

# LEICHHARDT CHILD CARE CENTRE

## LANDSCAPE WORKS SPECIFICATION

For



7-15 Wetherill Street  
Leichhardt NSW 2040  
<http://www.leichhardt.nsw.gov.au/>  
(02) 9367 9222

By



Suite 3 / 38 Albany Street  
St Leonards NSW 2065  
[www.corkeryconsulting.com](http://www.corkeryconsulting.com)  
t +61 2 9906 6636  
f +61 2 9906 6634

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

Requirement: Provide walling and edging, as documented.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Landscape – Fences and Barriers*
- *Landscape – Gardening*

**1.3 INSPECTION****Notice**

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

- Setting out before commencement of construction.
- Geotextiles and subsurface drainage in place before backfilling.

**1.4 SUBMISSIONS****Samples**

Submit samples for approval of Superintendent as follows:

- recycled brick for strips in crushed sandstone in 0-2 years old play area
- sandstone quarry blocks for edge to sandpit in 2-5 years old play area
- boulders
- timber posts to amphitheatre
- mortar colour

**2 PRODUCTS****2.1 TIMBER AMPHITHEATRE****Hazard class**

General: As defined in AS 1604.1.: H5 (Ground Contact)

**Hardwood**

General: To AS 2796.1 Section 2.

- Grade: To AS 2796.2: Kiln Dried
- Type: Red Ironbark

Durability class: To AS 1720.2.: Class: 1 (>25 years in ground)

**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: Not permitted to be used.

**2.2 CONCRETE****General**

Standard: To AS 1379.

Exposure classification: To AS 3600 Table 4.3.

Grade: Where there are cast in metal items:

- Exposure classification:

- . A1, A2: N25.
- . B1: N32.
- . B2, C: N40.
- . Otherwise: N20.

### **2.3 SANDSTONE BLOCK EDGE**

Quarried stone: Cut random size stone.

Source of supply: Gosford Quarries (Contact John Carrasco Tel: 0458 230 278) or approved equivalent

Minimum unit size (mm): 300x300x400

### **2.4 BOULDERS EDGE**

Quarried stone: Irregular shapes and rounded edges.

Source of supply: Gosford Quarries (Contact John Carrasco Tel: 0458 230 278) or approved equivalent

Minimum unit size (mm): 300x300x400 nominal

### **2.5 CONCRETE BLOCK WALL**

#### **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.

Standard for masonry segmental retaining wall units: Refer to engineers details

### **2.6 GEOTEXTILES**

#### **General**

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

Identification and marking: To AS 3705.

Location: As indicated on drawings

#### **Protection**

General: Provide heavy duty protective covering. 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.

### **2.7 EDGING**

#### **Concrete**

Standard: To AS 1379 – Grade N20.

#### **Steel**

Product: 'Formboss' steel edging (Tel: 1800 367626) or approved equivalent.

Size and profile: 150mm x 2mm with bullnose top (6.5mm)

Finish: Hot-dip galvanized.

Fixing: Steel stakes 12mm diameter x 400mm long at 800 spacing.

## **3 EXECUTION**

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### **3.1 GENERAL**

#### **Set out**

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

#### **Clearing**

Extent: Site clearing and excavation to be carried out by others.

**Excavation**

Extent: Obtain approval of Superintendent before carrying out any excavation for foundations and footings.

**3.2 AMPHITHEATRE TIMBER****Construction**

Notify Superintendent before placing timber logs on mortar bed in accordance with details shown on drawings. Select the logs for their locations, place them in vertical arrangement and backfill gaps with mortar / coarse aggregate in accordance with details.

**3.3 SANDSTONE BLOCK EDGE****Construction**

Notify Superintendent before placing sandstone blocks on prepared concrete slab base in accordance with details shown on drawings. Select the blocks for their locations and lay them with the minimum of stonecutting. Close butt the sandstone blocks to a close neat fit and fill joints with mortar.

**3.4 SANDSTONE BOULDER EDGE****Construction**

Place sandstone boulders on prepared concrete mortar base in accordance with details shown on the drawings and as instructed by the Superintendent. Select the boulders to suite their location and lay them with large face down and stepped back from boulders below. Bury rock two thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.

**3.5 EDGING****Concrete**

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

**Steel**

Place edges in accordance with details shown on the drawings.

Fixing: steel rods at 800mm spacing in accordance with detail.

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

Requirement: Provide fences and barrier systems conforming to the layout and details on drawings and as follows:

- Complete for their function.
- Firmly fixed in position.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Landscape – walling and edging*

**1.3 INSPECTION****Notice**

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

- Boundary survey location.
- Set-out before construction.
- Foundation conditions before placing concrete in footings.

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

Durability Class to AS 1720.2: Class: 1 (>25 years in ground)

Hazard Class to AS 1604.1: H3 (Outside above ground) + H4 (Outside in ground)

**Posts and rails**

Hardwood: To AS 2082.

Stress grade: F17, F27

**Pickets and palings**

Hardwood: To AS 2796.1, Section 8.

- Grade to AS 2796.2: Medium feature.

**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: Not to be used.

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

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

- Grade: C350L0.

**2.3 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. Give notice for Superintendent to inspect set out before construction.

Property boundaries: Confirm by survey.

##### Excavation

Posts: Excavate post holes so that they have vertical sides and a firm base. Spread or dispose of surplus material as directed by the Superintendent.

##### Erection

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

##### Concrete footings

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

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 as per details on drawings.

#### 3.2 GATES

##### Hardware

General: Provide the following:

- Child proof latch as approved by Superintendent.
- Provision for locking by padlock.
- Hinges with smooth operation and adjustment for future sagging.

#### 3.3 TIMBER FENCING

##### Hardwood picket fence

Dimensions as per details on drawings.

##### Lap and cap paling fence

Dimensions as per details on drawings.

##### 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.

Lap and cap paling fence: Provide 3 rails for fences, and locate 275 mm from the bottoms of the palings and abutting the tops of palings as per details on drawings.

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.

Finish: Cabot's Garden Furniture Oil or approved equivalent

#### 3.4 TIMBER SLAT FENCE & SCREEN

Height (mm): fence 2100 mm.

Post spacing: as shown on details on drawings.

Steel posts, beams, frames dimensions: as shown on details on drawings

Steel Finish: Powder coated

Colour: Colorbond Slate Grey

Steel spacers: dimensions as shown on details on drawings

Timber slats & purlins: dimensions as shown on details on drawings

Finish: Cabot's Garden Furniture Oil or approved equivalent

Base: Concrete wall footing.

**Installation**

Fabricate panels with timber slats in workshop.

Attach panels to posts with fixing clips and hexagon head bolts. Set panels clear of the ground.

**3.5 PERIMETER SECURITY FENCE**

Height (mm): fence 2100 mm.

Post spacing: as shown on details on drawings

Steel posts: as shown on details on drawings

Steel frames: as shown on details on drawings

Steel slats: as shown on details on drawings

Steel rail rods: as shown on details on drawings

Base: Concrete wall footing.

Finish: Powder coated

Colour: Colorbond Slate Grey

**Installation**

Fabricate panels in workshop

Attach panels to posts with fixing clips and hexagon head bolts. Set panels clear of the ground.

**3.6 STEEL FENCE AT BUILDING ENTRANCE****General**

Height (mm): fence 1500 mm.

Post spacing: As per drawings.

Steel posts, frames, slats, rail and rods as shown in drawings.

Footing as per detail on drawings.

**Installation**

Fabricate panels in workshop

Attach panels to posts with fixing clips and hexagon head bolts. Set panels clear of the ground.

Attach panels to posts with fixing clips and hexagon head bolts. Set panels clear of the ground.

**Gates**

As per details on drawings.



**0250 LANDSCAPE – GARDENING****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide plants as documented that have been grown to a standard that allows them to establish rapidly and grow to maturity.

Maintenance: Encourage and maintain healthy growth for the duration of the contract.

Program: Provide a suitable irrigation, pruning, fertiliser and monitoring program for all plant materials held by the supplier. Take any other precautions required to safeguard the health and well-being of all plant materials before and including their delivery to site.

**Coordination: Note that a Remediation Action Plan (RAP) has been adopted for the site that includes Site Management Plan to control and manage site activities during the implementation of the RAP. Give notice to the Superintendent before commencing any excavation or importing any sub-grade or topsoil material on to the site and meet the requirements of the RAP Site Management Plan.**

**1.2 STANDARDS**

Top Soil: AS 4419

Potting mixes: AS 3743

Composts, soil conditioners and mulches: AS 4454

Tree supply: NATSPEC Guide: *Specifying Trees – A guide to assessment of tree quality* (Clark R. 2003)

**1.3 INTERPRETATION****Definitions**

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

- Imported topsoil: Similar to naturally occurring local topsoil, suitable for the establishment and on-going viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture to AS 4419 Appendix 1, as follows:
  - . Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
  - . Medium: Sandy loam, fine sandy loam.
  - . Coarse: Sand, loamy sand.

**1.4 INSPECTION****Notice**

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

- Setting out completed.
- Subgrades prepared for placing topsoil.
- Topsoil spread before planting.
- Ares prepared before turfing.
- Turfing completed.
- Plant holes excavated and prepared for planting.
- Plant material set out before planting.
- Planting, staking and tying completed.
- Completion of planting establishment work.

## 1.5 SUBMISSIONS

### Accreditation of plant supplier

Proof: Submit evidence of accreditation as follows:

- Species: Provide written certification that all plant material is true to the required species and type.

### Maintenance manual

General: Submit recommendations for maintenance of plants.

### Materials

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

- Material source of supply for topsoil, filling, stone, filter fabrics and plant material.
- Certificate of proof of compost pH value.

### Replacement plants

Species: Submit written certification that all plant material is true to the required species and type.

### Samples

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

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

### Suppliers

Statements: Submit statements from suppliers, giving the following, where applicable:

- Particulars of the supplier's experience in the required type of work.
- Production capacity for material of the required type and quantity.
- Lead times for delivery of materials to the site.

## 2 PRODUCTS

### 2.1 TOPSOIL

#### Standard

Imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

Composts, soil conditioners and mulches: To AS 4454.

#### Source

General: Import topsoil as documented in the **Imported topsoil schedule**.

#### Imported topsoil

Particle size: Provide soil to the **Topsoil particle size table** for the textures nominated in **SELECTIONS**.

#### Topsoil particle size table (% passing by mass)

Sieve aperture to AS 1152 (mm)	Soil textures		
	Fine	Medium	Coarse
2.36	100	100	100
1.18	90 – 100	90 – 100	90 – 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

Nutrient levels: Provide soil to the **Topsoil nutrient level table**.

#### Topsoil nutrient level table

Nutrient	Unit	Sufficiency range
Nitrate-N (NO <sub>3</sub> )	mg/kg	> 25

Nutrient	Unit	Sufficiency range
Phosphate-P (PO <sub>4</sub> ) – P tolerant	mg/kg	43 - 63
Phosphate-P (PO <sub>4</sub> ) – P sensitive	mg/kg	< 28
Phosphate-P (PO <sub>4</sub> ) – P very sensitive	mg/kg	< 6
Potassium (K)	mg/kg	178 - 388
Sulphate-S (SO <sub>4</sub> )	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
<b>Method References</b>		
pH in H <sub>2</sub> O (1:5), pH in CaCl <sub>2</sub> (1:5) and Electrical Conductivity (EC) by Rayment & Higginson (1992) method 4A2, 4B2, 3A1		
Soluble Nitrate-N by APHA 4500		
Soluble Chloride by Rayment & Higginson (1992) modified method 5A2		
Extractable P by Mehlich 3 – ICP		
Exchangeable cations – Ca, Mg, K, Na by Mehlich 3 – ICP		
Extractable S by Mehlich 3 – ICP		
Extractable trace elements (Fe, Mn, Zn, Cu, B) by Mehlich 3 - ICP		

### Site topsoil

General: Site topsoil is not to be used for landscape works due to potential contamination. Existing site topsoil is to be stripped and disposed of in accordance with the Site Remediation Action Plan prepared by SESL for Leichhardt Municipal Council in June 2014.

## 2.2 GRASS

### Turf

Supplier: Obtain turf from a specialist grower of cultivated turf.

Quality: Provide turf of even thickness, free from weeds and other foreign matter.

## 2.3 FERTILISER

### Fertiliser

Planting beds: Proprietary fertiliser Terra Cottem Universal (Tel: 1800 65828) delivered to site in sealed bags marked to show manufacturer, weight, fertiliser type, N:P:K ratio, recommended use and application rates.

Turf: Proprietary fertiliser Terra Cottem Turf (Tel: 1800 65828) delivered to site in sealed bags marked to show manufacturer, weight, fertiliser type, N:P:K ratio, recommended use and application rates.

Citrus in containers: Osmocote Plus Trace Elements – Fruit, Citrus, Trees & Shrubs, recommended use and application rates.

## 2.4 PLANTS - GENERAL

### Source

Pre-order plant material to ensure availability when required. No extension of time will be granted if plant material is not available because of late ordering. The stock must be ready for inspection within four (4) weeks of the contract being awarded. Contractor to advise Superintendent immediately if any plant material cannot be supplied at the time required to meet the agree project program.

### Labelling

General: Clearly label individual plants and batches.

- Label type: To withstand transit without erasure or misplacement.

### Health and vigour

Health: Supply plants with foliage size, texture and colour at time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species.

**Vigour:** Supply plants with extension growth consistent with that exhibited in vigorous specimens of the species nominated.

**Damage:** Supply plants free from damage and from restricted habit due to growth in nursery rows.

**Stress:** Supply plants free from stress resulting from inadequate watering, excessive shade or excessive sunlight experienced at any time during their development.

**Site environment:** Supply plants that have been grown and hardened off to suit the conditions that could reasonably be anticipated to exist on site at the time of delivery.

#### **Root development**

**Containers:** Grow plants in their final containers for the following periods:

- Plants < 25 L size: > 6 weeks.
- Plants > 25 L size: > 12 weeks.

#### **Freedom from pests and disease**

**Pests and disease:** Supply plants with foliage free from attack by pests or disease.

**Native species with a history of attack by native pests:** Restrict plant supply to those with evidence of previous attack to < 15% of the foliage and ensure absence of actively feeding insects.

#### **Root system**

**Requirement:** Supply plant material with a root system that is:

- Well proportioned in relation to the size of the plant material.
- Conducive to successful transplantation.
- Free of any indication of having been restricted or damaged.

**Root inspection:** If inspection is by the removal of soil test, such as investigative inspection, sample as follows:

- For > 100 samples: Inspect 1%.
- For < 100 samples: Inspect 1 sample.

**Sample plants:** Replace plants used in investigative inspection.

**Rejection:** Do not provide root bound stock.

### **2.5 MULCH**

**Soft Fall Mulch:** To be 'Port Stevens' pine bark mulch recycled from plantation timber production, graded to meet requirements for use in playgrounds or approved equivalent to depth specified on drawings.

**Planting Area Surface Mulch:** 'Leaf Litter 20-40mm or approved; depth as specified on drawings.

## **3 EXECUTION**

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### **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 rate.

**Manual weeding:** Remove rubbish and weed growth throughout grassed, planted and mulched areas by hand, regularly. Continue eradication 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 ROCK WORK**

#### **New rock work**

**General:** Place rocks while ground formation work is being carried out. Provide imported rock as required.

Place boulders with large face down and stepped back from boulders below.

Bury rock two thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.

### 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 as determined by 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 or as directed by the Superintendent.

Pipes, culverts and associated structures: Construct mounding to avoid unbalanced loading.

### 3.4 SUBSOIL

#### Planting beds

Cultivation depths: as shown on drawings

Grassed mound areas (turf): as shown on drawings

### 3.5 TOPSOIL

#### Placing topsoil

General: Spread the topsoil and grade evenly, making the necessary allowances to permit the following:

- Required finished levels and contours may be achieved after light compaction.
- Grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

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 pending, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

#### Topsoil depths

General: Spread topsoil to depths shown on drawings

- Excavated planting areas: 225 mm.
- Earth mounds with turf surface: 100 mm.

#### Surplus topsoil

General: Spread surplus topsoil on designated areas on site or dispose off-site as agreed with the Superintendent.

### 3.6 TURFING

#### Supply

Elapsed time: Deliver the turf within 24 hours of cutting, and lay it within 36 hours of cutting. Prevent it from drying out between cutting and laying. If it is not laid within 36 hours of cutting, roll it out on a flat surface with the grass up, and water as necessary to maintain a good condition.

#### Laying

General: Lay the turf in the following manner:

- In stretcher pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.
- To finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

#### Tamping

General: Lightly tamp to an even surface immediately after laying. Do not use a roller.

**Fertilising**

General: Mix the fertiliser thoroughly into the topsoil before placing the turf. Apply lawn fertiliser at the completion of the first and last mowings, and at other times as required to maintain healthy grass cover.

**Watering**

General: Water immediately after laying until the topsoil is moistened to its full depth. Continue watering to maintain moisture to this depth.

**Mowing**

Height: 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 within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

**Maintenance**

General: Maintain turfed areas until the attainment of 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 relay 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.

**Top dressing**

General: When the turf is established, mow. Remove cuttings and lightly top dress to a depth of 10 mm. Rub the dressing well into the joints and correct any unevenness in the turf surface.

**3.7 PLANTING****Locations**

General: If it appears necessary to vary plant locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, give notice to Superintendent and await instruction.

**Planting conditions**

Weather: Do not plant in unsuitable weather conditions such as 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.

**Placing**

Method: Remove the plant from the container with minimum disturbance to the root ball. Make sure that the root ball is moist and place it in its final position, in the centre of the hole and plumb, and with the top soil level of the plant root ball 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 in accordance with manufacturers recommendation.

**Backfilling**

General: Backfill with topsoil mixture. Tamp lightly 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.

**3.8 MULCHING****Placing mulch**

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread and roll mulch so that after settling, or after rolling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds, and not closer to the stem than 50 mm in the case of gravel mulches.

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.

Extent: Provide mulch to 750 mm diameter, to surrounds of plants planted in riplines and grass areas.

Depths: Spread organic mulch to a depth of 75 mm.

### 3.9 SPRAYING

#### Notice

General: Immediately give notice to the Superintendent of evidence of insect attack or disease amongst plant material and implement agreed treatment.

#### Spraying

Product: Spray with insecticide, fungicide or both, as required in accordance with Superintendent's approval.

## 4 ESTABLISHMENT

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### 4.1 GENERAL

#### Responsibilities

Plant Establishment: Maintain the contract area during the plant establishment period

Plant establishment period: The period between the date of practical completion and the date of final completion.

#### Reporting

Monthly report: Submit regular reports by the last Friday of each month of the general status of works and plant replacement requirements.

Incident reports: Report immediately verbally and confirm in writing to the Superintendent any disturbance or incident affecting or likely to affect the day to day scheduling of work.

#### Disruption of works by others

Other contractors: Make arrangements to work around disturbances.

### 4.2 GRASS

#### Mowing and trimming

Height: Consistent with the growth habit of the grass variety and maintained at 40mm to 65mm throughout the year.

Edges: At the same time as mowing trim lawn edges to ensure trees and shrubs are not damaged.

#### Topdressing

Topdressing for remediation of irregularities: Apply coarse or medium soil to AS 4419 suitable for application to turf. Rub the dressing well into the joints and correct any unevenness in the turf surface. Do not cover or bury the turf. Remove excess material from site.

#### Fertilising

Fertilising: Apply lawn fertiliser as required to maintain healthy grass cover. Advise the Superintendent of fertiliser used and method of application and when it was applied.

### 4.3 PLANTING WORKS

#### Planting

Planting: Ensure the general appearance and presentation of the landscape and the quality of plant material at date of practical completion is maintained for the full planting establishment period.

Replacements: Replace failed, dead and/or damaged plants immediately as necessary throughout the full plant establishment period.

#### Pruning

General: Where pruning is required obtain prior approval from the Superintendent or prune as directed in accordance with AS 4373.

#### Fertilising

Season: Fertilise plants according to their seasonal growth requirements.

#### Weeding

Trees and shrubs: remove all weeds as required for planted and mulched areas so they are weed free when observed at bi-weekly intervals.

Method: By hand

**Rubbish removal**

Rubbish: Remove loose rubbish and litter from the site.

Execute this work regularly so that all areas are free from rubbish when observed at weekly intervals.

Leaf litter: Remove from all path and lawn areas.

**Much surfaces**

Maintain 75mm cover and ensure weed suppression and the quality of finish.

**4.4 WATERING****Establishment**

Extent: All planting areas, turf and trees.

Watering program: Minimum three complete watering soaking to a depth of 150mm at weekly intervals for the first 6 weeks of plant establishment. Where heavy or prolonged natural rainfall has occurred, ask for instructions from Superintendent.

Water restrictions: Coordinate the water supply and confirm the watering regime in accordance with federal and state legislation and any restrictions that may apply at the time.

**4.5 COMPLIANCE****Criteria**

General: Plant establishment will be deemed complete, subject to the following:

- Repairs to planting media completed.
- Ground surfaces are covered with the specified treatment to the specified depths.
- Pests, disease, or nutrient deficiencies or toxicities are not evident.
- Organic mulched surfaces have been maintained in a weed free and tidy condition and to the specified depth.
- Vegetation is established and well formed.
- Plants have healthy root systems that have penetrated into the surrounding sub-grade and not able to be lifted out of planting hole.
- Vegetation is not restricting essential sight lines and signage.
- All hard landscape works have been installed as specified.
- There is no evidence of rubbish and litter.
- All mulch has been removed from drainage and access areas.
- All non-conformance reports and defects notifications have been closed out.

**5 SELECTIONS****5.1 TOPSOIL****Imported topsoil schedule**

Location	Soil Type	Depth
Type A – Planting beds	Organic Soil Mix Benedict Premium Organic Garden Mix or approved equivalent	As specified
Type B – Turf areas and topdressing	80/20 Sandy/soil mix Benedict SmartMix 1 or approved equivalent	As specified
Type C - Trees in containers	Lightweight Planter box Mix Benedict SmartMix 4 or approved equivalent	As specified

**5.2 PLANT MATERIAL**

Refer to Plant Schedule on Drawing L-L004

**5.3 TURFING**

Refer to Plant Schedule on Drawing L-L004.



#### **5.4 PLANT MATERIAL**

Maintenance Period: Fifty two (52) weeks

**0252 LANDSCAPE – SOFT SURFACES****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide soft surfaces for landscaping as documented.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*

**1.3 INSPECTION****Notice**

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

- Clearing completed.
- Setting out completed.
- Grassing bed prepared before turfing, seeding, or temporary grassing.
- Grassing or turfing completed.

**1.4 SUBMISSIONS****Execution**

Program: Submit a work program in the form of a bar chart, for the landscape works.

Maintenance program: Submit a proposed planting maintenance program.

Material storage on site: Submit proposal.

**Materials**

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

- Material source of supply.

**Samples**

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

**Suppliers**

Statements: Submit statements from suppliers, giving the following, where applicable:

- Particulars of the supplier's experience in the required type of work.
- Production capacity for material of the required type and quantity.
- Lead times for delivery of material to the site.

**2 PRODUCTS****2.1 RUBBER SOFTFALL****General**

Definition: Wet pour rubber *in situ*.

Standards:

AS/NZS 4422.

AS1924 1981 Playground equipment for Park, Schools & domestic use.

AS/NZS4422-1996 Playground Surfacing-Specifications requirements & test methods.

Certification: Provide evidence to AS/NZS 4422 & source of materials.

Material: EPDM (Ethylene Propylene)

The base course shall be a minimum 50 -100mm thick layer of crusher dust (or similar) laid over the prepared sub grade surface to the entire play surfacing area, evenly graded with a slight fall to permit run off to drainage points and compacted.

The impact absorbing soft fall base material shall be an in situ black rubber material, consisting of either finely shredded rubber or granulated rubber bound with a polyurethane binding agent at varying thickness as per manufacture's specifications and for equipment specified.

The top layer shall be a minimum of (3) three colours of EPDM wet pour rubber. The thickness of the soft fall material shall be appropriate for the relevant play equipment.

Colours: light green / earth ochre / ocean blue

Certification & Warrants: The Contractor shall submit certification and manufacturer's warranties for the soft fall upon completion with a minimum two (2) year for workmanship and 8 years for System Performance

## 2.2 GRASS

### Turf

Supplier: Obtain turf from a specialist grower of cultivated turf.

Quality: Provide turf of even thickness, free from weeds and other foreign matter.

## 3 EXECUTION

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### 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 rate.

Manual weeding: Remove rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area of 750 mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

### 3.2 RUBBER SOFTFALL

#### Witness Points

- Placement of rubber underlay
- Benching of metal crusher dust
- Finished levels of wetpour rubber safety softfall
- Finished critical fall heights and distances

#### Installation

Preparation: Excavate to required levels and compact subgrade. Place and compact minimum 50 mm of DGB20 sub base (can be road base gravel, crushed rock or compacted earth).

Then a layer of crusher dust is used to compact and level the base to achieve the desired shape and contour of the area.

Soft fall is to be wet pour rubber and three (3) colours need to be provided and installed as directed by Superintendent.

#### Installation

The separate coloured areas will be installed over consecutive successive days so that one area is allowed to properly dry prior to commencement of the adjoining area.

The finished soft fall wear layer (top) surface shall be a dense, solid coloured, homogenous mass with no discernible cracks or joints and finished flush with all surrounding edges.

#### Colour Finish

Samples and colours of the top wear layer system are to be approved by the Superintendent prior to commencing installation. The various colours are to be consistent and of uniform density throughout the full extent of the Soft fall area.

### Curing Time

A minimum twenty-four (24) hours total curing time is specified for the wet pour soft fall. A security fence is to be installed to ensure the integrity of the site. The security of the wet pour is the responsibility of the contractor and is to allow for security and the reinstatement of vandalised (caused during the curing time) wet pour in their lump sum quotation.

### Rejection

The wet pour rubber and the artificial grass shall be liable to rejection if it fails to comply with the provisions of this soft fall specification and the requirements of AS/NZS4422-1996. Any rejected soft fall surfacing shall be removed and replaced with new work that complies with this specification. The contractor shall obtain all tests necessary to provide conforming results at no cost to Council.

## **3.3 TURFING**

### **Supply**

Elapsed time: Deliver the turf within 24 hours of cutting, and lay it within 36 hours of cutting. Prevent it from drying out between cutting and laying. If it is not laid within 36 hours of cutting, roll it out on a flat surface with the grass up, and water as necessary to maintain a good condition.

### **Laying**

General: Lay the turf in the following manner:

- In stretcher pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.
- To 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. Apply a layer of top dressing between the strips of turf. Finish with an even surface.

### **Tamping**

General: Lightly tamp to an even surface immediately after laying. Do not use a roller.

### **Pegging**

Stabilising: Peg the turf (on steep slopes) to prevent downslope movement. Remove the pegs when the turf is established.

### **Fertilising**

General: Mix the fertiliser thoroughly into the topsoil before placing the turf. Apply lawn fertiliser at the completion of the first and last mowings, and at other times as required to maintain healthy grass cover.

### **Watering**

General: Water immediately after laying until the topsoil is moistened to its full depth. Continue watering to maintain moisture to this depth.

### **Mowing**

Height: 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 within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

### **Maintenance**

General: Maintain turfed areas until the attainment of 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 relay 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.

### **Top dressing**

General: When the turf is established, mow. Remove cuttings and lightly top dress to a depth of 10 mm. Rub the dressing well into the joints and correct any unevenness in the turf surface.

**0261 LANDSCAPE – FURNITURE AND FIXTURES****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide landscape furniture and fixtures, as documented.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Concrete Pavement*
- *Segmental Pavers*

**1.3 INSPECTION****Notice**

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

- Custom-built 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.

**1.4 SUBMISSIONS****Installation**

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

**Preservative treatment**

Hardwood timber: Kiln dried

CCA treated timber: Not to be used.

**Subcontractors**

General: Submit names and contact details of proposed suppliers and installers.

**2 EXECUTION****2.1 FIXING****Erection**

Line and level: Erect posts or poles vertically. Erect furniture items level. Provide a level area around benches and seats where installed on slopes.

**2.2 COMPLETION****Maintenance manual**

General: Submit the manufacturers' data as follows:

- Recommendations for service use, care and maintenance.
- List of manufacturers and suppliers of replacement parts.

**3 SELECTIONS****3.1 FURNITURE****Benches**

Type: Metro Bench

Description: timber slat bench 1800L supported by cast aluminium frames

Supplier: Landmark

Product No.: FFSA001001

Finish: Battens hardwood timber Cabot's Garden Furniture Oil or approved equivalent

Fixing: Stainless Steel assembly fixings as per manufactures recommendation, Dynabolts, cast-in hold down bolts or chemical anchors.

#### **Timber Sitting Deck 0-2 years old play area**

Type: Raised timber deck seating.

Description: timber platform bench for children/adults as shown in drawings

Finish: Cabot's Garden Furniture Oil or approved equivalent

Fixing: Stainless Steel assembly fixings.

#### **Timber Deck/Planter 2-3 years old**

Type: Raised timber deck as seating and core ten tree planter.

Description: round timber platform bench and tree planter as shown in drawings

Finish: Cabot's Garden Furniture Oil or approved equivalent

Fixing: Steel assembly fixings.

#### **Timber Bridges ( 2-3 year & 3-5 year old areas)**

Type: Flat timber plank bridge.

Description: hardwood timber plank bridge over dry creek flushed to adjacent surfaces.

Finish: Cabot's Garden Furniture Oil or approved equivalent

Fixing: as shown in drawings.

#### **Timber Boardwalk (adjoining fig tree at Mary Street)**

Type: Hardwood timber pedestrian boardwalk over roots of adjoining Fig tree

Description: hardwood timber planks on substructure supported by steel piles as per details shown on drawings

Finish: Cabot's Garden Furniture Oil or approved equivalent

Fixing: As per details shown on drawings

### **3.2 PLANTING FITTINGS**

#### **Tree planter boxes**

Description: Corten steel planter with timber decking supported by steel sub-frame.

Size: as per details shown on drawings

Finish: as shown in drawings.

Fixing: as shown in drawings.

Installation: Fabricate planter boxes with steel sub-frame in workshop and install temporary bracing as required to avoid damage during transportation and installation.

Remove temporary bracing when planter is located in final position

#### **Recycle tyre vegetable containers**

Description: recycled tyre planter for vegetables growing.

Size: typical car tyre diameter

Finish: as shown in drawings.

Fixing: as shown in drawings.

#### **Mesh for climbing plants on lap and cap fence**

Type: steel trellis

Description: galvanized steel trellis attached to Lap & Cap timber fence.

Mesh Size: 1000W x 1600H mm

Finish: as shown in drawings.

Fixing: as shown in drawings.

### 3.3 FIXTURES

#### **Bicycle racks**

Type: Semi bike stand W845mm x H850mm

Description: U-shaped stainless steel stand

Supplier: Street Furniture Australia

Product No.: Semi hoop BST03

Finish: Stainless steel.

Fixing: Stainless Steel assembly fixings, 4 x M8 installation fixings, Dynabolts, cast-in hold down bolts or chemical anchors.

#### **Hardwood Timber poles / props**

Type: Hardwood poles

Description: Red Ironbark poles set at various angles as shown on drawings

Size: As per details on drawings

Finish: Painted with Cabot's Timbercolour

Colour: Pinjarra

Fixing: As per details on drawings

#### **Shade Sail Cloth**

Type: Soltis92 pvc coated mesh

Description: All outer edges are tabled over to provide triple sail thickness and then further reinforced with a double thickness fabric strip. All corners are reinforced with an additional fabric panel. Tension is applied at each corner via a stainless steel turnbuckle.

Supplier: Soltis

Colour: proposed colour 2045 Beaten-metal.

Size: As per details on drawings

Finish to support elements: Stainless steel turnbuckle and pulley attached to hardwood post as shown on drawing details.

### 3.4 PLAY EQUIPMENT

#### **Sand pit**

Materials:

- Sand: Clean, sharp river sand.
- Aggregate: 15 mm gauge road base.
- Sub-surface drainage pipe: as per hydraulic engineers details
- Filter fabric: As per Schedule of Finishes

Installation: Compact aggregate to 100 mm depth.

Lay sub-surface drainage pipe in aggregate and cover with filter fabric allowing for a fall of 1:75 towards the sub-surface drainage pipe.

Cover with 400 mm (Minimum) sand.

#### **Play water pump**

Type: Water Pump with Reservoir

Description: Steel pump and handle with water chamber.

Supplier: Play Works

Product No.: PN 444

Finish: Stainless steel pump and handle with polypropylene water pit and aluminium chamber and cover.

Fixing: Stainless steel as per suppliers recommendations

#### **Mirrors on Lap & Cap timber fence**

Description: mirrors to replace top layer of palings in lap & cap timber fence as per details on drawing.

Size: 100mm wide x 15mm thick

Finish: Safety backed mirrors

Fixing: Adhesive

**Steel Arbour in 0-2 years old area**

Description: Steel 40x4 SHS arches & cross beams

Fabrication: contractor to provide shop drawings for approval by Superintendent

Arches and cross beams to be fabricated off site in workshop and delivered to site without distortion or surface damage.

Finish: Powder coated

Colour: Colorbond Slate Grey

Installation: Arches to be slid over 32x32 steel bars embedded 250mm in to concrete edge/seat and attached with screws as per detail on drawings.

Cross beams to be bolted on site to flanges welded to arches in workshop prior to powder coating.



**0271 PAVEMENT BASE AND SUBBASE****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide base and subbase courses as shown on drawings.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Earthwork.*
- *Concrete pavement*
- *Segmental pavers*
- *Granular surfaces*

**1.3 INTERPRETATION****Abbreviations**

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

- CBR: California bearing ratio.
- CRB: Crushed rock base.
- CRS: Crushed rock subbase.
- NGB: Natural gravel base.
- NGS: Natural gravel subbase.
- RCCB: Recycled crushed concrete base.
- RCCS: Recycled crushed concrete subbase.

**Definitions**

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply:

- Absolute level tolerance: Maximum deviation from design levels.
- Base: Layer(s) of material forming the uppermost structural element of a pavement and on which the surfacing may be placed.
- Flexible pavement: A pavement which obtains its load-spreading properties from intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Subbase: Material laid on the subgrade (or selected material), below the base, either for the purpose of making up additional pavement thickness, to prevent intrusion of the subgrade into the base, or to provide a working platform.

**1.4 INSPECTION****Notice**

Inspection: Give notice to Superintendent 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.

**1.5 SUBMISSIONS****Execution**

General: Submit details of the proposed work methods and equipment for each pathway operation, including the following:

- Staging of the work, access control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Sources of materials.

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.

### Materials

Source of material: Submit the supplier name, material type (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Compliance of material: Provide certification and test results from a NATA registered laboratory confirming that the material conforms to the documented requirements.

### Tests

Material property testing: Conform to the **Base material properties table** and the **Subbase material properties table** test methods.

## 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 and recycled material class

Requirement: Provide crushed rock and recycled material as documented, from the following classes:

- Class 1: Pavement base material (with a minimum plasticity index) for unbound pavements requiring a very high standard of surface preparation for a sprayed sealed or thin asphalt surfacing.
- Class 2: Pavement base material (with no minimum plasticity index) for unbound pavements which may not require a very high standard of surface preparation.

#### Crushed rock

Designation: Unbound crushed rock materials are designated as follows:

- CRB20-1: 20 mm nominal sized class 1 crushed rock base.
- CRB20-2: 20 mm nominal sized class 2 crushed rock base.
- CRS20: 20 mm nominal sized crushed rock subbase.
- CRS40: 40 mm nominal sized crushed rock subbase.

#### Recycled crushed concrete

Designation: Recycled crushed concrete materials are designated as follows:

- RCCB20-1: 20 mm nominal sized class 1 recycled crushed concrete base.
- RCCB20-2: 20 mm nominal sized class 2 recycled crushed concrete base.
- RCCS20: 20 mm nominal sized recycled crushed concrete subbase.

#### Natural gravel

Designation: Unbound natural gravel materials are designated as follows:

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

#### Base material properties

Base materials: Conform to the **Base material properties table**.

#### Base material properties table

Test method	Description	CRB20-1	CRB20-2	RCCB20-1	RCCB20-2	NGB20
AS 1289.3.6.1	Particle size distribution					
AS 1289.3.6.1	% passing 26.5 mm sieve	100	100	100	100	100
AS 1289.3.6.1	% passing 19.0 mm sieve	95-100	95-100	95-100	95-100	93-100

Test method	Description	CRB20-1	CRB20-2	RCCB20-1	RCCB20-2	NGB20
AS 1289.3.6.1	% passing 13.2 mm sieve	77-93	77-93	78-92	78-92	-
AS 1289.3.6.1	% passing 9.5 mm sieve	63-83	63-83	63-83	63-83	71-87
AS 1289.3.6.1	% passing 4.75 mm sieve	44-64	44-64	44-64	44-64	47-70
AS 1289.3.6.1	% passing 2.36 mm sieve	29-49	29-49	30-48	30-48	35-56
AS 1289.3.6.1	% passing 0.425 mm sieve	13-23	13-23	13-21	13-21	14-32
AS 1289.3.6.1	% passing 0.075 mm sieve	5-11	5-11	5-9	5-9	6-20
AS 1289.3.1.1	Liquid limit	max 30	max 30	max 35	max 35	max 25
AS 1289.3.3.1	Plasticity index:					
	All areas	min 2	-	min 2	-	-
	Areas with annual rainfall > 500 mm	max 6	max 6	max 6	max 6	max 6
	Areas with annual rainfall < 500 mm	max 10	max 10	max 10	max 10	max 10
AS 1289.3.4.1	Linear shrinkage:					
	All areas:	min 0.7	-	min 0.7	-	-
	Areas with annual rainfall > 500 mm	max 2.0	max 2.0	max 2.0	max 2.0	max 2.0
	Areas with annual rainfall < 500 mm	max 4.0	max 4.0	max 4.0	max 4.0	max 4.0
Direct measurement	Foreign materials in that fraction of RCCB retained on 4.75 mm sieve - % by mass:					
	High density (brick, etc)	—	—	max 2.0	max 2.0	—
	Low density (plaster, etc)	—	—	max 0.5	max 0.5	—
	Organic matter (wood, etc)	—	—	max 0.1	max 0.1	—
	Asbestos and hazardous	—	—	0	0	—
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	max 35%	—
AS 1141.22	Aggregate wet strength*	min 100 kN	min 80 kN	min 100 kN	min 80 kN	—
AS 1141.22	Wet/dry strength variation* (dry - wet)/dry	max 35%	max 35%	max 35%	max 35%	—
AS 1141.23	Los Angeles value	max 35%	max 35%	max 40%	max 40%	—
AS 1289.6.1.1	4 day soaked CBR (98% modified compaction)	min 80%	min 80%	min 80%	min 80%	min 80%

## NOTES:

\* All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction which is at risk of failing in the opinion of the Engineer.

**Subbase materials:** Conform to the **Subbase material properties table**.

**Subbase material properties table**

Test method	Description	CRS20	CRS40	RCCS20	NGS20	NGS40
AS 1289.3.6.1	Particle size distribution					
AS 1289.3.6.1	% passing 53.0 mm sieve	-	100	-	-	100
AS 1289.3.6.1	% passing 37.5 mm sieve	-	90-100	-	-	95-100
AS 1289.3.6.1	% passing 26.5 mm sieve	100	74-97	100	100	80-97
AS 1289.3.6.1	% passing 19.0 mm sieve	90-100	62-86	95-100	96-100	-
AS 1289.3.6.1	% passing 13.2 mm sieve	74-96	-	74-95	-	-

Test method	Description	CRS20	CRS40	RCCS20	NGS20	NGS40
AS 1289.3.6.1	% passing 9.5 mm sieve	61-85	42-66	60-90	65-90	48-85
AS 1289.3.6.1	% passing 4.75 mm sieve	42-66	28-50	42-76	47-80	35-73
AS 1289.3.6.1	% passing 2.36 mm sieve	28-50	20-39	28-60	32-67	25-58
AS 1289.3.6.1	% passing 0.425 mm sieve	11-27	8-21	10-28	14-42	10-33
AS 1289.3.6.1	% passing 0.075 mm sieve	4-14	3-11	2-10	6-26	3-21
AS 1289.3.1.1	Liquid limit	max 35	max 35	max 40	max 35	max 35
AS 1289.3.3.1	Plasticity index:					
	Areas with annual rainfall > 500 mm	max 12	max 12	max 12	max 12	max 12
	Areas with annual rainfall < 500 mm	max 15	max 15	max 15	max 15	max 15
AS 1289.3.4.1	Linear shrinkage:					
	Areas with annual rainfall > 500 mm	max 4.5	max 4.5	max 4.5	max 4.5	max 4.5
	Areas with annual rainfall < 500 mm	max 6.0	max 6.0	max 6.0	max 6.0	max 6.0
Direct measurement	Foreign materials in that fraction of RCCB retained on 4.75 mm sieve - % by mass:					
	High density (brick, etc)	—	—	max 3.0	—	—
	Low density (plaster, etc)	—	—	max 1.0	—	—
	Organic matter (wood, etc)	—	—	max 0.2	—	—
	Asbestos and hazardous	—	—	0	0	—
AS 1141.52	Maximum dry compressive strength on fraction passing 19 mm sieve (only applies if plasticity index is less than 1)	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa	min 1.0 MPa
AS 1141.14	Particle shape by proportional calliper - % misshapen (2:1)	max 35%	max 35%	max 35%	—	—
AS 1141.22	Aggregate wet strength*	min 50 kN	min 50 kN	min 50 kN	—	—
AS 1141.22	Wet/dry strength variation* (dry - wet)/dry	max 40%	max 40%	max 40%	—	—
AS 1141.23	Los Angeles value	max 40%	max 40%	max 40%	—	—
AS 1289.6.1.1	4 day soaked CBR (94% modified compaction)	min 30%	min 30%	min 30%	min 30%	min 30%
NOTES:						
* All fractions of the proposed mix must satisfy this requirement. Use the fraction with the highest wet/dry strength variation as the value for determining conformance. Test the fraction 19.0 mm to 9.5 mm. In the case of blended materials, also test the fraction 9.5 mm to 4.75 mm. Test any other fraction which is at risk of failing in the opinion of the Engineer.						

### 3 EXECUTION

#### 3.1 SUBGRADE PREPARATION

##### General

Requirement: Prepare the subgrade in conformance with the *Earthwork* worksection.

#### 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 which is free draining and evenly graded between level points.

Base abutting gutters:  $\pm 5$  mm from the level of the lip of the gutter, minus the design thickness of the wearing course.

Tolerances: Conform to the **Surface level tolerances table**. The tolerances apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the wearing course.

##### Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Subbase surface	+ 10 mm, - 25 mm	10 mm
Base surface	+ 10 mm, - 5 mm	5 mm

#### 3.4 SUBBASE AND BASE COMPACTION

##### General

Construction operation: Compact each layer of fill to the required depth and density, as a systematic construction operation and to conform to the **Minimum relative compaction table**.

##### Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1
Subbase	95%
Base	98%

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.

**Compaction requirements**

General: Apply uniform compaction effort, over the whole area to be compacted, until the required density is achieved or until failure is acknowledged. If failure acknowledged, the subclause **Rectification** applies.

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 material to dry back to 60% to 80% of the optimum moisture content before applying the seal or wearing course.

**Rectification**

General: If a section of 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: Grade off.
- Low areas: Remove layers to a minimum depth of 75 mm, lightly tyne and replace with new material and re-compact.

**3.5 TESTING****Compaction control tests**

Standard: To AS 1289.5.4.1 and AS 1289.5.4.2.

**Frequency of compaction control tests**

General: Not less than the following (whichever requires the most tests):

- 1 test per layer per 100 lineal metres for 2-lane roads.
- 1 test per layer per 2000 m<sup>2</sup> for carparks.
- 3 tests per layer.
- 3 tests per visit.

**0274 CONCRETE PAVEMENT****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide finished surfaces as documented and as follows:

- Free draining and evenly graded between level points.
- Even and smooth riding.

**Performance**

Conformance: Conform to the local authority requirements for levels, grades and the minimum details of thickness, reinforcement and concrete strength for pavements within the kerb-and-gutter property boundaries.

**Design**

Coordination: Determine the local authority requirements initially as they may affect grades, transition, zones for the works. Considerations include:

- Drainage.
- Tree's (due to settlement).
- Adjacent structures.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Earthwork.*
- *Concrete – combined.*
- *Pavement base and subbase* worksection.

**1.3 STANDARDS****Concrete**

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Ambient temperature: The air temperature at the time of mixing and placing of concrete.
- Average ambient temperature: Average value of the maximum and minimum ambient temperatures over the relevant period at a site.
- Concrete class:
  - . Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in conformance with AS 1379 clause 1.5.3.
  - . Special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in conformance with AS 1379 clause 1.5.4.
- Green concrete: Concrete which has set but not appreciably hardened.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Weather:
  - . Cold: Ambient shade temperature less than 10°C.

- . Hot: Ambient shade temperature greater than 32°C.

## 1.5 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.

## 1.6 TOLERANCES

### General

Edges abutting gutters: Within  $\pm 5$  mm of the level of the actual gutter edge.

Rigid pavement surface:

- Absolute tolerance: + 10 mm, - 0 mm.
- Relative tolerance:  $\pm 5$  mm.

Joint locations in plan (rigid pavement):  $\pm 15$  mm.

## 1.7 SUBMISSIONS

### Execution

Work method statements: Submit proposals for the methods and equipment to be used for the pavement works, 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.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.
- Methods of concrete manufacture.
- Temperature control, curing and protection methods for concrete.

Mix design variation: If a variation is proposed, submit a further mix design report.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water at the site.
- Changes to the plastic concrete mix.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence and times for 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 splicing not documented 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.

Concrete placing: Submit proposals for size of the area to be placed and the spacing of planned construction joints before placement commences.



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 trial pavement.

### **Products**

Aggregates: Nominate the source for all aggregates proposed.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an independent testing authority.

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.

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

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.

### **Testing**

Compliance certificate: As an alternative to testing a product, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

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

## **2 PRODUCTS**

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### **2.1 REINFORCEMENT**

#### **Steel reinforcement**

Standard: To AS/NZS 4671.

Shape: As specified on the drawings

Ductility class: As specified on the drawings

Strength grade and ductility class: To AS 3600 Table 3.2.1

Identification: Supply reinforcement with readily identifiable grade and origin.

Reinforcement and joint requirements: Submit type-test reports to verify conformance for each reinforcement type

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which may reduce the bond between the reinforcement and concrete.

#### **Protective coatings**

Protective coating: Coatings to reinforcement must not reduce the performance of the reinforcement. Do not galvanize reinforcement steel. For pavements 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.

- Thickness: 200  $\mu\text{m}$  minimum.

#### **Steel fibres**

Fibre reinforcement: To CIA CPN35.

Steel fibre content: 75  $\text{kg/m}^3$ .

#### **Accessories**

Bar chairs: Use plastic tipped wire bar chairs.

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.

Quality: Provide at least 40% by mass of the total aggregates in the concrete mix of quartz sand aggregate having a nominal size of less than 5 mm and containing at least 70% quartz by mass.

Durability: All constituent, fraction of constituent or aggregates to conform to AS 1141.22 and the following:

- Wet strength not less than 80 kN.
- 10% Fines Wet/Dry Variation not to exceed 35%.

Recycled concrete aggregate (RCA): Use coarse aggregates from demolition concrete or RCA.

Blending: If blending coarse RCA with natural aggregates, make sure substitution rates are below 30%.

Slipform grading requirements: For concrete mixes proposed for slipforming, conform to the **Combined aggregate grading table** for the combined total aggregates proportion by mass passing the Australian Standard sieves.

**Combined aggregate grading table**

Australian Standard sieve	% passing by mass of sample
19.00 mm	95–100
9.50 mm	55–75
4.75 mm	36–48
2.36 mm	30–42
1.18 mm	22–34
600 µm	16–27
300 µm	5–12
150 µm	0–3
75 µm	0–2

**2.3 CEMENT****General**

Standard: To AS 3972.

Transport: Cement in watertight packaging and 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.

**2.4 FLY ASH****General**

Standard: Fine grade fly ash to AS 3582.1.

Fly ash quantity: Nil to 70 kg/m<sup>3</sup>.

Minimum binder content (fly ash plus cement): 300 to 330 kg/m<sup>3</sup>.

## 2.5 WATER

### General

Standard: Chloride ion to AS 3583.13 and sulphate ion to AS 1289.4.2.1.

Quality: Water used in the production of concrete to be potable, free from materials harmful to concrete or reinforcement, and be neither salty nor brackish.

Limits: Not containing more than:

- 600 parts per million of chloride ion, determined to AS 3583.13.
- 400 parts per million of sulphate ion, determined to AS 1289.4.2.1.

## 2.6 ADMIXTURES

### General

Standard: Chemical admixtures to AS 1478.1.

Quality: Provide admixtures 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 air temperature and setting time in conformance with 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 (ligpol) set-retarding admixture (Type Re or Type WRRe) as approved to control slump within the limits stated in Concrete mix, properties.

Cool season retarder: During the cool season, (April to September inclusive), use only a lignin or lignin based set-retarding admixture containing not more than 6% reducing sugars (Type WRRe complying with AS 1478.1).

## 2.7 CURING COMPOUNDS

### General

Curing compounds: To AS 3799 and AS 1160, Type 2, white pigmented or containing aluminium reflective pigments.

Sheet material covering: To ASTM C171, white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

## 2.8 OTHER MATERIALS

### Tactile ground surface indicators

Standard: To AS/NZS 1428.4.1.

## 3 EXECUTION

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### 3.1 TRAFFIC CONTROL

#### General

Traffic restriction: Do not allow traffic or construction equipment other than those associated with testing, sawcutting, cleaning or joint sealing on pavement for minimum 10 days after placing, or when the concrete has reached compressive strength of at least 20 Mpa, and joints have been completely sealed.

### 3.2 SUBGRADE

#### Preparation

Conformance: Prepare subgrade in conformance with the *Earthwork* worksection.

Extent: Prepare a uniform subgrade for the full pavement formation, extending at least to the back of kerbs.

Reinstatement: Make sure of uniformity for backfilling of any utility trenches.

### 3.3 SUBBASE

#### Thickness

Subbase thickness: As per details on drawings

**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 path.

Unbound subbase materials and installation: Conform to the *Pavement base and subbase* worksection.

Bound subbase materials and installation: Conform to the *Pavement base and subbase* worksection.

**Tolerance and friction reduction**

Tolerance: Subbase finished surface level, + 0 mm to –10 mm.

Friction reduction: 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**

Trial pavement: Demonstrate by placing a test section that the proposed method of placement will produce a conforming pavement. Remove test sections which do not comply with requirements and dispose of as directed.

Minimum area of test section: As agreed with Superintendent.

Location: As agreed with Superintendent.

**3.5 CONCRETE MIX****Standard**

Concrete mix and supply: To AS 3600 Section 17 and AS 1379.

**Properties**

Concrete pavement thickness: As per details on drawings.

Concrete pavement strength: As per details on drawings.

Workability: Slump values to conform to the following:

- Fixed form paving with manual operated vibration: 50 to 60 mm.
- For slip form with no side forms: 30 to 50 mm.
- Drying shrinkage: Maximum 450 µε after 21 days of air drying.

**Special class concrete additional properties**

Colour: As per details on drawings.

Aggregates: As per details on drawings.

Cement colour: As per details on drawings.

**Elapsed delivery time**

General: Ensure that the elapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 32°C.

**Elapsed delivery time table**

Concrete temperature at time of discharge (°C)	Maximum elapsed time (hours)
10 – 24	2.00
24 – 27	1.50
27 – 30	1.00
30 – 32	0.75

**Site mixed supply**

Emergencies: If mixing by hand is carried out, provide details.

Plant: Mix concrete in a plant located on the construction site as agreed with Superintendent.

**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, submit 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 during pour.
- 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.

Sampling frequency: To the **Project assessment sampling table**.

Testing authority: Concrete supplier or NATA registered laboratory.

#### Concrete testing methods

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

- Standard: To AS 1012.3.1.
- Maximum slump variation:  $\pm 10$  mm.

Compressive strength: Test to AS 1012.8.1.

Drying shrinkage: Test to AS 1012.13.

Flexural strength: To AS 1012.8.2 and AS 1012.11.

#### Project assessment sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples
1	1
2-5	2
6-10	3
11-20	4
each additional 10	1 additional

Acceptance criterion: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.

### 3.7 INSTALLATION

#### Junctions with existing pavements

Trimming: Where the pavement is to be joined to an existing pavement, remove a strip of the existing pavement at least 300 mm wide for its full depth and trim the edge vertically before placing new pavement material.

Existing sealed pavement: Trim the seal to a neat edge.

#### Fixed formwork

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks, with the full width of their top edges covered with steel angle sections finishing flush with the form face.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Absolute level tolerance:  $\pm 5$  mm.

- Relative level tolerance:  $\pm 5$  mm.
- Horizontal tolerance:  $\pm 10$  mm (maximum departure of face 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. Clean the reinforcement to remove all traces of release agent.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel 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 cross wires.

Supports: Provide proprietary concrete, metal or plastic supports to reinforcement in the form of chairs, spacers, stools, hangers and ties, as follows:

- 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, or are used with galvanized or zinc-coated reinforcement.
- Minimum spacing:
  - . Bars:  $\leq 60$  diameters.
  - . Fabric:  $\leq 800$  mm.
- Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.
- Projecting reinforcement: If starter or other bars project beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is incorporated into subsequent work.
- Tying: Secure the reinforcement against displacement by tying at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.
- 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, reposition but do not cut reinforcement, and maintain cover to reinforcement.

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

## 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 placing. Hand spread concrete using shovels, not rakes.

Remove: Any water ponding on the ground.

Placing sequence: Commence from one corner (usually the lowest point) and proceed continuously out from that point.

Weather: Do not place concrete in 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

General: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date of concrete placement.
- Delivery dockets noting the specified grade and source of concrete.
- Slump measurements to AS 1012.3.1.
- The portion of work.
- Volume placed.

### Rain

General: During placement and before setting, do not expose concrete to rain.

Protection: Protect surface from damage by covering until hardened.

### Concrete placing in cold weather

Cement: Do not use high alumina cement.

Placing concrete: Maintain the temperature of the freshly mixed concrete at 5°C.

Formwork and reinforcement: Before and during placing maintain temperature at 5°C.

Severe weather: If severe weather conditions are predicted, use high early strength cement.

Temperature control: Heat the concrete materials, other than cement, to the minimum temperature necessary to ensure that the temperature of the placed concrete is within the limits specified.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.

Maximum temperature of water: 60°C when it is placed in the mixer.

Plastic concrete: Prevent plastic concrete from freezing, without using salts or chemicals.

### Concrete placing in hot weather

Handling: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses. Mix, transport, place and compact the concrete in conformance with the **Elapsed delivery time table**.

Placing concrete: Maintain the temperature of the freshly mixed concrete in conformance with the **Hot weather placing table**.

Formwork and reinforcement: Before and during placing maintain temperature at 35°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.

### Hot weather placing table

Concrete element	Temperature limit
Normal concrete in footings, beams, columns, walls and slabs	35°C
Concrete in sections $\geq 1$ m in all dimensions except for concrete of strength 40 MPa or greater, in sections exceeding 600 mm in thickness	27°C

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

## 3.9 CONCRETE PRIMARY FINISH

### General

Finishing: Do not commence finishing until all bleed water has evaporated from the surface.

Commence: Immediately after placement and spreading and compaction of the plastic concrete, start finishing operations to achieve the documented finish.

Finish: As per details on drawings.

#### **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.

### **3.10 CONCRETE CURING**

#### **General**

Curing: Commence curing as soon as possible after finishing and extend for a minimum period of 3 days.

End of curing period: Prevent rapid drying out at the end of the curing period.

Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

#### **Cold weather curing**

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

#### **Hot weather curing**

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

Protection: Select a protection method as applicable.

- If the concrete temperature exceeds 25°C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is more than 35°C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

#### **Curing methods**

Covering sheet method: Immediately after finishing operations, 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: Immediately after finishing operations and when the concrete has set sufficiently not to be damaged by the curing process, 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.

Self-levelling toppings: To AS 3799, if also used for curing.

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.

#### **Curing compound**

Application: 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.

### **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 per details on drawings.



**Contraction joints**

Installation: Construct transverse and longitudinal contraction joints by early power sawing or by placing an insert in the fresh concrete.

**Dowelled joints**

Dowelled contraction joint: Place dowels at 300 mm centres orthogonal to the joint direction and parallel to the pavement surface, accurate alignment is critical, ensure proper field supervision.

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: Coat with a debonding coating to 0.5 length + 25 mm. Embed the unpainted half of the dowels in the slab placed first.

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.

**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**

Requirement: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

Dowelled expansion joints: Cap dowels at one end with a compressible material.

**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 steel 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 ravelling 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 has 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. If uncontrolled cracking occurs, suspend concrete placing.
- 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. Temporarily

caulk the joint using plastic or rubber tubing, or a suitable Tee shaped extrusion. Leave the caulking in place until grooving and sealing.

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.

Protection: Where there is a time elapse after sawing and before joint sealing, install a thin-splined rubber strip with a free width slightly larger than the saw cut at the bottom of the saw cut after washing slurry from sawn groove to temporarily prevent ingress of solid material.

### **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**

### **Concrete finishes**

Conform to: Finishes in the *Concrete – combined* worksection and as per details on drawings.

### **Surface repairs**

Repair method: If required, submit proposals.

## **3.13 COMPLETION**

### **Protection**

General: Keep traffic, including construction plant, off the pavement entirely at all times.

### **Reinstating adjacent surfaces**

General: Reinstat surfaces next to new pavements and associated elements. Where an existing road pavement has been disturbed, trim it back to a straight and undisturbed edge, 250 to 300 mm from and parallel to the new concrete for the full depth of the slab.

### **Testing**

Concrete pavement: Check tolerances. Where pavement does not conform submit rectification proposal.

Unplanned cracking:

- 0.3 mm wide crack is acceptable.
- > 1 mm must be assessed, submit a proposal for possible cause and rectification processes.

**0275 SEGMENTAL PAVERS – MORTAR AND ADHESIVE BED****1 GENERAL****1.1 RESPONSIBILITIES****General**

Requirement: Provide segmental paving, as documented and as follows:

- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Resistant to expected impacts in use.
- Set out with joints accurately aligned in both directions.
- To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

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

Requirement: Conform to the following worksection(s):

- *General requirements.*
- *Pavement base and subbase*

**1.3 STANDARDS****Slip resistance**

Classification: To AS 4586.

Slip resistance measurement of completed installations: To AS 4663.

**1.4 INTERPRETATION****Definitions**

General: For the purposes of this worksection the definitions given below apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Bedding: Mixtures of materials which are applied to substrates in a plastic state and dry and cure to adhere pavers to substrates.
  - . Adhesive bedding: Paving adhered by a cementitious adhesives bed.
  - . Mortar bedding: Paving adhered in a cementitious mortar bed.
- Cementitious adhesives (C): Adhesives in which the binders are hydraulic, e.g. Portland cement, with aggregates and organic additives.
- Lippage: Height deviation between adjacent pavers or other surface features.
- Pavers: Units made from clays, stone, precast concrete and/or other inorganic raw materials generally over 20 mm thick used as coverings for floors and supported over continuous substrates.
- 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.
- Soldier course: A course of whole or trimmed rectangular pavers at the pavement restraint edge.

**1.5 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.

## 1.6 TOLERANCES

### Completed paving

General: Conform to the **Surface level tolerances table**.

#### Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Pedestrian pavements	± 10 mm	10 mm

Lippage:

- Unpolished pavers: Less than 2 mm.

## 1.7 SUBMISSIONS

### Execution

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.

### Materials

Product conformity: Submit current assessments of conformity as follows:

- Marking and classification of adhesive to AS ISO 13007.1.

### Samples

General: Submit labelled samples of pavers, grout and sealants, illustrating the range of variation in colour and finish.

### Sample panels

General: 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.

Location: As agreed with Superintendent.

### Tests

Type tests: Submit results, as follows:

- Type test slip resistance of pavers to AS 4586.

Other tests: Submit results, as follows:

- Site slip resistance test of completed installation to AS 4663.
- Salt efflorescence of paver prototype testing.

## 2 PRODUCTS

### 2.1 MARKING

#### Identification

General: Deliver materials to the site in the manufacturer's original sealed containers or packaging, legibly marked to show the following:

- Manufacturer's identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.
- Material composition and characteristics such as volatility, flash point, light fastness, colour and pattern. Provide technical data sheets if not shown on labels.
- Handling and installation instructions.

- Safety data sheets.

## 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.

Gauging: Site gauged by volume.

## 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 PAVERS

### Masonry units, pavers and flags

Standard: To AS/NZS 4455.2.

### Sandstone flagging

Description: Provide sound stone flags of uniform quality. Reject flags with any of the following defects liable to affect strength and durability: Vents, cracks, fissures, seams, porous inclusions, foreign material, loose surface material or discolouration.

Matching: Select for optimum matching of colour and pattern.

Split flagging thickness: Minimum 50 mm, maximum 75 mm.

Face size: Utilise smaller sizes for pathways and larger sizes for open areas and maintain traditional stone flagging appearance.

### Stone setts

Description: Igneous stone, cubed, cobble-style setts.

## 2.5 OTHER MATERIALS

### 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.

### 3 EXECUTION

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#### 3.1 SUBSTRATES

##### Drying and shrinkage

General: 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.

#### 3.2 PREPARATION

##### 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.

##### 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.

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.

#### 3.3 PAVING GENERALLY

##### 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.

### 3.4 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 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.

#### 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.

Nominal thickness: As per details on drawings.

#### 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

Description: 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.

### 3.5 MOVEMENT JOINTS

#### General

General: 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 COMPLETION**

#### **Spare pavers**

General: Supply spare matching pavers of each type for future replacement purposes. Store the spare materials on site as directed by the Superintendent.

Quantity: At least 1% of the quantity installed.

Storage location: As agreed with Superintendent

#### **Cleaning**

Completion: Clean progressively and leave pavements clean on completion.

#### **Operation and maintenance manuals**

General: Submit a manual describing care and maintenance of the paving, including procedures for maintaining the slip-resistance grading stating the expected life of the slip-resistance grade.

## **4 SELECTIONS**

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### **4.1 SCHEDULES**

Refer to Schedule of Materials and Finishes on drawings.