LANDSCAPE DESIGN GUIDELINES
CKS-700

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1. SCOPE

The purpose of this document is to outline requirements for Designers and Contractors completing Landscaping work for the City. The City's objective is to standardise the quality of landscape design, construction, and maintenance of its parks and gardens.

All works shall be carried out to current Australian and industry standards where applicable.

These Landscape Guidelines should be considered a minimum standard.

Any instructions from the manufacturer of specific landscape components will be followed.

Any instructions from the landscape designer or relevant City staff for specific work, through extra specifications or drawings, should be followed.

1.1 Applicable Standards

The installation, materials and workmanship shall comply with all relevant current Australian Standards, Codes and Regulations and all reference codes and Standards listed in the prefaces to those standards and codes.

Where Australian Standards and Codes do not exist the appropriate International Standard or Codes shall apply. Request an instruction from the City for amendments to Standards, Codes or Regulations that come into effect during the works and affect the works of the contract.

Document	Title
AS 1100	Drawing Practice
AS/NZS 1158 Suite	Lighting for roads and public spaces
AS 1428 Suite	Design for access and mobility
AS 1477	PVC Pipes and fittings for pressure applications
AS 1646	Elastomeric seals for waterworks purposes
AS/NZS 1680.5	Interior and workplace lighting - Outdoor workplace lighting
AS 2303	Tree stock for landscape use
AS 2560.2	Sports lighting, Part 2: Specific applications
AS 4373	Pruning of amenity trees
AS 4419	Soils for landscaping use

AS 4422	Playground surfacing – specifications, requirements and test methods
AS 4454	Composts, soil conditioners and mulches
AS 4685 Suite	Playground equipment
AS 4970	Protection of trees on development sites
AS 5181	Use and installation of turf as an erosion, nutrient and sediment control measure
AGRD6B	Austroads Guide to Road Design – Part 6B
Agricultural & Veterinary Chemicals (Western Australia) Act 1995	Agricultural & Veterinary Chemicals (Western Australia) Act 1995
Biodiversity Conservation Act 2016	Biodiversity Conservation Act 2016
Biodiversity Conservation Regulation Licences	Biodiversity Conservation Regulation Licences
Biodiversity Conservation Regulations 2018	Biodiversity Conservation Regulations 2018
City Specifications	City Concrete Specifications
City's Strategic Plan	City's Community Strategic Plan
City - Drawing Standards	City - Drawing Standards
City Irrigation	City Irrigation Specifications 2019
City Parks and Open space Operation Levels of Service	City Parks and Open space Operation Levels of Service
City Play Space Standards	City Play Space Standards
Environmental Protection Act 1986	Environmental Protection Act 1986
2-2005 Code of Practice for the use of Agricultural & Veterinary Chemicals in Western Australia	2-2005 Code of Practice for the use of Agricultural & Veterinary Chemicals in Western Australia
Main Roads Western Australia Guideline	Main Roads Western Australia – Vegetation Placement within the Road Reserve Guideline
Policy - TE3	Policy - TE3 Maintenance of Street Trees, Reserves and Street Verges Adjoining Residential Properties
Service Level Classifications	Service Level Classifications

Work Health & Safety (General) Regulations 2022	Work Health & Safety (General) Regulations 2022
Western Australia Workplace Health & Safety Act 2020	Western Australia Workplace Health & Safety Act 2020
Western Australian Environmental Guidelines	Western Australian Environmental Guidelines for the establishment and maintenance of turf grass areas (2001, Reviewed 2014)

Acronym	Full Form
AQF	Australian Qualification Framework
CPTED	Crime Prevention through Environmental Design
NPK	Nitrogen Phosphorous Potassium

2. PRINCIPLES

As part of the City's Community Strategic Plan, these Landscape Guidelines are prepared in accordance with the following principles:

- Sustainability - Ensuring appropriate use and protection of resources, recognising, and protecting areas of Biodiversity, maintaining well-managed natural assets and including the best use of parklands by maintaining Public Open Space (POS) for future generations and ensuring appropriate use of public assets.
- Quality and Functional Community Facilities - Delivering Public Open Spaces and quality streetscapes that provide an aesthetic and diverse functionality that people will safely enjoy using.
- Diversity and Flexibility - Provide a diverse range of experiences, functionality and opportunities within the Public Open Spaces and streetscapes for community and tourists that enhance the City experience and raise the profile of the City.
- Access and Equity - Equitable distribution of Public Open Spaces in terms of the amount, condition, and amenity across the City so that locations, user groups or segments of the community are not disadvantaged.
- Integration - Co-location of facilities such as park amenities and sporting buildings, or the inclusion of significant vegetation that enhances and complements landscaped areas.
- Asset Management – Ensuring appropriate management of existing assets according to the four fundamentals of asset management; extending asset life, optimising maintenance and renewal, developing accurate long-term funding strategies and sustaining long-term performance.
- Best Practice – procedures that are accepted & prescribed as being correct or most effective
- Local Provenance & Environmental Weeds – Delivering Public Open Spaces and streetscapes that incorporate species of local provenance and take into consideration environmental weeds and the invasive species list.
- Cultural Awareness – Ensuring the consideration of significant sites and vegetation and the legislation surrounding them.

3. APPROVED CONTRACTORS

All construction and maintenance work shall be carried out by suitably licenced, experienced, and qualified landscapers approved by the City.

All work should be carried out according to the supplied technical standards, relevant Australian Standards, manufacturer's instructions, and any other job-specific specifications issued.

The Contractor shall provide all relevant and Current Certificates of Currency for each contracted job and abide by all City policies and contracts.

Tree workers shall be qualified to a minimum AQF Level-2 in arboriculture or have equivalent recognised and relevant on-the-job experience, in accordance with AS 4373 Clause 3.46.
Pest and Weed controllers are required to be licensed with the WA Department of Health and hold the WA Pest Management Technicians Qualifications.

Irrigation system connections shall be carried out by licenced plumbers.

4. DESIGN & CONSTRUCTION

New parks, gardens, and public infrastructure shall be designed and drafted by suitably qualified designers or relevant City staff.

Landscaping designs shall incorporate sound principles and consider Environmental, Function and Horticultural requirements. Designers must take into consideration Crime Prevention through Environmental Design (CPTED) Principles and apply them to new and renovation projects.

Landscape designs should comply with AGRD6B: Roadside Environment.

4.1 Landscape Design

Landscape Designers shall develop additional technical specifications relating to the work above and beyond this general specification. Designers and Contractors must ensure the Australian Standards, Codes of Practice and Industry Guidelines are adhered to, and the City's Vision, Policies and Specifications have been addressed and referenced as required.

Designers shall produce scaled detailed design drawings complying with AS 1100 to enable Landscape works.

Where applicable, the landscaping plan is encouraged to promote a theme such as colour, plant origin or pedestrian comfort.

To give a development a pleasing aesthetic effect and ensure that the landscaping 'fits in' with the appearance and purpose of the area, the plan is encouraged to:

- Consider pedestrian comfort in commercial areas.
- Consider the appearance and colour schedule of buildings, structures, and hard-standing areas on the site.
- Look for elements in other vegetation in the street that form a continuing pattern and, if a pattern exists, extend the pattern to the landscaping in the proposed development.
- Drawings must provide sufficient detail to:
- Represent proposed constructed designs
- Enable Landscape Contractors to procure materials and plan safe installation methods
- Confirm the design criteria, including relevant engineering specifications for built structures.

Designers will take into consideration Service locations and constraints prior to presenting landscape plans.

Minor variations to the design may be considered appropriate due to site conditions or variations to the contract. Any proposed changes are to be submitted to the City for approval before implementing the change.

Landscape Drawings are to adhere to the City's Drawing Standards and Conventions.

Landscape Designers will develop and refine concept designs considering (but not limited to):

- Service locations
- The agreed functional requirements
- Appropriate plant species for the region
- Climatic conditions of the region, including cyclonic conditions
- Stakeholder engagement and compliance, e.g., Main Roads, City Policies
- The appearance and form of the final design
- Civil / Structural design requirements
- Meeting the Project budget
- Meeting statutory requirements
- Full Compliance with the Project Brief
- Natural Heritage
- Sacred Sites / Sites of cultural significance
- Endangered Species
- National Parks (e.g., Burrup)
- Restricted Zones (e.g., Rio Tinto, Woodside, Karratha Airport)

Landscape Designs shall incorporate the following categories of hydro-zones. They are as follows:

- High Profile turf areas (e.g., City Centre, Red Earth Arts Precinct)
- Active turf areas (Karratha Leisureplex, Ovals)
- Passive turf areas (Parks)
- Exotic garden areas
- Native Garden areas
- Low passive areas
- Shaded areas
- Tree watering systems
- Natural Areas (reliant on rainfall only)
- Flood zones
- Water table
- Soil profiles
- Effluent Reuse Scheme sites – consider potential overspray onto BBQ etc.

4.2 Design Approval

All Landscape Designs must be submitted to the City for assessment and approval. Site works and installation must not commence until the City provides approval in writing.

All Verge planting must be approved by the City prior to installation and follow the City Verge Policy: TE3 Maintenance of Street Trees, Reserves and Street Verges Adjoining Residential Properties.

4.3 As-Constructed Drawings

Upon completion, a set of detailed drawings of landscape areas must be provided in accordance with the City Drawing Standards and Conventions.

Drawings are to show the location of all works undertaken, including tree locations, plantings, irrigation, turf areas, playground spaces, park furniture, bollards, pathways, and lighting.

Drawings are to be presented and supplied electronically in AUTOCAD (DWG and PDF format).

4.4 Road Visibility

Vegetation in the road verge shall not restrict sight lines, particularly for intersections and roundabouts. Ensure sight distances requirements are achieved in accordance with MRWA's standards and Austroads' Guidelines.

Vegetation shall comply with the requirements of the *MRWA Vegetation within the Road Reserve Guideline.*

Trees with a diameter greater than 70mm pose a hazard to vehicles when close to the travelled path.

Table 1: Clearance requirements between vegetation and roads (MRWA Vegetation within the Road Reserve Guideline

	Minimum clearance between trees with trunks greater than 100mm and the edge of the traffic lane (m)	
Design Speed (km/h)	**Vegetation lower or equal to road level**	**Vegetation higher than road level**
≤ 60	5.0	5.0
70 – 80	6.5	6.5
90	7.5	7.5
≥ 100	10.0	8.5

4.5 Underground Services

The Contractor will ensure all site services are located as a minimum via a *Dial Before You Dig Australia* service and engage the relevant service authority to determine locations and depths of all services, which may include potholing to assets. Contractors shall take all precautions necessary to prevent service infrastructure damage and will be liable for any damage.

4.6 Irrigation

Irrigation shall be designed and installed in accordance with Section 7 of this specification.

No irrigation shall be installed without prior approval and inspection by the City Parks and Gardens Coordinator/Parks & Gardens Asset Supervisor or their delegated representative.

Irrigation systems shall be commissioned with a watering schedule appropriate for the plants' requirements.

4.7 Subsoil Drainage

Subsoil drainage, particularly in roundabout and median areas, shall comply with the City's *Stormwater Drainage Design Guidelines, CKS-500.*

4.8 Plantings

Plantings should complement any naturally occurring flora, minimise water use and provide a safe and attractive environment for residents and visitors. Local provenance of native flora is encouraged where practicable.

Retention and enhancement of naturally occurring native vegetation is encouraged.

All plant species must be approved by the City.

Planting layouts within mass plantings shall generally have low plants to the front and taller types to the back or middle.

All garden beds and/or mass-planted areas shall be enclosed by a paved edging of concrete kerbs, limestone blocks and/or other approved boundary material with a minimum height of 150mm. Refer to the City's Road Specification for preferred kerb dimensions.

Planting design and species selection shall not impede sight lines for motorists; refer to Table 2. Plans may also require Main Roads approval.

Table 2: Minimum clear sight distances required at intersections (for the greater of 5s gap in traffic or minimum stopping sight distance from AS/NZS 2890.1:2004 Figure 3.2).

Frontage Road Speed (km/h)	Sight distance (Y) along frontage road (m)
40	55
50	69
60	83
70	97
80	111
90	130
100	160
110	190

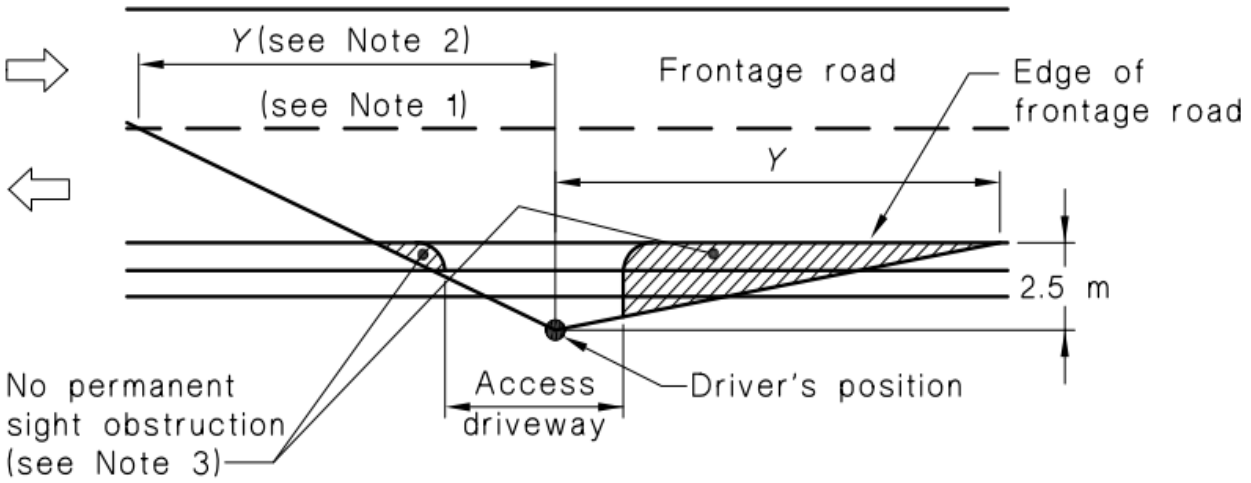

Figure 1: Sight distance (Y) required at intersections - extract from AS/NZS 2890.1:2004 Figure 3.2

All plantings shall be mulched with arbour timber mulch or approved stone fill. A 1kg sample is required for approval by the Contractor prior to delivery to the site.

4.8.1 Replacement Plants

All species must have written certification that plant material is true to species and type and free of disease and fungal infection, when relevant a quarantine certificate must be supplied.

Relevant to contract requirements, all plant replacements must have a quote and purchase order provided prior to any work commencing.

4.8.2 Mulching

Timber Mulch shall be placed to a minimum depth of 75mm and a maximum of 100mm. All rock mulch must be appropriate for the area and have been assessed with CPTED principles applied. Samples shall be provided to the City representative prior to installation.

Gravel mulch to be 50mm thick.

Contractors or City staff using mulch from the City Waste facility must ensure they have the required tip mulch documentation, including the unprotected loading/unloading request form completed and approved. Notification of when loading is requested should occur prior to attending the City Waste facility.

4.9 Trees, Shrubs & Ground Covers

Trees & shrubs shall be planted in accordance with the City standard planting detail drawing.

Trees, shrubs and ground covers are chosen to reflect the local character and conditions and provide attractive streetscapes and public amenities in the form of shade, improved micro-climate and landscape amenities.

Tree, shrub, and ground cover species shall be selected to minimise fertiliser, water and ongoing maintenance. Tree species will be selected, taking into consideration cyclone and drought resilience species as set out in Karratha's Street Tree Strategy.

All plant stock should be sourced from NIASA-approved nurseries or supplied at NIASA standards.

All plant stock availability should be confirmed on the award of the contract, and any substitute species or pot sizes should be confirmed prior to installation.

Local native tree, shrub and ground cover species are preferred, but the City recognises that exotic tree species may be used to provide better diversity, form and function to landscaped areas.

4.9.1 Stakes And Ties

If plants are unable to be self-supported or if stakes are damaged, stake or re-stake the plants as follows:

- Drive 3 Jarrah hardwood stakes placed obliquely with the first stake on the opposite side to the prevailing winds.
- double tied with 20mm flat hessian/jute tree tie. Stakes and Ties.
- Do not single stake large plants.
- If the plants are robust with well-developed systems and are strong enough to require support no longer, remove stakes and ties.
- Ensure reticulation / underground service locations are identified to avoid damage.

Tree Stock shall be selected in accordance with AS 2303 & AS 4373.

Shrubs and ground covers shall range between 140mm and 300mm, with 200mm preferred.

Tube stock may be suitable for mass plantings when designed and approved by the City.

Holes for trees, shrubs, and ground covers, at a minimum, must be double the capacity of their pot size. Soil conditioner must be adequately incorporated into the topsoil with a 50:50 mix and planted level with the existing soil. Tree wells must be created with all new plantings and reticulation located within. Pre-watering of holes with Seasol or similar liquid fertiliser approved by the City, especially when planting advanced specimens, is a requirement to minimise transplanting shock and assist with establishment.

4.10 Tree Planting Requirements

Refer to the IPWEA Standard Drawings on landscaping for details on tree and shrub planting, including planting hole dimensions and planting material thickness.

Trees shall be protected in accordance with the requirements of AS 4970.

Activities and structures should not encroach within the tree protection zone (TPZ) in accordance with Table 3.

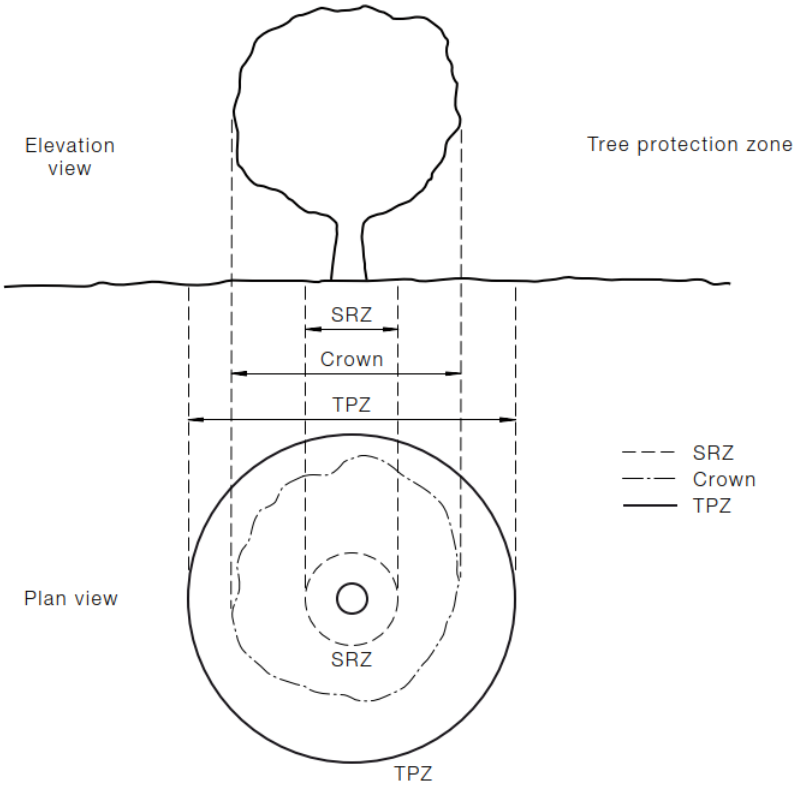

Figure 2: Tree Protection Zone and Structural Root Zone – extract from AS 4970:2009

Minor encroachment

If structures, pavements, signage or kerbing is required within the TPZ, only up to 10% of the TPZ area shall be encroached. A suitable equal or greater compensating area shall be provided around the rest of the tree in accordance with Figure 3. A root control barrier directs tree roots downward, away from the protected structure; these barriers shall be installed to minimise tree root growth imposing damage to structures.

Table 3: Tree Protection Zone in accordance with AS 4970

Tree trunk diameter at breast height (DBH) (mm)	Tree protection zone diameter (TPZ) (m)
Less than 166	2
200	2.4
400	4.8
600	7.2
800	9.6
1000	12
1200	14
Above 1250	15

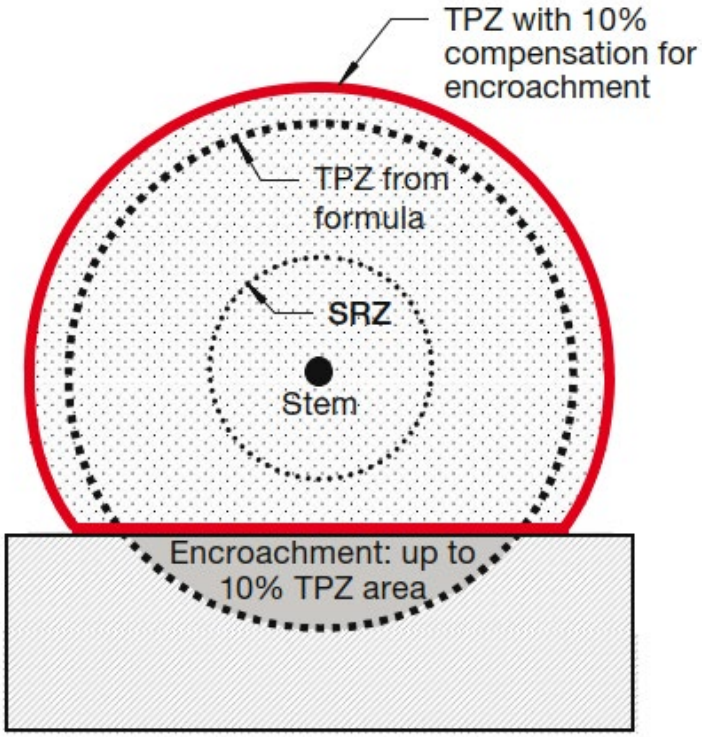

Figure 3: Up to 10% encroachment into the TPZ is permitted provided an equal or greater area is provided around the rest of the tree to compensate. Extract from AS 4970.

Major Encroachment

If a structure or activity is required greater than 10% into the area of the TPZ or is anywhere within the SRZ (refer Table 4), a project arborist must demonstrate the trees are viable. An equal compensating area should be provided.

Table 4: Structural Root Zone diameter

Diameter of tree trunk above root buttress (D) (mm)	Structural Root Zone Diameter (SRZ) (m)
Less than 150	3
200	3.4
400	4.5
600	5.3
800	6.0
1000	6.6
1200	7.1

Trees shall be planted greater than 5m from streetlights. The City shall review tree planting locations where this is not achievable.

Horizontal clearances of trees shall be in accordance with, taken from, the recommendations in AGRD06B.

Table 5: Horizontal clearance of trees from the edge of the road for medians and roadside plantations (refer AGRD06B)

Tree Group	Tree trunk horizontal clearance from the edge of the road			
	Median Width <6m	Median Width between 6 to 10m	Median Width > 10m	Roadside plantations
Shrubs and small trees	Minimum: centre planting only Desirable: 2.5m desirable	Minimum: 3m Desirable: 4m	Minimum: 4m Desirable: greater of 1.5x mature tree height or 2x mature canopy width	Minimum: 4m Desirable: greater of 1.5x mature tree height or 2x mature canopy width
Small trees	Not permitted	Minimum: 3m Desirable: 5m	Minimum: 4m Desirable: greater of 1.5x mature tree height or 2x mature canopy width	Minimum: 6m Desirable: greater of 1.5x mature tree height or 2x mature canopy width
Medium trees	Not permitted	Not permitted	Minimum: 6m Desirable: greater of 1.5x mature tree height or 2x mature canopy width	Minimum: 8m Desirable: greater of 1.5x mature tree height or 2x mature canopy width
Large trees	Not permitted	Not permitted	Minimum: 8m Desirable: greater of 1.5x mature tree height or 2x mature canopy width	Minimum: 10m Desirable: greater of 1.5x mature tree height or 2x mature canopy width

Tree canopies shall be designed and maintained for the following clear canopy heights in Table 6.

Table 6: Minimum tree clear canopy height requirements

Environment	Minimum Tree Canopy Height Required (m)
Pedestrian only environments	2.4
Cyclist Environments (cycle paths and shared access paths)	2.7
Roads used by trucks and buses (typically high and very high clearance routes)	6.0

Where trees are located in grass areas, their spacing shall be greater than 3m with a minimum tree well of 1.2m with a height of 200mm. All grass shall be removed from within the tree wells at planting to allow access for mowing equipment and to alleviate damage from maintenance activities. Tree wells shall be mulched to 100mm depth.

4.11 Tube Stock

- Spacings to be as per design or with the consultation of the City
- Backfilled with 50:50 soil conditioner and existing soil
- Hole to be excavated to allow a minimum of 50mm around the root ball.
- Tree Well to be sufficient enough to hold 5litres of water

4.11.1 Trees – Container Size 5L to 45L

- spaced a minimum of 3m apart
- All trees will be staked with a minimum of 3 Jarrah hardwood stakes 55-60mm x 1800mm and double tied with 20mm flat hessian/jute tree tie
- Backfilled with 50:50 soil conditioner and existing soil
- Tree Well construction to be 200mm high by 500mm from the centre of the tree with 100mm mulch cover
- All grass shall be removed from within the tree wells at planting to allow access for mowing equipment and to alleviate damage from maintenance activities

4.11.2 Trees – Container Size 45L to 100L

- spaced a minimum of 8m apart
- All trees will be staked with a minimum of 3 Jarrah hardwood stakes 75mm x 2400mm and double tied with 20mm flat hessian/jute tree tie
- Backfilled with 50:50 soil conditioner and existing soil
- Tree Well construction to be 200mm high by 500mm from the centre of the tree with 100mm mulch cover
- All grass shall be removed from within the tree wells at planting to allow access for mowing equipment and to alleviate damage from maintenance activities

4.11.3 Trees – Container Size Greater than 100L

- Spacing to be agreed with the City
- All trees will be staked with a minimum of 3 Jarrah hardwood stakes 75mm x 2400mm and double tied with 20mm flat hessian/jute tree tie
- Backfilled with 50:50 soil conditioner and existing soil
- Tree Well construction to be 200mm high by 1000mm from the centre of the tree with 100mm mulch cover
- All grass shall be removed from within the tree wells at planting to allow access for mowing equipment and to alleviate damage from maintenance activities

Design, plant choice, and planting guidelines should follow the Urban Heat Mitigation protocols and the Water Sensitive Urban Design, taking into consideration the heat island effect mitigation.

4.12 Turf And Lawn

Turf is hereafter referred to as instant natural turf laid in rolls. Turfed areas are defined as cultivated areas of grass that are kept mown and even in height.

Active and Passive Turf areas are provided as Part of Public Open Space throughout the City that form aesthetic and functional value for the public and are an intrinsic part of the landscape design.

Turf areas are to be prepared in accordance with AS 5181 and AS 4419.

Suitable grass species in the City include:

- Couch Grass (and hybrids) Cynodon dactylon;
- Buffalo Grass (and hybrids) Stenotaphrum secundatum; and
- Zoysia Grass (and hybrids) Zoisya japonica

Turf to be supplied from a specialist grower of cultivated turf rolls with clean cut edges and square ends, ample roots, and be certifiable by the grower to be true to species, free of weeds, fungus, insects, pest and other deleterious matter.

Turf area gradients must not be greater than 1 in 6 where possible. Designs shall provide for areas to be accessible by a ride on mower or push mower to this gradient

Turf is to have a uniform deep green foliage and not be discoloured.

Turf is to be laid within 24 hours of delivery.

The cut turf rolls shall be prepared such that the rolls have uniform dimensions in length, width and thickness. For a standard roll, the maximum thickness will be 25mm made up of 15mm of soil/root material and 10mm maximum of leaf/thatch.

New imported topsoil to be used: In Point Samson, Roebourne and Wickham NWSG Blended topsoil will be used. In Karratha and Dampier Corps Blended topsoil will be used.

Areas of new turfing are to be excavated to 200mm in depth below ground level, and new topsoil is to be imported into this area.

Fertiliser, at the rate of 100g per m^2 and mixed thoroughly into the prepared soil, is to be applied before the installation of the new turf

Fertiliser product agreed by the City: Use of morphous Silica (Mineral Magic) at 500g/m2 and 100g/m2 Baileys Energy Manure pellets on the surface or Baileys Energy Manure pellets incorporated into the soil at 500g/m2

Turf to be laid in a stretcher pattern with the joints staggered and close butted, parallel with the long sides of level areas, and with contours on slopes and to finish flush.

Turf is to be lightly tamped to an even surface immediately after laying with adjacent finished ground surfaces, paving edging, or grass-seeded areas.

Turf is to be pegged on steep slopes to prevent down-slope movement, with the pegs being removed once the turf is established.

Turf is to be watered immediately after laying until the topsoil is moistened to its full depth.

Watering is to continue to maintain moisture to this depth: 15 watering periods post-planting, schedule as follows – Week 1 – 6, Week 2 – 5, Week 3 – 4.

1% W/W non-ionic surfactant added to water for irrigating new turf.

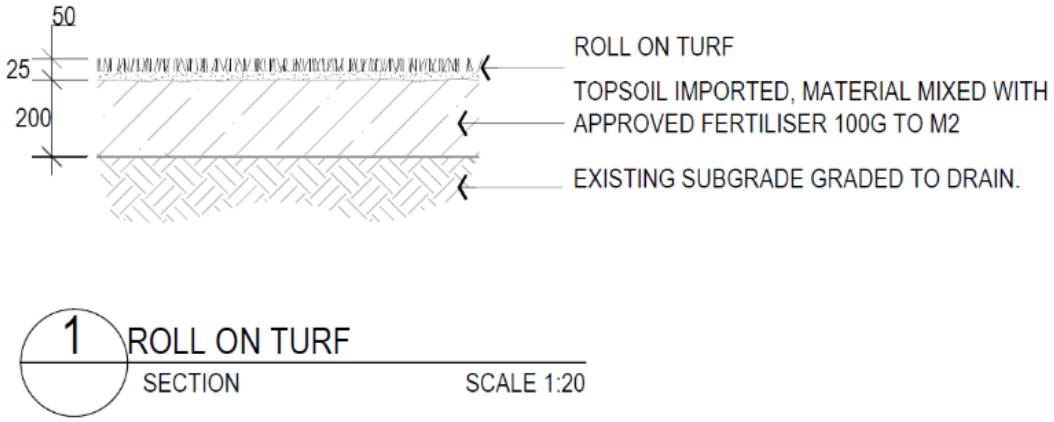

Figure 4: Roll on turf soil layer requirements

4.12.1 Lawn And Turf Establishment

Soil samples must be collected in August prior to the application of fertiliser. Soil sample testing shall identify if the soil has a low Phosphorous Replacement Index (PRI).

Lawns and turf shall be established per AS 5181 Clause 5.5 and the WA environmental guidelines for establishing and maintaining turf grass areas.

The establishment of lawn and turf grass areas can take several months; root systems are immature and have minimal water and nutrient capacity. Contractors shall apply a correct balance of water and fertiliser to establish a suitable root system without excess fertiliser leaching past the root system.

Fertilisers used for this application shall be released slowly and comply with the requirements of Section 6 of this document.

Nitrogen

All nitrogenous fertilisers should be applied frequently with low rates of fertiliser, at rates of between 10 to 40 kg N/ha. The frequency of application may be higher during the initial establishment phase but as the

turf develops, less frequent applications are required. The addition of an organic fertiliser will provide a steady source of nutrients during establishment; however, excessive rates may cause nitrogen leaching.

Phosphorous

Most virgin, sandy soils have a deficiency in phosphorus and a low Phosphorous Replacement Index (PRI). If soils have a low PRI, phosphorus should be applied frequently and at low rates. Organic fertilisers contain a high phosphorus-to-nitrogen ratio and are a slow-release source of phosphorus.

The level of phosphorus in the soil after application of fertiliser should not exceed 10 mg/kg as this level is sufficient to maintain healthy turf grass growth. Leaf tissue analysis can also be used to determine the phosphorus needs of the turf. Application rates of fertiliser will depend on the PRI of the soil, and the timing of application should be based on leaf tissue analysis of phosphorus levels in the turf.

Table 7: Required leaf phosphorous concentration (Extract from WA Environmental Guidelines for the establishment and maintenance of turf grass areas Table 6).

Phosphorous Concentration (%)		
Low	**Sufficient**	**High**
0.15-0.20	0.20-0.40	>0.40

Table 8: Phosphorous application guidelines (Extract from WA Environmental Guidelines for the establishment and maintenance of turf grass areas Table 7).

PRI (Allen & Jeffery)	Available P (Colwell test)	Recommendation
0 or negative	Recommended not to apply Phosphorous	Do not apply P
0.1 to 0.5	Less than 5ppm More than 5ppm	Apply up to 5kg P/ha
0.5 to 2.0	Less than 7ppm More than 7ppm	Apply up to 5kg P/ha Do not apply P
3.0 to 5.0	Less than 10ppm	Apply up to 10kg P/ha

	More than 10ppm	Do not apply P
>5.0	Less than 10ppm	Apply up to 20kg P/ha

Stolon

Stolon application, involving the application of shredded turf material, requires the City's approval and consultation. Turf area irrigation systems are to be designed in accordance with the City Irrigation Specifications 2023 using hydro zoning principles to ensure minimal water usage.

Each turf area shall be bounded by a road, garden kerb or path.

4.12.2 Top Dressing

Top Dressing (Levelling) is the practice by which sand is applied to a turf area to fill depressions and form a smooth, level surface over the turf area. Following Top Dressing (Levelling), the surface will be smooth, level and uniform.

The application of organic fertiliser must be ensured prior to Top dressing. Top dressing material for established lawns should be weed-free, imported sandy topsoil, and completed as deemed required. Apply coarse or medium soil, to AS 4419, suitable for application to turf or grass seeded areas.

Top Dressing (Levelling) shall be completed to ensure a level surface is achieved by using clean, free draining sand, free of clay, lime and all foreign matter.

- A 1kg sample of sand and a nominated sand supplier must be sent in for assessment
- City currently uses a Pindan and Sams Creek Blended soil.

Levelling will be undertaken to remove lumps and ridges, fill depressions, hollows, uncovered and irregular areas and finish to trees and even grades and falls.

Top-dressing sand will be to the depth of 12 to 15mm minimum/maximum cover of approved clean sand free of all foreign matter.

Levelling shall finish flush with any adjoining kerbs to roads, parking and paved areas, and with footpaths, terraces, verandas, mowing strips, manholes, pits, etc.

Top dressing must be completed in the growing season. Where possible, coring/aeration of compacted zones must be completed prior to top dressing and fertiliser application, and coring holes must be filled with coarse sand on completion.

Lawns should have a consistent and even surface with all undulations removed through correct topdressing procedures.

5. MAINTENANCE

A detailed maintenance program shall be submitted for consideration and approval by the City prior to construction. Corrective, preventative, risk-based, condition-based, and reactive maintenance should be included within the detailed maintenance program.

The City requires a minimum maintenance period of thirteen (13) weeks. Maintenance is to be conducted ‘as required’ but not less than twice weekly and includes, but is not limited to:

- Site to remain clean and tidy - all rubbish to be removed, including all debris and green waste.
- Weed removal.
- Tree and stake management.
- Additional remedial watering as required.
- Re-mulching needs to be addressed.
- Identification and replacement of dead plants.

- Irrigation performance checks.

5.1 Maintenance Reporting Cycles

Provide a weekly report, in the format approved by the City, is required and should include:

- A summary of the actions required and taken.
- Record of all replacement and repairs to the works.
- Images of the actions taken in relation to subsections (a) and (b) above.

Provide a monthly report should include under the sub-heading Re-Planting, an executive summary of the weekly reporting, in the format approved by the City.

5.2 Turf And Lawn Maintenance

5.2.1 Objective Of Lawn Maintenance

To maintain lawns so that they:

- Are healthy and vigorous.
- Have a density such that no sand/soil is visible beneath the sward.
- Are smooth and evenly groomed in appearance.
- Are free of weeds, pests, and diseases.
- Are uniform in colour.
- Are not encroaching over fixed objects or edges of paving, kerbs valve boxes, service pits and garden beds.

5.3 Application Of Fertiliser

Ongoing application of fertiliser to lawns and turf shall comply with Table 9.

Table 9: Guide to Nitrogen application for turf and lawn

Turf Category	Nitrogen (kg/ha/year)
Grass buffers	0
Minor passive turf	0-50
Low-use active and premium passive turf	50-100
High-use active turf	100-200

Established turf grasses are very efficient at using phosphorus and may require no more than 5 mg/kg of phosphorus in the soil.

5.3.1 Mowing Guidelines

- Remove litter and branches prior to mowing.
- Do not mow under wet conditions.
- Edges are to be completed at the same time as mowing.

5.3.2 Mowing Cutting Height

The cutting height shall be such that:

- Sward height shall be maintained between 25mm and 40mm in height from the actual soil level as per the type of usage and seasonal conditions.
- a consistent height of cut exists across all lawn areas.
- not more than one-third of the grass leaf blade is removed at any service visit.

5.3.3 Quality Of Cut

The quality of cut shall be such that grass:

- Is not scalped.
- Leaf blades are cut cleanly and not torn.
- Is smooth and free of steps and ridges.

5.3.4 Removal Of Grass Cuttings and Debris

- Grass catchers are not required to be used unless directed by the City's Representative for the removal of excess cuttings.
- Grass catchers are to be used whenever excess cuttings are present.
- Grass cuttings and sand shall be vacuumed off footpaths, paved areas, kerbs and driveways, irrespective of being present before commencement of mowing activities.
- Grass cuttings and sand shall not be swept/blown into garden beds, onto footpaths, paved areas, kerbs, or the vehicle carriageway as a method of disposal, and
- Grass clippings shall be disposed of at an appropriate approved facility at the Contractor's expense.

5.3.5 Definition Of Edging

To make the borders of lawns trim, neat, regular, and smooth in appearance by cutting or clipping and removing excess or extraneous grass growth along the perimeter.

5.3.6 Objective Of Lawn Edging

To maintain lawn borders to:

- A consistently smooth and regular appearance; and
- Ensure that grass is not encroaching over fixed objects or edges of paving, kerbs, valve boxes, service pits and garden beds.

5.3.7 Distance From Fixed Objects and Edges

Grass shall be maintained at a minimum distance of 5mm and a maximum distance of 10mm from the edge of all fixed objects and edges.

5.3.8 Quality Of Lawn Edges

Lawn edges shall be smooth and regular in appearance.

5.3.9 Lawn That Surrounds Trees

To prevent damage to trees, brush cutters are to be minimised to remove grass close to tree trunks. Grass shall be maintained around trees by approved application of herbicide or growth retardant to a maximum circumference width of 100mm, the treated area is strictly not to extend beyond the 100mm circumference. If the treated area extends beyond the maximum, the Contractor may be requested to replant grass beyond the 100mm.

An application of approved timber mulch surrounding the tree/ plant trunk should be maintained.

5.3.10 Lawn Abutting Fence Lines – Chemical Edging

To prevent damage to fence lines, the use of brush cutters is to be minimised to remove vegetation along fence lines other than where a fence is constructed of brick or reconstituted limestone. Vegetation of this nature can be managed by the approved application of herbicide or growth retardant to maintain a width of 100mm of vegetation-free adjacent fence lines.

5.4 Biocide

Chemical use should be minimised to control invasive grass matter:

- Around fixed objects
- Along edges
- Where grass may come into contact with garden plants.
- As directed by the Manufactures instructions

5.4.1 Mowing Around Fixed Objects Including Bollards

- All fixed objects shall be mown around as close as practicable using mowers and brush cutters. The aim shall be to remove any grass or vegetation that cannot be reached by broad acre mowers.
- Brush cutters are to be minimised to remove vegetation from around trees. Vegetation of this nature shall be removed by approved application of herbicide so as to maintain a circumference of not greater than 100mm around trees.
- Brush cutters are not to be used to remove vegetation along fence lines. Vegetation of this nature shall be removed by approved application of herbicide so as to maintain a width of 100mm of vegetation-free adjacent fence lines.

5.4.2 Damage To Mulch Around Trees

Should mulch be disturbed as a result of mowing operations, the Contractor shall make good any disturbance to mulch that has been placed around the base of trees by the City.

5.5 Manuals

Upon completion, an electronic copy of all relevant information on the installed landscape equipment will be supplied for future reference.

- Operating and installation manuals
- Product brochures
- List of all equipment, suppliers and part numbers installed
- Maintenance requirements/replacement part suppliers

5.5.1 Notice

A minimum of two (2) days' notice and all relevant documentation, application rates and Safety Data Sheets are required for the following operations:

- Application of herbicide
- Application of fertiliser
- Site Maintenance visit
- Work affecting public access or amenity

5.5.2 Logbooks

The following records are to be logged on a weekly basis:

- Description, time, and method of toxic material as applied or within one business day
- Maintenance work details
- Inclement weather to verify inability to carry out works within the specified time frame

5.5.3 Disruption Of Works By Others

The Contractor shall discuss with other contractors and the City to work around the disturbance and log disruptions accordingly.

5.5.4 Chemical Applications

The contractor will be appropriately trained and licenced for any chemical treatments.

All product applications will be logged and reported within 24 hours.

5.6 Protection Of Persons And Property

Guards, fencing, footpaths, signs and lighting shall be provided and maintained to a safe and serviceable standard during the works.

Access ways Services: Do not obstruct or damage footpaths, drains and watercourses or other existing services in use on or adjacent to the site.

Property: Do not interfere with or damage property which is to remain on or adjacent to the site, including adjoining property encroaching onto the site and trees. Ensure accurate Dial Before You Dig locations and relevant Traffic Management Plans are supplied.

5.7 Damage Caused During Works

Damage caused to accessways and services including footpaths, drains, watercourses, or other existing services in use on or adjacent to the site must be immediately rectified. Temporary access or services must be provided whilst repairs are being completed.

Any interference or damage to property which is to remain on or adjacent to the site including trees or any adjoining property encroaching onto the site must also be immediately rectified.

If any infrastructure damage occurs the City Parks & Gardens department must be notified within 24 hours by way of an incident report.

All damage will be the responsibility of the contractor to rectify and pay any costs associated with rectification works

5.8 Weed & Pest Treatment

All herbicides/pesticides must be approved for use by the City's Representative before use. All employees associated with the application and management of the open areas spraying will be required to hold a certified WA Pest Management Technicians License as outlined by the Department of Health Guidelines.

Herbicides/pesticides are to be applied as per the following certificate of competencies:

- AHCPMG301 - Control Weeds
- AHCCHM303 - Prepare and Apply Chemicals, and
- AHCCHM304 - Transport and Store Chemicals or
- SRTC008 - Pesticide Spraying, handheld or backpack

Chemicals requiring a licence for application shall not be used unless under the express permission of the City's Representative or their nominated representative, with the authorisation given in writing. Persons will be required to hold the following competencies:

- AHCCHM303 - Prepare and Apply Chemicals,
- AHCCHM304 - Transport, Handle and Store Chemicals,
- AHCPMG301 - Control Weeds,
- AHCPMG302 - Control Plant Pests, Diseases and Disorders,
- AHCCHM401 - Develop procedures to minimise risks in the use of chemicals, and
- AHCCHM402 - Plan and Implement a Chemical Use Program or
- SRTC009 - Pesticide Spraying, mechanical.

All herbicides/pesticides must be registered for their intended use

Weather Conditions

Spraying shall cease immediately under the following weather conditions:

- Wind Strength over 25 km/hr. Below 25km/hr, the Contractor must identify and ensure service areas have minimal impact of spray drift downwind.
- Temperatures greater than 45 degrees Celsius.
- The contractor through the course of open-air spray techniques, will need to ensure that these are controlled to prevent overspray of treatment products outside of the operational area. Any damage caused to vegetation will be the responsibility of the Contractor to rectify and replace if required.

5.8.1 Weeding

Remove unwanted broadleaf plants and grasses considered invasive to the locality with a schedule as follows:

- Gardens - As required for planted and mulched areas, weeds are to be removed when observed at weekly/fortnightly intervals. Weeds should be removed as soon as visible. Weeds should not be allowed to produce flowers or seeds.
- Pathways – Weeds should be removed or chemically sprayed as soon as visible.
- Ensure the removal of invasive weed species and dispose of them appropriately as soon as possible. Ensure to report weeds with the requirement to do so.
- Maximum height of weed species 100mm Diameter/150mm high – larger specimens require manual removal.

5.8.2 Herbicide & Chemical Application

The contractor must supply the City with the information relevant to the application of the Herbicide, including Safety Work Method Statements and Chemical Application Forms.

Herbicide products containing Glyphosate must be registered with the APVMA and used in accordance with the manufacturer’s instructions. When spraying activities are being conducted, “Caution - Glyphosate In Use” signage must be visible to the general public.

When applying a Herbicide, avoid windy days or if rain is likely to follow within 12 hours and apply as follows:

- To the manufacturer's recommendations and the material data and safety data sheets.
- When the weather is humid with moderate temperatures and maximum sunlight.
- When the ground has adequate soil moisture.
- When target species are actively growing.
- Do not apply when the target species is producing fruit.

The contractor must take care around school zones and must avoid application at drop off / pick up times.

5.8.3 Pest And Disease Control

The contractor is responsible for the control of any pest or disease that may affect the lawn and garden bed areas. If a problem is identified, the following actions must be taken:

- Execute the correct treatment until the problem has been eliminated.
- Utilize Integrated Pest Management processes.
- Apply hazardous material out of normal working hours.
- Comply with noise restriction regulations.
- Protect staff and the public.

5.9 Trees & Shrubs

5.9.1 Pruning And Trimming

The four key factors that should be considered during pruning and trimming are the following:

- Compartmentalisation - When a tree is pruned, the cuts should be made at the correct locations and angles to encourage the tree to create effective barriers around the wound, limit the spread of disease or decay into healthy tissues and aid the tree's ability to compartmentalise.
- Apical Dominance – apical buds can be removed to encourage lateral buds to grow and promote lateral branching, and help maintain a tree's balanced and symmetrical shape, with a fuller canopy.
- Tree Biomechanics - removing dead, weak, or overextended branches reduces the risk of structural failures and enhances the tree's ability to withstand external forces such as wind and snow loads. Pruning can also address co-dominant stems or branches that could lead to weak branch attachments.
- Carbohydrate storage and energy expenditure - By selectively removing branches, the tree's energy resources are allocated more efficiently to the remaining branches and growing points. This can improve the tree's overall vigour and health. Additionally, pruning can help balance the crown and root system, ensuring a proper ratio between energy production (through photosynthesis) and energy consumption (growth, maintenance, and defence).

The following are the general requirements for pruning:

- Prune to reflect the natural growth, flowering, and regrowth habit of the individual species, generally in spring and summer and on an as-needed basis.
- Shrubs are to be pruned after flowering unless species growth habit requires alternative techniques.
- Hedge trimming and vigorous grasses should be scheduled at times that will maintain the character and design of hedges, gardens, visibility and aesthetics, fire protection, line of sight and pedestrian safety;
- allowing for trimming up to 4 times per season or maintaining shape.
- Retain the form and shape of the planting scheme and avoid straight pruning unless formal hedging is required.
- Clear and keep clear, vigorous ground covers 200mm from the base of any shrub or tree
- Retain clear boundaries between lawns/ gardens and hardstand areas and
- Remove all branches, leaf litter and trimmings from the site.

Approved Pruning Methods:

- Crown thinning
- Crown raising
- Crown reduction
- Crown cleaning or deadwood pruning
- Crown restoration
- Vista pruning
- Espalier pruning

Table 10: Tree & Shrub Pruning Requirements

TYPE	PURPOSE	METHOD	RESTRICTIONS
Tip Pruning	Encourage the development of new shoots during the active growing season	Removal of the top 25mm or growing tip of each branch	Do not remove buds before the flowering season in those plants that have terminal flowers
Radical Pruning	To maintain a hedge or formal shape or when a particular problem, growth habit,		Do not remove more than 25% of new growth

	damage, or disease requires branch removal		
TYPE	**PURPOSE**	**METHOD**	**RESTRICTIONS**
Tree Pruning	Eliminate diseased or damaged growth, avoid inter-branch contact and thin out crowns in a natural manner. Safety Uniformity Tradition Aesthetic Value Temporary Branches Maintain sight lines to signs and lights. Maintain visibility for personal security.	Light pruning. Removal of deadwood. Major pruning (more than 15% of top of plant removed).	Growth Cycle e.g., Deciduous trees Ensure Apical Dominance Avoid Lions Tailing Avoid lopping or topping (See AS 4373, Clause 3.31/3.44)
Tree Branch Removal	As per AS 4373	Give notice and engage a suitably qualified arborist.	Avoid lopping or topping (See AS 4373, Clause 3.31/3.44)

Under pruning, consists of pruning all lateral branches, leaves, water shoots and suckers from ground level to a height of 2.4 meters over the verge and 4.3 meters over the road carriageway. Pruning of any basil growth on the trunk of the tree. Removing branches considered hazardous to traffic, pedestrians, buildings or any other structure, whilst leaving no stubs or sharp ends.

5.9.2 Root Pruning

The effects of root pruning are not always predictable; the pruning of roots may place the tree under stress, allowing entry of pathogens, including root-rotting fungi and may destabilise the tree. Before pruning any roots, refer to the City – an arborist with minimum qualification AQF Level 4 is required to be consulted for specialist advice in accordance with AS 4373 Clause 9.

- When requested, the Contractor will install a root barrier membrane on behalf of the City to a depth of either 600 mm, or 800mm as specified. The barrier will be located in the position as instructed by the City's Representative, having due regard to the specific site constraints, utilities and services and the ongoing health and stability of the adjacent tree/s.
- The barrier will be installed to provide a continuous sheet. However, where lengths need to be joined, the Contractor must overlap the joint a minimum of 500 mm, turn the overlap back and engage the two membrane sheets to form a stable joint. At ground level, the barrier sheet is to sit flush with the surface so as to avoid any potential trip hazard.

- The Contractor must ensure that prior to any excavation works being undertaken all services and utilities are appropriately identified and located.
- The Contractor will only prune or cut the roots necessary to install the barrier sheet, with all roots to be cut neatly and cleanly with sharp tools or equipment designed specifically for that purpose.

5.9.3 Stump Grinding

The Contractor will be required to grind tree stumps of various size diameters to a practicable depth below the level of the surrounding area, excluding any mounding caused by the growth of the tree. Any large surface or protruding roots are to be removed during this process. If specified in the work instruction, the City's Representative may request any recognised sucker tree species stump to be treated with herbicide to prevent regrowth.

In the event of a tree or stump having protruding surface roots, these roots shall be ground to a depth that provides an acceptable ground level as determined by the City's Representative to enable nature strip restoration and minimise any pedestrian trip hazard.

5.9.4 Tree And Shrub Fertilising

The fertilising program should be based on the soil testing results taken at the commencement of the contract and from a cross-section of planting beds, soil profiles or planting mediums.

Apply additional fertilisers and soil conditions as indicated from soil testing or from the physical soil structure. Maintain a pH range of 5.5 to 7.0. Apply aluminium sulphate or well-decomposed compost in order to maintain this range.

Table 11: Tree & Shrub Fertilising Requirements

NPK RATIO	RATE	APPLICATION	SENSITIVE NATIVE SPECIES
Balanced 10:4:6	To the manufacturer's recommendation and cultivate two rows into the soil 100mm deep.	Macro and Micronutrients Use of both liquid organic and granulated organic Each September & March	Apply appropriate dosage Minimising Phosphorous

Notify the supervisor if trees require additional nutrients and await instruction. Apply the pill to the root zone at a distance from the trunk equal to the foliage spread. Make holes 400mm deep to take the pill, equally spaced around the plant and backfill with sand. Apply liquid fertiliser for quick response till granular takes effect.

5.9.5 Plant Replacements

Replace all plants that have died or lost 50% of their normal foliage cover. Provide replacement plants as follows:

- Of the same species and barite and of the closest commercially available in size
- With a balanced, healthy root system in relation to the size of the plant and conducive to successful transpiration. Inspect the root conditions of plants by removing plants from their containers.
- Without signs of having been stressed at any stage during their development due to inadequate watering, excessive shade/sunlight, suffered physical damage or restricted habit due to growth in nursery rows; and
- Grown in final containers for not less than twelve weeks and long enough to hold the shape of the pot
- As per correct procurement processes

5.10 Watering Of Lawn and Planted Areas

Lawn and planted areas should generally maintain a vigorous, healthy appearance. Water should be applied to a soak depth of 150mm for lawn and 300mm for planting. Avoid frequent dampening of the surface and allow the surface of the soil to partially dry out between watering. Confirm soaked depth and record it in the logbook. Water at times of day to minimise water evaporation loss. Do not water during the hottest period on summer days. Coordinate the water supply and confirm the watering regime against legislation and restrictions applying at the time.

Ref: Effluent Reuse – best practice principles – ref: sodium levels

Hand watering is required for all lawn and planting areas and advanced tree specimens in the absence of an irrigation system or until the proposed irrigation system is fully operational.

Irrigation Systems should be programmed for the following:

- To suit the moisture requirements of the individual zones/stations with regard to types of plants
- The infiltration rate of the soil/medium and associated physical factors of seasons, evaporation, exposure, topography, and local authority restrictions
- Adjusted or shut down during and after periods of prolonged heavy rains; and
- Water supply and watering regime of legislation and restrictions applied at the times
- Sporting and user group bookings
- Turf renovation programs

Equipment maintenance should ensure that the overall operation of the system is efficient and operational during the maintenance contract by adjustment or replacement of components. This should

comply with the Irrigation systems maintenance schedule and include:

- Checking all components for proper operation
- Repair or replace damaged components with equivalent parts
- Flushing any dirt or foreign matter from the system and clearing all blockages
- Efficient and effective operation of available water resources.

Programming of Automated systems should coincide with optimum periods of water pressure and water absorption and not inconvenience persons occupying the site by water spray or blocking normal pedestrian/traffic flow. Overflow and runoff should be minimised where possible.

5.11 Hardstand

Hardstands should have all vegetation, weeds, leaves, branches, and clippings removed.

The integrity of hardstands will be maintained and should not be impacted by

- Vehicles
- Weeds

- Vegetation clipping.
- Irrigation runoff or leaks

Concrete hardstands should comply with the City's General Concrete Supply & Installation Specification CKS100 and, where relevant, the Footpath Design Specification CKS200.

5.11.1 Supplementary Works

Include as follows:

- Removal of waste from maintenance work.
- Removal of leaf litter fortnightly during leaf fall.
- Wash paving on completion of herbicide application, ensuring to avoid the dilution of the sprayed area.

5.11.2 Furniture, Signage and Barriers

Includes all fixed and movable features:

- Ensure no obstructions/ slippery surfaces, or weeds impact these areas.
- Signage must maintain sight line visibility.
- Remove all weeds, and edge appropriately around base of signs.
- Application of herbicide to sign bases is not appropriate.

5.12 Maintenance Schedules

5.12.1 Monthly Maintenance Schedule

Table 12: Monthly Landscape Maintenance Schedule

ITEM	ACTION
Plant Material/Weeding	Replace failed plants
	Additional planting
	Treat for disease or insect attack
	Tree Maintenance
	Fertilising Generic (liquid/granular)
	Fertilising for specific nutrient deficiencies/Optimum pH
	Thin out planting
	Pruning/Trimming
Turf/Fertilising	Returfing
	Seeding
	Treat for disease or insect attack
	Top dressing/Coring/Aeration
	Weeding/Broadleaf Spraying
	Mowing/Trimming
Soil	Erosion/bank stabilisation
	Additional soil/Levelling

	Soil conditioner
	Weeding
Mulch	Top up mulch
Rubbish Removal	All litter removal
	Remove leaf/litter from path and paved areas & mulch/sand
Irrigation	Replace parts
	Repair
	Clean out
	Adjust/Monitor
	Clean out subsurface drains
Paving and pathways	Repair dips, hollows and irregularities
	Remove stains and graffiti
	Replace sections of uplift
	Clear main pathway drains of debris
	Weeding/Spraying
Furniture and hard fixtures	Bollard/Gates
	Lighting
	Shade Structures
	Fencing

5.12.2 Annual Maintenance Schedule

Table 13: Annual Maintenance Schedule

WEEK	SPRING	SUMMER	AUTUMN	WINTER
1	Mow and trim lawns	Mow lawns; weed	Mow lawns	Weed
2	Weed; trim and adjust trees and shrubs	Weed; mow lawns, trim and adjust trees and shrubs	Weed; mow lawns, trim and adjust trees and shrubs	Weed; mow lawns, trim and adjust trees and shrubs
3	Mow and fertilise lawns; treat plant material for insects and disease	Mow lawns; weed; treat plant material for insects and disease	Mow and trim lawn	Weed
4	Weed; top-dress, condition lawns and over sow bare patches. Issue maintenance report	Weed; mow and trim lawns. Issue maintenance report	Weed; mow lawns. Issue maintenance report	Mow lawns. Issue maintenance report

5	Fertilise all trees and shrubs in garden beds; mow and trim lawns	Mow lawns; weed	Mow lawns	Mow lawns
6	Weed; inspect mulch for deficiencies in cover; check and adjust irrigation	Mow lawns; check and adjust irrigation	Weed; inspect mulch for deficiencies in cover; check and adjust irrigation	Mow and trim lawns; treat for insects and diseases; check and adjust irrigation
7	Reinstate mulch as required; treat plant material for insects and disease; mow lawns	Mow lawns; weed	Reinstate mulch as required; mow, trim and fertilise lawns	Mow Weed
8	Weed; inspect the condition of paving and furniture; issue maintenance report	Mow and trim lawns; inspect condition of paving and furniture; issue maintenance report	Weed; inspect the condition of paving and furniture; issue maintenance report	Mow lawns; inspect the condition of paving and furniture; issue maintenance report
9	Mow and trim lawns	Mow lawns; treat plant material for insects and disease	Mow lawns	Weed
10	Weed; mow lawns	Mow and top-dress lawns	Weed; treat plant materials for insects and disease	Mow and trim lawns
11	Mow and fertilise lawns; trim and adjust trees and shrubs	Mow lawns; trim and adjust lawns; weed	Mow and trim lawns; trim and adjust trees and shrubs	Prune back trees and shrubs after flowering
12	Weed; mow lawns; treat plant material for insects and disease	Mow, trim and fertilise lawns	Weed	Mow lawns; treat plant material for insects and disease
13	Check and adjust irrigation; mow lawns; issue maintenance report	Check and adjust irrigation; mow lawns; weed; issue maintenance report	Check and adjust irrigation; mow lawns; weed; issue maintenance report	Check and adjust irrigation; weed; issue maintenance report

6. COMPOSTS, SOIL CONDITIONERS AND MULCHES

Composts, soil conditioners, and mulch products are classified and defined by AS 4454, refer.

Table 14: Compost, Soil Conditioner and Mulch Products

Classification Category	Classification (AS 4454)	Definition
Maturity	Raw Mulch	Mulch from a single known plant material type that poses minimal risk of plant propagules or pathogens. Typically includes ornamental barks, untreated wood, and bagasse. Excludes mixed plant materials such as mixed garden organics, leaf mulches, engineered or chemically treated post-consumer timber products and raw manures.
Maturity	Pasteurised Product	Mulch that has been treated to reduce plant and animal pathogens in accordance with AS 4454 Clause 1.5.13

Maturity	Composted Product	Mulch that has undergone controlled and aerobic and thermophilic biological transformation through the composting process in accordance with AS 4454 Clause 1.5.5 and achieved a level of maturity with AS 4454 Appendix N
Maturity	Mature Compost	Compost that exhibits lower levels of phytotoxicity and a higher degree of biological stability.
Particle Size	Soil conditioner	Organic products suitable for adding to soil, typically labelled “soil amendment”, “soil additive”, and “soil improver”. Soil conditioner contains less than 20% of its particles by mass above 16mm in size.
Particle Size	Coarse Mulch	Coarse mulch contains at least 70% of its particles by mass above 16mm in size.
Particle Size	Fine Mulch	Fine mulch contains less than 20% of its particles by mass, below 5mm in size, and less than 20% of its particles by mass, above 16mm in a sieve.

Soil amendments may be required as instructed for individual landscape works. The City’s aim is to promote growth and increase water retention by an increase in organic matter and improved soil structure throughout landscaped areas. Organic soil conditioner is the preferred additive for the City. All other mediums must be approved prior to use.

- Soil improvements will use the following Australian Standards as best practice for works:
    - AS 4419
    - AS 4454
- Composts, soil conditioners and mulch products shall be recommended by suppliers based on plant type. The depth of application shall be in accordance with the manufacturer’s recommendations.
- Soil amendments will be added and integrated evenly into the topsoil to improve structure, nutrient levels of degraded, saline, or otherwise marginal soils.
- Contractors must specify and provide samples of soil conditioner prior to installation. Soil conditioners must be AS 4454 compliant soil conditioners.

Selection and use of soil shall comply with the following recommendations from AS 4419 Appendix M2:

- High and medium organic blends (with organic matter above 5%) blends should not be used as subsoil (soil greater than 300mm below natural ground level). During overwatering or high rainfall, the soil risks becoming too wet and anaerobic. The organic matter will continue to decompose which could also risk slumping and subsidence. Low organic matter blends should be used at depths below 300mm.
- Slopes, installed drainage and subgrade conditions shall be made suitable to prevent waterlogging of topsoil, particularly fine sand, silt and clay which can wash away during excess rainfall or irrigation.
- Soils with woody content, such as low-density soils, organic soils and soil blends from garden organics can cause nitrogen drawdown and stunt plant growth. Nitrogen rich fertilisers should be added to these types of soils prior to installation in the landscape. Additional, continued application of the fertiliser at higher-than-recommended application rates for up to 2 years is recommended. In low density soils, use of controlled, slow-release fertilisers is recommended.
- Landscape contractors shall consult soil suppliers, to ensure plants have a suitable phosphorous content. Excess phosphorous can cause a nutrient imbalance and potentially leach into the water table.
- The optimum ratio of calcium to exchangeable magnesium shall be in the range of 2 to 10. The City shall advise if an assessment of products is required in the case of large landscaping projects.
- Landscape contractors shall consult soil suppliers to ensure the pH range is suitable for the plant. Some neutral to alkaline soils with high organic matter may provide inadequate iron and manganese, causing

chlorosis (yellowing of youngest leaves). Soil suppliers shall advise if iron sulphate will need to be added, recommended at an addition rate of between 0.5kg/m^3 and 2kg/m^3 depending on soil pH.

- A fertiliser maintenance program shall be established. Turf roots shall be established before embarking on a fertiliser program. With low-density plant containers, fertilisers such as controlled release or liquid feed should be used. Only soil with medium to high organic matter from nutrient-rich sources such as manures or green waste composts can be expected to provide sufficient nutrients without additional fertiliser.
- Sports turfs shall only be maintained using mineral sand-based or low organic matter topdressing mix. High organic matter topdressing is more suited to renovating or conditioning local, school and council-grade ovals constructed of natural soil.

7. IRRIGATION

7.1 Scope

The City is committed to the sustainable use of water resources and maximising the efficiency of its landscape and turf irrigation systems. The intention of this section is to provide the

irrigation designer and installer a guideline for the provision of irrigation systems for the City.

By providing a standard for all irrigation works, the City can be assured that all works will be compliant with their existing system.

All works will be carried out according to current industry standards and Australian Standards where applicable. These specifications should be considered a minimum standard.

Any instructions from the manufacturer of specific irrigation components will be followed.

Any instructions from the irrigation designer or relevant City staff, for specific work, through extra specifications or drawings, will be followed.

Materials listed under “preferred item” will be mandatorily used and will need approval from City Staff to alter. Materials listed under “approved alternative item” can be used without further approval. Any items not listed will not be used unless a request is submitted and approved.

7.2 Design

All designs are to be done by Landscape/Turf Certified Irrigation Designers or relevant City staff.

Designs to include any additional specifications relating to the work above and beyond this general specification. Designs to include scaled working drawings suitable for the installer to work from.

Drawings are generally to be adhered to; however, minor variations may be considered appropriate due to site conditions. Any proposed changes will be submitted for approval before implementing the change.

Designers are to incorporate correctly selected pipe and wire sizing to suit the design and as per current industry standards.

Due to the large variation in available pressures in City, all designs must have a flow and pressure test done on the site before the commencement of installation.

Designs must include a maximum flow and minimum flow and pressure on site and report if design parameters are exceeded.

Drawings are to be presented in paper format (x2) of suitable size to allow reasonable interpretation and supplied electronically in AUTOCAD (DWG and PDF format).

7.3 Hydrozoning

Irrigation servicing the following categories of hydro-zones should be valved separately and stationed according to their respective hydro-zones. They are as follows:

- High Profile turf areas
- Active turf areas
- Passive turf areas
- Exotic garden areas
- Native Garden areas
- Low passive areas
- Shaded areas
- Tree watering systems

7.4 Design Approval

All designs must be submitted to the City for assessment and approval. Installation MUST NOT commence until the City provides approval.

7.5 Approved Contractors

All work is to be carried out by suitably qualified irrigation installers and performed under the supervision of a competent person acceptable to City.

All work should be carried out according to the relevant Australian Standards, manufacturer's instructions and any other job-specific specifications issued.

7.6 Irrigation Controller

The controller must allow an operator to activate the controller manually, automatically, and wirelessly. The controller must have Mobile Phone compatibility (Commercial) and be installed within a sufficiently sized, lockable, and vandal-proof enclosure, and a Modem and Antenna must be included if Relay cube is required.

Preferred Item

- Signal SDS 50 (Commercial).
- Signal SDS 75 (Commercial).
- Signal SDS 100 (Commercial).
- Hunter Pro C Controller (Domestic).

7.7 Main Filters

The main filter is used to avoid contaminants entering an irrigation system and should incorporate:

- Stainless steel woven screen.
- Sized to suit the attached system flow.
- 130 micron screen unless specified otherwise.
- 1000 KPa rating.

Preferred Item

- Filtomat
- Arkal

Installation

- One filter should be installed at each potable water connection point immediately after the backflow protection device and prior to the master valve.
- If installed above ground, there should be sufficient clearance from the ground and nearby pipe to allow the filter element to be removed for cleaning.
- If installed underground, the filter should be housed in a rectangular valve box.
- Swivel unions on either side of the filter for maintenance.
- Filter element housing to be pointing downwards to avoid contaminants falling back into body when filter is removed.

7.8 Back-Up Filters

The backup filter is used to avoid contaminants entering an individual drip irrigation zone and should incorporate:

- Polypropylene construction.
- Stainless steel woven screen.
- Sized to suit the attached system flow.
- 130 micro screens unless specified otherwise.
- 800 KPa rating.

Preferred Item

- Arkal polypropylene screen filter.

Approved Alternative Item

- PPI threaded screen filter

Installation

- One filter should be installed immediately after each solenoid valve operating drip irrigation and prior to the inlet manifold.
- If installed above ground, there should be sufficient clearance from ground and nearby pipe to allow filter element to be removed for cleaning.
- If installed underground the filter should be housed in a rectangle valve box.
- Swivel unions either side of filter for maintenance.
- Filter element housing to be pointing downwards to avoid contaminants falling back into body when filter is removed.

7.9 Backflow Protection Devices

The backflow protection devices prevent contamination due to backflow as per Water Corporation specifications.

7.10 Trenching

Trenching is used all underground installation of pipes and wiring. Trenches can be dug by hand, trencher, backhoe, excavator etc.

Installation

- Unless specified otherwise, turf and /or mulch removal is not required before trenching.
- All nearby services to be identified and located prior to commencement of trenching.
- Trenches to be straight lines and uniform grades.
- The trench bottom shall be continuous, firm, relatively smooth, and free of rocks, rubble or sharp objects.
- The depth of the trench shall also provide for the placement of 100mm approximately of clean
- sand into the bottom of the trench, surrounding pipe and above the pipework.
- A minimum of 100mm clearance is required between pipe and trench wall.
- A minimum 100mm is required between pipes and conduits in shared trenches.
- Original material used for final backfill over sand bedding unless deemed unsuitable or specified otherwise.
- All trenches shall be plate compacted unless otherwise specified.
- Final level of compacted material to be on same grade as surrounding surface.
- Stacking of pipes within a trench is not permitted
- Any excess material to be removed from site.

7.11 Access Sleeves

The Access sleeve allows irrigation pipes and wiring to pass under roads, paths etc. All access sleeves should incorporate:

- Sleeves to be PVC Pipe PN12.
- Sleeves to be large enough to accommodate expected irrigation components plus 50% (e.g. 63mm poly requires a 95mm sleeve or larger).

Installation

- Installed with a maximum 450mm cover under paths and 600mm cover under roads.
- Sleeves to be surrounded in a minimum of 100mm sand.
- Sleeves to protrude a minimum of 300mm from the edge of the path or road.

7.12 Mainline Pipe

The mainline pipe distributes water from the supply connection to valves and should incorporate:

- PVC-M PN12 rubber ring joint pipe.

Preferred Item

- IPLEX White Rhino.

Installation

- To be installed as per manufacturer's instructions.
- PVC rubber ring joint pipes are to be thrust-blocked at changes of direction, end stops, and valves.
- Elbows and bends to be used rather than bending pipe where a change in direction is required.
- Use thread tape and sealing compound on threads.
- All mains are to be installed in trenches with a minimum cover of 450mm.
- All pipes are to be covered with 100mm clean bedding sand all around the pipe.
- Installed in trench as per trenching details above.
- Pipes to be flushed from ends furthest from the source.
- Pipe ends left overnight to be covered to avoid mud, rocks and vermin entering.
- Bending of pipes will not be permitted under any circumstance.

7.13 Lateral Pipe

The lateral pipe distributes water from solenoid valves to sprinklers and drip manifolds and should

incorporate:

- UPVC PN12 Solvent weld joint pipe (to AS1477)

Installation

- To be installed as per manufacturer's instructions.
- Elbows, bends, and tees to be used rather than bending pipe where a change in direction is
- required.
- Use thread tape and sealing compound on threads.
- All laterals are to be installed in trenches with a minimum cover of 300mm.
- All pipes are to be covered with 100mm clean bedding sand all around the pipe.
- Lateral pipework for part-circle sprinklers shall be installed 600mm off-road edges with a branch off at each sprinkler location.
- Installed in trench as per trenching details above.
- Pipes to be flushed from ends furthest from the source.
- Cutting of the pipe shall be done in a neat workman-like manner with the use of a fine tooth saw,
- tube cutter, etc. The cuts shall be square, and all burrs shall be removed.
- Pipe ends left overnight to be covered to avoid mud, rocks and vermin entering.
- Minimum of 300mm between fittings.

7.14 PVC Pipe Joints

To be used for all PVC pipe joints and should incorporate:

- Solvent cement supplied shall be in accordance with the pipe manufacturer's recommendations.
- Priming or cleaning fluids shall be as recommended by the pipe manufacturer.
- Ring lubricant as recommended by the manufacturer of the pipe or fittings.

Preferred Items

- Christy's Pipe Cement
- Christy's Primer
- Soudal PVC Pipe Cement- Green (preferred product)

Installation

- To be installed as per manufacturer's instructions
- Minimum of 300mm in-between joints

7.15 PVC Pipe Fittings

All PVC pipe fittings should incorporate:

- Ductile iron rubber ring fittings shall comply with Australian Standards AS1646 - 1992
- Tapping bands with stainless steel nuts and bolts
- Class 18 PVC fittings

Preferred Item

- iPlex gunmetal tapping bands.

Approved Alternative Items

- iPlex ductile iron fittings
- 4N tapping bands

Installation

- To be installed as per manufacturer's instructions
- Rubber ring joint fittings to be supported with thrust blocks as per pipe manufacturer's recommendations

7.16 ERS Systems

- All effluent re-use system work will require Lilac pipe to be installed, lilac sprinkler heads and lilac-coloured valve boxes
- At the discretion of the City, Lilac coloured tape may be considered when installing lilac pipe, but approval must be gained before consideration of this installation method.
- All work with existing or upgrading ERS systems will have to comply with DoH regulations when working with Effluent water

7.17 Isolation Valves

The isolation valve is used to isolate sections of pipe or irrigation items for maintenance or for manual

control of irrigation systems and should incorporate:

- Chrome-plated brass or plastic
- Ball valve operation
- 20, 25, 40, 50 and 80mm FBSP inlet and outlet

Preferred Item

- Philmac

Alternative Item

- Bermad

Installation

- Sizing to be identical to matched irrigation item or pipe.
- Housed underground in a round valve box if independent of other irrigation items.
- Housed underground in a rectangular valve box if installed with other irrigation items.

7.18 Air Release Valves

The air release value is used to remove air from pipes and should incorporate:

- Reinforced nylon body construction
- 25mm inlet

Preferred Item

- Bermad

Installation

- To be installed at high points in main line pipes.
- Isolating ball valve installed prior to air valve.
- Housed underground in valve box.

7.19 Pressure Regulators

The pressure regulator is used to reduce downstream pressure of solenoid valve to optimum operating pressure of attached irrigation system. It is fitted on all solenoid valves operating drip irrigation where upstream pressure is above 300 KPa and must be included on all solenoid valves operating any other irrigation where upstream pressure is more than 200 KPa higher than the nominal operating pressure of the irrigation outlets. Pressure regulators should incorporate:

- Glass filled nylon body.
- Attaches to solenoid valve so valve acts as pressure reducing valve.

Preferred Item

- Bermad.

Installation

- To be installed after manual ball/gate valves as per manufacturer’s instructions.

7.20 Solenoid Valves

The solenoid valve automatically operates irrigation via a 24V AC signal from a controller and should incorporate:

- 25, 40, 50 OR 80mm inlet and outlet.
- The maximum operating pressure not to exceed 650Kpa.

All solenoid valves must be SDS compatible.

Preferred Item

- Bermad 200 or 400 Series.

Installation

- Isolating Philmac ball valve installed prior to solenoid valve.
- Housed underground in rectangular valve box.
- Top of valve to be located a maximum depth of 350 mm below finished ground level.
- A clearance of 100 mm minimum between top of valve (flow control stem) and the underside of the valve box lid.
- Minimum of 500mm of pipe before first fitting.
- Installed with a Signal orange wired data control solenoid.
- Sporting Ovals to be installed with a Signal blue wired latching data control solenoid.

7.21 Plastic Tag

Plastic tags are used to identify solenoid valves, water meters, controllers etc. and should incorporate:

- Exterior grade plastic label.
- Blue background colour with white writing or purple background with black writing for reclaimed water.
- Writing to be laser engraved into tag.
- Minimum size 70 x 45 x 1.6mm.

Installation

- Label to read valve type, active valve and station number.
- Attached to the valve with a plastic zip tie.

7.22 Valve Boxes

Value boxes are used to house irrigation components such as valves and wire joints underground and should incorporate:

- Green high-density polyethylene (HDPE) base and lid construction.
- Stainless steel locking bolt.
- Lilac lids installed when effluent water is used.

Preferred Item

- Rainbird Jumbo

Installation

- Boxes supported on all sides by bricks or pavers.
- Base of box lined with minimum 100mm gravel for drainage.
- Minimum 50mm clearance between gravel layer and irrigation item (e.g., Valve).
- Valves shall be centrally located within the valve box, and the valve shall be clearly exposed.
- Within the valve box. Boxes lined with geotextile fabric to avoid ingress of soil.
- Isolation valve to have sufficient clearance to be operated without impediment.
- Box not to come in contact with irrigation item or pipe.

7.23 Wiring

Wiring sends electrical current from the controller to solenoid valves. Care shall be taken at all times when laying cables not to drag, kink, skin, etc., any wires. A surplus loop of one metre in length shall be looped and placed alongside each solenoid valve to allow for future servicing. Sizing shall be as follows:

- 0.5mm multi-core (Domestic).
- 1.5mm multi-core. (Commercial).

Two wire solenoid control cable and size shall be as specified by the controller's manufacturer and equivalents are not acceptable.

Installation

- Within MD grey PVC 32mm conduit with the ends of the conduits to be sealed to prevent the ingress of dirt, water, and insects.
- PVC conduit to extend into valve boxes a maximum of 100mm and not impede maintenance of valves.
- Cable pits shall be installed at all changes of direction of a conduit run with cable pits at all changes in direction and/or 100m maximum length of continuous run.
- Where the two wire or multicore cable is extended to terminate at a location other than a solenoid valve, the ends of all spare wires shall be sealed in a DBY or HIT DBC connector.
- All wire joints are to be located within a wire pit for easy location.

7.24 Cable Joiners

Cable joiners are required to join or splice multiple wires and should incorporate:

- The number of in-ground joints shall be kept to an absolute minimum.
- Gel filled.
- Direct bury (2 wires).

Preferred Item

- DBY Yellow

Installation

As per manufacturer's specifications.

7.25 Sprinklers

Sprinklers are used to irrigate areas with overhead watering and are mainly used in areas up to 5 metres wide. The spray pattern is dependent on the nozzle selected and should incorporate a 15mm FBSP inlet.

Preferred Item

- Toro 570 Series sprinkler body (existing systems).
- Hunter Pro-Spray PRS40 sprinkler body (new systems).
- Hunter MP Rotators.
- Hunter Precision Adjustable Nozzles.

Installation

- 15mm funny pipe/flexible pipe to connect sprinklers to pipe on pop-up sprinklers.
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas.

7.26 Mid-range gear-driven sprinklers

Mid-range gear-driven sprinklers are used to irrigate small to medium areas that require overhead watering and should incorporate:

- Adjustable arc setting.
- 20mm FBSP inlet.

Preferred Item

- Rainbird 5004, Stainless Steel, Plus.

Installation

- 20mm articulated risers to connect sprinklers to pipe on pop-up sprinklers.
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas.

7.27 Long-range gear-driven sprinklers

Long range gear driven sprinklers are used to irrigate large areas that require overhead watering and should incorporate:

- Adjustable arc setting.
- 25mm FBSP inlet.
- Continuous rotation provides even coverage when set at 360 degrees.

Preferred Item

- Hunter I-40.

Approved Alternative Items

- Rainbird 8005 SS (City approval required for use).
- Hunter I-25 (City approval required for use).

Installation

- 25mm Swing Joints to connect sprinklers to pipe on pop-up sprinklers.
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas.

7.28 Swing joints

Swing joints allow connection of pop-up sprinklers to lateral pipes and allow sprinkler to be set at serviceable depth irrespective of pipe depth. They also allow vertical alignment of sprinkler irrespective of pipe direction and should incorporate:

- 15, 20 or 25mm PVC.

Installation

- Installed prior to sprinklers.
- Riser should be installed less than 45 degrees to horizontal.

7.29 Bubblers

Bubblers are used to irrigate trees and shrubs and should incorporate:

- Pressure compensating Bubbler nozzles on pop-up sprinkler body.
- Root zone watering system.

Preferred Item

- Hunter PCN bubbler.
- Hunter RZWS.

Installation

- 15mm funny pipe/flexible pipe connected to PVC pipe.
- Installed with top of assembly flush with ground level with risers retracted.

7.30 Single Emitters

Single Emitters are used to irrigate mass planted garden bed areas and should incorporate:

- Installed on 4mm tubing.
- Standard spacing's of 0.4 meters between emitters unless design requires closer spacing.

Preferred Item

- Antelco Astra Drip
- Toro Turbo Drippers
- Hunter Point Source Emitters.
- Hunter Multi Point Emitters.

Installation

- Installed as per manufacturer's specifications.

7.31 Swing Pipe

Swing pipe is Flexible tubing to irrigate trees, shrubs and garden beds and should incorporate:

- 13mm (1/2 Inch) or 19mm (3/4 inch) swing pipe.

Preferred Item

- TORO Funny Pipe.

Approved Alternative Item

- Rainbird SPX-FLEX.

Installation

- Installed as per manufacturer's specifications.

7.32 Swing pipe fittings

A Swing pipe fitting connects to the swing pipe to attach a flexible swing assembly and includes:

- 1⁄2" M NPT x 1⁄2" barb elbow.
- 3⁄4" M NPT x 1⁄2" barb elbow.
- 1⁄2" M NPT x 1⁄2" barb adapter.
- 1⁄2" barb x 1⁄2" barb x 1⁄2" barb tee.
- 1⁄2" barb x 1⁄2" barb coupling.
- Ratcheting Saddle w/ 1/2" (12.7 mm) Piercing Cap.
- Ratcheting Saddle w/ 3/4" (19.0 mm) Piercing Cap.
- Norma Cobra 13.5 – 15.0mm or 17.5 – 19.0mm stainless steel clamps.

Preferred Item

- Rainbird Spiral Barb Fittings.

Approved Alternative Item

- TORO Funny Pipe Fittings.

Installation

- Installed as per manufacturer's specifications.

7.33 Maintenance

A maintenance program shall be submitted for consideration and approval by the City prior to construction.

The maintenance programme will ensure the irrigation system and components are working as expected and includes:

- Regular programmed site visits to maintain the irrigation system.
- Testing of each station for controller operation and programming, valve operation, sprinkler operation, height adjustment of sprinklers, valve boxes and subsidence of trenches.
- Repair of any defects found.

The maintenance period is to be determined as stated in individual contracts.

Any defects liability period covers the irrigation and reticulation systems for a minimum of twelve (12) months in addition to any manufacturer's warranty.

All City Public Open Space will be maintained in accordance with the Parks and Open space Operation Levels of Service.

Contractors installing new Landscape works with ensuing maintenance periods will maintain the same Level of Service as above and will be responsible for ensuring the City Landscaped asset has been maintained for the entire maintenance period. Areas not at an appropriate standard at handover will be the contractor's responsibility to rectify.

Incident Reports: All incidents are to be reported verbally immediately and confirmed in writing detailing the incident and any disturbance affecting or likely to affect the scheduling of the works.

7.34 As-Constructed Drawings

Upon completion, a set of detailed drawings of all irrigation control valves, with valve number, flow (L/sec) and precipitation rate (mm/hour) for each valve, valve decoder number, and graphically showing communication network must be provided in accordance with the City Drawing Standards and Conventions.

Drawings are to be presented in paper format of suitable size to allow reasonable interpretation or supplied electronically in AUTOCAD (DWG and PDF format.

7.35 Manuals

Upon completion, an A4 3-ring binder must be provided with all relevant information about the irrigation system for future reference (commercial installations). The Binder is to have the site description, the contractor's name and the date of installation included on the front cover and spine.

The Binder is to include the following:

- Operating and installation manuals.
- Product brochures.
- List of all equipment installed.
- As constructed drawings on paper and native files.
- Information shall not be "generalised" and shall cover the full range of equipment and components installed at each site.

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