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<td>1354</td>
<td>Drainage structures</td>
</tr>
</tbody>
</table>
1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide labour, materials, plant and equipment to construct the Works as documented.

Location
Description: To be described or as per Development or Contract.

Type of contract
Quality system: To be described.

Special requirements: To be described.

Design
Designer: A Suitably qualified Engineer to RP Eng or CP Eng standard to authorise design by signature. Note: for Pavement Design, Designer: Accredited RPEng and/or CPEng or alternatively listed on the AAPA (Australian Asphalt Pavement Association) Sprayed Seal Design Registry as having successfully completed the assessment.

Authority requirements: Conform to Council requirements and be subject to approval by Council. May require Review of Environmental Factors (REF) (Part V Assessment), Statement of Environmental Factors (SEE) or Environmental Impact Statement EIS) depending on size and scale of development. Council Road Permits also may be required. Refer to Conditions of Development Consent.

1.2 PRECEDENCE

General
Worksections and standards:
- Requirements of other worksections of the specification override conflicting requirements of this worksection.
- The technical requirements of the worksections override conflicting requirements of their referenced documents.
- The requirements of referenced documents are minimum requirements.

1.3 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0161 Quality (Construction).
- 1102 Control of erosion and sedimentation (Construction).
- 1112 Earthworks (Roadways).
- 1195 Boundary fences for road reserves.
- 1351 Stormwater drainage (Construction).

Cross referencing
Within the text:
- Worksection titles are indicated by italicised text.
- Clause titles are indicated by BOLD text.

1.4 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:

Note: Only the most current standards are to be used

Australian standards
AS1319 Safety signs for the occupational environment
AS1348 Glossary of terms - Roads and traffic engineering
AS/NZS1680 Interior lighting
Great Lakes Council 0136 General requirements (Construction)
AS/NZS1680.2.4 Industrial tasks and processes
AS2670 Evaluation of human exposure to whole body vibration
AS2670.1 General requirements (ISO 2631-1:1985)
AS2670.2 Evaluation of human exposure to whole-body vibration - Continuous and shock-induced vibration in buildings (1 to 80 Hz)
Austroads
AP-C87 Glossary of Austroads terms.
Intergovernmental Committee on Surveying & Mapping
ICSM QA Specification G71 Road construction surveys

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
- AS: Australian Standard.
- CAD: Computer Aided Design.
- ICSM: Intergovernmental Committee on Surveying & Mapping
- NZS: New Zealand Standard.
- RMS: Root mean square.
- TBS: To Be Supplied.

Definitions
General: For the purposes of this contract the definitions given in AS 1348, AP-C87 and the following apply:
- Authorities: Includes Agencies. Contractor: In terms of these technical specifications, the context of a Contractor can be either Contractor engaged by Council to undertake a project or a Contractor engaged by a Developer to complete an approved development. The form of project will define this relationship.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Geotechnical site investigation: The process of evaluating the geotechnical characteristics of the site in the context of existing or proposed construction.
- Give notice: Give notice, submit, advise, inform and similar expressions mean give notice (submit, advise, inform) in writing to the Superintendent.
- Manufacturers’ and suppliers’ recommendations: Recommendations, instructions, requirements, specifications (and similar expressions) provided in written or other form by the manufacturer relating to the suitability, use, installation, storage and or/ handing of a product.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the Superintendent.
- Permanent marks: Survey control marks that are permanent by nature and are uniquely defined in the state control survey. Also known as State survey marks (SSM) or Bench marks (BM).
- Principal: Principal has the same meaning as Owner, Client and Proprietor and is the party to whom the Contractor is legally bound to construct the Works. The primary obligation of the Principal is to make payments to the Contractor. A Principal in a Council funded project is the Council. The Principal in a private Development is the Developer.
- Professional engineer: A person who is listed or eligible for listing on the National Professional Engineers Register (NPER) and has appropriate experience and competence in the relevant discipline at the relevant time.
- Proprietary: Identifiable by naming manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Provide: Provide and similar expressions mean supply and install and include development of design beyond that documented.
- Registered testing authority:
  - An organisation registered by NATA to test in the relevant field; or
  - An organisation outside Australia registered by an authority recognised by NATA through a mutual recognition agreement; or
Great Lakes Council

0136 General requirements (Construction)

- An organisation recognised as being a Registered Testing Authority under legislation at the time the test was undertaken.

- Required: Required by the documents, the Local Council or statutory Authorities.

- If required: A conditional specification term for work which may be shown in the documents or be a legislative requirement.

- Superintendent: Superintendent has the same meaning as Contract Administrator or Principal's representative. The Superintendent may be party to the contract or appointed by the Principal to administer the contract. The powers, duties and authorities of the Superintendent are covered in the contract. These can be changed in writing at any time during the contract. As alluded to elsewhere, the Superintendent for a Council funded project is the Council's Superintendent. The Superintendent for a private development is the developers Superintendent. Note that for a private development project, that Council's Engineering Development Officer will have Hold Points to release that sit above those of the Principal's Superintendent.

- Supply: Supply, furnish and similar expressions mean supply only.

- Tests:
  - Completion tests: Tests carried out on completed installations or systems and fully resolved before the date for practical completion, to demonstrate that the installation or system, including components, controls and equipment, operates correctly, safely and efficiently, and meets performance and other requirements. The Superintendent may direct that completion tests be carried out after the date for practical completion.
  - Pre-completion tests: Tests carried out before completion tests.
  - Production tests: Tests carried out on a purchased item, before delivery to the site.
  - Site tests: Tests carried out on site.
  - Type tests: Tests carried out on an item identical with a production item, before delivery to the site.

- Tolerance: The permitted difference between the specified value and the upper limit and the lower limit of dimension, value or quantity.

- Verification: Provision of evidence or proof that a performance requirement has been met or a default exists.


1.6 SUBMISSIONS

Acceptance criteria
General: All submissions will be subject to the approval of the Superintendent. Some HOLD POINTS will require release by the Council's Engineering Development Officer.

Alternative construction
Detailed working drawings: If a tender based on the use of alternative material, design or method of construction is accepted, prepare and submit detailed working drawings, design calculations and specifications for the alternative, together with details of necessary alterations to this worksection.

Certification: Prepare and certify design and construction documents by a CP Eng/RP Eng Engineer experienced in that type of design.

Submission: Submit documents at least four weeks before construction of the relevant part of the work is scheduled to commence. Do not commence work on that part without approval. This is a HOLD POINT.

Costs: Pay the cost of submissions and evaluations and tests of proposed alternatives, whether subsequently accepted as a variation or not. The costs will be calculated at the current charge-out rates of the relevant consultant(s).

Substitution: If alternatives to the documented products, methods or systems are proposed, submit sufficient information to permit evaluation of the proposed alternatives, including the following:

- Reasons for the proposed substitutions.
- Statement of the extent of revisions to the contract documents.
- Statement of the extent of revisions to the construction program.
- Statement of consequent alterations to other parts of the Works.
- Statement of cost implications including costs outside the contract.
- Evidence that the performance is equal to or greater than that specified.
- Evidence of conformity to a referenced document.
Great Lakes Council

- Essential technical information, in English.
- Samples.

Availability: If the documented products or systems are unavailable within the time constraints of the construction program, submit evidence.

Criteria: If the substitution is for any reason other than unavailability, submit evidence that the substitution:
- Is of net enhanced value to the Principal.
- Is not prohibited by the Contract documents and is as effectual as the identified item, detail or method.

Execution details
Construction management: Prepare the following for submission:
- To be described.

Materials
Product certification: Submit evidence of product conformance with relevant product certification schemes.

Product data: For proprietary equipment, submit the manufacturer’s product data as follows:
- Technical specifications and drawings.
- Type-test reports.
- Performance and rating tables.
- Recommendations for installation and maintenance.

OHS: Hazardous materials storage and procedure to counteract spillages.

To be supplied: Nominated TBS items program.

Type tests
Requirement: Provide all test results and survey records promptly if requested. The cost of such testing and survey shall be borne by the Contractor.

Working drawings
Working documentation: Provide 2 sets of CAD working drawings and any supporting calculations before the scheduled commencement of the work concerned.

Approval to proceed: Do not commence work until a set of working drawings has been returned with written authorisation to proceed. The Superintendent’s written authorisation to proceed does not relieve the Contractor of the responsibilities for the design (where applicable) and construction of the Works in conformance with the Contract.

Revisions: Promptly attend to any required revisions to drawings or calculations and resubmit 4 sets of the revised drawings and calculations.

Authorised variations: Obtain written authorisation for the variation from the Superintendent to proceed. Submit 2 sets of revised working drawings.

Work-as-executed drawings
Submission: Provide marked up and certified work-as-executed drawings for the whole of the Contract before issue of the Final Certificate.

Contract drawings: Digital contract drawings supplied by Superintendent at no cost for mark up.

Roadworks: Mark up in red and certify all changes to the contract drawings and actual values of all levels, signed by the surveyor.

Bridgeworks: Mark up in red and certify 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.

Public utilities: Record as required by the worksections.

Digital copies of the drawings are to be provided to Council.

1.7 INSPECTION

Notice
General: Give notice so that inspection may be made of the following:
## Summary of HOLD POINTS

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submissions</td>
<td>Alternative construction details</td>
<td>4 weeks before work commences</td>
<td>Superintendent &amp; Council’s Engineering Development Officer</td>
</tr>
<tr>
<td>Signage</td>
<td>Submit details</td>
<td>1 week before purchase</td>
<td>Superintendent &amp; Council’s Engineering Development Officer</td>
</tr>
<tr>
<td>Survey control</td>
<td>Submit relocation</td>
<td>1 week</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Survey control</td>
<td>Procedure to protect pegs</td>
<td>1 week before site work</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Environmental planning</td>
<td>Dust control details</td>
<td>1 week before site work</td>
<td>Superintendent &amp; Council’s Engineering Development Officer</td>
</tr>
<tr>
<td>Utilities and Authorities</td>
<td>Confirmation of relocation</td>
<td>3 working days before new work</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Site facilities</td>
<td>Positioning of services</td>
<td>1 week before installing services</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

### Summary of WITNESS POINTS — Off-site activities

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items to be supplied (TBS) by the Principal</td>
<td>Notice of time of delivery</td>
<td>2 working days</td>
</tr>
<tr>
<td>Pipe culverts supplied by the Principal</td>
<td>Notice of time of delivery</td>
<td>30 working days</td>
</tr>
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</table>

### Summary of WITNESS POINTS — On-site activities

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
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</thead>
<tbody>
<tr>
<td>Storage of fuels and chemicals</td>
<td>Approval for toxic chemicals</td>
<td>1 week</td>
</tr>
<tr>
<td>Utilities and Authorities</td>
<td>Conflict with drawings</td>
<td>1 week</td>
</tr>
<tr>
<td>Protection of services</td>
<td>Notice to divert</td>
<td>3 working days</td>
</tr>
<tr>
<td>Programming utility adjustments</td>
<td>Notice of date of completion of associated work</td>
<td>3 weeks</td>
</tr>
<tr>
<td>Adjoining works</td>
<td>Notice of commencement of works</td>
<td>1 week</td>
</tr>
</tbody>
</table>

## 2 PRE-CONSTRUCTION PLANNING

### 2.1 CONTRACT ADMINISTRATION

#### Insurance

Requirement: Provide evidence of currency for Workers Compensation Insurance, Insurance of the Works or Public Liability Insurance.

- Superintendent's representative: To be described. (Note) The Superintendent for a Council funded project is Council's Director of Engineering Services. The Superintendent for a private development is the developers Superintendent. Council's Hold Point's for private developments will be managed by Council's Engineering Development Officer.
3 CONSTRUCTION REQUIREMENTS

3.1 GENERAL

Contractual relationships
Contractual responsibilities: Responsibilities and duties of the Principal, Contractor and Superintendent are not altered by requirements in the referenced documents.
Directions: All instructions are directed to the Contractor unless noted otherwise.
Approvals: Obtain all approvals from the Superintendent unless noted otherwise.

Current editions
General: Use referenced documents (including test methods) which are the relevant editions, with amendments, which is current at issue of the Construction Certificate or 3 months before the element of works being constructed, except where other editions or amendments are required by statutory Authorities
Site copies: To be described.

Drawings
Contract documents: The issued drawings which form part of the Contract documents are bound in a separate volume.

Contract documents
General: Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.
Before commencing work:
  - Obtain measurements and other necessary information.
  - Coordinate the design and installation in conjunction with all trades.

Spot levels: Documented spot levels take precedence over documented contour lines and ground profile lines.

Inspections
Concealment: If notice of inspection is required for parts of the Works that will be concealed, advise when the inspection can be made before concealment.
Light level requirements: To AS/NZS 1680.2.4.

Adjoining works
Adjoining works: Make sure that there are smooth junctions with the existing or adjoining work.
Adjoining property owners: Give notice to all adjoining property owners of the commencement of the Works.

Materials
Manufacturers’ or suppliers’ recommendations: Provide, including select, if no selection is given, transport, deliver, store, handle, protect, finish, adjust and prepare for use, manufactured items in conformance with the current written recommendations and instructions of the manufacturer or supplier.
Proprietary items/systems/assemblies: Assemble, install or fix in conformance with the current manufacturers’ or suppliers’ recommendations
Project modifications: Advise of activities that supplement, or are contrary to, manufacturers’ or suppliers’ recommendations.
Sealed containers: If materials or products are supplied by the manufacturer in closed or sealed containers or packages, bring the materials or products to point of use in the original containers or packages.

3.2 PROJECT SPECIFIC REQUIREMENTS

Site access
Contractor’s access to site: Shall only be via a Public Road and under the direction of the Superintendent.
Public access to site: The Contractor is to maintain a safe and secure workplace. Public Access shall be under the control of the Superintendent.

Working area
Designated areas: To be within the property boundary of the development/project unless other prior permission is obtained from Council.
Great Lakes Council
0136 General requirements (Construction)

Working areas: Restrict construction working areas and areas for temporary site facilities such as the storing of materials, use of plant and erection of sheds, to areas documented on the drawings. Do not work or occupy areas outside of the designated areas.

Security: Take security measures for the safe-keeping of any plant, equipment, tools, materials or other property. Submit proposals for any boundary security fencing for approval. The Great Lakes Council takes no responsibility for the safe keeping of the Contractors plant, tools, materials or property.

Temporary fencing: Provide and maintain temporary fencing and warning signage during the contract to prevent unauthorised entry into the property.

Existing fencing: Reinstate the existing fencing and remove temporary fencing before the date of practical completion.

Date for possession of the site: Effective following issue of Construction Certificate.

Site restraints
Special site conditions: As detailed in conditions of consent.

Reports supplied for information only: To be described.

Status: Reports supplied for information only can not be relied upon as contractual.

3.3 WORK NOT IN CONTRACT

Work by others
Program precautions: Coordinate the Works with simultaneous and/or adjacent work by others and liaise with other Contractors and Authorities to avoid disruption, delays and possible conflict.

Access: If required, by the Superintendent, allow free access for completion of any work by others.

Work by others: To be confirmed and as detailed in conditions of consent / letter of approval.

Items to be supplied (TBS) by the principal
TBS by Principal: To Items to be supplied by Principal schedule.

TBS: Items listed in Annexure A are supplied, delivered and unloaded by the Principal free of cost to the Contractor at nominated points.

Time of delivery: Give notice of the required time of delivery for TBS items. This is a WITNESS POINT.

Damaged or defective: Give notice of any TBS item found damaged or defective within 2 days of taking delivery of such item. If the Contractor does not report damage or defect it is deemed that the TBS item was free from damage or defect when received and the Contractor is responsible for any replacement or making good as directed by the Superintendent.

Storage: Store, protect and insure of all TBS Items received.

Pipe culverts supplied by the Principal
Time of delivery: Give 30 days notice of the time delivery. This is a WITNESS POINT.

Supplied: Pipe culverts are supplied by the Principal at no cost to the Contractor for the actual length laid of pipe culvert required under the contract.

Additional pipe culverts: If any pipe culverts are required in addition to those supplied, it is the responsibility of the Contractor to supply at no cost to the Principal.

Program: Complete works by the programmed dates listed in Annexure A to Relocation/alteration to services (by Principal) Schedule.

3.4 SITE INVESTIGATION

Geotechnical and environmental reports
General: Where a geotechnical and environmental site investigation report is provided it is for information only. The provided geotechnical information, including information on contaminants, is information on the nature of the ground at each tested part. It is not a complete description of conditions existing at or below ground level.

Geotechnical information: To be applied within the context of the development or Council project.

Contractors responsibility: Examine and assess the following:
- Geotechnical information and the site to determine the impact on the construction of the Works.
- The in situ moisture content likely at the actual time the work is carried out.
3.5 SIGNAGE

General
All signs: Submit all safety and project signs for approval before sign manufacture or purchase. This is a HOLD POINT.

Safety signs
Requirement: Provide appropriate regulatory, hazard, emergency information and fire signs to AS1319.
Location: Display safety signs at prominent locations around the working areas and temporary site facilities including:
- Mandatory signs for personal protective equipment such as eye, head and foot protection.
- DANGER signs such as ‘DANGER, Construction Site. No Unauthorised Access’.

Advertising signs
Advertising: No advertising is permitted on the site other than the following:
- Approved project signs.
- Manufacturer's name or names of owner on items of construction plant.
- Contractor's mail box.

Project work signs
Requirement: Supply, install, maintain and remove all project work signs.
Project works signs: Provide as required in Conditions of Development Consent or Construction Certificate or as required by the Superintendent for Council projects.
Site possession: Install all project works signs no later than one week from receiving the notice of possession of site.
Removal of signs after practical completion: No earlier than 4 weeks and no later than 6 weeks after practical completion

3.6 SURVEY CONTROL

General: All survey required by the Specifications shall be arranged and carried out by the Contractor. All costs shall be borne by the Contractor.
Road construction survey: To ICSM QA Specification G71 Road construction surveys.

Supplied survey setting out information
Certification: Before commencing the Works, check the digital design model provided for discrepancies between the digital design model and the drawings.
Provision of marks: The Superintendent will provide permanent marks as shown on the drawings and establish bench marks related to the level datum.
Transfer of marks: Transfer permanent survey marks clear of the operations before any of the given survey marks on the base lines or the various control lines are affected by the Works. This is a WITNESS POINT.
Relocation of survey control: Submit request for relocation of survey control, establishment of recovery pegs, or setting out or levelling. If no notice is provided and a control mark is disturbed or destroyed, then the cost of re-establishing the control is borne by the Contractor. This is a HOLD POINT.
Protection: Protect all supplied survey marks. The Contractor is responsible for any costs associated with re-establishing marks.

Set out pegs
Recovery pegs: Provide and fix adequate recovery pegs in suitable locations adjacent to the elements of work.
Removal: Unless otherwise directed, remove all pegs and profiles at practical completion.

Survey equipment
Requirement: Use electronic total stations and ancillary equipment for survey tasks in conformance with the following:
- Electromagnetic distance measuring device (EDM): Standard deviation for error < 5 mm ± 5 ppm.
- Horizontal and vertical circles: Angular measurement standard deviation for error < 3 seconds of arc.
- One second of arc minimum count.
- Diometrical vertical circle reading and automatic tilt compensator.
- Capability to electronically record and store field data such as horizontal and vertical angles, distances, point notation, target and instrument heights.
- Calibration procedure and calibrated at all times.
- Calibrate immediately after any repairs.

**Laser and global positioning construction control systems**
Horizontal and longitudinal alignment control requirements:
- Offset pegs on one side of the road formation.
- Offset pegs 500 mm from the surface design edge of subgrade.
- Clearly mark chainages on the pegs.
- Spacing between pegs < 50 m on the straights and < 20 m on curves including all curve tangent points.
- Place pegs vertically.
- Tolerance:± 25 mm to the exact horizontal location.
- Protect from disturbance. Submit procedure. This is a HOLD POINT.

**Removal**: Remove all pegs at practical completion.

### 3.7 SITE COMMUNICATIONS

**Site meetings**
Representation: Provide representation, including any Subcontractors that may be required to attend regular site meetings.

Meeting agenda: Include performance measures, coordination of program and work under the contract and resolution of any questions regarding the intent or interpretation of the documents.

Meeting time: To be determined by the Superintendent.

Minutes: Site meetings will be chaired and minuted by the Superintendent. Copies of the minutes will be issued to all present at the meeting and others concerned with the matters discussed.

Note: For development works, the Council Engineering Development Officer is to be provided with Meeting agendas prior to the meeting and minutes after the meeting should they be required by the Council Engineering Development Officer.

### 3.8 ENVIRONMENTAL PLANNING

**Protection of the environment**
General: As defined in the Conditions of Development Consent for Development and as defined in approvals for Council projects.

Environmental assessment and planning: As defined in the Conditions of Development Consent and as defined in approvals for Council projects.

Project specific environmental requirements: As defined in the Conditions of Development Consent and as defined in approvals for Council projects.

Erosion and sedimentation control: To 1102 Control of erosion and sedimentation.

Work outside working hours: Submit for approval any works required outside of normal working hours. Do not use any plant, machinery or equipment that would cause or is likely to cause a nuisance to the public.

Dust control: Minimise dust from disturbed areas. Submit dust control strategy before commencing excavation/earthworks operations. This is a HOLD POINT.

Removal of material: Dispose of material off-site to the requirements of the relevant Authorities.

Keep roads clean of soil: If required, keep roads clean of soil, provide the following:
- Wheel washes and rumble grids at all main road crossings.
- Sweep roads at least once a day where construction vehicles are travelling off the site.
- Cover all loads of soil being taken off site for disposal.

**Drainage of Works**

Stormwater control: To 1351 Stormwater drainage (Construction).

Stormwater diversion: Provide effectual diversion of surface water and proper flushing for storm and subsoil water across and beyond the works at all times. Do not interrupt the flow of stormwater and drainage along existing gutters and water tables.

Pumping: Keep trenches and excavations dewatered at all times during construction, including maintaining any pumping equipment.
Great Lakes Council

Timing: Complete all permanent retention basins, and temporary erosion and sedimentation control measures before commencing earthworks.

**Blasting**
Blasting is not permitted: If required, submit for approval to conform with *Earthworks (Roadways)*.

**Air quality**
Exhaust gases: Ensure there is no health risk or loss of amenity due to the emission of exhaust gases to the environment.

**Storage of fuels and chemicals**
Storage: Safely store all fuel and chemicals and conform to the following:
- Minimise fuels and chemicals stored on site.
- Install bunds and take other precautions to reduce the risk of spills.
- Implement a contingency plan to handle spills.

Toxic chemicals: Do not use herbicides and other toxic chemicals without written approval. This is a **WITNESS POINT**.

### 3.9 NOISE AND VIBRATION CONTROLS

#### Limits on noise

Working hours: Operational hours of plant, including the entry and/or departure of heavy vehicles, is restricted to 7 am to 6 pm Monday to Friday, 8 am to 1 pm-Saturday and at no times on Sundays or Public Holidays. In addition, a piling hammer or excavation shall only be used between the hours of 8 am and 5 pm Mondays to Fridays. Work outside of the hours specified is not permitted without approval. Maximum noise levels: Avoid excessive noise and long periods of elevated noise that is reasonably anticipated to annoy or adversely affect the adjacent community.

Sound pressure threshold: Less than $L_{10}$ sound pressure level threshold, when measured at noise sensitive locations such as residential premises.

Assigned $L_{10}$ sound pressure level threshold:

According to the *Environmental Protection Agency - EPA - the Day-Night Sound Levels - $L_{eq}$* and the *Equivalent Sound Level - $L_{eq}$* - should not exceed certain limits to protect public health and welfare.

Values that should not be exceeded can are indicated in the table below:

<table>
<thead>
<tr>
<th>Effect</th>
<th>Level</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing</td>
<td>$L_{eq} (24) &lt; 70$ dBA</td>
<td>All areas</td>
</tr>
<tr>
<td>Outdoor activity interference</td>
<td>$L_{eq} &lt; 55$ dBA</td>
<td>Outdoors in residential areas and farms where people spend varying amounts of time in which quiet is a basis for use</td>
</tr>
<tr>
<td>and annoyance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor activity interference</td>
<td>$L_{eq} &lt; 45$ dBA</td>
<td>Indoor residential areas</td>
</tr>
<tr>
<td>and annoyance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor activity interference</td>
<td>$L_{eq} &lt; 45$ dBA</td>
<td>Indoor areas with human activities such as schools, etc.</td>
</tr>
<tr>
<td>and annoyance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Outdoor yearly $L_{eq}$ levels protect public health and welfare if they do not exceed 55 dBA in sensitive areas as residences, schools, hospitals, etc.
* Indoor building yearly $L_{eq}$ levels protect public health and welfare if they do not exceed 45 dBA.

**Note:** To protect against hearing damage, one's 24-hour noise exposure at the ear should not exceed 70 dBA.

Noise suppression: Minimise noise nuisance including the following:
- Enclose noisy equipment.
- Provide noise attenuation screens.
- Maintain plant in good working order.
- Fit effective residential class silencers to all engine exhausts.
- Fit engine covers to all plant.

**Damage**
Responsibility for damage: Any damage and compensation payments resulting from non observance of the above requirements are the responsibility of the Contractor.
Limits on ground vibration

Levels: Make sure ground vibration levels transmitted from operating items of plant in the vicinity of residential premises do not exceed levels that are close to the lower level of human perception inside the premise or cause structural damage to the building.

Vibration limits: To AS 2670.1 and AS 2670.2.

Preferred and maximum weighted RMS values for continuous and impulsive vibration acceleration (m/s²): 1-80 Hz: Curve 4 for period of 1 month or less, Curve 2 for a period of more than 1 month.

Acceptable vibration dose values for intermittent vibration (m/s¹.75): 5mm/sec.

Vibration assessment report: A vibration assessment report will be required if called for in the Conditions of Development Consent or the Construction Certificate.

Responsibility for damage: The Contractor is responsible for any damage and compensation payments as a result of non-observance of the above requirements; no claims will be considered by the Principal for Development nor the Council for Council Construction projects.

3.10 UTILITIES AND AUTHORITIES

Location

Drawings: The location of all existing utilities and services shown on the drawings are indicative only.

Verify: Before the commencing any excavation, ascertain and verify the location and depth of all Public Utility Mains and Consumer Services.

Contact: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, of locating underground pipe and cables. See www.dialbeforeyoudig.com.au.

Notify: If there is any conflict between the actual location or elevation of any item and the location or elevation of any item shown on the drawings, notify the Superintendent. This is a WITNESS POINT.

Protection of services and utilities

Precautions: Secure and protect existing gas, water or drainage pipes, sewers, electric conduits or other existing works both underground and overhead.

OHS: Comply with statutory requirements for maintaining safe working clearance to overhead electrical services.

Repair to existing: Repair any damage caused to existing water, gas or drainage pipes, sewers, electric conduit or other existing works or services to the satisfaction of the Superintendent and the relevant Authority.

Costs: If repairs are not acceptable, the Superintendent may arrange repairs and charge the Contractor.

Notice to divert services: Give notice if it is required to remove, divert or cut into any existing sewer, drainage pipe, gas or water main, service pipes, electric conduits or other existing works. Obtain direction for alterations to existing works. This is a WITNESS POINT.

Protection responsibility: The Contractor is responsible for the protection of any facilities and structures during the Contract period.

Liaison

Contractor responsibilities: Liaise with the service Authorities contractors as follows:

- Make appropriate allowances in the program for coordination with service Authorities.
- Make appropriate allowances in the program for the provision of installation by service Authorities during the works.
- Reinstatement, make good and backfill service trenches to the requirements of the service Authorities.
- Do not stop work due to operations by service Authorities without written notice.
- Do not interfere with the operations of service Authorities or their contractors on or near the site.
- Allow service Authorities to work on or near the site.

Limitations to work methods: Confirm, and include within work method procedures, any limitations with the relevant Authority, such as vibrations in the vicinity of underground and overhead facilities.

Relocation of services

Relocations of services by the Contractor: Arrange all relocations or alterations to the Relocation/alteration to services (by Contractor) schedule.

Timing of Contractor relocations of services: The Contractor is to program service relocations to align with the project timeline and so as to provide minimum inconvenience to the Community.
Great Lakes Council 0136 General requirements (Construction)

Relocations of services by the Principal: Relocations and expected program to Relocation/alteration to services (by Principal) schedule. Confirm relocation/alteration to services before commencement of works. This is a HOLD POINT.

Additional adjustments: If required by an Authority, provide additional adjustment to plant.

Maintenance responsibility: The Contractor is not 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).

Utility relocation: Do not move utilities due to equipment or method of operation without approval from the relevant Authority.

Programming and duration of utility adjustments

Notice of date of completion: Give notice 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 worksection can be relocated. This is a WITNESS POINT.

Timing: Do not proceed with final trimming or subsequent parts of the work in any area of the work until the adjustment of all utilities within that area is complete.

Delays due to work by Authorities: If required, allow Authorities to remove, relocate, or work on their facilities before continuing the Works.

Allowance for utility adjustments: Program of utility adjustments to be provided to the Superintendent prior to commencement of works.

Extension of time: The Contractor is entitled to extensions of time if the utilities have not been relocated by these dates and this causes delay to the Contract. The Contractor has no right to monetary compensation or to any claim for damages because of any loss attributable to such delays.

3.11 SITE FACILITIES

General

Requirement: Provide and maintain temporary site facilities for personnel, including the office for the Superintendent, and the necessary temporary utility services. Remove or restore at practical completion.

Facilities required: Provide, equip and maintain temporary ablution facilities, dressing rooms, tool houses and other facilities required by any Industrial Ordinance, Award or Agreement for use of workers employed by the Contractor, or the Contractor’s sub-contractors. Remove them at practical completion.

Latrines: Provide temporary latrine accommodation for use of the workers, suitably enclosed and screened and in conformance with the requirements of the Local Authority.

Sewer: Make a temporary connection to an existing sewer where one is available. Cap temporary sewer connection at practical completion.

Site facility design: Before erecting site facilities, submit a proposal for positioning of all units, services including septic or sewer, rubbish collection and storage areas for approval. Obtain approval from the local Authorities prior to submission. This is a HOLD POINT.

Office for Superintendent. Note: Optional condition for development. Required for Council Project.

Requirement: Provide, equip, maintain and remove at practical completion, an office, including toilet facilities, for the sole use of the Superintendent and staff. Conform with the following:

| Prefabricated building | - Minimum inside dimensions: 6 x 3 x 2.4 m high exclusive of toilet facilities. |
|                        | - Weatherproof, adequately insulated and well ventilated. |
|                        | - Provide two opening type windows fitted with insect-proof screens and an external door fitted with a cylinder night lock with two keys. |
|                        | - Floor area: Approved vinyl flooring. |
|                        | - Walls and ceiling: Painted to the approval of the Superintendent. |

| Furniture and fittings | - One reference table of minimum size 1.5 x 0.9 m. |
|                        | - One desk, with lockable drawers, of minimum size 1.5 x 0.9 m. |
|                        | - Three office chairs and one stool all with padded seats, swivel base and adjustable height. |
|                        | - Two 1.2 m² pin boards fixed to the walls. |
|                        | - One 0.75 kW reverse cycle air conditioner. |

| Prefabricated toilet   | - Weatherproof and well ventilated, and connected to the temporary |
| Facilities                | sewerage system.  
|                          | - Minimum of one partitioned w.c. cubicle with door and latch. 
|                          | - Separate wash area with minimum of one wash basin connected with hot and cold running water. 
|                          | - Lockable external door with two keys. 
| Electricity              | - Lighting to the office and toilet facilities. 
|                          | - Two double power points to the office. 
| Telephone and data service| - Two telephone lines connected to the office with one line fitted with a telephone hand set. 
|                          | - Provide a second line for a facsimile machine supplied by the Superintendent. 
|                          | - Provide data telecommunication service connection to access emails and download drawings etc. |

Charges: Pay all charges resulting from the supply, erection, installation, maintenance, cleaning and removal of the office, toilet facilities, electricity and telephone services.

Alternative site facilities: Submit proposal with full details for the use of alternative site facilities in existing buildings adjacent to, or in close proximity to, the Works.

**Water supply**
Temporary water supply: Provide temporary water supply for site facilities and for carrying out the Works.

Approvals: Obtain all approvals from the appropriate Authority for temporary water supply.

Removal: Remove on completion of the contract the temporary water supply service, except that to the Superintendent’s office.

**Electrical service**
Temporary electricity supply: Provide any temporary electricity supply required for site facilities and for carrying out the work under the contract.

Approvals: Obtain all approvals from the appropriate Authority for temporary electricity supply.

Removal: Remove on completion of the contract the temporary electricity supply service, reticulation and lighting except that to the Superintendent’s office.

**First aid**
Requirement: Provide, equip and maintain an adequate First Aid Treatment Centre on the site with an experienced First Aid person available at all times when work is in progress.

Signage and location: Clearly mark the First Aid facilities and make accessible to all personnel at all times.

Minimum provisions: To the current statutory requirements.

**Chain wire fence**
Fence: Provide a 1.83 m high galvanized chain wire mesh perimeter fence to 1195 Boundary fences for road reserves.

Gate: Provide a galvanized tubular steel vehicular access gate, for the temporary site facilities as documented or as directed.

Hessian covering: Cover the mesh fence with a suitable hessian or shaded cloth screen for its full height.

Removal: Remove all galvanized fence, screen material and gate at practical completion.

## 4 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

### 4.1 MEASUREMENT

**Methodology**
The following methodology will be applied for measurement and payment:

- No separate measurement and payment will be made for compliance with the requirements of this work section except as specified in the pay item below.
4.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0136.1 Site Establishment</td>
<td>Lump sum</td>
<td>All costs associated with site establishment. To include all documented facilities, site security, fencing, signage, etc.</td>
</tr>
<tr>
<td>0136.2 Office for Superintendent</td>
<td>Lump sum</td>
<td>All costs associated with the provision of the documented facilities.</td>
</tr>
<tr>
<td>0136.3 Items from Superintendent</td>
<td>Each Calculate for each type and quantity of each type of item/material.</td>
<td>All costs associated with receiving, storing and handling items to be supplied from Superintendent.</td>
</tr>
</tbody>
</table>

5 ANNEXURE A

Note: This item is an Optional condition for Development. Required for Council Project.

5.1 ITEMS TO BE SUPPLIED BY PRINCIPAL

<table>
<thead>
<tr>
<th>Purpose in works</th>
<th>Material type</th>
<th>Location</th>
<th>Approx. quantity available</th>
<th>Cost as a rate excl GST</th>
<th>When available</th>
<th>Worksection clause</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

5.2 RELOCATION/ALTERATION TO SERVICES (BY CONTRACTOR)

<table>
<thead>
<tr>
<th>Type of utility or service</th>
<th>Owner</th>
<th>Location</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3 RELOCATION/ALTERATION TO SERVICES (BY PRINCIPAL)

<table>
<thead>
<tr>
<th>Type of utility or service</th>
<th>Owner</th>
<th>Location</th>
<th>Requirement</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4 CONTACTS

Contacts schedule

<table>
<thead>
<tr>
<th>Authority</th>
<th>Name</th>
<th>Position</th>
<th>Phone number</th>
<th>Fax number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and sewerage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telstra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Establish, implement and maintain a quality management system (QMS) that provides confidence to the Principal of the following:
- The product specified can be produced.
- Critical processes are under control.
- Product performance has been confirmed.

Design
- design details and all the design parameters for the project for design

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Note: Only the most current standards are to be used.

Standards
AS 1289 Methods of testing soils for engineering purposes
AS 1289.1.4.1 Sampling and preparation of soils-Selection of sampling or test sites
Random number method
AS/NZS ISO 9000 Quality management systems-Fundamentals and vocabulary
AS/NZS ISO 9001 Quality management systems-Requirements
AS/NZS ISO 10005 Quality management systems-Guidelines for quality plans
AS ISO 10013 Guidelines for quality management system documentation
AS/NZS ISO 19011 Guidelines for quality and/or environmental management systems auditing

1.4 STANDARDS

General
Standard: To AS/NZS ISO 9001.

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
- CAR: Corrective Action Request.
- ITP: Inspection and Test Plan.
- NNC: Notice of Nonconformance.
- QAR: Quality Assurance Representative (Principal).
- QMR: Quality Management Representative (Contractor).
- QMS: Quality Management System.
- WAE: Work-as-executed.

Definitions
For the purpose of this worksection, the definitions given in AS/NZS ISO 9000 and the following apply:
- Certification: A written assertion of facts.
- Corrective action request: A formal advice/instruction from the Superintendent requesting action to eliminate the cause of a detected nonconformity or other undesirable situation. Unless specifically noted, it will not require raising of an NCR.
- Disposition: Action taken to resolve nonconformance. (Lot Specific)
- Hold Point: A defined position during the Contract beyond which work cannot proceed without mandatory verification and acceptance by the Superintendent. The issue of an NCR or a 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.
- Lot: Any part of the works which has been constructed/manufactured under a continuous operation of uniform conditions and is essentially homogeneous with respect to material and general appearance. The whole of the work included in a lot of a uniform quality without obvious changes in attribute values.
- 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.
- Notice of nonconformance: Formal instruction from the Superintendent regarding product nonconformance from documented requirements. It automatically creates a Hold Point and requires an NCR from the Contractor.
- Performance audit (Process audit, Technical procedure audit, Methods audit): An examination to evaluate whether established methods and procedures are being adhered to in practice.
- Product: The result of a set of interrelated or interacting activities which transforms inputs into outputs.
- Product audit (Conformance audit, Service audit): An assessment of the conformity of the product with the specified technical requirements.
- Qualified surveyor: A surveyor who is eligible for membership of the Spatial Sciences Institute as a certified engineering surveyor.
- Quality assurance representative (QAR): Appointed by the Principal for a specific project and responsible for the auditing, review and surveillance of procedures and documentation required by the Contractor's approved Quality Plan.
- Quality 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 management representative (QMR): Also known as Project quality representative, appointed by the Contractor for a specific project with the authority and responsibility for the implementation and operation of the Quality Plan, to ensure that QMS requirements are not subordinated to design and productivity.
- Quality register: The files containing all quality control records such as test results, completed check lists, certificates of compliance, consignment dockets for materials procured.
- Quality management system: The organisational structure, responsibilities, procedures, processes and resources for implementing quality management.
- Quality management system requirements: The administrative activities affecting quality that need to be implemented and controlled to make sure that the product or a service meets documented quality requirements.
- Special processes: Those processes, the results of which cannot be directly examined to establish full conformance. Assurance of satisfactory conformance depends on evidence generated during the process.
- System audit: An examination of the documented quality management system represented by the quality manual, quality plan and quality register to evaluate their effectiveness in meeting the requirements of Australian Standards and the Contract documents.
- Validation: Confirmation, through the provision of objective evidence, that requirements for a specific intended use or application have been fulfilled.
- Witness point: A nominated position in the manufacture/construction stages of the Contract where the option of attendance may be exercised by the Superintendent, after notification of the requirement.
- Works: All labour, plant, equipment and materials required to complete a project in conformance with the Contract documents.

2 QUALITY MANAGEMENT SYSTEM

2.1 GENERAL REQUIREMENTS

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

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

Responsibility: QMS requirements do not relieve the Contractor of the responsibility to conform with the contract documents.

Subcontractors and Suppliers: Conform with this worksection and AS/NZS ISO 9001. This can be achieved by either of the following:
- Suppliers and Subcontractors operating their own QMS, linked to and coordinated under the Contractor’s QMS.
- Suppliers and Subcontractors operating under the Contractor’s QMS.

System requirements
QMS: Plan, develop and maintain a documented QMS conforming to this worksection, Annexure A and AS/NZS ISO 9001.

System purpose: To make sure of the following:
- The proposed work method is consistent with the specification requirements.
- ITPs and checklists are adequate and complete.
- Approved work methods are followed.
- The Superintendent adequately checks Hold and Witness Points.

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

Management responsibility
Commitment: In the development a corporate QMS in conformance with AS/NZS ISO 9001 section 5, top management must perform the following:
- Focus on customer, statutory and regulatory requirements.
- Define authorities and responsibilities.
- Appoint QMR.
- Establish internal communication and review procedures.
- Make sure resources are available.

2.2 DOCUMENTATION REQUIREMENTS

General
QMS documentation requirements: Include the following:
- Quality policy and its objectives.
- Quality manual.
- Procedure documents.
- Work instructions.
- Forms.
- Quality plans.
- Specifications.
- Relevant external documents.
- Records.

Changes: Immediately implement changes to the project Quality Plan and QMS if the following occurs:
- Specification requirements are not adequately addressed.
- Nonconformity resulting from the Quality Plan or QMS.
- Audit initiates changes to the QMS.
- Practices have changed.

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

AS/NZS ISO 9001: Keep a copy on site at all times.

**Quality manual**

Requirement: To AS/NZS ISO 9001 clause 4.2.2 and AS/NZS ISO 10013 clause 4.4. Include the following in the Quality Manual:
- Responsibility statements.
- Corporate policy.
- All applicable system requirement descriptions with reasons for those not regarded as applicable.
- Standard method statements.
- Standard ITPs.

**Project Quality Plan**

Requirement: Provide and maintain a Quality Plan to AS/NZS ISO 9001 and AS/NZS ISO 10005. Provide the following:
- Progressive documentation of new procedures as the work types become evident.
- Planning and control systems: Describe critical processes and activities and provide verification for product control.
- Coordination with the Contractor's corporate Quality Manual.
- Project specific quality system: Inform and direct personnel about the specific quality practices, resources, sequence of activities, controls and checks that must be implemented during the works.
- Controlled conditions: Documentation to explain how each work process will be carried out.
- Organisation structure: Include details of the specific responsibilities and authorities of the key personnel nominated for the management of the project.
- QMR: Include the person's qualifications, technical experience and present position, together with responsibilities and authorities to resolve quality matters.
- Details of 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.
- Details of the person authorised to change construction processes on site.
- ITPs to verify the works conform with the contract documents.
- Purchasing quality requirements:
  - Critical characteristics of purchased products that affect the quality of the final product.
  - Method of communication with suppliers.
  - Methods used to evaluate, select and control suppliers.
  - The facilities and services that will be outsourced.
  - Material samples: The approved sample is the quality benchmark.
- Purchasing quality verification: Conform to the following worksections:
  - 0162 Quality (Supply).
  - 0163 Quality (Delivery).

**Control of documents**

Document control: Conform to AS/NZS ISO 9001 clauses 4.2.3 and 4.2.4 and AS/NZS ISO 10005 clauses 5.6 and 5.7.

Register: Maintain a register of each part of the Quality Plan. Register the number, date and recipient(s). Reissue to all registered when the Quality Plan is changed, superseded or recalled as required.
Requirement: Document within the Quality Plan the method of keeping quality registers, tracking and handling of NCR's, NNC's and site correspondence.

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

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

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

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

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

Audit reports: Provide copies to the Superintendent as requested.

NOTE for Developments provide a completed QA package to Council at the conclusion of the works. That is, all project records and test results as above.

2.3 RESOURCE MANAGEMENT

General

Conformance: Conform to AS/NZS ISO 9001 section 6 and AS/NZS ISO 10005 section 5.8.

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

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

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

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

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

2.4 PRODUCT REALISATION

Planning and design

Planning: Conform to AS/NZS ISO 9001. Determine the following:
- Quality objectives and requirements for the product.
- Processes and documents specific to the product.
- Required verification, validation, monitoring, measurement, inspection, test activities and the criteria for acceptance of the product.
- Records required as evidence that the realisation processes and resulting products conform.

Design: Design and/or verify the following, to conform with the Technical Specifications and AS/NZS ISO 9001:
- Temporary structures.
- Checking of permanent structures for construction loadings.
- Lifting devices for manufactured items.
- Alternative permanent structures or structural components proposed.
- Concrete mixes for structures and pavements and asphalt mixes for permanent works.
- Traffic control, temporary roadways and detours.
- Permanent works where design is nominated in the contract.

2.5 CONSTRUCTION AND SERVICE PROVISION

Control

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

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

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

System audit: Audit each method statement whilst the process is in effect.

Absence of a method statement: If a method statement for a particular activity is required and there is none submitted, this will generate a Hold Point.

**Construction activities table**

<table>
<thead>
<tr>
<th>Worksection</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0257 Landscape – roadways and street trees</td>
<td>Landscaping</td>
</tr>
<tr>
<td>0292 Masonry walls</td>
<td>Construction of masonry walls</td>
</tr>
<tr>
<td>0293 Crib retaining walls</td>
<td>Construction of crib retaining walls</td>
</tr>
<tr>
<td>0319 Minor concrete works</td>
<td>Sprayed concrete</td>
</tr>
<tr>
<td>1111 Clearing and grubbing</td>
<td>Selective clearing and proposed equipment. Work near trees. Work within 4 m of tree</td>
</tr>
<tr>
<td>1112 Earthworks (Roadways)</td>
<td>Excavation procedures</td>
</tr>
<tr>
<td>1113 Stabilisation</td>
<td>Proposed curing method</td>
</tr>
<tr>
<td>1193 Rigid concrete and road safety barrier systems</td>
<td>Precast barriers. Installation</td>
</tr>
<tr>
<td>1341 Water supply - reticulation (Construction)</td>
<td>Protection of existing services. Cutting and disposal of existing asbestos pipe</td>
</tr>
<tr>
<td>1361 Sewerage systems – reticulation (Construction)</td>
<td>Protection of existing services</td>
</tr>
<tr>
<td>1392 Trenchless conduit installation</td>
<td>Trenchless conduit installation. Existing services</td>
</tr>
<tr>
<td>1433 Footpath and kerb ramp repairs</td>
<td>Safe work</td>
</tr>
</tbody>
</table>

**Lot identification**

Lots: Divide all items of work into lots as follows:
- Limits: Before sampling, choose lots within the limits given in the particular technical specification.
- Lot size: Not exceeding one day’s output for each work process being testing.
- Lot numbering: Allocate unique lot numbers compatible with the construction program. Use lot numbers to be identifiers on all QMS data.
- Field identification: Physically identify each lot, clearly identify lot boundaries. Maintain identification until the lot has achieved the specified quality.

Work on a lot: Do not commence work until the field identification is established.

Lot boundaries: When boundaries of a lot change, update the quality register.
Lot identification system: Make sure all site records and sample numbering systems allow easy identification of all test results and the materials incorporated in the works.

**Traceability**

*General: Provide and maintain records of components for audit. Include the following traceability in the records:
- Concrete: Start the trace at the batch plant and finish at the location where the concrete is incorporated in the works.
- Asphalt: Start the trace at the batch plant and finish at the location where the asphalt is incorporated in the works.
- Stabilised material: Start trace at the batch plant and finish at the location where the material is incorporated in the works.
- Steel: Start the trace at the steelworks and finish at the location where the steel is incorporated in the works. Record the steel heat number, testing details and final location of installation.
- Batch details: Record all batch quantities, mix and dispatch time, testing details and location of placement.

**Control of monitoring and measuring equipment**

Equipment accuracy: Maintain inspection, testing and measuring equipment capable of producing the degree of accuracy specified in the referenced test methods. Records: Demonstrate accuracy with regular records of calibration.

### 2.6 MEASUREMENT AND ANALYSIS

#### General

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

Sampling: Conduct by personnel from the NATA registered laboratory which has been accredited for that sampling procedure and supervised by the approved signatory from that laboratory.

Test results: Report on NATA endorsed test documentation which includes a statement by the approved signatory certifying that the correct sampling procedures have been followed.

Reinstatement: Reinstall all core holes, test holes, excavations and any other disturbance resulting from any testing activity to the standard within the Technical Specification.

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

Sampling locations: Propose sampling locations for approval prior to proceeding.

In-process and conformance inspections: Required for all works to confirm conformance. Performed by a responsible officer nominated in the Check List and certified by the Contractor’s QMR.

#### Frequency of testing

Minimum frequency of testing: Must be not less than that stated in the relevant work section and as listed within the Sub-annexes of Annexure C.

Reduced frequency of testing: Submit proposal for approval with supporting statistical analysis verifying consistent conformance to the quality requirements.

#### Inspection and test plans

Document: Include within the quality plan all inspections, tests and documentation necessary to demonstrate that the works conform.

ITP: Establish and progressively maintain a system to demonstrate inspection and testing in conformance with AS/NZS ISO 9001 clause 8.2.4.

Minimum information for ITP (or ITP forms): Include the following:
- Person responsible for carrying out in-progress and final inspections or testing and at what stage of works these are to be carried out.
- Proposed inspection or test methods and recording of results.
- Acceptance criteria and frequency of inspection and testing.
- Specification tolerances.
- Person responsible for reviewing inspection and test results, evaluating whether work conforms, determining future action when work does not conform and closing out work lots.
- Measures to control nonconformity.
- When statistical analysis of test results is required.
- Person responsible for performing the final review of results to confirm that all inspections and tests have been carried out to verify complete conformity for each lot.
- Time limits for testing, submission, Hold Points and Witness Points that are nominated in the specifications.
- Identification of Hold Points or Witness Points.
- Check list for each lot.

Test Register
Lot identification register: Include the following information:
- Three dimensional surveyed location of the lot to include the chainage of the start and finish points, lateral location and layer location and/or the particular structure (eg. pier or abutment number, concrete placement number, etc).
- Indication of conformance or nonconformance.
- Summary of test results.
- Location of test sites including test identification numbers.
- For nonconforming lots, allocate a new number to the resubmitted/subdivided lot(s), ensure it also references the original lot number.

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

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

Test locations: Determine test locations for random sampling in conformance with AS 1289.1.4.1.
Location restrictions: Do not restrict sampling to locations dimensioned or otherwise defined for setting out the works in the drawings or specification.

2.7 MONITORING AND MEASUREMENT

Hold points
Format: A summary of Hold Points are tabled in the INSPECTIONS clause of each worksection.
Notice of inspection: Notify the Superintendent in advance of a Hold Point being reached.

Requirements for approval to proceed: In conformance with the following:
- Provide the information required by the technical specification.
- Certify that the particular lot/process is conforming.
- 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.

Witness point: If the Hold Point has resulted from an NCR or NNC, the Superintendent's approval may be conditional on a Witness Point being included. A summary of Witness Points on-site and off-site are tabled in the INSPECTIONS clause of each worksections.

2.8 SURVEYING CONTROL

Requirements
Survey control: A separate system requirement to include all measurement, calculation and recording procedures necessary to:
- Set out the works.
- Verify conformance with the drawings and specification in relation to dimensions, tolerances and three dimensional position.
- Determine lengths, areas or volumes of materials or products, where required for measurement of work.
Method Statement: Describe the control parameters for special processes which cannot be fully verified by inspection and testing. Address all potential errors that could be introduced by survey methods.

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

Equipment: The procedures and equipment used must be capable of attaining the tolerances nominated in the specification.

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

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

Control of documentation
Survey conformance report: Submit a survey conformance report for each lot or component where design levels, position and/or tolerances have been specified. Refer to the relevant worksection of the technical specification to establish if a Hold Point is generated before further works can commence.

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

Survey records: Provide all survey records including equipment calibration records and nonconformity registers.

Field book pages: Include the following, clear labels, date and signature by the surveyor, cross indexed references to equipment used and lot/component identification. Survey conformance reports produced must reference the relevant field book page numbers.

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

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

2.9 CONTROL OF NONCONFORMING WORKS

General
Detection and reporting: Report any works that depart from the documented requirements on a NCR form within two working days of detection, including the proposed disposition. A sample NCR form is included in Annexure B.

Proposed disposition: Include any of the following actions:
- Proposed additional works to bring the lot up to the specified standard.
- Proposed replacement of all or part of the lot to bring it up to the specified standard.
- A request to use the lot for a reduced level of service, if such a clause exists in the relevant worksection of the Technical Specification.
- For incidental defects, a request that the Superintendent accept the lot without alteration, as an exception with or without alteration to the respective unit rates.

Monitoring and measuring
NCR: Generates an automatic Hold Point until conformance has been achieved and the Superintendent has signed authorisation to proceed.

Progress: Do not cover any nonconforming works until a disposition has been accepted/approved and implemented.

Reworking: If the nonconformance can be overcome by reworking the lot with the original process, an NCR will not be required. However, maintain a record of the non-conformance to aid continual improvement.

Verification: Reworked/replaced lots to conform to the specified requirements.

Discrepancy: The Superintendent's test results will prevail where there is any discrepancy in test results.

Control of documentation
CAR: Issued by the Superintendent for nonconformance to the Contractor's quality system or methods. Unless specifically stated, this will not create a Hold Point.
NNC: Issued by the Superintendent for product nonconformance. This will immediately create a Hold Point and the Contractor is required to submit an NCR.

NCR form: Example form provided in Annexure B. If using alternative form it must include the following:
- 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.

Authorised representative: All actions are to be signed off by authorised representatives of the Contractor and Superintendent as applicable (i.e. QAR and QMR).

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

Corrective action
Requirement: Document procedure for corrective action to quality plan in conformance with AS/NZS ISO 9001 clause 8.5.2.

Proposed corrective action: Indicate on the NCR form the corrective action appropriate to ensure that the quality plan is effective in avoiding a recurrence of the nonconformance and continues to be effective.

2.10 COMPLETION

Finalisation
WAE: Submit WAE drawings for all works upon practical completion.

Register: Submit a copy of the quality register within one month of the date of practical completion.
Also provide a copy of all quality records to Council.

Defects liability period: All quality related issues must be resolved and closed out before the end of the defects liability period.

Maintenance
Documents: Provide copies of all:
- Commissioning records.
- Operation manuals.
- Maintenance manuals.
- Product warranties.

Review
Note: Optional condition for development. Required for Council Project.

Requirement: Organise meeting(s) at end of contract to review the quality system and technical issues encountered on the project and the lessons to be learned for future projects. Review to focus on:
- The identification of nonconformances and the implementation of corrective action.
- Issues arising from inspections and audits.
- Specification issues.
- Design and technical issues.
- Safety issues.

Timing: Hold meeting(s) as close to practical completion as possible, before key personnel move on, so that they are still available to participate in review process.

Documentation: Determine procedures for end of contract review within quality plan.
3 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

3.1 MEASUREMENT

General
Payments made to the Schedule of Rates: To 0152 Schedule of rates – projects, this worksection, the drawings and Pay items 0161.1.

Unpriced items: If any item, for which a quantity of work is listed in the Schedule of Rates, is not priced, make due allowance in the prices of other items for the cost of the activity.

Methodology
The following methodology will be applied for measurement and payment:

- Progress payments for Pay item 0161.1 are made pro rata on the monthly value of work done.
- Include any costs associated with preparing and conforming to the supply Quality Plan, see worksection 0162 Quality (Supply), in the unit price for product supply.
- Include any costs associated with preparing and conforming to the delivery Quality Plan, see worksection 0163 Quality (Delivery), in the unit price for product delivery.

3.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0161.1 Quality requirements</td>
<td>Lump sum</td>
<td>All costs for inspections, conformance surveys and testing required to verify that all aspects of the Works conform to the quality assurance provisions of the Contract.</td>
</tr>
</tbody>
</table>
4.1 ANNEXURE A - PROJECT QMS DOCUMENTATION FLOW CHART

```
CONTRACT DOCUMENTS

AS/NZS ISO 9001

Specification for Contract Quality system

Technical Specification

0147 Conditions of contract

JOB SPECIFIC DOCUMENTS

Quality Manual Annexures

Method Statements

Inspection and Test Plans

Checklists

QUALITY PLAN

SELECTED STANDARD CORPORATE DOCUMENTATION

Company Quality Manual Including SYSTEM REQUIREMENT DESCRIPTIONS

Standard Method Statements

Inspection and Test Plans

Standard Checklists

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April 2015
```
4.2 ANNEXURE B – SAMPLE NONCONFORMANCE REPORT

<table>
<thead>
<tr>
<th>NONCONFORMANCE REPORT</th>
<th>NCR No:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONTRACT:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PRODUCT OR SERVICE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SUB-CONTRACTOR (if appropriate):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>INSPECTION &amp; TEST PLAN (ITP) No:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LOT No AND DESCRIPTION/LOCATION:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DETAILS OF NONCONFORMANCE:**

- ...
- ...
- ...
- ...
- ...
- ...

**PROPOSED DISPOSITION:**

- ...
- ...
- ...
- ...
- ...
- ...

**IS A SUPPLEMENTARY REPORT ATTACHED?:** YES ☐ NO ☐

**PRINCIPAL:** APPROVED ☐ REJECTED ☐

**COMMENT:**

- ...
- ...
- ...
- ...
- ...

**PRINCIPAL SIGNATURE:**

<table>
<thead>
<tr>
<th>Disposition Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Contractor) DATE:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Release of Hold Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Superintendent) DATE:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Close Out of Nonconformance Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Contractor QMR) DATE:</td>
</tr>
</tbody>
</table>
4.3 ANNEXURE C - MAXIMUM LOT SIZES AND MINIMUM TEST FREQUENCIES

General
Lot sizes and test frequency: To the following Sub-annexures.
Contract requirements summary: To the Contract requirements summary table.
Certification: If material/product quality certification can be obtained from the supplier, documented tests need not be repeated.
Large projects: The Superintendent may relax the testing frequency after the Contractor has demonstrated consistent conformance to the quality requirements.

Contract requirements summary table

<table>
<thead>
<tr>
<th>Sub-annexure</th>
<th>Reference Worksection</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Earthworks (Roadways)</td>
<td>1112 Earthworks (Roadways)</td>
</tr>
<tr>
<td>C2 Water cycle management</td>
<td>1121 Open drains, including kerb and gutter</td>
</tr>
<tr>
<td></td>
<td>1122 Kerb and gutter replacement</td>
</tr>
<tr>
<td></td>
<td>1351 Stormwater drainage (Construction)</td>
</tr>
<tr>
<td></td>
<td>1352 Pipe drainage</td>
</tr>
<tr>
<td></td>
<td>1353 Precast box culverts</td>
</tr>
<tr>
<td></td>
<td>1354 Drainage structures</td>
</tr>
<tr>
<td>C3 Pavement moisture control</td>
<td>1171 Subsurface drainage</td>
</tr>
<tr>
<td></td>
<td>1172 Subsoil and foundation drains</td>
</tr>
<tr>
<td></td>
<td>1173 Pavement drains</td>
</tr>
<tr>
<td></td>
<td>1174 Drainage mats</td>
</tr>
<tr>
<td>C4 Stabilisation</td>
<td>1113 Stabilisation</td>
</tr>
<tr>
<td>C5 Flexible pavement base and subbase</td>
<td>1141 Flexible pavement base and subbase</td>
</tr>
<tr>
<td>C6 Bituminous cold mix</td>
<td>1142 Bituminous cold mix</td>
</tr>
<tr>
<td>C7 Sprayed bituminous surfacing</td>
<td>1143 Sprayed bituminous surfacing</td>
</tr>
<tr>
<td>C8 Asphaltic concrete</td>
<td>1144 Asphaltic concrete</td>
</tr>
<tr>
<td>C9 Placement rolled concrete subbase</td>
<td>1131 Rolled concrete subbase</td>
</tr>
<tr>
<td>C10 Placement of lean mix concrete subbase</td>
<td>1132 Lean mix concrete subbase</td>
</tr>
<tr>
<td>C11 Placement of plain and reinforced concrete base</td>
<td>1133 Plain and reinforced concrete base</td>
</tr>
<tr>
<td>C12 Placement of steel fibre reinforced concrete base</td>
<td>1134 Steel fibre reinforced concrete base</td>
</tr>
<tr>
<td>C13 Placement of continuously reinforced concrete base</td>
<td>1135 Continuously reinforced concrete base</td>
</tr>
<tr>
<td>C14 Ready mixed concrete production and supply</td>
<td>0319 Minor concrete works</td>
</tr>
<tr>
<td></td>
<td>1131 Rolled concrete subbase</td>
</tr>
<tr>
<td></td>
<td>1132 Lean mix concrete subbase</td>
</tr>
<tr>
<td></td>
<td>1133 Plain and reinforced concrete base</td>
</tr>
<tr>
<td></td>
<td>1134 Steel fibre reinforced concrete base</td>
</tr>
<tr>
<td></td>
<td>1135 Continuously reinforced concrete base</td>
</tr>
<tr>
<td>C15 Segmental paving</td>
<td>1145 Segmental paving</td>
</tr>
<tr>
<td>C16 Bituminous slurry surfacing</td>
<td>1146 Bituminous slurry surfacing</td>
</tr>
<tr>
<td>C17 Pavement markings</td>
<td>1191 Pavement markings</td>
</tr>
<tr>
<td>C18 Signposting</td>
<td>1192 Signposting</td>
</tr>
<tr>
<td>C19 Minor concrete works</td>
<td>0319 Minor concrete works</td>
</tr>
<tr>
<td>C20 Landscape – roadways and street trees</td>
<td>0257 Landscape – roadways and street trees</td>
</tr>
<tr>
<td>C21 Masonry walls</td>
<td>0292 Masonry walls</td>
</tr>
<tr>
<td>C22 Crib retaining walls</td>
<td>0293 Crib retaining walls</td>
</tr>
</tbody>
</table>
Sub-annexure C27 Pathways and cycleways
Reference Worksection
0292 Pathways and cycleways (Construction)

Sub-annexure C1 Earthworks (Roadways)
(1112 Earthworks (Roadways))

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stripping topsoil</td>
<td>Surface levels</td>
<td>10,000 m²</td>
<td>1 Cross Section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td>Excavation</td>
<td>Geometry</td>
<td>10,000 m²</td>
<td>1 Cross Section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td>Floor of cuttings</td>
<td>Material quality: - CBR</td>
<td>5,000 m²</td>
<td>1 per 1,000 m² *</td>
<td>AS 1289.6.1.1</td>
</tr>
<tr>
<td></td>
<td>Compaction</td>
<td>10,000 m²</td>
<td>1 per 500 m²</td>
<td>AS 1289.5.4.1 or AS 1289.5.7.1</td>
</tr>
<tr>
<td>Blasting</td>
<td>Ground vibration/noise control</td>
<td>1 day’s blasting</td>
<td>Continuous monitoring</td>
<td></td>
</tr>
<tr>
<td>Foundation for Embankments</td>
<td>Compaction</td>
<td>5,000 m²</td>
<td>1 per 500 m²</td>
<td>AS 1289.5.4.1 or AS 1289.5.7.1</td>
</tr>
<tr>
<td>Embankments - General</td>
<td>Geometry</td>
<td>One layer</td>
<td>1 Cross Section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td>Material quality: - CBR</td>
<td>10,000 m²</td>
<td>1 per 800 m³</td>
<td>AS 1289.6.1.1</td>
</tr>
<tr>
<td></td>
<td>Compaction/Moisture content</td>
<td>5,000 m²</td>
<td>1 per 250 m³</td>
<td>AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1</td>
</tr>
<tr>
<td>Embankments - Select zone</td>
<td>Geometry</td>
<td>One layer</td>
<td>1 Cross Section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td>Material quality: - Particle size distribution - CBR</td>
<td>10,000 m²</td>
<td>1 per 1,000 m³ * 1 per 500 m³ *</td>
<td>AS 1289.6.1.1</td>
</tr>
<tr>
<td></td>
<td>Compaction/moisture content</td>
<td>5,000 m²</td>
<td>1 per 250 m³ *</td>
<td>AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1</td>
</tr>
<tr>
<td>Fill adjacent to bridges, wingwalls,</td>
<td>Material quality: - Particle size distribution - Plasticity index</td>
<td>1 Structure</td>
<td>1 per 200 m³ * 1 per 200 m³ *</td>
<td>AS 1289.3.3.1</td>
</tr>
<tr>
<td>retaining walls and culverts</td>
<td>Compaction/moisture content</td>
<td>1 Structure</td>
<td>1 per layer</td>
<td>AS 1289.5.1.1 AS 1289.5.4.1 AS 1289.5.7.1</td>
</tr>
</tbody>
</table>

* Note: or part thereof, per lot.

Sub-annexure C2 Water cycle management
(1351 Stormwater drainage, 1325 Pipe drainage, 1353 Precast box culverts, 1354 Drainage structures, 1121 Open drains including kerb and gutter, 1122 Kerb and gutter replacement)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>© AUS-SPEC (Oct 12) 15 April 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 0161 Quality (Construction)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply of precast units</td>
<td>Precast quality: Suppliers documentary evidence and certification</td>
<td>1 batch</td>
<td>1 per type/size/ class per batch</td>
<td></td>
</tr>
<tr>
<td>Siting and Excavation</td>
<td>Geometry</td>
<td>1 drainage line/structure</td>
<td>1 per drainage line/structure</td>
<td>Survey</td>
</tr>
<tr>
<td>Excavation by Blasting</td>
<td>Peak particle velocity</td>
<td>1 drainage line/structure</td>
<td>1 per drainage line/structure</td>
<td>Measure</td>
</tr>
<tr>
<td>Foundation</td>
<td>Compaction</td>
<td>1 drainage line/structure</td>
<td>1 per 20 lin m *</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>Material surrounding steel</td>
<td>Material quality: -pH/Electrical resistivity</td>
<td>1 drainage line/structure</td>
<td>1 per material</td>
<td>AS 1289.4.3.1</td>
</tr>
<tr>
<td>Bedding</td>
<td>Material quality:</td>
<td></td>
<td></td>
<td>AS 1289.4.4.1</td>
</tr>
<tr>
<td></td>
<td>-Particle size distribution</td>
<td>1 contract</td>
<td>1 per 200 m³ *</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>Compaction/moisture content</td>
<td>1 drainage line/structure</td>
<td>1 per layer, per 20 lin m</td>
<td>AS 1289.5.4.1, AS 1289.5.7.1</td>
</tr>
<tr>
<td>Concrete bedding or lining</td>
<td>Geometry</td>
<td>1 Cross Section per 25 m</td>
<td>Survey and 3 m Straight Edge</td>
<td></td>
</tr>
<tr>
<td>Installation of precast units</td>
<td>Geometry</td>
<td>1 drainage line/structure</td>
<td>1 per drainage line/structure</td>
<td>Survey</td>
</tr>
<tr>
<td>Selected backfill</td>
<td>Material quality:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Maximum particle size</td>
<td>1 contract</td>
<td>1 per 100 m³ *</td>
<td>AS 1289.3.3.1</td>
</tr>
<tr>
<td></td>
<td>-Plasticity index</td>
<td>1 contract</td>
<td>1 per 100 m³ *</td>
<td>AS 1289.5.4.1, AS 1289.5.7.1</td>
</tr>
<tr>
<td></td>
<td>Compaction/moisture content</td>
<td>1 drainage line/structure</td>
<td>1 per 2 layers per 50 m²</td>
<td></td>
</tr>
<tr>
<td>Rock fill for gabions/ wire</td>
<td>Material quality:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mattresses</td>
<td>-Wet strength</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td></td>
<td>-Wet/dry strength variation</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td>Kerb and gutter</td>
<td>Geometry</td>
<td>1 Cross section per 25 m</td>
<td>Survey and 3 m straight edge</td>
<td></td>
</tr>
</tbody>
</table>

* Note: or part thereof, per lot

### Sub-annexure C3 Pavement Moisture Control

(1171 Subsurface drainage, 1172 Subsoil and foundation drains, 1173 Pavement drains, 1174 Drainage mats)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material supply</td>
<td>Material quality—Supplier’s documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pipe</td>
<td>1 contract/size</td>
<td>1 per type/size</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>Filter material:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Grading (Type A, B, C, D)</td>
<td>1 contract/size</td>
<td>1 per type</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>-Coefficient of permeability (Type B)</td>
<td>1 contract/size</td>
<td>1 per type</td>
<td>AS 1289.5.1.1, ASTM-D2434-88</td>
</tr>
<tr>
<td></td>
<td>-Grading variation after Treatment (Type B)</td>
<td>1 contract/size</td>
<td>1 per type</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>-Wet Strength (Type C, D)</td>
<td>1 contract/size</td>
<td>1 per type</td>
<td>AS 1141.22</td>
</tr>
</tbody>
</table>

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### Great Lakes Council

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10% Fines Wet/Dry (Type C, D)</td>
<td>Geometry</td>
<td>1 contract/size</td>
<td>1 per type</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td>Geotextile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excavation – Trench base</td>
<td>Line and Grade</td>
<td>1 drainage line</td>
<td>1 per 200 lin m</td>
<td>Survey</td>
</tr>
<tr>
<td>Compaction</td>
<td></td>
<td>1 drainage line</td>
<td>1 per 200 lin m</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>Bedding and backfill:</td>
<td>Compaction</td>
<td>1 drainage line</td>
<td>1 per drainage line</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>-Filter material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Selected backfill</td>
<td>Compaction</td>
<td>1 drainage line</td>
<td>1 per 200 lin m</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>-Earth backfill</td>
<td>Compaction</td>
<td>1 drainage line</td>
<td>1 per 200 lin m</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>Drainage mat</td>
<td>Geometry</td>
<td>2000m²</td>
<td>1 Cross Section per 25 m</td>
<td>Survey</td>
</tr>
</tbody>
</table>

*Note: or part thereof, per lot*

### Sub-annexure C4 Stabilisation

#### (1113 Stabilisation)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material supply</td>
<td>Material quality – Supplier’s documentary evidence and certification of:</td>
<td>1 contract</td>
<td>1 per 100t</td>
<td>AS 3972 and AS 2350 (various)</td>
</tr>
<tr>
<td>-Cement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Quicklime</td>
<td>Available lime (CaO content)</td>
<td>1 contract</td>
<td>1 per 100t</td>
<td>AS 3583.12</td>
</tr>
<tr>
<td>Slaking rate</td>
<td></td>
<td>1 contract</td>
<td>1 per 100t</td>
<td>T432</td>
</tr>
<tr>
<td>Particle size Dist’n</td>
<td></td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td>-Hydrated lime</td>
<td>Available Lime (CaOH2)</td>
<td>1 contract</td>
<td>1 per 100t</td>
<td>AS 3583.12</td>
</tr>
<tr>
<td>Residue on sieving</td>
<td></td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 3583.14</td>
</tr>
<tr>
<td>-Ground blast furnace slag</td>
<td></td>
<td>1 contract</td>
<td>1 per month</td>
<td>AS 3583.2 and AS 3882.2</td>
</tr>
<tr>
<td>-Flyash</td>
<td></td>
<td>1 contract</td>
<td>1 per month</td>
<td>AS 3583.1 and AS 3882.1</td>
</tr>
<tr>
<td>-Blended stabilising agent</td>
<td></td>
<td>1 contract</td>
<td>1 per month</td>
<td>AS 2350.4</td>
</tr>
<tr>
<td>-Water</td>
<td>Chloride ion content</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 3583.13</td>
</tr>
<tr>
<td>Sulphate ion content</td>
<td></td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1289.4.2.1</td>
</tr>
<tr>
<td>Undissolved solids</td>
<td></td>
<td>1 contract</td>
<td>1 per contract</td>
<td></td>
</tr>
<tr>
<td>Mix design</td>
<td>NATA certification—Supplier’s documentary evidence and certification</td>
<td>1 mix</td>
<td>1 per mix</td>
<td></td>
</tr>
<tr>
<td>Stationary mixing plant</td>
<td>Application rate of stabilising agent</td>
<td>1 day’s production</td>
<td>1 per 100t</td>
<td></td>
</tr>
<tr>
<td>Compressive strength of product</td>
<td></td>
<td>1 day’s production</td>
<td>1 per 100t</td>
<td>AS 1289.6.1.1</td>
</tr>
<tr>
<td>In-situ spreading</td>
<td>Spread rate</td>
<td>1 layer 1,000 m²</td>
<td>1 per lot</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix uniformity</td>
<td></td>
<td>1 layer 1,000 m²</td>
<td>1 per 500m²</td>
<td>Visual</td>
</tr>
<tr>
<td>Trimming and compaction</td>
<td>Geometry</td>
<td>1 layer 2,000 m², max 1 day's placement</td>
<td>One cross section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td>Surface quality</td>
<td></td>
<td>1 layer 2,000 m², max 1 day's placement</td>
<td>10 per 200 m</td>
<td>3 m straight edge</td>
</tr>
<tr>
<td>Average layer thickness</td>
<td></td>
<td>1 layer 2,000 m², max 1 day's placement</td>
<td>1 per lot</td>
<td>Survey</td>
</tr>
<tr>
<td>Average width</td>
<td></td>
<td>1 layer 2,000 m², max 1 day's placement</td>
<td>1 per lot</td>
<td>Measure/survey</td>
</tr>
<tr>
<td>Relative compaction/moisture content</td>
<td></td>
<td>1 layer 2,000 m², max 1 day's placement</td>
<td>3 per lot</td>
<td>AS 1289.5.7.1 AS 1289.5.8.1</td>
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</tbody>
</table>

* Note: or part thereof, per lot.

Sub-annexure C5 Flexible pavement base and subbase

<table>
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<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base and subbase supply</td>
<td>Material quality—Supplier's documentary evidence and certification</td>
<td>1 Contract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Particle size distribution</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1289.3.6.1</td>
<td></td>
</tr>
<tr>
<td>- Liquid Limit</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1289.3.1.1</td>
<td></td>
</tr>
<tr>
<td>- Plasticity Index</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1289.3.3.1</td>
<td></td>
</tr>
<tr>
<td>- Linear shrinkage</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1289.3.4.1</td>
<td></td>
</tr>
<tr>
<td>- Maximum dry compressive strength</td>
<td></td>
<td>1 per 5,000t</td>
<td>AS 1141.52</td>
<td></td>
</tr>
<tr>
<td>- Particle shape</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1141.14</td>
<td></td>
</tr>
<tr>
<td>- Aggregate wet strength</td>
<td></td>
<td>1 per 5,000t</td>
<td>AS 1141.22</td>
<td></td>
</tr>
<tr>
<td>- Wet/Dry strength variation</td>
<td></td>
<td>1 per 5,000t</td>
<td>AS 1141.22</td>
<td></td>
</tr>
<tr>
<td>- Los Angeles value</td>
<td></td>
<td>1 per 1,000t</td>
<td>AS 1141.23</td>
<td></td>
</tr>
<tr>
<td>- CBR</td>
<td></td>
<td>1 per 5,000t</td>
<td>AS 1289.6.1.1</td>
<td></td>
</tr>
<tr>
<td>- Modified Texas Triaxial classification</td>
<td></td>
<td>1 per contract</td>
<td>T171</td>
<td></td>
</tr>
<tr>
<td>- Unconfined compressive strength</td>
<td></td>
<td>1 per 5,000t</td>
<td>AS 5101.4</td>
<td></td>
</tr>
<tr>
<td>- Unconfined compressive strength (Bound)</td>
<td></td>
<td>1 Contract</td>
<td>AS 5101.4</td>
<td></td>
</tr>
<tr>
<td>Placement</td>
<td>Geometry: Alignment &amp; level</td>
<td>One layer 2,000 m² or max 1 day's placement</td>
<td>1 Cross Section per 15 m</td>
<td>Survey</td>
</tr>
<tr>
<td>- Width and Surface Trim</td>
<td></td>
<td>10 per selected 200 lin. m</td>
<td>Measure &amp; 3 m Straight Edge</td>
<td></td>
</tr>
<tr>
<td>Compaction/moisture content /</td>
<td></td>
<td>One layer</td>
<td>10 per</td>
<td>T130</td>
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### Sub-annexure C6 Bituminous cold mix
(1142 Bituminous cold mix)

<table>
<thead>
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<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
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<td>Materials supply</td>
<td>Material Quality—Supplier's documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Coarse aggregates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wet strength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wet/dry strength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flakiness index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fractured faces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>1 per month</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>1 per contract or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>change in material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>AS 2758.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>AS 1141.11.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>AS 1141.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>AS 1141.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>AS 1141.18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Fine aggregates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 contract or 1 mth's prod'n</td>
<td></td>
<td>1 per month</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>- Mineral filler</td>
<td></td>
<td>1 per month</td>
<td>AS 2150</td>
</tr>
<tr>
<td></td>
<td>- Class 170 or 320 bitumen binder</td>
<td></td>
<td>1 per month</td>
<td>AS 2008</td>
</tr>
<tr>
<td></td>
<td>Cutback bitumen</td>
<td></td>
<td>1 per delivery/</td>
<td>AS 2157</td>
</tr>
<tr>
<td></td>
<td>tanker</td>
<td></td>
<td>tanker</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flux Oil and Cutter Oil</td>
<td></td>
<td>1 per delivery/</td>
<td>AS 3568</td>
</tr>
<tr>
<td></td>
<td>tanker</td>
<td></td>
<td>tanker</td>
<td></td>
</tr>
<tr>
<td>Mix design</td>
<td>Approval of mix and NATA documentation. Supplier's documentary evidence</td>
<td>1 mix per contract (less than 12 months old)</td>
<td>1 per mix</td>
<td>Approval</td>
</tr>
<tr>
<td></td>
<td>and certification.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production mix</td>
<td>Grading</td>
<td></td>
<td>1 per contract or</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>Binder</td>
<td></td>
<td>as requested by</td>
<td>AS/NZS 2891.3.1</td>
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<tr>
<td></td>
<td>Each production lot or 1 day's production (whichever is the lesser)</td>
<td></td>
<td>Superintendent</td>
<td></td>
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<tr>
<td></td>
<td>(sampling by production lot)</td>
<td></td>
<td>(sampling by production lot)</td>
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### Sub-annexure C7 Sprayed bituminous surfacing
(1143 Sprayed bituminous surfacing)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials supply</td>
<td>Material Quality - Suppliers documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Class 170 bitumen</td>
<td>1 tanker load</td>
<td>1 per tanker load</td>
<td>AS 2008</td>
<td></td>
</tr>
<tr>
<td>- Refinery cutback bitumen</td>
<td>1 tanker load</td>
<td>1 per tanker load</td>
<td>AS 2157</td>
<td></td>
</tr>
<tr>
<td>- Polymer modified binder</td>
<td>1 tanker load</td>
<td>1 per tanker load</td>
<td>AS 2341.21</td>
<td></td>
</tr>
<tr>
<td>- Bitumen Adhesion agent</td>
<td>1 delivery</td>
<td>1 per delivery</td>
<td>AS 3568</td>
<td></td>
</tr>
<tr>
<td>- Cutback oils</td>
<td>1 delivery/ tanker</td>
<td>1 per delivery/tanker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Aggregate precoating agent</td>
<td>1 delivery/ tanker</td>
<td>1 per delivery/ tanker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Aggregate</td>
<td>1 contract</td>
<td>1 per 400 m³</td>
<td>AS 2758.2</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Application rates</th>
<th>Binder</th>
<th>1 day's operation</th>
<th>Calculate per spray run</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>1 day's operation</td>
<td>Calculate per spray run</td>
<td></td>
</tr>
</tbody>
</table>

*Note: or part thereof, per lot

Sub-Annexure C8 Asphaltic concrete
(1144 Asphaltic concrete (Roadways))

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials supply</td>
<td>Material quality—Supplier's documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Coarse and fine aggregates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grading</td>
<td>1 wk's prod'n</td>
<td>1 per day</td>
<td>AS 2758.5</td>
<td></td>
</tr>
<tr>
<td>Moisture content</td>
<td>1 wk's prod'n</td>
<td>1 per day</td>
<td>AS 1141.11.1</td>
<td></td>
</tr>
<tr>
<td>Wet strength</td>
<td>1 contract</td>
<td>1 per</td>
<td>AS 1289.2.1.1</td>
<td></td>
</tr>
<tr>
<td>Wet/dry strength variation</td>
<td>1 contract</td>
<td>1 per</td>
<td>AS 1141.22</td>
<td></td>
</tr>
<tr>
<td>Particle shape</td>
<td>1 contract</td>
<td>1 per</td>
<td>AS 1141.14</td>
<td></td>
</tr>
<tr>
<td>Fractured faces</td>
<td>1 contract</td>
<td>1 per</td>
<td>AS 1141.18</td>
<td></td>
</tr>
<tr>
<td>Polishing agg friction value</td>
<td>1 contract</td>
<td>1 per</td>
<td>AS 1141.42</td>
<td></td>
</tr>
<tr>
<td>- Mineral filler</td>
<td>1 contract or 1 month's production</td>
<td>contract or 1 per month's production</td>
<td>AS 2150</td>
<td></td>
</tr>
<tr>
<td>- Bitumen binder</td>
<td>1 refinery batching</td>
<td>1 per tanker load</td>
<td>AS 2008</td>
<td></td>
</tr>
<tr>
<td>- Polymer modified bitumen</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Elasticity recovery at 60°C</td>
<td>1 production batch by supplier</td>
<td>1 per tanker load</td>
<td>AG:PT/T121</td>
<td></td>
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<tr>
<td>Viscosity on ER at 60°C</td>
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<td></td>
<td>AG:PT/T121</td>
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</tr>
<tr>
<td>Torsional recovery at 25°C</td>
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<td></td>
<td>AG:PT/T122</td>
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</tr>
<tr>
<td>Viscosity at 180°C</td>
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<td></td>
<td>AG:PT/T111</td>
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<tr>
<td>- Bitumen adhesion agent</td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>T230 or nominated equivalent</td>
<td></td>
</tr>
<tr>
<td>Resistance to stripping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Reclaimed asphalt pavement (RAP)</td>
<td>1 stockpile</td>
<td>1 per stockpile</td>
<td>AS 1141.11.1</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Key quality verification requirements</td>
<td>Maximum lot size</td>
<td>Minimum test frequency</td>
<td>Test method</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>- Bitumen emulsion</td>
<td></td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>AS 1160</td>
</tr>
<tr>
<td>Mix design — Nominated mix</td>
<td>Approval of mix and NATA certification, Supplier's documentary evidence and certification</td>
<td>1 mix per contract</td>
<td>1 per mix</td>
<td></td>
</tr>
<tr>
<td>Production mix</td>
<td>Temperature</td>
<td>1 per truck load</td>
<td>Measure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moisture content</td>
<td>1144 7 from Spec 1144 Asphaltic concrete as included as separate table below. Additionally, max lot size one 12 hr shift's production.</td>
<td>AS/NZS 2891.10 AS/NZS 2891.3 3 AS/NZS 2891.3 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grading, Binder content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resistance to stripping</td>
<td>1 production mix 1 per mix per 5000 t or once per month (whichever is the most frequent)</td>
<td>T640</td>
<td></td>
</tr>
<tr>
<td>Laying and compaction</td>
<td>Temperature</td>
<td>1 day's laying per site</td>
<td>1 per truck load</td>
<td>Measure</td>
</tr>
<tr>
<td></td>
<td>Levels</td>
<td>1 day's laying per site</td>
<td>1 cross section per 25 m</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td>Shape</td>
<td>1 day's laying</td>
<td>10 per 200 m* lane length</td>
<td>3 m Straight Edge</td>
</tr>
<tr>
<td></td>
<td>Relative compaction/layer thickness</td>
<td>1 day's laying</td>
<td>6 cores per lot or 10 nuclear density tests per lot</td>
<td>AS 2891.9.3 or Nuclear Density Meter</td>
</tr>
</tbody>
</table>

* Note: or part thereof, per lot.

Minimum Testing Frequencies For Asphalt Production

<table>
<thead>
<tr>
<th>Quantity of asphalt in production lot</th>
<th>Minimum frequency of testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100 tonnes</td>
<td>One per 50 tonnes or part thereof</td>
</tr>
<tr>
<td>101 to 300 tonnes</td>
<td>One per 100 tonnes or part thereof</td>
</tr>
<tr>
<td>301 to 600 tonnes</td>
<td>One per 150 tonnes or part thereof</td>
</tr>
<tr>
<td>Over 600 tonnes</td>
<td>One per 200 tonnes or part thereof</td>
</tr>
</tbody>
</table>

Sub-annexure C10 Placement of lean mix concrete subbase
(1132 Lean mix concrete subbase)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-mixed concrete Production and supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete/air temperature</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>Measure</td>
<td></td>
</tr>
<tr>
<td>Air content</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>AS 1012.4.2</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Key quality verification requirements</td>
<td>Maximum lot size</td>
<td>Minimum test frequency</td>
<td>Test method</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------</td>
<td>------------------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Consistency—Slump</td>
<td>50 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
</tr>
<tr>
<td></td>
<td>Compressive strength (7 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1012.9</td>
</tr>
<tr>
<td></td>
<td>Compressive strength (28 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1012.8.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1012.9</td>
</tr>
<tr>
<td>Placement</td>
<td>Thickness</td>
<td>50 m³</td>
<td>5 m grid on plan area</td>
<td>Survey and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>check with</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>subgrade</td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td>50 m³</td>
<td>1 cross section per 15 m</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 m straight</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>edge</td>
</tr>
<tr>
<td>Curing</td>
<td>Material quality—Supplier’s documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per production batch</td>
<td>AS 3799</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1160</td>
</tr>
<tr>
<td></td>
<td>Application rate</td>
<td>1 day’s work</td>
<td>1 per 1000 m²</td>
<td></td>
</tr>
<tr>
<td>Joints</td>
<td>Geometry</td>
<td>50 m³</td>
<td>All joints</td>
<td>Survey</td>
</tr>
</tbody>
</table>

Sub-annexure C11 Placement of plain and reinforced concrete base

(1133 Plain and reinforced concrete base)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-Mixed Concrete Production and Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concrete/Air Temperature</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>Measure</td>
</tr>
<tr>
<td></td>
<td>Air Content</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>AS 1012.4.2</td>
</tr>
<tr>
<td></td>
<td>Method 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consistency - Slump</td>
<td>50 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
</tr>
<tr>
<td></td>
<td>Compressive Strength (7 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
</tr>
<tr>
<td></td>
<td>Compressive Strength (28 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1012.8.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS 1012.9</td>
</tr>
<tr>
<td>Placement</td>
<td>Relative Compaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Machine placed</td>
<td>50 m³</td>
<td>1 per 50 m³*</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td></td>
<td>-Hand placed</td>
<td>Area between 2</td>
<td>2 per lot</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>consecutive</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>const. joints or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 m³</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(whichever is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>the lesser)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>50 m³</td>
<td>5 m grid on plan area</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td>50 m³</td>
<td>1 cross section per 15 m</td>
<td>Survey and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 m straight</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>edge</td>
</tr>
<tr>
<td>Ride Quality</td>
<td>Profile factor</td>
<td>1000 m²</td>
<td>10/lane/lot</td>
<td>3 m straight edge</td>
</tr>
<tr>
<td>Activity</td>
<td>Key quality verification requirements</td>
<td>Maximum lot size</td>
<td>Minimum test frequency</td>
<td>Test method</td>
</tr>
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<td>----------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Surface Texture</td>
<td>Texture depth</td>
<td>1000 m²</td>
<td>2 per lot</td>
<td>Survey</td>
</tr>
<tr>
<td>Curing</td>
<td>Material quality - supplier's documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per production batch</td>
<td>AS 3799, AS 1160</td>
</tr>
<tr>
<td></td>
<td>Application rate</td>
<td>1 day's work</td>
<td>1 per 1000 m²*</td>
<td></td>
</tr>
<tr>
<td>Joints</td>
<td>Sealant material quality - supplier's documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per prod'n batch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td>50 m³</td>
<td>All joints</td>
<td>Survey</td>
</tr>
</tbody>
</table>

* Note: or part thereof, per lot.

Sub-annexure C12 Placement of steel fibre reinforced concrete base
(1134 Steel fibre reinforced concrete base)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-mixed concrete production and supply</td>
<td>A production lot</td>
<td>As required by Superintendent</td>
<td>Measure</td>
</tr>
<tr>
<td></td>
<td>Concrete/air temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air content</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1012.4.2 Method 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consistency—Slump</td>
<td>50 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compressive strength (7 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1 AS 1012.8.1 AS 1012.9</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Compressive strength (28 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1 AS 1012.8.1 AS 1012.9</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drying shrinkage</td>
<td>1 day's production or 150 m³ (whichever is the lesser)</td>
<td>3 per lot</td>
<td>AS 1012.13</td>
</tr>
<tr>
<td>Placement</td>
<td>Relative compaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine placed</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hand placed</td>
<td>Area between 2 consecutive const. joints</td>
<td>2 per lot</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>50 m³</td>
<td>5 m grid on plan area</td>
<td>Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td>50 m³</td>
<td>1 cross section per 15 m</td>
<td>Survey 3 m straight edge</td>
</tr>
<tr>
<td>Ride Quality</td>
<td>Profile factor</td>
<td>50 m³</td>
<td>All lanes</td>
<td>3 m str. edge</td>
</tr>
<tr>
<td>Surface Texture</td>
<td>Texture depth</td>
<td>50 m³</td>
<td>2 per 50 m³</td>
<td>Survey</td>
</tr>
<tr>
<td>Curing</td>
<td>Material quality—Supplier's documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per production batch</td>
<td>AS 3799, AS 1160</td>
</tr>
<tr>
<td></td>
<td>Application Rate</td>
<td>1 day's work</td>
<td>1 per 1000 m²</td>
<td></td>
</tr>
<tr>
<td>Joints</td>
<td>Material quality—Sealant supplier's documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per production batch</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Key quality verification requirements</td>
<td>Maximum lot size</td>
<td>Minimum test frequency</td>
<td>Test method</td>
</tr>
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<td>--------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Geometry</td>
<td></td>
<td>50 m³</td>
<td>All joints</td>
<td>Survey and 3 m straight edge</td>
</tr>
<tr>
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<td>Material quality—Supplier’s documentary evidence and certification</td>
<td>1 Contract</td>
<td>1 per contract</td>
<td>AS/NZS 4671</td>
</tr>
<tr>
<td>Steel reinforcement</td>
<td>1 Contract</td>
<td>1 per contract</td>
<td>AS/NZS 4671</td>
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</tr>
<tr>
<td>Steel fibre</td>
<td>1 Contract</td>
<td>1 per contract</td>
<td>ASTM A 820/820m</td>
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</tbody>
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Sub-Annexure C13 Placement of continuously reinforced concrete base
(1135 Continuously reinforced concrete base)

<table>
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<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel supply</td>
<td>Material quality – Supplier’s documentary evidence and certification</td>
<td>1 Contract</td>
<td>1 per contract</td>
<td>AS/NZS 4671</td>
</tr>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-mixed concrete production and supply</td>
<td></td>
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</tr>
<tr>
<td>Concrete/air temperature</td>
<td>A production lot</td>
<td></td>
<td>As required by Superintendent</td>
<td>Measure</td>
</tr>
<tr>
<td>Air content</td>
<td>1 Contract</td>
<td>1 per contract</td>
<td>AS 1012.4.2 Method 2</td>
<td></td>
</tr>
<tr>
<td>Consistency - Slump</td>
<td>50 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
<td></td>
</tr>
<tr>
<td>Compressive strength (7 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
<td></td>
</tr>
<tr>
<td>Compressive strength (28 day)</td>
<td>50 m³</td>
<td>1 pair per 50 m³</td>
<td>AS 1012.1</td>
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</tr>
<tr>
<td>Drying shrinkage</td>
<td>1 day’s production or 150 m³ (whichever is the lesser)</td>
<td></td>
<td>3 per lot</td>
<td>AS 1012.13</td>
</tr>
<tr>
<td>Placement</td>
<td>Relative compaction</td>
<td>50 m³</td>
<td>1 per 50 m³</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td>- Machine placed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hand placed</td>
<td>Area between 2 consecutive const. joints</td>
<td></td>
<td>2 per lot</td>
<td>AS 1012.14</td>
</tr>
<tr>
<td>Thickness</td>
<td>50 m³</td>
<td>5 m grid on plan area</td>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>Geometry</td>
<td>50 m³</td>
<td>1 cross section per 15 m</td>
<td>Survey 3 m Straight Edge</td>
<td></td>
</tr>
<tr>
<td>Ride quality</td>
<td>Profile factor</td>
<td>50 m³</td>
<td>All lanes</td>
<td>3 m Str. Edge</td>
</tr>
<tr>
<td>Surface texture</td>
<td>Texture depth</td>
<td>1 day’s work</td>
<td>1 per 2000 m²</td>
<td>T240</td>
</tr>
<tr>
<td>Curing</td>
<td>Material quality—Supplier’s documentary evidence and certification</td>
<td>1 contract</td>
<td>1 per production batch</td>
<td>AS 3799</td>
</tr>
<tr>
<td></td>
<td>Application rate</td>
<td>1 day’s work</td>
<td>1 per 1000 m²</td>
<td>AS 1160</td>
</tr>
</tbody>
</table>
### Sub-annexeure C14 Ready-mixed concrete production & supply

**0319 Minor concrete works, 1131 Rolled concrete subbase, 1132 Lean mix concrete subbase, 1133 Plain and reinforced concrete base, 1134 Steel fibre reinforced concrete base, 1135 Continuously reinforced concrete base**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials supply</td>
<td>Material quality—Supplier's documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement</td>
<td>1 mth's prod'n</td>
<td>1 per week</td>
<td>AS 3972</td>
</tr>
<tr>
<td></td>
<td>Flyash</td>
<td>1 mth's prod'n</td>
<td>1 per month</td>
<td>AS 3582.1</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 3583.13, AS 1288.4.2.1</td>
</tr>
<tr>
<td></td>
<td>Admixtures</td>
<td>1 mth's prod'n</td>
<td>1 per month</td>
<td>AS 1478.1</td>
</tr>
<tr>
<td>Fine aggregates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Grading</td>
<td>1 wk's prod'n</td>
<td>1 per 200 m³ concrete*</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>- Moisture content</td>
<td>N/A</td>
<td>1 per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Sulphate soundness</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.24</td>
</tr>
<tr>
<td></td>
<td>- Bulk density</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Unit mass (Particle density)</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Water absorption</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Material finer 2 μm</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Deleterious material (Impurities/reactive)</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td>Coarse aggregates:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Grading</td>
<td>1 wk's prod'n</td>
<td>1 per 200 m³ concrete*</td>
<td>AS 1141.11.1</td>
</tr>
<tr>
<td></td>
<td>- Moisture content</td>
<td>N/A</td>
<td>1 per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Wet strength</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td></td>
<td>- Wet/dry strength variation</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.22</td>
</tr>
<tr>
<td></td>
<td>- Sulphate soundness</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.24</td>
</tr>
<tr>
<td></td>
<td>- Particle shape</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.14</td>
</tr>
<tr>
<td></td>
<td>- Fractured faces</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 1141.18</td>
</tr>
<tr>
<td></td>
<td>- Bulk density</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Unit mass (Particle density)</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Water absorption</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Material finer 75 μm</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Weak particles</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Light particles</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td></td>
<td>- Deleterious materials (Impurities/reactive)</td>
<td>1 contract</td>
<td>1 per contract</td>
<td>AS 2758.1</td>
</tr>
<tr>
<td>Activity</td>
<td>Key quality verification requirements</td>
<td>Maximum lot size</td>
<td>Minimum test frequency</td>
<td>Test method</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------</td>
<td>------------------</td>
<td>------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Mix design</td>
<td>Compressive strength</td>
<td>1 contract mix</td>
<td>1 per mix per contract</td>
<td>AS 1012.9</td>
</tr>
<tr>
<td></td>
<td>Aggregate moisture content</td>
<td>1 contract mix</td>
<td>1 per mix per contract</td>
<td>AS 1012.3.1</td>
</tr>
<tr>
<td></td>
<td>Consistency—Slump</td>
<td>1 contract mix</td>
<td>1 per mix per contract</td>
<td>AS 1012.4.2 Method 2</td>
</tr>
<tr>
<td></td>
<td>Air content</td>
<td>1 contract mix</td>
<td>1 per mix per contract</td>
<td>AS 1012.13</td>
</tr>
<tr>
<td></td>
<td>Shrinkage</td>
<td>1 contract mix</td>
<td>1 per mix per contract</td>
<td></td>
</tr>
</tbody>
</table>

* Note: or part thereof, per lot.

Sub-annexure C17 Pavement markings
(1191 Pavement markings)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials supply</td>
<td>Material Quality—Supplier's documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Paint</td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>AS 4049.3</td>
</tr>
<tr>
<td></td>
<td>-Glass beads</td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>AS 2009</td>
</tr>
<tr>
<td></td>
<td>-Thermoplastic material</td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>AS 4049.2</td>
</tr>
<tr>
<td></td>
<td>-Raised pavement markers</td>
<td>1 contract</td>
<td>1 per contract or change in material</td>
<td>AS 1906.3</td>
</tr>
<tr>
<td>Paint application</td>
<td>Wet film thickness</td>
<td>1 contract</td>
<td>1 per site visit or change in pressure settings</td>
<td>AS/NZS 1580.1 07.3</td>
</tr>
<tr>
<td></td>
<td>Application rate of glass beads</td>
<td>1 contract</td>
<td>1 per site visit or change in pressure settings</td>
<td>1191 Pavement markings Annexure A</td>
</tr>
<tr>
<td>Thermoplastic Application</td>
<td>Coid film thickness</td>
<td>1 contract</td>
<td>1 per site visit or change in pressure settings</td>
<td>Measure by micrometer</td>
</tr>
<tr>
<td></td>
<td>Application rate of glass beads</td>
<td>1 contract</td>
<td>1 per site visit or change in pressure settings</td>
<td>1911 Pavement markings Annexure A</td>
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Sub-annexure C18 Signposting
(1192 Signposting)
<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials supply</td>
<td>Material quality—Supplier’s documentary evidence and certification of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Sign blanks</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 1743</td>
</tr>
<tr>
<td></td>
<td>- Aluminium extrusion backing</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 1866</td>
</tr>
<tr>
<td></td>
<td>- Retro-reflective material</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 1743</td>
</tr>
<tr>
<td></td>
<td>- Non-reflective paint</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 2311</td>
</tr>
<tr>
<td></td>
<td>- Non-reflective sheet material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Steel sign support structures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Grade</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 1627.9</td>
</tr>
<tr>
<td></td>
<td>- Protective treatment</td>
<td>1 contract</td>
<td>1 per contract, or change in material</td>
<td>AS 4680 and AS 1214</td>
</tr>
<tr>
<td>Concrete foundations</td>
<td>Refer ‘Minor concrete works’</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sub-annexure C19 Minor concrete works (0319 Minor concrete works)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgrade</td>
<td>Compaction</td>
<td>1000 lin m or 1000 m²</td>
<td>1 per 200 lin m or 200 m²</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>Gravel subbase construction</td>
<td>Compaction</td>
<td>1 day’s placement</td>
<td>1 per 100 lin m or 100 m²</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td></td>
<td>Subbase geometry</td>
<td>1 day’s placement</td>
<td>1 per 25 lin m</td>
<td>3 m straight edge</td>
</tr>
<tr>
<td>Steel supply</td>
<td>Material quality—Suppliers documentary evidence and certification</td>
<td>1 delivery</td>
<td>1 per production batch</td>
<td></td>
</tr>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-mixed concrete production and supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consistency—Slump</td>
<td>15 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
</tr>
</tbody>
</table>
|                           | Compressive strength (7 and 28 day)                                                                     | 15 m³            | 2 pairs per 15 m²                                          | AS 1012.1
|                           |                                                                                                        |                  |                                                             | AS 1012.8.1         |
|                           |                                                                                                        |                  |                                                             | AS 1012.9           |
| Concrete placement        | Finished Levels                                                                                         | 15 m³            | 1 cross section per 15 m                                   | Survey and 3 m straight edge |
|                           | Surface dimensions                                                                                      | Single fabrication | As required to confirm design dimensions                    | measure             |
| Backfilling               | Material quality:                                                                                       |                  |                                                             |                     |
|                           | - Maximum particle size                                                                                 | 1 contract       | 1 per 200 m³                                               |                     |

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### Activity | Key quality verification requirements | Maximum lot size | Minimum test frequency | Test method
---|---|---|---|---
Sprayed concrete | Test panels and cores | 1 contract | 3 test panels and 4 cores per mix design | AS 1012.4.2 AS 1012.9 AS 1012.14
| Compressive strength cores | 15 m³ | 2 per 15 m³ | AS 1012.4.2 AS 1012.9 AS 1012.14
| Curing material quality—Supplier’s documentary evidence and certification | 1 contract | 1 per production batch |

### Sub-annexure C20 Landscape – roadways and street trees

#### 0257 Landscape – roadways and street trees

### Activity | Key quality verification requirements | Maximum lot size | Minimum test frequency | Test method
---|---|---|---|---
Seed | Certification of authenticity for the prescribed mix | 1 contract | Certification for each production batch delivered | AS 4419
Imported topsoil | Material quality: | | |
- pH | 10,000 m³ | 1 per 500 m³ * |
- Organic content | 10,000 m³ | 1 per 500 m³ * |
- Soluble salt content | 10,000 m³ | 1 per 500 m³ * |
Mulch for planting | Material quality | 1 Contract | 1 Contract | AS 4454

* Note: or part thereof, per lot.

### Sub-annexure C21 Masonry walls

#### 0292 Masonry walls

### Activity | Key quality verification requirements | Maximum lot size | Minimum test frequency | Test method
---|---|---|---|---
Alignment | Set out | Contract | 25 m sections | Survey
Footing | Concrete slump | Contract | 1 per load | AS 1012.3.1
| Concrete strength | Contract | 1 per contract or 100 m³ (whichever is the lesser) | AS 1012.9
Concrete grout | Strength | Contract | As required by Superintendent | AS 1012.9
Backfilling | Drainage layer grading | Contract | 1 per contract | AS 1141.11.1
Foundations and backfill | Compaction | Contract or 200 lineal metres (whichever is the lesser) | 3 per 200 lineal metres | AS 1289.5.4.1

### Sub-annexure C22 Crib retaining walls

#### 0293 Crib retaining walls
<table>
<thead>
<tr>
<th>Activity</th>
<th>Key quality verification requirements</th>
<th>Maximum lot size</th>
<th>Minimum test frequency</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgrade</td>
<td>Compaction</td>
<td>1000 lin m or 1000 m³</td>
<td>1 per 200 lin m or 200 m³</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td>Subbase/ Granular base placement</td>
<td>Compaction</td>
<td>1 day's placement</td>
<td>1 per 100 lin m or 100 m³</td>
<td>AS 1289.5.4.1</td>
</tr>
<tr>
<td></td>
<td>Geometry</td>
<td>1 day's placement</td>
<td>1 per 25 lin m</td>
<td>3 m straight edge</td>
</tr>
<tr>
<td>Steel supply</td>
<td>Material quality—Suppliers documentary evidence and certification</td>
<td>1 delivery</td>
<td>1 per production batch</td>
<td></td>
</tr>
<tr>
<td>Concrete supply</td>
<td>Refer Sub-Annexure C14: Ready-mixed concrete production and supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consistency—Slump</td>
<td>15 m³</td>
<td>1 per load</td>
<td>AS 1012.3.1</td>
</tr>
<tr>
<td></td>
<td>Compressive strength (28 days)</td>
<td>15 m³</td>
<td>2 pairs per 15 m³</td>
<td>AS 1012.1 AS 1012.8.1 AS 1012.9</td>
</tr>
<tr>
<td>Concrete placement</td>
<td>Finished Levels</td>
<td>15 m³</td>
<td>1 cross section per 15 m</td>
<td>Survey and 3 m straight edge</td>
</tr>
<tr>
<td></td>
<td>Surface dimensions</td>
<td>Single fabrication</td>
<td>As required to confirm design dimensions</td>
<td>Measure</td>
</tr>
</tbody>
</table>

Sub-annexure C27 Construction of pathways and cycleways
(0282 Pathways and cycleways (Construction))
Annexure D – Matrix for compliance with AS/NZS ISO 9001 and this specification.

<table>
<thead>
<tr>
<th>Clause</th>
<th>AS/NZS ISO 9001</th>
<th>Records</th>
<th>Project quality plan</th>
</tr>
</thead>
</table>
| 2.1    | QMS.             | -Project quality plan.  
<p>|        |                  | -Quality manual.        | -QMS and procedures. |
|        | Control of documents | -List of who holds issued documents. |
|        | Management responsibility | -Register of current document issued/revision. |
|        | Resource management | -Corporate QMS.          | -Description of how quality records will be stored and maintained. |
| 2.5    | Design and development | -Provision of resources. |
| 2.5, 2.11 and 2.12 | Purchasing | -Evaluation of Subcontractors and Suppliers. |
|        |                  | -Surveillance, audit of Subcontractors. |
|        |                  | -Subcontractor supplied documentation. |
|        |                  | -Certificate of testing by Suppliers. |
| 2.6    | Control of production and service provision | -Procedures describing how to control work processes. |
|        |                  | -Records demonstrating effectiveness of work process controls. |
|        |                  | -Records of process validation when applicable. |
| 2.6    | Identification and traceability | -Product batch/traceability records. |
|        |                  | -Lot identification register. |
| 2.6 and 2.9 | Control of monitoring and measuring devices | -Calibration certificates. |
|        |                  | -Survey control. |
| 2.7    | Inspection and test planning | -ITP’s. |
|        |                  | -Records/checklists of inspection and testing. |
|        |                  | -Conformity reports for each completed lot. |
|        |                  | -Procedure for inspections, testing and closing out work lots. |
|        |                  | -How to keep records of inspection and test results. |
|        |                  | -ITP and forms. |
|        |                  | -Method for identifying, controlling and verifying inspection and test status. |</p>
<table>
<thead>
<tr>
<th>Clause</th>
<th>AS/NZS ISO 9001</th>
<th>Records</th>
<th>Project quality plan</th>
</tr>
</thead>
</table>
| 2.8    | Monitoring and measurement | -Hold Point and Witness Point schedule.  
| 2.10   | Control of nonconforming product | -Nonconformity reports.  
         |                  | -Notifications of nonconformity register. | -Method of registering and closing nonconformance. |
|        | Corrective action | -Corrective action reports and register.  
         |                  | -Corrective action requests. | -Method of ensuring against corrective action. |
1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide vegetation as documented to the following areas:
- Cut and fill batters
- Pathway verges
- Median areas and open drains, and
- Street tree planting.

Performance
Requirements: As required by the Conditions of Development Consent.
Erosion control: To 1102 Control of erosion and sedimentation.
Selections: Conform to the selections in Annexure A.

Design
Authority requirements: Conform to the following:
- Statutory requirements for Work Heath and Safety.
- Individual State and Local Council planting lists.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following worksections:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 1102 Control of erosion and sedimentation.
- 1112 Earthworks (Roadways).

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents incorporated in this worksection by reference:
Note: Only the most current standards are to be used
AS 1160 Bituminous emulsions for the construction and maintenance of pavements
AS 2507 The storage and handling of agricultural and veterinary chemicals
AS 4419 Soils for landscaping and garden use
AS 4454 Composts, soil conditioners and mulches
AS 4843 Synthetic weed blocking fabric

1.4 STANDARDS

General
Storage and handling of pesticides: To AS 2507.

1.5 INTERPRETATION

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

Definitions
General: For the purposes of this worksection the following definitions:
Ameliorant: Material used to make or improve soil.
Anionic bitumen: A type of bituminous emulsion where dispersed particles comprise a bituminous binder and are negatively charged.
1.6 SUBMISSIONS

Soil tests for imported topsoil
Report: Submit a certificate noting the:
- Suitability of each soil type for its specified use.
- Similarity to naturally occurring local soil.
- Suitability for establishment and on-going viability of the site specified vegetation.
- Absence of any weed propagules or contaminants.
- Maintenance schedule.

Ameliorants recommendation: If required to include ameliorants, recommend the source of ameliorant material, rates and methods of incorporation.

Samples
General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Bulk materials: Submit a 5kg sample of each type specified. Submit bulk material samples, with required test results, at least 10 working days before bulk deliveries.

Samples required: Samples required for: filling, topsoil, topsoil additives, compost and mulch or as required by the Conditions of Development Consent. Test results to be referred to the Developer for a Development and to Council for both Developments and Council Projects.

Seed
Supply: Submit the name/s of the proposed seed supplier/s.
Timing: Within 2 weeks of the acceptance of the tender.
Lead time for native seed: Notify the lead time that may be required to procure native seed species.

Plant provenance
Locality: Provide written certification that all plant material has been grown from locally provenanced stock. If this is not achievable give notice.
Species: Provide written certification that all plant material is true to the required species and type.

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

The HOLD POINTS table and WITNESS POINTS table summarise the Hold points and Witness points within this worksection.

<table>
<thead>
<tr>
<th>HOLD POINTS table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause/subclause</td>
</tr>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
</tr>
<tr>
<td>Transportation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WITNESS POINTS Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause/subclause</td>
</tr>
<tr>
<td>EXECUTION</td>
</tr>
<tr>
<td>Slopes and drains – Preparation</td>
</tr>
<tr>
<td>Slopes and drains – Seed mixing</td>
</tr>
<tr>
<td>Slopes and drains – Watering</td>
</tr>
<tr>
<td>Transplanting street trees – General</td>
</tr>
<tr>
<td>Transplanting street trees –</td>
</tr>
</tbody>
</table>
maintenance of on-site plant material
Transplanting street trees – Above ground

| applications | Approval for pruning of branches | Prior to pruning |

2 PRE-CONSTRUCTION PLANNING

2.1 SPECIMEN PLANTS

Properties
Source: From locations where these plant materials are growing in 'natural' ground conditions.
Non-containerised nursery stock: Required.
Presentation: Provide maximum initial impact at the time of project opening.
Properties: To the Specimen plants schedule.
Preparation: Program the preparation of specimen plants and preparation works to assure readiness of specimen plants for transplanting to site when required.

Transportation
Responsibility: Ensure plants are transported to the site without physical damage or drying out. This is a HOLD POINT.

3 MATERIALS

3.1 SELECTIONS

General
Selections: To Annexure A.

3.2 TOPSOIL – MINOR WORKS

General
Source: Imported topsoil and/or topsoil won and stockpiled on site to 1112 Earthworks - Roadways.
Standard: To AS 4419.
Topsoil description:
- Of a friable, porous nature.
- Free of weeds and weed seeds, bulbs, corms and vegetable propagules.
- Free of refuse or materials toxic to humans, animals or plants.
- Free of stumps, roots, clay lumps or stones larger than 50 mm in size.
- Minimum organic content: 3% by mass.
- pH range: 5.5 to 7.5.
- Maximum soluble salt content: 0.06% by mass.

Health warning: Provide a health warning to conform with AS 4419 on packaging or invoice for bulk supply.

3.3 FERTILISER AND MULCHES

Fertiliser
Type: Organic.
NPK ratio:

Vegetable mulch
Hydro mulch: Straw, chaff, wood fibre paper pulp finely shredded to a maximum dimension of 10 mm.
Paper mulch, if used, shall not exceed 50% by mass of total mulch. Paper Mulch to comply with AS 4454–2012.

Prohibited material: Meadow hay and weeds.
Binder: Grade ASS slow setting anionic bitumen to AS 1160.
Straw mulching
Material: Straw matrix.
Prohibited material: Meadow hay and weeds.
Binder: Grade ASS slow setting anionic bitumen to AS 1160.
Straw mat finished thickness: > 20 mm.

Mulch types
Organic landscape mulch: To AS 4454.
- Composition:
  - Fines: < 5% by volume.
  - Woodchip: Maximum size < 50 mm.
  - Leaf mulch: < 25% by volume.
Quality: Free of weeds and allelopathic organisms.
Synthetic weed blocking fabric: To AS 4843.

Hardwood stakes
Material: Sharpened at one end, as follows:
- Marker stakes (for tube stock): 15 x 15 x 800 mm.
- Stakes (for advanced stock): 2 stakes, 25 x 25 x 2000 mm.
- Stakes (for super advanced stock): 3 stakes, 50 x 50 x 3000 mm.

3.4 ACCESSORIES AND DRAINAGE

Street tree accessories
Tree guards:
- Product: [complete/delete]
- Size: [complete/delete]
- Finish: [complete/delete]

Tree grates:
- Product: As required by the Conditions of Development Consent.
- Size: As required by the Conditions of Development Consent.
- Size of opening: As required by the Conditions of Development Consent. Material: As required by the Conditions of Development Consent.
- Finish: As required by the Conditions of Development Consent.
Trunk collar guards: 200 mm length of 100 mm diameter agricultural pipe split lengthways.

Street tree subsoil drainage
Drainage cells:
- Product: As required by the Conditions of Development Consent.
- Size of cell panel: As required by the Conditions of Development Consent.
- Filter fabric: As required by the Conditions of Development Consent.
Location: Planting excavations adjacent roadway kerbing.

Subsoil drainage disposal: As required by the Conditions of Development Consent.
Describe or refer to 0224 Stormwater – site.

Root barrier:
- Product: As required by the Conditions of Development Consent.
- Depth: 600 mm.
Location: Planting excavations adjacent to, and within 4 m, of roadway kerbing.

Porous bonded gravel
Tree surround surfacing:
- Product: As required by the Conditions of Development Consent.
- Filter fabric: As required by the Conditions of Development Consent.
- Gravel: As required by the Conditions of Development Consent.
3.5 PLANT MATERIAL

Seed
Certification: Provide a Certificate of Authenticity for all seed as follows:
- Grass and clover: Pre-packed commercially with an accompanying certificate of germination.
- Native seed: Deliver to the site in separate lots for each species and variety, clearly labelled to show species, variety and weight.

Storage: Do not take possession of the seed more than seven days before sowing is to occur. Store seed in clean, air tight containers and keep away from direct sunlight. Do not expose seed to the elements at any stage during storage.

Seed batch not true to type: Replace.

Turf
Description: 25 mm depth of dense, well rooted, vigorous grass growth with 25 mm depth of topsoil and free of weeds, soil pests and diseases.

Species: To Annexure A.

Prohibited material: Kikuyu grass.

Supply: As rolls in long lengths of uniform width in sound unbroken condition.

Width of rolls: > 300 mm.

Plant material – minor works
Balance (small plants) assessment requirements:
- Tubes or plant cells: Height above soil level must be between 1.5 and 2.5 times the height of the tube or plant cell.
- Trees and shrubs in containers < 20 L (other than tubes or plant cells) or ex-ground trees of size index < 35 (e.g. 1.4 m high x 25 mm calliper); height must fall within the range indicated for the container size in the Small container-grown plant table.
- Containers/rootballs (other than tubes or plant cells) must remain flat on the ground when the stem, held at 80% of height above ground, is deflected 30° from the vertical, side to side.

Plant stock classification: To the Small container-grown plant table.

Plant description:
- Healthy, of good form and not soft or forced.
- Large robust root systems.
- Not rootbound.
- Free from disease and insect pests.

Tree description: Single leading shoot.

Hardening off: Deliver all plants to a site within the locality of the works at least four weeks before planting out.

Plant root systems: Maintain root moisture at all times with particular attention to watering during the on-site period before and during planting.

Planting hole depths: Equal to the depth of container soil.

Fertilising: Submit details of fertiliser to be used and application rate for approval.

Small container-grown plant table

<table>
<thead>
<tr>
<th>Minimum rootball diameter or container size</th>
<th>Height range (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thin-stemmed species</td>
</tr>
<tr>
<td>Tubes or plant cells</td>
<td>Height between 1.5 and 2.5 x the height of the container</td>
</tr>
<tr>
<td>150 mm (1.8 L)</td>
<td>0.4 – 0.6</td>
</tr>
<tr>
<td>170 mm (2.6 L)</td>
<td>0.5 – 0.7</td>
</tr>
<tr>
<td>200 mm pot (4 L)</td>
<td>0.7 – 0.9</td>
</tr>
<tr>
<td>200 mm bag (5 L)</td>
<td>0.8 – 1.0</td>
</tr>
<tr>
<td>250 mm (8 L)</td>
<td>1.0 – 1.2</td>
</tr>
<tr>
<td>300 mm (15 L)</td>
<td>1.2 – 1.5</td>
</tr>
</tbody>
</table>
Plant material – major works

3.6 STREET TREES

General
Labelling: Clearly label individual plants and batches.
- Label type: To withstand transit without erosion or misplacement.

Health
Foliage: Consistent with the size, texture and colour shown in healthy specimens of the nominated species.

Vigour
Extension growth: Consistent with vigorous specimens of the species nominated.

Damage
Supply: Free from damage and from restricted habit due to growth in nursery rows.

Stress
Supply: Free from stress resulting from inadequate watering, excessive shade or excessive sunlight.

Site environment
Grown and hardening off conditions: To suit the conditions that could be reasonably anticipated to exist on site at the time of delivery.

Root development
Final containers: Grow plants in their final containers for the following periods:
- Plants less than 25 L size: over 6 weeks.
- Plants greater than 25 L size: over 12 weeks.

Pests and disease
Supply: Foliage free from attack by pests or disease.

Native species susceptible to attack by native pests
Evidence of previous attack: To no more than 15% of the foliage. Ensure absence of actively feeding insects.

Large trees (Balance)
Conformance at inspection: To balance (large trees) assessment requirements.
Balance (large trees) assessment requirements:
- For trees grown in containers ≥ 20 L, the size index must lie within the range for the nominal container size shown in the Common container volumes table.
- Ex-ground trees with a size index ≥ 35 (e.g. 1.4 m high x 25 mm caliper) must have rootball diameters ≥ the minimum rootball diameters shown in the Ex-ground trees table.

Common container volumes table

<table>
<thead>
<tr>
<th>Size index</th>
<th>Nominal container volume (L)</th>
<th>Size index</th>
<th>Nominal container volume (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-33</td>
<td>20</td>
<td>371-480</td>
<td>450</td>
</tr>
<tr>
<td>32-41</td>
<td>25</td>
<td>412-518</td>
<td>500</td>
</tr>
<tr>
<td>45-58</td>
<td>35</td>
<td>453-587</td>
<td>550</td>
</tr>
<tr>
<td>57-74</td>
<td>45</td>
<td>495-640</td>
<td>600</td>
</tr>
<tr>
<td>77-99</td>
<td>60</td>
<td>533-716</td>
<td>700</td>
</tr>
<tr>
<td>83-107</td>
<td>75</td>
<td>632-818</td>
<td>800</td>
</tr>
<tr>
<td>111-143</td>
<td>100</td>
<td>711-921</td>
<td>900</td>
</tr>
<tr>
<td>154-200</td>
<td>150</td>
<td>791-1023</td>
<td>1000</td>
</tr>
<tr>
<td>194-251</td>
<td>200</td>
<td>842-1089</td>
<td>1100</td>
</tr>
<tr>
<td>227-314</td>
<td>250</td>
<td>918-1188</td>
<td>1200</td>
</tr>
<tr>
<td>273-353</td>
<td>300</td>
<td>1148-1485</td>
<td>1500</td>
</tr>
<tr>
<td>289-373</td>
<td>350</td>
<td>1530-1980</td>
<td>2000</td>
</tr>
<tr>
<td>330-427</td>
<td>400</td>
<td>1913-2475</td>
<td>2500</td>
</tr>
</tbody>
</table>

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### Ex-ground trees table

<table>
<thead>
<tr>
<th>Size index</th>
<th>Minimum rootball diameter (mm)</th>
<th>Size index</th>
<th>Minimum rootball diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36–55</td>
<td>350</td>
<td>341–383</td>
<td>850</td>
</tr>
<tr>
<td>56–72</td>
<td>400</td>
<td>384–429</td>
<td>900</td>
</tr>
<tr>
<td>73–106</td>
<td>450</td>
<td>430–530</td>
<td>1000</td>
</tr>
<tr>
<td>107–131</td>
<td>500</td>
<td>531–642</td>
<td>1100</td>
</tr>
<tr>
<td>132–156</td>
<td>550</td>
<td>643–732</td>
<td>1200</td>
</tr>
<tr>
<td>157–173</td>
<td>600</td>
<td>733–859</td>
<td>1300</td>
</tr>
<tr>
<td>174–228</td>
<td>650</td>
<td>860–1144</td>
<td>1500</td>
</tr>
<tr>
<td>229–249</td>
<td>700</td>
<td>1145–1507</td>
<td>1750</td>
</tr>
<tr>
<td>250–299</td>
<td>750</td>
<td>1508–1968</td>
<td>2000</td>
</tr>
<tr>
<td>300–340</td>
<td>800</td>
<td>1969–3075</td>
<td>2500</td>
</tr>
</tbody>
</table>

Trees outside the ranges shown in the **Common container volumes table** and the **Ex-ground trees table**:
- Height: As required by the Conditions of Development Consent.
- Calliper: As required by the Conditions of Development Consent.
- Rootball volume: As required by the Conditions of Development Consent.

Photographs: Provide current colour copies with date verification.

### 3.7 ABOVE-GROUND QUALITIES

**Supply**
General: Supply only trees that:
- Are free from injury.
- Are self-supporting.
- Have the calliper at any given point on the stem greater than the calliper at any higher point on the stem.

**Pruning**
Clean stem height: less than 40% of total tree height.

**Pruning wounds**
Extent: Restrict fresh (i.e. recent, non-calloused pruning wounds) to < 20% of total tree height.
Type: Ensure a clean-cut at the branch collar.
Diameter of wound: less than 50% of the calliper immediately above the point of pruning.

**Apical dominance**
Species with an excrurent form: Defined central leader and intact apical bud.

**Crown symmetry**
Crown distribution: Difference on opposite sides of the stem axis < 20%.

**Stem structure**
Species with excrurent form: Single stem roughly in the centre of the tree with any deviation from vertical less than 15°.
Species with decurrent form: Central stem undivided below the clean stem height nominated with sound stem junction at the point of division.
All species: Branch diameter less than or equal to one-half of the calliper immediately above the branch junction.

**Included bark**
General: Convex branch/stem bark ridges at junctions between stems and branches and between co-dominant stems.

**Trunk position**
Variation in distance from the centre of the trunk to the extremity of the rootball: no more than 10%.

**Compatibility of graft unions**
Union between the scion and rootstock: Sound for the perimeter of the graft.
Diameter of the scion immediately above the graft: Equal to the diameter of the rootstock immediately below the graft (+20%).

**Indication of north**
Trees in containers greater than 100 L or of size index greater than 140: Indicate the northerly aspect during growth in the nursery.
General: Indicator to withstand transit without erasure or misplacement.

### 3.8 STREET TREES – BELOW-GROUND QUALITIES

**Root division**
Trees in containers less than or equal to 45 L or ex-ground trees with a size index less than or equal to 70: Primary division of roots at less than 100 mm intervals.
Trees in containers greater than 45 L or ex-ground trees with a size index greater than 70: Primary division of roots within the outer 50% of the rootball at less than 100 mm intervals.

**Root direction**
General: Ensure that roots generally grow in an outwards (radial) or downwards direction from the point of initiation and that any deviation from the established direction is less than 45°.
Trees with a caliper at ground level less than 40 mm: Ensure the diameter of any nonconforming roots at the extremity of the rootball is less than 25% of the caliper.
Trees with a caliper at ground level of 40 mm or larger: Ensure the diameter of any nonconforming roots at the extremity of the rootball is less than 10 mm.

**Rootball occupancy**
Soil retention: On shaking or handling the unsupported rootball, at least 90% of the soil volume to remain intact.

**Rootball depth**
Rootball depth assessment for containers/rootballs 45 L or larger:
- Depth: no greater than maximum depth documented.
- Maximum depth (regardless of size): 550 mm.
- Diameter: Greater than or equal to depth.

**Height of root crown**
General: Ensure that root crown is at the surface of the rootball.

**Non-suckering rootstock**
Grafted cultivars/varieties: Supply trees grafted onto non-suckering rootstock.

### 4 EXECUTION

#### 4.1 SLOPES AND DRAINS

**Program**
Between September and May: Vegetate exposed surfaces before the area exceeds 1 ha.
Between June and August: Do not carry out landscape work to exposed surfaces without approval.

**Preparation**
Herbicide treatment:
- Spray application
- Rate: To Annexure A.
- Program: Maintain sprayed areas undisturbed for 2 weeks. This is a WITNESS POINT.

Soil conditioning:
- Material and rate: To Annexure A.
- Gypsum application: Acceptable methods:
  - Spread evenly over the subsoil by a mechanical spreader and topsoil on the same day.
  - Thoroughly mixed into the topsoil whilst the topsoil is being removed from stockpiles.
  - Apply conditioners other than gypsum to the supplier’s recommendations and as approved by the Superintendent.

Seed mixing:
- Notice prior to sowing: 2 days. This is a WITNESS POINT.
- Mix, pre-treat and place seed in the sowing equipment for each operation on site.
- Sow seed on the day of mixing with pesticide.

**Watering**

Application:
- Initial watering: To a uniform moisture condition without run-off.
- After turfing: Re-water to a uniform moisture condition without run-off.
- After sowing: Re-water to a uniform moisture condition without causing rills in the surface, daily for 15 days or as directed.

Excessive rilling: If excessive rilling has occurred, as determined by the Superintendent, re-prepare and re-sow the affected area. This is a WITNESS POINT.

4.2 SLOPES 3H TO 1V OR FLATTER

**Preparation of the surface**

Cultivation: Before topsoiling, tyre to a depth of 200 mm to produce a loose surface and remove all large stones, rubbish and other materials that may hinder germination.

**Topsoil**

Approval from the Superintendent: Required.
Application: Apply uniformly to provide an average compacted thickness of 50 mm with a minimum compacted thickness of 30 mm at any location.
Cultivation depth: 50 mm, to provide a roughened surface with soil lumps not exceeding 50 mm.

**Incorporation of pesticide**

Timing: Immediately before sowing.
Pesticide type: Powder form.
Application: Mix thoroughly with the seed at the rate specified in Annexure A, to the equivalent mass of seed to be spread on 1 hectare of the surface in accordance with Annexure A.

**Grassing**

Sowing:
- Application: Distribute evenly by a mechanical seeder following the finished contours wherever possible.
- Depth: 5 mm as sown or 5 mm cover by raking or harrowing.
- Fertiliser: Apply concurrently with seeding to Annexure A.

Turfing:
- Laying: On the prepared topsoiled surface.
- Runs of turf: Butt hard against each other and be placed perpendicular to the direction of water flow.
- Slopes 5:1 to 3:1: Peg turfs and remove pegs when established.

Seams: Topdress with topsoil.

Topdressing:
- Timing: 4 to 6 weeks after laying turf.
- Requirement: Correct any undulations or unevenness in the established turf.

Maximum slope for areas to be maintained by a ride-on mower with a 2 m wide deck: 4:1.

4.3 SLOPES STEEPER THAN 3H TO 1V

**Methods**

Vegetate slopes by one of the following methods:
- Topsoiling and hydromulching.
- Topsoiling, hydroseeding and straw mulching.
- Hydroseeding.

Determination of method: If not shown on drawings, by the Superintendent.

**Preparation of the surface**

General: Remove all loose material from fill batters and cut batters.
Timing: No more than seven days before seeding.
Method:
- If batters are not stepped: By dragging a steel chain of 30 kg/m minimum weight.
- Elsewhere: As approved by the Superintendent.

**Topsoil**
Application:
- Stepped batters: Loosely fill with topsoil.
- Elsewhere: Apply uniformly to provide an average thickness of 50 mm with a minimum compacted thickness of 30 mm.

**Hydromulching or hydroseeding**
Application rate: To the **Hydromulching or hydroseeding table**.
Watering: Water dry surfaces by a fine spray before the application of the hydromulch.

**Pesticide:**
- **Timing:** Apply during preparation of the hydromulch or hydroseed slurry.
- **Pesticide type:** Liquid, added to the slurry storage tank.
- **Rate:** 6 litres of pesticide to the equivalent volume of hydromulch or hydroseed slurry to be spread on 1 hectare of surface.

Equipment: Clean and free of contamination from previous operations.
Mix: The addition of the specified materials in the tank and agitated to maintain a uniform consistency during application.
Application: Uniformly over the whole surface.

Weather Conditions: Do not apply Hydromulch or hydroseed under the following weather conditions at the site:
- When temperature is higher than 35°C.
- When winds exceed 15 km/hr.
- Where, in the opinion of the Superintendent, the surface is too wet.
- During rain periods or when rain appears imminent.

<table>
<thead>
<tr>
<th>Material</th>
<th>Application rate per hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydromulching</td>
</tr>
<tr>
<td>Vegetable mulch (kg)</td>
<td>1500</td>
</tr>
<tr>
<td>Water (L)</td>
<td>35,000</td>
</tr>
<tr>
<td>Binder (L)</td>
<td>1200</td>
</tr>
<tr>
<td>Fertiliser</td>
<td>See Annexure A</td>
</tr>
<tr>
<td>Seed</td>
<td>See Annexure A</td>
</tr>
<tr>
<td>Wetting agent (L)</td>
<td>35</td>
</tr>
<tr>
<td>Pesticide (L)</td>
<td>5</td>
</tr>
</tbody>
</table>

**Straw mulching**
Application: Apply uniformly by a suitable blower.
Rate: 250 bales (each of 20 kg) of straw per hectare of surface.
Bitumen emulsion: Incorporate as a spray into the air stream of the mulch blower at ≥2500 litres per hectare of surface.
Straw mat thickness: ≥20 mm at any location.

**4.4 OPEN DRAINS**

**Preparation of the surface**
Topsoil: Spread to provide an average compacted thickness of 50 mm with a minimum compacted thickness of 30 mm at any location.
Timing: Complete vegetation within 7 days of the completion of open drain excavation.

**Sowing**
Rate: To Annexure A.
Application: Apply uniformly by one of the following procedures as directed by the Superintendent:
- Mechanical sowing.
- Hydromulching or hydroseeding.
- By hand.

**Surface protection**

Provide protection to all or part of the sown surface by one of the following methods:

- Bitumen emulsion: Spray the surface with an anionic slow setting bitumen emulsion to Grade ASS of AS 1160 at a rate of 1 litre of bitumen emulsion per square metre of surface.

- Organic fibre mat: Line the channel with an organic fibre mat listed in Annexure A. Lay the runs of matting along the direction of water flow loosely on the soil surface and not stretched. Slot the upstream end of the matting into a trench 150 mm wide by 150 mm deep and pinned to the base of the trench at 200 mm centres. Backfill the trench with soil and compact by foot. Provide ‘U’ shaped pins of 4 mm gauge wire, 50 mm wide and 150 mm long legs. Overlap adjacent runs of matting 100 mm with the higher run lapped over the lower run. Pin the matting along the sides of each run at 500 mm centres and along the middle of each run at 1000 mm centres. Provide end overlaps 150 mm wide with the higher run end lapped over the start of the lower run and pinned at 200 mm centres.

- Turfing: Butt runs of turf hard against each other and placed perpendicular to the direction of water flow in the drain. Pin into position at 500 mm centres. Topdress seams of turf with topsoil.

**Determination of method:** If not shown on drawings, by the Superintendent.

### 4.5 LANDSCAPE PLANTING

**Conditions**

Timing: Give minimum 2 days notice of commencement of planting.

Conditions: Do not carry out landscape planting in extreme weather conditions (above 35°C or below 10°C), unless otherwise approved by the Superintendent.

**Preparation generally**

Weed management by herbicide spray:

- Rate: To Annexure A.
- Program: Maintain sprayed areas undisturbed for 2 weeks.
- Spray drift: Ensure there is no contact with planted material.

**Alternative weed management by synthetic weed blocking fabric:**

- Extent: 800 mm surrounding each proposed planting.
- Approval: Required.

**Soil conditioning:**

- Material and rate: To Annexure A.
- Gypsum application: Acceptable methods:

  Spread evenly over the subsoil by a mechanical spreader and topsoiled on the same day.

Thoroughly mixed into the topsoil whilst the topsoil is being removed from stockpiles.

- Other conditions: Apply to the supplier’s recommendations and as approved.

**Mass planting in mulched bed**

Surface preparation: Rip the surface at 500 mm centres to a depth of 300 mm and break up the top 200 mm of the planting bed by cultivation to a maximum size of 50 mm.

Mulch: Spread 75 mm thick.

**Individual planting**

Preparation: Loosen a planting area 600 mm diameter to a depth of 400 mm.

Mulch: Spread 75 mm thick to 600 mm radius around the plant.

**Planting – minor works**

This clause is for minor works such as mass planted areas associated with cut and fill batters, pathway verges, median areas and open drains.

Method: Remove the localised mulch. Root prune to ensure all circling roots have been either severed or aligned radially into the surrounding soil. Place the plant, backfill the planting hole with topsoil and compact lightly so as to minimise subsidence without compacting the backfill. Avoid mixing mulch with topsoil.
Stakes and ties: 'Advanced' and 'super advanced' stock:
- Drive stakes 300 mm deep and 200 mm clear of the plant.
- Ties: 50 mm wide hessian webbing strips, attached loosely.
Watering: 10 litres of water per hole before the mulch is respread over the disturbed area.
Mulching: Replace, and leave the plant stem clear.

**Landscape planting - major works**

If the project is of a major scope the following procedure should be followed:

**Care of landscape planting – minor works**

This clause is for minor works such as mass planted areas associated with cut and fill batters, pathway verges, median areas and open drains.

Watering: Water all plants, from the time of planting, at the rate of 10 litres per plant every third day for the first twelve weeks.

Replacement: Replace missing plants, dead plants and plants nominated by the Superintendent as unhealthy with plants of similar size and quality and of identical species and variety to the plant being replaced.

Weed and grass growth in mulched areas: Control with herbicide, in accordance with the manufacturer's instructions at monthly intervals during the construction period and contract maintenance period. Replace plants damaged by herbicide application.

**Landscape planting – major works**

If the project is of a major scope the following procedure should be followed:

### 4.6 STREET TREES

**Unpaved areas**

Excavation:

- Containers < 75 litre: Twice the diameter of the root ball.
- Containers ≥75 litre: three times the diameter of the root ball.
- Depth: Root ball plus 100 mm. Loosen the compacted sides, and the bottom a further 100 mm.

Planting: if clay is present add 1 kg of agricultural gypsum soil conditioning.

Accessories and drainage: Fit trunk collar guard, root barrier and subsoil drainage measures prior to backfilling.

Backfill: Topsoil.

Mulch: 75 mm thick and 50 mm clear of plant stem.

Initial watering: 50 litres per tree applied in stages during backfilling.

**Paved areas**

Select a cubic capacity to suit the size and species of the tree. A potentially large tree may need 12 m³.

Accessories and drainage: Fit trunk collar guard, root barrier and subsoil drainage measures prior to backfilling.

Backfill: Provide structural soil to the **Structural soil table.**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Fertiliser</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural soil</td>
<td>75% 20 mm crushed river gravel 25% filler soil of 1 part screened dolomite to 1 part screened sandy loam</td>
<td>Trace element mix: 300 g/m³, Potassium nitrate: 500 g/m³, Ammonium nitrate: 500 g/m³, Superphosphate: 500 g/m³, Ion sulphate: 1.5 kg/m³, 8/9 month Controlled Release: 2 kg/m³, Gypsum: 500 g/m³, Magnesium sulphate: 400 g/m³, Magnilime: 600 g/m³</td>
<td>100 mm</td>
</tr>
<tr>
<td>20 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural soil</td>
<td>80% 40 mm basalt aggregate 20% filler soil of 1 part screened dolomite to 1 part screened sandy</td>
<td>Trace element mix: 300 g/m³, Potassium nitrate: 500 g/m³, Ammonium nitrate: 500 g/m³, Superphosphate: 500 g/m³, Ion sulphate: 1.5 kg/m³</td>
<td>Varies</td>
</tr>
<tr>
<td>40 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>Fertiliser</td>
<td>Depth</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>------------</td>
<td>-------</td>
</tr>
</tbody>
</table>
|     | loam        | 8/9 month Controlled Release: 2 kg/m³  
Gypsum: 500 g/m³  
Magnesium sulphate: 400 g/m³  
Magnilime: 600 g/m³ |       |

Structural soil type: As required by the Conditions of Development Consent.
Mulch: 10 mm screenings 75 mm thick.
Initial watering: 50 litres per tree applied gradually.

**Porous bonded gravel**
Backfill: Allow for base aggregate and gravel.
Filter fabric: Lay over growing medium pre cut to size.
Base aggregate: 5 to 7 mm crushed blue metal laid 70 mm deep and hand consolidated.
Porous paving: Mix and place to the manufacturers published directions.
- Thickness: To manufacturers guidelines.

### 4.7 TRANSPLANTING STREET TREES

**General**
General: Conform to the Transplanting schedule.
Notice: Give notice prior to:
- Watering
- Fertilising
- Root cutting
This is a **WITNESS POINT**. Notice 48 Hours.

NOTE: This notice shall also be provided to the Council Tree Management’s Officer.
Conditions: Select a time for transplanting having regard to the appropriate season, time of actual operation, rootball diameter and depth, lifting methods, weather conditions and the like.

**Preparation**
Watering: Establish a temporary trickle irrigation system, or manually water the intended trees for a period of two weeks prior to ball excavation work.
Fertilising: Apply one application of liquid fertiliser mix to the foliage and root as appropriate to the species. Apply sufficient liquid fertiliser mix to allow the spray to drip from foliage and soak into the rootball. Do not spray the fertiliser mix on excessively hot, dry or windy days.

**Rootball**
General: Minimise the cutting of roots. Use only sharp tools, water blasting or water cutting.

Initial cut:
- Manually or by chain trenching machine. Trees whose rootballs have been excavated by backhoe or excavator are not acceptable.
- Located 250 mm beyond the required finished rootball dimensions of each side to allow any damaged roots to be trimmed back to final dimensions and sealed.

Hand trimming:
- To 100 mm less than the required finished rootball dimension. Cut back and seal with an approved horticultural sealer on and all roots greater than 25 mm diameter.

Outcome: Cut rootball to be:
- Symmetrical about the trunk and in proportion to the overall size of the tree except where the limitations of individual tree planter openings requires specific tailoring of the rootball dimension.
- Cut to a size designed to maximise the rootball in the best interests of each specimen.

Trench: Backfill and lightly compact with clean sand, free of any foreign matter, pathogens or any substances likely to be deleterious to future root growth. Apply sufficient root inducing formulation, at the manufacturer’s recommended concentration, to effectively saturate the backfill in the trench.

**Maintenance of on-site plant material**
Watering: Maintain a trickle irrigation system around each tree, located within the trenched rootball perimeter. Program the system to supply water at an optimum rate to encourage healthy growth and
avoid desiccation through excessive transpiration following the pruning of the roots. Monitor the system until the tree is lifted and transplanted.

Fertilising: Submit a program for regular fertiliser applications continued over this period. This is a WITNESS POINT.

Responsibility: Take precautions to safeguard the health and well being of all on site plant material prior to the lifting and transplanting.

Above ground
Pruning: If selected pruning of branches appears necessary to balance root loss obtain prior approval. This is a WITNESS POINT.
Lifting: Thoroughly irrigate to the full depth of the rootball two days prior to transplanting of each specimen. Do not fracture the ball of soil around the root system. Maintain ball in firm condition during transplanting by wrapping in hessian or other appropriate open weave material, securely tied.
Storage: Transport transplanted trees to a designated nursery site. Store and maintain until ready for planting.
Planting: Avoid disturbance to the rootball during moving and planting. After placement, remove the rootball wrapping and ties by cutting.
Watering: At the completion of transplanting, water the rootball thoroughly and continue to water until established.

4.8 LIMITS AND TOLERANCES

Application
Summary: The limits and tolerances applicable to this worksection are summarised in Summary of limits and tolerances table.

Limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/tolerances</th>
<th>Worksection reference Clause/subclause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td></td>
<td>MATERIALS/Topsoil – minor works</td>
</tr>
<tr>
<td>- Organic content</td>
<td>&gt; 3% by mass</td>
<td></td>
</tr>
<tr>
<td>- pH</td>
<td>&gt; 5.5 &lt; 7.5</td>
<td></td>
</tr>
<tr>
<td>- Soluble Salt</td>
<td>&lt; 0.06% by mass</td>
<td></td>
</tr>
<tr>
<td>Turf</td>
<td></td>
<td>MATERIALS/Plant material (Turf)</td>
</tr>
<tr>
<td>- Width of rolls</td>
<td>&gt; 300 mm</td>
<td></td>
</tr>
<tr>
<td>Vegetable Mulch</td>
<td></td>
<td>MATERIALS/Fertiliser and mulches</td>
</tr>
<tr>
<td>- Hydromulch</td>
<td>Maximum size &lt; 10 mm</td>
<td></td>
</tr>
<tr>
<td>- Paper pulp</td>
<td>&lt; 50% by mass of total mulch</td>
<td></td>
</tr>
<tr>
<td>Straw mulching</td>
<td></td>
<td>MATERIALS</td>
</tr>
<tr>
<td>- Straw mat</td>
<td>Finished thickness &gt; 20 mm</td>
<td></td>
</tr>
<tr>
<td>Mulch composition</td>
<td></td>
<td>MATERIALS/Fertiliser and mulches (Mulch types)</td>
</tr>
<tr>
<td>- Fines</td>
<td>&lt; 5% by volume</td>
<td></td>
</tr>
<tr>
<td>- Woodchip</td>
<td>Maximum size &lt; 50 mm</td>
<td></td>
</tr>
<tr>
<td>- Leaf mulch</td>
<td>&lt; 25% by volume</td>
<td></td>
</tr>
<tr>
<td>Plant material</td>
<td></td>
<td>Plant materials</td>
</tr>
<tr>
<td>- Container soil mix</td>
<td>Contain 20% to 25% by volume of clay</td>
<td></td>
</tr>
<tr>
<td>Topsoil (Execution)</td>
<td></td>
<td>EXECUTION/Slopes 3:1 or flatter, Slopes steeper than 3:1</td>
</tr>
<tr>
<td>- Temperature</td>
<td>Minimum compacted thickness at any location of 30 mm</td>
<td>EXECUTION/Landscape planting (Conditions)</td>
</tr>
<tr>
<td>Landscape planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Temperature</td>
<td>Planting not to be undertaken when temperatures &gt; 35°C or &lt; 10°C.</td>
<td></td>
</tr>
</tbody>
</table>

Location of planting
General: Do not obstruct access to services or sightlines to signage. Do not obstruct pedestrian or vehicular traffic.

Street trees
Ground clearance:
- Clearance height at maturity: 2.4 m.
- Clearance height at time of planting: 1.5 m.

Setbacks:
- Mature canopy clearance: Locate trees to achieve clearances from the following:
  Electricity or telecommunication poles or pillars: > 4 m.
  Streetlights: > 7.5 m.
  High voltage transmission lines: > 4 m radius.
  Stormwater drainage pits: > 2 m.

Kerbs: 750 mm to 1000 mm measured to the back of the kerb.
Driveways: > 3 m.
Intersections: > 10 m measured from the face of the kerb of the adjoining street.
Existing trees: The combined mature canopy width.

Roundabouts
Setback: From the inside edge of the kerb as follows:
- 0 – 1 m: Appropriate pavement material.
- 1 – 3 m: Shrubs/groundcovers with a maximum mature unpruned height of 600 mm above the road pavement.
- 3 m and over: Trees and shrubs/groundcovers.

Median Islands
Setback: From the inside edge of the kerb as follows:
0 m – 0.3 m: Appropriate pavement material.
0.3 m – 1 m: Appropriate groundcovers, 200 mm high with minimal pruning requirements.

5 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

5.1 MEASUREMENT

General
Payment to the schedule of rates: To 0152 Schedule of rates – projects, worksection 0257 Landscape – roadways and street trees, the drawings and Pay items 0257.1 to 0257.5.
Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology
The following methodology will be applied for measurement and payment:
- All areas of landscape works: In the plane of the surface.
- Thickness: Applied perpendicular to the surface.
- Erosion and sedimentation control measures: To 1102 Control of erosion and sedimentation.
- Topsoil stockpiling: To 1112 Earthworks (Roadways).

5.2 PAY ITEMS

This clause assumes the contract is tendered on the basis of a Schedule of Rates as appropriate for minimal documentation of landscaped areas.

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule Rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0257.1 Vegetation of slopes 3 to 1 or flatter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0257.1(1) Vegetation—Seeding</td>
<td>m²</td>
<td>All costs associated with the vegetation of slopes by seeding other than the cost of watering, and supply of imported topsoil.</td>
</tr>
<tr>
<td>0257.1(2) Vegetation—Turfing</td>
<td>m²</td>
<td>All costs associated with the vegetation of such slopes by turfing other than the cost of watering, and supply of imported topsoil.</td>
</tr>
</tbody>
</table>
**0257.2 Vegetation of slopes steeper than 3 to 1**

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule Rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0257.2(1) Preparation of surface other than stepped batters</td>
<td>m²</td>
<td>All costs associated with the preparation of the surface for vegetation other than the cost of supply of imported topsoil.</td>
</tr>
<tr>
<td>0257.2(2) Preparation of surface of stepped batters</td>
<td>m² on the batter slope</td>
<td>All costs associated with the preparation of the batter slope for vegetation other than the cost of supply of imported topsoil.</td>
</tr>
<tr>
<td>0257.2(3) Hydromulching</td>
<td>m²</td>
<td>All costs associated with hydromulching other than the watering of dry surfaces.</td>
</tr>
<tr>
<td>0257.2(4) Hydroseeding</td>
<td>m²</td>
<td>All costs associated with hydroseeding other than the watering of dry surfaces.</td>
</tr>
<tr>
<td>0257.2(5) Straw Mulching</td>
<td>m²</td>
<td>All costs associated with straw mulching.</td>
</tr>
<tr>
<td>0257.2(6) Watering Determination of volume: By calibrated dipstick readings or other method approved by the Superintendent.</td>
<td>Kilolitre</td>
<td>All costs associated with supply and delivery of the water and the watering of dry surfaces.</td>
</tr>
</tbody>
</table>

**0257.3 Vegetation of open drains**

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule Rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0257.3(1) Preparation and Topsoiling of Drains</td>
<td>m²</td>
<td>All costs associated with preparation of the surface for sowing.</td>
</tr>
<tr>
<td>0257.3(2) Mechanical Sowing</td>
<td>m²</td>
<td>All costs associated with sowing and fertilizing.</td>
</tr>
<tr>
<td>0257.3(3) Hydromulching</td>
<td>m²</td>
<td>All costs associated with hydromulching other than the watering of dry surfaces.</td>
</tr>
<tr>
<td>0257.3(4) Hydroseeding</td>
<td>m²</td>
<td>All costs associated with hydroseeding other than the watering of dry surfaces.</td>
</tr>
<tr>
<td>0257.3(5) Hand Sowing</td>
<td>m²</td>
<td>All costs associated with sowing by hand.</td>
</tr>
<tr>
<td>0257.3(6) Spray with bitumen emulsion</td>
<td>m²</td>
<td>All costs associated with the supply and spraying of bitumen emulsion.</td>
</tr>
<tr>
<td>0257.3(7) Lining with organic fibre mat</td>
<td>m²</td>
<td>All costs associated with the supply and placement of organic fibre mat.</td>
</tr>
<tr>
<td>0257.3(8) Turfing</td>
<td>m²</td>
<td>All costs associated with the supply and placement of turf.</td>
</tr>
<tr>
<td>0257.3(9) Watering Determination of volume: By calibrated dipstick readings or other method approved by the Superintendent.</td>
<td>Kilolitre</td>
<td>All costs associated with supply and delivery of the water and the watering of dry surfaces and all treated drain areas.</td>
</tr>
</tbody>
</table>

**0257.4 Landscape planting**

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule Rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0257.4(1) Provision of mulched bed for mass planting</td>
<td>m²</td>
<td>All costs associated with the preparatory work of the mulched bed before planting.</td>
</tr>
<tr>
<td>Pay Items</td>
<td>Unit of measurement</td>
<td>Schedule Rate scope</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>0257.4(2) Mass planting</td>
<td>Each plant</td>
<td>All costs associated with the planting in the mulched bed and subsequent care of each plant.</td>
</tr>
<tr>
<td>0257.4(3) Individual Landscape</td>
<td>Each plant</td>
<td>All costs associated with the preparatory work, planting and subsequent care of each plant.</td>
</tr>
<tr>
<td>Planting of Stock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0257.5 Supply of imported</td>
<td>The cubic metre</td>
<td>All costs associated with the supply and delivery of the topsoil to the site as directed by the Superintendent. Placing and spreading of the topsoil</td>
</tr>
<tr>
<td>topsoil</td>
<td>measured loose in</td>
<td>is excluded from this pay item and is included in the specific activity pay items for vegetation or planting as appropriate.</td>
</tr>
<tr>
<td></td>
<td>the truck as</td>
<td></td>
</tr>
<tr>
<td></td>
<td>delivered</td>
<td></td>
</tr>
</tbody>
</table>

6 ANNEXURE A

6.1 LANDSCAPING MATERIALS

Edit with additions or deletions to suit the project.

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Minimum application rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Herbicide*</td>
<td>Glyphosate e.g. Roundup</td>
<td>9 litres/200 litres water/ha</td>
</tr>
<tr>
<td>2. Seed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Grass</td>
<td>Rye Corn (April-August) or</td>
<td>60 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Japanese Millet (September-March)</td>
<td>60 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Hullied Couch</td>
<td>5 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Red Clover (Inoculated)</td>
<td>5 kg/ha</td>
</tr>
<tr>
<td></td>
<td>White Clover (Inoculated)</td>
<td>5 kg/ha</td>
</tr>
<tr>
<td></td>
<td>'Elka' Perennial Rye</td>
<td>5 kg/ha</td>
</tr>
<tr>
<td>- Native</td>
<td>Acacia dealbata</td>
<td>4 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Acacia buxifolia</td>
<td>1 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Acacia decurrens</td>
<td>1 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Acacia pravissima</td>
<td>1 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Leptospermum lanigerum</td>
<td>1 kg/ha</td>
</tr>
<tr>
<td></td>
<td>Hardenbergia violacea</td>
<td>500 g/ha</td>
</tr>
<tr>
<td></td>
<td>Kennedia prostrata</td>
<td>500 g/ha</td>
</tr>
<tr>
<td></td>
<td>Acacia impexa</td>
<td>200 g/ha</td>
</tr>
<tr>
<td></td>
<td>Banksia marginata</td>
<td>200 g/ha</td>
</tr>
<tr>
<td></td>
<td>Bursaria spinosa</td>
<td>200 g/ha</td>
</tr>
<tr>
<td></td>
<td>Callistemon pallidus</td>
<td>200 g/ha</td>
</tr>
<tr>
<td></td>
<td>Dodonaea viscosa</td>
<td>200 g/ha</td>
</tr>
<tr>
<td>3. Turf grass</td>
<td>Couch</td>
<td>Refer to Drawings</td>
</tr>
<tr>
<td>- Medians</td>
<td>Buffal0</td>
<td></td>
</tr>
<tr>
<td>- Verges/Footpaths</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Type</td>
<td>Minimum application rate</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>4. Fertiliser *</td>
<td>Dynamic Lifter ‘Nitro’</td>
<td>1000 kg/ha</td>
</tr>
<tr>
<td>Vegetation of Slopes/Drains</td>
<td>‘Aquasoil’</td>
<td>1 litre/1000 litres of mix water</td>
</tr>
<tr>
<td>5. WETTING AGENT *</td>
<td>‘Lorsban 500 EC’</td>
<td>5 litres</td>
</tr>
<tr>
<td></td>
<td>‘Lorsban 260 W’</td>
<td>10 kg</td>
</tr>
<tr>
<td>6. PESTICIDE *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Powder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SOIL CONDITIONER*</td>
<td>Gypsum</td>
<td>400 g/m²</td>
</tr>
<tr>
<td>Vegetation of Slopes/Drains</td>
<td>N:P:K ratio 6.3:1.8:2.8</td>
<td>5kg g/m²</td>
</tr>
<tr>
<td>Landscape Planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. ORGANIC FIBRE MAT*</td>
<td>‘Sta-firma’ (light grade)</td>
<td>—</td>
</tr>
<tr>
<td>9. MULCH</td>
<td>Composted/Pasteurized</td>
<td>75 mm thick</td>
</tr>
</tbody>
</table>

* Provide the material as listed or as approved by the local authority.
0319 MINOR CONCRETE WORKS

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide cast concrete as documented and as follows:
- In conformance with the design details.
- Which satisfies quality and inspection requirements.
- Compatible with design finishes.

Design
Formwork: The design of the formwork, other than profiled steel sheeting composite formwork is the contractor's responsibility.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:
Note: Only the most current standards are to be used

AS 1012  Methods of testing concrete
AS 1012.3.1  Determination of properties related to the consistency of concrete—Slump test
AS 1012.14  Method for securing and testing cores from hardened concrete for compressive strength
AS 1141  Methods for sampling and testing aggregates
AS 1141.14  Particle shape by proportional calliper
AS 1141.21  Aggregate crushing value
AS 1141.23  Los Angeles value
AS 1141.24  Aggregate soundness—Evaluation by exposure to sodium sulphate solution
AS 1348  Glossary of terms - Roads and traffic engineering
AS 1379  Specification and supply of concrete
AS 1397  Steel sheet and strip - Hot-dipped zinc-coated or aluminium/zinc-coated
AS 1478  Chemical admixtures for concrete, mortar and grout
AS 1478.1  Admixtures for concrete
AS 1554  Structural steel welding
AS 1554.3  Welding of reinforcing steel
AS 2327  Composite structures
AS 2327.1  Simply supported beams
AS 2758  Aggregates and rock for engineering purposes
AS 2758.1  Concrete aggregates
AS 2870  Residential slabs and footings
AS 3600  Concrete structures
AS 3610  Formwork for concrete
AS 3610.1  Documentation and surface finish
AS 3735  Concrete structures retaining liquids
AS 3799  Liquid membrane-forming curing compounds for concrete
AS 3972  General purpose and blended cements
AS/NZS 4586  Slip resistance classification of new pedestrian surface materials
AS/NZS 4671  Steel reinforcing materials
AS/NZS 4880  Hot-dipped galvanized (zinc) coatings on fabricated ferrous articles
AS 6669                        Plywood – Formwork
AS/NZS ISO 9001                Quality management systems - Requirements
CIA CPN35                      Fibres in concrete
NP:PCH                         Precast concrete handbook

**Other publications**

Note: Only the most current standards are to be used

Environmental Best Management Practice Guideline for Concreting Contractors from the Department of Environment and Conservation (NSW)

CIA CPN17                       The use of galvanised reinforcement in concrete
DECC                            Environmental Best Management Practice Guideline for Concreting Contractors

NATSPEC DES 001                 Slip resistance performance
NATSPEC DES 006                 Specifying concrete
NATSPEC TECH report             Specifying ESD
SAA HB 197                      An introductory guide to the slip resistance of pedestrian surface materials
WTIA TN11-2004                  Commentary on the Structural Steel Welding - Standard
AS/NZS 1554                     AS/NZS 1554

**1.4 STANDARDS**

**General**

Formwork design and construction formed surfaces: To AS 3610 and AS 3610.1.

Plywood formwork: To AS 6669.

Profiled steel sheeting, including shear connectors: To AS 2327.1.

Specification and supply of concrete: To AS 1379.

Concrete materials and construction: To AS 3600.

Concrete structures for retaining liquids: To AS 3735.

**Methods and equipment**

Precast elements: Comply with the recommendations of NP:PCH.

**1.5 INTERPRETATION**

**Definitions**

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

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.

- Average ambient temperature: Average value of the daily maximum and minimum ambient temperatures over the relevant period at a site.

- Concrete class:
  - Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise to conform with AS 1379 clause 1.5.3.
  - Special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.

- Early age strength: A mean compressive strength at 7 days exceeding the values shown in Table 1.2 of AS 1379.

- Green concrete: Concrete which has set but not appreciably hardened.

- Joints:
  - Construction joint: A joint with continuous reinforcement provided to suit construction sequence.
  - Control joint: An unreinforced joint between or within discrete elements of construction which allows for relative movement of the elements.
  - Contraction joint: An opening control joint with a bond breaking coating separating the joint surfaces to allow independent and controlled contraction of different parts or components, induced by shrinkage, temperature changes or other causes. It may include unbound dowels to assist vertical deflection control.
Expansion joint: A closing control joint with the joint surfaces separated by a compressible filler to allow axial movement due to thermal expansion or contraction with changes in temperature or creep. It may include unbound dowels to assist vertical deflection control.

Isolation joint: A joint between elements of a structure designed to isolate structural movement while permitting horizontal and/or vertical movement between abutting elements.

Weakened plane joint: A contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.

Structural control joint: A control joints (contraction, expansion and isolation) in structural elements when used with applied material and finishes.

Substrate joint: A joint in the substrate which includes construction joints and joints between different materials.

Sealant joint: A joint filled with a flexible synthetic compound which adheres to surfaces within the joint to prevent the passage of dust, moisture and gases.

- Pave: The definitions given in AS 1348 apply.
- Sprayed concrete: Concrete pneumatically applied at high velocity on to a surface. Application may be either a wet or dry process, to produce a sound homogeneous product with surface finish reasonably uniform in texture and free from blemishes.
- Weather:
  - Cold: Ambient shade temperature < 10°C.
  - Hot: Ambient shade temperature > 30°C.

1.6 SUBMISSIONS

Approval
Submissions: To the Superintendent's approval.

Construction proposals
Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:
- Addition of water at the site.
- Changes to the plastic concrete mix.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Placing under water.
- Sequence and times for concrete pours, and construction joint locations and relocations.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.

Design
Submit: Shop drawings for cores, fixings, embedded items and precast concrete items.

Materials
Submit: Test results for all materials.

Samples
Execution details: Formwork certificate.

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

<table>
<thead>
<tr>
<th>HOLD POINTS table</th>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td>Loads on minor concrete structures</td>
<td>Approval for early loading of the structure by design</td>
<td>3 working days</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Clause/subclause</td>
<td>Requirement</td>
<td>Notice for inspection</td>
<td>Release by</td>
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<tr>
<td><strong>Design documentation</strong></td>
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<tr>
<td>strength in situ tests</td>
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<tr>
<td><strong>Design documentation</strong></td>
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<tr>
<td>Formwork design certificates</td>
<td></td>
<td>3 working days</td>
<td>Superintendent</td>
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<tr>
<td>Proposed loading schedule</td>
<td></td>
<td>3 working days</td>
<td>Superintendent</td>
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<tr>
<td><strong>EXECUTION</strong></td>
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<tr>
<td>Ground preparation - Base preparation</td>
<td></td>
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<tr>
<td>Inspect membrane or film underlay</td>
<td></td>
<td>1 working day prior to</td>
<td>Superintendent &amp;</td>
<td></td>
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<tr>
<td>installed</td>
<td></td>
<td>covering</td>
<td>Council’s Engineering Development Officer</td>
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<tr>
<td>Ground preparation - Polymeric film</td>
<td></td>
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<tr>
<td>underlay installation</td>
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<tr>
<td>Inspect membrane or film underlay</td>
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<td>1 working days prior to</td>
<td>Superintendent &amp;</td>
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<td>installed</td>
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<td>covering</td>
<td>Council’s Engineering Development Officer</td>
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<tr>
<td>Formwork - General</td>
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<tr>
<td>Certification of installed formwork</td>
<td></td>
<td>1 working day prior to</td>
<td>Superintendent &amp;</td>
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<td>and inspection</td>
<td></td>
<td>covering</td>
<td>Council’s Engineering Development Officer</td>
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<tr>
<td>Steel reinforcement placement - Approval</td>
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<tr>
<td>of reinforcement before concrete</td>
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<td>placement</td>
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<tr>
<td>Inspect reinforcement placement</td>
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<td>2 working day prior to</td>
<td>Superintendent &amp;</td>
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<td></td>
<td></td>
<td>covering</td>
<td>Council’s Engineering Development Officer</td>
<td></td>
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<tr>
<td>Cores, fixings and embedded items -</td>
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</tr>
<tr>
<td>General</td>
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<tr>
<td>Shop drawings for cores, fixings and</td>
<td></td>
<td>7 working days prior to</td>
<td>Superintendent</td>
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<tr>
<td>embedded items</td>
<td></td>
<td>commencing works</td>
<td></td>
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<tr>
<td>Sprayed concrete – Method statement</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Submit proposal for spraying</td>
<td></td>
<td>14 days prior</td>
<td>Superintendent</td>
<td></td>
</tr>
</tbody>
</table>

**WITNESS POINTS table**

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION PLANNING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate of compliance</td>
<td>NATA certificates for all materials</td>
<td>7 days prior to commencing on site</td>
</tr>
<tr>
<td>Concrete curing</td>
<td>Certified test results for curing</td>
<td>7 days prior</td>
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<tr>
<td></td>
<td>compound</td>
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</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground preparation – Mass concrete bedding on earth foundations</td>
<td>Inspect concrete blinding slab</td>
<td>1 working day prior to covering notice to Council’s Engineering Development Engineer</td>
</tr>
<tr>
<td>Concrete quality requirements – Formwork</td>
<td>Check erection tolerances</td>
<td>1 working day</td>
</tr>
<tr>
<td>Concrete quality requirements – Surface quality</td>
<td>Conf&lt;i&gt;irm&lt;/i&gt; surf&lt;i&gt;ace&lt;/i&gt; quality</td>
<td>1 working day</td>
</tr>
<tr>
<td>Concrete quality requirements – Flatness</td>
<td>Conf&lt;i&gt;irm&lt;/i&gt; unformed surfaces</td>
<td>1 working day</td>
</tr>
<tr>
<td>Formwork – void formers</td>
<td>Test certificates for void formers</td>
<td>Prior to using in the works</td>
</tr>
<tr>
<td>Steel reinforcement placement – Delivery and receipt of reinforcement</td>
<td>Submit notice for test inspection</td>
<td>10 working days</td>
</tr>
<tr>
<td>Steel reinforcement placement – Placing</td>
<td>Submit proposed changes to reinforcement</td>
<td>7 days prior to commencing on site</td>
</tr>
<tr>
<td>Clause title/Item</td>
<td>Requirement</td>
<td>Notice for inspection</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Steel reinforcement placement</td>
<td>Submit proposed repair method</td>
<td>2 working days prior</td>
</tr>
<tr>
<td>- Damaged galvanizing</td>
<td></td>
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</tr>
<tr>
<td>Steel reinforcement placement</td>
<td>Submit proposed changes to spacing, cover, splicing or welding or reinforcement</td>
<td>2 working days prior</td>
</tr>
<tr>
<td>- Provision for concrete placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cores, fixings and embedded items</td>
<td>Approval for cutting or coring hardened concrete</td>
<td>2 working days prior</td>
</tr>
<tr>
<td>- Cutting or coring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixing of concrete - Consistency</td>
<td>Submit proposal for concrete mixing plan</td>
<td>7 days prior</td>
</tr>
<tr>
<td>Mixing of concrete - Pre-mixed supply</td>
<td>Submit delivery dockets and subcontractors details</td>
<td>Progressive</td>
</tr>
<tr>
<td>Concrete placing and compaction - Placing</td>
<td>Proposed sequence of concrete placement</td>
<td>7 days prior</td>
</tr>
<tr>
<td>Concrete placing and compaction - Concrete placing under water</td>
<td>Submit proposal for placing concrete under water</td>
<td>7 days prior</td>
</tr>
<tr>
<td>Joints - General</td>
<td>Submit proposal for sawn joints</td>
<td>7 days prior</td>
</tr>
<tr>
<td>Formed surfaces - General</td>
<td>Proposed method of surface repair</td>
<td>2 working days prior</td>
</tr>
<tr>
<td>Sprayed concrete - Method statement</td>
<td>Submit proposal for sprayed concrete</td>
<td>14 days</td>
</tr>
<tr>
<td>Sprayed concrete - Sprayed concrete test panel</td>
<td>Approval of sample panels</td>
<td>2 working days</td>
</tr>
</tbody>
</table>

2 PRE-CONSTRUCTION PLANNING

2.1 LOADING

Loads on minor concrete structures
Prohibition: Avoid application of superimposed load 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 until the Contractor can demonstrate that 95% of the design strength of the concrete has been achieved. This is a HOLD POINT.

2.2 PRODUCT CONFORMITY

Requirement
General: Submit current assessments of conformity, as follows:
- Certificate of conformity by a JAS-ANZ accredited third party.
- Declaration of conformity by an AS/NZS ISO 9001 quality management system certified supplier.
- Mark of conformity of a JAS-ANZ accredited third party applied to the product.
- Report by a NATA accredited laboratory describing tests and giving results which demonstrate that the product conforms.

Curing compounds: If it is proposed to use a liquid membrane-forming curing compound submit the following information:
- Certified test results for water retention to AS 3799 Appendix B.
- Evidence of compatibility with concrete, and with applied finishes including toppings and render, if any, including methods of obtaining the required adhesion.
- For visually important surfaces, evidence that an acceptable final surface colour will be obtained. This is a WITNESS POINT.
2.3 DESIGN DOCUMENTATION

Requirement
Formwork design: Conform to AS 3610.1.
Certification: For other than profiled steel sheeting composite formwork, submit certification by a professional structural engineer experienced in formwork design verifying conformance of the design for concrete structures needing a structural design for formwork i.e. deep drainage pits.
This is a HOLD POINT.
Loading: Submit details of proposed construction systems, loads and procedures, including propping and re-shoring. This is a HOLD POINT.

2.4 CERTIFICATES OF COMPLIANCE

Requirement
Verification: Provide certificates from a NATA registered laboratory. Perform all phases of any particular test at one laboratory. Accompany the certificate with all relevant test results carried out within twelve months of the submission date. This is a WITNESS POINT.
General: Use materials only after receipt of the Superintendent's notification of acceptance of test reports and other submissions, and then only if they conform to this worksection.

2.5 SELECTIONS

General
All selection schedules are be referenced back to the approved Construction Certificate plans

3 MATERIALS

3.1 GENERAL

Stockpile
General: If uniform, consistent colour is required, stockpile sand, cement and aggregates for the project.
Cement
Standard: To AS 3972.
Age: Less than 6 months old.
Storage: Store cement bags under cover and above ground.
Aggregates
Standard: To AS 2758.1.
Coarse aggregate: Grading to AS 1141.11 and limits of deviation to AS 2758.1 Table 2.
Fine aggregate: Grading to AS 1141.11 and limits of deviation to AS 2758.1 Table 3.
Aggregate properties: Conform to the Aggregate property schedule.

Water
Standard: To AS 1379.
Quality: Provide clean water, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.
Polymeric film underlay
Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.
Chemical admixtures
Chemical admixtures: To AS 1478.1.
Chemical admixture content: Free of chlorides, fluorides and nitrates.
Curing compounds
Curing compounds: To AS 3799.
3.2 CONCRETE

Properties
Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
  - Properties: Conform to the Concrete properties schedule - performance.
  - Note: Council to nominate strength grade, slump, aggregate size.
  - Note: AS 1379 clause 1.5.3.2 basic parameters must be specified including strength grade, slump, aggregate size either on the structural drawings or to the Concrete property schedule - performance.

- Special-class: To AS 1379 clause 1.5.4.
  - Properties: Conform to the Concrete properties schedule - performance.

Cover
Concrete cover generally: To AS 3600.

3.3 FORMWORK

General
Linings, facings and release agents: Form for compatibility with applied finishes.
Lost formwork: Provide lost formwork which is without chlorides, and without impairment to the structural performance of the concrete members.
Void formers: Material capable of maintaining rigidity and shape until the concrete has set, withstanding construction loads and non-collapsible on absorption of moisture.

Plywood formwork
Material: Plywood sheeting to AS 6669.
Grade: To meet the design dimensions, loading and surface quality specified to AS 3610 and AS 3610.1.
Joints: Seal the joints consistent with the surface finish class.

3.4 REINFORCEMENT

Fibre reinforcement
Standard: To CIA CPN35.

Steel reinforcement
Standard: To AS/NZS 4671.
- Type: As shown on the Approved Drawings.
- Ductility grade: As shown on the Approved Drawings.
Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Protective coating
Corrosion: Protect from corrosion in conformance with AS 3600.
Epoxy coating: High build, high solids chemically resistant coating.
- Thickness: 200 μm minimum.

Galvanizing: To AS/NZS 4680:
- Sequence: If fabrication is to occur after galvanizing, submit proposals for galvanizing repair and coating of cut ends.
- Zinc-coating (minimum): 600 g/m².

Tie wire
General: Annealed steel 1.25 mm diameter (minimum).
External and corrosive applications: Galvanized.

3.5 MISCELLANEOUS

Coloured concrete
Standard: To AS 3610.1.
Surface hardeners, sealants and protectors
Material supply: If required by the project documentation, provide proprietary products in conformance with the manufacturer’s written requirements.

3.6 MINOR PRECAST UNITS

Marking
Identification: Identify units by marks which are as follows:
- Remain legible until after the unit has been fixed in place.
- Are not visible in the completed structure.
- Show the date of casting.
- Show the correct orientation of the unit.
- On other than units manufactured as a standard product, indicate the locations within the structure in conformance with the marking plan.

Tolerances
Fixings and embedded items in precast units: To AS 3610.1, as applicable.

Attachments
Sealing: Recess lifting attachments such as ferrules, or other types of cast-in fixings, and provide plugs for sealing.

Welding of connections
Standard: To AS/NZS 1554.3.

4 EXECUTION

4.1 GROUND PREPARATION

Base preparation
General: According to base type, as follows:
- Concrete working base: Remove projections above the plane surface, and loose material.
- Graded prepared subgrade: Blind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay. This is a HOLD POINT.

Polymeric film underlay installation
General: Lay over the base, lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape. Face the laps away from the direction of concrete pour. Take the underlay up vertical faces past the damp proof course where applicable, and tape fix at the top. Patch or seal punctures or tears before pouring concrete. Cut back as required after concrete has gained strength and forms have been removed. This is a HOLD POINT.

Rock foundations
Minimum depth: Extend the excavation for a minimum depth of 150 mm into the rock for retaining walls, headwalls and wingwalls
Cut-off walls: Provide a depth of cut-off in rock foundations less than that shown in the drawings, if approved by the Superintendent.

Mass concrete bedding on earth foundations (concrete blinding slab)
Concrete walls: Prior to the construction of footings for cast-in-situ concrete walls on earth foundations, cover the latter with a mass concrete blinding slab.
Precast concrete: Unless otherwise specified, place precast concrete wall sections on a fresh mass concrete bedding layer while it is still in a plastic state.
Earth foundation: Place concrete not less than 50 mm thick.
Rock foundation: Place the concrete at least 50 mm above the highest points of rock.
Restriction: Place neither forms nor other materials on the bedding layer within 48 hours of the concrete being placed. This is a WITNESS POINT.

4.2 CONCRETE QUALITY REQUIREMENTS

Formwork
Formed element: AS 3610.1 clause 5.2.2.
Position: Construct formwork so that finished concrete conforms to AS 3600 clause 17.5.
Erection tolerances: Check dimensions and position of forms, after the forms are erected. Align forms accurately and check the location of all fittings and void formers prior to placing concrete. This is a WITNESS POINT.

Surface quality
Formed surfaces: To AS 3610.1 for the surface class nominated in the Formed surface finishes schedule. This is a WITNESS POINT.

Flatness
Unformed surfaces: Conform with the Flatness tolerance class table for the class of finish nominated using a straight edge placed anywhere on the surface in any direction. This is a WITNESS POINT.

<table>
<thead>
<tr>
<th>Class</th>
<th>Measurement</th>
<th>Maximum deviation (mm)</th>
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<tbody>
<tr>
<td>A</td>
<td>3 m straight edge</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>3 m straight edge</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>600 mm straight edge</td>
<td>6</td>
</tr>
</tbody>
</table>

Type and frequency
Sampling, identification and testing of specimens: Sample the concrete on site, at the point of discharge from the agitator to AS 1012 and AS 1379.

Frequency: To 0161 Quality (Construction) Sub-annexure C14.

Records and reports: To AS 1012.

Test certificates and records: Submit test certificates, and also retain results on site.

Concrete testing methods
Slump: Test at least one sample from each batch before placing concrete from that batch in the work.

Strength grade/Characteristic compressive strength: Spread the site sampling evenly throughout the concrete placement.

- Sampling frequency: To the Project assessment strength grade sampling table.

<table>
<thead>
<tr>
<th>Project assessment strength grade sampling table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of batches for each type and grade of</td>
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<tr>
<td>concrete per day</td>
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<tr>
<td>Minimum number of samples</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2-5</td>
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<tr>
<td>6-10</td>
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<tr>
<td>11-20</td>
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<tr>
<td>each additional 10</td>
</tr>
</tbody>
</table>

Cores and test acceptance
General: If the test specimens fail to achieve the specified strength, arrange for cores to be taken from the work. Submit locations of proposed cores for approval. This is a WITNESS POINT.

Acceptance: For acceptance, demonstrate compliance of the average strength of cores with the requirements of the Concrete age conversion factors table and the Concrete strength requirements table.

Strength age factor
Increase: If the testing is carried out at ages in excess of 28 days, validate against the 28 day strength increased by the factors given in the Concrete age conversion factors table.

Failure of cores
Deduction: If cores taken fail to satisfy the strength requirements, by more than 10% and less than 15% a bond guarantee shall be lodged with Council in the amount of the value of demolition, material disposal costs and full reconstruction. Such bond to be released after 12 months of work satisfactory. If failure, bond to be released to reconstruct. If greater than 15% work to be redone.
Concrete age conversion factors table

<table>
<thead>
<tr>
<th>*Age of test specimen in days of date of testing</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>1.00</td>
</tr>
<tr>
<td>35</td>
<td>1.02</td>
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<tr>
<td>42</td>
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<td>168</td>
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<tr>
<td>196</td>
<td>1.20</td>
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<tr>
<td>224</td>
<td>1.22</td>
</tr>
<tr>
<td>308</td>
<td>1.24</td>
</tr>
<tr>
<td>365 and greater</td>
<td>1.25</td>
</tr>
</tbody>
</table>

*For intermediate ages the factor shall be determined by proper interpolation.

Coarse aggregate

Wear: To AS 1141.23.

Loss of weight: < 30%.

Standard tests: When required, test coarse aggregate for conformance to the following properties:
- Aggregate crushing value: To AS 1141.21: < 25%.
- Soundness: To AS 1141.24.
- The loss of mass when tested with sodium sulphate: < 12%.
- Particle Shape: To AS 1141.14.
- The proportion of misshapen particles (2:1 ratio): < 35%.

Control tests

General: Determine strength using site cured specimens in conformance with the Control tests schedule.

Test authority

General: Concrete supplier or NATA registered laboratory.

4.3 FORMWORK

General

Standard: To AS 3610.1.

Certification and inspection: Submit certification by a professional structural engineer experienced in formwork design and construction verifying conformance of the completed formwork where height of formwork requires structural design i.e. deep drainage pits. This is a HOLD POINT.

Requirements

Profile: Provide formwork to produce hardened concrete to the lines, levels and shapes documented.

Robustness: Provide formwork of adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape.

Stripping: Provide forms for removal without risk of damage to the completed structure.

Side forms: Where concrete is placed in earth excavations, provide side forms to prevent contact between concrete and the in situ earth.

Design for placement of concrete: Design formwork so that for high sections concrete cannot fall freely for a height greater than 1.2 m or so that concrete is not moved along the formwork after deposition.

Formwork fittings: Make provision for the accurate location and firm support of fittings, bolts, anchorages and formers of holes as documented.

Temporary fittings for the support of the formwork: Arrange to permit removal without damage to the concrete.
Projection: Do not use wires and or bolts extending to the surface of the concrete except where documented or approved by the Superintendent.

Finish
General: Conform to the Formed surfaces finishes schedule shown in the Construction Certificate documentation.

Material
Formwork material: Provide the type and quality of material for formwork and the workmanship in construction to obtain the surface finish documented. Construct to achieve the erection tolerances.

Preparation
Cleaning: Before placing concrete, remove free water; dust, debris and stains from the forms and the formed space.

Corners
All work above ground: Fillet at re-entrant angles, and chamfer at corners.
- Face of bevel 25 mm.

Embedments
General: Fix embeddings through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

Release agents
Application: Before placing reinforcement, apply a release agent to form linings and facings.
Staining: If commercial quality form oil or grease are used, ensure that surfaces to be exposed will not become stained or discoloured.
Application: Spread the coating uniformly in a thin film and remove any surplus prior to placing concrete.
Unlined timber forms: Wet the timber thoroughly before oiling.

Steel linings
Rust: Clean off any rust and apply rust inhibiting agent prior to reuse.

Joints: Provide joints in the formwork perpendicular to the main axis of the shape of the concrete.

Hidden surfaces
General: Construct forms for all surfaces which will be completely enclosed or permanently hidden below the ground from dressed or undressed timber, steel, plywood or particleboard.

4.4 CONCRETE SUPPLY

General
General: Provide concrete in conformance with the Construction Certificate documentation.

Strength requirement
Variation: For departure from the minimum requirements cited in the Concrete strength requirements table reference a specific minimum cement content on the drawings, or submit for approval.

Concrete strength requirements table

<table>
<thead>
<tr>
<th>Use</th>
<th>MPa</th>
<th>Minimum Portland cement GP (GB)</th>
<th>Coarse aggregate nominal size</th>
<th>Cylinder strength required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Kg/m$^3$</td>
<td>mm</td>
<td>7 days</td>
</tr>
<tr>
<td>Foundations, mass retaining walls</td>
<td>20</td>
<td>270 (330)</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>Mass concrete footings, pitching, linings etc.</td>
<td>20</td>
<td>270 (330)</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Drainage structures, driveways,</td>
<td>20</td>
<td>270 (330)</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Use</td>
<td>MPa</td>
<td>Minimum Portland cement GP (GB)</td>
<td>Coarse aggregate nominal size Kg/m³ mm</td>
<td>Cylinder strength required MPa MPa 7 days 28 days</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>---------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>footpaths, miscellaneous minor concrete work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforced concrete culverts, headwalls, base slabs, sign structure</td>
<td>32</td>
<td>320 (380)</td>
<td>20</td>
<td>24 32</td>
</tr>
<tr>
<td>large footings, retaining walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety barriers</td>
<td>40</td>
<td>330 (380)</td>
<td>20</td>
<td>24 40</td>
</tr>
<tr>
<td>Extruded concrete</td>
<td>20</td>
<td>270 (330)</td>
<td>14</td>
<td>15 20</td>
</tr>
</tbody>
</table>

**Elapsed delivery time**

General: Ensure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C unless approved measures are taken by heating or cooling so that the delivered concrete is within the range 5°C - 35°C.

**Elapsed delivery time table**

<table>
<thead>
<tr>
<th>Concrete temperature at time of discharge (°C)</th>
<th>Maximum elapsed time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 24</td>
<td>120</td>
</tr>
<tr>
<td>24 – 27</td>
<td>90</td>
</tr>
<tr>
<td>27 – 30</td>
<td>60</td>
</tr>
<tr>
<td>30 – 32</td>
<td>45</td>
</tr>
</tbody>
</table>

**Pre-mixed supply**

Addition of water: To AS 1379 clause 4.2.3 if water is approved for addition.

Transport: Mode must prevent segregation, loss of material and contamination of the environment, and must not adversely affect placing or compaction.

**4.5 STEEL REINFORCEMENT PLACEMENT**

**Tolerances**

Fabrication and fixing: To AS 3600 clause 17.2.

**Dowels**

Fixing: If a dowel has an unpainted half, embed this in the concrete placed first.

Tolerances:
- Alignment: 2 mm in 300 mm.
- Location tolerance: ± half the diameter of the dowel.

Grade: 250 N.

**Supports**

General: Provide proprietary concrete, metal or plastic supports to reinforcement in the form of chairs, spacers, stools, hangers and ties, as follows:
- With a protective coating if they are ferrous metal extending to the surface of the concrete, or are used with galvanized or zinc-coated reinforcement.

Minimum spacing:
- Bars: ≤ 60 diameters.
- Fabric: ≤ 800 mm.

Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.
Projecting reinforcement
General: If 'starter' or other bars project beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is incorporated into subsequent work.

Tying
General: Secure the reinforcement against displacement by tying at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.
Beams: Tie stirrups to bars in each corner of each stirrup. Fix other longitudinal bars to stirrups at 1 m maximum intervals.
Columns: Secure longitudinal column reinforcement to all ties at every intersection.
Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections

Welding
General: If welding of reinforcement is proposed, provide details.

Bending
General: Do not be bend or straighten in a manner that will injure the material. Do not provide bars with kinks or bends not documented.
Heating: Do not use heat to bend or straighten reinforcement.

Splicing
Plan lengths: Provide all reinforcement in the lengths documented. If splicing is required conform to AS/NZS 4671.
Testing of splices not as shown on the drawings: Costs to the Contractor.
Lapped splices: Provide laps in reinforcing bars, wire or fabric as shown on the drawing or as follows:
- Plain bars, Grade 250: Minimum 40 bar diameters.
- Deformed bars, Grade 400: Minimum 35 bar diameters.
- Hard-drawn wire: Minimum 50 bar diameters.
- Securely wired together in at least two places, unless welded.
Splicing in reinforcing fabric: Provide an overlap, measured between outermost transverse wires of each sheet of fabric of not less than the spacing of those wires plus 25 mm.
Staggering: Stagger splices as shown on the drawings or submit proposal for approval.

Marking
Bundles: Bundle bars of identical shape in bundles of three and securely tie together by soft iron wire.
Label: Provide each bundle with a stout metal label of not less than 40 mm diameter.
Marking: Ensure that each metal label has been punched with the appropriate marking in conformance with the documented steel list.
Prefix: If documented, ensure that the marking incorporates a prefix. Store bars with different prefixes separately.

Storage
General: Store reinforcement above the surface of the ground and protect from damage and from deterioration by exposure.

Delivery and receipt of reinforcement
Test before delivery: If it is proposed to have the reinforcement tested off-site, obtain the approval before reinforcement is delivered to site. This is a WITNESS POINT.
Payment: No extra payment will be made as a result of any delays incurred by the Superintendent carrying out, or waiving, the inspection with reasonable expediency.

Placing
Reinforcement position: Place reinforcement as documented and hold securely by blocking from the forms, by supporting on concrete or plastic chairs, or metal hangers, and by wiring together at all intersections or at 0.5 m centres, whichever is the greater distance, using annealed iron wire of diameter not less than 1.25 mm.
Prohibition: Do not support steel on metal supports which extend to the surface of concrete, on wooden supports, or on pieces of coarse aggregate.
Cover: Provide reinforcement with the minimum cover documented, or as follows, but in no case less than 1.5 times the diameter of the bar:
- Concrete normally in contact only with air:
  - Slabs: 40 mm.
  - Other than slabs: 45 mm.
- Concrete in contact with earth or fresh water:
  - Slabs of box culverts: 50 mm.
  - Other than culverts: 50 mm.

Reinforcement: If changes are proposed to reinforcement shown on the drawings, submit details. This is a WITNESS POINT.

Damaged galvanizing: If repair is required, submit proposals to AS/NZS 4680 Section 8. This is a WITNESS POINT.

Provision for concrete placement: If spacing, splicing, welding or cover of reinforcement does not comply give notice. This is a WITNESS POINT.

Tack welding
Approval: If the use of tack welding instead of wire ties on reinforcing wire is proposed, submit for approval.

Standard: All welding of reinforcing steel to AS 1554.3.
Prohibition: Do not tack weld cold-worked and hard grade bars.

Approval of reinforcement before concrete placement
General: Submit the approval for the reinforcement in each section of the work before any concrete is deposited in that section. Allow adequate time for inspections and any corrective work. This is a HOLD POINT.

4.6 CORES, FIXINGS AND EMBEDDED ITEMS

General
Cores, fixings and embedded items: Submit shop drawings showing the proposed locations, clearances and cover, and indicating proposed repositioning of reinforcement. This is a HOLD POINT.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details. This is a WITNESS POINT.

Adjoining elements
General: For adjoining elements to be fixed to or supported on the concrete, provide for the required fixings. If required, provide for temporary support of adjoining elements during construction of the concrete.

Corrosion: If in external or exposed locations, galvanize anchor bolts and embedded fixings, or propose alternative materials such as stainless steel.

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, reposition but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items so that water cannot track to concrete providing minimum cover to reinforcement.

4.7 MIXING OF CONCRETE

Measurement of materials
General: Measure all materials by weight, except if required:
- Water: Measure by volume with an approved adjustable water-measuring and discharging device.
- Cement: Measure by bags as packed by the manufacturer. Proportion batches on the basis of one or more unbroken bags of cement, assumed to weigh 40 kg per bag.

Bulk cement: Weigh in an individual hopper and keep separate from the aggregates until the components of the batch are discharged from the batching hopper.

Measurement by volume for smaller works: Submit for approval.
Measuring by weight: On-site mixing
Mixing by weight on site: If mixing concrete on site, and if mix control is likely to be less efficient than at a central batching plant, conform to the Materials in batch containing 1 bag (40 kg) cement table as a guide to produce the classes of concrete specified.

Small changes: Adopt small changes in the proportions of fine and coarse aggregate to improve density or workability of the concrete if required.

Materials in batch containing 1 bag (40 kg) cement table

<table>
<thead>
<tr>
<th>MPA</th>
<th>Cement (kg)</th>
<th>Fine aggregates (kg)</th>
<th>Coarse aggregates (kg)</th>
<th>Total aggregates (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>40</td>
<td>130</td>
<td>250</td>
<td>380</td>
</tr>
<tr>
<td>15</td>
<td>40</td>
<td>100</td>
<td>190</td>
<td>290</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
<td>88</td>
<td>126</td>
<td>214</td>
</tr>
</tbody>
</table>

Variation in aggregate moisture content: If the moisture content of fine and coarse aggregates exceeds 8% or 3% respectively, adjust the proportions of the mix to compensate for the excess water in the aggregate.

Measuring by volume: On-site mixing
Mixing by volume on site: If measurement by volume is approved, proportion the materials to produce a mix free of voids and having the specified strength at 28 days.

Volume batching: Adopt the nominal proportions given in Volume batching table may be used as a guide for volume batching.

Volume batching table

<table>
<thead>
<tr>
<th>MPA</th>
<th>Parts by volume</th>
<th>Cement</th>
<th>Fine aggregate</th>
<th>Coarse aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>1</td>
<td>2.25</td>
<td>4.5</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Fine aggregate bulking: If the fine aggregate contains sufficient moisture to produce ‘bulking’ in excess of 10%, increase the volume of fine aggregate a corresponding amount.

Batch measurement: Measure the volumes of fine and coarse aggregates for each batch in boxes or bins, to details approved by the Superintendent including:
- Measure the aggregates loose (i.e. without compaction) in the boxes and strike off level.
- Do not undertake measurements by shovels or like methods.
- Arrange batch proportions for each batch to contain 1 bag of cement. Assume one 40 kg bag of cement to have a volume of 27.5 litres.

Consistency
General: If approved add sufficient quantity of water to the mix so that the consistency of the concrete enables it to 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.

Standard: Determine the consistency of the concrete to AS 1012.3.1.

Slump: Except for extruded concrete, concrete slump ≤ 75 mm for concrete compacted by vibrators.

Extrusion machine: If concrete is placed by an extrusion machine, provide only sufficient water in the mix to produce a slump of 10 mm to 15 mm.

Mechanical mixing: Mix all concrete with mechanically operated mixers. If there is an emergency, provide proposals for hand mixing.

Mixing location: Submit proposal for concrete mixing location. This is a WITNESS POINT

Segregation of concrete: Reject any concrete which exhibits signs of segregation as directed by the Superintendent.

Mixing at site
Machine mixing at site: Conform to the following:
- Mixer requirements: Adopt a batch mixer which will ensure a uniform distribution of the materials throughout the batch.
- Mixer capacity: Provide a mixer with capacity for one or more whole bags of cement to be used per batch of concrete. Do not exceed the manufacturer’s rated capacity of the mixer with the volume of the mixed material.
- Mixing time: Allow a mixing time for each batch of not less than 1.5 minutes after all ingredients are assembled in the mixer, and prior to any portion of the batch being removed.
- Total mix discharge: Discharge the entire contents of a batch from the mixer before any materials are placed therein for the succeeding batch.

**Mixing in an emergency**

Mixing in an emergency: Conform to the following:
- Hand mixing: If there is a breakdown of the mechanical mixing equipment, seek approval of the Superintendent to hand mix in small quantities so as to complete a section of the work or reach a suitable construction joint.
- Hand mixing conditions: Hand mix on an approved water-tight platform of sufficient size to allow the mixing of at least two batches simultaneously. Use an amount of cement 10% more than the amount specified for machine mixed concrete.
- Hand mixing procedure:
  . First mix the fine aggregate and cement until a uniform colour is obtained, and then spread on the mixing platform in a thin layer.
  . Spread the coarse aggregate, previously drenched with water, over the fine aggregate and cement in a uniform layer, and turn the whole mass over as further water is added with a rose sprinlizer.
  . After the water is added, turn the mass at least three times, not including shovelling into barrows or forms, until the mixture is uniform in colour and appearance.
- Hand-mixed batches: Do not exceed 0.25 cubic metres each.

**Pre-mixed supply**

Delivery docket: For each batch, submit a docket listing the information required by AS 1379, and the following information:
- For special class performance concrete, specified performance and type of cement binder.
- For special class prescription concrete, details of mix, additives, and type of cement binder.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The amount of water, if any, added at the site.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.

Subcontractors: Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply. This is a WITNESS POINT.

4.8 CONCRETE PLACING AND COMPACTION

**Placing**

Activities include: Taking delivery of fresh concrete, placing, transfer and/or finishing the concrete into its final position.

Sequence of placement: If sequential placement of slab segments is proposed, provide details. This is a WITNESS POINT.

Preparation: Clean and moisten the area prior to placing concrete: Remove any ponding water.

Method: Use placing methods which avoid segregation and loss of concrete, and which minimise plastic settlement. Maintain a generally vertical and plastic concrete edge during placement.

Layers: Place concrete in layers ≤ 300 mm thick, such that each succeeding layer is compacted before previous layer has taken initial set. Compact into previous layer.

Conveying equipment: Provide conveying equipment including open troughs and chutes, where required, of metal, or with metal linings.
Steep slopes: Provide troughs and chutes with baffles, or place in short lengths in such a way that the direction of flow of the concrete is changed.
Positioning of chutes: Provide chutes long enough to permit delivery to the whole of the area enclosed by the forms.
Discharge of cleaning water: Discharge the water used for flushing the chutes and for cleaning in an area acceptable to the Superintendent. At a minimum discharge into a geofabric lined pit of sufficient size to contain all material/liquids located on-site. Pit to be rehabilitated prior to project finish.

Compaction
Methods: Use immersion and screed vibrators accompanied by hand methods as appropriate to remove entrapped air and to fully compact the mix.
Vibrators: Do not allow vibrators to come into contact with set concrete, reinforcement or items including pipes and conduits embeded in concrete. Do not use vibrators to move concrete along the forms. Avoid over-vibration that may cause segregation.

Placing records
General: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:
- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Rain
General: During placement and prior to setting, do not expose concrete to rain.
Protection: Protect surface from damage by covering until hardened.

Time between adjacent placements
General: Conform to the Minimum time delay schedule.

Slurry for extruded concrete
General: If concrete is placed by an extrusion machine place in the special receptacle in the machine, if the machine is so equipped, mix 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, and feed onto the surface of the concrete at a rate sufficient to produce a smooth and uniform finish.

Concrete placing in cold weather
Cement: Do not use high alumina cement.
Placing concrete: Maintain the temperature of the freshly mixed concrete at $\geq 5^\circ$C.
Formwork and reinforcement: Before and during placing maintain temperature at $\geq 5^\circ$C.
Severe weather: If severe weather conditions are predicted, use high early strength cement.
Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary to ensure that the temperature of the placed concrete is within the limits specified.
Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.
Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.
Maximum temperature of water: 60$^\circ$C when it is placed in the mixer.
Plastic concrete: Prevent plastic concrete from freezing, without using salts or chemicals.

Concrete placing in hot weather
Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses. Mix, transport, place and compact the concrete in conformance with the Elapsed delivery time table.
Placing concrete: Maintain the temperature of the freshly mixed concrete in conformance with the Hot weather placing table.
Formwork and reinforcement: Before and during placing maintain temperature at $\leq 35^\circ$C.
Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete at 35°C:
- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water prior to mixing.
- Use chilled mixing water.

**Hot weather placing table**

<table>
<thead>
<tr>
<th>Concrete element</th>
<th>Temperature limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal concrete in footings, beams, columns, walls and slabs</td>
<td>35°C</td>
</tr>
<tr>
<td>Concrete in sections ≥ 1 m in all dimensions except for concrete of strength 40 MPa or greater, in sections exceeding 600 mm in thickness</td>
<td>27°C</td>
</tr>
</tbody>
</table>

Evaporation control barriers: Erect barriers to protect freshly placed concrete from drying winds.

**Concrete placing under water**

Condition: If placing in the dry is practicable by pumping or other means of dewatering, do not place under water.

Minimum cement content for the mix: Increase by 25%.

Method: If required, submit proposals. This is a **WITNESS POINT**.

### 4.9 CONCRETE CURING

**General**

Requirements: Taking into account the average ambient temperature at site over the relevant period affecting the curing, adopt procedures to ensure the following:

- Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, is at least the following, unless accelerated curing is adopted:
  - Fully enclosed internal surfaces/Early age concrete: 3 days.
  - Other concrete surfaces: 7 days.
- End of curing period: Prevent rapid drying out at the end of the curing period.
- Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

**Cold weather curing**

General: Maintain concrete temperature between 10 – 20°C for curing period.

**Curing compounds**

Standard: To AS 3799.

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for the required curing period after application.

Substrates: Do not use wax-based or chlorinated rubber-based curing compounds on surfaces forming substrates to applied finishes, concrete toppings and cement-based render.

Self-leveling toppings: If used also as curing compounds, confirm compliance with AS 3799.

Visually important surfaces: Apply curing compounds to produce uniform colour on adjacent surfaces.

**Hot weather curing**

Curing compounds: If it is proposed to use curing compounds, provide details.

Protection: Select a protection method as applicable.

- If the concrete temperature exceeds 25°C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature exceeds 35°C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.
Water curing
General: If water is used, pond or continuously sprinkle in such a way as to not cause damage to the concrete surface, for the required curing period.

4.10 JOINTS

General
Sawn joints: Submit proposed methods, timing and sequence of sawing joints. This is a WITNESS POINT.

Horizontal construction joint
Location: If horizontal construction joints are found to be necessary in walls, or cast-in-situ drainage structures, make the joints at the base of walls and at other locations in the walls where approved by the Superintendent.
Preparation: In order to provide for bond between the new concrete and the concrete which has already set, clean the surface on which the new concrete is to be placed of loose material, foreign matter and laitance prior to:
- Roughening or keying and saturating with water.
- Removing any excess water, and thinly coating the surface with a neat cement grout.

Retaining wall vertical expansion joints
Location: Provide vertical expansion joints as documented.
Material: Provide jointing material of approved quality, and of thickness as documented, for the full depth of the joint.
Trim: Trim to match the surface of the concrete.

Footpaths, medians, driveways
Location: In footpaths, median toppings and driveways, unless otherwise documented, provide expansion joints 15 mm in width for the full depth of paving, constructed at intervals not exceeding 15 m and where the pavement abuts against gutters, pits and structures.
Material: Preformed jointing material of bituminous fibreboard or approved equivalent.

Unreinforced paving
Location: Provide all unreinforced paving with narrow vertical grooves, 20 mm deep to induce contraction joints for the control of cracking.
Timing and set out: Form joints in the freshly placed concrete in a neat regular pattern to form ‘slabs’ no bigger than 2 m square.
Proportion: The ratio of the longest side to the shortest side ≤1.6.

Expansion joints
Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly flush with adjoining surfaces.
Preparation: Before filling, dry and clean the joint surfaces, and prime.
Watertightness: Apply the jointing material so that joints subject to ingress of water are made watertight.
Jointing materials: Provide jointing materials compatible when used together, and non-staining to concrete in visible locations.
Bond breaking: Provide back-up materials for sealants, including backing rods, which do not adhere to the sealant. They may be faced with a non-adhering material.
Foamed materials (in compressible fillers): Closed-cell or impregnated types which do not absorb water.

Slip joints
Requirement: If concrete slabs are supported on masonry, provide proprietary slip joints.

4.11 FORMED SURFACES

General
General: Provide formed concrete finishes in conformance with the Formed surface finishes schedule.
Damage: Do not damage concrete works through premature removal of formwork.
Surface repair method: If required, submit details of the proposed method before commencing repairs. This is a WITNESS POINT.

Curing
General: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

Quality of surfaces
General: Provide concrete surfaces which are true and even, free from stone pockets, depressions or projections beyond the surface. Ensure all arisings are sharp and true, and mouldings evenly mitred or rounded.

Repair of defects
General: As soon as the forms are removed from mass or reinforced concrete work, repair all rough places, holes and porous spots by removing defective work and after wetting, filling with stiff cement mortar having the same proportions of cement and fine aggregate as used in the concrete, and bring to an even surface with a wooden float. Similarly repair all cavities caused by removal of fitments or tie wires and pack with cement mortar.

Removal of the wires: Cut back any tie wires or other fitments extending to outside surfaces after removal of forms, to a depth of at least 40 mm with sharp chisels or cutters.

Coating with bonding agent: If required, coat the surfaces of bolt cavities, tie wire holes, and all defects prior to the placing of mortar, grout, or fresh concrete, with an approved bonding agent, in lieu of wetting with water, generally as required by the manufacturer.

4.12 REMOVAL OF FORMS

Formwork removal
Extent: Remove formwork, other than profiled steel reinforcement decking, including formwork in concealed locations, but excepting lost formwork.

Timing: Do not disturb forms until concrete is hardened enough to withstand formwork movements and removal without damage.

Stripping:
- General: To AS 3600 where it is more stringent than AS 3610.1.

Walls, sumps and other structures
General: Maintain all forms in place, after placement of concrete, for following minimum periods, or as extended by the Superintendent if the air shade temperature falls below 10°C:
- Mass retaining walls, headwalls, wingwalls, gully pits, sumps and similar drainage structures: 2 days.
- Footpaths, driveways and similar: 2 days.
- Sides of reinforced concrete walls when height of each day pour is:
  . Under 0.6 metres: 1 day.
  . 0.6 m to 3 m: 2 days.
  . 3 m to 6 m: 3 days.
  . 6 m to 9 m: 5 days.
- Supporting forms under deck slabs of culverts: 10 days.

Concrete containing special additives: In case of concrete containing special additives, conform to stripping times as determined by the Superintendent.

Protection of concrete during form removal: Remove forms so that the concrete will not be cracked, chipped or otherwise damaged. Do not use of crowbars or other levering devices exerting pressure on the fresh concrete to loosen the forms.

Removal of hole formers: Remove hole formers such as pipes and bars as soon as the concrete has hardened sufficiently for this to be done without damage to the concrete.

Superimposed load
Prohibition: Do not apply superimposed load to any part of a structure until the concrete has reached at least 70% of the design strength.
4.13 UNFORMED SURFACES

General
General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class noted in the Unformed surface finishes schedule.

Surface finishes
General: Provide surface finishes in conformance with the Unformed surface finishes schedule.

Surface repairs
Surface repair method: If surface repairs are required, submit proposals.

Mortar capping: Not permitted.

Finishing methods – surfaces other than wearing surfaces
General: Compact and tamp so as to flush mortar to the surface, screed off and finally dress with a wooden float to an even surface, including to:
- Drain or otherwise remove promptly any water which comes to the surface.
- Roughen all future contact surfaces, with the coarse aggregate at the surface firmly embedded but not forced below the surface.

Finishing methods – wearing surfaces
General: Compact then screed off the surface with a vibrating screed, or hand screed if the distance between forms perpendicular to the direction of screed is no greater than 2 metres.
Correction: Immediately following compaction and screeding test and correct for high or low spots.
Tolerance: Conform to the following
- The finished surfaces of concrete structures not adjacent to road pavements – Deviation is ≤25 mm in plan position and ≤25 mm from the specified levels.
- In the case of drainage pits and other structures adjacent to road pavements, the finished concrete ≤10 mm from the specified levels and alignment.
- Longitudinal surfaces greater than 10 metres in length: Deviation from level or alignment < 5 mm from a straight-edge 3 metres long, subject to any necessary allowances on vertical and horizontal curves.

Final finish: Finish the surface true and uniform and free of any glazed or trowelling finish and finally dress with a wooden template or float, or by the use of belling in an approved manner.
Surface to receive asphalt: After compacting, screeding and correcting, dress with a wooden float and finally broom to produce a rough surface.
Textured patterned surface: To be terracotta and herringbone.

4.14 PRECAST UNITS (RESERVED).

Handling
Lifting: Lift or support units only at designated or other approved points. Use handling methods which do not overstress, warp or damage the units.

Attachments
Remove temporary attachments after erection. Seal and make good residual recesses.

Installation
Fixing: Fix the units securely and accurately in their final positions.
Ancillaries: Provide components and materials, including fasteners, braces, shims, jointing strips, sealant, flashings, grout and mortar, necessary for the installation of the units.

Protection
General: Protect the units against staining, discolouration and other damage until they are installed in their final location.

Storage
Support points: Store elements at designated storage points.
Prevent damage: Adequately store units to prevent warping, twisting, crushing, cracking and staining.
Protection: Protect the units against staining, discolouration and other damage until they are installed in their final location.

Lifting and handling
Lifting and handling: Conform to the ASCC National code and AS 3850.
Site conditions: Ensure the wind and temperature conditions allow handling and fixing consistent with structural capability and geometry of the element.

Cranes: To AS 2550.
Temporary bracing and propping: To AS 3850 and AS/NZS 1170.2.

4.15 SPRAYED CONCRETE

Materials
Standard to AS 3600.
Detail
Minimum depth: 75 mm.
Colour: Spray coloured concrete lining in open drains to match the adjoining rock colour.

Strength
Minimum cement content: 380 kg/m³ as discharged from the nozzle.
Minimum compressive strength: 25 MPa at 28 days when tested by means of 75 mm diameter cores taken from in-place sprayed concrete.

Test cores
Securing, accepting, curing, capping and testing: To AS 1012.14.
Equipment and facilities: Provide for taking of the cores from the work.
Curing and testing: NATA registered laboratory.
Results: Submit copies of test results.
Costs: To be borne by the Contractor.

Method statement
General: Submit at least 14 days prior to applying any sprayed concrete including details of the proposed procedure, plant, materials and mix proportions. This is a WITNESS POINT.

Surface preparation
Earth: Grade, trim, compact and dampen earth surfaces prior to applying the sprayed concrete. Take any necessary precautions to prevent erosion when the sprayed concrete is applied.
Rock: Clean off loose material, mud and other foreign matter that might prevent bonding of the sprayed concrete onto the rock surface. dampen the rock surfaces prior to applying the sprayed concrete.
Steel pipes: Corrugated steel pipes are cleaned of loose material, mud and any other foreign matter.
Water flow: Remove free water and prevent the flow of water which could adversely affect the quality of the sprayed concrete.

Application of sprayed concrete
Procedure: Begin application at the bottom of the area being sprayed and build up making several passes of the nozzle over the working area.
Technique: Hold the nozzle so that the stream of material impinges as nearly as possible perpendicularly to the surface being coated.
Spraying around reinforcement: If spraying around reinforcement, spray concrete behind the reinforcement before concrete can accumulate on the face of the reinforcement.
Protection of adjoining surfaces: Protect adjoining surfaces not requiring sprayed concrete from splash and spray rebound.

Regulation: Regulate the velocity of discharge from the nozzle, the distance of the nozzle from the surface and the amount of water in the mix so as to produce a dense coating with minimum rebound of the material and no sagging.
Rebound: Remove and dispose of splash and rebound material from the surface after the initial set as work proceeds by air-water jet or other suitable means.
Wind problems: If wind causes separation of the nozzle stream, discontinue spraying.
Air temperature: If air temperature is less than 5°C, do not spray.

Construction joints
General: Keep construction joints to a minimum.
Forming: Form joint by placing or trimming the sprayed concrete to an angle between 30° and 45° to the sprayed concrete surface.
Preparation: Clean and wet by air-water jet the joint edge before recommencing concrete spraying.

Curing
Commence curing within one hour of the application of sprayed concrete with water or colourless wax emulsion curing compound complying with AS 3799 and applied in conformance with manufacturer's specifications.
Water curing: If water curing, keep the surface of the sprayed concrete continuously wet for at least seven days.

4.16 COMPLETION

Loading
General: Do not erect masonry walls or other brittle elements on beams and slabs while they are still supported by formwork.

Unencased reinforcement
General: If 'starter bars' and other items project from cast concrete for future additions and are exposed to the weather, provide details of protection.

Protection
Protection: Protect the concrete from damage due to construction load overstresses, physical and thermal shocks, and excessive vibrations, particularly during the curing period.
Surface protection: Protect finished concrete surfaces and applied finishes from damage.

5 LIMITS AND TOLERANCES

5.1 APPLICATION

Summary
The limits and tolerances applicable to this worksection are summarised in Summary of limits and tolerances table.

Summary of limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/Tolerances</th>
<th>Worksection Clause Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgrade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative compaction</td>
<td>≥ 95% (standard compactive effort).</td>
<td>Foundations</td>
</tr>
<tr>
<td>Formwork</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position of forms</td>
<td>Align forms accurately so that departure of the forms from the surfaces specified on the drawings do not exceed 1/300 of the space between supports for any surface visible in the completed work and 1/150 for hidden work.</td>
<td>Erection</td>
</tr>
<tr>
<td>Fine aggregate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grading</td>
<td>To be evenly graded within the absolute limits and not deviate from the grading of sample aggregate as per the Fine aggregate grading table to AS 2758.1 Table 3.</td>
<td>Fine aggregate</td>
</tr>
<tr>
<td>Coarse aggregate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of wear</td>
<td>Loss of weight &lt; 30%.</td>
<td>Coarse aggregate</td>
</tr>
<tr>
<td>Crushing value</td>
<td>Crushing value &lt; 25%.</td>
<td>Coarse aggregate</td>
</tr>
<tr>
<td>Soundness</td>
<td>The loss of mass when tested with sodium sulphate &lt; 12%</td>
<td>Coarse aggregate</td>
</tr>
<tr>
<td>Particle shape</td>
<td>The proportion of mis-shapen particles (2:1 ratio) &lt; 35%.</td>
<td>Coarse aggregate</td>
</tr>
</tbody>
</table>
Activity | Limits/Tolerances | Worksection Clause Reference
--- | --- | ---
Grading | To be evenly graded within the absolute limits and not deviate from the grading of sample aggregate as per the Coarse aggregate grading table. | Coarse aggregate
Aggregate moisture content | Where moisture content of fine aggregate exceeds 8%, or moisture content of coarse aggregate exceeds 3%, change the proportion of mix. | Measuring by weight, on-site mixing
Bulking of fine aggregate | Where bulking of the fine aggregate exceeds 10%, make a corresponding increase in volume of fine aggregate. | Measuring by volume, on-site mixing
Consistency | In conformance with AS 1012.3.1, the slump < 75 mm for concrete compacted by vibrators. | Consistency
| In the case of concrete placed by extrusion machine, the slump will be between 10 mm and 15 mm. | Consistency

**Finishing of unformed/formed concrete surfaces**

| Wearing surface | To be finished true and uniform so that departure from designed grade < 5 mm in any 3 metre length. | Finishing of unformed surfaces

### 6 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

#### 6.1 MEASUREMENT

**General**

Payment to the schedule of rates: To 0152 Schedule of rates – supply projects, this worksection, as shown on the drawings and Pay items 0310.1 to 0310.5 inclusive.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

**Methodology**

The following methodology will be applied for measurement and payment:

- Concrete payment rates: At the scheduled rates provided the concrete meets the strength requirements shown in the Concrete strength requirements table or as otherwise documented.

- Reduction in payment rates: Where any concrete does not reach the strength specified in the Concrete strength requirements table, at the scheduled rate of payment 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%.

- Rejection: 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.

**Pay items table**

| Pay items | Unit of measurement | Schedule rate scope | Finishing of unformed surfaces
--- | --- | --- | ---

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## 0319 Minor concrete works

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>0319.1 Excavation</td>
<td>m³, measured in bank volume of excavation</td>
<td>This pay item applies to works included in pay items 0310.2 and 0310.3. Include in the rate for excavation: - Excavation and backfilling of all types of materials, with no separate rates for earth and rock. - The disposal of surplus material. - The control of stormwater runoff. Do not include: - Drying out wet excavated material or replacement of over excavation beyond the design cross-sectional limits defined above.</td>
</tr>
<tr>
<td>0319.2 Footpaths, driveways, median toppings and works of similar nature</td>
<td>m², measured as the horizontal surface area of the concrete footpath, driveways, median topping, or similar as constructed</td>
<td>Include all operations involved in the forming and compaction of foundations, subbase, concreting, finishing, curing and backfilling. Where specified on the Drawings, include the supply and placement of reinforcing steel.</td>
</tr>
<tr>
<td>0319.3 Sprayed concrete</td>
<td>m² of sprayed concrete in place</td>
<td>Include all the operations involved in the surface preparation, spraying, jointing, removal of splash and rebound material, curing and testing.</td>
</tr>
<tr>
<td>0319.4 20 MPa Concrete for miscellaneous minor concrete work</td>
<td>m³ of concrete supplied and placed</td>
<td></td>
</tr>
<tr>
<td>0319.5 32 MPa Concrete for miscellaneous minor concrete work</td>
<td>m³ of concrete supplied and placed</td>
<td></td>
</tr>
</tbody>
</table>

### ANNEXURE A

#### 7 SELECTIONS

Note: Schedules approved with Construction Certificate take precedence over this specification

#### Aggregate property schedule

<table>
<thead>
<tr>
<th>Aggregate property</th>
<th>Tests</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle density</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water absorption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particle size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durability</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Formed surface finishes schedule

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Surface finish class to AS 3610.1</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Form lining type</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Colour control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt hole filling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface finish type</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Concrete properties schedule – performance

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal and special class</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air entrainment – air volume (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum aggregate size (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slump (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strength grade/characteristic compressive strength (MPa)</td>
<td>Refer to the Concrete strength requirements table.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Special class</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleeding (mL/mm²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density of hardened concrete (kg/m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Density of plastic concrete (kg/m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drying shrinkage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of air drying</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early age strength (MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexural strength (MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect tensile strength (MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral oxide content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water:cement ratio maximum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56 day shrinkage strain tested to AS 1012.13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Control tests schedule

<table>
<thead>
<tr>
<th>Concrete element</th>
<th>28 day strength</th>
<th>Transfer strength (MPa)</th>
<th>Days after pouring</th>
<th>Early strength (MPa)</th>
<th>Days after pouring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Minimum time delay schedule

<table>
<thead>
<tr>
<th>Between (pour locations)</th>
<th>Minimum period between adjacent pours (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent pours abutting horizontal construction joints in walls</td>
<td></td>
</tr>
<tr>
<td>Adjacent pours abutting vertical construction joints in walls</td>
<td></td>
</tr>
<tr>
<td>Floor slab construction joints</td>
<td></td>
</tr>
<tr>
<td>&quot;Pour strips&quot; and adjacent concrete</td>
<td></td>
</tr>
<tr>
<td>Retaining wall construction joints</td>
<td></td>
</tr>
</tbody>
</table>

### Uniformed surface finishes schedule

<table>
<thead>
<tr>
<th>Property</th>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatness tolerance class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary finish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary finish</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip resistance classification to AS/NZS 4586</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip resistance treatment</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slip resistance tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface modifier</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1101 CONTROL OF TRAFFIC

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
Traffic control: Provide traffic control for works on roads. Construct the work with the least possible obstruction to traffic.
Costs: All costs associated with the requirements of this specification shall be borne by the Contractor.

Performance
General: Provide the following, as documented:
- Personnel plant and equipment.
- Temporary roadways and detours.
- Arrangement for traffic.
- Traffic control devices.
Requirements: Ensure the safety of workers and safety and convenience of road users at all times.

Design
Designer: Suitably qualified to undertake the works with the relevant Roads and Maritime Services (RMS) accreditations including the previous Orange Card and Red Card "Prepare a Work Zone Traffic Management Plan".
Nominate the designer e.g. Registered architect, NPER Engineer, Equipment supplier etc. whose role is covered in the General requirements worksection.
Authority requirements: To RMS (includes RMS GIO for work on MR692 and AI) and AS 1742 requirements, and subject to approval by Council.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 1101 Traffic control.
- 1102 Control of erosion and sedimentation.
- 1111 Clearing and grubbing.
- 1112 Earthworks (Roadways).
- 1121 Open drains, including kerb and gutter.
- 1141 Flexible pavement base and subbase.
- 1192 Signposting.
- 1193 Guide posts.
- 1194 Non-rigid road safety barrier system.
- 1351 Stormwater drainage (Construction).
- 1352 Pipe drainage.
- 1354 Drainage structures.
- 1143 Sprayed bituminous surfacing.
- 1144 Asphalitic concrete (Roadways).

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:
Note: Only the most current standards are to be used
AS 1742  Manual of uniform traffic control devices
AS 1742.3  Traffic control for works on roads
AS 1742.14  Traffic signals
AS 1743  Road signs - Specifications
AS 1744  Forms of letters and numerals for road signs (known as Standard alphabets for road signs)
AS/NZS 1906  Retroreflective materials and devices for road traffic control purposes
AS/NZS 1906.1  Retroreflective sheeting
AS/NZS 1906.4  High-visibility materials for safety garments
AS 4191  Portable traffic signal systems
AS/NZS 4192  Illuminated flashing arrow signs
AS/NZS 4602  High visibility safety garments
AS/NZS 4602.1  Garments for high risk applications

Other publications
AUSTROADS
AGRD03-2010  Guide to road design - Geometric Design
AP-R337-09-2009  National approach to traffic control at work sites
AGRS 06-09-2009  Guide to road safety Part 6: Road safety audit.
AGTM06-2007  Guide to Traffic management – Intersection, interchanges and crossings

1.4 STANDARDS

General
Standard: To AS 1742.3 and AP-R337/09.

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
- TCP: Traffic Control Plan.
- TGS: Traffic Guidance Scheme.

Definitions
General: For the purposes of this worksection the following definitions apply:
Competent person: A person who has, through a combination of training, qualification and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

1.6 SUBMISSIONS

Approval
Submissions: To the Superintendent’s approval.

Approvals
- Traffic guidance scheme.
- Statutory approvals from council or other relevant authority. Note RMS Approvals required for MR692 and the M1.

Drawings
- Temporary roadways and detours.
- Signpost layout plan.
- Pavement marking details.

Execution details
- Schedule of working times.
1.7 INSPECTION

1.8 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

**HOLD POINTS table**

<table>
<thead>
<tr>
<th>Clause title/item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION PLANNING</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic guidance scheme</td>
<td>Approval of Traffic guidance scheme</td>
<td>4 weeks before proposed commencement on site</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Traffic guidance scheme</td>
<td>Approvals from Council and other Authorities for Temporary traffic arrangement</td>
<td>4 weeks before proposed commencement on site</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Levels of Traffic Guidance Schemes</td>
<td>Carry out a risk assessment for works not involving complex traffic arrangements or staged works or both</td>
<td>4 weeks before proposed commencement on site</td>
<td>Superintendent.</td>
</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side roads and property accesses - Access</td>
<td>Proposal for access</td>
<td>5 working days prior to carrying out works</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Side roads and property accesses - Notice to property owners</td>
<td>Approval to deny vehicular access and provide notice to property owners</td>
<td>3 working days prior to carrying out works</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Plant and equipment - Inadequate traffic control devices</td>
<td>Rectify non conforming traffic control devices</td>
<td>1 working day of notice</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Opening to traffic - Opening temporary road ways and detours to traffic</td>
<td>Redirection onto existing roadway in the event of failure</td>
<td>1 working day</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Opening to traffic - Opening temporary road ways and detours to traffic</td>
<td>Inspect and approve all roadways and detours prior to opening</td>
<td>2 working days prior to carrying out works</td>
<td>Superintendent.</td>
</tr>
<tr>
<td>Opening to traffic - Opening completed work</td>
<td>Written notice and procedure for road opening</td>
<td>5 working days prior to carrying out works</td>
<td>Superintendent.</td>
</tr>
</tbody>
</table>

**WITNESS POINTS table - On-site activities**

<table>
<thead>
<tr>
<th>Clause/Item</th>
<th>Requirement</th>
<th>Notice for inspection by the Superintendent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION PLANNING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic Guidance Scheme</td>
<td>Site copy of TGS</td>
<td>Progressive</td>
</tr>
<tr>
<td>Safety Audit</td>
<td>For complex traffic arrangements</td>
<td>Progressive</td>
</tr>
</tbody>
</table>
### Clause/Item

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Notice for inspection by the Superintendent</th>
</tr>
</thead>
<tbody>
<tr>
<td>and staged works carry out safety audits</td>
<td></td>
</tr>
</tbody>
</table>

### MATERIALS

| Barriers and fencing – Boom gates                                           | Provide if requested                        | Prior to commencing works                  |
| Barriers and fencing – Cones and bollards                                   | Restrictions for use of cones when attended by an employee. | Progressive                              |
| Temporary markings – Line marking                                           | Ineffective line marking, remark within 48 hours. | Progressive                              |
| Temporary markings – Old markings                                          | Obliterate or remove old markings.           | Progressive                              |
| Temporary markings – Raised Pavement markers                                | Replace ineffective markers within 24 hours. | Progressive                              |

### EXECUTION

| Personnel - Traffic controllers                                           | Submit names and declaration of proposed traffic controllers | Prior to commencing work                  |
| Personnel - Traffic controllers                                           | Additional traffic controller required where sight distance is restricted | Progressive                              |
| Personnel - Night and poor light                                          | Flood light as required.                          | Progressive                              |
| Plant and equipment – Temporary speed zoning                              | Diary and method of works                        | Progressive                              |
| Plant and equipment – Arrangement and placement of traffic control devices | To the approved TGS                               | Progressive                              |
| Temporary roadways and detours - Drainage                                  | Pavement drainage construction                   | Progressive                              |
| Temporary roadways and detours – Wearing surface                          | Width of wearing surface and position of finish tying into existing works | 3 working days prior to carrying out works |
| Temporary roadways and detours – Construction under traffic               | Approval required to construct under traffic     | 3 working days prior to carrying out works |
| Temporary roadways and detours – Construction under traffic               | Prior notice of work commencing under traffic    | 5 working days prior to carrying out works |
| Opening to traffic – Opening temporary roadways and detours to traffic   | Traffic switch requires workers on site for a minimum of 2 working days | 2 working days                           |
| Opening to traffic – Maintain temporary roadways and detours              | Ensure safe surface for traffic                  | Progressive                              |

## 2 PRE-CONSTRUCTION PLANNING

### 2.1 TRAFFIC GUIDANCE SCHEME

**General**
Requirement: Submit a traffic guidance scheme for approval at least 4 weeks prior to proposed commencement on site. The Traffic guidance scheme must include both the traffic management plan and the Traffic control plan. The Traffic Guidance scheme must be prepared by a competent person. Where the control of traffic does not require pavement or drainage works the period of notice will be 2 weeks. This is a HOLD POINT.

Obtain: All necessary approvals from Councils and other authorities for temporary traffic arrangements. This is a HOLD POINT.

Site copy: Keep an approved copy off the Traffic Guidance Scheme on site at all times. This must be used to check the arrangement and maintenance of traffic control devices. This is a WITNESS POINT.

Level of Traffic guidance schemes
Levels: For traffic guidance schemes conform to the following:
- a) Short term and mobile works not involving full or part road closure.
- b) Works involving relatively simple part-roadway closures.
- c) Works involving complex traffic arrangements or staged works or both.

Risk assessments: Carry out for (a) and (b) considering factors such as traffic volume and speed, road geometry and width and the general behaviour of road users. If the risk can not be tolerated a fully protected work site will be required. This is a HOLD POINT.

Traffic Management Plan
Include: The Traffic Management Plan must include the following:
- Design drawings for any temporary roadways and detours to conform with Design drawings showing pavement, wearing surface and drainage details.
- Details of arrangements for construction under traffic.
- Traffic Control Plan(s).
- Vehicle Movement Plan(s) – Planning for movement of work vehicles including deliveries, personnel and contractors and gang trucks.
- Application for temporary speed zoning changes.
- Special consideration to the safety of the workers, pedestrians, cyclists.
- Names, addresses and means of communicating with personnel nominated for contact outside normal working hours to arrange for adjustments or maintenance of traffic control devices and temporary roadways and confirmation that this list has been supplied to the local Police.

Traffic Control Plan
Include: The Traffic Control Plan must include the following:
- A proposal to erect a Regulatory Traffic Control Device showing locations and times of operation.
- Appropriate temporary speed zoning signs.
- Boom gates.
- Portable traffic signals.
- Temporary fixed traffic signals.
- A signpost layout plan showing:
  - Location, size and legend of all temporary signs.
  - Temporary regulatory signs and temporary speed zones.
  - All traffic control devices such as temporary traffic signals, linemarking, pavement reflectors, guildeposts, guardfence and barrier boards.
- Working times when traffic control measures are in place to minimise disruption to traffic during periods of peak flows.
- Take particular care when requiring reversal of traffic flows or the separation of unidirectional flow by medians or other physical separation.

Submission: Minimum 2 weeks notice for the submission of traffic control plans for approval, minimum 5 weeks where regulatory devices are involved.

Safety Audit
Audit: Conduct a safety audit for the construction phase as recommended in AGRS 06-09 for complex traffic arrangements and staged works. This includes risk assessments for the workers safety. This is a WITNESS POINT.
2.2 DESIGN

Design standards
Standard alignment and grading: Adopt the specific provisions of this worksection, AUSTROADS AGRD03, Local Authority's design standards.
Intersections: Design intersections to AUSTROADS AGTM06.
Road safety: Conform with documentation on road safety to AGRS 06-09.

Design drawings
Requirement: Submit design drawings for approval that show:
- 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, extend levels showing the full cross section along the existing road for a minimum length of 200 m.
- A sight distance diagram if opposing traffic is to use a single carriageway.
- Intersections, and any other locations where traffic may be required to make turning, merging or diverging movements, at a scale of 1:500.
- Pavement marking details.
- Sufficient cross-sections to indicate the feasibility of making connections between various parts of the work.
- Sufficient dimensions, especially lane widths, to make clear the geometry and clearances of the proposed Works.
- A north point or some other location method to orientate the plan.
- Pavement type and surface type.
- Roadside furniture:
- Drainage culverts and pits.

Design parameters
Design travel speed (km/hr): As required by the Conditions of Development Consent.
Minimum widths of traffic lanes (m): As required by the Conditions of Development Consent.
Minimum widths of shoulders (m): As required by the Conditions of Development Consent.
Minimum width of shoulder seal (m): As required by the Conditions of Development Consent.

Wearing surface:
- Minimum surface type: As required by the Conditions of Development Consent.
- Minimum thickness (mm): As required by the Conditions of Development Consent.

Base:
- Type: As required by the Conditions of Development Consent.
- Minimum thickness (mm): As required by the Conditions of Development Consent.

Sub-base:
- Type: As required by the Conditions of Development Consent.
- Minimum thickness (mm): As required by the Conditions of Development Consent.

Signage
Signing: Careful considerations must be given to the signing of the work site regardless of the occupation time of the site. This includes:
- Protection of workers.
- Provision of adequate warning of changes in surface condition and the presence of personnel or plant engaged in work on the road.
- Adequate instruction of road users and their guidance safely through, around or past the work site.

3 MATERIALS

3.1 SIGNS

Specifications
Selection of signs: To AS 1742.3.
Design and manufacturing of signs: To AS 1743.
Details of each letter: To AS 1744.
Reflective material: Class 1 material complying with AS 1906.1.
Sign size: To AS 1742.3, AS 1743 and Annexure.
Signs for night work: Floodlit if outside of the car headlight beams to AS 1742.3.
Flashign arrow signs: To AS/NZS 4192 and installed to AS 1742.3.

**Supplementary signs**
Annexure: Signs supplementary to AS 1742.3 and AS 1743.
Use: In lieu of or in addition to those shown in AS 1743 as follows:

- Heavy machinery crossing temporary sign SW5-22 in lieu of trucks entering sign W5-22.
- Cycle hazard grooved road temporary sign ST1-10 in addition to T1-10 where the road is grooved and is a hazard to cyclists.
- Tar spraying possible short delay temporary sign ST3-1 in addition to T3-1 for bituminous surfacing works.
- Changed traffic conditions ahead temporary sign ST1-6 in addition to T1-1, T1-6, T2-6 and T2-21 on long term works, sidetracks and detours.

3.2 **BARRIERS AND FENCING**

**Barrier boards**
Standard: To AS 1742.3.
Size: 160 to 200 mm high, 4 m maximum length.
Colour: Alternate diagonal stripes of black and reflective yellow terminating in yellow at each end.
Retroreflective sheeting: Minimum Class 1 to AS/NZS 1906.1.
Placement: Do not place parallel to the direction of traffic flow.
Support: Mount on trestles or fixed posts at about 1 m above the pavement.
Support Material: Timber, metal or other suitable material.
Support Colour: Yellow.
Stability: Provide concrete blocks, sandbags or other approved devices to ensure barriers are stable.
Bases: Keep the bases of the trestles within the ends of the boards.

**High visibility flexible mesh fencing**
Standard: To AS 1742.3.
Height: Approximately 1 m.
Colour: Orange.
Support: Top of the fence is at least 800 mm above ground level at all times.
Posts: Use temporary post-mounted delineators.
Location: Erect parallel to and in close proximity to traffic.

**Boom gates**
Type and location: As requested by the Superintendent or Local Roads Authority. This is a **WITNESS POINT**.

**Cones and bollards**
Standard: To AS 1742.3.
Cones: Fluorescent red or orange material resilient to impact.
Small cones: Used in most built up areas, footpaths, shared paths, and speeds < 70 km/hr. 450 to 500 mm high.
Large cones: Minimum 700 mm high all other locations or instead of the small cones.
Spacing: To AS 1742.3 and all purposes with speed limit less then 50 km/h maximum spacing 4 m.
Bollards: Vertical tube fluorescent red or orange material resilient to impact. At least 750 mm high and 100 mm diameter.
Placement: Locate traffic cones and bollards to AS 1742.3.
Restrictions: Unless cones are firmly fixed in position use only while work is in progress, or in locations where there is an employee in attendance to reinstate any of the cones which have been dislodged by traffic. Alternatively use bollards or barriers. This is a **WITNESS POINT**.
Cones and bollards used under night conditions: White horizontal retroreflective class 1 material band, size and location to AS 1742.3.

3.3 TEMPORARY MARKINGS

Pavement reflectorised markings
Pavement markings: Include painted lines, roadmarking tape and raised pavement markers.
Standard: To AS 1742.3.
Edgelining: Where the adjoining roadway is edgelined, provide edgelining to temporary roadways.
Linemarking
Type: Pavement marking tape.
Maintenance: If the pavement linemarking becomes ineffective remark within 48 hours of direction by the Superintendent. This is a WITNESS POINT.

Arrows
Location: If single carriageway is opened adjacent to or in lieu of an existing dual carriageway length.
Place: Pavement arrows indicating the direction of flow of traffic at not more than 500 m.
Remove: Arrows if the section is then reincorporated as dual carriageway.

Old markings
Removal: Obliterate or remove all superseded pavement markings immediately before, or after placement of, new markings. Do not obliterate by painting on a final surface. This is a WITNESS POINT.

Raised pavement markers
Ineffective markers: Replace raised pavement markers which have become ineffective, within 24 hours of direction by the Superintendent. This is a WITNESS POINT.

Costs: To be borne by the Contractor.

3.4 TRAFFIC SIGNALS

Portable traffic signals
Standard: To AS 4191.
Use: Short term applications of shuttle control where a single lane has to be used alternately by traffic from opposite directions or at road crossings or intersections.

Temporary fixed traffic signals
Design and installation of temporary fixed traffic signals: To AS 1742.14.
Use: Longer term shuttle operations or for non-shuttle control of intersecting traffic flows.

Traffic warning lamps
Installation: To AS 1742.3.
Maintain: In good working order, correctly aligned and positioned with respect to the direction of traffic flow each night, before the site is left unattended.

4 EXECUTION

4.1 SIDE ROADS AND PROPERTY ACCESSES

Access
Passage: At all times provide safe and convenient passage for vehicles, pedestrians and stock to and from side roads and property accesses connecting to the roadway.
Alternative access: Submit proposal for approval prior to commencing the work affecting access.
This is a HOLD POINT.

Notice to property owners
Denial of vehicular access: Where access needs to be denied due to particular construction activities undertake the following:
- Obtain the approval the of the Superintendent.
- Advise the property owners of such occurrences by way of letter drop at least 24 hours prior to such an interruption.
- Repeat this advice verbally to the property owner in a courteous manner.
- Keep these interruptions to an absolute minimum. This is a HOLD POINT.

4.2 PERSONNEL

Traffic controllers
Standard: To AS 1742.3.

Personnel: Submit names of proposed traffic controllers with a signed declaration that they are appropriately trained in the duties of traffic controllers to AS 1742.3 and suitably accredited by the RMS.

Recognition marks: A distinguishing mark on the outer garment of authorised traffic controllers indicating their authority.

Location of traffic controllers: One traffic controller will remain at the head of each traffic queue while it is halted.

Restricted sight distance: An additional traffic controller must be placed at the tail end of the queue. This is a WITNESS POINT.

Two-way radio: Where both ends of the work are not intervisible, use two-way radio for the traffic controller at each end, or an intermediate traffic controller, from whom both other traffic controllers take their cue, is stationed where both can see extremities of the work.

Night and poor light

Wand: Use an illuminated red cone wand (torch) with a minimum capacity of 30,000 candela to control traffic.

Lighting: The traffic controller and the work area adjacent must be illuminated where possible by flood lighting. Position the flood lighting above the work area and direct downwards and incline slightly to illuminate the face of the STOP/SLOW bat. This is a WITNESS POINT.

Flood lighting: Must not create glare for approaching drivers.

Environmental effects: Consider the adverse effects of high lighting levels close to residential property.

Approved clothing for work personnel

Standard: To AS 1742.3, AS/NZS 4602 and AS/NZS 1906.4.

Requirements: All personnel are required to wear a garment or garments of the classification appropriate for the time of work as follows:

- Class D—garments for daytime use only. Red-orange or yellow.
- Class N—garments for night-time use only. Retroreflective strips of White or yellow.
- Class D/N—garments for both day and night use. Red-orange or yellow.

Flammable: Potentially flammable clothing must not be worn close to work likely to generate flame or hot splatter / molten metal.

4.3 PLANT AND EQUIPMENT

Plant delineation

Plant and equipment: When working in a position adjacent to traffic with a projection beyond the normal width of the item, for example, a grader blade. Direct traffic around such plant and equipment as follows:

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

Night time Clearance

Remove plant: Where traffic is permitted to use the whole or portion of the existing road, remove all plant items and similar obstructions from the normal path of vehicles.

Lateral clearance: At least 6 m where practicable, with a minimum clearance of 1.2 m.

Lamps: Flashing yellow lamps may be used to draw attention to advance signs. Do not use for delineation.

Signs and devices

Conform to the following:

- Must be installed by a competent person.
- Must be appropriate to the conditions at the work site and used to AS 1742.3 unless a competent person has carried out a risk assessment for an alternative arrangement.
- Must be erected before work commences at a work site.
- Regularly check and maintain in a satisfactory condition.
- Remove from the work site as soon as practicable after works complete including stone removal and line marking.
- Keep records of all signing and delineation at roadway or part roadway closures.
- Relocate or reposition traffic control items so they are visible and perform their regulatory function.
- Place 1m clear of the travelled path. For works taking longer than 2 weeks signs must be mounted on poles sunk into the ground and duplicated on the right side of the road if physically possible.

**Temporary speed zoning**

**General:** Conform to the following:

- Arrange for the supply of appropriate temporary speed zoning signs, including posts and fittings, for erection where a temporary speed limit has been approved by the Local Council Traffic Committee or Road Authority.
- 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 as directed or approved.
- Keep a diary recording operation times of the speed zone to be made available when requested. This is a WITNESS POINT.

**Costs:** To be borne by the Contractor.

**Arrangement and placement of traffic control devices**

Layout: To the approved Traffic guidance scheme and AS 1742.3. This is a WITNESS POINT.

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

Maintain: All traffic control devices in accordance with AS 1742.3 so that they are in good order and in the correct positions day and night. At all times the signs should be neat, clean, clear and legible.

**Costs:** To be borne by the Contractor.

**Unacceptable traffic control devices**

Do not use: The following items for traffic control:
- Steel drums.
- Isolated or non-continuous barrier units.
- Barrier boards parallel to and within 4m of the direction of traffic flow.

**Inadequate traffic control devices**

Nonconforming traffic control devices: Where the Contractor fails to provide and maintain traffic control devices as specified in this worksection and to conform with the approved Traffic Guidance Scheme and Standards. This is a HOLD POINT.

### 4.4 TEMPORARY ROADWAYS AND DETOURS

**Drainage**

**General:** Construct drainage structures and drains in accordance with the following worksections:
- **1121 Open drain, including kerbs and gutter.**
- **1351 Stormwater drainage.**
- **1352 Pipe drainage.**
- **1354 Drainage structures.**

**Design frequency:** Provide for run-off due to one in five year ARI rainfall, without overflow affecting the road.

**Pavement drainage:** Design and construct pavements to prevent water ponding on the wearing surface or shoulders. Construct temporary formations not to dam water. This is a WITNESS POINT.

**Temporary roadways**

**General:** Construct Temporary roadways in accordance with the following worksections:
- **1102 Control of erosion and sedimentation.**
- **1111 Clearing and grubbing.**
1101 Control of traffic

- **1112 Earthworks (Roadways).**
- **1141 Flexible pavement base and subbase.**
Temporary kerbing (approval from the Superintendent must be obtained for use): To conform with:
- Forming temporary medians, traffic islands or pavement edges.
- Height < 150 mm.
- Securely fastened to the pavement.
- Clearly delineate.
- As seen by the approaching traffic the width must be in a continuous line of 150 mm.
- Conform to **1121 Open drains, including kerb and gutter.**

**Wearing surface**

General: Construct surfacing to conform with the worksections:
- **1143 Sprayed bituminous surfacing, and/or**
- **1144 Asphalitic concrete (Roadways).**
Quality: Firm, even and skid resistant under all weather conditions and designed to remain sound during use.

Width of the wearing surface: As shown on the drawings or width of the traffic lanes plus the width of each shoulder. This is a **WITNESS POINT.**

Tie-in to existing work: Carry the wearing surface onto any existing connecting roadway so as to finish square to the existing roadway centreline. This is a **WITNESS POINT.**

**Road safety barrier**

Location: 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 2 m and as otherwise documented.

Type: Corrugated steel or precast concrete safety barriers.

Erection: To conform with the following:
- **1163 Rigid road safety barrier systems.**
- **1194 Non-rigid road safety barrier systems.**

**Construction under traffic**

Situation: Where a temporary roadway or a detour is not provided or available then construction under traffic is permitted provided the minimum widths are achieved. This is a **WITNESS POINT.**

Minimum widths: Conform to the following:
- Through traffic on a two lane roadway a minimum of one 3.5 m lane width.
- Multilane roads minimum 3.5 m lane width in both directions.

Carriageway restoration: To a safe and trafficable state for through traffic prior to ceasing work each day.

Prior notice of work: Notify the Superintendent of the arrangements and methods for traffic control at least five working days before undertaking any work which would involve construction under traffic. This is a **WITNESS POINT.**

4.5 **OPENING TO TRAFFIC**

Opening temporary roadways and detours to traffic

Program: Complete all signposting, pavement marking, guard fence and portable or temporary traffic signals before the opening of temporary roadways to traffic.

Traffic switch: To a temporary roadway or detour must only occur where the Contractor’s usual workforce will be on site for a minimum of two days thereafter. This is a **WITNESS POINT.**

Arrange: The opening of temporary roadways so that sections of existing roadway being replaced are not disturbed for a minimum of forty-eight hours.

Roadway failure: In the event of temporary roadway failure direct the traffic back onto the existing roadway. This is a **HOLD POINT.**

Inspection: Do not open temporary roadways and detours (including portable or temporary traffic signals sites) to traffic until they have been inspected and approved in writing. This is a **HOLD POINT.**
Partial completion: The use of the completed Works or part of the Works in providing for traffic is not considered as full opening to traffic and not a reason for payment under the completion of the works.

Maintain: Temporary roadways and detours and ensure the road surface is kept safe for traffic. Repair any potholes or other failures without delay. This is a WITNESS POINT.

Costs: To be borne by the Contractor.

Opening completed work
Prior notice: Provide the Superintendent with at least five working days written notice confirming the date of opening completed work to traffic. Determine the procedure for opening through consultation with the Superintendent and local Police. This is a HOLD POINT.

Complete: All permanent signposting, pavement markings, guard fence and traffic signals relevant to the completed work under the Contract prior to opening completed work to traffic.

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

Restore: The area to a condition at least equivalent to that at commencement.

5 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

5.1 MEASUREMENT

General
Payments made to the Schedule of Rates: To 0152 Schedule of rates — supply projects, this worksection, the drawings and Pay items 1101.1.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology
The following methodology will be applied for measurement and payment:

- Drainage is measured and paid in accordance with:
  - 1121 Open drain, including kerbs and gutter.
  - 1351 Stormwater drainage.
  - 1352 Pipe drainage.
  - 1354 Drainage structures.

- Temporary roadways and detours is measured and paid in accordance with:
  - 1102 Control of erosion and sedimentation.
  - 1111 Clearing and grubbing.
  - 1112 Earthworks (Roadways).
  - 1121 Open drain, including kerbs and gutter.
  - 1141 Flexible pavement base and subbase.

- Wearing surface is measured and paid in accordance with:
  - 1143 Sprayed bituminous surfacing, and/or
  - 1144 Asphaltic concrete (Roadways).

- Road safety barriers is measured and paid in accordance with:
  - 1163 Rigid road safety barrier systems.
  - 1194 Non-rigid road safety barrier systems.

All activities for the construction, maintenance and removal of temporary roadways, including side-tracks and divided road crossovers, and detours detailed in this worksection, to the requirements of specific activity worksections parts, are measured and paid in accordance with those worksections parts.

5.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule Rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1101.1 Control of traffic</td>
<td>Lump Sum item</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- All documentation and</td>
</tr>
</tbody>
</table>
6 ANNEXURES

6.1 SUPPLEMENTARY TEMPORARY WARNING SIGNS IN ADDITION TO AS 1743 AND AS 1742.3.

![Heavy Machinery Crossing Sign Diagram]

Dimensions are in mm
Colours: Black letters and border on yellow reflectorised ground.
Sign SW5-22
Dimensions are in mm
Colours: Black letters and border on yellow reflectorised ground.
Sign ST1-10

Dimensions are in mm
Colours: Black letters and border on yellow reflectorised ground.
Sign ST3-1
Dimensions are in mm
Colours: Black letters and border on yellow reflectorised ground.
Sign ST1-6
1102 CONTROL OF EROSION AND SEDIMENTATION (CONSTRUCTION)

Licence to the control of erosion and sedimentation in accordance with an Environmental Management Plan for moderate sized works and supplemented by a Soil and Water Management Plan for major works, both prepared by the Contractor.

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide the works and implement measures to control erosion and sedimentation, as documented and in accordance with the approved Environmental Management Plan.

Design
Requirements: Design the control measures for erosion and sedimentation to comply with statutory requirements. Preclude any potential hazard to persons or property.

Designer: Suitably qualified Engineer to RP Eng or CP Eng standard to authorise design by signature.

Authority requirements: As required by the Conditions of Development Consent.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 0257 Landscape – roadways and street trees.
- 1101 Control of traffic.
- 1111 Clearing and grubbing.
- 1112 Earthworks (Roadways).
- 1121 Open drains, including kerb and gutter.

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Note: Only the most current standards are to be used


1.4 STANDARDS

The following documents are incorporated into this worksection by reference:
- Documents: Nil.

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
CEMP: Environmental Management Plan.
ESCP: Erosion and Sediment Control Plan.

NTU: The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units.
SWMP: Soil and Water Management Plan.

Definitions
General: For the purposes of this worksection the following definitions apply:
- Erosion: The wearing away of land by the action of rainfall, running water, wind, moving ice or gravitational creep. Soil detachment (erosion) occurs when the erosive forces exceed the soil’s resistance, causing the soil particles to move.
- Sediment: Sediment is the result of erosion, and consists of small detached soil particles. It occurs when the transportation of detached soil particles ceases or slows and the soil particles fall out of suspension.

1.6 SUBMISSIONS

Approval
Submissions: To the Superintendent’s approval & Council’s Engineering Development Officer.

Documents
- Contractors Environmental Management Plan (CEMP).
- Soil and Water Management Plan (SWMP).
- Erosion and Soil Control Plan (ESCP).
- Program for coordination of work schedules including order of works and timing.

Drawings
- Access and haulage tracks.
- Borrow pits and stock areas.
- Compound areas.
- Features of the site.
- Relevant construction details.

Calculations
- Survey of embankments.

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractors Environmental Management Plan (CEMP) - General</td>
<td>Submit CEMP with detailed section plans for each catchment area and site section</td>
<td>7 days before site disturbance on each section</td>
<td>Superintendent for Council Projects &amp; Council's Engineering Development Officer for Development Works</td>
</tr>
<tr>
<td>EXECUTION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion and sedimentation control measures - Stockpile sites</td>
<td>Proposed stockpile locations</td>
<td>14 days before site disturbance or material delivery</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Earthworks – Embankments and sediment removal</td>
<td>Survey information for volume measurement</td>
<td>3 working days before embankment construction or sediment removal</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

WITNESS POINTS table

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection by the Superintendent &amp; Council’s Engineering Development Officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion and sedimentation control measures - Control measures</td>
<td>Diversion and catch drains - constructed and lined before the adjacent ground is disturbed and</td>
<td>3 working days before ground disturbance</td>
</tr>
</tbody>
</table>
### 1102 Control of erosion and sedimentation (Construction)

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection by the Superintendent &amp; Council's Engineering Development Officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>the excavation is commenced</td>
<td></td>
<td>3 working days before the adjacent ground is disturbed</td>
</tr>
<tr>
<td>Areas of erodible material not approved for clearing or disturbance clearly marked, fenced off or protected against disturbance</td>
<td></td>
<td>7 days before site disturbance</td>
</tr>
</tbody>
</table>

**Erosion and sedimentation control measures - Access and exit areas**

- Decontamination - shake-down or other methods for the removal of soil materials from motor vehicles

2 days before site disturbance

**Temporary erosion and sedimentation control - General**

- Provide temporary erosion and sedimentation control measures

7 days before site disturbance

**Temporary erosion and sedimentation control - Control measures**

- Provide temporary sediment traps and trash barriers

3 working days before ground disturbance

**Temporary erosion and sedimentation control - Maintenance**

- Provide access roads for inspection and maintenance sedimentation control works

Progressive

**Temporary erosion and sedimentation control - Removal**

- Removal of temporary erosion and sedimentation control works

3 working days before each stage of progressive removal

---

### 2 PRE-CONSTRUCTION PLANNING

#### 2.1 CONTRACTORS ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

**General**

Minor works: Prepare a CEMP covering erosion and sedimentation control.

Major works: Prepare a SWMP including both CEMP and ESCP.

Approval criteria: As required by the Conditions of Development Consent.

Site sections: At least seven days before the natural surface is disturbed on each of these sections, submit a CEMP for that section. Superimpose the plan on the drainage drawings of the works. This is a HOLD POINT.

Responsibility: The Contractor has the responsibility to provide whatever measures are required for the effective erosion and sedimentation control at all times.

**Responsibilities**

- Adherence: Adhere to the approved CEMP. Submit a revised CEMP for approval seven days in advance of an intended variation from the approved plan.

- Salinity prevention: In known salt affected areas, seek advice from the relevant land and water resource authority to ensure that the proposed CEMP conforms to the current salinity prevention measures outlined in the IPWEA publication, *Local Government Salinity Management Handbook*.

**Minimising erosion**

Objective: To minimise the quantity of soil lost during construction due to land clearing and earthworks.

Content: Provide documentation and program scheduling to address the following:

- Minimum land clearance, particularly of areas of highly erodible soils and steep slopes prone to water and wind erosion.

- Progressive revegetation and mulching, as each site section is complete.

- Coordination of work schedules for multiple contractors, to avoid delays resulting in disturbed land remaining unstabilised.
- Time schedules for the construction of structures and the implementation of measures to control erosion and sedimentation. Where possible, program the work to avoid seasonal intense rain storms.
- An order of works based upon construction and stabilisation of all culverts and surface drainage works, at the earliest practical stage.
- A time schedule to address HOLD POINTS and WITNESS POINTS.

Documentation: Implement ahead of, or in conjunction with clearing and grubbing operations (as required by 1111 Clearing and grubbing) all permanent and temporary erosion and sedimentation control measures, including the control measures.

Site sections: For implementation divide the site into sections based on the catchment area draining to each permanent drainage structure in the works and based on the area bounded by the road reserve.

Site section information: Provide diagrams indicating the following:
- Access and haulage tracks.
- Borrow pits and stockpile areas.
- Compound areas, such as Contractor’s facilities and concrete batching areas.
- Features of the site, including contours and drainage paths.
- Relevant construction details of all erosion and sedimentation control structures.
- Permanent and temporary measures.
- Staging and timing of works.

2.2 SOIL AND WATER MANAGEMENT PLAN - SUPPLEMENT

General
Objective: To minimise the generation of contaminated stormwater.

Content: Provide documentation to address the following:
- Minimising the quantity of uncontaminated stormwater entering cleared areas.
- Establishing cut-off or intercept drains to redirect stormwater away from cleared areas and sloping to stable (vegetated) areas or effective treatment installations.
- Reducing water velocities.

Preparation
Expertise: Employ an experienced consultant to design, document and technically report on the implementation of the plan and submit details of experience.

Environmental assessment: Identify and obtain information on any relevant environmental impact that may be caused by the works.

Risk assessment: Identify and quantify risks and remedial action that may arise from the construction of the works.

Sediment controls
Objective: To minimise the impact of contaminated water on receiving waters.

Content: Provide documentation to address the following:
- Installing erosion and sediment control measures before construction where possible.
- Identifying drainage lines and install control measures to handle predicted stormwater and sediment loads generated in the mini catchment.
- Designing erosion and sediment run-off control measures appropriate to the site conditions to handle storm events with 2 year ARI with intensity of 6 hours, for temporary structures, and 50 year ARI, for permanent structures.
- Preparing an inspection, maintenance and cleaning program for sediment run-off control structures.
- Creating contingency plans for unusual storm events.
- Planning for the continual assessment of the effectiveness of sediment control measures.

De-watering work sites
Objective: To ensure that de-watering operations do not result in turbid water entering natural waterways.

Content: Provide documentation to address the following with regard to de-watering by pumping:
- Treating contaminated water if the turbidity exceeds 30 NTU.
- Only pump water into natural waterways that does not exceed regulatory water quality standards.
- Pumping water, wherever practical, to vegetated areas of sufficient width to remove suspended soil, or to sediment control structures.
- Monitoring turbidity hourly, if discharge is to a natural waterway.
- Provide NSW Office of Water Controlled Activity Approval under the Water Management Act 2000 to the Superintendent or Council Development Engineer prior to commencement of works.

**Dust control**

Objective: To ensure there is no health risk or loss of amenity due to emission of dust to the environment.

Content: Provide documentation to address the following:
- Suppressing dust by watering.
- Installing wind fences.

**Management of stockpiles and batters**

Objective: To manage soil stockpiles so that dust and sediment in run-off are minimised.

Content: Provide documentation to address the following:
- Minimising the number of stockpiles, and the area and the time stockpiles are exposed.
- Separating soil and overburden stockpiles.
- Locating stockpiles away from drainage lines, at least 10 m away from natural waterways and where least susceptible to wind erosion.
- Designing stockpiles and batters with slopes no steeper than 2H:1V.
- Stabilising stockpiles that will remain bare for more than 28 days by covering with mulch, anchored fabrics or seeding with sterile grass.
- Establishing sediment controls around unstabilised stockpiles and batters.

**Working in waterways and floodplains**

Objective: To minimise stress on aquatic communities when working in a waterway.

Content: Provide documentation to address the following:
- Planning in-stream works to minimise contact time.
- Establishing special practices to minimise impacts on the waterway and disturbance of the banks.
- Stabilising the banks and the in-stream structures so they do not contribute to the sediment load.
- Maintaining minimum flows to ensure the viability of aquatic communities. Ensure the free passage of fish.
- Designing crossings that do not contribute to the sediment load.
- Preparing a contingency plan for severe rainfall events.
- Preparing a reinstatement plan for work in a stream that could alter the waterway structure.
- Provide NSW Office of Water Controlled Activity Approval under the Water Management Act 2000 to the Superintendent or Council Development Engineer prior to commencement of works.

3 EXECUTION

3.1 PROVISION FOR TRAFFIC

**General**

Control of traffic: Conform to the following:
- Conform with 1101 Control of traffic.
- Conform with Traffic Guidance Scheme in 1101 Control of traffic.

3.2 EROSION AND SEDIMENTATION CONTROL MEASURES

**Control measures**

Construction: To the CEMP and the drawings.

Requirement: Provide erosion and sedimentation control measures to include, but not limited to, the following:
- The installation of permanent drainage structures before the removal of topsoil and before the commencement of earthworks for formation within the catchment area of each structure.
- The prompt completion of all permanent and temporary drainage works, once commenced, to minimise the period of exposure of disturbed areas.
- Provide temporary sedimentation collection structures prior to commencement of works to intercept construction sediment, that can be cleaned and converted to operate as post construction sedimentations/bio retention devices.
- The construction of diversion and catch drains to divert uncontaminated runoff from outside the site, clear of the site. Construct and line catch drains before the adjacent ground is disturbed and the excavation is commenced. This is a WITNESS POINT.
- To provide for the passage of uncontaminated water through the site without mixing with contaminated runoff from the site.
- 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.
- The provision of sediment filtering or sediment traps, ahead of and in conjunction with earthworks operations, to prevent contaminated water leaving the site.
- 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.
- The limitation of areas or erodible material exposed at any time to those areas being actively worked. Clearly mark, fence off or otherwise protect any areas not approved for clearing or disturbance. This is a WITNESS POINT.
- 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.
- The progressive revegetation of the site, in accordance with 0257 Landscape - Roadways and street trees.

Stockpile sites
Location: Areas pre-approved for such use.
Protection: Provide a 5 m buffer zone to between stockpile sites and any stream or flow path. Protect all stockpiles from erosion and contamination of the surrounding area by use of the measures approved in the CEMP. This is a HOLD POINT.

Access and exit areas
Decontamination: Include shake-down or other methods approved for the removal of spoil materials from construction plant or vehicles. This is a WITNESS POINT.

3.3 EARTHWORKS

Permanent erosion and sedimentation control basins
Planned levels: Construct earthworks for permanent erosion and sedimentation control basins to the documented levels and dimensions shown on the drawings or such levels and dimensions as determined by the Superintendent.

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

Sedimentation collection: Provide temporary sedimentation collection structures prior to commencement of works to intercept construction sediment, that can be cleaned and converted to operate as post construction sedimentations devices.

3.4 INLETS, SPILLWAYS AND LOW FLOW OUTLETS

Sedimentation control basins and sediment traps
Rock mattresses: Construct inlets and spillways using rock filled woven galvanized steel mattresses and geotextile. Install the rock filled mattresses to conform with the requirements for rock filled wire mattress and geotextile in 1121 Open drains, including kerb and gutter.

Plastic pipe outlet: Install a low flow outlet consisting of a 150 mm diameter plastic pipe in the locations shown on the drawings.
3.5 DROP INLET SEDIMENT CONTROL

Permanent traps
Timing: Construct permanent drop inlet sediment traps and inlet control banks, on completion of gully pits as shown 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 during construction of the gully pits.

Purpose: Construct the inlet control banks as required to prevent the surface flows bypassing the gully pits. The drop inlet sediment traps are to remove sediment from the surface flow before it enters the drainage system.

Sediment traps and control banks: Conform to the following:
- Construct the drop inlet sediment traps with the associated inlet control banks to consist of at least two courses of sandbags containing a 10:1 sand/cement mix as shown on the drawings.
- Key the bags at least 25 mm into the surface, dampen sufficiently to ensure hydration of the cement and tamp lightly to provide mechanical interlock between adjacent bags.

3.6 CLEANING

Sedimentation control structures
Timing: Clean out permanent sedimentation control/structures, whenever the accumulated sediment has reduced the capacity of the structure by 50% or more, or whenever the sediment has built up to a point where it is less than 300 mm below the spillway crest. This is a WITNESS POINT.

Removal of sediment: Remove accumulated sediment from permanent sedimentation control structures, in such a manner as not to damage the structures.
Disposal: Remove the sediment to a nominated soil stockpile site or dispose in such locations that the sediment will not be conveyed back into the construction areas or into watercourses.
Access: Provide and maintain suitable access to permanent sedimentation control structures, to allow cleaning out in all weather conditions.

Completion
Cleaning: Clean all permanent sedimentation control structures, prior to Practical Completion of the Works.

3.7 TEMPORARY EROSION AND SEDIMENTATION CONTROL

General
Continuous control: Ensure that effective erosion and sedimentation control is provided at all times during the contract. Remove and/or reinstate any temporary or redundant control works at appropriate times during the contract.
Runoff: Prior to dispersing any runoff must be free of pollutants as defined in the relevant legislation. Disperse clean runoff to stable areas or natural water courses.
Control: Provide temporary erosion and sedimentation control measures where the natural surface is disturbed by construction, including roads, depot and stockpile sites. This is a WITNESS POINT.
Maintenance: Provide and maintain slopes, crowns and drains on all excavations and embankments to ensure satisfactory drainage at all times. Do not allow water to pond on the works unless such ponding is part of an approved CEMP.
Costs: To be borne by the Contractor.

Control measures
Temporary drains: Control runoff from areas exposed during the work by construction of temporary contour drains and/or temporary diversion drains, which take 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.
Contour drains: Provide contour drains across the natural surface at approximately the same elevation. Immediately after a construction site is cleared, intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. Construct as follows:
- Contour drains, as shown on the drawings, formed with a grade of not less than 1% or greater than 1.5% and spaced at intervals of not less than 20 m or greater than 50 m, depending on the erodibility of the exposed soil.
Diversion drains: Provide diversion drains 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, constructed as follows:
- Formed to intercept and divert runoff from the road or track to stable outlets.
- Spacing of diversion drains not greater than that required to maintain runoff at non-erosive velocities.

Temporary sediment traps: Provide devices during construction to remove sediment from runoff flowing from areas of 0.5 ha or more before the runoff enters stormwater drainage systems, natural water courses or adjacent land. This is a WITNESS POINT.

Trash barriers: Provide and maintain trash barriers to prevent debris from entering natural watercourses.

Batter protection: Take all necessary action to protect batters from erosion during the contract. Minimise scour of newly-formed fill batters during and after embankment construction by diverting runoff from the formation away from the batter until vegetation is established.

Maintenance
Maintenance and inspection: Inspect all temporary erosion and sedimentation control works after each rain period and during periods of prolonged rainfall. Rectify any defects revealed by such inspections immediately. Clean, repair and augment, as required, the works, to ensure effective erosion and sedimentation control thereafter.

Access: Provide and maintain access from within the road reserve, or from other acceptable locations, for clearing out sedimentation control works. This is a WITNESS POINT.

Removal
Timing: Remove all temporary erosion and sedimentation control works when revegetation is established on formerly exposed areas before the end of the contract. Remove from the site or otherwise dispose, all materials and components used for the temporary erosion and sedimentation control works. This is a WITNESS POINT.

4 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

4.1 MEASUREMENT

General
Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, the drawings and Pay items 1102.1 to 1102.5 inclusive.
Lump Sum: Not acceptable for any item other than Pay Item 1102.1.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology
The following methodology will be applied for measurement and payment:
- Clearing and grubbing is measured and paid in accordance with 1111 Clearing and grubbing.
- Landscaping works are measured and paid in accordance with 0257 Landscape – roadways and street trees.
- Topsoil stripping and removal of unsuitable material are measured and paid in accordance with 1112 Earthworks (Roadways).

4.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1102.1 Temporary erosion and sedimentation control</td>
<td>Lump sum</td>
<td>All costs associated with the installation, maintenance, inspection and removal of the temporary erosion and sedimentation control measures in accordance with Temporary erosion and sedimentation control inclusive and the drawings.</td>
</tr>
<tr>
<td>Pay items</td>
<td>Unit of measurement</td>
<td>Schedule rate scope</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>1102.2 Earthworks for permanent erosion and sedimentation control basins</strong></td>
<td>m³. The volume will be determined by calculation using the end area method.</td>
<td>All costs associated with compacted embankment constructed in accordance with <strong>Earthworks for permanent erosion and sedimentation control basins</strong> and the drawings. The schedule rate to cover the excavation of material from within the sedimentation control basin and embankment construction required under <strong>Earthworks for permanent erosion and sedimentation basins</strong> and will be an average rate for all types of materials. The cost of excavating and transporting material for embankment construction and obtained from within cuttings or from borrow will be included in the schedule rate for General Excavation in 1112 <strong>Earthworks (Roadways)</strong>.</td>
</tr>
<tr>
<td><strong>1102.3 Inlets, spillways and low flow outlets for sedimentation control basins</strong></td>
<td>m² of horizontal surface area</td>
<td>All costs associated with the rock filled mattress constructed in accordance with <strong>Inlets, spillways and low flow outlets for sedimentation control basins and sediment traps</strong> and the drawings.</td>
</tr>
<tr>
<td><strong>1102.4 Drop inlet sediment traps and inlet control banks</strong></td>
<td>'Each' drop</td>
<td>All costs associated with drop inlet <strong>sediment trap</strong> including inlet control bank constructed in accordance with <strong>Drop inlet sediment control</strong> and the drawings.</td>
</tr>
<tr>
<td><strong>1102.5 Cleaning of permanent sedimentation structures</strong></td>
<td>m³ of in-place sediment</td>
<td>All costs associated with sediment removal from the structure in accordance with <strong>Cleaning sedimentation control structures</strong>. The volume of sediment removed will be determined by survey or by methods approved by the Superintendent. The schedule quantity is a provisional quantity.</td>
</tr>
</tbody>
</table>
1111 CLEARING AND GRUBBING

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide clearing and grubbing of vegetation to allow site works for construction to conform with drawings, permits, vegetation clearing schedules as documented.

Performance
Requirements: Provide cleared land, remove and dispose of all rubbish and materials unsuitable for subsequent works as shown on the drawings and directed by the Superintendent.
Requirements: As required by the Conditions of Development Consent.
Authority requirements: As required by the Conditions of Development Consent and compliance with Council's Tree Preservation Orders.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 0257 Landscape – roadways and street trees.
- 1101 Control of traffic.
- 1102 Control of erosion and sedimentation.
- 1195 Boundary fences for road reserves.

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:
Note: Only the most current standards are to be used
AS 1473.1 Wood-processing machinery -- safety Part 1: Primary timber milling machinery
AS 1744 Forms of letters and numerals for road signs (known as Standard alphabets for road signs).
AS 4373 Pruning of amenity trees.
AS/NZS 4671 Steel reinforcing materials.

1.4 STANDARDS

General
Standard: To AS 4373.

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviation apply:
TMO: Council's Tree Management Officer

Definitions
General: For the purposes of this worksection the following definition apply:
- Council: Great Lakes Council.
- Council's Senior Ecologist or their nominated representative: Council appointed person authorised to determine specific environmental matters.
1.6 SUBMISSIONS

Approval
Submissions: To the Superintendent's approval.

Documents
Submit the following for approval:
- Weed management plan as noted in Pre-construction planning.
- Drawings: Showing area of work completed.
- Calculations: Confirmation of areas or units claimed for "Execution."
- Execution details: Method statements for selective clearing and proposed equipment.
- Technical data: Survey diagrams to record set out results.

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limits of clearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extent of clearing</td>
<td>Submit peg out and extent of clearing survey</td>
<td>7 days before proposed commencement of clearing</td>
<td>Superintendent &amp; Council's Environment Officer</td>
</tr>
<tr>
<td>Trees to be preserved</td>
<td>Confirm clearing perimeters and mark trees to be preserved</td>
<td>7 days before proposed site clearing</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td><strong>Tagging</strong></td>
<td>Confirm clearing perimeters and mark trees to be preserved</td>
<td>7 days before proposed site clearing</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td>Work near trees noted for protection</td>
<td>Work method statement for works within the exclusion zone</td>
<td>7 days before proposed works</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td>Excavation within 4m of tree trunks</td>
<td>Develop appropriate work methods to avoid damage to the tree for approval</td>
<td>7 days before proposed excavation</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td>Trees within proposed embankment areas</td>
<td>Direction to remove or protect trees within proposed embankments</td>
<td>7 days before proposed site clearing</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td>Unsound trees in road reserve</td>
<td>Direction on removal of trees or branches not within the clearing limits</td>
<td>7 days before proposed site clearing</td>
<td>Superintendent and CTPO</td>
</tr>
<tr>
<td>Timber falling on private property</td>
<td>Written consent of owner to leave in place or to enter property to remove</td>
<td>Prior to carrying out works</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>Damage</strong></td>
<td>Approval for any rehabilitation of vegetation or fauna habitat</td>
<td>3 working days prior to carrying out works</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>Grubbing</strong></td>
<td>Explosives not permitted without prior approval</td>
<td>Progressive</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>Disposal of materials</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burning of material</td>
<td>NOTE: Burning not permitted.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
WITNESS POINTS table – On site activities

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing Utility services - Marking</td>
<td>Locate all underground pipe and cables</td>
<td>Before commencing any earthworks</td>
</tr>
<tr>
<td>Weed control - Procedures</td>
<td>Tag all areas identified in the Weed Management Plan</td>
<td>7 days before commencing works</td>
</tr>
<tr>
<td>Trees to be preserved – Work near trees noted for protection</td>
<td>Exclusion zone around protected trees</td>
<td>Progressive</td>
</tr>
<tr>
<td>Trees to be preserved – Tree protection</td>
<td>Tree’s and roots not to be cut or damaged</td>
<td>Progressive</td>
</tr>
<tr>
<td>Grubbing - Backfill</td>
<td>Backfill and compact grub holes</td>
<td>Progressive</td>
</tr>
<tr>
<td>Chipping of cleared vegetation - Stockpiling</td>
<td>Stockpile location approval</td>
<td>Prior to stockpiling</td>
</tr>
</tbody>
</table>

2 PRE-CONSTRUCTION PLANNING

2.1 WEED MANAGEMENT PLAN

Content
Details required:
- Identification of weeds and infestation zones within the work site/investment date.
- Method of cleaning vehicles and machinery, and cleaning date.
- Cleaning bay location and treatment date.
- Contaminated fill stockpile, treatment type and treatment date.

2.2 ESTABLISHMENT

Survey: Provide a qualified survey team to prepare site plans and carry out pegging.
Program: Provide planning resources to allocate plant and personnel for the construction period.
Control measures: In advance or in conjunction with clearing and grubbing operations implement adequate measures in accordance with 1102 Control of erosion and sedimentation.

3 EXECUTION

3.1 EXISTING UTILITY SERVICES

Marking
Location: Before commencing earthworks, locate and mark existing underground services in the areas to be affected by the works including clearing, excavating and trenching.
Contact: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia. Underground pipe and cables are located (possible within two working days). See www.1100.com.au.
Prevent damage: Take all measures to prevent damage to existing underground and overhead utility services. Do not excavate by machine within 1 m of existing underground services. This is a WITNESS POINT.

3.2 LIMITS OF CLEARING

Survey
Submission: Submit a survey plan showing the proposed area for clearing to confirm the clearing perimeters. This is a HOLD POINT.

Pegging: Requirement for pegging includes surveying the areas and locating recovery pegs.

Extent of clearing Pegs to be installed at 25m intervals and at change of direction.

Clearing: The areas to be cleared are as shown on the drawings or schedules supplied and areas that will be occupied by:
- The completed Works.
- Erosion and sedimentation measures.
- Stockpile sites and borrow areas.
- A clearance zone of 4 m beyond tops of cuts and toes of embankments where the natural fall of the ground is towards the roadway.
- A clearance zone of 2 m 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.

Planning and programming: Clearing is to be carried out progressively with only the minimum area of land left disturbed at any time. Ensure that only the absolute minimum area for construction is cleared.

Trees outside limits of work: Plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified or approved.

Natural landscape features: Protect against disturbance any natural rock outcrops, natural vegetation, soil and water courses outside the limits of clearing.

3.3 WEED CONTROL

Procedures
Tagging: Tag areas identified in the Weed management plan. The Superintendent may require additional areas. This is a WITNESS POINT.

Implementation: Avoid spreading weeds during the clearing operations and remove all identified weeds as a separate operation.

Spraying: All persons engaged in spraying to have a current pesticide operator’s licence as issued by the Great Lakes Council.

3.4 TREES TO BE PRESERVED

Tagging
Inspection: The Superintendent and CTMO will inspect the proposed area for clearing to confirm the clearing perimeters and mark with ribbon markers, or indicate to the Contractor the trees to be preserved or transplanted. This is a HOLD POINT

Program: Implement protective measures before commencement of clearing.

Signage
Warning sign: Display a sign in a prominent position at each entrance to the site, warning that trees and plantings are to be protected during the contract. Remove on completion.

Lettering: Road sign type sans serif letters, 100 mm high, in red on a white background, to AS 1744.

Work near trees noted for protection
Exclusion zone: The area within 4 m of the trunks of trees tagged to be protected is to be an exclusion zone. The following activities must not occur within this zone unless prior approval has been received:
- Erection of structures.
- Excavation and filling.
- Changes to soil profiles.
- Stockpiling of spoil.
- Storage of other materials.
- Driving or parking of any vehicle or machinery.

This is a WITNESS POINT

Work method statement: Approval by both the Superintendent and the CMPO is required for works within the exclusion zone of the protected trees. Submit a detailed work method statement involving the protection methods listed in Tree protection. This is a HOLD POINT.

Harmful materials: Keep the area within the dripline free of sheds and paths, construction material and debris. Do not place bulk materials and harmful materials under or near trees. Do not place spoil from excavations against tree trunks. Prevent wind-blown materials such as cement from harming trees and plants.

Transplanting
Method: The lifting and temporary storage of the nominated vegetation for transplanting to conform with 0257 Landscape – roadways and street trees.
Excavation within 4 m of tree trunks
Damage prevention: Submit a work method statement prior to any excavation within 4 m of the trunk of any tree. The work method must avoid damage to the tree and its root system. This work method must be approved by the Superintendent and CMPO. This is a HOLD POINT.
Open excavations: Work methods should minimise the time period an excavation is left open under tree canopies.
Tree protection
Tree enclosures: Temporary protective enclosures must be 10 times the trunk diameter at 1500 mm measured as a radius from the trunk and may consist of wire, mesh or chain material.
Wire enclosures: Four strands of fencing wire, or plastic mesh barrier, supported on plastic capped star pickets spaced at not more than 4 m.
Mesh enclosures: SL 62 to AS/NZS 4671 reinforcing mesh 1800 mm high wired to 2400 mm long star pickets, driven 800 mm into the ground, spaced 1800 mm apart at a minimum distance of 1 m from the tree trunk.
Chain wire enclosures: 1800 mm high chain wire panels fixed to 40 mm diameter galvanized steel posts.
Trunk protection: If space is not available for tree enclosures provide trunk protection comprising 2000 mm long planks of 100 mm x 50 hardwood stacked vertically around the trunk and secured with 10 gauge wire over hessian protective padding.
Sheeting to excavations: Where excavations are to be made near trees, add continuous 900 mm high corrugated galvanized steel sheeting, bedded 150 mm into the ground, wired to the enclosure.
Damage: Prevent damage to tree bark and root system. Do not attach stays and guys to trees.
Tree roots: No tree roots to be cut without prior approval. This is a WITNESS POINT.
Work under trees: Do not remove or add topsoil to the area within the dripline of the trees.
Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged.
Clearing machines: Fit machines used for pushing and heaping operations with root takes or similar and operate to ensure as little soil as possible is removed and heaped with the cleared vegetative material.
Roots: Do not cut tree roots exceeding 50 mm diameter. Where it is necessary to cut tree roots, use means of cutting that do not unduly disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots (e.g. Formula 20® or Hormone 20®).
Backfill material: Backfill around tree roots must be a mixture consisting of three parts by volume of topsoil and one part of well rotted compost. The compost is to have a neutral pH value, free from weed growth and harmful materials.
Backfill layers: Backfill layers to be each of 300 mm maximum depth.
Compaction of backfill: Place layers of backfill and compact to a dry density similar to that of the original or surrounding soil.
Backfill height: Do not backfill around tree trunks to a height greater than 200 mm above the original ground surface.
Watering: Water trees as necessary, including where roots are exposed at ambient temperature greater than 35°C. Thoroughly water the root zone surrounding the tree immediately after backfilling.
Compacted ground: Do not compact the ground or use skid-steel vehicles under the tree dripline. If compaction occurs, give notice and obtain instructions.
Compaction protection: Protect areas adjacent to the tree dripline, if required submit within the work method statement a proposal for an elevated platform to suit the proposed earthworks machinery.
Mulching: Spread 100 mm thick organic mulch to the whole of the area covered by the drip line of all protected trees.
Trees within proposed embankment areas
Notice: Give notice immediately where a tree marked for preservation is located within an area proposed for embankment construction. The Superintendent will decide after approval from the CMPO whether the tree is to be removed or protected. This is a HOLD POINT.
Unsound trees in road reserve
Clearing: Seek approval from CMPO and the Superintendent to clear any unsound tree remaining within the road reserve, but outside the limits of clearing that is likely to fall upon the roadway. This is a HOLD POINT.

Pruning: Cut back by hand close to the bole of the tree or main branches, any branch overhanging the road formation to within 0.5 m of the tree trunk to conform with AS 4373.

Disposal: Dispose of any unsound trees and over hanging branches to conform with Chipping of cleared vegetation.

Timber falling on private property:
- Prevention: Take every precaution to prevent timber from falling on private property at all times.
- Owners consent: If timber does fall on private property obtain written consent from the property owner for it to remain there or approval to enter the property and remove it for disposal. Submit the owners written consent. This is a HOLD POINT.

Costs: To be borne by the Contractor.

Damage
Restoration: Make good damage of any kind, including damage to trees or fencing, occurring during clearing operations and construction.

Rehabilitation: Any damage caused by the Contractor to vegetation, landforms or fauna habitat must be rehabilitated in consultation with Council’s Parks (Natural Assets) Officer. Restore to the pre-existing condition within the shortest period of time. This is a HOLD POINT.

Methods: This may include but is not limited to deep ripping or hand scarifying and raking of wheel tracks and compacted soil, reinstatement of rocks or stones, planting of seeds or seedlings together with subsequent nurturing, repairs to foliage or root systems of trees and shrubs and reinstatement of fauna habitat.

Costs: To be borne by the Contractor.

3.5 GRUBBING

General
Extent of grubbing: All trees and stumps on, or within the limits of clearing which are unable to be felled and removed.

Depth of grubbing: Carry out grubbing operations to a depth of 0.5 m below the natural surface or 1.5 m below the finished surface level, whichever is the lower.

Blasting: Explosives are not permitted for any site activity without prior approval. This is a HOLD POINT.

Backfill
Backfill holes: To prevent the infiltration and ponding of water immediately backfill holes or depressions remaining after trees and stumps have been grubbed with soil material similar to the adjacent ground. Compact the backfill material to the density of the existing material in the adjacent ground. This is a WITNESS POINT.

3.6 TREATMENT OF CLEARED VEGETATION

Milling
Millable timber: Trim branches to conform with AS 1473.1 any timber species identified for milling. Stack in neat manageable stockpiles in approved locations.

Fauna habitat
Large tree trunks: Cut into transportable logs not less than 3.4 m in length and stockpile clear of construction for later placement any tree trunks nominated for salvage as fauna habitat logs.

Wood chip mulch
Prepare: Cut or split to a size to facilitate chipping or incorporation into the existing topsoil as specified all remaining timber that is not for milling or use as fauna habitat logs or for disposal offsite.

Wood-chip mulch: Produce a wood-chip mulch derived from crowns of trees and branches of shrubs cleared under this worksection.
Dimensions of wood-chip mulch: Produce the wood-chip mulch from branches having a maximum diameter of 100 mm and the chipped material produced is not to have two orthogonal dimensions exceeding 75 mm and 50 mm.

Timing: Chip cleared vegetation within 7 days of clearing to avoid excessive drying out of the vegetation and loss of seed stock.

Stockpiling
Landscaping: Stockpile the wood-chip mulch for subsequent use in landscaping to conform with 0257 Landscape – roadways and street trees or for use at other locations as directed. This is a WITNESS POINT.

Mixing: Unless specified otherwise, the mixing of cleared vegetation into the existing topsoil occurs during the topsoil operation and prior to the removal and stockpiling.

Avoid degradation: Stockpiling operations to ensure that the properties of the cleared vegetation are not degraded and made unsuitable for use in the revegetation works.

Avoid contamination: Stockpiles of vegetation must be free from stones, soil, rubbish and other materials and not be contaminated with matter toxic to plant growth.

Shape: Stockpiles of chipped vegetation 5 m bottom width, 1.5 m high, batter 1 H: 1.5 V.

Weed free: Maintain weed free vegetation stockpile sites for the duration of the stockpiling period. Treat weeds as many times as necessary to control the weed species.

Location: Locate stockpile sites away from drainage lines and position to allow ease of transport of materials at any time. Stockpiles must not impinge on drivers sight lines or affect road safety.

Rehabilitation: Rehabilitate stockpile sites to conform with 0257 Landscape – roadways and street trees.

3.7 DISPOSAL OF MATERIALS

General
Removal from site: Unless otherwise specified elsewhere in this worksection, all materials cleared and grubbed become the property of the Contractor and are to be removed from the site and disposed of legally.

Burning of disposed material: No Burning of material is allowed.

4 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

4.1 MEASUREMENT

General
Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, the drawings and Pay item 1111.1.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology
The following methodology will be applied for measurement and payment:
- Erosion and sedimentation control measures are measured and paid in accordance with 1102 Control of erosion and sedimentation (Construction).
- Clearing and grubbing for boundary fencing is measured and paid in accordance with 1195 Boundary fencing for road reserves.

4.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1111.1 Clearing and grubbing</td>
<td>Hectare</td>
<td>All costs associated with all documentation, survey, clearing and grubbing within the plan area bounded by the limits of clearing specified in Limits of clearing.</td>
</tr>
<tr>
<td>Pay items</td>
<td>Unit of measurement</td>
<td>Schedule rate scope</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1111.2 Removal of trees outside limits of clearing</td>
<td>‘Each’ tree</td>
<td>All costs associated with removal of trees outside the area bounded by the limits of clearing specified in Limits of clearing. The schedule quantity is a provisional quantity.</td>
</tr>
<tr>
<td>1111.3 Wood-chipping</td>
<td>‘m³’ in stockpile.</td>
<td>All costs associated with wood-chipping and stock piling the schedule quantity is a provisional quantity.</td>
</tr>
</tbody>
</table>
1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide Earthworks for roadways as documented.

Performance
Requirements: Conform to this worksection, the Drawings and Standards as directed and approved.

Design
Designer: Suitably qualified Engineer to RP Eng or CP Eng standard to authorise design by signature.
Authority requirements: As required by the Conditions of Development Consent.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 0257 Landscape – roadways and street trees.
- 1101 Control of traffic.
- 1102 Control of erosion and sedimentation (Construction).
- 1111 Clearing and grubbing.
- 1113 Stabilisation.
- 1351 Stormwater drainage (Construction).
- 1352 Pipe drainage.
- 1353 Precast box culverts.
- 1354 Drainage structures.

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:

Note: Only the most current standards are to be used

AS 1289 Methods of testing soils for engineering purposes.
AS 1289.3.3.1 Soil classification tests—Calculation of the plasticity index of a soil.
AS 1289.5.1.1 Soil compaction and density tests—Determination of the dry density or moisture content relation of a soil using standard compactive effort.
AS 1289.5.4.1 Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio.
AS 1289.5.7.1 Soil compaction and density tests—Compaction control test—Hilf density ratio and Hilf moisture variation.
AS 1289.6.1.1 Soil strength and consolidation tests—Determination of the California Bearing Ratio of a soil—Standard laboratory method for a remoulded specimen.

AS 2187 Explosives—Storage, transport and use.
AS 2187.1 Storage.
AS 2187.2 Use of explosives.
BS 6472 Guide to evaluation of human exposure to vibration in buildings
BS 6472-1 Vibration sources other than blasting

Other publications
Workplace Relations Ministers' Council (WRMC) Australian Code for the Transport of Explosives by Road and Rail 2009
1.4 STANDARD

General
Soil testing: To AS 1289 (Various).

1.5 INTERPRETATION

Definitions
General: For the purposes of this worksection the following definitions apply:
- Open drains: All drains other than pipe and box culverts and include catch drains, gutters and kerbs and gutters.
- Rock: Monolithic material with volume greater than 0.5 m\(^3\) in sites which cannot be removed until broken up by explosives, rippers or percussion tools. For support purposes material hardness on the Mohr scale ≥3 and not deteriorate on exposure to the atmosphere.
- Selected material zone: The top part of the Upper zone of formation in which material of a specified higher quality is required.
- Topsoil: The surface soil reasonably free from subsoil, refuse, clay lumps, stones and timber fragments.
- Unsuitable material: Material with properties outside the values set out in Annexure A and as determined as unsuitable by the Superintendent.

1.6 SUBMISSIONS

Approvals
- Submissions: To the Superintendent’s approval.
- Planning approval for spoil and borrow.
- Permits for access to spoil and borrow locations.

Documents
General:
- Drawings: Work as Executed Drawings.
- Calculations: Survey records, cut and fill calculations.
- Execution details: As documented. Refer to HOLD POINTS, WITNESS POINTS.

Technical data
General:
- CBR tests.
- Proof rolling and deflection monitoring.
- Compaction tests.

Materials:
- Select materials.
- Synthetic membrane.

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for Inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment -</td>
<td>Replace and/or dry out</td>
<td>1 working day prior to next</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Protection of</td>
<td>wet material to minimise</td>
<td>activity</td>
<td></td>
</tr>
<tr>
<td>earthworks</td>
<td>any consequent delays to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>the operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishment -</td>
<td>Approval to use of any</td>
<td>3 working days before</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Stockpile sites</td>
<td>stockpile site not shown</td>
<td>stockpiling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>on the Drawings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuttings - Ripping floors of cuttings</td>
<td>Submit ripped or loosened material for inspection</td>
<td>Before recompaaction commences</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Cuttings - Compacting floors of cuttings</td>
<td>Inspection of compacted cutting floor</td>
<td>Prior to placing any subsequent layers over the completed cutting floor</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Batter - Variation for batter slopes</td>
<td>Superintendent to order variation if a batter slope is redetermined after completion</td>
<td>Progressive</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Unsuitable material - Floor inspection</td>
<td>Re-present the floor of the excavation after the removal of unsuitable material</td>
<td>Prior to backfilling with replacement material</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Embankments - Foundations</td>
<td>Inspection of the embankment foundation area</td>
<td>1 working day prior to next activity</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Embankments - Bridging layer</td>
<td>Inspection and direction for bridging layer where required</td>
<td>3 working days before proceeding</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Placing fill - Trimming tops of embankments</td>
<td>Inspection of the completed surface to receive subsequent pavement layers</td>
<td>Prior to placing any subsequent pavement layers</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Selected material zone - Inspection</td>
<td>Inspection of the completed select material zone surface prior to placing any subsequent pavement layers</td>
<td>1 working day before proceeding</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>Fill adjacent to structures - Treatment at weepholes</td>
<td>Proposal to use synthetic membrane geotextile</td>
<td>3 working days before proposed use</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Compaction and moisture requirements - Deflection monitoring or proof rolling</td>
<td>Present the completed work for deflection monitoring or proof rolling</td>
<td>2 working days before next activity</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
</tbody>
</table>

**WITNESS POINTS table – On-site activities**

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-CONSTRUCTION PLANNING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural surface - Contractor's survey system</td>
<td>Survey method and results, including any discrepancies</td>
<td>At least 7 days notice</td>
</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of topsoil - Program</td>
<td>Inspect cleared site prior to removal of topsoil</td>
<td>3 working days prior to removal</td>
</tr>
<tr>
<td>Cuttings - Floors of cuttings</td>
<td>Floors to be no more than 50 mm above or below the designed floor and provide suitable support</td>
<td>1 working day before next activity</td>
</tr>
<tr>
<td>Batter - Excavation beyond the batter line</td>
<td>Minor change in the general slope of the batter to suit the site</td>
<td>1 working day before next activity</td>
</tr>
<tr>
<td>Clause/subclause</td>
<td>Requirement</td>
<td>Notice for inspection</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Transition from cut to fill -</td>
<td>Excavate a terrace for the width of the selected material zone to a depth</td>
<td>1 working day before excavating terrace</td>
</tr>
<tr>
<td>Terrace</td>
<td>of 900 mm below and parallel to the cutting floor.</td>
<td></td>
</tr>
<tr>
<td>Unsuitable material - General</td>
<td>Material deemed unsuitable for embankment or pavement support in its present</td>
<td>Progressive</td>
</tr>
<tr>
<td></td>
<td>position</td>
<td></td>
</tr>
<tr>
<td>Placing fill - Rock pieces</td>
<td>Modify grading of fill material to achieve compaction</td>
<td>Progressive</td>
</tr>
<tr>
<td>Fill adjacent to structures -</td>
<td>Concrete strength required for early filling to structures</td>
<td>3 working days prior to fill placement</td>
</tr>
<tr>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spoil – Haulage disposal</td>
<td>Obtain planning approval and any permits</td>
<td>3 working days before commencing activity</td>
</tr>
<tr>
<td>Borrow - Requirement</td>
<td>Obtain planning approval and any permits</td>
<td>3 working days before commencing activity</td>
</tr>
</tbody>
</table>

2. PRE-CONSTRUCTION PLANNING

2.1 PROGRAMMING

Management
Resources: Provide planning resources to allocate plant and personnel for the construction period.
Quality: Program the work to meet the constraints of HOLD POINTS, WITNESS POINTS.

2.2 NATURAL SURFACE

Contractor’s survey system
Approval: Submit details of the Contractor’s proposed survey system for approval by the Superintendent (being the Developer for a Development or the Council for a Council Project) within 14 days of possession of site being granted and prior to commencement of clearing and grubbing or earthworks.
Verification: The contractor may receive verified ground models prior to commencement of Contract. They will be in the form of computer generated road design data files in the format of the approved software.
Verification alternative: The Contractor may verify the accuracy of the model by field surveys.
Discrepancies: If the Contractor considers any areas of the model not to be representative, or submitted plans to be inaccurate, give not less than 7 days notice, prior to commencement of Works to allow checking.
Survey: Submit survey verifying existing ground profile. This is a WITNESS POINT.
Costs: If the subsequent check survey reveals the ground model and plans to be correct, then the Contractor is to bear the cost of the check survey.

2.3 MANAGEMENT OF STOCKPILES AND BATTERS

Dust and sediment minimisation
Manage: Soil stockpiles so that dust and sediment in run-off are minimised as follows:
- Minimise the number of stockpiles, and the area and the time stockpiles are exposed.
- Keep topsoil and underburden stockpiles separate.
- Locate stockpiles away from drainage lines, at least 10 m away from natural waterways and where they will be least susceptible to wind erosion.
- Ensure that stockpiles and batters are designed with slopes no greater than 2:1 (horizontal/vertical).
- Stabilise stockpiles and batters that will remain bare for more than 28 days by covering with mulch or anchored fabrics or seeding with sterile grass.
- Establish sediment controls around unstabilised stockpiles and batters.
- Suppress dust on stockpiles and batters, as circumstances demand.

3 MATERIALS

3.1 MATERIAL CHARACTERISTICS

Assumptions
Quality and quantity: The Contractor is responsible for any assumptions made for the material or the quantity. This may include:
- Nature and types of the materials encountered in excavations.
- The bulking and compaction characteristics of materials incorporated in embankments.
- The estimated quantity for general earthworks at any cutting includes all types of materials which may be encountered in the cutting.

Embankment material deficiency
Embankment material: Use material from excavations if acceptable for embankments.
Deficiency: If a deficiency of material for embankment construction is created by the Contractor electing to use the material for other purposes, make good that deficiency from sources of material meeting the quality requirements specified in Benching in cuttings.
Costs: To be borne by the Contractor.

3.2 CONTAMINATED MATERIAL AND WASTES

Excavating contaminated material
Contamination: Excavate and dispose of all contaminated material in an environmentally responsible manner including the following:
- Assay material uncovered on-site prior to disposal. If the wastes include putrescibles wastes, then also analyse leachate and landfill gases.
- Excavate material in a manner which avoids off-site environmental problems.
- Seal remaining contaminated material or wastes, where only part of the tip has been excavated, to ensure than there is no off-site effect now or in the future.
- Transport odorous wastes in covered vehicles.
- Dispose of contaminated material at the Tuncurry Transfer Station or the Great Lakes Waste Centre at Mirimbah when the Tuncurry facility is no longer operational. Fees apply.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

General
Requirement: Conform to 1101 Control of traffic.

4.2 ESTABLISHMENT

Excavation method
General: Provide a method statement covering excavation procedures based on geotechnical information shown on the drawings and/or geotechnical report.
Blasting: Provide details of special procedures for design and execution of blasting to meet all statutory and environmental requirements and in accordance with Annexure B.

Protection of earthworks
Erosion and sedimentation control: Install effective erosion and sedimentation control measures to 1102 Control of erosion and sedimentation prior to commencing earthworks and maintain these control measures for the duration of the contract.
Drainage of working areas: Maintain drainage of all working areas 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.
Salinity prevention: In salt affected areas, take adequate precautions to minimise ingress of surface water into the groundwater table.

Wet weather precautions: If rain is likely or if work is not proposed to continue in a working area on the following day, take precautions to minimise ingress of any excess water into earthworks material.

Loose material: Seal off ripped material remaining in cuttings and material placed on embankments by compaction to provide a smooth tight surface.

Wet material: If in-situ or stockpiled material becomes excessively wet as a result of the Contractor not providing adequate protection of earthworks, replace and/or dry out the material to minimise any consequent delays to the operations. This is a HOLD POINT.

Batter indicators
Timing: Establish batter indicator boards and pegs before earthworks operations commence and after survey controls are in place.

Indicators: Locate indicators as follows:
- Horizontal: Generally 25 m intervals, at each cross section shown on the Drawings, or at each change in the slope of the batter, whichever is the lesser.
- Vertical interval to not be more than 5 m height.

Information on the indicator: Clearly mark the chainage/station, offset from control line and slope distance to finished surface level.

Retention and removal of pegs: Maintain all pegs and batter indicators in their correct positions. Remove them on completion of the contract or separable part.

Additional pegs: Additional pegs and indicators may be required to suit the Contractor. Do not paint these with the same colours used for the specified setting out pegs and stakes.

Transitions cuttings/embankments: Mark clearly labelled stakes in accordance with Transition from cut to fill and Foundations for embankments the position and extent of all transitions from cuttings to embankments and foundations for shallow embankments.

Stockpile sites
Additional stockpile sites: Obtain approval to use any stockpile site not shown on the Drawings. State the maximum dimensions of the proposed stockpile. This is a HOLD POINT.

Clearing and grubbing: To 1111 Clearing and grubbing.

Temporary erosion and sedimentation control measures: To 1102 Control of erosion and sedimentation.

Restoration: To 0257 Landscape – roadways and street trees following completion of the work.

4.3 REMOVAL OF TOPSOIL

Program
Timing: Commence removal of topsoil 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 to 1102 Control of erosion and sedimentation (Construction) and 1111 Clearing and grubbing.

This is a WITNESS POINT.

Extent of work
General: Remove topsoil throughout the length of the Work and stockpile separately clear of the work. Take care to avoid contamination by other materials.

Cuttings: Remove topsoil to a depth quoted as detailed in the approved CC drawings or as directed.

Embankments: Remove topsoil over the base of embankments up to the depth below the natural surface quoted as detailed in the approved CC drawings, or as directed.

Shallow embankments: If the height of embankment from natural surface to underside of pavement is less than 2 m, remove topsoil which is deeper than the depth quoted as detailed in the approved CC drawings to its full depth as directed.

Survey
This condition is optional for Developer works. Required for Council projects.

Earthwork volumes: Provide earthwork volumes if payment is on a ‘Schedule of Rates’ basis unless alternative arrangements have been made. After removing the topsoil, determine the surface levels in
each cutting and embankment at sufficient locations to calculate the volume of excavation for general earthworks and the volume of compacted fill. This is a HOLD POINT.

**Stockpiles**
Height and batter: Conform to the following:
- Maximum height: 2.5 m.
Trim: To a simple shape.

**Erosion control**
Stabilisation: Track roll or stabilise by other approved means to minimise erosion.

Seeding: Where seeding of stockpiles is recommended, conform to 0257 Landscape – roadways and street trees.

### 4.4 CUTTINGS

**Cuttings in rock**
Dimensions: Provide detailed procedures to maintain accurate dimensions and uniform batters in rock.

**Acceptable material**
Cut: Construction of cuttings includes 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.

Preparation: Loosen and break down materials encountered in cuttings so that they are acceptable for incorporation in the Works.

Acceptable material: Refer to Unsuitable material and Embankment construction and Embankment material.

**Benching in cuttings**
Benches: Cut batters to be benched at locations and widths shown on the Drawings notwithstanding the tolerances permitted under Batter tolerances.

Bench maintenance: Remove loose stones and boulders regularly throughout the construction period. The cost of such maintenance shall be borne by the Contractor.

**Variable material**
Excavation methods: If material of variable quality or moisture content is encountered after topsoil has been removed, adjust excavation methods to ensure blending of the materials, to obtain material meeting the requirements of Embankment material.

**Floors of cuttings**
Excavation level: Excavate the floors of cuttings, parallel to the designed grade line, to a designed floor level at the underside of the selected material zone or where there is no selected material zone, to the underside of the pavement subbase.

Tolerance: Trim the floors to a level ± 50 mm to the designed floor level.

Unsuitable material: Remove as set out in Unsuitable material. This is a WITNESS POINT.

CBR testing: Prior to ripping the cutting floor, determine the CBR to AS 1289.6.1.1 of the material in the floor. Sufficient tests to be taken to represent all the various materials which may exist in the cutting floor. A direction will be given if material in the floors of cuttings has a CBR value less than the value quoted as detailed in the approved CC drawings.

**Ripping floors of cuttings**
Loosen: Rip material of the floor to a minimum depth of 200 mm 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 not to exceed 150 mm.

Inspection: Submit ripped or loosened material for inspection before re-compaction commences. This is a HOLD POINT.

**Compacting floors of cuttings**
Compaction: Re-compact ripped or loosened material to conform with Compaction and moisture requirements. No account to be taken of the volume involved in loosening when measuring the volume of excavations.

Trim: After re-compaction, re-trim the floors of cuttings parallel with the finished wearing surface.

Tolerances: As detailed in the approved CC drawings.
Inspection: Prior to placing subsequent layers over the completed cutting floor, present the completed surface for inspection. Verify as part of the quality system that the completed surface has achieved full conformance with all respects of this worksection. This is a HOLD POINT.

4.5 BATTERS

Batter slopes
Profile: Provide batter slopes as shown on the Drawings or directed on the basis of site inspection and investigation during the excavation.

Tops of cuttings: Neatly round tops of cutting to the dimensions shown on the Drawings.

Cutting batters: Batter for cuttings to be even and without undulations in the general plane of the batter except that batters may require progressive flattening at the ends of cuttings due to the presence of less stable material.

Unstable material: Clean cut faces of loose or unstable material progressively as the excavation proceeds.

Batter tolerances: The tolerances for the excavation of batters are given in Excavation tolerances for batters table.

Excavation tolerances for batters table

<table>
<thead>
<tr>
<th>Location</th>
<th>Tolerance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slope 1:1 or flatter</td>
</tr>
<tr>
<td>Toe of better and level of table drain</td>
<td>+ 0</td>
</tr>
<tr>
<td></td>
<td>- 150</td>
</tr>
<tr>
<td>2 m above table drain and higher</td>
<td>+ 300</td>
</tr>
<tr>
<td></td>
<td>- 300</td>
</tr>
<tr>
<td>Between level of table drain and 2 m above table drain</td>
<td>pro rata basis</td>
</tr>
</tbody>
</table>

Note: Tolerances are measured normal to the batter surface with (+) measured towards the roadway.

Variation for batter slopes (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

Instruction: A variation to the Contract will be issued where batter slope of any section of a cutting after it has been completed to conform with this Clause is changed. The Contractor will require to reset out, remove additional material and retrim the batter. This is a HOLD POINT.

Costs: The costs of changing the batter slopes will be paid as a variation to the Contract.

Excavation beyond batter line

THIS IS A WITNESS POINT.

Corrective measures: Submit details of the material and/or methods proposed to restore the specified slope and stability of the batter. This is a WITNESS POINT.

Minor over excavation: Minor change in the general slope of the batter to suit the site conditions may be approved, however, this does not constitute a variation for batter slopes.

Batters steeper than 1:1: A direction to restore batter slopes may be given if any section of the batter up to a height of 3 m above the table drain level has been over excavated beyond the tolerance limit specified. The batter will be required to be restored to the average batter slope using randomly mortared stone.

Restoration material:
- Stone: Similar to the sound rock in the cutting and the
- Mortar: Coloured to match the colour of the rock.

Cost of restoration: To be borne by the Contractor.

4.6 TRANSITION FROM CUT TO FILL

Intersection line
Survey: Mark the position of the intersection line between cutting and embankment occurring at the underside of the selected material zone or pavement subbase, after the removal of topsoil and before the excavation of any cutting commences.
Terrace
Construction: Following excavation to the cutting floor, excavate a terrace for the width of the selected material zone (or subbase layer, where no selected material zone) to a depth of 900 mm below and parallel to the cutting floor, as shown in Figure Transition from cut to fill, unless otherwise approved. This is a WITNESS POINT.
Extent of terrace: Extend the cut to the point where the cutting floor is 900 mm below the original stripped surface, or a distance of 20 metres, whichever is the lesser.
Excavated material: Incorporate the material excavated in the embankments or dispose of as directed.
Quantities: Material incorporated in embankments to be included in the excavated volume for Pay item 1112.2 and spoil to be included in the excavated volume of Pay item 1112.3.
Quality and compaction: The material placed above the terrace to satisfy the requirements of Embankment material and be compacted to conform with Compaction and moisture requirements.

Figure - Transition from cut to fill

4.7 UNSUITABLE MATERIAL

General
Location: Unsuitable material is that occurring below the designed floor level of cuttings and below the nominated depth for stripping topsoil beneath embankments.
Unsuitable: If unsuitable material is identified for embankment or pavement support in its present position, remove and replace. This is a WITNESS POINT.

Extent of excavation
Removal: Excavate unsuitable material as directed

Floor inspection
Extent: After removal of the unsuitable material, and prior to backfilling with the replacement material, present the floor of the excavation for inspection. This will determine whether a sufficient depth of unsuitable material has been removed. This is a HOLD POINT.
Compaction: To conform with Compaction and moisture requirements, prior to replacing material.

Replacement material
Quality: Replace unsuitable material with material from cuttings, or with material borrowed in to conform with Borrow, of the quality specified in Embankment material.
Status: Replacement material is deemed to form part of embankment construction.
Construction: Place to conform with Placing fill for embankment construction and to conform with Compaction and moisture requirements.
Resultant unsuitable material: Rework or replace any material deemed to have become unsuitable because of inappropriate construction activities. Costs to be borne by the Contractor.

4.8 EMBANKMENTS

Embarkment construction
Scope: Embankment construction includes:
- All operations associated with the preparation of the foundation areas on which fill material is to be placed, and the placing and compacting of approved material within areas from which unsuitable material has been removed.
- The placing and compacting of fill material and of materials of specified quality in nominated zones throughout the Works.
- All other activities required to produce embankments as specified to the alignment, grading and dimensions shown on the Drawings.
- Pre-treatment, such as breaking down or blending material or drying out material containing excess moisture.

**Embankment material**
Source and quality: Obtain the material for embankment construction from the cuttings within the Works to conform with Benching in cuttings, and supplement by borrow to conform with Borrow and from other sources as approved if necessary.
Quality: Free of tree stumps and roots, clay, topsoil, steel, organic material and other contaminants and suitable to be compacted to conform with Compaction and moisture requirements.
Availability: Program the work so that material of the quality specified in Placing fill for embankment construction and Selected material zone for the upper zones of the formation is available when required.

**Foundations**
Timing: Make the embankment foundation area available for inspection by the Superintendent following removal of topsoil This is a HOLD POINT.
Unsuitable material: If any underlying material is unsuitable remove and replace the material to conform with Unsuitable material.
Preparation: Grade and level the general area, adjust the moisture content where necessary and compact the top 200 mm as specified in Compaction and moisture requirements.

**Foundations for shallow embankments**
Type: Shallow embankments are those embankments of a depth less than 1.5 metres from the top of pavement to natural surface.

Preparation: Loosen the material exposed to a depth of 200 mm, adjust the moisture content of the loosened material and compact as specified in Compaction and moisture requirements, after removing topsoil and unsuitable material.
Foundation damage: Use suitable equipment and techniques to minimise surface heaving or other foundation damage.

**Bridging layer**
Status: If a bridging layer has been specified as a foundation treatment in the Contract documents, supply and place it as part of Pay item 1112.2. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal). Material: The bridging layer to consist of free-draining granular material with or without geotextile interlayer as specified on the Drawings.
Method: End-dump the granular material and spread in a single layer in sufficient depth to allow the passage of earthmoving equipment with minimal surface heaving. The compaction requirements of Compaction and moisture requirements not to apply to the bridging layer.
Status: If it is necessary to import suitable material from off site and if no suitable borrow source is available as provided in Natural surface and earthworks materials, the supply and placing of the bridging layer may be treated as a Variation to the Contract. This is a WITNESS POINT. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal). Seepage from foundations: A bridging layer may also be employed, subject to approval, 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 Compaction and moisture requirements. This is a HOLD POINT.
Unacceptable location: If its proximity to the pavement is likely to affect the pavement design.
Working platform: As an alternative to a bridging layer, approval of a working platform created by the chemical stabilisation of in situ material to conform with 1113 Stabilisation may be required.

**Hillside embankments**
Criteria: If embankments are constructed on or against any natural slopes or the batters of existing embankments, and if the existing slope or batter is steeper than 4H:1V in any direction.
Terrace: Extent and method as follows:
- Cut horizontal terraces over the whole area to be covered by new filling.
- Step the existing slope or batter in successive terraces, each at least 1 metre in width, and cut the terraces progressively as the embankment is placed.
- Coincide terraces with natural discontinuities wherever possible.
- Provide subsoil drainage if required.
- Compact excavated material as part of the new embankment material.

Excavated volume: No account to be taken of the material removed in terracing when determining the excavated volume for Pay item 1112.2. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

**Batter slopes**

Design criteria: The batter slopes shown on the Drawings represent the estimated requirements for the expected types of materials.

Redetermination: Batter slopes may be changed as directed following further assessment of the materials encountered on site.

Slope: When completed, the average planes of the batters of embankments are to conform to those shown on the Drawings or as directed.

Tolerance: Conform to the following:
- For a vertical distance to 1 m below the shoulder, no point on the completed batter to vary from the specified slope line by more than 150 mm when measured at right angles to the slope line.
- At distances greater than 1 m vertically below the shoulder, no point on the completed batter to vary from the specified slope line by more than 300 mm when measured at right angles to the slope.
- In no case is the edge of the formation at the underside of the pavement to be nearer to the roadway than shown on the Drawings and the batter slope at no point be steeper than the specified slope.

Slope undulations: Avoid and remove undulations in the general plane of the batter.

Slope redetermination: A direction to change the slope of any section of an embankment batter that has been completed to conform with this Clause, will constitute a Variation to the contract. The Contractor will require to reset out and remove or add fill material and re-trim the batter. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

**Batter slope for median areas**

Requirement: The batter slopes for median areas to conform to those shown on the Drawings and undulations in the general plane of the batter slope are not permitted.

Batter tolerances:
- For a horizontal distance of 2 m from the edge of the shoulder, no point on the completed batter to vary from the specified slope line by more than 50 mm when measured at right angles to the slope line within 24 hours after compaction.
- At distances greater than 2 m horizontally from the edge of the shoulder, no point on the completed batter to vary from the specified slope line by more than 100 mm when measured at right angles to the slope line within 24 hours after compaction.

Free draining: The medians to be graded so as not to pond water.

**Rock facing of embankments**

Type: Embankment batters, including embankments at bridge abutments, to be faced with clean, hard, durable rock.

Location: Where shown on the Drawings.

Rock placement: Exercise extreme caution whilst placing the rock facing as follows:
- Where embankment material is placed above other roads in use, place the outer rock layer in such a manner as to prevent movement down the batter or onto the roadway.
- Ensure that, under no circumstances, any rock can be dislodged and roll onto any adjacent roadway or track in use.
- Provide traffic control procedures to ensure safe passage of vehicles and pedestrians.
Mechanical interlock: Build up the rock facing in layers ahead of each layer of filling. Place rock by hand or plant in such a manner that its least dimension is vertical and that mechanical interlock between the larger stones occurs.

Excess fine material: Remove rock facing that has an excess of fine material surrounding it, together with the fine material, and replace rocks.

Rock supply: Adjust working methods and program the work so as to obtain hard and durable rock of the specified dimensions as it is required.

Graded filter: Fill the space between larger batter rocks with progressively smaller rocks to form a 'graded filter' which prevents the leaching out of fines from the fill material but which does not overfill the voids between larger rocks, or cause the larger rocks to lose contact with one another. Remove fine material from the outside of the rocks on the face of the batter.

Leaching: Use an appropriate geotextile for embankment construction to prevent the leaching out of fines from the fill material as shown on the drawings.

4.9 PLACING FILL

General
Uniformity of material: Select the methods of excavation, transport, depositing and spreading of the fill material so as to ensure that the placed material is uniformly mixed.

Embarkment stability: Construct the embankment and stabilise by compaction of the fine material embedding the rock pieces. Compact fine material to meet the requirements of Compaction and moisture requirements.

Sources of material and processing: Determine suitable sources of material and any processing to satisfy these quality requirements.

Layer thickness
Placement: Place layers parallel to the grade line and compact to conform with Compaction and moisture requirements.

Description: Uniform compacted layers of thickness not exceeding 200 mm

Large rock: Approval required to increase thickness where more than 25% by volume of the filling consists of rock with any dimension larger than 150 mm.

Direction: Approval required to increase in the compacted layer thickness to 300 mm, provided that the relative compaction specified in Compaction and moisture requirements is attained.

Rock pieces
Maximum size: Less than two-thirds of the approved compacted layer thickness measured in any direction. Reduce any larger rock pieces in size for incorporation in the embankment layers.

Grading of fill material: Break down rock material and evenly distribute it through the fill material, and place sufficient fine material around the larger material as it is deposited to achieve the specified compaction of each layer and produce a dense, compact embankment.

Insufficient fine material: If deemed insufficient fine material is present to fill the voids, obtain additional fine material from other places in the work or change the method of winning fill material. This is a WITNESS POINT.

Stony patches
Insufficient fine material: Rework stony patches having insufficient fine material to achieve compaction, with additional fine material blended in to achieve a dense, compact layer.

Equipment selection for placement: In placing embankment layers, use suitable equipment and techniques to avoid surface heaving or other damage to the foundations and underlying embankment layers.

CBR value
Value: Compacted embankment material in the selected material zone and below (or subbase layer, where no selected material zone) to have a CBR value not less than that quoted for the depth(s) specified as detailed in the approved CC drawings.

Test method: The CBR value of the material to be determined by Test Method AS 1289.6.1.1

Trimming tops of embankments
Embarkment: Trim the top of embankments 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.
Compaction: Compact the tops of embankments at these levels to meet the requirements of Compaction and moisture requirements.
Tolerances: Trim to maximum 10 mm above or 40 mm below the levels as calculated above.
Inspection: Present the completed surface for inspection before placing any subsequent pavement layers over the completed top of embankment filling. Verify as part of the quality system that the completed surface has achieved full conformance with all respects of this worksection. This is a HOLD POINT.

4.10 SELECTED MATERIAL ZONE
Site won selected material
Quality: Conform to the following:
- Free from stones larger than 100 mm maximum dimension and have no less than 50% passing the 19 mm sieve.
- Have a CBR value not less than that specified in the approved CC drawings for the fraction passing 19 mm AS sieve.
- Plasticity Index of 15 maximum.
Stabilisation: If chemical stabilisation is specified these requirements must apply to the selected material immediately prior to incorporating the stabilising agent.
Winning material: Obtain the selected material from cuttings excavated under the Contract or from borrow areas as specified in Borrow.
Working methods: Use working methods to yield material that conforms to the requirements of this Clause, and break down oversize rock if required.

Conservation of material
Stockpiles: If the material is not placed directly in the selected material zone, stockpile it at approved locations for future use until at least sufficient material is reserved to complete the selected material zone over the whole work.
Extra material: If suitable available material has not been conserved, provide material of equivalent quality.

Placing and compaction
Layers: Place and compact in layers with the compacted thickness of each layer not exceeding 150 mm, homogeneous and free from patches containing segregated stone or excess fines. Refer to Compaction and moisture requirements.
Non-complying material: Exclude all non-complying material from all areas.
Top of the selected material zone: Compact and trim 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 the approved CC drawings.

Inspection
Timing: Present the completed surface for inspection prior to placing any subsequent pavement layers over the completed select material zone surface.
Conformance: Verify as part of the quality system that the completed surface has achieved full conformance with all respects of this worksection. This is a HOLD POINT.

4.11 FILL ADJACENT TO STRUCTURES

General
Payment: Supply and placement of fill adjacent to structures is deemed to be part of Pay item 1112.2. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).
Structure types: Structures include bridges, precast and cast-in-place box culverts and retaining walls.
Cross references: Fill adjacent to other culverts and drainage structures to be provided to conform with 1351 Stormwater drainage (Construction), 1352 Pipe drainage, 1353 Precast box culverts and 1354 Drainage structures.
Time of placement: Do not place fill against structures, retaining walls, headwalls or wing walls within 21 days after placing of the concrete, unless approved by the Superintendent.
Approval required: To decrease the lag time the walls may be supported by struts, or the Contractor can demonstrate that 85% of the design strength of the concrete has been achieved. This includes concrete in bridge decks and fill placement that impacts the position, stability and serviceability of bridge deck member bearings. This is a WITNESS POINT.

Treatment at weepholes
Gravel: Provide drainage adjacent to weepholes by a layer of broken stone or river gravel consisting of clean, hard, durable particles graded from 50 mm to 10 mm as follows:
- The maximum particle dimension not to exceed 50 mm,
- No more than 5% by mass to pass the 9.5 mm AS sieve.
Extent: Continuous in the line of the weepholes, extend at least 300 mm horizontally into the fill and extend from 200 below to at least 450 mm vertically above the level of the weepholes, where practicable.

Geotextile membrane: Alternatively, provide a geotextile membrane of equivalent drainage characteristics at no extra cost. Store and install in accordance with Manufacturer's instructions. The use of geotextile is subject to approval. This is a HOLD POINT.

Selected backfill
Location: Place selected backfill adjacent to structures to conform with Selected backfill width and height table.
Material: Selected backfill to consist of a granular material having a maximum dimension not exceeding 50 mm and a Plasticity Index, determined by AS 1289.3.3.1, neither less than 2 nor more than 12.

Selected backfill width and height table

<table>
<thead>
<tr>
<th>Structure type</th>
<th>Selected backfill</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridge abutments</td>
<td>2 m</td>
<td>H</td>
</tr>
<tr>
<td>Cast-in-place box culverts</td>
<td>H/3</td>
<td>H + 300 mm</td>
</tr>
<tr>
<td>Corrugated steel pipes and arches</td>
<td>0.5 m</td>
<td>H + 500 mm</td>
</tr>
<tr>
<td>Retaining walls</td>
<td>H/3</td>
<td>H</td>
</tr>
<tr>
<td>Where H = height of structure)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Placement: Place the selected backfill in layers, with a maximum compacted thickness of 150 mm simultaneously on both sides of box culverts and other drainage structures to avoid differential loading. Start compaction at the wall and proceed away from it, meeting the requirements of Compaction and moisture requirements.

Horizontal terraces: Cut the existing embankment slope behind the structure in the form of successive horizontal terraces, each terrace being at least 1 m in width, and the selected backfill placed to conform with Placing fill for embankment construction.

Spill through abutments: Do not dump rocks against the columns or retaining walls, build up evenly by individual placement around or against such structures.

Framed structures: For embankments at both ends of the structure, bring up backfill at both ends simultaneously, keeping the difference between the levels of the embankments less than 500 mm.

4.12 SPOIL

General
Spoil: The surplus material from excavations under the Contract that is not required to complete the Works as specified or material from excavations under the Contract whose quality is deemed to be unacceptable for incorporation in the Works.

Incorporation in the works
Embankments: The Superintendent may direct flatter batter slopes or uniform widening on embankments that have not been commenced. The surface shaped to provide a tidy appearance and effective drainage.

Surplus material: Spread and compact the surplus material as specified in Placing fill for embankment construction and Compaction and moisture requirements for material in embankments.
Haulage disposal
Planning approval: As defined in DA approval, obtain planning approval and bear all costs in obtaining such approval by Council's Town Planning Manager, if handling of spoil is involved. This is a WITNESS POINT.

Method: Dispose of spoil in a manner and at approved locations. Compact spoil as specified in Compa ction and moisture requirements for material in embankments.

Payment (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).
Haulage: Disposal of spoil as follows:
- Up to five kilometres from the point of excavation to be included in Pay item 1112.2.
- If haulage exceeds five kilometres, payment to be made at the rate nominated in Annexure A for haulage of spoil.

4.13 BORROW

Requirement
Criteria: Unless provided by the Contract, borrow will only be authorised for:
- Constructing cuttings and embankments to the batter slopes as directed.
- Providing materials of the quality specified.
- When there is an overall deficiency in either the quantity or the quality of material required to complete the works.

Material quality: As approved and to conform with Embankment material, Rock facing of embankments, or Fill adjacent to structures.
Permits: Obtain approval from Council and acquire permits required for entry on land and pay any royalty for such borrow material. This is a WITNESS POINT.

Authorities: Comply with any requirements of the Great Lakes Council, land owners, and the State environmental planning legislation, livestock protection boards and soil conservation services, as appropriate.

Borrow sites
Location: Ensure the edges are no closer than 3 m from any fence line, boundary or edge of excavation or embankment and provide adequate clearance for the construction of catch drains.

Borrow site location: As approved by the Superintendent.

Drainage: Provide drainage outlets acceptable to the Superintendent.

Batter slopes:
- Not steeper than 4 H:1 V.
- To be left in a tidy and safe condition.

Site preparation and restoration: For borrow within the defined working area for the Works as specified, site preparation to be in accordance with 1111 Clearing and grubbing and Removal of topsoil.

Restoration: Restore borrow sites to 0257 Landscape – roadways and street trees.

Widening of cutting: If borrow material is obtained by uniformly widening a cutting, apply the requirements of Excavation, Batter tolerances and Treatment of floors of cuttings to the readetermination of batter slopes, the trimming of batters and the compaction of floors of cuttings respectively.

Payment
Borrow: Payment to be made to the Contractor as follows:
- Within the specified working area is deemed to be part of Pay item 1112.2.
- If the Superintendent accepts that borrow must to be obtained from locations outside the specified working area for the Works, such work to be treated as a Variation to the Contract.
Haulage: If haulage exceeds five kilometres, payment to be made at the rate nominated in the CC for haulage of borrow. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

4.14 COMPACTION AND MOISTURE REQUIREMENTS

Trimming and compaction
Sequence: Compact all layers uniformly to not less than the relative compaction specified before the next layer is commenced.

Trimming: Trim each layer of material prior to and during compaction to avoid bridging over low areas and to present a smooth surface at the top of each layer.

92% Compaction
Requirements: Compact the following areas to provide a relative compaction, not less than 92% determined by AS 1289.5.7.1 or AS 1289.5.4.1 for modified compactive effort to the following:
- Each layer of material replacing unsuitable material as detailed in Unsuitable material.
- 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.

Unsuitable material: Remove Unsuitable Material to nearest Council Landfill as per section 3.2 (pg 5).

97% Compaction
Requirements: Compact the following areas to provide a relative compaction of not less than 97% as determined by AS 1289.5.7.1 or AS 1289.5.4.1 for modified compactive effort to the following:
- Foundations for shallow embankments.
- The whole area on the floor of cuttings.
- Each upper zone layer of the embankment within 1.5 metres from the top of pavement.
- Each layer of the selected material zone as specified in Selected material zone.
- 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 Fill adjacent to structures and Selected backfill in each layer within 1.5 metres from the top of the pavement.

Shallow cutting
Definition: Cut the prepared subgrade to a depth below natural surface of less than 0.5 metres where the vertical alignment design is such that a substantial portion of the road is required to be built at or close to the natural surface.

Treatment: Treat the floor of shallow cutting as specified in Treatment of floors of cuttings and Transition from cut to fill and compact to provide a relative compaction of not less than 97% for a depth of 200 mm determined by AS 1289.5.7.1 or AS 1289.5.4.1, for modified compactive effort.

Cut-fill transition
Requirement: Approval is required when shallow cutting conditions occur, the specified transition from cut to fill may be modified such that the depth of terrace excavation at the transition from cut to fill is reduced from 900 mm to 250 mm.

Proof rolling
Requirement: Proof roll as directed in the approved CC drawings sections where ripping or loosening of the cutting floor is not required.

Locations: Proof rolling to conform with Deflection monitoring or proof rolling.

Moisture content
Compaction timing: Adjust the moisture content of the material at the time of compaction to permit the specified compaction to be attained at a moisture content which is within the range set out in the approved CC drawings of the optimum moisture content as determined by AS 1289.5.1.1 or AS 1289.5.7.1.
- Wet material: Do not compact material that has become wetted up after placement until it has dried out so that the moisture content is within this range.
- Aeration: The drying process may be assisted by aeration, or where approved, by the use of hydrated or quick lime at the Contractor’s cost.
- Drying: Alternatively the Contractor may transport the wet material to a stockpile site for drying out and later use as fill material at the Contractor’s cost.
- Dry material: If the material is too dry for compaction as specified, add water. Apply water uniformly and thoroughly mix with the material until a homogeneous mixture is obtained.

Compaction
Extent: Undertake compaction 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.

Rain damage: Complete compaction promptly to minimise the possibility of rain damage.

Repair: Loosen, recondition and recompact rain damaged surfaces before placing another layer of material.

Compaction and moisture tests
Test locations: Determine sampling locations for testing as described in 0161 Quality – Construction.
Preparation: Prepare the area at the determined locations for specified compaction and moisture tests.
Moisture content: Prior to testing, work the lot to ensure uniform moisture content and compaction of all material within the lot.
Test representation: The test/s then taken are to be considered to represent the total volume of material placed within the lot.

Further testing: If the material which is present has not achieved uniformity required by this Clause or Placing fill for embankment construction, further testing may be directed. The Superintendent to nominate the area to be represented by the additional testing.
Material not conforming: If such testing confirms that material not conforming to the worksection is present, perform remedial work as necessary to achieve conformance to the requirements of Compaction and moisture requirements.

Deflection monitoring or proof rolling
Presentation for testing: Present the work available in lots, for the Superintendent to carry out deflection monitoring or proof rolling. Further compact as directed due to results of proof rolling. This is a HOLD POINT.
Timing: Following completion of the formation to the underside of the selected material zone and completion of the selected material zone.
Size: A continuous length of formation of at least 300 m, or lesser length as approved, and a single carriageway width which is generally homogeneous with respect to material and appearance.
Boundaries: Identify the boundaries of each lot with stakes clearly labelled to the satisfaction of the Superintendent.

Costs: The cost of preparing the surface for deflection monitoring or proof rolling is included in the rate for Pay item 1112.2. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

4.15 FURNITURE AND SERVICES

Widening of formation
General: Widen road shoulders and formation to accommodate footpaths, guard fence, streetlight plinths, emergency telephone bays and vehicle standing areas as shown on the Drawings.

5 LIMITS AND TOLERANCES

Application
Summary: The limits and tolerances applicable to this worksection are summarised in Summary of limits and tolerances table.

Summary of limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Location or timing</th>
<th>Limits/Tolerances</th>
<th>Worksection clause/subclause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batter slopes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Location or timing</td>
<td>Limits/Tolerances</td>
<td>Worksection clause/subclause</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Excavation</td>
<td>At toe of batter and level of table drain</td>
<td>Batter ≤ 1:1, + 0, - 150 mm Batter &gt; 1:1, + 0, - 200 mm</td>
<td>Batters/Excavation tolerances for batters</td>
</tr>
<tr>
<td></td>
<td>2 m above table drain and higher</td>
<td>Batter ≤ 1:1, ± 300 mm Batter &gt; 1:1, ± 300, - 600 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Between level of table drain and 2 m above table drain</td>
<td>Pro-rata basis</td>
<td></td>
</tr>
<tr>
<td>Embankment</td>
<td>1 m below shoulder</td>
<td>± 150 mm</td>
<td>Embankments/Batter slopes</td>
</tr>
<tr>
<td></td>
<td>More than 1 m below shoulder</td>
<td>± 300 mm</td>
<td>Embankments/Batter slopes</td>
</tr>
<tr>
<td>Median Areas</td>
<td>2 m from edge of shoulder</td>
<td>± 50 mm</td>
<td>Embankments/Batter slopes for median areas</td>
</tr>
<tr>
<td></td>
<td>More than 2 m from edge of shoulder</td>
<td>± 100 mm</td>
<td></td>
</tr>
</tbody>
</table>

### Embankments

<table>
<thead>
<tr>
<th>Trimming tops of embankments</th>
<th>At completion of embankment construction</th>
<th>Parallel to the designed grade line, + 10 mm or - 40 mm of the levels specified</th>
<th>Placing fill/Trimming tops of embankments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected material</td>
<td>Rock Quality</td>
<td>Minimum CBR value as per the approved CC drawings</td>
<td>Selected material zone/Site won selected material</td>
</tr>
<tr>
<td>Selected backfill</td>
<td>Adjacent to structures</td>
<td>Plasticity Index 2 to 12</td>
<td>Fill adjacent to structures/Selected backfill</td>
</tr>
</tbody>
</table>

Plus (+) is towards the roadway/surface and minus (−) is away from the roadway/surface. Tolerances are measured at right angles to the slope line.

### 6 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

#### 6.1 MEASUREMENT

**General**

Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, the drawings and Pay items 1112.1 to 1112.6 inclusive.

Lump Sum prices: Not acceptable.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

**Methodology**

The following methodology will be applied for measurement and payment:

- Control measures for erosion and sedimentation are measured and paid in accordance with 1102 Control of erosion and sedimentation.
- Clearing and grubbing of stockpile sites and borrow areas is measured and paid in accordance with 1111 Clearing and grubbing.
- Seeding and restoration of stockpile sites and borrow areas is measured and paid in accordance with 0257 Landscape – roadways and street trees.
- Traffic control for blasting operations is measured and paid in accordance with 1101 Control of traffic.
- Fill adjacent to culverts, other than box culverts, and drainage structures is measured and paid in accordance with 1351 Stormwater drainage (Construction), 1352 Pipe drainage.
- Selected backfilling to box culverts is measured and paid in accordance with 1353 Precast box culverts.
- Working platforms created by chemical stabilisation are measured and paid in accordance with 1113 Stabilisation.

### 6.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1112.1 Removal and stockpiling of topsoil</td>
<td>m² excavated</td>
<td>- All costs associated with all activities associated with stripping topsoil, carting and placing into stockpile, then stabilising and trimming the stockpiles.</td>
</tr>
<tr>
<td></td>
<td>The volume to be the sum of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 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;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 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 A, plus;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The additional volume of topsoil removed from shallow embankments below the depth nominated in Annexure A and calculated on the basis of plan area multiplied by the directed depth of excavation, or as directed.</td>
<td></td>
</tr>
<tr>
<td>1112.2 General earthworks</td>
<td>m³ measured as volume.</td>
<td>The schedule rate for this Pay Item to 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.</td>
</tr>
<tr>
<td></td>
<td>The volume of earthworks in cuttings to 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 is deducted the volume of topsoil as calculated under Pay Item 1112.1. No account to be taken of the allowable batter tolerances or stepping of batters for topsoiling.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>All costs associated with all documentation, approvals, survey and 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:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- removal of unsuitable material to spoil to be paid under Pay item 1112.3;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- extra costs in processing selected material to be paid under Pay item 1112.4;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- overhaul of spoil or borrow to be paid under Pay items 1112.5 and 1112.6 respectively.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The base of the excavation to be the designed floor level in accordance with Treatment of floors of cuttings and no account to be taken of level tolerances.</td>
</tr>
<tr>
<td>Pay items</td>
<td>Unit of measurement</td>
<td>Schedule rate scope</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1112.3 Unsuitable material to spoil</td>
<td>m² measured as volume of excavation</td>
<td>This Pay item refers only to unsuitable material as defined in Unsuitable material which is removed to spoil stockpile.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the material is such that the volume of excavation cannot be measured, the Superintendent will determine the conversion factors to be applied to the loose volumes measured in haulage units or to the measured stockpile volumes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All costs associated with all operations involved in the excavation, haulage, drying out, compaction or other activity required under Unsuitable material for its disposal as spoil in accordance with Spoil.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When this Pay item provides for ranges of provisional quantities, the rates are to be applied successively, but not cumulatively, as the volume of unsuitable material increases from one provisional quantity range to the next higher range.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Each rate to 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.</td>
</tr>
<tr>
<td>1112.4 Selected material</td>
<td>m² measured as embankment volume in place in the selected material zone. The volume to be determined by multiplying the theoretical plan area of the top of the selected material zone with its nominated thickness.</td>
<td>All costs associated with 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 1112.2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The width and depth to be taken as shown on the Drawings or as directed by the Superintendent. No account is to be taken of level tolerances.</td>
</tr>
<tr>
<td>1112.5 Haulage of spoil</td>
<td>Per bank m² for each kilometre or part thereof in excess of five kilometres.</td>
<td>Where an approved location for spoil disposal is more than five kilometres by road from the point of excavation of material being spoiled, payment to be made for haulage at the rate nominated.</td>
</tr>
<tr>
<td>Pay items</td>
<td>Unit of measurement</td>
<td>Schedule rate scope</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1112.6 Haulage of borrow</td>
<td>Per bank m³ for each kilometre or part thereof in excess of five kilometres.</td>
<td>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 to be made for haulage at the rate nominated in Annexure A and include all costs associated with this activity.</td>
</tr>
</tbody>
</table>

## 7 ANNEXURE B - BLASTING

### HOLD POINTS table

<table>
<thead>
<tr>
<th>Item/Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-blast survey</td>
<td>Determine and record the existing condition of all structures</td>
<td>7 days before the start of blasting operations</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Survey report</td>
<td>Advise Superintendent of blasting charge details and adequacy of survey</td>
<td>3 days before the start of blasting</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Proposed blasting procedure</td>
<td>Written details of the proposed blasting procedure including proposed measures to limit noise and damage</td>
<td>Before the start of blasting operations - progressive</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Control of air blast over-pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive air blast over-pressure</td>
<td>Suspend further blasting work and submit proposals of additional steps and precautions to avoid recurrence</td>
<td>24 hours prior to next activity</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

### WITNESS POINTS table – On site activities

<table>
<thead>
<tr>
<th>Item/Clause title</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licences</td>
<td>Obtain all necessary licences and comply with all Government and Council regulations.</td>
<td>7 days before initiating blasting</td>
</tr>
<tr>
<td>Blasting records</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recording procedure</td>
<td>Prepare records as holes are loaded and signed by the Powderman</td>
<td>On the day of the blast</td>
</tr>
<tr>
<td>Advice to residents</td>
<td>Report any special condition affecting any resident</td>
<td>Progressive – 24 hours prior to blasting</td>
</tr>
<tr>
<td>Control of ground vibration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring vibrations</td>
<td>Design may be adjusted provided</td>
<td>24 hours before next activity</td>
</tr>
<tr>
<td>Item/Clause title</td>
<td>Requirement</td>
<td>Notice for inspection</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td></td>
<td>that further ground vibration monitoring is done and it is demonstrated that peak particle velocity limits are not exceeded</td>
<td></td>
</tr>
</tbody>
</table>

7.1 GENERAL

Licences
Requirement: When explosives are permitted to be used by the Superintendent, and the Contractor wishes to undertake blasting, obtain all necessary licences from the appropriate authorities, and 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 AS 2187.1 and AS 2187.2.
Conform to the following:
- The transport of explosives to be in accordance with the Australian Code for the Transport of Explosives by Road and Rail. This is a WITNESS POINT.
- Comply with the requirements of the Environment Protection Authority (EPA).
- The Contractor to be liable for any accident, damage or injury to any person, property or thing, resulting from the use of explosives.

Pre-blast survey
Requirement: Before the start of blasting operations, conduct a survey in the presence of the Superintendent to determine and record the existing condition of all structures likely to be affected by any blast. This is a HOLD POINT.
Extent of survey: The survey to include all structures (including utility services) within 500 m of any blast and 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.
Survey report
Content: Submit a written report of the survey, supported by photographs where necessary, together with a list of any existing defects in the structures, to the owner of each structure and to the Superintendent before blasting commences.
Maximum instantaneous charge: Submit for approval the 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. This is a HOLD POINT.
Blast monitoring: Amend survey where required due to the outcome of blast monitoring.
Costs: To be borne by the Contractor.

Proposed blasting procedure
Written submission: Before each blasting operation, submit written details of the proposed blasting procedure including:
- The quantity and type of explosive to be detonated
- The blasting pattern to be used
- Measures proposed to limit noise
- To ensure that vibration from blasting does not adversely affect nearby structures.
This action is a HOLD POINT.
Release of the HOLD POINT does not in any way reduce the Contractor’s responsibility set out in Contractor to obtain licences.
Limits on vibration: To BS 6472-1.
Ground vibration: Ground vibration caused by blasting not to exceed the values of peak particle velocity listed in the Limiting peak particle velocity table.

<table>
<thead>
<tr>
<th>Point of Potential Damage (within 1 km of blasting site)</th>
<th>Peak Particle Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed and cured bridge structures or sub-structures (e.g. completed abutment)</td>
<td>25 mm/sec</td>
</tr>
</tbody>
</table>
### Point of Potential Damage (within 1 km of blasting site) | Peak Particle Velocity
--- | ---
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

### Advice to residents
Procedure: Advise all residents within a radius of 1 km; by letter drop before blasting operations commence. Details to include the likely times, frequency and duration of blasting and precautions being taken to ensure that damage to property will not result. Ensure residents acknowledge receipt of this advice. Report any special condition or approval requirement affecting any resident to the Superintendent. This is a WITNESS POINT.

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

Safety precautions: When blasting operations are being carried out, take precautions to ensure the safety of persons and animals and the road to be closed to traffic and the appropriate signs erected in accordance with 1101 Control of Traffic.

Warning procedure: Establish and observe a standard warning procedure at all times to AS 2187.2.

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

#### 7.2 BLASTING RECORDS

Records to be kept
Requirement: Maintain accurate records of each blast showing the details listed below:
- 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.
- 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.

Recording procedure
Methodology: Prepare the records as holes are loaded and signed by the Powderman. Provide a copy to the Superintendent on the day of the blast. This is a WITNESS POINT.

#### 7.3 CONTROL OF AIR BLAST OVER-PRESSURE

Proximity to noise sensitive locations
Application: This Clause only applies where a noise sensitive location exists within 1 km of the blasting site.

Noise control manual: The Contractor’s attention is drawn to the recommendations given in the EPA Environmental criteria for road traffic noise for the reduction of air blast over-pressure.

Noise limitations: Limit the noise emanating from blasting operations to an over-pressure level of 115 decibels (linear peak) at any noise sensitive location (such as residential premises, schools or hospitals). Up to 10% of the total number of blasts may exceed this value provided a level of 120 decibels is not exceeded at any time.
Monitoring of air blast over-pressure
Procedure: Conform to the following:
- Arrange for the monitoring of air blast over-pressure to ensure compliance with the specified limits.
- All monitoring to be carried out by personnel possessing current NATA registration.
- Report all test results on NATA endorsed test certificates which include a clear statement as to compliance or non-compliance with the requirements of this worksection.
- In general, establish a monitoring location near the perimeter of the noise sensitive location at the point closest to the maximum charge.
- Submit a copy of the monitoring record to the Superintendent.

Excessive air blast over-pressure
Procedure: In the event that the measured air blast over-pressure exceeds the specified limits, suspend further blasting work and submit proposals detailing any additional steps and precautions that will be taken to ensure that for any future blast, the limiting over-pressure will not be exceeded. This is a HOLD POINT.

7.4 CONTROL OF GROUND VIBRATION

Monitoring vibrations
Requirement: Arrange for the monitoring of ground vibrations to ensure compliance with the peak particle velocity limits shown in the Limiting peak particle velocity table. All monitoring to be carried out by personnel possessing current NATA registration for such monitoring.

Total results: Report all test results on NATA endorsed test certificates to include a clear statement as to compliance or non-compliance with the requirements of this Part of the worksection.

Monitoring locations: In general, establish a monitoring location near the perimeter of the structure or building at the point closest to the maximum charge.

Record: Submit a copy of the monitoring record to the Superintendent.

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

Maximum Instantaneous Charge: For the first blast, set up monitors at not less than five points at varying distances away from the blasting site. The Maximum Instantaneous Charge for the first blast is not to exceed that calculated and certified by an approved explosives specialist. Submit a calculated relationship for Maximum Instantaneous Charge to AS 2187.2, and for future blasting, ground vibration as vector peak particle velocity.

Adjustment of blast design: 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. This is a WITNESS POINT.

Line plots: The Contractor to make the regression line plots available to the Superintendent, if so requested.
1113 STABILISATION

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide stabilisation of subgrade and pavement courses using the specified materials and processes as documented.

Performance
Requirements: Provide the work in accordance with the specification, standards, quality requirements and approved work plan.

Design
Authority requirements: Conform to statutory requirements for Work Health and Safety.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 1101 Control of traffic.
- 1112 Earthworks (Roadways).
- 1141 Flexible pavement base and subbase.
- 1351 Stormwater drainage (Construction).

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:
Note: Only the most current standards are to be used.

AS 1141 Methods for sampling and testing aggregates
AS 1141.11.1 Particle size distribution – sieving method
AS 1289 Methods of testing soils for engineering purposes
AS 1289.4.2.1 Soil chemical tests - Determination of the sulfate content of a natural soil and the sulfate content of the groundwater - Normal method
AS 1289.5.7.1 Soil compaction and density tests - Compaction control test - HiIff density ratio and HiIff moisture variation (rapid method)
AS 1289.5.8.1 Soil compaction and density tests - Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge - Direct transmission mode
AS 1289.6.1.1 Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil - Standard laboratory method for a remoulded specimen
AS 2350 Various Methods of testing Portland and blended cements
AS/NZS 2350.4 Setting time of Portland and blended cements
AS 2350.9 Determination of residue on the 45 μm sieve
AS 3582 Supplementary cementitious materials for use with portland and blended cement
AS 3582.1 Fly ash
AS 3582.2 Slag - Ground granulated iron blast-furnace
AS 3583 Methods of test for supplementary cementitious materials for use with portland cement
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

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AS 3972  General purpose and blended cements
Other publications
Note: Only the most current standards are to be used
AUSTROADS
AGPT04D  Guide to pavement technology Part 4D - Stabilised materials.
AP-C87  Austroads Glossary of terms
NSW RMS Test Methods  Rate of slaking of quicklime

1.4 STANDARDS

General
Standard: To AGPT04D.

1.5 INTERPRETATION

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

Definitions
General: For the purposes of this worksection the following definitions apply:
- Field Working Period: Time period from addition of mixing water until completion of compaction.
- Joints: Interfaces between work episodes delayed by more than the Field Working Period.
- Stabilising agent: Quicklime, hydrated lime, slag/lime blend, cement.

1.6 SUBMISSIONS

Approvals
Submissions: To the Superintendent’s approval.
- Proposed Workplan.
- Stabilisation mix.

Materials: Cement, Quicklime, Hydrated lime, Ground granulated blast furnace slag, Flyash, Blended stabilising agents, Water.

Calculations
General:
- Application rate.
- Unconfined compressive strength.

Execution
- Trial stabilisation.

Documents
Submit the following for approval:
Field working period:

1.7 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials proposed for use in the work</td>
<td>Submit NATA certificate of compliance</td>
<td>14 days prior to commencement of works</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Field Working period</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Clause/subclause
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>- Laboratory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominate the specific field working period in annexure A</td>
<td>14 days prior to commencement of works</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Storage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re-test cement stored in excess of 3 months</td>
<td>2 working days prior to usage</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilisation processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Proposed equipment and procedures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submit a Work Plan nominating proposed plant and work sequence</td>
<td>14 days prior to commencement</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Application of stabilising agent</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- In situ application</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposals for special processes of supply of stabilising agent into the mixing bowl</td>
<td>7 days prior to mixing</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>Trimming and compaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Trimming</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work methods to exclude laminations and slurring</td>
<td>3 working days prior to production stabilisation</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>- Survey control methods</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of trimmed material as fill or spoil</td>
<td>3 working days prior to disposition</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>Curing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Method statement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submit details of proposed curing method</td>
<td>As directed</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

### WITNESS POINTS table – Off-site activities

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td>Quicklime</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td>Hydrated lime</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td>Ground granulated blast furnace slag</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td>Flyash</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td>Blended stabilising agent</td>
<td>Proof of quality and source</td>
<td>Progressive</td>
</tr>
<tr>
<td><strong>- Standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Handling and storage</strong></td>
<td>Comply with supplier's handling and storage requirements and arrange sampling of agent</td>
<td>Progressive</td>
</tr>
</tbody>
</table>

### Summary of WITNESS POINTS – On-site activities

<table>
<thead>
<tr>
<th>Clause/subclause</th>
<th>Requirement</th>
<th>Notice for Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Compaction</strong></td>
<td>Adjustment of Field Working Period for site conditions</td>
<td>Progressive</td>
</tr>
<tr>
<td><strong>Application of stabilising agent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>- Stationary mixing plant</strong></td>
<td>Monitoring application of</td>
<td>Progressive</td>
</tr>
<tr>
<td>Clause/subclause</td>
<td>Requirement</td>
<td>Notice for inspection</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td></td>
<td>stabilising agent at the plant</td>
<td></td>
</tr>
<tr>
<td>- Stationary mixing plant</td>
<td>Removal of spilled stabilising agent</td>
<td>Immediately upon spillage event</td>
</tr>
<tr>
<td>- Spreading out</td>
<td>Actual spread to be recorded and checked</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Spreading out</td>
<td>Record average spreading rate using load cells</td>
<td>Progressive</td>
</tr>
</tbody>
</table>

**Mixing**

- Stationary mixing plant | Test unconfined compressive strength | Progressive |
- In situ mixing process  | Visual inspection to ensure uniform mixing and record | Progressive |
- In situ mixing process  | Additional passes of mixing equipment to improve uniformity | Progressive |

**Trimming and compaction**

- Survey control methods  | Survey to confirm pavement layer thickness remains within tolerances after trimming | Progressive |
- Straight edge test      | Conform to surface tolerances prior to sealing or practical completion of work component | As directed by Superintendent |

**Dimensions**

- Width                   | Random measurement of stabilised layer width         | As directed by Superintendent |

2 PRE-CONSTRUCTION PLANNING

2.1 SPECIFIED MATERIALS

Materials proposed for use in the work
Certificates of compliance: Provide a certificate from a NATA registered laboratory showing the following:
- The stabilised material meets the requirements of 1141 Flexible pavement base and subbase if incorporated into the works as a pavement layer or
- 1112 Earthworks (Roadways) or
- 1351 Stormwater drainage (Construction).
This is a HOLD POINT.

Inspection, sampling and testing
Quality checks: Regular inspection, sampling and testing of pavement and subgrade materials to be undertaken by the Contractor while stabilisation is in progress in accordance with this worksection.

2.2 WORKS GENERALLY

Provision for traffic
Protection: Provide for traffic in accordance with 1101 Control of traffic while undertaking the work and 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.

Delays: 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 to be temporarily diverted while the work is in progress.
Proposals for construction
Program: Plan program of works to address time and access constraints. Develop equipment selection and material sources to suit the sequence of operations. Address the interaction with the Superintendent on approvals and inspections. Generate the Work Plan for Submission.

2.3 FIELD WORKING PERIOD

Laboratory tests
Submit: Provide the nominated Field Working Period in Annexure A for the stabilising agent approved for the works. This is a HOLD POINT.

Method: The nominated Field Working Period to 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% points.

Samples: This testing to be undertaken utilising AS 1289.5.7.1 and samples of the materials representative of those to be utilised in the works.

Type: The field working period may vary significantly with variations in the type of stabilising agent.

3 MATERIALS

3.1 GENERAL

Stabilisation types: The requirements for stabilisation of the types of pavement courses and subgrade zones or layers are shown in **Types of pavement courses, subgrade zones or layers and stabilising binder Table**. The pavement course or subgrade zone or layer for stabilisation is as specified in 1141 Flexible pavement base and subbase.

**Types of pavement courses, subgrade zones or layers and stabilising binder table**

<table>
<thead>
<tr>
<th>Pavement course or subgrade zone or layer</th>
<th>Stabilising binder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base and subbase</td>
<td>Cement</td>
</tr>
<tr>
<td></td>
<td>Blended Stabilising Agent</td>
</tr>
<tr>
<td></td>
<td>Hydrated Lime (pugmill)</td>
</tr>
<tr>
<td></td>
<td>Quicklime (in situ)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subgrade zone or layer</th>
<th>Stabilising binder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected Material Zone</td>
<td>Cement</td>
</tr>
<tr>
<td></td>
<td>Blended Stabilising Agent</td>
</tr>
<tr>
<td></td>
<td>Quicklime (in situ)</td>
</tr>
<tr>
<td></td>
<td>Hydrated Lime (pugmill)</td>
</tr>
</tbody>
</table>

| Other Subgrade Layers                   | Cement            |
|                                          | Blended Stabilising Agent |
|                                          | Quicklime (in situ) |
|                                          | Hydrated Lime (pugmill) |

| Selected Backfill Zone                  | Cement            |
|                                          | Hydrated Lime (pugmill) |

3.2 CEMENT

**Standard**

General: To AS 3972.

Testing: To AS 2350 (Various).

Proof of quality: Provide documentary evidence of the quality and source of the cement upon request at any stage of the work. This is a WITNESS POINT.

**Storage**

Storage period: Prior to use re-test and submit test results for cement that has been stored for a period in excess of three months from the time of manufacture to ensure the cement still complies with AS 3972. This is a HOLD POINT.

Transport: Transport cement in water tight packaging and protect from moisture until used. Do not use caked or lumpy cement.
3.3 QUICKLIME

Standard
Type:
- Available lime: To AS 3583.12.
- Temperature rise: To test method RMS T432.
- Particle size: To AS 1141.11.1.

Quality: Provide NATA laboratory test results to confirm that the quicklime supplied conforms with that specified. This is a WITNESS POINT.

Properties
Calcium oxide: Quicklime to consist of essentially calcium oxide in a highly reactive form. At the point of spread the content of calcium oxide > 85%.
Slaking rate: The active slaking time ≤ twenty minutes. The temperature rise on slaking > 40°C in 6 minutes (determined from the average of four samples tested in accordance with Test Method RMS T432).

Particle size: The particle size distribution of the quick lime to comply with the following requirements in Table 3.1.

<table>
<thead>
<tr>
<th>Table 3.1 Particle size distribution of quicklime</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS Sieve</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>13.2 mm</td>
</tr>
<tr>
<td>9.5 mm</td>
</tr>
<tr>
<td>4.75 mm</td>
</tr>
<tr>
<td>2.36 mm</td>
</tr>
</tbody>
</table>

3.4 HYDRATED LIME

Standard
Type:
- Available lime: To AS 3583.12.
- Fineness: To AS 2350.9.
- Particle size: To AS 3583.14.

Quality: Provide NATA laboratory test results to confirm that the hydrated lime supplied conforms with that specified. Details to include percentage of calcium hydroxide, fineness expressed by percentage by mass passing the 45 μm sieve and source. This is a WITNESS POINT.

Properties
Calcium hydroxide: Hydrated lime to consist essentially of calcium hydroxide > 80%. Both when used as the sole stabilising agent or blended with other additives.

Form: The material to be in powder form and must be dry.

Residue on sieving (Particle Size): The residue on a 300 μm sieve < 2%.

3.5 GROUND GRANULATED BLAST FURNACE SLAG

Standard
Type: To AS 3582.2.
- Fineness: To AS 2350.9.
- Relative strength: To AS 3583.6.

Quality: Provide NATA laboratory test results to confirm that the slag supplied conforms with that specified. Details to include fineness expressed by percentage by mass passing the 45 μm sieve, relative strength (28 days) and source. This is a WITNESS POINT.

Slag: Ground granulated blast furnace slag is known as 'slag'.

3.6 FLYASH

Standard
Type: To AS 3582.1.
- Fineness: To AS 2350.9.
- Loss on ignition: To AS 3583.3.
Quality: Provide NATA laboratory test results to confirm that the flyash supplied conforms with that specified. Details to include fineness expressed by percentage by mass passing the 45 μm sieve, loss on ignition and source. This is a WITNESS POINT.

3.7 BLENDED STABILISING AGENTS

Standard
Type:
- Fineness: To AS 2350.9.
- Setting time: To AS/NZS 2350.4.
Quality: Provide NATA laboratory test results to confirm that the blended agent supplied is in accordance with that specified. Details to include fineness expressed by percentage by mass passing the 45 μm sieve, setting time and source of each component. This is a WITNESS POINT.

Batch information
Requirements: A blended stabilising agent may be used.
Blending mass: The mass of components of the nominated blended stabilising agent are not to vary by more than ± 3% from the blend percentages nominated in the mix design described in as detailed in the approved CC drawings.

Handling and storage
Requirements: Comply with the supplier's handling and storage requirements. Also arrange for sampling of the agent as required. This is a WITNESS POINT.

3.8 WATER

Standard
Chloride ion: To AS 3583.13.
Sulphate ion: To AS 1289.4.2.1.

Quality
Water to be free from harmful amounts of materials such as oils, salts, acids, alkalis and vegetable substances. Water accepted as potable and fit for human consumption will not require testing to confirm suitability.
Tolerances: Water not to contain more than:
- 800 parts per million of chloride ion.
- 400 parts per million of sulphate ion.
- 1% by mass of undissolved solids.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

General
Requirement: Conform to 1101 Control of traffic.

4.2 STABILISATION PROCESSES

Proposed equipment and procedures
Work plan: Submit details of the proposed equipment (including the mixing plant) and stabilisation procedures to be used in the work. This submission will be known as the Work Plan and is to include the following:
- The sequence of operations.
- Widths of stabilisation passes.
- Provision for traffic if appropriate.
- Comply with Statutory requirements for WHS.
- Testing methods and frequency.
- Comply with this worksection.
- Survey control methods.
- Curing methods.

This is a **HOLD POINT**.

## 4.3 QUALITY REQUIREMENTS

### Compaction

Compaction within Field Working Period: 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. This is a **WITNESS POINT**.

**Weather conditions**

Moisture Content: Do not proceed with the stabilisation of pavement materials 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.

Wind: Do not proceed with spreading during windy conditions which may cause loss of stabilising agent or cause nuisance or danger to people or property.

### 4.4 APPLICATION OF STABILISING AGENT

**Stationary mixing plant**

Application rate: Monitor the application rate of stabilising agent at the pug mill or equivalent approved plant. Record for every 100 tonnes of production in kg/tonne. This is a **WITNESS POINT**.

Accuracy: The achieved accuracy of application rate ± 10% of the rate nominated in as detailed in the approved CC drawings.

Spillage: Remove any spillage of the stabilising agent on site or at any loading location related to the site as soon as possible and within the same work shift of such spillage. This is a **WITNESS POINT**.

Excessive application: Prevent excessive application so as not to exceed the nominated rate by more than 10%.

**In situ application**

Application process: The incorporation of stabilising agent is to follow a process where it is spread on the pavement in advance of the specialist mixing equipment.

Special processes: Any processes nominated by the contractor involving supply of stabilising agent within the mixing bowl of equipment must be approved. A demonstration of the process at the Contractor’s expense may be requested. This is a **HOLD POINT**.

**Spreading out**

Mechanical spreader: Carry out spreading using the approved mechanical spreader nominated in the Work Plan.

Spread rate: Nominated in as detailed in the approved CC drawings.

Tolerances: The actual spread rate to be within ±10% of the nominated rate. Verify this by testing the spread rate for each lot or 500 m² of pavement treated (whichever is less) in each application of binder. This is a **WITNESS POINT**.

Testing: Spread rate testing to be performed by weighing the contents of a suitable 4 sided tray placed on the pavement and between the wheels of the mechanical spreader. Calculate the rate of stabilising agent spread by dividing the mass collected (kg) by the area of the tray (m²).

Average spread rate: Where spreading vehicles are fitted with load cells, ascertain the average spreading rate of the stabilising agent by dividing the mass of the stabilising agent spread per run by the area of the run.

Record: Submit data for each run, however such action will not cancel the Contractor’s obligation to undertake the prescribed testing of spread rate. This is a **WITNESS POINT**.

Construction traffic: Traffic or equipment not involved in spreading or mixing of the stabilising agent not to pass over the spread material until it has been mixed into the layer to be stabilised.

### 4.5 MIXING

**Stationary mixing plant**

Type: Purpose build the stationary mixing plant for the process of mixing road making materials.

Maintain equipment: Maintain and calibrate all equipment so as to provide a uniformly mixed product without segregation of the aggregate material.
Water addition: Control and meter the inclusion of water into the mix.
Stationary mixing equipment: Incorporate a delivery system for mix materials capable of producing a uniform mixture to design requirements.
Strength test: Confirm performance by monitoring the unconfined compressive strength of production, to conform with AS 1289.6.1.1. Test a pair of specimens for each 100 tonnes of production. This is a WITNESS POINT.

In situ mixing process
Equipment: Mixing equipment and procedure to comply with the following:
- Purpose built for the process of in situ mixing of road making materials.
- Capable of mixing to the depth specified for the layer to be stabilised.
- Distribute 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, replace to maintain mixing efficiency consistent with that demonstrated during the trial section.
- Mixing equipment 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.
Approval: Demonstrate the mixing efficiency. This is a HOLD POINT.
Uniform mixture: The resultant mix must 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.
Work plan: The procedure nominated in the Work Plan is to minimise disturbance of the distribution of stabilising agent spread in advance of the mixing process.
Inspections: Carry out visual inspections during mixing to ensure uniform mixing is being achieved in the layer. Record inspection results to conform with 0161 Quality (Construction) or 0167 Integrated management, as applicable. This is a WITNESS POINT.
Additional mixing: The Superintendent may direct that additional passes by the mixing equipment be carried out to improve the visual uniformity of the mix and/or the moisture content. This is a WITNESS POINT. Such additional works shall be at no cost to the Principal.

4.6 TRIMMING AND COMPACTION

Tolerances
Level tolerance: After mixing, trim and compact the layer to conform with 1141 Flexible pavement base and subbase 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 Limits and Tolerances.

Trimming
Secondary trimming: 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 to 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. This is a HOLD POINT.

Survey control methods
General: Provide adequate survey control methods as stated in the Work Plan to ensure that the pavement layer thickness is not reduced during secondary trimming to an extent that it fails to comply with the requirement for layer thickness in accordance with the tolerance specified.
Layer thickness after trimming: When required by the Superintendent provide survey results to confirm that the pavement layer thickness remains within tolerance after secondary trimming. This survey will be at no cost to the Principal. This is a WITNESS POINT.

Trimmed material: All trimmed material having been cut to waste is to be used as fill or spoil as directed. Any trimmed material that cannot be reused on the project is to be taken to the Great Lakes Waste Centre. This is a HOLD POINT.

Straight edge test
General: Conform to the following:
- Measurements with a 3 metre straight edge to 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 not to exceed 12 mm.
- This testing will be undertaken immediately prior to sealing or prior to agreed practical completion of any work component. This is a WITNESS POINT.

Compaction
General: Compact the stabilised layer 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 1141 Flexible pavement base and subbase, 1112 Earthworks (Roadways) or 1351 Stormwater drainage (Construction), as appropriate.
Test method: To provide true relative compaction assessments the lots will be sampled and tested within the nominated Field Working Period to conform with AS 1289.5.7.1.
Wet Density: The maximum wet density (modified compaction) will be determined by sampling immediately after the determination of field density and testing to 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.
In situ dry density: The field density may be determined by in situ sand replacement testing or by single probe Nuclear Density Meter in direct transmission mode to conform with AS 1289.5.8.1.

4.7 JOINTS

Joint type
General: Joints 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 is 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.

Cutting back
General: Conform to the following:
- All longitudinal and transverse joints to be formed by cutting back into the previously stabilised and fully compacted sections.
- A minimum longitudinal overlap of mixing runs to be 75 mm.
- Transverse joints to be overlapped by a minimum of 2 m.
- Remix the material disturbed during cutting back at full depth and incorporate into the new work.
- No longitudinal joints to be allowed within 0.5 m of the centreline of a typical wheelpath.

Finish: The level and shape of the joints to be within the limits specified in Limits and Tolerances.

4.8 DIMENSIONS

Levels and surface trim
Surface levels: Conform to the following:
- The surface level after primary trimming + 30 mm and + 10 mm of the levels shown on the drawings.
- The surface level after secondary trimming + 15 mm and - 15 mm of the levels shown on the drawings.
- The pavement surface after secondary trimming and immediately prior to sealing to be of a quality such that deviation under a 3 metre straight edge does not exceed 12 mm.
- Ensure the final surface level is within ± 15 mm of the design levels in the event only a single trim is carried out.

Layer thickness
Layer thickness: Conform to the following:
- The final thickness of the stabilised layer at any point tolerance of + 20 mm and - 10 mm of the nominated layer thickness.
- The average thickness of the layer in a lot is determined from measurements of six randomly selected locations over any 200 m length of a lot and not less than that required to meet the specified final thickness tolerances after trimming.
- The layer thickness is measured at the edges of the stabilising run before compaction commences and measured relative to the finished design level.
Width
General: Conform to the following:
- The minimum width measured at any point of the stabilised layer must not be less than the specified width as shown in the drawings by more than 50 mm.
- Average width of the layer determined from measurements at 3 sites selected at random by the Superintendent over any 200 m length of a lot and not less than the specified width. This is a WITNESS POINT.

4.9 CURING
Method statement
Requirement: Submit to the Superintendent details of the proposed method of curing as part of the Work Plan. This is a HOLD POINT.
Curing method
Water curing: Protect the stabilised work 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 to consist of frequent light uniform spraying that will not produce significant run off or flooding on sections of the area. Avoid slurring of the surface or leaching of the stabilising agent.
Curing Period: Under this Worksection provision for curing up to the period detailed in the approved CC drawings is the responsibility of the Contractor at cost to the Contractor. (Optional for Developer works where the Principal is the Developer. Required for Council Projects where the Council is the Principal).

4.10 LIMITS AND TOLERANCES
Application
Summary: The limits and tolerances applicable to this worksection are summarised in Summary of limits and tolerances table.
Summary of limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/Tolerances</th>
<th>Worksection Clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quicklime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Available lime</td>
<td>&gt; 85% Calcium Oxide content</td>
<td>Quicklime</td>
</tr>
<tr>
<td>- Slaking rate</td>
<td>Active Slaking time &lt; twenty minutes, and temperature rise on slaking &gt; 40°C in 6 minutes (for an average of four samples).</td>
<td>Quicklime</td>
</tr>
<tr>
<td>- Particle distribution</td>
<td>Fraction passing AS Sieve:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100% for 13.2 mm Sieve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>96-100% for 9.5 mm Sieve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70-100% for 4.75 mm Sieve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0-90% for 2.36 mm Sieve</td>
<td></td>
</tr>
<tr>
<td>Hydrated lime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Available lime</td>
<td>&gt; 80% Calcium Hydroxide</td>
<td>Hydrated lime</td>
</tr>
<tr>
<td>- Particle size</td>
<td>&lt; 2% residue on a 300 μm Sieve</td>
<td></td>
</tr>
<tr>
<td>Blended stabilising agents</td>
<td>Blend percentages to not vary by more than ± 3% from those nominated in Annexure A</td>
<td>Blended stabilising agents</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Chloride ion content</td>
<td>&lt; 600 PPM Chloride ion</td>
<td>Water</td>
</tr>
<tr>
<td>- Sulphate ion content</td>
<td>&lt; 400 PPM Sulphate ion</td>
<td>Water</td>
</tr>
<tr>
<td>- Undissolved solids</td>
<td>&lt; 1 percent by mass of undissolved solids</td>
<td>Water</td>
</tr>
<tr>
<td>Application of stabilising agent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Spread rate or incorporation rate for in situ plant.</td>
<td>Actual spread rate shall be within ± 10% of the nominated rate</td>
<td>Application of stabilising agent</td>
</tr>
</tbody>
</table>
### Activity | Limits/Tolerances | Worksection Clause
---|---|---
Trimming and compaction | | 
-Surface level | After primary trimming be within + 30 mm and +10 mm of levels shown on drawings  
After secondary trimming be within ± 15 mm of levels shown on drawings  
Final surface level ± 15 mm of design levels | Dimensions
-Shape | Not to deviate more than 12 mm under a 3 m straight edge immediately prior to first sealing | Dimensions
-Layer thickness | Final thickness of layers not to vary more than + 20 mm and - 10 mm of required thickness | Dimensions
Width | | 
-Width of stabilised layer | At any point, the width to be not less than 50 mm short of the width shown on the drawings with an average width always greater than that shown on the drawings | Dimensions
Joints | | 
-Longitudinal joint overlap | > 75 mm overlap of mixing runs | Joints
-Transverse joint overlap | > 2 m overlap of transverse joints | Joints
-Longitudinal joints | Not within 0.5 m of the centreline of a typical wheelpath | Joints

### 5 MEASUREMENT AND PAYMENT

Note: This item is an Optional condition for Development. Required for Council Project.

#### 5.1 MEASUREMENT

**General**
Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, as shown on the drawings and Pay items 1113.1 to 1113.2 inclusive.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

**Methodology**
The following methodology will be applied for measurement and payment:
- No account to be taken of allowable tolerances or overlaps.
- 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 to conform with 1141 Flexible pavement base and subbase or 1112 Earthworks (Roadways), as appropriate, for supply of the material as a pre-mix product. Supply in these circumstances includes all testing.
- Supply, spread and compact subbase, or base material is measured and paid to conform with 1141 Flexible pavement base and subbase.
- Supply, spread and compact select material is measured and paid to conform with 1112 Earthworks (Roadways).
- Control of traffic is measured and paid to conform with 1101 Control of traffic.

#### 5.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
</table>
| 1113.1 Supply stabilising agent (in situ mixing only) | Tonne  
Calculate for each type and quantity of each stabilising agent to be used. | All costs associated with the supply and delivery of the stabilising agent, including testing in accordance with this worksection. |
<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1113.2 Spread and mixing of stabilising agent</td>
<td>m²</td>
<td>All costs associated with the spreading and mixing of the stabilising agent with the designated materials in-situ and to the nominated depth in accordance with this worksection.</td>
</tr>
</tbody>
</table>

Determine the area by the length and width of work as specified on the drawings or as directed by the Superintendent. Depth of stabilisation to be shown on drawings or as directed by the Superintendent.
1121 OPEN DRAINS INCLUDING KERB AND GUTTER

Including unlined and lined open drains, kerb and/or channel (gutter) and rock filled wire mattresses and gabions.

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide all types of open drains including unlined and lined open drains, kerb and/or gutter and rock filled wire mattresses and gabions, as documented.

Performance
Requirements: Construct open drains to the specification and dimensions shown on the drawings.

Design
Designer: Suitably qualified Engineer to RP Eng or CP Eng standard to authorise design by signature.

Authority requirements: As required by the Conditions of Development Consent.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 0257 Landscape – roadways and street trees.
- 0319 Minor concrete works.
- 1101 Control of traffic.
- 1102 Control of erosion and sedimentation (Construction).
- 1352 Pipe drainage.

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:

Note: Only the most current standards are to be used

AS 1141 Methods for sampling and testing aggregates
AS 1141.22 Wet/dry strength variation
AS 1289 Methods of testing soils for engineering purposes
AS 1289.5.4.1 Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio
AS 1289.5.6.1 Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material
AS 2758 Aggregates and rock for engineering purposes
AS 2758.4 Aggregate for gabion baskets and wire mattresses
AS 2876 Concrete kerbs and channels (gutters)—Manually or machine placed
AS/NZS 4534 Zinc and zinc/aluminium-alloy coatings on steel wire

Other publications
AUSTROADS
AGPT04B Guide to pavement technology Part 4B - Asphalt
AGPT04G/09-2009 Guide to Pavement Technology Part4G- Geotextiles and geogrids
ASTM A975 – 2011 Standard specification for double-twisted hexagonal mesh gabions and revet mattresses (metallic coated steel wire or metallic coated steel wire and PVC coatings)
1.4 INTERPRETATION

Definitions
General: For the purposes of this worksection the following definition apply:
- Kerb and gutter: Includes all forms of concrete gutters, dish drains, grated drains, and mountable median and barrier kerbing.
- Open drains: All drains other than pipe and box culverts and include catch drains, gutters and kerbs and gutters.

1.5 SUBMISSIONS

Approval
Submissions: To the Superintendent's approval.

Documents
General: Submit the following documents for approval:
- Calculations:
  - Proposals for temporary drainage and changed hydraulic capacity.
- Design:
  - Temporary works details.
  - Traffic guidance scheme.
  - Temporary drainage plan.
  - Road opening permit.
- Drawings:
  - Locations of driveways and laybacks.
  - Gully pit hydraulic capacity.
- Execution:
  - Trial section.
- Technical data:
  - Components for concrete materials and drainage structures, material for backfill, rock filled gabions, pipe work and precast products.
  - Compaction data on earth materials as specified.
  - Materials for gabions and mattress mesh, concrete in situ/precast, pipes.
- Calculations:
  - Survey set-out data for gradients and table drains.
- Technical data:
  - Compaction data on earth materials as specified.
  - Survey data for construction to tolerances.
- Type test results.
  - Data on extrusion / slip forming performance as required.

1.6 HOLD POINTS AND WITNESS POINTS

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authority Approvals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Provision for traffic</td>
<td>Submit Traffic Guidance Scheme for approval</td>
<td>2 weeks prior to site commencement</td>
<td>Superintendent</td>
</tr>
<tr>
<td>- Temporary drainage</td>
<td>Submit details of</td>
<td>2 weeks prior to site</td>
<td>Superintendent &amp;</td>
</tr>
<tr>
<td>Clause title/Item</td>
<td>Requirement</td>
<td>Notice for inspection</td>
<td>Release by</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------</td>
<td>-----------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>procedures/devices for approval</td>
<td></td>
<td>commencement</td>
<td>Council's Engineering Development Officer</td>
</tr>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>NATA compliance certificates for concrete and constituents</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Joint Fillers and sealants</td>
<td>NATA compliance certificates for proposed joint filler</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Proprietary Products</td>
<td>Submit proprietary products and manufacturers' instructions</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Wire mattresses</td>
<td>NATA compliance certificates for proposed wire mattress</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Gabions</td>
<td>NATA compliance certificates for proposed Gabions</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Rock fill material</td>
<td>NATA compliance certificates for proposed rock fill material</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Geotextile</td>
<td>NATA compliance certificates for proposed Geotextile material</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open drains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Excavation</td>
<td>Approval to divert drain to avoid trees and/or rocks.</td>
<td>1 working day before set-out.</td>
<td>Superintendent</td>
</tr>
<tr>
<td>- Excavation</td>
<td>Location and construction of drains to prevent salination</td>
<td>1 working day before set-out.</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Kerb and gutter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Foundation</td>
<td>Approval for shape and compaction of foundation material.</td>
<td>1 working day before forming</td>
<td>Superintendent &amp; Council's Engineering Development Officer</td>
</tr>
<tr>
<td>- Construction</td>
<td>Submit details of proposed method</td>
<td>14 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Backfilling and reinstatement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Gully pits</td>
<td>Submit details for fixing to existing works for approval</td>
<td>1 working day before demolition</td>
<td>Superintendent</td>
</tr>
<tr>
<td>- Gully pits</td>
<td>Hydraulic capacity changes</td>
<td>7 days prior to commencement on site</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>
### WITNESS POINTS table – On-site activities

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXECUTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open drains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Excavation</td>
<td>Unsuitable material removal and disposal</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Excavation</td>
<td>Spoil site locations</td>
<td>Prior to placement</td>
</tr>
<tr>
<td>- Embankment</td>
<td>Embankment compaction and revegetation</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Construction</td>
<td>Grade and compaction of open drains</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Construction</td>
<td>Proprietary items installed to manufacturers recommendations</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Types</td>
<td>Maintain catch drains</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Types</td>
<td>Construct minor diversion and contour drains, table drains, swales and depressed medians</td>
<td>Progressive</td>
</tr>
<tr>
<td>- Types</td>
<td>Channels preserving the existing stream bed</td>
<td>Progressive</td>
</tr>
<tr>
<td><strong>Lining</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Concrete lining</td>
<td>Instruction on weep hole location.</td>
<td>1 working day before concreting.</td>
</tr>
<tr>
<td>- Concrete lining</td>
<td>Joints and tolerances</td>
<td>1 working day before concreting.</td>
</tr>
<tr>
<td>- Stone pitching</td>
<td>Bedding material and placement</td>
<td>1 working day before concreting.</td>
</tr>
<tr>
<td><strong>Kerb and gutter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Stormwater outlets</td>
<td>Direction for other than flexible pipework</td>
<td>1 week before ordering</td>
</tr>
<tr>
<td>- Vehicular or pedestrian access</td>
<td>Laybacks confirmation</td>
<td>3 working days prior to works</td>
</tr>
<tr>
<td><strong>Backfilling and reinstatement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Backfill behind kerbs</td>
<td>Backfilling timing, material and compaction</td>
<td>1 working day prior to backfilling</td>
</tr>
<tr>
<td>- Pavement backfill</td>
<td>Backfill adjacent new gutter material and location</td>
<td>3 working days prior to works</td>
</tr>
<tr>
<td>Rock filled wire mattresses and gabions – Completion</td>
<td>Inspection of rockfill material and filling method</td>
<td>On completion of works</td>
</tr>
</tbody>
</table>

### 2 PRE-CONSTRUCTION PLANNING

#### 2.1 AUTHORITY APPROVALS

**Provision for traffic**

*Documentation:* Submit a Traffic Guidance Scheme for control of vehicular and pedestrian traffic to conform with 1101 Control of traffic. Construct the works with the least possible obstruction to traffic, both vehicular and pedestrian. This is a HOLD POINT.

**Temporary drainage**

*Documentation:* Submit details of procedures/devices to maintain effective drainage of the works area during construction. This is a HOLD POINT.

**Road opening permit**

*Application:* Submit application to Great Lakes Council or Mid Coast Water for approval to undertake works to road or footpath. This application includes but is not limited to the following information:
- Ascertain the location of services.
- Opening and compaction specifications.

2.2 ESTABLISHMENT

Documentation
Survey control: Required for the following:
- Mapping and pegging the drainage system.
- Locating components.

3 MATERIALS

3.1 CONCRETE

General
Standard: To AS 2876
Specification: Concrete properties and delivery, placing, compaction, finishing, curing and protection to conform with 0319 Minor concrete works.
Documentation: Submit NATA registered Compliance Certificates for all constituents of the mix as verification of the mix suitability. This is a HOLD POINT.

3.2 JOINT FILLERS AND SEALANTS

General
Documentation: Submit preformed joint filler proposed for use at least 7 days prior to use in the works.
Supply NATA registered compliance certificates. This is a HOLD POINT.

3.3 PROPRIETARY PRODUCTS

General
Approval: Use only proprietary products to conform with the manufacturers instructions. This is a HOLD POINT.

3.4 WIRE MATTRESSES

General
Standard: To ASTM A975.
Submit: For approval the type of mattress proposed and a schedule of locations. This is a HOLD POINT.
Dimension: Unless otherwise shown on the drawings, 6 m × 2 m × 230 mm. Cut to suit areas if required.
Diaphragms: Divide mattress into cells not exceeding 1 m centres.
Forming diaphragms: Folding the base layer of a mattress, provided that the bottom of each of the diaphragm halves is securely tied together so that the transmission of tensile forces in the mesh of the base layer is not impeded.
Mattress material: Flexible woven heavily galvanised wire to ASTM A975.
Mesh size: 60 × 80 mm.
Galvanizing: Coating mass for round wire Class W10 to AS/NZS 4534. 95% zinc 5% aluminium mischmetal alloy.
Body wire: 2.0 mm minimum core diameter.
PVC wire coating: 0.4 mm required as shown on the drawings.
Selvedge wire: 2.4 mm minimum core diameter for mattresses less then 350 mm thick, Mattresses between 350 mm and 550 mm minimum diameter of mesh must be 2.4 mm and minimum galvanized wire 3.0 mm.
Selvedge properties: Ensure the mesh does not unravel and that the strength of the connection between the selvedge wire and the mesh ≥the breaking strength of the mesh.
Lacing wire: 2.2 mm minimum core diameter.
3.5 GABIONS

General
Standard: To ASTM A975.
Submit: For approval the type of mattress proposed and a schedule of locations. This is a HOLD POINT.
Dimension: As shown on the drawings.
Diaphragms: Divide gabion into cells not greater than the width of the gabion plus 100 mm.
Material: Flexible woven heavily galvanized wire to ASTM A975.
Mesh size: 80 x 100 mm nominal.
Galvanizing: Coating mass for round wire Class W10 to AS/NZS 4534. 95% zinc 5% aluminium mischmetal alloy.
Body wire: 2.7 mm minimum core diameter.
PVC wire coating: 0.4 mm required as shown on the drawings.
Selvedge wire: 3.4 mm minimum core diameter.
Selvedge properties: Ensure the mesh does not unravel and that the strength of the connection between the selvage wire and the mesh ≥ the breaking strength of the mesh.
Lacing wire: 2.2 mm minimum core diameter.

3.6 LACING AND CONNECTING WIRE

General
Standard: To ASTM A975.
Minimum diameter: 2.2 mm
Alternative fasteners: ‘C’ clips conforming with ASTM A975 may be used if approved.

3.7 ROCK FILL MATERIAL

General
Standard: To AS 2758.4.
Rock quality: Clean, dense, durable hard rock.
Wet strength: > 100 kN to AS 1141.22.
Wet / dry strength variation: < 35% to AS 1141.22.
Submit: For approval rock material and NATA certificates of compliance of the proposed rock fill material. This is a HOLD POINT.
Particle sizes for wire mattresses: Between 75 mm and two-thirds of the mattress thickness, or 250 mm, whichever is the lesser.
Particle size for gabions: Between 100 mm and 250 mm and preferably not greater than 200 mm.

3.8 GEOTEXTILE

General
Submit: For approval the proposed geotextile material and NATA certificates of compliance. Submit a sample of the fabric, the manufacturer information and installation instructions. This is a HOLD POINT.
Type: As shown on the drawings.
Properties
Classification: Properties, functions, design and construction requirements to AUSTROADS AGPT04B/09.
Specification: Material type and minimum mass requirements as shown on the drawings.
Quality: Free of any flaws, stabilised against UV radiation, rot proof, chemically stable, low water absorbency. Filaments must resist delamination and maintain their relative dimensional stability.
Geotextile strength and filtration: Require a knowledge of the site soils including gradings, plasticity and strength, protection of the layers supporting the drains.
Robustness and strength: Conform to the following:
- Conform to the classifications for robustness and strength cited in AGPT04G/09.
- Select material based on tests and subgrade conditions for the relevant location/function.
Delivery and storage
Delivery: At least 14 days prior to commencement of installation.
Storage: Under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid any damage prior to installation. Store to conform to manufacturers recommendations.
Damage: Must not be stored directly on the ground or in any manner that adversely effect the material by heat, dirt or damage.
Label: Ensure the geotextile material is clearly labelled showing manufacturer, type and batch number.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC
General
Requirement: Conform to 1101 Control of traffic.

4.2 OPEN DRAINS
Excavation
Clear: To 1111 Clearing and grubbing, strip topsoll and any unsuitable material.
Trees and rock outcrops: Approval to divert the drain where trees marked for preservation or rock outcrops occur. This is a HOLD POINT.
Control of erosion: Conform to 1102 Control of erosion and sedimentation (Construction).
Salinity prevention: Locate and construct open drains to avoid recharging groundwater, a shallow water table and salinity degradation of adjacent land. This is a HOLD POINT.
Excavate: To the dimensions shown on the drawings or where not shown to minimum depth of 300 mm and minimum waterway area 0.2 m².
Cross section: V-shaped or trapezoidal unless otherwise shown on drawings.
Batter slope: Not steeper than 2H:1V.
Unsuitable material: Notify the Superintendent of any unsuitable material and seek a direction for removal. Dispose of the unsuitable material at the nearest Landfill with fees paid as necessary. Replace unsuitable material with acceptable cut or other material. This is a WITNESS POINT.
Surplus material: Use the excavated material in the works or remove to spoil stockpiles as directed. This is a WITNESS POINT.
Waterways outside the site: Do not disturb with activities associated with the work.

Embarkment
Construct: In layers maximum 200 mm in depth and compact in layers of maximum depth 150 mm.
Compaction of excavated material: Not less than 95% for standard compactive effort to AS 1289.5.4.1.
Revegetation: Vegetate the embankment after its completion to 0257 Landscape – roadways and street trees.
Backfill: To excavation below the level of the natural channel with suitable material. Compact to a density equal to and compatible with that existing naturally. This is a WITNESS POINT.

Construction
Discharge: Extend open drains to natural drainage depressions, culverts, or pits connected to underground drainage systems. Follow existing watercourses and depressions in the natural surface.
Trimming: To a uniform surface free of irregularities and compact any surface to be lined to 90% relative compaction.
Open drains: Grade to ensure free flow of water and minimum grade of 0.5%. This is a WITNESS POINT.

Types
Provide catch drains: Before construction of the adjacent roadway.
Location of catch drains: > 2 m above the tops of cuttings or > 2 m along the toes of embankments.
Maintain: The fall of the catch drains unless otherwise approved. This is a WITNESS POINT.
Minor diversion and contour drains: Provide the same capacity as the nearest pipe culvert on the line of the drain.
Table drains, swales and depressed medians: Construct as part of earthworks, with the line and level as shown on the drawings or from calculations. This is a WITNESS POINT.

Channels: Excavate inlet, outlet and diversion channels as shown on the drawings and, unless noted otherwise, extend to join the existing stream bed, avoiding disturbance in stream flow. Preserve the existing stream bed as far as possible outside the limits of the excavation. This is a WITNESS POINT.

4.3 LINING

General

Lining choice: Unless otherwise shown on the drawings use the following linings:
- Organic fibre mat and vegetation where the longitudinal grade of the completed drain lies between 1% and 5% inclusive; or
- Concrete where the longitudinal grade of the completed drain is less than 1% or greater than 5%.

Timing: Within 7 days of shaping and compacting the foundation.

Proprietary Items: Install approval proprietary items to conform to the manufacturer's instructions. This is a WITNESS POINT.

Organic fibre mat and vegetation

Conform to: 0257 Landscape – roadways and street trees.

Concrete lining

Concrete: Minimum compacted thickness 100 mm measured at right angles to the surface of the lining.

Colour: To match that of the surrounding materials or as directed.

Method: Cast-in-situ or sprayed concrete to conform with 0319 Minor concrete works.

Weepholes: Provide weepholes in locations shown on the drawings or at 2 m spacing in non-horizontal elements or as directed. This is a WITNESS POINT.

Top of finished lining: True to line and of uniform width, free from humps, sags or other irregularities.

Tolerances: Conform to the following limits:
- Finished levels of lining surface: Within ± 10 mm of design levels.
- Surface deviation: Not more that 5 mm from a 3 m straight edge parallel to the direction of flow, except at kerb laybacks, grade changes or curves, or at gully pits requiring channel depression.

Contraction joints: Conform to the following:
- Width: 5 mm minimum.
- Depth: 20 mm minimum.
- Intervals: Every 3 m of lining.

Expansion joints: Conform to the following:
- Width: 15 mm.
- Depth: Full thickness of the concrete lining.
- Intervals: 15 m maximum.
- Material: Approved preformed jointing material. This is a WITNESS POINT.

Stone pitching

Material: Sound durable rock not less than 100 mm thick, properly bedded on approved loam or sand and mortared to present a uniform surface.

The exposed surface of each stone: Approximately flat and not less than 0.05 m² in area.

Spaces between adjacent stones or blocks: 20 mm maximum width. This is a WITNESS POINT.

Batter drains

Material: Half round steel pipes or precast nestable concrete units as shown on the drawings.

Install: The units in a carefully excavated and template controlled trench to form an even top edge +0 mm to -50 mm from the batter line at the underside of topsoil.

Backfill and compact: Backfill over-excavation and undulations in the batter line. Compact both sides of the drain over the full length to form a firm shoulder against the top edge of the batter drain.

Taper topsoil: Over a width of 1 m to zero thickness at the rim of the drain.

Turf: Both sides of the drain for a minimum width of 600 mm to conform with 0257 Landscape – roadways and street trees.
4.4 KERB AND GUTTER

Foundation
Shape and compaction: Before placing any kerb and/or gutter, shape and compact the foundation material to an approved firm base.
Relative compaction: To AS 2876 except where placed on pavement courses, then to the requirements of the respective pavement course. This is a HOLD POINT.

Construction
Construct: Kerb and/or gutters in fixed forms, by extrusion or by slip forming to AS 2876. Submit:
Details of method proposed including type of extrusion or slipform, concrete properties, equipment and finish. Note: Only full extrusion machines shall be used in Great Lakes Council Area. (No slurry seal—surface topping units shall be used). This is a HOLD POINT.

Finish
Finish true to line: The top and face of the finished kerb and gutter.
Top surface: Uniform width, free from humps, sags and other irregularities.
Type: Steel float finish or as otherwise shown on drawings.

Tolerances
Finished levels of gutter surface: Within ± 10 mm of design levels.
Surface deviation of kerb face and gutter surface: ± 5 mm from the edge of a 3 m straight edge, except at kerb laybacks, grade changes or curves, or at gully pits requiring gutter depression.

Joints
Contraction joints: Unless shown otherwise on the drawings, conform to the following:
- Width: 5 mm minimum.
- Depth: 20 mm.
- Intervals: Every 3 m of gutter length for a minimum of 50% of cross sectional area of concrete.
- Tooling: 20 mm in depth to form a neat groove of 5 mm minimum width.
Expansion joints: Provide where the gutter abuts against pits, retaining walls, overbridges and at both sides of kerb laybacks for vehicular or pedestrian access. Unless shown otherwise on the drawings, conform to the following:
- Width: 15 mm.
- Depth: Full depth of kerb and gutter.
- Maximum intervals: 15 m.

Joints adjacent to concrete pavement: If kerbs and/or gutters are cast adjacent to a concrete pavement, continue the contraction, construction and expansion joints documented for the concrete base across the kerb and/or gutter.

Stormwater outlets
General: Reconnect and extend all existing house stormwater outlets through the kerb to match the existing type and size of pipe as shown on the drawings.
Pipes: Conform to 1352 Pipe drainage. This is a WITNESS POINT.

Vehicular or pedestrian access
Barrier kerb: Discontinue opposite all driveways as shown on the drawings or as directed.
Kerb laybacks: As shown on the drawings where the barrier kerb is discontinued.
Footpath crossovers: Meet the laybacks as shown on the drawings or reinstate to match existing materials. This is a WITNESS POINT.

4.5 BACKFILLING AND REINSTATEMENT

Backfill behind kerbs
Timing: Not earlier than 3 days after concreting, backfill and reinstate the spaces on both sides of the kerb and/or gutter to conform with the drawings, or as directed.
Material: Granular material, free of organic material, clay and rock in excess of 50 mm diameter, or approved material.
Layers: Compact in layers not greater than 150 mm thick.
Relative compaction: 95% when tested in conformance with AS 1289.5.4.1 for standard compactive effort or density index 70 if non-cohesive material to AS 1289.5.6.1.

Surface treatment: Free draining and free from undulations and trip hazards. This is a WITNESS POINT.

Pavement backfill
Backfill: Material adjacent to the new gutter as shown on the drawings or as directed. This is a WITNESS POINT.

Gully pits
Reconstruct: The top of gully pits or adjust precast units to suit new kerb and gutter profile to conform with 0319 Minor concrete works.

Adjustment: Demolish and reconstruct gully pits to suit new line or level of the kerb and gutter to match the design standard of the existing gully pit.

Fixing to existing works: Fix new wall sections in concrete or brick securely to the retained wall section. Submit details of the proposed procedure for approval. This is a HOLD POINT.

Hydraulic capacity: Retain or improve the capacity of the original gully pit. Cavity shapes to be regular and oriented so as not to impede flow into and out of the pit.

Submit: Provide sketches and/or calculations relevant to such hydraulic capacity. This is a HOLD POINT.

4.6 ROCK FILLED WIRE MATTRESSES AND GABIONS

General
Location: As shown on the drawings.

Foundations
Finished level of excavation: Prior to installation of rock filled wire mattress or gabion excavate so the mattresses finish flush with the surrounding ground.

Shape and compaction: Not less than 95% for standard compactive effort to AS 1289.5.4.1. to form a uniform channel cross-section prior to installation of mattresses.

Geotextile: Before laying out the wire mattresses or gabions, place geotextile between the wire cage and the material being protected as shown on the drawings.

Assembly
Prior to assembly: Open the wire mesh out flat on the ground and stretch it to remove all kinks and bends.

Gabion boxes: Individually assemble by raising the sides, ends and diaphragms, ensure all creases are in the correct position and that all four sides and the diaphragms are even.

Lace: The four corners first and then the edges of internal diaphragms to the sides.

Lacing and twisting: Commence the lacing by twisting the end of the lacing wire around the selvage(s) then pass it around the two edges being joined using alternate single and double loops through each mesh in turn and tie it off securely at the bottom.

Ends: Turn the ends of all lacing wires to the inside of the box on completion of each lacing operation.

Erection
Conform to the following:
- Only assembled boxes, or groups of boxes must be positioned in the structure.
- Secure the end to either the completed work or by galvanised star pickets driven into the ground at 1 m spacing.
- Firmly embed the star pickets into the ground by minimum 900 mm.
- Star pickets to be at least the height of the box.
- Place boxes in the structure lacing securely the proceeding one along all common corners and diaphragms.

Stretcing for gabion boxes: Using a pull lift of at least 1 tonne capacity, firmly secured to the free end of the assembled gabion boxes. Whilst under tension, securely lace the gabion boxes along all edges and at diaphragm points to adjacent boxes.

Mattresses: Adjust the position of the diaphragms so that the sides hinge up on the thicker wire woven in the mesh.
Filling
Gabion boxes: Conform to the following:
- Fill whilst the gabion boxes are under tension.
- Place the rocks at the front face and other exposed faces by hand to produce a neat face free of excessive bulges, depressions and voids.
- Internal bracing wires 4 per m$^2$ at 330 mm centres to prevent distortion.
- Face bracing wires 4 per m$^2$ of face.
- Mechanical filling equipment may be used with caution to protect any PVC or galvanized coatings from abrasion.
- Release the tension on the gabion boxes only when fully faced so as to prevent any slackening.
Mattresses:
- Mechanical filling equipment may be used with caution to protect any PVC or galvanized coatings from abrasion.
- Redistribute the filling materials by hand to ensure that all diaphragm compartments are fully filled to produce a neat and level top surface.
- Overfill by 25 to 50 mm to allow for subsequent settlement.
Final lacing
Close and lace lids: As soon as practicable after filling particularly if there is a storm or flood expected. Stretch lids tightly over the filling and lace down securely.
Completion
Inspection: Inspection of rock fill material and filling method. This is a WITNESS POINT.

4.7 LIMITS AND TOLERANCES
The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/Tolerances</th>
<th>Worksection Clause/subclause</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire mattresses</td>
<td>Diaphragm cells at 1 m centres</td>
<td>Wire mattresses</td>
</tr>
<tr>
<td></td>
<td>Mesh size 60 x 80 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Galvanising 95% zinc, 5% aluminium</td>
<td></td>
</tr>
<tr>
<td>Gabions</td>
<td>Diaphragms &lt; width plus 100 mm</td>
<td>Gabions</td>
</tr>
<tr>
<td></td>
<td>Mesh size 80 x 100 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Galvanising 95% zinc, 5% aluminium</td>
<td></td>
</tr>
<tr>
<td>Rock fill material</td>
<td>Wet strength &gt; 10 kN</td>
<td>Rock fill material</td>
</tr>
<tr>
<td></td>
<td>Wet/dry strength &lt; 35%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Particle size for mattresses between 75 mm and 150 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Particle size for gabions &gt; 100 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 250 mm</td>
<td></td>
</tr>
<tr>
<td>Unlined open drains</td>
<td>Grade &gt; 0.5%</td>
<td>Open drains – Construction</td>
</tr>
<tr>
<td></td>
<td>Depth &gt; 300 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waterway Area &gt; 0.2 m$^2$</td>
<td></td>
</tr>
<tr>
<td>Catch Drain Location</td>
<td>&gt; 2 m from top of cuttings or toes of embankments</td>
<td>Open drains - Types</td>
</tr>
<tr>
<td></td>
<td>Compaction &gt; 95% (standard compaction)</td>
<td>Open drains - Embankment</td>
</tr>
<tr>
<td>Activity</td>
<td>Limits/Tolerances</td>
<td>Worksection Clause/subclause</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Lining</td>
<td>1% to 5% use organic mat or vegetation</td>
<td>Lining</td>
</tr>
<tr>
<td></td>
<td>Less 1% greater than 5% use concrete lining</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concrete 100 mm thick measured at right angles</td>
<td>Concrete lining</td>
</tr>
<tr>
<td>Contraction joints</td>
<td>Width: 5 mm minimum</td>
<td>Concrete lining</td>
</tr>
<tr>
<td></td>
<td>Depth: 20 mm minimum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervals: every 3 m of lining</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tooling: 20 mm in depth groove 5 mm minimum width</td>
<td></td>
</tr>
<tr>
<td>Expansion joints</td>
<td>Width: 15 mm minimum</td>
<td>Concrete lining</td>
</tr>
<tr>
<td></td>
<td>Depth: full thickness of the concrete lining</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervals: 15 m maximum</td>
<td></td>
</tr>
<tr>
<td>Stone pitching</td>
<td>Rock &gt; 100 mm thick</td>
<td>Stone pitching</td>
</tr>
<tr>
<td></td>
<td>Exposed surface &gt; 0.05 m²</td>
<td></td>
</tr>
<tr>
<td>Batter drains</td>
<td>Install 0 to 50 mm below batter line</td>
<td>Batter drains</td>
</tr>
<tr>
<td></td>
<td>Top soil: thickness 1 m to 1 at rim of drain</td>
<td></td>
</tr>
<tr>
<td>-Compaction of Foundation</td>
<td>&gt; 95% (standard compaction)</td>
<td>Lined open drains</td>
</tr>
<tr>
<td>-Level of lining surface</td>
<td>Level ± 10 mm of design level</td>
<td>Concrete lining</td>
</tr>
<tr>
<td>-Surface uniformity</td>
<td>Deviation lining surface from 3 m straight edge ≤ 5 mm</td>
<td>Concrete lining</td>
</tr>
</tbody>
</table>

**Kerb and gutter**

<table>
<thead>
<tr>
<th>Kerb and gutter</th>
<th>Execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Relative compaction of</td>
<td>To AS 2876</td>
</tr>
<tr>
<td>foundation</td>
<td></td>
</tr>
<tr>
<td>-Finished levels of gutter</td>
<td>Level ± 10 mm of design level</td>
</tr>
<tr>
<td>surface</td>
<td></td>
</tr>
<tr>
<td>-Surface deviation of kerb</td>
<td>± 5 mm from 3 m straight edge</td>
</tr>
<tr>
<td>and gutter surface</td>
<td></td>
</tr>
<tr>
<td>-Contraction joints</td>
<td>Width: ≥ 5 mm</td>
</tr>
<tr>
<td></td>
<td>Depth: 20 mm</td>
</tr>
<tr>
<td></td>
<td>Intervals every 3 m of gutter length for a minimum of 50% of CS area of concrete</td>
</tr>
<tr>
<td>-Expansion joint interval</td>
<td>≤ 15 m</td>
</tr>
<tr>
<td></td>
<td>Width: 15 mm</td>
</tr>
<tr>
<td></td>
<td>Depth: Full depth of kerb and gutter</td>
</tr>
<tr>
<td>Backfill behind kerb</td>
<td></td>
</tr>
<tr>
<td>-Layer thickness</td>
<td>≤ 150 mm</td>
</tr>
<tr>
<td>-Relative compaction</td>
<td>95% (standard compaction)</td>
</tr>
<tr>
<td>Rock filled wire mattresses and gabions</td>
<td></td>
</tr>
<tr>
<td>-Star pickets for ties</td>
<td>Depth in ground &gt; 900 mm</td>
</tr>
<tr>
<td></td>
<td>Spacing &lt; 1 m</td>
</tr>
<tr>
<td>Bracing wires</td>
<td>Internal: 4 per m³ at 330 mm centres</td>
</tr>
<tr>
<td>Activity</td>
<td>Limits/Tolerances</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Face: 4 per m² of face</td>
<td>mattresses and gabions - Filling</td>
</tr>
<tr>
<td>Wire mattress filling</td>
<td>Over fill mattresses by 25 to 50 mm</td>
</tr>
</tbody>
</table>

5 MEASUREMENT AND PAYMENT

NOTE: This item is an optional condition for development. Required for council project.

5.1 MEASUREMENT

General
Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, the drawings and Pay items 1121.1-1121.8 inclusive.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology
The following methodology will be applied for measurement and payment:

- Erosion and sedimentation control measures: In conformance with 1102 Control of erosion and sedimentation (Construction).
- Sprayed concrete lining of open drains: In conformance with 0319 Minor concrete works.
- Cast-in-situ concrete or other lining of open drains: In conformance with this worksection and not 0319 Minor concrete works.
- Miscellaneous minor concrete work not included in the pay items in this worksection: In conformance with 0319 Minor concrete works.
- Topsoiling and turfing to sides of batter drains: In conformance with 0257 Landscape – roadways and street trees.

5.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1121.1 Excavation—catch, contour and minor diversion drains</td>
<td>Linear metre measured along the invert of the drain.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Excavation of all types of material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Does not include separate rates for earth and rock.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Placement and compaction of material excavated from the drains on the lower sides of the drains to form banks in the excavation rates.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Temporary measures for the control of stormwater runoff.</td>
</tr>
<tr>
<td>1121.2 Excavation—inlet, outlet and diversion channels</td>
<td>m³ measured from cross sections on the drawings using the end area method, or as 'each' where minor work is involved.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Excavation of all types of material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Does not include separate rates for earth and rock.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The disposal of surplus material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Temporary measures for the control of stormwater runoff.</td>
</tr>
<tr>
<td>1121.3 Concrete lining of open drains</td>
<td>m² of concrete in place.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Surface preparation, supply and placing of</td>
</tr>
<tr>
<td>Pay Items</td>
<td>Unit of measurement</td>
<td>Schedule rate scope</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1121.4 Stone pitching of open drains</td>
<td>m² of stone pitching in place.</td>
<td>concrete, jointing and curing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Surface preparation, supply of stone, placing, final trimming and mortar jointing.</td>
</tr>
<tr>
<td>1121.5 Batter drains</td>
<td>Linear metre along the length of the drain formed by batter drain units.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply of the units, excavation, installation, backfilling and compaction.</td>
</tr>
<tr>
<td>1121.6 Rock filled gabions</td>
<td>m³ of rock filling.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Rock volumes taken from the drawings and adjusted for any authorised changes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and placement of geotextile material behind the gabions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and assembly of the gabions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and placing of the rock fill in the gabions.</td>
</tr>
<tr>
<td>1121.7 Rock filled wire mattresses</td>
<td>m² of rock filled mattress complete.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Area determined from the actual completed work including the area folded into the trench.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and placement of geotextile material, star pickets and ties.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and assembly of the wire mattresses.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Supply and placing of the rock fill.</td>
</tr>
<tr>
<td>1121.8 Kerb and/or gutter</td>
<td>Linear metre measured along the length of the kerb and/or gutter including kerb laybacks and perambulator ramps.</td>
<td>All costs associated with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Compaction of foundations, forming, concreting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Expansion and contraction joints.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Backfilling and compaction adjacent to the completed kerb.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Separate pay items for each type of kerb and/or gutter.</td>
</tr>
</tbody>
</table>
1132 LEAN MIX CONCRETE SUBBASE

1 GENERAL

1.1 RESPONSIBILITIES

Objectives
General: Provide lean mix concrete subbase and associated components, as documented.

1.2 CROSS REFERENCES

General
Requirement: Conform to the following:
- 0136 General requirements (Construction).
- 0161 Quality (Construction).
- 1101 Control of traffic.
- 1102 Control of erosion and sedimentation.
- 1112 Earthworks (Roadways).
- 1133 Plain and reinforced concrete base.

1.3 REFERENCED DOCUMENTS

Standards
General: The following documents are incorporated into this worksection by reference:
Note: Only the most current standards are to be used

Australian standards
AS 1012  Methods of testing concrete
AS 1012.1  Sampling of fresh concrete
AS 1012.3.1  Determination of properties related to the consistency of concrete - Slump test
AS 1012.3.3  Determination of properties related to the consistency of concrete - Vebe test
AS 1012.4.2  Determination of air content of freshly mixed concrete - Measuring reduction in air pressure in chamber above concrete
AS 1012.8.1  Method for making and curing concrete - Compression and indirect tensile test specimens
AS 1012.9  Determination of the compressive strength of concrete specimens
AS 1012.13  Determination of the drying shrinkage of concrete for samples prepared in the field or in the laboratory
AS 1012.14  Method for securing and testing cores from hardened concrete for compressive strength
AS 1141  Methods for sampling and testing aggregates
AS 1141.5  Particle density and water absorption of fine aggregate
AS 1141.6.1  Particle density and water absorption of coarse aggregate - Weighing-in-water method
AS 1141.11.1  Particle size distribution - sieving method
AS 1141.12  Materials finer than 75 μm in aggregates (by washing)
AS 1141.13  Material finer than 2 μm
AS 1141.14  Particle shape, by proportional calliper
AS 1141.18  Crushed particles in coarse aggregate derived from gravel
AS 1141.22  Wet/dry strength variation
AS 1141.24  Aggregate soundness - Evaluation by exposure to sodium sulfate solution
AS 1141.35  Sugar
AS 1160  Bituminous emulsions for the construction and maintenance of pavements
AS 1289  Methods of testing soils for engineering purposes
AS 1289.3.6.3  Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis using a hydrometer

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AS 1289.4.2.1  Determination of the sulfate content of a natural soil and the sulfate content of the groundwater - Normal method
AS 1379    Specification and supply of concrete
AS 1478    Chemical admixtures for concrete, mortar and grout
AS 1478.1  Admixtures for concrete
AS/NZS 1554.3 Structural steel welding -- Welding of reinforcing steel
AS 2758    Aggregates and rock for engineering purposes
AS 2758.1  Concrete aggregates
AS 3582    Supplementary cementitious materials for use with portland and blended cement
AS 3582.1  Fly ash
AS 3583    Methods of test for supplementary cementitious materials for use with portland cement
AS 3583.13 Determination of chloride ion content
AS 3600    Concrete structures
AS 3799    Liquid membrane—forming curing compounds for concrete
AS 3972    General purpose and blended cements
AS/NZS 4671 Steel reinforcing materials
AS/NZS 4680 Hot-dipped galvanized (zinc) coatings on fabricated ferrous articles
SAA HB 155  Guide to the use of recycled concrete and masonry materials
Austroads
AGPT04C    Guide to pavement technology part 4C: Materials for concrete road pavements
AGPT04E    Guide to pavement technology part 4E: Recycled materials
AGPT04G    Guide to pavement technology part 4G: Geotextiles and geogrids
AGPT04J    Guide to pavement technology part 4J: Aggregate and source rock
AGPT08     Guide to Pavement Technology Part 8: Pavement construction

1.4 STANDARDS

General
Standards: To AS 1379, AS 3600, AGPT08 and AGPT04C.

1.5 INTERPRETATION

Abbreviations
General: For the purposes of this worksection the following abbreviations apply:
CRCP: Continuously reinforced concrete.
JRCP: Jointed reinforced concrete.
PCP: Jointed plain concrete.
SFPCP: Jointed steel fibre reinforced concrete pavement.

Definitions
General: For the purposes of this worksection the following definitions apply:
- Lot: A continuous placement of up to 50 m³ of subbase concrete.
- Nominated mix: Proposed concrete mix after the approval.
- RMS -- Roads and Maritime Services.

1.6 HOLD POINTS AND WITNESS POINTS

Approval
Submissions: To the Superintendent's approval.

Notice
General: Give notice so that the documented inspection and submissions may be made to the HOLD POINT table and the WITNESS POINT table.

HOLD POINTS table

<table>
<thead>
<tr>
<th>Clause title/item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
<th>Release by</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE-CONSTRUCTION PLANNING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESIGN AND CONTROL OF CONCRETE MIX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clause title/Item</td>
<td>Requirement</td>
<td>Notice for inspection</td>
<td>Release by</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Nominated mix</td>
<td>Submit details of concrete mix and materials including NATA certificates and test results</td>
<td>21 working days before ordering concrete</td>
<td>Superintendent</td>
</tr>
<tr>
<td>Variations to nominated mix and materials</td>
<td>Submit details of any change to nominated mix and materials</td>
<td>21 working days before implementing change</td>
<td>Superintendent</td>
</tr>
</tbody>
</table>

**EXECUTION**

**SITE ESTABLISHMENT**

| Subgrade survey                  | Submit work-as-executed survey of the subgrade.                            | 2 working days before starting                             | Superintendent|

**TRIAL LEAN MIX CONCRETE SUBBASE**

| Construction                     | Inspection of the trial lean mix concrete subbase                          | At least 5 working days before starting the subbase works  | Superintendent|

**PRODUCTION, TRANSPORT AND DELIVERY OF CONCRETE**

| Concrete production and transport | Submit proposed work methods                                               | 21 working days before starting                            | Superintendent|

**CONCRETE PLACING AND FINISHING**

| Equipment and methods             | Submit details of proposed equipment, methods and paving plan              | 21 working days before starting                            | Superintendent|
| Acceptance criteria for subbase thickness | Submit subbase survey                                                      | Within 2 working days of completing concrete works        | Superintendent|

**TESTING OF CONCRETE FOR COMpressive stRENGTH**

| Sampling, curing and testing of fresh concrete | Inspection of sampling procedure                                           | Progressive                                               | Superintendent|
| Acceptance criteria                | Submit test results                                                        | Progressive                                               | Superintendent|
| Acceptance criteria for cored concrete | Submit test results                                                        | Progressive                                               | Superintendent|

**REMOVAL AND REPLACEMENT OF SUBBASE**

| General                           | Submit proposed method of removal                                          | 7 working days before removal                              | Superintendent|

**WITNESS POINTS table**

<table>
<thead>
<tr>
<th>Clause title/Item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MATERIALS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage and transport</td>
<td>Test the cement stored for longer than 3 months</td>
<td>Progressive</td>
</tr>
<tr>
<td>Clause title/Item</td>
<td>Requirement</td>
<td>Notice for Inspection</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Storage</td>
<td>Storage and handling to preserve quality of aggregate</td>
<td>Progressive</td>
</tr>
<tr>
<td>STEEL REINFORCEMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>Provide test certificates</td>
<td>Progressive</td>
</tr>
<tr>
<td>EXECUTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRODUCTION, TRANSPORT AND DELIVERY OF CONCRETE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete delivery</td>
<td>Keep record of the delivery information</td>
<td>Progressive</td>
</tr>
<tr>
<td>SUBGRADE BEAMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>Provide subgrade beams</td>
<td>7 working days before concrete placement</td>
</tr>
<tr>
<td>Excavation</td>
<td>Inspection of subgrade beams excavation profile</td>
<td>2 working days before concrete placement</td>
</tr>
<tr>
<td>CONCRETE PLACING AND FINISHING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment and methods</td>
<td>Give 7 days notice before starting</td>
<td>7 working days</td>
</tr>
<tr>
<td>Consistency</td>
<td>Provide consistency test results</td>
<td>Progressive</td>
</tr>
<tr>
<td>Ground surface conditions</td>
<td>Provide damp, clean and compacted ground surface</td>
<td>Progressive</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>Protect concrete when cold or hot weather and when it rains</td>
<td>Progressive</td>
</tr>
<tr>
<td>Evaporation and moisture loss</td>
<td>Prevent moisture loss when evaporation rate exceeds prescribed limits</td>
<td>Progressive</td>
</tr>
<tr>
<td>Paving in general</td>
<td>Provide base slab anchors if required</td>
<td>Progressive</td>
</tr>
<tr>
<td>Paving continuity</td>
<td>Provide a construction joint if paving is disrupted</td>
<td>Progressive</td>
</tr>
<tr>
<td>Alignment and surface tolerances</td>
<td>Remediation of surfaces above or below level tolerances</td>
<td>Progressive</td>
</tr>
<tr>
<td>Acceptance criteria for subbase thickness</td>
<td>Remove insufficiently thick subbase</td>
<td>As directed</td>
</tr>
<tr>
<td>JOINTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>Inspection of joints</td>
<td>Progressive</td>
</tr>
<tr>
<td>CURING AND DEBONDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of curing compound</td>
<td>Check application rate with a nominated lot</td>
<td>Progressive</td>
</tr>
<tr>
<td>CONCRETE CRACKING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-conforming concrete</td>
<td>Treatment as directed by Superintendent</td>
<td>Progressive</td>
</tr>
<tr>
<td>Treatment of spalling</td>
<td>Treatment as directed by Superintendent</td>
<td>Progressive</td>
</tr>
<tr>
<td>TESTING OF CONCRETE FOR COMpressive STRENGTH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing by specimens cut from</td>
<td>Cut cores in the presence of the</td>
<td>Progressive</td>
</tr>
<tr>
<td>Clause title/item</td>
<td>Requirement</td>
<td>Notice for inspection</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>the work</td>
<td>Superintendent</td>
<td></td>
</tr>
<tr>
<td>Remedial work after coring</td>
<td>Advise proposed method of restoration</td>
<td>Progressive</td>
</tr>
</tbody>
</table>

REMOVAL AND REPLACEMENT OF SUBBASE

<table>
<thead>
<tr>
<th>Clause title/item</th>
<th>Requirement</th>
<th>Notice for inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal and replacement</td>
<td>Damaged pavement adjacent rejected subbase</td>
<td>As directed</td>
</tr>
</tbody>
</table>

2 PRE-CONSTRUCTION PLANNING

2.1 ACTIVITY PLAN

General
Program: Plan the following activities:
- Provide planning resources to allocate plant and personnel for the contract period.
- Program the work to meet the constraints of HOLD POINTS and WITNESS POINTS.

2.2 DESIGN AND CONTROL OF CONCRETE MIX

Nominated mix
General: Before starting the production of the concrete for subbase works, carry out a trial mix to certify the conformance of the proposed concrete mix.
Testing authority: NATA registered laboratory.
Submission requirements:
- Details of all material constituents and test reports to the MATERIALS clause and the following:
  - Cement: Brand and source.
  - Fly ash: Powerhouse source.
  - Admixtures: Proprietary source, type, name and dosage recommended by manufacturer.
  - Aggregates: Source, geological type, moisture condition, proportions and grading for each type and grading for combined aggregate.
  - Curing compounds: Application rate.
- Concrete mix design.
- Test results and certificates of conformance for the proposed concrete mix:
  - Standard: To AS 1379.
  - Acceptance criteria: To CONCRETE QUALITY REQUIREMENTS.
Submission type: HOLD POINT.

Pre-approved mix
Identical mix: To avoid testing the nominated mix, submit results from earlier testing of a mix identical with the nominated mix for approval.
Pre-approval: A mix may be pre-approved under the following conditions:
- If the mix was used in a separate contract within 12 months of the proposed works date.
- If fully approved details have been previously used.
- If the constituent materials and quality remain unchanged from those previously approved.
- If the in-service performance of the concrete incorporating the nominated mix is acceptable.

Variations to nominated mix and materials
Approval: Submit details of any changes to the nominated mix, its method of production or source of supply of constituents.
Submission type: HOLD POINT.
Non-conformance: Consider any change without approval to a material in the approved mix as a non-conforming material. Concrete containing this material may become non-conforming concrete.
3 MATERIALS

3.1 CEMENT

General
Standard: To AS 3972.

Storage and transport
Storage: Store cement bags under cover and above ground.
Storage time: Re-test cement that has been stored for longer than three months. Costs to be borne by the Contractor.
Inspection type: WITNESS POINT.
Transport: Transport cement in watertight packaging and protect from moisture. Do not use caked or lumpy cement.

3.2 FLYASH

General
Standard: To AS 3582.1.

3.3 WATER

General
Standard: AS 1379.
Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter.
Limits: Provide water with less than:
- 300 parts per million of chloride ion, determined by AS 3583.13.
- 400 parts per million of sulfate ion, determined by AS 1289.4.2.1.

3.4 ADMIXTURES

General
Standard: To AS 1478.1.
Requirement: Provide admixtures free from calcium chloride, calcium formate, or triethanolamine or any other accelerator.
Dosage: Vary the dosage of chemical admixture to account for air temperature and setting time to conform to the manufacturer’s recommendations.
Compatibility of admixtures: Provide certificate from the manufacturer for combinations of two or more admixtures.

Types of admixtures
Warm season retarder: To control slump within the limits stated in Consistency during the warm season, (October to March inclusive), use a lignin or lignin-based ('lipol') set-retarding admixture (Type Re or Type WRRe).
Cool season retarder: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture containing no more than 6% reducing sugars (Type WRRe conforming to AS 1478.1).
Alkali contribution: For concrete mix with less than 50 kg/m³ fly ash, the total alkali contribution (measured as Na₂O) from all admixtures used in any mix must not exceed 0.20 kg/m³.
Types: Superplasticisers and high range water reducers (type HR, WR, Re) may be used.

3.5 AGGREGATES

General
Properties: All aggregate to AS 2758.1, AGPT04J and the following:
- Samples for testing: From dedicated stockpiles or from materials delivered to site.
- Chloride and sulfate ion contents: Less than 0.8 kg/m³ and 5% respectively.
- Soluble salt content assessment: Maximum 12 months before closing of tenders.
Requirement: Clean, durable materials sourced from natural gravel, crushed stone, air-cooled iron blast furnace slag and sand. Do not use steel-plant slag.
Recycled concrete aggregate
Course aggregates from demolition concrete: To the recommendations of SAA HB155 and AGPT04E.

Blending: If blending coarse recycled concrete aggregate with natural aggregates make sure substitution rates are below 30%.

Additional properties for fine aggregate
General: To the Fine aggregate properties table.

Fine aggregate properties table

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Density</td>
<td>1200 kg/m³ minimum</td>
<td>AS 1141.4(1)</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>5.0% maximum, except slag</td>
<td>AS 1141.5 and AS 1141.6.1</td>
</tr>
<tr>
<td></td>
<td>aggregate: 6.0%</td>
<td></td>
</tr>
<tr>
<td>Material finer than 75 μm</td>
<td>Maximum 10.0 %</td>
<td>AS 1141.12</td>
</tr>
<tr>
<td>Material finer than 2 μm</td>
<td>Maximum 1.0 %</td>
<td>AS 1141.13</td>
</tr>
<tr>
<td>Soundness</td>
<td>12 % max weighted average loss</td>
<td>AS 1141.24</td>
</tr>
<tr>
<td>Organic impurities</td>
<td>Maximum 0.5 %</td>
<td>AS 1289.4.1.1</td>
</tr>
<tr>
<td>Sugar content</td>
<td>Less than 1 part in 10,000</td>
<td>AS 1141.35</td>
</tr>
</tbody>
</table>

Notes: (1) ‘Bulk density’ in AS 2758.1 means the same as ‘unit mass’ in AS 1141.4.

Sodium sulfate soundness: Do not exceed the limits shown in the Sodium sulfate soundness limits table as determined by AS 1141.24.

Sodium sulfate soundness limits table

<table>
<thead>
<tr>
<th>Australian Standard Sieve</th>
<th>% Loss by mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75 mm to 2.36 mm</td>
<td>4</td>
</tr>
<tr>
<td>2.36 mm to 1.18 mm</td>
<td>6</td>
</tr>
<tr>
<td>1.18 mm to 600 μm</td>
<td>8</td>
</tr>
<tr>
<td>600 μm to 300 μm</td>
<td>12</td>
</tr>
</tbody>
</table>

Blending: If two or more fine aggregates are blended, apply the above limits to each constituent material.

Grading: Provide fine aggregate and grading determined by AS 1141.11.1 within the limits shown in the Fine aggregate grading table.

Fine aggregate grading table

<table>
<thead>
<tr>
<th>Australian Standard sieve</th>
<th>Proportion passing (% of mass of sample)</th>
<th>Deviation from proposed grading (% of mass of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.50 mm</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>90–100</td>
<td>± 3</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>65–95</td>
<td>± 10</td>
</tr>
<tr>
<td>1.18 mm</td>
<td>40–80</td>
<td>± 10</td>
</tr>
<tr>
<td>600 μm</td>
<td>24–52</td>
<td>± 10</td>
</tr>
<tr>
<td>300 μm</td>
<td>8–25</td>
<td>± 5</td>
</tr>
<tr>
<td>150 μm</td>
<td>1–8</td>
<td>± 2</td>
</tr>
<tr>
<td>75 μm</td>
<td>0–3</td>
<td>-</td>
</tr>
</tbody>
</table>

Additional properties for coarse aggregate
General: To the Coarse aggregate properties table.

Coarse aggregate properties table

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification limits</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>Specification</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td>1200 kg/m³ minimum</td>
<td></td>
</tr>
<tr>
<td>Water absorption</td>
<td>Slag: 6 % max Other: 5 % max</td>
<td></td>
</tr>
<tr>
<td>Material finer than 75 µm</td>
<td>Maximum 2.0 %</td>
<td></td>
</tr>
<tr>
<td>Material finer than 2 µm</td>
<td>Maximum 1.0 %</td>
<td></td>
</tr>
<tr>
<td>Particle shape, 2:1 and 3:1 ratios</td>
<td>Maximum 35 % and 10 %</td>
<td></td>
</tr>
<tr>
<td>Wet strength</td>
<td>Minimum 50 kN</td>
<td></td>
</tr>
<tr>
<td>Wet/dry strength variation</td>
<td>Maximum 35 %</td>
<td></td>
</tr>
<tr>
<td>Soundness - loss in mass</td>
<td>Maximum 9.0%</td>
<td></td>
</tr>
<tr>
<td>Fractured faces (two or more)</td>
<td>Minimum 80%</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) 'Bulk density' in AS 2758.1 means the same as 'unit mass' in AS 1141.4.

Grading: Provide coarse aggregate with grading determined by AS 1141.11.1 within the limits given in the Coarse aggregate grading table.

### Coarse aggregate grading table

<table>
<thead>
<tr>
<th>Australian Standard sieve</th>
<th>Proportion passing (% of mass of sample)</th>
<th>Deviation from proposed grading (% of mass of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.50 mm</td>
<td>100</td>
<td>± 2</td>
</tr>
<tr>
<td>19.00 mm</td>
<td>95–100 (accepted design mix)</td>
<td>± 5</td>
</tr>
<tr>
<td>13.20 mm</td>
<td>25–55</td>
<td>± 5</td>
</tr>
<tr>
<td>9.50 mm</td>
<td>0–10</td>
<td>± 3</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>0–2</td>
<td></td>
</tr>
<tr>
<td>2.36 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Storage**

Storage areas: Locate the storage area to prevent the aggregates becoming intermixed or mixed with foreign materials or segregated.

Inspection type: WITNESS POINT.

### 3.6 CURING AND SURFACE DEBONDING COMPOUNDS

**General**


Efficiency index: Minimum 90 % when tested to AS 3799 Appendix B.

#### Curing compounds and debonding

<table>
<thead>
<tr>
<th>Type</th>
<th>Suitability with bituminous/asphaltic surfacing</th>
<th>Base type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wearing surface</td>
<td>No wearing surface</td>
</tr>
<tr>
<td>C5 hydrocarbon resin compound conforming to AS 3799 Class B and with no aromatic hydrocarbon additions. *</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Water borne hydrocarbon resin or styrene butadiene resin (SBR) conforming with AS 3799 Class Z. *</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Bitumen emulsion grade CRS/170 conforming to AS 1160. *</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Type</td>
<td>Suitability with bituminous/asphaltic surfacing</td>
<td>Base type</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Wearing surface</td>
<td>No wearing surface</td>
</tr>
<tr>
<td>White pigmented wax emulsion Class A Type 2. *</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Debonding bitumen sprayed seal with 7 mm aggregate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes:
* For paving in NSW from November to March, use a Type 2 compound which contains a titanium dioxide reflective pigment. At all other times, use a Type 1-D compound.

3.7 STEEL REINFORCEMENT

General
Standard: To AS/NZS 4671.
Grade, type and size: As shown on the drawings.
Surface condition: Free from loose mill scale, rust, grease, mud, mortar or any other material which would reduce the bond between the reinforcement and the concrete.
Certification: Provide test certificates for the steel reinforcement to AS/NZS 4671.
Activity type: WITNESS POINT.
Bar chairs: Plastic bar chairs or plastic tipped wire chairs capable of withstanding a load of 200 kg mass on the chair for one hour at 23 ± 5°C without malfunction.
Galvanised bars: Hot dipped to AS/NZS 4680.

3.8 CONCRETE QUALITY REQUIREMENTS

Compressive strength
Minimum compressive strength:
- At 7 days: 4 MPa.
- At 28 days: 5 MPa.
Maximum compressive strength:
- At 28 days: 15 MPa.
- For drying shrinkage less than 400 µε: 20 MPa.
Testing: To TESTING OF CONCRETE FOR COMRESSIVE STRENGTH.

Drying shrinkage
Standard: To AS 1012.13.
Maximum drying shrinkage after 21 days air drying:
- 450 µε if maximum aggregate size > 20 mm.
- 550 µε if maximum aggregate size ≤20 mm.

Consistency
Standard: To AS 1012.3.1.
Slump range:
- For mechanically placed concrete: 25 mm to 40 mm.
- For hand placed concrete: 50 mm to 65 mm.
Slipform concrete mix: Vebe reading of the trial mix to AS 1012.3.3.

Air content
Standard: To AS 1012.4.2.
Maximum air content of fresh concrete: 5.0 ± 2.0%.
Special circumstances
Approval: If concrete qualities do not conform to the above, provide approval before ordering concrete.

3.9 CONCRETE FOR SUBGRADE BEAMS

General
Strength: 32 MPa normal class to conform to AS 1379.
Aggregate size: Maximum nominal size 20 mm.
Slump at the point of placement: 50 to 80 mm.

3.10 BINDER CONTENT FOR LEAN MIX CONCRETE

General
Binder content: The hydraulic, cementitious binder content to conform to the following table:

<table>
<thead>
<tr>
<th>Mix Category</th>
<th>Flyash (kg/m³)(1)</th>
<th>Cement (kg/m³)(1)</th>
<th>Total binder (kg/m³)(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subbase</td>
<td>100 minimum</td>
<td>90 minimum</td>
<td>250 minimum</td>
</tr>
</tbody>
</table>

(1) per yielded cubic metre of concrete

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

General
Requirement: Conform to 1101 Control of traffic.

4.2 SITE ESTABLISHMENT

Subgrade survey
Measure the subbase invert levels: If the underlying layer is required to be spray sealed, take levels on the top of the seal and after removal of foreign or loose material such as aggregate.
Method: Report levels to the nearest mm and survey on 5.0 m grid on a plan area.
Requirement: Submit work-as-executed survey of the subgrade to the full extent of the works.
Highlight any locations where the actual level is higher than the design levels.
Submission type: HOLD POINT.
Non-conforming levels: In the case of non-conforming levels, locally redesign the pavement levels as directed by the Superintendent.

4.3 TRIAL LEAN MIX CONCRETE SUBBASE

Construction
Requirement: Before starting the paving works, construct a trial section of lean mix concrete subbase as follows:
- Incorporate the trial section into the subbase works.
- Construct separate trial sections for each subbase type.
- Length:
  - 50 m to 100 m for mechanical placing.
  - 15 m to 50 m for manual placement.
- Width: Same as proposed for the work.
Materials and methods: Construct the trial lean mix concrete subbase using the materials, concrete mix, equipment and methods for the entire subbase works.
Inspection: Notify the Superintendent for inspection of the completed trial lean mix concrete subbase.
Approval: Obtain approval of the trial section before starting the remaining works.
Inspection type: HOLD POINT.
Deficient trial section
Assessment: If there are deficiencies in the trial concrete subbase, review the method, equipment, materials and personnel and submit a report.
Submission type: HOLD POINT.

Non-conforming trial section
General: If the trial concrete subbase is not approved, conform to the following:
- Submit changes proposed for construction of the new trial section including the equipment, materials, mix, plant or rate of paving.
- Remove the non-conforming subbase and make good any damage caused by such removal.
- Construct the new trial subbase in conformance with REMOVAL AND REPLACEMENT OF SUBBASE.

Inspection type: HOLD POINT.

4.4 PRODUCTION, TRANSPORT AND DELIVERY OF CONCRETE

General
Standard: To AS 1379.

Concrete production and transport
General: Submit, at least 4 weeks prior to commencing work, the proposed work methods for the following:
- Handling, storing and batching of materials for concrete.
- Monitoring and measuring the constituent materials for concrete.
- Mixing and transport of concrete.

Submission type: HOLD POINT.

Concrete delivery
Delivery dockets: For each batch of mix, keep record of the following delivery information:
- Supplier name and location.
- Volume of material supplied.
- Product constituents.
- Dispatch time and date.

Inspection type: WITNESS POINT.

Delivery time limits: After addition of the cement to the aggregate, concrete to be incorporated into the works within:
- 90 minutes if transported by truck mixer or agitator.
- 60 minutes if transported by non-agitating trucks.

4.5 SUBGRADE BEAMS

General
Location: Provide below the subbase at expansion joints and isolation joints in the concrete base as shown in the drawings or as directed. Construct subgrade beams before the subbase.

Inspection type: WITNESS POINT.

Extent: Full length of joints or as shown on the drawings.

Excavation
Dimensions and levels: Excavate to the dimensions shown on the drawings. Finish the top surface of the subgrade beam level with the top of the subgrade.

Method: Remove all loose material and trim the vertical faces to neat lines. Re-compact the bottom of the trench as required, to the degree of consolidation of the adjacent undisturbed material.

Inspection type: WITNESS POINT.

Concrete
Minimum compressive strength at 28 days: 32 MPa.

Steel reinforcement
Conform to the following:
- Reinforcement dimensions and shapes as shown on the drawings.
- Bent to an internal bend radius at least twice the diameter of the bar.
- Do not bend or straighten in a manner that will damage the material.
- Do not use with kinks or bends not shown on the drawings.
- Do not heat for the purpose of bending.

Bar splicing: Fabricate all reinforcement in the lengths indicated on the drawings. Splice to conform to the drawings. Obtain approval for any additional splicing by location and method.

Plan lengths: Conform to the following for length of lapped splices for unhooked bars not shown on the drawings shall be as follows:

- Plain bars, Grade 250: 40 bar diameters.
- Deformed bars, Grade 500: 40 bar diameters.
- Hard-drawn wire: 50 bar diameters.
- Reinforcement fabric: Overlap between the outermost wire in each sheet of fabric transverse to the direction of the splice greater than the pitch of the transverse wires plus 25 mm.

Lapped splices: The ends of the bars forming a lapped splice must be welded or securely wired together in at least 2 places. Welding to conform to AS/NZS 1554.3.

On-site bending: Do not use heat for bending of reinforcement.

Construction and protection

Voids: If any loose material is removed, fill the voids with mortar or concrete and screed to provide a surface flush with the top of the subgrade beam.

Finish: Use a steel float to produce a smooth surface finish, free of any texture.

Protection: Protect from damage by plant, motor vehicles and the paving operation.

Curing: Cure the top surface of the subgrade beam before placing the subbase.

Bond breaker: Apply to the top surface of the subgrade beam, 24 to 72 hours before placing of subbase concrete.

4.6 CONCRETE PLACING AND FINISHING

Equipment and methods

Proposal: Submit, at least 4 weeks prior to commencing work, the full details of the equipment and methods proposed for placing and finishing the concrete subbase, together with a paving plan showing proposed paving widths, sequence and estimated daily outputs.

Submission type: HOLD POINT.

Notice: Give notice before construction of the subbase on any section of work including the trial subbase.

Inspection type: WITNESS POINT.

Consistency

Requirement: Supply concrete of a homogeneous, dense and non-segregated mass with low bleeding. If bleed water flows over the slab edge, cease paving until the mix is redesigned and approved.

Concrete edges: Construct edges with no sag or tear.

Consistency check: Perform slump test on each truckload of concrete.

Slump tolerances:
- ± 10 mm for slipformed concrete.
- ± 15 mm for manually placed concrete.

Test results: Provide all consistency test results.

Inspection type: WITNESS POINT.

Ground surface conditions

General: Provide ground surface for the concrete subbase that is damp, clean and free of loose or foreign matter and compacted.

Inspection type: WITNESS POINT.

Ambient conditions

Air temperature: If the air temperature in the shade is below 10°C or above 30°C, protect the concrete from cold or hot weather. Provide detailed proposals for protection of concrete in cold or hot weather.

Concrete temperature limits: 5°C to 35°C.

Rain: In case of rain, protect the concrete from rain damage and provide detailed proposals for protection procedures.
Inspection type: **WITNESS POINT.**
Records: Measure and record concrete temperature and wind velocity at the point of concrete placement throughout the course of the work.
Equipment: Provide and maintain all equipment necessary for such measuring and recording.

**Evaporation and moisture loss**
Evaporation limit: Take precautionary measures when the value of rate of evaporation, as determined from the **Rate of evaporation graph**, exceeds 0.50 kg/m²/hr. Obtain approval for the measures used or cease work.
Inspection type: **WITNESS POINT.**

Evaporation retarder: If an evaporation retarder is used to prevent excessive moisture loss, apply by fine spray after all finishing operations are complete, except minor manual bull-floating. Re-application of evaporation retarder after level floating may be directed as required.

**Rate of evaporation graph**

Using the **Rate of evaporation graph**
Information: The graph shows the effects of air temperature, humidity, concrete temperature and wind velocity on the rate of evaporation of water from freshly placed and unprotected concrete.
Example: To determine the evaporation rate from the graph using air temperature at 27°C, relative humidity at 40%, concrete temperature at 27°C and a wind velocity of 26 km/h:
- Enter the graph at the air temperature of 27°C.
- Move vertically to intersect the curve for relative humidity encountered 40%.
- Move horizontally to the respective line for concrete temperature of 27°C.
- Move vertically down to the respective wind velocity curve and interpolate for 26 km/hour.
- Then move horizontally to the left to intersect the scale for the rate of evaporation.
- The rate of evaporation would be 1.6 kg/m²/hour in this example.

**Paving in general**

Surface finish:
- Generally: Steel screed or float finish.
- For asphaltic base or concrete base with bitumen seal: Hessian dragged finish.
- For concrete base without bitumen seal: Smooth surface without dimpling, ridges or recesses.

Base slab anchors: During construction of the subbase, make provision for the construction of base slab anchors at the locations shown on the drawings.

**Inspection type:** WITNESS POINT.

**Paving continuity**

Continuity: Make sure the supply of concrete and the concrete paving operation are continuous so that the mechanical paver is not stopped due to lack of concrete.

Disruptions: If disruptions occur in mechanical or hand paving, form a construction joint before restarting the paving operations. The cost of forming such construction joints shall be borne by the Contractor.

**Inspection type:** WITNESS POINT.

**Mechanical paving**

Paver machine: Conform to the following:
- A self-propelled machine with a gross operating mass of not less than 4 tonnes per lineal metre of paved width.
- Capable of paving at a speed of one metre per minute or less as required to enable the continuous operation of the paver and obtain the required degree of compaction.
- Include an automatic control system with a sensing device to control line and level to the specified tolerances.
- Able to spread the mix uniformly and regulate the flow of mix to the vibrators without segregation of the components.
- Contain internal vibrators capable of compacting the full depth of the concrete.
- Contain an adjustable extrusion screed and/or conforming plate to form the slab profile and produce the required finish on all surfaces.
- Capable of paving in the slab widths or combination of slab widths and slab depths shown on the drawings.

Supporting surface: Provide a supporting surface for the tracks of the paver, curing machine and any other equipment in the paving and curing train to be in a smooth and firm condition.

**Hand placing**

Restriction: Use hand placement only in areas where mechanical placement is not practical. Obtain approval before starting the works.

Formwork: Provide formwork as follows:
- Designed and constructed so that it can be removed without damaging the concrete.
- True to line and grade.
- Braced to support wet concrete.
- Mortar tight.
- Prevents adhesion of concrete to the forms.

Placing in forms: Deliver concrete in agitator trucks and deposit uniformly in the forms without segregation.

Compaction: Compact the concrete by poker vibrators and by two passes only of a hand-guided vibratory screed traversing the full width of the slab on each pass.

Build-up: Prevent any build-up of concrete between the forms and vibratory screed.

Standby vibrators: Require minimum of 1 standby vibrator and ¼ of the vibrator number in use.

Vibrators: Not less then 1 internal vibrators for each 10 m³ of concrete placed per hour. For paving widths greater than 2.5 m a minimum of 2 vibrators must be used.
Screed: Compact and finish the slab by at least 2 passes of a hand guided vibratory screed traversing the full width of the slab on each pass.

**Alignment and surface tolerances**

Outer edge: Construct outer edges of the subbase to be square to the subgrade and 50 mm wider than the plan position of the base formation with a tolerance of ±25 mm.

Longitudinal construction joint: If an edge of a slab is to form a longitudinal construction joint line to conform to **Longitudinal construction joints** for the allowable horizontal alignment tolerances.

Subbase tolerance: +0 mm to −20 mm deviation from the design level.

Finished surface tolerance: ±5 mm deviation from a 3 m straight edge.

Remedial works: Remove concrete found to be above level. If concrete is found to be below level tolerance, make it up with base concrete.

Inspection type: **WITNESS POINT**.

**Acceptance criteria for subbase thickness**

Subbase survey: Perform survey level runs after the placement of subbase, taken on a 5 m grid on the plan area. Round off the measurements to the nearest 5 mm.

Subbase thickness determination: Assess the subbase thickness by comparing the subbase survey to **SITE ESTABLISHMENT, Subgrade survey**.

Requirement: Submit work as executed survey of the subbase to the full extent of works. Highlight locations where the actual level is higher or lower than the design levels.

Submission type: **HOLD POINT**.

Verification of subbase thickness: Cut concrete cores from the pavement edge if directed by the Superintendent.

Accepted tolerance: Accept subbase which is 10 mm or less below the theoretical thickness if represents isolated sections within a lot and such sections comprise less than 5% of the area of the lot.

Non-conforming thickness: After making due allowance for the tolerances, remove the subbase which is more than 20 mm below the theoretical thickness. Cost borne by the Contractor.

Inspection type: **WITNESS POINT**.

**Protection of work**

Traffic restrictions: Do not allow traffic or construction equipment, other than that associated with testing, on the subbase until the strength of the subbase has reached at least 4.0 MPa.

Damage: Rectify any damage caused to the subbase.

**4.7 JOINTS**

**General**

Inspection: Inspect the location and condition of all joints.

Inspection type: **WITNESS POINT**.

**Transverse construction joints**

General: Conform to the following:
- Do not scabble.
- Provide only at discontinuities in the placement of concrete determined by paving operations.
- Construct normal to the edge line and as shown on the drawings.
- 10 mm maximum deviation from a 3 m straightedge with due allowances for any planned curvature.
- Make smooth across the joint.

**Longitudinal construction joints**

General: Conform to the following:
- Do not scabble.
- Form within 100 mm of the base longitudinal joints or as shown in the drawings.
- 20 mm maximum deviation from the plan or nominated position.
- 10 mm maximum deviation from a 3 m straightedge with due allowances for any planned curvature.
- Make smooth across the joint.
- Make perpendicular to the subgrade surface.
4.8 CURING AND DEBONDING

Application of curing compound
Application method: Fine spray immediately following the surface finishing.

Minimum application rate: As stated on the certificate of conformance or at the following rates, whichever rate is the greater.
  - Generally: 0.2 litres/m²
  - Bitumen emulsion: 0.5 litres/m² of residual bitumen.
  - Hand application: Increase the rates by 25%.

Calculations of application rate: Calculate the amount of curing compound applied to a measured area of a lot nominated by the Superintendent.

Inspection type: **WITNESS POINT**.

Requirement: If the base consists of asphaltic concrete, do not use wax emulsion curing compounds.

Curing period: Maintain the curing membrane intact for seven days after placing the concrete.

Damage: Make good any damage to the curing membrane by hand spraying of the affected areas.

Application of bond breaker
Preparation: Immediately before the application of bond breaker, clean the subbase surface of all loose, foreign and deleterious material.

Application rate: Minimum of 0.2 litres/m².

Timing: Apply the bond breaker within the following time frame:
  - After the subbase has achieved strength of 4.0 MPa.
  - After the subbase level schedules have been completed.
  - Within 49 days of placement of the subbase or within 14 days of the achievement of strength conformity, whichever occurs first.
  - After the curing compound is applied.
  - Minimum 72 hours before placement of the base.

Type of curing compound: If wax emulsion is used, make sure this is the same wax emulsion as used for curing.

4.9 CONCRETE CRACKING

Typical subbase cracks
Definition: Full-depth transverse cracks continuous for the full width of the paving run at approximately 3-15 m centres.

Remedial work: Not required.

Plastic shrinkage cracks
Definition: Discrete cracks of length less than 300 mm and a depth less than 50 % of the slab thickness that do not intersect a formed edge.

Remedial work: To **Corrective action**.

Additional longitudinal and transverse cracks
Definition: Other than typical subbase cracks and plastic shrinkage cracks with cumulative length of cracking in excess of 2 m in any 25 m² area of subbase.

Remedial work: To **Corrective action**.

Corrective action
Strain alleviating membrane strip: Apply 300 mm minimum width geotextile backed polymer modified bitumen strip over the crack before the placement of the first asphalt base layer or concrete base.

Installation: To manufacturer's recommendations and AGPT04G.

Wax emulsion: Provide double application of wax emulsion for a width of 300 mm along the crack when a concrete base is required.

Non-conforming concrete
Criteria: Remove and replace subbase if one or more of the following occurs:
  - Transverse cracks over 300mm in length at average spacing of less than 2 m over a length of 5 metres.
  - Longitudinal cracks for a contiguous length exceeding 5 m.
- Cracks over 300 mm in length within a distance of 1.5 m from a construction joint, isolation joint or free edge.

Inspection type: **WITNESS POINT.**

**Treatment of spalling**
Preparation of subbase: Immediately before the treatment, clean the subbase surface of all loose, foreign and deleterious material to the satisfaction of the Superintendent. Wet the area and sprinkle with neat cement.
Inspection type: **WITNESS POINT.**

Treatment method: If the spalled area is greater than 10 mm deep and 15 mm wide infill the area with 6:1 sand/cement mortar and screed the surface flush with the surrounding concrete.

Spalling repair time: Complete treatment no earlier than five working days before the application of the bond breaker.

Costs: To be borne by the Contractor.

**4.10 TESTING OF CONCRETE FOR COMPRESSIVE STRENGTH**

**Sampling, curing and testing of fresh concrete**
Method of sampling: AS 1012.1.
Sampling locations: Take samples from the delivery vehicles or from concrete deposited ready for placement.
Minimum frequency of sampling: To AS 1379 and the following:
- At least one sample for the concrete being placed at one time.
- At least one sample for each lot.
Inspection type: **HOLD POINT.**

Moulding: Mould at least two test specimens from each sample to AS 1012.8.1. Supply the number of moulds required for the documented frequency of testing.
Curing: Carry out initial curing on site between 18 to 36 hours. Inspect, cap and mark specimens for identification before sending to testing laboratory.
Transport: Do not transport specimens within 3 hours of being cast.
Testing of specimens: Test each specimen for compressive strength to AS 1012.9.
Test authority: NATA registered laboratory.

Compressive strength of each sample: Average compressive strength of the two specimens taken from the sample and tested at the same age.

**Age of specimens: 28 days or 7 days (as required by the Conditions of Development Consent).**

Adjustment due to age: If specimens are tested at more than 28 days after moulding, obtain the equivalent 28 day compressive strength by dividing the test compressive strength by the factor shown in the Concrete age conversion factors table. For intermediate ages determine the factor by interpolation.

**Concrete age conversion factors table**

<table>
<thead>
<tr>
<th>Age of specimen at time of test (days)</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>1.00</td>
</tr>
<tr>
<td>35</td>
<td>1.02</td>
</tr>
<tr>
<td>42</td>
<td>1.04</td>
</tr>
<tr>
<td>49</td>
<td>1.06</td>
</tr>
<tr>
<td>56</td>
<td>1.08</td>
</tr>
<tr>
<td>70</td>
<td>1.10</td>
</tr>
<tr>
<td>84</td>
<td>1.12</td>
</tr>
<tr>
<td>112</td>
<td>1.14</td>
</tr>
<tr>
<td>140</td>
<td>1.16</td>
</tr>
<tr>
<td>168</td>
<td>1.18</td>
</tr>
<tr>
<td>196</td>
<td>1.20</td>
</tr>
<tr>
<td>224</td>
<td>1.22</td>
</tr>
</tbody>
</table>
Acceptance criteria
Assessment process of test results: Project assessment to AS 1379.
Reports and records of test results: To AS 1012. Submit test results and keep copies on site.
Submission type: HOLD POINT.
Average compressive strength of samples representing the lot: To CONCRETE QUALITY REQUIREMENTS, Compressive strength.
Non-conforming concrete: Perform coring test to Testing by specimens cut from the work
Testing by specimens cut from the work
General: If the subbase concrete strength is non-conforming, request permission to core the in situ subbase for testing of the actual compressive strength representing the particular lot.
Testing authority: NATA registered laboratory nominated by the Contractor.
Specimens’ characteristics:
- Shape: Cylindrical cores.
- Preferred dimension of cores: 100 mm diameter.
- Minimum dimension of cores: 75 mm diameter or two and one half times the nominal size of the coarse aggregate, whichever is the greater.
- Tolerance in uncapped state: 5 mm.
- Minimum length: Same as the core diameter.
Frequency of coring: One core for each lot or one core for the area of subbase placed between any two consecutive construction joints, whichever is the lesser. Nominate the lot represented by each core at the time of sampling and record before testing.
Coring procedure: Carry out core cutting in the presence of and at the locations nominated by the Superintendent.
Inspection type: WITNESS POINT.
Curing of cores: Despatch cores to arrive at the testing laboratory within 24 hours of the core being cut from the subbase. Start wet curing within 24 hours of the receipt of the cores.
Test method: To AS 1012.14 and the following:
- Adjust the test strength determined for form by a factor to conform to Core strength factor table.
- Only wet use wet conditioning.
Core strength factor table

<table>
<thead>
<tr>
<th>Length/diameter ratio</th>
<th>Correction factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1.75</td>
<td>0.98</td>
</tr>
<tr>
<td>1.50</td>
<td>0.96</td>
</tr>
<tr>
<td>1.25</td>
<td>0.93</td>
</tr>
<tr>
<td>1.00</td>
<td>0.89</td>
</tr>
</tbody>
</table>
Interpolate factors for intermediate form ratios.

Costs: To be borne by the Contractor.

Remedial work after coring
Restoration: Advise proposed method of restoration.
Inspection type: WITNESS POINT.
Acceptance criteria for cored concrete
Equivalent 28 days compressive strength of the specimens cut from work: To CONCRETE QUALITY REQUIREMENTS, Compressive strength.
Test results: Submit the test results for approval.
Submission type: HOLD POINT.
Non-conforming concrete: To REMOVAL AND REPLACEMENT OF SUBBASE.

4.11 REMOVAL AND REPLACEMENT OF SUBBASE

General
Non-conforming subbase: Remove rejected subbase and replace to conform to this clause. Replace rejected subbase, which extends more than 25 m longitudinally by mechanical means unless the slabs are odd-shaped or mismatched.
Proposed method: Submit details of the proposed methods of carrying out the work that will prevent damage to the adjoining subbase.

Submission type: HOLD POINT.

Subbase sawcuts
Transverse sawcut:
- Make a transverse sawcut the full depth of the subbase layer at each end of the section of subbase to be removed.
- Make the sawcut normal to the control line.
- Do not over-saw into the adjoining base or underlying sub base.

Longitudinal sawcuts:
- Locate the cut 150–300 mm offset from planned longitudinal contraction joints in the overlying base.
- Do not to extend more than 250 mm past the transverse sawcut at each end of the section to be removed.

Over-sawing: Do not over-saw on any additional internal sawcuts made to aid the removal of the subbase.

Removal and replacement
Disposal: Dispose the removed subbase slabs.
Damage to adjoining pavement: Remove and replace any pavement adjacent to the original area of rejected subbase damaged by the operations.

Inspection type: WITNESS POINT.
Replacement of bondbreaker: After construction of the replacement subbase, prepare and debond the pavement in conformance with this workssection.

4.12 LIMITS AND TOLERANCES

Application
Summary: The limits and tolerances applicable to this workssection are summarised in Summary of limits and tolerances table.

Summary of limits and tolerances table

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/Tolerances</th>
<th>Worksection clause/subclause</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials for concrete</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properties for coarse aggregates</td>
<td>To the Coarse aggregate properties table</td>
<td>AGGREGATES, Additional properties for coarse aggregate</td>
</tr>
<tr>
<td>Aggregates grading</td>
<td>Deviation from submitted sample not greater than Fine aggregate grading table</td>
<td>AGGREGATES, Additional properties for fine aggregate</td>
</tr>
<tr>
<td>Concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drying Shrinkage at 21 days:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Maximum aggregate size &gt; 20 mm</td>
<td>maximum 450 με</td>
<td>CONCRETE QUALITY REQUIREMENTS, Drying shrinkage</td>
</tr>
<tr>
<td>- Maximum aggregate size ≤ 20 mm</td>
<td>maximum 500 με</td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Limits/Tolerances</td>
<td>Worksection clause/ subclause</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Consistency</td>
<td>Mechanically placed: 25 mm - 40 mm Hand placed: 50 mm - 65 mm</td>
<td>CONCRETE QUALITY REQUIREMENTS Consistency</td>
</tr>
<tr>
<td>Air content</td>
<td>3% to 7%</td>
<td>CONCRETE QUALITY REQUIREMENTS Air content</td>
</tr>
<tr>
<td>Thickness</td>
<td>Remove concrete if thickness &gt; 20 mm below documented thickness.</td>
<td>CONCRETE PLACING AND FINISHING Acceptance criteria for subbase thickness</td>
</tr>
<tr>
<td>Mixing and transport</td>
<td>After addition of cement to the aggregate incorporate concrete into the work within: 90 minutes where transported by truck mixer or agitator 60 minutes where transported by non agitating trucks PRODUCTION, TRANSPORT AND DELIVERY OF CONCRETE Concrete delivery</td>
<td></td>
</tr>
<tr>
<td>Placing</td>
<td>Protect concrete when the air temperature in the shade is &lt; 10°C or &gt; 30°C.</td>
<td>CONCRETE PLACING AND FINISHING Ambient conditions</td>
</tr>
<tr>
<td></td>
<td>Protect concrete when the Rate of Evaporation exceeds 0.50 kg/m²/h.</td>
<td>CONCRETE PLACING AND FINISHING Evaporation and moisture loss</td>
</tr>
<tr>
<td>Alignment and surface tolerances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal alignment</td>
<td>Outer edges not to deviate from plan position by more than ± 25 mm.</td>
<td>CONCRETE PLACING AND FINISHING Alignment and surface tolerances</td>
</tr>
<tr>
<td>Vertical alignment - subbase</td>
<td>Level on top surface: ± 0 mm to - 20 mm deviation from that shown on the drawings.</td>
<td></td>
</tr>
<tr>
<td>Surface finish</td>
<td>Top surface: ± 5 mm deviation from a 3 m straightedge laid in any direction</td>
<td></td>
</tr>
<tr>
<td>Joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transverse construction joints</td>
<td>± 10 mm deviation from a 3 m straight edge.</td>
<td>JOINTS, Transverse construction joints</td>
</tr>
<tr>
<td>Longitudinal construction joints</td>
<td>- ± 20 mm deviation from the plan or nominated position. -± 10 mm deviation from a 3 m straight edge placed along the joint after allowing for any curvature.</td>
<td>JOINTS, Longitudinal construction joints</td>
</tr>
<tr>
<td>Bond breaker</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 5 MEASUREMENT AND PAYMENT

**Note:** This item is an Optional condition for Development. Required for Council Project.

#### 5.1 MEASUREMENT

**General**
Payments made to the Schedule of Rates: To 0152 Schedule of rates – supply projects, this worksection, the drawings and Pay items 1132.1 to 1132.5 inclusive.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

**Methodology**
The following methodology will be applied for measurement and payment:
- The cost of all work, materials and equipment is included in the schedule rate for each Pay Item.

Concrete and steel reinforcement for subgrade beams is measured and paid to conform to this worksection. Base slab anchors are measured and paid to conform to 1133 Plain and reinforced concrete base.

#### 5.2 PAY ITEMS

<table>
<thead>
<tr>
<th>Pay items</th>
<th>Unit of measurement</th>
<th>Schedule rate scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1132.1 Supply and place concrete in subbase</td>
<td>m³ of concrete in place. Volume calculated from width, length and depth shown on drawings or directed by Superintendent.</td>
<td>All costs associated with all documentation and approvals and the supply and placing of concrete subbase in place including construction joints.</td>
</tr>
<tr>
<td>1132.2 Finish and cure subbase</td>
<td>m³ of subbase. Area calculated from width, length and depth shown on drawings or directed by Superintendent. Do not include sides of slabs in area calculation.</td>
<td>All costs associated with the finishing and curing of the subbase.</td>
</tr>
<tr>
<td>1132.3 Crack treatment by stress alleviating membrane strip (for asphalt base)</td>
<td>Linear metre of strip. Length is actual length measured on site.</td>
<td>All costs associated with the supply and installation of membrane strip.</td>
</tr>
<tr>
<td>1132.4 Bond breaker</td>
<td>m² of bond breaker. Area based on actual length measured on site and design width shown on drawings. Take no account of tolerances.</td>
<td>All costs associated with the supply and installation of bond breaker.</td>
</tr>
<tr>
<td>1132.5 Subgrade beams</td>
<td>m³ of concrete. Volume determined from width, length, and depth shown on drawings or as directed by Superintendent.</td>
<td>All costs associated with the supply, placing and installation of concrete and reinforcing steel for subgrade beams.</td>
</tr>
</tbody>
</table>