

PLANS AND DOCUMENTS  
referred to in the PDA  
DEVELOPMENT APPROVAL

Approval no: DEV2023/1411

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# O2LA STANDARD LANDSCAPE SPECIFICATION

## HARDWORKS AND SOFTWORKS

LS002

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### LANDSCAPE ARCHITECT

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| <b>TABLE OF CONTENTS</b> |
|--------------------------|

|                                                      |     |
|------------------------------------------------------|-----|
| Table of contents .....                              | 2   |
| 0171b General requirements .....                     | 3   |
| 0172 Environmental management .....                  | 10  |
| 0181 Adhesives, sealants and fasteners.....          | 16  |
| 0183 Metals and prefinishes.....                     | 21  |
| 0185 Timber products, finishes and treatment.....    | 25  |
| 0195p DTAC tactile indicators and stair edgings..... | 29  |
| 0201 Demolition .....                                | 32  |
| 0221 Site preparation .....                          | 36  |
| 0222 Earthwork .....                                 | 40  |
| 0223 Service trenching .....                         | 47  |
| 0224 Stormwater – site.....                          | 54  |
| 0241 Landscape – walling and edging .....            | 59  |
| 0242 Landscape – fences and barriers .....           | 63  |
| 0251 Landscape – soils.....                          | 67  |
| 0252 Landscape – natural grass surfaces .....        | 74  |
| 0253 Landscape – planting.....                       | 79  |
| 0254 Irrigation .....                                | 83  |
| 0256b Landscape – establishment .....                | 88  |
| 0259 Landscape – maintenance.....                    | 92  |
| 0261 Landscape – furniture and fixtures .....        | 97  |
| 0262 External sports and playground surfacing.....   | 98  |
| 0271 Pavement base and subbase .....                 | 104 |
| 0274 Concrete pavement .....                         | 109 |
| 0275 Paving – mortar and adhesive bed .....          | 121 |
| 0277 Pavement ancillaries .....                      | 126 |
| 0310 Concrete – combined .....                       | 130 |
| 0331 Brick and block construction.....               | 146 |
| 0332 Stone masonry.....                              | 154 |
| 0344 Steel – hot-dip galvanized coatings .....       | 163 |
| 0345 Steel – protective paint coatings .....         | 165 |
| 0382 Light timber framing.....                       | 170 |
| 0383 Sheet flooring and decking .....                | 174 |
| 0671 Painting .....                                  | 179 |



**0171B GENERAL REQUIREMENTS****1 GENERAL****1.1 DESIGN**

Conflict with the documents: If it is believed that a conflict exists between statutory requirements and the documents, notify the contract administrator immediately and provide a recommendation to resolve the conflict.

**1.2 PRECEDENCE****General**

Order of precedence:

- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

**1.3 CROSS REFERENCES****General**

- 0221 *Site preparation*
- 0224 *Stormwater - site*
- 0252 *Landscape – natural grass surfaces*
- 0253 *Landscape - planting*
- 0254 *Irrigation*
- 0256b *Landscape - establishment*
- 0259 *Landscape - maintenance*

**Cross referencing styles**

General: Within the text, titles are cross referenced using the following styles:

- Worksection titles are indicated by *Italicised text*.
- Subsection titles are indicated by **BOLD** text.
- Clause titles are indicated by **BOLD** text.
- Subclause titles are indicated by **Bold** text.

**1.4 REFERENCED DOCUMENTS****General**

Contractual relationships: Responsibilities and duties of the principal, contractor and contract administrator are not altered by requirements in the documents referenced in this specification.

Current editions: Use referenced documents which are the editions, with amendments, current 3 months before the closing date for tenders, except where other editions or amendments are required by statutory authorities.

**1.5 INTERPRETATION****Documentation conventions**

Imperative mood and streamlined language: The words shall or shall be are implied where a colon is used following a keyword or within a sentence or sentence fragment.

Subject of sentences and phrases: Specification requirements are to be performed by the contractor, unless stated otherwise.

**Abbreviations**

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

- AS: Australian Standard.
- BCA: National Construction Code Series Volume One: Building Code of Australia Class 2 to 9 Buildings and Volume Two: Building Code of Australia Class 1 and Class 10 Buildings.
- EN: European Norm (European Standard).
- GRP: Glass Reinforced Plastic.

- IP: Ingress protection.
- NATA: National Association of Testing Authorities.
- NCC: National Construction Code.
- NZS: New Zealand Standard.
- PCA: National Construction Code Series Volume 3: Plumbing Code of Australia.
- PVC: Polyvinyl Chloride.
- PVC-U: Unplasticised Polyvinyl Chloride. Also known as UPVC.
- SDS: Safety data sheets.
- VOC: Volatile Organic Compound.
- WHS: Work Health and Safety.

**Definitions**

General: For the purposes of this specification, the following definitions apply:

- Access for maintenance: Includes access for maintenance, inspection, measurement, operation, adjustment, repair, replacement and other maintenance related tasks.
- Accessible, readily: Readily accessible, easily accessible, easy access and similar terms mean capable of being reached quickly and without climbing over or removing obstructions, using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform.
- Accredited Testing Laboratory:
  - . An organisation accredited by the National Association of Testing Authorities (NATA) to test in the relevant field; or
  - . An organisation outside of Australia accredited to undertake the relevant tests by an authority recognised by NATA through a mutual recognition agreement; or
  - . An organisation recognised as being an Accredited Testing Laboratory under legislation at the time the test was undertaken.
- Attendance: Attendance, provide attendance and similar expressions mean give assistance for examination and testing.
- Contract administrator: Has the same meaning as architect or superintendent and is the person appointed by the owner or principal under the contract.
- Contractor: Has the same meaning as builder and is the person or organisation bound to carry out and complete the work under the contract.
- Default: Specified value, product or installation method which is to be provided unless otherwise documented.
- Design life: The period of time for which it is assumed, in the design, that an asset will be able to perform its intended purpose with only anticipated maintenance but no major repair or replacement being necessary.
- Documented: Documented, as documented and similar terms mean contained in the contract documents.
- Economic life: The period of time from the acquisition of an asset to the time when the asset, while still physically capable of fulfilling its function and with only anticipated maintenance, ceases to be the lowest cost alternative for satisfying that function.
- 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 contract administrator.
- Local (government) authority: A body established for the purposes of local government by or under a law applying in a state or territory.
- Manufacturer's recommendations: Recommendations, instructions, requirements, specifications (and similar expressions) provided in written or other form by the manufacturer and/or supplier relating to the suitability, use, installation, storage and/or handling of a product.
- Obtain: Obtain, seek and similar expressions mean obtain (seek) in writing from the contract administrator.
- Pipe: Includes pipe and tube.
- Practical completion or defects free completion: The requirements for these stages of completion are defined in the relevant building contract for the project.

- 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.
- Proprietary: Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
- Provide: Provide and similar expressions mean supply and install and include development of the design beyond that documented.
- Record drawings: Record drawings has the same meaning as as-installed drawings, as-built drawings and work-as-executed drawings.
- Referenced documents: Standards and other documents whose requirements are included in this specification by reference.
- Required: Required by the contract documents, the local council or statutory authorities.
- If required: A conditional specification term for work which may be shown in the documents or is a legislative requirement.
- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Statutory authority: A public sector entity created by legislation, that is, a specific law of the Commonwealth, State or Territory.
- Subcontractor: A person or organisation, other than the principal, having a contract with the contractor for the provision of part of the works.
- Supply: Supply, furnish and similar expressions mean supply only.
- Tests – completion: 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.
- Tests – pre-completion: Tests carried out before completion tests, including:
  - . Production: Tests carried out on a purchased item, before delivery to the site.
  - . Progressive: Tests carried out during installation to demonstrate performance in conformance with this specification.
  - . Site: Tests carried out on site.
  - . Type: Tests carried out on an item identical with a production item, before delivery to the site.
- Tolerance: The permitted difference between 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 CONTRACT DOCUMENTS

### Services diagrammatic layouts

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.

### Levels

General: Spot levels take precedence over contour lines and ground profile lines.

### Drawings and manuals for existing services

Warranty: No warranty is given as to the completeness or accuracy of drawings and/or manuals of existing services.

## 1.7 SUBMISSIONS

### Requirement

General: Submit the following:

- Authority approvals: Notes of meetings with authorities whose requirements apply to the work and evidence that notices, fees and permits have been sought and paid, that authority connections are

complete and that statutory approvals by the authorities whose requirements apply to the work have been received.

- Certification: Certification of conformance to documented requirements.
- Design documentation: Design data and certification of proposed work, if required and as documented.
- Execution details: Execution programs, schedules and details of proposed methods and equipment.
- Marking and labelling: Samples and schedules of proposed marking and labels to **EXECUTION, MARKING AND LABELLING**.
- Operation and maintenance manuals: For the whole of the work to **EXECUTION, OPERATION AND MAINTENANCE MANUALS**.
- Products: Products and materials data, including manufacturer's technical specifications and drawings, type tests results, evidence of conformance to product certification schemes, performance and rating tables and installation and maintenance recommendations.
- Records: As-built documents, photographs, system diagrams, schedules and logbooks to **EXECUTION, RECORD DRAWINGS**.
- Samples: Representative of proposed products and materials and including proposals to incorporate samples into the works, if any to **EXECUTION, SAMPLES**.
- Substitutions: To PRODUCTS, **GENERAL, Substitutions**.
- Tests:
  - . Inspection and testing plan consistent with the construction program including details of test stages and procedures.
  - . Test reports for testing performed under the contract.
- Warranties: To **EXECUTION, WARRANTIES**.

Contractor review: Before submissions, review each submission item and check for coordination with other work of the contract and conformance to contract documents.

Submit to: Contract Administrator

#### **Submission times**

Default timing: Make submissions at least 5 working days before ordering products or starting installation of the respective portion of the works.

#### **Identification**

Requirement: Identify the project, contractor, subcontractor or supplier, manufacturer, applicable product, model number and options, as appropriate and include relevant contract document references. Include service connection requirements and product certification.

Non-conformance: Identify proposals that do not conform with project requirements, and characteristics which may be detrimental to successful performance of the completed work.

#### **Errors**

Requirement: If a submission contains errors, make a new or amended submission as appropriate, indicating changes made since the previous submission.

#### **Electronic submissions**

Electronic copies file format: CAD file format: CAD files in AutoCAD .dwg format using an agreed layering and drawing convention.

#### **Hard copy submissions**

Hard copy quantity: Standard contract drawing size

### **1.8 INSPECTION**

#### **Notice**

Concealment: If notice of inspection is required for parts of the works that are to be concealed, advise when the inspection can be made before concealment.

Tests: Give notice of the time and place of documented tests.

Minimum notice: Unless otherwise advised at least 5 working days

#### **Light levels**

Requirements: To AS/NZS 1680.2.4.

#### **Attendance**

General: Provide attendance for documented inspections and tests.

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## 2 PRODUCTS

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### 2.1 GENERAL

#### Manufacturers' or suppliers' recommendations

General: Provide and select, if no selection is given, transport, deliver, store, handle, protect, finish, adjust and prepare for use the manufactured items in conformance with the recommendations of the manufacturer or supplier.

Proprietary items/systems/assemblies: Assemble, install or fix to substrate in conformance with the recommendations of the manufacturer or supplier.

Project modifications: Advise of activities that supplement, or are contrary to the recommendations of the manufacturers or supplier.

#### Product identification

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.

Other products: Marked to show the following, as applicable:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

#### Prohibited materials

General: Do not provide the following:

- Materials, exceeding the limits of those listed, in the Safe Work Australia *Hazardous Chemical Information System* (HCIS).
- Materials that use chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) in the manufacturing process.

#### Substitutions

Identified proprietary items: Identification of a proprietary item does not necessarily imply exclusive preference for the identified item, but indicates the necessary properties of the item.

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

- Evidence that the performance is equal to or greater than that specified.
- Evidence of conformity to a cited standard.
- Samples.
- Essential technical information, in English.
- 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 cost implications including costs outside the contract.
- Statement of consequent alterations to other parts of the works.

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 consistent with the contract documents and is as effective as the identified item, detail or method.

### 2.2 MATERIALS AND COMPONENTS

#### Consistency

General: For each material or product use the same manufacturer or source and provide consistent type, size, quality and appearance.

### 3 EXECUTION

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#### 3.1 SAMPLES

##### General

Incorporation of samples: Only incorporate samples in the works which have been endorsed for inclusion. Do not incorporate other samples.

Retention of samples: Keep endorsed samples in good condition on site, until the date of practical completion.

Unincorporated samples: Remove on completion.

#### 3.2 OFF-SITE DISPOSAL

##### Removal of material

General: Dispose of building waste material off site to the requirements of the relevant authorities.

#### 3.3 SERVICES CONNECTIONS

##### Connections

General: Connect to network distributor services or service points. Excavate to locate and expose connection points. Reinstate the surfaces and facilities that have been disturbed.

##### Network distributors' requirements

General: If the network distributor elects to perform or supply part of the works, make the necessary arrangements. Install equipment supplied, but not installed, by the authorities.

#### 3.4 SERVICES INSTALLATION

##### General

Fixing: If non-structural building elements are not suitable for fixing services to, fix directly to structure and trim around holes or penetrations in non-structural elements.

Installation: Install equipment and services plumb, fix securely and organise reticulated services neatly. Allow for movement in both structure and services.

Concealment: Unless otherwise documented, conceal all cables, ducts, trays and pipes except where installed in plant spaces, ceiling spaces and riser cupboards. If possible, do not locate on external walls.

Arrangement: Arrange services so that services running together are parallel with each other and with adjacent building elements.

##### Temporary capping

Pipe ends: During construction protect open ends of pipe with metal or plastic covers or caps.

##### Piping

General: Install piping in straight lines at uniform grades without sags. Arrange to prevent air locks. Provide sufficient unions, flanges and isolating valves to allow removal of piping and fittings for maintenance or replacement of plant.

Spacing: Provide at least 25 mm clear between pipes and between pipes and building elements, additional to insulation.

Changes of direction: Provide long radius elbows or bends and sets where practicable, and swept branch connections. Provide elbows or short radius bends where pipes are led up or along walls and then through to fixtures. Do not provide mitred fittings.

Vibration: Arrange and support piping so that it remains free from vibration whilst permitting necessary movements. Minimise the number of joints.

Valve groupings: If possible, locate valves in groups.

#### 3.5 PLANT AND EQUIPMENT

##### General

Location: Locate so that failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents including water sensitive equipment or finishes.

Safe tray and an overflow pipe: Provide to each tank, hot water heater and storage vessel.

### 3.6 MARKING AND LABELLING

#### General

Requirement: Mark and label services and equipment for identification purposes as follows:

- Locations exposed to weather: Provide durable materials.
- Pipes, conduits and ducts: To AS 1345 throughout its length, including in concealed spaces.
- Cables: Label to indicate the origin and destination of the cable.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

#### Label samples and schedules

Submission timing: Before marking or labelling.

Schedule: For each item or type of item include the following:

- A description of the item or type of item for identification.
- The proposed text for marking or labelling.
- The proposed location of the marking and labelling.

#### Labels and notices

Label locations: Locate labels so that they are easily seen and are either attached to, below or next to the item being marked.

### 3.7 WARRANTIES

#### General

Requirement: If a warranty is documented, name the principal as warrantee. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Warranty period: Start warranty periods at acceptance of installation.

Approval of installer: If installation is not by manufacturer, and product warranty is conditional on the manufacturer's approval of the installer, submit the manufacturer's written approval of the installing firm.

### 3.8 RECORD DRAWINGS

#### General

Requirement: Show the following:

- Installed locations of services
- Off-the-grid dimensions and depth if applicable.
- Any provisions for the future.

#### Recording, format and submission

Progress recording: Keep one set of drawings on site at all times, expressly for the purpose of marking changes made during the progress of the works.

Drawing layout: Use the same borders and title block as the contract drawings.

Quantity and format: Conform to **SUBMISSIONS**.

Endorsement: Sign and date all record drawings.

Accuracy: If errors in, or omissions from, the record drawings are found, amend the drawings and re-issue in the quantity and format documented for **SUBMISSIONS**.

Date for submission: Not later than 2 weeks after the date for practical completion.

### 3.9 CLEANING

#### Final cleaning

General: Before the date for practical completion, clean throughout, including all exterior surfaces except those totally and permanently concealed from view.

Labels: Remove all labels not required for maintenance.

**0172 ENVIRONMENTAL MANAGEMENT****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide environmental management, as documented.

**Management and control plans**

Implementation: To approved management plans.

**Management and control measures**

Implementation: To the documented management and control measures.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 INTERPRETATION****Abbreviations**

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

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

**Definitions**

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

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

**1.4 SUBMISSIONS****1.5 INSPECTION****Notice**

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

- Non-conforming items, e.g. ground contamination.
- Completed removal or rectification of non-conforming items.



- Unexpected finds.

## 2 ENVIRONMENTAL ADMINISTRATION, MONITORING AND REPORTING

### 2.1 PROCEDURAL AND PERSONNEL

#### Legislative environmental control requirements

##### Community liaison

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

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

Notification content:

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

##### Emergency response

Emergency response personnel: Provide staff names and contact details.

##### Complaints

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

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

##### Unexpected finds

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

### 2.2 MONITORING

#### Internal monitoring

Documentation: Provide descriptions of the following:

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

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

Internal monitoring personnel: Provide staff names and contact details.

Machinery and equipment: Provide details of proposed plant.

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

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

### 2.3 REPORTING

#### General

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

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

- Summary of corrective actions where required.
- Unexpected finds.

### 3 ENVIRONMENTAL MANAGEMENT

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#### 3.1 ENVIRONMENTAL MANAGEMENT PLAN

##### Control plan

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

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

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

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

##### Control measures

#### 3.2 SOIL EROSION AND SEDIMENT CONTROL

##### Control plan

Plan: Prepare a soil erosion and sediment control plan to protect natural stormwater drainage systems from sedimentation by minimising soil erosion and sediment transportation. Include the following details:

- Staging of operations and sequence of works.
- Diversion of upstream water around the site.
- Provision of temporary drains and catch drains.
- Erosion control measures.
- Sediment control measures.
- Stormwater control measures, including diversion, dispersal and/or retention to control and dissipate stormwater throughout the site without damage.
- Maintenance procedures for control measures.
- Progressive restoration of disturbed areas.

Extent: All site areas, access and haulage tracks, borrow pits, stockpile and storage areas and compound areas.

**Control measures**

Requirement: Protect natural and stormwater drainage systems from sedimentation by minimising soil erosion and sediment transportation.

Maintenance of controls: Check control measures, minimum daily and following storms, and rectify as required.

Extent: All site areas, access and haulage tracks, borrow pits, stockpile and storage areas and compound areas.

**3.3 WASTE MANAGEMENT****Control plan**

Plan: Prepare a waste management control plan to minimise solid waste generated by construction activities and to dispose of the solid waste. Include the following details:

- Major waste streams.
- For each waste stream describe the following:
  - . Location.
  - . Disposal method.
  - . Transport method.
  - . Storage method.

**Control measures**

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

Major waste streams that will be generated during the works:

- Vegetation waste.
- Construction waste, including:
  - . Spoil.
  - . Demolition waste.
  - . Asphalt or bitumen.
  - . Concrete.
  - . Metal.
  - . Hazardous materials including paint.
  - . Office waste.
  - . Kitchen waste.

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

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

**3.4 GROUND CONTAMINATION****Control plan**

Plan: Prepare a ground contamination control plan for land suspected of being contaminated or the presence of acid sulphate soil is found, in conformance with the state Environmental Protection Authority (EPA) and the relevant state planning guidelines. Include the following details:

- Preliminary investigation.
- Detailed investigation.
- Site Remedial Action Plan (RAP).
- Stockpile sites.
- Site auditing and reporting procedures.
- Record of maintenance procedures, including record of remediation work, certificates issued and restrictions placed on the site.

**Control measures**

Requirement: Prevent environmental impacts of ground contamination and acid sulphate soils.

Stockpile sites: Locate on previously cleared areas.

**3.5 WEED MANAGEMENT****Control plan**

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

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

**Control measures**

Requirement: Prevent the growth and spread of weeds.

**3.6 AIR QUALITY****Control plan**

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

- Dust control.
- Exhaust gases emission control.

**Control measures**

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

Prohibition: Do not light fires.

**3.7 WATER QUALITY****Control plan**

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

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

**Control measures**

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

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

Washout: Prevent washout from entering waterways or stormwater drains.

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

Water disposal: Dispose off-site.

**3.8 NOISE CONTROL AND VIBRATION****Control plan**

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

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

**Control measures**

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

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

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

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

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

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

Monitoring: Provide the following:

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

### 3.9 FLORA AND FAUNA

#### Control plan

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

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

#### Control measures

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

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

Tree pruning: To AS 4373.

Provision of alternative habitat:

- Material: Felled trees and excavated rocks.

### 3.10 CULTURAL AND ABORIGINAL HERITAGE

#### Control plan

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

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

#### Control measures

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

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

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

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

**0181 ADHESIVES, SEALANTS AND FASTENERS****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide adhesives, sealants and fasteners, as documented.

**Performance**

Requirements: Conform to the following:

- Fitness for purpose: Capable of transmitting imposed loads, sufficient to maintain the rigidity of the assembly, or integrity of the joint.
- Finished surface: That will not cause discolouration.
- Compatibility: Compatible with the products to which they are applied.
- Sealant replacement: Capable of safe removal without compromising the application of the replacement sealant for future refurbishment.
- Movement: If an adhered or sealed joint is subject to movement, select a system certified to accommodate the projected movement under the conditions of service.
- Fasteners: Suitable for the particular use, capable of transmitting imposed loads and maintaining the rigidity of the assembly.

**1.2 PRECEDENCE****General**

Order of precedence:

- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- *0171 General requirements.*

**1.4 SUBMISSIONS****Products and materials**

Sealants: Submit technical data sheets.

Adhesives and sealants: Submit safety data sheets (SDS).

**Samples**

Visible joint sealants: Submit colour samples.

**Tests**

Compatibility testing: Submit adhesion and compatibility testing data demonstrating that adhesive, sealant or fastener is compatible with materials to be fixed and is suitable for the project conditions.

**Warranties**

Manufacturer's warranty: Submit the manufacturer's published product warranties.

**1.5 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of prepared joints and penetrations for each sealant application included in the **Installed sealant tests schedule**.

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## 2 PRODUCTS

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### 2.1 ADHESIVES

#### Standards

Gypsum plaster adhesive: To AS 2753.

#### High strength adhesive tape

General description: A foam of cross linked polyethylene or closed cell acrylic coated both sides with a high performance acrylic adhesive system, encased in release liners of paper or polyester.

Product classification: Select tape to suit substrate as follows:

- Firm high strength foam tapes: For high energy surfaces including most bare metals such as stainless steel and aluminium.
- Conformable high strength foam: For the following:
  - . Medium energy surfaces including many plastics and paints, and bare metals.
  - . Lower energy surfaces including many plastics, most paints and powder coatings, and bare metals.

Thickness: Select the tape to make sure a mismatch between surfaces does not exceed half the tape thickness under the applied lamination pressure.

### 2.2 SEALANTS

#### Standards

General: To ISO 11600.

#### External masonry joints

General: Provide sealant and bond breaking materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed-cell or impregnated, not water-absorbing.

#### Lightweight building element joints

Joints subject to rapid changes of movement: Provide sealants that accommodate the movement of the contact materials.

#### Floor control joints

General: Provide trafficable sealants.

Bond breaking backing:

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed-cell or impregnated, not water-absorbing.

### 2.3 FASTENERS

#### General

Masonry anchors: Proprietary expansion or bonded type anchors conforming to **SELECTIONS, ANCHORS**.

Plain washers: To AS 1237.1.

- Provide washers to the heads and nuts of bolts, and the nuts of coach bolts.

Plugs: Proprietary purpose-made plastic.

Stainless steel fasteners: To ASTM A240/A240M.

Steel nails: To AS 2334.

- Length: At least 2.5 times the thickness of the member being secured, and at least 4 times the thickness if the member is plywood or building board less than 10 mm thick.

Unified hexagon bolts, screws and nuts: To AS/NZS 2465.

Fasteners in CCA treated timber: Epoxy coated or stainless steel.

#### Bolts

Coach bolts: To AS/NZS 1390.

Hexagon bolts Grades A and B: To AS 1110.1.

Hexagon bolts Grade C: To AS 1111.1.

**Corrosion resistance**

Atmospheric corrosivity category: To 0171 General requirements.

Steel products: Conform to the **Corrosion resistance table** or provide proprietary products with metallic and/or organic coatings of equivalent corrosion-resistance.

**Corrosion resistance table**

| Atmospheric corrosivity category to AS 4312                                          | Threaded fasteners and anchors           |                                               | Powder actuated fasteners |
|--------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------|---------------------------|
|                                                                                      | Material                                 | Minimum local metallic coating thickness (µm) | Material                  |
| C1 and C2                                                                            | Electroplated zinc or Hot-dip galvanized | 30                                            | Stainless steel Type 316  |
| C3                                                                                   | Hot-dip galvanized                       | 50                                            | Stainless steel Type 316  |
| C4                                                                                   | Stainless steel Type 316                 | -                                             | Stainless steel Type 316  |
| Note: For categories C5, CX and T to the AS/NZS 2312 series, seek specialist advice. |                                          |                                               |                           |

**Finishes**

Electroplating:

- Metric thread: To AS 1897.
- Imperial thread: To AS 4397.

Galvanizing:

- Threaded fasteners: To AS/NZS 1214.
- Other fasteners: To AS/NZS 4680.

Mild steel fasteners: Galvanize if:

- Embedded in masonry.
- In external timbers.
- In contact with chemically treated timber other than CCA treated timber.

Epoxy coated: CCA treated timber.

**Nuts**

Hexagon chamfered thin nuts Grades A and B: To AS 1112.4.

Hexagon nuts Grade C: To AS 1112.3.

Hexagon nuts Style 1 Grades A and B: To AS 1112.1.

Hexagon nuts Style 2 Grades A and B: To AS 1112.2.

**Screws**

Coach screws: To AS/NZS 1393.

Hexagon screws Grades A and B: To AS 1110.2.

Hexagon screws Grade C: To AS 1111.2.

Hexagon socket screws: To AS 1420.

Self-drilling screws: To AS 3566.1.

Self-tapping screws:

- Crossed recessed countersunk (flat – common head style): To AS/NZS 4407.
- Crossed recessed pan: To AS/NZS 4406.
- Crossed recessed raised countersunk (oval): To AS/NZS 4408.
- Hexagon: To AS/NZS 4402.
- Hexagon flange: To AS/NZS 4410.
- Hexagon washer: To AS/NZS 4409.
- Slotted countersunk (flat – common head style): To AS/NZS 4404.
- Slotted pan: To AS/NZS 4403.
- Slotted raised countersunk (oval – common head style): To AS/NZS 4405.



**Blind rivets**

Description: Expanding end type with snap mandrel.

Type: Closed end for external application, open end for internal application.

End material:

- Aluminium base alloy for metallic-coated or prepainted steel.
- Stainless steel for stainless steel sheet.
- Copper for copper sheet.

Size:

- For sheet metal to sheet metal: 3 mm.
- For sheet metal to supports, brackets and rolled steel angles: 4.8 mm.

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### 3 EXECUTION

#### 3.1 ADHESIVES

**General**

Requirement: Install to the manufacturer's recommendations.

**Preparation**

Substrates: Conform to the following:

- Remove any deposit or finish which may impair adhesion.
- If framed or discontinuous, provide support members in full lengths without splicing.
- If solid or continuous, remove excessive projections.
- If previously painted, remove cracked or flaking paint and lightly sand the surface.

**Contact adhesive**

Precautions: Do not use contact adhesive if:

- A substrate is polystyrene foam.
- A PVC substrate may allow plasticiser migration.
- The adhesive solvent can discolour the finished surface.
- Dispersal of the adhesive solvent is impaired.

Two-way method: Immediately after application, press firmly to transfer adhesive and then pull both surfaces apart. Allow to tack off and then reposition and press firmly together. Tap areas in contact with a hammer and padded block.

One-way method: Immediately after application, bring substrates together and maintain maximum surface contact for 24 hours by clamps, nails or screws as appropriate. If highly stressed, employ permanent mechanical fasteners.

**High strength adhesive tape**

Preparation:

- Non-porous surfaces: Clean with surface cleaning solvents such as isopropyl alcohol/water, wash down and allow to dry.
- Porous surfaces: Prime the surface with a contact adhesive compatible with the tape adhesive system.

Application to copper, brass, plasticised vinyl and hydrophilic surfaces such as glass and ceramics in a high humidity environment: Conform to manufacturer's recommendations.

Applied lamination pressure: Make sure the tape experiences 100 kPa.

Application temperature: Generally above 10°C and to the manufacturer's recommendations.

Completion: Do not apply loads to the assembly for 72 hours at 21°C.

#### 3.2 JOINT SEALING

**General**

Requirement: Install to the manufacturer's recommendations.

**Joint preparation**

Cleaning: Cut flush joint surface protrusions and rectify if required. Mechanically clean joint surfaces free of any deposit or finish which may impair adhesion of the sealant. Immediately before sealant application, remove loose particles from the joint, using oil-free compressed air.

Bond breaking: Install bond breaking backing material.

Taping: Protect the surface on each side of the joint using 50 mm wide masking tape or equivalent means. On completion of sealant application, remove the tape and remove any stains or marks from adjacent surfaces.

Primer: Apply the recommended primer to the surfaces in contact with sealant materials.

#### **Sealant joint proportions**

General weatherproofing joints (width:depth):

- 1:1 for joint widths less than 12 mm.
- 2:1 for joint widths greater than 12 mm.

#### **Sealant application**

General: Apply the sealant to dry joint surfaces using a pneumatic applicator gun. Make sure the sealant completely fills the joint to the required depth, provides good contact with the full depth of the sides of the joint and traps no air in the joint. Do not apply the sealant outside the recommended working time for the material or the primer.

#### **Weather conditions**

Two pack polyurethanes: Do not apply the sealant if ambient conditions are outside the following:

- Temperature: Less than 5°C or greater than 40°C.
- Humidity: To the manufacturer's recommendations.

#### **Joint finish**

General: Force the sealant into the joint and finish with a smooth, slightly concave surface using a tool designed for the purpose.

Excess sealant: Remove from adjoining surfaces using cleaning material nominated by the sealant manufacturer.

#### **Protection**

General: Protect the joint from inclement weather during the setting or curing period of the material.

#### **Rectification**

General: Cut out and remove damaged portion of joint sealant and reinstall so repaired area is indistinguishable from undamaged portion.

### **3.3 TESTING**

#### **Installed sealant tests**

Sampling: For each sealant test, take 3 samples of installed and cured sealant, each at least 50 mm long, from completed joints.

Reinstatement: Repair-as-new the joints from which the samples were taken.

#### **Installed sealant tests schedule**

| Item to be tested | Property to be tested | Applicable standard |
|-------------------|-----------------------|---------------------|
|                   |                       |                     |
|                   |                       |                     |
|                   |                       |                     |

### **3.4 FASTENERS**

#### **General**

Requirement: Install to the manufacturer's recommendations.

#### **Fastening to wood and steel**

Timber substrates: To AS 1720.1 Section 4.

Self-drilling screws: To AS 3566.1 for timber and steel substrates.

#### **Masonry anchors**

Installation: To the manufacturer's recommendations.

**0183 METALS AND PREFINISHES****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirements: Provide metal and prefinishes, as documented.

**Performance**

Requirement: Provide metals in sections of strength and stiffness suited to their required function, finish and method of fabrication.

**1.2 PRECEDENCE****General**

Order of precedence:

- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 General requirements.

**1.4 SUBMISSIONS****Samples**

General: Submit samples of the following:

- Stainless steel: One sample of every documented surface finish.
- Anodising: One sample of every colour and finishing option.

**2 PRODUCTS****2.1 METALS****Aluminium and aluminium alloys**

Drawn pipe: To AS/NZS 1867.

Drawn rod, bar and strip: To AS/NZS 1865.

Extrusions: To AS/NZS 1866.

Plate and sheets: To AS/NZS 1734.

**Coated steel**

Electrogalvanized (zinc) coating on ferrous hollow and open sections: To AS 4750.

Metallic-coated: Steel coated with zinc or aluminium-zinc alloy as follows:

- Ferrous open sections by an in-line process: To AS/NZS 4791.
- Ferrous hollow sections by a continuous or specialised process: To AS/NZS 4792.
- Metallic-coated steel sheet: To AS 1397. Metal thicknesses specified are base metal thicknesses.

Steel wire: To AS/NZS 4534.

**Copper and copper alloys**

Casting: To AS 1565.

Plate, sheet and strip: To AS 1566.

Rods, bars and sections: To AS/NZS 1567.

Composition and designations: To AS 2738.

**Stainless steel**

Bars: To ASTM A276/A276M.

Plate, sheet and strip: To ASTM A240/A240M.

Welded pipe (plumbing applications): To AS 1769.

Welded pipe (round, square, rectangular): To ASTM A554.

### **Steel**

Sheet: To AS/NZS 1595.

Structural bars and sections: To AS/NZS 3679.1.

Structural hollow sections: To AS/NZS 1163.

### **Steel for prefinishes**

Cold rolled bar: To AS 1443 - Bright.

Cold rolled sheet: To AS/NZS 1595.

- Designation: CA2S-E.

Electric resistance welded tube: To AS 1450.

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## **3 EXECUTION**

### **3.1 GENERAL**

#### **Metal separation**

Incompatible sheet metals: Prevent direct contact between incompatible metals. Provide separation by one of the following:

- Apply an anti-corrosion low moisture transmission coating such as alkyd zinc phosphate primer or aluminium pigmented bituminous paint to contact surfaces.
- Insert a concealed, non-metallic separation layer such as polyethylene film, adhesive tape, neoprene, nylon or bituminous felt.

Incompatible fixings: Do not use.

Incompatible service pipes: Install lagging or grommets. Do not use absorbent, fibrous or paper products.

#### **Brazing**

General: Make sure brazed joints have sufficient lap to provide a mechanically sound joint.

Butt joints: Do not use butt jointing for joints subject to load. If butt joints are used, do not rely on the filler metal fillet only.

Filler metal: To AS/NZS 1167.1.

#### **Finishing**

Visible joints: Finish visible joints made by welding, brazing or soldering using methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanizing or electroplating. Make sure self-finished metals are without surface colour variations after jointing.

#### **Preparation**

General: Before applying decorative or protective prefinishes to metal components, complete welding, cutting, drilling and other fabrication, and prepare the surface using a suitable method.

Standard: To AS 1627 series.

Priming steel surfaces: If site painting is documented to otherwise uncoated mild steel or similar surfaces, prime as follows:

- After fabrication and before delivery to the works.
- After installation, repair damaged priming and complete the coverage to unprimed surfaces.

#### **Welding**

Aluminium: To AS/NZS 1665.

Stainless steel: To AS/NZS 1554.6.

Steel: To AS/NZS 1554.1.

### **3.2 STAINLESS STEEL FINISHES**

#### **General**

Requirement: Provide a surface finish to match the approved sample.

**Pre-assembly**

Bead blasted finish: Provide a uniform non-directional low reflective surface by bead blasting. Do not use sand, iron or carbon steel shot. Blast both sides of austenitic stainless steel to equalise induced stress.

**Post-assembly pre-treatment**

Heat discolouration: Remove by pickling.

Welds: Grind excess material, brush, and polish to match the pre-assembly finish.

**Post-assembly finish**

Electropolish finish for external installations: Provide an electro-chemical process to stainless steel type 316.

Brushed electropolish finish: Conform to the following:

- Pre-assembly finish: No. 4 brushed finish.
- Post-assembly finish: Provide an electro-chemical processed finish to achieve a No. 7 to No. 8 brushed finish.

Mirror electropolish finish:

- Pre-assembly finish: Mill finish 2B or mirror polished finish.
- Post-assembly finish: Provide an electro-chemical processed finish to achieve a No. 8 mirror like finish.

**Completion**

Cleaning: Clean and rinse to an acid free condition and allow to dry. Do not use carbon steel abrasives or materials containing chloride.

Protection: Secure packaging or strippable plastic sheet.

**3.3 NON-FERROUS FINISHING****Mechanical finishes**

Bright finished copper alloy surfaces: For indoor applications, apply a clear lacquer protective coating.

**3.4 ELECTROPLATING****Electroplated coatings**

Chromium on metals: To AS 1192.

- Service condition number: At least 2.

Nickel on metals: To AS 1192.

- Service condition number: At least 2.

Zinc on iron or steel: To AS 1789.

**3.5 ANODISING****General**

Standard: To AS 1231.

Thickness grade: To AS 1231 Table H1.

**Sample**

General: Provide a finish to match the sample in terms of colour and finishing options.

**3.6 METAL SPRAYING****Metal spray**

Standard: To ISO 2063.2.

Minimum thicknesses:

- Indoor applications: 125 µm.
- Outdoor applications: 175 µm.

Process: Electric arc.

Seal coat: Cover the metal spray finish with two coats of vinyl seal to a total dry film thickness of 80 µm.

**3.7 PREPAINTING****Air-drying enamel**

Application: Spray or brush.

Finish: Full gloss.

General use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.
- Top coats: 2 coats to AS 3730.6.

Oil resistant use:

- Primer: Two-pack epoxy primer to AS/NZS 3750.13.
- Top coats: 2 coats to AS/NZS 3750.22.

#### **Equipment paint system**

Description: Brush or spray application using paint as follows:

- Full gloss enamel finish coats, oil and petrol resistant: To AS/NZS 3750.22, two coats.
- Prime coat to metal surfaces generally: To AS/NZS 3750.19 or AS/NZS 3750.20.
- Prime coat to zinc-coated steel: To AS 3730.15 or AS/NZS 3750.16.
- Undercoat: To AS/NZS 3750.21.

#### **Prepainted metal products**

Standard: To AS/NZS 2728.

Product type as noted in AS/NZS 2728: Not lower than the type appropriate to the documented atmospheric corrosivity category.

#### **Stoving enamel**

Application: Spray or dip.

#### **Two-pack liquid coating**

Application: Spray.

Finish: Full gloss.

Primer: Two pack epoxy primer to AS/NZS 3750.13.

Topcoat:

- Internal use: Proprietary polyurethane or epoxy acrylic system.
- External use: Proprietary polyurethane system.

### **3.8 COMPLETION**

#### **Damage**

Damaged prefinishes: Remove and replace items, including damage caused by unauthorised site cutting or drilling.

#### **Repair**

Metallic-coated sheet: If repair is required to metallic-coated sheet or electrogalvanizing on inline galvanized steel products, clean the affected area and apply a two-pack organic primer to AS/NZS 3750.9.

**0185 TIMBER PRODUCTS, FINISHES AND TREATMENT****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide timber products with finishes and treatments, as documented.

**Performance**

Requirements:

- Appropriate for durability and fire-resistance.
- Appropriate certification for the finishing applications.

**1.2 PRECEDENCE****General**

Order of precedence:

- The requirements of other worksections of the specification override conflicting requirements of this worksection.
- The requirements of worksections override conflicting requirements of their referenced documents. The requirements of the referenced documents are minimum requirements.

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 *General requirements.*
- 0184 *Termite management.*
- 0671 *Painting.*

**1.4 STANDARDS****General**

Sawn and milled products:

- Hardwood: To AS 2796.1.
- Softwood: To AS 4785.1.

Reconstituted wood based panels:

- Particleboard: To AS/NZS 1859.1.
- Dry process fibreboard: To AS/NZS 1859.2.
- Decorative overlaid wood panels: To AS/NZS 1859.3.
- Wet process fibreboard: To AS/NZS 1859.4.

Plywood:

- Structural: To AS/NZS 2269.0.
- Interior: To AS/NZS 2270.
- Exterior: To AS/NZS 2271.
- Marine: To AS/NZS 2272.

Glued laminated timber: To AS/NZS 1328.1.

Laminated veneer lumber: To AS/NZS 4357.0.

**1.5 INTERPRETATION****Abbreviations**

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

- EWPA: Engineered Wood Products Association of Australasia.
- LVL: Laminated Veneer Lumber.
- MDF: Medium Density Fibreboard.

**Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 4491 and the following apply:

- Dry process fibreboard (MDF): Panel material with a nominal thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from a synthetic adhesive added to the fibres and the panels are manufactured with a forming moisture content of less than 20%.
- Particleboard: Panel material manufactured under pressure and heat from particles of wood (wood flakes, chips, shavings, sawdust and similar) and/or lignocellulosic material in particle form (flax shives, hemp hurds, bagasse fragments, rice hulls, wheat straw and similar) with the addition of an adhesive.
- Wet process fibreboard: Panel material with a nominated thickness of 1.5 mm or greater, manufactured from lignocellulosic fibres (derived from wood or other materials) with application of heat and/or pressure, the bond of which is derived from the felting of the fibres and the panels are manufactured with a forming moisture content greater than 20%.

**1.6 SUBMISSIONS****Products and materials**

Chain of custody of forest products: Submit the following as evidence of conformity to

**CERTIFICATION, Timber source certification:**

- Third party certification of supplier's chain of custody management system.
- Formal claim of chain of custody by supplier.

Pressure preservative treatment: For timber required to be pressure treated, submit a certificate or other evidence showing that the timber has been treated.

Treated timber: Submit safety data sheets (SDS) for preservative treated timber.

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**2 PRODUCTS****2.1 GENERAL****Storage and handling**

General: Deliver timber products to site in unbroken wrapping or containers and store so that the moisture content is not adversely affected.

**Product identification**

Preservative treated timber: Marking to include the following:

- A unique identifier for the treatment plant.
- A unique identifier for the preservative.
- Hazard class.

**2.2 CERTIFICATION****Timber source certification**

Requirement: Use timber products originating from sustainably managed forests.

**Engineered timber product certification and identification**

Branding: Brand timber products under the authority of a certification scheme applicable to the product. Locate the brand on faces or edges which will be concealed in the works.

Inspection: If neither branding nor certification is adopted, have an independent inspecting authority inspect the timber.

**2.3 FIRE-RESISTANCE****General**

Timber structures: To AS/NZS 1720.4.

**Bushfire prone areas**

Standard: To AS 3959 Appendix F.

**2.4 DURABILITY****General**

Requirement: Provide timbers with natural durability appropriate to the conditions of use, or preservative-treated timber of equivalent durability.



Natural durability class: To AS 5604.

Naturally termite-resistant timbers: To AS 3660.1 Appendix C.

Timber quality: Free of core wood (material within 50 mm of the tree's centre) and free of splits, checks, loose knots and cavities. Free of sapwood (lighter coloured wood found on the outer layer of the tree).

Lycid susceptible timbers: Do not provide untreated timbers containing lycid susceptible sapwood.

Untreated sapwood: If used, place to the outside of joints or in locations exposed to higher levels of ventilation.

#### **Preservative treatment**

Sawn and round timbers: To AS 1604.1.

Reconstituted wood-based products: To AS/NZS 1604.2.

Plywood: To AS/NZS 1604.3.

Laminated veneer lumber (LVL): To AS/NZS 1604.4.

Glued laminated timber products: To AS/NZS 1604.5.

#### **Moisture content**

Moisture content: [complete/delete]

Test: Methods as follows:

- Timber: To AS/NZS 1080.1.
- Plywood: To AS/NZS 2098.1.
- Reconstructed wood-based products: AS/NZS 4266.1.

Protection: Protect timber and timber products stored on site from moisture and weather. For milled, prefinished, prefabricated and similar elements that are to be protected in the final structure, provide temporary weather protection until the permanent covering is in place.

#### **Termite management**

Requirement: To 0184 *Termite management*.

## **2.5 FINISHING**

#### **Production finish**

Hardwood: To AS 2796.1 Table B1.

Softwood: To AS 4785.1 Table B1.

#### **Surface coating**

Painting and staining: To 0671 *Painting*.

Application: To the manufacturer's specification.

## **2.6 RECYCLED TIMBER**

#### **General**

Grit blasted or re-machined: Remove all nails and screws.

Classification: Visually graded.

## **3 EXECUTION**

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### **3.1 JOINTS**

#### **General**

Joints and connections: Use hot-dipped galvanized or stainless steel fasteners, composite bolts, nails or nailed metal connectors.

Timber-to-timber interfaces: Provide a seal coating of preservative treatment and include inside bolt holes and the end grain of the timber.

Water retention: Avoid details that may trap water including housed, checked or birdsmouth joints.

Fasteners: To prevent chemical treatments reacting with fasteners, install to manufacturer's recommendations.

### **3.2 SHRINKAGE RESTRAINT**

#### **General**

Requirement: Use seasoned timber, if possible, to avoid shrinkage restraint, particularly where timber elements are integrated with steel and/or concrete.

Moisture content: Use finishes and end-grain sealants to minimise moisture content changes.

Fasteners: Align fasteners along member axis and use single fasteners at joints.

Connections: Use connections that allow for movement without adversely affecting the performance of the connection.

Unseasoned timber: Provide as follows:

- Drill holes 10% oversize.
- Use species with similar shrinkage values to reduce movement and shrinkage.
- For framing provide adequate clearance at the top of masonry veneer and face fixed members to reduce vertical movement.

### **3.3 FINISHING**

#### **Ploughing**

General: Back plough boards liable to warp (e.g. if exposed externally on one face). Make the width, depth and distribution of ploughs appropriate to the dimensions of the board and degree of exposure.

#### **Painting**

Edges: Chamfer edges of work to receive paint or similar coatings.

Priming: For woodwork to be painted, prime hidden surfaces before assembly.

#### **Working with treated timber**

Safety: Handle preservative treated timber to the manufacturer's recommendations and to NOHSC 2003 and the recommendations of NOHSC 3007.

**0195P DTAC TACTILE INDICATORS AND STAIR EDGINGS****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide DTAC tactile indicators and edging, as documented.

**1.2 COMPANY CONTACTS****DTAC technical contacts**

Website: [www.dtac.com.au/contact](http://www.dtac.com.au/contact)

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 General requirements.

**1.4 STANDARDS****General**

Tactile indicators: To AS/NZS 1428.4.1.

Stair edging: To AS 1428.1.

**Slip resistance**

Classification: To AS 4586.

**1.5 MANUFACTURER'S DOCUMENTS****Technical manuals**

DTAC Tactile ground surface indicators: [www.dtac.com.au/product-category/tactile-ground-surface-indicators](http://www.dtac.com.au/product-category/tactile-ground-surface-indicators)

DTAC Stair & tread edging: [www.dtac.com.au/product-category/stair-treads-edging](http://www.dtac.com.au/product-category/stair-treads-edging)

DTAC Edge protector: [www.dtac.com.au/product-category/urban-products](http://www.dtac.com.au/product-category/urban-products)

**1.6 SUBMISSIONS****Products and materials**

Type tests: Submit results, as follows:

- Slip resistance of tactile indicators and edgings.
- Luminance contrast testing: Submit evidence of conformity to AS/NZS 1428.4.1 Appendix E and AS 1428.1 Appendix B.

**Prototypes**

General: Provide a prototype of the DTAC product installed in the finished substrate.

**Warranties**

Tactile indicators, edge protectors and stair edging: Submit DTAC product and installation warranties.

**1.7 INSPECTION****Notice**

Inspection: Give notice so that inspection may be made of the completed substrate ready for tactile indicators and edging installation.

**2 PRODUCTS****2.1 GENERAL****Product substitution**

Other products: Conform to PRODUCTS, **GENERAL**, **Substitutions** in 0171 General requirements.

## 2.2 DTAC TACTILE INDICATORS, EDGE PROTECTORS AND STAIR EDGING

### Warning tactile products

Classic: Tactile indicators with a concentric circle design machined or injection moulded on the horizontal face and a smooth outer edge.

Terraced: Tactile indicators with a concentric circle design machined or injection moulded on the horizontal face and a terraced slip-resistant outer edge.

Classic Colourmax: Tactile indicators with a concentric circle design machined on the type 316 stainless steel horizontal face with a smooth injection moulded UV stabilised thermoplastic urethane (TPU) outer edge.

Handrail button: Machined domed type 316 stainless steel button.

Ecotac™ Classic: Tactile indicators with a cupped underside, a concentric circle design machined on the type 316 stainless steel horizontal face and a smooth outer edge.

Ecotac™ Terraced: Tactile indicators with a cupped underside, a concentric circle design machined on the type 316 stainless steel horizontal face and a terraced slip-resistant outer edge.

Ultimat™ Tactile Classic: UV stabilised thermoplastic urethane (TPU) injection moulded tactile with Classic tactile indicators on the horizontal face.

### Directional tactile products

Ecotac™ Classic: Tactile indicator type 316 stainless steel with a cupped underside, a grooved design machined on the horizontal face and a smooth outer edge.

Ecotac™ Terraced: Tactile indicator type 316 stainless steel with a cupped underside, a grooved design machined on the horizontal face and a terraced slip-resistant outer edge.

Classic: UV stabilised thermoplastic urethane (TPU) injection moulded tactile with an undulating groove design on the horizontal face and a smooth outer edge.

### Integrated tactile products

Classic: Type 316 stainless steel plate with Classic tactile indicators integrated on the horizontal face.

Classic Black Top: Type 316 stainless steel plate with Classic Black tactile indicators integrated on the horizontal face.

### Edge protector

Round button: 35 mm diameter urban edge protector.

Bevelled button: 35 mm diameter urban edge protector.

Thin bar: 5 mm thick type 316 stainless steel bar.

Thick bar: 10 mm thick type 316 stainless steel bar.

### Stair edging products

Corduroy edging: Extruded aluminium sections with a continuous corduroy pattern.

Pinstripe edging: Extruded smooth, blunt edged aluminium sections with an intermittent high and low profile.

Pleat edging: Extruded smooth, aluminium sections with an intermittent continuous corduroy pattern.

Stitch edging: Extruded aluminium sections with a continuous stitch pattern.

Suede edging: Extruded anodised aluminium sections with a continuous band of silicon carbide.

Urban edging: Continuous band of silicon carbide inserted into anodised aluminium extrusions.

Urban edging - Mill finished aluminium: Intermittent striations of silicon carbide inserted into aluminium extrusions.

Rugged™ edging: Continuous band of fibre glass reinforced plastic extrusion.

## 3 EXECUTION ---

### 3.1 GENERAL

#### Substrate preparation and installation of DTAC products

Requirement: To DTAC's recommendations and fitting instructions.

Location: As documented.

Classic, Terraced and Classic Colourmax:

- Stone, masonry, timber or vinyl substrates: Drill and pressure fit.
- Carpet or carpet tile substrates: Drill and screw.

Handrail button: Drill and glue to substrate.

Ultimat™ Tactile: Direct stick to substrate with DTAC anchor adhesive.

Button and bar urban edge protector:

- Stone, masonry, timber or vinyl substrates: Drill and glue.
- Vitrified porcelain, ceramics, glass or metal substrates: Diamond core drill and glue.

### **Fixing stair edging**

Corduroy, Pinstripe, Pleat, Stitch, Suede:

- Stone, masonry, timber or vinyl substrates: Adhesive fix.
- Vitrified porcelain, ceramics, glass or metal substrates: Adhesive fix.
- Carpet or carpet tile substrates: Screw-fix or adhesive fix.

Urban and Rugged™: Screw-fix with optional adhesive.

## **3.2 TESTING**

### **Completion tests**

Slip resistance of completed installation: To AS 4663.

Luminance contrast testing of completed installation: Submit evidence of conformity to AS/NZS 1428.4.1 Appendix E and AS 1428.1 Appendix B.

## **3.3 COMPLETION**

### **Warranties**

Conditions: Installation by DTAC or DTAC approved by installer.

Warranty period: 2 years.

**0201 DEMOLITION****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Carry out demolition, as documented.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 STANDARDS****General**

Demolition: To AS 2601.

**1.4 INTERPRETATION****Definitions**

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

- Demolition: The complete or partial dismantling of a building or structure, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic or video and written record of the condition of the portion of the existing building retained, adjacent buildings, and other relevant structures or facilities, before the start of demolition work.
- Dismantle: The reduction of an item to its components in a manner to allow re-assembly.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

**1.5 SUBMISSIONS****Authority approvals**

Evidence of compliance: Before starting demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been obtained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Certification that each person having access to the construction site has completed site-specific WHS induction training.
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority.
- Fees and other costs have been paid.

**Execution details**

Requirement: Submit the following, as documented:

- Hazardous Substances Management Plan.
- Investigation and work plan.

Off-site disposal locations: Submit details of the proposed locations for the disposal of material required to be removed from the site, and evidence of conformance with the requirements of relevant authorities.

Recycling: Submit details of the proposed recycling facility.

- Certification: Submit evidence of delivery of recycled materials.
- Concrete crushing: If proposed on site, submit details of plant and environmental controls.

Stockpile locations: Submit details of the proposed locations of on-site stockpiles for demolished materials for recycling in the works. Coordinate with the locations for storage of other waste streams, and prevent mixing or pollution.

### Records

Dilapidation record:

- Before demolition: Submit to each owner of each adjacent property, a copy of the part of the record relating to that property and obtain their written agreement to the contents.
- Rectification work: Submit written acceptance of rectification works from the owner of each adjoining property affected.

### Tests

Requirement: Submit test results of compliance tests for building service components to be re-used.

## 1.6 INSPECTION

### Notice

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

- Adjacent structures before starting and at completion of demolition.
- Services before disconnection or diversion.
- Trees documented to be retained, before starting demolition.
- Contents of building before starting demolition.
- Structure after stripping and removal of roof coverings and external cladding.
- Underground structures after demolition above them.
- Excavations remaining after removal of underground work.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

## 2 PRODUCTS

### 2.1 DEMOLISHED MATERIALS

**Demolished material classes table**

| Class                                          | Requirement                                                                                                                    | Ownership            |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Recovered items for re-use in the works        | Recover without damage items identified in the <b>Recovered items for re-use in the works schedule</b>                         | Principal/proprietor |
| Recovered items for delivery to the principal  | Recover without damage items identified in the <b>Recovered items for delivery to the principal schedule</b>                   | Principal/proprietor |
| Demolished material for recycling in the works | Stockpile material identified in the <b>Demolished material for recycling in the works schedule</b>                            | Contractor           |
| Demolished material for recycling off-site     | Demolish and deliver for recycling material identified in the <b>Demolished material for recycling off-site schedule</b>       | Contractor           |
| Dismantle for relocation as part of the works  | Dismantle without damage and store items identified in the <b>Dismantle for relocation schedule</b>                            | Principal/proprietor |
| Demolish for removal                           | Remove from the site demolished materials identified in the <b>Demolish for removal schedule</b> . Do not burn or bury on site | Contractor           |

| Class | Requirement                                                  | Ownership |
|-------|--------------------------------------------------------------|-----------|
|       | Transit: Prevent spillage of demolished materials in transit |           |

### 3 EXECUTION

#### 3.1 HAZARDOUS SUBSTANCES

##### Identified hazardous substances

Register: Hazardous substances have been identified as present on site and a Hazardous substances register has been prepared.

Availability: [complete/delete]

##### Audit

Requirement: Prepare a Hazardous Substances Management Plan to AS 2601 clause 1.6.1. Include the following:

- Asbestos or material containing asbestos.
- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.
- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

##### Removal of hazardous substances

Standard: To AS 2601 clause 1.6.2.

#### 3.2 INVESTIGATION AND WORK PLAN

##### General

Requirement: Before demolition or stripping work, prepare the work plan to AS 2601 Section 2. Include the check list items appropriate to the project from AS 2601 Appendix A, and the following:

- Method of protection and support for adjacent property.
- Locations and details of service deviations and terminations.
- Sequence of work.
- If the demolition program results in components temporarily cantilevered, provide a certificate from a professional engineer.
- Proposals for the safe use of mobile plant on suspended structural members including provisions for the protection of lower floors in the event of structural failure.
- If implosion methods are proposed, provide a separate report of methods and safeguards.
- Wheel loads of tipping or loading vehicles.

#### 3.3 SUPPORT

##### Temporary support

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

##### Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.



### 3.4 PROTECTION

#### Encroachment

General: Prevent the encroachment of demolished materials onto adjoining property, including public places.

#### Weather protection

General: If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant, equipment and materials intended for re-use.

#### Dust protection

General: Provide dustproof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

#### Security

General: If walls or roofs are opened for alterations or additions, provide security against unauthorised entry to the building.

#### Temporary screens

General: Fill the whole of designated temporary openings or other spaces using dustproof and weatherproof temporary screens, fixed securely to the existing structure, and installed to shed water to avoid damage to retained existing elements or adjacent structures and contents.

Type: Timber framed screens sheeted with 12 mm plywood and painted. Seal the junctions between the screens and the openings.

#### Temporary access

General: If required, provide a substantial temporary doorset fitted with a rim deadlock, and remove on completion of demolition.

#### Exposed surfaces

General: Where necessary, protect and weatherproof the surfaces of adjacent structures exposed by demolition.

#### Existing services

Location: Before starting demolition, locate and mark existing underground services in the areas which will be affected by the demolition operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1 m of existing underground services.

#### Fixed items

#### Recovered items

General: If items are documented for recovery and re-use, minimise damage during removal and recover all associated components required for their re-use.

**0221 SITE PREPARATION****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide site preparation, as documented.

**Incidental works**

Generally: Undertake the following:

- Reinstatement: Reinstatement undeveloped ground surfaces to the condition existing at the commencement of the contract.
- Minor trimming: As required to complete the works, as documented.

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

Requirement: Conform to the following:

- 0171b General requirements.

**1.3 INTERPRETATION****Definitions**

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

- Authorities: Any authority or agency covering statutory requirements relating to the project, including clearances for work in that particular area.
- Clearances: A formal certificate, approval or condition issued by an authority to allow work to be carried out in a particular area.
- Network Utility Operator: The entity undertaking the piped distribution of drinking water or natural gas for supply or is the operator of a sewerage system or external stormwater drainage system.

**1.4 SUBMISSIONS****Execution details**

Requirement: Submit details of methods and equipment proposed for the following:

- Clearing and grubbing.
- Tree removal and transplanting.

**1.5 INSPECTION****Notice**

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

- Enclosures around trees to be retained.
- Trees to be removed.

**2 EXECUTION****2.1 EXISTING SERVICES****General**

Requirement: Before commencing earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not machine excavate within 1 m of existing underground services.

Existing service lines: If required, divert services detected during excavation to new routes, clear of the building, and reconnect to the Network Utility Operator's requirements.

## 2.2 SITE CLEARING

### Extent

Requirement: Clear only areas to be occupied by works such as structures, paving, excavation, regrading and landscaping or other areas designated to be cleared.

Contractor's site areas: If not included within the areas documented above, clear generally only to the extent necessary for the performance of the works.

### Clearing and grubbing

Clearing: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble.

Grubbing: Grub out stumps and roots over 75 mm diameter to a minimum depth of 500 mm below subgrade under buildings, embankments or paving, or 300 mm below finished surface in unpaved areas. Backfill holes remaining after grubbing with sand material to prevent ponding of water. Compact the material to the relative density of the existing adjacent ground material.

Redundant/decommissioned works: Remove works, including slabs, foundations, pavings, drains and access chambers covers found on the surface.

### Batters

Temporary protection: Where change in level between crest and toe is more than 1.5 m, protect from erosion with geofabric, a hessian and tar or heavy duty black polythene sheet waterproof cover. Seal joints and securely fix down at crest and toe.

### Surplus material

Topsoil and excavated material: Unless otherwise advised, continually remove unwanted stripped soil and other material from the site as the work proceeds,

## 2.3 EXISTING WORKS TO BE RETAINED

### Marking

Requirement: Mark out works with 1 m high 50 x 50 mm timber stakes with yellow plastic tapes attached to prevent accidental damage.

## 2.4 TREES TO BE REMOVED

### Designation

Marking: Mark trees and shrubs to be removed 1000 mm above ground level.

## 2.5 TREE PROTECTION

### General

Warning signs: Display 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.

Protection measures: Provide before commencement of earthworks.

### Trees to be retained

Extent: All trees NOT marked for removal.

### Tree protection

Unless indicated on drawings provide tree protection to

- Tree protection zone (TPZ): To AS 4970 Section 3.
- Tree protective measures: To AS 4970 Section 4.
- Monitoring and certification: To AS 4970 Section 5.

### Work near trees

Harmful materials: Conform to the following:

- 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.

Damage: Prevent damage to tree bark. Do not attach stays, guys and the like to trees.

Work under trees: Do not remove topsoil from, or add topsoil to, the area within the dripline of the trees.

Excavation: If excavation is required near trees to be retained, give notice. Minimise period of excavation under tree canopies.

**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 so that root systems are intact and undamaged.

**Roots:** Do not cut tree roots exceeding 50 mm diameter. Where it is necessary to cut tree roots, use cutting methods that do not excessively disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.

**Backfilling:** Backfill excavations around tree roots. Place the backfill in layers of 300 mm maximum depth and compacted to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 200 mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

**Backfill material:**

- Mix proportions (topsoil:well-rotted composts) by volume: 3:1.
- Neutral pH value.
- Free from weed growth and harmful materials.

**Compacted ground:** Do not compact the ground or use skid-steel vehicles under the tree dripline. If compaction occurs, give notice.

**Compaction protection:** Protect areas adjacent the tree dripline. Submit proposals for an elevated platform to suit the proposed earthworks machinery.

**Watering:** Water trees as necessary, including where roots are exposed at ambient temperature more than 35°C.

**Mulching:** Spread 100 mm thick organic mulch to the whole of the area covered by the drip line of all protected trees.

## 2.6 TEMPORARY LANDSCAPE FENCING

### Fence dimensions

Height: 1200 mm.

Maximum post spacing: 5000 mm.

### Components sizes

Corner and gate posts: Hardwood or preservative-treated softwood, 250 mm diameter.

Intermediate posts: Star picket.

Gate: Provide a suitable hinged gate with a gate latch.

Wire: Top, intermediate and bottom rows of 3.2 mm plain galvanized steel wire. Thread the top wire through pieces of plastic tube and through corner posts.

### Removal

Completion: Remove the fence at the end of the planting establishment period.

## 2.7 TREE MAINTENANCE

### General

**Notice:** Give notice before commencing tree maintenance.

**Pruning:** To AS 4373 using a fully qualified and experienced arborist. Carry out all required works in a safe manner.

### Execution

**Repair:** Undertake tree surgery and rectify any damage to existing trees to be retained.

**Operations:** Remove dead and decayed wood or limbs that have been broken. Make all cuts at branch collars. If trees show signs of deterioration after the work is completed, carry out a program of soil amelioration such as soil aeration, irrigation or incorporation of organic material. Continue this program until the end of the plant establishment period.

**Root pruning:** Do not excessively disturb the remaining root system. Cut off damaged roots cleanly inside the exposed or damaged area. Cover exposed root area with soil immediately after pruning, do not leave roots exposed.

**Wetting and new root stimulation:** Form a water collecting basin and apply a rooting hormone and wetting agent to the rootball.

**Precautions:** Avoid damage to trees being treated and to nearby trees and surroundings. Do not use trees as anchors for winching operations or bracing. Provide bracing as necessary before cutting to prevent uncontrolled breakages and damage to surroundings.

Failure: If repair work is impracticable, or is attempted and is rejected, remove the tree and root system and make good.

## **2.8 COMPLETION**

### **Temporary works**

Remove prior to acceptance of Practical Completion

**0222 EARTHWORK****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide earthworks to the dimensions and tolerances, as documented.

**1.2 DESIGN****General**

Geotechnical and environmental reports provided: [complete/delete]

**Requirements**

Design of footing or pier depths: [complete/delete]

Contract depths: The footing or pier depths shown on the drawings are provisional.

Authority requirements: [complete/delete]

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 General requirements.
- 0172 Environmental management.

**1.4 STANDARDS****General**

Earthworks: Conform to the recommendations of those parts of AS 3798 that are referenced in this worksection.

Description and classification of soils: To AS 1726.

**1.5 INTERPRETATION****Abbreviations**

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

- GITA: Geotechnical inspection and testing authority.
- GTA: Geotechnical testing authority.

**Definitions**

General: For the purposes of this worksection the definitions given in AS 3798 and the following apply:

- Bad ground: Ground unsuitable for the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground that is, or becomes, soft, wet or unstable.
- Rock: Monolithic material with volume greater than 0.3 m<sup>3</sup> that cannot be removed until broken up by rippers or percussion tools.
- Site topsoil: Natural soil, excavated from the site, that contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and is free from the following:
  - . Stones more than 25 mm diameter.
  - . Clay lumps more than 50 mm diameter.
  - . Weeds and tree roots.
  - . Sticks and rubbish.
  - . Material toxic to plants.
- Subgrade: The trimmed or prepared earth material on which the pavement, footing or slab is constructed. Generally taken to relate to the upper line of the earth material.
- Zone of influence: A foundation zone bounded by planes extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.

## 1.6 TOLERANCES

### General

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades: + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces:  $\pm 50$  mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

## 1.7 SUBMISSIONS

### Design documentation

Calculations: Submit calculations by a professional engineer showing the stability and safety of proposed excavations and temporary supports, including supports required for adjacent structures.

### Execution details

Report: Submit a time-based schedule detailing the methods and equipment proposed for the earthworks, including the following:

- Dewatering and groundwater control and disposal of surface water.
- Excavation methods, stages, clearances, batters and temporary supports.
- Stockpiles and borrow pits.
- Placing and compaction methods and stages.

Geotechnical site investigations: Provide a geotechnical report supporting the methods proposed for excavation.

Disposal location: Submit details of the locations and evidence of compliance with the appropriate authority requirements for the disposal of material requiring removal from site.

Temporary shoring: Submit a proposal for any temporary shoring required, including the progressive removal.

Proof rolling: Submit details of proposed method and equipment for proof rolling.

Records of measurement: Submit a certified copy of the agreed records of measurement.

Site records: Submit the following to AS 3798 clause 3.4 and Appendix B:

- Geotechnical site visit record.
- Earthworks summary report or daily geotechnical reports.

### Products and materials

Imported fill: Submit certification or test results by a GTA registered laboratory of the imported fill as evidence of conformity with the contract, including the source.

### Tests

Compaction: Submit certification and/or test results in conformance with the documented level of inspection and testing to AS 3798.

## 1.8 INSPECTION

### Notice

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

- Items to be measured as listed in **RECORDS OF MEASUREMENT**.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof rolled subgrade before placing fill.
- Filling completed to contract levels.
- Stockpiled topsoil before spreading.

## 2 PRODUCTS

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### 2.1 FILL MATERIALS

#### General

Suitable material: To AS 3798 clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: To AS 3798 clause 4.3.

Sulfur content: Do not provide material with sulfur content exceeding 0.5% within 500 mm of cement bound elements (for example concrete structures or masonry) unless the elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material to AS 3798 clause 4.4.

#### Stockpiles

General: Segregate the earth and rock material and stockpile for re-use in backfilling operations.

Location: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along drainage channels.

### 2.2 BORROW OR IMPORTED FILL

#### General

Borrow or imported material: Use only when suitable excavated material from site is not available.

- Suitable material: To AS 3798 clause 4.4.

### 2.3 GEOTEXTILE

#### General

Material: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Identification and marking: To AS 3705.

## 3 EXECUTION

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### 3.1 SITE PREPARATION

#### Erosion and sedimentation control

Requirement: To *0172 Environmental management*.

### 3.2 GEOTECHNICAL

#### As found site conditions

General: If the following are encountered, give notice and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancy in expected conditions.
- Rock.
- Springs, seepages.
- Topsoil more than 100 mm deep.

#### Inspection and testing

Frequency of testing: To AS 3798 Table 8.1.

### 3.3 RECORDS OF MEASUREMENT

#### Excavation and backfilling

Agreed quantities: If a schedule of rates applies, provisional quantities are documented, or there are variations to the contract levels or dimensions of excavations, do not backfill or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: By registered surveyor.



**Rock**

Level and class: If rock is measured for payment purposes, either as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and the classes of rock have been determined.

**3.4 REMOVAL OF TOPSOIL****General**

Extent: Areas of cut or fill and areas occupied by structures, pavements and embankments.

Maximum depth: 200 mm.

Disposal: Remove topsoil unsuitable for re-use from the site to AS 3798 clause 6.1.8.

**Topsoil stockpiles**

General: Stockpile site topsoil intended for re-use.

Stockpile maximum height: 1.5 m.

Identification: Mark and label stockpiles of different soil types.

Vegetation: Do not burn off or remove plant growth that occurs during storage.

Protection: Conform to the following:

- Provide drainage and erosion protection.
- Do not allow traffic on stockpiles.
- If a stockpile is to remain for more than four weeks, sow with temporary grass.
- Protect the topsoil stockpiles from contamination by other excavated material, weeds and building debris.

**3.5 EXCAVATION****Extent**

Site surface: Excavate the site to the levels and profiles required for the documented structures, pavements, filling and landscaping. Make allowance for compaction, settlement or heaving.

Footings, pits, wells and shafts: Excavate to the required sizes and depths. Confirm that the foundation conditions meet the design bearing capacity.

**Bearing surfaces**

Requirement: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes. If supporting masonry, make the steps appropriate to the courses.

**Rock**

General: Do not use explosives.

**Existing footings**

Requirement: If excavation is required within the zone of influence of an existing footing, provide supports to the footing sufficient to prevent damage arising from the works. Use methods including temporary shoring or underpinning.

**Existing services**

Location: Before starting earthworks, locate and mark existing underground services in the areas that will be affected by the earthworks operations including clearing, excavating and trenching.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

Excavation: Do not excavate by machine within 1000 mm of existing services.

**Proof rolling**

Extent: Proof roll excavations for pavements, filling and non-spanning slabs on ground to determine the presence of bad ground.

Proof rolling method and equipment: To AS 3798 clause 5.5.

Requirement: If excessive settlement, rebound or heaving is encountered, provide test pits or trenching to determine the extent of bad ground.

**Disposal of excess excavated material**

General: Remove excess excavated material from site not required or unsuitable for fill.

Standard: To AS 3798 clause 6.1.8.

### 3.6 REINSTATEMENT

#### Deterioration of bearing surfaces

Requirement: If the bearing surface deteriorates because of water or other cause, excavate to a sound surface before placing the loadbearing element.

#### Subgrades affected by moisture

Requirement: If, due to high moisture content the subgrade cannot support construction equipment or the overlying pavement cannot be compacted, perform one or more of the following:

- Allow the subgrade to dry until it provides support for equipment and allows compaction.
- Scarify the subgrade to a depth of 150 mm, work as necessary to accelerate drying, and recompact when the moisture content is satisfactory.
- Excavate the wet material and remove to spoil, and backfill excavated areas.

#### Over excavation

Requirement: If excavation exceeds the required depths, reinstate to the correct depths, levels and bearing capacity.

Zone of influence: Within the zone of influence of footings, beams, or other structural elements, use concrete of strength equal to the structural element, minimum 15 MPa. Make sure that remedial concrete does not create differential bearing conditions.

Below slabs or pavements: Rectify the over excavation as follows:

- Generally: Provide selected fill compacted to the documented density.
- Less than 100 mm: Do not backfill. Increase the thickness of the layer above.

Rock depressions and subsoil drains: Backfill rock depressions and over excavation of subsoil drains using coarse subsoil filter.

### 3.7 SUPPORTING EXCAVATIONS

#### Removal of supports

General: Remove temporary supports progressively as backfilling proceeds.

#### Voids

General: If voids occur outside sheeting or sheet piling, fill and compact voids to a dry density similar to that of the surrounding material.

### 3.8 ADJACENT STRUCTURES

#### Temporary supports

General: If required, provide supports to adjacent structures, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support with shoring.

Vertical supports: If required, provide vertical support with piling or underpinning or both.

#### Permanent supports

General: If permanent supports for adjacent structures are required and are not documented, give notice and obtain instructions.

#### Encroachments

General: If encroachments from adjacent structures are encountered and are not documented give notice and obtain instructions.

### 3.9 ROCK BOLTING

#### General

Requirement: For temporary or permanent support of rock faces, provide proprietary high strength steel bars or tubes anchored into holes drilled in the rock and tensioned against plates bearing on the rock face. Schedule the installation to conform to systematic bolting or calculated relief, as documented.

Standard: To AS 4678.

#### Protection

General: Protect permanent rock bolts by grouting the drilled hole with cement grout after tensioning the rock bolt. Protect the bearing plate and the exposed portion of rock bolt and anchorage with a protective coating or by embedment in concrete.

### 3.10 GEOTEXTILE

#### General

Preparation: Trim the ground to a smooth surface free from cavities and projecting rocks.

Installation: Lay the fabric flat, not stretched tight, and secure with anchor pins. Overlap joints 300 mm minimum.

### 3.11 PREPARATION FOR FILLING

#### Preparation

Stripping: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements to AS 3798 clause 6.1.5. Remove material that inhibits or prevents satisfactory placement of fill layers, loose material, debris and organic matter.

Foundation preparation: To AS 3798 clause 6.1.7.

Compaction: Compact the ground exposed after stripping or excavation, to a minimum depth of 150 mm, to the minimum relative compaction in AS 3798 Table 5.1.

Ground treatment or improvement methods:

- Scarify method: Loosen exposed excavation by scarifying to a minimum of 150 mm, moisture-condition and compact to AS 3798 Section 5.
- Impact roller and impact compaction: Use an approved method.

Slope preparation: If fill is placed on a surface steeper than 4:1 (horizontal:vertical), bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps more than 1 m in width and more than 100 mm deep. Recompress the excavated material as part of the filling. Shape to provide free drainage.

#### Under earth mounds

General: Cultivate the ground to a depth of 200 mm before mound formation.

#### Under slabs, paving and embankments

General: If required, loosen the ground to a depth of more than 200 mm and adjust the moisture content before compaction to a density consistent with subsequent filling.

#### Rock ledges

General: Remove overhanging rock ledges.

### 3.12 PLACING FILL

#### General

Extent: Place fill to the documented dimensions, levels, grades, and cross sections so that the surface is always self-draining.

Layers: Place fill in near-horizontal layers of uniform thickness, deposited systematically across the fill area.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, make sure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. If required, limit the size of compaction equipment or compact by hand.

Protective covering to membranes: Do not disturb or damage during backfilling.

#### Placing at structures

Fill adjacent structures and trenches: To AS 3798 clause 6.2.6.

Requirement: Place and compact fill in layers simultaneously on both sides of structures, culverts and pipelines to avoid differential loading. Commence compacting each layer at the structure and proceed away from structure.

Over the top of structures: Carefully place first layers of fill.

Retaining walls: Do not place fill against concrete retaining walls until the concrete has been in place for 28 days unless the structure is supported by struts.

#### Compaction

General: Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation. Shape surface to provide drainage and prevent ponding.

Maximum rock and lump size in layer after compaction: To AS 3798 clause 6.2.2.

Fill batter faces: Either compact separately, or overfill and cut back. Form roughened surfaces to the faces.

Minimum relative compaction: To AS 3798 Table 5.1.

### 3.13 PLACING TOPSOIL

#### **Stockpiled topsoil**

Cultivation: Rip subgrade to a depth of 100 mm or to the depth of rippable subgrade if less. Cultivate around services and tree roots by hand. Trim to allow for the required topsoil depth.

Herbicide: Apply before placing topsoil.

Placing: Spread and grade evenly.

Compaction: Lightly compact topsoil so that the finished surface is smooth, free from lumps of soil, at the required level, ready for cultivation and planting.

Edges: Finish topsoil flush with abutting kerbs, mowing strips and paved surfaces. Feather edges into adjoining undisturbed ground.

#### **Disposal of excess topsoil**

On-site: Dispose of surplus topsoil remaining on site by spreading evenly over the areas already placed.

Off-site: Remove excess topsoil from the site and dispose of legally.

### 3.14 FILL MOISTURE CONTROL

#### **General**

Moisture content: Adjust the moisture content of fill during compaction within the range of 85% to 115% of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1, as appropriate, to achieve the required density.

### 3.15 COMPACTION TESTS

#### **Compaction control tests**

Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.

#### **Compaction control test frequency**

Standard: To AS 3798 Table 8.1.

Confined operations: 1 test per 2 layers per 50 m<sup>2</sup>.

### 3.16 COMPLETION

#### **Geotechnical report**

#### **Grading**

External areas: Grade to give falls away from buildings, minimum 1:100.

Subfloor areas: Grade the ground surface under suspended floors to drain ground or surface water away from buildings without ponding.

#### **Site restoration**

Requirement: If variation of existing ground surfaces is not required as part of the works, restore surfaces to the condition existing at the commencement of the contract.

## 0223 SERVICE TRENCHING

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

Requirement: Provide trenching for underground services, as documented.

**1.2 DESIGN****Requirements**

Trench design: Design and coordinate all trenching required for proposed inground services, as documented.

Existing services: Where possible, design to avoid all existing services. Locate existing services to **EXECUTION, EXISTING SERVICES.**

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 General requirements.

**1.4 STANDARDS****Trenching**

Earthworks: To AS 3798.

Electrical services: To AS/NZS 3000.

Hydraulic services: To AS/NZS 3500.1.

Communication services: AS/CA S009.

**1.5 TOLERANCES****Surface levels**

Earthworks: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and load bearing elements: + 0, - 25 mm.
- Pavement subgrades: + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Make sure flatter slopes do not impact on boundaries or required clearances to buildings, pavements or landscaping.
- Other ground surfaces:  $\pm 50$  mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

Pavement base and subbase: Finish the surface to the required level, grade and shape within the following tolerances:

- Subbase: + 10 mm, - 25 mm.
- Base: + 10 mm, - 5 mm.

Finished pavement or paving surface: Conform to the documented level within the following tolerances:

- Asphalt:  $\pm 10$  mm.
- Concrete: + 10 mm, - 0 mm.
- Paving:
  - . Finished level:  $\pm 8$  mm.
  - . Height deviation between adjacent units (lippage):  $\pm 2$  mm.
- Granular surfaces:  $\pm 10$  mm.
- Lippage between restored surface and adjacent existing surface:  $\pm 5$  mm.

**1.6 SUBMISSIONS****Execution details**

Excavation method: Submit details of proposed equipment and method of excavation, including the following:

- Service location and type: A plan of the trench works showing the location and type of service.
- Open excavation: Proposed duration.
- Shuttering and/or bracing of trench sides: If required for safety and stability, provide proposals.
- Geotechnical data: Geotechnical report supporting the procedures proposed for trenching and/or boring.
- Boring: Proposals for the following:
  - . Limits on length.
  - . Existence of other services and method of protection.
  - . Pressure grouting to voids.
  - . The effect of pressure grouting on other services, ground heave and proposals for minimising such effects.
  - . Access to properties outside the site.
  - . Council permits.
  - . Service interruptions including a plan for minimising unintended interruptions.
- Hazards: Identify WHS hazards that may be encountered with deep trenches including toxic gases and liquids.

Off-site disposal location: Submit details of the proposed disposal locations and evidence of conformance with the relevant authorities for the disposal of material required to be removed from the site.

### Records

As-built location: Upon completion submit to the relevant authority, as-built documentation to show the location of the installed services.

## 1.7 INSPECTION

### Notice

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

- Items to be measured as listed in **GROUND CONDITIONS, Records of measurement**.
- Service trenches excavated before laying the service.
- Services laid in trenches and ready for backfilling.
- Completed surface restoration.

## 2 PRODUCTS

### 2.1 FILL MATERIALS

#### General

Suitable material: To AS 3798 clause 4.4 including inorganic, non-perishable material suitably graded and capable of compaction to the documented density.

Unsuitable materials: Do not use unsuitable material for fill in conformance with AS 3798 clause 4.3.

Sulfur content: Do not provide filling with sulfur content exceeding 0.5% within 500 mm of cement bound elements (for example concrete structures or masonry) unless such elements are protected by impermeable membranes or equivalent means.

Re-use of excavated material: Only re-use suitable material in conformance with AS 3798 clause 4.4.

Material in reactive clay areas: In sites classified M, M-D, H1, H1-D, H2, H2-D, E or E-D to AS 2870, re-use excavated site material at a moisture content within  $\pm 1\%$  of that of the adjoining in situ clay.

### 2.2 SURFACE RESTORATION MATERIALS

#### General

Re-use: If possible re-use the existing surface materials that were removed during trench excavation, whilst conforming to the documented material requirements.

#### Subbase and base

Requirement: Provide crushed rock material configured in layers and depths to match existing and adjacent work, as follows:

- Base: 20 mm nominal size.
- Subbase: 40 mm nominal size.

**Pathways and paved surfaces generally**

Requirement: Provide materials consistent with those of the existing surface before service trenching works commenced.

**Concrete surfaces**

Material requirements: Normal-class to AS 1379.

Concrete strength grade: N25.

Slump: Maximum 100 mm.

**Asphalt surfaces**

Aggregate: To AS 2758.5 or to AS 2758.2 for sprayed bituminous surfaces.

Hot mix asphalt: To AS 2150.

Medium cut back bitumen: To AS 2157.

Bitumen emulsion: To AS 1160.

Bitumen binder: Class 170.

**Pavers**

Concrete and clay pavers: To AS/NZS 4455.2.

Bedding and joint filling sand: Well-graded sand, free of deleterious material such as soluble salts which may cause efflorescence.

Stone pavers and setts: Provide sound stone pavers and setts of uniform quality. Reject any with defects liable to affect strength and durability.

Bedding mortar mix (cement:sand): Select from the range 1:3 to 1:4 to obtain satisfactory adhesion. Provide minimum water.

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**3 EXECUTION****3.1 EXISTING SERVICES****Location**

Requirement: Before commencing service trenching, locate and mark existing underground services in the areas which will be affected by the service trenching operations.

Utility services: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables.

**Excavation**

General: Do not excavate by machine within 1 m of existing underground services.

**3.2 EXISTING SURFACES****Concrete and asphalt pavements**

Method: Sawcut trench set out lines for the full depths of the bound pavement layers except where the set out line is located along expansion joints.

Removal of concrete and asphalt: Break out concrete or asphalt pavement material between the trench set out lines, remove and dispose of off-site.

**Paving**

Removal: Take up paving units both full and cut by hand, between the trench set out lines, and neatly stack on wooden pallets.

Concrete edging: Break out, remove and dispose of off-site.

Concrete subbase: If present, sawcut along the trench set-out lines.

**Grass**

Removal method: Neatly cut grass turf between trench set-out lines into 300 mm squares.

Grass suitable for re-use: Take up and store the turf and water during the storage period.

Unsuitable grass: Remove and dispose of off-site.

**Small plants, shrubs and trees**

Remove for re-planting: Take up and store. Wrap the rootball in a hessian or plastic bag with drain holes and water during the storage period.

Unsuitable vegetation: Remove and dispose of off-site.

### 3.3 GROUND CONDITIONS

#### As found site conditions

Unexpected conditions: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies to expected ground conditions.
- Rock.
- Springs, seepages.
- Topsoil > 100 mm deep.

#### Records of measurement

Excavation and backfilling: If a schedule of rates applies, provisional quantities are specified, or there are variations to the contract levels or dimensions of excavations, do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

### 3.4 EXCAVATION

#### General

Requirement: Excavate for underground services in conformance with the following:

- To required lines and levels, with uniform grades.
- Straight between access chambers, inspection points and junctions.
- With stable sides.
- Width tolerance:  $\pm 50$  mm, unless constrained by adjacent structures.
- Tree protection: To AS 4970.

#### Adjacent structures

Existing footings: If excavation is required within the zone of influence of an existing footing, use methods including (temporary) shoring or underpinning that maintain the support of the footing and make sure that the structure and finishes supported by the footing are not damaged.

Temporary supports: Provide supports to adjacent structures where necessary, sufficient to prevent damage arising from the works, as follows:

- Lateral supports: Provide lateral support using shoring.
- Vertical supports: Provide vertical support where necessary using piling or underpinning or both.

Permanent supports: If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

Encroachments: If encroachments from adjacent structures are encountered and are not shown on the drawings, give notice and obtain instructions.

#### Trench widths

General: Keep trench widths to the minimum, consistent with the laying and bedding of the relevant service and construction of access chambers and pits.

#### Trench depths

General: As required by the relevant service and its bedding method.

#### Obstructions

General: Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services. Remove other obstructions including stumps and boulders which may interfere with services or bedding.

#### Dewatering

General: Keep trenches free of water. Place bedding material, services and backfilling on firm ground, free of surface water.

Pumping: Provide pump-out from adjacent sumps or install well points.

Adjacent subsidence: Provide recharge points to isolate the dewatering zone.



**Excess excavation**

General: If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or sand stabilised with 1 part of cement to 20 parts of sand by volume.

**Stockpiles**

Topsoil removal: Stockpile topsoil intended for re-use to a maximum height of 1500 mm.

Excavated material for backfill: If required, segregate the earth and rock material and stockpile, for re-use in backfilling operations.

Locations: Do not stockpile excavated material against tree trunks, buildings, fences or obstruct the free flow of water along gutters where stockpiling is permitted along the line of the trench excavation.

Disposal: If stockpiling is not permitted, dispose of excavated material off-site.

**Unsuitable material**

Disposal: Remove unsuitable material from the bottom of the trench or at foundation level and dispose of off-site. Replace with trench backfill material.

**Boring**

Subcontractor: If boring is required instead of trenches, engage a suitably qualified subcontractor to do the work.

**3.5 TRENCH BACKFILL****General**

Place fill: To AS 3798 clauses 6.2.2 and 6.2.6.

Timing: Backfill service trenches as soon as possible after laying and bedding the service, if possible on the same working day.

Removal of supports: Remove temporary supports progressively as backfilling proceeds.

**Marking services**

Marking tape: Provide marking tape above service, with appropriate labelling, to AS/NZS 2648.1 and as follows:

- Non-metallic services: Provide tape capable of being detected by inground scanning devices.
- Location: Locate tape approximately half the depth of the service being marked, to a maximum depth of 200 mm below the finished ground level.

Boring: If boring techniques are used to install the service, provide permanent on site labelling at the start and end of the service run and record on the as-built documentation.

**Bedding, haunch, side and overlay zones**

Installation and material: To the particular utility authority or utility service requirements. Secure pipes against floatation.

Bedding of services: Surround pipes or conduits on all sides with a minimum of 75 mm compacted bedding sand, or as documented.

Overlay zone thickness: Maximum 300 mm immediately over the utility service.

**Trees**

Backfill at trees: Backfill minimum 300 mm thick, around tree roots with a topsoil mixture. Place and compact in layers of 150 mm minimum depth to a dry density equal to that of the surrounding soil.

Original surface level: Do not place backfill above the original ground surface around tree trunks or over the root zone.

Watering: Thoroughly water immediately after backfilling the tree root zone.

**Compaction**

Control moisture within backfill: To AS 3798 clause 6.2.3.

Layers: Compact all material in layers not exceeding 150 mm compacted thickness. Compact each layer to the required relative compaction before starting the next layer.

Compaction: To AS 3798 Section 5.

Frequency of testing: To AS 3798 clause 8.7.

Precautions: Use compaction methods which do not cause damage or misalignment to utility services.

**Density tests**

Testing authority: Carry out density tests of pipe bedding and backfilling by an Accredited Testing Laboratory.

Test methods: Conform to the following:

- Compaction control tests: To AS 1289.5.4.1 or AS 1289.5.7.1.
- Field dry density: AS 1289.5.3.2 or AS 1289.5.3.5.
- Standard maximum dry density: AS 1289.5.1.1.
- Dry density ratio: AS 1289.5.4.1.
- Density index: AS 1289.5.6.1.

### 3.6 SURFACE RESTORATION

#### Subbase and base

Compaction: Uniformly compact each layer of the subbase and base courses over the full area and depth within the trench to a relative compaction of 100% when tested in conformance with AS 1289.5.4.1.

Compacted layer thickness:

- Maximum: 200 mm.
- Minimum: 100 mm.

Compaction test frequency: Minimum 1/every second layer/50 m<sup>2</sup> of restoration surface area.

#### Concrete surfaces

Construction: Conform to the following:

- Prime coat the cut edges of the existing surfaces with cement slurry. Lay and compact concrete so that the edges are flush and the centre is cambered 5 mm above the adjoining existing surfaces.
- Surface finish and pattern: Match existing adjoining work.
- Minimum thickness: 75 mm or the adjacent pavement thickness, whichever is thicker.
- Reinforcement and dowels: If required, provide steel reinforcement with dowels into the adjacent concrete.
- Expansion joints: 15 mm thick preformed jointing material of bituminous fibreboard placed in line with joints in existing concrete.
- Control joints:
  - . Form control joints strictly in line with the control joints in existing concrete.
  - . Around service poles: Terminate the concrete paving 200 mm from the pole and fill the resulting space with cold mix asphalt.

Weather: Do not place concrete in ambient temperatures above 30°C or below 10°C, without adequate precautions. Protect surface from rain damage, if required.

Compaction: Compact as follows:

- Thickness 100 mm or less: Compact by placing, screeding and finishing processes. If required use a hand-held vibrating screed at the surface. Do not use immersion vibrators.
- Thickness more than 100 mm and downturns: Use an immersion vibrator.

Curing: Cure by keeping continuously wet for 7 days.

#### Asphalt surfaces

Placement: To AS 2150.

Operations: Spread the asphalt mix in layers covering the full width of the trench.

Thickness: Match the adjoining asphalt surface.

Finish: Compact to a smooth even surface.

Sprayed bituminous surfaces: To AS 3727.1 Section 8.

#### Pavers

Bedding: Replicate the bedding used for the original paved surface. Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material.

Laying: Re-lay to match the pattern and surface levels of the existing paving.

Damaged pavers unsuitable for relaying: Replace with new pavers of the same material, type, size and colour as the existing.

#### Landscaped areas

In topsoil areas: Complete the backfilling with topsoil for at least the top 100 mm.

Lawn: Re-lay stockpiled turf. If existing turf is no longer viable, re-sow the lawn over the trench and other disturbed areas.

Planted areas: Overfill to allow for settlement.

### **3.7 COMPLETION**

#### **General**

As-built documentation: Upon completion, record the location of all installed services on the as-built documentation.

**0224 STORMWATER – SITE****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide stormwater drainage, as documented.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 STANDARDS****Stormwater drainage**

Standard: To AS/NZS 3500.3.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the following definition applies:

- Pipe surround: Includes pipe overlay, pipe side support, side zone and haunch zone.

**1.5 SUBMISSIONS****Certification**

Requirement: Submit certificate stating that network is leak free upon completion.

**Samples**

General: Submit samples of the following:

- Each type of imported pipe bedding material.
- Each type of filter material.

**Tests**

Results: Submit results from pre-completion leak testing.

**1.6 INSPECTION****Notice**

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

- Excavated surfaces prior to placing bedding material.
- Underground services, or services to be concealed, before being covered.
- Pipe joints before covering.
- Placing of concrete.
- Upon completion.

**2 PRODUCTS****2.1 MATERIALS****Concrete and mortar**

Concrete: To AS 3500.3 clause 2.9 and the following:

- Grade: N15.
- Cement: To AS 3972.
  - Type: GP, GL or GB.

Steel reinforcement:

- Bars and machine welded mesh: To AS/NZS 4671.

**Joints**

Solvent cement and priming fluid: To AS 3879.

Rubber ring joints/elastomeric seals: To AS 1646.

### Pipes and fittings

Fibre reinforced cement (FRC): To AS 4139 and the following:

- ≤ 450 mm diameter: Rubber ring joints to AS 4139.
- > 450 mm diameter: With a purpose machined internal spigot and socket system within the pipe wall.

Glass-reinforced plastic (GRP): To AS 3571.1.

Access covers and grates: To AS 3996.

Polyvinyl chloride (PVC): To AS/NZS 1254, AS/NZS 1260 or AS 1273, as appropriate.

Polyethylene (PE): To AS/NZS 4129, AS/NZS 4130, ISO 8770 or AS/NZS 2033, as appropriate.

Precast concrete: To AS/NZS 4058.

Plastic pipe for subsoil drainage: To AS 2439.1.

Vitrified clay or ceramic: To AS 1741.

### Bedding material

Bed and haunch zones: Provide granular material graded to the AS 1141 series.

#### Bedding material grading table

| Sieve size (mm) | Weight passing % |            |
|-----------------|------------------|------------|
|                 | Bed and haunch   | Side zones |
| 75.0            | -                | 100        |
| 19.0            | 100              | -          |
| 9.5             | -                | 50 - 100   |
| 2.36            | 50 - 100         | 30 - 100   |
| 0.60            | 20 - 90          | 15 - 50    |
| 0.30            | 10 - 60          | -          |
| 0.15            | 0 - 25           | -          |
| 0.075           | 0 - 10           | 0 - 25     |

### Filter material

Requirement: Materials consisting of natural clean washed sands and gravels and screened crushed rock, to AS/NZS 3500.3 clause 2.13.1.

## 2.2 GEOTEXTILES

### General

Material: UV stabilised, permeable, polymeric, woven or non-woven textile material used in contact with soil/rock material.

Identification and marking: To AS 3705.

### Subsoil drainage

Filter: Conform to AS/NZS 3500.3 clause 2.13.2.

## 2.3 PREFABRICATED PITS

### General

Requirement: Precast or prefabricated pits conforming to AS/NZS 3500.3 clauses 2.12.8 and 7.5.

### Access covers and grates

Cover finish and load classification: Provide access cover and grate with the documented finish, slip resistance and load class.

### 3 EXECUTION

#### 3.1 PIPING

##### Installation

Laying: Lay lengths separately with the barrel bearing evenly on the prepared bedding.

Sockets: Lay with socket ends pointing upstream.

Cleaning: Clean pipe interior of dirt, debris, mortar and other foreign matter.

Protection: Provide temporary caps over the ends of incomplete sections to prevent the entry of foreign matter.

#### 3.2 TOLERANCES

##### Pipeline tolerances table

|                                                                                                                                                 | Permissible angular deviation from the documented alignment | Permissible displacement from the documented positions |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------|
| Horizontal                                                                                                                                      | 1:300                                                       | 15 mm                                                  |
| Vertical                                                                                                                                        | 1:500                                                       | 5 mm                                                   |
| Note: These tolerances are conditional on falls to outlets being maintained and no part of a pipeline having less than the documented gradient. |                                                             |                                                        |

#### 3.3 STORMWATER DRAINS

##### Location

Layout: Provide stormwater drains to connect surface drains, subsoil drains and drainage pits to the outlet point or point of connection. Make sure that location of piping will not interfere with other planned services and building elements not yet installed or built. Subject to the preceding and documented layouts, follow the most direct route with the least number of changes in direction.

##### Laying

Installation: Lay in straight lines between changes in direction or grade. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the adjacent pipe.

##### Identification

Requirement: Lay a detectable strip or plastic tape in the trench after pipe laying, testing and initial backfilling.

##### Pipe underlay

Bedding: Bed piping on a continuous underlay of bedding material, minimum 75 mm, maximum 150 mm thick after compaction. Grade the underlay evenly to the gradient of the pipeline.

Chases: If necessary, form chases to prevent projections such as sockets and flanges from bearing on the trench bottom or underlay.

##### Pipe surrounds

Placement: Place the material in the pipe surround in layers, maximum 200 mm loose thickness, and compact without damaging or displacing the piping.

##### Trench backfill

General: Backfill the remainder of the trench to the underside of the subgrade with fill material placed in layers, maximum 200 mm loose thickness and compacted to minimum 90%, or 95% under pavements, of the standard maximum dry density.

##### Lifting holes

Sealing: Seal lifting holes in all pipes with plastic preformed plugs or 3:1 (sand:cement) mortar, before the commencement of backfilling.

##### Anchor blocks

Restraint: If necessary, to restrain lateral and axial movement of the stormwater pipes, provide anchor blocks at junctions and changes of grade or direction conforming to AS/NZS 3500.3 clause 7.9.

### 3.4 SUBSOIL DRAINS

#### General

Requirement: Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Piping: As documented.

Trench width:  $\geq 450$  mm.

Trench floor: Grade the trench floor evenly to the gradient of the pipeline. If the trench floor is rock, correct any irregularities with compacted bedding material.

Pipe depth: Provide the following minimum clear depths, measured to the crown of the pipe, where the pipe passes below the following elements:

- 100 mm below subgrade level of the pavement, kerb or channel.
- 100 mm below the level of the bottom of footings.
- 450 mm below the finished surface of unpaved ground.

#### Jointing

General: At junctions of subsoil pipes, provide tees, couplings or adaptors to AS 2439.1.

#### Pipe underlay

Bedding: Bed piping on a continuous underlay of bedding material, minimum 75 mm, maximum 150 mm thick after compaction. Grade the underlay evenly to the gradient of the pipeline.

Chases: If necessary, form chases to prevent projections such as sockets and flanges from bearing on the trench bottom or underlay.

#### Pipe surrounds

Placement: Place the material in the pipe surround in layers, maximum 200 mm loose thickness, and compact without damaging or displacing the piping.

Depth of overlay:

- To the underside of the bases of overlying structures such as pavements and channels.
- To within 150 mm of the finished surface of unpaved or landscaped areas.

#### Geotextiles

Marking: To AS 3705.

Laying: Place geotextile, as documented.

Protection: During installation do not expose the filter fabric to sunlight for more than 14 days.

#### Filter socks

General: Provide permeable polyester socks, capable of retaining particles 0.25 mm and greater. Securely fit or join the sock at each joint.

### 3.5 PITS

#### Installation

Requirement: Prepare foundation, install pit and connect pipes, to manufacturer's recommendations.

Location: At junctions, changes of gradient and changes of direction of stormwater drains, as documented.

#### Finish to in situ exposed surfaces

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Corners: Cove or splay internal corners.

#### Metal access covers and grates

Cover levels: Top of cover or grate, including frame:

- In paved areas: Flush with the paving surface.
- In landscaped areas: 25 mm above finished surface.
- Gratings taking surface water runoff: Locate to receive runoff without ponding.

### 3.6 TESTING

#### Pre-completion tests

General: Before backfilling or concealing, carry out an air or water pressure test to AS/NZS 3500.3 Section 9.

Leaks: If leaks are found, rectify and re-test.

### **3.7 COMPLETION**

#### **Cleaning**

General: Clean and flush the whole installation.



**0241 LANDSCAPE – WALLING AND EDGING****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide landscape walling and edging, as documented.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 SUBMISSIONS****Samples**

Submit samples as per the sample schedule

**1.4 INSPECTION****Notice**

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

- Set out before starting construction.
- Geotextiles and subsurface drainage in place before backfilling.

**2 PRODUCTS****2.1 TIMBER****Durability**

Natural durability class to AS 5604: Class 1.

**Preservative treatment**

Timber type: Provide only timbers with preservative treatment appropriate to the Hazard class.

Cut surfaces: Provide supplementary preservative treatment to all cut and damaged surfaces.

CCA treated timber: If proposed, provide details.

**Hardwood**

General: To AS 2796.1 Section 2.

**Softwood**

General: To AS 4785.1 Section 2.

**2.2 STEEL****Steel tubes**

Posts, rails, stays: To AS/NZS 1163.

- Grade: C350L0.

**Wire**

Chainwire, cable wire, tie wire and barbed wire: To AS 2423.

**2.3 CONCRETE****General**

Standard: To AS 1379.

Exposure classification: To AS 3600 Table 4.3.

Grade, if there are cast-in metal items: To AS 3600 Table 4.4.

**2.4 DRY STONE WALLS****Walling stone**

Natural stone: Stone of uniform quality, sound and free from defects liable to affect its strength, appearance or durability.

Field stone: Local weathered uncut random sized natural stones.

Quarried stone: Cut or uncut random or regular size stone.

## **2.5 SLEEPER WALLS**

### **Sleepers**

Hardwood: Sound durability class or preservative treated hardwood sleepers to AS 3818.2.

Softwood: Sound preservative treated softwood sleepers.

Concrete: Proprietary system of concrete sleepers and concrete or galvanized steel posts.

## **2.6 CRIB WALLS**

### **General**

Type: Proprietary system of interlocking precast concrete or preservative treated timber cribs with selected backfill placed and compacted progressively with the crib to form a retaining wall.

## **2.7 MASONRY SEGMENTAL WALLS**

### **General**

Type: Proprietary system of interlocking masonry segmental units with selected backfill placed and compacted progressively to form a retaining wall.

Masonry segmental retaining wall units: To AS/NZS 4455.3.

## **2.8 GABIONS**

### **General**

Type: Proprietary system of rock filled wire baskets.

## **2.9 EARTH REINFORCEMENT**

### **General**

Type: Proprietary system of galvanized steel strips or steel mesh strips placed in layers with compacted selected fill and connected to precast concrete facing panels to form vertical retaining walls. Provide the necessary accessories including levelling pad, bearing pads, and joint fillers or covers to keep the selected fill material out of the panel joints.

## **2.10 GEOTEXTILES**

### **General**

Type: Polymeric fabric formed from a plastic yarn composed of at least 85% by weight of propylene, ethylene, amide or vinylidene chloride and containing stabilisers or inhibitors to make the filaments resistant to deterioration due to ultraviolet light.

Identification and marking: To AS 3705.

## **2.11 EDGING**

### **Concrete**

Standard: To AS 1379 – Grade N20.

---

## **3 EXECUTION**

### **3.1 GENERAL**

#### **Set-out**

General: Set out the position of walls and edging and mark the position of furniture.

#### **Clearing**

Extent: Except for trees or shrubs to be retained, clear vegetation within 1 m of the landscape walls. Grub out stumps and roots of removed trees or shrubs and trim the grass to ground level, but do not remove the topsoil.

#### **Excavation**

Extent: Excavate for foundations and footings.

#### **Geotextiles**

Storage and handling: Store clear of the ground and out of direct sunlight. During installation do not expose the filter fabric to sunlight for more than 14 days.

### 3.2 DRY STONE WALLS

#### Construction

Generally: Select the stones for their locations and lay in the wall with minimum stonecutting as follows:

- Each stone is stable, non-rocking, and firmly interlocked with adjacent stones without mortar.
- The wall face shows reasonably regular, flat and vertical stone faces.
- Vertical joints or perpend between stones are spanned by the next stone above.
- Stones are laid generally as through stones whenever possible.
- At least 50% of footings, 30% of wall stones, and all coping stones are laid as through stones.

Footings: Select the largest, flattest and most regular stones for footings, and set them one third of their depth into the ground.

Copings: Select stones of reasonably uniform size and finish the top of the wall to a level line.

#### Retaining walls

Construction: If dry stone walls act as retaining walls, construct the stonework to be free draining through the wall. Secure the top course of the wall with cement mortar bedding. Backfill progressively, with a layer at least 300 mm thick of porous material, such as coarse aggregate or crushed rock in the size range 20 to 40 mm.

Minimum thickness: 300 mm.

Wall face batter: Batter back the wall face 50 mm to 70 mm for every 300 mm in height.

#### Rip-rap retaining walls

Construction: Construct as dry stone retaining walls with large random sized boulders recovered from excavations, to form gravity walls retaining, and supported by, embankments. Place boulders with large face down and stepped back from boulders below.

### 3.3 SLEEPER WALLS

#### Construction

Timber sleeper wall: Erect sleeper posts at 2 m centres, buried one third. Brace wall at half height above ground with sleepers returned into embankment, spiked to posts. Lay sleepers in stretcher bond behind the verticals and securely spike together at joints and at 2 m centres. Back with geotextile and place a 100 mm draining layer of coarse sand or fine gravel between the fabric and backfill.

Concrete sleeper wall: To manufacturer's recommendations.

Backing: Backfill to ground level with compacted fine crushed rock or gravels.

### 3.4 CRIB WALLS

#### Construction

Requirement: Construct walls to the manufacturer's recommendations.

### 3.5 GABIONS

#### Assembly

Requirement: Assemble the baskets and join together by wiring along the horizontal and vertical edges before placing the rock fill. Fix the top of the basket by wiring to the sides and the diaphragms.

#### Filling

Requirement: Place rocks, by hand, at the front and other exposed faces to form a neat face free of bulges, depressions and voids.

### 3.6 EARTH REINFORCEMENT

#### Construction

Requirement: Construct walls to the manufacturer's written recommendations.

### 3.7 EDGING

#### Log edges

Installation: Excavate to lay logs at least half diameter into the ground. Spike through logs with two 13 mm diameter galvanized mild steel rods per log, penetrating a minimum of 500 mm into the subgrade. Drive the rods flush with the upper surface of the log. Butt the logs together to a close neat fit. Select adjacent logs with similar diameter.

**Sawn timber**

Installation: Set edgings flush with adjoining surfaces. Drive pegs into the ground at 1200 mm centres on the planting side of the edging and on both sides of joints between boards, with peg tops 15 mm below top of edging. Fix the pegs with galvanized nails, two per fixing.

Curving: Space the pegs to hold edging to a uniform curve. Reduce edging thickness to 15 mm if required for bending.

**Sleeper**

Installation: Spike through sleepers with two 13 mm diameter galvanized mild steel rods per sleeper, penetrating a minimum of 500 mm into the subgrade. Drive the rods flush with the upper surface of the sleeper. Arris the upper exposed sleeper edges to produce a 15 mm wide face at 45 degrees to the edges.

**Concrete**

Edging strip: Place in a shallow trench between timber forms. Wood float finish flush with the adjacent finished level. Provide control joints, filled with resilient bituminous material, at 3 m maximum centres.

Concrete kerb: Fixed form, extrusion or slip forms to AS 2876.

**Steel**

Fixing:

- Angle section: Fixed in place by the mass of surrounding soil works.
- Flats: Fix in place with 250 mm long x 10 mm galvanized steel spikes driven through 50 x 50 mm fixing plates. Weld holed plates at right angles to the face of the flat at 1000 mm centres on alternate sides set parallel and 25 mm below the top of the edging.

**Spade edge**

Edges: Define mass planting beds by cutting through soil with garden spade at approximately 70° to vertical. Remove sods from garden beds and spread throughout grassed areas.

Finish: Free from kinks in alignment with one curve grading evenly into the next, and free of straight sections.

**Brick**

Setting: On a 1:1:6 (cement:lime:sand) mortar haunch.

Joints: 3 mm struck flush.

Alignment: Even and free from dips, humps and bends.

Cleaning: Wash off mortar progressively.

**0242 LANDSCAPE – FENCES AND BARRIERS****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide fences and barrier systems, as documented.

**Performance**

Requirements:

- Complete for their function.
- Conforming to the detail and location drawings.
- Firmly fixed in position.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 SUBMISSIONS****Products and materials**

Requirement: Submit the manufacturer's standard drawings and details showing methods of construction, assembly and installation; with dimensions and tolerances.

**Prototypes**

Requirement: The first installed portion of each assembly fixed in its final position in the works, at least 2 panels wide, incorporating at least one example of each typical panel is to be inspected and following approval will be considered the installed prototype.

**Samples**

Submit samples as per the sample schedule

**Shop drawings**

Custom-built items: Submit shop drawings to a scale that best describes the details, showing methods of construction, assembly and installation, with dimensions and tolerances.

**Warranties**

Requirements: Submit the manufacturer's published product warranties.

**1.4 INSPECTION****Notice**

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

- Boundary survey location.
- Set-out before construction.
- Foundation conditions after excavation.
- Completion of installation.

**2 PRODUCTS****2.1 GENERAL****Storage and handling**

General: Deliver, unload and store components and accessories in unbroken manufacturer's packaging.

**2.2 TIMBER****Posts and rails**

Hardwood: To AS 2082.

Softwood: To AS 2858.

Softwood: To AS 4785.1, Section 7.

Seasoned cypress pine: To AS 1810, Section 5.

**Preservative treatment**

Timber type: Provide only timbers with preservative treatment to the documented Hazard class.

Cut surfaces: Provide supplementary preservative treatment to all cut and damaged surfaces.

CCA treated timber: If proposed to be used, provide details.

**2.3 STEEL****Steel tubes**

Posts, rails, stays and pickets: To AS/NZS 1163.

- Grade: C350L0.

Post and rail finish: Hot-dip galvanize.

**Fencing wire**

Chain wire, cable wire, tie wire and barbed wire: To AS 2423.

**2.4 CONCRETE****General**

Standard: To AS 1379.

Exposure classification: To AS 3600 Table 4.3.

**3 EXECUTION**

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**3.1 CONSTRUCTION GENERALLY****Set-out**

General: Set out the fence line and mark the positions of posts, gates and bracing panels.

Property boundaries: Confirm by survey.

**Clearing**

Fence line: Except for trees or shrubs to be retained, clear vegetation within 1 m of the fence alignment. Grub out the stumps and roots of removed trees and shrubs, and trim the grass to ground level. Do not remove the topsoil.

**Excavation**

Posts: Excavate post holes so that they have vertical sides and a firm base. Spread surplus material on the principal's side of the fence.

**Earth footings**

Base: Place 100 mm of gravel in the footing base under posts.

Compaction: Backfill with earth around posts, compacting firmly by hand or machine in 150 mm deep layers.

**Concrete footings**

In ground: Place mass concrete around posts to protect posts from waterlogged conditions and finish with a weathered top falling 25 mm from the post to ground level.

On slabs: Provide welded and drilled post base flanges for fixing with masonry anchors to the concrete.

**Erection**

Line and level: Erect posts vertically. Set heights to follow the contours of natural ground, unless documented otherwise.

**3.2 GATES****Hardware**

General: Provide the following:

- Drop bolt and ferrule to each leaf of double gates.
- Latch to one leaf of double gates.
- Provision for locking by padlock.
- Hinges with smooth operation and adjustment for future sagging.

**Hand access**

Requirement: Where required, provide hand holes to give access from outside to reach locking provision.

### 3.3 TIMBER FENCING

#### **Radiata pine picket fencing**

General: As documented.

Footing type: Earth.

#### **Radiata pine paling fencing**

General: As documented.

Footing type: Earth.

#### **Hardwood paling fencing**

General: As documented.

#### **Installation**

General: Mortice posts, taper splice rails and nail twice in mortices. Set pickets and palings clear of the ground.

Picket fence: Nail twice to each rail.

Plain paling fence: Provide 2 rails for fences up to 1800 mm high, and locate 200 mm from the tops and bottoms of the palings. Close butt palings and nail twice to each rail.

Lap and cap paling fence: Provide 2 rails for fences up to 1800 mm high, and locate 200 mm from the bottoms of the palings and abutting the tops of palings. Close-butt larger palings and nail twice to each rail. Fix smaller palings over joints and nail twice to each rail. Nail capping to the top rail.

#### **Timber gates**

Ledges and braces: Match fence rails.

### 3.4 STEEL TUBE PICKET FENCING

#### **Steel picket fencing**

General: As documented.

Footing type: Concrete.

#### **Installation**

General: Fit tightly fittings caps to steel posts. Attach panels to posts with fixing clips and galvanized M8 x 75 mm hexagon head bolts before concreting footing.

### 3.5 CHAIN LINK FABRIC FENCING

#### **Security fencing and gates**

General: As documented.

Standard: To AS 1725.1.

#### **Tennis court fencing – commercial**

General: As documented.

Standard: To AS 1725.2.

Gate frames: To AS 1725.2 Appendix D.

Bracing stays and backstays: To AS 1725.2 Appendix E.

Baseplates: To AS 1725.1 Appendix F.

#### **Tennis court fencing – private/residential**

General: As documented.

Standard: To AS 1725.3.

Gate frames: To AS 1725.3 Appendix D.

Bracing stays and backstays: To AS 1725.3 Appendix E.

Baseplates: To AS 1725.1 Appendix F.

#### **Cricket net enclosures**

General: As documented.

Standard: To AS 1725.4.

Roof rails: To AS 1725.4 clause 4.4.

Gate frames: To AS 1725.4 Appendix D, Appendix F and Appendix G.

Fencing details: To AS 1725.4 Appendix E.

Baseplates: To AS 1725.1 Appendix F.

**Sports ground fencing**

General: As documented.

Standard: To AS 1725.5.

Gate frames: To AS 1725.5 Appendix E.

Baseplates: To AS 1725.1 Appendix F.

**3.6 WELDED MESH FENCING****Welded mesh fencing**

General: As documented.

Footing type: Concrete.

**Installation**

General: Fit tightly fittings caps to steel posts. Attach panels to posts with fixing clips and galvanized M8 x 75 mm hexagon head bolts before concreting footing.

**3.7 SWIMMING POOL FENCING****Pool fencing**

General: As documented.

**Installation**

Construction and performance: To AS 1926.1 and AS 1926.2.

Installation: Provide complete with accessories.

**3.8 TEMPORARY LANDSCAPE FENCING****Fence dimensions**

Height: 1200 mm.

Maximum post spacing: 5000 mm.

**Component sizes**

Corner and gate posts: Hardwood or preservative-treated softwood, 250 mm diameter.

Intermediate posts: Star picket.

Gate: Provide a suitable hinged gate with a gate latch.

Wire: Top, intermediate and bottom rows of 3.2 mm plain galvanized steel wire. Thread the top wire through pieces of plastic tube and through corner posts.

**Removal**

Completion: Remove the fence at the end of the planting establishment period.

**3.9 COMPLETION****Cleaning**

Requirement: Remove excess debris, metal swarf and unused materials. Clean all visible metal surfaces with soft clean cloth or brush and clean water or approved cleanser, finishing with a clean cloth. Do not use abrasive or alkaline materials.

Powder coated aluminium architectural applications: Clean completed assembly to AS 3715 Appendix C.

Powder coated metal, other than aluminium, architectural applications: Clean completed assembly to AS 4506 Appendix D.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

**Warranties**

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the manufacturer and the installer.



## 0251 LANDSCAPE – SOILS

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

Requirement: Provide soil for landscaping, as documented.

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

Requirement: Conform to the following:

- 0171b General requirements.
- 0224 Stormwater – site.

**1.3 STANDARDS****Soils**

Site and imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 4419 and the following apply:

- Bad ground: Ground unsuitable for the work, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is, or becomes, soft, wet or unstable.
- Imported topsoil: Similar to naturally occurring local topsoil, suitable for the establishment and ongoing viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture to AS 4419 Appendix K Table KI, as follows:
  - . Fine: Clay loam, fine sandy clay loam, sandy clay loam, silty loam, loam.
  - . Medium: Sandy loam, fine sandy loam.
  - . Coarse: Sand, loamy sand.
- Site rock: Rocks selected for salvage.
- Site topsoil: Natural soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine-to-medium texture classification to AS 4419 and free from the following:
  - . Stones more than 25 mm diameter.
  - . Clay lumps more than 50 mm diameter.
  - . Weeds and tree roots.
  - . Sticks and rubbish.
  - . Material toxic to plants.
- Soil blend: A general purpose soil derived from the blending of two or more of sand, natural soil material or organic materials, and with a bulk density and organic matter content to meet site specific requirements.
- Structural soil: A soil that can be compacted to pavement design and installation requirements while permitting root growth. A mixture of graded aggregate, clay loam, and a hydrogel stabilizing agent to prevent the mixture from separating.
- Top dressing: A soil which is suitable for surface application to lawn.

**1.5 SITE INVESTIGATION****Notice**

Requirement: If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies.

- Rock.
- Springs, seepages.
- Topsoil > 100 mm deep.

## 1.6 SUBMISSIONS

### Certification

Compost: Submit certification as evidence of compost pH value.

### Products and materials

Supplier's data: Submit supplier's data including the following:

- Material source of supply for topsoil, filling, stone and filter fabrics.

Type tests: Submit a test report for the imported topsoil, including the following:

- Suitability of each soil type for documented use.
- Similarity to naturally occurring local soil.
- Suitability for establishment and on-going viability of the documented site vegetation.
- Absence of any weed propagules or contaminants.
- Soil amelioration recommendations: If required, the source of ameliorant materials, 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: At least 5 working days before bulk deliveries, submit a 1 kg sample of each type documented with required test results.

### Subcontractors

General: Submit names and contact details of proposed suppliers and evidence of the following, if appropriate:

- Experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of material to the site.

### Tests

Site tests: Submit a test report for the site topsoil, including the following:

- Suitability of the soil for documented use.
- Suitability for establishment and on-going viability of the documented site vegetation.
- Presence of any weed propagules or contaminants.
- Recommendation:
  - . Soil amelioration: If required, the source of ameliorant materials, rates and methods of incorporation and recommendations for the following purposes:
    - \* Bushland reconstruction areas.
    - \* Planting on grade.
    - \* Grass mixes.
  - . Weed eradication: Species and eradication method.
  - . Contaminant removal.

## 1.7 INSPECTION

### Notice

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

- Subgrades cultivated or prepared for placing topsoil.
- Topsoil spread before planting.
- Grassing bed prepared before turfing, seeding, or temporary grassing.

## 2 PRODUCTS

### 2.1 SUBSOIL

#### Source

Subsoil profile requirement: Unless otherwise documented use ameliorated subgrade.

### 2.2 TOPSOIL

#### Source

General: If the topsoil of documented quality cannot be provided from material recovered from the site, provide imported topsoil.

#### General

Deliveries: Documentation to AS 4419, clause 6 and 7.

Additives: If using additives to ameliorate topsoil conform to the relevant criteria of AS 4419.

Nitrogen drawdown: If the  $NDI_{150}$  value is less than 0.5 to AS 4419 Appendix E, add a source of soluble nitrogen to bring the value above zero.

Compost: Well rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth to AS 4454 and to the organic content by mass, as documented.

Bushland restoration nutrient levels: Topsoil with nutrient levels equivalent to the soils of the local natural bushland.

#### Imported topsoil

General: Provide imported topsoil, as documented.

#### Imported topsoil particle size table (% passing by mass)

| Sieve aperture (mm) | Soil textures |          |          |
|---------------------|---------------|----------|----------|
|                     | Fine          | Medium   | Coarse   |
| 2.36                | 100           | 100      | 100      |
| 1.18                | 90 – 100      | 95 – 100 | 95 – 100 |
| 0.60                | 75 – 100      | 75 – 100 | 70 – 90  |
| 0.30                | 57 – 90       | 55 – 85  | 30 – 46  |
| 0.15                | 45 – 70       | 38 – 55  | 10 – 22  |
| 0.075               | 35 – 55       | 25 – 35  | 5 – 10   |
| 0.002               |               | 2 – 15   | 2 – 8    |

#### Imported topsoil nutrient level table

| Nutrient                                  | Unit  | Sufficiency range |
|-------------------------------------------|-------|-------------------|
| Nitrate-N ( $NO_3$ )                      | mg/kg | > 25              |
| Phosphate-P ( $PO_4$ ) – P tolerant       | mg/kg | 43 - 63           |
| Phosphate-P ( $PO_4$ ) – P sensitive      | mg/kg | < 28              |
| Phosphate-P ( $PO_4$ ) – P very sensitive | mg/kg | < 6               |
| Potassium (K)                             | mg/kg | 178 - 388         |
| Sulphate-S ( $SO_4$ )                     | mg/kg | 39 - 68           |
| Calcium (Ca)                              | mg/kg | 1200 - 2400       |
| Magnesium (Mg)                            | mg/kg | 134 - 289         |
| Iron (Fe)                                 | mg/kg | 279 - 552         |
| Manganese (Mn)                            | mg/kg | 18 - 44           |
| Zinc (Zn)                                 | mg/kg | 2.6 - 5.1         |
| Copper (Cu)                               | mg/kg | 4.5 - 6.3         |
| Boron (B)                                 | mg/kg | 1.4 - 2.7         |

#### Method References

pH in  $H_2O$  (1:5), pH in  $CaCl_2$  (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1.

| Nutrient                                                                                                                                                                                                                                                                                                       | Unit | Sufficiency range |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------|
| Soluble Nitrate-N by APHA 4500.<br>Soluble Chloride by Rayment and Lyons 2011 modified method 5A2.<br>Extractable P by Mehlich 3 – ICP.<br>Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP.<br>Extractable S by Mehlich 3 – ICP.<br>Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 – ICP. |      |                   |

**Site topsoil**

General: Provide site topsoil, as documented.

Soil blend: If required, stripped natural soil with sand and/or organic matter and recommended ameliorants.

**2.3 STRUCTURAL SOIL****General**

General: Provide structural soil, as documented

**Structural soil type table**

| Type                  | Description                                    | Fertiliser                                                                                                                                                                                                                                                                                                                                                                                      | Depth  |
|-----------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Structural soil 40 mm | 80% 40 mm basalt aggregate,<br>20% filler soil | Trace element mix:<br>300 g/m <sup>3</sup><br>Potassium nitrate:<br>500 g/m <sup>3</sup><br>Ammonium nitrate:<br>500 g/m <sup>3</sup><br>Superphosphate:<br>500 g/m <sup>3</sup><br>Iron sulphate: 1.5 kg/m <sup>3</sup><br>8/9 month Controlled Release: 2 kg/m <sup>3</sup><br>Gypsum: 500 g/m <sup>3</sup><br>Magnesium sulphate:<br>400 g/m <sup>3</sup><br>Magrilime: 600 g/m <sup>3</sup> | Varies |

**2.4 TESTING****Soil tests**

General: To AS 4419, Table 1.

Sampling: As recommended in AS 4419 Appendix A.

Laboratory: NATA registered.

Imported topsoil tests: Type tests to the following:

- Topsoil: AS 4419 Appendix B to K(topsoil).
- Potting mix: AS 3743 Appendix D to G (potting mixes).

Site topsoil tests: To AS 4419 Appendix C to K.

**3 EXECUTION****3.1 PREPARATION****Vegetative spoil**

Spoil suitable for bushland restoration: Spread freshly harvested native plant biomass, free of weed propagules.

Unsuitable material: Remove vegetative spoil from site. Do not burn.

**Embankment stabilisation**

Requirement: If necessary to prevent erosion or soil movement, stabilise embankments with matting overlay or hydromulching.

Matting overlay material: Unless otherwise documented, biodegradable fibre reinforced with lightweight polymer mesh.

- For high erosion zones: Flexible carbon black UV stabilised interwoven nylon mesh.

Matting overlay pegs: U-shape galvanized steel, at 1000 x 1000 mm intervals generally, 250 mm at overlaps.

Matting overlay installation:

- If seeding is required, sow before installing lightweight matting.
- If planting is required, plant after installing medium or heavy weight matting.
- Peg the matting into 300 x 300 mm anchor trenches at top and bottom, backfill the trenches with soil and compact.

### 3.2 ROCK WORK

#### Existing rock

General: Protect existing rock, rock shelves and rock outcrops from mechanical damage, surface defacement and other works.

Rock surfaces: Report damage or defacement occurring to any rock faces during the course of the works.

#### Planted treatment to rock faces

Location: As documented

Seed mix type: As documented

Treatment: Bonded fibre matrix product including the following:

- Fertiliser starter hydraulically applied as one blended slurry.
- Seed mix.
- Insecticide.

Application: Spray, by an approved applicator, on to the rockface to encourage vegetation growth in crevices and hollows.

#### New rock work

General: Provide new rock work as documented

Erosion control: Bury rock two thirds by volume or as appropriate for effective erosion control, with weathered faces exposed. Protect the weathered faces from damage.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock which has been selected before delivery.

Placing rocks: Place while ground formation work is being carried out, as documented.

### 3.3 EARTH MOUNDS

#### Construction

Placing: Place clean fill in layers approximately 150 mm thick compacted to 85% of the dry density ratio of the surrounding soil tested to AS 1289.5.4.1. Minimise slumping and further compacting.

Edges: Construct changes in grade over a minimum width of 500 mm to smooth, gradual and rounded profiles with no distinct joint.

Existing trees: Maintain the natural ground level under the canopy.

Pipes, culverts and associated structures: Construct mounding to avoid unbalanced loading.

Drainage: Construct mounds to allow free drainage of surface water and to eliminate ponding.

### 3.4 SUBSOIL

#### Ripping

General: Rip parallel to the final contours. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Subsoil: Unless documented rip the subsoil to the typical depths

- Compacted subsoil: 300 mm.
- Heavily compacted clay subsoil: 450 mm.

#### Planting beds

Excavated: Excavate to reduce the subsoil level to the depth of the documented/ nominated topsoil depth below finished design levels. Shape the subsoil to fall to subsoil drains, if required. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, rubbish and other debris. Reduce the planting bed level to 75 mm below finished design levels.

**Cultivation**

Minimum depth: 100 mm.

Cultivation depths (mm):

- Grassed areas (seeded, turf, strip turf, stolonized): As documented
- Hydroseeded or hydromulched areas: As documented
- Planting areas: As documented

Services and roots: Do not disturb services or tree roots. If required cultivate these areas by hand.

Cultivation: Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

**Additives**

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil as documented.

Gypsum: Incorporate at the rate of 0.25 kg/m<sup>2</sup>.

**Herbicides**

General: Before spreading topsoil apply a herbicide treatment to subsoil to manufacturers recommendations.

**3.5 TOPSOIL****Site topsoil preparation**

Screening: By a power hydraulic screen capable of handling 100 tonne per hour, with sieves grading from 20 mm to 15 mm.

Additives: During the screening process add the following:

- 15% by weight coarse sand minimum particle size 0.2 mm.
- Ameliorants materials to the recommendations documented in **SUBMISSIONS, Tests**.
- Additives program: 8 weeks before stolonizing or turfing.

Waste: Remove from site all clay lumps, balled compacted particles greater than 20 mm, stones and rubbish foreign to the normal composition of soil.

Contamination: If diesel oil, cement or other phytotoxic material has been spilt on the site topsoil, excavate the contaminated soil and dispose of the soil off-site.

**Placing topsoil**

Site topsoil: Do not incorporate site topsoil into the works until soil testing results have been approved. Remove unauthorised material from the site.

Spreading: Spread the topsoil on the prepared subsoil and grade evenly, making allowances, if appropriate, for the following:

- Required finished levels and contours after light compaction.
- Grassed areas finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Steep batters: If using a chain drag for spreading, make sure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

**Consolidation**

General: Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

**Topsoil depths**

General: Unless otherwise documented, spread topsoil to the following typical depths:

- Planting areas generally: 300mm.
- Grassed areas generally: 150mm.

- Top dressing: 10 mm.

**Surplus topsoil**

General: Spread surplus topsoil on designated areas on-site or dispose off-site.

**3.6 STRUCTURAL SOIL****Preparation**

Existing soil: Remove.

Depth: As documented

Disposal: Spread surplus soil on designated areas on-site or dispose off-site.

Subsoil: Break up the surface and shape to drains. Remove rock.

Drainage: To *0224 Stormwater – site*.

**Construction**

Spreading: Maintain a self-draining surface.

Protection: Limit the size of compaction equipment or compact by hand to prevent damage.

Moisture content: Adjust the moisture content at the time of works to 12.5% of the optimum moisture content to AS 1289.5.4.1.

Contaminated structural soil: If contamination occurs after placing, excavate and dispose off-site.

Surplus structural soil: Remove.

## 0252 LANDSCAPE – NATURAL GRASS SURFACES

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

Requirement: Provide natural grass surfaces, as documented.

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

Requirement: Conform to the following:

- 0171b General requirements.
- 0251 Landscape – soils.

**1.3 SUBMISSIONS****Execution details**

Program: Submit a work program in the form of a bar chart, for the natural grass surfaces landscape works.

Material storage on site: Submit proposal.

**Products and materials**

Supplier's data: Submit supplier's data including the following:

- Material source of supply.
- Evidence of experience in supply of the required material.
- Production capacity for material of the required type and quantity.
  - Lead times for delivery of material to the site.

**1.4 INSPECTION****Notice**

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

- Grassing bed prepared before turfing, seeding, or temporary grassing.
- Grassing or turfing completed.

**2 PRODUCTS****2.1 GRASS****Seed mixtures**

Description: Fresh, clean, uncoated new seed, thoroughly pre-mixed with a bulking material such as safflower meal.

Unacceptable seed: Wet, mouldy, or otherwise impaired.

Purity (minimum): 98%.

Germination viability (minimum): 86%.

Age (maximum) from date of harvest: 2 years.

Handling: Deliver to the site in bags marked to show weight, seed species and supplier's name.

**Hydroseeding mixture**

Description: A slurry of seed mixture, fertiliser, binder and water.

Supplier: A specialist supplier of prepared slurry mixture.

**Hydromulching mixture**

Description: A slurry of seed mixture, fertiliser, binder, mulch and water.

Supplier: A specialist supplier of prepared slurry mixture.

**Turf**

Description: Cultivated turf of even thickness, free from weeds and other foreign matter.

Supplier: A specialist grower of cultivated turf.



**Stolons**

Description: Well established fibrous runners 50 to 100 mm in length, with minimum green leaf material.

Supplier: A specialist grower of cultivated turf.

**Grass reinforcing**

Description: Lightweight interlocking plastic cellular paving system suitable for pedestrian and occasional vehicular traffic including emergency vehicles.

Product: Provide as documented.

**2.2 FERTILISER****General**

Description: Proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

**3 EXECUTION****3.1 PREPARATION****Existing grass removal**

Herbicide: Spray existing grass with a non-residual glyphosate herbicide in any registered formulae, at the recommended maximum rate.

Manual removal: A minimum 2 weeks after application of herbicide remove existing grass layer.

**Weed eradication**

Herbicide: Eradicate weeds using environmentally acceptable methods, including a non-residual glyphosate herbicide in any registered formulae, at the recommended maximum rate.

Manual weeding: Remove weed growth throughout grassed areas.

**Vegetative spoil**

Disposal: Remove vegetative spoil from site. Do not burn.

**Soil preparation**

Subsoil: To 0251 Landscape – soils **EXECUTION, SUBSOIL**.

Site topsoil or imported topsoil: To 0251 Landscape – soils **EXECUTION, TOPSOIL**.

Levelling: Remove any debris and level and shape the dry soil surface. Allow maximum 30 mm set-down to hard surfaces for turf and stolons.

**Fertiliser**

Soil improvement: Spread the fertiliser evenly over the cultivated bed a maximum 48 hours before placing grass as follows:

- Grass seed: Rake lightly into the surface.
- Turfing and stolonising: Mix the fertiliser thoroughly into the topsoil before placing the turf or stolons.

**3.2 GRASS SEEDING****Preparation**

General: If a prepared area becomes compacted before sowing can begin, rework the ground surface before sowing.

**Application**

General: As documented.

Ambient conditions: Do not sow in periods of extreme heat, cold or wet or when wind velocities exceed 8 km/h or if frost is likely before the grass is established.

Method: Evenly distribute the seed using purpose made sowing machinery. Lightly rake the surface to cover the seed.

Rolling: Roll the seed bed immediately after sowing.

- Roller weight (maximum):
  - . Clay and packing (heavy) soils: 90 kg/m width.
  - . Sandy and light soils: 300 kg/m width.

Reseeding: If germination has not occurred within one month, reseed the sown areas.

Reseeding mixture: Original seed mixture

**Watering**

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Until germination, keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the ambient climatic conditions.

**Establishment**

General: Maintain sown areas until there is a dense continuous sward of healthy grass over the whole of the seeded area, evenly green and of a consistent height.

Protection Protect the newly sown areas against traffic until established.

Weeding: Remove weeds from the sown areas. If required spray with a selective herbicide for broad leaved weeds. Do not spray grass seeded areas within 3 months of germination.

Fertilising after germination: As follows:

- Six weeks after germination: Spread fertiliser evenly over the sown area and water in. Do not apply fertiliser to wet grass.
- Ten weeks after germination: If the planting establishment period occurs during the summer months, spread pelleted sulfate of ammonia at the rate of 250 kg/ha.

Mowing: Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing not more than 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

### 3.3 HYDROSEEDING AND HYDROMULCHING

**Mix application rates**

Seed mixture: The rate applicable to the mix type.

Mulch: At least 2.5 t/ha with seed, or 5 t/ha without seed.

Binder:

- Bitumen emulsion: 2000 L/ha of residual bitumen.
- Polymer: 250 L/ha.

Water: Suitable for the site conditions, and sufficient to assist in the distribution of the seed, fertiliser and mulch.

**Preparation**

Bed: Scarify the area for seeding and provide a firm friable seed bed. Place any topsoil before scarifying.

**Application**

General: As documented.

Method: Apply as follows:

- Moisten the topsoil to full depth before applying the slurry.
- Spray the slurry mixture under pressure, using high pressure pumping equipment.
- Maintain a thoroughly mixed supply.
- Evenly distribute the slurry mixture along the operating front.
- Complete each front before starting the next.

**Watering**

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Until germination, keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the ambient climatic conditions.

### 3.4 TURFING

**Supply**

Elapsed time: Deliver the turf within 24 hours of cutting, and lay within 36 hours of cutting. Prevent turf from drying out between cutting and laying. If not laid within 36 hours of cutting, roll turf out on a flat surface with the grass up, and water as required to maintain a good condition.

**Application**

General: As documented.

Method: Lay the turf as follows:

- Stretcher bond pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.
- Finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Strip turf: Close butt the end joints and space the strips 300 mm apart. Lay top dressing between the turf strips. Finish with an even surface.

Tamping: Lightly tamp to an even surface immediately after laying. Do not use a roller.

Stabilising on steep slopes: Peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

### **Watering**

General: Water immediately after laying until the topsoil is moistened to its full depth. Maintain moisture to this depth.

### **Establishment**

General: Maintain turfed areas until there is a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and replace with new turf.

Levels: If levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

Fertiliser: Apply lawn fertiliser at the completion of the first and last mowing, and at other times as required to maintain healthy grass cover.

Mowing: Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing not more than 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

Top dressing: Mow the established turf and remove cuttings. Lightly top dress to a depth of 10 mm. Rub the dressing into the joints and correct any unevenness in the turf surface.

## **3.5 STOLONISING**

### **Preparation**

General: Moisten topsoil to full depth.

### **Supply**

Elapsed time: Deliver stolons to the site within 24 hours of harvesting, and plant within 36 hours of arrival on site. Prevent stolons from drying out between harvesting and planting.

### **Application**

General: As documented.

Method: Using a disk sprigger or row planter, mechanically sprig the stolons into the prepared soil to a minimum depth of half the stolon length, at maximum centre to centre spacings of 150 mm in both transverse directions over the whole of the planting area, and extending 1 m into adjacent grassed areas.

Stimulant: Three days after planting, spray with hormone root growth stimulant.

Binding: Immediately after planting in erosion areas, including slopes and drainage swales, spray with binder at the rate of 250 L/ha.

### **Watering**

General: Water thoroughly on completion of planting. Keep the topsoil moist to full depth.

### **Establishment**

General: Replant areas that fail to grow.

## **3.6 TEMPORARY GRASSING**

### **Preparation**

General: If a prepared area becomes compacted before sowing begins, rework the ground surface before sowing.

### **Application**

General: As documented.

Method: Evenly distribute the seed using purpose made sowing machinery. Lightly rake the surface to cover the seed.

Cover crop density: Sufficient to hold the soil and prevent erosion.

Minimum coverage: No bare areas greater than 50 mm in diameter to 90% of the documented area, and no bare areas greater than 200 mm to 100% of the area.

Reseeding: Reseed areas where the seed fails to germinate within three weeks of the date of original sowing, and within 3 months where required densities have not been met. Continue to reseed at minimum monthly intervals with an additional soil preparation as required, until required densities are met.

#### **Watering**

General: Immediately after sowing, water to a depth of 100 mm. Continue watering to obtain germination and establish grass.

After establishment: Water as required to maintain seed material in a healthy condition.

#### **Establishment**

General: Maintain temporary grassing areas until no longer required.

Weeding: Remove weeds that emerge in newly established hydroseeded/hydromulched areas.

Reseeding: Reseed over the course of the contract to maintain required densities.

### **3.7 GRASS REINFORCING**

#### **Installation**

Preparation: Excavate to required levels and compact subgrade.

Base course: Place and compact either of the following:

- Non-calcareous, free draining washed sand, comprising 80% 0.1 mm to 1.0 mm grading.
- 1.0 mm to 5.0 mm gravel aggregate.

Base course depth unless documented:

- Pedestrian walkways: 100 mm.
- Passenger vehicles: 150 mm.
- Heavy vehicles: 250 mm.

Growing media: 80:20 (sand:organic sandy soil) mix.

Pavers: Place and interlock grass pavers on base course and spread growing media over pavers to heights as follows:

- Turf: 5 mm.
- Hydroseeded: 15 mm.

Protection: Exclude traffic until the root system becomes established and anchored to the base course.

### **3.8 COMPLETION**

#### **Existing grass**

General: Where existing grass is within the landscape contract area, maintain it as for the corresponding classifications of new grass.

#### **Grassed areas**

Maintenance: Start grass maintenance works at the completion of sowing, hydroseeding and turfing. Maintain healthy weed-free growth.

## 0253 LANDSCAPE – PLANTING

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

Requirement: Provide landscape planting, as documented.

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

Requirement: Conform to the following:

- 0171b General requirements.

**1.3 SUBMISSIONS****Certification**

Plant species: Submit the supplier's certification as evidence that plants are true to the required species and type and free from diseases, pests and weeds at time of delivery.

Compost: Submit a certification as evidence of compost pH value.

**Execution details**

Program: Submit a work program in the form of a bar chart, for the landscape works.

Planting machine: If a planting machine is to be used as an alternative to hand planting, submit proposal.

Spraying: Submit proposal.

Plants – open rooted stock: If open rooted stock is to be used, submit proposal.

Material site storage: Submit proposal.

**Products and materials**

Supplier's data: Submit supplier's data including the following:

- Material source of supply.

**1.4 INSPECTION****Notice**

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

- Plant material set out before planting.
- Planting, staking and tying completed.
- Completion of planting establishment work.

**2 PRODUCTS****2.1 SOIL CONDITIONING COMPOST****Compost**

Type: Mature soil conditioning compost free from harmful chemicals, grass and weed growth.

Application rate: Apply at an application rate that accounts for the immediate fertilizer equivalence of the compost as part of the overall fertilizer management schedule.

Particle size as a soil conditioner, pH, physical and chemical contaminants: To AS 4454 Table 3.1(A).

Mature compost: To AS 4454 Appendix N Table N3.2.

**Soil conditioning properties**

Wettability:  $\leq 2$  to AS 3743 Table 2.1 as tested to Appendix C.

Total water holding capacity:  $\geq 40$  to AS 3743 Table 2.1 tested to Appendix B.

Nitrogen draw down index:  $\geq 0.7$  to AS 3743 Table 2.1 tested to Appendix E.

Chlorine content:  $< 1000$  mg/kg to Rayment and Lyons 2011 test method.

**Compost fertiliser equivalence properties values**

Requirement: Establish the following values for each type of soil conditioning compost to Rayment and Lyons 2011 test methods:

- Nitrogen content (kg/ton):
  - . Total N.
  - . Nitrate.
- Phosphorus content (kg/ton):
  - . Total P.
  - . Colwell P.
- Plant available Potassium (kg/ton).

## 2.2 FERTILISER

### General

Type: Proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or supplier, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.

Application rate: Vary the application rate to allow for the plant available immediate fertilizer equivalence value of the soil conditioning compost.

## 2.3 MULCH

### General

Type: Free of deleterious and extraneous matter including soil, weeds, plastic, metal, paint and sticks. Do not include fine mulch.

Properties:

- Particle size, physical and chemical contaminants: To AS 4454 Table 3.1(A).
- pH, electrical conductivity, ammonium, chlorine and other nutrients: To AS 3743 Table 2.1 for regular mix.
- Organic mulches: Free of stones.

### Organic mulch types

Brush chippings and leaf litter: Vegetative material processed through a chipper to pieces not larger than 75 x 50 x 15 mm as follows:

- Material permitted: Leaf matter and tree loppings from *Eucalyptus*, *Tristania* and *Pinus* species.
- Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow, and declared (noxious) weeds.

Pine bark: From mature trees, graded in size from 50 x 50 x 25 mm to 25 x 15 x 15 mm, free from wood slivers.

Pine flake: *Pinus* species sapwood slivers in size range 250 x 25 mm to 30 x 3 mm, including fragments of pine bark.

Straw: Cereal straw, wood fibre, or other suitable vegetative material (but not meadow hay) free from weeds and seeds, applied in conjunction with a bitumen emulsion or polymer binder.

### Inorganic mulch types

Washed river pebble: Uniform size or graded material in the size range 6 to 10 mm.

Decomposed granite gravel: Uniform size or graded material in the size range 5 to 20 mm, of uniform colour and low plasticity.

Crushed quartz: Uniform size or graded material in the size range 5 to 20 mm, of uniform colour.

Marble chip gravel: Uniform size or graded material in the size range 5 to 20 mm, of uniform colour.

Slate: Plum slate slivers in the size range 5 to 25 mm.

Shale: Uniform size or graded material, no particles smaller than 0.1 mm diameter.

Scoria: Uniform size or graded material.

### Binders

General: Materials suitable for cold spray application to stabilise mulched or seeded surfaces on banks or high erosion areas.

Type: Provide as documented

### 3 EXECUTION

#### 3.1 PREPARATION

##### Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual glyphosate herbicide in any of its registered formulae, at the recommended maximum application rate.

Manual-weeding: Regularly remove weed growth by hand throughout grassed, planted and mulched areas. Remove weed growth from an area 750 mm diameter around the base of the trees in grassed areas. Continue weeding throughout the course of the works and during the planting establishment period.

##### Vegetative spoil

Disposal: Remove vegetative spoil from site. Do not burn.

#### 3.2 PLANTING

##### General

Plant location and spacing: If necessary to vary plant locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, give notice.

##### Planting conditions

Weather: Do not plant in unsuitable weather conditions, including extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

##### Watering

Timing: Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

##### Preparation

Individual plantings in grassed areas: Prepare for planting as follows:

- Excavate a hole twice the diameter of the root ball and at least 100 mm deeper than the root ball.
- Break up the base of the hole to a further depth of 100 mm.
- Loosen compacted sides of the hole to prevent confinement of root growth.

##### Placing

General: Place plants as follows:

- Remove the plant from the container with minimum disturbance to the root ball. Make sure that the root ball is moist.
- Place the plant in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant, level with the finished surface of the surrounding soil.

##### Fertilising

Pellets: In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting to manufacturers recommendations

##### Backfilling

General: Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Make sure that topsoil is not placed over the top of the root ball, so the plant stem remains the same height above ground as it was in the container. Avoid mixing mulch with topsoil.

#### 3.3 MULCHING

##### Placing mulch

General: Place mulch to the required depth and clear of plant stems so that after settling it conforms to the following:

- Smooth and evenly graded between design surface levels.
- Flush with the surrounding finished levels.
- Sloped towards the base of plant stems in plantation bed.
- For gravel mulches: Not closer to the stem than 50 mm.

Extent: Unless otherwise documented, provide mulch to 750 mm diameter to surrounds of plants planted in grassed areas.

Depths:

- Organic mulch: 100 mm.

Installation:

- In mass planted areas: Place after the preparation of the planting bed but before planting and other work.
- In smaller areas (e.g. planter boxes): Place after the preparation of the planting bed, planting and other work.

### 3.4 TREATMENT

#### General

Insect attack or disease: If evidence of insect attack or disease of plant material is discovered, immediately give notice.

#### Physical removal

General: Remove insect infestation and diseased plant material by hand if appropriate.

#### Pesticide

Product: Spray with insecticide, fungicide or both, as required.

### 3.5 STAKES AND TIES

#### Stakes

Material: Hardwood, straight, free from knots or twists, pointed at one end.

Installation: Drive stakes into the ground at least one third of their length, avoiding damage to the root system.

Stake sizes and quantities:

- For plants  $\geq 2.5$  m high: Three 50 x 50 x 2400 mm stakes per plant.
- For plants 1 to 2.5 m high: Two 50 x 50 x 1800 mm stakes per plant.
- For plants  $< 1$  m high: One 38 x 38 x 1200 mm stake per plant.

#### Ties

General: Provide ties fixed securely to the stakes as documented. Attach ties loosely so as not to restrict plant growth.

Tie types: Unless otherwise documented:

- For plants  $\geq 2.5$  m high: Two strands of 2.5 mm galvanized wire neatly twisted together, passed through reinforced rubber or plastic hose, and installed around stake and stem in a figure eight pattern.
- For plants  $< 2.5$  m high: 50 mm hessian webbing stapled to the stake.

### 3.6 COMPLETION

#### Cleaning

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences: Remove temporary protective fences at the end of the planting establishment period.



**0254 IRRIGATION****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide automatically controlled, fixed irrigation systems, as documented.

**Performance**

Requirements:

- Achieve the documented flow rates over the irrigated area.
- Meet statutory requirements for backflow prevention.

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

Requirement: Conform to the following:

- *0171b General requirements.*

**1.3 STANDARDS****Water supply**

General: To AS/NZS 3500.1.

**1.4 INTERPRETATION****Abbreviations**

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

- LDPE: Low-density polyethylene.

**Definitions**

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

- Backflow prevention device: Means an air gap, break tank or mechanical device that is designed to prevent the unplanned reversal of flow of water or contaminants into the water service or a Network Utility Operator's water supply.
- Emitter: A device used to control the rate at which water is applied to a specific area.

**1.5 SUBMISSIONS****Shop drawings**

General: Submit drawings and schedules showing the layout and details of the system, including the following:

- Micro-irrigation stake layout.
- Irrigation controller cabinets.

**Tests**

Site tests: Submit results, as follows:

- Distribution uniformity (DU) – Sprinkler.
- Distribution uniformity (DU) – Subsurface drip.

**1.6 INSPECTION****Notice**

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

- Excavated surfaces ready for installation.
- Concealed or underground services ready for backfilling.

## 2 PRODUCTS

### 2.1 AUTOMATIC CONTROL VALVES

#### General

Type: 24 V solenoid actuated hydraulic valves with flow control and a maximum operating pressure rating of at least 1 MPa and able to be serviced without removal from the line.

Materials: Cast iron body and bonnet. Stainless steel bonnet holding down bolts and internal metal parts.

Isolating valve: A gate valve of the same size immediately upstream of each automatic control valve.

Housing: House both valves in the same valve box.

### 2.2 FIXED LOCATION SYSTEMS

#### Heads

Performance: Heads conforming to the following:

- Maintain a preset arc of throw.
- Adjustable for radius during watering operations.
- Vandal-resistant.
- Protected from damage in normal operation.

Pop-up type heads:

- Type: Designed to rise at least 50 mm out of the housing under supply pressure and return to flush position on removal of pressure.
- Components: Provide wiper seals, stainless steel return springs and removable internal filters.
- Playing fields: Covers designed and constructed to prevent injury.

Sprinkler heads:

- Type: Gear driven and spray sprinklers with matched precipitation rates for the various areas of throw.
- Flow rate: Adjustable down to zero.

Impact sprinkler heads: Bronze bodies in high impact plastic cases with drainage holes.

#### Valves

Check valves: If a rotating head is more than 300 mm below the highest head on the same automatic valve, fit an internal or external anti-drain check valve to prevent low head drainage.

Pressure regulating valves: Provide pressure regulating valves at off-take points as follows:

- Adjustable between 100 and 700 kPa.
- Complete with 800 µm filter sized to suit the flow and installed immediately upstream from the pressure regulating valve.
- Installed with isolating valves upstream from the filter and downstream from the pressure regulating valve.
- Fitted for backflow prevention.
- Mount the assembly in an accessible position in a valve box, access pit or adjacent building.

#### Soil moisture sensors

Type: Fixed ceramic moisture sensors.

Connection: Fit to the irrigation controller via moisture control units.

#### Irrigation controllers

Type: Automatic controllers that are easily programmed and include the following:

- Manual cycle and individual control valve operation.
- Manual on/off operation of irrigation without loss of program.
- ≥ 4 on/off cycles per day.
- Day omit.
- 240 V input and 24 V output capable of operating 2 control valves simultaneously.
- ≥ 24 hour battery program backup.
- Power surge protection.
- Mount in a lockable cabinet minimum IP 54 to AS 60529 in external locations.

- Electrical connection: If connected to wall outlets, provide 3 core 10 A, 240 V flexible cord and plug. Provide an isolating switch at the controller.

## 2.3 MICRO-IRRIGATION SYSTEMS

### Tubing

Type: Polyethylene micro-irrigation pipe.

### Emitter

Type: Unless otherwise documented provide:

- Dripper: planting areas
- Spray: turf / grass areas

### Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

### Valve boxes

Requirement: Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter: 200 µm.
- Pressure-reducing valve with 170 kPa outlet pressure.

## 2.4 DRIP IRRIGATION SYSTEMS

### Integrated drip line systems

Type: Tubing with integral drippers inserted into the tube during manufacture.

### Discrete drip emitter systems

Tubing: Polyethylene micro-irrigation pipe.

Drippers: Turbulent flow types, easily dismantled for cleaning.

### Emitters

Type: If the difference in elevation between the control box and all emitters is:

- < 1.5 m: Pressure compensated or non-pressure compensated type.
- ≥ 1.5 m: Pressure compensated type only.

### Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

### Valve boxes

Requirement: Provide the following in each valve box:

- Automatic control valve.
- Isolating valve.
- Filter: 100 µm.
- Pressure-reducing valve with 170 kPa outlet pressure.

## 2.5 SUBSURFACE DRIP IRRIGATION SYSTEMS

### Tubing

Collector and distributor mains: LDPE or PVC pipe.

Dripline: LDPE pipe.

### Components

System requirements:

- Reduced pressure zone (RPZ) backflow prevention device.
- Electric or manual valve.
- Filter: 120 mesh screen or disc.
- Auto pressure regulator: 150 to 200 kPa.
- Air vacuum breaker.
- Automatic line flushing valve.
- Chemical injection system.

### Fittings

Type: Barbed fittings rated for the pressure class of the pipe, fastened with ratchet type clamps.

**Root-intrusion prevention**

Requirement: To prevent root intrusion, provide one of the following:

- Herbicide impregnated emitters or filters.
- Root-intrusion chemical injection system.

**Valve boxes**

Requirement: Provide valve boxes for system components.

**2.6 VALVE BOXES****General**

Construction: UV-resistant high impact plastic with high impact snap lock plastic cover.

Location: Support on bricks at each side. Install with top, as follows:

- Within playing fields: 150 mm below the surface.
- Other locations: At finished ground level.

**3 EXECUTION****3.1 FIXED LOCATION SYSTEMS****Control wiring**

General: Connect the automatic control valves and soil moisture sensors to the controller as follows:

- Cable type: Double insulated.
- Cable runs: Underground in PVC conduit to AS/NZS 3000 and laid alongside piping where possible.
- Connectors: Waterproof.
- Jointing: Loop cables and join only at valves, sensors and controllers.
- Movement provision: Provide expansion loops at changes of direction and at joints.

**Quick coupling valves**

General: Provide DN 20 double lugged bronze quick coupling valves with neoprene seats mounted on DN 20 copper risers offset at least 150 mm from the supply pipe. Install in valve boxes.

**Heads**

Impact sprinkler heads: Provide granular fill for at least 75 mm around the base of the case.

Risers: Mount as follows:

- Above ground heads: Mount on fixed risers.
- Galvanized steel risers: Set in 300 x 300 x 200 mm deep concrete blocks.
- In-ground heads: Mount on reticulated risers.

**Piping**

Mainline and submains: Install 600 mm below the finished surface and lay marker tape along the top of the line.

Lateral piping for roof and planting areas: Install below the topsoil profile and anchor at 1.5 m maximum centres with U-shaped stakes.

**Valve boxes**

Installation: Install with top surface flush with the surrounding surface.

Base: Concrete plinth.

Surround: Geofabric.

**3.2 MICRO-IRRIGATION SYSTEMS****Installation**

General: Connect micro-tube laterals with proprietary push in or screw in fittings.

Drippers: Connect directly into piping or provide appropriately sized micro-tubes

Microsprays: Mount microsprays 300 mm above ground on stakes and connect to the piping with appropriately sized micro-tubes.

Piping: Lay polyethylene micro-irrigation pipe on finished ground surface under planting bed mulch and anchor at 1.5 m maximum intervals with U-shaped stakes.

Air release valves: Provide at the highest point in each section to drain the system when flow stops.

### 3.3 DRIP IRRIGATION SYSTEMS

#### Installation

Discrete drippers: Connect directly into piping or provide appropriately sized micro-tubes.

Piping: Lay polyethylene micro-irrigation pipe on finished ground surface under planting bed mulch and anchor at 1.5 m maximum intervals with U-shaped stakes.

Air release valves: Provide at the highest point in each section to drain the system when flow stops.

### 3.4 SUBSURFACE DRIP IRRIGATION SYSTEMS

#### Installation

Piping: Install at least 150 mm below ground.

Automatic line flushing valve:

- Location: At the furthest point from the valve on the collector main.
- Discharge point: Locate in same plane as the pipe leading to it, so water can easily be flushed out.
- Gravel bed: Install a 0.3 m<sup>3</sup> minimum volume gravel bed in valve box. Maintain 50 mm clearance between gravel bed and the lowest discharge point of the valve.

Filter: Install in horizontal plane (or to prevent material entering mainline on cleaning) with 100 mm clearance from soil level.

Valve boxes: Provide 100 mm minimum clearance from filters and 50 mm min clearance from valves.

### 3.5 TESTING

#### Site tests

The Distribution Uniformity (DU) site test must be performed by a recognised irrigation professional.

Minimum recommended DU for open space turf areas is as follows:

- Sprinkler: 75%.
- Subsurface drip: 85%.

### 3.6 COMPLETION

#### General

Requirement: On completion of the irrigation system, carry out the following:

- Flush system thoroughly. Check heads, sprays and drippers and clean if blocked.
- Clean strainers.
- Adjust for even distribution with no dry areas.

## 4 ---

#### General

Requirement: Provide as documented

**0256B LANDSCAPE – ESTABLISHMENT****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide plant establishment, as documented.

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

Requirement: Conform to the following:

- 0171b General requirements.

**1.3 INTERPRETATION****Definitions**

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

- Plant establishment period: The period as documented..

**1.4 SUBMISSIONS****Execution details**

General: Give two days' notice of the following operations:

- Application of herbicide.
- Application of fertiliser.
- Watering.
- Each site maintenance visit.

Reporting: Submit monthly reports by the last Friday of each month.

**Records**

Logbook: Record the following on a weekly basis:

- Description, time and method of application of toxic material.
- Maintenance work details.
- Inclement weather to verify inability to carry out work within the specified time frame.

Availability: Upon request.

**Monitoring program**

General: Submit a monitoring program developed by a specialist monitoring consultant and incorporating the following:

- Photographic record including:
  - . Colour photographs.
  - . Documented monitoring locations and photograph angles.
- Reporting periods including photographic records at the following:
  - . Before commencement of the works.
  - . Date of practical completion.
  - . Three monthly intervals during the plant establishment period.
  - . End of defects liability period.
  - . Date of final completion.
  - . Benchmark definition based on remnant communities.
  - . Replicated measurements over time and comparative analysis with regard to the benchmark.

Specialist consultant: Submit the name, contact details and qualifications including research papers and scientific publication details of the specialist monitoring consultant.

**Replacement plants**

Species: Provide written certification that all plant material is true to the required species and type.

## 1.5 INSPECTION

### Notice

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

- Date of practical completion.
- Three monthly intervals during the plant establishment period or at the end of the plant establishment period whichever one is sooner.

## 2 EXECUTION ---

### 2.1 PLANTING WORKS

#### Planting

Requirement: Make sure the general appearance and presentation of the landscape and the quality of plant material at date of practical completion is maintained for the planting establishment period.

Existing plant material: Maintain existing planting and grass within the landscape contract area as documented for the matching classifications of new grassland or planting.

Plant replacement: Replace failed, dead and/or damaged plants at maximum 3 weekly intervals as necessary throughout the plant establishment period.

#### Fertilising

Soil tests: Take samples from both planting beds and lawn areas and conduct tests.

Fertilising program: Base the program on soil testing results.

Application: Apply either an all purpose fertiliser or a 12 month slow release fertiliser, in two rows and cultivated into soil to a depth of 100 mm.

Program: September and March according to seasonal growth requirement.

N:P:K ratio: Balanced 10:4:6.

Rate: To the manufacturer's recommendation.

Sensitive native species: Apply appropriate dosage.

#### Insect and disease control

Responsibility for insect and disease control: Contractor

Period for treatment: Until the problem has been eliminated.

Chemical spray: Apply outside of normal working hours.

#### Stakes and ties

Generally: If plants are not self-supporting or if stakes are damaged, stake or restake the plants as follows:

- Drive three hardwood stakes placed diagonally with the first stake on the opposite side to the prevailing winds.
- Do not single stake large plants.

Removal: If plants are robust with well-developed systems and no longer require support, remove stakes and ties.

### 2.2 GRASS

#### Mowing and trimming

Litter: Remove litter and fallen branches before mowing.

Height: Consistent with the growth habit of the grass variety and maintained at 25 mm to 40 mm throughout the year.

Program: Weekly during the mowing season, November to March, and at fortnightly intervals from April to October. Do not mow during wet conditions.

Raking: Once every month before mowing from November to March, rake the grass with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.

Edges: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Do not damage trees and shrubs.

Clippings distribution: Remove from site unless directed otherwise

#### Topdressing

Topdressing material for established lawns: Weed-free imported sandy topsoil to a depth of 5 mm.

- Program: The spring following establishment.

Topdressing material for remediation of depressions or irregularities: Apply coarse or medium soil to AS 4419 suitable for application to turf or grass seeded areas.

### **Fertilising**

Fertilising: Apply lawn fertiliser at the completion of the first and last mowings of the plant establishment period, and at other times as required to maintain healthy grass cover.

## **2.3 WEEDING**

### **General**

Requirement: Remove unwanted broadleaf plants and grasses considered invasive to the locality.

Program:

- Lawns: Quarterly, and as required to maintain the general lawn condition.
- Trees and shrubs: As required for planted, paved and mulched areas to be weed free when observed at fortnightly intervals.

Vigorous ground covers: Keep 200 mm clear from the base of any shrub or tree. Remove as follows:

- Small areas: By hand.
- Large areas: Proprietary herbicides.

Herbicide application: Apply as follows:

- To the manufacturer's instructions and Safety Data Sheets(SDS).
- When the weather is humid with moderate temperatures and maximum sunlight.
- When the ground has recommended soil moisture.
- Avoid windy days or if rain is likely to follow within 12 hours.

### **Rubbish removal**

Rubbish: Remove loose rubbish such as bottles, papers, and cigarette butts from the site. Execute this work regularly so that all areas are free from rubbish when observed at fortnightly intervals.

Leaf litter: Remove from all path and lawn areas.

### **General**

Inspection: Fortnightly to determine mulch requirements.

Requirement: Maintain minimum depth as follows:

- 75 mm for organic mulch.
- 50 mm for gravel mulch.

Remulching: Maintain the original ground levels around the base of plants.

## **2.4 WATERING**

### **Establishment**

Extent: All irrigated and non-irrigated plantings, lawn areas and street trees.

Water quality:

- pH between 5.5 and 7.5.
- Total soluble salts less than 1000 mg/litre.
- No substances toxic to plant growth.

Watering program: Minimum three complete waterings, soaking to a depth of 150 mm at fortnightly intervals for the first 6 weeks of plant establishment irrespective of natural rainfall. Confirm soaked depth and record in the log book.

Water restrictions: Coordinate the water supply and conform to legislation and restrictions applying at the time.

### **Irrigation**

Hand watering: Manually water all lawn and planting areas until the proposed irrigation system is fully operational, soaking to a depth of 150 mm for lawn and 300 mm for planting. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings.

Irrigation system program: Adjust to suit the following:

- The precipitation requirements of the individual zones/stations with regard to types of plants.
- The infiltration rate of the soil/medium and associated physical factors, seasons, evaporation, exposure, topography and local authority restrictions.
- Adjustment or shut down during and after periods of prolonged heavy rain.



Equipment maintenance:

- Check all components for proper operation.
- Repair or replace damaged components with parts from the same manufacturer.
- Flush any dirt or foreign matter from the system and clear all blockages.

#### **Hand watering**

Requirement: Manually water all lawn and planting areas, soaking to a depth of 150 mm for lawn and 300 mm for planting. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings.

## **2.5 PAVING AND STRUCTURES**

### **Paving**

Weed and grass control: Sprayed herbicide

## **2.6 COMPLIANCE**

### **Criteria**

Generally: Plant establishment shall be deemed complete, subject to the following:

- Repairs to plant material are complete.
- Ground surfaces are covered with the documented treatment to the documented depths.
- Pests, disease, or nutrient deficiencies or toxicities are not evident.
- Organic and gravel mulched surfaces are in a weed free and tidy condition and to the documented depth.
- Vegetation is established and well formed.
- Vegetation cover to cell, seeded and/or hydromulched areas is established
- Plants have healthy root systems that have penetrated into the surrounding, undisturbed ground and are not able to be lifted out of the planting holes.
- Vegetation is not restricting essential sight lines and signage.
- Only frangible species are growing within road side clear zones.
- Specified vegetation setbacks from services and road furniture are evident.
- All hard landscape works are installed and operating as documented.
- Litter collection and removal is complete.
- Mulch is removed from drainage and access areas.
- All non-conformance reports and defects notifications are complete.

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**0259 LANDSCAPE – MAINTENANCE**


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**1 GENERAL**


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**1.1 RESPONSIBILITIES**
**General**

Requirement: Provide landscape maintenance of the contract area during the maintenance period.

**Performance**

Extent of maintenance:

- Weeding of lawn, garden bed areas, and pavement.
- Supply and spreading of fertiliser to lawn, garden bed areas and pots.
- Supply and installation of mulch to existing garden bed areas and pots.
- Pruning, trimming and tree surgery.
- Insect and disease control of lawn, shrubs and trees.
- Mowing and edge trimming to all lawn areas including collection and removal of clippings.
- Replacement of dead or failed plants.
- Maintenance of irrigation systems.
- Removal of rubbish and debris in garden areas.
- Keeping of a log book.
- Monthly reports.

Maintenance period: Plant maintenance period, as documented.

Maintenance procedures: To the **Maintenance schedule**.

**1.2 THE SITE**

Entry permits: Make available, to persons entering designated secure areas, valid entry permits. Make sure these persons comply with conditions of entry.

**Protection of persons and property**

Accessways, services: Do not obstruct or damage footpaths, drains and watercourses or other existing services in use on or adjacent to the site.

Property: Do not interfere with or damage property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site, and trees.

**Rectification**

Accessways, services: Rectify immediately any obstruction or damage to footpaths, drains and watercourses or other existing services in use on or adjacent to the site. Provide temporary services whilst repairs are carried out.

Property: Rectify immediately any interference or damage to property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site, and trees.

**1.3 GENERAL CONDITIONS**
**Contractor and staff**

Affiliation: Provide professional qualifications/affiliations of the maintenance contractor to the superintendent.

Representative: Nominate a senior partner/personal experienced in maintenance nursery practices and horticulture, to be responsible for taking and carrying out instruction, and reporting to the principal.

**Special instructions**

Priority: If instructed by the principal attend to certain areas and procedures as a priority. Obtain approval for additional costs prior to commencement of works.

**Reporting**

Monthly report: Submit regular reports by the last Friday of each month, to the **Monthly reports schedule** and as follows:

- General status of the works.
- Soil test results included as required for the fertilising programs.

- Any plant replacement requirements.

Incident reports: Report immediately verbally and confirmed in writing any disturbance or incidence affecting or likely to affect the scheduling of the works.

**Notice**

Inspection: Provide two days' notice of the following operations:

- Application of herbicide.
- Application of fertiliser.
- Each site maintenance visit.
- Work affecting public access or amenity on the Thursday of the week before the work is planned.

**Log book**

Records: Log the following on a weekly basis:

- Description, time and method of application of toxic material.
- Maintenance work details.
- Inclement weather to verify inability to carry out work within the specified time frame.

Availability: Upon request.

**Replacement plants**

Species: Provide written certification that all plant material is true-to-species and type, and free of disease and fungal infection.

**Disruption of works by others**

Other contractors: Make arrangements to work around the disturbance.

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## 2 EXECUTION

### 2.1 GENERAL

**Weeding**

Requirement: Remove unwanted broadleaf plants and grasses considered invasive to the locality.

Program:

- Lawns: Quarterly.
- Trees and shrubs: As required for planted, paved and mulched areas to be weed free when observed at fortnightly intervals.

Vigorous ground covers: Keep 200 mm clear from the base of any shrub or tree. Remove as follows:

- Small areas: By hand.
- Large areas: Proprietary herbicides.

Herbicide application: Apply as follows:

- To the manufacturer's recommendations and the material data and safety data sheets.
- When the weather is humid with moderate temperatures and maximum sunlight.
- When the ground has adequate soil moisture.
- Avoid windy days or if rain is likely to follow within 12 hours.

**Insect and disease control**

Requirement: Control any insects or diseases affecting the lawn and garden bed areas as follows:

- Identify the problem.
- Execute the correct treatment until the problem has been eliminated.
- Apply hazardous material out of normal working hours.
- Protect staff and public.

### 2.2 GRASS

**Mowing and trimming**

Litter: Remove litter and fallen branches before mowing.

Height: Consistent with the growth habit of the grass variety and maintained at 25 mm to 40 mm throughout the year.

Program: Weekly during the mowing season, November to March, and at fortnightly intervals during April to October. Do not mow during wet conditions.

Raking: Once every month before mowing during the mowing season, rake the grass with a flexible rake. On alternate mowings, adopt a north-south and east-west pattern.

Edges: At the same time as mowing, trim lawn edges to plant beds, pathways, base of trees and other obstacles. Do not damage trees or shrubs.

Clippings distribution: Remove from site unless directed otherwise

Non-selective herbicide: Make sure application does not exceed the area limits of normal manual trimming. Repair any damage from overuse or over spray.

### **Fertilising**

N:P:K (Nitrogen:Phosphorus:Potassium) ratio: Balanced 10:4:6.

Rate: To the manufacturer's recommendation.

Program:

- Regular application: Each September and April.
- Additional application: Each November and February at reduced rates.

Soil pH adjustment: Apply additional fertilisers and soil conditioners as indicated from soil testing or from the physical soil structure. Maintain a pH range of 5.5 to 6.5.

pH testing program: Two year schedule commencing in the first year of the contract.

Application: Spread as follows:

- Dry: Crush lumps and broadcast dry material by hand or mechanically when the lawn is dry.
- Spray: Acceptable.
- Prevent fertiliser from leaching to adjoining planted beds, particularly those with sensitive native trees and shrubs.

### **Topdressing**

Topdressing material for established lawns: Weed free imported sandy topsoil to a depth of 5 mm.

Topdressing material for remediation of depressions or irregularities: Apply coarse or medium texture soil, to AS 4419, suitable for application to turf or grass seeded areas.

### **Renovation**

Established lawns of sandy soil profile: Renovate by dethatching or verticutting.

## **2.3 TREES AND SHRUBS**

### **Pruning and trimming**

General: Prune to reflect the natural growth, flowering and regrowth habit of the individual species.

Program generally: Spring and Summer and on a spot basis as required.

Shrubs: Prune after flowering.

Hedge trimming: Schedule trimming at times that maintains the character and design of hedges. Allow up to three times per season.

Tip pruning:

- Purpose: To encourage development of new shoots during the active growing season.
- Method: Removal of the top 25 mm or growing tip of each branch.
- Restriction: Do not remove buds before the flowering season in those plants that have terminal flowers.

Radical pruning:

- Purpose: To maintain a hedge or formal shape or when a particular problem, growth habit, damage, or disease requires branch removal.

Tree pruning:

- Eliminate diseased or damaged growth, avoid inter-branch contact and thin out crowns in a natural manner.
- Maintain sight lines to signs and lights.
- Maintain visibility for personal security.

Tree branch removal:

- To AS 4373.
- Give notice and engage a suitably qualified arborist.

### **Fertilising**

Fertilising program: Base the program on soil testing results.

Soil testing: Undertake soil tests as follows:

- At the commencement of the contract.
- Take samples from a cross section of planting beds.

Soil pH adjustment: Apply additional fertilisers and soil conditioners as indicated from soil testing or from the physical soil structure. Maintain a pH range of 5.5 to 6.5.

Shrubs:

- N:P:K ratio: Balanced 10:4:6.
- Rate: To the manufacturer's recommendation and cultivate two rows into the soil 100 mm deep.
- Regular application: Each September and March.
- Sensitive native species: Apply appropriate dosage.

Trees:

- Fertiliser type: Agriform 10 gram 20:4.3:4.1 (N:P:K)
- Dose: To manufacturers recommendations
- Application: Apply pill to the root zone at a distance from the trunk equal to the spread of the foliage. Make holes 400 mm deep to take the pill, equally spaced around the plant and backfill with sand.

Micro nutrients: Apply 1 kg of urea in 20 litres of water per 100 m<sup>2</sup>, through a hose proportioner every four weeks during Summer.

### Stakes and ties

Generally: If plants are not self-supporting or if stakes are damaged, stake or re-stake the plants as follows:

- Drive three hardwood stakes placed diagonally with the first stake on the opposite side to the prevailing winds.
- Do not single stake large plants.

Removal: If plants are robust with well-developed systems and no longer require support, remove stakes and ties.

### Plant replacements

General: Replace all evergreen plants that have died or lost 50% of their normal foliage cover. Provide replacement plants as follows:

- Of the same species and variety and of the closest commercially available size.
- With a balanced root system in relation to the size of the plant and conducive to successful transpiration. Inspect the root conditions of plants by knocking plants from their containers.
- Without signs of having been stressed at any stage during their development due to inadequate watering, excessive shade/sunlight, suffered physical damage or have restricted habit due to growth in nursery rows.
- Grown in final containers for not less than twelve (12) weeks.

## 2.4 WATERING

### Lawn and planted areas

Generally: Maintain a vigorous healthy appearance.

Application rates: Soak to a depth of 150 mm for lawn and 300 mm for planting. Avoid frequent dampening of the surface. Allow the surface of the soil to partially dry out between waterings. Confirm soaked depth and record in the log book.

Timing: Water at times of day to minimise water evaporation loss. Do not water during the hottest period of Summer days.

Water restrictions: Coordinate the water supply and conform to legislation and restrictions applying at the time.

### Irrigation

Irrigation system program: Adjust to suit the following:

- The precipitation requirements of the individual zones/stations with regard to types of plants.
- The infiltration rate of the soil/medium and associated physical factors, of seasons, evaporation, exposure, topography, local authority restrictions.
- Adjustment or shut down during and after periods of prolonged heavy rains.
- Water supply and watering regime of legislation and restrictions applying at the time.

Equipment maintenance: Confirm the following:

- Check all components for proper operation.
- Obtain approval to repair or replace damaged component with equivalent parts.
- Flush any dirt or foreign matter from the system and clear all blockages.

System maintenance: Conform to the **Irrigation system maintenance schedule**.

### **Programming**

Automated systems: Program to coincide with optimum periods of water pressure and water absorption.

Public access: Do not inconvenience persons occupying the site by water spray or block normal pedestrian or traffic flow.

## **2.5 MULCHING**

### **General**

Clean up: Remove all mulching materials off lawn or paved areas and maintain a clean and tidy appearance when viewed on a weekly basis.

Requirement: Maintain a minimum depth as documented.

Top up: Areas of excessive wear.

### **Organic Mulch**

Existing material: As documented

### **In –Organic Mulch**

Existing material: As documented

Appearance: Maintain to keep clean and tidy with no soil disturbance evident on the surface of the mulch.

## **2.6 INCIDENTAL WORKS**

### **Supplementary works**

General: Execute the following:

- Removal of waste from maintenance work.
- Removal of leaf litter fortnightly during leaf fall.
- Wash paving on completion of herbicide application.

**0261 LANDSCAPE – FURNITURE AND FIXTURES****3 GENERAL****3.1 RESPONSIBILITIES****General**

Requirement: Provide landscape furniture and fixtures, as documented.

**3.2 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 *General requirements.*
- 0262 *External sports and playground surfacing.*

**3.3 SUBMISSIONS****Operation and maintenance manual**

Requirement: Submit the manufacturer's published use, care and maintenance requirements for each item.

**Products and materials**

Requirement: Submit the manufacturer's standard drawings and details showing methods of construction, assembly and installation; with dimensions and tolerances.

Type test: Submit results as follows:

- Playground equipment: To AS 4685 series.

**Shop drawings**

Custom-built furniture and fixtures: Submit shop drawings to a scale that best describes the details, showing methods of construction, assembly and installation, with dimensions and tolerances.

**Subcontractors**

General: Submit names and contact details of proposed suppliers and installers.

**Warranties**

Requirement: Submit the manufacturer's published product warranties.

**3.4 INSPECTION****Notice**

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

- Custom-built furniture and fixtures fabricated and ready to be delivered to the site.
- Furniture items delivered to site before installation.
- Site locations or substrates prepared to receive furniture or fixtures before installation.
- Set-out of furniture and fixtures.
- Completed installation.

**4 PRODUCTS****4.1 GENERAL****Storage and handling**

General: Deliver, unload and store products and accessories in sealed manufacturer's packaging.

**Preservative treatment**

CCA treated timber: If proposed, provide details.

**Labelling**

Playground equipment: To AS 4685 series.

**Weathering steel**

Standard: To AS/NZS 3678.

Grade: WR350.

## 4.2 ELEMENTS

### Playground equipment and exercise stations

Soft surfacing: To 0262 External sports and playground surfacing.

Playground equipment: To the AS 4685 series.

### Sand pits

Materials:

- Aggregate: 15 mm gauge road base.
- Agricultural pipe: 75 mm diameter slotted PVC pipe.
- Sand: Clean, sharp river sand.

## 5 EXECUTION

### 5.1 INSTALLATION

#### Erection

Line and level: Erect posts or poles vertically. Erect furniture items level. Where installed on slopes, provide a level area around benches and seats.

#### Sand pits

Requirement: Compact aggregate to 100 mm depth after installation of play structure components. Lay agricultural pipe in aggregate and cover with filter fabric allowing for a fall of 1:75 towards the agricultural pipe. Top up with 300 mm (minimum) sand.

### 5.2 COMPLETION

#### Cleaning

General: On completion, remove protective coatings, clean all surfaces and remove all labels not required for maintenance, or by AS 4685 series.

|                                                      |
|------------------------------------------------------|
| <b>0262 EXTERNAL SPORTS AND PLAYGROUND SURFACING</b> |
|------------------------------------------------------|

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide external sports and playground surfacing, as documented.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.
- 0271 Pavement base and subbase.
- 0272 Asphalt.
- 0310 Concrete – combined.

### 1.3 STANDARDS

#### General

Playground surfacing: To AS 4685.0 and AS 4685.1.

### 1.4 INTERPRETATION

#### Abbreviations

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

- EDPM: Ethylene propylene diene monomer (M-class) rubber.
- SBR: Styrene-butadiene rubber.

#### Definitions

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



- Critical fall height: The maximum free height of fall for which a surface provides an acceptable level of impact attenuation.
- Rubber: Polymeric material, either natural or synthetic that is elastomeric.
- Substrate: The surface to which a material or product is applied.
- Surfacing: An impact-attenuating surface consisting of one or more material components cast in situ, formed into a sheet, tile or other continuous surface where the underlying protective properties of the impact surfacing remain constant with consecutive and/or repeated use.

## 1.5 TOLERANCES

### Sports surfacing

General: No ridges, bumps or hollows to cause a hazard or to deflect a ball from its true path.

Gradients: Not greater than 1:100 in any direction.

Deviation from the finished plane: When checked on a 10 m grid the difference in level between adjacent grid points, after taking design gradients into account, must not exceed 25 mm.

### Playground surfacing

General: No ridges, bumps or hollows to cause a hazard, with a 2.5 m gradual transition from playground surfacing to adjacent surfaces.

## 1.6 SUBMISSIONS

### Operation and maintenance manuals

General: Submit manufacturer's published use, care and maintenance requirements for each type of surfacing.

### Products and materials

Manufacturer's data: Submit the manufacturer's product data for each type of surfacing, and the manufacturer's recommendations for its application in the project including the following, as appropriate:

- Product technical data sheets.
- Safety data sheets (SDS).
- Maintenance recommendations.

Type tests: Submit results, as follows:

- Impact-attenuation performance of surfaces: To AS 4422.
- Slip resistance: To AS 4586.

### Samples

Synthetic turf surfacing: For each type, submit a sample of the following:

- Turf fabric: 300 mm x 300 mm.
- Game line turf fabric: 300 mm long by line width.
- Infill material: 100 g of each type.
- Impact-attenuation layer: 300 mm x 300 mm.
- Seam sample: 300 mm x 300 mm square with seam centered in sample.

Polymeric cast in situ surfacing and polymeric liquid coatings: For each type, submit a sample of the following:

- Coating system including impact-attenuation layer on a suitable base.
- Minimum size per sample: 450 mm x 450 mm.
- Game line sample: 450 mm long by line width.

Polymeric cast prefabricated surfacing: For each type, submit a sample of the following:

- Minimum size per sample: 450 mm x 450 mm.
- Game line sample: 450 mm long by line width.

Polymeric granular material: For each type, submit a 100 g sample of the material.

Identification: Label each sample, with brand, product name, and manufacturer's code reference (including the code for each coat of multi-coat work).

### Shop drawings

Synthetic turf surfacing: Submit shop drawings to a scale that best describes the detail, showing the following:

- Sections and details.

- Locations of seams and method of seaming.
- Layout of game lines, numbers, and letters. Indicate application method of each line and marking.

Polymeric surfacing: Submit shop drawings to a scale that best describes the detail, showing the following:

- Installation details.
- Layout of game lines, numbers, and letters. Indicate application method of each line and marking.
- Location of equipment inserts.
- Method of joining different colours and separate pours.

#### **Subcontractors**

General: Submit names and contact details of proposed suppliers and applicators.

Substrate acceptance: Submit evidence of applicator's acceptance of the surfacing substrate before commencing installation.

#### **Tests**

Site tests: Submit results, as follows:

- Impact-attenuation performance of completed surfaces.
- Slip resistance test of completed installations.

#### **Warranties**

Requirement: Submit warranties, as documented.

### **1.7 INSPECTION**

#### **Notice**

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

- Base preparation completed.
- Substrate preparation completed.
- Setting out completed.
- Installation completed.

## **2 PRODUCTS**

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### **2.1 GENERAL**

#### **Storage and handling**

General: Deliver, unload and store surfacing materials in unbroken manufacturer's packaging. Inspect for damage upon delivery.

Storage: Store in a dry environment and in a location to allow installation of the surfacing without excess disturbance of the substrate.

### **2.2 SUBSTRATES**

#### **Base and subbase**

Requirement: To 0271 *Pavement base and subbase*.

#### **Asphaltic concrete**

Requirement: To 0272 *Asphalt*.

#### **Concrete**

Requirement: To 0310 *Concrete – combined*.

### **2.3 GEOTEXTILE MATERIALS**

#### **General**

Material: UV stabilised polymeric fabric formed from a plastic yarn composed of at least 85% by weight.

Identification and marking: To AS 3705.

Quality: Free of flaws, stabilised against UV radiation, rot proof, chemically stable and with low water absorbency. Filaments resistant to delamination and dimensionally stable.

### **2.4 IMPACT-ATTENUATION LAYER**

#### **General**

Description: Proprietary resilient layer between the base and surface with the following properties:

- Reduce injury risk from falls.
- Reduce lower leg stress.
- Control ball bounce.

## 2.5 SYNTHETIC TURF

### General

Description: Proprietary matting made from synthetic fibres tufted into a water-permeable woven backing, including the following:

- Unfilled synthetic turf: A sporting surfacing that requires prolonged wetting before use.
- Dressed or filled synthetic turf: A sports surfacing that incorporates granular fill.

Pile height maximum variation:  $\pm 15\%$  of the mean height.

Pile distribution: Uniform over the surface.

Rubber Infill: Ground SBR crumb rubber free of metal, non-metallic fibres, and contaminants.

Sand Infill: Uniformly sized kiln dried silica sand free of silts, clays, vegetable matter and contaminants, and of sub-angular or rounder shape.

## 2.6 POLYMERIC CAST IN SITU

### General

Description: Proprietary polymeric system comprising polyurethane binder and granular rubber mixed and cast in situ and finished with a coloured spray coating.

Game lines and markings: Inlaid or painted.

## 2.7 POLYMERIC PREFABRICATED SHEETS AND TILES

### General

Description: Proprietary system of prefabricated sheets or tiles comprising polyurethane binder and granular rubber.

Game lines and markings: Inlaid or painted.

## 2.8 POLYMERIC GRANULAR MATERIAL

### General

Definition: Proprietary system comprising loose laid granular rubber.

Granular rubber: Shredded particles free of metal, non-metallic fibres, rubber dust and contaminants.

Edging: Water-resistant interconnected modular units.

## 2.9 POLYMERIC LIQUID COATINGS

### General

Description: Proprietary system comprising acrylic or polyurethane coatings with or without an impact-attenuation layer.

Game lines and markings: Painted.

## 3 EXECUTION ---

### 3.1 GENERAL

#### Subcontractors

Requirement: Use specialist applicators recommended by the material manufacturer.

#### Combinations

General: Do not combine products from different manufacturers in a surfacing system.

### 3.2 SUBSTRATES

#### Drying and shrinkage

General: Before laying surfaces, allow at least the following times to elapse for these substrates:

- Concrete slabs: 28 days.
- Asphaltic concrete: 14 to 21 days.

### 3.3 PREPARATION

#### Substrate condition

Requirement: Sound, clean and free of any deposit or finish, including laitance, efflorescence, curing compounds, dirt and grease, which may impair bonding or is incompatible with the surfacing.

Substrate alkalinity and adhesion: Verify the concrete pH is within the range recommended by the manufacturer. Perform adhesion tests to the manufacturer's recommendations, do not proceed with application unless the substrate passes the test.

#### Substrate correction

Substrate rectification: Conform to the following:

- Surface treatments: Mechanically remove the following surface treatments:
  - . Sealers and hardeners.
  - . Curing compounds.
  - . Waterproofing additives.
  - . Surface coatings and contamination.
- Planeness, smoothness, projections: Remove projections and fill voids and hollows with a smoothing and self-levelling compound compatible with the adhesive. Allow filling or levelling compound to dry to manufacturer's recommendations.

#### Ambient conditions

Ambient air temperature: If less than 5°C or more than 35°C, do not lay surfacing.

Ambient surface temperature: If less than 10°C or more than 60°C, do not lay surfacing.

Rainfall and humidity: If rainfall is imminent or high humidity may prevent drying, do not lay surfacing.

#### Falls

Requirement: Make sure the fall in the substrate conforms to the fall documented for the surface finish.

#### Geotextile

Preparation: Trim the ground to a smooth surface free from cavities and projecting rocks.

Placing: Lay the fabric flat, but not stretched tight, and secure it with anchor pins. Overlap joints 300 mm minimum.

#### Priming

General: If required by the surfacing manufacturer, prime the substrates with a primer compatible with the surfacing system.

### 3.4 SYNTHETIC TURF

#### Installation

Preparation: Place and compact minimum 50 mm cement stabilised crusher dust as bedding layer for synthetic turf. Avoid disturbance to the bedding during installation.

Laying: Cut to shape, spread without wrinkles and lay carpet as follows:

- In continuous lengths across the width of the pitch with no cross joints.
- Level differences and separation at joints and seams: < 2 mm.
- Seams or textural variations not to cause ball deflection from true path.

Impact-attenuation layer: Roll out and allow to relax for a minimum of 6 hours. Stagger head seams between adjacent rows.

Joints: To the manufacturer's detail.

Inlaid game lines: Cut through turf fabric and fix with seaming tape

Infill dressing: Spread and groom by machine in proportions and depths, as documented. Rake fibres trapped by infill to surface.

Painted game lines: Apply to the manufacturer's recommendations.

### 3.5 POLYMERIC CAST IN SITU

#### Installation

General: Mix and apply components of seamless surfacing to manufacturer's recommendations to produce uniform, monolithic, and impact-attenuating surfacing of required overall thickness.

Substrate primer: Apply over prepared substrate.

Impact-attenuating layer: Spread evenly over primed substrate to form a uniform layer with a minimum of cold joints.

Intercoat primer: Apply primer over cured cushioning layer.

Wearing layer: Spread over primed substrate or impact-attenuation layer to form a uniform layer and, except where colour changes, with a minimum of cold joints. Finish surface to standard wearing surface texture.

Topcoat: Spray or roller apply in one continuous operation.

Joints: To the manufacturer's detail.

Edge treatment: Fully adhere edges to substrate with full coverage of substrate. Maintain the cushioned thickness required to conform with performance requirements.

Game lines: Mask surfacing and apply to the manufacturer's recommendations.

### 3.6 POLYMERIC PREFABRICATED SHEETS AND TILES

#### Installation

General: Apply components of prefabricated surfacing to manufacturer's recommendations to produce a uniform wearing surface without unaligned units, raised edges (lipping), or other surface imperfections.

Prefabricated sheet: Lay from centreline established between principal perimeter edges.

Prefabricated tiles: Lay out from centreline established between principal perimeter edges, with tiles at opposite sides of installation of equal width. Adjust as required to avoid cut tiles less than one-half of a tile width and as follows:

- Alignment axis and pattern: Lay units along axis and in grid pattern, as documented.

Obstructions: Scribe, cut, and fit prefabricated units to vertical surfaces, equipment anchors and other interruptions of floor surface.

Fixing sheets and tiles:

- Adhesive: Adhere to substrates using a full spread of adhesive applied to substrate or to sheet/tile.
- Mechanical: Anchor to substrates.

Joints: To the manufacturer's details.

Edging: Maintain cushioned thickness required to conform with performance requirements.

Game lines: Mask surfacing and apply to the manufacturer's recommendations.

### 3.7 POLYMERIC GRANULAR MATERIAL

#### Installation

General: Apply components of loose-fill surfacing to manufacturer's recommendations to produce a uniform surface.

Edging: Install and permanently secure edging in place, and attach units to each other.

Loose fill: Place loose-fill materials to required depth after installation of playground equipment support posts and foundations, including the recommended amount of additional material to offset compaction over time.

Grading: Uniformly grade loose fill to an even surface free from irregularities.

### 3.8 POLYMERIC LIQUID COATINGS

#### Installation

General: Mix and apply flooring components according to manufacturer's recommendations to produce a uniform surface.

Substrate primer: Apply over prepared substrate.

Impact-attenuation layer: Roll out and fix with adhesive. Stagger head seams between adjacent rows. Apply sealer over impact-attenuation layer.

Wearing layer: Apply by spray or roller over primed substrate or impact-attenuation layer to form a uniform layer.

Topcoat: Apply by spray or roller in one continuous operation.

Game lines: Mask surfacing and apply to the manufacturer's recommendations.

### 3.9 TESTING

#### Completion tests

Slip resistance of testing of completed installation: To AS 4663.

Impact-attenuation performance of completed surfaces: To AS 4422.

### 3.10 COMPLETION

#### Protection

General: Keep traffic off finished work for 48 hours after installation.

#### Reinstatement

Extent: Repair or replace faulty or damaged work. If the work cannot be repaired satisfactorily, replace the whole area affected.

#### Spare materials

General: Supply spare matching surfacing and accessories of each type for future replacement purposes. Store the spare materials on site where directed.

Quantity: At least 1% of the quantity installed.

#### Warranties

Surfacing: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.

## 0271 PAVEMENT BASE AND SUBBASE

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide base and subbase courses as documented.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.
- 0222 Earthwork.

### 1.3 INTERPRETATION

#### Definitions

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

- Base: One or more layers of material, forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Subbase: Material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform.

### 1.4 SUBMISSIONS

#### Execution details

General: Submit details of the proposed work methods and equipment for each pathway and roadworks operation, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.

Compaction: If a layer is proposed to exceed 200 mm in thickness, submit evidence that the proposed compaction equipment can achieve the required density throughout the layer.

#### Products and materials

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Conformance: Submit type test results for each material listed in the **Base material properties and test methods table** and **Subbase material properties and test methods table** from an Accredited testing laboratory as evidence of material conformance.

## 1.5 INSPECTION

### Notice

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

- Prepared subgrade.
- Proof rolling of subbase before spreading of base.
- Proof rolling of base before sealing.

## 2 PRODUCTS

### 2.1 BASE AND SUBBASE MATERIAL

#### Granular material

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

#### Crushed rock

Requirement: Provide crushed rock as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

#### Recycled materials

Requirement: Provide recycled materials as follows:

- Base and subbase: Conform to the **Limits on use of recycled and manufactured materials as constituent materials table** and the **Undesirable material properties table**.

#### Natural gravel

Requirement: Provide unbound natural gravel materials as follows:

- Base: 20 mm nominal.
- Subbase: 40 mm nominal.

#### Subbase material properties and test methods table

| Property and test method                                                         | Differentiating criteria            | Material requirements |                |
|----------------------------------------------------------------------------------|-------------------------------------|-----------------------|----------------|
|                                                                                  |                                     | Crushed rock          | Natural gravel |
| Particle size distribution or grading (% passing through sieve) to AS 1289.3.6.1 | <b>Sieve size (mm)</b>              | —                     | —              |
|                                                                                  | 53.0 mm                             | 100                   | 100            |
|                                                                                  | 37.5                                | 90 - 100              | 95 - 100       |
|                                                                                  | 26.5                                | 74 - 96               | 80 - 97        |
|                                                                                  | 19.0                                | 62 - 86               | —              |
|                                                                                  | 13.2                                | —                     | —              |
|                                                                                  | 9.5                                 | 42 - 66               | 48 - 85        |
|                                                                                  | 4.75                                | 28 - 50               | 35 - 73        |
|                                                                                  | 2.36                                | 20 - 39               | 25 - 58        |
|                                                                                  | 0.425                               | 8 - 21                | 10 - 33        |
|                                                                                  | 0.075                               | 3 - 11                | 3 - 21         |
| Liquid limit ( $w_L$ ) to AS 1289.3.1.1                                          | —                                   | max 25%               | max 25%        |
| Plasticity index ( $I_P$ ) to AS 1289.3.3.1                                      | —                                   | max 12%               | max 12%        |
| Linear shrinkage ( $LS$ ) to AS 1289.3.4.1                                       | <b>Rainfall</b>                     | —                     | —              |
|                                                                                  | Areas with annual rainfall > 500 mm | max 4.5%              | max 4.5%       |

| Property and test method                                                                                                                                                                                                                                        | Differentiating criteria            | Material requirements |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|----------------|
|                                                                                                                                                                                                                                                                 |                                     | Crushed rock          | Natural gravel |
|                                                                                                                                                                                                                                                                 | Areas with annual rainfall < 500 mm | max 6.0%              | max 6.0%       |
| Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1) to AS 1141.52                                                                                                                                | —                                   | min 1.0 MPa           | min 1.0 MPa    |
| Particle shape by proportional calliper - % misshapen (2:1) to AS 1141.14                                                                                                                                                                                       | —                                   | max 35%               | —              |
| Aggregate wet strength* to AS 1141.22                                                                                                                                                                                                                           | —                                   | min 50 kN             | —              |
| Wet/dry strength variation* (dry - wet)/dry to AS 1141.22                                                                                                                                                                                                       | —                                   | max 40%               | —              |
| Los Angeles value to AS 1141.23                                                                                                                                                                                                                                 | —                                   | max 40%               | —              |
| 4 day soaked CBR (98% modified compaction) to AS 1289.6.1.1                                                                                                                                                                                                     | —                                   | min 30%               | min 30%        |
| *Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing. |                                     |                       |                |

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

| Recycled material   | Unbound or modified base and subbase | Bound base and subbase |
|---------------------|--------------------------------------|------------------------|
| Iron and steel slag | 100%                                 | 100%                   |
| Crushed concrete    | 100%                                 | 100%                   |
| Brick               | 20%                                  | 10%                    |
| RAP                 | 40%                                  | 40%                    |
| Fly ash             | 10%                                  | 10%                    |
| Furnace bottom ash  | 10%                                  | 10%                    |
| Crushed glass fines | 10%                                  | 10%                    |

#### Undesirable material properties table

| Property and test method                                                      | Differentiating criteria                                                         | Material requirements |                   |                |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------|-------------------|----------------|
|                                                                               |                                                                                  | Crushed rock          | Recycled material | Natural gravel |
| Undesirable constituent materials (% retained on a 4.75 mm sieve) to RMS T276 | <b>Material type</b>                                                             | —                     | —                 | —              |
|                                                                               | Type I - Metal, glass, stone, ceramics and slag                                  | —                     | max 2.0 %         | —              |
|                                                                               | Type II - Plaster, clay lumps and other friable material                         | —                     | max 0.5%          | —              |
|                                                                               | Type III - Rubber, plastic, paper, cloth, paint, wood and other vegetable matter | —                     | max 0.1%          | —              |



Base material properties and test methods table

| Property and test method                                                                                                                                                                                                                                                         | Differentiating criteria            | Material requirements |                   |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|-------------------|----------------|
|                                                                                                                                                                                                                                                                                  |                                     | Crushed rock          | Recycled material | Natural gravel |
| Particle size distribution or grading (% passing through sieve)<br>AS 1289.3.6.1                                                                                                                                                                                                 | <b>Sieve size (mm)</b>              | —                     | —                 | —              |
|                                                                                                                                                                                                                                                                                  | 26.5                                | 100                   | 100               | 100            |
|                                                                                                                                                                                                                                                                                  | 19.0                                | 95 - 100              | 95 - 100          | 93 - 100       |
|                                                                                                                                                                                                                                                                                  | 13.2                                | 77 - 93               | 78 - 92           | —              |
|                                                                                                                                                                                                                                                                                  | 9.5                                 | 63 - 83               | 63 - 83           | 71 - 87        |
|                                                                                                                                                                                                                                                                                  | 4.75                                | 44 - 64               | 44 - 64           | 47 - 70        |
|                                                                                                                                                                                                                                                                                  | 2.36                                | 29 - 49               | 30 - 48           | 35 - 56        |
|                                                                                                                                                                                                                                                                                  | 0.425                               | 13 - 23               | 13 - 21           | 14 - 32        |
|                                                                                                                                                                                                                                                                                  | 0.075                               | 5 - 11                | 5 - 9             | 6 - 20         |
| Liquid limit ( $w_L$ ) to AS 1289.3.1.1                                                                                                                                                                                                                                          | —                                   | max 25%               | max 30%           | max 25%        |
| Plasticity index ( $I_P$ ) to AS 1289.3.3.1                                                                                                                                                                                                                                      | <b>Rainfall</b>                     | —                     | —                 | —              |
|                                                                                                                                                                                                                                                                                  | All areas                           | —                     | —                 | —              |
|                                                                                                                                                                                                                                                                                  | Areas with annual rainfall > 500 mm | max 6%                | max 6%            | max 6%         |
|                                                                                                                                                                                                                                                                                  | Areas with annual rainfall < 500 mm | max 10%               | max 10%           | max 10%        |
| Linear shrinkage ( $LS$ ) to AS 1289.3.4.1                                                                                                                                                                                                                                       | <b>Rainfall</b>                     | —                     | —                 | —              |
|                                                                                                                                                                                                                                                                                  | All areas                           | —                     | —                 | —              |
|                                                                                                                                                                                                                                                                                  | Areas with annual rainfall > 500 mm | max 2.0%              | max 2.0%          | max 2.0%       |
|                                                                                                                                                                                                                                                                                  | Areas with annual rainfall < 500 mm | max 4.0%              | max 4.0%          | max 4.0%       |
| For materials with plasticity index less than 1: Maximum dry compressive strength to AS 1141.52                                                                                                                                                                                  | —                                   | min 1.7 MPa           | min 1.7 MPa       | min 1.7 MPa    |
| Particle shape by proportional caliper (% misshapen for 2:1 caliper ratio) to AS 1141.14                                                                                                                                                                                         | —                                   | max 35%               | max 35%           | —              |
| Aggregate wet strength* to AS 1141.22                                                                                                                                                                                                                                            | —                                   | min 80 kN             | min 80 kN         | —              |
| Wet/dry strength variation* to AS 1141.22                                                                                                                                                                                                                                        | —                                   | max 35%               | max 35%           | —              |
| Los Angeles value (% loss or abrasion) to AS 1141.23                                                                                                                                                                                                                             | —                                   | max 35%               | max 40%           | —              |
| CBR (98% modified compaction) to AS 1289.6.1.1                                                                                                                                                                                                                                   | —                                   | min 80%               | min 80%           | min 80%        |
| Unconfined compressive strength to AS 5101.4                                                                                                                                                                                                                                     | —                                   | max 1.0 MPa           | max 1.0 MPa       | —              |
| <b>NOTES:</b><br>*Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 to 9.5 mm. For blended materials, also test the fraction 9.5 to 4.75 mm. Test any other fraction where there is risk of failing. |                                     |                       |                   |                |

**Tests**

Material property testing: Conform to the **Base material properties and test methods table** and the **Subbase material properties and test methods table**.

Frequency of material property tests: Not less than the following:

- Particle size distribution: 1 per 1000 t (or part of).
- Liquid limit: 1 per 1000 t (or part of).
- Plasticity index: 1 per 1000 t (or part of).
- Linear shrinkage: 1 per 1000 t (or part of).
- Foreign materials content: 1 per 1000 t (or part of).
- Maximum dry compressive strength: 1 per 5000 t (or part of).
- Particle shape: 1 per 1000 t (or part of).
- Los Angeles value: 1 per 1000 t (or part of).
- Aggregate wet strength: 1 per 5000 t (or part of).
- Wet/dry strength variation: 1 per 5000 t (or part of).

**3 EXECUTION****3.1 SUBGRADE PREPARATION****General**

Requirement: Prepare the subgrade to 0222 *Earthwork*.

**3.2 PLACING BASE AND SUBBASE****General**

Weak surfaces: Do not place material on a surface that is weakened by moisture and is unable to support, without damage, the construction plant required to perform the works.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Compacted layer thickness: 200 mm maximum and 100 mm minimum. Provide layers of equal thickness in multilayer courses.

**Joints**

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by a minimum of 300 mm.

Start of shift: Remix last 2 m of previous days' work for continuity of compaction.

**Final trimming**

General: Trim and grade the base course to produce a tight even surface with no loose stones or slurry of fines.

**3.3 TOLERANCES****Surface level**

General: Provide a finished surface level which is free draining and evenly graded between level points.

Subbase: + 10 mm, - 25 mm.

Base: + 10 mm, - 5 mm.

Base abutting gutters:  $\pm 5$  mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

**Surface deviation**

Base:  $\leq 5$  mm from a 3 m straightedge laid on the surface.

**3.4 BASE AND SUBBASE COMPACTION****General**

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation.

Unstable areas: If unstable areas develop during rolling or are identified by proof rolling, open up, dry back and recompact, to the requirements of this worksection. If dry back is not possible, remove for the full depth of layer, dispose of and replace with fresh material.

#### Minimum relative compaction table

| Item description | Minimum dry density ratio (modified compaction) to AS 1289.5.2.1 |
|------------------|------------------------------------------------------------------|
| Subbase          | 95%                                                              |
| Base             | 98%                                                              |

#### Compaction requirements

General: Apply uniform compactive effort over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure is acknowledged, conform to

#### Rectification.

Equipment: Use rollers appropriate to the materials and compaction requirements documented.

#### Moisture content

General: During spreading and compaction, maintain material moisture content within the range of - 2% to +1% from the optimum moisture content (modified compaction).

Spraying: Use water spraying equipment to distribute water uniformly, in controlled quantities, over uniform lane widths.

Dry back: Allow materials to dry to 60 to 80% of the optimum moisture content before applying the seal or wearing course.

#### Rectification

General: If a section of the pavement material fails to meet the required density or moisture content after compaction, remove the non-conforming material, dispose of off-site or rectify for re-use, replace with fresh material, and re-compact.

#### Level corrections

General: Rectify incorrect levels as follows:

- High areas: If the area can be rectified by further trimming to produce a uniform, hard surface by cutting without filling, trim so that the rectified area conforms to **TOLERANCES**.
- Low areas and high areas not rectifiable by further trimming: Remove layers to a minimum depth of 75 mm, lightly tyne and replace with new material and re-compact.

### 3.5 TESTING

#### Site tests

Compaction control tests: To AS 1289.5.4.1 and AS 1289.5.4.2.

Frequency of compaction control tests: Not less than the following (whichever requires the most tests):

- 1 test per layer per 100 lineal metres for two-lane roads.
- 1 test per layer per 2000 m<sup>2</sup> for car parks.
- 3 tests per layer.
- 3 tests per visit.

## 0274 CONCRETE PAVEMENT

### 1 GENERAL

#### 1.1 RESPONSIBILITIES

##### General

Requirement: Provide concrete pavement as documented.

##### Performance

Requirement:

- Free draining and evenly graded between level points.
- Even and smooth riding surfaces.

Conformance: Conform to the local authority requirements for levels, grades and minimum thickness, reinforcement and concrete strength for pavements within the kerb-and-gutter property boundaries.

## 1.2 DESIGN

### General

Coordination: Determine the local authority requirements that may affect grades, transitions and work zones, including the following:

- Drainage.
- Trees (due to settlement).
- Adjacent structures.

## 1.3 CROSS REFERENCES

### General

Requirement: Conform to the following:

- 0171 *General requirements*.
- 0222 *Earthwork*.
- 0271 *Pavement base and subbase*.

## 1.4 STANDARDS

### Concrete

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

Residential pavements: To AS 3727.1.

### Slip resistance

Classification: To AS 4586.

## 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.
- Concrete class – normal: Concrete that is specified primarily by a standard compressive strength grade up to 50 MPa and otherwise in conformance with AS 1379 clause 1.5.3.
- Concrete class – special: Concrete that 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.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

## 1.6 TOLERANCES

### General

Surface abutting gutters:  $\pm 5$  mm from the level of the gutter edge.

Rigid pavement surface:

- From design level: + 10 mm, - 0 mm.
- From a 3 m straightedge placed anywhere on surface: 5 mm.

Horizontal position of outer concrete edge: 30 mm from documented position.

Joint locations in plan : 10 mm from documented position.

## 1.7 SUBMISSIONS

### Certification

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

Compliance certificate: If product testing is not proposed, submit a manufacturer's certificate together with results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

### Execution details

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water on site.
- Changes to the concrete mix.
- Temperature control, curing and protection methods.

- Cutting or displacing reinforcement.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence, size and times of concrete pours, and construction joint locations and relocations.

Cores, fixings and embedded items: If required, submit shop drawings showing the proposed locations, clearances and cover, and indicate any proposed repositioning of reinforcement.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

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

Splicing: If undocumented splicing is proposed, submit details.

Welding: If welding of reinforcement is proposed, provide details and give notice before welding reinforcement.

Joint sealants: Submit proposals for installation methods and sealant performance.

Crack assessment: If unplanned cracks occur in the finished pavement, submit proposals for investigation.

Surface repair method: If required, submit details of the proposed method before commencing repairs.

Trial section: Submit proposal for trial pavement.

### **Products and materials**

Aggregates: Nominate the source for all aggregates.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an Accredited Testing Laboratory.

Liquid curing compounds: Submit certified test results, including the application rate and the efficiency index to AS 3799 Appendix B.

Curing by covering: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

Concrete: Submit the concrete supply delivery dockets.

Trial mix design report: Six weeks before commencing production, submit a report for each mix design containing the information required in AS 1012.2, the individual and combined aggregate particle size distribution, and the records and reports for the tests.

### **Subcontractors**

Pre-mixed supply: 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.

### **Tests**

Site tests: Submit results, as follows:

- Slip resistance test of completed installations.

## **1.8 INSPECTION**

### **Notice**

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

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Concrete formwork, reinforcement and dowels in position.
- Commencement of concrete placing.
- Completion of concrete placing.
- Evaluation of surface finish.

---

## **2 PRODUCTS**

### **2.1 REINFORCEMENT**

#### **Steel reinforcement**

Standard: To AS/NZS 4671.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material that may reduce the bond between the reinforcement and concrete.

**Protective coatings**

Requirement: For concrete containing protective coated reinforcement, provide the same coating type to all reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules.

Epoxy coating: Provide high build, high solids chemically resistant coating to AS/NZS 3750.14.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanising and coat cut ends.
- Zinc-coating (minimum): 600 g/m<sup>2</sup>.

**Steel fibres**

Fibre reinforcement: To CIA CPN35.

Steel fibre content: 45 to 75 kg/m<sup>3</sup> and the steel fibre manufacturer's recommendations.

**Accessories**

Reinforcement supports: To AS/NZS 2425.

Tie wire: Galvanized annealed steel 1.25 mm diameter minimum.

**Dowels**

General: Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs.

Standard: To AS/NZS 4671.

Grade: 250R steel bars 450 mm long.

**Tie bars**

Type: Deformed bar, 12 mm diameter, grade 500N, 1 m long.

**2.2 AGGREGATE****Characteristics**

Standards: AS 2758.1.

Durability: Tested to AS 1141.22:

- Wet strength not less than 80 kN.
- 10% Fines Wet/Dry Variation not to exceed 35%.

Recycled concrete aggregate (RCA): If blending coarse RCA with natural aggregates, make sure substitution rates are below 30%.

**2.3 CEMENT****General**

Standard: To AS 3972.

Moisture: Protect from moisture until used. Do not use caked or lumpy cement.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

**Supplementary cementitious materials**

Fly ash: To AS/NZS 3582.1.

Slag: To AS 3582.2.

Amorphous silica: To AS/NZS 3582.3.

**2.4 WATER****General**

Quality: Drinking water free from materials harmful to concrete or reinforcement, and not salty or brackish.

Limits: Not containing more than:

- 600 parts per million of chloride ion, tested to AS 3583.13.
- 400 parts per million of sulphate ion, tested to AS 1289.4.2.1.

**2.5 ADMIXTURES****General**

Standard: Chemical admixtures to AS 1478.1, used to the manufacturer's recommendations.

Quality: Free from calcium chloride, calcium formate, or triethanolamine or any other accelerator. Do not use admixtures or combinations of admixtures without prior written approval.

Dosage: Vary the dosage of chemical admixture to account for factors such as air temperature, setting time and cement content to the manufacturer's recommendations.

#### **Types of admixtures**

Air entraining agent: Adjust mix for workability allowing up to 5% air entrainment.

Warm season retarder: During the warm season, (October to March inclusive), use a lignin or lignin-based (Iigpol) set-retarding admixture (Type Re or Type WRRe) if required to control slump within the limits stated in Concrete mix, properties.

Cool season accelerator: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture, if required, containing not more than 6% reducing sugars (Type Ac or Type WRAc to AS 1478.1).

## **2.6 CURING COMPOUNDS**

### **General**

Curing compounds: To AS 3799 and AS 1160, Type 2.

Sheet material covering: To ASTM C171, white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

## **2.7 OTHER MATERIALS**

### **Tactile ground surface indicators**

Standard: To AS/NZS 1428.4.1.

## **3 EXECUTION**

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### **3.1 GENERAL**

#### **Traffic control**

Traffic restriction: Do not allow traffic or construction plant other than that associated with testing, sawcutting, cleaning or joint sealing on pavement for minimum 10 days after placing, or when the concrete has reached a compressive strength of at least 20 MPa, and joints have been completely sealed.

### **3.2 SUBGRADE**

#### **Preparation**

Conformance: Prepare subgrade to *0222 Earthwork*.

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs or at least 300 mm beyond each side of the carriageway if kerbs are not proposed.

Reinstatement: Make sure of uniformity for backfilling of any utility trenches.

### **3.3 SUBBASE**

#### **Thickness**

#### **Width**

Subbase width: Extend the subbase at its full depth to at least the back of kerbs or other edge stops before their installation.

No integral kerbs: Extend granular unbound subbase at least 300 mm beyond each side of the carriageway.

#### **Tolerance**

Subbase finished surface level: + 0 mm, - 10 mm.

#### **Placement**

Bound and unbound subbase materials and placement: To *0271 Pavement base and subbase*.

#### **Friction reduction**

Requirement: Provide 200 µm thick polyethylene sheeting with 200 mm taped minimum laps and/or a 20 mm thick layer of sand (silt and clay material less than 5%) directly beneath the concrete pavement.

### 3.4 TRIAL PAVEMENT

#### General

Requirement: Provide a trial section of pavement to demonstrate that the proposed method of placement produces a conforming pavement. Remove test sections that do not comply with requirements.

### 3.5 CONCRETE MIX

#### Standard

Concrete mix and supply: To AS 3600 clause 17.1 and AS 1379.

#### Properties

Slump: Maximum 100 mm.

Drying shrinkage: Maximum 450 µε after 21 days of air drying.

#### Special class concrete additional properties

##### Elapsed delivery time

General: Make sure 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 heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

##### Elapsed delivery time table

| Concrete temperature at time of discharge (°C) | Maximum elapsed time (minutes) |
|------------------------------------------------|--------------------------------|
| 5 – 24                                         | 120                            |
| 24 – 27                                        | 90                             |
| 27 – 30                                        | 60                             |
| 30 – 35                                        | 45                             |

#### Site mixed supply

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

#### Pre-mixed supply

Addition of water: Do not add water.

Transport: Make sure the mode of transport prevents segregation, loss of material and contamination of the environment, and does not adversely affect placing or compaction.

Concrete delivery docket: For each batch, provide a docket listing the information required by AS 1379 clause 1.7.3, and the following information:

- Any binders or additives.
- Method of placement and climate conditions.
- Name of concrete delivery supervisor.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.

### 3.6 TESTING

#### Standards

Sampling, identification, testing and recording: To the AS 1012 series.

Specimens: Sample the concrete on-site, at the point of discharge from the agitator.

Type and frequency: To AS 1379.

Testing authority: Concrete supplier or Accredited Testing Laboratory.

#### Concrete testing methods

Slump: To AS 1379 clause 5.2.

Compressive strength: Test to AS 1012.8.1 and AS 1012.9.

Drying shrinkage: Test to AS 1012.8.4 and AS 1012.13.

Flexural strength: Test to AS 1012.8.2 and AS 1012.11.

Acceptance criterion for strength: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.



Sampling frequency: Provide a minimum of one sample from each 50 m<sup>3</sup> of concrete.

### 3.7 INSTALLATION

#### Junctions with existing pavements

Trimming: If new pavement is to be joined to an existing pavement, trim the edge of the existing pavement to create a neat vertical edge for its full depth before placing new pavement material.

#### Fixed formwork

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Level of top of form: - 0 mm, + 10 mm from pavement surface design level.
- Horizontal tolerance: 10 mm (maximum departure from a plane surface).
- Verticality: 3 mm departure from vertical.

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Release agent: Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel or timber form strips accurately located at the mid-depth of the slab and securely fastened flush against the formwork face.

#### Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

Locate reinforcement: Place reinforcement in the top half of the pavement.

Minimum cover to reinforcement: 30 mm.

Splicing mesh: Overlap a minimum of 2 crosswires.

Supports: Provide reinforcement supports as follows:

- Able to withstand construction and traffic loads and maintain the concrete cover, as documented.
- With a protective coating if they are ferrous metal extending to the surface of the concrete.
- Use plastic or concrete supports with galvanized or zinc-coated reinforcement.
- Spacing:
  - . Bars: ≤ 60 diameters.
  - . Mesh: ≤ 600 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: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

Tying: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting into the concrete cover.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

#### Cores, fixings and embedded items

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

Isolation: Isolate embedded items to prevent water tracking to concrete providing minimum cover to reinforcement.

### 3.8 CONCRETE PLACING AND COMPACTION

#### Concrete placing

General: Place concrete uniformly over the width of the slab or lane and so that the face is generally vertical and normal to the direction of placement. Hand spread concrete using shovels, not rakes.

Ponding: Remove any water ponding on the base or subbase before starting placement.

Placing sequence: Commence from one corner (usually the lowest point) and proceed continuously out from that point.

Weather: Do not place concrete in ambient temperatures above 30°C or below 10°C, without adequate precautions.

#### Compaction

Thickness 100 mm or less: Compact by placing, screeding and finishing processes. If required use a hand-held vibrating screed at the surface. Do not use immersion vibrators.

Thickness more than 100 mm and downturns: Use an immersion vibrator.

#### Placing records

Log book: 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

Protection: During placement and before setting, protect surface from damage.

#### Concrete placing in cold weather

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete:  $\geq 5^{\circ}\text{C}$ .
- Formwork and reinforcement before and during placing:  $\geq 5^{\circ}\text{C}$ .
- Water: Maximum 60°C when placed in the mixer.

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is  $\geq 5^{\circ}\text{C}$ .

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 formwork, materials, and equipment coming in contact with the concrete.

Placed concrete: Prevent 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.

Hot weather placing: Maintain concrete at a temperature  $\leq 35^{\circ}\text{C}$ .

Formwork and reinforcement: Before and during placing maintain temperature  $\leq 35^{\circ}\text{C}$ .

Severe weather: If ambient shade temperature more than 38°C, do not mix concrete.

Temperature control: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- 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 before mixing.
- Use chilled mixing water or ice.

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

### 3.9 CONCRETE FINISH

#### General

Commencement: Immediately after placement, spreading and compaction of the concrete, start initial finishing procedures to achieve the documented finish.

Final finishing: Do not commence final finishing until all bleed water has evaporated from the surface after initial finishing procedures.

#### Unformed surfaces

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class and finish documented.

#### Formed surfaces

Damage: Do not damage concrete works through premature removal of formwork.

Curing: 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.

#### Finishing methods - primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Wood float finish: After machine floating use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling draw a broom or hessian belt across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating and steel trowelling, obtain an even textured sand finish by wiping the surface using a damp sponge.

#### Finishing methods - supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate, using hard, sharp graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations and trowel to achieve the required appearance.

Stamped and coloured pattern finish: Provide finishing system.

#### Surface repairs

Method: If surface repairs are required, detail proposals.

### 3.10 CONCRETE CURING

#### General

Curing: Commence curing as soon as possible after finishing, when the concrete has set sufficiently not to be damaged by the curing process, and extend for a minimum period of 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 surface temperatures above 5°C for the duration of the curing period.

#### Hot weather curing

Requirement: If the concrete temperature exceeds 25°C, or the ambient shade temperature exceeds 30°C, protect from drying winds and sun by using an evaporative retarder until curing is commenced.

#### Curing methods

Covering sheet method: Cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears immediately.

Moist curing method: Keep the concrete surface continuously damp by ponding or spraying constantly with water, fog, or mist, using suitable spraying equipment. Continue wetting for the curing period.

Curing compound: Provide a uniform continuous flexible coating to AS 3799, without visible breaks or pinholes. Make sure coating remains unbroken at least for the required curing period after application. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain.

Self-levelling toppings: If used also as curing compounds, conform to AS 3799.

Coloured concrete: Do not cure with plastic sheeting, damp sand or wet hessian. Use only chemical curing compounds compatible with the sealer or a sealer to the manufacturer's recommendations.

### 3.11 JOINTS

#### General

Requirement: Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints. Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Joint layout: Install joints as documented.

#### Contraction joints

Installation: Construct transverse and longitudinal contraction joints by early power sawing at an appropriate time, tooling or by placing an insert in the fresh concrete.

#### Dowelled joints

Requirement: Place dowels as documented, orthogonal to the joint direction and parallel to the pavement surface, accurate alignment is critical.

Dowel assembly: Use a dowel-assembly support frame firmly secured to the subbase during concrete placement. Prevent the dowel assembly support frame from passing through the joint. Do not insert dowels during the placement of concrete.

Debond dowel: Provide a proprietary sleeve or coat with a debonding coating to 0.5 length + 25 mm. Embed the unsleeved or unpainted half of the dowels in the slab placed first.

Dowelled expansion joints: Cap dowels at one end with a compressible material.

Movement: Do not distort or displace beyond the alignment tolerances under testing or during construction. Do not remove and replace dowels in pre-formed holes.

Dowel tolerances:

- Alignment: 1:150.
- Location:  $\pm$  half the diameter of the dowel.

#### Tie bar joints

Longitudinal contraction joints: Place tie bars at 800 mm centres. Alignment accuracy of tie bars is not critical.

#### Construction joints

Installation: Place header board on the subbase or subgrade at right angles to the pavement centre line.

Planned location: Terminate each day's placing operation at a transverse construction joint located to coincide with a planned contraction or expansion joint.

Unplanned joints: If placement is interrupted for 30 minutes or longer, form a tied transverse construction joint within the middle third of the distance between planned joints but no closer than 1.5 m to the nearest planned joint. If necessary remove placed concrete back to the required location.

#### Expansion joints

Joint filling: Fill with jointing materials as documented. Finish visible jointing material neatly flush with adjoining surfaces.

Jointing materials: Provide jointing materials compatible with each other, and non-staining to concrete in visible locations.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

#### Isolation joints

Requirement: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

#### Formed joints

Full depth joints: Form the edge of the concrete placed first to provide a smooth, vertical face. After stripping and cleaning fix the joint filler with a suitable waterproof adhesive to the face of the slab, and place the adjoining concrete after the adhesive has set.

**Weakened plane joint:** Cut a crack-inducing groove by using a suitable tool into the plastic concrete during finishing of the concrete surface. Compact and refinish the plastic concrete around the groove after forming the joint.

**Rebated groove joints:** Form the rebate by securely fixing removable steel or timber form strips to the form or forms on the slab which is placed first, so that the top of the strip is flush with the top of the form. After stripping and cleaning, fix the joint filler in the rebate after placing the adjoining concrete.

### **Sawn joints**

**Weakened plane joint:** Saw the hardened concrete to depth at least  $\frac{1}{4}$  to  $\frac{1}{3}$  of the pavement thickness and to a uniform width in the range of 3 to 5 mm as follows:

- **Timing:** Commence sawing, regardless of time or weather conditions, as soon as the concrete has hardened sufficiently to permit cutting with only minor raveling of the edges of the saw cut. Complete sawing no later than 24 hours after concrete placement.
- **Sequence:** If possible, saw every third transverse joint initially, then saw the intermediate joints. Start where concrete placement commenced.
- **Cracking:** If the concrete has already cracked near the location chosen for a joint, do not saw a joint in that location. If a crack develops ahead of the saw cut, discontinue sawing and submit proposals for extra sawn joints.
- **Stand-by machines:** Provide one stand-by sawing machine for each machine planned to be used.
- **Cleaning and protection:** Immediately after each joint is sawn, flush the saw cut and adjacent concrete surface using water, until the waste from sawing is removed from the joint.

**Rebated groove joints:** Saw straight, parallel sided grooves for joint seals on top of and centred on the sawn weakened plane joints.

- **Timing:** Commence sawing after the curing period has ended, immediately before joint sealing. Saw during daylight hours.

### **Preparing joints**

**Stripping time:** At least 12 hours.

**Clean:** Immediately before installation of the sealer, make sure the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

### **Joint sealing**

**Sealant type:** Provide silicone sealant in conformance with the manufacturer's recommendations.

**Backing rod:** Compressible closed cell polyethylene foam with a bond breaking surface.

## **3.12 SURFACE SEALERS**

### **General**

**Application:** Apply surface sealer after the curing period and when concrete has dried to allow the sealer to penetrate into the concrete surface.

**Curing sealer compound:** If using the sealer as a curing compound, apply directly after finishing.

## **3.13 COMPLETION**

### **Completion tests**

**Slip resistance of completed installation:** To AS 4663.

### **Rectification**

**Reinstating adjacent surfaces:** Reinstall surfaces next to new pavements and associated elements. If an existing road pavement has been disturbed, trim back to a straight, neat and undisturbed edge, parallel to the new concrete for the full depth of the slab.

**Concrete pavement:** If pavement does not conform to the tolerances, submit rectification proposal.

**Unplanned cracking:**

- Maximum 0.4 mm wide crack is acceptable.
- > 1 mm must be assessed, detail a proposal for possible cause and rectification processes.

### **Cleaning**

**Excavated material:** Remove from site.

**4 SELECTIONS**

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**4.1 SCHEDULES**

As documented in the selections schedule

**0275 PAVING – MORTAR AND ADHESIVE BED****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide paving, as documented.

**Performance**

Requirements:

- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Resistant to expected loads in use.
- Set out with joints accurately aligned in both directions.
- All surface water directed to drainage outlets.

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

Requirement: Conform to the following:

- 0171 General requirements.

**1.3 STANDARDS****Slip resistance**

Classification: To AS 4586.

**1.4 INTERPRETATION****Definitions**

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

- Absolute level tolerance: Maximum deviation from design levels.
- Adhesives - cementitious (C): Adhesive in which the binders are hydraulic, e.g. General purpose cement, with aggregates and organic additives.
- Bedding: Mixtures of materials which are applied to substrates in a plastic state and which dry, cure and adhere tiles to substrates:
  - . Adhesive bedding: Paving/tiling adhered by adhesives.
  - . Mortar bedding: Paving/tiling adhered in a cementitious mortar bed.
- Lippage: Height deviation between adjacent units.
- Pavers: Units made from concrete, clay, stone and/or other inorganic raw materials, generally over 20 mm thick, used as coverings for horizontal surfaces.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Substrate: The surface to which a material or product is applied.

**1.5 TOLERANCES****Completed paving**

Level tolerance:

- Absolute:  $\pm 8$  mm.
- Relative: 8 mm.

Lippage: Less than 2 mm.

**1.6 SUBMISSIONS****Execution details**

Grouting: Submit proposals for grouting methods and materials.

Margins: If it appears that minor variations in joint widths or overall dimensions will avoid cut pavers, submit a proposal.

**Operation and maintenance manuals**

General: Submit a manual describing care and maintenance of the paving, including procedures for maintaining the slip-resistance classification stating the expected life of the slip-resistance classification.

**Products and materials**

Product conformity: Submit evidence of conformity as follows:

- Marking and classification of adhesive to AS ISO 13007.1.
- Clay and concrete paver properties to AS/NZS 4455.2.

Type tests: Submit results, as follows:

- Slip resistance of pavers.
- Accelerated wear test of pavers.
- Stone paver properties.

Waterproof membrane: Submit evidence of the waterproofing membrane's suitability for pavers to be installed over.

**Samples**

General: Submit labelled samples of pavers, grout and sealants, showing the range of variation in colour and finish.

Sample panel: Prepare a sample panel of each type of finish as follows:

- Size:  $\geq 2 \text{ m}^2$ .
- Include samples of junction details and trim.
- Preserve each panel until related work is complete.

**Tests**

Site tests: Submit results, as follows:

- Slip resistance of completed installation.
- Salt efflorescence of paver prototype testing.

**Warranties**

Requirement: Submit warranties to **COMPLETION, Warranties**.

**1.7 INSPECTION****Notice**

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

- Substrate immediately before paving.
- Trial set-outs before execution.
- Control joints before sealing and grouting.
- Completed paving.

---

**2 PRODUCTS****2.1 ADHESIVES****General**

Standard: To AS ISO 13007.1.

**Type**

General: Provide adhesives compatible with the materials and surfaces to be adhered.

Prohibited uses: Do not provide the following combinations:

- Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.
- PVA (polyvinyl acetate) based adhesives in wet areas or externally.

**2.2 MORTAR****Materials**

Cement: To AS 3972.

- Type: GP.
- Iron salt content:



- . White cement:  $\leq 1\%$ .
- . Off-white cement:  $\leq 2.5\%$ .

Lime: To AS 1672.1.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Water: Clean and free from any deleterious matter.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

### **Bedding mortar**

Mix proportion (cement:sand): Select from the range 1:3 to 1:4 to obtain satisfactory adhesion. Provide minimum water.

Mixing: To AS 3958.1 clause 2.15.

## **2.3 GROUT**

### **Type**

Portland cement-based grout: Mix with fine sand. Provide minimum water to achieve workability.

- Mix proportion (cement:sand): 1:3.

### **Pigments**

Pigments for coloured grout: Provide colourfast pigments compatible with the grout material. For cement-based grouts, provide inorganic mineral pigments or lime-proof synthetic metallic oxides compatible with cement.

### **Water**

General: Clean and free from any deleterious matter.

## **2.4 CONCRETE AND CLAY PAVERS**

### **General**

Standard: To AS/NZS 4455.2.

### **Properties**

Requirement: To AS/NZS 4455.2 Table 2.8.

## **2.5 STONE PAVERS**

### **Natural stone**

Description: Natural stone pavers of uniform quality and sound. Reject stone pavers with any of the following defects liable to affect strength and durability:

- Vents.
- Cracks.
- Fissures.
- Seams.
- Porous inclusions.
- Foreign material.
- Loose surface material.
- Discolouration.

Matching: Select for optimum matching of colour and pattern.

Split flagging thickness: Minimum 50 mm, maximum 75 mm.

Face size: Use smaller sizes for pathways and larger sizes for open areas and maintain traditional stone flagging appearance.

### **Cast stone**

Description: Reconstituted stone manufactured from selected aggregates and cement.

### **Stone setts**

Description: Igneous stone, cubed, cobble-style setts.

### **Tests**

## **2.6 OTHER MATERIALS**

### **Tactile ground surface indicators**

Standard: To AS/NZS 1428.4.1.

**Control joint types**

General: As documented.

Divider strip: A proprietary expansion joint consisting of a neoprene filler sandwiched between plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: Two-pack self-levelling flexible mould resistant, one-part silicone or polyurethane sealant applied over a backing rod. Finish flush with the paver surface.

- Floors: Trafficable, shore hardness more than 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

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**3 EXECUTION****3.1 PREPARATION****Ambient temperature**

General: If the ambient temperature is less than 5°C or more than 35°C, do not lay pavers.

**Substrates**

General: Make sure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of pavers.
- Projections are hacked off and voids and hollows are filled with a cement:sand mix not stronger than the substrate nor weaker than the bedding.

Drying and shrinkage: Before paving, allow at least the following times to elapse (for curing and initial shrinkage) for these substrates:

- Concrete slabs: 28 days.
- Toppings on slabs: A further 21 days.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling or the like to remove 3 mm of the surface and expose the aggregate then apply a bonding treatment.

**Fixtures**

General: Before paving make sure that fixtures interrupting the surface are accurately positioned in their designed or optimum locations relative to the paving layout. Allow for movement between paving and fixtures.

**3.2 INSTALLATION****Trial set-out**

General: Prepare a trial paving set-out to each area as follows to:

- Maximise the size of equal margins of cut pavers.
- Locate control joints.
- Note minor variations in joint widths to eliminate cut pavers at margins.

**Variations**

General: If necessary, distribute variations in hue, colour, or pattern uniformly, by mixing pavers or paving batches before laying.

**Paving joints**

Joint widths: Set out pavers to give uniform joint widths of 6 to 12 mm.

**Margins**

General: Provide whole or purpose-made pavers at margins where practicable, otherwise set out to give equal margins of cut pavers. If margins less than half paver width are unavoidable, locate the cut pavers where they are least conspicuous.

**Protection**

Traffic: Keep pedestrian and vehicular traffic off paving until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

### 3.3 MORTAR BEDDING

#### Preparation of pavers

Suction: Soak porous pavers in water for half an hour and then drain until the surface water has disappeared.

#### Bedding

General: Use bedding methods and materials that are appropriate to the paver, the substrate, the conditions of service, and that leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

#### Mortar beds

Substrate preparation: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, on to the paver back. Do not provide mortar after initial set has occurred.

#### Sandstone flagging

Mortar bed thickness: Minimum 50 mm to maximum 60 mm.

Laying pattern: Random, with smaller stones filling the gaps to produce roughly uniform joint widths. Lay flags and fill joints in one operation.

#### Stone setts dry bed

General: Lay and tamp setts on to a dry sand and cement mix, compact and moisten as follows:

- Mortar bed mix proportion (cement:sand): 1:3 screeded to the level required to allow setts to be firmly tamped.
- Select the top side of the sett for surface uniformity and tap into the mix to the pre-compaction position.
- Compact with a hand ram or mechanical compactor.
- Water spray the surface and allow the bedding to harden.
- Grout joints.

### 3.4 ADHESIVE BEDDING

#### Preparation of pavers

Adhesive bedding: Fix pavers dry.

#### Bedding

General: Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

#### Thick adhesive beds

General: Provide on substrates with deviations up to 6 mm when tested with a 2 m straight edge, and with pavers having deep keys or frogs.

Nominal thickness: 6 mm.

#### Adhesive bedding application

General: Apply adhesive by notched trowel to substrates and direct to pavers if required, to provide evenly distributed coverage of more than 90% after laying.

Pattern of distribution of adhesive: Conform to AS 3958.1. Verify by examining one paver in ten as work proceeds.

Grouting: Allow the adhesive to cure for the period recommended by the manufacturer before grouting.

### 3.5 MOVEMENT JOINTS

#### General

Requirement: Provide control joints as follows:

- Location:
  - . Over structural control joints.
  - . At internal corners.
  - . Close to external corners in large paved areas.
  - . Around the perimeter at abutments.
  - . At junctions between different substrates.
  - . To divide large paved areas into bays, maximum 5 m wide, maximum area 16 m<sup>2</sup>.

- At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- Depth of joint: Right through to the substrate.
- Sealant width: 6 to 25 mm.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

### 3.6 GROUTED JOINTS

#### Grouting

General: Commence grouting as soon as practicable after bedding has set and hardened sufficiently. Clean out joints as necessary before grouting.

Face grouting: Fill the joints solid and tool flush. Clean off surplus grout and wash down as the grouting proceeds.

### 3.7 TESTING

#### Site tests

#### Completion tests

Slip resistance of completed installation: To AS 4663.

### 3.8 COMPLETION

#### Spare pavers

General: Supply spare matching pavers of each type for future replacement purposes. Store the spare materials on site.

Quantity: At least 1% of the quantity installed.

#### Cleaning

General: Leave pavements clean on completion.

#### Warranties

### 0277 PAVEMENT ANCILLARIES

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide pavement ancillaries, as documented.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.

### 1.3 INTERPRETATION

#### Definitions

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

- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.

### 1.4 TOLERANCES

#### Channels and kerbs

Absolute level tolerance:  $\pm 10$  mm at any point on the finished surface.

Relative level tolerance: 5 mm to the top or face of kerbs, and to the surface of channels.

Plan position deviation: 25 mm.

Exception: Kerb laybacks, grade changes or curves, or at gully pits requiring channel depression.

#### Linemarking

Longitudinal line lengths:  $\pm 20$  mm from the lengths documented in AS 1742.2.

Longitudinal line widths:  $\pm 10$  mm from the widths documented in AS 1742.2

Transverse line lengths and widths:  $\pm 10$  mm from the lengths and widths documented in AS 1742.2.

Other markings:  $\pm 50$  mm from the dimensions documented or in AS 1742.2 for arrows, chevrons, painted medians, painted left turn islands and speed markings. Place arrows and speed markings square with the centreline of the traffic lane.

**Raised pavement markers**

Plan position deviation: 20 mm.

Directional displacement:  $\pm 4^\circ$ .

**Vehicle barriers**

Plan position deviation: 50 mm.

Length:  $\pm 20$  mm.

Bollard plumb: H/100.

**1.5 SUBMISSIONS****Products and materials**

Linemarking material properties: Submit Accredited Testing Laboratory test reports to the AS 4049 series, at least seven days before work is scheduled to start, including paint and glass beads.

**1.6 INSPECTIONS****Notice**

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

- Set-out of pavement ancillaries.
- Trial sections:
  - . Channels and kerbs.
  - . Linemarking.

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**2 PRODUCTS**

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**2.1 CHANNELS AND/OR KERBS****Concrete**

Precast: Proprietary precast units as documented.

In situ: To AS 2876.

Grade: N20.

**2.2 LINEMARKING****Pavement marking paint**

Requirement: Conform to the following:

- Solvent-borne paint: To AS 4049.1.
- Waterborne paint: To AS 4049.3.
- High performance: To AS 4049.4.

**Glass beads**

Standard: To AS/NZS 2009.

Bead type: B.

**2.3 RAISED PAVEMENT MARKERS****General**

Standard: To AS/NZS 1906.3.

**2.4 VEHICLE BARRIERS****Timber log barriers**

Hardwood: To AS 2082.

Softwood: To AS 2858 and AS 1720.2, Grade 5.

Timber preservative for softwood: Minimum hazard class H4 to AS 1604.1.

Size: Diameter range 125 to 150 mm for both posts and rails.

**Precast concrete wheel stops**

Material: Precast concrete units with pre-drilled holes located 300 mm from each end for fixing to ground surface.

Size: 2000 x 150 x 100 mm high.

**Steel tube bollards**

Type: Bollards fabricated from heavy steel tube, to AS 1074.

Minimum nominal size: DN 100.

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**3 EXECUTION**

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**3.1 CHANNELS AND/OR KERBS****General**

Precast: Install to manufacturer's instructions.

In situ: Construct channels and/or kerbs in fixed forms, by extrusion or by slip forming to AS 2876.

**Preparation**

Requirement: To AS 2876 Section 8.

Subgrade or subbase material: Shape and compact to form a firm base before placing channels and/or kerbs.

**Setting out**

General: Set out the work so that all channels and kerbs are placed with tolerances, as documented.

**Joints**

Requirement: To AS 2876 clause 11.

Concrete pavement: If channels and/or kerbs are cast adjacent to a concrete pavement, continue the same joint type, as documented for the concrete pavement, across the channels and/or kerbs.

**Backfill**

Timing: Not earlier than three days after placing channels and/or kerbs, backfill and reinstate the spaces on both sides of the channels and/or kerbs.

Material: Granular, free of organic material, clay and rock in excess of 50 mm diameter.

Compaction: Compact backfill in maximum 150 mm thick layers, to a relative compaction of 95% tested to AS 1289.5.4.1, for standard compactive effort.

Pavement: Backfill pavement material adjacent to new channels and/or kerbs to the documented requirements of the pavement material.

**3.2 LINEMARKING****Preparation**

Surface: Clean, dry and free of any deposit which may impair adhesion of the linemarking.

Wet weather: Do not apply linemarking during wet weather or if rain is likely to fall during application or paint drying time.

Provision for traffic: Allow for traffic during application and protect linemarkings until the material has dried sufficiently to carry traffic without being damaged.

Mixing of paint: Before use, mix all paint in its original container to produce a smooth uniform product consistent with the freshly manufactured product.

**Setting out**

General: Set out the work so that all linemarkings are placed within tolerances, as documented.

**Application of linemarking**

Longitudinal lines: Spray all longitudinal lines with a self-propelled machine. For a one-way or two-way barrier line pattern, concurrently spray the two sets of lines.

Hand spraying: Hand spray transverse lines, symbols, letters, arrows and chevrons using templates.

Paint thickness: Uniform wet film thickness: 0.35 mm to 0.40 mm.

Linemarking alignment: Straight or with smooth, even curves as documented.

Edges: Form clean, sharp edges. Remove any paint applied beyond the defined edge of the linemarking and leave a neat and smooth marking on the wearing surface of the pavement.

**Glass bead application**

Glass beads: Apply glass beads immediately after the application of the paint, at the following minimum rates:

- Longitudinal lines: 0.5 kg/m<sup>2</sup>.
- Other markings: 0.3 kg/m<sup>2</sup>.

**Removal of existing pavement markings**

General: Remove existing linemarking, as documented, from the wearing surface of pavements without causing significant damage to the surface.

**3.3 RAISED PAVEMENT MARKERS****Preparation**

Surface: For concrete wearing surfaces, scabble the full area below each marker to remove the fine mortar material.

Adhesive preparation: Freshly heat and mix the adhesive to the manufacturer's recommendations. Do not allow the adhesive to cool and do not reheat before use.

**Setting out**

General: Set out the work so that all raised pavement markers are placed within tolerances, as documented.

**Installation to regular surfaces**

Application of adhesive: Spread the adhesive uniformly over the underside of the raised pavement marker to a depth of approximately 10 mm.

Adhesion of marker to pavement: Conform to the following:

- Press the raised pavement marker onto the pavement surface in its correct position and rotate slightly until the adhesive is squeezed out around all edges of the marker.
- Do not disturb the raised pavement marker until the adhesive has set.

**Installation to rough surfaces**

Adhesion of marker: Conform to the following:

- Apply an initial pad of adhesive of diameter 20 mm larger than the diameter of the base of the raised pavement marker.
- Apply the adhesive to fill the irregularities in the pavement surface to produce a flat, smooth surface flush with the upper level.
- Allow the adhesive pad to set.
- Apply adhesive to the raised pavement marker and adhere to the adhesive pad on the pavement surface, in conformance with **Installation to regular surfaces**.

**3.4 VEHICLE BARRIERS****Timber log barriers**

Installation: Check out the posts to receive the rails. Set each post 600 mm below the finished surface level and surround with compacted fine crushed rock, gravel or cement stabilised rammed earth. Bolt rails to posts with M12 diameter galvanized bolts and washers, with bolt heads and nuts recessed.

**Precast concrete wheel stops**

Installation: Drive 12 mm diameter galvanized steel rods a minimum of 600 mm below finished surface level and stop the top of the rod 25 mm below the top of the wheel stop.

Concrete pavement/slab: Bolt the wheel stop to the pavement using galvanized steel masonry anchors, installed to manufacturer's recommendations. Top of bolt to stop 25 mm below the top of the wheel stop.

Completion: Grout fill the holes flush to match the concrete finish.

**Steel tube bollards**

Installation: Encase buried end of bollard in concrete footing, minimum 600 mm deep x 250 mm diameter. Finish top of footing minimum 100 mm below finished surface level.

On concrete slabs: Weld on a 10 mm thick baseplate drilled for 4 bolts, and bolt to concrete slab using galvanized steel masonry anchors installed to manufacturer's recommendations.

Filling: Fill the tube with 15 MPa concrete.

Open ends: Seal with matching fabricated end caps, spot welded and ground smooth.

**Timber bollards**

Installation: Encase buried end of bollard in concrete footing, minimum 600 mm deep x 300 mm diameter. Finish top of footing minimum 100 mm below finished surface level.

**3.5 COMPLETION****Cleaning**

Completion: Clean progressively and leave adjoining surfaces, pavements and ancillaries clean on completion.

**0310 CONCRETE – COMBINED****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide cast in situ reinforced concrete, as documented.

**Performance**

Requirements:

- Conforming to the design details and performance criteria.
- Satisfying quality and inspection requirements.
- Compatible with documented applied finishes.

**1.2 DESIGN****General**

Formwork: The design of formwork, other than permanent composite form systems, is the contractor's responsibility. Allow for dimensional changes, deflections and cambers resulting from the following:

- Imposed actions.
- Concrete shrinkage and creep.
- Temperature changes.
- The application of prestressing forces (if any).

Structural design: To AS 3600.

Post-tensioned concrete: To AS 3600.

Concrete structures retaining liquids: To AS 3735.

**1.3 CROSS REFERENCES****General**

Requirement: Conform to the following:

- 0171 General requirements.

**1.4 STANDARDS****General**

Formwork design and construction: To AS 3610.1.

Plywood formwork: To AS 6669.

Composite steel-concrete construction, including profiled steel sheeting and shear connectors: To AS/NZS 2327.

Reinforced concrete construction: To AS 3600.

Specification and supply of concrete: To AS 1379.

Residential ground slabs and footings: To AS 2870.

Post-tensioned concrete: To AS 3600.

Concrete structures for retaining liquids: To AS 3735.

Strand, bar and wire: To AS 4672.1.

Design, installation and testing of post-installed and cast-in fastenings: To AS 5216.

Formed surfaces: To AS 3610.1.



**Slip resistance**

Classification: To AS 4586.

**1.5 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 1314, AS 1379, AS 3600, AS 3610.1 and the following apply:

- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Anti-burst reinforcement: Reinforcement cage surrounding anchorages to control the tensile bursting stresses.
- Early age strength: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has recently set but has not achieved any design strength.
- Sample: A physical example that illustrates workmanship, materials or equipment, and establishes standards by which the work will be judged. It includes samples and sample panels.
- Specimen: A portion of a sample which is submitted for testing.
- Weather – cold: Ambient shade temperature less than 10°C.
- Weather – hot: Ambient shade temperature greater than 30°C.

**1.6 TOLERANCES****Formwork**

Plumb of elements > 8 m high: 1:1000.

Plumb of elements ≤ 8 m high: To AS 3610.1.

Position: Construct formwork so that finished concrete conforms to AS 3600 clauses 3.3 and 17.5 and as documented in the **Formwork dimensional deviation schedule**.

**Reinforcement**

Fabrication: To AS 3600 clause 17.2.

Reinforcement and tendon position: To AS 3600 clause 17.5.3.

**Formed surfaces**

Finish quality: To AS 3610.1 Table 3.3.3.1.

**Unformed surfaces**

Flatness: To the **Flatness tolerance class table**, using a straightedge placed anywhere on the surface in any direction, for the documented class of finish.

**Flatness tolerance class table**

| Class | Measurement         | Maximum deviation (mm) |
|-------|---------------------|------------------------|
| A     | 2 m straightedge    | 4                      |
| B     | 3 m straightedge    | 6                      |
| C     | 600 mm straightedge | 6                      |

**1.7 SUBMISSIONS****Certification**

Formwork design certification: For other than permanent composite form systems, submit certification by a professional engineer experienced in formwork design verifying conformance of the design.

Formwork execution certification: Submit certification by a professional engineer experienced in formwork design and construction, verifying conformance of the completed formwork, including the suitability of the formwork for the documented surface finish class.

**Design documentation**

Formwork calculations: Submit calculations by a professional engineer experienced in formwork design to show that allowable concrete stresses will not be exceeded and formwork capability will be maintained if the following is proposed:

- Formwork procedures or loadings that differ from those documented.
- Props above a floor that do not coincide with the props below.
- Undocumented formwork shoring or stripping procedures.
- Loadings from stacked materials.

Post-tensioned calculations: Submit the following:

- Calculations of tendon jacking forces, theoretical extensions and losses for each stressing stage and at final stressing, before stressing operations begin.
- Amount of draw-in expected in seating anchorages, friction along tendon (wobble) coefficient and friction curvature coefficient for tendons and duct-forming material.

#### **Execution details**

Moveable formwork: Provide the following details on the formwork drawings:

- Table form and climbing formwork: Proposed method and sequence of moving the formwork to provide concrete of the documented quality and surface finish.
- Continuously climbing formwork (Slipform): The average rate of movement.

Reshoring: Submit details of any proposed reshoring.

Reinforcement: Submit the following:

- General: Details of any proposed changes to documented reinforcement.
- Damaged galvanizing: Details of proposed repair to AS/NZS 4680 Section 8.
- Mechanical bar splices: Details and test certificates for each size and type of bar to be spliced.
- Provision for concrete placement: Details of spacing or cover to reinforcement that does not conform to AS 3600.
- Splicing: Details of any proposed changes to documented requirements.
- Welding: Details of any proposed welding of reinforcement to AS/NZS 1554.3.

Post-tensioning: Submit the following:

- Details of the proposed post-tensioning system tested and certified to AS/NZS 1314, including performance test certificates for each type and size of anchorage and coupler.
- Safe work method statements including the name and contact details of the subcontractor.
- Details of proposed gauging, stressing and grouting equipment and current calibration certificates for tensioning and tension measuring equipment.
- Concrete strength early age test results.

Loading: Submit details of proposed construction systems, loads and procedures, including propping and re-shoring.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Changes to the concrete mix.
- Curing and protection methods.
- Curing period for low-pressure steam curing.
- Cutting or displacing reinforcement, or cutting or coring hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Placing under water.
- Sequence and times for concrete placement, and construction joint locations and relocations. Include any proposed sequential placement of slab segments.
- Site storage, mixing and transport methods and equipment, if applicable.
- Temperature control methods.
- Sawed joints: Submit details of proposed methods, timing and sequence of sawing joints.

Pre-mixed supply delivery dockets: For each batch, submit a docket listing the information required by AS 1379, and the following:

- For special-class performance concrete: Documented 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 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.

Surface repairs: If surface repairs are required, submit proposed methods.

**Products and materials**

Void formers: Submit type-test results as evidence of conformity to requirements of PRODUCTS, **FORMWORK, Void formers.**

Reinforcement strength and ductility: Submit type-test reports as evidence of conformity to AS 3600 Table 3.2.1 for each reinforcement type.

Post-tensioning: Submit the following:

- Grout: Proposed grout mix and certified test results (including grading, proportions, compressive strength, shrinkage and additives if any).
- Epoxy grout: If required, proposed formulation.
- Duct-forming material: Samples of proposed material.
- Prestressing steel: Test certificates to AS/NZS 4672.2 for every delivery of strand, bar or wire proposed.

Product conformity: Submit evidence of conformity, as appropriate, as follows:

- Certification by a JAS-ANZ accredited third party.
- Report by an accredited testing laboratory describing tests and giving results which demonstrate that the product conforms.

Concrete mixes: Submit details, for each grade and type of concrete including any proposed use of special-purpose cement types.

Curing compounds: Submit details of any proposed curing compounds, including the following:

- Certified type-test results for water retention to AS 3799 Appendix B for liquid membrane-forming compounds.
- 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.

Admixtures: Submit details of any proposed admixtures, including the following:

- Brand name.
- Place of manufacture.
- Basic chemical composition.

**Prototypes**

Test panels: Provide test panels to AS 3610.1 clause 3.7 and as documented in the **Test panels schedule.**

Manufacture: Cast the panels using the form, concrete, compaction equipment, form release agents, curing and formwork removal methods which are to be used in the final work.

Storage: Once accepted, maintain the panels on site undamaged and protected from the weather, as reference prototypes for evaluation of completed work.

Surface treatment: Do not proceed with the related work until the acceptable range of surface treatments has been determined.

**Records**

Post-tensioning: Submit the following:

- Post-tensioning record.
- Post-tensioning stressing schedule.
- Post-tensioning grouting record.

**Samples**

Coloured concrete: Submit sample blocks of coloured concrete produced using the proposed mix and casting method before casting final concrete, as follows:

- Number: 4.
- Size (nominal): 300 x 300 x 50 mm.

**Shop drawings**

Formwork: Submit shop drawings including details of proposed forms, falsework, form liners, bolt positions, release agents and, where applicable, re-use of formwork.

Post-tensioned drawings: Submit shop drawings showing the following:

- Profiles, sizes and details of tendons, tendon numbers, anchorages, ducts, duct formers, splicing, sheathing, end block reinforcement and other associated components.

- Stressing requirements including sequence of stressing, jacking forces and the basis of assumed loss calculations.
- Number, size and position of grout openings, vents and drain holes in the ducts.

Cores, fixings and embedded items: Submit the proposed locations, clearances and cover and show any proposed repositioning of reinforcement.

#### **Subcontractors**

Pre-mixed supply: 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.

#### **Tests**

Requirement: Submit test results, as follows:

- Concrete compressive strength test results to AS 1012.9.
- Slip resistance test of completed installations.

### **1.8 INSPECTION**

#### **Notice**

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

- Used forms, after cleaning and before re-use.
- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Completed formwork and reinforcement, tendons, cores, fixings and embedded items fixed in place before placing concrete.
- Concealed surfaces or elements before covering.
- Commencement of concrete placing.
- Evaluation of the off-form finishes.
- Evaluation of surface finish.

## **2 PRODUCTS**

### **2.1 CONCRETE**

#### **General**

Stockpile: If uniform, consistent colour is documented, stockpile sand, cement and aggregates.

#### **Properties**

Concrete mix and supply: Conform to the following:

- Normal-class: To AS 1379 clause 1.5.3.
  - . Properties: As documented in the **Concrete properties schedule - performance**.
- Special-class: To AS 1379 clause 1.5.4.
  - . Performance properties: As documented in the **Concrete properties schedule - performance**.
  - . Prescription properties: As documented in the **Concrete properties schedule - prescription**.

#### **Aggregates**

Standard: To AS 2758.1.

#### **Cement**

Standard: To AS 3972.

Age: Less than 6 months old.

Storage: Store cement bags under cover and above ground.

Supplementary cementitious materials:

- Fly ash: To AS/NZS 3582.1.
- Slag: To AS 3582.2.
- Amorphous silica: To AS/NZS 3582.3.

#### **Water**

Standard: To AS 1379 clause 2.4.

Requirement: Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

**Concrete colour**

Standard: To AS 3610.1.

**Chemical admixtures**

Standard: To AS 1478.1, used to manufacturer's recommendations.

**Early strength****2.2 FORMWORK****General**

Form face, linings and release agents: Compatible with documented concrete surface finish and any proposed applied finishes to concrete.

Trapped forms: Free of timber or chlorides and not to impair the structural performance of the concrete members.

**Void formers**

Requirement: Material capable of maintaining rigidity and shape until the concrete has set, capable of withstanding construction loads and non-collapsible on absorption of moisture.

Laboratory testing: Use void formers tested under laboratory conditions for conformance with the following:

- Deflection during placing and compaction of the concrete does not exceed beam or slab span/1000.
- Additional deflection between initial set and 7 days does not exceed span/400.

Test method: Place formers on damp sand and load with a mass of wet concrete at least equal to the mass of the beams or slabs to be supported.

**Profiled steel sheeting composite forms**

Material: Hot-dipped zinc-coated sheet steel to AS 1397.

Minimum steel grade: G550.

Accessories: Use materials and corrosion protection compatible with the profiled steel sheeting.

**Plywood forms**

Material: To AS 6669.

Grade: Use appropriate grade for the documented design dimensions, loading and surface quality.

Joints: Seal the joints consistent with the documented surface finish class.

Tolerances: To AS 3610.1 Section 3.

**2.3 REINFORCEMENT****Fibre reinforcement**

Steel fibres: To AS 3600 clause 16.7.1.

Other fibres: To CIA CPN35.

**Steel reinforcement**

Standard: To AS/NZS 4671.

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**

Standard: To AS 3600 clause 17.2.1.2.

Requirement: For concrete elements containing protective coated reinforcement, provide the same coating type to all that element's reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules, and protect other embedded metals with a suitable coating.

Epoxy coating: High-build, high solids, chemically resistant coating to AS/NZS 3750.14.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680, as follows:

- Sequence: If fabricating after galvanizing, repair damaged galvanizing and coat cut ends.
- Zinc-coating (minimum): 600 g/m<sup>2</sup>.

**Tie wire**

General: Annealed steel 1.25 mm diameter (minimum).

External and corrosive applications: Galvanized.

**Supports**

Standard: To AS/NZS 2425.

**2.4 POST-TENSIONING****Grout properties**

Standard: To AS 3600 clause 17.1.8.

Maximum shrinkage: 1% by volume after 24 hours.

Maximum water:cement ratio: 0.45 (by weight).

Compressive strength: 32 MPa at 7 days.

**Grout materials**

Fine aggregates: Do not use aggregates for post tensioning grout unless cross sectional area of ducts is 5 times the cross sectional area of the tendon.

Cement: To AS 3972 and free from calcium chloride and less than two months old.

Admixtures: To AS 1478.1. Include an anti-bleed additive.

Fly ash: To AS/NZS 3582.1 and proportioned according to early strength requirements.

Water: To AS 1379. Clean, free from oil, acid, alkali, organic or vegetable matter and including not more than 500 mg/l of chloride ions.

Epoxy grout type: Commercial epoxy formulation of compressive strength exceeding 40 MPa.

**Ducts**

Robustness: Provide ducts with sufficient strength to retain their shape, resist damage during construction, and prevent deterioration or electrolytic action due to cement paste or water from the concrete entering the duct.

Wall thickness: To allow for abrasion during stressing of the tendon.

Size: To allow feeding of tendons and grouting.

**Tendon material**

Prestressing steel: Type and grade of strand, wire or bar, to AS 4672.1.

Type: 7 wire, stress relieved, high tensile steel and strand.

Quality: Make sure tendons have no nicks, pitting, indents, damage or foreign matter such as mud and dirt. Inspect at delivery and store the prestressing steel on supports clear of the ground.

Straightening of tendons: Not permitted. Supply tendons in coils large enough to self straighten.

High tensile steel bars: Inspect individually and reject any bars with surface imperfections more than 0.40 mm deep.

**Other steel**

Anchor plates: Hot-dip galvanized to AS/NZS 4680.

Anchorage: To AS/NZS 1314.

Reinforcement: To AS/NZS 4671.

**2.5 MISCELLANEOUS****Polymeric film underlay**

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

**Curing compounds**

Liquid membrane-forming compounds: To AS 3799.

**Surface modifiers**

Hardeners, sealants and protectors: If documented, proprietary products conforming to the manufacturer's recommendations.

Slip resistance treatment: If documented, proprietary products conforming to the manufacturer's recommendations.

**3 EXECUTION****3.1 POLYMERIC FILM UNDERLAY****Location**

Requirement: Under slabs on ground, including integral ground beams and footings, provide a vapour barrier or, in areas prone to rising damp or salt attack, a damp-proofing membrane.

**Base preparation**

Requirement: Conform to base type, as follows:

- Concrete working base: Remove projections above the plane surface, and any loose material.
- Graded prepared subgrade: Blind with sand to create a smooth surface free from hard projections. Lightly wet the sand just before laying the underlay.

**Installation**

Standard: To AS 2870 clause 5.3.3.

Requirement: Lay underlay over the base, as follows:

- 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.
- Continue up vertical faces past the damp-proof course where applicable, and tape fix at the top.
- Patch or seal punctures or tears before placing concrete.
- Cut back as required after concrete has gained strength and formwork has been removed.

**3.2 FORMWORK****General**

Requirement: As documented in the **Formed surface finishes schedule**.

**Substrates**

Cleaning: Before placing concrete remove free water, dust, debris and stains from the form face and the formed space.

**Bolt holes**

Formwork tie bolts left in the concrete: Position more than 50 mm from the finished surface.

**Corners**

Work above ground: Bevel with a chamfer at re-entrant angles, and a fillet at corners.

Face of bevel: 25 mm.

**Embedments**

Fixing: Fix embedments through formwork to prevent movement, or loss of slurry or concrete, during concrete placement.

**Openings**

Requirement: In vertical forms provide openings or removable panels for inspection and cleaning, at the base of columns, walls and deep beams.

Access: For thin walls and columns, provide access panels for placing concrete.

**Release agents**

Application: Before placing reinforcement, apply a release agent to form face and linings.

**Climbing formwork**

Provision for inspection: Provide access below the movable formwork, from which surface treatment and inspection may be carried out.

**Profiled steel sheeting composite formwork**

Fixing: If sheeting cannot be fixed to structural steel supports with puddle welds, or with welded shear studs, provide details of proposed fixings.

**Steel linings**

Rust: Clean off any rust and apply rust inhibiting agent prior to re-use.

**Visually important surfaces**

Surface finish classes 1, 2 or 3: Set out the formwork to give a regular arrangement of panels, joints, bolt holes, and similar visible elements in the formed surface.

**Void formers**

Protection: Keep void formers dry until use, install on a firm level surface and place reinforcement and concrete with minimum delay.

**3.3 REINFORCEMENT****Dowels**

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

Tolerances:

- Alignment: 1:150.

- Location:  $\pm$  half the diameter of the dowel.

Grade: 250 N.

#### **Cover**

Concrete cover generally: To AS 3600 clause 4.10.

Concrete cover for structures for retaining liquids: To AS 3735 clause 4.4.

Concrete cover for residential ground slabs and footings: To AS 2870.

#### **Supports**

Concrete, metal or plastic supports: Provide as follows:

- Able to withstand construction and traffic loads.
- With a protective coating if they are ferrous metal, located within the concrete cover zone, or are used with galvanized or zinc-coated reinforcement.

Spacing:

- Bars:  $\leq$  60 bar diameter.
- Mesh:  $\leq$  600 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**

Protection: If starter or other bars extend beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is cast into later work.

#### **Tying**

Requirement: Secure the reinforcement against displacement at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of formwork or unformed faces to prevent the ties projecting 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.

Bundled bars: If required, tie bundled bars in closest possible contact. Provide tie wire at least 2.5 mm diameter and spaced not more than 24 times the diameter of the smallest bar in the bundle.

Columns: Secure longitudinal column reinforcement to all fitments (or helical reinforcement) at every intersection.

Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

#### **Fibre-reinforced concrete**

Steel fibres: To AS 3600 Section 16.

### **3.4 POST-TENSIONING**

#### **General**

Protection: Protect post-tensioning tendons, anchorages, ducts, supports and grout from damage or contaminants, including from swarf, loose grease, oil and paint.

Tolerances: To AS 3600 clause 17.5.3.

Minimum concrete cover: As documented.

Post-tensioning record: Provide details of the following:

- Concrete mix.
- Concrete placing and curing methods, including dates.
- Placing of reinforcement and tendons.
- Dates of post-tensioning operations.
- Name of operator.
- Identification of tendons.
- Stressing method (single or double end, monostrand or multistrand).
- Early age test results for strength.
- Tendon breakage and non-conformance reports.

#### **Ducts**

Standard: To AS 3600 clause 17.3.

Placement: Locate and secure to positions, as documented.

Supports: Support and fix at regular intervals. Protect from collapse and other damage.



Sheathing: If ducts are formed with sheaths, provide sheathing material capable of transferring the tendon stresses into the body of the concrete.

Sequence: Assemble tendons on site by installing strand, bar or wire within the duct before concreting.

Damage: If damaged, repair ducts as follows:

- Small holes: Waterproof adhesive tape.
- Larger holes: Metal strips wrapped around the duct, with 100 mm overlap and sealed by a waterproof adhesive tape.

Crossover points: If ducts running in opposite directions clash, consult the professional engineer. Do not relocate ducts without approval.

### **Anchorage**

Anti-burst reinforcement: As documented.

### **Tendons**

Care: Do not weld tendons. Do not expose tendons to sparks, ground current or excessive temperatures such as flame or oxyacetylene cutting.

Grout fittings and ducts: For bonded construction, protect from collapse and other damage.

Conformance: Provide tendons as documented in the **Tendon schedule**.

Protection: Make sure tendons are not displaced by heavy and prolonged vibration, the pressure of the concrete being placed, workmen or construction traffic.

Temperature: Maintain concrete around grouted tendons at 5°C or more for at least 3 days after grouting.

Slab marking: If there is possibility for future slab penetrations, mark the tendon locations, either on the slab surface or the soffit.

### **Gauges and jacks**

Standard: To AS 1349.

Maximum error in pressure indication: 1% of the maximum scale (concentric) value.

Period: Calibrate gauges and jacks at intervals not exceeding 6 months, after re-sealing of jack or gauge, or if any inaccuracy in the gauges is suspected.

Sets: Calibrate and use jacks and gauges as a set.

### **Stressing**

Post-tensioning: To AS 3600 clause 17.3.4.5.

Concrete strength: Complete early age tests before stressing.

Stressing procedure: Carry out stressing after age tests results indicate concrete has attained the required strength.

Stressing stages: As documented.

Marking: Mark strands after wedges are installed and before initial stress.

Slip: Check markings whilst stressing to make sure there is no slip of strands.

Stress records: Measure gross extensions on site and include initial and final stress extensions.

Site extensions: Submit the site extensions on the same day as measured for review and approval by the structural engineer.

Non-conformance: If the difference between theoretical and measured extensions is greater than 10%, provide an explanation of the cause.

Cutting tendons: Do not cut tendons until the actual extensions are approved.

Re-stress or de-stress: Adjust stress in tendons if necessary, after the theoretical and site extensions are compared.

Post-tensioning stressing schedule: Provide a stressing schedule, including the following information.

- Setting out, elongation and jacking forces.
- Identification number of dynamometers, gauges, pumps and jacks.
- Initial stressing force (or pressure) when tendons are marked for measurement of elongation, but not marked at nil load.
- Force applied (dynamometers).
- Pump or jack pressure and area of the piston.
- Elongation before anchoring.
- Elongation remaining after anchoring.

**Grouting**

Timing: Grout tendons as soon as practicable after stressing and within the time limits applicable to the atmospheric corrosivity category, as documented:

- C1 or C2: Three weeks.
- C3: Two weeks.
- C4: One week.
- C5 or CX: Seek specialist advice.

Procedure: Prevent damage to grout vents and fittings during grouting. Do not use manually powered grouting machines. Completely fill the duct during grouting. Inject grout into voids between tendons, ducts and anchorages, until grout flows from vents without air bubbles. Close vents as they fill, progressively in the direction of flow. If there is a blockage or interruption, completely flush grout from the duct using water.

Grout caps: Provide at each anchorage and seal for grouting and venting operations

Post-tensioning grouting record: For each duct grouted, provide the following:

- Duct and tendon identification.
- Grouting date.
- Composition of the grout (water:cement ratio, admixtures).
- Grout tests, including air tests of ducts.
- Details of grouting (including pumping or supply interruptions, topping up).

**Protection**

Grout ducts: Do not subject grouted ducts to shock, vibration, construction traffic or similar loads until 24 hours after completion of grouting.

**Permanent protection**

Tendons and anchorages: On completion of stressing and grouting, permanently protect anchorage and tendons. Provide at least 40 mm of cover over the cut tendons when the recesses are concreted. Keep anchorages free of foreign matter (rust, grease, oil, paint).

**3.5 CONCRETE SUPPLY****Elapsed delivery time**

General: Make sure 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 heating or cooling measures are taken to deliver concrete within the range 5°C to 35°C.

**Elapsed delivery time table**

| Concrete temperature at time of discharge (°C) | Maximum elapsed time (minutes) |
|------------------------------------------------|--------------------------------|
| 5 – 24                                         | 120                            |
| 24 – 27                                        | 90                             |
| 27 – 30                                        | 60                             |
| 30 – 35                                        | 45                             |

**Pre-mixed supply**

Addition of water: To AS 1379 clause 4.2.3.

Transport method: Select to prevent segregation, loss of material and contamination of the environment, and not to adversely affect placing or compaction.

**Site mixed supply**

Emergencies: If mixing by hand, provide details.

Plant: Mix concrete in a plant located on the construction site.

**3.6 TESTING****General**

Test authority: Concrete supplier or an Accredited Testing Laboratory.

Reports and records of test results: To the relevant parts of the AS 1012 series. Keep results on site.

**Assessment process of test results**

Standard: To AS 1379.

Method of assessment: Project assessment.

### Sampling

Method of sampling: AS 1012.1.

Sampling locations: To AS 1012.1 and the following:

- Slump tests: On site, at the point of discharge from the agitator.
- Compressive strength tests: Spread the site sampling evenly throughout the pour.

Frequency of sampling: To AS 1379 Sections 5 and 6 and the following:

- Slump tests: Take at least one sample from each batch.
- Compressive strength tests: To the **Project assessment strength grade sampling table**.

### Project assessment strength grade sampling table

| Number of batches for each type and grade of concrete per day | Minimum number of samples: Columns and load bearing wall elements/batch | Minimum number of samples: Other elements/day |
|---------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------|
| 1                                                             | 1                                                                       | 1                                             |
| 2-5                                                           | 1                                                                       | 2                                             |
| 6-10                                                          | 1                                                                       | 3                                             |
| 11-20                                                         | 1                                                                       | 4                                             |
| each additional 10                                            | 1                                                                       | 1 additional                                  |

### Making and curing of specimens

General: To AS 1012.8.1 and AS 1012.8.2.

Specimens for compressive strength tests: Make and cure at least two specimens from the sample of each grade.

Specimen size:

- Aggregate size ≤ 20 mm: Nominally 200 x 100 mm diameter.
- Aggregate size > 20 mm: Nominally 300 x 150 mm diameter.

### Test methods

General: To the relevant parts of the AS 1012 series.

Acceptance criteria:

- General: As documented in the **Concrete properties schedule – performance**.
- Early age compressive strength: As documented in the **Control tests schedule**.

Drying shrinkage at 56 days: To AS 1012.8.4 and AS 1012.13.

### Liquid retaining structures

Testing for liquid tightness: To AS 3735.

## 3.7 CORES, FIXINGS AND EMBEDDED ITEMS

### General

Requirement: Install fasteners to manufacturer's recommendations and the assumptions of AS 5216 Appendix D.

### Adjoining elements

Fixings: Provide fixings for adjoining elements. If required, provide temporary support to the adjoining elements during concreting, to prevent movement.

### Protection

General: Grease threads. Protect embedded items against damage.

Compatibility: Provide inserts, fixings and embedded items that are compatible with each other, with the reinforcement and with the documented concrete mix and surface finish.

Corrosion: In external or exposed locations, galvanize anchor bolts and embedded fixings.

### Structural integrity

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

Isolation: Isolate embedded items to prevent water tracking to concrete that provides minimum cover to reinforcement.

**Tolerances**

General: Maximum deviation from correct positions:

- Anchor bolt groups for structural steel: To AS/NZS 5131.
- Cores and embedded items generally: 10 mm.
- Other fixing bolts: 3 mm.

**3.8 CONCRETE WORKING BASE****Finish**

Membrane support: Wood float finish or equivalent.

**Installation**

General: Lay over the base or subgrade and screed to the required level.

**Surface flatness tolerance**

Maximum deviation: 6 mm from a 3 m straightedge.

**3.9 PLACING AND COMPACTION****Placing**

Horizontal transport: Use suitable conveyors, clean chutes, troughs, hoppers or pipes.

Methods: Avoid segregation and loss of concrete, and minimise plastic settlement. Maintain a nominally vertical and plastic concrete edge during placement.

Horizontal elements: Place concrete in layers not more than 300 mm thick. Compact the following layer into previous layer before previous layer has taken initial set.

**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 contact set concrete, reinforcement or items including pipes and conduits embedded in concrete. Do not use vibrators to move concrete along the formwork. Avoid causing segregation by over-vibration.

**Placing records**

Log book: 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**

Protection: During placement and before setting, protect the surface from damage.

**Time between adjacent placements**

Minimum time delay: As documented in the **Minimum time delay schedule**.

**Vertical elements**

Placement: Limit the free fall of concrete to maximum of 2000 mm.

**Placing in cold weather**

Cement: Do not use high alumina cement.

Temperature limits: Maintain the following:

- Freshly mixed concrete:  $\geq 5^{\circ}\text{C}$ .
- Forms and reinforcement before and during placing:  $\geq 5^{\circ}\text{C}$ .
- Water: Maximum  $60^{\circ}\text{C}$  when placed in the mixer.

High early strength cement: If deteriorating weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary so that the temperature of the placed concrete is  $\geq 5^{\circ}\text{C}$ .

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.

Freezing: Prevent concrete from freezing.

#### **Placing in hot weather**

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses.

Temperature limits: Maintain the following:

- Normal concrete in footings, beams, columns, walls and slabs:  $\leq 35^{\circ}\text{C}$ .
- For concrete strength grade less than 40 MPa with section thickness  $\geq 1$  m in all dimensions:  $\leq 27^{\circ}\text{C}$ .
- For concrete strength grade 40 MPa or greater with section thickness  $\geq 600$  mm in all dimensions:  $\leq 27^{\circ}\text{C}$ .
- Forms and reinforcement before and during placing:  $\leq 35^{\circ}\text{C}$ .

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

Temperature control: Select one or more of the following methods of maintaining the temperature of the placed concrete at  $35^{\circ}\text{C}$  or less:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover horizontal transport containers.
- Spray the coarse aggregate using cold water before mixing.
- Use chilled mixing water.

#### **Placing under water**

General: Do not place under water unless conditions prevent dewatering.

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

### **3.10 JOINTS**

#### **Construction joints**

Location: Do not relocate or eliminate construction joints, or form undocumented construction joints. If emergency construction joints are made necessary by unforeseen interruptions to the concrete pour, submit a report on the action taken.

Finish: Butt join the surfaces of adjoining pours. In visually important surfaces make the joint straight and true, and free from blemishes impermissible for its surface finish class.

Preparation: Roughen and clean the hardened concrete joint surface. Remove loose or soft material, free water, foreign matter and laitance. Dampen the surface just before placing the fresh concrete and coat with a neat cement slurry.

#### **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 with each other, 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.

Foamed materials (in compressible fillers): Closed-cell or impregnated, not water absorbing.

#### **Slip joints**

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

### **3.11 SURFACE MODIFIERS**

#### **General**

Application: Apply to clean surfaces, to the manufacturer's recommendations.

### 3.12 FORMED SURFACES

#### General

Surface finish: As documented in the **Surface finish class schedule** and the **Formed surface finishes schedule**.

Damage: Do not damage concrete works through premature removal of formwork.

#### Curing

Requirement: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

#### Evaluation of formed surfaces

General: If evaluation of formed surface is required, complete the evaluation before surface treatment.

#### Finishing methods

Requirement: If soffits of horizontal concrete elements or faces of vertical concrete elements are to have a finish other than an off-form finish, provide finishes as documented.

Form removal: If vertical face formwork needs to be removed for finishing methods, while the concrete is green, make sure the concrete has sufficiently set to prevent slump.

Blasted finishes:

- Abrasive: Blast the cured surface using hard, sharp graded abrasive particles until the coarse aggregate is in uniform relief.
- Light abrasive: Blast the cured surface using hard, sharp graded abrasive particles to provide a uniform matt finish without exposing the coarse aggregate.

Bush hammered finish: Remove the minimum matrix using bush hammering to expose the coarse aggregate, recessing the matrix no deeper than half the aggregate size, to give a uniform texture.

Exposed aggregate finish: While the concrete is green, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Do not use acid etching. Rinse the surface with water.

Floated finishes:

- Sand floated finish: While the concrete is green, wet the surface and rub using a wood float. Rub fine sand into the surface until a uniform colour and texture are produced.
- Grout floated finish: While the concrete is green, dampen the surface and spread a slurry, using hessian pads or sponge rubber floats. Remove surplus slurry and work until a uniform colour and texture are produced.

Smooth rubbed finish: While the concrete is green, wet the surface and rub using a carborundum or similar abrasive brick until a uniform colour and texture are produced.

### 3.13 UNFORMED SURFACES

#### General

Surface finish: As documented in the **Unformed surface finishes schedule**.

Finished levels: Strike off, screed and level slab surfaces to finished levels and to the flatness tolerance class documented.

#### Finishing methods – primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating, finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy finish, uniform in texture and appearance, and free of trowel marks and defects.

Wood float finish: After machine floating, use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling use a broom or hessian belt drawn across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, use a stiff brush or rake drawn across the surface before final set, to produce a coarse scored texture.

Sponge finish: After machine floating and steel trowelling, use a damp sponge to wipe the surface to produce an even textured sand finish.

Exposed aggregate finish: After floating and when concrete has stiffened, wet the surface and scrub with stiff fibre or wire brushes, flushing continuously with clean water, until the aggregate is uniformly exposed. Rinse the surface with water.

#### **Finishing methods – supplementary finish**

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate, using hard, sharp graded abrasive particles.

Coloured applied finish: After machine floating, apply a proprietary liquid or dry shake material to the manufacturer's recommendations and trowel to achieve the required appearance.

Stamped and coloured pattern finish: Provide a proprietary finishing system.

Polished finish: After steel trowelling, grind the cured surface of the concrete.

### **3.14 CURING**

#### **General**

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

- Curing: Cure continuously from completion of finishing, when the concrete has set sufficiently not to be damaged by the curing process, until the minimum total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, conforms to the following, unless accelerated curing is adopted:
  - . Fully enclosed internal surfaces/Early age strength 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.

#### **Curing compounds**

Liquid membrane-forming compounds: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken for at least 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-levelling toppings: If used also as curing compounds, conform to AS 3799.

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

#### **Cold weather curing**

Temperature: Maintain concrete surface temperatures above 5°C for the duration of the curing period.

#### **Hot weather curing**

Requirement: If the concrete temperature exceeds 25°C, or the ambient shade temperature exceeds 30°C, protect from drying winds and sun by using an evaporative retarder until curing is commenced.

#### **Water curing**

Method: Select a method of ponding or continuously sprinkling to prevent damage to the concrete surface during the required curing period.

### **3.15 COMPLETION**

#### **Formwork removal**

Extent: Remove formwork, other than permanent forms and trapped forms, including formwork in concealed locations.

Timing: Do not disturb formwork until concrete has reached sufficient hardness to withstand formwork movements and removal without damage.

Stripping:

- General: To AS 3600 where it is more stringent than AS 3610.1.
- Vertical formwork: To AS 3610.1 Appendix C Table C2.
- Multi-storey work: Remove formwork without disturbing props supporting succeeding floors.

- Post-tensioned concrete: Remove formwork supporting post-tensioned concrete members to AS 3600 clause 17.6.2.7.

Removable bolts: Remove tie bolts without damaging the concrete.

Bolt hole filling: Provide material with durability and colour matching the concrete.

Recessed filling: Fill or plug the hole to 6 mm below the finished surface.

Curing: If formwork is stripped before the minimum curing period for the concrete has elapsed, continue curing the exposed faces as soon as the stripping is completed.

#### Protection

General: Protect the concrete from damage due to construction loads, physical and thermal shocks, and excessive vibrations, particularly during the curing period.

Surface protection: Protect finished concrete surfaces and applied finishes from damage.

#### Completion tests

Slip resistance of completed installation: To AS 4663.

### 0331 BRICK AND BLOCK CONSTRUCTION

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide brick and block construction, as documented.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.

### 1.3 STANDARDS

#### General

Materials and construction: To AS 3700.

### 1.4 INTERPRETATION

#### Definitions

General: For the purposes of this worksection the definitions in AS 3700 clause 1.5.2, AS/NZS 4455.1 clause 1.4 and the following apply:

- Facework: Masonry intended to be exposed in a wall.

### 1.5 TOLERANCES

#### General

Requirement: To AS 3700 Table 12.1.

### 1.6 SUBMISSIONS

#### Fire performance

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE, Fire-resistance of building elements.**

#### Products and materials

Type tests: Submit results, as follows:

- Characteristic unconfined compressive strength of masonry unit: To AS/NZS 4456.4.

#### Samples

Face units: Submit face units of each type illustrating the range of variation available, including colour, texture, surface irregularities, defective arrises, and shape.

- Number of each type: 6.

Facework sample panel: Submit a sample panel in a suitable position for each type of facework including face or pointing mortar and a finished vertical control joint.

- Minimum size (face of panel): 1200 mm high x 1190 mm or closest unit module long.



Sand: Submit a 2 kg sample of each type of sand required to be of a particular colour, grade or source.

**Tests**

Site tests: Submit results as follows:

- Mortar.
- Special masonry.

**Weatherproofing performance**

Requirement: Submit evidence of conformity to EXECUTION, **GENERAL**, Weatherproofing.

**1.7 INSPECTION****Notice**

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

- Set-out.
- Unit type, colour and texture.
- Bottoms of cavities, after cleaning out.
- Bottoms of core holes, before grouting.
- Reinforcement type and diameter.
- Positioning of reinforcing before grouting.
- Control joints, ready for insertion of joint filler.
- Damp-proof courses, in position.
- Flashings, in position.
- Lintels, in position.
- Structural steelwork, including bolts and shelf angles, in position.

---

**2 PRODUCTS****2.1 FIRE PERFORMANCE****Fire-resistance of building elements**

Fire-resistance level: Tested to AS 1530.4.

**2.2 DURABILITY****General**

Exposure locations: To AS 3700 clause 5.4.

**2.3 MATERIALS****Masonry units**

Selections: As documented.

Standard: To AS/NZS 4455.1 and AS/NZS 4455.3.

Salt attack resistance grade: To AS 3700 Table 5.1.

Minimum age of clay bricks: 7 days.

**Mortar materials**

Mortar class: To AS 3700 Table 5.1.

Cement: To AS 3972.

White cement: With not more than 1% iron salts content.

Lime: To AS 1672.1.

Sand: Fine aggregate with a low clay content and free from efflorescing salts, selected for colour and grading.

Water: Clean and free from any deleterious matter.

Admixtures: To AS 3700 clause 11.4.2.4.

Pigment: To EN 12878, and as follows:

- Integral pigment mix proportion: Not more than 10% by weight of cement.

**Masonry cement mortar mix proportions table (cement:lime:sand), by volume**

| Mortar class to AS 3700 | Clay  | Concrete | Calcium silicate | Water thickener |
|-------------------------|-------|----------|------------------|-----------------|
| M3                      | 1:0:4 | 1:0:4    | n/a              | Yes             |
| M4                      | 1:0:3 | n/a      | n/a              | Yes             |

**Cement (GP/GB) mortar mix proportions table (cement:lime:sand), by volume**

| Mortar class to AS 3700 | Clay       | Concrete   | Calcium silicate | Water thickener |
|-------------------------|------------|------------|------------------|-----------------|
| M2                      | 1:2:9      | n/a        | n/a              | No              |
| M3                      | 1:1:6      | 1:1:6      | n/a              | Optional        |
| M3                      | 1:0:5      | 1:0:5      | 1:0:5            | Yes             |
| M4                      | 1:0.5:4.5  | 1:0.5:4.5  | n/a              | Optional        |
| M4                      | 1:0:4      | 1:0:4      | 1:0:4            | Yes             |
| M4                      | 1:0-0.25:3 | 1:0-0.25:3 | n/a              | Optional        |

**Grout**

Standard: To AS 3700 clause 11.7.

Minimum characteristic compressive strength: 12 MPa.

**2.4 BUILT-IN COMPONENTS****General**

Durability class of built-in components: To AS 3700 Table 5.1.

**Steel lintels**

Angles and flats: To AS/NZS 3679.1.

Cold formed proprietary lintels: Designed to AS/NZS 4600.

Corrosion protection: To AS 2699.3.

Galvanizing: Do not cut after galvanizing.

**Reinforcement**

Standard: To AS/NZS 4671.

Corrosion protection: To AS 3700 clause 5.9.

Minimum cover: To AS 3700 Table 5.1.

**Wall ties**

Standard: To AS 2699.1.

Type: A.

Corrosion protection: To AS 2699.1.

**Connectors and accessories**

Standard: To AS 2699.2.

Corrosion protection: To AS 2699.2.

**Flashings and damp-proof courses**

Standard: To AS/NZS 2904.

**Slip joints**

Standard: To AS 3700 clause 4.14.

**Air vents**

Blockwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frame, 390 x 190 mm.
- Vent blocks: Purpose-made vent blocks.

Brickwork: Select from the following:

- Concrete framed: Bronze wire mesh in concrete frames, 470 x 160 mm.
- Cut brick: Two cut bricks laid vertically and evenly spaced in a 230 mm wide x two course high opening, backed with bronze wire mesh built in.
- Terracotta: Perforated, 230 x 160 mm.

### 3 EXECUTION

#### 3.1 GENERAL

##### **Weatherproofing**

Requirement: Construct masonry as documented. Conform to BCA FP1.4.

##### **Mortar mixing**

General: Measure volumes accurately to the documented proportions. Machine mix for at least six minutes.

##### **Protection**

Masonry materials and components: Protect from ground moisture and contamination.

During construction: Cover the top surface of masonry to prevent the entry of rainwater and contaminants.

##### **Bond**

Type: Stretcher bond.

AAC units: Running 100 mm stagger bond.

##### **Building in**

Embedded items: Build in wall ties and accessories as the construction proceeds. If not practicable to obtain the required embedment within the mortar joint in cored or hollow masonry units, fill appropriate cores with grout or mortar.

Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

##### **Clearance for timber frame shrinkage**

General: In timber frame masonry veneer construction, leave clearances between window frames and sill and between roof frames and the masonry veneer as follows:

- Single storey frames and ground floor windows (not for slab on ground): 10 mm.
- Two storey frames and upper floor windows: 20 mm.
- Additional clearance: To accommodate additional shrinkage of unseasoned floor timbers.

##### **Monolithic structural action**

Construction at different rates or times: If two or more adjoining sections of masonry, including intersecting walls, are constructed at different rates or times, rake back or tie the intersections between those sections to obtain monolithic structural action in the completed work.

Header units: Except in stretcher bond facework, provide masonry header units, to AS 3700 clause 4.11.2.

- Spacing: 600 mm maximum.
- Location: Provide header units in the following locations:
  - . At engaged piers.
  - . At engagement of diaphragms with the leaves in diaphragm walls.
  - . At intersections of flanges with shear walls.
  - . At intersections with supporting walls and buttresses.
  - . Between leaves in solid masonry construction.

##### **Joining to existing**

General: Provide a control joint where joining to existing structures. Do not tooth new masonry into existing work unless approved by a professional engineer.

##### **Mortar joints**

General: Set out masonry with joints of uniform width and minimum cutting of masonry units.

Solid and cored units: Lay on a full bed of mortar. Fill perpends solid. Cut mortar flush.

Face-shell bedded hollow units: Fill perpends solid. Cut mortar flush.

Joint thickness: 10 mm.

Finish: Conform to the following:

- Externally: Tool to give a dense water-shedding finish.
- Internally: If wall is to be plastered, do not rake more than 10 mm to give a key.

##### **Rate of construction**

General: Regulate the rate of construction to eliminate joint deformation, slumping or instability.

**Rods**

Set-out: Construct masonry to the following rods:

- 75 mm high units: 7 courses to 600 mm.
- 90 mm high units: 6 courses to 600 mm.
- 190 mm high units: 3 courses to 600 mm.

**Temporary support**

General: If the final stability of the masonry is dependent on construction of (structural) elements after the masonry is completed, provide proposals for temporary support or bracing.

**3.2 FACEWORK****Cleaning**

General: Clean progressively as the work proceeds to remove mortar smears, stains and discolouration. Do not erode joints if using pressure spraying.

Acid solution: Do not use.

**Colour mixing**

Distribution: In facework, distribute the colour range of units evenly to prevent colour concentrations and banding.

**Below ground**

Facework: Commence facework at least one full course for blockwork, or two full courses for brickwork, below adjacent finished surface level.

**Double face walls**

Selection: Select face units for uniform width and double-face qualities in single-leaf masonry with facework both sides.

Preferred face: Before starting, obtain approval of the preferred wall face, and favour that face should a compromise be unavoidable.

**Perpends**

General: If other than vertically aligned perpends in alternate courses are proposed, provide details.

**Sills and thresholds**

General: Solidly bed sills and thresholds and lay them with the top surfaces draining away from the building.

Minimum size of cut unit: Three quarters full width.

**3.3 SUBFLOOR WORK****Access openings**

General: In internal walls, provide door-width openings beneath doorways to give access to underfloor areas.

**Air vent locations**

General: Provide air vents to give adequate cross ventilation to the space under suspended ground floors.

Cavity walls: Provide matching vents in the internal leaves located as near as practicable to the vents in the external leaves.

Location: Below damp-proof course to internal and external walls.

**Underpinning**

Requirement: Install underpinning, without causing damage to the building.

Grouting: Pack dry mix M4 mortar between underpinning and existing structure at the completion of each panel of underpinning.

**3.4 CAVITY WORK****Cavity clearance**

General: Keep cavities clear at all times.

**Cavity fill**

General: Fill the cavity with mortar to one course above the adjacent finished (ground) level. Fall the top surface towards the outer leaf.

**Cavity width**

General: Construct minimum cavity widths in conformance with the following:

- Masonry walls: 50 mm.

- Masonry veneer walls: 40 mm between the masonry leaf and the load bearing frame and 25 mm minimum between the masonry leaf and sheet bracing.

**Openings**

Jambs of external openings: Do not close the cavity.

**Wall ties, connectors and accessories**

Protection: Install to prevent water passing across the cavity.

**3.5 DAMP-PROOF COURSES****Location**

General: Locate damp-proof courses, as follows:

- Timber floors: In the first course below the level of the underside of ground floor timbers in internal walls and inner leaves of cavity walls.
- Cavity walls built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf one course above. Project 10 mm beyond the external slab edge and turn down at 45°.
- Internal walls built off slabs on ground: In the first course above floor level.
- Masonry veneer construction built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity. Fasten to the inner frame 75 mm above floor level.
- Walls adjoining infill floor slabs on membranes: In the course above the underside of the slab in internal walls and inner leaves of cavity walls. Project 40 mm and dress down over the membrane turned up against the wall.

Height: Not less than:

- 150 mm above the adjacent finished ground level.
- 75 mm above the finished paved or concrete area.
- 50 mm above the finished paved or concreted area and protected from the direct effect of the weather.

**Installation**

General: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding two courses per step for brickwork and one course per step for blockwork. Sandwich damp-proof courses between mortar.

Junctions: Preserve continuity of damp-proofing at junctions of damp-proof courses and waterproof membranes.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

**3.6 FLASHINGS****Location**

General: Locate flashings, as follows:

- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf two courses above for brick and one course above for block. If the slab supports the outer skin and is not rebated, bed the flashing in a suitable sealant.
- Under sills: 30 mm into the outer leaf bed joint one course below the sill, extending up across the cavity and under the sill in the inner leaf or the frame for masonry veneer. Extend at least 150 mm beyond the reveals or each side of the opening.
- Over lintels to openings in cavity walls: Full width of outer leaf immediately above the lintel, continuous across cavity, turned 30 mm into the inner leaf two courses above for brick and one course above for block or turned up against the inner frame and fasten to it. Extend at least 150 mm beyond the lintels.
- At abutments with structural frames or supports: Vertically flash in the cavity using 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At jambs: Vertically flash jamb, extending 75 mm into the cavity, interleaved with the sill and head flashing at each end. Fix to jambs.
- At roof abutments with cavity walls: Cavity flash immediately above the roof and over-flash the roof apron flashing.

**Installation**

General: Sandwich flashings between mortar except where on lintels or shelf angles. Bed flashings, sills and copings in one operation to maximise adhesion.

Laps: If required, lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding two courses per step for brickwork and one course per step for blockwork.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

Pointing: Point up joints around flashings, filling voids.

**Weepholes**

Requirement: Locate weepholes to external leaves of cavity walls in the course immediately above flashings, and cavity fill, and at the bottoms of unfilled cavities.

Form: Open perpend.

Maximum spacing: 1200 mm.

**3.7 WALL TIES****Location**

General: Space wall ties in conformance with AS 3700 clause 4.10 and at the following locations:

- Not more than 600 mm in each direction.
- Adjacent to vertical lateral supports.
- Adjacent to control joints.
- Around openings.

**Installation**

Embedment: At least 50 mm into mortar. Make sure that mortar cover is 15 mm minimum to the outside face of the mortar.

Fixing of masonry veneer ties:

- To timber frames: Screw fix to outer face of timber frames with fasteners to AS 3566.1.
- To concrete: Masonry anchors.
- To steel frames: Screw fix to outer face of steel studs with fasteners to AS 3566.1.

**3.8 CONTROL JOINTS****General**

Location and spacing: Provide control joints to AS 3700 clause 4.8.

**Control joint filling**

Filler material: Provide compatible sealant and bond breaking backing materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed-cell or impregnated, not water-absorbing.

Installation: Clean the joints thoroughly and insert an easily compressible backing material before sealing.

Sealant depth: Fill the joints with a gun-applied flexible sealant for a depth of at least two-thirds the joint width.

**Fire-resisting control joints**

General: If a control joint is located in an element of construction required to have a fire-resistance level (FRL), construct the control joint with fire-stopping materials which maintain the FRL of the element.

Fire-stopping: To AS 4072.1.

**3.9 BRICKWORK AND BLOCKWORK DUCT RISERS****General**

Location: Build a one-piece corrosion resistant metal tray to the masonry duct risers at roof level to shed water from the duct above roof flashing level.

Material: [complete/delete]

**Installation**

General: Cut an opening for the riser. Turn tray edges up 25 mm around the opening 13 mm clear of the walls. Externally turn the tray up 100 mm under the stepped flashing and down 100 mm over the apron flashing. Lap and solder joints.

**Weepholes**

General: Provide two weepholes through the masonry duct riser walls on opposite sides immediately above the tray.

**3.10 BRICKWORK BED JOINT REINFORCEMENT****Location**

General: Locate as follows:

- In two bed joints below and above head and sill flashings to openings.
- In two bed joints below and above openings.
- In third bed joint above bottom of wall.
- In second bed joint below top of wall.

Maximum vertical intervals: 500 mm.

**Installation**

General: Lap 450 mm at splices. Fold and bend at corners so that the longitudinal wires are continuous. Stop 50 mm short of control joints. Extend 450 mm beyond each side of openings.

**Reinforcement**

Material: Galvanized welded wire mesh.

Width: Equal to the width of the leaf, less 15 mm cover from each exposed surface of the mortar joint.

**3.11 REINFORCED AND GROUTED BLOCKWORK****Cleaning core holes**

General: Provide purpose-made cleanout blocks or machine cut a cleaning hole at the base of each grouted core.

Location: Locate on the side of the wall which is to be rendered or otherwise concealed.

Cleaning: Rod cores to dislodge mortar fins protruding from the blocks and mortar droppings from reinforcement. Remove through the clean-out blocks.

**Grouting**

Commencement: Do not commence until grout spaces have been cleaned out and the mortar joints have attained sufficient strength to resist blow-outs.

Height of lift: Limit the height of individual lifts in any pour to make sure that the grout can be thoroughly compacted to fill all voids.

Compaction: Compact by vibration or by rodding.

Topping up: On the completion of the last lift, top up the grout after 10 min and within 30 min, and vibrate or rod to mix with the previous pour.

**3.12 LINTELS****Location**

General: Install one lintel to each wall leaf, as documented.

**Installation**

General: Do not cut on site. Keep lintels 10 mm clear of heads of frames.

Steel lintels: Pack mortar between any vertical component and supported masonry units. For angles, install the long leg vertically.

Minimum bearing each end:

- Span not more than 1000 mm: 100 mm.
- Span more than 1000 mm and not more than 3000 mm: 150 mm.
- Span more than 3000 mm: To structural drawings.

Propping: Provide temporary props to lintels to prevent deflection or rotation.

- Minimum propping period: 7 days.

### 3.13 CONNECTORS AND ACCESSORIES

#### Slip joints

General: Install slip joints to top of all unreinforced masonry walls supporting concrete slabs and other concrete elements.

Protection: Keep the slip joints in place and protect from displacement.

#### Flexible masonry ties

General: Install stabilising ties at control joints and abutting structural elements, including columns, beams and slab soffits.

Locations and details: As documented.

### 3.14 ARCHES

#### Arch voussoirs

General: Cut units using a masonry saw.

#### Shapes and dimensions

General: Form arches using solid or cored (not hollow) masonry units.

### 3.15 BAGGING

#### Preparation

General: Cut joints flush before bagging.

#### Dry bagging

Application: Apply laying mortar to the surface using a hessian bag or similar. Flush up irregularities, but leave a minimum amount of mortar on the surface.

#### Textured bagging

Application: Apply laying mortar to the surface using a sponge float. Flush up irregularities, but leave approximately 2 mm of mortar on the surface. When initial set is reached, texture using a hand bristle brush.

### 3.16 TESTING

#### Mortar

Durability: Scratch index test to AS 3700 Appendix E.

Compressive strength: To AS 3700 Appendix C.

Flexural strength: To AS 3700 Appendix D.

#### Special masonry

Sampling and testing: To AS 3700 clause 12.7.

Performance: As documented.

|                           |
|---------------------------|
| <b>0332 STONE MASONRY</b> |
|---------------------------|

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide stone masonry construction, as documented.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.

### 1.3 STANDARD

#### General

Masonry: To AS 3700.



## 1.4 INTERPRETATION

### Definitions

## 1.5 TOLERANCES

### General

Requirement: To AS 3700 Table 12.1.

### Dimension stone units

Maximum deviation from required dimensions:

- Load bearing stone:  $\pm 2$  mm.
- Other stone:  $\pm 10$  mm.

## 1.6 SUBMISSIONS

### Design documentation

Bird proofing: Submit details of the proposed method and evidence of proven performance including addresses of existing installations, date of installation, contact personnel at the installation addresses, and current performance data.

### Execution details

Supervision: Submit the names and qualifications of proposed bench masons.

Temporary support: If the final stability of the stonework is dependent on (structural) elements to be constructed later, submit proposals for temporary support or bracing.

### Operation and maintenance manuals

Requirement: Submit on completion.

### Products and materials

Proposed mortar mix: Submit details of the proposed mix, at least 7 days before starting stonework.

Supplier's data: Submit statements from the stone supplier, with the following information:

- The supplier's experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Particulars of established quality control procedures (if any), and the category of the procedures to the relevant standard.
- The physical properties of the required material.
- Lead times for delivery of the material to the site.

### Prototypes

Self-supported stonework prototypes: Erect a prototype wall section consisting of at least two courses of masonry, each at least 1500 mm long, and including the following:

- Corner stones or quoins.
- Joint finishes (including mortar pointing and sealant).

### Samples

Stone: For each type and grade of stone (including natural and cast stone), submit 3 samples of each stone unit (e.g. block, panel, tile) as follows:

- Either the full size of the unit, or 300 x 300 mm, whichever is the smaller.
- Showing the expected range of variation of colour, pattern, texture and surface finish.

Cast stone: Submit samples which consist of both facing and backing material, if different.

Sand: Submit a 2 kg sample of each type of sand required to be a particular colour, grade or source.

Accessories: Submit two samples of each accessory proposed for fixing stonework.

Labelling: Label samples for identification. Label natural stone samples to show the quarry source, section, bed and lift.

Bird proofing fixing: Submit samples of proposed fixing methods and materials, including adhesives.

### Shop drawings

General: Submit shop drawings to a scale that best describes the detail, showing the following where applicable:

- Projecting courses.
- Quoin stones.
- Cutting details for mouldings such as lintels, sills, steps and cornices.

- Stonework setting out.
- Position and identifying number of each stone.
- Dimensions of each stone and lay of natural bed.
- Lifting detail and fixing detail of each stone.
- Proposed dowel restraints for column and mullion joints.

**Subcontractors**

General: Submit names and contact details of proposed specialist stoneworker.

**Tests**

Pre-completion tests: Submit results for the following:

- Stone tests.
- Mortar tests.
- Structural fixings tests.

**Weatherproofing performance**

Requirement: Submit evidence of conformity to EXECUTION, **GENERAL**, Weatherproofing.

**1.7 INSPECTION****Notice**

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

- Proposed stone source (quarry, storage yard).
- Proposed mason's yard.
- Materials stored at the yard or on site.
- Prepared stone sample range.
- Stone in worked condition at the mason's yard.
- Installed prototype.
- Substrate prepared to receive the specified stonework.
- Stone laid out before fixing.
- Control joints ready for insertion of joint filler.
- Damp-proof course, in position.
- Flashings, in position.
- Lintels, in position.
- Structural steelwork, including bolts and shelf angles, in position.
- Rainwater goods, in position.

**2 PRODUCTS****2.1 DURABILITY****General**

Exposure locations: To AS 3700 clause 5.4.

**2.2 TESTING****Stone tests**

Pre-completion tests: Obtain test samples, representative of each required type of stone, and have the documented tests carried out at the following stages:

- Before awarding a stone supply contract.
- On dimension stone prepared for the works, at intervals during the course of the works.

**Natural stone tests schedule**

| Property to be tested                                                                | Test standard                     | Test criterion (if not in the test standard) | Number and frequency of tests |
|--------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|-------------------------------|
| Unconfined compressive strength (dry and saturated):<br>- Intact rock core specimens | ASTM D7012<br><br>ASTM C170/C170M |                                              |                               |

| Property to be tested     | Test standard   | Test criterion (if not in the test standard) | Number and frequency of tests |
|---------------------------|-----------------|----------------------------------------------|-------------------------------|
| - Dimension stone         |                 |                                              |                               |
| Surface absorption rate   | ASTM C97/C97M   |                                              |                               |
| Porosity                  | ASTM C97/C97M   |                                              |                               |
| Wet and dry density       | ASTM C97/C97M   |                                              |                               |
| Modulus of rupture        | ASTM C99/C99M   |                                              |                               |
| Sodium sulphate soundness |                 |                                              |                               |
| Flexural strength         | ASTM C880/C880M |                                              |                               |
| Other properties          |                 |                                              |                               |

**Cast stone tests schedule**

| Property to be tested      | Test standard | Test criterion (if not in the test standard) | Number and frequency of tests |
|----------------------------|---------------|----------------------------------------------|-------------------------------|
| Compressive strength       | BS 1217       |                                              |                               |
| Drying shrinkage           | BS 1217       |                                              |                               |
| Initial surface absorption | BS 1217       |                                              |                               |
| Other properties           |               |                                              |                               |

**Slate tests schedule**

| Property to be tested        | Test standard   | Test criterion (if not in the test standard) | Number and frequency of tests |
|------------------------------|-----------------|----------------------------------------------|-------------------------------|
| Delamination                 | BS 5642-1       |                                              |                               |
| Sulfuric acid immersion test | BS 5642-1       |                                              |                               |
| Flexure                      | ASTM C120/C120M |                                              |                               |
| Water absorption             | ASTM C121/C121M |                                              |                               |
| Weather resistance           | ASTM C217/C217M |                                              |                               |

**Mortar tests**

Pre-completion tests: Obtain test samples, representative of each required type of stone, and have the documented tests carried out before starting stonework and at intervals during the course of the works.

**Mortar tests schedule**

| Property to be tested                    | Test standard | Test criterion (if not in the test standard) | Number and frequency of tests |
|------------------------------------------|---------------|----------------------------------------------|-------------------------------|
| Compressive strength                     | AS 3700       |                                              |                               |
| Bulk density                             |               |                                              |                               |
| Soluble silica and calcium oxide content | AS 2701       |                                              |                               |

**Structural fixings tests**

Sampling: Sample structural fixings at the rate of one item per 100 fixings, or part thereof, of each type.

Structural fixings: Test to confirm material, grade or designation as required.

**Structural fixings tests schedule**

| Item to be tested | Property to be tested | Applicable standard |
|-------------------|-----------------------|---------------------|
|                   |                       |                     |
|                   |                       |                     |
|                   |                       |                     |

## 2.3 NATURAL STONE

### General

Requirement: Conform to the approved samples and prototypes, as documented.

### Stone selection

Performance: Select stone as follows:

- To the designated quality grade and of uniform quality within any grade.
- Within each grade for the optimum matching of visual properties such as colour and pattern.
- Sound and free from defects liable to affect strength, appearance and durability under the intended conditions of use.

### Stone defects

Sandstone : Minor shale laminae or interbeds and minor concentrations of carbonaceous material (tea leaves) are acceptable in visible faces at ground level or in public areas. Neither defect is acceptable in carved or moulded work.

Granite: A small degree of microcracking that does not affect soundness is acceptable.

## 2.4 MORTAR

### Mortar materials

Cement: To AS 3972.

White cement: With not more than 1% iron salts content.

Lime: To AS 1672.1.

Sand: Fine aggregate with no clay content, free from efflorescing salts, selected for colour and grading.

Crushed stone: Fine aggregate consisting partly or wholly of crushed stone, made from material of the same type as the stone facing.

Water: Clean and free from any deleterious matter.

Admixtures: Do not provide admixtures.

Pigment: To EN 12878, and as follows:

- Integral pigment mix proportion: Not more than 10% by weight of cement.
- For light colours: Use off white cement in the mix.

### Mortar mix

Batching: Batch by weight and machine mix.

Mix compressive strength: Not more than compressive strength of the stone bedded on it.

Mix permeability: More than stone permeability.

Preparing lime putty:

- Using hydrated lime: Add lime to water in a clean container and stir to a thick creamy consistency. Leave undisturbed for at least 16 hours. Remove excess water and protect from drying out.
- Using quicklime: Run to putty as soon as possible after receipt of quicklime. Partly fill a clean container with water, add lime to half the height of the water, then stir and hoe ensuring that no lime remains exposed above the water. Continue stirring and hoeing for at least 5 minutes after all reaction has ceased, then sieve into a maturing bin. Leave undisturbed for at least 14 days. Protect from drying out. Take appropriate safety measures.

### Sand stockpile

General: Before commencing stonework, stockpile sand sufficient for the whole of the works. Keep stockpiled sand dry.

## 2.5 BUILT-IN COMPONENTS

### General

Durability class of built-in components: To AS 3700 Table 5.1.

### Openings

#### Steel lintels

Angles and flats: To AS/NZS 3679.1.

Cold formed proprietary lintels: Designed to AS/NZS 4600.

Corrosion protection: To AS 2699.3.

Galvanizing: Do not cut after galvanizing.

**Wall ties**

Standard: To AS 2699.1.

Type: A.

Corrosion protection: To AS 2699.1.

**Wall ties category table**

| Classification to AS 2699.1 | Service conditions         |
|-----------------------------|----------------------------|
| Medium duty                 | Normal cavity construction |
| Medium duty                 | Tie bonding at abutments   |
| Heavy duty                  | Cavities > 60 mm wide      |

**Connectors and accessories**

Standard: To AS 2699.2.

Corrosion protection: To AS 2699.2.

**Flashings and damp-proof courses**

Standard: To AS/NZS 2904.

**Fixings**

General: Provide metal fixings as follows:

- Corrosion resistant, e.g. non-ferrous metal or stainless steel.
- Stamped for identification.
- Compatible with the materials the fixings will contact or insulated from electrochemical reaction with incompatible materials.

**Air vents****3 EXECUTION****3.1 GENERAL****Weatherproofing**

Requirement: Construct masonry as documented. Conform to BCA FP1.4.

**Bench mason**

Supervision by qualified bench mason: Stonework fixing and site adjustments to joints and surface finishing.

**Storage and handling**

Stone masonry: Store stone to protect from the weather and atmospheric pollution, clear of the ground on its natural bed, on supports that do not locally overstress the stone and in conditions suitable to promote good seasoning without staining, marking or damage.

**Protection**

Masonry materials and components: Protect from ground moisture and contamination.

During construction: Cover the top surface of masonry to prevent the entry of rainwater and contaminants.

**Cutting**

General: Cut, shape and surface the stone to designated profiles including weathering, jointing, chasing, forming grooves and drilling for handling and fixing. Work the bed, face and back joints of the stone square and true.

**Carving and moulding**

General: Provide a clean sharp finish.

**Visual variations**

General: If the accepted samples and prototype panels have a range of variation in colour, pattern, texture or surface finish, distribute the production panels throughout the work so that local concentrations of similar variations do not occur.

**Building in**

Embedded items: Build in wall ties and accessories as the construction proceeds.

Steel door frames: Fill the backs of jambs and heads solid with mortar as the work proceeds.

**Rate of construction**

General: Regulate the rate of construction to eliminate joint deformation, slumping or instability.

**3.2 LAYING UNITS****Bedding**

General: Remove dust and foreign material from the bedding surfaces. If necessary, adjust the moisture content of the stone units so that adverse effects, such as reduced bond, are kept within acceptable limits. If possible, bed and joint the stone in one operation. Lay each stone on a full bed of mortar. Solidly fill vertical joints, joggles and cramps as the work proceeds. Point up joints around flashings, as necessary.

**Natural bed**

General: Lay load bearing sedimentary stone or slate with its natural bed normal to the load (e.g. horizontal in walling, perpendicular to the line of thrust in arch voussoirs), except for the following:

- Overhanging projecting stones (cornices and string courses): If edge bedding is required, lay each stone with its natural bed vertically and at right angles to the wall.
- Cladding panels: In non-load bearing cladding panels, form each panel with its natural bed at right angles to the face.

**Temporary support**

General: Provide support as necessary to the stonework as follows:

- While the mortar is curing, using bracing, joint spacers, or both.
- If the final stability of the stonework is dependent on (structural) elements to be constructed later.

Bracing and joint spacers: Non-damaging and non-staining softwood wedges or laths soaked in water. Do not allow metal pinch bars to bear directly on the stone.

**Raking and toothing**

General: Raise advanced work no more than 1.5 m above the general level, and rake back. Do not tooth stonework for subsequent additions except where toothing is documented.

**Bonding**

General: Bond the masonry to provide stability and monolithic structural action to the stonework assembly.

**Stonework****3.3 FIXINGS****Provision of fixings**

General: Provide fixings to support and restrain each stone and to resist the loads from permanent, imposed, wind and earthquake actions that the stonework will be subjected to in service, if not provided as part of the building structure.

Fixings: Stainless steel.

**3.4 BIRD PROOFING****Performance**

Requirement: Provide a system, as follows:

- Defensive against current infestation and reinfestation.
- Not reliant on chemical attack, sterilisation, poisoning or predators.
- Durable in the installed location.
- Safe for persons working on the facade for purposes such as window cleaning, maintenance and access to equipment.

**3.5 DAMP-PROOF COURSES****Location**

General: Locate damp-proof courses, as follows:

- Timber floors: In the first course below the level of the underside of ground floor timbers in internal walls and inner leaves of cavity walls.
- Cavity walls built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf one course above. Project 10 mm beyond the external slab edge and turn down at 45°.
- Internal walls built off slabs on ground: In the first course above floor level.

- Masonry veneer construction built off slabs on ground: In the bottom course of the outer leaf, continuous horizontally across the cavity. Fasten to the inner frame 75 mm above floor level.
- Walls adjoining infill floor slabs on membranes: In the course above the underside of the slab in internal walls and inner leaves of cavity walls. Project 40 mm and dress down over the membrane turned up against the wall.

Height: Not less than:

- 150 mm above the adjacent finished ground level.
- 75 mm above the finished paved or concrete area.
- 50 mm above the finished paved or concreted area and protected from the direct effect of the weather.

#### Installation

General: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding two courses per step. Sandwich damp-proof courses between mortar.

Junctions: Preserve continuity of damp-proofing at junctions of damp-proof courses and waterproof membranes.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

### 3.6 FLASHINGS

#### Location

General: Locate flashings, as follows:

- Floors: Full width of outer leaf immediately above slab or shelf angle, continuous across cavity and up the inner face bedded in mortar, turned 30 mm into the inner leaf one course above. If the slab supports the outer skin and is not rebated, bed the flashing in a suitable sealant.
- Under sills: 50 mm into the outer leaf bed joint one course below the sill, extending up across the cavity and under the sill. Extend at least 150 mm beyond the reveals on each side of the opening.
- Over lintels to openings in cavity walls: Full width of the outer leaf immediately above the lintel, continuous across cavity, turned 50 mm into the inner leaf two courses above. Extend at least 150 mm beyond the lintels.
- At abutments with structural frames or supports: Vertically flash in the cavity using 150 mm wide material, wedged and grouted into a groove in the frame opposite the cavity.
- At jambs: Vertically flash jamb, extending 75 mm into the cavity, interleaved with the sill and head flashing at each end. Fix to jambs.
- At roof abutments with cavity walls: Cavity flash immediately above the roof and over-flash the roof apron flashing.

#### Installation

General: Sandwich flashings between mortar except where on lintels or shelf angles. Bed flashings, sills and copings in one operation to maximise adhesion.

Laps: If required, lap full width at angles and intersections and at least 150 mm at joints. Step as necessary, but not exceeding 500 mm.

Lap sealing: Seal with a bituminous adhesive and sealing compound.

Pointing: Point up joints around flashings, filling voids.

#### Weepholes

Requirement: Locate weepholes to external leaves of cavity walls in the course immediately above flashings, damp-proof courses, lintels and supporting ledges.

Form: Open perpend stone course high, at least 8 mm wide.

Maximum spacing: 1000 mm.

### 3.7 WALL TIES

#### Location

General: Space wall ties in conformance with AS 3700 clause 4.10 and at the following locations:

- Not more than 600 mm in each direction.
- Adjacent to vertical lateral supports.
- Adjacent to control joints.
- Around openings.

**Installation**

Embedment: At least 50 mm into mortar. Make sure that mortar cover is 15 mm minimum to the outside face of the mortar.

Fixing of masonry veneer ties:

- To timber frames: Screw fix to outer face of timber frames with fasteners to AS 3566.1.
- To concrete: Masonry anchors.
- To steel frames: Screw fix to outer face of steel studs with fasteners to AS 3566.1.

**3.8 JOINTING AND POINTING****General**

Requirement: Carry out jointing and pointing simultaneously to form a homogeneous bed.

**Column and mullion joints**

Method: Bed the joints in stone columns and mullions in mortar:

- Joggle the bed joints to prevent movement.
- Dowel the stones together with restraint fixings.
- Make column joints over a concealed lead pad with the centre cut out to allow for settlement.

**Joints**

Thickness, Jointing and Raking as per selections

**3.9 CONTROL JOINTS****General**

Location and spacing: Provide control joints to AS 3700 clause 4.8.

**Control joint filling**

Filler material: Provide compatible sealant and bond breaking backing materials which are non-staining to masonry. Do not use bituminous materials with absorbent masonry units.

- Bond breaking materials: Non-adhesive to sealant, or faced with a non-adhering material.
- Foamed materials: Closed-cell or impregnated, not water-absorbing.

Installation: Clean the joints thoroughly and insert an easily compressible backing material before sealing.

Sealant depth: Fill the joints with a gun-applied flexible sealant for a depth of at least two-thirds the joint width.

**Fire-resisting control joints**

General: If a control joint is located in an element of construction required to have a fire-resistance level (FRL), construct the control joint with fire-stopping materials which maintain the FRL of the element.

Fire-stopping: To AS 4072.1.

**3.10 SURFACE TREATMENTS****Abutting surfaces**

General: Seal concealed faces of stone walling or facing panels where they abut brickwork or concrete.

**Dissimilar stones**

Isolation: Isolate contact surfaces of dissimilar types of stone with a membrane. Isolate sedimentary stonework from brickwork and other masonry to prevent salts movement.

**3.11 LEAD SHEETING****Material**

General: DM machine cast copperised lead sheeting, with copper content between 0.015% and 0.20%.

Minimum weight: 20 kg/m<sup>2</sup>.

**Laying**

General: Lay lead sheets flat in 1500 mm maximum lengths, on a clean stone surface, free of sharp objects or debris. Insert the sheet 25 mm into the first joint above the coping or cornice and fix with lead wedges. Point the joint with an elastomeric sealant. Dress the lead from the first joint to the front edge of the cornice or coping stone, and turn it down over the edge a maximum of 25 mm and a



minimum of 10 mm; or, where the stone edge is less, return the lead under the edge a maximum of 12 mm.

#### Jointing

Seams: Join the lead sheeting with flat folded welt seams with 25 mm and 50 mm legs folded and dressed away from the prevailing rains and secured with 50 mm wide x 0.6 mm bitumen coated copper clips, twice brass screwed to plastic or lead inserts set into the stone. Align the welts generally with the stone joints.

Burned seams jointing: Provide joints which have a minimum 50 mm flat lap. Clean, scrape and lead fill without excessive cutting in.

#### Fixing

General: Fix the sheet lead with 50 mm wide x 20 kg/m<sup>2</sup> lead straps twice fixed with brass screws into plastic or lead plugs at 1 m minimum centres, 125 mm back from the face edge. Cut away the 12 mm under soffit lead to allow for clips. Fold clips up the nosing and dress neatly over the leading edge.

Lead fixing plugs: Pour molten lead into prepared holes drilled through the lead sheet at least 25 mm into the stone. Complete the plug by forming a lead burned dot over the hole.

Intermediate fixings: Wiped soldered dot finished flush, or lead burned dot, made with brass screws and washer screwed into the brass insert set into the stone. Set the head of the screw below the surface of the lead and fill without excessive cutting in.

### 3.12 COMPLETION

#### Operation and maintenance manual

Requirement: Provide a manual of maintenance procedures for the care and maintenance of the stonework, including the following:

- Particulars of stone source, type of stone, and jointing materials.
- A program for regular maintenance cycles at not more than five-year intervals.
- Stonework cleaning.
- Desalination.
- Inspection and repair of joints and flashings.
- Inspection of rainwater goods for blockages and breakdown.
- Detection of potential failures arising from movement or other causes.

#### Cleaning

Requirement: Leave the stonework clean on completion.

### 0344 STEEL – HOT-DIP GALVANIZED COATINGS

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide hot-dip galvanized coatings, as documented.

#### Performance

Requirement: Control atmospheric corrosion to structural steelwork or steel products until the first scheduled maintenance.

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.

### 1.3 STANDARDS

#### General

Coating: To AS/NZS 4680.

Coating on fasteners: To AS/NZS 1214.

Durability: To AS/NZS 2312.2.

**Metal finishing**

Coating mass/thickness minimum: To AS/NZS 4680.

Threaded fasteners coating mass/thickness minimum: To AS/NZS 1214.

**1.4 SUBMISSIONS****Execution details**

Holes and lifting lugs: If holes and lifting lugs are required to facilitate handling, filling, venting and draining during galvanizing, submit details on size and location.

Detailing features: If design and fabrication features of the items to be galvanized may lead to dimensional change, distortion or difficulties during galvanizing, identify these and submit details for improvement.

**1.5 INSPECTION****Notice**

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

- Coating appearance and thickness, at the galvanizing plant.

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**2 EXECUTION**

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**2.1 GENERAL****Care**

Embrittlement: Take due care to avoid embrittlement of susceptible steels.

Mechanical properties: Avoid mechanical damage. Make sure that mechanical properties of the base metal do not change.

**Surface preparation**

Surface contaminants and coatings generally: Chemical clean, then acid pickle.

Chemical cleaning: To AS 1627.1.

Acid pickling: To AS 1627.5.

- Inhibitor: Required.

**Coating process**

General: To AS/NZS 4680 Section 6.

Threaded fasteners: To AS/NZS 1214 Section 5.

**Post treatment**

General: Passivate.

**Drilling after completion of hot-dip galvanizing**

Repair: Prime drill hole surfaces to AS/NZS 4680 clause 8 before the surfaces begin to corrode.

**Surface finish**

Standard: To AS/NZS 4680 clause 7.

Coating quality: Continuous and as smooth and evenly distributed as possible. Free of blisters, roughness, sharp points, flux residues and any defects that may affect the end use of the article.

Silicon killed steels: Dull grey is acceptable.

Surplus zinc on fastener threads: Remove.

Friction-type bolted connections: Treat coated contact surfaces to achieve the required design slip factor, without removing excessive coating thickness as follows:

- Contact surface preparation: To *GAA Galvanizing After fabrication hot dip galvanizing* Chapter 4.
- Slip factor test: To AS 4100 Appendix J.

**Coating repair**

Rejection: If uncoated surfaces or areas damaged by handling at the galvanizing plant exceed the limits specified for repair in AS/NZS 4680 clause 8, reject the galvanizing.

Extent and methods: To AS/NZS 4680 clause 8.

**Preparation of galvanized surfaces for paint finishes**

Coarse preparation: Remove spikes, and make sure edges are free from lumps and runs.

Light sweep blasting before painting: Required.

- Maximum zinc removal: 10 microns.

- Abrasive grade (range): 150 to 180 microns.
- Abrasive type: Clean ilmenite or garnet.
- Blasting angle to surface: 45° maximum.
- Blast pressure (maximum): 275 kPa.
- Distance of nozzle from surface (range): 350 to 400 mm.
- Nozzle type: 10 to 13 mm minimum diameter venturi type.

## 2.2 TESTING

### Galvanizing tests

Coating thickness tests: To AS/NZS 4680 clause 9.2 and Appendix G.

## 2.3 SITE WORK

### Site welding

Grinding of edges: Permitted.

Weld areas: Reinstate coating to AS/NZS 4680 clause 8.

### Site coating reinstatement

Rejection: If any item has damaged areas exceeding the limits specified for repair in AS/NZS 4680 clause 8.1, reject the item.

Extent: Areas damaged by transport, site welding, site flame cutting, site handling, or erection.

Method: To AS/NZS 4680 clause 8.

## 0345 STEEL – PROTECTIVE PAINT COATINGS

## 1 GENERAL

### 1.1 RESPONSIBILITIES

#### General

Requirement: Provide protective paint coatings for the protection of steel products and structural steelwork against interior and exterior atmospheric corrosion, as documented.

#### Performance

Requirement: Control atmospheric corrosion to structural steelwork and steel products until the first scheduled maintenance.

Period from application to first scheduled maintenance: [complete/delete]

### 1.2 CROSS REFERENCES

#### General

Requirement: Conform to the following:

- 0171 General requirements.

### 1.3 STANDARDS

#### General

Surface preparation and coating: To AS/NZS 5131 Section 9 and the recommendations of AS 2312.1.

### 1.4 INTERPRETATION

#### Abbreviations

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

- DFT: Dry Film Thickness.
- ITP: Inspection and Test Plan.
- MIO: Micaceous Iron Oxide.
- PDS: Product Data Sheet.
- SDS: Safety Data Sheet.

#### Definitions

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Coating contractor: The protective coatings application contractor conducting the on- or off-site coating application works.
- Coating manufacturer: The supplier and/or manufacturer of the protective coating materials used.
- Inspection and test plans (ITP): A series of formal inspection and test plans, prepared by the coating contractor to reflect the specific inspection and testing that will be carried out on the surface preparation, coating application and the record keeping tasks to be undertaken.

## 1.5 SUBMISSIONS

### Execution details

Detailing features: If design and fabrication features of the items to be coated may lead to difficulties, identify these and submit details for improvement.

Repair of damaged coating: If the protective coating is damaged, submit a coating repair proposal, based on the coating manufacturer's recommendations for reinstating the corrosion protection function of the system.

Reinstatement: If final coat varies from the submitted sample, submit proposals for reinstatement of the visible final coating system.

### Maintenance painting

Existing steelwork: Identify, itemise and submit details of areas of corrosion, damage and other degradation.

Recoating systems: Submit details of coating systems for maintenance painting of previously coated items and structural elements, including surface preparation.

### Products and materials

Multi-component coatings: If partial mixing of packs is proposed, submit details.

### Quality

ITPs: Submit for each proposed coating system.

Quality supervisor: Submit the name and record of experience of the person responsible for the implementation of the ITPs.

### Records

General: Prepare and maintain records of all surface preparation and coating application works, as follows:

- Standards: To AS 3894.10, AS 3894.11, AS 3894.12, AS 3894.13 and AS 3894.14.
- Reference the relevant parts of the ITP and record conformance.

### Samples

Painting and coating colour: Submit a 400 x 400 mm sample of the finished product for each coating system.

Retention: Retain samples for comparison during application.

### Subcontractors

General: Submit names and contact details of proposed suppliers and applicators.

Requirement: Submit proof of currency of the applicator's environmental operating licence.

Substrate acceptance: Submit evidence of applicator's acceptance of the coating substrate before starting installation.

### Warranties

General: Submit details of the proposed warranty terms, form and period.

## 1.6 INSPECTION

### Notice

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

- Items after fabrication, before commencing surface cleaning and preparation.
- Surfaces after preparation, before application of first coating.
- Coating stages:
  - . After application of primer or seal coats.
  - . After application of each subsequent coat.
- Repair of coating damage: Exposure of corrosion pitting or significant metal loss by blasting process.

## 2 PRODUCTS

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### 2.1 GENERAL

#### Storage and handling

Requirement: Handle, store, mix and apply all protective coatings in conformance with the manufacturer's recommendations.

Original containers: Deliver coating products to site in manufacturer's labelled and sealed containers.

Ambient temperature range for storage: 3°C to 30°C, or to manufacturer's recommendations.

Sunlight: Protect coating materials from direct sunlight before mixing or adding the converter (catalyst).

Use-by-date: Use products with limited shelf life before their use-by-date, unless written authorisation from the coating manufacturer's technical services section is provided.

#### Paint material

Requirement: To AS/NZS 5131 clause 9.9.3.

#### Proprietary products

Requirement: Provide all products from the one manufacturer's supply.

Product data sheets (PDS): Keep on site copies of all relevant manufacturer's PDS.

Safety data sheets (SDS): Keep on site copies of all relevant manufacturer's SDS.

Recording: To AS/NZS 5131 clause 9.9.5.

## 3 EXECUTION

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### 3.1 GENERAL

#### Product warnings

Requirement: Conform to the SDS.

#### Surroundings

Protection: Prevent the release of abrasives, overspray or paint waste debris into the air, ground or to any watercourse. Prevent damage to other assets, services or equipment.

Reinstatement: Repair and/or clean affected surrounding areas.

#### Working area

General: Perform all painting under cover and/or protected from rain, condensation, dew, excessive wind, overspray or wind-blown dust.

Period: Continue protection where any of these conditions exist until the coating is no longer affected.

### 3.2 SURFACE PREPARATION

#### General

Requirement: Conform to AS/NZS 5131 clauses 9.3, 9.4 and 9.5.

#### Galvanized, aluminium and zinc primed surfaces

Requirement: Remove grease, oil and other solvent-soluble contaminants to AS 1627.1. Allow to dry and immediately proceed with the next operation.

Galvanized and aluminium surfaces: Abrade surfaces to a medium coarse type finish to provide an adhesion key.

Zinc primed surfaces: If present, remove zinc salts from zinc primers.

#### Treatment of welds

Requirement: Clean welds to remove roughness, using power tools to AS 1627.2. Remove filings by vacuuming or compressed air.

Temporary welds: Grind flush any temporary welds.

Porous, skip or stitch welds: Not permitted.

Site welding: If possible, avoid site welding. If on site welding is required, prepare and treat the weld to AS/NZS 5131 clause 9.12.2.

#### Shop priming

Requirement: Dust off and apply a coat of primer in conformance with the manufacturer's recommendations.

**Site coating**

General: High pressure wash down all surfaces with clean water. Lightly sand down primer/intermediate coats, which have been shop applied, before site application of next coat.

**3.3 PREPARATION ASSESSMENT****General**

Conformance: Assess all surfaces of each steel member for conformance with the documented preparation requirements.

**Abrasive blast cleaning**

Assessment: To AS 1627.4 and AS 1627.9.

**Chloride level testing**

Test: To AS 3894.6 Method A.

Maximum allowable chloride levels: 50 mg/m<sup>2</sup> for critical applications (heavy condensation, fresh water ponding or immersion) or to manufacturer's recommendations.

Conformance: If the maximum allowable chloride is exceeded, rewash the affected surface area until the chloride level is within the acceptable limits using clean water or chloride neutralising solutions. Jet-washing or steam cleaning is also acceptable before re-testing and re-abrasive blasting.

Timing of testing: Early in the blasting work so that removal procedures can be started before the blasting is completed.

**3.4 MIXING****General**

Requirement: To AS/NZS 5131 clause 9.9.6.

Powered agitators: Mix package sizes larger than 4 litres using powered agitators driven by air motors.

Multi-component coatings: Combine as whole pack units before application.

Thinners: If addition of thinners is proposed, conform to the coating manufacturer's recommendations for the documented product.

Colour consistency: If colour consistency is required, pre-mix tinted products, before the addition of the curing agent or converter and before coating application.

**3.5 COATING APPLICATION****General**

Requirement: Conform to AS/NZS 5131 clause 9.9 and the PDS.

Painting and coating colour: Verify all project finish colours with the retained samples.

**Final surface preparation or coating application**

Limits: If the environmental/climatic/substrate conditions listed in AS/NZS 5131 clause 9.9.10 and the following are present do not apply coating:

- Ambient air temperature below 5°C or above 40°C.
- Substrate temperature below 5°C or above 35°C.
- Full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.
- Surface preparation standard has not been achieved.
- Time between final surface preparation and the commencement of coating has exceeded 4 hours.
- Visual tarnishing or black spots develop on the surface of the steel.

Exception: Preliminary blast or other surface preparations may be performed in conditions that are outside the limits, providing the final surface preparation and all coating applications are undertaken under the limit conditions.

Pre-coating: Before the spray application of each coating, stripe coat by brush method all edges, welds, seams, rivets, bolts, boltholes (including slots) and difficult to spray areas. Prime the underlying surfaces of replacement bolting, washers and nuts before installation.

Procedure: Conform to the coating order shown in **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS**.

Subsequent coats: Before applying any subsequent coating layer, make sure the surface condition of the preceding coat conforms to **SELECTIONS, PROTECTIVE PAINT COATING SYSTEMS** and is clean and free from defects.

**Wet film thickness (WFT)**

Method of measurement: To AS 3894.3 Appendix C using an approved wet film gauge continuously during application.

**Dry film thickness (DFT)**

Method of measurement: To AS 3894.3 clause 10.

Extent: Measure all surfaces at the completion of each prime, intermediate and finish coats, including areas of the element difficult to paint, masked by structure, or where double or light coating is likely.

Number of measurements: To AS 3894.3 clause 7.

Coatings with DFT 150 µm or less: If testing, deduct the effect of the measured surface profile from all DFT readings.

Single readings: Conform to the following:

- The average of 5 point readings for each 10 m<sup>2</sup> area of coating surface to be within the documented coating thickness range.
- No single point reading in any 10 m<sup>2</sup> to be less than 80% of the specified minimum coating thickness. If the average of three readings is used to produce a point reading, an individual reading may be less than 80% of the minimum coating thickness.
- Check any single reading that is greater than 150% of the documented maximum DFT with three additional readings within 50 mm of the original reading. If the average of these three readings is not greater than 150% of the specified DFT, take the average reading as the point reading. If greater than 150%, reject the DFT for that area. If no maximum limit for DFT is documented, consult manufacturer.

**Rectification and defects**

Rectification: Re-work areas rejected, using the same surface preparation, coatings and sequence as for the original work.

Defects (including under-thickness and over-thickness): Mark with dustless chalk, adhesive inspection labels or masking tape. Do not use crayon, paint or spirit based ink pens.

**3.6 PROTECTION****Contamination**

Surfaces: Prevent contamination of coated surface, which are not yet dry, from blasting dust, abrasive or surface preparation debris and any other foreign matter.

**Post application care**

General: Protect the coating against physical, chemical, or atmospheric damage until all components are fully cured.

Care: Stack and handle all coated items using fabric slings or padded chains. Use soft packaging, carpet strips or other deformable materials between all coated items.

Water ponding: Stack coated items to prevent water ponding.

**3.7 COATING REPAIR****Repair of coating damage**

Preparation: Feather back by hand or machine sanding all leading edges of intact coating adjacent to the repair, to remove any sharp edge.

Surface contamination: Remove by dusting or blowing down before applying the first coat of paint.

Sequence: Apply the repair coating in the same sequence and manner as the original coating.

Areas damaged without exposing the primer: Wash with a proprietary detergent solution, rinse with clean water and abrade so that edges of sound paint are feathered. Coat the area with the appropriate intermediate and finishing coat materials.

Areas damaged exposing the primer or steel surface: Blast clean to the original standard. Prepare at least 50 mm into the sound coating and to a further feathering zone of approximately 50 mm. Recoat with the documented system to restore the film thickness and integrity over the whole prepared surface including the feathered zone.

Aesthetic reinstatement: If required, repaint to a physical or discernible boundary line.

Defects: If corrosion pitting or areas of significant metal loss and defects are exposed by the blasting process, advise for inspection and have areas passed as being fit for service before proceeding with the coating system.

Timing: Apply the protective coating system within 4 hours of blast cleaning or in any case before visual tarnishing of the steel occurs.

### 3.8 COMPLETION

#### General

Joints: On completion, seal all joints and mating surfaces with a compatible polyurethane sealant.

#### Warranties

Requirement: Cover materials and workmanship in the terms of the warranty in the form of interlocking warranties from the supplier and the applicator.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Period: As offered by the supplier.

## 0382 LIGHT TIMBER FRAMING

### 1 GENERAL

#### 1.1 RESPONSIBILITIES

##### General

Requirement: Provide light timber floor, wall and roof framing, as documented.

#### 1.2 CROSS REFERENCES

##### General

Requirement: Conform to the following:

- 0171 *General requirements.*
- 0181 *Adhesives, sealants and fasteners.*
- 0185 *Timber products, finishes and treatment.*

#### 1.3 STANDARDS

##### General

Framing: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

Design: To AS 1720.1.

#### 1.4 INTERPRETATION

##### Definitions

General: For the purposes of this worksection the definitions given in the AS 1684 series apply.

#### 1.5 TOLERANCES

##### Floors

Maximum deviation from a 3 m straightedge laid in any direction on the floor framing: 5 mm.

##### Wall tolerances table

| Property                                                                                                                                                                                             | Permitted deviation |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Generally: Verticality in 2 m                                                                                                                                                                        | 1:500               |
| Generally: Flatness <sup>1</sup> in 2 m                                                                                                                                                              | 3 mm                |
| Features <sup>2</sup> : Verticality in 2 m                                                                                                                                                           | 1:1000              |
| Features <sup>2</sup> : Horizontality in 2 m                                                                                                                                                         | 1:1000              |
| 1. Flatness: Measured under a straightedge laid in any direction on a surface.<br>2. Features: Conspicuous horizontal or vertical lines including external corners, parapets, reveals, heads, sills. |                     |

#### 1.6 SUBMISSIONS

##### Certification

Requirement: Submit certification by a professional engineer of the design, documentation and erected work to AS 1684 and AS 1720.1. Include the following:



- Reactions: Provide location and magnitude of reactions to be accommodated by the support structure.
- Floor, wall and roof frame member sizes: A schedule of proposed member sizes, certified as meeting stated project requirements for spans, spacings, loadings and deflections.
- Species and stress grade.

**Products and materials**

Supply: Submit supplier's evidence of conformity (which may be included on an invoice or delivery docket) verifying that the timber conforms to the documented requirements.

Inspection: Submit the inspection authority's evidence of conformity verifying that the erected timber frame conforms to the documented requirements.

Moisture content: Submit records of moisture content.

CCA treated timber: If proposed to be used, submit details.

**Shop drawings**

General: Submit shop drawings, to a scale that best describes the detail, certified by a professional engineer stating that the design has been carried out to the requirements of the AS 1684 series and AS 1720.1, for the documented configurations and loadings.

Prefabricated roof trusses: Include the following:

- Marking plans.
- Truss plan layout.
- Elevations, with the arrangement of members allowing for the accommodation of in-roof services and the size and section type of each member.
- Camber of all elements.
- The method of assembly, connection, lifting, holding down and bracing.

Prefabricated wall frames: Include the following:

- Wall plan, showing all wall layouts.
- Elevations showing the arrangement of members, and the size and section type of each member.
- The method of assembly, connection, lifting, holding down and bracing.

**Subcontractors**

Prefabricated items: Submit the name and contact details of proposed manufacturers, suppliers and installers.

## 1.7 INSPECTION

**Notice**

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

- Prefabricated units before installation.
- Fabricated items before priming or water-repellent treatment.
- Bolts after final tightening.
- Timber work after erection but before it is covered.

## 2 PRODUCTS

### 2.1 GENERAL

**Storage and handling**

General: Do not distort or damage timber or timber products.

Moisture content: Maintain the equilibrium moisture content of seasoned timber.

**Marking**

Branding: Brand structural timber, under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment* as applicable to the product. Locate the brand mark on faces or edges which will be concealed in the works. Include the following data for timbers not covered by branding provisions in Australian Standards or regulations for which branding is required:

- Stress grade.
- Method of grading.
- If seasoned, the word, SEASONED or DRY, or an abbreviation of seasoned, such as SEAS or S.

- The certification mark of the product certification scheme.
- The applicable standard.

Trusses: Permanently mark each truss to show:

- Project identification.
- Manufacturer.
- Tag or number.
- Location.
- Support points.

## 2.2 TIMBER

### Certification

Requirement: Certification, chain of custody and product labelling to *0185 Timber products, finishes and treatment*.

### Fascias and barge boards

Hardwood: To AS 2796.1.

Seasoned cypress pine: To AS 1810.

Softwood: To AS 4785.1.

### Preservative treatment

Requirement: To *0185 Timber products, finishes and treatment*, including for termite treatments.

### Trusses

Design: To AS 1720.1.

Nailplated roof trusses: To AS 1720.5.

Camber: Camber bottom chord upward.

Overhangs: Free from spring or splits.

## 2.3 LAMINATED VENEER LUMBER AND GLUED LAMINATED TIMBER

### Laminated veneer lumber

Standard: To AS/NZS 4357.0.

### Glued laminated timber

Standard: To AS/NZS 1328.1.

## 2.4 STRUCTURAL PLYWOOD

### General

Standard: To AS/NZS 2269.0.

Bond: Type A to AS/NZS 2754.1.

### Bracing

#### Veneer

Veneer quality to visible surfaces: CD (minimum) to AS/NZS 2269.0.

## 2.5 COMPONENTS

### Nailplated joined beams

Standard: To AS 4446.

Type: Engineered beam made from stress-graded timber pieces joined together with nailplates.

### Mild steel post bases

Embedment: Embed base a minimum of 150 mm into the concrete support.

Location: To timber posts supported off concrete slabs or footings.

Finish: Galvanize after fabrication.

### Fasteners

Requirement: Conform to *0181 Adhesives, sealants and fasteners*.

Installation: Do not split or otherwise damage the timber.

Coating: Before placing bolts in contact with CCA treated timber, coat the shank of the bolt in a grease or bituminous coating.

### Damp-proof course

Material: To AS/NZS 2904.

**Flashings**

Material: To AS/NZS 2904.

**2.6 FINGER JOINTED STRUCTURAL TIMBER****General**

Performance: To AS/NZS 8008 (Int).

Production: To AS 5068.

**2.7 RECONSTITUTED STRUCTURAL TIMBER PRODUCTS****Wet process fibreboard (including hardboard)**

Standard: To AS/NZS 1859.4.

**3 EXECUTION****3.1 FLOOR FRAMING****Bearers and joists**

Levelling: Level bearers and joists by checking or by packing for the full width of the member with dense corrosion resistant material which is secured in place.

Maximum thickness of packing: 3 mm.

Spring: Lay bearers and joists to allow for straightening under loading.

**Joints**

Requirement: Locate joints only over supports:

- Minimum bearing of bearers: 50 mm.
- Minimum bearing of joists: 30 mm.

**Fixing and restraint**

Fixing: Secure bearers and joists to supports to provide restraint against lateral movement.

Deep joists: To AS 1684.2 clause 4.2.2.3 or AS 1684.3 clause 4.2.2.3 as appropriate.

Herringbone strutting dimensions: Minimum 38 x 38 mm.

Trimmers or blocking dimensions:

- Depth: Joist depth less 25 mm.
- Minimum thickness: 25 mm.

Engineered timber joists 200 mm deep or greater: Provide lateral restraint using blocking or seasoned rim board.

**Decks and balconies**

Attachment to external walls: To BCA 3.10.6.

**3.2 WALL FRAMING****Additional support**

Requirement: Provide additional support in the form of noggings, trimmers and studs for fixing lining, cladding, hardware, accessories, fixtures and fittings, as required.

Spacing of noggings: Maximum 1350 mm centres.

**Vermin barriers**

Requirement: Provide vermin barriers as follows:

- Brick veneer barrier: Close nail 10 mm galvanized steel wire mesh to the underside of the bottom plate of external stud walls, extending across the cavity for building into brickwork.

**Damp-proof course**

Requirement: Provide damp-proof courses under the bottom plate of stud walls built off slabs or masonry dwarf walls, as documented and as follows:

- External walls (not masonry veneer): Turn up at least 75 mm on the inside and tack. Project 10 mm beyond the external slab edge or dwarf wall and turn down at 45°.
- Walls of bathrooms, shower rooms and laundries: Turn up at least 150 mm on the wet side and tack to studs.

Installation: Lay in long lengths. Lap full width at angles and intersections and at least 150 mm at joints.

Junctions: Preserve continuity at junctions of damp-proof courses, sarkings and waterproof membranes.

**Flashings**

Location: Provide flashings to external openings to prevent the entry of moisture. Form trays at the ends of sill flashings.

Masonry veneer construction: Extend flashing across cavities and build into brickwork.

**3.3 ROOF AND CEILING FRAMING****Wall plates**

Fixing: Fix timber wall plates to masonry, with straps, bolts or both.

**Fixing plates**

Requirement: Provide 45 mm minimum thick timber fixing plates to transfer the design loads where timber joists, rafters or purlins bear on or into steel members. Bolt to the steel member at maximum 500 mm centres and at a maximum of 100 mm from the end of the fixing plate.

**Beam framing**

Ridge straps: Butt ends of rafters together at ridge, and strap each pair together with 900 mm long steel strap passing over the ridge, triple nail to each rafter.

**Additional support**

Requirement: Provide a frame member behind every joint in fibre cement sheeting or lining.

Water tank or heater in roof space: Provide a support platform to AS/NZS 3500.4 clause 5.5.1.

**Anti-ponding boards**

Standard: To AS 4200.2.

**Trusses**

Nailplated prefabricated roof trusses: To AS 4440.

Support: Support trusses on bottom chord at two points only, unless designed for additional support.

Plumb: The lesser of  $H/50$  or 50 mm, where H is the height of the truss at point where plumb is being measured.

Vertical movement: Provide minimum vertical clearance of 10 mm plus ceiling batten depth over internal non-load bearing walls. Use bracing methods which allow for the design vertical movements.

**3.4 ROOF TRIM****Fascia, valley and barge boards**

Requirement: Fix fascia, valley gutter boards and barge boards.

**3.5 COMPLETION****Protection**

Protection from weather: Provide temporary protection for members until permanent covering is in place.

**Tightening**

Requirement: Retighten bolts, screws and other fixings so that all joints and anchorages are secure at the date of practical completion.

**Cleaning**

General: On completion of framing remove debris from any gaps between members and make sure void between bottom chord of roof trusses and top of any non-supporting internal wall is clear.

**0383 SHEET FLOORING AND DECKING****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide sheet flooring and decking, as documented.

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

Requirement: Conform to the following:

LS002\_O2LA STANDARD LANDSCAPE SPECIFICATION COMBINED HARDWORKS AND SOFTWARES.docx

- 0171 General requirements.

### 1.3 STANDARD

#### General

Flooring and decking: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

#### Slip resistance

Classification: To AS 4586.

### 1.4 INTERPRETATION

#### Definitions

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

- Butt joints (flooring): Floor units cross cut square with plain ends for joining over supports.
- Decking: Intermittently-supported external flooring with drainage gaps between boards.
- Flooring - fitted: Flooring fitted between the walls of each room i.e. not platform floors.
- Flooring - intermittently-supported: Flooring which is supported by, and spans across joists or battens.
- Platform flooring: Flooring laid over the whole of the joisted floor structure prior to the erection of external and internal wall frames.
- Subfloor: The structure that supports the flooring.

### 1.5 TOLERANCES

#### Sheet flooring

Maximum deviation from a 3 m straightedge laid in any direction on the floor surface: 3 mm.

### 1.6 SUBMISSIONS

#### Certification

Requirement: Submit evidence of conformity to documented requirements for grading, species and board size. Evidence may be in any of the following forms:

- Supplier's certificate which may be included on an invoice, delivery docket or packet label.
- Report by an independent inspecting authority.

Moisture content: Submit documentation noting moisture content of timber products.

#### Operation and maintenance manuals

General: Submit a manual describing care and maintenance of the decking, including manufacturer's published instructions.

#### Products and materials

Type tests: Submit results, as follows:

- Slip resistance of decking.

#### Samples

General: Submit samples of each timber or synthetic decking type illustrating the range of variation in colour and figure.

#### Subcontractors

General: Submit names and contact details of proposed suppliers and installers.

#### Tests

Site tests: Submit results, as follows:

- Slip resistance of completed installation.

### 1.7 INSPECTION

#### Notice

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

- Subfloor before laying sheet flooring, fibre cement flooring or decking.

## 2 PRODUCTS

### 2.1 GENERAL

#### Storage

Timber decking: Deliver to site and store on dry ground on level bearers 150 mm high, block stacked, banded and protected against the weather.

Plywood and particleboard sheet flooring: Deliver to site and store on dry ground on level bearers 150 mm high, stacked on flat and protected against the weather.

### 2.2 DECKING

#### Recycled timber decking

Standard: To FWPA PN06.1039.

#### New timber decking

Standard:

- Treated softwood to AS 4785.1 Section 4.
  - . Grade to AS 4785.2: To the **Timber decking schedule**.
- Hardwood to AS 2796.1 Section 4.
  - . Grade to AS 2796.2: To the **Timber decking schedule**.

Durability:

- Natural durability classification to AS 5604: Class 2 minimum.
- Preservative treatment to AS 1604.1 Table D1: H3 minimum.
- Identification: Brand preservative treated decking timber to AS 1604.1.

Arrises: Chamfered or round.

#### Composite decking

Grading: as per selections

#### Compressed fibre cement decking

Standard: To AS/NZS 2908.2.

Category: Minimum 4.

Classification: Type A.

### 2.3 SHEET FLOORING

#### Plywood

Standard: To AS/NZS 2269.0.

Plywood formaldehyde emission class to AS/NZS 2269.0: Class E<sub>1</sub>.

Stress grade: as per selections

Surface grade: CD.

Bond: Type A to AS/NZS 2754.1.

Durability:

- Preservative treatment to AS 1604.1 Table D1:
  - . Indoors above ground: H2 minimum.
  - . Outdoors above ground: H3 minimum.
- Identification: Brand preservative treated decking timber to AS 1604.1.

#### Particleboard

Particleboard flooring: To AS/NZS 1860.1, Class 1.

Particleboard formaldehyde emission Class to AS/NZS 1860.1: Class E<sub>1</sub>.

#### Product certification scheme

Identification: Identify timber products using branding or certification.

- Branding: Brand plywood and particleboard under the authority of a recognised product certification scheme to *0185 Timber products, finishes and treatment*, as applicable to the product. Locate the brand mark on faces or edges which will be concealed.
- Certification: Provide certification from a recognised product certification scheme to *0185 Timber products, finishes and treatment* as appropriate to the product.

**Compressed fibre cement sheeting**

Standard: To AS/NZS 2908.2.

Category: Minimum 4.

Classification: Type: A.

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**3 EXECUTION**

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**3.1 PREPARATION****Subfloors**

General: Make sure support members are in full lengths without splicing.

Flatness: Less than 3 mm deviation of the substrate under a 3 m straightedge laid in any direction with no abrupt variations greater than 1 mm over 250 mm.

**Timber decking on steel joists**

General: Screw fix seasoned battens to the steel joists so that their top surfaces are aligned.

- Batten size: Minimum 35 mm thick.
- Spacing of fasteners: Less than 600 mm.

**3.2 FIXING SHEET FLOORING****Particleboard flooring**

Installation: To AS 1860.2.

**Plywood flooring**

Installation: To AS 1684.2, AS 1684.3 or AS 1684.4, as appropriate.

**Compressed fibre cement flooring**

Installation: Lay the length of the sheets at right angles to the joists. Stagger the end joints and locate centrally over joists. Apply adhesive to edges of sheets and firmly butt join together.

Minimum number of spans across support: 2.

Fixing: Pre-drill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion resistant countersunk screws.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Wet area flooring: Stop screw heads with sealant.

**3.3 FIXING DECKING****Timber decking**

Standard: To AS 1684.2, AS 1684.3 or AS 1684.4 as appropriate.

Installation: Lay in long lengths with the ends of each board firmly butted to the next and firmly in contact with the joists. Stagger the end joints and locate them centrally over joists.

Gap between edges of seasoned boards: Minimum 4 mm.

Minimum number of spans across supports: 3.

Nailing:

- General: Make sure the boards are in contact with the joists at the time of nailing, particularly where boards are machine nailed. If nails are to be less than 10 mm from ends of boards, pre-drill nail holes 0 to 1 mm undersize.
- Top nailing: Double nail at each bearing with hot dip galvanized or stainless steel nails driven flush. Offset nails at intermediate fixings or skew nail 10° in opposite directions.

Sealing: Apply 1 coat of water repellent preservative and 1 coat of finish coat to top surface of joists and all surfaces of boards before fixing.

**Compressed fibre cement decking**

Installation: Lay the length of the sheets parallel or at right angles to the joists. Locate end joints centrally over joists. Provide noggings or trimmers joists, cut between and fixed to joists to support the edges of sheets.

Minimum number of spans across support: 2.

Fixing: Pre-drill screw holes with 1 mm clearance over screw diameter and countersink. Fix with corrosion resistant countersunk screws. Apply sealant to screw hole and screw before fixing and stop screw head with sealant, finished slightly below the surface after fixing.

Spacing of fasteners:

- Sheet edge and intermediate: Less than 450 mm.
- Corners and sheet edges: At least 12 mm from sheet edges and 50 mm from corners.

Joints: Provide butt joints 5 mm wide. Insert compressible closed cell polyethylene foam backing rod and fill the joint with a flexible sealant.

#### **Composite decking**

Installation: In conformance with manufacturer's recommendations.

### **3.4 TESTING**

#### **Completion tests**

Slip resistance of completed installation: To AS 4663.



## 0671 PAINTING

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

Requirement: Provide coating systems to substrates, as documented.

**Performance**

Requirement:

- Consistent in colour, gloss level, texture and dry film thickness.
- Free of runs, sags, blisters, or other discontinuities.
- Paint systems which are fully opaque or at the documented level of opacity.
- Clear finishes at the level of transparency consistent with the product.
- Fully adhered.
- Resistant to environmental degradation within the manufacturer's stated life span.

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

Requirement: Conform to the following:

- 0171 *General requirements*.

**1.3 STANDARDS****Painting**

General: To the recommendations of those parts of AS/NZS 2311 referenced in this worksection.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS/NZS 2310 and the following apply:

- Gloss: The optical property of a surface, characterised by its ability to reflect light specularly.
- Gloss unit: Numerical value for the amount of specular reflection relative to that of a standard surface under the same geometric conditions.
- Levels of gloss finish: When the specular direction is 60 degrees, surfaces with the following specular gloss reading is defined as follows:
  - . Full gloss: Over 85 gloss units.
  - . Gloss: Over 50 and up to 85 gloss units.
  - . Semi-gloss (satin): Over 20 and up to 50 gloss units.
  - . Low gloss (low sheen): Over 5 and up to 20 gloss units.
  - . Flat finish (matt): Up to 5 gloss units.
- Opacity: The ability of a paint or textured and membrane coating to obliterate the colour difference of a substrate.
- Paint or coating system: A product in liquid form, which when applied to a surface, forms a dry film having protective, decorative or other specific technical properties.
- Primer, prime coat: The first coat of a painting system that helps bind subsequent coats to the substrate and which may inhibit its deterioration.
- Sealer: A product used to seal substrates to prevent the following:
  - . Materials from bleeding through to the surface.
  - . Reaction of the substrate with incompatible top coats.
  - . Undue absorption of the following coat into the substrate.
- Substrate: The surface to which a material or product is applied.
- Undercoat: An intermediate coat formulated to prepare a primed surface or other prepared surface for the finishing coat.

## 1.5 SUBMISSIONS

### Products and materials

General: Submit the following at least 3 weeks before the paint is required:

- Paint brand name and product range quality statement.
- Safety data sheets (SDS) showing the health and safety precautions to be taken during application.
- The published recommendations for maintenance.

### Samples

Clear finish coatings: Submit labelled samples of timber or timber veneer matching those to be used in the works as follows:

- Label for identification and prepare, putty, stain, seal and coat, as documented.
- Size: Minimum 500 x 500 mm.

Opaque coatings: Submit labelled samples of each coating system, on representative substrates, showing surface preparation, colour, gloss level, texture, and physical properties.

### Coated samples schedule

| Substrate | Paint system | Colour | Sample size |
|-----------|--------------|--------|-------------|
|           |              |        |             |
|           |              |        |             |
|           |              |        |             |

### Wet samples

General: Submit two clearly labelled, 500 mL samples of each type of coating required to be tested.

### Wet samples schedule

| Coating type | Colour |
|--------------|--------|
|              |        |
|              |        |
|              |        |

### Subcontractors

Specialist applicators: Submit name and contact details of proposed specialist applicators.

### Warranties

General: Submit the coating manufacturer's

## 1.6 INSPECTION

### Notice

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

- Opaque finishing stages:
  - . Completion of surface preparation.
  - . After application of final coat.
- Clear finishing stages:
  - . Before surface preparation of timber.
  - . Completion of surface preparation.
  - . After application of final coat.

## 2 PRODUCTS

### 2.1 GENERAL

#### Storage and handling

General: Store materials not in use in tightly covered containers in well-ventilated areas with temperatures maintained at the manufacturer's recommendations.

Delivery: Deliver paints to the site in the manufacturer's labelled and unopened containers.

## 2.2 PAINTING MATERIALS

### Standards

Paint types: To AS/NZS 2311 Table 4.2 and the following:

- Metal primer - general purpose for iron and steel: To AS/NZS 3750.19.
- Metal primer - latex for metallic zinc surfaces: To AS 3730.15.
- Metal primer - solvent borne for ferrous metallic surfaces: To AS 3730.21.
- Metal primer - zinc-rich organic for iron and steel: To AS/NZS 3750.9.

### Combinations

General: Do not combine products from different manufacturers in a paint system.

Clear timber finish systems: Provide only the combinations of putty, stain and sealer recommended by the manufacturer of the topcoat.

### Putty and fillers

Material: To the recommendations of the paint system manufacturer, suitable for the substrate and compatible with the primer.

### Tinting

General: Provide only products which are colour tinted by the manufacturer or supplier.

### Toxic ingredients

General: To the *Poisons Standard (SUSMP)* Part 2 Section 7.

## 3 EXECUTION

### 3.1 PREPARATION

#### Order of work

Other trades: Before painting, complete the work of other trades as far as practicable within the area to be painted, except for the installation of fittings, floor sanding and laying flooring materials.

Clear finishes: Complete clear timber finishes before commencing opaque paint finishes in the same area.

#### Protection

General: Before painting, clean the area and protect it from dust contamination. Use drop sheets and masking agents to protect surfaces, including finished surfaces and adjacent finishes, during painting.

Fixtures and furniture: Remove door furniture, switch plates, light fittings and other fixtures before painting, and conform to the following:

- Labelling and storage: Attach labels or mark fixtures using a non-permanent method, identifying location and refixing instructions, if required. Store and protect against damage.

Difficult to remove fixtures: Where removal is impractical or difficult, apply surface protection before substrate preparation and painting.

#### Substrate preparation – generally

General: Prepare substrates to receive the documented paint system.

Cleaning: Clean down the substrate surface. Do not cause damage to the substrate or the surroundings.

Filling: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth:

- Clear finish: Provide filler tinted to match the substrate.

Clear timber finish systems: Prepare the surface so that its attributes will show through the clear finish without blemishes, using methods including the following:

- Removal of bruises.
- Removal of discolourations, including staining by oil, grease and nailheads.
- Bleaching where necessary to match the timber colour sample.
- Puttying.
- Fine sanding, with the last abrasive no coarser than 220 grit, so that there are no scratches across the grain.

Treated surfaces: If surfaces have been treated with preservatives or fire retardants, make sure the paint system is compatible with the treatment and does not adversely affect its performance.

**Unpainted surfaces**

Standard: To AS/NZS 2311 Section 3.

**Previously painted surfaces**

Preparation of a substrate in good condition: To AS/NZS 2311 clause 7.4.

Preparation of a substrate in poor condition: To AS/NZS 2311 clause 7.5.

Preparation of steel substrates with protective coatings: To AS 2312.1 Section 8 and AS 1627.1.

PVC-U: Clean with methylated spirit and a nylon scouring pad.

Wallcovering: Remove wallcovering and residual paste with clean water. Patch and repair substrate to a uniform surface before painting.

Lime wash paints: Remove by brushing with warm water.

Reconditioned damaged surfaces in galvanized steel: To AS/NZS 4680 clause 8.

**Cleaning external surfaces**

Sound external surfaces other than timber: Remove dirt, grease, loose and foreign matter, efflorescence and mould by water blasting or steam cleaning without damaging the surface. Remove remaining loose material with hand tools. Use sanding blocks to preserve the arrises of masonry and stone details.

Efflorescence: Eliminate the source of salt and water before cleaning. Allow surface to dry for 15 to 30 days before repainting.

New masonry: Allow 30 days for the masonry to cure and pH level to stabilise before painting.

**Particular preparation requirements schedule**

| Substrate | Preparation method | Applicable standard |
|-----------|--------------------|---------------------|
|           |                    |                     |
|           |                    |                     |
|           |                    |                     |

**3.2 PAINTING SYSTEMS****General**

Number of coats: Except where one or two coat systems are documented, each paint system consists of at least 3 coats.

**Low VOC emitting paints**

General: Provide the VOC limits as documented.

**New unpainted interior surfaces**

Standard: To AS/NZS 2311 Table 5.1.

**New unpainted exterior surfaces**

Standard: To AS/NZS 2311 Table 5.2.

**Previously painted surfaces**

Interior surfaces: To AS/NZS 2311 Table 8.2.

Exterior surfaces: To AS/NZS 2311 Table 8.3.

**Specialised painting systems**

Standard: To AS/NZS 2311 clause 5.2. Provide the following final coats:

- High build textured or membrane finishes for concrete and masonry: Paint reference number B38 using products conforming to the AS 4548 series.
- Two-pack gloss pigmented polyurethane: Paint reference number B44.
- Two-pack epoxy: Paint reference number B29.
- Two-pack water based epoxy: Paint reference number B29A.

**3.3 APPLICATION****Light levels**

General:  $\geq 400$  lux.

**Substrate moisture content**

Requirement: Use a moisture meter to demonstrate that the moisture content of the substrate is at or below the recommended maximum level for the type of paint and the substrate material.

**Paint application**

Standard: To AS/NZS 2311 Section 6.

Timing: Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Apply subsequent coats after the manufacturer's recommended drying period has elapsed.

**Painting conditions**

General: Unless the paint is recommended for such conditions, do not paint under the following conditions:

- Dusty conditions.
- Relative humidity: > 85%.
- Surface temperature: < 10°C or > 35°C.

**Priming timber before fixing**

General: Apply one coat of wood primer, and 2 coats to end grain, to the back of the following before fixing in position:

- External fascia boards.
- Timber door and window frames.
- Bottoms of external doors.
- Associated trims and glazing beads.
- Timber board cladding.

**Spraying**

General: If the paint application is by spraying, use conventional or airless equipment which conforms to the following:

- Satisfactorily atomises paint being applied.
- Does not require paint to be thinned beyond the maximum amount recommended by the manufacturer.
- Does not introduce oil, water or other contaminants into the applied paint.

Paint with known health hazards: Provide personal protection, masking, ventilating and screening facilities to AS/NZS 4114.

**Sanding**

Clear finishes: Sand the sealer using abrasives no coarser than 320 grit without cutting through the colour. Take special care with round surfaces and edges.

**Repair**

Requirement: Clean off marks, paint spots and stains progressively and restore damaged surfaces to their original condition.

Maintenance painting: To AS/NZS 2311 Section 8.

**Repair of galvanizing**

Cleaning: For galvanized surfaces which have been subsequently welded, power tool grind to remove all surface contaminants, including rust and weld splatter. Prime affected area immediately after cleaning.

Primer: Type 2 organic zinc-rich coating for the protection of steel to AS/NZS 3750.9.

**Tinting**

General: Tint each coat of an opaque coating system so that each has a noticeably different tint from the preceding coat, except for top coats in systems with more than one top coat.

**Services**

General: Paint all new services and equipment, including those in plant rooms, if not embedded, except chromium, anodised aluminium, GRP, PVC-U, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces.

Proprietary items: Repaint only if damaged.

**Windows**

Operation: Make sure opening windows function correctly before and after painting.

**Doors**

Drying: Maintain door leaf in the open position during drying. Do not allow door hardware or accessories to damage the door finish during the drying process.

**Wet paint warning**

Notices: Place in a conspicuous location and do not remove until the paint is dry.

**3.4 COMPLETION****General**

Protection and masking: Remove masking and protection coverings before paint has dried.

Cleaning: On completion of painting, remove splatters from adjacent finished surfaces by washing, scraping or other methods which do not scratch or damage the surface.

Reinstatement: Repair, replace or refinish any damage, including works of other trades. Touch up new damaged paintwork or misses only with the paint batch used in the original application.

Fixtures: Refix removed and undamaged fixture in the original location, make sure they are properly fitted and in proper working order.

**Disposal of paint and waste materials**

Requirement: Conform to requirements of the local government authority.

**Spares**

Spare material: Supply clearly labelled sealed containers of each type, coat and colour of paint/coating from the same batch, for future repair purposes.