The finished subgrade foundation for the provision of subbase and/or base shall be presented for the approval of the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the subgrade foundation is required prior to the release of the hold point. **HP**

254.12 SUBBASE

- 1. Where shown on the Drawings or as directed by the Superintendent a subbase or working platform shall be constructed in accordance with the relevant Specification for STABILISATION, FLEXIBLE PAVEMENTS, or MASS CONCRETE SUBBASE. **Specifications**
- 2. The subbase shall be constructed to the specified thickness, compaction and depth below finished surface level and to the design grade and crossfalls of the finished surface. **Levels**

254.13 BASE

- 1. The base shall be constructed to the specified thickness and depth below finished surface level, and to the design grade and crossfalls of the finished surface, as shown on the Drawings or as directed by the Superintendent in accordance with the Specification for FLEXIBLE PAVEMENTS. **Levels**
- 2. The base course shall extend in width to at least the rear face of all new edge restraints. **Extent**
- 3. Notwithstanding the finished level tolerances contained within the Specification **Tolerances**

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for FLEXIBLE PAVEMENTS for base of ±10mm of design levels, the level on the finished surface of the base course for road pavements to be overlain with segmental paving shall be trimmed to within +10mm or -0mm of design levels. The deviation from a 3m long straight edge placed anywhere and laid in any direction on the top surface of the base course for all segmental paving shall not exceed 10mm. Sand bedding material shall not be used as a levelling material to compensate for base finishing outside the above tolerances.

4. The finished surface of the base shall drain freely without ponding.

Free Drainage

5. The finished base shall be presented for the approval of the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the finished base is required prior to the release of the hold point.

HP

254.14 EDGE RESTRAINTS

1. Edge restraints in the form of kerb and/or channel or edge strips shall be constructed along the perimeter of all segmental paving as shown on the Drawings or as instructed by the Superintendent. Concrete kerb and/or channel and edge strips shall be constructed in accordance with the Specifications for OPEN DRAINS INCLUDING KERB AND CHANNEL and MINOR CONCRETE WORKS.

Requirements

2. Faces of edge restraints abutting pavers shall be vertical.

3. Edge restraints shall be supported on compacted base and/or subbase of the thickness as shown on the Drawings. Where not otherwise specified or indicated, the minimum thickness of compacted base beneath the edge restraints shall be 100mm adjacent to road pavements and medians, and 50mm adjacent to footpaths, cycleways and driveways.

Support

4. Unless otherwise shown on the Drawings, contraction joints of 20mm depth shall be formed every 5m of edge restraint length.

Joints

5. After placing, the concrete shall be left to harden for at least 3 days unless otherwise directed by the Superintendent. The spaces at the back of the edge restraint shall then be backfilled with earth, compacted in layers not greater than 150mm thick, then topsoiled to meet surrounding of design levels.

Backfilling

254.15 SAND BEDDING COURSE

1. The sand bedding course shall be spread in a single uniform layer and screeded in a loose condition to the nominated design profile and levels plus that necessary to achieve a uniformly thick nominal 20-25mm layer following final compaction of the segmental paving.

Allowance Levels

2. Any depressions in the screeding sand exceeding 5mm shall be loosened, raked and rescreeded before laying paving units.

Depressions

3. For the manual placing of paving units, the bedding sand shall be maintained at a uniform loose density. For mechanised laying, the bedding sand shall be uniformly and firmly, but not fully, compacted.

Compaction

4. Screeded sand left overnight and subject to rain shall be checked for level and rescreeded where necessary before pavers are placed. The sand shall not be screeded more than two metres in advance of the laying face at the completion of work on any day.

Screeding

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254.16 LAYING PAVERS

- 1. Pavers shall be uniformly placed on the screeded sand bedding to the nominated laying pattern. Pavers shall be placed so that they are not in direct contact with each other and shall have uniform 3mm nominal joint widths. The pavers shall be mixed between various pallets to ensure that any colour variation from one pallet of pavers to the next is evenly distributed over the entire paved area. **Placement and Jointing**
- 2. The first row shall be located next to an edge restraint or an established straight line and laid at a suitable angle to achieve the required orientation of pavers in the completed pavement. **Sequence**
- 3. In each row, full units shall be laid first. Edge or closer units shall be neatly cut using a paver scour, or mechanical or hydraulic guillotine, and fitted subsequently. Cut pieces of pavers which are smaller in size than one quarter of a full block shall not be used. **Odd Shapes**
- 4. Access chambers, drainage gullies and similar penetrations in the pavement shall be finished against the paving with a concrete surround or apron designed to suit and fit the laying pattern, otherwise complying with the requirements for edge restraints. **Penetrations**
- 5. Where pavers are placed over an isolation, contraction or expansion joint in an underlying concrete pavement, a joint is to be provided in the pavers. The joint shall consist of 10mm thick preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent. **Formed Joints**
- 6. On completion of subsequent bedding compaction and joint filling operations, all joints shall have widths within the range 2-4mm. **Tolerance**

254.17 BEDDING COMPACTION

- 1. After laying the pavers the sand bedding shall be fully compacted and the surface brought to design levels and surface profiles by not less than two passes of a high frequency low amplitude plate compactor which covers at least 12 units. Compaction shall continue until all pavers form a smooth surface with adjacent paver edges matching. The level difference between the adjoining edges of any two pavers shall be a maximum of 2mm, to avoid trip hazards, unless approved otherwise by the Superintendent for rough textured pavers. **Compaction**
- 2. Any units which are structurally damaged during bedding compaction shall be removed and replaced. The pavement shall then be recompacted for at least one metre surrounding each replacement unit. **Damage**
- 3. The paving operations shall be arranged so that the use of the plate compactor proceeds progressively behind the laying face without undue delay, and such that compaction is completed prior to cessation of construction activity on any day. Compaction shall not be attempted within one metre of the laying face except on completion of the pavement against an edge restraint. **Progressive Compaction**
- 4. The finished surface level shall not vary from the design level at any point laid in any direction, by more than ±6mm for all areas with Class 4 clay or 80mm thick concrete segmental pavements and ±8mm for all other areas of segmental paving. Notwithstanding this, the finished surface of the segmental paving, including where the paving abuts an edge restraint other than a drainage inlet, shall not deviate from the bottom of a 3 metre straight edge laid in any direction, except at grade changes, by more than 6mm for road pavements and 8mm for all other areas of segmental paving. **Finished Levels**
- 5. The channels formed between abutting chamfered units shall finish with their inverts not less than 5mm nor more than 10mm above adjacent drainage inlets. **Drainage Inlets**

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6. All compaction shall be complete and the pavement shall be brought to design profiles before spreading or placing sand filling in the joints. **Joint Filling**

254.18 FILLING JOINTS

1. As soon as practicable after bedding compaction, and in any case prior to termination of work on any day, dry sand for joint filling shall be spread over the pavement and the joints filled by brooming. **Timing**

2. To ensure complete filling of the joints, both the filling sand and pavers shall be as dry as practicable when sand is spread and broomed into the joints. **Condition**

3. The pavement shall then receive one or more passes of a plate compactor and the joints then refilled with sand, with the process then repeated sufficiently to ensure that the joints are completely filled. **Process**

254.19 PROTECTION OF WORK

1. Other than foot and barrow traffic, wheeled trolleys, forklifts and cluster-clamp vehicles, construction and other traffic shall not use the pavement until compaction and joint filling operations have been completed. **Restricted Use**

254.20 OPENING TO TRAFFIC

1. As soon as practicable after the filling of joints, construction vehicles may use the pavement, and should be encouraged to traverse the greatest possible area of pavement to assist in the development of 'lock-up'. **No Tracking**

2. Excess joint filling sand shall be removed prior to opening to traffic. **Excess Sand**

3. The pavement shall then be inspected by the Contractor at regular intervals up until the expiration of the Defects Liability Period to ensure that all joints remain completely filled. **Inspections**

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**254.21 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 254.2 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Base		
	(a) Surface Level	Finished level of base for road pavements to be within +10mm or - 0mm of design levels.	254.13
		Finished level of base other than for road pavements, to be within ± 10 mm of design levels.	254.13
		The top surface of the base for all segmental paving shall not deviate from a 3m straight edge, laid in any direction, by more than 10mm.	254.13
2.	Laying Paving Units		
	(a) Joint widths	Within the range 2 -4mm.	254.16
3.	Completed Segmental Paving		
	(a) Surface level	Finished surface level of pavers shall not vary from design levels by more than ± 6 mm for road pavements and ± 8 mm for other than road pavements.	254.17
		Finished surface of pavers shall not deviate from a 3m straight edge, laid in any direction, by more than 6mm for road pavements and 8mm for other than road pavements.	254.17
	(b) Level adjacent to drainage inlets	Invert level of channels between abutting chamfered units shall be not less than 5mm and not more than 10mm above the level of adjacent drainage inlets.	254.17
	(c) Difference in level of adjacent pavers	≤ 2 mm	254.17

Table 254.2 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT

254.22 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in the Specification on a schedule of rates basis in accordance with Pay Items 254(a) to 254(c) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Excavation and preparation of subgrade is measured and paid in accordance with the Specification for EARTHWORKS.
5. Subbase and Base are measured and paid in accordance with the Specifications for STABILISATION, FLEXIBLE PAVEMENTS, or MASS CONCRETE SUBBASE as appropriate.
6. Kerb and/or channel is measured and paid in accordance with the Specification for OPEN DRAINS INCLUDING KERB AND CHANNEL.
7. Edge strips are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
8. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.
Pay Item 254(a) EDGE STRIPS

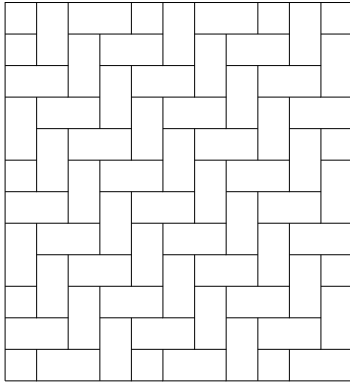
1. The unit of measurement shall be the linear metre measured along the length of the edge strip.
2. The schedule rate shall include all activities involved in the excavation, forming, concreting, contraction joints, backfilling and compaction adjacent to the completed edge strip.
Pay Item 254(b) SEGMENTAL PAVING - ROAD PAVEMENTS

1. The unit of measurement shall be the square metre of surface of segmental paving for road and driveway pavements.
2. The width and length shall be as shown on the Drawings or as directed by the Superintendent.
3. The schedule rate shall include all activities involved in the supply, laying and compaction of segmental paving units, bedding sand and joint filling sand, including any cutting of units, joints overlying concrete pavement joints, and concrete surrounds or aprons around surface penetrations.
Pay Item 254(c) SEGMENTAL PAVING - OTHER THAN ROAD PAVEMENTS

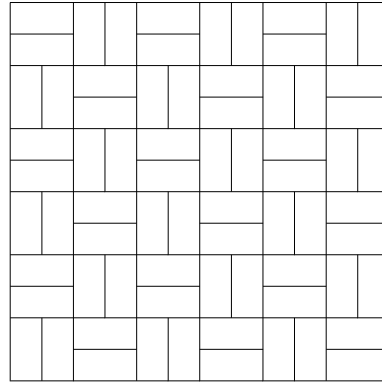
1. The unit of measurement shall be the square metre of surface of segmental paving for other than road pavements, including medians, traffic islands, footpaths, cycleways and other pedestrian areas.
2. The width and length shall be as shown on the Drawings or as directed by the Superintendent.
3. The schedule rate shall include all activities involved in the supply, laying and compaction of segmental paving units, bedding sand and joint filling sand, including any cutting of units, joints overlying concrete pavement joints, and concrete surrounds or aprons around surface penetrations.

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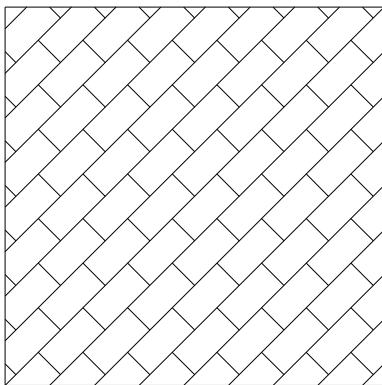
ANNEXURE 254-A
LAYING PATTERNS



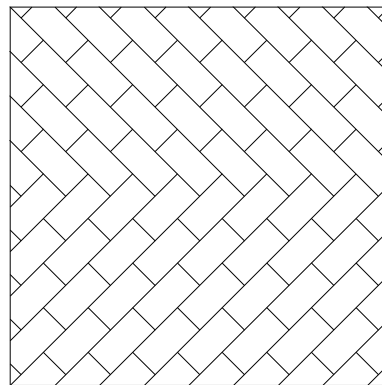
Herringbone



Basketweave



Stretcher



Zig Zag Running Bond

CITY OF GREATER DANDENONG

SPECIFICATION

255

**BITUMINOUS
MICROSURFACING**

SPECIFICATION 255: BITUMINOUS MICROSURFACING

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LIMITS AND TOLERANCES 344

255.24 SUMMARY OF LIMITS AND TOLERANCES344

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SPECIFICATION 255 : BITUMINOUS MICROSURFACING**GENERAL****255.01 SCOPE**

1. The work to be executed under this Specification consists of the design, supply, mixing and placement of bituminous microsurfacing for surface correction and wearing surface applications on road pavements, carparks, cycleways and footpaths.

2. Bituminous microsurfacing shall consist of a mixture of emulsified polymer modified bitumen binder, mineral aggregate, mineral filler, additives and water proportioned and mixed to form a slurry which is placed and spread evenly on the road surface. It shall be capable of being spread in variably thick layers for surface correction and for wearing surface applications.

***Bituminous
Slurry***

3. The size, nominal thickness, and extent of bituminous microsurfacing shall be as shown on the Drawings or as directed by the Superintendent.

***Size and
Extent***

4. For all new works on road and carpark pavements, this Specification should be read in conjunction with the Specification for SPRAYED BITUMINOUS SURFACING. For new works on road and carpark pavements, bituminous microsurfacing shall be preceded by the application of a sprayed bituminous seal a minimum of two weeks prior to the application of the bituminous microsurfacing wearing course.

***Preceded by
Sprayed
Bituminous
Seal***

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

Quality

255.02 TERMINOLOGY

1. Bituminous microsurfacing is one of two types of bituminous slurry surfacing. It is distinguished from the other type, slurry seals, by the incorporation of polymer and other additives to the bituminous binder to improve the performance of the slurry surfacing.

***Polymer
Modified
Binder***

2. Bituminous microsurfacing is also commonly known under various proprietary names such as 'cold overlay', 'microsealing', 'paveseal', 'microasphalt', etc.

***Proprietary
Names***

3. The size of the bituminous microsurfacing is based on the nominal largest stone size in the mix. For the purpose of this Specification, the size shall be either Size 5 or Size 7.

Size

255.03 REFERENCE DOCUMENTS

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

***Documents
Standards
Test Methods***

(a) Council Specification

- 201 - Control of Traffic
- 244 - Sprayed Bituminous Surfacing

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(b) Australian Standards

- AS 1141.11 - Particle size distribution by dry sieving
- AS 1141.12 - Material finer than 75 µm in aggregates (by washing)
- AS 1141.22 - Wet/dry strength variation
- AS 1141.23 - Los Angeles value
- AS 1141.25 - Degradation factor - source rock
- AS 1141.42 - Pendulum friction test (PAFV)
- AS 1160 - Bitumen emulsions for construction and maintenance of pavements
- AS 1289.3.7.1 - Determination of the sand equivalent of a soil using a power-operated shaker
- AS 2008 - Residual bitumen for pavements
- AS 2357 - Mineral fillers for asphalt
- AS 2891.3.1 - Bitumen content and aggregate grading (reflux method)

(c) International Slurry Surfacing Association

- ISSA TB 100 - Test method for wet track abrasion of slurry surfaces
- ISSA TB 114 - Wet stripping test for cured slurry seal mix
- ISSA TB 139 - Test method to classify emulsified asphalt/aggregate mixture systems by modified cohesion tester measurement of set and cure characteristics
- ISSA TB 144 - Test method for classification of aggregate filler-bitumen compatibility by Schulze-Breuer and ruck procedure

255.04 CONTROL OF TRAFFIC

1. The Contractor shall provide for traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC while undertaking the work and shall take all necessary precautions to protect the work from damage until such time as the new work has developed sufficient strength to carry normal traffic without damage.

2. The Contractor shall take all necessary steps to avoid or minimise delays and inconvenience to road users during the course of the work. Where adequate detours or side tracks are included in the Contract or are otherwise available, traffic shall be temporarily diverted while the work is in progress.

MATERIALS**255.05 BINDER**

1. The binder supplied and used in the works shall be an emulsified polymer modified bitumen, formulated to meet the performance requirements of the mix specified in Clauses 255.11 and 255.19.

***Polymer
Modified
Bitumen
Emulsion***

2. Prior to emulsification, incorporation of polymer and additives, the bitumen shall comply with AS 2008.

Specification

3. The Contractor shall provide the Superintendent with sufficient information to verify that the binder supplied is the same as that nominated in the mix design.

Verification

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255.06 MINERAL AGGREGATES

1. Mineral aggregates shall consist of crushed rock or crushed gravel, or a mixture of crushed rock or crushed gravel and natural sand. It shall consist of clean, hard, angular, durable particles, and free from clay, dirt, organic material or other deleterious matter.

Quality

2. The aggregate from each source shall comply with the requirements given in Table 255.1.

Aggregate Properties

Property	Test Method	Requirement
Degradation Factor	AS 1141.25	50 minimum
Los Angeles Value	AS 1141.23	30 maximum
Aggregate Wet Strength	AS 1141.22	150 kN minimum
Wet/Dry Strength Variation	AS 1141.22	30% maximum
Polished Aggregate Friction Value	AS 1141.42	45 minimum
Sand Equivalent	AS 1289.3.7.1	60 minimum

Table 255.1 - Aggregate Properties

3. When tested in accordance with AS 1141.11 and AS 1141.12, the aggregate (including mineral filler) shall conform with the grading limits given in Table 255.2.

Grading Limits

Sieve Size	Percent Passing by Mass	
	Size 5	Size 7
13.2 mm	100	100
9.50 mm	100	100
6.70 mm	100	85-100
4.75 mm	90-100	70-90
2.36 mm	50-70	45-70
1.18 mm	30-50	28-50
600 µm	20-35	19-34
300 µm	12-25	12-25
150 µm	7-18	7-18
75 µm	4-10	5-15

Table 255.2 - Grading Limits for Combined Aggregate/Filler

4. The Contractor shall nominate the source/s of aggregates to the Superintendent, and shall submit NATA certified test reports on the quality and grading of the combined aggregate proposed to be used.

NATA Certification

5. The Contractor shall submit test results to the Superintendent for each lot/stockpile of aggregate a minimum of seven days prior to incorporation in the works.

7 Days**255.07 MINERAL FILLER**

1. Mineral filler shall consist of hydrated lime, flyash, portland cement, or other material approved by the Superintendent.

Type

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2. The mineral filler shall be dry, free from lumps and any deleterious material, with a minimum of 85 per cent passing a 75 μm sieve. In all other respects, the mineral filler shall comply with the requirements of AS 2357. **Quality**

3. The quantity of filler added to the bituminous microsurfacing during placement shall not vary by more than 1 per cent of the total aggregate (by mass) from the filler content nominated in the mix design. **Proportion**

255.08 WATER

1. Water added to the bituminous microsurfacing shall be potable and shall be compatible with the component materials. **Potable**

255.09 ADDITIVES

1. Details of the type, source and nominal proportions of additives shall be submitted to the Superintendent with the mix design. **Type and Proportion**

255.10 SAMPLING AND TESTING OF MATERIALS

1. Sampling and testing of materials shall be arranged by the Contractor and carried out by a NATA registered laboratory for the nominated test methods. **Contractor's Responsibility**

2. All costs associated with sampling and testing of materials shall be borne by the Contractor. **Contractor's Costs**

MIX DESIGN

255.11 MIX PROPERTIES

1. The nominated mix design shall satisfy the properties given in Table 255.3. **Mix Properties**

Mix Property	Test Method	Requirement
Wear Loss	ISSA TB 100 6 day	800 g/m ² maximum
Traffic Time	ISSA TB 139 30 minutes 60 minutes	12 kg.cm minimum 20 kg.cm minimum
Adhesion	ISSA TB 114 or ISSA TB 144	≥ 90% or 11 grade points minimum (AAA, BAA)

Table 255.3 - Mix Properties

255.12 NOMINATED MIX

1. At least seven days before commencing bituminous microsurfacing work, the Contractor shall submit to the Superintendent for approval, details of the nominated bituminous microsurfacing mix design for the work including the target application rate (m³ of mix/m² of road surface) and the corresponding nominal layer thickness, together with NATA certification and test results demonstrating that the nominated mix and its **Submit for Approval**

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constituents meet the requirements of the Specification.

2. The details of the nominated mix design shall include the following:

**Mix Design
Details**

- (a) Bitumen emulsion content of the mix, and the residual binder content of the emulsion;
- (b) Target combined aggregate/filler grading;
- (c) Proportions of constituent materials used; and
- (d) Type and sources of aggregates, filler and binder.

255.13 APPROVED MIX

1. When a nominated mix has been approved by the Superintendent, it shall be known as the 'approved mix'. A **HOLD POINT** shall apply and work shall not commence until a bituminous microsurfacing mix has been approved and the Superintendent releases the hold point.

HP

2. The combined aggregate/filler grading and the binder content of the approved mix will be termed the 'approved grading' and the 'approved binder content' respectively.

**Grading and
Binder
Content**

PRODUCTION AND PAVING

255.14 REQUIREMENTS OF PRODUCTION MIX

1. Bituminous microsurfacing produced in the paving unit at the site shall be known as the 'production mix'.

**Production
Mix**

2. The production mix shall comply with the requirements given in Table 255.4.

**Permitted
Variation**

Production Mix Properties	Maximum Permitted Variations from Approved Mix (by mass)	
	Size 5	Size 7
Grading*		
Passing 9.50mm AS sieve and larger	Nil	Nil
Passing 6.70mm	Nil	± 7%
Passing 4.75mm	± 6%	± 6%
Passing 2.36mm and 1.18mm	± 5%	± 5%
Passing 0.600mm	± 4%	± 4%
Passing 0.300mm	± 3%	± 3%
Passing 0.150mm	± 2%	± 2%
Passing 0.075mm	± 1.5%	± 1.5%
Residual Binder Content	- 0.5% + 1.0%	- 0.5% + 1.0%
* Notwithstanding, these allowable variations shall not fall outside the limits for design of nominated mix as given in Table 255.2.		

Table 255.4 - Maximum Permitted Variations from Approved Mix

255.15 PAVING UNIT CALIBRATION

- 1. The paving unit to be used shall be calibrated for the component materials of the approved mix prior to the commencement of paving. Previous calibration documentation covering the same materials and approved mix shall be acceptable provided that calibration has been carried out within the previous twelve months. **Calibration**
- 2. The documentation shall include an individual calibration for each component material at various settings which can be related to the paving unit's metering devices. **Documentation**
- 3. No paving unit shall be allowed on the work until the calibration has been verified and approved by the Superintendent. **Approval by Superintendent**

255.16 PREPARATION OF PAVEMENT

- 1. The existing surface shall be clean and free from any loose stones, dirt, dust and foreign matter. The surface shall be swept beyond the edge of the area to be surfaced by at least 300mm. Any foreign matter adhering to the pavement and not swept off shall be removed by other means. Any areas significantly affected by oil contamination shall be cleaned to the satisfaction of the Superintendent. **Clean Pavement**
- 2. Minor surface defects existing in the primerseal or seal shall be brought to the attention of the Superintendent so as to allow repairs by the Principal prior to the spreading of bituminous microsurfacing. **Minor Repairs**
- 3. The Contractor shall take all necessary precautions to prevent the bituminous microsurfacing or other materials used on the work from entering or adhering to kerbs, gutters, driveways, gratings, hydrants, valve boxes, access chamber covers, bridge or culvert decks or other road fixtures. **Protection of Services**

255.17 WEATHER LIMITATIONS

- 1. Bituminous microsurfacing shall not commence if either the pavement or air temperature is below 10°C and falling. **Temperature**
- 2. Bituminous slurry may be applied when both pavement and air temperatures are above 7°C and rising, or above 10°C. **Temperature**
- 3. Spreading shall not proceed during rain or when rain appears imminent. **Rain**

255.18 SPREADING

- 1. The surface may be pre-dampened if necessary by fogging ahead of the spreader box. Water used for pre-wetting the surface shall be applied so that the entire surface is damp with no apparent flowing water ahead of the spreader box. The application rate of the fog spray shall be adjusted to suit temperature, surface texture, humidity and dryness of the surface being covered. **Water Fog Spray**
- 2. Bituminous microsurfacing shall be mixed and applied using a purpose built paver. The mix shall be of the desired consistency when deposited in the spreader box, and nothing more shall be added other than minor amounts of water for the purpose of overcoming temporary build-up of microsurfacing in the corners of the spreader box. **Paving Unit**
- 3. The mixing time shall be sufficient to produce a complete and uniform coating of the aggregate and the resulting mixture shall be conveyed into the moving spreader box at a sufficient rate to always maintain an ample supply across the full width of the strike-off. **Mixing Time and Rate**

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4. The strike-off shall be adjusted to provide an application rate which will completely fill the surface voids and provide the nominal application rate of bituminous microsurfacing as scheduled. **Application Rate**
5. After the bituminous microsurfacing has been spread, the Contractor shall ensure that all kerbs, channels, driveways, gratings, hydrants, valve boxes, access chamber covers, etc are uncovered and left in a clean and satisfactory condition. **Clean Services**
6. After the emulsion has broken and the mix is sufficiently stable, rolling shall be carried out using pneumatic tyred rollers to produce a dense, even, homogeneous compacted surface where there is insufficient local traffic to achieve satisfactory compaction across the mat. **Rolling**
7. Bituminous microsurfacing shall be capable of carrying slow moving traffic (<40km/h) within one hour of application without permanent damage occurring, such as rutting or ravelling. When the time before the microsurfacing is capable of carrying traffic exceeds one hour, work shall cease unless specifically approved by the Superintendent. **Traffic**

255.19 SURFACE TEXTURE

1. The resulting surface after spreading shall be uniform in appearance, and free of areas exhibiting segregation or excessive or insufficient binder. **Uniform Texture**
2. The surface texture shall be demonstrated on a short test run for approval by the Superintendent. If the surface texture is acceptable to the Superintendent, then all subsequent work shall be finished to an equivalent surface texture. **Test Run**
3. Where increased surface texture is required, a fabric skirt may be trailed behind the spreader box. **Increased Texture**

255.20 JOINTS

1. Longitudinal joints in the wearing course shall be straight and placed at either the edge or the centre of a traffic lane. If necessary, the edges and joints shall be lightly screeded with a hand squeegee to achieve a smooth uniform appearance and to remove excess build-up of material. **Uniform Joints**

255.21 SAMPLING AND TESTING OF PRODUCTION MIX

(a) Lot Definition

1. Compliance sampling and testing of bituminous microsurfacing shall be undertaken on a lot by lot basis. For this purpose, 50m³ or one day's production (whichever is the lesser), or such smaller quantity which is considered as representative of consistent production of the paving unit, shall be considered as representative of consistent production of the paving unit. **Lots**

(b) Responsibility of Sampling

1. The Contractor shall be responsible for taking samples and shall supply all facilities, equipment and labour for that purpose. **Contractor's Responsibility**
2. The costs associated with taking samples of production mix shall be borne by the Contractor. **Contractor's Cost**

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(c) Frequency of Sampling

1. For the testing of production mix, two 1.5kg representative samples of bituminous microsurfacing shall be taken from each lot at random intervals. The samples shall be taken from the discharge of the paving unit and the sample containers immediately sealed. **Mix Samples**

2. For the testing of the binder, two 2L samples of bitumen emulsion shall be taken from each bulk delivery in accordance with AS 1160. **Bitumen Emulsion**

(d) Testing

1. The samples of bituminous slurry shall be treated and tested at a NATA registered laboratory to confirm compliance with Table 255.4. Prior to testing for Residual Binder Content and Aggregate Gradation, as determined by AS 2891.3.1, the samples shall be dried to constant weight in an oven at 60°C for a minimum of 15 hours. **Mix Tests**

2. Each delivery of emulsion shall be tested for residual binder content or accompanied by a certification of specification compliance traceable to the relevant batch at the suppliers storage tank. If testing is required, at the discretion of the Superintendent, then one sample of bituminous emulsion shall be tested for Residue from Evaporation in accordance with AS 1160 Appendix D, and the second sample retained as a referee sample. **Emulsion Tests**

255.22 SHAPE AND LEVELS

1. Where a correction and wearing course have been placed, the finished surface level shall not vary from the design level at any point by more than ± 10 mm. Additionally immediately adjacent to any kerb and/or gutter the finished surface level shall not be below nor more than 10mm above the level of the lip of the adjacent gutter. **Level Tolerances**

2. Notwithstanding the above, the deviation from a 3m long straight edge placed anywhere on the top of the finished surface shall not exceed 10mm when assessed within 24 hours of work completion. **3m Straight Edge**

255.23 NONCONFORMANCE OF MATERIALS AND FINISHED SURFACING

1. If any materials supplied fail to conform to the requirements in this Specification or if any section of bituminous microsurfacing fails to conform to the requirements of this Specification - whether failure of the work is due to bad workmanship, defective materials supplied by the Contractor or materials made defective by the method of operation adopted - then such failure or failures shall constitute a 'Nonconformance' under the Contract. Such nonconforming sections of bituminous microsurfacing work shall be either replaced or corrected. **Non-conformance Conditions**

2. The cost of rectifying nonconformances, including any restoration work to any underlying or adjacent surface or structure, which becomes necessary as a result of such replacement or correction, shall be borne by the Contractor. Materials removed from the site by the Contractor shall be replaced with materials which conform to this Specification. **Contractor's Cost**

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**255.24 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 255.5 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	Mineral Aggregate	As per Table 255.1	255.06
2.	Combined Aggregate/filler	As per Table 255.2	255.06
3.	Mineral Filler	> 85% passing a 75µm Sieve	255.07
4.	Mix Properties		
	a) Design properties	As per Table 255.3	255.11
	b) Permitted variations	As per Table 255.4	255.14
5.	Surface Preparation	Sweeping shall extend at least 300mm beyond edge of area to be surfaced	255.16
6.	Weather Limitations	Microsurfacing shall not commence if both air or pavement temperature is below 10°C and falling, and shall only commence if both air and surface temperature is above 7°C and rising or above 10°C	255.17
7.	Shape and Levels		
	a) Finished Levels	Shall not vary at any point by more than ± 10mm from design levels. Immediately adjacent to kerb and/or gutters, levels shall not be below nor more than 10mm above design level	255.22
	b) Finished Shape	Deviation from the bottom of a 3m straight edge shall not vary by more than 10mm	255.22

Table 255.5 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**255.25 PAY ITEMS**

1. Payment shall be made for all activities associated with completing the work detailed in this Specification for BITUMINOUS MICROSURFACING in accordance with Pay Items 255(a) and 255(b) inclusive.

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

3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Control of traffic is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.

Pay Item 255(a) Size 5 Bituminous Microsurfacing

1. The unit of measurement shall be the cubic metre of the combined mix as spread on the road surface.

2. The volume of the combined mix in cubic metres shall comprise the volume of the dry mineral aggregate (excluding filler) used in completing the works recorded by the paving unit. Documentation of the calibration of this measure shall be made available to the Superintendent and shall be subject to Superintendent's approval.

3. The schedule rate shall include preparation of the surface, mix design, all sampling and testing, supply of all materials to site, and loading, mixing and spreading the bituminous microsurfacing including finishing, joint treatment and clean-up.

Pay Item 255(b) Size 7 Bituminous Microsurfacing

1. The unit of measurement shall be the cubic metre of the combined mix as spread on the road surface.

2. The volume of the combined mix in cubic metres shall comprise the volume of the dry mineral aggregate (excluding filler) used in completing the works recorded by the paving unit. Documentation of the calibration of this measure shall be made available to the Superintendent and shall be subject to Superintendent's approval.

3. The schedule rate shall include preparation of the surface, mix design, all sampling and testing, supply of all materials to site, and loading, mixing and spreading the bituminous microsurfacing including finishing, joint treatment and clean-up.

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CITY OF GREATER DANDENONG
SPECIFICATION

256

**SMALL SCALE
ASPHALT WORKS**

SPECIFICATION 256: SMALL SCALE ASPHALT WORK

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SPECIFICATION 256 : SMALL SCALE ASPHALT WORK**GENERAL****256.01 SCOPE**

1. The specification includes requirements for site preparation, placing and compacting of granular base, priming, tack coating and the spreading and compaction of asphalt.

256.02 DESCRIPTION OF WORKS

1. The works shall include any or all of the following items as specified in Schedule A:

Site clearing including excavation and removal of vegetation and topsoil.

Excavation of soil or rock to a depth consistent with the specified pavement thickness and finished pavement surface levels.

Excavation and removal from site or stockpiling on site of existing granular material.

Preparation of subgrade including the sterilisation for weed growth

Installation of sub-surface drains and connection to existing stormwater pit(s) or drains.

Installation of kerb and channel.

Installation of masonry or timber edging strips.

Installation of grated surface drains.

Supply, spread and compact of granular material.

Supply, place and compact asphalt base.

Supply, place and compact asphalt surfacing.

2. The Works shall be constructed in accordance with this specification and any plans and/or written instructions provided by the Service Management Team to the Contractor prior to the commencement of the Works.

256.03 EQUIPMENT AND LABOUR

1. The Contractor shall provide all equipment and labour to complete the work in accordance with this specification and any plans and written instructions provided by the Service Management Team.

256.04 MATERIALS

1. (a) Bitumen shall conform to the requirements of Australian Standard AS2008 "Residual Bitumen for Pavements".

(b) Cutback Bitumen Cutback bitumen shall conform to the requirements of AS2157.

(c) Bitumen Emulsion Bitumen emulsions shall conform to the requirements of AS 1160.

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(d) Granular Material Granular material shall conform to the requirements of the Local Government or State VicRoads specification for 20 mm nominal maximum size base or sub-base.

(e) Asphalt Asphalt shall conform to the requirements of Australian Standard AS2150 "Asphalt (hot-mixed)".

256.05 SITE CLEARING

1. The area to be paved shall be cleared of all vegetation and topsoil to the limits shown on the drawings.
2. Any existing trees, shrubs or bushes outside the area to be cleared that are to be protected shall be identified by the Superintendent and notified to the Contractor prior to the commencement of the Works. The Contractor shall put in place appropriate measures to safeguard such vegetation from damage for the duration of the Works.
3. Vegetation and soil contaminated with weeds shall be removed from the site and disposed of at a location and in a manner conforming with State Regulations and Local By-laws. Clean topsoil shall be stockpiled on site unless otherwise specified in the Schedule A.

256.06 SUBGRADE PREPARATION

1. For new pavements, the Contractor shall excavate and remove so much of the underlying soil and/or rock as is necessary to achieve subgrade levels consistent with the specified pavement thickness and finished surface levels. All excavated material shall be removed from the site.

***New
Pavements***

2. Any areas, which are excessively wet and/or soft shall be excavated to a firm base and infilled with suitable material to the level of the surrounding subgrade. Suitable fill material, other than topsoil, may be obtained from agreed excavations on site or may be imported. The Contractor shall not proceed with the removal and replacement of soft subgrade without the express consent of the Service Management Team/Client.

3. Following the removal and replacement of any soft material, the subgrade shall be compacted to 95% of the Maximum Dry Density as determined in accordance with Australian Standard AS 1289.6.1 and graded to provide a smooth, free draining surface.

4. For existing unsealed pavements, where it is necessary to remove the existing granular material due to either its unsuitability or a requirement to further excavate the subgrade in order to meet pavement thickness and finished surface level requirements, the subgrade shall be prepared and compacted as for a new pavement.

***Existing
Unsealed
Pavements***

5. Granular material deemed unsuitable for reuse in the pavement shall be removed from the site. Granular materia, which conforms to the requirements of this specification, shall be stockpiled on site in a location and in a manner which avoids contamination.

6. For new pavements and for existing unsealed pavements, where the existing granular material has been removed the subgrade shall be treated with an appropriate herbicide to prevent weed growth. The herbicide shall be applied strictly in accordance with the manufacturer's instructions in a manner which ensures a total and uniform coverage of the area to be paved.

Sterilisation

7. The Contractor shall take appropriate measures to ensure that the manner of application does not result in damage to vegetation beyond the area to be paved or in the herbicide entering any stormwater drainage system.

8. Where required, subsurface drains shall be installed at a minimum depth of 300 mm below the subgrade or to such other depth as specified on the drawings and shall be

***Subsurface
Drainage***

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provided with a free outlet to a stormwater collection pit, drain or channel.

9. The drains shall be 100 mm slotted PVC pipe or slotted flexible polyethylene pipe and shall be laid in trenches of a minimum width of 200 mm, which shall be backfilled to the level of the subgrade using 7 mm nominal size screenings.

256.07 EDGE RESTRAINT

1. If there is no other edge constraint, such as a kerb or kerb and channel, the perimeter of the area to be paved shall be provided with an edge restraint such as timber or masonry edging as specified in the drawings.

2. Timber edging shall comprise red gum or treated pine slabs having a minimum thickness of 50 mm and a minimum width equal to the minimum compacted thickness of granular material and/or asphalt. The edging shall be fixed securely to the subgrade so that it will not move laterally or rotate under the action of rollers during the construction of the pavement.

3. Masonry edging shall be laid in a mortar bed placed on the compacted granular base material and constructed in accordance with good practice for masonry construction.

256.08 GRANULAR BASE

1. Where required, the base material shall be supplied, spread to the required thickness as specified in the drawings, graded to level and compacted. The minimum compacted density of the material shall be 95% of the Maximum Dry Density as determined in accordance with Australian Standard AS1289.6.2.

***New
Pavements***

2. The finished surface of the base at any point shall not be above nor more than 10 mm below the level required to meet both the minimum thickness of asphalt surfacing and the finished pavement level at that point.

3. For existing unsealed pavements, where the existing granular material is of adequate quality and thickness, the surface shall be graded to level and compacted in accordance with the requirements for new pavements. Where the existing granular material comprises a limestone aggregate or other material with natural cementing properties, the layer shall be tyned prior to regrading and re-compaction to break the cementitious bonds and allow a better bond with the overlying asphalt.

***Existing
Pavements***

4. Where the existing granular material is of adequate quality but inadequate thickness and finished pavement levels allow the placement of an additional layer of granular material, the Contractor shall tyne the existing pavement prior to placing additional material to promote bonding of the two materials. The new granular material and the existing material shall then be compacted as a single layer in accordance with the requirements for new pavements.

256.09 PRIME

1. Where specified, the Contractor shall prime the finished surface of the base prior to placing asphalt. The prime shall be a cutback bitumen sprayed at a rate of 1 l/m² unless otherwise specified in Schedule A or determined by the Contractor on site at the time or priming.

2. An emulsion tack coat may be used in place of a cutback prime on pavements subject to limited vehicular traffic, such as driveways, or to pedestrian traffic only.

256.10 TACK COAT

1. Tack coat shall only be applied to the existing asphalt surfaces, which have been

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thoroughly cleaned of all soil, weed growth and other contamination. Tack shall consist of a 60/40 CRS emulsion and shall be applied at a rate of 0.21 l/m² to 0.31 l/m² of residual bitumen.

256.11 ASPHALT

1. Asphalt shall be supplied, placed and compacted to the minimum thicknesses specified in the drawings in accordance with the Australian Standard AS2734 except as noted herein. **General**

2. Where the asphalt is to be machine laid, it shall be discharged from the delivery vehicle into the hopper of the paver and spread and compacted in a continuous operation.

3. Where the asphalt is to be hand spread, it shall be stockpiled on the pavement at a rate consistent with the rate at which it is being spread and compacted. Individual stockpiles should contain no more material than is required to cover an area of 15 m² to the minimum thickness specified in the Schedule. Asphalt stockpiles shall be spread using wooden lutes or the backs of rakes to avoid segregation of the mix and at such a rate that ensures that the asphalt temperature after spreading is adequate to achieve the specified level of compaction. Any segregated or cold mix shall be removed from site and not reincorporated in the asphalt. Asphalt shall not be thrown or scattered over the finished surface prior to compaction. **Hand Spreading**

4. Where specified, asphalt base shall comprise a dense graded asphalt of the nominal size specified in the drawings. The asphalt shall contain Class 320 bitumen and shall meet the requirements specified for a 50-blow Marshall design or 80-cycle gyratory design. **Base**

5. The asphalt shall be compacted using a vibrating steel-wheeled roller to a mean density of 94% of the laboratory compacted density.

6. The asphalt surfacing shall comprise a fine gap graded or dense grade asphalt of the maximum nominal size shown in the drawings. The mix may contain either a Class 320 or a Class 170 bitumen and shall meet the requirements specified for a 35-blow or 50-blow Marshall design or 50-cycle or 80-cycle gyratory design. **Surfacing**

7. The asphalt shall be compacted using a vibrating steel-wheeled roller to achieve a mean density of 96% of the laboratory compacted density.

8. The finished surface shall conform to the required levels within +/-5 mm and shall not deviate from a 3 m straightedge placed on the surface by more than 7 mm for machine-laid work and more than 10 mm for manually placed work. **Finished Surface**

256.12 TESTING AND QUALITY CONTROL

1. The Contractor shall undertake or arrange to be undertaken all testing as specified herein. The testing shall be undertaken by a laboratory certified by NATA for the specified test or tests. The type and frequency of testing shall be as specified in the Quality Control Requirements and results shall be provided to the Service Management Team within 7 days of the test being completed.

256.13 SCHEDULE AND TERMS OF PAYMENT

1. The contract shall be for a lump sum fixed price as quoted in Schedule B. Any variations to the work as described in Schedule A of this specification shall be agreed by the Service Management Team and the contractor before any work is carried out. The cost of such variations shall be determined from the quantity of additional work and the rate for such work as provided in the attached schedule. The scheduled rates shall be provided by the Contractor as part of their quote for the work.

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256.14 DEFECTS LIABILITY PERIOD

1. The Contractor shall make good any defect in materials or workmanship provided under the contract for a period of 12 months, or such longer period as stipulated in Schedule at no cost to the client.

2. This requirement does not include defects arising from:

excessive use of the pavement by heavy vehicles,

deep-seated soil movements as a result of soil moisture variation,

the ingress of tree roots beneath the pavement, the ingress of moisture into or beneath the pavement, unless subsurface drains were installed as part of the contract,

fuel or oil spills or

other factors for which the pavement was not designed.

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VICTORIA
SPECIFICATION

257

**SUPPLY OF RECYCLED
MATERIAL FOR ROADWORKS**

(Specification based on Resource NSW Publication, the Institute of Public Works Engineering Australia
and Waste Management Association of Australia)

SPECIFICATION 261 – SUPPLY OF RECYCLED MATERIAL FOR ROADWORKS

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SPECIFICATION FOR SUPPLY OF RECYCLED MATERIAL FOR ROADWORKS

257.01. Scope

This Specification covers the supply of recycled materials predominantly comprising crushed concrete, brick and reclaimed asphalt blends for use in pavements and related engineering construction. The requirements of this Specification are appropriate for most engineering projects for local government works.

There are numerous potential uses for recycled materials in engineering construction. The uses outlined below are not intended to limit the utilisation of recycled materials. Instead, they indicate areas where high potential exists to use recycled materials and avoid the landfilling of valuable resources.

Pavement materials used in motorways, major highways, urban arterial roads or collector roads are covered in specifications produced by State road authorities.

This Specification is limited to recycled materials without any additional strength enhancing agents. In pavement construction, there may be opportunities to utilise recycled material with additives such as slag, cement, lime, flyash etc., or blends of some or all of these materials to form lightly bound or heavily bound layers. In such circumstances, the designer/specifier should consider the fatigue characteristics of stabilised recycled materials to determine whether shrinkage or block cracking may present problems with the life of the pavement. Similarly, some additives can be used to alter the plasticity characteristics of a 'run of crusher' product to make it more suitable for use. Nothing in this Specification limits the scope for adopting innovative strategies for blending materials to achieve the required outcome.

Material Types

1. **RECYCLED CONCRETE MATERIALS** - Where it is proposed to make use of recycled materials in flexible pavements, the requirements of Vicroads Standard Section 820 shall be met for the manufacture of recycled concrete and plant mixed wet mix crushed concrete products. Where it is proposed to incorporate a cement treated bound layer in a pavement subbase using nominal 20mm sized recycled concrete material, the product shall conform to the requirements of Vicroads standard section 821.

2. **RECLAIMED ASPHALT PAVEMENT (RAP)**
Reclaimed, comingled asphalt and pavement material may be permitted to be used in new asphalt production provided it has been crushed and screened and is free of contaminants. Vicroads standard specification 407 must be complied with and the maximum allowable amount of RAP to be included will be determined by the mix design which is required to meet loading and service conditions of the pavement. Accredited comparative performance test results may be submitted to justify the use of a higher percentage of RAP, where these tests show that the higher percentage of RAP provides better performance outcomes than the corresponding mix using virgin components.

3. **CRUSHED GLASS FINE**

Glass fines manufactured from container glass cullet, free from contamination and graded to a 5mm product may be used in non-wearing course asphalt layers as detailed in the product mix design where these meet the requirements of Vicroads standard section 702.

4. **REGISTRATION OF MIX**

Crushed granular mixes incorporating recycled materials must comply with Vicroads Code of Practice RC 500 series relevant to the proposed application. These materials may be classified as general or conditional according to their level of compliance with the code of practice.

5. **MIX GUIDANCE MATRIX**

Vicroads Technical Note 107 (September 2011) provides comprehensive advice on how materials are to be used as alternatives to conventional products.

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257.02. Material Classes

The terminology and designated material classes used in this Specification are as follows:

Terminology

- Road base – A generic term for road making materials which covers both basecourse and subbase. In this Specification, materials are not distinguished by their position in a pavement

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CITY OF GREATER DANDENONG

SPECIFICATION

261

PAVEMENT MARKINGS

SPECIFICATION 261 - PAVEMENT MARKINGS

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261A PROCEDURE FOR MEASUREMENT OF RATE OF APPLICATION OF SPHERICAL GLASS BEADS

SPECIFICATION 261 : PAVEMENT MARKINGS**GENERAL****261.01 SCOPE**

1. The work to be executed under this Specification consists of the setting out, supply and application of pavement marking paint, thermoplastic pavement marking material, pavement marking tape and raised pavement markers as shown on the Drawings and in accordance with this Specification.

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

Quality**261.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

201 - Control of Traffic

(b) Australian Standards

AS 1580.107.3 - Determination of wet film thickness by gauge.
 AS 1742.2 - Traffic control devices for general use.
 AS 1906.3 - Raised Pavement Markers (retroreflective and non-retroreflective).
 AS 2009 - Glass beads for road-marking materials.
 AS 4049.1 - Solvent-borne paint - For use with drop-on beads.
 AS 4049.2 - Thermoplastic road marking materials.
 AS 4049.3 - Waterborne paint - For use with drop-on beads.

261.03 TYPE OF MARKINGS

1. Details of the various types of pavement markings and devices are generally in accordance with the requirements of AS 1742.2.

Standard**261.04 TYPES OF MATERIALS TO BE APPLIED**

1. The materials shall be applied, unless otherwise directed by the Superintendent as follows:

**Locations for
Use****(a) Pavement Marking Paint**

Permanent markings on all wearing surfaces. Temporary markings, other than on the final wearing surfaces. Traffic islands and kerbs where specified.

(b) Thermoplastic Pavement Marking Material

Permanent markings on all wearing surfaces as shown on the Drawings or as directed by the Superintendent.

(c) Pavement Marking Tape

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Temporary markings on interim and final wearing surfaces.

- (d) Reflective Glass Beads

To be applied to all painted and thermoplastic markings.

- (e) Raised Pavement Markers

To be installed as permanent and temporary markings as shown on the Drawings.

261.05 MATERIAL QUALITY

1. The Contractor shall submit to the Superintendent NATA Registered Laboratory Test Reports, at least seven days before work is scheduled to commence, on the quality of the materials, including paint, glass beads, raised pavement markers and thermoplastic material proposed for use. This action constitutes a **HOLD POINT**. The Superintendent’s approval of the submitted reports is required prior to the release of the hold point.

HP

2. Only materials conforming to the requirements of the referenced Standards shall be used.

Quality Requirements

261.06 SETTING OUT

1. The Contractor shall set out the work to ensure that all markings are placed in accordance with the Drawings or as directed by the Superintendent, to the defined tolerances. The work shall be set out with materials which will be easily removable upon placement of permanent markings. This action constitutes a **HOLD POINT**. The Superintendent’s approval of the set out is required prior to the release of the hold point.

HP

2. The locations of pavement markings shall not vary by more than 50mm from the locations shown on the Drawings, or as directed by the Superintendent.

Tolerance

261.07 SURFACE PREPARATION

1. Pavement markings shall only be applied to clean dry surfaces. The Contractor shall clean the surface to ensure a satisfactory bond between the markings and wearing surface of the pavement.

Clean Dry Surface

2. Pavement marking shall not be carried out during wet weather or, if in the opinion of the Superintendent, rain is likely to fall during the process.

Wet Weather

3. Where raised pavement markers are specified for pavements having a concrete wearing surface, the full area under each raised pavement marker shall be lightly scabbled to remove fine mortar material (laitance).

Scabbling

261.08 PROVISION FOR TRAFFIC AND PROTECTION OF WORK

1. The Contractor shall provide for traffic, in accordance with the Specification for CONTROL OF TRAFFIC, while undertaking the work and shall protect the pavement markings until the material has hardened sufficiently so that traffic will not cause damage.

Contractor's Responsibility

261.09 MAINTENANCE OF PAVEMENT MARKINGS

1. The Contractor shall be responsible for the maintenance, and replacement if necessary, of raised pavement markers and all pavement marking during the contract period and the contract defects liability period.

Responsibility in Contract Period

PAVEMENT MARKING PAINT

261.10 MATERIALS

1. Paint shall comply with the requirements of AS 4049.3 or AS 4049.4 as directed by the Superintendent. In this Specification, the term 'paint' shall mean 'pavement marking paint.'

Paint Quality

2. Glass beads shall comply with the requirements of AS 2009 for drop-on beads.

Glass Beads Quality

261.11 MIXING OF PAINT

1. All paint shall be thoroughly mixed in its original container before use to produce a smooth uniform product consistent with the freshly manufactured product.

Uniform Product

261.12 APPLICATION OF PAINT AND BEADS

1. All longitudinal lines shall be sprayed by an approved self propelled machine. The two sets of lines forming a one-way or two-way barrier line pattern shall be sprayed concurrently.

Longitudinal Lines

2. Hand spraying with the use of templates to control the pattern and shape shall be permitted for transverse lines, symbols, legends, arrows and chevrons.

Hand Spraying

3. The paint shall be applied uniformly and the wet film thickness shall be neither less than 0.35mm nor more than 0.40mm.

Paint Thickness

4. Glass beads shall be used on the markings and shall conform with the requirements for drop-on beads as described in AS 2009, except that E20 beads shall be adopted for use with 0.3 mm minimum dry film thickness linemarking applications of water-borne paint. Glass beads shall comply with size distribution requirements of table below.

Glass Beads

Sieve Size µm	Drop-On Glass Beads	% Passing E20 Glass Beads	Type 3 Glass Beads	% Retained Intermix Glass Beads
2.36			100	
2.0			95 – 100	
1.7			80 – 95	0 – 3
1.4		100	10 – 40	
1.18		95 – 100	0 – 5	5 – 20
1.0	100	80 – 95	0 – 2	
0.85		10 – 40		
0.71		0 – 5		
0.60	90 – 100	0 – 2		

0.42	35 – 75	65 – 95
0.30	15 – 45	
0.15	0 – 5	
0.75	0 – 1	
Pan		0 - 10

6. Pavement markings shall be straight or with smooth, even curves where intended. All edges shall have a clean, sharp cut off. Any marking material applied beyond the defined edge of the marking shall be removed leaving a neat and smooth marking on the wearing surface of the pavement. **Pavement Marking Finish**

7. The lengths of longitudinal lines shall not vary by more than 10mm from the lengths shown in AS 1742.2. The widths of longitudinal lines shall not vary by more than 5mm from the widths shown in AS 1742.2. **Longitudinal Line Tolerances**

8. The lengths and widths of transverse lines shall not vary by more than 10mm from the lengths and widths shown in AS 1742.2. **Transverse Line Tolerance**

9. The dimensions of arrows, chevrons, painted medians, painted left turn islands and speed markings shall not vary by more than 50mm from the dimensions shown on the Drawings or in AS 1742.2 as appropriate. Arrows and speed markings shall be placed square with the centreline of the traffic lane. **Arrows, Chevrons Tolerance**

10. Paint shall not be applied if the ambient temperature is below or above that recommended by the paint Manufacturer. Such criteria is to be confirmed by the Superintendent prior to application. **Ambient Temperature**

261.13 FIELD TESTING

1. The thickness of the wet film applied to the road pavement shall be checked by the method described in AS 1580.107.3 Method B, comb gauge. **Paint Application**

2. The application rate of glass beads applied to the surface of the markings shall be checked by the method described in Annexure 261A and as quantified in Table 261.1. **Beads Application**

Road Speed km/h	Line Widths			
	75mm	100mm	125mm	150mm
8	371	495	619	742
13	603	804	1006	1207
16	742	990	1238	1484

- NOTE:**
1. Tolerance of +10% shall be permissible when measuring the above volume.
 2. When two or more glass bead dispensers are to be used, each dispenser shall be checked separately to make up the totals shown.
 3. Glass beads weigh approximately 1.53 grams per millilitre.

Table 261.1 - Glass Bead Application Testing
Volume of glass beads (ml) required in 10 seconds of operation.

THERMOPLASTIC PAVEMENT MARKING MATERIAL

261.14 MATERIALS

- 1. Thermoplastic pavement marking material shall comply with the requirements of AS 4049.2. **Thermoplastic Quality**
- 2. In this Specification, the term 'thermoplastic material' shall mean 'thermoplastic pavement marking material'. **Definition**
- 3. Glass beads shall be incorporated in thermoplastic material, in the proportion of 20 per cent of the total mass, as part of the aggregate constituent and shall comply with the requirements of AS 2009, Intermix type. **Glass Bead Proportion**
- 4. Glass beads for surface application shall comply with the requirements of AS 2009, Drop-on beads. **Glass Bead Quality**
- 5. Tack coat material, where required by the Superintendent, shall be to the manufacturer's specification. **Tack Coat**

261.15 PREPARATION OF THERMOPLASTIC MATERIAL ON SITE

- 1. Immediately before application, the thermoplastic material shall be uniformly heated in a suitable oil bath kettle to the temperature recommended by the manufacturer. The thermoplastic material shall not be heated above the temperature recommended by the manufacturer. The thermoplastic material shall not remain molten for more than six hours for hydrocarbon resins and four hours for wood and gum resins. Should over-heating occur and/or the time expire for molten materials, then the thermoplastic material shall be discarded. **Heating**

261.16 APPLICATION OF THERMOPLASTIC MATERIAL AND BEADS

- 1. Where the wearing surface of the pavement is smooth or polished, a tack coat of material may be required by the Superintendent and shall be applied in accordance with recommendations of the thermoplastic manufacturer. The tack coat shall be applied immediately before the application of the thermoplastic material in accordance with the directions of the manufacturer of the thermoplastic material and the manufacturer of the tack coat material. **Tack Coat Requirement**
- 2. All longitudinal lines shall be sprayed by a self propelled machine approved by the Superintendent. The two sets of lines forming a one-way or two-way barrier line shall be sprayed concurrently. The thermoplastic material shall be applied uniformly and the cold film thickness shall be 2mm with a tolerance of plus or minus 0.5mm. **Longitudinal Lines**
- 3. Glass beads shall be applied by air propulsion to the surface of all longitudinal lines at a net application rate of 0.30 kilograms per square metre immediately after application of the thermoplastic material. The actual application rate shall be set to overcome any loss of beads between the bead dispenser and the sprayed line. **Beads for Longitudinal Lines**
- 4. All transverse lines, symbols, legends and arrows shall be screeded. The screeded thermoplastic material shall be applied using a mobile applicator, approved by the Superintendent, and templates to control the pattern. **Screed**
- 5. The thermoplastic material for transverse lines, symbols, legends and arrows shall be applied uniformly and the cold film thickness shall be 3.5mm with a tolerance of plus or minus 1.5mm. The surface finish shall be smooth. **Tolerance**
- 6. Glass beads for other than longitudinal lines shall be uniformly applied to **Beads for**

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screeded markings at a net application rate of 0.30 kilograms per square metre immediately after application of the thermoplastic material by a method approved by the Superintendent.

**Other
Markings**

7. Pavement marking shall be straight or with smooth, even curves where intended. All edges shall have a clean, sharp cut off. Any marking material applied beyond the defined edge of the marking shall be removed leaving a neat and smooth marking on the wearing surface of the pavement.

**Pavement
Marking Finish**

8. The lengths of longitudinal lines shall not vary by more than 10mm from the lengths shown in AS 1742.2. The widths of longitudinal lines shall not vary by more than 5mm from the widths shown in AS 1742.2.

**Longitudinal
Line
Tolerances**

9. The lengths and widths of transverse lines shall not vary by more than 10mm from the lengths and widths shown in AS 1742.2.

**Transverse
Line
Tolerances**

10. The dimensions of arrows, chevrons, painted medians, painted left turn islands and speed markings shall not vary by more than 50mm from the dimensions shown on the Drawings or in AS 1742.2 as appropriate. Arrows and speed markings shall be placed square with the centreline of the traffic lane.

**Arrows,
Chevrons
Tolerance**

261.17 FIELD TESTING

1. The thickness of the cold film of thermoplastic material applied to the road pavement shall be checked by measurement, using a micrometer, of the thickness of thermoplastic material applied to a metal test plate.

**Thickness of
Thermoplastic
Material**

2. The application rate of glass beads applied to the surface of the markings shall be checked by the method described in Annexure 261A.

**Glass Beads
Application
Rate**

PAVEMENT MARKING TAPE

261.18 MATERIALS

1. Pavement marking tape shall be a strippable type of tape, such as 'Staymark - Detour Grade', or equivalent tape approved by the Superintendent.

Brands

261.19 APPLICATION OF PAVEMENT MARKING TAPE

1. The method of application of pavement marking tape, including surface preparation, shall be in accordance with the manufacturer's recommendations.

**Manufacturer's
Recommendation**

261.20 REMOVAL OF PAVEMENT MARKING TAPE

1. When directed by the Superintendent, the Contractor shall remove pavement marking tape in accordance with the manufacturer's recommendations.

**Manufacturer's
Recommendation**

RAISED PAVEMENT MARKERS

261.21 MATERIALS

1. Raised pavement markers, both reflective and non-reflective, shall comply with AS 1906. 3 and shall have the dimensions shown on the Drawings.

Standard

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2. The adhesive used for attaching the raised pavement markers to the wearing surface of the pavement shall be a hot melt bitumen adhesive or an equivalent product approved by the Superintendent.

Bituminous Adhesive

261.22 INSTALLATION OF RAISED PAVEMENT MARKERS

1. Raised pavement markers shall be fixed to the wearing surface of the pavement using hot melt bitumen adhesive or an equivalent product approved by the Superintendent. The adhesive shall be freshly heated to the Manufacturer's instructions and thoroughly mixed. The adhesive shall not be allowed to cool and be reheated prior to use.

Adhesive Quality

2. The adhesive shall be spread uniformly over the pavement covering an area 20mm broader than that of the raised pavement marker to a depth of approximately 10mm. The raised pavement marker shall be firmly pressed down onto the pavement surface in its correct position and shall be rotated slightly until the adhesive is squeezed out around all edges of the marker. The raised pavement marker shall not be disturbed until the adhesive has set.

Method

3. On rough surfaces, such as newly laid coarse sprayed bituminous seals, and where directed by the Superintendent, an initial pad of adhesive of diameter 20mm larger than the diameter of the base of the raised pavement marker, shall be provided. The adhesive shall be applied to fill the irregularities in the pavement surface to produce a flat, smooth surface flush with the upper stone level. The adhesive pad shall be allowed to set. Additional adhesive shall be applied to the pavement, as described above, and then the raised pavement marker shall be firmly pressed down onto the adhesive pad on the pavement surface to ensure good adhesion.

Rough Surfaces

REMOVAL OF PAVEMENT MARKINGS

261.23 GENERAL

1. The Contractor shall remove pavement markings, no longer required, from the wearing surface of pavements. The resulting pavement surface to be achieved will be to return the surface to a condition as close as possible to the adjacent pavement surface.

Undamaged Pavement

2. The method of removal shall be approved by the Superintendent before commencement of the work. Painting out of markings shall not be permitted without written approval of the Superintendent.

Removal Method

3. All residue material and debris resulting from the pavement marking removal process shall be removed from the site and disposed of in a manner approved by the Superintendent.

4. Equipment and machinery used in the pavement marking removal process, and the hours of operation, shall comply with the Environment Protection Authority requirements with regard to noise.

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**261.24 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses of this Specification are summarised in Table 261.2 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Location of Markings	± 50mm from specified location	261.06
2.	Longitudinal Lines		261.12
	(a) Length	± 10mm from lengths shown in AS 1742.2	261.16
	(b) Width	± 5mm from widths shown in AS 1742.2	261.12 261.16
3.	Transverse Lines		
	(a) Length)	± 10mm from lengths and widths shown in AS 1742.2	261.12
	(b) Width)		261.16
4.	Arrows, Chevrons, Painted Medians, Speed Markings etc.	± 50mm from the dimensions shown on the Drawings or in AS 1742.2	261.12 261.16
5.	Application of Paint		
	(a) Film Thickness	>0.35mm <0.40mm	261.12
6.	Application of Thermoplastic		
	(a) Longitudinal Lines - Cold Film Thickness	2mm ± 0.5mm	261.16
	(b) Transverse Lines, Symbols, Arrows etc. Cold Film Thickness	3.5mm ± 1.5mm	261.16
7.	Glass Beads		
	(a) Volume used in operation	0.30 kg/sq m + 10%	261.12 261.16

Table 261.2 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT

261.25 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 261(a) to 261(f) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the item which has not been priced.
4. No additional payment shall be made for maintenance and replacement of pavement markers in accordance with Clause 261.09. Where remarking is directed by the Superintendent, the schedule rates shall also apply.

5. Provision for traffic is measured and paid in accordance with this Specification and not in the Specification for CONTROL OF TRAFFIC.
 Pay Item 261(a) PAVEMENT MARKING PAINT - LONGITUDINAL LINES

1. The unit of measurement shall be the square metre.
2. The area shall be calculated from the specified width (excluding tolerances) and the actual application length measured along the centre line of the longitudinal line.

3. The schedule rate shall cover all costs associated with the setting out of the work, the supply and application of the paint and beads and provision for traffic.
 Pay Item 261(b) PAVEMENT MARKING PAINT - TRANSVERSE LINES, SYMBOLS, LEGENDS, ARROWS, CHEVRONS, TRAFFIC ISLANDS AND KERBS

1. The unit of measurement shall be the square metre.
2. The area of the painted surface shall be determined by direct measurement of the markings as applied.

3. The schedule rate shall cover all costs associated with the setting out of the work, the supply and application of all material and the provision for traffic
 Pay Item 261(c) THERMOPLASTIC PAVEMENT MARKING MATERIAL - LONGITUDINAL LINES

1. The unit of measurement shall be the square metre.
2. The area shall be calculated from the specified width (excluding tolerances) and the actual application length measured along the centre line of the longitudinal line.

3. The schedule rate shall cover all costs associated with the setting out of the work, tack coating where necessary, the supply and application of the thermoplastic material and beads and provision for traffic.
 Pay Item 261(d) THERMOPLASTIC PAVEMENT MARKING MATERIAL - TRANSVERSE LINES, SYMBOLS, LEGENDS AND ARROWS

1. The unit of measurement shall be the square metre.
2. The surface area of the thermoplastic material applied shall be determined by direct measurement of the markings as applied.

3. The schedule rate shall cover all costs associated with the setting out of the work, tack coating where necessary, the supply and application of all material and the provision for traffic.
 Pay Item 261(e) RAISED PAVEMENT MARKERS (all applications)

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1. The unit of measurement shall be 'each' raised pavement marker installed.
 2. The schedule rate shall cover all costs associated with the setting out of the work, the supply and application of all material including the provision of an initial pad of adhesive when required on rough surfaces and the provision for traffic.
- Pay Item 261(f) REMOVAL OF PAVEMENT MARKINGS

1. The unit of measurement shall be the square metre.
2. The surface area of the pavement marking removed shall be determined by direct measurement of the markings removed.

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ANNEXURE 261A**PROCEDURE FOR MEASUREMENT OF
RATE OF APPLICATION OF SPHERICAL GLASS BEADS****1. SCOPE**

The following procedure shall be adopted for field measurement of the rate of application of spherical glass beads on to wet paint or thermoplastic surfaces.

2. SPHERICAL GLASS BEADS

The glass beads shall comply with AS 2009.

3. MEASUREMENT

The method of field measurement shall be as follows:

- (a) Turn off the paint or thermoplastic supply valves and operate the glass bead dispenser for exactly 10 seconds allowing glass beads to run into a plastic bag or tray.
- (b) Pour the glass beads from the bag or tray into a suitable measuring cylinder calibrated in millilitres to measure the volume of glass beads collected. Level but do not compact the glass beads in the cylinder.
- (c) Compare the volume of glass beads collected with the correct figure given in Table 261.1.

Table 261.1 shows the correct volumes of glass beads required to give a net application rate on the marked line of approximately 0.30 kilograms per square metre for different line widths and road speeds. The glass bead volume figures given in Table 261.1 are calculated for an actual application rate of 0.34 kilograms per square metre. These figures 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.

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SIGNPOSTING

SPECIFICATION 262 – SIGNPOSTING

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MEASUREMENT AND PAYMENT 389

262.21 PAY ITEMS 389

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SPECIFICATION 262 : SIGNPOSTING**GENERAL****262.01 SCOPE**

1. The work to be executed under this Specification consists of:
 - (a) the supply and erection of the Regulatory, Warning and Guide signs as described in AS 1742 (all parts), AS 1743 and AS 1744,
 - (b) the supply and erection of proprietary Street Name and Community Facility Name signs,
 - (c) the supply and erection of sign support structures to support the signs, and
 - (d) the adjustment of existing signs and sign support structures.
2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality**262.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

- 201 - Control of Traffic
271 - Minor Concrete Works

(b) Australian Standards

- AS 1163 - Structural steel hollow sections
 AS 1214 - Hot-dip galvanised coatings on threaded fasteners
 AS 1250 - The use of steel in structures (SAA Steel Structures Code)
 AS 1302 - Steel reinforcing bars for concrete
 AS 1303 - Steel reinforcing wire for concrete
 AS 1304 - Welded wire reinforcing fabric for concrete
 AS 1379 - The specification and manufacture of concrete
 AS/NZS 1554.1 - Welding of steel structures
 AS/NZS 1580.602.2 - Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°
 AS 1580.108.2 - Dry film thickness - Paint inspection gauge.
 AS 1734 - Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate
 AS 1742 - Manual of uniform traffic control device (all parts)
 AS 1743 - Road Signs – Specifications
 AS 1744 - Forms of letters and numerals for road signs
 AS 1866 - Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
 AS 2700 - Colour standards for general purposes
 AS 3678 - Structural steel - Hot-rolled plates, floorplates and slabs
 AS 3679.1 - Structural steel - Hot-rolled bars and sections
 AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on fabricated ferrous articles

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262.03 PROVISION FOR TRAFFIC

1. The Contractor shall provide for traffic in accordance with the requirements of the Specification for CONTROL OF TRAFFIC while undertaking the work and shall organise the work to avoid or minimise delays and inconvenience to traffic, both vehicular and pedestrian.

**Minimise
Inconvenience**

2. Where a sign is erected before it is intended for use by traffic and is visible to traffic, the face of the sign shall be completely and securely wrapped in porous cloth sheeting or other opaque covering material approved by the Superintendent, until the Superintendent directs that the sign shall be uncovered.

**Premature
Sign Exposure**

SIGNS

262.04 STREET AND COMMUNITY FACILITY NAME SIGNS

1. All street and community facility name signs shall comply with Council's adopted signage system and with the details as shown on the Drawings.

**Signage
System**

2. Proprietary signs shall be manufactured and installed in accordance with the requirements of AS 1742.5, Street Name and Community Facility Name Signs, to the following details:

**Proprietary
Sign
Requirements**

(SAMPLE ONLY - TO BE COMPLETED BY COMPILER)

- a) Colour:
 - Legend - *Blue, Non-reflective*
 - Background - *Yellow, Class 1 Retroreflective*
- b) Lettering and Numerals:
 - Font Type - *Series D*
 - Height - *100mm*

3. Details of Council's logo shall be supplied to the Contractor by the Superintendent.

Logo

4. Details of the signs and legends to be provided under the Contract shall be as shown on the Drawings.

Legends

5. The Contractor shall submit details of Manufacturer, all sign materials and sign attachment system to the Superintendent for approval prior to commencement of sign manufacture. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

HP

262.05 REGULATORY, WARNING AND GUIDE SIGNS

(a) General

1. The Contractor shall advise the names of the proposed suppliers of signs for the Superintendent's concurrence. Only suppliers who have previously established, or can now establish, their competence to carry out the work in accordance with this Specification shall be used.

**Approved
Supplier**

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2. The Contractor shall supply documentary evidence, satisfactory to the Superintendent, that all materials and parts proposed for use comply with the requirements of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

**Proof of
Quality**

HP

3. Details of the signs to be provided under the Contract shall be as shown on the Drawings.

Details

4. The dimensions, legend and background for each sign shall be in accordance with this Specification and the Drawings.

**Dimensions
Legend and
Background**

5. Temporary signs for control of traffic shall be as specified in the Specification for CONTROL OF TRAFFIC.

**Temporary
Signs**

(b) Sign Blanks

1. Sign blanks shall be 1.6mm thick aluminium sheet alloy of Type 5251 or Type 5052 and Temper H38 or Temper H36 in accordance with AS 1734.

**Aluminium
Quality**

2. Sign blanks shall be free of cracks, tears and other surface blemishes and the edges shall be true and smooth. The dimensions of the sign blank shall be within plus or minus 1.5 mm of the dimensions specified and the finished sign shall be flat within a maximum allowable bow of 0.5 per cent of the maximum dimension of the sign blank in any direction.

**Dimension
Tolerances**

3. Sign blanks shall be one piece except where the sign is of such a size as to require more than one full sheet of aluminium in which case a multipiece sign shall be allowed.

One Piece

4. A multipiece sign shall be made up of the minimum number of pieces practical and sheets of the multipiece sign shall be butted together with a maximum gap of 1mm at any point along the joint.

**Multipiece
Sign**

5. All joints shall be covered by a backing strip. The backing strip shall be riveted to each sheet with rivets, coloured to match the background material on the face of the sign, at a spacing not exceeding 200mm. Backing strips shall be of the same material and colour as used for the sign blank and shall have a minimum width of 50mm over the full length of the joint.

**Joint Backing
Strips**

6. The aluminium extrusion used for mounting may be used as the backing strip for horizontal joints where it complies with the spacing requirements.

**Aluminium
Extrusion as
Backing Strip**

7. The face of each sign blank shall be chemically cleaned and etched or mechanically abraded. Where the sign blank is to receive a paint background, the face shall be spray painted with a compatible etch primer.

**Face
Treatment**

8. The back of each sign blank shall be uncoated and the surface finish shall be rendered dull and non-reflective either by mechanical or chemical means and shall be free of scratches and blemishes.

**Back
Treatment**

9. Signs shall be supplied with square holes or aluminium extrusion backing for mounting purposes, at the centre spacings as shown on the Drawings.

Mounting

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(c) Aluminium Extrusion Backing

1. The signs shall include special aluminium extruded sections, as shown on the Drawings, for mounting purposes. The aluminium shall be Type 6063-T5 in accordance with AS 1866. **Design Section**

2. The aluminium extrusion shall be fixed at the centre spacings as shown on the Drawings and shall be riveted to the sign blank with correctly coloured rivets at a spacing not exceeding 200mm. **Fixing**

(d) Rivets

1. Each rivet shall consist of a domed head and shank made of aluminium alloy and a steel mandrel which is discarded after securing the rivet. **Head and Shank**

2. A paint coating shall be applied to the domed head so that when the rivet is in position it will show the same colour as the material to which it is attached. Paint may cover the shank of the rivet, providing the coating thickness does not restrict the insertion of the shank into the standard drilled hole for that rivet. **Painted Head**

3. The paint shall be an alkyd enamel, which shall be applied after an appropriate treatment of the shank of the rivet to ensure long lasting adhesion. **Paint Application**

(e) Retro-Reflective Material For Background And Legend

1. The retro-reflective material shall be approved by the Superintendent. The background and legend material shall be compatible both in application and durability. **Approval**

2. Retro-reflective material shall conform in colour and class to the requirements of AS 1743 for Class 1, Class 2 and Class 2A materials. Unless shown otherwise on the Drawings, the material shall be Class 2. **Standard**

3. Retro-reflective material shall be applied to the sign blank in accordance with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes. **Application**

(f) Non-Reflective Background Material**(i) Background Paint**

1. Background paint shall be an approved long life industrial quality, two compound polyurethane paint. The paint shall exhibit high standards of adhesion, abrasion resistance, resistance to weathering and colour fastness under widely varying conditions of exposure. The paint shall be compatible with the etch primer used on the sign blank. **Quality**

2. The paint shall be applied using conventional air spray application to give a uniform cover free of blemishes. A minimum dry film thickness of 38 microns is required when tested in accordance with AS 1580.108.2. **Application**

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3. Non-reflective background paint shall be as specified in AS 1743 from one of the following AS 2700 colours: **Colours**

- Red - R13 Signal Red
- Yellow - Y14 Golden Yellow
- Brown - X65 Dark Brown
- Blue - B11 Rich Blue
- Standard Green - G12 Holly Green
- Freeway Green - Emerald

4. Exact colorimetric values are set out in AS 2700. **Gloss Levels**

- For matt coatings, the gloss level, determined by AS/NZS 1580.602.2, using an 85° head, shall be neither less than 12 per cent of gloss nor more than 15 per cent of gloss.
- For gloss coatings, the gloss level, determined by AS/NZS 1580.602.2 using a 20° head shall be neither less than 85 per cent of gloss nor more than 95 per cent of gloss.

(ii) Background Sheet Material **Quality**

1. Adhesive cast vinyl sheet material or other equivalent material approved by the Superintendent may be used in place of background paint. The material shall be of uniform density and compatible with the material used for the legend both in application and durability.

2. The colours and gloss levels shall be uniform and conform to the requirements of Clause 262.05(f)(i). **Colours and Gloss**

3. Sheet material shall be applied to the sign blank in accordance with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes. **Application**

(g) Non-Reflective Material For Legend

(i) Legend Screening Ink

1. Screening ink shall be a high quality, full gloss, non-fade, non-bleed and scratch resistant type of ink compatible with the material to which it is applied. Screening ink shall have durability at least equal to the material to which the screening ink is applied. **Quality**

2. Screening ink legends shall be applied to the background material in accordance with the manufacturers recommended methods. **Application**

(ii) Legend Sheet Material

1. Adhesive cast vinyl sheet material or other equivalent material approved by the Superintendent may be used in place of screening ink. The material shall be of uniform density and compatible with the material used for the background both in application and durability. **Quality**

2. Sheet material legends shall be applied to the background material in accordance with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes. **Application**

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(iii) Colours and Finish

1. The requirements of Clause 262.05(f)(i) shall also apply to non-reflective materials for legends but additional colours complying with AS 2700 may be specified.

Colours and Gloss

262.06 REFERENCE MARKINGS

1. All warning, regulatory and guide signs shall be clearly and permanently stamped or engraved with an identification coding. The coding shall appear in ciphers of height neither less than 6mm nor more than 10mm on the rear of the sign and shall be carried out in such a manner that the front face of the sign is not damaged.

Identification Code

2. For rectangular signs, the coding shall appear as near as practicable to the bottom rear left hand corner. For other shaped signs, the coding shall be positioned on or below the horizontal centre line and as near as practicable to the left hand rear edge.

Location

3. Manufacturers shall include coding information in the following format:-

Information Shown

- Sign Reference Number
- Manufacturer's Name
- Month and Year of Manufacture
- Manufacturer and Class of Retro-Reflective Material

4. The requirements for reference markings shall not apply to proprietary street name or community facility name signs.

Proprietary Signs

262.07 PROTECTION OF SIGNS

1. Signs shall be adequately protected from damage during storage and transportation to site.

SIGN SUPPORT STRUCTURES

262.08 GENERAL

1. The work to be executed under this section includes the supply of materials, fabrication of components and protective treatment of the sign support structures and anchor bolt assemblies and the supply and fabrication of footing reinforcement cages.

Scope

2. The Contractor shall advise the names of the proposed suppliers of sign support structures for the Superintendent's concurrence. Only suppliers who have previously established, or can now establish, their competence to carry out the work in accordance with this specification shall be used

Approved Supplier

3. The Contractor shall supply documentary evidence, satisfactory to the Superintendent, that all materials and parts proposed for use comply with the requirements of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

Proof of Quality

HP

4. Details of the sign support structures to be provided under the Contract shall be as shown on the Drawings.

Structure Details

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262.09 SIGN STRUCTURES AND ANCHOR BOLT ASSEMBLIES**(a) Fabrication**

1. Sign support structures shall be either: **Type**
- (i) Standard round galvanised steel posts of size 50, 65 or 80mm nominal bore, as shown on the Drawings, fitted with a cap for waterproofing.
 - (ii) Purpose-designed steel structures as shown on the Drawings and manufactured in accordance with the requirements of AS 1250.
2. Purpose-designed steel structures shall be fabricated from steel sections which shall comply with the requirement of AS 1163, AS 3678 and AS 3679.1. **Standards**
3. Splices in members shall be restricted to a maximum of one splice per member. Splices shall be full penetration butt welds. **Splices**
4. All welding shall be as shown on the Drawings and in accordance with the requirements of AS 1554.1, Category SP for sign structure welds and Category GP for anchor bolt assemblies.
5. Anchor bolt assemblies for purpose-designed structures shall be fabricated as shown on the Drawings. **Anchor Bolts**
6. All steelwork shall be finished in a workmanlike manner and shall be free from pitting, sharp corners and projections and cleaned of mill scale, loose rust and foreign particles either by blast cleaning or other effective method. **Finish**

(b) Protective Treatment

1. Except for standard galvanised steel posts, all steel components including brackets and anchor bolt assemblies shall be protected by hot-dip galvanising after all fabrication processes are completed. **Hot-Dip Galvanising**
2. The steel components shall be finished by the hot-dip galvanising process in accordance with AS/NZS 4680 to provide an average minimum coating thickness of 85 microns and a bright finished surface free from white rust and stains. **Finish**
3. Bolts, nuts and washers and brackets shall be galvanised in accordance with AS 1214. **Bolts, Nuts etc.**
4. Splices in standard galvanised steel posts shall be painted by using an organic zinc-rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Appendix E of AS/NZS 4680. **Splices in Galv. Posts**

(c) Attachment of Signs

1. Posts and other components shall be provided with the required sign attachment holes or fittings to suit the typical attachment systems as shown on the Drawings. Sign panels shall be attached to each supporting member at each extrusion section or bolt hole in the sign panel. **Typical Systems**
2. The Contractor shall submit details of the proposed attachment systems for the Superintendent's approval. **Contractor's Responsibility**

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262.10 STEEL REINFORCEMENT CAGES

1 Steel reinforcement in cages for sign support structure footings shall comply with the requirements of AS 1302, AS 1303 or AS 1304 as appropriate.

Standards

2. If requested, the Contractor shall supply evidence satisfactory to the Superintendent that all materials conform with the requirements of this specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the supplied evidence is required prior to the release of the hold point.

Evidence of Quality

HP

3. Steel reinforcement shall be free from loose or thick rust, grease, tar, paint, oil, mud, millscale, mortar or any other coating, but shall not be brought to a smooth polished condition.

Cleanliness

4. Reinforcement shall be carefully formed to the dimensions and shapes shown on the Drawings. Heating of reinforcement for purposes of bending will not be permitted unless Grade 400 deformed bar reinforcement is specified.

Accuracy

5. All reinforcement shall be furnished in the lengths indicated on the Drawings. Splicing of bars will only be permitted with the approval of the Superintendent as to the location and method of splicing.

Full Bars

6. Splicing in reinforcing fabric shall be measured as the overlap between the outermost wire in each sheet of fabric transverse to the direction of splice. This overlap shall not be less than the pitch of the transverse wires plus 25mm.

Splicing

7. Welded splices and tack welding of bars shall conform to the requirements of AS 1554.

Welding

262.11 MANUFACTURER'S IDENTIFICATION

1. Each purpose-designed structure shall carry a clear marking on the post column one metre above base plate, the outreach arm, as well as the sign support vertical, showing:

Information Shown

- Sign Reference Number
- Manufacturer's Name
- Month and Year of Manufacture
- Drawing No.

2. The marking shall be legibly and durably applied by etching, stamping, engraving or welding.

Application

3. This marking shall be additional to date stamping required under Clause 262.14.

Warranty

262.12 INSPECTION

1. All purpose-designed structures covered by this Specification shall be subject to an inspection at the Contractor's Works prior to acceptance.

Pre-delivery Inspection

2. The Contractor shall give the Superintendent at least two working day's notice of the availability of the sign structures for pre-storage or pre-delivery inspection. This action constitutes a **HOLD POINT**. The Superintendent's certification of the sign support structures is required prior to the release of the hold point.

Two Days Notice

HP

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3. The Superintendent will issue the Contractor with a Certificate listing particulars of the items inspected. The Certificate will indicate either: **Inspection Certificate**

(a) the sign structures satisfy the requirements of the Specification and shall be accepted; or

(b) the grounds for rejection of the goods.

262.13 STORAGE

1. The Contractor shall store the sign support structures and reinforcement cages until required to be incorporated into the Works or required by the Superintendent. **Contractor's Responsibility**

2. Completed reinforcement cages shall be stored under a waterproof shelter and supported above the surface of the ground, and shall be protected from injury and from deterioration due to exposure. **Storage**

262.14 WARRANTY PERIOD

1. Supply of any structure under this Specification shall be subject to a warranty period of 12 months following the date of dispatch from the Contractor's Works to the Site. **Warranty Period**

2. Any sign structure which has failed in service or found to be defective within 12 months of the date of dispatch shall be removed by the Contractor, who shall then make good the defect or arrange to have the defect made good, and subsequently return and re-erect the good unit at the original location at no charge to the Principal. Unless otherwise agreed, defective structures shall be processed and returned within 30 calendar days from the date the Contractor is notified by the Principal of the defect. **Contractor's Responsibility**

3. It is expressly understood that any structure which has failed as a result of a traffic accident, abuse or act of vandalism caused by a third party after delivery to the Site shall not be covered by warranty provisions. **Exclusion**

4. In order to facilitate checking of warranty claims all separate items of the sign structure shall be legibly stamped, etched or engraved to show the date of dispatch from the Contractor's Works to the Site. **Date of Dispatch Mark**

5. This warranty shall apply notwithstanding any defects liability period provided for in the General Conditions of Contract. **Application**

ERECTION OF NEW SIGNS

262.15 SET OUT

1. The location of signs shall be as shown on the Drawings or as directed by the Superintendent. The Contractor shall set out the work to ensure that all signs and support structures are placed in accordance with the Drawings or as directed by the Superintendent. **Location**

2. Underground services laid in proximity to the signs shall be located prior to placement of footings and erection of signs, all care shall be taken not to damage such services.

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3. Signs shall be aligned approximately at right angles to the direction of the traffic they are intended to serve. On curved alignments, the angle of placement should be determined by the course of approaching traffic rather than the orientation of the road at the point where the sign is located.

Alignment

4. The Contractor shall submit details of the set out, for the Superintendent's inspection and approval, and the proposed disposition and alignment of each sign support structure. This action constitutes a **HOLD POINT**. The Superintendent's approval of the set out, disposition and alignment of the sign support structures is required prior to the release of the hold point.

Set Out



262.16 CLEARING

1. Any trees and undergrowth within three metres of the sign support structure and along a driver's line of sight to the front of the sign shall be cleared and removed following set out approval by the Superintendent on advice from Council's Tree Preservation Officer.

Extent of Work

262.17 SIGN STRUCTURE FOOTINGS

1. The footings for a simple pipe support or the footings for each post of a purpose-designed sign support structure shall be constructed in accordance with the Drawings or as directed by the Superintendent.

Details

2. The footings shall be neatly excavated to the depth and width shown on the Drawings. The material from the excavation shall be disposed of in a manner approved by the Superintendent.

Excavation

3. When anchor bolt assemblies are specified they shall be accurately placed and firmly supported. Anchor bolt assemblies shall be provided with levelling nuts under the sign structure baseplates to allow adjustment of the structure after installation. All exposed bolt threads shall be protected from damage or adhesion of concrete during footing construction.

Anchor Bolt Assemblies

4. Steel reinforcement shall be placed as shown on the Drawings.

Steel Reinforcement

5. Concrete in the footings of sign support structures shall comply with the Specification for MINOR CONCRETE WORKS and have a minimum compressive strength at 28 days of 20MPa for pipe support footings and 32MPa for purpose-designed support footings.

Concrete Quality

6. If ready mixed concrete is used, the concrete shall be mixed and delivered in accordance with AS 1379.

Ready Mixed Concrete

262.18 ERECTION

1. All components shall be accurately positioned and supported during erection.

Position and Support

2. The top of each pipe support post shall extend sufficiently beyond the upper extrusion section or bolt holes on the sign panels to enable attachment of the signs. The top of each post shall be below the top edge of the sign panel.

Top of Post Level

3. For pipe support multi-post installations, the tops of the posts shall be at the same level except where sign shape or the arrangement of sign panels dictates otherwise.

Multi-Post Installation

4. During erection, sign panels shall be suitably supported and braced and the sign

Sign Damage

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face protected from damage. Signs damaged during erection shall be repaired to a standard equivalent to the original sign or replaced by the Contractor at the Contractor's cost.

**Contractor's
Cost**

5. Galvanised coatings on purpose-designed support structures which are scratched or slightly damaged during erection shall be renovated by using an organic zinc-rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Appendix E of AS/NZS 4680. This method of renovation shall be restricted to areas not exceeding 2500 square millimetres on any one structure. Any structure with totally-damaged coating areas exceeding 2500 square millimetres shall be regalvanised.

**Treatment of
Damaged
Areas**

6. The cost of regalvanising such damaged coating areas shall be borne by the Contractor.

**Contractor's
Costs**

ADJUSTMENT OF EXISTING SIGNS AND SUPPORT STRUCTURES

262.19 GENERAL

1. Where shown on the Drawings and where directed by the Superintendent, the Contractor shall adjust existing sign panels and sign support structures. The work shall include minor adjustments of existing sign panels and/or sign support structures or the work may extend to the dismantling of signs and sign support structures, relocation or replacement of sign support structures including footings and re-erection of signs including all fittings.

Extent of Work

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**262.20 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this specification are summarised in Table 262.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Sign Blanks		
	(a) Dimensions	± 1.50mm	262.05
	(b) Bow	< 0.5% of maximum dimension	262.05
	(c) Butt gap in multipiece sign	< 1mm	262.05
	(d) Rivet spacing in backing strip	< 200mm	262.05
	(e) Backing strip width	>50mm	262.05
2.	Extrusion Backing		
	(a) Rivet Spacing	<200mm	262.06
3.	Background Paint		
	(a) For matt coatings, gloss level	>12% and <15%	262.09
	(b) For gloss coatings, gloss level	>85% and <95%	262.09
4.	Reference Marking		
	(a) Height of Coding	>6mm and <10mm	262.11
5.	Sign Support Structures		
	(a) Protective Treatment thickness	>100 microns	262.14b
	(b) Paint coating over Splices in standard galvanised posts	>100 microns	262.14b
	(c) Damaged Surface of galvanised surfaces:		
	(i) Coating with zinc rich paint	Area <2500 sq. mm	262.23
	(ii) Regalvanise	Area >2500 sq. mm	262.23
6.	Clearing		
	(a) Trees and Undergrowth to be cleared	<3 metres from sign support structure	262.21

Item	Activity	Limits/Tolerances	Spec Clause
7.	Concrete in Footings of Sign Support Structures		
	(a) Strength		
	(i) Pipe Support	>20 MPa at 28 days	262.22
	(ii) Purpose-designed Support Footings	>32 MPa at 28 days	262.22

Table 262.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**262.21 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 262(a) to 262(l) inclusive.

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. The cost of any provision for traffic and covering of signs shall be deemed to be included in the various pay items in this Specification and not in the Specification for CONTROL OF TRAFFIC.

5. Sign structure support concrete footings are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.

6. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.

Pay Item 262(a) SUPPLY AND DELIVERY OF SIGNS (AREA LESS THAN 1 sq m)

1. The unit of measurement shall be each.

2. The schedule rate shall include the costs of mounting extrusions, fittings, labelling, packaging and delivery to site.

Pay Item 262(b) SUPPLY AND DELIVERY OF SIGNS (AREA BETWEEN 1 AND 3sq m)

1. The unit of measurement shall be each.

2. The schedule rate shall include the costs of mounting extrusions, fittings, labelling, packaging and delivery to site.

Pay Item 262(c) SUPPLY AND DELIVERY OF SIGNS (AREA GREATER THAN 3 sq m)

1. The unit of measurement shall be the area in square metres of signs supplied.

2. The area shall be calculated by totalling the face surface area of each sign supplied.

3. The schedule rate shall include the costs of mounting extrusions, fittings, labelling, packaging and delivery to site.

Pay Item 262(d) SUPPLY AND DELIVERY OF SIGN SUPPORT STRUCTURES (STANDARD ROUND GALVANISED POSTS)

1. The unit of measurement shall be each post.

2. The schedule rate shall include the costs of fabrication, fittings, caps, packaging, storage for up to 2 months and delivery free on truck.

Pay Item 262(e) SUPPLY AND DELIVERY OF SIGN SUPPORT STRUCTURES (PURPOSE-DESIGNED)

1. The unit of measurement shall be each sign support structure.

2. The schedule rate shall include fabrication, hot-dip galvanising, fittings, packaging, storage for up to 2 months and delivery free on truck.

3. Where a purpose-designed sign support structure consists of more than one post, the unit of measurement (each) shall include all posts required for that particular sign.

Pay Item 262(f) SUPPLY AND DELIVERY OF ANCHOR BOLT ASSEMBLIES

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- (1) Mk 1
- (2) Mk 2
- (3) Mk 3
- etc

1. The unit of measurement shall be each for the anchor bolt assemblies for each individual footing.
 2. The Schedule rate shall include the costs of fabrication, hot-dip galvanising, fittings, packaging, storage for up to 2 months and delivery free on truck.
- Pay Item 262(g) SUPPLY AND DELIVERY OF REINFORCEMENT CAGES

- (1) (Size)
- (2) (Size)
- (3) (Size)
- etc

1. The unit of measurement shall be each for the complete reinforcement cage for each individual footing.
 2. The schedule rate shall include the costs of fabrication, packaging, storage for up to 2 months and delivery free on truck.
- Pay Item 262(h) ERECTION OF SIGN STRUCTURES (STANDARD ROUND GALVANISED POSTS)

1. The unit of measurement shall be each post erected.

2. The schedule rate shall include the costs of clearing, excavation, casting of concrete footings, erection and bracing.
- Pay Item 262(i) ERECTION OF SIGN STRUCTURES (PURPOSE-DESIGNED)

1. The unit of measurement shall be each sign support structure erected.
 2. The schedule of rate shall include the costs of clearing, excavation, placement of reinforcement cages and anchor bolt assemblies, casting of concrete footings, erection and bracing.
 3. Where a purpose-designed sign support structure consists of more than one post and footing, the unit of measurement (each) shall include all posts and footings required for that particular sign.
- Pay Item 262(j) ERECTION OF SIGNS (TO STANDARD ROUND GALVANISED POSTS)

1. The unit of measurement shall be each sign erected.
 2. The schedule rate shall include the costs of erection and attachment costs and any necessary temporary covering of signs with plastic or other approved opaque covering.
- Pay Item 262(k) ERECTION OF SIGNS (TO PURPOSE-DESIGNED STRUCTURES)

1. The unit of measurement shall be the area in square metres of signs erected.
 2. The area shall be determined by totalling the face surface area of the signs.
 3. The schedule rate shall include the costs of erection and attachment costs and any necessary temporary covering of signs with plastic or other approved opaque covering.
- Pay Item 262(l) ADJUSTMENT OF EXISTING SIGNS AND SUPPORT STRUCTURES

1. The unit of measurement shall be the area in square metres of signs adjusted.
2. The area shall be determined by totalling the face surface area of the signs adjusted.
3. The schedule rate shall include the costs of dismantling of signs and sign structure, relocation or replacement of sign structures including excavation, concrete footings, (including placement of reinforcement cages and anchor bolt assemblies where specified) and re-erection of signs including all fittings.

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4. Separate pay items shall be included for each adjustment required to re-erect existing signs and sign support structures and shall cover all work required that is not covered by the other pay items under signposting.

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CITY OF GREATER DANDENONG

SPECIFICATION

263

GUIDE POSTS

SPECIFICATION 263 - GUIDE POSTS

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SPECIFICATION 263 : GUIDE POSTS

GENERAL

263.01 SCOPE

1. The work to be executed under this Specification consists of the setting out, supply of all materials and erection of guide posts at the locations shown on the Drawings or as directed by the Superintendent in areas where streetlighting is not provided.

263.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

201 - Control of Traffic

(b) Australian Standards

AS 1604.1 - Specification for preservative treatment – Part 1: Sawn and round timber.
 AS 1906.2 - Retroreflective devices (non-pavement application).
 AS 2082 - Visually stress-graded hardwood for structural purposes.

263.03 MATERIALS

(a) General

1. Guide posts shall be of timber or, as an alternative, the Superintendent may approve of a proprietary metallic or flexible (driveable or non-driveable) post.

Type

2. The surface of all posts shall have a gloss or semi-gloss white finish. The surface shall be smooth and easily cleaned.

Surface Finish

3. Proprietary posts shall be minimum 1350mm in length and shall have one face of 100mm width.

Dimensions

(b) Timber Posts

1. Timber posts shall be cut from Select Grade hardwood and conform with AS 2082. All surfaces shall be smooth and free from obvious saw marks.

Quality

2. The posts shall be of rectangular cross-section having dimensions of 100mm x 50mm and shall be 1,400mm in length. The tops of the guide posts shall be sloped so that one 100mm edge is 10mm lower than the opposite edge.

Dimensions

(c) Proprietary Posts

1. Where a proprietary metallic or flexible guide post is proposed, the Contractor shall supply details of the proposed guide post including the manufacturer’s recommended installation procedure, technical specifications and test certificates for consideration by the Superintendent. The test certification shall address post strength, flexibility, impact and heat resistance and durability. This action constitutes a **HOLD POINT**. The Superintendent’s approval of the submitted details and acceptance of the nominated guide post type and supplier is required prior to the release of the hold point.

HP

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(d) Delineators

1. Corner-cubed delineators, conforming to AS 1906.2 shall be attached to each post. **Standard**
2. The delineators shall be neither less than 80mm nor more than 85mm diameter. **Diameter**

CONSTRUCTION**263.04 GENERAL**

1. The Contractor shall at all times conform to the requirements of the Specification for CONTROL OF TRAFFIC. **Traffic Control**
2. Where the shoulder is in embankment, in cutting or at natural surface level, the guide posts shall be placed near the outer edge of the shoulder and at a uniform distance, minimum 1m, from the pavement edge line. Where the shoulder is located in a cutting, the guide posts shall be placed on the road pavement side of the table drain in such a manner as not to impede the flow of water in the drain. **Positioning**
3. Guide posts shall be erected at the locations shown on the Drawings or as directed by the Superintendent. **Location**
4. Underground services laid in proximity to the guide posts shall be located prior to erection of posts, all care shall be taken not to damage such services. **Underground Services**

263.05 PROTECTIVE TREATMENT OF TIMBER GUIDE POSTS

1. The portion of the guide post below ground level shall be treated with creosote, such that the penetration and retention of creosote preservative conforms with the requirements for minimum Hazard Class H4 treatment in accordance with AS 1604.1. **Creosote**
2. All timber above ground level shall be painted with pink primer and any holes, cracks, or other surface imperfections in the timber, shall be stopped with white putty. This work shall be followed by painting with a white undercoat and a white enamel finishing coat. **Painting**
3. Painted surfaces shall be thoroughly dry before the second coat is applied. Paints shall be handled and applied in accordance with the manufacturer's directions. **Dry Surfaces**
4. All paints shall be of the best quality, durable and suitable for exterior application on timber surfaces. **Paint Quality**

263.06 ERECTION OF GUIDE POSTS

1. Guide posts shall be set vertically in the ground to a depth of approximately 500mm. In order to offset shoulder irregularities this depth shall be varied so as to give uniform display of guide posts to a height of approximately 900mm above ground level, with the tops evenly graded. Each guide post shall be erected with the 100mm axis at right angles to the centre line of the road. **Details**
2. Allowance shall be made in the height of guide posts above the ground for the effects of superelevation and other road geometry in order to keep the guide posts within the range of the beam of vehicle headlights. **Vertical Alignment**
3. Backfilling shall be compacted in layers of depth not more than 150mm for the full depth of the guide posts up to ground level. The density of the compacted backfilling shall not be less than that of the adjacent undisturbed ground. Guide posts shall be firm **Backfilling**

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in the ground to the satisfaction of the Superintendent.

4. Proprietary guideposts, when installed in the ground in accordance with the recommendations of the manufacturer, shall resist overturning, twisting and displacement from wind and impact forces.

***Proprietary
Guideposts***

5. All necessary steps shall be taken to prevent people and stock from stepping into the post holes during the erection of the guide posts.

***Contractor's
Responsibility***

263.07 DELINEATORS

1. 'Corner Cubed' delineators, complying with AS 1906.2, shall be attached to each guide post using one way, anti-theft screws. In the case of proprietary posts, the delineators shall be glued or otherwise fastened to the post in such a manner that they are not dislodged or rendered inactive under vehicular impact.

Fixing

2. The delineators shall be mounted so that the top of the reflector is 50mm below the top of the guide post.

Position

3. The delineators shall be so arranged that drivers approaching from either direction will see only red delineators on their left side and white delineators on their right side.

Arrangement

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**263.08 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Item 263(a).

2. A lump sum price shall not be accepted.

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Traffic control is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
Pay Item 263(a) GUIDE POSTS

1. The unit of measurement shall be 'each' guide post.

2. The schedule rate shall cover all costs associated with the erection of each post, including supply of post, erection, painting (if applicable), and supply and fixing of corner-cubed delineators.

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CITY OF GREATER DANDENONG
SPECIFICATION

264

**NON-RIGID ROAD
SAFETY BARRIER SYSTEMS**
(Public Domain)

SPECIFICATION 264 – NON-RIGID ROAD SAFETY BARRIER SYSTEMS (Public Domain)

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**SPECIFICATION 264:
NON-RIGID ROAD SAFETY BARRIER SYSTEMS (Public Domain)**

GENERAL**264.01 SCOPE**

1. The work to be executed under this Specification consists of the setting out, supply of all materials and erection of road safety barriers and terminals, in accordance with the requirements for non-rigid road safety barrier systems in AS/NZS 3845, at the locations shown on the Drawings or as directed by the Superintendent.
2. This Specification details the requirements for public domain non-rigid road safety barrier systems. Where a patented non-rigid road safety barrier system is specified and shown on the Drawings, all materials shall be in accordance with the manufacturer's specifications and, it shall be constructed strictly in accordance with the manufacturer's instructions.
3. Rigid road safety barrier systems are specified in a separate Specification Part.

264.02 REFERENCE DOCUMENTS

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

**Documents
Standards Test
Methods**

(a) Council Specifications

- | | | |
|-----|---|------------------------------------------------------------|
| 201 | - | Control of Traffic |
| 267 | - | Rigid Concrete Road Safety Barrier Systems (Public Domain) |
| 271 | - | Minor Concrete Works |

(b) Australian Standards

- | | | |
|-------------|---|-------------------------------------------------------------------|
| AS 1906.2 | - | Retroreflective devices (non pavement application). |
| AS/NZS 3845 | - | Road safety barrier systems. |
| AS/NZS 4680 | - | Hot-dip galvanised (zinc) coatings on fabricated ferrous articles |

MATERIALS**264.03 COMPONENTS**

1. All steel components for public domain non-rigid road safety barrier systems, W-beam and Thrie-beam, shall be in accordance with AS/NZS 3845 and shall be of the type as shown on the Drawings.
2. Timber posts are to be used only in W-beam terminal sections, as detailed on the Drawings and shall be of the timber type, grade, size and treatment level in accordance with AS/NZS 3845. All surfaces shall be smooth and free from obvious saw marks.

Steel

Timber

264.04 CERTIFICATION

1. Steel and timber road safety barrier components shall not be erected until the Contractor has produced documentary evidence to the Superintendent that the steel and timber road safety barrier components conform to the requirements of this Specification. This action constitutes a **HOLD POINT**. The Superintendent's approval of the

HP

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documentary evidence is required prior to the release of the hold point.

CONSTRUCTION

264.05 GENERAL

1. The Contractor shall at all times conform to the requirements of the Specification for CONTROL OF TRAFFIC. *Traffic Control*
2. Construction of non-rigid road safety barrier shall comply with AS/NZS 3845 except where explicit departures are detailed on the Drawings.
3. Road safety barriers shall be erected after the construction of the base on concrete pavements and after the placing of the initial layer of asphaltic concrete or sprayed seal on a flexible pavement, unless otherwise approved by the Superintendent. *Timing of Construction*
4. The Contractor shall set out the work to ensure that all road safety barriers and terminal sections are located in accordance with the Drawings or as directed by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the set out is required prior to the release of the hold point. **HP**
5. Underground cables and ducts laid in the road safety barrier area shall be located prior to the erection of posts and all care must be taken not to damage such cables and ducts. *Cables and Ducts*
6. The posts should be set to the full depth as shown on the Drawings. If this is not possible due to the presence of an underground obstruction, an alternative method of setting the posts, as approved by the Superintendent, shall be used. *Underground Obstruction*
7. Posts shall stand vertical and the spacing shall be such that when the safety barrier is erected no post movement is necessary in order to align holes or for any other reason. *Post Accuracy*

264.06 ERECTION OF STEEL POSTS

1. The safety barrier posts are to be located as shown on the Drawings. The top of the post shall be 710mm, 805mm or 865mm as appropriate for W-beam, Thrie-beam or modified blockout Thrie-beam respectively, above the ground level, unless otherwise shown on the Drawings. On terminal ends, the level of the posts shall be such as to conform to the extended crossfall of the main pavement unless otherwise shown on the Drawings. *Positioning of Posts*
2. When erected in position the posts shall be on a smooth line both horizontally and vertically with the tops of posts within ± 20 mm of the heights specified in paragraph 1 of this Clause. *Smooth Line/ Tolerances*
3. Steel posts shall be erected by driving, or by other means, as directed by the Superintendent, in accordance with the requirements for foundation posts in AS/NZS 3845. The open section of the post shall point in the same direction as adjacent traffic. The posts are to be firm in the ground and any movement at ground level shall not exceed 3mm in any direction when force tested in accordance with AS/NZS 3845. *Foundation and Testing*
4. The posts shall not have any obvious deformation as a result of driving. Any damage which does occur to the posts is to be repaired within 24 hours using an organic zinc-rich primer in accordance with the repair requirements of Appendix E in AS/NZS 4680. *Damage to Posts*
5. Any post which has been excessively damaged will be rejected by the Superintendent and shall be replaced by the Contractor at its own expense. *Contractor's Cost*

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264.07 ERECTION OF TIMBER POSTS

1. The safety barrier posts are to be located as shown on the Drawings. The top of the posts shall be 710mm \pm 20mm above the ground level, unless otherwise shown on the Drawings. On terminal ends the level of the posts shall be such as to conform to the extended crossfall of the main pavement, unless shown otherwise on the Drawings. **Positioning of Posts**
2. When erected in position the posts shall be on a smooth line both horizontally and vertically. **Smooth Line**
3. The section of the timber posts to be cast into a reinforced concrete footing shall be wrapped in 12mm thick polystyrene foam sheeting before concrete casting. **Polystyrene Foam**
4. Concrete used in the footings for timber posts shall have a minimum compressive strength of 32MPa at 28 days and shall conform with the requirements of the Specification for MINOR CONCRETE WORKS. **Concrete**
5. Concrete footings shall be 600mm diameter, and shall have tolerances of minus zero or plus 50mm. Overbreak and excessive depth shall be filled with 32MPa concrete at no cost to the Principal. **Footing Size**
6. Wire fabric reinforcing shall be as detailed on the Drawings. **Reinforcing Fabric**
7. The surface area of the posts which will be above ground shall be painted with two coats of grey acrylic paint. **Painting**

264.08 ERECTION OF ROAD SAFETY BARRIER RAILS

1. Steel blackout pieces shall be erected with the open section pointing in the same direction as adjacent traffic. **Blockouts**
2. All rail laps shall be in the same direction as adjacent traffic such that approach rail ends are not exposed to traffic. **Rail Laps**
3. Stiffening pieces, 300mm long, shall be used on intermediate posts. **Stiffening Pieces**
4. Road safety barrier rails and blackout pieces shall be handled and erected in such a manner that no damage occurs to the galvanising. Any minor damage occasioned to the galvanising shall be repaired within 24 hours using an organic zinc-rich primer in accordance with the repair requirements of Appendix E in AS/NZS 4680. **Minor Damage to Galvanising**
5. Any road safety barrier rails or blackout pieces which have been excessively damaged will be rejected by the Superintendent and shall be replaced by the Contractor at its own expense. **Contractor's Cost**
6. Road safety barrier rail attachment bolts and splice bolts are to be tightened initially such that the barrier can be erected. Adjustments are then to be made to the rails using the slotted holes provided to produce a smooth regular line, free of any kinks or bumps. The overall line of the top of the safety barrier rails is to visually conform with the vertical alignment of the road pavement. **Erection Procedure**
7. When the alignment both vertically and horizontally is obtained the splice bolts are to be fully tightened. The bolt head (not the shoulder) should be in full bearing with the rail. **Splice Bolt Tightening**

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264.09 END TREATMENT OF ROAD SAFETY BARRIERS

1. Both approach and departure ends of the road safety barrier shall be constructed with leading and trailing terminal sections at locations shown and as detailed on the Drawings. **Leading, Trailing Terminals**
2. Modified eccentric loader terminals (MELT) shall be constructed, as detailed on the Drawings and, at approach end locations of road safety barriers as shown on the Drawings. Where the departure end of a road safety barrier is within the clear zone of opposing traffic, a MELT shall be constructed in place of a trailing terminal section. **MELT**
3. The approach and departure ends of double sided road safety barriers shall have terminal sections as detailed on the Drawings. **Double Sided Safety Barrier**
4. Non-rigid road safety barrier connections to rigid road safety barriers or bridge parapets shall be as detailed on the Drawings and specified in the Specification for RIGID CONCRETE ROAD SAFETY BARRIER SYSTEMS (PUBLIC DOMAIN). **Connections to Rigid Barriers**

264.10 DELINEATORS

1. Delineators complying with AS 1906.2 shall be fixed with brackets to the road safety barrier, to the details and at the locations shown on the Drawings beginning at the first post and then in accordance with the following table:- **Fixing**

Radius of Curve	Spacing of Reflectors on Barrier
m	every
30 - 90	3rd post
90 - 180	5th post
180 - 275	8th post
275 - 365	11th post
over 365	16th post
(including straight road)	

2. The delineators shall be so arranged that drivers approaching from either direction will see only red reflectors on their left side, and white reflectors on their right. **Arrangement and Colour**

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**264.11 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this specification are summarised in Table 264.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Vertical Alignment		
	(a) Tops of steel posts.	± 20mm	264.06
	(b) Tops of timber posts	± 20mm	264.07
2.	<i>Post Movement</i>	≤ 3mm	264.06
3.	Concrete Footings		
	(a) Diameter	-0mm or +50mm	264.07

Table 264.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**264.12 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 264(a) to 264(g) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Concrete footings for timber posts are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
5. Miscellaneous minor concrete work not included in the pay items in this Specification shall be in accordance with pay items described in the Specification for MINOR CONCRETE WORKS.
6. Traffic control is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.

Pay Item 264(a) SINGLE SIDED ROAD SAFETY BARRIER

- (i) Single W-beam
- (ii) Nested W-beam
- (iii) Single Thrie-beam
- (iv) Nested Thrie-beam
- (v) Single Modified Blockout Thrie-beam
- (vi) Nested Modified Blockout Thrie-beam
- (vii) Single W-Thrie-beam Transition
- (viii) Nested W-Thrie-beam Transition

1. The unit of measurement shall be the linear metre.
2. The distance shall be measured along the centre line of the rail, centre to centre of posts, excluding terminal sections and connectors to rigid safety barriers or bridge parapets..
3. The schedule rate shall include the supply of all components and fixings and all activities associated with the erection of each type of road safety barrier.

Pay Item 264(b) MODIFIED ECCENTRIC LOADER TERMINAL (MELT)

1. The unit of measurement shall be "each" MELT section supplied and erected as detailed on the Drawings.

Pay Item 264(c) TERMINAL SECTION

- (i) Leading Terminal
- (ii) Trailing Terminal

1. The unit of measurement shall be "each" terminal section supplied and erected as detailed on the Drawings.

Pay Item 264(d) CONNECTORS TO RIGID ROAD SAFETY BARRIERS (RSB) OR BRIDGE PARAPET

- (i) W-beam to RSB
- (ii) W-beam to Thrie-beam to RSB
- (iii) Thrie-beam to RSB

1. The unit of measurement shall be "each" connector supplied and erected as detailed on the Drawings, excluding the anchorage assemblies cast into the rigid road safety barrier or bridge parapet.

Pay Item 264(e) DELINEATOR BRACKETS

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1. The unit of measurement shall be "each".
Pay Item 264(f) DOUBLE SIDED ROAD SAFETY BARRIER

- (i) Single W-beam
- (ii) Nested W-beam
- (iii) Single Thrie-beam
- (iv) Nested Thrie-beam
- (v) Single Modified Blockout Thrie-beam
- (vi) Nested Modified Blockout Thrie-beam
- (vii) Single W-Thrie-beam Transition
- (viii) Nested W-Thrie-beam Transition

1. The unit of measurement shall be the linear metre.

2. The distance shall be measured along the centre line of the rails, centre to centre of posts, excluding terminal sections and connectors to rigid safety barriers or bridge parapets.

3. The schedule rate shall include the supply of all components and fixings and all activities associated with the erection of each type of road safety barrier.

Pay Item 264(g) DOUBLE SIDED ROAD SAFETY BARRIER TERMINAL SECTION

1. The unit of measurement shall be "each" terminal section supplied and erected as detailed on the Drawings.

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CITY OF GREATER DANDENONG
SPECIFICATION

265

BOUNDARY FENCING

SPECIFICATION 265 - BOUNDARY FENCING

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MEASUREMENT AND PAYMENT 421

265.25 PAY ITEMS 421

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SPECIFICATION 265 - BOUNDARY FENCING**GENERAL****265.01 SCOPE**

1. The work to be executed under this Specification includes setting out, clearing of fence line, supply of material and erection of boundary fencing, of the type or types specified, and gates in accordance with this Specification and the Drawings or as directed by the Superintendent.

265.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 212 - Clearing and Grubbing
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1725 - Galvanized rail-less chainwire security fences and gates
- AS 2423 - Galvanized wire fencing products

MATERIALS**265.03 GENERAL**

1. All materials shall be supplied by the Contractor and shall be of dimensions, manufacture and quality in accordance with the requirements of this Specification and all galvanised wire fencing products shall conform to AS 2423.

**Dimensions
and Quality**

2. For each type of material to be supplied, the Contractor shall submit to the Superintendent for approval the source, manufacturer, and also the type if applicable. This constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

**Details to be
Provided**

HP

265.04 GALVANISED POSTS AND BRACES (URBAN FENCING)

1. All posts and bracing shall be galvanised iron pipe in accordance with AS 1725 and shall be to the following dimensions:

Dimensions

- (i) End, Corner, Strainer and Gate Post - shall be 60mm outside diameter.
- (ii) Intermediate Posts - shall be 42mm outside diameter.
- (iii) Braces - shall be 48mm outside diameter.

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2. All pipe joints shall be welded. All welds shall be satisfactorily cleaned and painted with a cold galvanising compound to the satisfaction of the Superintendent. **Welded Joints**

265.05 CHAIN WIRE

1. Galvanised chain wire mesh, 1,450mm wide (1830mm wide for Manproof Fencing) shall be of 3.15mm diameter wire woven to a 50 x 50mm square mesh. The selvedge edges of the chain wire shall be left barbed, and it shall be supplied in lengths of not less than 30m. The zinc coating shall be uniform, continuous, free from imperfections and thoroughly adherent. The coating shall be applied to the wire before the mesh is woven. The weight of the zinc coating shall not be less than 290 g/sq m of wire surface. **Dimensions and Zinc Coating**

2. Where specified, the chain wire shall be coated in black PVC after galvanising. **PVC Coating**

265.06 WIRE NETTING

1. Wire netting shall be standard quality galvanised 1.40mm diameter wire, 40mm mesh, 1.05m wide for normal use and 1.60mm diameter wire, 50mm mesh, 0.90m wide where used in creek crossings. **Dimensions**

265.07 GATES

1. Gates shall be of galvanised tubular steel construction, 3.6 metres in width by 1.5 metres or 1.2 metres (as specified) in height, and shall be fitted with substantial hinges, catch, drop bolts and locking chains unless otherwise shown on the Drawings or directed by the Superintendent. **Dimensions and Fittings**

2. Where required, gates shall have stout and well supported rabbit-proof mesh to a height of at least 900mm above ground level. **Rabbit Proofing**

265.08 REINFORCED CONCRETE POSTS

(a) Strainer Posts

1. Concrete strainer posts shall be approximately 150 x 150 square in section and lengths as shown on the Drawings. Each post shall be provided with 12mm dia holes to suit the spacing of the wires shown on the Drawings for the particular type(s) of fencing to be erected. **Dimensions**

2. The posts shall be reinforced longitudinally with not less than four reinforcing bars each 12mm diameter. All posts shall have suitable stirrup reinforcement to control diagonal cracking. Longitudinal reinforcement shall have 25mm minimum cover. End cover on reinforcement shall be 25mm. **Reinforcing Steel**

3. The steel reinforcement and concrete shall comply with the Specification for MINOR CONCRETE WORKS. **Material Quality**

4. The concrete shall have a minimum 28 day compressive strength of 20MPa. **Concrete Strength**

5. When advising the type, source and manufacturer of the posts proposed for use, the Contractor shall also submit full details of steel reinforcement. **Contractor's Responsibility**

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(b) Intermediate Posts

1. Intermediate Posts shall generally conform to the requirements for Strainer Posts, except that the longitudinal reinforcing bars shall be 9mm dia. **Quality**

265.09 PRESTRESSED CONCRETE POSTS**(a) Strainer Posts**

1. At least four longitudinal high carbon deformed high tensile strands (or equivalent) of 5mm diameter, shall be provided. The strands shall be tensioned to a stress of 800MPa minimum prior to placing concrete. Cross sectional dimensions of the posts shall be as shown on the Drawings. **Tendons**
2. Concrete shall comply with the Specification for MINOR CONCRETE WORKS and shall have a minimum compressive strength of 32MPa at 24 hours. **Concrete**
3. In lieu of holes for wires, grooves may be provided to suit the spacing of the wires shown on the appropriate Drawings for the particular types of fencing to be erected. The grooves shall be at least 5mm deep and 5mm wide at the surface of the post. **Grooves for Wire**
4. When advising the type, source and manufacturer of the posts proposed for use, the Contractor shall also submit full details of prestressing tendons. **Contractor's Responsibility**

(b) Intermediate Posts

1. Intermediate posts and strainer stays shall generally conform to the requirements for Strainer Posts except that two only high tensile, high carbon deformed strands shall be required. **Quality**
2. Cross sectional dimensions shall be as shown on the Drawings. **Dimensions**

265.10 STEEL POSTS (RURAL FENCING)

1. Steel posts shall be "STAR" pattern, of manufacture approved by the Superintendent. Posts shall be drilled to suit the spacing of the wires shown on the Drawing(s), and shall be black varnished or galvanised. **Type**
2. The total weight of 300 posts each 1.65m long shall be at least one (1) tonne. **Weight**

265.11 GALVANISED PIPE POSTS (RURAL FENCING)

1. Galvanised pipe posts shall be used where shown on the Drawings. The pipes shall be of the dimensions shown on the Drawings and shall be of first grade quality in accordance with AS 1725. **Dimensions and Quality**

265.12 WIRES**(a) Plain Wire**

1. Plain wire shall be standard galvanised drawn annealed steel wire of diameters shown on the Drawings. **Type**

(b) High Tensile Plain Wire

1. High Tensile wire shall be galvanised and of diameters shown on the Drawings. **Type**

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(c) Barbed Wire

1. Barbed wire including barbs shall be 2.5mm diameter galvanised drawn annealed steel wire, with clusters of four barbs spaced at 90mm maximum. Alternatively barbed wire may be of 1.6mm diameter high tensile steel wire, with clusters of barbs spaced at 90mm maximum.

Type and Dimensions**(d) Cable Wire**

1. Cable wire shall consist of three pairs of 2 x 3.15mm galvanised iron wire tightly twisted around posts and located as shown in the Drawings.

Type and Dimensions**(e) Tie Wire**

1. The wire shall be 2mm diameter galvanised wire.

Type and Dimensions**265.13 CONCRETE BACKFILLING**

1. All concrete backfilling specified on the Drawings shall be 20MPa concrete and shall conform to the requirements of the Specification for MINOR CONCRETE WORKS.

Specification**CONSTRUCTION****265.14 GENERAL**

1. Boundary fencing shall be erected prior to the commencement of other work on a particular section of the work, unless directed otherwise by the Superintendent.

Construction Priority

2. All fencing shall be erected in a workmanlike manner, and when completed shall be sound, strong and of neat appearance.

Quality

3. In the case of Controlled Access boundary fencing, the fence shall be erected 300mm on the roadway side of the pegged boundary line. Unless directed otherwise, all other fencing shall be erected on the pegged line, or on the line shown on the plans.

Position

4. For a clear width of one metre on either side of the fence line, and for the full length of the line, all logs, boulders, stumps, roots, undergrowth and rubbish shall be removed and disposed of by the contractor in accordance with the Specification for CLEARING AND GRUBBING. Trees within this area shall be removed only as directed by the Superintendent in consultation with Council's Tree Preservation Officer.

Clearing

5. If trees on or adjacent to the fence line are to be retained the arrangement of the fencing at the trees shall be as directed by the Superintendent.

Trees Retained

6. Wire shall not be strained around or against any trees to be left in the fence line, and strainer posts are to be provided on both sides of each tree.

Trees on Fence Line

7. Where minor irregularities occur in the ground the vertical alignment of the fence shall not follow these irregularities, but shall be aligned to a uniform grade between definite changes in the natural slope of the ground.

Uniform Grade

8. All survey pegs shall be left undisturbed and the post spacing shall be altered slightly where necessary to avoid pegs.

Survey Pegs

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9. The Contractor shall maintain the fencing at all times in a condition secure against the ingress or egress of stock, and shall take such precautions as are necessary to prevent people or stock from stepping into holes excavated for the construction of fencing. **Stock Proof**
10. Where old fencing is to be replaced by new fencing, all holes left after removal of the old fencing shall be backfilled and rammed firmly in layers of maximum depth 150mm. **Backfilling of Old Holes**
11. Where the old fencing is rabbit-proof it shall be maintained in a rabbit-proof condition at night, and during all other periods when fencing operations are not being carried out, until such time as the new rabbit-proof fencing is erected. **Rabbit Proof**
12. The Contractor shall be held responsible for any loss, damage, or injury to buildings, goods, crops, livestock, property of any kind or persons due to negligence on the Contractor's part. **Contractor's Responsibility**

265.15 CHAIN LINK FENCING

(a) Erection of Posts

1. All posts shall be erected vertically and set in concrete blocks approximately 250mm diameter and 600mm deep except for end, corner, strainer and gate posts which shall be set in concrete blocks approximately 250mm diameter and 900mm deep unless otherwise shown on the Drawings. Concrete shall have a minimum compressive strength of 20MPa at 28 days and shall conform to the requirements of the Specification for MINOR CONCRETE WORKS. **Concrete Blocks and Quality**
2. Galvanised weather caps shall be fitted to all galvanised posts. **Weather Caps**
3. Strainer posts shall be used at ends of fencing, angles, intersections with other fencing, gates and at intermediate points. Distances between strainer posts shall not exceed 120 metres. **Strainer Posts**

(b) Erection Of Wire

1. All wire shall be spaced as shown in the Drawings. Wire shall be securely fastened and strained to an even tension between strainer posts. **Fasten and Strain**
2. Where specified, or shown on the Drawings, chain wire mesh shall be erected on the outside of the posts and fastened with two turns of the wire to each cable wire on both sides of each post and at intervals of not more than 900mm between posts and to each post midway between cable wires. **Chain Wire Mesh**

265.16 STOCK-PROOF FENCING

(a) Erection of Posts

1. All posts shall be erected vertically. Reinforced concrete posts shall be erected in neatly cut holes sunk in earth, or in rock where this is encountered. Steel posts, except where placed in rock, shall be driven with suitable driving equipment, care being taken not to damage the tops of the posts during driving. **Method**
2. Where prestressed posts are proposed to be used, they shall be either erected as for reinforced concrete posts or shall be driven. Where driven, the Contractor shall use a suitable post driver which shall be equipped with two (2) sets of guiding rollers, to hold the post vertical and in position during driving. **Driving Prestressed Posts**
3. A steel cap with a plywood cushion not less than 36mm (3 x 12mm) thick shall be used to protect the top of the post during driving. **Protection Cap**

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4. If the post cannot be driven for the full depth specified, or if it becomes significantly damaged, or cannot be driven vertically, it shall be removed. The same post if undamaged, or a new post, shall be erected as described for reinforced concrete posts.

Removal of Posts

5. Posts shall be sunk to the depths shown in Table 265.1.

Type of Post	Depth	
	Earth	Rock
Concrete Corner Posts & Strain Posts	900	*600
Concrete Intermediate Posts	600	*450
Steel Posts	450	450
Note* Permitted only in cases where posts of the correct length are provided (see below), otherwise the depth of sinking shall be the same as for earth.		

Table 265.1 - Post Depth in Ground

6. Cutting of concrete posts will not be permitted, and in order to take advantage of the lesser depth of sinking permitted in rock, it will be necessary to use posts manufactured in lengths to suit the depth of sinking. Where rock is encountered, steel posts shall be sunk in drill holes of sufficient diameter to permit them to be refilled with cement mortar consisting of one part of cement to two parts of clean sand.

Variations to Post Length

7. Earth shall be backfilled around intermediate posts in layers of maximum depth 150mm for the full depth of the hole and up to ground level. The relative compaction of the rammed material shall be not less than that of the original undisturbed ground.

Backfilling at Intermediate Posts

8. Where concrete posts are placed in rock, the space around the posts shall be tightly filled with cement mortar consisting of one part of cement to two parts of sand, or approved concrete where this is available.

Mortar Backfill

9. Strainer posts shall be used at ends of fencing, angles, intersections with other fencing, gates and at intermediate points. These posts shall be backfilled with approved concrete to their full depth.

Strainer Posts

10. Distances between strainer posts shall not exceed 120m in the case of fencing using steel intermediate posts, and 90m in the case of fencing for the retention of cattle (for which only concrete posts are permitted). Junctions with existing fencing shall be made in an approved manner.

Spacing of Posts

(b) Erection of Wires

1. All wire shall be placed as shown on the Drawings. Wires shall be securely fastened and strained to an even tension between strainer posts with an approved wire strainer. Where barbed wire is to be used, it shall be tied in position at the top of intermediate posts, and where additional barbed wires are called for they shall be secured to the sides of the posts as shown on the Drawings.

Fastening and Straining

2. Where concrete posts are used and the barbed wires are secured either to the tops or sides of the posts by tie wire, the tie wire shall be stretched tight and shall fit snugly against the sides of the posts to prevent movement of the barbed wire.

Barbed Wire

3. Where prestressed posts are used, wires shall be securely tied so that they seat firmly in the grooves.

Prestressed Posts

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4. All joints in wires shall be as shown on the Drawings.

Wire Joints

265.17 RABBIT-PROOF FENCING

(a) General

1. Wire netting shall be erected on the side of the fence remote from the roadway in the case of road reserve boundary fences. In other cases netting shall be erected on the side as directed by the Superintendent.

**Netting
Position**

2. The netting shall be erected so that there is a 200mm lap laid on the ground surface, or trenched 215mm into the ground as shown on the Drawings for the type of fence to be erected.

Lap/Trench

3. Netting shall be tied with tie wire or fixing clips approved by the Superintendent.

**Fixing of
Netting**

4. The netting shall be loosely tied to fence wires then carefully strained without disturbing or breaking the mesh, and shall then be tied to the wires immediately on each side of the post and at intervals not exceeding 1.0m.

**Straining and
Tying**

5. At each strainer post strut, additional netting shall be attached to the fence adjacent to the strainer post, to a height of 450mm above the strut.

**Additional
Netting**

265.18 CROSSING OF WATERCOURSES AND DEPRESSIONS

1. The crossing of all watercourses and depressions shall be made secure by longer posts, suitably strutted as directed by the Superintendent. Additional cable wire and chain wire/wire netting shall be provided as necessary to make the fence marsupial proof.

**Marsupial
Proof**

2. The fence shall allow the passage of floodwater without the accumulation of debris. If directed by the Superintendent, flood gates shall be provided in accordance with Clause 265.20.

Floodwater

265.19 CONNECTIONS TO EXISTING FENCES

1. Existing cross fences shall be connected to the new fence using a strainer post with braces in each direction of strain (including cross fence) and the wires in both fences properly fastened to the post.

Strainer Posts

265.20 FLOOD GATES

(a) General

1. Suitable provision for the passage of flood waters past the fence shall be made at all watercourses. In all cases flood gates shall be of the type indicated on the Drawings, or as directed by the Superintendent, and shall be erected so as to prevent the accumulation of flood debris, while remaining stock-proof or rabbit-proof.

Requirements

(b) Small Watercourses

1. Flood gates, in accordance with the Drawings, shall be provided in small gullies at the locations indicated on the Drawings or as directed by the Superintendent. The opening of each flood gate shall provide a waterway area at least twice that of the culvert opposite to which it is placed, or as otherwise directed by the Superintendent.

Waterway Area

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(c) Large Gullies and Creeks

1. Flood gates, in accordance with the Drawings, shall be provided in gullies and creeks at the locations indicated on the Drawings, or as directed by the Superintendent. **Location**
2. A 9mm galvanised wire rope shall be carried over the gully in one span, threaded through a strainer post and tied back to an anchor at an adjacent concrete intermediate post. Turnbuckles are to be provided at each end to tension the wire rope. Netting shall be suspended from the wire rope and shall be overlapped and securely tied. The netting shall be of sufficient length to lie on the ground for a distance of not less than 1.0m on the downstream side. **Construction Detail**
3. Ballast, of sound timber securely tied to the netting, shall be provided at the downstream end of the netting. **Netting Ballast**
4. The sides of the gully shall be trimmed, as necessary, to ensure that the flood gate shall be stock-proof or rabbit-proof. The flood gate shall have sufficient movement of the suspended portion under the flow of flood waters to prevent damage to the fence and the accumulation of debris against it. Each strainer post shall be stayed in three directions, as shown on the Drawings. **Construction Requirements**

265.21 ERECTION OF GATES

1. Where gates are specified or shown on the Drawings, or are to be provided at the direction of the Superintendent, they shall be erected so that they swing away from the road. Double gates shall be supplied if directed by the Superintendent, otherwise a single gate only shall be supplied. **Swing Away From Road**
2. At the location of gates the surface shall be levelled and shall be nearly horizontal. The area where the gates swing shall be similarly levelled. **Level Surface**
3. The gates shall be hung as indicated in the Drawings. **Hanging**

265.22 CATTLE GRIDS

1. Where shown on the Drawings, or as directed by the Superintendent, cattle grids shall be erected in accordance with the Drawings. **Standard**
2. The cattle grid shall be evenly bedded on a continuous layer of compacted sand or other granular material approved by the Superintendent. The bedding material shall be compacted so that the relative compaction as determined by AS 1289.5.4.1 is not less than 95 per cent. **Bedding**
3. Cattle grids shall be installed on raised abutments with approach ramps where possible. Alternatively, a cattle grid may be placed over an excavated pit, in which case adequate drainage shall be provided. **Raised Abutments**
4. Crossfall for single lane cattle grids shall be level and for two lane cattle grids each section shall have a crossfall conforming to the crossfall of the approach road. **Crossfall**
5. The cattle grid construction shall include all activities associated with the cattle grid including any adjustments to the fencing as shown on the Drawings. **Extent of Work**
6. Advance signposting shall be provided on each approach to the cattle grid in accordance with the Specification for SIGNPOSTING.

265.23 REMOVAL OF EXISTING FENCING

1. Where required, existing fencing is to be removed as shown on the Drawings. **Location**

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2. No fencing is to be removed if there is a risk of egress or ingress of stock. If the existing fence is a rabbit-proof fence, then the contractor shall ensure that at night and weekends and other such times when work is not in hand that the whole of the fence is maintained in a rabbit-proof condition, even if temporary fencing is required. No extra payment will be made for this requirement. ***Contractor's Responsibility***

3. All material removed in demolishing existing fencing shall be disposed of by the Contractor as provided by Clause 265.24. ***Old Material***

265.24 REMOVAL AND DISPOSAL OF SURPLUS MATERIAL AND RUBBISH

1. All surplus material, offcuts, timber, roots and other debris resulting from the fencing contract shall be removed or otherwise disposed of to the satisfaction of the Superintendent. ***Contractor's Responsibility***

2. The Contractor shall be responsible for any damage which may result from the lighting of fires if burning off is permitted by the Superintendent. ***Fire Damage***

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**265.25 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay items 265(a) to 265(d) inclusive.

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Clearing and grubbing is measured and paid in accordance with this Specification and not in the Specification for CLEARING AND GRUBBING.

5. Concrete posts, backfilling and blocks are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.

6. Cattle grid signposting is measured and paid in accordance with this Specification and not in the Specification for SIGNPOSTING.

Pay Item 265(a) - Supply and Erection of Boundary Fencing

1. The unit of measurement shall be the linear metre of fencing, chain link, stock-proof or rabbit-proof, measured on site.

2. Separate pay items shall be shown for each type of fence specified.

3. The schedule rate under this Pay item shall include the supply of all materials, the clearing of site, and all activities associated with the erection of the fence, including the levelling of mounds (if required), concreting, the provision of crossings for watercourses and depressions as necessary, flood gates as necessary, and the connection of the new fence to existing fence where required. The schedule rate shall also cover all types of excavation material encountered during construction work, both earth and rock and the removal and disposal of surplus material and rubbish.

Pay item 265(b) - Supply & Erection of Boundary Fence Gates

1. The unit of measurement shall be "each" gate erected.

2. The schedule rate shall include the supply of all material and all activities associated with the erection of each gate.

Pay item 265(c) - Supply & Installation of Cattle Grid

1. The unit of measurement shall be "each" cattle grid installed.

2. The schedule rate shall include the supply of the cattle grid together with all activities associated with the construction of the cattle grid including bedding, approach ramps, wings, drainage, adjustment to fencing and the provision of signs.

Pay item 265(d) - Removal of Existing Fence

1. The unit of measurement shall be the linear metre of fencing removed as measured on site.

2. The schedule rate shall include all activities associated with the demolition and disposal of the existing fence.

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CITY OF GREATER DANDENONG

SPECIFICATION

267

**RIGID CONCRETE ROAD
SAFETY BARRIER SYSTEMS
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**SPECIFICATION 267 – RIGID CONCRETE ROAD SAFETY BARRIER SYSTEMS
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**Chapter 1 SPECIFICATION 267 : RIGID CONCRETE ROAD SAFETY BARRIER SYSTEMS
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GENERAL**267.01 SCOPE**

1. The work to be executed under this Specification consists of the setting out and construction of concrete safety barriers from precast units, by fixed forms or slipforming in accordance with the requirements for rigid road safety barrier systems in AS/NZS 3845..
2. Safety barriers may be constructed adjacent to or on new or existing pavements.
3. This Specification details the requirements for public domain, Type F and VCB, rigid road safety barrier systems. Where a patented rigid road safety barrier system is specified and shown on the Drawings, all materials shall be in accordance with the manufacturer's specifications and, it shall be constructed strictly in accordance with the manufacturer's instructions.
4. Where a patented crash attenuator is specified and shown on the Drawings, all materials shall be in accordance with the manufacturer's specifications and, it shall be constructed strictly in accordance with the manufacturer's instructions.
5. Non-rigid road safety barrier systems are specified in a separate specification part.

267.02 REFERENCE DOCUMENTS

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

***Documents
Standards
Test Methods***

(a) Council Specifications

- | | | |
|-----|---|-------------------------------------------------------|
| 201 | - | Control of Traffic |
| 261 | - | Pavement Markings |
| 262 | - | Signposting |
| 264 | - | Non-Rigid Road Safety Barrier Systems (Public Domain) |
| 271 | - | Minor Concrete Works |

(b) Australian Standards

- | | | |
|---------------|---|------------------------------------------------------------------------------------|
| AS 1289.5.4.1 | - | Compaction control test – Dry density ratio, moisture variation and moisture ratio |
| AS 1379 | - | The specification and manufacture of concrete |
| AS 1906.2 | - | Retroreflective devices (non pavement application) |
| AS 3610 | - | Formwork for concrete |
| AS 3799 | - | Liquid membrane - forming curing compounds for concrete |
| AS/NZS 3845 | - | Road safety barrier systems |

MATERIALS**267.03 CONCRETE**

1. Supply and placement of concrete, steel reinforcement, formwork, tolerances, construction joints and protection shall conform to the requirements of the Specification for MINOR CONCRETE WORKS.

Concrete

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| 2. | The minimum strength of concrete at 28 days shall be 30 MPa for cast-in-situ formed concrete or precast concrete and 40 MPa for slip formed concrete construction unless shown otherwise on the Drawings. | Strength |
| 3. | The maximum nominal size of aggregate shall be 20mm, and the specified slump at the point of placement shall be 25mm for slipforming and 80mm for fixed forms. | Slump |
| 4. | If ready-mixed concrete is used, the concrete shall be mixed and delivered in accordance with AS 1379. | Ready Mixed Concrete |
| 5. | Concrete shall be sampled and tested by personnel from a NATA registered laboratory and the test results certified by a NATA endorsed signatory. All costs for sampling and testing shall be borne by the Contractor. | Sampling & Testing Contractor's Cost |
| 6. | A pair of cylinders shall be provided and tested for compressive strength for every 50m ³ of concrete placed. Strength results shall be submitted to the Superintendent if so requested by the Superintendent. | Testing Frequency |

CONSTRUCTION

267.04 GENERAL

- | | | |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1. | The Contractor shall at all times conform to the requirements of the Specification for CONTROL OF TRAFFIC. | Traffic Control |
| 2. | Construction of rigid barrier shall comply with AS/NZS 3845 except where explicit departures are detailed in the Drawings. | |
| 3. | Unless otherwise stated on the Drawings, the barrier may be precast, constructed in fixed forms or slip-formed to the dimensions and details as shown on the Drawings. | Types |
| 4. | Where a non-rigid road safety barrier is to be connected to a rigid road safety barrier, anchorage assemblies shall be cast into the road safety barrier to the dimensions and details as shown on the Drawings. All other components for non-rigid road safety barriers are specified in a separate specification part. | Connections To Non-Rigid Barriers |
| 5. | The set out of the safety barrier shall be presented to the Superintendent for approval before construction commences. This action constitutes a HOLD POINT . The Superintendent's approval to the set out is required prior to the release of the hold point. | Set Out |

HP

267.05 PREPARATION OF THE BASE

- | | | |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 1. | For safety barriers constructed on new or existing pavements, before placing the mortar pad for precast units or placing concrete or slipforming, the base shall be cleaned of all loose materials and dust. | Cleaning |
| 2. | Safety barriers constructed on new or existing pavements shall be provided with dowels in cored holes at regular staggered spacings as shown on the Drawings. When precast units are used care must be taken to align and space the core holes accurately. | Dowels and Core Holes |
| 3. | For safety barriers constructed adjacent to new or existing pavements, the foundation material shall be shaped and compacted to form a firm base. Other than for barriers constructed on pavement courses, the relative compaction shall be at the 95 per cent level in accordance with AS 1289.5.4.1 for standard compactive effort. Where placed on pavement courses, the foundation shall be compacted to the requirements of the respective pavement course. | Compaction of Foundations |

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4. For safety barriers containing street lighting standards, the conduit carrying electrical cables must be located in the base rather than in the barrier, as detailed on the Drawings, unless otherwise approved by the Superintendent. For slip-formed barriers the conduit trench forms a key and no dowels are required unless shown otherwise on the Drawings.

Electrical Conduits**267.06 CONCRETE PLACEMENT**

1. For fixed form construction, the concrete shall be thoroughly compacted and the surface screeded off. Immediately following compaction and screeding the concrete shall be tested for high or low spots and any necessary corrections shall be made before the concrete has hardened.

High/Low Spots

2. For fixed form construction, the concrete surface shall be finished true and uniform to a class 2 finish in accordance with AS 3610.

Concrete Finish

3. For slip form construction, where hand finishing is required, every effort shall be made to provide a uniform appearance of the barrier.

Hand Finishing

4. Precast units shall be placed on a mortar pad of 10mm minimum thickness.

Precast Units**267.07 ALIGNMENT AND LEVEL**

1. The top and face of the barrier shall be true to line and the top surface shall be of uniform width, free from humps, sags and other irregularities.

Finish and Appearance

2. The line and level at any point on the safety barrier shall be within ± 50 mm of the plan location and within ± 20 mm of the design levels as shown on the Drawings.

Line and Level Tolerance

3. When a 3m long straight edge is laid on top of or along any face of the barrier the surface shall not vary more than 5mm from the edge of the straight edge except at grade changes or curves in which case the faces shall transition uniformly.

Surface Tolerance**267.08 JOINTS**

1. Where construction is in fixed forms or by slip-forming, contraction joints of minimum 50mm depth shall be formed on all exposed surfaces at 4m spacing.

Contraction Joints

2. Expansion joints of 15mm width for the full depth of the barrier shall be constructed where specified on the Drawings. Expansion joints shall consist of a preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

Expansion Joints

3. Where the barrier is cast on concrete pavement the contraction, isolation, tied or expansion joints as they appear in the pavement shall be continued through the barrier.

Pavement Joints

4. Where the barrier is cast adjacent to a concrete pavement the contraction joints shall be formed at 4m centres.

Adjacent to Pavement

5. Precast units shall be placed such that all connections are tight, secure and true in line and level.

Precast Units**267.09 CURING**

1. For slip-formed barriers either wax emulsion, hydrocarbon resin or water borne curing compounds to the requirements of AS 3799 Class A Type 1, Class B Type 1-D or Class Z Type 1-D respectively shall be used.

Curing Compound

2. The Contractor shall provide a certificate of compliance for the curing compound

Compliance

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from a laboratory with appropriate NATA registration.

- | | | |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 3. | The curing compound shall be applied in a fine spray to provide even coverage at a rate of 0.2 l/m ² or the rate determined on the test certificate to achieve 95 per cent water retention, whichever is the greater. | <i>Application Rate</i> |
| 4. | Equipment and materials for the curing operations shall be kept on site at all times during slip-forming of the barrier. | <i>Equipment on Site</i> |
| 5. | Moist curing systems are acceptable when demonstrated as an effective process during manufacture of precast barrier units. | <i>Precast Units</i> |

267.10 DELINEATORS

- | | | |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1. | Delineators complying with AS 1906.2 shall be fixed with brackets to the concrete safety barrier at locations, and to the details, as shown on the Drawings. | <i>Fixing</i> |
| 2. | The delineators shall be so arranged that drivers approaching from either direction will see only red reflectors on their left side and white reflectors on their right. | <i>Arrangement and Colour</i> |

267.11 SIGNING AND LINEMARKING AT BARRIER

1. Permanent signing, and longitudinal linemarking adjacent to the concrete safety barrier shall be provided in accordance with the Specifications for SIGNPOSTING and PAVEMENT MARKINGS.
2. Temporary traffic control devices installed for the control of traffic shall not be removed before the concrete safety barrier, permanent signing and longitudinal linemarking have been inspected and approved by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the concrete safety barrier, signing and linemarking is required prior to the release of the hold point.

HP

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**267.12 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 267(a) to 267(b) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Traffic control is measured and paid in accordance with the Specification for CONTROL OF TRAFFIC.
5. Concrete safety barrier is measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
6. Linemarking and signing are measured and paid in accordance with the Specifications for PAVEMENT MARKINGS and SIGNPOSTING.
Pay Item 267(a) – ROAD SAFETY BARRIER

- (i) Type F
- (ii) Type VCB

1. The unit of measurement shall be the linear metre measured along the top of the barrier, excluding terminal ends.
2. A separate schedule shall be provided for differing base conditions.
3. The schedule rate shall include all operations and provision of materials as described in this Specification and shown on the Drawings to provide the safety barriers complete in all respects.
Pay Item 267(b) - TERMINAL ENDS

1. The unit of measurement shall be “each” terminal end provided.
2. The schedule rate shall include all operations and provision of materials as described in this Specification and shown on the Drawings to provide the terminal ends complete in all respects.
3. The schedule rate shall also include, where specified and shown on the Drawings, cast in anchorage assemblies for the connection of non-rigid road safety barriers.

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CITY OF GREATER DANDENONG
SPECIFICATION

271

MINOR CONCRETE WORKS

SPECIFICATION 271 - MINOR CONCRETE WORKS

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SPECIFICATION 271 : MINOR CONCRETE WORKS**GENERAL****271.01 SCOPE**

1. The Work to be executed under this Specification consists of the supply and placement of concrete, including sprayed concrete, and ancillary requirements like excavation, preparation of foundations, forming up, placement of reinforcement and backfilling for work shown on the Drawings but not having individual Specifications. These Works include drainage pits and other supplementary structures, headwalls, box culverts, box culvert base slabs, driveways, footpaths, median toppings, retaining walls, footings, paving edge strips and works of a similar nature.

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

Quality**271.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Australian Standards**

- AS 1012.1 - Sampling fresh concrete
- AS 1012.3.1 - Determination of properties related to the consistency of concrete - Slump test.
- AS 1012.8 - Making and curing concrete compression, indirect tensile and flexure test specimens in the laboratory or in the field
- AS 1012.9 - Determination of the compressive strength of concrete specimens
- AS 1012.14 - Securing and testing cores from hardened concrete for compressive strength
- AS 1141.14 - Particle shape by proportional calliper
- AS 1141.21 - Aggregate crushing value
- AS 1141.23 - Los Angeles value
- AS 1141.24 - Soundness (by use of sodium sulphate solution)
- AS 1289.3.3.1 - Calculation of plasticity index of a soil
- AS 1289.5.1.1 - Determination of the dry density/moisture content relation of a soil using standard compactive effort
- AS 1289.5.2.1 - Determination of the dry density/moisture content relation of a soil using modified compactive effort
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1302 - Steel reinforcing bars for concrete
- AS 1303 - Steel reinforcing wire for concrete
- AS 1304 - Welded wire reinforcing fabric for concrete
- AS 1379 - The specification and manufacture of concrete
- AS 1478.1 - Chemical admixtures for concrete, mortar and grout – Part 1: Admixtures for concrete
- AS 1554.3 - Welding of reinforcing steel
- AS/NZS 1859 - Reconstituted wood-based panels
- AS 2082 - Visually stress-graded hardwood for structural purposes
- AS 2271 - Plywood and blockboard for exterior use
- AS 2758.1 - Concrete aggregates
- AS 3600 - Concrete structures
- AS 3610 - Formwork for concrete
- AS 3799 - Liquid membrane-forming curing compounds for concrete

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AS 3972 - Portland and blended cements

(b) Council Documents

City of Greater Dandenong:2002 – Paths Asset Management Plan

271.03 LOADS ON MINOR CONCRETE STRUCTURES

1. No superimposed load shall be allowed on any part of what will become a load bearing structure within 21 days after placing concrete unless the structure is effectively and independently supported to the satisfaction of the Superintendent or when the Contractor can demonstrate that 95 per cent of the design strength of the concrete has been achieved.

EXCAVATION AND FOUNDATIONS

271.04 GENERAL

1. The subgrade or subbase where specified, shall be formed at the required depth below the finished surface levels shown on the drawings. Rock foundations shall be neatly excavated to form a bed for the concrete, and shall be thoroughly scraped and cleaned. Soil foundation shall, as far as possible, be excavated neatly from the solid material to coincide with the under-surface of the concrete, or of the subbase material (where specified). **Foundations**

2. All soft, yielding or other unsuitable material shall be replaced with sound material approved by the Superintendent, and the subgrade shall be compacted to provide a minimum relative compaction of 95 per cent as determined by AS 1289.5.4.1 for standard compactive effort. If the subgrade is dry it shall be sprinkled with as much water as it will readily absorb, before the concrete is placed. **Unsuitable Material**

3. The Contractor shall supply all necessary sheeting and bracing to safely support the excavation in accordance with Statutory requirements. The excavation shall be kept free of water. **Shoring**

271.05 DRIVEWAYS AND FOOTPATHS

1. For driveways and footpaths a subbase of approved quality and of minimum 150mm compacted thickness, unless otherwise shown on the Drawings, shall be placed over the subgrade. The surface shall then be checked for uniformity, line and level, and all irregularities shall be made good. **Subbase**

2. The subbase material shall be compacted to provide a minimum relative compaction as determined by AS 1289.5.4.1 of 100 per cent for standard compactive effort or 97 per cent for modified compactive effort as appropriate. **Compaction**

3. The finished subbase shall not deviate more than 15mm under a straight edge 3 metres long, subject to any necessary allowance on vertical curves. **Subbase Tolerance**

271.06 DRAINAGE PITS AND OTHER SUPPLEMENTARY STRUCTURES

1. Where the excavation is in sound rock, and the Superintendent so directs, part of the concrete lining of gully pits and other structures may be omitted, provided that a neatly formed pit of the required dimensions is constructed, and provided that the wall of the pit adjacent to and parallel with the road is constructed of formed concrete in all cases. **Pit Walls**

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271.07 RETAINING WALLS, HEADWALLS AND WINGWALLS

1. In the case of rock foundations for retaining walls, headwalls and wingwalls, the excavation shall be carried into the rock for a minimum depth of 150mm. Where cut-off walls are to be provided, the depth of cut-off in rock foundations may be less than that shown in the Drawings, if approved by the Superintendent. **Rock Foundations**
2. Prior to the construction of cast-in-situ concrete walls on earth foundations, the latter shall be covered by a mass concrete bedding layer at least 50mm thick and finished to a uniform surface. No forms or other materials shall be placed upon the bedding layer within a period of 48 hours after the concrete has been placed. **Earth Foundations**
3. Unless otherwise specified, precast concrete wall sections shall be placed on a fresh mass concrete bedding layer while it is still in plastic state. In the case of soil foundations, the concrete shall be not less than 50mm thick, and where the foundation is in rock, the concrete shall be of such thickness as is required to provide a uniform surface at least 50mm above the highest points of rock. **Precast Concrete**

FORMWORK**271.08 GENERAL**

1. Formwork shall be provided in accordance with AS 3610 to produce hardened concrete to the lines, levels and shapes shown on the Drawings or specified elsewhere. It shall have adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape. Forms shall be mortar tight and designed to allow removal without risk of damage to the completed structure. Joints in the formwork shall be perpendicular to the main axis of the shape of the concrete. **Formwork Requirements**
2. Where concrete is placed in earth excavations, side forms shall be provided to prevent contact between concrete and the insitu earth. **Side Forms**
3. Design of formwork for high sections shall be such that it shall not be necessary to drop concrete freely from a greater height than 1.2 metres or to move concrete along the formwork after deposition. **Placement of Concrete**
4. Formwork material used shall be sound and suitable for the purpose intended and surface finish specified. **Material**
5. Provision shall be made for the accurate location and firm support of fittings, bolts, anchorages and formers of holes as shown on the Drawings. Temporary fittings used for the support of the formwork shall be arranged to permit removal without damage to the concrete. The use of wires and or bolts extending to the surface of the concrete shall not be permitted except where shown on the Drawings or approved by the Superintendent. **Formwork Fittings**
6. Forms for edges of concrete shall be filleted and for re-entrant angles chamfered as shown on the Drawings. **Edge Treatment**
7. Temporary openings shall be provided where necessary for cleaning out of formwork and inspection before concreting. **Cleaning and Inspection**

271.09 APPROVAL OF FORMWORK DESIGN

1. For box culverts and reinforced concrete retaining walls, detailed drawings, design calculations, description and/or samples of materials proposed for use shall, if required by the Superintendent, be submitted for the Superintendent's concurrence **Approval to Design**

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before manufacture of the formwork is commenced. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details, or direction that they are not required, is necessary prior to the release of the hold point.

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271.10 PROVISION FOR DRAINAGE

1. Where shown on the Drawings, or where directed by the Superintendent, weepholes of 50mm diameter shall be provided in retaining walls and wingwalls. **Weep Holes**

271.11 CONSTRUCTION

1. The type and quality of material selected for formwork and the workmanship used in construction shall be such that the surface finish specified shall be obtained. Construction shall be such that the erection tolerances shall be obtainable. **Formwork Material**

2. Timber for formwork shall be well seasoned, free from defects and, where in contact with fresh concrete, free from loose knots. **Timber Requirements**

3. Timber forms for exposed surfaces shall be constructed from plywood or particle board with hardwood or approved softwood studs and wales. Dressed timber may be used only with the approval of the Superintendent. The plywood used for forms shall comply with AS 2271, the hardwood shall comply with AS 2082 and the particle board with AS/NZS 1859. **Timber Standards**

4. Formwork for exposed surfaces shall be made from panels having uniform widths of not less than 1m and uniform lengths of not less than 2m, except where the dimensions of the member formed are less than the specified panel dimensions. Plywood panels shall be placed with the grain of the outer plies perpendicular to the studding or joists. Where form panels are attached directly to the studding or joists the panel shall be not less than 15mm thick. Form panels less than 15mm thick, otherwise conforming to these requirements may be used with a continuous backing of dressed material of 20mm minimum thickness. All form panels shall be placed in a neat, symmetrical pattern. **Formwork Panels for Exposed Surfaces**

5. Forms for all surfaces which will be completely enclosed or permanently hidden below the ground may be constructed from dressed or undressed timber, steel, plywood or particle board. **Hidden Surfaces**

6. Mild steel form surfaces in contact with concrete shall have all bolt and rivet heads counter-sunk and all welds ground back to even and smooth surfaces. **Mild Steel Surfaces**

271.12 ERECTION

(a) General

1. Dimensions and position of forms, shall be carefully checked after the forms are erected. Forms shall be aligned accurately and the location of all fittings, hold formers, etc. checked prior to placing concrete. Departure of the forms from the surfaces shown on the drawings shall not exceed 1/300 of the space between supports for any surface visible in the completed work and 1/150 for hidden work. For tolerances in plan position and levels, refer to clauses 271.25 and 271.28. **Formwork Position Tolerances**

2. Joints as erected shall be mortar tight. **Mortar tight**

3. The interior surface of the forms shall be treated to ensure non-adhesion of the mortar. Commercial quality form oil or grease will be acceptable, but the oil or grease used on forms against surfaces to be exposed shall not stain or discolour the concrete surface. The coating shall be uniformly spread in a thin film and any surplus shall be removed prior to placing concrete. In the case of unlined timber forms, the timber shall be thoroughly wetted before oiling. Forms shall be treated before placing reinforcement **Coating of Internal Surface**

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to ensure that the form release agent will not contaminate the surface of the reinforcing steel or construction joints.

- 4. Formwork hardware shall be treated with a form release agent and so arranged that it may be removed from the concrete without excessive jarring or hammering. **Release Agent**

(b) Approval by the Superintendent

- 1. The formwork shall be inspected by the Superintendent, and the placing of reinforcement in the spaces formed, where specified, shall not commence until the formwork is approved by the Superintendent. **Reinforcement Placement**

- 2. Placing of concrete shall not commence until the reinforcement, where specified, has been accepted by the Superintendent, and all dirt, chips, hardened concrete, mortar and all foreign matter removed from the forms. **Concrete Placement**

- 3. When an inspection is requested by the Contractor, notice of not less than 24 hours, excluding Saturdays, Sundays and Public Holidays, shall be given to the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the formwork and reinforcement placement is required prior to the release of the hold point. **Notice of Inspection**

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MATERIALS FOR CONCRETE

271.13 CEMENT

- 1. Cement shall be Type GP Portland Cement, or as nominated by the Superintendent, complying with AS 3972. **Type**

- 4. If the Contractor proposes to use cement which has been stored for a period in excess of 3 months from the date of testing, the Superintendent may require a re-test at the Contractor's expense before the cement is used. **Storage Time**

- 5. All cement shall be transported in watertight containers and shall be protected from moisture until used. Caked or lumpy cement shall not be used. **Transport and Storage**

271.14 WATER

- 1. Water shall be free from injurious amounts of materials harmful to concrete and to its reinforcement and neither salty nor brackish. **Quality**

- 2. Water which is not potable for human beings shall not be used in reinforced concrete. **Potability**

271.15 FINE AGGREGATE

- 1. Fine aggregates shall consist of clean, hard, tough, durable uncoated grains, uniform in quality, and shall conform to the requirements of AS 2758.1 in respect of bulk density, water absorption (maximum 5 per cent) material finer than 2 micrometres, impurities and reactive materials. **Quality**

- 2. Fine aggregates shall be evenly graded within the absolute limits shown in Table 271.1, and shall not deviate from the proposed grading by more than the amounts in Table 271.1. **Grading Requirements**

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Australian Standard Sieve	Proportion Passing (% of Mass)	Deviation from Proposed Grading (% of Mass of Sample)
9.50mm	100	
4.75mm	90 - 100	±5
1.18mm	40 - 85	±10
300µm	8 - 30	±10
150µm	2 - 10	±5
75µm	0 - 4	±3

Table 271.1 - Fine Aggregate Grading

271.16 COARSE AGGREGATE

1. Coarse aggregate shall consist of clean, hard, durable, crushed stone, crushed river gravel, screened river gravel or metallurgical furnace slag and shall conform to the requirements of AS 2758.1 in respect of particle density, bulk density, water absorption (maximum 2.5 per cent), material finer than 75 micrometres, weak particles, light particles, impurities and reactive materials, iron unsoundness and falling or dusting unsoundness. In all other respects, the coarse aggregate shall comply with this Specification. If required, coarse aggregate shall be washed to satisfy these requirements.

Quality

2. The percentage of wear shall be determined by AS 1141.23, and the loss of weight shall not exceed 30 per cent.

Wear Test

3. When required by the Superintendent, coarse aggregate shall be tested for conformance for any or all of the properties set out below:

Standard Tests

(i) Crushing Value - AS 1141.21

The aggregate crushing value shall not exceed 25 per cent.

(ii) Soundness - AS 1141.24

The loss of mass when tested with sodium sulphate shall not exceed 12 per cent.

(iii) Particle Shape - AS 1141.14

The proportion of mis-shapen particles (2:1 ratio) shall not exceed 35 per cent.

4. Coarse aggregate shall be evenly graded within the absolute limits shown in Table 271.2 and shall not deviate from the grading of the samples submitted under Clause 271.18 by more than shown.

Grading Requirements

Australian Standard Sieve (mm)	Proportion Passing (% of Mass)			Deviation Proposed Grading (% of Mass of Sample)
	40mm Nominal	20mm Nominal	Extrusion Concrete	
	For Walls exceeding 150mm thickness	For all other structures		
53.0	100			±10
37.5	95 - 100			
26.5		100		±10
19.0	30 - 70	95 - 100		
13.2			100	±5
9.50	10 - 35	25 - 35		
4.75	0 - 10	0 - 10		±5
2.36	0 - 2	0 - 2		

Table 271.2 - Coarse Aggregate Gradings

271.17 ADMIXTURES

1. Chemical admixtures and their use shall comply with AS 14781. Admixtures shall not contain calcium chloride, calcium formate, or triethanolamine or any other accelerator. Admixtures or combinations of admixtures other than specified below, shall not be used.

Quality and Use

2. During the warm season, (October to March inclusive), a lignin or lignin-based ('ligpol') set-retarding admixture (Type Re or Type WRRe) approved by the Superintendent shall be used to control slump within the limits stated in Clause 271.22. The dosage shall be varied to account for air temperature and haul time in accordance with the manufacturer's recommendations. A copy of the NATA endorsed Certificate of Compliance with AS 14781 for Type Re or Type WRRe shall be submitted to the Superintendent, together with the proposed 'dosage chart' in accordance with Clause 271.18.

Retarder for Warm Season

3. During the cool season, (April to September inclusive), only a lignin or lignin based set-retarding admixture containing not more than 6 per cent reducing sugars (Type WRRe complying with AS 14781) may be used in the mix.

Retarder for Cool Season**271.18 TESTING OF MATERIALS**

1. The Contractor shall submit to the Superintendent a copy of a NATA Certified Laboratory Test Report on the quality and gradings of the aggregates proposed to be used in the work. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted report is required prior to the release of the hold point.

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2. The materials shall only be used after receipt of the Superintendent's notification of acceptance, and then only so long as the materials accord with the Specification.

Use of Material

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HANDLING AND TREATMENT OF CONCRETE**271.19 MEASURING**

1. All materials shall be measured by weight, except that:-

- (a) Water may be measured by volume with an approved adjustable water-measuring and discharging device, and,
- (b) Cement may be measured by bags as packed by the manufacturer in which case batches shall be proportioned on the basis of one or more unbroken bags of cement, and for this purpose one bag of cement shall be assumed to weigh 40kg. Bulk cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the components of the batch are discharged from the batching hopper.
- (c) Measurement by volume for smaller works may be undertaken with the prior approval of the Superintendent.

**Measurement
of Material**

271.20 MEASURING BY WEIGHT, ON-SITE MIXING

1. Where concrete is to be mixed on site, and where mix control is likely to be less efficient than at a central batching plant, the weights of cement, fine and coarse aggregate shown in Table 271.3 may be used as a guide to produce the classes of concrete specified. Small changes in the proportions of fine and coarse aggregate may be required to improve density or workability of the concrete. The use of proportions shown in Table 271.3 shall not relieve the Contractor of the Contractor's obligation to provide concrete of the specified compressive strength.

**Mixing by
Weight on Site**

MPa	Cement Kg	Fine Aggregates Kg	Coarse Aggregates Kg	Total Aggregates Kg
10	40	130	250	380
15	40	100	190	290
20	40	88	126	214

Table 271.3 - Materials in Batch containing 1 bag (40Kg) Cement

2. The proportions set out in Table 271.3 make allowance for moisture contents of aggregates of 6 per cent for fine aggregates and 1 per cent for coarse aggregates. Where the moisture content of aggregates exceeds 8 per cent or 3 per cent respectively, the proportions of the mix shall be changed to compensate for the excess water in the aggregate.

**Variation in
Aggregate
Moisture
Content**

271.21 MEASURING BY VOLUME, ON-SITE MIXING

1. Where measurement by volume is approved, the proportions of the materials shall be such as are required to produce a mix free of voids and having the specified strength at 28 days.

**Mixing by
Volume on
Site**

2. The nominal proportions given in Table 271.4 may be used as a guide for volume batching.

**Volume
Batching**

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MPa	Parts by Volume		
	Cement	Fine Aggregate	Coarse Aggregate
10	1	3	6
15	1	2.25	4.5
20	1	2	3

Table 271.4 - Volume Batching

3. If, in the opinion of the Superintendent, the fine aggregate contains sufficient moisture to produce 'bulking' in excess of 10 per cent, a corresponding increase in the volume of fine aggregate shall be made.

***Fine
Aggregate
Bulking***

4. The volumes of fine and coarse aggregates for each batch shall be measured in boxes or bins, the details of which shall be subject to the approval of the Superintendent. The aggregates shall be measured loose (i.e. without compaction) in the boxes and shall be struck off level. Measurements by shovels or like methods will not be permitted. Batch proportions shall be so arranged that each batch contains 1 bag of cement. One 40kg bag of cement shall be assumed to have a volume of 27.5 litres.

***Batch
Measurement***

271.22 CONSISTENCY

1. A sufficient quantity of water shall be added to the mix so that the consistence of the concrete is such that it can be placed in the forms, compacted and worked into all corners without permitting the ingredients to segregate, or excess free water to collect on the surface. If required by the Superintendent, the Contractor shall determine the consistence of the concrete in accordance with AS 1012.3.1. Except for extruded concrete, the slump shall not exceed 75mm for concrete compacted by vibrators.

***Consistence
Requirements***

2. In the case of concrete placed by an extrusion machine, the water in the mix shall be only sufficient to produce a slump of 10mm to 15mm.

***Extruded
Concrete
Consistence***

271.23 MIXING AND DELIVERY

(a) General

1. Concrete may be mixed either at the site or at a central mixing plant, as approved by the Superintendent. All concrete shall be mixed with mechanically operated mixers. In an emergency, hand mixing may be permitted.

***Mechanical
Mixing***

2. Any concrete which exhibits signs of segregation may be rejected by the Superintendent.

***Segregation of
Concrete***

(b) Machine Mixing at Site

1. The mixing of concrete shall be done in a batch mixer which will ensure a uniform distribution of the materials throughout the batch.

***Mixer
Requirements***

2. The mixer shall be of such capacity that one or more whole bags of cement may be used per batch of concrete. The volume of the mixed material shall not exceed the manufacturer's rated capacity of the mixer.

Mixer Capacity

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3. The mixing time for each batch shall not be less than 1.5 minutes after all ingredients are assembled in the mixer, and prior to any portion of the batch being removed. **Mixing Time**

4. The entire contents of a batch shall be discharged from the mixer before any materials are placed therein for the succeeding batch. **Total Mix Discharge**

(c) Mixing in an Emergency

1. In the case of breakdown of the mechanical mixing equipment, the Superintendent may give approval to hand mixing in small quantities so as to complete a section of the work or reach a suitable construction joint. **Hand Mixing**

2. Hand mixing shall be done on an approved water-tight platform of sufficient size to allow the mixing of at least two batches simultaneously. The amount of cement used shall be 10 per cent more than the amount specified for machine mixed concrete. **Hand Mixing Conditions**

3. The fine aggregate and cement shall first be mixed until a uniform colour is obtained, and then spread on the mixing platform in a thin layer. The coarse aggregate, which shall have been previously drenched with water, shall then be spread over the fine aggregate and cement in a uniform layer, and the whole mass turned over as further water is added with a rose sprinkler. After the water is added, the mass shall be turned at least three times, not including shovelling into barrows or forms, until the mixture is uniform in colour and appearance. Hand-mixed batches shall not exceed 0.25 cubic metres each. **Hand Mixing Procedure**

(d) Ready-Mixed Concrete

1. The concrete shall be mixed and delivered in accordance with the requirements of AS 1379, relating to:- **Mixing Standard and Discharge Time**

(a) Mixing and Delivery; and

(b) Use of Non-Agitating Equipment,

with the exception that in (a) the time taken from the introduction of water until the concrete is completely discharged shall be not more than 1.5 hours, and in (b) not more than 30 minutes.

2. The water used for flushing the chutes and for cleaning shall be discharged in an area acceptable to the Superintendent. The chutes shall be long enough to permit delivery to the whole of the area enclosed by the forms. **Cleansing and Positioning of Chutes**

271.24 PLACING AND COMPACTING CONCRETE

1. No concrete shall be mixed or placed, without the approval of the Superintendent, while the air temperature is, or is likely to be within 24 hours, below 5°C or while the shade temperature exceeds 38°C. All concrete shall be placed in the dry. Prior to placing concrete the area shall be clean and moist but free from any ponding of water. **Air Temperature Requirements**

2. The concrete shall be mixed in the quantities required for immediate use and shall be placed in position as rapidly as possible. Any concrete which has developed initial set, or which does not reach the forms within 30 minutes after the water has been added (except when transported in agitator trucks) shall not be used. **Placement within Time Limit**

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3. The concrete shall be deposited in the forms, without separation of the aggregates. Concrete shall not be dropped freely from a height greater than 1.2 metres, or be deposited in large quantities at any point and moved or worked along the forms. Conveying equipment, including open troughs and chutes, where used, shall be made of metal, or have metal linings. Where used on steep slopes, troughs and chutes shall be equipped with baffles, or be placed in short lengths in such a way that the direction of flow of the concrete is changed. The concrete shall be placed in horizontal layers in one continuous operation between the ends of the work and/or construction joints. Care shall be taken to fill every part of the forms and to work the coarser aggregate back from the face. The freshly placed concrete shall be compacted by continuous spading, slicing or by vibrator units. Vibrators shall not be left in one position for more than 30 seconds, and shall not be permitted to rest on reinforcement.
- Placement in Forms, Vibrating**
4. Exposed surfaces of the concrete shall be struck off and finished with a wooden float. Where shown on the Drawings corners and edges shall be left neatly rounded or chamfered. Re-entrant angles shall be neatly filleted.
- Exposed Surfaces**
5. Concrete shall not be moved after it has been in the forms for more than 10 minutes.
- Initial Set**
6. In the case of concrete placed by an extrusion machine, small quantities of cement-sand slurry, comprised of two parts of plasterer's sand and one part of cement (by volume), together with sufficient water to bring it to a semi-fluid condition, shall be placed in the special receptacle in the machine, if the machine is so equipped and shall be fed onto the surface of the concrete at a rate sufficient to produce a smooth and uniform finish.
- Slurry for Extruded Concrete**

271.25 FINISHING OF UNFORMED SURFACES

(a) Surfaces other than Wearing Surfaces

1. Unformed surfaces shall be compacted and tamped so as to flush mortar to the surface, screeded off and finally dressed with a wooden float to an even surface. Care shall be taken to drain or otherwise remove promptly any water which comes to the surface. A capping of mortar will not be permitted.
- Finish for Unformed Surfaces**
2. All future contact surfaces shall be left rough, with the coarse aggregate at the surface firmly embedded but not forced below the surface.
- Future Contact Surfaces**

(b) Wearing Surfaces

1. Where a concrete wearing surface is shown on the Drawings the concrete shall be thoroughly compacted and the surface screeded off by a vibrating screed, or hand screeded where the distance between forms perpendicular to the direction of screed is no greater than 2 metres. Immediately following compaction and screeding the concrete shall be tested for high or low spots and any necessary corrections made. The surface shall be finished true and uniform and free from any glazed or trowelled finish and shall be finally dressed with a wooden template or float, or by the use of belting in an approved manner. The departure from grade shall not exceed 5mm in any 3 metre length.
- Finish for Wearing Surfaces**
2. Where an asphalt wearing surface is specified, the surface of the concrete, after being compacted, screeded and corrected, shall be dressed with a wooden float and finally broomed to produce a rough surface.
- Surface to receive Asphalt**
3. Concrete wearing surfaces shown on the Drawings to be coloured, textured or patterned shall be finished as directed by the Superintendent.
- Textured Patterned Surface**

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(c) Finished Levels and Locations

1. The finished surfaces of concrete structures not adjacent to road pavements shall not vary more than 25mm in plan position and not more than 25mm from the specified levels. In the case of drainage pits and other structures adjacent to road pavements, the finished concrete shall not vary more than 10mm from the specified levels and alignment. Longitudinal surfaces greater than 10 metres in length shall not deviate from level or alignment by more than 5mm from a straight-edge 3 metres long, subject to any necessary allowances on vertical and horizontal curves.

**Surface
Tolerance****271.26 CURING AND PROTECTION**

1. All exposed surfaces of the freshly placed concrete shall be kept moist either by the use of plastic sheeting, damp sand or commercial curing compounds in accordance with AS 3799 for a minimum period of 3 days and to a maximum of 14 days if so directed by the Superintendent. During this time the work must be adequately protected from the effects of excessive surface evaporation, rain, running water, vandalism and other causes likely to damage the concrete. All costs involved in making good or replacing any work that has been damaged due to the above mentioned factors shall be borne by the Contractor.

**Curing
Requirements****271.27 REMOVAL OF FORMS**

1. All forms shall remain in place, after placement of concrete, for minimum periods specified hereinafter. These periods may be extended by the Superintendent if the air shade temperature falls below 10°C during the periods specified.

**Walls, Sumps
etc.**

(a)	Mass retaining walls, headwalls, wingwalls, gully pits, sumps, and similar drainage structures	48 hours
(b)	Footpaths, driveways and similar	48 hours
(c)	Sides of reinforced concrete walls when height of each day pour is:	
	(i) under 0.6 metres	1 day
	(ii) 0.6m to 3m	2 days
	(iii) 3m to 6m	3 days
	(iv) 6m to 9m	5 days
	Supporting forms under deck slabs of culverts	10 days

2. In case of concrete containing special additives, stripping times shall be as determined by the Superintendent.

**Special
Additives**

3. Care shall be taken in removing forms so that the concrete will not be cracked, chipped or otherwise damaged. The use of crowbars or other levering devices exerting pressure on the fresh concrete to loosen the forms will not be permitted.

**Protection of
Concrete**

4. Hole formers such as pipes and bars shall be removed as soon as the concrete has hardened sufficiently for this to be done without damage to the concrete.

**Removal of
Hole Formers**

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271.28 TREATMENT OF FORMED SURFACES

1. All concrete surfaces shall be true and even, free from stone pockets, depressions or projections beyond the surface. All arrises shall be sharp and true, and mouldings shall be evenly mitred or rounded. Care shall be exercised in removing forms to ensure this result. Formed concrete surfaces shall have finishes in accordance with the classes of surface finish in AS 3610 as follows:

Non-visible surfaces	-	Class 4
Visible surfaces	-	Class 2

Quality of Surfaces

2. As soon as the forms are removed from mass or reinforced concrete work, all rough places, holes and porous spots shall be repaired by removing defective work and filling with stiff cement mortar having the same proportions of cement and fine aggregate as used in the concrete, and shall be brought to an even surface with a wooden float.

Repair of Defects

3. Any tie wires or other fitments extending to outside surfaces, shall be cut back after removal of forms, to a depth of at least 40mm with sharp chisels or cutters. All cavities caused by removal of fitments or tie wires shall be wetted and carefully packed with cement mortar, as above.

Removal of the Wires

4. If required by the Superintendent, the surfaces of bolt cavities, tie wire holes, and all defects in concrete shall be coated prior to the placing of mortar, grout, or fresh concrete, with an approved bonding agent, in lieu of wetting with water. The method of application of such agent and the conditions in which it is to be used shall generally be as laid down by the manufacturer and shall be approved by the Superintendent.

Coating with Bonding Agent

5. The formed surfaces of concrete structures not adjacent to road pavements shall not vary more than 25mm in plan position and not more than 25mm from the specified levels. In the case of drainage pits and other structures adjacent to road pavements, the finished concrete shall not vary more than 10mm from the specified levels and alignment.

Surface Tolerance**271.29 JOINTS**

1. Where horizontal construction joints are found to be necessary in walls, or cast-in-situ drainage structures the joints may be made at the base of walls and at other locations in the walls where approved by the Superintendent. In order to provide for bond between the new concrete and the concrete which has already set, the surface on which the new concrete is to be placed shall be thoroughly cleaned of loose material, foreign matter and laitance. The surface shall be roughened or keyed and saturated with water. After any excess water has been removed, the surface shall be thinly coated with a neat cement grout.

Horizontal Construction Joint

2. Retaining walls shall be provided with vertical expansion joints as shown on the Drawings. The expansion joints shall consist of jointing material of approved quality, and of thickness shown on the drawings, and a depth sufficient to fill the joint. The jointing material shall be neatly cut to fit the surface of the concrete.

Vertical Expansion Joints

3. In footpaths, median toppings and driveways, unless otherwise shown on the Drawings, expansion joints, 15mm in width for the full depth of paving, shall be constructed at intervals not exceeding 15m and where the pavement abuts against gutters, pits and structures. Expansion joints shall consist of a preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent.

Footpaths, Medians, Driveways

4. All unreinforced paving shall be provided with narrow vertical grooves, 20mm deep to induce contraction joints for the control of cracking. The joints shall be formed in the freshly placed concrete in a neat regular pattern to form "slabs" no bigger than 2m². The ratio of the longest side to the shortest side shall not exceed 1.6.

Unreinforced Paving

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271.30 STRENGTH OF CONCRETE

1. When tested in accordance with AS 1012.9, the concrete shall have a compressive strength not less than that shown on the Drawings or if not shown shall have a compressive strength not less than that specified in Table 271.5 for the particular class of work. The cement content restrictions shown in Table 271.5 refer to Portland cement. Where General Purpose Blended cements are utilised the acceptable minima are indicated in brackets. When Works are expected to experience extreme exposure or in other special circumstances, departure from the minimum cement content requirements and specific blended cements may be recommended. Departure from the minimum requirements cited in Table 271.5 shall require a specific minimum cement content as shown on the Drawings, or the written approval of the Superintendent.

Strength Requirement

2. The strength shall be determined from the average of not less than two specimens, moulded from each class of concrete being used in the work, and selected to represent the whole of the concrete placed at the time of moulding.

Determination of Strength

3. In general, two pairs of test specimens shall be moulded for each 15 cubic metres of concrete, or part thereof, one pair being intended for the 7 day test if required and the other pair for a 28 day test.

Moulding of Cylinders

Use	MPa	Minimum Portland Cement per cu metre (Minimum GP Blended Cement)	Coarse Aggregate Nominal Size	Cylinder Strength Required	
				7 days	28 days
				MPa	MPa
Foundations, mass retaining walls	20	270 (330)	40	15	20
Mass concrete footings, pitching, linings etc.	20	270 (330)	20	15	20
Drainage structures, driveways, footpaths, miscellaneous minor concrete work	20	270 (330)	20	15	20
Reinforced concrete culverts, headwalls, base slabs, sign structure large footings, retaining walls	32	320 (380)	20	24	32
Safety Barriers	40	330 (380)	20	24	40
Extruded concrete	20	270 (330)	14	15	20

Table 271.5 - Concrete Strength Requirements**NOTE:**

The total cement and Portland cement quantities indicated as minima are aimed at providing suitably durable concrete for exterior public works under normal circumstances.

4. If the test specimens fail to achieve the specified strength, the Contractor may,

Cores and Test

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with the approval of the Superintendent, arrange for cores to be taken from the work. If the average strength of such cores complies with the specified requirements nominated in Table 271.5, the concrete will be accepted.

Acceptance

*Age of test specimen in days of date of testing	Factor
28	1.00
35	1.02
42	1.04
49	1.06
56	1.08
70	1.10
84	1.12
112	1.14
140	1.16
168	1.18
196	1.20
224	1.22
308	1.24
365 and greater	1.25
*For intermediate ages the factor shall be determined on a pro-rata basis	

Table 271.6 - Concrete Age Conversion Factors

5. The strengths specified at 28 days shall be increased as shown in Table 271.6 for tests at ages in excess of 28 days.

Strength Age Factor

6. If cores taken fail to satisfy the strength requirements, the deduction provisions of Clause 271.51 will apply.

Failure of Cores**271.31 SAMPLING CONCRETE**

1. Equipment and facilities shall be provided by the Contractor for the taking and storage of samples of any materials or concrete being used, or intended to be used in the work.

Contractor's Responsibility

2. Concrete test specimens shall be cylinders 300mm long and 150mm diameter, moulded concurrently in the presence of the Superintendent or Superintendent's representative, in accordance with AS 1012.8, from samples taken in accordance with AS 1012.1.

Moulding of Test Cylinders

3. Test specimens shall be tested only by laboratories with appropriate NATA registration. Copies of test results shall be forwarded to the Superintendent immediately upon receipt.

Testing

4. The costs of all work and material required in the taking, handling, delivery and testing of specimens shall be borne by the Contractor.

Contractor's Cost

STEEL REINFORCEMENT FOR CONCRETE**271.32 MATERIAL**

1. Steel reinforcement shall comply with the requirements of the appropriate following Australian Standards:

- (a) AS 1302 - Steel Reinforcing Bars for Concrete
- (b) AS 1303 - Steel Reinforcing Wire for Concrete
- (c) AS 1304 - Welded Wire Reinforcing Fabric for Concrete

2. The type and size of bars shall be as shown on the Drawings.

Type and Size

3. Steel reinforcement shall be free from loose or thick rust, grease, tar, paint, oil, mud, millscale, mortar or any other coating, but shall not be brought to a smooth polished condition.

Quality

4. The Contractor shall supply evidence satisfactory to the Superintendent that steel reinforcement complies with AS 1302, AS 1303 or AS 1304, as appropriate. Test certificates shall show the results of mechanical tests and chemical analysis. This action constitutes a **HOLD POINT**. The Superintendent's approval of the supplied details is required prior to the release of the hold point.

HP

5. Where the material cannot be identified with a test certificate, samples shall be taken and testing arranged by the Contractor. The samples shall be selected randomly and consist of three specimens each at least 1.2 m in length. The cost of all samples and tests shall be borne by the Contractor.

**Further
Sampling
Contractor's
Cost**

6. Plastic bar chairs or plastic tipped wire chairs shall be capable of withstanding a load of 200kg mass on the chair for one hour at 23± 5°C without malfunction. The Contractor shall demonstrate that the proposed chairs conform with these requirements.

Bar Chairs**271.33 BENDING**

1. Reinforcement shall be formed to the dimensions and shapes shown on the Drawings. It shall not be bent or straightened in a manner that will injure the material, and bars with kinks or bends not shown on the Drawings will not be accepted. Heating of reinforcement for purposes of bending will only be permitted if uniform heat is applied. Temperature shall not exceed 450°C and the heating shall extend beyond the portion to be bent. Heated bars shall not be cooled by quenching.

**Cutting and
Bending****271.34 SPLICING****(a) General**

1. All reinforcement shall be furnished in the lengths indicated on the Drawings. If splicing is required, it shall be in accordance with the provisions of AS 1302.

Plan Lengths

2. The cost of any test ordered in connection with splices not shown on the drawing shall be borne by the Contractor.

**Contractor's
Cost**

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(b) Lapped Splices

1. Laps in reinforcing bars, wire or fabric shall be as shown on the Drawings. Laps not shown on the Drawings shall be as follows for unhooked bars:-

**Lap
Dimensions**

Plain bars, Grade 250	40 bar diameters
Deformed bars, Grade 400	35 bar diameters
Hard-drawn wire	50 bar diameters

2. Splices in reinforcing fabric shall be so made that the overlap, measured between outermost transverse wires of each sheet of fabric is not less than the spacing of those wires plus 25mm.

**Splice
Dimensions**

271.35 MARKING

1. Bars of identical shape shall be made up in bundles of three and securely tied together by soft iron wire. Each bundle shall have a stout metal label of not less than 40mm diameter attached to it. Each metal label shall be punched with the appropriate marking in accordance with the steel list shown on the drawings. If called for on the Drawings the marking shall incorporate a prefix, and bars with different prefixes shall be stored separately.

Marking Details

271.36 STORAGE

Reinforcement shall be stored above the surface of the ground and shall be protected from damage and from deterioration by exposure.

**Protection of
Reinforcement**

271.37 DELIVERY AND RECEIPT OF REINFORCEMENT

1. Unless the Contractor elects to have the reinforcement inspected at the site, no reinforcement shall be delivered to the site until permission to deliver has been granted by the Superintendent.

**Test before
Delivery**

2. The Contractor shall give 10 working days notice to the Superintendent for carrying out the inspection. This action constitutes a **HOLD POINT**. The Superintendent's inspection and approval of the reinforcement is required prior to the release of the hold point. The Superintendent will carry out, or waive, the inspection with reasonable expediency, however the Contractor shall not be entitled to an extra payment as a result of any delays incurred.

Notice to Test

HP

271.38 PLACING

1. Reinforcement shall be accurately placed as shown on the Drawings and shall be securely held by blocking from the forms, by supporting on concrete or plastic chairs, or metal hangers, and by wiring together at all intersections or at 0.5m centres, whichever is the greater distance, using annealed iron wire of diameter not less than 1.25mm. Steel shall not be supported on metal supports which extend to the surface of concrete, on wooden supports, or on pieces of coarse aggregate. Reinforcement shall have the minimum cover shown on the Drawings.

**Reinforcement
Position**

2. The Superintendent may approve the use of tack welding instead of wire ties on reinforcing wire. All welding of reinforcing steel shall be in accordance with as 1554.3. Tack welding of cold-worked and hard grade bars shall not be permitted.

Tack Welding

3. The reinforcement in each section of the work shall be approved by the Superintendent before any concrete is deposited in the section and adequate time shall

**Inspection
Required**

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be allowed for inspections and any corrective work which may be required. Notice for inspection shall not be less than four normal working hours. This action constitutes a **HOLD POINT**. The Superintendent's approval of the reinforcement is required prior to the release of the hold point.

HP

4. Splices shall be staggered where practicable and when not shown on the drawings they shall be arranged as directed by the Superintendent.

Splices

5. Bars forming a lapped splice shall be securely wired together in at least two places, unless welded.

Lapped Splice

6. The clear cover of any bar, including stirrups, to the nearest concrete surface shall be as shown on the Drawings. Where not so indicated it shall be as stated below:

Bar Cover

(a) Concrete normally in contact only with air

(i) Slabs: 40mm

(ii) Other than slabs: 45mm

(b) Concrete in contact with earth or fresh water

(i) Slabs of box culverts: 50mm

(ii) Other than culverts: 50mm

In no cases shall the cover be less than 1½ times the diameter of the bar.

BACKFILLING

271.39 GENERAL

1. Backfilling at paving and minor concrete works shall not commence until after the concrete has hardened and not earlier than three days after placing.

2. No filling shall be placed against retaining walls, headwalls or wingwalls within 21 days after placing of the concrete, unless the walls are effectively supported by struts to the satisfaction of the Superintendent, or when the Contractor can demonstrate that 95 per cent of the design strength of the concrete has been achieved.

Adjacent to Walls

3. Selected backfill shall be placed against retaining walls and cast-in-place box culverts for a horizontal distance equal to one-third of the height of the wall. It shall consist of granular material, free from clay and stone larger than 50mm gauge. The Plasticity Index of this selected backfill material shall not be less than 2 or more than 12 when tested in accordance with AS 1289.3.3.1. The material shall be placed in layers not exceeding 150mm and shall be compacted to provide a relative compaction of not less than 92 per cent below 1.5m of the finished surface and 100 per cent within 1.5m of the finished surface as determined by AS 1289.5.4.1 for modified compactive effort.

Selected Backfill

271.40 TREATMENT AT WEEPHOLES

1. Drainage adjacent to weepholes shall be provided by either a layer of broken stone or river gravel consisting of clean, hard, durable particles graded from 50mm to 10mm such that:

Size & Type of Backfill Material

(a) The maximum particle dimension shall not exceed 50mm

(b) No more than 5 per cent by mass shall pass the 9.5mm A.S. sieve.

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2. The broken stone or river gravel, enclosed in a filter fabric approved by the Superintendent, shall be continuous in the line of the weepholes, extend at least 300mm horizontally into the fill and extend at least 450mm vertically above the level of the weepholes.

Extent of Material

3. Alternatively the Contractor may provide a synthetic membrane of equivalent drainage characteristics at no extra cost to the Principal. It shall be stored and installed in accordance with Manufacturer's instructions. The use of a synthetic membrane shall be subject to the Superintendent's approval.

Synthetic Membrane

SPRAYED CONCRETE

271.41 GENERAL

1. Sprayed concrete is concrete pneumatically applied at high velocity on to a surface. Application may be either a wet or dry process. A sound homogeneous product shall be provided with surface finish reasonably uniform in texture and free from blemishes.

Definition

2. The minimum depth of sprayed concrete to be applied shall be 75mm.

Depth

3. Sprayed concrete lining in open drains shall be coloured to match the adjoining rock colour.

Colour

4. Sprayed concrete shall have a minimum cement content of 380 kg/m³ as discharged from the nozzle and shall have a minimum compressive strength of 25 MPa at 28 days when tested by means of 75mm diameter cores taken from in-place sprayed concrete.

Strength

5. Cores shall be secured, accepted, cured, capped and tested in accordance with AS 1012.14. Equipment and facilities shall be provided by the Contractor for the taking of cores from the work. The Contractor shall arrange for a laboratory with appropriate NATA registration for the curing and testing of the cores. Copies of test results shall be forwarded to the Superintendent.

Test Cores

6. The cost of all work and material required in the taking, handling, delivery and testing of cores shall be borne by the Contractor.

Contractor's Cost

7. At least 14 days prior to applying any sprayed concrete the Contractor shall submit to the Superintendent details of his proposed procedure, plant, materials and mix proportions. Materials shall comply with AS 3600. This action constitutes a **HOLD POINT**. The superintendent's approval of the submitted details is required prior to the release of the hold point.

HP

271.42 TEST PANELS

1. Not less than 10 days before applying concrete, the Contractor shall prepare at least 3 test panels for each mix proposed, in conditions similar to those in the works and in the presence of the Superintendent. The test panels shall be made by applying a 75mm thickness of sprayed concrete to a hardboard panel approximately 750mm square. The sprayed concrete shall be applied to the panels in the same manner, using materials including steel reinforcing fabric, equipment, pressures and curing that will be used in the Works. The panels shall be submitted to the Superintendent for examination.

Test Panels

2. The Contractor shall cut four 75mm diameter cores from one test panel for each proposed mix approximately 48 hours after the panel has been sprayed. The cores shall be tested as for cores from in-place sprayed concrete. One core shall be compression tested at 3 days, one core at 7 days and the remaining two cores at 28

Cores

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days.

3. Should any of the cores reveal defects such as lack of compaction, dry patches, voids or sand pockets or should the test panel exhibit an unacceptable surface finish, the Contractor shall modify the mix design and/or method of placement and prepare fresh test panels for testing and inspection.

Defective Core

4. Sprayed concrete shall not be applied to the Works until the Contractor produces test panels for the approval of the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the test panels is required prior to the release of the hold point.

HP

271.43 SURFACE PREPARATION

1. Earth surfaces shall be graded, trimmed and compacted and shall be dampened prior to applying the sprayed concrete. The Contractor shall take any precautions necessary to prevent erosion when the sprayed concrete is applied.

Earth

2. Rock surfaces shall be cleaned of loose material, mud and other foreign matter that might prevent bonding of the sprayed concrete onto the rock surface. The rock surface shall be dampened prior to applying the sprayed concrete.

Rock

3. Corrugated steel pipes shall be cleaned of loose material, mud and any other foreign matter.

Steel Pipes

4. The Contractor shall remove free water and prevent the flow of water which could adversely affect the quality of the sprayed concrete.

Water Flow

271.44 APPLICATION OF SPRAYED CONCRETE

1. Application shall begin at the bottom of the area being sprayed and shall be built up making several passes of the nozzle over the working area. The nozzle shall be held so that the stream of material shall impinge as nearly as possible perpendicular to the surface being coated. The velocity of discharge from the nozzle, the distance of the nozzle from the surface and the amount of water in the mix shall be regulated so as to produce a dense coating with minimum rebound of the material and no sagging. Rebound material shall be removed after the initial set by air jet or other suitable means from the surface as work proceeds and disposed of.

Procedure

2. Spraying shall be discontinued if wind causes separation of the nozzle stream.

Wind Problem

3. Concrete shall not be sprayed in air temperatures less than 5°C.

Air Temperature

4. Construction joints shall be kept to a minimum. A joint shall be formed by placing or trimming the sprayed concrete to an angle between 30° and 45° to the sprayed concrete surface. The joint edge shall be cleaned and wetted by air-water jet before recommencing concrete spraying.

Construction Joints

5. When spraying around reinforcement, concrete is to be sprayed behind the reinforcement before concrete is allowed to accumulate on the face of the reinforcement.

Spraying around Reinforcement

6. Adjoining surfaces not requiring sprayed concrete shall be protected from splash and spray rebound. Splash or rebound material on these adjoining surfaces shall be removed by air-water jet or other suitable means as work proceeds.

Protection of Adjoining Surfaces

271.45 CURING

1. Curing shall commence within one hour of the application of sprayed concrete

Commencement

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and may be by water or by colourless wax emulsion curing compound complying with AS 3799 and applied in accordance with manufacturer's specifications.

2. In water curing, the surface of the sprayed concrete shall be kept continuously wet for at least seven days. ***Water Curing***

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**271.46 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 271.7 below:

Item	Activity	Limits/Tolerances	Spec Clause
1.	Subgrade		
	(a) Relative Compaction	≥ 95% (standard compactive effort)	271.04
2.	Driveways, Footpaths		
	(a) Finished Subbase	To be trimmed and compacted so that the levels do not vary more than 15mm under a straight-edge 3 metres long.	271.05
	(b) Relative Compaction of Subbase	≥ 97% (modified compactive effort) ≥100% (standard compactive effort)	271.05
3.	Formwork		
	(a) Position of Forms	Forms shall be aligned accurately so that departure of the forms from the surfaces specified on the Drawings shall not exceed 1/300 of the space between supports for any surface visible in the completed work and 1/150 for hidden work.	271.12
4.	Fine Aggregate		
	(a) Grading	To be evenly graded within the absolute limits and shall not deviate from the grading of sample aggregate as per Table 271.1.	271.15
5.	Coarse Aggregate		
	(a) Percentage of wear	Loss of weight shall not exceed 30%	271.16
	(b) Crushing Value	Crushing value shall not exceed 25%	271.16
	(c) Soundness	The loss of mass when tested with sodium sulphate shall not exceed 12%	271.16
	(d) Particle Shape	The proportion of mis-shapen particles (2:1 ratio) shall not exceed 35%	271.16
	(e) Grading	To be evenly graded within the absolute limits and shall not deviate from the grading of sample aggregate as per Table 271.2.	271.16

Item	Activity	Limits/Tolerances	Spec Clause
6.	Aggregate Content Moisture	Where moisture content of fine aggregate exceeds 8%, or moisture content of coarse aggregate exceeds 3%, the proportion of mix shall be changed.	271.20
7.	Bulking of Fine Aggregate	Where bulking of the fine aggregate exceeds 10%, a corresponding increase in volume of fine aggregate shall be made.	271.21
8.	Consistency	In accordance with AS 1012.3 Method 1, the slump shall not exceed 75mm for concrete compacted by vibrators.	271.22
		In the case of concrete placed by extrusion machine, the slump will be between 10mm and 15mm.	271.22
9.	Ready-Mixed Concrete (a) Mixing & Delivery	The time taken from the introduction of water until the concrete is completely discharged shall be not more than 1.5 hours.	271.23
		Where non-agitating equipment is used the concrete shall be completely discharged not more than 30 minutes after the addition of water.	
10.	Placing & Compacting of Concrete	Concrete shall not be placed without the approval of the Superintendent if the air temperature within 24 hours is likely to be below 5°C or the shade temperature is likely to exceed 38°C.	271.24
11.	Finishing of Unformed/Formed Concrete Surfaces		
	(a) Wearing Surface	To be finished true and uniform so that departure from designed grade shall not exceed 5mm in any 3 metre length.	271.25 (b)
	(b) Finished Surfaces		
	(i) Not adjacent to Roads	≤ 25mm Plan position ≤ 25mm Level	271.25 (c)
	(ii) Adjacent to Roads	≤ 10mm Alignment ≤ 100mm Level	271.28

Table 271.7 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT**271.47 DEDUCTIONS**

1. Payment shall be made at the scheduled rates provided the concrete meets the strength requirements shown in Table 271.5 or as shown on the Drawings.
2. Where any concrete does not reach the strength specified in Table 271.5, the scheduled rate of payment shall be reduced by 2% for each 1%, or fraction thereof, by which the strength of the specimen fails to reach the specified strength, up to a maximum deficiency of 10%.
3. If the deficiency in strength exceeds 10%, the concrete represented by the specimens may be rejected, in which case no payment will be made for the work nor for any remedial work to rectify the deficiency.

271.48 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification and the associated activity specific specifications on a schedule of rates basis in accordance with Pay Items 271(a) to 271(e) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. The pay items applicable to particular activities are listed in the Specifications for these activities
4. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
Pay Item 271(a) EXCAVATION

1. The unit of measurement shall be the cubic metre measured as bank volume of the excavation.
2. This pay item applies to works included in pay items (b) and (c).
3. The disposal of surplus material shall be included in the excavation rates.
4. No additional payment shall be made for drying out wet excavated material or replacement of over excavation for any reason.
5. The schedule rate for excavation shall allow for excavation and backfilling of all types of material. Separate rates shall not be included for earth and rock.
6. The control of stormwater runoff shall be included in the rate for excavation.
Pay Item 271(b) FOOTPATHS, DRIVEWAYS, MEDIAN TOPPING AND WORKS OF SIMILAR NATURE.

1. The unit of measurement shall be the square metre, measured as the horizontal surface area of the concrete footpath, driveways, median topping, or similar as constructed.
2. The schedule rate under this Pay Item shall include all operations involved in the forming, compaction of foundations, subbase, concreting, finishing, curing and backfilling.
3. Where specified on the Drawings, this Pay Item shall include the supply and

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placement of reinforcing steel.

Pay Item 271(c) SPRAYED CONCRETE

1. The unit of measurement shall be the square metre of sprayed concrete in place.

2. The schedule rate under this Pay Item shall include all the operations involved in the surface preparation, spraying, jointing, removal of splash and rebound material, curing and testing.

Pay Item 271(d) 20MPa CONCRETE FOR MISCELLANEOUS MINOR CONCRETE WORK

1. The unit of measurement shall be the cubic metre of concrete supplied and placed.

Pay Item 271(e) 32 MPa CONCRETE FOR MISCELLANEOUS MINOR CONCRETE WORK

1. The unit of measurement shall be the cubic metre of concrete supplied and placed.

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CITY OF GREATER DANDENONG

SPECIFICATION

273

LANDSCAPING

SPECIFICATION 273 - LANDSCAPING

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ANNEXURE

273A LANDSCAPING MATERIALS

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SPECIFICATION 273 : LANDSCAPING**GENERAL****273.01 SCOPE**

1. The work to be executed under this Specification consists of:
 - (a) The vegetation of cut and fill batters, median areas, pathways, parks, verges, open drains and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising, turfing or sowing of seed and may include surface protection works, hydroseeding, hydromulching and straw mulching.
 - (b) The supply of plants, planting at locations as shown on the Drawings, fertilising, mulching, staking, watering and maintenance of plants.
2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements.

Quality**273.02 REFERENCE DOCUMENTS**

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

**Documents
Standards
Test Methods****(a) Council Specifications**

- 211 - Control of Erosion and Sedimentation.
- 213 - Earthworks.

(b) Australian Standards

- AS 1160 - Bitumen emulsions for construction and maintenance of pavements.
- AS 2507 - The storage and handling of pesticides..
- AS 4419 - Soils for landscaping and garden use
- AS 4454 - Composts, soil conditioners and mulches.
- AS 4843 - Synthetic weed blocking fabric.

VEGETATION OF SLOPES AND DRAINS**273.03 EXECUTION AND TIMING OF WORK**

1. In association with the work to be executed under this Specification, the Contractor shall implement effective erosion and sedimentation control measures in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.
2. The work to be executed under Vegetation of Slopes and Drains includes the vegetation of cut and fill batters, pathway verges, median areas, open drains and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising and either sowing of seed or turfing as shown on the Drawings.

**Contractor's
Responsibility****Vegetation**

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3. Between the months of September and May inclusive, exposed surfaces shall be vegetated before the area exceeds one hectare or lesser area as directed by the Superintendent. No vegetation shall be carried out between June and August inclusive unless otherwise approved by the Superintendent.

Time

273.04 MATERIALS

(a) Topsoil

1. The Contractor shall use imported topsoil and/or topsoil won and stockpiled on site under the Specification for EARTHWORKS. Where imported topsoil is required it shall comply with AS 4419 and shall:-

Quality

- be of a friable, porous nature,
- be free of weeds and weed seeds, bulbs, corms and vegetable propagules.
- contain no refuse or materials toxic to humans, animals or plants,
- contain no stumps, roots, clay lumps or stones larger than 25mm in size,
- have an organic content of at least 3 per cent by mass,
- have a pH neither less than 6.0 nor more than 7.5,
- have a soluble salt content not exceeding 0.06 per cent by mass.

(b) Herbicide

1. Herbicide used shall be an approved glyphosate based herbicide.

(c) Seed

1. All seed used shall be of approved species and varieties approved and shall be sown at the application rates. The Contractor shall submit to the Superintendent the name/s of the proposed species, seed supplier/s and application rates within two weeks of the acceptance of the tender.

Seed Type and Supplier

2. The Contractor's attention is drawn to the lead time that may be required to procure some native seed species. The native seed shall be delivered to the site in separate lots for each species and variety, clearly labelled to show species, variety and weight.

Lead Time for Native Seed

3. All seed must be accompanied by a "Certificate of Authenticity" which shall be furnished by the Contractor to the Superintendent upon request at any stage of the work.

Certification

4. The Contractor shall not take possession of the seed more than seven days before sowing is to occur. The seed shall be stored in clean, air tight containers and kept away from direct sunlight. It shall not be exposed to the elements at any stage during storage.

Storage

5. The Contractor shall replace any exotic seed batch found not true to type. The cost of replacement shall be borne by the Contractor.

Contractor's Cost

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(d) Turf

1. Turf shall consist of 25mm depth of dense, well rooted, vigorous grass growth with 25mm depth of topsoil. The type of grass turf to be used shall be Couch and Buffalo and in accordance with the Drawings. Unless specified, Kikuyu grass shall not be used. Turf shall be free of weeds, soil pests and diseases. The turf shall be supplied as rolls in long lengths of uniform width, not less than 300mm, and shall be in sound unbroken condition.

Quality**(e) Fertiliser**

1. Fertiliser shall be an approved organic type.

Type**(f) Vegetable Mulch**

1. Vegetable mulch used in hydromulching shall consist of straw, chaff, wood fibre, paper pulp or similar material all finely shredded to a maximum dimension of 10mm. Meadow hay or weeds shall not be used and paper pulp if used shall not exceed 50 per cent by mass of the total mulch.

Composition**(g) Binder**

1. The binder used in hydromulching and strawmulching shall be a Grade ASS slow setting anionic bitumen emulsion complying with AS 1160.

(h) Wetting Agent

1. The soil wetting agent added in hydromulching or hydroseeding shall be approved and applied at the application rate specified therein.

(k) Soil Conditioner

1. Unless shown otherwise in Annexure 273A, the soil conditioner used shall be gypsum.

273.05 VEGETATION OF SLOPES 3 TO 1 OR FLATTER**(a) Preparation of Surface**

1. Slopes shall be sprayed with herbicide, applied at the rate specified in Annexure 273A, to kill weed infestation. Sprayed areas shall remain undisturbed for two weeks.

Herbicide Treatment

2. The surface shall then be tyned to a depth of 200mm to produce a loose surface and all large stones, rubbish and other materials that may hinder germination shall be removed before topsoiling.

Preparation

3. All areas that are to be topsoiled shall have gypsum, or other specified soil conditioner, added at the rate specified in Annexure 273A.

Soil Conditioner

4. The gypsum shall be added by one of the following methods as directed by the Superintendent:

Gypsum Application

- it shall be spread evenly over the subsoil prior to topsoiling by a mechanical spreader. Any area that is spread with a soil conditioner shall be topsoiled on that day; or
- it shall be thoroughly mixed into the topsoil whilst topsoiling is being removed from the topsoil stockpiles.

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5. Soil conditioners, other than gypsum, shall be applied as directed by the Superintendent. ***Application of Other Conditioners***

(b) Topsoiling

1. Placing and spreading of topsoil shall not commence without the prior approval of the Superintendent. ***Approval***

2. Topsoil shall be uniformly applied to provide an average compacted thickness of 50mm with a minimum compacted thickness of 30mm at any location. The topsoiled area shall be cultivated to a depth of 50mm to provide a roughened surface with soil lumps not exceeding 25mm dimension. ***Application***

(c) Mixing of Seed

1. The Contractor shall give the Superintendent two days' notice before each sowing operation. ***Notice***

2. Seed to be used for each operation shall be mixed, pretreated and placed into the sowing equipment on site. Seed shall be sown on the day of mixing with pesticide. ***Seed Mixing***

(d) Incorporation of Pesticide

1. Immediately before sowing, all grass and native seed shall be treated with pesticide (powder form). The pesticide shall be thoroughly mixed as a dry powder with the seed at the rate specified to the equivalent mass of seed to be spread on 1 hectare of the surface. ***Mixing***

(e) Sowing

1. Sowing shall be carried out with an appropriate mechanical seeder. Where practicable, passes shall follow finished surface contours. Seed shall be sown at a depth of 5mm or shall be raked or harrowed to provide 5mm cover. ***Seeder***

2. Seed and fertiliser shall be evenly distributed over the areas to be sown at the rates. Fertiliser shall be applied concurrently with the seeding operation. ***Sowing Rate***

(f) Turfing

1. Turf shall be placed on the prepared topsoiled surface. Runs of turf shall butt hard against each other and be placed perpendicular to the direction of water flow. Turf seams shall then be topdressed with topsoil. ***Placing***

2. Four to six weeks after placement, the turf shall be lightly topdressed with topsoil to correct any undulations or unevenness in the established turf. ***Topdressing***

(g) Watering

1. The Contractor shall water areas to be sown or turfed to a uniformly moist condition without run-off.

2. After sowing or turfing the areas shall be rewatered to a uniformly moist condition without run-off, and for sowing without causing rills in the surface, on a daily basis for a minimum of 15 days after sowing, or as otherwise directed by the Superintendent, to promote and maintain growth. ***Uniform Application***

3. If the Superintendent is of the opinion that excessive rilling has occurred in the surface, from whatever cause, the Superintendent shall direct the Contractor to re-prepare and re-sow the affected area. The costs of such work shall be borne by the ***Excessive Rilling Contractor's***

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Contractor.

Cost**273.06 VEGETATION OF SLOPES STEEPER THAN 3 TO 1****(a) General**

1. Where shown on the Drawings or directed by the Superintendent, slopes shall be vegetated by one of the following methods: **Method**

- (i) Topsoiling and hydromulching;
- (ii) Topsoiling, hydroseeding and straw mulching;
- (iii) Hydroseeding.

(b) Preparation of Surface

1. Weeds shall be killed by spraying with herbicides as specified under Clause 273.05(a). **Herbicide Treatment**

2. No more than seven days before seeding all loose material shall be removed from fill batters and cut batters, which are not stepped, by dragging a heavy steel chain of minimum weight of 30 kilograms per metre of length or by other methods approved by the Superintendent. **Preparation**

3. All areas that are to be topsoiled shall have gypsum, or other specified soil conditioner, added as specified under Clause 273.05(a). **Soil Conditioner**

(c) Topsoiling

1. Where batters have been stepped, the steps shall be loosely filled with topsoil. Elsewhere, topsoil shall be uniformly applied to provide an average thickness of 50mm with a minimum compacted thickness of 30mm. **Application**

(d) Hydromulching or Hydroseeding

1. The hydromulch or hydroseed shall comprise the materials shown in Table 273.1. The materials shall be applied at the application rates shown in Table 273.1. **Application Rate**

2. Dry surfaces shall be watered by a fine spray before the application of the hydromulch. **Watering**

3. The mixing and treatment of seed shall be carried out in accordance with Clause 273.05(c). **Treatment of Seed**

4. During preparation of the hydromulch or hydroseed slurry, liquid form pesticide shall be added to the storage tank, to facilitate surface application, at a rate of 5 litres of pesticide to the equivalent volume of hydromulch or hydroseed slurry to be spread on 1 hectare of surface in accordance with Table 273.1. **Pesticide**

5. Storage tanks, containers and equipment to be used in hydromulching or hydroseeding of slopes shall be clean and free of contamination from previous operations. **Equipment**

6. A slurry mixture shall be produced by addition of the specified materials in the tank and agitated to maintain a uniform consistency during application. It shall be applied uniformly over the whole surface. **Uniform Mix**

7. Hydromulch or hydroseed shall not be applied under the following weather conditions at the site: **Weather Conditions**

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- when temperature is higher than 35°C
- when winds exceed 15 kilometres per hour
- where, in the opinion of the Superintendent, the surface is too wet or
- during rain periods or when rain appears imminent.

8. Application rates shall be in accordance with Table 273.1

Material	Application Rate per Hectare	
	Hydromulching	Hydroseeding
i) Vegetable Mulch (kg)	1,500	Nil
ii) Water (l)	35,000	20,000
iii) Binder (l)	1,200	Nil
iv) Fertiliser	See Annexure 273A	
v) Seed	See Annexure 273A	
vi) Wetting Agent (l)	35	20
vii) Pesticide (l)	5	5

Table 273.1 - Materials and Application Rates

(e) Straw Mulching

1. The mulch to be applied after hydroseeding shall comprise a matrix of straw and an anionic slow setting bitumen emulsion binder. Meadow hay shall not be used. The straw mulch shall be uniformly applied by a suitable blower unit at a rate of 250 bales (each of 20 kilograms) of straw per hectare of surface. The bitumen emulsion shall be incorporated as a spray into the air stream of the mulch blower at a rate of not less than 2,500 litres of bitumen emulsion per hectare of surface. The finished straw mat shall have a minimum thickness of 20mm at any location.

Method

273.07 VEGETATION OF OPEN DRAINS

(a) Preparation of Surface

1. The Contractor shall so execute the work that the excavation of open drains to the specified profiles is followed within seven days by the vegetation of the surface as specified in this Clause. Topsoil shall be spread to provide an average compacted thickness of 50mm with a minimum compacted thickness of 30mm at any location.

Profile and Topsoil

(b) Sowing

1. Before sowing, the surface shall be watered as specified under Clause 273.05(g). Seed and fertiliser shall then be applied uniformly at the rates specified in Annexure 273A by one of the following procedures as directed by the Superintendent:

Procedure

- (i) Mechanical sowing.
- (ii) Hydromulching or hydroseeding.

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(iii) By hand.

(c) Surface Protection

1. Where shown on the Drawings or directed by the Superintendent, one of the following protective treatments shall be applied immediately to all or part of the sown surface.

Methods

(i) Spraying with Bitumen Emulsion

An anionic slow setting bitumen emulsion, conforming with Grade ASS of AS 1160, shall be sprayed over the surface at a rate of 1 litre of bitumen emulsion per square metre of surface.

Application Rate

(ii) Lining with Organic Fibre Mat

The channel surface shall be lined with an approved organic fibre mat. The runs of matting shall be laid along the direction of water flow. The matting shall be laid loosely on the soil surface and not stretched.

Laying

The upstream end of the matting shall be slotted into a trench 150mm wide by 150mm deep and pinned to the base of the trench at 200mm centres. The trench shall be backfilled with soil and compacted by foot.

Anchorage

The pins shall be 'U' shaped, 4mm gauge wire, 50mm wide and 150mm long legs.

Pins

Adjacent runs of matting shall be overlapped 100mm with the higher run lapped over the lower run. The matting shall be pinned along the sides of each run at 500mm centres and along the middle of each run at 1m centres. End overlaps shall be 150mm wide with the higher run end lapped over the start of the lower run and pinned at 200mm centres.

Lapping

(iii) Turfing

Turf shall be as specified under Clause 273.04(d).

Quality

Runs of turf shall butt hard against each other and be placed perpendicular to the direction of water flow in the drain, and pinned into position at 500mm centres.

Placing

Seams of turf shall be topdressed with topsoil.

Topdressing

(d) Watering

1. The Contractor shall water treated areas in order to promote and maintain growth.

LANDSCAPE PLANTING

273.08 EXECUTION AND TIMING OF WORK

1. The work to be executed under Landscape Planting includes the ground preparation, the supply of plants, planting as shown on the Drawings, fertilising, mulching, staking, watering and maintenance of plants.

Extent of Work

2. The Contractor shall give the Superintendent a minimum of two days' notice of commencement of planting. Landscape planting shall not be carried out in extreme weather conditions (above 35°C or below 10°C), unless otherwise approved by the

Notice of Commencement

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Superintendent.

273.09 MATERIALS

(a) Topsoil

1. Topsoil shall comply with the requirements of Clause 273.04(a).

(b) Herbicide/Weed Blocking Fabric

1. Herbicide shall comply with the requirements of Clause 273.04(b).
2. Synthetic weed blocking fabric shall comply with AS 4843.

(c) Fertiliser

1. Fertiliser shall be a slow-release type in pellet form, with a nine months' release period and having Nitrogen:Phosphorus: Potassium (N:P:K) ratios of 6.3 : 1.8 : 2.8 or as approved.

Quality

(d) Mulch

1. All mulches used for landscape planting shall consist of organic material complying with the requirements of AS 4454. Mulch shall be composted or pasteurised. The use of other materials as ground cover shall be as indicated on the Drawings and approved by the Superintendent.

Quality

2. A 10 kilogram sample of mulch proposed by the Contractor shall be submitted for approval to the Superintendent two weeks before its intended use. The mulch subsequently used shall be consistent in every respect with the sample approved by the Superintendent.

Sample

(e) Plant Material

1. The Contractor shall obtain all plants from a nursery located in an area having a similar climate to the site of the Works.

Source

2. There shall be no substitution of any species without the Superintendent's approval. All plant material shall be true to species and sizes. Plants shall be healthy, of good form, not soft or forced and with large robust root systems. They shall not be rootbound and shall be free from disease and insect pests. All container soil mix shall contain between 20 per cent and 25 per cent clay by volume. Trees shall have a single leading shoot. For hardening off purposes, all plants shall be delivered to a site within the locality of the works at least four weeks before planting out. Plant root systems shall be maintained moist at all times with particular attention being paid to watering during the on-site period before and during planting. Plant stock shall be classified and planted in accordance with the Drawings.

Quality

(f) Stakes

1. Plants shall be staked at locations shown on the Drawings. Stakes shall be hardwood and sharpened at one end, with dimensions as follows:

Size

- | | | |
|-------|-------------------------|----------------------|
| (i) | Marker Stakes (Tube) | 15mm x 15mm x 800mm |
| (ii) | Stakes (Advanced) | 25mm x 25mm x 2000mm |
| (iii) | Stakes (Super Advanced) | 50mm x 50mm x 3000mm |

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273.10 MOUND PLANTING

The following process shall be followed for all plantings specified as part of the works.

Services

1. Check location of underground services as built before commencing works. The Contractor shall contact all service authorities and locate all relevant services. The following offsets for trees are required.

Powerlines – 6 metres
Fence boundary – 6 metres

2. Prior to planting and grassing works, all perennial and annual weeds shall be controlled by herbicide application. Herbicide treatment shall be with a non-volatile, water soluble, liquid, non-selective, knockdown herbicide of trade-name "Roundup" or similar approved type. The areas to be treated are to be sprayed twice, one month before, and then 7 days prior to commencement of planting and grassing works.

**Pre-Planting
Herbicide
Treatment**

3. Refer to plant schedule on drawing for plant species, pot sizes and quantities. All plants shall be true to species and the best of their respective kinds. Tubestock shall be young and vigorous, free of pests, disease and weeds and without roots coiled around the inside of the tube. Provide local provenance material available in suitable condition where possible. Tubestock to be inspected (pre-purchase) by Mike Smith (City of Greater Dandenong).

**Planting
Material**

For all mass planting install plant specimens in groups of 5-10 of the same species. No tree species to be planted within drip lines of existing trees. Setout of planting areas to be approved by Superintendent prior to excavation of planting holes. Layout to be confirmed by the Delegated Officer (City of Greater Dandenong).

Mike Smith Phone No: 9797 1768 to arrange the inspection.

Suitable Nursery contacts include:
Din San Nursery: Phone 9551 1988
Plants of Provenance: (Mark Elliston) Phone 0419 899 598
Greenlink Sandbelt Indigenous Nursery Phone 9556 4433

4. Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant root ball level with the finished surface of the surrounding soil

**Planting
Procedure**

5. Apply 'Osmocote' for native slow release fertiliser, at the rate recommended by the manufacturer to each plant prior to backfilling plant with topsoil.

Fertilising

6. Backfill plant hole with in-situ topsoil and lightly water to eliminate air pockets, and remove all rocks, weeds or other debris. Ensure that in-situ topsoil is not placed over the top of the root ball, so that the plant stem remains the same height above ground as it was in the container.

Backfilling

7. All plants shall be watered before planting and immediately after planting, and at such other times during the contract period as is required to maintain growth free of water stress.

Watering

8. Supply and install individual tree guards to each tree and shrub (exclude tufties and groundcovers). Install plastic tree guards such as 'Treemas Treeguard Sleeves' – Standard Sleeve (or similar approved) and install (3) Standard bamboo stakes per guard.

Tree Guards

Contact: Treemax Phone 9429 6000

9. Any stock found to be dead, damaged or missing due to any cause whatsoever

Stock

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during the contract period shall be replaced by the Contractor. Stock replacement shall be of the same kind as specified in the Plant Schedule.

Replacement

10. Supply and spread Eucal mulch or similar approved on mound. Material permitted: leaf matter and tree loppings from Eucalyptus, Tristania, Melaleuca or other native species. Place mulch to a depth of 75mm, clear of plant stems, and ensure plants are not buried by mulch.

Mulch

11. Supply and install treated and redried pine plinth edging to all edges between garden beds and lawn areas and as indicated on drawings. The plinth shall be 100 x 19mm on edge, the top flush with the adjoining lawn. The plinth shall be fixed at 1200mm max. centres with 75 x 25 x 400mm treated pine stakes, galvanised nailed to finish 20mm below the plinth level.

Timber Edge

273.11 CARE OF LANDSCAPE PLANTING

1. Maintenance shall include the care of the contract areas by accepted horticultural practices, as well as rectifying any defects that become apparent in the works under normal use. Watering, pruning, mowing, weeding, rubbish removal, replanting, cultivating, reinstatement of mulch, insecticide, fertilising, replacement and keeping the site neat and tidy throughout the contract and maintenance period. Practical completion shall be reached when all species are healthy and vigorous. The planting establishment period commences at the date of practical completion. The Contractor shall maintain the works for a period of 3 years following practical completion.

Maintenance

2. Missing plants, dead plants and plants nominated by the Superintendent as unhealthy shall be replaced by the Contractor. Replacement plants shall be of similar size and quality and of identical species and variety to the plant being replaced. The cost of replacement shall be borne by the Contractor.

**Replacement
Plants
Contractor's
Cost**

3. Weed and grass growth in mulched areas shall be killed by treatment with herbicide, in accordance with the manufacturer's instructions at monthly intervals during the construction period and contract maintenance period. Contact of the herbicide with the new plants shall be avoided and any damage or damaged plant material replaced by the Contractor at no cost to the Principal.

**Weed Control

Contractor's
Cost**

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**273.13 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 273(a) to 273(e) inclusive.

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

3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Notwithstanding any general statements to the contrary that may be made elsewhere in this Specification, in the context of landscape works all areas shall be measured in the plane of the surface and thicknesses specified shall apply perpendicular to the surface.

Pay Item 273(a) VEGETATION OF SLOPES 3 TO 1 OR FLATTER

Pay Item 273(a)(i) Vegetation - Seeding

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the vegetation of such slopes by seeding other than the cost of watering, and supply of imported topsoil.

Pay Item 273(a)(ii) Vegetation - Turfing

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the vegetation of such slopes by turfing other than the cost of watering, and supply of imported topsoil.

Pay Item 273(a)(iii) Watering

1. The unit of measurement shall be the kilolitre. The volume shall be determined by calibrated dipstick readings or other method approved by the Superintendent.

2. The schedule rate shall cover all costs associated with supply and delivery of the water and the watering of the seeded and/or turfed areas.

Pay Item 273(b) VEGETATION OF SLOPES STEEPER THAN 3 TO 1

Pay Item 273(b)(i) Preparation of Surface other than Stepped Batters

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the preparation of the surface for vegetation other than the cost of supply of imported topsoil.

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Pay Item 273(b)(ii) Preparation of Surface of Stepped Batters

1. The unit of measurement shall be the square metre on the batter slope.
2. The schedule rate shall cover all costs associated with the preparation of the batter slope for vegetation other than the cost of supply of imported topsoil.

Pay Item 273(b)(iii) Hydromulching

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with hydromulching as specified other than the watering of dry surfaces.

Pay Item 273(b)(iv) Hydroseeding

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with hydroseeding as specified other than the watering of dry surfaces.

Pay Item 273(b)(v) Straw Mulching

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with straw mulching.

Pay Item 273(b)(vi) Watering

1. The unit of measurement shall be the kilolitre.
2. The volume shall be determined by calibrated dipstick readings or other method approved by the Superintendent.
3. The schedule rate shall cover all costs associated with supply and delivery of the water and the watering of dry surfaces.

Pay Item 273(c) VEGETATION OF OPEN DRAINS

Pay Item 273(c)(i) Preparation and Topsoiling of Drains

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with preparation of the surface for sowing.

Pay Item 273(c)(ii) Mechanical Sowing

1. The unit rate of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with sowing and fertilizing.

Pay Item 273(c)(iii) Hydromulching

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with hydromulching as specified other than the watering of dry surfaces.

Pay Item 273(c)(iv) Hydroseeding

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with hydroseeding as specified other than the watering of dry surfaces.

Pay Item 273(c)(v) Sowing by Hand

1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with sowing by hand.

Pay Item 273(c)(vi) Spray with Bitumen Emulsion

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1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with the supply and spraying of bitumen emulsion.
Pay Item 273(c)(vii) Lining with Organic Fibre Mat
1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with the supply and placement of organic fibre mat.
Pay Item 273(c)(viii) Turfing
1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with the supply and placement of turf.
Pay Item 273(c)(ix) Watering
1. The unit of measurement shall be the kilolitre.
2. The volume shall be determined by calibrated dipstick readings or other method approved by the Superintendent.
3. The schedule rate shall cover all costs associated with supply and delivery of the water and the watering of dry surfaces and all treated drain areas.
Pay Item 273(d) LANDSCAPE PLANTING
Pay Item 273(d)(i) Provision of Mulched Bed for Mass Planting
1. The unit of measurement shall be the square metre.
2. The schedule rate shall cover all costs associated with the preparatory work of the mulched bed before planting.
Pay Item 273(d)(ii) Mass Planting
1. The unit of measurement shall be `each' plant.
2. The schedule rate shall cover all costs associated with the planting in the mulched bed and subsequent care of each plant.
Pay Item 273(d)(iii) Individual Landscape Planting of Stock
1. The unit of measurement shall be `each' plant.
2. The schedule rate shall cover all costs associated with the preparatory work, planting and subsequent care of each plant.
Pay Item 273(e) SUPPLY OF IMPORTED TOPSOIL
1. The unit of measurement shall be the cubic metre measured loose in the truck as delivered.
2. The schedule rate shall cover all costs associated with the supply and delivery of the topsoil to the site as directed by the Superintendent.
3. Placing and spreading of the topsoil is excluded from this pay item and is included in the specific activity pay items for vegetation or planting as appropriate.

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ANNEXURE 273A
LANDSCAPING MATERIALS
(SAMPLE ONLY - TO BE COMPLETED BY COMPILER)

MATERIAL	TYPE	MINIMUM APPLICATION RATE
1. HERBICIDE *	'Roundup'	9 litres/200 litres water/ha
2. SEED		
a) Grass	Rye Corn (April-August) or Japanese Millet (September-March) Hulled Couch Red Clover (Inoculated) White Clover (Inoculated) "Elka" Perennial Rye	60 kg/ha 60 kg/ha 5 kg/ha 5 kg/ha 5 kg/ha 5 kg/ha
(b) Native	Acacia dealbata Acacia buxifolia Acacia decurrens Acacia pravissima Leptospermum lanigerum Hardenbergia violacea Kennedia prostrata Acacia implexa Banksia marginata Bursaria spinosa Callistemon pallidus Dodonaea viscosa	4 kg/ha 1 kg/ha 1 kg/ha 1 kg/ha 1 kg/ha 500 g/ha 500 g/ha 200 g/ha 200 g/ha 200 g/ha 200 g/ha 200 g/ha
3. TURF GRASS		
(a) Medians	Couch	Refer to Drawings
(b) Verges/Footpaths	Buffalo	"
(c) Other Areas	Couch	"
4. FERTILISER *		
(a) Vegetation Slopes/Drains	of Dynamic Lifter 'Nitro' 'Kokei' pellets	1000 kg/ha Refer Table C273.2
(b) Landscape Planting		
5. WETTING AGENT *	'Aquasoil'	1 litre/1000 litres of mix water
6. PESTICIDE *		
(a) Liquid	'Lorsban 500 EC'	5 litres
(b) Powder	'Lorsban 250 W'	10 kg
7. SOIL CONDITIONER*		
(a) Vegetation Slopes/Drains	of Gypsum	400g/m ² 5kg/m ²
(b) Landscape Planting	_____	
8. ORGANIC FIBRE MAT *	'Sta-firma' (light grade)	-
9. MULCH	Composted/Pasteurised	100mm thick
* Material shall be as listed or equivalent as approved by Superintendent.		

CITY OF GREATER DANDENONG
SPECIFICATION

274

MASONRY WALLS

SPECIFICATION 274 - MASONRY BLOCK WALLS

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SPECIFICATION 274 : MASONRY WALLS**GENERAL****274.01 SCOPE**

1. This Specification covers the laying of concrete, brick or stone masonry units and construction for retaining walls and free-standing walls such as noise attenuation, dwarf and feature walls for landscaping or similar structures.

2. The work to be executed under this Specification consists of excavation for foundations, construction of reinforced concrete footing, placement of masonry units, backfill and subsurface drainage to the wall as shown on the Drawings.

**General
Requirements**

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

Quality

274.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 211 - Control of Erosion and Sedimentation
- 230 - Subsurface Drainage - General
- 231 - Subsoil and Foundation Drains
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 1012.3.1 - Determination of properties related to the consistency of concrete - Slump test.
- AS 1012.9 - Determination of the compressive strength of concrete specimens.
- AS 1141.11 - Particle size distribution by dry sieving.
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 2758.1 - Concrete aggregates.
- AS 3700 - Masonry in buildings (SAA Masonry Code).
- AS 3972 - Portland and blended cements.
- AS/NZS 4455 - Masonry units and segmental pavers.
- AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.

274.03 CONTROL OF EROSION AND SEDIMENTATION

1. The Contractor shall install and maintain effective erosion and sedimentation control measures during the construction of the masonry wall in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

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MATERIALS**274.04 MASONRY**

1. Masonry units shall comply with AS/NZS 4455 and shall be manufactured from either:

- (a) autoclaved aerated concrete
- (b) calcium silicate (sand-lime)
- (c) concrete (dense or lightweight)
- (d) dimension stone (cut or dressed)
- (e) fired clay (with or without shale).

2. The masonry unit material, type and category shall be as shown on the Drawings.

3. For concrete masonry, irregular faced units shall be either split face, profiled, textured or rock-faced as shown on the Drawings or as directed by the Superintendent.

4. The colour of masonry units shall be as shown on the Drawings and shall be within the agreed range as approved by the Superintendent.

5. Dimension stone shall be of the type and quality, and to the dimensions as shown on the Drawings or as directed by the Superintendent.

6. Masonry units shall not be placed in position until the Contractor has produced documentary evidence to the Superintendent that the units conform to the requirements of this Specification and AS/NZS 4455. This action constitutes a **HOLD POINT**. The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

Conformance**HP****274.05 CEMENT**

1. The cement used shall be Type GP portland cement complying with AS 3972.

274.06 SAND

1. The sand shall conform to AS 2758.1. It shall be clean, sharp and free from salts, vegetable matter and impurities.

274.07 MORTAR

1. The mortar shall consist of 1 part of portland cement, 4 parts of sand and 0.005 parts of a water thickener approved by the Superintendent. Suitable pigments shall be used to match the colour of the adjacent units.

274.08 CONCRETE

1. Concrete supplied and placed for the reinforced concrete footing shall comply with the Specification for MINOR CONCRETE WORKS.

Specification

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2. Unless otherwise indicated on the Drawings, the concrete shall have a compressive strength not less than 20MPa when tested in accordance with AS 1012.9, with a maximum nominal size of aggregate of 20mm and a nominated slump at the point of placement **not exceeding 80mm** as determined by AS 1012.3.1. **Strength**

274.09 STEEL REINFORCEMENT

1. Steel reinforcement provided for concrete shall comply with the Specification for MINOR CONCRETE WORKS. **Specification**

2. In addition, where galvanising of reinforcing steel is indicated on the Drawings or otherwise specified, such galvanising shall be an average minimum coating thickness of 85µm of not less than 98 per cent by mass of zinc when tested in accordance with AS/NZS 4680. **Galvanising**

SITING AND EXCAVATION

274.10 SET OUT

1. The Contractor shall set out the masonry wall structure as shown on the Drawings in sufficient detail to identify the location, length and height of the wall.

2. Should the Contractor propose changes to location, length, height, design levels or strength, to suit the Contractor's purposes or construction techniques, the Contractor's proposals shall be presented for the Superintendent's approval. Changes to suit the Contractor's construction procedures shall be at the Contractor's cost. **Changes**
Contractor's Cost

3. The Contractor shall present the masonry wall structure set out, including any changes proposed by the Contractor, for the Superintendent's approval prior to commencing excavation. This action constitutes a **HOLD POINT**. The Superintendent's approval of the set out is required prior to the release of the hold point.

HP

274.11 FOUNDATION LEVEL

1. The foundation level shall be defined as the level at the underside of the reinforced concrete footing. **Definition**

2. The levels and dimensions of foundations shall be recognised as subject to confirmation or alteration before construction, and the Superintendent may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation. **Confirmation of Foundation**

274.12 EXCAVATION

1. Excavation shall be undertaken to the required width, depths and dimensions of footings shown on the Drawings. All loose material shall be removed. Minor fissures in rock shall be thoroughly cleaned out and filled with concrete, mortar or grout.

2. The base of the excavation shall be compacted in accordance with the requirements of Clause 274.22 and trimmed to ensure that at no point the level is more than 25mm above the design Foundation Level. The levels of the base of the excavation shall be confirmed by survey. **Compaction**

3. Any over-excavation in rock below foundation level shall be filled with concrete of the same quality as that of the footing, while over-excavation in earth below foundation level shall be backfilled and recompacted to the requirements of Clause 274.22. **Over-excavation**

4. Surplus excavated material shall be used in the construction of embankments, or

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spoiled as directed by the Superintendent.

5. The Contractor shall supply and erect any necessary sheeting and bracing to support the excavation in a safe manner and in accordance with statutory requirements. The excavation shall be kept free of water.

**Excavation
Regulations**

6. Following excavation to Foundation Level, the Contractor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the Superintendent. If the foundation is composed of material which the Superintendent deems to be unsuitable to support the proposed structure, such material shall be excavated to the extent directed by the Superintendent, backfilled with sound material, and recompact to the requirements of Clause 274.22. The foundation shall then be presented again for the approval of the Superintendent. The unsuitable material from the excavation below Foundation Level shall be spoiled as directed by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the foundation is required prior to the release of the hold point.

**Unsuitable
Material**

HP

CONSTRUCTION

274.13 REINFORCED CONCRETE FOOTING

1. The reinforced concrete footing shall be constructed to the details as shown on the Drawings.

2. Unless otherwise indicated on the Drawings, forms shall be used for all vertical concrete surfaces. All formwork shall comply with the Specification for MINOR CONCRETE WORKS.

Formwork

3. For the reinforced concrete footing, the placement and compaction of concrete, including joints, finishing, curing and protection of concrete, and the placement of the reinforcing steel, including starter bars, shall comply with the Specification for MINOR CONCRETE WORKS.

**Placement and
Compaction**

4. The finished concrete footing shall not vary by more than 10mm from the specified levels and by more than 25mm from the specified horizontal alignment.

Tolerance

274.14 MASONRY

1. All workmanship and site control in masonry construction shall be in accordance with AS 3700.

Standard

2. The surface on which the first course is to be laid shall be clean. It shall be checked for vertical and horizontal alignment and any excessive discrepancy shall be corrected before masonry construction is commenced.

First Course

3. Masonry shall be placed in horizontal courses and to the details as shown on the Drawings.

**Horizontal
Courses**

3. Weepholes shall be provided in the wall as shown by the Drawings.

Weepholes

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274.15 MORTAR JOINTS

1. Bed joints and perpendicular joints shall be 10mm thick. In hollow masonry units, mortar shall be face shell bedded and for structural work shall be ironed. To control cracking, joint reinforcement, consisting of two 3.0mm galvanised wires shall be incorporated at a maximum of 600mm centres. All joints shall be ironed on both sides.

Reinforcement**274.16 CONTROL MOVEMENT JOINTS****(a) Location and Detail**

1. Control movement joints shall be built into masonry where shown on the Drawings and at all points of potential cracking. The joint spacing shall not be greater than 10 metres.

Potential Cracking

2. The joints shall be 12mm wide and completely clean and free from any hard or incompressible material for the full width and depth of the joint.

Width**(b) Joint Filling**

1. After completion of the walls, a suitable backing rod shall be inserted on both sides of the joint and the joint filled with an elastic polyurethane joint sealant approved by the Superintendent.

Joint Sealant

2. Sealing of joints shall be carried out in accordance with the Sealant Manufacturer's instructions and recommendations.

3. The colour of the joint sealant shall be selected by the Superintendent from samples provided by the Contractor.

Colour**274.17 REINFORCEMENT**

1. Vertical steel reinforcement shall be tied to steel starter bars through cleanout holes in each reinforced hollow unit and fixed in position at the top of the wall by plastic clips. Horizontal steel may be laid in contact with rebated webs. It shall be held in position by plastic clips when vertical steel is to be positioned subsequent to wall construction. Cover to horizontal steel in lintel blocks shall be maintained by the use of wheel type plastic clips. The minimum cover to the inside face of the block shall be 15mm unless specified otherwise.

Horizontal and Vertical**274.18 CONCRETE GROUT**

1. Concrete grout shall be a minimum portland cement content of 300kg/cubic metre, sufficient slump to permit it to completely fill the hollow units and a minimum compressive cylinder strength of 20MPa when tested to AS 1012.9.

Hollow Unit Filling

2. The Contractor shall ensure that the bottoms of hollows are cleaned of loose material before being filled with grout.

274.19 RATE OF CONSTRUCTION

1. The rate of new construction shall be limited so as to eliminate any possibility of joint deformation, slumping or instability which may reduce bond strength in the wall.

274.20 CLEANING OF MASONRY

1. Where the wall is constructed as a free standing wall, both sides of the wall shall be cleaned of all mortar splashes and stains.

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2. Where acid cleaning is required, the following shall apply:
- (a) The acid mixture shall be 1 part of hydrochloric acid to 15 parts of water.
 - (b) Mortar joints must be a minimum of 7 days old before cleaning commences.
 - (c) All masonry being cleaned shall be thoroughly wetted by hosing before any acid solution is applied and kept wet ahead of the acid application.
 - (d) The acid mixture shall be thoroughly hosed off as the cleaning proceeds.
3. If high pressure water jet method is used for cleaning, extreme care shall be taken to avoid "blowing out" the joints.

274.21 BACKFILLING FOR RETAINING WALLS

1. Where masonry walls are constructed as retaining walls, all timbering, bracing and rubbish of all descriptions shall be removed before backfill is placed. No backfilling shall be placed against retaining walls for a minimum period of 28 days after completion

Timing

2. Behind the masonry wall and for the full height of the wall, a continuous granular drainage layer of width as shown on the Drawings (measured perpendicular to the face of the wall) shall be progressively placed in layers not exceeding 150mm and compacted in accordance with Clause 274.22. It shall consist of broken stone or river gravel, consisting of clean, hard, durable particles graded from 50mm to 10mm to AS 1141.11 such that:

Drainage Layer

- (a) The maximum particle dimension shall not exceed 50mm;
- (b) No more than 5 per cent by mass shall pass the 9.5mm AS sieve.

3. A subsoil drainage line shall be constructed at the base of the drainage layer as shown on the Drawings. It shall outlet either into adjacent stormwater gully pits or headwalls, or alternatively through adjacent fill batter, and be suitably marked. The subsoil drain shall comply with the requirements of the Specifications for SUBSURFACE DRAINAGE - GENERAL and SUBSOIL AND FOUNDATION DRAINS and shall consist of 100mm diameter slotted corrugated plastic pipe and seamless tubular filter fabric, surrounded by a maximum of 100mm of Type A Filter Material contained within a layer of geotextile. Unless shown otherwise on the Drawings, the subsoil pipe shall be laid to an even line and uniform grade of not less than two per cent fall towards the outlet.

Subsoil Pipe

4. Except as specified above, excavations for foundations and for the construction of the masonry walls shall be backfilled to the level of the surrounding ground with material from cuttings, or with other material acceptable to the Superintendent, and compacted in accordance with Clause 274.22.

Other Backfill Material

5. Complete sealing utilising compacted earth, or other treatment as shown on the Drawings, shall be provided at the top of masonry walls over the full length and at the vertical edge at both ends of all masonry walls to the satisfaction of the Superintendent.

Sealing Tops and Ends of Walls

6. Where erosion is likely to occur the Superintendent may direct that backfilling around the ends of walls be of stone fill or lean mix concrete, in which case the extra work will be paid for as a Variation to the Works.

Other Forms of Sealing

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274.22 COMPACTION

1. Foundations and backfill shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort:-

**Relative
Compaction**

- | | | |
|-----|----------------------------------------------------------------------------------------------------------------|-----|
| (a) | Foundations or base of excavation to a depth of 150 mm below foundation levels | 95% |
| (b) | Granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material | 95% |

Unless otherwise directed by the Superintendent, all material shall be compacted in layers not exceeding 150mm compacted thickness.

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LIMITS AND TOLERANCES**274.23 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 274.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1	Excavation		
	(a) Foundation Level	Level of foundation for footing at any point shall not be more than 25mm.	274.12
2.	Reinforced Concrete Footing		
	(a) Finished Level	Finished level of footing shall not vary more than 10mm from the specified levels.	274.13
	(b) Horizontal Alignment	Horizontal alignment of footing shall not vary more than 25mm from the specified alignment.	274.13
3.	Masonry		
	(a) Control Movement Joint	Spacing \leq 10m.	274.16a

Table 274.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**274.24 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 274(a) to 274(d) inclusive.

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

5. Construction of footings, including concrete, reinforcement, formwork, etc, is measured and paid in this Specification and not in the Specification for MINOR CONCRETE WORKS.

6. The granular drainage layer, subsoil drainage pipe and filter material is measured and paid in accordance with this Specification and not in the Specification for SUBSURFACE DRAINAGE - GENERAL or SUBSOIL AND FOUNDATION DRAINS.

Pay Item 274(a) EXCAVATION

1. The unit of measurement shall be the cubic metre measured in bank volume of excavation.

2. The volume shall be determined by the End Area Method using design cross-sectional areas calculated at each change in height or width of the wall.

3. The disposal of surplus material shall be included in the excavation rates.

4. No additional payment shall be made for drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.

5. The schedule rate for excavation shall allow for excavation and backfilling of all types of materials. Separate rates shall not be included for earth and rock.

6. The control of stormwater runoff shall be included in the rate for excavation.

Pay Item 274(b) UNSUITABLE MATERIAL BELOW FOUNDATION

1. The unit of measurement shall be the cubic metre measured as bank volume of excavation below foundation level which is directed to be removed and replaced.

2. The schedule rate under this Pay Item shall include all operations involved in the excavation and removal to spoil of unsuitable material below foundation level of the concrete footing and the backfilling and compaction to foundation level with replacement material.

Pay Item 274(c) REINFORCED CONCRETE FOOTING

1. The unit of measurement shall be the cubic metre of reinforced concrete.

2. The volume shall be taken from the Drawings.

3. The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all formwork, embedments, reinforcement (including starter bars where specified), concrete, stepping of footing, joints, curing and backfilling to the footing.

Pay Item 274(d) CONSTRUCT MASONRY WALL

1. The unit of measurement shall be the square metre, measured as face area of masonry wall from the top of the footing to the top of the wall.

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2. The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all materials and workmanship required to provide the completed structure as shown on the Drawings including supply, placement and cleaning of masonry units, and where specified granular drainage layer behind the wall, earth backfill and capping, and subsoil drain at the base of the drainage layer.

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SPECIFICATION

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CRIB RETAINING WALLS

SPECIFICATION 276 - CRIB RETAINING WALLS

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SPECIFICATION 276 : CRIB RETAINING WALLS**GENERAL****276.01 SCOPE**

1. This Specification covers the construction of proprietary timber crib and precast concrete crib retaining walls.

2. The work to be executed under this Specification consists of excavation for foundations, construction of reinforced concrete footing, precast concrete or treated timber crib wall, selected backfill in and behind crib wall, and subsurface drainage to the wall as shown on the Drawings.

**General
Requirements**

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

Quality

276.02 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 211 - Control of Erosion and Sedimentation
- 230 - Subsurface Drainage - General
- 231 - Subsoil and Foundation Drains
- 271 - Minor Concrete Works

(b) Australian Standards

- AS 1012.3.1 - Determination of properties related to the consistence of concrete - Slump test.
- AS 1012.9 - Determination of the compressive strength of concrete specimens
- AS 1141.11 - Particle size distribution by dry sieving
- AS 1289.3.3.1 - Calculation of the plasticity index of a soil
- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio
- AS 1604.1 - Specification for preservative treatment – Part 1: Sawn and round timber
- AS/NZS 4680 - Hot-dip galvanised (zinc) coatings on fabricated ferrous articles.

276.03 CONTROL OF EROSION AND SEDIMENTATION

1. The Contractor shall install and maintain effective erosion and sedimentation control measures during the construction of the crib wall in accordance with the Specification for - CONTROL OF EROSION AND SEDIMENTATION.

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MATERIALS**276.04 PRECAST CONCRETE CRIB WALL COMPONENTS**

1. Crib wall components shall consist of proprietary precast concrete crib wall systems of reinforced or prestressed concrete interlocking or pinned stretchers and headers of the dimensions as shown on the Drawings.

Proprietary Systems

2. Where the Contractor proposes using an alternative concrete crib wall system to the one detailed on the Drawings, detailed drawings, design calculations and Engineer's certification, and full details of installation procedures shall be submitted for approval to the Superintendent a minimum of 28 days prior to delivery of components to site for incorporation into the Works. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Alternative System**HP****276.05 TREATED TIMBER CRIB WALL COMPONENTS**

1. Crib wall components shall consist of proprietary timber crib wall systems of insect and fungi resistant treated timber, of minimum Hazard Class H4 in accordance with AS 1604.1, interlocking or pinned stretchers and headers of the dimensions as shown on the Drawings.

Proprietary Systems

2. Where the Contractor proposes using an alternative timber crib wall system to the one detailed in the Drawings, detailed drawings, design calculations and Engineer's certification, and full details of installation procedures shall be submitted for approval to the Superintendent a minimum of 28 days prior to delivery of components to site for incorporation into the Works. This action constitutes a **HOLD POINT**. The Superintendent's approval of the submitted details is required prior to the release of the hold point.

Alternative System**HP****276.06 CONCRETE**

1. Concrete supplied and placed for the reinforced concrete shall comply with the Specification for MINOR CONCRETE WORKS.

Specification

2. Unless otherwise indicated on the Drawings, the concrete shall have a compressive strength not less than 20MPa when tested in accordance with AS 1012.9, with a maximum nominal size of aggregate of 20mm and a nominated slump at the point of placement not exceeding 80mm as determined by AS 1012.3.1.

Strength**276.07 STEEL REINFORCEMENT**

1. Steel reinforcement provided for concrete shall comply with the Specification for MINOR CONCRETE WORKS.

Specification

2. In addition, where galvanising of reinforcing steel is indicated on the Drawings or otherwise specified, such galvanising shall be an average minimum coating thickness of 85µm of not less than 98 per cent by mass of zinc when tested in accordance with AS/NZS 4680.

Galvanising**SITING AND EXCAVATION****276.08 SET OUT**

1. The Contractor shall set out the crib wall structure as shown on the Drawings in sufficient detail to identify the location, length and height of the wall, together with the line

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of the top of cut batter.

2. Should the Contractor propose changes to location, length, height, design levels or strength, to suit the Contractor's purposes or construction techniques, the Contractor's proposals shall be presented for the Superintendent's approval. Changes to suit the Contractor's construction procedures shall be at the Contractor's cost.

Changes

**Contractor's
Cost**

3. The Contractor shall present the crib wall structure set out, including any changes proposed by the Contractor, for the Superintendent's approval prior to commencing excavation.

WP

276.09 FOUNDATION LEVEL

1. The foundation level shall be defined as the level at the underside of the reinforced concrete footing.

Definition

2. The levels and dimensions of foundations shall be recognised as subject to confirmation or alteration before construction, and the Superintendent may direct such changes of the levels and of dimensions of footings as may be necessary to ensure a satisfactory foundation.

**Confirmation
of Foundation**

276.10 EXCAVATION

1. Excavation shall be undertaken to the required width and batter angle behind the finished face of the crib wall and to the depths and dimensions of footings shown on the Drawings. All loose material shall be removed. Minor fissures in rock shall be thoroughly cleaned out and filled with concrete, mortar or grout.

2. The base of the excavation shall be compacted in accordance with the requirements of Clause 276.14 and trimmed to ensure that at no point the level is more than 25mm above the design Foundation Level. The levels of the base of the excavation shall be confirmed by survey.

Compaction

3. Any over-excavation in rock below foundation level shall be filled with concrete of the same quality as that of the footing, while over-excavation in earth below foundation level shall be backfilled and recompacted to the requirements of Clause 276.14.

**Over-
excavation**

4. The batter slope and alignment of the excavation shall be trimmed to ensure that at no point the line of the batter is more than 25mm inside the line of the specified batter slope, after allowing for the width of the crib wall and the granular drainage layer behind the wall. The batter slope and alignment of the excavation for the crib wall shall be confirmed by survey.

**Batter Slope
Trimming**

5. Surplus excavated material shall be used in the construction of embankments, or spoiled as directed by the Superintendent.

6. The Contractor shall supply and erect any necessary sheeting and bracing to support the excavation in a safe manner and in accordance with statutory requirements. The excavation shall be kept free of water.

**Excavation
Regulations**

7. Following excavation to Foundation Level, the Contractor shall present the foundation on which the footing for the wall is to be placed for inspection and approval by the Superintendent. If the foundation is composed of material which the Superintendent deems to be unsuitable to support the proposed structure, such material shall be excavated to the extent directed by the Superintendent, backfilled with sound material, and recompacted to the requirements of Clause 276.14. The foundation shall then be presented again for the approval of the Superintendent. The unsuitable material from the excavation below Foundation Level shall be spoiled as directed by the Superintendent.

**Unsuitable
Material**

WP

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CONSTRUCTION**276.11 REINFORCED CONCRETE FOOTING**

1. The reinforced concrete footing shall be constructed to the details as shown on the Drawings.

2. Unless otherwise indicated on the Drawings, forms shall be used for all vertical concrete surfaces. All formwork shall comply with the Specification for MINOR CONCRETE WORKS.

Formwork

3. For the reinforced concrete footing, the placement and compaction of concrete, including joints, finishing, curing and protection of concrete and the placement of the reinforcing steel shall comply with the Specification for MINOR CONCRETE WORKS.

Placement and Compaction

4. The finished concrete footing shall not vary by more than 10mm from the specified levels and by more than 25mm from the specified horizontal alignment.

Tolerance**276.12 ERECTION OF CRIB WALL**

1. All works in crib wall construction shall be in accordance with manufacturers' recommendations, commencing at the lowest part of the wall, with alternating rows of accurately positioned interlocking stretchers and headers.

Manufacturer's Recommendations

2. Wall units are to be placed so as to form closely butted joints, and shall be checked for line and level after each course is laid. The level of each course of stretcher units shall not vary from the planned level by more than 25mm at any point. The maximum deviation of a course of stretcher units from a 3m straight-edge placed longitudinally along the wall shall not exceed 10mm.

Course Levels

3. Header units shall be placed so as to maintain the ends of header units vertical for the full height of the wall and the ends of stretcher units shall be close abutting and maintain a vertical line throughout the height.

Unit Ends Vertical

4. Each unit shall bear evenly on the underlying unit and connect to it as shown on the manufacturer's detail drawings. Dry mortarless joints shall be used for concrete crib units except where otherwise shown on the Drawings. Where shown as mortar bedded, the joints between units shall be properly bedded in a cement mortar containing a sand/cement ratio of 3:1 and an approved bonding additive.

Joints

5. The slope of the batter shall be maintained throughout the work and the plane face or even curvature maintained over the full area of the work. The completed crib wall shall not vary from the specified batter slope by more than 25mm.

Maintain Shape**276.13 BACKFILLING**

1. All timbering, bracing and rubbish of all descriptions shall be removed before backfill is placed.

2. Selected backfill shall be progressively placed within the crib wall as each course of stretchers and headers is installed. It shall consist of granular material, free from clay, having a maximum dimension not exceeding 50mm and a Plasticity Index of not less than 2 nor more than 12 when tested in accordance with AS 1289.3.3.1. The material shall be placed in layers not exceeding 150mm and compacted in accordance with Clause 276.14. Care shall be taken during compaction to avoid damaging or distorting the wall.

Progressively Placed

3. The Contractor may submit alternative backfill materials for approval by the

Alternative

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Superintendent.

Material

4. Behind the line of the crib wall units, and for the full height of the wall, a continuous granular drainage layer of width as shown on the Drawings (measured perpendicular to the face of the crib wall) shall be progressively placed in layers not exceeding 150mm and compacted in accordance with Clause 276.14. It shall consist of broken stone or river gravel, consisting of clean, hard, durable particles graded from 50mm to 10mm to AS 1141.11 such that:

Drainage Layer

- (a) The maximum particle dimension shall not exceed 50mm;
- (b) No more than 5 per cent by mass shall pass the 9.5mm AS sieve.

A layer of geotextile complying with the Specification for SUBSURFACE DRAINAGE – GENERAL shall be placed between the back of the crib wall units and the granular drainage layer.

Geotextile

5. A subsoil drainage line shall be constructed at the base of the drainage layer as shown on the Drawings. It shall outlet either into adjacent stormwater gully pits or headwalls, or alternatively through adjacent fill batter, and be suitably marked. The subsoil drain shall comply with the requirements of the Specifications for SUBSURFACE DRAINAGE - GENERAL and SUBSOIL AND FOUNDATION DRAINS and shall consist of 100mm diameter slotted corrugated plastic pipe and seamless tubular filter fabric, surrounded by a maximum of 100mm of Type A Filter Material contained within a layer of geotextile. Unless shown otherwise on the Drawings, the subsoil pipe shall be laid to an even line and uniform grade of not less than two per cent fall towards the outlet.

Subsoil Pipe

6. Except as specified above, excavations for foundations and for the construction of the crib walls shall be backfilled progressively with crib wall construction, to the level of the surrounding ground with material from cuttings, or with other material acceptable to the Superintendent, and compacted in accordance with Clause 276.14.

Other Backfill Material

7. Complete sealing utilising compacted earth shall be provided at the top of crib walls over the full length and at the vertical edge at both ends of all crib walls in accordance with the manufacturer's instructions and to the satisfaction of the Superintendent.

Sealing Tops and Ends of Walls

8. Where erosion is likely to occur the Superintendent may direct that backfilling around the ends of walls be of stone fill or lean mix concrete, in which case the extra work will be paid for as a Variation to the Works.

Other Forms of Sealing

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276.14 COMPACTION

1. Foundations and backfill shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for standard compactive effort:-

**Relative
Compaction**

- | | | |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| (a) | Foundations or base of excavation to a depth of 150 mm below foundation levels | 95% |
| (b) | Selected backfill within crib wall structure | 98% |
| (c) | All other fill material for crib wall construction including granular drainage layer, subsoil filter material, material replacing unsuitable material and backfill material | 95% |

Unless otherwise directed by the Superintendent, all material shall be compacted in layers not exceeding 150mm compacted thickness.

SPECIAL REQUIREMENTS

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LIMITS AND TOLERANCES**276.15 SUMMARY OF LIMITS AND TOLERANCES**

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table 276.1 below:

Item	Activity	Limits/Tolerances	Spec Clause
1	Excavation		
	(a) Foundation Level	Level of foundation for footing at any point shall not be more than 25mm.	276.10
	(b) Batter Slope	Batter slope and alignment of excavation shall not be more than 25mm inside the line of the specified batter slope behind the line of the wall and granular drainage layer.	276.10
2.	Reinforced Concrete Footing		
	(a) Finished Level	Finished level of footing shall not vary more than 10mm from the specified levels.	276.11
	(b) Horizontal Alignment	Horizontal alignment of footing shall not vary more than 25mm from the specified alignment.	276.11
3.	Crib Wall		
	(a) Level of Stretcher Units	The level of each course shall not vary more than 25mm from the specified level. The departure from the line of each course of stretcher units shall not exceed 10mm in any 3 metre length.	276.12
	(b) Deviation of Stretcher Units		
	(c) Batter Slope of Wall	The completed crib wall shall not vary more than 25mm from the specified batter slope.	276.12

Table 276.1 - Summary of Limits and Tolerances

MEASUREMENT AND PAYMENT**276.16 PAY ITEMS**

1. Payment shall be made for all the activities associated with completing the work detailed in this Specification on a schedule of rates basis in accordance with Pay Items 276(a) to 276(d) inclusive.

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

5. Construction of footings, including concrete, reinforcement, formwork, etc, is measured and paid in this Specification and not in the Specification for MINOR CONCRETE WORKS.

6. The granular drainage layer, subsoil drainage pipe and filter material is measured and paid in accordance with this Specification and not in the Specification for SUBSURFACE DRAINAGE - GENERAL or SUBSOIL AND FOUNDATION DRAINS.

Pay Item 276(a) EXCAVATION

1. The unit of measurement shall be the cubic metre measured in bank volume of excavation.

2. The volume shall be determined by the End Area Method using design cross-sectional areas calculated at each change in height or width of the wall. The design cross-sectional areas shall be bounded by the underside of the 50mm mass concrete layer, the width of the footing shown on the Drawings plus the width of the granular drainage layer at a batter slope parallel to the front face of the crib wall, and the reduced level at the top of the crib wall.

3. The disposal of surplus material shall be included in the excavation rates.

4. No additional payment shall be made for drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.

5. The schedule rate for excavation shall allow for excavation and backfilling of all types of materials. Separate rates shall not be included for earth and rock.

6. The control of stormwater runoff shall be included in the rate for excavation.

Pay Item 276(b) UNSUITABLE MATERIAL BELOW FOUNDATION

1. The unit of measurement shall be the cubic metre measured as bank volume of excavation below foundation level which is directed to be removed and replaced.

2. The schedule rate under this Pay Item shall include all operations involved in the excavation and removal to spoil of unsuitable material below foundation level of the concrete footing and the backfilling and compaction to foundation level with replacement material.

Pay Item 276(c) REINFORCED CONCRETE FOOTING

1. The unit of measurement shall be the cubic metre of reinforced concrete.

2. The volume shall be taken from the Drawings.

3. The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all formwork, embedments, reinforcement, concrete, stepping of footing, joints, curing and backfilling to the footing.

Pay Item 267(d) CONSTRUCT CRIB WALL

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1. The unit of measurement shall be the square metre, measured as face area of crib wall from the top of the footing to the top of the wall.
2. The schedule rate under this Pay Item shall include all operations involved in the supply and placement of all materials and workmanship required to provide the completed structure as shown on the Drawings including supply and erection of crib wall units, selected backfill within the wall, granular drainage layer behind the wall, earth backfill and capping, and subsoil drain at the base of the drainage layer.

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SPECIFICATION

303

SERVICE CONDUITS

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SPECIFICATION 303 - SERVICE CONDUITS**GENERAL****303.01 SCOPE**

1. The work to be executed under this Specification includes the supply of materials and the installation of electrical and telephone conduits, pits and footings for streetlighting columns in accordance with the Specification and Drawings.
2. The Specification excludes the installation of wiring, equipment and streetlighting columns
3. Electrical conduits and pits shall be installed in accordance with AS 3000 (SAA Wiring Rules) and the Service and Installation Rules of the local electricity supply Authority. **Electricity**
4. Telephone conduits and pits shall be installed in accordance with the AUSTEL Customer Premises Cabling Manual. **Telephone**
5. The Contractor shall complete all necessary notices, pay all fees and charges and arrange for all inspections and tests required by the relevant Authority.

303.02 REFERENCE DOCUMENTS

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

(a) Council Specifications

271 - Minor Concrete Works

(b) Australian Standards

AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
 AS 1477 - Unplasticised PVC (UPVC) pipes and fittings for pressure applications.
 AS/NZS 2053 - Conduits and fittings for electrical installations.
 AS 3000 - Electrical Installation - Buildings, Structures and Premises (known as the SAA Wiring Rules)

(c) Australian Telecommunications Authority (AUSTEL) Standards

Customer Premises Cabling Manual

MATERIALS**303.03 GENERAL**

1. All pipes, fittings and pits shall be sourced from quality assured suppliers. The Superintendent may reject any components deemed not to be fit for the purpose. **WP**

303.04 CONDUITS

1. Conduits and conduit fittings for all electrical cabling shall be category 'A' orange **Electrical**

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coloured heavy duty rigid UPVC manufactured in accordance with AS/NZS 2053 and with solvent welded joints. All conduits shall be of the sizes shown on the Drawings.

2. Conduits and conduit fittings for all telephone cabling shall be Class 12 white coloured UPVC manufactured in accordance with AS 1477 and with solvent welded joints. All conduits shall be of the sizes shown on the Drawings. **Telephone**

303.05 JUNCTION PITS

1. Electrical junction pits shall be supplied to the standards required by the relevant Electricity Company, with 'Electricity' impressed in the lid. **Electrical**
2. Telephone pits shall be to the standards required by the relevant Electricity Company with the relevant telephone Company's symbol impressed in the lid. **Telephone**

303.06 CONCRETE FOOTINGS

1. Concrete footings for streetlighting columns shall be 20MPa compressive strength in accordance with the requirements of the Specification for MINOR CONCRETE WORKS. **Quality**

303.07 ANCHOR BOLTS

1. Anchor bolt assemblies to be cast into streetlighting column footings shall be to the relevant Australian Standard design requirements. **Supply**

CONSTRUCTION

303.08 LAYOUT OF CONDUIT

(a) Roadway Crossings

1. The conduits shall be installed where shown on the Drawings or as directed by the Superintendent after construction of earthworks to subgrade level. The grade of the conduit shall be such as to provide a minimum cover over the conduit of 400mm to the top of select subgrade level under pavement and shoulders. **Minimum Cover**
2. The conduit shall be laid on a straight grade and line, in a trench not more than 300mm wide and on a bed of compacted sand of 50mm minimum thickness. Backfill over the conduit shall be compacted so that the relative compaction as determined by AS 1289.5.4.1 is not less than 100 per cent. **Laying Conditions**
3. Draw wire shall be provided in all conduits. **Draw Wire**
4. A mark shall be made in the face of kerb on both sides of the road indicating the location of the conduit crossing. The mark shall consist of the letter E for electrical or T for telephone, as appropriate, routed into the concrete and at minimum 75mm high. **Marks in Kerb**
5. Where kerb and channel construction has not yet commenced, temporary timber post markers shall be installed at the conduit crossings so that markings in the face of kerb can be made at the correct locations at the time of kerb and channel construction. **Temporary Markers**

(b) Other Locations

1. The conduit shall be laid on a straight grade and line and in normal trench conditions on a bed of compacted sand 50mm minimum thickness. The width of trench shall not exceed 300mm and the minimum cover over the conduit to finished surface level shall be 300mm. Backfill over the conduit shall be compacted so that the relative compaction as determined by AS 1289.5.4.1 is not less than 95 per cent. **Laying Conditions**

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2. Draw wire shall be provided in all conduits. **Draw Wire**

303.09 JUNCTION PITS

1. Junction pits shall be installed at locations shown on the Drawings or as directed by the Superintendent. **Location**
2. All junction pits shall be installed firmly in the ground on a drainage bed of 5mm nominal size screened aggregate of minimum thickness 150mm. All conduit connections to junction pits shall be made waterproof by bitumastic sealant or other method approved by the Superintendent. **Installation Method**
3. A 50mm diameter UPVC drain shall be provided in each junction pit. The drain shall be graded to a stormwater drainage pit or discharge through an embankment batter. **Drain**

303.10 FOOTINGS FOR STREETLIGHTING COLUMNS

1. The Contractor shall construct concrete footings at the locations for streetlighting columns shown on the Drawings or as directed by the Superintendent. **Location**
2. Excavation for footings shall be neatly cut from solid material. Excavated material shall be disposed of at locations approved by the Superintendent. **Excavation**
3. Footings shall be constructed to the dimensions and details as shown on the Drawings. **Dimensions**
4. The anchor bolt assembly shall be accurately located and firmly supported. **Anchor Bolt Assembly**
5. Concrete and reinforcement shall be supplied and placed in accordance with the requirements of the Specification for MINOR CONCRETE WORKS. **Concrete Specification**
6. Concrete shall not be placed until the formwork and anchor bolt assembly location have been approved by the Superintendent. **WP**

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**303.11 PAY ITEMS**

1. Payment shall be made for all activities associated with completing the work scheduled in this Specification on a schedule of rates basis in accordance with Pay Items 303(a) to 303(c) inclusive.

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

3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Concrete and reinforcement for footings is measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
Pay Item 303(a) Supply and Lay UPVC Conduit

1. The unit of measurement shall be the linear metre of conduit installed.

2. A separate unit rate shall be included in the Schedule of Rates for each size and type of conduit.

3. The schedule rate shall be inclusive of the supply of conduit and bends, excavation, laying of conduit in trench or structure, backfilling, the provision of draw wire and connection to junction pits.

Pay Item 303(b) Junction Pits

1. The unit of measurement shall be per "each" pit installed.

2. A separate unit rate shall be included in the Schedule of Rates for each type of junction pit.

3. The schedule rate shall be inclusive of the supply of the junction pits, excavation, installation, backfilling and drain from pit.

Pay Item 303(c) Concrete Footing for Streetlighting Columns

1. The unit of measurement shall be per "each" footing installed.

2. A separate unit rate shall be included in the Schedule of Rates for each type of footing.

3. The schedule rate shall be inclusive of all work and materials required for the construction of the footing including excavation, formwork, concrete reinforcement and installation of the supplied anchor bolt assembly.

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SPECIFICATION

305

**TRENCHLESS
CONDUIT INSTALLATION**

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SPECIFICATION 305 - TRENCHLESS CONDUIT INSTALLATION

GENERAL

305.01 SCOPE

1. This Specification covers the installation of any type of drainage or service conduit where it is a requirement of the Contract that trenchless techniques are to be used. Trenchless techniques minimise interference with existing features, facilities or traffic. These techniques may be by jacking, ramming, bursting, thrust or auger boring, micro-tunnelling, directional drilling or other suitable technique as appropriate for the particular installation.
2. This Specification should be read in conjunction with the Specification for **STORMWATER DRAINAGE - GENERAL, PIPE DRAINAGE, PRECAST BOX CULVERTS, DRAINAGE STRUCTURES or SERVICE CONDUITS** as appropriate. **Associated Specifications**
3. The work to be executed under this Specification consists of supply of the conduit, installation and all necessary ancillary work, whether such work is temporary or permanent, as shown on the Drawings. **Extent of Work**
4. The conduit and all aspects of the work shall meet the performance requirements detailed in this Specification. **Performance**

305.02 TERMINOLOGY

1. Some of the trenchless techniques available are described below in accordance with the ISTT Glossary of trenchless terms:
 - a. **Jacking** - A system of directly installing pipes behind a shield machine by hydraulic jacking from a drive shaft such that the pipes form a continuous string in the ground. **Jacking**
 - b. **Ramming** - A non-steerable system of forming a bore by driving a steel casing, usually open-ended, using a percussive hammer from a drive pit. The soil may be removed from an open-ended casing by augering, jetting or compressed air. In appropriate ground conditions a closed casing may be used. **Ramming**
 - c. **Bursting** - A technique for breaking the existing pipe by brittle fracture, using force from within, applied mechanically, the remains being forced into the surrounding ground. At the same time a new pipe, of the same or larger diameter, is drawn in behind the bursting tool. The pipe bursting device may be based on a pneumatic impact moling tool to exert diverted forward thrust to the radial bursting effect required, or by a hydraulic device inserted into the the pipe and expanded to exert direct radial force. **Bursting**
 - d. **Thrust Boring** - A method of forming a pilot bore by driving a closed pipe or head from a thrust pit into the soil which is displaced. Some small diameter models have steering capability achieved by a slanted pilot-head face and electronic monitoring, generally in conjunction with a locator. Back reaming may be used to enlarge the pilot bore. **Thrust Boring**
 - e. **Auger Boring** - A technique for forming a bore from a drive pit to a reception pit, by means of a rotating cutting head. Spoil is removed back to the drive shaft by helically wound auger flights rotating in a steel casing. The equipment may have limited steering capability. **Auger Boring**
 - f. **Micro-tunnelling** - Steerable remote control pipe jacking to install pipes of internal diameter less than that permissible for man-entry. **Micro-tunnelling**

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- g. **Directional Drilling** - A steerable system for the installation of pipes, conduits and cables in a shallow arc using a surface launched drilling rig. Traditionally the term applies to large scale crossings in which a fluid filled pilot bore is drilled without rotating the drill string, and this is then enlarged by a washover pipe and back reamer to the size required for the product pipe. The required deviation during pilot boring is provided by the positioning of a bent sub. Tracking of the drill string is achieved by the use of a downhole survey tool. **Directional Drilling**

305.03 REFERENCE DOCUMENTS

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

(a) Council Specifications

- 101 - General
- 220 - Stormwater Drainage - General
- 221 - Pipe Drainage
- 222 - Precast Box Culverts
- 223 - Drainage Structures
- 271 - Minor Concrete Works
- 303 - Service Conduits
- 306 - Road Openings and Restorations

(b) Australian Standards

- AS 3725 - Loads on buried concrete pipes.
- AS 4058 - Precast concrete pipes (pressure and non-pressure).

(c) Other

- CPAA - Concrete Pipe Association of Australia
- Pipe Jacking, Design Guidelines.
- Concrete Pipe Jacking, Technical Bulletin.
- ISTT - International Society for Trenchless Technology
(Represented in Australia by the Australasian Society for Trenchless Technology)
Glossary of Trenchless Terms

305.04 METHODOLOGY

1. The Contractor shall submit a clear and detailed methodology for the execution of the trenchless conduit installation. This detailed methodology shall be included in the CONTRACTOR'S TENDER SUBMISSION as a METHOD STATEMENT.

2. The Method Statement shall adequately address the following items as a minimum requirement. **Method Statement**

- (a) General description of method and sequence of operation.
- (b) Specialist subcontractors to be utilised.
- (c) Conduit type and specification, including compliance with relevant Australian Standard.
- (d) Jointing type and specification.
- (e) Grout type, if required, methodology and equipment for grout injection.

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- (f) Mechanical description of any motorised pumping, jacking, horizontal boring, directional drilling or mining equipment intended for use.
- (g) Existing underground utility services:
 - Treatment at conflict locations
 - Protection of services in zone of influence.
- (h) Survey equipment and methods.
- (i) Direction of installation of conduit.
- (j) Size, depth and position of temporary access pits required.
- (k) Location of temporary spoil site if required and nature of haulage equipment.
- (l) Programmed daily working hours and duration for the operation.
- (m) Strategy for dealing with noise pollution problems.
- (n) Traffic management.
- (o) Dewatering.

3. General requirements and design guidelines for jacking precast concrete and other rigid pipes are given in the CPAA publications, Pipe Jacking - Design Guidelines and Concrete Pipe Jacking - Technical Bulletin.

4. The Contractor shall be responsible for checking the locations of all services prior to the commencement of work. The contacts for each of the service authorities are detailed in the Specification - GENERAL.

Services

CONSTRUCTION

305.05 CONDUIT

1. For precast concrete pipes, the strength of the conduit shall be verified by the Contractor as adequate for the purpose utilising the methodology set out in AS 3725 with reference to AS 4058, for cracking load test parameters, and the Contractor's own determination of appropriate soil parameters. The ultimate load for the conduit is to exceed cracking load by a factor of safety of 50 per cent.

Concrete Pipe Strength

2. The Contractor shall provide similar and equivalent verification if the conduit does not comprise precast reinforced concrete pipe.

Other Pipe Strengths

3. All pipes, fittings and pits shall be sourced from quality assured suppliers. The Superintendent may reject any components deemed not to be fit for the purpose.

Load Testing

305.06 INSTALLATION

1. The installation shall provide for the following performance requirements:

Performance Requirements

- (a) The installation of the conduit by open trenching shall not be permitted over the length designated for trenchless techniques.
- (b) Where appropriate, voiding around the conduit shall be eliminated by grouting prior to completion of works, with material and methodology of grouting described in the Method Statement.

Trenching

Grouting

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- (c) The line and grade of the conduit shall comply with the Drawings within the tolerances indicated on the Drawings or stated in Clause 305.07 when not explicitly shown on the Drawings. **Alignment**
- (d) After installation all joints shall be flush to the internal conduit walls and watertight. **Flush Joints**
- (e) After installation of the conduit laid by trenchless techniques and prior to any grouting procedures, bulkhead walls shall be established at locations shown on the Drawings. Such bulkheads shall comply with Clause 305.09. **Bulkheads**
- (f) The installation of the conduit shall not affect any adjacent building foundations and shall provide for consistent support prior to, during and after installation. **Adjacent Buildings**
- (g) The installation of the conduit shall not endanger the stability or health of the root systems of trees to be retained as designated by the Superintendent in conjunction with Council's Tree Preservation Officer. **Tree Roots**

305.07 TOLERANCES

1. The conduit shall be installed in accordance with the horizontal and vertical alignment as shown on the Drawings subject to the following definition of tolerances.

- (a) The position of both the inlet and outlet of the conduit shall be determined by a registered Surveyor and shall comply with the Drawings for horizontal position to a tolerance of $\pm 30\text{mm}$. **Horizontal**
- (b) Vertical tolerance at the inlet/outlet of the conduit where installation commences shall be $\pm 10\text{mm}$. **Vertical**
- (c) The average grade of the conduit shall comply with the grade as shown on the Drawings ± 0.05 per cent. **Grade**
- (d) The conduit alignment at all joints will be true with a tolerance of $\pm 5\text{mm}$ deflection in any direction at 1.5m from the joint. **Joints**

305.08 PERMANENT AND TEMPORARY PITS

(a) Excavation

1. Any permanent and/or temporary pits established for purposes of installation shall be constructed in accordance with the excavation requirements of the Specification for STORMWATER DRAINAGE - GENERAL.

(b) Backfill

1. Backfilling of temporary pits shall comply with the backfilling and compaction requirements of the Specification for STORMWATER DRAINAGE - GENERAL. **Temporary Pits**

2. The surface of temporary pits, after backfilling, shall be restored to pre-construction condition as in accordance with the Specification for ROAD OPENINGS AND RESTORATIONS. **Restoration**

3. Permanent pits or access chambers, located at the pits used for trenchless conduit installations, shall be constructed to the details as shown on the Drawings and in accordance with the appropriate Specification following demobilisation of the trenchless conduit installation equipment. **Permanent Pit Construction**

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4. Backfill and compaction around permanent pits or access chambers shall be in accordance with the requirements of the Specification for STORMWATER DRAINAGE - GENERAL. ***Permanent Pits***

305.09 BULKHEADS

1. Bulkheads shall be constructed in accordance with the Drawings or as nominated in the Method Statement submitted. They shall be built in reinforced concrete as detailed in the Drawings, and fabricated to bond to the conduit so as to exclude direct grout pressure loss at the conduit/soil interface. ***Grout Loss***
2. Bulkheads shall be constructed, and any grouting undertaken, prior to construction of adjacent conduits installed under conventional trench techniques so as to prevent undermining of the previously installed trenchless conduit. ***Installation Sequence***

305.10 CONCRETE WORK

1. For all concrete work, the Contractor shall comply with the Specification for MINOR CONCRETE WORKS in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection. ***Specification***

SPECIAL REQUIREMENTS

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MEASUREMENT AND PAYMENT**305.11 PAY ITEMS**

1. Payment shall be made for all activities associated with completing the work detailed in this Specification on a schedule of rates basis, in accordance with the Pay Items 305(a) to 305(e).
 2. A lump sum price for any of these items, except item 305(a), shall not be accepted.
 3. If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in other items for the cost of the activity which has not been priced.
 4. Excavation for permanent pits or access chambers is measured and paid in accordance with the Specification for STORMWATER DRAINAGE - GENERAL.
 5. Excavation and backfilling for temporary pits, including additional excavation and backfill at permanent pits sites, is measured and paid in this Specification and not in the Specification for STORMWATER DRAINAGE - GENERAL.
 6. Restoration for temporary pits is measured and paid in accordance with this Specification and not in the Specification for ROAD OPENINGS AND RESTORATIONS.
 7. Construction of, and backfilling for, permanent pits or access chambers is measured and paid in accordance with the appropriate conjunctive Specifications.
 8. Bulkheads are measured and paid in accordance with this Specification and not in the Specification for MINOR CONCRETE WORKS.
- Pay Item 305(a) MOBILISATION, ESTABLISHMENT AND DEMOBILISATION

1. The unit of measurement shall be an item.
 2. The sum shall include all activities involved in the mobilisation, establishment and demobilisation of the trenchless conduit installation equipment and facilities.
 3. The sum shall be all inclusive.
- Pay Item 305(b) TRENCHLESS INSTALLATION OF CONDUIT

1. The unit of measurement shall be the plan linear metre measured in the plane including access pits along the centreline of each particular type, class and size of conduit installed by trenchless techniques.
 2. The schedule rate shall include:
 - Survey and setting out
 - Supply of conduit
 - Installation
 - Jointing
 - Lining
 - Grouting
 - Excavation, removal and disposal
 - Temporary pits, excavation, backfill and restoration.
- Pay Item 305(c) BULKHEADS

1. The unit of measurement shall be "each" bulkhead completed.
 2. The rate shall include all activities and materials required to complete the bulkhead structures as shown on the Drawings.
- Pay Item 305(d) EXCAVATION FOR TEMPORARY PITS

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1. The unit of measurement shall be the cubic metre measured as bank volume of excavation.
2. The schedule rate shall be an average rate to cover all types of material encountered during excavation. Separate rates shall not be included for earth and rock.
3. The plan area for payment shall be the area calculated from the outside dimensions of the pit as shown on the Drawings. The depth shall be determined from the actual site measurement of the distance from the surface at the time of excavation to the base of the pit.
Pay Item 305(e) BACKFILL FOR TEMPORARY PITS

1. The unit of measurement shall be the cubic metre of compacted material.
2. The schedule of rate shall include backfill and compaction in layers as specified and restoration of surface to pre-construction condition.

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SPECIFICATION

306

**ROAD OPENINGS
AND RESTORATIONS**

SPECIFICATION 306 - ROAD OPENINGS AND RESTORATION

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ANNEXURE 306A

306A RESTORATION REQUIREMENTS

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SPECIFICATION 306 : ROAD OPENINGS AND RESTORATIONS**GENERAL****306.01 SCOPE**

1. The work to be executed under this Specification consists of the clearing, excavation, backfilling and restoration activities associated with the installation of Council and/or public utility services within public road reserves or other reserves under the control of the Council.

2. The Specification shall apply to Works under Contract where the Principal to the Contract is either:

- a) The Council
- b) The relevant Public Utility Authority for the works under execution.

3. This Specification excludes the installation activities of the relevant public utility service.

4. Installation of utility services by open trenching methods in carriageway concrete pavements shall not be permitted without the prior approval of the Superintendent, or Council in the case where the Utility Authority is the Principal in the Contract. Utility services under carriageway concrete pavements shall be installed in accordance with the Specification for TRENCHLESS CONDUIT INSTALLATION.

**Utility Services
Under
Concrete
Pavements**

5. The Council may require removal and restoration to footpaths and/or carriageway pavements, adjacent to the Works, in addition to the removal and restoration requirements of the scope of this specification. Such additional work shall be identified and defined by Council's Restoration Officer at the Set Out Inspection and Approval hold point of the Contract. In this case, payment for the additional removal and restoration activities shall be made as a Variation to the Contract at the schedule rates for the particular activities.

**Additional
Work**

306.02 DEFINITIONS

For the purposes of this Specification the definition of terms used to define the components of the road reserve shall be in accordance with AS 1348.1.

Standard

The terms are:

- Carriageway - That portion of a road or bridge devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes.
- Clearing - The removal of vegetation or other obstacles at or above ground.
- Footpath - The paved section of a pathway.
- Pathway - A public way reserved for the movement of pedestrians and of manually propelled vehicles.
- Pavement - That portion of a carriageway placed above the subgrade for the support of, and to form a running surface for, vehicular traffic.
- Shoulder - The portion of the carriageway beyond the traffic lanes and contiguous and flush with the surface of the pavement.
- Verge - That portion of the formation not covered by the carriageway or footpath.

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306.03 REFERENCE DOCUMENTS

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

**Documents
Standards
Test Methods**

(a) Council Specifications

- 201 - Control of Traffic
- 242 - Flexible Pavements
- 243 - Bituminous Cold Mix
- 244 - Sprayed Bituminous Surfacing
- 245 - Asphalt
- 305 - Trenchless Conduit Installation

(b) Australian Standards

- AS 1289.5.4.1 - Compaction control test - Dry density ratio, moisture variation and moisture ratio.
- AS 1289.5.7.1 - Compaction control test (Rapid method)
- AS 1289.F1.2 - Determination of the California bearing ratio of a soil, Standard laboratory method for an undisturbed specimen.
- AS 1348.1 - Road and traffic engineering - Glossary of terms, Road design and construction.

(c) Other

Street Openings Conference - Information Bulletin on Codes and Practices, 1997.

306.04 PROVISION FOR TRAFFIC

1. The Contractor shall construct the Works in a safe manner with the least possible obstruction to traffic, both vehicular and pedestrian.

2. The Contractor shall submit a Traffic Management Plan and carry out all activities for controlling traffic, both vehicular and pedestrian, in accordance with the Specification for CONTROL OF TRAFFIC.

**Traffic
Management
Plan**

3. Safe, all weather vehicular and pedestrian access to properties shall be maintained wherever possible. Notice of 48 hours shall be provided to property owners whose access will be restricted.

Access

CLEARING**306.05 SET OUT**

1. The Contractor shall set out the limits of the proposed excavation for trenches, pits and chambers required for the utility service installation. The set out shall be in chalk or crayon so as to be readily understandable by Council's Restoration Officer and will not permanently deface any surface.

Initial Limits

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2. In order to minimise or eliminate residue small portions of paving slabs the set out shall be adjusted as necessary. Any adjustments will be with respect to the existing paved surfaces and joint patterns. Adjustments shall be in accordance with the following guidelines:

Adjusted Limits

(a) Pathways

1. The set out line shall be varied in accordance with the reinstatement requirements of the Street Opening Conference’s publication, Information Bulletin on Codes and Practices.

- (i) Bitumen and Concrete Paving - In accordance with the reinstatement provisions and sketches of the above Information Bulletin.
- (ii) Segmental Paving Units - The set out line shall be at least one whole unit clear of both sides of the minimal alignment of the trench.
- (iii) Textured or Patterned Concrete - The set out line shall be as determined by Council’s Restoration Officer in conjunction with the Contractor’s surveyor.

2. Where the Superintendent directs that driveways are not to be disturbed, the utility services under driveways shall be installed in accordance with the Specification for TRENCHLESS CONDUIT INSTALLATION.

(b) Carriageways

1. In asphalt pavements, the proposed trench set out shall be at the minimum width for the depth of service and, wherever possible, shall be at right angles to the road reserve boundary.

Minimum Width

2. Any trench or surface work proposed in the vicinity of Permanent or State Survey Marks shall be referred to the Department of Natural Resources and Environment, prior to commencement or Work, to obtain protection or relocation requirements.

Survey Marks

3. The set out line shall be presented to the Superintendent for approval prior to the commencement of any surface clearing work. This action constitutes a **HOLD POINT**. The Superintendent and Council’s Restoration Officer shall inspect and approve the set out, and define any additional removal and restoration work required by Council, prior to the release of the hold point.



306.06 SURFACE TREATMENT REMOVAL

1. Trench set out lines located on concrete or asphalt footpaths, and asphalt carriageway pavements, shall be sawcut for the full depths of the bound pavement layers except where the set out line is located along expansion joints. Where a concrete subbase is found, upon removal of segmental pavers, it shall also be sawcut along the trench set out lines.

Sawcut

2. Concrete or asphalt footpath and carriageway pavement material shall be broken out, between the trench set out lines, removed and legally disposed of off-site by the Contractor or stockpiled at a site nominated by the Superintendent.

Concrete and Asphalt

3. Segmental paving units both full and cut, between the trench set out lines, shall be taken up by hand and neatly stacked on wooden pallets at locations as directed by the Superintendent. Any dimension stone kerb and gutter units within the set out lines shall also be taken up and stacked in a similar manner.

Pavers

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4. Concrete edging, associated with the lifted segmental pavers, shall be broken out, removed and legally disposed of off-site by the Contractor or stockpiled at a site nominated by the Superintendent. **Paver Edging**
5. Grass turf, between trench set out lines, shall be neatly cut into squares of approximately 300mm square, taken up and stored at locations as directed by the Superintendent and shall be watered as directed during the storage period. If the grass is considered by the Superintendent to be unsuitable for reuse, it shall be removed and legally disposed of off-site by the Contractor. **Grass**
6. Small plants, shrubs and trees, between the set out lines, identified as being suitable for replanting shall be taken up and stored at locations nominated by the Superintendent. The root ball of such plants, shrubs and trees shall be wrapped in a hessian or plastic bag with drain holes and shall be watered as directed during the storage period. **Plants, Shrubs, Trees**
7. Other plants, shrubs and trees deemed unsuitable for replanting shall be removed and legally disposed of off-site by the Contractor. **Unsuitable Vegetation**
8. House stormwater pipes discharging into carriageway gutters shall be maintained at all times. Any damage to these pipes caused by the Contractor's activities shall be repaired or replaced to the satisfaction of the Superintendent. The costs of such rectification works shall be borne by the Contractor. **House SW Pipes Contractor's Cost**

EXCAVATION

306.07 TOPSOIL

1. Before undertaking trench excavation, topsoil which is considered by the Superintendent to be suitable for reuse in the restoration work, shall be removed and stockpiled at a site nominated by the Superintendent. **Suitable for Reuse**

306.08 TRENCH EXCAVATION

1. Trenches shall be excavated to the standard widths and depths for the particular utility service installation or to dimensions as shown on the Drawings.
2. In undertaking trench excavation, the Contractor shall provide any shoring, sheet piling or other stabilisation of the sides necessary to comply with statutory requirements. **Safety**
3. Where other public utilities exist in the vicinity of the Works, the Contractor shall obtain the approval of the relevant authority to the method of excavation before commencing excavation. The locations of existing underground services shall be established by exploratory excavation prior to the principal trench excavation. Proof of approval of the relevant authority shall be provided to the Superintendent, if requested. **Approval by Other Public Utility authorities**
4. The Contractor shall be responsible for checking the locations of all services prior to the commencement of work. The contacts for each of the service authorities are detailed in the Specification - GENERAL. **Services**
5. Existing retired services shall be excavated and removed off-site and legally disposed of by the Contractor. The resulting excavation shall be backfilled in accordance with Clause 306.11. **Retired Services**

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6. Trench or foundation excavation shall be undertaken to the planned level for the bottom of the specified bedding or foundation level or such other depth as directed by the Superintendent. This action constitutes a **HOLD POINT**. The Superintendent's approval of the trench or foundation level is required prior to the release of the hold point.

Excavation Level

HP

7. The excavated earth and rock material shall be segregated and stockpiled, at sites nominated by the Superintendent, for reuse in backfilling operations. Excavated material shall not, at any time, be stockpiled against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation. Where stockpiling is not permitted the excavated material shall be legally disposed of off-site.

Stockpiles

8. Any material at the bottom of the trench or at foundation level which the Superintendent deems to be unsuitable shall be removed and legally disposed of off-site by the Contractor and replaced with backfill material in accordance with the requirements of this Specification. The bottom of the excavated trench or foundation, after any unsuitable material has been removed and replaced, shall be aligned at the specified level and slope of the utility service.

Unsuitable Material

306.09 PROTECTION OF TREES

1. Existing trees shall be protected from all damage during the Works.

2. The Contractor shall not store, stockpile, dump or otherwise place under or near trees bulk materials and harmful materials including oil, waste concrete, clearings, boulders and the like and shall prevent wind blown materials from harming trees and plants.

Materials Clear of Trees

3. The Contractor shall not attach stays, guys and the like to trees and shall prevent damage to tree bark.

No Attachments

4. When working near trees the Contractor shall not remove topsoil from within the drip line of trees unless otherwise specified or directed. Where it is necessary to excavate within the drop line, hand methods or trenchless methods, such that root systems are preserved intact, shall be used. The duration of open excavations under tree canopies shall be determined by the Superintendent at the time of the excavation and shall comply with the requirements of Council's Tree Preservation Officer.

Work Near Trees

5. The Contractor shall not cut tree roots exceeding 50mm in diameter without the approval of Council's Tree Preservation Officer. Where it is necessary to cut tree roots, a saw or similar means shall be used such that the cutting does not unduly disturb or rock the remaining root system. Immediately after cutting, an approved bituminous fungicidal sealant shall be applied to the cut to prevent the incursion of root disease.

Tree Roots

BACKFILL

306.10 BEDDING ZONES

1. Bedding material for the bed, haunch, side and overlay zone shall be to the requirements, and shall be installed in accordance with the Specification for the particular utility service being installed.

Particular Service Specification

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2. The overlay zone is defined as that part of the trench backfill immediately over the utility service for a maximum of 300mm. With the side zones material, overlay zone material typically comprises selected backfill compacted in accordance with Clause 306.12.

Overlay Zone

306.11 TRENCH BACKFILL

1. Between the overlay zone and the top of subgrade, the trench shall be backfilled with 14 to 1 moist sand/cement mix using washed river sand or non-cohesive backfill material approved by the Superintendent in layers as directed. Backfill material shall be nominated for approval of the Superintendent at least 7 days prior to commencement of work.

Approved Material

2. Where the trench excavation material has been disposed of off-site, the trench shall be backfilled with imported backfill material, from a source approved by the Superintendent, free of tree stumps and roots and capable of being compacted in accordance with Clause 306.12.

Imported Material

3. Where excavation is through a selected material zone below the subbase layer, the section of trench within the select material zone shall be backfilled with selected material free from stone larger than 100mm maximum dimension and the fraction passing a 19mm AS sieve shall have a 4 day soaked CBR value, in accordance with AS 1289.F1.2, not less than that of the adjacent selected material zone.

Selected Material Zone

4. Except in carriageway pavements, backfilling, for a minimum 300mm thickness, around tree roots shall consist of a topsoil mixture approved by the Superintendent, placed and compacted in layers of 150mm minimum depth to a dry density equal to that of the surrounding soil.

Tree Roots

5. The Contractor shall not place backfill material above the original ground surface around tree trunks or over the root zone unless approved by the Superintendent

Backfill at Trees

6. Immediately after backfilling the tree root zone shall be thoroughly watered.

Watering Root Zone

306.12 COMPACTION

1. Backfilling shall be compacted to the following requirements when tested in accordance with AS 1289.5.4.1 for modified compactive effort.

	Relative Compaction
Foundations or trench base to a depth of 150mm below foundation levels	92%
Material replacing unsuitable material	92%
Bedding material	92%
Selected backfill and ordinary backfill material	
· below 1.5m of finished surface	92%
· within 1.5m of finished surface	97%
Backfill material within the selected material zone	97%

2. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the relative compaction specified before the

Layers

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next layer is commenced.

3. At the time of compaction, the moisture content of the material shall be adjusted so as to permit the specified compaction to be attained at a moisture content which, unless otherwise approved by the Superintendent, is neither less than 60 per cent nor more than 95 per cent of the apparent optimum moisture content, as determined by AS 1289.5.7.1 (modified compaction).

**Moisture
Content**

4. The Contractor shall arrange for compaction testing in accordance with AS 1289.5.7.1 on the completed backfill and shall submit the results of such tests to the Superintendent within 2 weeks of the tests being performed. Compaction tests shall be undertaken by the Contractor at a minimum frequency of 1 per every second layer per 50 square metres of backfill surface area.

Testing

5. When compacting adjacent to utility services, the Contractor shall adopt compaction methods which will not cause damage or misalignment to any utility service.

Precautions

RESTORATION

306.13 GENERAL

1. Carriageway pavements and pathways shall be restored in a continuous manner to a condition equivalent to that existing at the commencement of the Works as determined by Council's Restoration Officer.

**Equivalent
Condition**

2. Utility service surface pits, access chamber frames and lids, etc, shall be set such that carriageway pavements and footpaths can be restored to original levels. The Contractor shall liaise with other utility authorities should any other utility service surface box be required to be adjusted or replaced prior to restoration.

**Surface Pits,
etc**

3. The Contractor shall form up and prepare the areas for paved restoration and present the prepared areas to the Superintendent for approval prior to the commencement of any paving restoration work. This action constitutes a **HOLD POINT**. The Superintendent and Council's Restoration Officer shall inspect and approve the prepared areas, and verify any additional restoration work required by Council, prior to the release of the hold point.

HP

306.14 TEMPORARY PAVEMENT

(a) Carriageways

1. Immediately after backfilling to subgrade level the carriageway pavement shall be temporarily restored and re-opened to traffic, if the planned date for final restoration exceeds 5 days.

**Re-open to
Traffic**

2. Temporary restoration shall consist of either:

- Bituminous cold mix, of a maximum thickness 50mm, on a base of compacted crushed stone, gravel or other material approved by the Superintendent.
- Steel plating, over the trench, of sufficient thickness to support traffic loadings and suitably secured with pins or bituminous cold mix to the satisfaction of the Superintendent.

**Flexible
Pavement**

Steel Plating

3. Where steel plating is used, advance warning signs shall be provided in accordance with AS 1742.3.

(b) Footpaths, including driveways

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- 1. Immediately after backfilling to subgrade level the footpaths, including driveways, shall be temporarily restored and re-opened for pedestrian use, if the planned date for final restoration exceeds 2 days. **Re-open to Traffic**
- 2. Temporary restoration shall consist of:
 - Bituminous cold mix, of maximum thickness 50mm, or other material approved by the Superintendent.

306.15 CARRIAGEWAY SUBBASE AND BASE

- 1. Prior to final carriageway pavement restoration, the temporary pavement material shall be removed and disposed of off-site by the Contractor. If approved by the Superintendent, the temporary base material may remain in place and be incorporated into the final pavement. In any case the asphaltic material shall be removed and disposed of off-site by the Contractor. **Remove Temporary Pavement**
- 2. Subbase and base shall consist of crushed rock material, from a source approved by the Superintendent and configured in layers and depths as indicated in Annexure 306A. Subbase and base layers shall be supplied and installed in accordance with the Specification for FLEXIBLE PAVEMENTS. **Material**
- 3. Each layer of the subbase and base courses shall be uniformly compacted over the full area and depth within the trench to a relative compaction of 100 per cent when tested in accordance with AS 1289.5.4.1. Compaction tests shall be undertaken by the Contractor at a minimum frequency of 1 per every second layer per 50 square metres of restoration surface area. **Uniform Compaction**

306.16 CARRIAGEWAY BITUMINOUS WEARING SURFACE

- 1. The bituminous wearing surface shall meet the requirements set out in Annexure 306A. Bituminous wearing surface shall also be supplied and laid in accordance with the Specifications for SPRAYED BITUMINOUS SURFACING or ASPHALT, as applicable.
- 2. The evenness of the resulting restored surface shall be such that when tested with a 3m straightedge, seven to ten days after completion, departures from the straightedge are less than ± 5 mm and the surface is such that an impact is not transmitted to traffic passing over the restoration. **Surface Tolerance**
- 3. The bituminous surfacing tack coat for asphalt or seal coat for sprayed bituminous seals shall present a waterproof surface at application. This bituminous surfacing shall extend a minimum dimension of 100mm beyond the perimeter of any trench excavation. **Tack Coat Limits**
- 4. Asphalt placed as restoration shall similarly extend in plan a minimum dimension of 100mm beyond the perimeter of any trench excavation. **Asphalt Limits**
- 5. The joint between new and existing asphalt shall be vertical and cut by diamond saw or milling machine. The vertical face and subgrade surface of the old asphalt shall be treated by bituminous tack coating. **Joint**
- 6. The thickness of asphalt at any point shall not vary from the specified layer thickness by more than +10mm or less than -0mm. **Thickness Tolerance**

306.17 PATHWAYS

- 1. Pathways, and other public areas, shall be restored with materials consistent with the existing surface before commencement of the Works, or as directed by the Superintendent.

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2. Prior to final footpath restoration, the temporary pavement material shall be removed and disposed of off-site by the Contractor. If approved by the Superintendent, the temporary material may remain in place and be incorporated into the final subbase. **Remove Temporary Material**

3. All paved footpaths, and paved areas, shall be constructed on a subbase of crushed rock compacted to 100 percent relative compaction in accordance with AS 1289.5.4.1 **Subbase Material**

4. For restoration patches in footpath surfaces, the surface level at any point along the patch's edge shall match the adjoining footpath surface within ±2mm. **Patches**

(a) Concrete Footpaths, including Textured and Patterned

1. Concrete footpaths shall be constructed in 20MPa concrete to the same thickness (with a minimum of 100mm), surface finish and pattern as the adjoining footpaths and driveways as appropriate or as directed by the Superintendent. **Match Existing Footpaths**

2. In concrete footpaths, expansion joints consisting of a 15mm thick preformed jointing material of bituminous fibreboard or equivalent approved by the Superintendent shall be placed where new concrete abuts existing concrete and in line with joints in existing concrete. **Expansion Joints**

3. Control joints shall be formed strictly in line with the control joints in existing concrete. **Control Joints**

4. Around electricity supply poles, the concrete paving shall be terminated 200mm from the pole and the resulting space filled with cold mix asphalt. **Poles**

(b) Asphalt Footpaths

1. Asphalt footpaths shall consist of asphalt in accordance with the Specification for ASPHALT, or BITUMINOUS COLD MIX where nominated by Council's Restoration Officer, and shall be constructed to the same thickness as the adjoining footpath and compacted to a smooth even surface. **Match Existing Footpaths**

(c) Segmental Paving Units

1. All activities associated with the restoration of segmental paving units shall be carried out to the requirements of the Specification for SEGMENTAL PAVING. **Specification**

2. Existing paving units, taken up and stored, shall be relaid to match the pattern and surface levels of the existing paving. **Match Existing**

3. Cut or damaged paving units which are unsuitable for relaying, as determined by the Superintendent, shall be replaced with new units. Such new paving units shall be supplied by the Contractor and shall be of the same material, type, size and colour as the existing paving units. **Damaged Units Replaced**

4. The paving pattern at tree surrounds, service boxes, poles, etc, shall match the pattern at similar existing features in the immediate area or be as directed by the Superintendent in consultation with Council's Restoration Officer. **Paving around Trees, etc.**

306.18 TURFED VERGES

1. A bed of stockpiled topsoil, of minimum thickness 50mm, shall be placed on the subgrade prior to restoration of turfed verges. **Topsoil Bed**

2. Existing grass turfs, taken up and stored, shall be relaid to conform with the original grassed surface. Turfs shall be hard butted against each other in rows and the seams topdressed with topsoil. Turf shall be rolled and watered to ensure direct and

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uniform contact with the topsoil.

- 3. Any additional turf required to fully restore grassed verges shall be supplied by the Contractor and shall be the same type as the existing grass. **Additional Turf**

306.19 VERGE PLANTS, SHRUBS AND TREES

- 1. Stockpiled topsoil shall be placed on the subgrade to the same thickness as the surrounding topsoil, prior to replanting. Planting holes shall be excavated, at locations determined by the Superintendent in consultation with Council's Restoration Officer, and the material spread evenly around each hole. **Topsoil Bed**

- 2. Existing plants, shrubs and trees, taken up and stored which are suitable for replanting as determined by the Superintendent, shall be replanted in the prepared holes. **Replanting**

- 3. The planting hole shall be backfilled with topsoil and compacted by foot up to surface level. The shrubs and trees shall be staked as directed by the Superintendent, watered and maintained for 2 months after the date of formal completion of the restoration works. **Compacted, Staked and Watered**

306.20 CLEANUP

- 1. Upon completion of all restoration Works, the areas affected by the Works and associated construction activities shall be cleaned up and restored to a condition equivalent to that existing at the commencement of the Works.

- 2. All formwork, rubbish and residue construction materials, including material left at stockpiles, shall be legally disposed of off-site by the Contractor.

- 3. The Contractor shall present the cleaned up restoration works to the Superintendent for approval. This action constitutes a **HOLD POINT**. The Superintendent's approval is required prior to the formal completion of the restoration works.

HP

306.21 WORK-AS-CONSTRUCTED DRAWINGS

- 1. The Contractor shall supply the Superintendent with fully marked-up Work-as-Constructed Drawings for the whole of the Contract within 2 weeks of approval of the restoration works by the Superintendent. Prints or reproducibles of the Contract Drawings will be supplied by the Principal free of charge for this purpose. **Submission**

SPECIAL REQUIREMENTS

306.22 CIVIL WORKS PERMIT

- 1. Prior to undertaking any opening within a road under the control of Council the Contractor shall obtain a Civil Works Permit, pay all fees and comply with the following conditions:

- a) Current public liability insurance policy with a cover of not less than \$5 million per claim, and that all responsibility for liability and/or claims for damages which arise as the result of the work are to be borne by the person or company to whom this is issued. Insurance must remain current for the duration of the works otherwise this permit will become invalid (Note: Council may request to sight your Insurance Policy at any time during the works).

- b) This permit is non refundable and must be available on site at all times whether the permit holder or any other person is carrying out the works

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- c) This permit is valid for 12 months (in accordance with the above dates) or when the prescribed works have concluded, whichever comes first.
- d) Give 24 hours notice for an inspection appointment.
- e) Any works in addition to those prescribed in this permit must not be conducted without prior approval by Council's appointed officer.
- f) Ensure that adequate and effective safety precautions (including traffic management to VicRoads code of practice if required) are adhered to at all times. Barriers and signs must be installed at the work site for the entire duration of the works in accordance with the Standards Association of Australia.
- g) Restriction of the free passage of traffic, including pedestrians, should be minimised, in both time and work area.
- h) Works which will affect access to, or the safe navigation of a public carriageway must be completed within one day, between the hours of 8am and 5pm Mon – Fri or 9am and 5pm any other day. Any variation to this requirement must be ratified by Council's appointed officer before starting works.
- i) Any further work by Council to a road opening that fails or does not meet Council's specifications will be at the cost of the permit holder. This includes the cost of any additional inspections required.
- j) On the completion of works the area around the work site must be restored to a safe, clean and tidy condition and all surplus material must be removed. Any damage to the road surface will be repaired by the Council at the permit holder's expense unless prior arrangements have been made. If applicable deposit refunds will not be processed until a site inspection has taken place to satisfy compliance with the permit conditions.
- k) Council may at any time assume control of the work site, should the permit holder fail to comply in a timely manner with the requirements of this permit or the directives of Council's Delegated Officer. Any costs associated with the permit holder failure to comply will be passed on.
- l) Council reserves the right to charge an additional fee should the scope of works change from that stated on the permit.

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MEASUREMENT AND PAYMENT

306.23 PAY ITEMS

1. Payment shall be made for all the activities associated with completing the work detailed in this specification on a schedule of rates basis in accordance with Pay Items 306(a) to 306(p) inclusive.
2. A lump sum price for any of these items shall not be accepted.
3. If any item, for which a quantity of work is listed in the Schedule of Rates, has not been priced by the Contractor it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.
4. Provision for traffic, both vehicular and pedestrian, shall be deemed to be included in the schedule rates generally in accordance with this Specification and not in the Specification for CONTROL OF TRAFFIC.
5. Segmental paving works are measured and paid in accordance with this Specification and not in the Specification for SEGMENTAL PAVING.
6. Trenchless installation of utility services under driveways is measured and paid in accordance with the Specification for TRENCHLESS CONDUIT INSTALLATION.
 Pay Item 306 (a) SAWCUT EXISTING PAVEMENT/FOOTPATH
 - (1) Bituminous Carriageway Pavement
 - (2) Bituminous Footpath
 - (3) Concrete Footpath, including Textured or Patterned Concrete.

1. The unit of measurement shall be the linear metre measured along the actual line of cut. Separate rates shall be given for sawcuts in each type of material.

2. The schedule rate shall include all activities associated with the sawcutting operations including hire of plant and provision of water.

Pay Item 306 (b) REMOVE EXISTING PAVEMENT/FOOTPATH

- (1) To Stockpile
- (2) Disposal off-site

1. The unit of measurement shall be the square metre of pavement removed including both bituminous and concrete material and including concrete subbase from segmental paving where applicable. Separate rates shall be given for removal to stockpile and disposal off-site.

2. The width and length shall be as shown on the Drawings or as directed by the Superintendent.

3. The schedule rate, for, item 306b(1), shall include all activities associated with breaking out, removing, carting and placing into stockpile.

4. The schedule rate, for item 306b(2), shall include all activities associated with breaking out, removing, transporting off-site, disposal and any tipping fees applicable.

Pay Item 306 (c)SEGMENTAL PAVING UNITS

- (1) Take Up and Stack Existing Units - Carriageway
- (2) Take Up and Stack Existing Units - Footpath
- (3) Lay Existing Units - Carriageway
- (4) Lay Existing Units - Footpath

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- (5) Supply and Lay New Units - Carriageway
- (6) Supply and Lay New Units - Footpath

1. The unit of measurement shall be the square metre of surface of segmental paving units taken up or laid. Separate rates shall be given for taking up existing, laying existing and supply and lay new paving units for carriageways or footpaths as appropriate.

2. The width and length shall be as shown on the Drawings or as directed by the Superintendent.

3. The schedule rate, for items 306c(1) and 306c(2), shall include all activities associated with taking up and stacking units on pallets at locations as directed. Concrete subbase, where applicable, shall be removed under Pay Item 306(b).

4. The schedule rate, for items 306c(3) and 306c(4), shall include all activities involved in the laying and compaction of subbase, including concrete subbase where applicable, and existing segmental paving units, bedding sand and joint filling sand, including any cutting of units, concrete edging, joints overlying concrete pavement joints, and concrete surrounds or aprons around surface penetrations.

5. The schedule rate, for items 306c(5) and 306c(6), shall include all activities involved in the laying and compaction of subbase, including concrete subbase where applicable, and supply, laying and compaction of segmental paving units, bedding sand and joint filling sand, including any cutting of units, concrete edging, joints overlying concrete pavement joints, and surrounds or aprons around surface penetrations.

Pay Item 306 (d) REMOVE EXISTING EDGE STRIPS

1. The unit of measurement shall be the linear metre measured along the length of the edge strip.

2. The schedule rate shall include all activities associated with breaking out, removing, transporting off-site, disposal and any tipping fees applicable.

Pay Item 306 (e) GRASS TURF

- (1) Take Up and Store Existing Turf
- (2) Lay Existing Turf
- (3) Supply and Lay New Turf

1. The unit of measurement shall be the square metre of surface of grass turf taken up or laid. Separate rates shall be given for taking up existing, laying existing and supply and lay new turf.

2. The width and length shall be as shown on the Drawings or as directed by the Superintendent.

3. The schedule rate, for item 306e(1), shall include all activities associated with cutting, taking up and storing turf at locations as directed.

4. The schedule rate, for item 306e(2), shall include all activities associated with the topsoil bedding, rolling, laying of existing turf and topdressing.

5. The schedule rate, for item 306e(3), shall include all activities associated with the topsoil bedding, rolling, supply and laying of new turf and topdressing.

Pay Item 306 (f) VERGE PLANTS, SHRUBS AND TREES

- (1) Take Up and Store Existing
- (2) Plant Existing

1. The unit of measurement shall be each plant, shrub or tree taken up or planted. Separate rates shall be given for taking up existing or replanting existing.

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2. The schedule rate, for item 306f(1), shall include all activities associated with taking up, storing and watering at locations as directed.

3. The schedule rate, for Item 306f(2), shall include all activities associated with topsoil placement, preparatory work, planting, staking and subsequent care of each plant for 2 months after the date of formal completion of the restoration works.

Pay Item 306 (g) STOCKPILING OF TOPSOIL

1. The unit of measurement shall be the cubic metre as bank volume.

2. The volume shall be calculated by multiplying the area, derived from the width and length as shown on the Drawings or as directed by the Superintendent, by the depth of topsoil directed to be removed by the Superintendent.

3. The schedule rate shall include all activities associated with stripping topsoil, carting and placing into stockpile.

Pay Item 306 (h) TRENCH EXCAVATION

(1) To Stockpile

(2) Disposal off-site

1. The unit of measurement shall be the cubic metre as bank volume of excavation. Separate rates shall be given for excavation to stockpile and disposal off-site.

2. The volume shall be calculated by multiplying the width by the depth by the length as follows:

Width - as specified for the particular utility service installation.

Depth - average actual depth from topsoil stripped ground surface to underside of specified bedding.

Length - actual excavation length, centre to centre of pits.

3. The schedule rate shall be an average rate to cover all types of material encountered during excavation. Separate rates shall not be included for earth and rock.

4. The schedule rate shall include all activities associated with:

- Excavation, including excavation and replacement of unsuitable material.
- Replacement for over-excavation for any reason.
- Excavation, removal and disposal of retired services, and backfilling of the resulting excavations.
- Protection of trees and treatment to cut tree roots.

5. The schedule rate, for item 306h(1), shall include all activities associated with carting and placing into stockpile.

6. The schedule rate, for item 306h(2), shall include all activities associated with transporting off-site, disposal and any tipping fees applicable.

Pay Item 306 (i) TRENCH BACKFILL

(1) From Stockpiled Material

(2) From Imported Material

1. The unit of measurement shall be the cubic metre measured as backfill compacted volume in place in the trench.

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2. The volume shall be calculated by multiplying the width by the depth by the length as follows:

Width - average trench width

Depth - average actual depth from top of subgrade to top of bedding overlay material around the utility service.

Length - actual trench length, centre to centre of pits.

3. The schedule rate shall include all activities associated with backfilling, compaction, testing and treatment around tree roots.

4. The schedule rate, for item 306i(1), shall include all activities associated with loading and carting from stockpile.

5. The schedule rate, for item 306i(2), shall include all activities associated with supply and delivery of imported material, including material for a selected material zone where specified.

Pay Item 306 (j) TEMPORARY PAVEMENT - CARRIAGEWAY AND FOOTPATH

1. The unit of measurement shall be the square metre of trench area restored with temporary pavement.

2. The area shall be calculated by multiplying the trench width by the actual length of temporarily restored pavement.

3. The schedule rate shall include all activities associated with the supply, delivery, placing and compaction of the base material and bituminous cold mix. It shall include all activities and material necessary for maintenance of the temporary pavement in a safe condition until the permanent restoration is executed.

Pay Item 306 (k) TEMPORARY STEEL PLATING

1. The unit of measurement shall be the square metre of trench area plus adequate allowance for support on both sides of the trench.

2. The area shall be calculated by multiplying the trench width by the actual length of trench to be covered.

3. The schedule rate shall include all activities associated with the hire, delivery, placement, securing and subsequent removal and return to depot of the steel plates. It shall include all activities and materials necessary for maintenance of the plating until permanent restoration is executed.

Pay Item 306 (l) SUBBASE

1. The unit of measurement shall be the square metre of trench.

2. The area shall be calculated by multiplying the trench width by the length.

3. The schedule rate shall include all activities associated with the removal of temporary pavement, supply, delivery, spreading and compaction in accordance with Annexure 306A.

Pay Item 306 (m) BASE

1. The unit of measurement shall be the square metre of trench.

2. The area shall be calculated by multiplying the trench width by the length.

3. The schedule rate shall include all activities associated with the removal of temporary pavement where no subbase is required, supply, delivery, spreading and compaction in accordance with Annexure 306A.

Pay Item 306 (n) BITUMINOUS WEARING SURFACE

1. The unit measurement shall be the square metre of new surface area in accordance with this Specification.

2. The area shall be calculated by multiplying the trench width +200mm by the length.

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3. The schedule rate shall include all activities associated with the removal of temporary pavement or existing pavement to the new perimeter, supply, delivery, spreading and compaction in accordance with Annexure 306A.

Pay Item 306 (o) FOOTPATH

- (1) Asphalt/Sprayed bituminous seal
- (2) Plain Concrete
- (3) Textured/Patterned Concrete

- 1. The unit of measurement shall be the square metre of paved surface, including driveways.
- 2. The width and length shall be as shown on the Drawings or as Directed by the Superintendent.
- 3. The schedule rate, for item 306o(1), shall include all activities associated with the forming, compaction of foundations, supply, delivery and compaction of subbase and bituminous material.
- 4. The schedule rate, for items 306o(2) and 306o(3) shall include all activities associated with the forming, compaction of foundations, supply, delivery and compaction of subbase, supply delivery, placing, finishing and curing concrete, including texturing or patterned finish where applicable. Where shown on the Drawings or as directed by the Superintendent this pay item shall include the supply and placement of reinforcing steel.

Pay Item 306 (p) CLEANUP

- 1. The unit of measurement shall be the square metre of carriageway and/or footway surface or other surface as applicable.
- 2. The lengths and widths shall be as shown on the Drawings or as directed by the Superintendent.
- 3. The schedule rate shall include all activities associated with the cleaning up of the Work site, and transporting off-site and disposal of material including any tipping fees applicable.

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ANNEXURE 306A
RESTORATION REQUIREMENTS
(TO BE COMPLETED BY COMPILER)

Description of Location:.....

Restoration Pavement Layers:

Wearing Surface Type.....Thickness (mm).....(or nominal stone size)

Base Layer Type.....Thickness (mm).....

Sub Base Layer Type.....Thickness (mm).....

Selected Material.....Thickness (mm).....

Special Requirements (e.g. *Linemarking, Traffic Signs, Advice to adjacent property owners etc.*)

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