# Brisbane City Council

# Reference Specifications for Engineering Work

# S190 Landscaping

## Amendment Register

|  |  |  |  |
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## GENERAL

### Section Content

Specified in this section: Ground preparation, cultivation, topsoiling, compost and fertiliser, grassing, hydroseeding and hydromulching, turfing, supply of plants and trees, mulching, transplanting, planting, plant support, tree surgery, planting establishment and supply and application of water.

### Compliance

All work should comply with all current and relevant legislation, standards requirements, including, but not limited to:

* Environmental Protection Act 1994 (Epact.)
* Work and Healthy Safety Act (the WHS Act)
* Construction Work: Code of Practice (Safe Work Australia)
* Excavation – Work Code of Practice (Safe Work Australia)
* Environmental Protection (Water) Policy 2009
* Brisbane City Council Legislation, Local Laws and Policies.

### Standards

|  |  |  |
| --- | --- | --- |
| Australian Standard | AS 1160 | Bituminous emulsions for the construction and maintenance of pavements |
| Australian Standard | AS 1289.5.1.1 | Methods of testing soils for engineering purposes – Soil compaction and density tests – Determination of the dry density/moisture content relation of a soil using standard compactive effort |
| Australian Standard | AS 1289.5.4.1 | Methods of testing soils for engineering purposes – Soil compaction and density tests – Compaction control test – Dry density ratio, moisture variation and moisture ratio |
| Australian Standard | AS 4373 | Pruning of amenity trees |
| Australian Standard | AS 4419 | Soils for landscaping and garden use |
| Australian Standard | AS 4454 | Composts, soil conditioners and mulches |
| Australian Standard | AS 4970 | Protection of trees on development sites |
| NATSPEC reference book |  | Specifying Trees – a guide to assessment of tree quality, 2003 (Ross Clark) |

### References

|  |  |
| --- | --- |
| Queensland Department of Science, Information Technology, Innovation and the Arts, Science Division Queensland | Acid Sulfate Soil Technical Manual |

The Contractor is responsible to ensure that landscape specification is read in conjunction with Reference Specifications for Engineering Works and Standard Drawings as required.

### Interpretation

Definitions

Site rock: Rocks approved for salvage.

Site topsoil: Soil excavated from the site that contains organic matter, supports plant life, and free from unwanted matter.

Unwanted matter (in topsoil): Stones over 25 mm diameter, clay lumps, weeds and tree roots, sticks and rubbish, and material toxic to plants.

Imported topsoil:

* Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
* Medium: Sandy loam, fine sandy loam.
* Coarse: Sand, loamy sand.

Topsoil mixture: Topsoil and compost or other additives, thoroughly mixed before placing.

Apical bud: The dominance of the terminal bud to the lateral buds.

Bark ridge: Raised or furrowed bark in the branch crotch that marks where the branch wood and trunk would meet.

Branch collar: Trunk tissue that forms around the base of a branch between the main stem and the branch.

Calliper: Stem diameter at a nominated point above the soil level within a container.

Central leader: The clearly defined single, dominant stem at the top of the tree.

Chlorosis: Abnormal yellow of a plant as from lack of iron in the soil.

Root girdling: Roots that encircle the base of the trunk and/or the buttress roots, and which may prevent their growth.

Internode: The portion of a stem between two nodes.

Node: The portion of a stem from which a leaf or bract rises.

## QUALITY

### Inspection

Witness points

*Refer annexure*. Give sufficient notice so that inspection may be made at the following stages:

* Setting out completed.
* Subgrades cultivated or prepared for placing topsoil.
* Topsoil spread before planting.
* Grassing area prepared before turfing, seeding, or temporary grassing.
* Plant holes excavated and prepared for planting.
* Trees before off loading on site.
* Plant material set out before planting.
* Planting, staking and tying completed.
* Grassing or turfing completed.
* Completion of planting establishment period.

Partial sampling

Method: Expose a small section of the rootball, by washing sufficiently to permit inspection of root development from the stem to the outer extremity. After inspection, carefully replace soil.

Rates: Inspect root systems using partial sampling at the following rates.

* ≤20 trees: 1 tree sampled.
* 21 - 50 trees: 2 trees sampled.
* ≥51 trees: 4%.

### Samples

General

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content. Unless specified otherwise, submit sample quantities as follows. *Refer annexure*.

* Seed (each species): 0.5 kg.
* Fertiliser: 1 kg.
* Planting media (topsoil): 5 kg.
* Soil additive: 0.5 kg.
* Organic mulch: 2 kg.
* Inorganic mulch: 5 kg.
* Plant ties: 2 No.
* Weed control matting: 1 m2.
* Tree mat: 1 No.
* Erosion control matting: 1 m2.
* Irrigation components: 1 of each type of component.
* Garden edge: 1 m.

Plant materials

Quantity: Unless specified otherwise, submit one plant sample for each 100 of each species or variety, in the condition in which it is proposed to supply that plant to the site. Alternatively arrange for an inspection of stock prior to delivery to site. *Refer annexure*.

### Submissions

The cost associated with material compliance testing/submissions shall be deemed to be incorporated in the relevant works. Payment for achieving the specified tolerance shall be deemed to be included in the Contractor’s schedule rate for the relevant works.

Grass seed (for approval):

* Submit a Certificate identifying seed species, purity, age and germination viability
* Material source of supply.

Turf (for approval):

* Submit a Certificate identifying species (Cultivar or true turf name)
* Submit a Turf warranty
* Submit a certificate of proof that the supplier is a certified specialist grower of cultivated turf
* Submit a certificate of proof that soils used in the production of turf must be free of Fungal Diseases (such as phytophra) and must conform to *AS 4419*
* Submit evidence of the grade of fertiliser in use and its release capabilities.

Mulch (for approval):

* Submit a certificate of compliance according to *AS 4454*.

Compost (for approval):

* Submit a certificate of proof of compost pH value complying with *AS 4454*.

Plants:

* Submit the supplier's written statement certifying that plants are true to the required species and type, and are free from diseases, pests and weeds.
* Submit Plant Supply Proposal for approval: (The Plant Supply Proposal nominates the supplier and location of the plants and certification that the plants will meet the specification at time of planting.)

Soil (for approval):

* Submit test results demonstrating all supplied soils complies with *AS 4419-Soils for Landscaping and Garden Use* and meets the chemical contaminants criteria for unrestricted use at the time of delivery.

## SITE AND SOIL

### 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. *Refer annexure*.

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

Manual removal of species designated as declared plants under the *Brisbane Invasive Species Management Plan*, in accordance with techniques described in Council’s Weed ID on-line tool. Monitor and remove any regrowth.

Vegetative spoil

Remove vegetative spoil from site. Do not burn.

Earth mounds

Place clean fill in layers approximately 150 mm thick (loose layer) compacted to 90% of the dry density ratio of the surrounding soil as determined by *AS 1289.5.1.1* and *AS 1289.5.4.1* (standard compactive effort). Minimise slumping and further internal packing down. Construct changes in grade over a minimum width of 2 m to smooth, gradual and rounded profiles.

Subgrade

Do not compact subgrade in garden and turf areas to greater than to 90% of the dry density ratio of the surrounding soil as determined by *AS 1289.5.1.*1 and *AS 1289.5.4.1* (standard compactive effort).

Embankment stabilisation

General: Where necessary to prevent erosion or soil movement, stabilise the embankments. *Refer annexure*.

Method: Either coir log or equivalent, matting overlay or hydromulching. Undertake preparations of the embankment including weed treatment, ground treatment and soil provision as nominated &/or as necessary to stabilise the slope and establish vegetation.

Where sowing is required, sow before matting is installed. Where planting is required, plant after matting is installed. Peg the matting into 300 x 300 mm anchor trenches at top and bottom, backfill the trenches with soil and compact.

Coir log: 100% coir fibre bound by coir fibre netting which is biodegradable.

Coir Log installation: 3 hwd 50 x50 x 800 mm pegs per log approximately 600 mm into ground and protrude 200 mm to top of log. Ensure pegs are fastened to logs per manufacturer’s instructions. *Refer annexure.*

Matting: Biodegradable fibre reinforced with lightweight polymer mesh. Provide lightweight material for seeding, medium or heavy weight material for planting. *Refer annexure*.

Matting pegs: U-shape galvanised steel, at 1000 x 1000 mm intervals generally, 250 mm at overlaps.

Landscape rock work

General: Place rocks while ground formation work is being carried out. Where appropriate provide site rock, otherwise provide approved imported rock. Bury rock two-thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.  *Refer annexure*.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock that has been selected before delivery.

Rock outcrops

General: Protect existing rock, rock shelves and rock outcrops from mechanical damage and surface defacement. *Refer annexure*.

### Subsoil

Ripping

General: Rip parallel to the final contours wherever possible. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Compacted subsoil: Rip 300 mm deep unless specified otherwise. *Refer annexure*.

Heavily compacted clay subsoil: Rip 450 mm deep unless specified otherwise. *Refer annexure*.

Cultivation

Cultivation depth to existing subgrade: 150 mm unless specified otherwise. *Refer annexure*.

Cultivation depth to garden areas: 300 mm unless specified otherwise. *Refer annexure*.

Cultivation depth to turf and grass areas: 100 mm unless specified otherwise. *Refer annexure*.

Services and roots: Do not disturb services. Keep clear of tree roots in drip zone. Cultivate by hand if necessary.

Method: Thoroughly mix in additives that are required to be incorporated into the subsoil. Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.  *Refer annexure*.

Additives

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil. Additive types are determined by the chemistry and structural condition of the site soils compared to the acceptable ranges described in *AS 4419*.

Gypsum: Incorporate at the rate of 0.25 kg/m2 where required. *Refer annexure*.

### Topsoil

Source

General: Import topsoil unless the topsoil type can be provided from material recovered from the site. *Refer annexure*.

**General requirements:**

All soils should be free of:

* Soil borne insects
* Plant propagules
* Plant pathogens; and

Be stored under conditions that do not favour infestation.

The soil should not contain any materials or organisms harmful to animals or humans. “Materials” includes harmful objects such as metal shards and glass, and chemicals at concentrations in excess of the levels specified within the *Queensland Environmental Protection Agency (EPA) Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* dated May 2003.

Soil supplied shall be sourced from a site not listed on the *Queensland Environmental Management Register (EMR)* or *Contaminated Land Register (CLR)*.

Soil material shall be sourced from low risk Acid Sulphate Soil Areas as described in the *Queensland Acid Sulfate Soil Technical Manual* and as shown in the *Queensland Soil and Land Information (SALI) database.*

Storage

All Materials shall be stored in an appropriate manner that ensures no deterioration or contamination occurs to the material. All necessary measures shall be implemented to reduce the potential for environmental harm which might arise from the storage of materials.

The Contractor shall comply with any relevant requirements in the Contract and/or Statutes/and or Australian Standards and/or the manufacturer’s instruction in relation to proper handling and care of materials.

Types and applications

Type: **Brisbane City Council Horizon A** (to Organic Soil per *AS 4419-2003*, except as specified in the table below):

| Soil Type | Brisbane City Council HORIZON A |
| --- | --- |
| Description/texture | Organic Soil Blend |
| Use | Podium planters & tree pits (Top 300°mm) |
| Hydraulic Conductivity | 15°-°30 cm/hr |
| Organic Matter Content by Mass | Max 30%  screened composted organic matter |
| Chlorine Content | Max 500 mg/kg |
| Electrical Resistivity of one in five soil/water mix | Max 1 ds/m |
| PH | 5.5°-°6.5 |
| Linear Shrinkage | 3% |

Type: **Brisbane City Council Horizon B** (to Soil Blend per *AS 4419-2003*, except as specified in the table below)

| Soil Type | Brisbane City Council HORIZON B |
| --- | --- |
| Description/texture | Soil blend, low organic, conforming to *AS°4419* |
| Use | Podium planters & tree pits (Below 300°mm) & structural cell filler soils |
| Hydraulic Conductivity | 30°-°80°cm/hr |
| Organic Matter Content by Mass | 3%-8% |
| Chlorine Content | Max 500°mg/kg |
| Electrical Resistivity of one in five soil/water mix | Max 1°ds/m |
| PH | 5.5°-°6.5 |
| Linear Shrinkage | 5% |

Type: **Brisbane City Council Top Dressing Soil Type ‘A’** (to Soil Blend, suitable for Top Dressing per *AS 4419-2003*, except as specified in the table below).

| Soil Type | Brisbane City Council Soil Type ‘A’ |
| --- | --- |
| Description/texture | Friable sandy loam textured material as per AS texture classification. Light to medium friable capable of being handled when wet but lacking cohesion so will fall apart when dry. |
| Use | Turf and top dressing |
| Organic Matter Content by Mass | Min 2% |
| Chlorine Content | Max 500°mg/kg |
| Electrical Resistivity of one in five soil/ water mix | Max 1°ds/m |
| PH | 5.5°-°6.5 |
| Linear Shrinkage | 3% |
| Particle Size | See table below |

|  |  |
| --- | --- |
| Topsoil Particle Size Soil Types ‘A’ | |
| A.S. sieve aperture | % passing by mass – Soil Type ‘A’ – Turf |
| 2.36 mm | 100 |
| 1.18 mm | 90 - 100 |
| 0.600 mm | 75 - 100 |
| 0.300 mm | 30 - 85 |
| 0.150 mm | 16 - 40 |
| 0.075 mm | 6 - 30 |

Type: **Brisbane City Council Turfing Soil Type ‘B’** (to Soil Blend per *AS 4419-2003* except as specified in the table below).

| Soil Type | Brisbane City Council Soil Type ‘B’ |
| --- | --- |
| Description/texture | Friable sandy loam textured material as per AS texture classification. Light to medium friable capable of being handled when wet but lacking cohesion so will fall apart when dry. |
| Use | Grassed areas |
| Organic Matter Content by Mass | Min 2% |
| Chlorine Content | Max 500°mg/kg |
| Electrical Resistivity of one in five soil/water mix | Max 1°ds/m |
| PH | 5.5°-°6.5 |
| Linear Shrinkage | 5% |
| Particle Size | See table below |

|  |  |
| --- | --- |
| Topsoil Particle Size Soil Types ‘B’ | |
| A.S. sieve aperture | % passing by mass – Soil Type ‘B’ – Turf |
| 2.36 mm | 100 |
| 1.18 mm | 90 - 100 |
| 0.600 mm | 70 - 100 |
| 0.300 mm | 30 - 95 |
| 0.150 mm | 16 - 60 |
| 0.75 mm | 6 - 45 |

Type: **Brisbane City Council Soil Type Enviro-Mix** (to Organic soil per *AS 4419-2003* except as specified in the table below)

| Soil Type | Brisbane City Council Soil Type Enviro-Mix |
| --- | --- |
| Description/texture | Organic Soil |
| Use | High Profile Garden beds/shrubs & groundcover planting |
| Australian Standard | *AS 4419-2003* |
| Components | 35% – comprised of abattoir waste, green waste and sawdust |
| 5% – sand |
| 60% – ground stone coal waste or approved equivalent |
| PH | 5.5°-°6.5 |

Type: **Brisbane City Council Parkland Soil Mix** (to Soil blend per *AS 4419-2003* except as specified in the table below.

| Soil Type | Council Parkland Soil |
| --- | --- |
| Description/texture | Friable natural soil & soil blend Texture of loam or sandy loam when determined in accordance with App I table II AS 4419-2003 |
| Use | Standard parklands / landscaping |
| Density | Not less than 1°kg/L |
| Hydraulic Conductivity | 20°-°80°cm/hr |
| Organic Matter Content by Mass | not less than 3% or more than 10% organic content |
| Electrical Resistivity of one in five soil/water mix | <1.2°ds/m |
| PH | 5.5°-°7.5 |
| Wettability | >°5°mm/min |
| Dispersibility | Conform with Emmerson Class 6 |
| Phosphorus Content | <20°mg/kg |
| Carbon to Nitrogen Ratio | <80°to°1 |
| Particle Size | Mineral particles not greater than 2.36°mm. Organic particles, not more than 4.75°mm and not more than 15% greater than 2.36°mm. |

Type: **Brisbane City Council Natural Soil** (as per Australian Standards except as specified in the table below)

| Soil Type | Natural Soil |  |  |
| --- | --- | --- | --- |
| Bulk Density kg/L | >0.7 | 1.4 | Natural Soil |
| Organic Matter Content (%) | 3.0% to 15% | 4.50 | Passes |
| Weed Content | Free of Vegetative Propagules |  | Passes |
| Wettability | >5°mm/min | 150.00 | Passes |
| Soil pH (1:5 Water) | Acid Soil pH Range 4.5°-°6.0 | 5.40 | Passes |
| Electrical Conductivity (1:5 Water) | <1.2°ds/m | 0.16 | Passes |
| Ammonium Toxicity | <200\* | <5 | Passes |
| Phosphorous Content | <20°mg/kg | 0.22 | Passes |
| Dispersibility | <2 Categories Difference | 1 | Passes |
| Toxicity | >50 | 84.00 | Passes |
| Nitrogen Drawdown (NDI) | >0 | 1 | Passes |
| Permeability | 2.0°to°100 | 9.00 | Passes |
| Texture | N/A | Loamy Sand |  |
| Large Particles | <10 | 0.00 | Passes |

Type: **Loam – as specified by Australian Standards**

Placing topsoil

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

* Achieve required finished levels and contours after light compaction.
* Finished surface levels of grassed areas to be flush with adjacent hard surfaces such as kerbs, paths and mowing strips.
* Finished surface levels of mulched areas to be 25 mm below adjacent pathways, kerb or the like.

Contamination: Where diesel oil, cement or other phytotoxic material has been spilt on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil to restore design levels.

Finishing: Feather edges into adjoining undisturbed ground.

Consolidation

Compact lightly and uniformly in 150 mm loose layers. Avoid differential subsidence and excess compaction. Produce a finished topsoil surface that has the following characteristics:

* Finish to design levels.
* Smooth and free from stones or lumps of soil.
* Graded to drain freely, without ponding or concentration of flows to catchment points.
* Graded evenly into adjoining ground surfaces.
* Ready for planting.

Topsoil depths

Excavated planting areas: Unless specified otherwise, 225 mm if using organic mulch and 250 mm if using gravel mulch. *Refer annexure*.

Podium planters: As specified otherwise, 1000 mm for small trees, 600 mm for screening shrubs, and 300 mm for ground cover.  *Refer annexure*.

Tree pits: As specified otherwise 800 mm.  *Refer annexure*.

Irrigated grassed areas generally: As specified otherwise 150 mm.  *Refer annexure*.

Irrigated grassed areas, heavy use (e.g. playing fields, playgrounds, public parks): As specified otherwise 200 mm.  *Refer annexure*.

Non-irrigated grass areas: As specified, otherwise 100 mm.  *Refer annexure*.

Surplus topsoil

General: Spread surplus topsoil on designated areas on site, if any. Otherwise, dispose of site. *Refer annexure*.

### Compost And Fertiliser

Compost

General: Provide well-rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth as per *AS 4454*.  *Refer annexure*.

Fertiliser

Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, N:P:K ratio, recommended uses and application rates.  *Refer annexure*.

## GRASS

### Grass Seeding

Seed

General: Provide seed mixtures that are thoroughly pre-mixed with a bulking material such as safflower meal. Deliver to the site in bags marked to show weight, seed species and supplier's name. Provide fresh, clean, uncoated new seed. Do not provide wet, mouldy, or otherwise impaired seed.

Purity: Minimum 98%.

Germination viability: Minimum 86%.

Age: Maximum 2 years from date of harvest.

Seed mix

Application: As specified otherwise, apply Mix Type A to all footpaths, batters, disturbed areas in and adjacent to road reserves, and to municipal areas of parks and gardens. Where required, the mix may be varied to suit local conditions, soil properties, method of works, etc. *Refer annexure*.

Table 4.1 – Mix Type A

|  |  |
| --- | --- |
| Seed species | Proportion |
| *Cynodon dactylon* (green couch) or *Digitaria didactyla* (blue couch) – hulled | 30% |
| *Cynodon dactylon* (green couch) or *Digitaria didactyla* (blue couch) – unhulled | 30% |
| *Axonopus affinis* (carpet grass) | 30% |
| Tetila rye (in dry season) or Japanese millet (in wet season) | 10% |

Table 4.2 – Mix Type B

|  |  |
| --- | --- |
| Seed species | Proportion |
| *Cynodon dactylon* (green couch) or *Digitaria didactyla* (blue couch) – hulled | 33% |
| *Cynodon dactylon* (green couch) or *Digitaria didactyla* (blue couch) – unhulled | 33% |
| *Axonopus affinis* (carpet grass) | 33% |

Preparation

Prepare the areas to be sown. Spread the fertiliser evenly over the cultivated bed within 48 hours before sowing, and rake lightly into the surface. If a prepared area becomes compacted from any cause before sowing can begin, rework the ground surface before sowing.

Sowing

Do not sow if frost is likely before the plant has reached an established state, or in periods of extreme heat, cold or wet, or when wind velocities exceed 8 km/h. Provide even distribution. Lightly rake the surface to cover the seed. *Refer annexure*.

Rolling

General: Roll the seed bed immediately after sowing.

Roller weight (maximum): 90 kg/m width applies to clay and packing (heavy) soils; 300 kg/m width applies to sandy and light soils.

Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

Germination

General: Maintain sown areas until the attainment of a dense continuous sward of healthy grass over the whole of the seeded area, evenly green and of a consistent height.

Reseeding: If germination has not been attained within one month, reseed the sown areas.

Reseeding mixture: Use the original seed mixture.

Weeding

Removal: Remove weeds that occur in sown areas.

Spraying: Where necessary spray with a selective herbicide for broad leafed weeds. Do not spray grass seeded areas within 3 months of germination.

Protection

General: Protect the newly sown areas against traffic until well established. *Refer annexure*.

Fertilising after germination

Six weeks after germination: Spread suitable grass establishment fertiliser evenly over the sown area and then water in. Do not apply the fertiliser to wet grass.

Ten weeks after grass germination: If the planting establishment period carries through the summer months, spread pelleted sulphate of ammonia at the rate of 250 kg/ha.

Mowing

Mow when grass height exceeds 100 mm. Maintain the grass height within the required range of 50 ± 15 mm. Carry out the last mowing within 7 days before the end of the planting establishment period. Disperse grass clippings evenly over the mowed area. In areas where mowers cannot gain access, trim grass with power scythes.

### Hydroseeding and Hydromulching

Hydroseeding mixture

A slurry of seed mixture, fertiliser, and water. Seed mix type A complying with Table 4.2. Fertiliser to be a broad spectrum type CK55 or equivalent. *Refer annexure*.

Hydromulching mixture

A slurry of seed mixture, fertiliser, mulch and water. Use in locations where turfing and drill seeding are unsuitable for grass establishment, such as slopes and batters steeper than 1V:4H, or areas too large to turf and too small to seed drill. Seed Mix Type A complying with Table 4.2. Fertiliser to be a broad spectrum type CK55 or equivalent. Mulch to consist of pulped paper and bagasse. *Refer annexure*.

Mixing

Thoroughly mix the slurry in a purpose made mechanical mixer.

Binder

Extent: Use for steep slopes or areas exposed to high winds. For application to sloping areas, include a bitumen emulsion or polymer binder, either as part of the mix, or applied separately.

Generally: Provide materials suitable for cold spray application to stabilise mulched or seeded surfaces on banks or high erosion areas.

Bitumen emulsion: To *AS 1160* Bituminous emulsions for the construction and maintenance of pavements. Type ASS/170-60 containing no ingredient toxic to plants.

Polymer: A suitable polymer based emulsion.

Application rates

Seed mixture: The rate applicable to the mix type. Refer Table 4.3.

Mulch: At least 2.5 t/ha with seed or 5 t/ha without seed. Refer Table 4.3.

Bitumen emulsion binder: 2000 L/ha of residual bitumen. Refer Table 4.3.

Polymer binder: 250 L/ha. Refer Table 4.3.

Water: Suitable for the site conditions, and sufficient to assist in the distribution of the seed, fertiliser and mulch. Refer Table 4.3.

Table 4.3 – Hydromulching application rates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Slurry mixture | Minimum application rate each 1000 m2 | | | | |
| Flat to gentle slopes <5% | Gentle slopes 5 - 12% | Slopes12 - 20% | Slopes  20 - 50% | Steep slopes >50% |
| Pulped paper | 200 kg | 100 kg | 125 kg | 125 kg | 250 kg |
| Bagasse | 200 kg | 400 kg | 500 kg | 700 kg | N/A |
| Fertiliser | 50 kg | 50 kg | 50 kg | 70 kg | As required |
| Seed | 6 kg | 6 kg | 6 kg | 7 kg | 12 kg |
| Water | As required | As required | As required | As required | As required |
| Binder | N/A | N/A | As required | As required | As required |

Preparation

Scarify the area to be seeded to provide a firm friable seed bed. If topsoil is to be added, place topsoil before scarifying.

Application

Moisten the topsoil to its full depth before applying the slurry. Apply the slurry using high pressure pumping equipment operated by trained personnel. Spray the mixed slurry under pressure, maintaining the thoroughly mixed supply, operating on a front so that the mixture is evenly distributed over the area. Complete each front before next.

Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

Mowing

Mow when grass height exceeds 100 mm at hydroseeded or hydromulched areas. Maintain the grass height within the required range of 50 + 15 mm. Carry out the last mowing within 7 days before the end of the planting establishment period. Disperse grass clippings evenly over the mowed area. In areas where mowers cannot gain access, trim grass with power scythes.

### Turfing

Turf

General: Obtain turf from a specialist grower of cultivated turf. Provide turf of even thickness, free from weeds (including nut grass and oxalis) and other foreign matter. Cut turf to a minimum 25 mm thick in long 300 mm wide strips.

Type: As specified otherwise, provide ‘A’ grade *Cynodon dactylon* (green couch) or *Digitaria didactyla* (blue couch). *Refer annexure*.

The following summary of applications and relevant currently used grass species are offered as a guide only. The species, their equivalent (in those instances where the species is a proprietary item) and their applications are not limited to;

* Public open space, footpaths, median strips, parks & recreation areas, erosion controls. Hard wearing, Drought and Frost tolerant turfgrasses (Green Couch – WinterGreen - Greenlees Park - Santa Ana – Legend – Plateau – CT2)
* Shade tolerant turfgrasses (Sir Walter – Palmetto - ST85 – Plateau – Sweet Smother)
* Sports-fields (Legend – TifSport – CT2)
* Salt resistant, environmentally friendly (Sea Isle 1 – Salteen – Sea Isle 2000)
* Erosion control (Reinforced Turf)
* Golf Greens (TifEagle – Sea Isle 2000 – TifGreen 328)
* Golf Fairways & Tees (Legend – Sea Isle 1 – CT2 – TifSport – Greenlees Park)
* Other applications (Blue Couch – Aussie Blue – Blue Green)

Turf grading

“PREMIUM Grade” or “A Grade” is turf of any particular species that contains 97% or more of that species per square metre, and no visible contamination from other species, weed (paspalum, nutgrass, oxalis, bindii, etc) or any other deleterious material. Soil quality, texture and structure are also major factors in determining turf quality.

“COVER Grade” or “B Grade” is turf containing 96% or less of the selected species per square metre, and minor visible contamination from other species or weed. It shall be supplied only on specific request from Council. Receipt of Cover Grade turf shall be subject to approval prior to laying.

The Contractor must provide Turf Certification of the species.

Turf harvesting

Turf shall be harvested by self-propelled mechanical harvesters, fitted with reciprocating cutter blades. Contractors must ensure that all relevant Federal, State and Local Occupational Health and Safety requirements are adhered to.

Harvesting equipment shall be operated by qualified and competent, trained operators.

Turf shall be free of weeds (paspalum, nutgrass, oxalis, bindii, etc.) and the soil attached shall be free of tree roots, rock and other deleterious matter.

Additional factors to be taken into consideration at the time of harvest are;

* Leaf colour and uniformity
* Density of stems and foliage
* Binding quality
* Amount of weed growth present
* Presence of insects and diseases.
* Roots present at lifting and the ability to re-establish successfully

Turf thickness

Thickness of rolls shall be of uniform size, determined by soil type and texture and shall conform to standard industry acceptance, but must take into consideration ease of handling and transportation. Turf must be able to withstand the lifting and transporting processes, without incurring significant deterioration of the product.

The Contractor shall use the industry standard of 35 mm as a guide (10 - 20 mm of soil & 10 - 15 mm of mat), but must also take into consideration moisture retention, ambient temperature, species, and the proposed method of installation.

The Contractor must demonstrate a commitment to the health and safety of its employees and Council personnel engaged in the handling of turf.

Roll lengths

Roll lengths shall be provided in accordance with industry standards and Council’s requirements and must take into consideration the deterioration that occurs during handling and transportation and the health and safety of those personnel engaged in handling turf.

Post harvest handling and delivery

Turf shall be stacked on wooden pallets or similar method for ease of handling. Loading and unloading by hand shall be executed with extreme care to minimise damage to the product.

The Contractor shall ensure that moisture loss from turf in transit is minimised. The Contractor must also ensure that loads do not cause traffic hazards through the loss of material during transit.

Where possible, pallets shall be placed on level ground at the site, as directed, but in close proximity, and with good access, to the site at which the turf will be placed. It is recommended that, where mechanical means are used to offload pallets (fork-lift), care be taken to avoid damage to the site and its surrounds. The Contractor must have the equipment necessary to distribute pallets of turf around the site to enable easy access and reduced laying time.

Empty pallets, turf off-cuts and other excess materials, used in the supply and laying of turf, must be removed from the site within 48 hours and any damage to the site repaired and reinstated. Deleterious material accumulated from maintenance activities must be removed from the site on completion of the maintenance works at the Contractor’s cost.

The Contractor must also be equipped and prepared to carry out laying of turf direct from truck to site (e.g. turf installation following footpath construction) if requested to do so.

Supply

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.

Preparation of surface for laying turf

The Contractor shall not proceed with laying turf until authorised. The area to be turfed shall be clear of debris and shall be prepared in accordance with the following:

* All weeds and grasses shall be sprayed out (14 days prior to installation) using a systemic weed killer (Round Up or an equivalent product) and existing turf removed. Obstacles such as sprinkler-heads, access points and sub-surface service connection points shall be flagged to avoid damage.
* The area shall be raked to eradicate rocks, roots and large clods of soil.
* Shape the site in accordance with project requirements and general industry standard.
* Apply, if specified, any under-turf additives (gravel, sand, soils, organic matter, fertilizers and water retention agents) to ensure soil quality is compatible with the turf to be laid. Typically, topsoil shall be spread to a finished depth of no less than 50 mm.
* Fertilisers are to be applied in accordance with manufacturers recommended application rate, or at the rate of 2.5 kg per 100 m2 where manufacturer’s recommendations do not exist.
* Roll the area to firm the surface and reveal low areas. Apply extra soil to low areas to obtain uniformity in levels.
* Slope the surface away from foundations towards drainage points.
* Finish the sub-surface (approx.) 25 mm below path edges and surrounding turf to ensure laid turf is finished flush.
* Lightly rake the rolled soil again prior to laying turf.
* Water the area to provide a moist base for the turf to a depth of 50 mm.
* In the preparation of surfaces for laying turf refer to Council’s *Reference Specification for Engineering Work S140 Earthworks*.
* The Contractor shall ensure that any soil imported for use in surface preparation conforms to *AS 4419-2003*.

Fertilising

The application of fertilisers to turf shall be carried out in accordance with the recommendations of fertiliser manufacturers. As a guide fertilisers shall be spread at the rate of 2.5 kg per 100 m2.

The application of fertilisers shall comply with all relevant health, safety and environmental requirements.

The Contractor shall provide evidence of the grade of fertiliser in use and its release capabilities.

* No (or very little) slow-release component
* Sulphur-Coated slow release component
* Polymer-coated slow release component (Lesco or similar)

A Material Safety Data Sheet (MSDS) is to be provided for each fertiliser prior to application

Laying

General: Lay the turf in the following manner:

* Commence turf laying against the longest straight line boundary. Butt and push ends and edges against each other tightly without stretching or tearing the turf. Gaps and overlaps must be avoided. Joints in rows must be staggered and a sharp knife used to trim around obstacles (posts, sprinklers, paths, etc.) The Contractor shall avoid the use of off-cuts or small strips at outer edges, as they will not retain moisture.
* Turf must be laid flush against existing grass or paved edges.
* Rolls shall be laid across steep slopes, rather than up or down the slope, unless otherwise directed by Council. Turf should be pegged until rooted to avoid slippage on steep slopes or batters.
* Laid turf must be dampened, tamped and/or gently rolled to establish good contact with the soil. Gaps shall be filled with loose soil, to reduce air pockets.
* The Contractor shall avoid all unnecessary walking or kneeling on newly laid, or freshly watered turf, to avoid indentations

Pegging

On steep slopes peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

Initial watering (at time of laying)

Depending on weather conditions, watering of newly laid turf must occur no later than 2 hours after being laid, and as a guide, a minimum of 25 mm is to be applied.

Mowing

Mow when grass height exceeds 80 mm. Maintain the grass height within the required range of 50 ± 15 mm. Carry out the last mowing within 7 days before the end of the planting establishment period. Disperse grass clippings evenly over the mowed area. In areas where mowers cannot gain access, trim grass with power scythes.

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: Where levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

**0** **-** **2 Week Maintenance**

Weather conditions will dictate the watering schedule for new turf, however new turf must be kept moist for two weeks to encourage robust roots and knitting together of laid rolls.

The Contractor shall use a sharp mower to ‘first-cut’ new turf 10 to 14 days following installation, however mowing of new turf must not be attempted until turf is firmly rooted and secure in place.

No more than 1/3 of the grass height shall be removed during the ‘first cut’.

Fertilisers and chemical applications shall be applied as necessary and must be applied in accordance with manufacturers and industry recommendations.

**Extended Maintenance**

**2** **-** **4 Week period**

Activities to include:

* mowing
* weed control
* insect control
* fungal control
* watering

**4** **-** **12 Week period**

Activities to include:

* mowing
* weed control
* insect control
* fungal control
* watering
* fertilising
* topdressing

Top dressing

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.

### Temporary Grassing

Location

Generally applies to temporary grassing of stockpiles and earthworks to minimise erosion and weed invasion. *Refer annexure*.

Seed mix type

Mix Type A in accordance with Table 4.1. *Refer annexure*.

Preparation

Prepare the areas to be sown. Spread the fertiliser evenly over the cultivated bed within 48 hours before sowing, and rake lightly into the surface. If a prepared area becomes compacted from any cause before sowing can begin, rework the ground surface before sowing.

Sowing

Provide even distribution. Rake the surface lightly to cover seed.

Watering

Immediately after sowing, water to a depth of 100 mm. Thereafter water to obtain germination and establish grasses. After establishment water only as necessary.

Maintenance

Maintain temporary grassing areas until no longer required.

## PLANTS

### General

General: Provide plants with the following characteristics:

* Large healthy root systems, with no evidence of root curl, restriction or damage.
* Vigorous, well established, free from disease and pests, of good form consistent with the species or variety.
* Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site.

Supply: Supply plants that are propagated in a nursery facility that have been accredited by the Nursery Industry Association of Australia

Replacement: Replace damaged or failed plants with plants of the same type and size.

### Plant Containers and Stock Sizes

General: Supply plants in weed free containers of the required size.

Minimum size: Unless specified otherwise, provide the following minimum size for plant materials. *Refer annexure*.

* 45 litre nursery stock for trees in car parking areas.
* 45 litre nursery stock for medians, tree guards, traffic islands and roundabouts.
* 25 litre nursery stock for trees in common areas and at critical interface.
* 250 mm pot for street tree planting in a new subdivision.
* 300 mm pot and 25 litre stock for trees in private areas.
* 200 mm pot for shrubs.
* 140 mm pot for groundcovers.
* Tubestock for trees and shrubs may be acceptable over extensive planting areas.

For example in conjunction with supplementary planting of bank stabilisation and rehabilitation works.

Conformance criteria: Comply with the requirements of Table 5.1.

Table 5.1 – Conformance criteria

| Pot size/ container volume | Minimum stem calliper measured at 10 mm above soil level | Minimum height of plant measured above soil level |
| --- | --- | --- |
| 100 mm Deep NT | Not applicable | -250 - 300 mm |
| 90 mm2 space saver | 5 mm | -300 - 500 mm |
| 140 mm | 5 mm | 300 - 500 mm |
| 200 mm | 10 mm | 600 - 900 mm |
| 300 mm | 15 - 25 mm | 1.0 - 1.5 m |
|  |  |  |
| 25 L | 35 - 45 mm | 1.5 - 2.0 m |
| 45 L | 50 - 60 mm | 17 - 2.3 m |
| 100 L | 75 - 85 mm | 2.5 - 3.5 m |
| 200 L | 85 - 95 mm | 3.2 - 4.5 m |
| Exground | 80 - 95 mm | 4.0 - 5.0 m |
| Exground | 95 - 120 mm | 5.0 - 6.0 m |
| Exground | 120 - 150 mm | 6.0 - 7.0 m |
| Exground | >200 mm | >7.0 m |

Labelling

Label at least one plant of each species or variety in a batch with a durable, readable tag.

Transportation and storage

Transportation: Transport plants in a covered vehicle to avoid wind stress.

Delivery: Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

Storage: Store surplus plant material in a well lit and ventilated area with conditions similar to the final planting locations.

### Trees

True to type

Type: Supply plants that are true to type of the species and variety as specified. Unless required to be multi-stemmed, provide trees that have a single leading shoot.

Health and vigour

Health: Supply plants with foliage size, texture and colour consistent with that shown in healthy specimens of the species. Plants must not exhibit any signs of leaf curl, chlorosis, and sooty mould.

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

Freedom from pests and disease

Foliage: Restrict attack by pests and disease to <10% of the foliage, such that potential for long term success of the trees is not affected.

Balance of crown

Maximum variation in crown bulk on opposite sides of stem axis: ±20%.

Uniformity of growth

Longest internode: Maximum 1.2 x shortest internode.

Branches

Requirement: Evenly spaced and no crossing branches.

Stem taper

Support: Supply trees that are self-supporting unstaked.

Stock size 20 L or larger: Calliper at 300 mm above ground to be at least 1.2 x calliper at 1 m above ground.

Pruning history

General: Comply with the recommendations of *AS 4373* Pruning of amenity trees.

Pruning wounds: Confine fresh pruning wounds to <25% of the clean stem height.

Wound diameter: <50% of stem diameter immediately above point of pruning.

Pruning location: Clean cut at branch collar.

Included bark

Bark ridge: Convex (outwardly pointing) at junctions between co-dominant stems, and stems and branches.

Grafted varieties or cultivars

Union between scion and rootstock: Sound for perimeter of graft.

Diameter of scion immediately above graft: Equal to diameter (±20%) of rootstock immediately below graft.

Apical dominance

Apical bud: If appropriate for the species, supply trees that have a defined central leader and intact apical bud.

Roots

General: Root system configuration and quality shall conform to NATSPEC tree quality guidance. Roots must show no signs of discolouration or girdling, and must not extend outside pot or container area.

Root division: Fibrous with repeated and sequential division to provide a strong structural base.

Root direction: At least 90% of roots within rootball must grow within the radial plane (out or down) at every stage of development.

Rootball occupancy: Shake or handle unsupported rootball. At least 90% of the soil volume must remain intact.

Stock size smaller than 20 L: Hold stem at 80% of height above ground, deflect 30° from vertical, side to side. Container or rootball must remain flat on the ground.

## PLANTING

### General

Individual tree stock in grassed areas and planting in beds: Excavate a hole to at least twice the diameter of the rootball and at least 1.5 times deeper than the rootball. Break up the base of the hole to a further depth of 100 mm, and loosen compacted sides of the hole to prevent confinement of root growth.

Ripline planting: Rip the row and excavate a plant hole for each plant large enough to accept the rootball plus any nominated backfilling with topsoil. Clear weeds and other vegetative material within 300 mm radius of the plants. If planting holes are excavated by mechanical means, increase the hole size by 100 mm and loosen compacted sides to prevent confinement of root growth.

### Watering

Requirement: Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

Watering basins for plants in grass: Except in irrigated grassed areas and normally moist areas and impervious subsurface strata, construct a watering basin around the base of each individual plant, consisting of a raised ring of soil capable.

### Placing

Remove the plant from the container with minimum disturbance to the rootball. Ensure that the rootball is moist and place it in its final position, in the centre of the hole and plumb, and with the topsoil level of the plant rootball level with the finished surface of the surrounding soil.

### Fertilising

In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting.

### Backfilling

Backfill with topsoil mixture. Lightly tamp and water to eliminate air pockets. Ensure that topsoil is not placed over the top of the rootball, so that the plant stem remains the same height above ground as it was in the container.

## TRANSPLANTING

General

Give sufficient notice before transplanting in ground plant materials. Seek specialist advice on transplanting significant plants. The majority of native trees and shrubs do not readily transplant. *Refer annexure*.

Conditions

Select a time for transplanting having regard to the time of actual operation, rootball diameter and length, lifting methods, weather conditions and the like.

Preparation

Two days before transplanting of each specimen, thoroughly irrigate it to the full depth of the rootball. Minimise the cutting of roots. Cut roots with sharp tools. Do not fracture the ball of soil around the root system, but maintain it in firm condition during transplanting by wrapping in appropriate open weave material (e.g. hessian), securely tied.

Planting

Avoid disturbance to the rootball and plant. Remove any rootball wrapping and ties by cutting.

Pruning

Prune as directed where selective pruning of branches or canopy is necessary. Comply with the recommendations of *AS 4373* Pruning of amenity trees.

**Watering**

At the completion of transplanting, water the rootball thoroughly. Continue to monitor the moisture levels at the rootball and soil interface, and water as required until established.

## MULCHING

### General

General: Organic Mulch shall be free from stones, soil, clay, dust, weeds, seeds, roots, sticks, rubbish, vermin, insects, pests, fungus, disease and other deleterious material. It shall be free from matter toxic to plant growth. Refer annexure.

Organic mulch shall be aged for a minimum of one month in a quality environment conducive to breakdown and turned every two weeks, unless otherwise specified.

### Organic Mulch Types

| Description | Source | Treatment Method | Acceptable Content | Unacceptable Content |
| --- | --- | --- | --- | --- |
| Aged forest mulch | Tree trimming/ removal contractors | Chipped or mulched with pieces no larger than 75 x 50 x 15 mm.  Standard in accordance with *AS 4454-2003.* | Leaf matter and tree waste material from trees, for example Eucalypts, Lophostemon and Melaleuca species. | Material from environmental and noxious weeds as defined by Council and/or the State Government. No inorganic or chemical based products including materials containing asbestos. Pasteurised to significantly reduce pathogens. |
| Aged mulch | Non Waste Transfer Station origin. Land Clearing or tree lopping contractors. | Tub Ground and/or chipped. Aged and composted. 80% of particles 25 mm - 150 mm in length. | Leaf matter and tree lopping predominantly from native species trees. | Material from environmental and noxious weeds as defined by Council and/or the State Government. No inorganic or chemical based products including materials containing asbestos. Pasteurised to significantly reduce pathogens. |

### Organic Mulch Installation

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread mulch to the specified thickness so that after settling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds. *Refer annexure*.

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: To surrounds of plants planted in riplines and grass areas, provide mulch to a minimum of 600 mm diameter. Keep organic and inorganic mulch not closer than 50 mm from plant stems.

Depths: Spread organic mulch to the nominated depth or a minimum depth of 100 mm. Spread gravel mulch to a nominal depth of 50 mm if atop weed mat, 100 mm without weed mat.

### Inorganic Mulch Types

Washed river pebble: Uniform size or graded material in the size range 6 - 10 mm.

River gravel: Uniform size or graded material in the size range 5 - 20 mm.

Decomposed granite gravel: Uniform size or graded material in the size range 5 -20 mm, of uniform colour and low plasticity.

Crushed quartz: Uniform size or graded material in the size range 5 - 20 mm, of uniform colour.

### Inorganic Mulch Installation

General: Place mulch to the required depth, clear of plant stems, and rake to an even surface flush with the surrounding finished levels. Spread mulch to the specified thickness so that after settling, it is smooth and evenly graded between design surface levels sloped towards the base of plant stems in plantation beds. *Refer annexure*.

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: To surrounds of plants planted in riplines and grass areas, provide mulch to a minimum of 600 mm diameter. Keep organic and inorganic mulch not closer than 50 mm from plant stems.

Depths: Spread organic mulch to a minimum depth of 100 mm. Spread gravel mulch to a nominal depth of 50 mm if atop weed mat, 100 mm without weed mat.

## PLANT SUPPORT

### Stakes and Ties

Stakes

Requirement: Generally, plants of good quality should be self-supporting, however stake plants located in open ground or adjacent to vehicular traffic or as directed to mark their location or provide additional protection.  *Refer annexure*.

Material: Hardwood, straight, free from knots or twists, pointed at one end.

Installation: Drive stakes into the ground for at least a fifth of their length, avoiding damage to the root system. Place stake at a clear distance of 50 mm from the edge of the rootball.

Plants ³2.5 m high: Three 50 x 50 x 2400 mm stakes per plant.

Plants 1.0 - 2.5 m high: Two 40 x 40 x 1800 mm stakes per plant.

Plants <1.0 m high: One 38 x 38 x 1200 mm stake per plant.

Ties

General: Provide ties fixed securely to the stakes, preferably one tie at no more than one-third of the main stem, others as necessary to stabilise the plant. *Refer annexure*.

Plants ³2.5 m high: Two strands of 2.5 mm galvanised wire neatly twisted together, passed through reinforced rubber or plastic hose, and installed around stake and stem in a figure of eight pattern.

Plants <2.5 m high: 50 mm hessian webbing stapled to the stake or plastic lock tie in a figure of eight pattern, placed at two-third of plant height above ground.

Marker stakes

Material: Timber offcuts 25 x 25 x 1200 mm. Dip the top 200 mm in white paint. *Refer annexure*.

Installation: Drive firmly into the ground at least 300 mm from the plant. Do not tie to the plant.

Ripline planting areas: Mark each ripline at every fifth plant along the line.

### Earth Anchors

Provide temporary support where necessary to trees, rootballs or stakes using galvanised steel cables attached to proprietary aluminium anchors or drive rods, which have been hand or power driven at an angle into the ground. *Refer annexure*.

## TREE SURGERY

Tree surgery: Employ a certified arborist (qualified to AQF Level 3 in Arboricultural competence) with a minimum five years experience to carry out tree surgery work in a safe and progressive manner.

Pruning: Conform to the requirements of *AS 4373* Pruning of amenity trees.

Timing: Undertake remedial or maintenance pruning prior to commencement of construction work.

Extent of work: Remove dead and decayed wood or limbs that have been broken. Make final cuts in accordance with *AS 4373*. Surgery work may include soil conditioning to existing tree root zones including fertilising, soil aeration, irrigation drainage or incorporation of organic material. Continue this program until the end of the planting establishment period. *Refer annexure*.

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

Root pruning: Do not unduly disturb the remaining root system.

## COMPLETION

### Planting Establishment

Period

Commencement: The planting establishment period commences at the date of practical completion inspection. Unless nominated differently, the following maintenance periods will apply. *Refer annexure*.

* General planting: Required period: 12 months.
* 100 mm Deep NT to 300 mm pot (inclusive): Required period: 12 months.
* 25 L pot to Ex-ground (inclusive): Required period: 24 months

Existing planting and grass

Where existing grass or planting is within the landscape contract area, maintain it as for the corresponding classifications of new grass or planting.

Recurrent works

Throughout the planting establishment period, carry out maintenance work including watering, mowing, weeding, rubbish removal, fertilising, pest and disease control, reseeding, returfing, staking and tying, replanting, cultivating, pruning, hedge clipping, aerating, reinstatement of mulch, renovating, top dressing, and keeping the site neat and tidy.

Replacements

Continue to replace failed, damaged or stolen plants.

Grassed areas

Commence grass maintenance works at the completion of sowing, hydroseeding and turfing. Maintain healthy weed free growth. Grass coverage must achieve at least 80% at the time of practical completion.

Log book

Keep a log book recording when and what maintenance work has been done and what materials, including toxic materials, have been used. Make the log book available for inspection at request.

### Off Maintenance

Comply with the Council’s nominated requirements for the Maintenance and Inspection processes. Refer to *Reference Specification* *S110 for General Requirements* for the Contractor’s submissions, including As-Constructed Drawings.

Maintenance manual

Submit recommendations for maintenance of plants.

Cleaning

Stakes and ties: Remove those no longer required at the end of the planting establishment period.

Temporary fences: Remove temporary protective fences at the end of the planting establishment period.

## SUPPLY AND APPLICATION OF WATER

### Water Quality

Water provided shall comply with the following criteria and be identified as Class A recycled water or above.

Potable

Potable water use is to comply with the current water restrictions and is not to be used unless specific permission has been granted from Council.

Untested Natural Water

All existing water is to be removed away from the supply point prior to filling to ensure contaminants, such as algae and microbes are not translocated across catchments.

Water selected shall be from the same catchment area and as close to the distribution point as practical.

Water is to be delivered directly from the supply location to the distribution point.

Water is to remain uncontaminated by any product from supply to distribution.

Where supplied water is to be recycled, potable or natural water it is to be identified prior to supply and records kept, including decontamination records. Records must be kept.

Where recycled water is used, the Contractor must ensure that personnel are trained in the handling and distribution.

Water Application – Landscaping

Costs to repair damage of treated areas that directly relate to the application of water will be incurred by the contractor.

Minimising Water Wastage

No excessive amounts of water shall be allowed to enter storm water gullies, spray onto or flow across or pond on paved areas including roadways, bikeways & footpaths.