Development manual planning scheme policy (PSP)

SC6.4.13 Irrigation

Index

SC6.4.13.1 Irrigation policy

(1) Introduction

(a) Purpose

The purpose of this section is to:

(i) support Part 9.3.3 Landscape code and other elements of the Townsville City Plan and SC6.4 Development manual planning scheme policy;

(ii) identify the application of this section to irrigation design across all types of openspace; and

(iii) provide detailed design and construction standards, advice, and guidelines for irrigation on private and public land ensuring a high standard, sustainability, life cycle costs & environmental enhancement of the city image and local character that are suited to site and climatic conditions and will remain fit for purpose over the long term.

(b) Scope

This section provides direction on irrigation design within open space, both within the public and private realm.

The scope of this section includes:

(i) overarching design, sustainability and management principles that should be applied to open space development including:

1. general design principles, master plans and identified design outcomes;
2. principles of sustainability economic, environmental, and social; and
3. management frameworks for Public Open Space (POS) Hierarchy, Public Open Space Management (POSM) Framework and Irrigation Profile Level (IPL) Framework;

(ii) the types, functions, and development objectives for open space:

1. private open space;
2. streetscapes; and
3. public open space recreation parks, sporting parks and other public open space; and

(iii) design and embellishment guidelines for application in open space development.

(c) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Townsville City Plan and SC6.4 Development manual planning scheme policy sections:

Part 9.3.4 – Reconfiguring a lot code

Section SC6.9 Natural assets planning scheme policy

Section SC6.4.6 Road works and traffic control, Clause SC6.4.6.1 Geometric road design

Section SC6.4.14 Public utility and building over/near services

Section SC6.4.20 Outdoor dining design

(ii) Australian Standards:

AS/NZS 1158.3.1	*Lighting for roads and public spaces - Part 3.1: Pedestrian area (Category P) lighting — Performance and design requirements*
AS 1170	*Structural design actions (set)*

AS 1428	*Design for access and mobility (set)*
AS 1926.1	*Swimming pool safety standards Part 1: Safety barriers for swimming pools*
AS 2156	*Walking tracks (set)*
AS 2890.3	*Parking facilities - Part 3: Bicycle parking*
AS 3996	*Access covers and grates*
AS 4373	*Pruning of amenity trees*
AS 4422	*Playground surfacing – Specifications, requirements, and test methods*
AS/NZS 4486.1	*Playgrounds and playground equipment – Part 1: Development, installation,inspection, maintenance, and operation*
AS 4685.1	*Playground equipment and surfacing – Part 1: General safety requirements and test methods*
AS 4685.2	*Playground equipment and surfacing – Part 2: Additional safety requirements and test methods for swings*
AS 4685.3	*Playground equipment and surfacing – Part 3: Additional safety requirements and test methods for slides*
AS 4685.4	*Playground equipment and surfacing – Part 4: Additional safety requirements and test methods for cableways*
AS 4685.5	*Playground equipment and surfacing – Part 5: Additional safety requirements and test methods for carousels*
AS 4685.6	*Playground equipment and surfacing – Part 6: Additional safety requirements and test methods for rocking equipment*
AS 4685.11	*Playground equipment and surfacing – Part 11: Additional specific safety requirements and test methods for spatial network*
AS/NZS 4456.9	*Masonry units and segmental pavers and flags – Methods of test – Determining abrasion resistance*
AS/NZS 4586	*Slip resistance classification of pedestrian surface materials*

(i) Other:

Austroads	*Guide to Road Design* (Set)
Department of Transport and Main Roads	*Road Landscape Manual, Second Ed., June* 2013
Department of Transport and Main Roads (MUTCD)	*Manual of Uniform Traffic Control Devices*
Department of Transport and Main Roads	*Queensland Guide to Traffic Management* (QGTM) - *Part 6: Intersection, Interchanges and Crossings Management*
Queensland Government	*Crime Prevention through Environmental Design*, *Guidelines for Queensland*,2021
Queensland Government	*Census of the Queensland Flora*, 2013, edited by Peter D.Bostock and AlisaE.Holland.

Western Australian Department of Sport and Recreation	*Sports Dimensions Guide for Playing Areas.*
Australian Building Codes Board	*National Construction Code*

(2) Irrigation design

(a) Introduction

Landscape and irrigation outcomes should demonstrate consideration and application of the overarching principles, as described within this section, Part 9.3.3 Landscape code and other parts of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in a "Landscape Statement of Intent", as detailed in Section SC6.4.2 Development application guidelines.

(b) Master plans

For certain sites or localities, Council may formally adopt Master Plans that identify specific strategies and plans to deliver key design and construction outcomes.

At sites or locations where these Master Plans apply, any landscape design outcomes must be in accordance with the requirements for that site or area.

The following plans contain site specific outcomes that must be complied with:

(i) Thuringowa Riverway Master Plan (2003); and

(ii) Riverway Sustainable Development Policy (2003).

Details of the above listed plans are contained in Clause SC6.4.13.4 Attachment B – Adopted Master Plans.

Editor's Note - Applicants should refer to all applicable sub-sections within the Development manual planning scheme policy which identify specific design principles and outcomes required across individual open space typologies as well as other infrastructure.

Editor's Note - Outcomes identified in an adopted master plan take precedence over all other design guidelines, unless approved otherwise. Where proposals deviate from the desired outcomes of the adopted master plan, applicants must justify this deviation for Council's assessment and approval.

(c) Identifiable character and/or identified design outcomes

For key sites or localities where Council has not formally adopted area specific plans and strategies but there is an identifiable character and/or desired design outcome, planning and design for new open space development in these areas should seek to be consistent or complementary to this established direction.

Identifiable character and/or design outcomes may include:

(i) an established colour or furniture palette;

(ii) a dominant tree, plant species or planting style;

(iii) heritage features or an identifiable character;

(iv) significant natural features, materials, or environmental setting (e.g., natural bushland or coastalsettings); and

(v) a consistent, hierarchical based landscape design style (e.g., all "main roads" to be developed in "tropical boulevard" style).

Editor's Note - Statements pertaining to identifiable character or design outcomes for particular locations or land uses are contained within Townsville City Plan. Where applicable, landscape design outcomes are to comply

with these statements and must be addressed within the “Landscape Statement of Intent”. Where proposals will deviate from the desired outcomes, applicants must justify this deviation for further assessment and approval by Council.

(3) Economic sustainability

Landscape and irrigation outcomes should demonstrate consideration and application of economic sustainability principles, as described within this section, Part 9.3.3 Landscape code and other areas of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in the “Landscape Statement of Intent”, as detailed in Section SC6.4.2 Development application guidelines.

(a) General principles

Principles for consideration should include, but are not limited to:

(i) promoting opportunities for business and investments by:

1. designing quality streetscapes that promote local business and attract patrons; and

2. creating opportunities for marketing initiatives such as festivals, events, and community-based activities (e.g., provision of event spaces within public open space areas);

(ii) developing and implementing an integrated and strategic approach to the long-term provision of open space infrastructure by:

1. aligning new public open space development with Council’s Public Open Space Embellishment Framework and priority infrastructure plans; and

2. designing and developing new infrastructure and open space that improves the quality and value of the built environment within both the public and private realm (e.g., creating more liveable spaces that promote the city as an attractive place to live and invest); and

(iii) establishing economically sustainable infrastructure outcomes by:

1. identifying the lifecycle costs of open space infrastructure (e.g., the costs to plan, develop, maintain, replace, and demolish a recreational facility are established); and

2. identifying and developing new infrastructure with consideration of the ongoing operational requirements (e.g., identify and design a new open space development in line with defined maintenance resources).

(b) Lifecycle costing

Editor’s Note - Currently, no framework or standard format for establishing lifecycle costs is developed. Applicants requested to submit lifecycle costing information should refer to best practice examples until a formal framework is established.

(c) Ongoing operational requirements

(i) Where requested, applicants are required to identify the ongoing operational requirements in a maintenance plan, as detailed in Section SC6.4.2 Development application guidelines.

(ii) For public open space, maintenance plans should be aligned with Public Open Space Management (POSM) Framework.

(4) Environmental sustainability

Landscape and irrigation outcomes should demonstrate consideration and application of environmental sustainability principles, as described within this section, Part 9.3.3 Landscape code, other areas of the Townsville City Plan and Council's Corporate Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in a "Landscape Statement of Intent", as detailed in Section SC6.4.2 Development application guidelines.

Editor's Note - Currently, no framework has been developed for identifying and documenting outcomes against the environmental sustainability objectives listed. Until a formal framework or best practice examples are identified, applications will be considered on a case-by-case basis. This includes recognition of independent certification under an incentive-based branding and certification frameworks (e.g., Enviro Development) designed to increased sustainability in developments.

(a) Principles for consideration should include, but are not limited to:

(i) conservation and substitution of non-renewable resources, by:

1. responsible use of finite resources; and
2. implementation of efficiency mechanisms and strategies, (e.g., reduction of potable water use through water wise landscape and irrigation design);

(ii) efficient and sustainable use of renewable resources, such as:

1. prioritising and promoting innovative use of new, renewable materials or substitutes; and
2. transitioning to renewable energy sources and infrastructure where practicable (e.g., solar lighting);

(iii) direct and indirect reduction in resource consumption and waste generation, by:

1. implementing opportunities for waste reduction and reuse;
2. prioritising and promoting use of recycled materials (e.g., recycled plastic composites);
3. promoting means for reducing carbon emissions and improving opportunities for carbon offsets and sequestration (e.g., reducing land clearing by promoting protection of existing trees and vegetation areas and incorporation of natural areas into public open space design); and
4. promoting environmentally sustainable design principles to reduce resource consumption directly and indirectly (e.g., increased street tree plantings to support passive cooling of streetscapes and buildings whilst improving amenity to promote pedestrian and cyclist activity); and

(iv) protection, rehabilitation or enhancement of existing natural assets and systems through methods such as:

1. responsive planting design and species selection;
2. protection of remnant vegetation, significant trees, and habitat areas;
3. promotion of ecological design and responsible urban forestry management; and
4. implementation of integrated water cycle management practices.

(5) Social sustainability

(a) Outcomes

Irrigation outcomes should demonstrate consideration and application of social sustainability principles, as described within this section, Part 9.3.3 Landscape code and other areas of the Townsville City Plan.

Alignment with applicable principles should be expressed in the landscape and irrigation design outcomes and addressed in the “Landscape Statement of Intent”, as detailed in Section SC6.4.2 Development application guidelines.

(6) Irrigation Profile Level (IPL) Framework

As part of Council’s commitment to efficient, cost effective and responsible use of natural resources, Council has developed an Irrigation Profile Level (IPL) Framework to categorise and define irrigation water usage within public open space.

The IPL Hierarchy identifies and defines a number of “profile levels” based on the level of irrigation applied, an indicative “functional application” based on open space typologies, and the performance indicators associated with each irrigation application rate. Refer to Clause SC6.4.13.1 (7) for IPL Hierarchy.

Supporting this, the IPL Matrix identifies a number of criteria and “influences” used in the determination of an assigned IPL. Refer to Clause SC6.4.13.4 Attachment D for the IPL Matrix.

Importantly, it must be recognised that the level of irrigation required is directly dependent upon the landscaping which it must support. As such, in the development of new public open space, the landscaping should be designed with consideration of the typical IPL classification for the public open space typology as well as the extent of landscaping and irrigation defined by the POS embellishment standards. Additional requirements are identified in Clause SC6.4.13.2 Irrigation design and system requirements.

For existing public open space, the IPL classification must be based upon the required irrigation application rate necessary to support the health and longevity of the existing landscaping. Where a change to the IPL is proposed, this must include consideration of the open space typology, the intended use of the open space area and the impacts of reduced water application rate on existing plant specimens and include changes to the landscaping plantings where required.

Critically, an area of public open space may have more than one IPL (e.g., “high” IPL level around the activity node or within the minimum usable space, and then a “medium” or “low” profile for the balance of the open space). To achieve this in an efficient and effective manner, however, the associated landscaping and irrigation systems must be purpose designed for this outcome (I.e., separate irrigation systems consistent with species selection and placement based on principles of hydro zoning).

(7) Irrigation Profile Level (IPL) Hierarchy Definition

The Council’s Irrigation Profile Level (IPL) Hierarchy includes the following types: High, Medium, Low, None.

Table SC6.4.13.1 - Irrigation Profile Level (IPL) Hierarchy Definition

IPL	Function Description	Performance Requirements	Typical Image of Turf Area
High	Provides irrigation to Townsville City Councils landscaped areas including: Public open spaces, Facilities, and utility assets, Local road reserves and street scaping Provides irrigation to State Government main road - road reserves. Formal gardens irrigatedto (IPL) levels High and Medium only.	Provide irrigation in a uniform application to supply landscaping plants with soil moistureto Promote: Vigorous plantgrowth, Best planthealth, Best presentation. Visual Indicators - turf:Lush thick turf, Rich even green appearance. Yearly application range (assumed clay to clay loam soil types and subject to site conditions) - Turf 28 - 38 mm per week. Garden 18 –28mm per week.	
Medium	Provides irrigation to Townsville City Councils landscapedareas including: Public open spaces, Facilities and utility assets, Local road reserves and street scaping Provides irrigation toState Government main road - road	Provide irrigation in a uniform application to supply landscaping plants with soil moisture to Promote: Good plantgrowth, Good planthealth, Good presentation. Visual Indicators - turf: Mostly mediumthickness turf, Mostly green appearance, with some	

	reserves. Formal gardens irrigated to (IPL) levels High and Medium only.	patches of green/brown. Yearly application range (assumed clay toclay loam soil types and subject to site conditions) - Turf 18 - 28mm/week, Garden 15 – 25mm/week.	
Low	Provides irrigation to Townsville City Council's landscapedareas including: Public open spaces, Facilities and utility assets Local road reserves and street scaping Provides irrigation to State Government main road - road reserves. Formal gardens irrigated to (IPL) levels High and Medium only.	Provide irrigation in a uniform application to supply landscaping plants with soil moisture to Sustain: Minimal plantgrowth, Minimal planthealth, Minimal plant presentation. Significant seasonal influences on landscaping. Visual Indicators – turf:Thin coverage ofturf, Mostly brown with green tingeappearance, some patches ofbrown. Yearly application range (assumed clay to clay loam soil types and subject to site conditions) - Turf 12 - 20mm/week.	

Non	Areas where no irrigation is required: Natural areas Naturally landscaped areas such as native plantings, Open grass areas such as drainage swales, Other areas deemed not requiring irrigation.	Areas depend solely onrain and naturally occurring moisture. Seasonal plant growth, health, and presentation.	

(8) Irrigation Profile Level (IPL) Matrix

SC6.4.13.2 Irrigation design and system requirements

(1) Introduction

(a) Intent

Irrigation systems solely exist for the purpose of providing water to maintain the soil moisture content above the horticultural assets permanent wilting point and below the maximum field capacity. These conditions are required to maintain the health and growth of the horticultural assets.

(i) These guidelines, set out the scope of work, workmanship standards and the responsibilities for the supply and installation of irrigation systems within private open space and public open space and streetscapes that will become a Council asset on handover.

(ii) In addition to this requirement Council seeks to minimise water usage within all open space and reduce maintenance and operational costs associated with the council owned irrigation systems.

(iii) Product and brand names for components in this sub-section are used to define a standard and quality acceptable to Council, with particular emphasis on long term maintenance requirements. Components other than those specified may only be used if the components are of equal or better standard and quality of those specified and an authorised change has been approved by Council.

(iv) Where the developer/applicant has installed an unauthorized irrigation system not approved by Council, the developer/applicant will be required to remove such irrigation systems and rectify at their expense.

(v) Developer/applicants must acquaint themselves with Council's water restrictions of the time, and where required obtain written permission from Council to implement landscape treatments that require establishment water treatment. Such water treatment permissions shall be in line with Council's water restriction policy requirements for the establishment period.

(b) Irrigation design objectives

(i) to ensure that irrigation systems are designed to the highest industry standards with the goal of maximising the efficient usage of water;

(ii) to ensure that irrigation systems and components are installed in accordance with the relevant industry standards and tradesman like workmanship; and

(iii) to ensure that the irrigation systems and components installed are of a quality and standard acceptable to Council, with regard to the life of the system, the ongoing ease of maintenance and operational costs of the system and its components.

(c) General requirements

(i) All irrigation must be of a high standard, being designed, constructed, and installed in accordance with:

1. the provisions within the planning scheme, planning scheme policies and this section of SC6.4 Development manual planning scheme policy;
2. manufacturer specifications;
3. all applicable Australian Standards and legislation;
4. all applicable Council local laws; and
5. Council's approved standard drawings.

(ii) All irrigation systems are to be:

1. designed to achieve an even and efficient supply of water to the nominated Hydro Zone areas;
2. designed with consideration of local conditions such as topography, prevailing winds, micro-climate, rainfall volumes and seasonal dry and wet periods;
3. constructed using quality materials and components;
4. automated to allow for efficient water usage;
5. programmed to operate in accordance with any Council water restrictions;
6. designed to operate efficiently and effectively based on the water supply pressure and flow volumeavailable to the system;
7. the minimum industry accepted standard by Council for turf sprinkler uniform cover is a Distribution Uniformity (DU) of 75% cover; and
8. the minimum industry accepted standard by Council for sports field turf sprinkler uniform cover is a Distribution Uniformity (DU) of 85% cover for all of the sport playing surface.

(iii) All irrigation in private open space that is to be:

1. installed and operated by a private entity, is not required to comply with the specific design and construction standards, however such systems that are connected to the reticulated water network is required to comply with Council's water restrictions of the time.
2. installed and/or operated by Council, is to be designed and constructed as per requirements detailed in this section.

(iv) All irrigation systems in public open space and road landscaping are to:

1. be designed by qualified professionals, being a certified irrigation agronomist or a certified irrigation designer;
2. constructed using quality materials and components to ensure a robust, reliable, and long assetlife;
3. be designed to minimise life cycle costs through reduced operational and maintenancerequirements;
4. be designed and apply volume that should not cause foreseeable damage to the road structure or surface; and
5. be designed and constructed as per requirements detailed in this section.

(v) All irrigation systems in streetscapes and car parking areas are to:

1. in a "main street" or "special character" situation where Council owns and operates an irrigation system or has agreed to accept irrigation assets, the irrigation is to be provided in accordance with this section and will be subject to the acceptance of works procedure as per Section SC6.4.24 Acceptance of completed works; and
2. in all other locations where irrigated turf or plantings are required as a condition of development, the irrigation system is to be connected to the adjacent private development.

(vi) Irrigation systems in public open space and streetscapes should be designed in conjunction with all landscape elements to ensure that:

1. landscape design and plant selection ensures the required level of irrigation to maintain the function and longevity of landscape is analogous with the assigned irrigation profile, as detailed in Clauses SC6.4.13.4 Attachment C Irrigation Profile Level Hierarchy and SC6.4.13.4 Attachment D Irrigation Profile Level Matrix;
2. landscape design, and plant selection facilitates, hydro zoning;
3. landscape features are designed to maximise water infiltration through use of appropriate landforms, soil types and mulches;
4. landscape features are designed and constructed to ensure ease of irrigation coverage in the short and long term; and
5. landscape features are designed to contribute to an integrated water management system.

(d) Irrigation type requirements

(i) All turf areas shall be irrigated with pop-up sprinklers or subsurface drip irrigation with the following specific requirements:

1. all turf areas in roundabouts and median strips that border roadways shall be irrigated by drip irrigation;
2. all turf areas within 5 m of a roadway and within 50 m of the centre of an intersection shall be drip irrigated; and
3. where a site-specific risk analysis recommending either method has been provided and accepted by Council.

(ii) All garden areas shall be irrigated with subsurface drip irrigation, except for areas containing plants or trees with vigorous root systems such as palms or lilies which shall be irrigated by pop-up sprinklers.

(e) Agronomic requirements

For all irrigation systems the approved hours of operation shall be between 10.00 pm and 5.00 am, the operation of such irrigation systems shall also comply with Council's water restrictions of the time.

(i) For pop-up sprinklers the total time taken to deliver 7 mm of equivalent precipitation when each station is operated individually and consecutively shall not exceed a 7-hour period for all stations on a given system. Variations to this requirement may apply for stations operated simultaneously.

(ii) For drip irrigation the total time taken to deliver 7 mm of equivalent precipitation when each station is operated individually and consecutively shall not exceed a 7-hour period for all stations on a given system. Variations to this requirement may apply for stations operated simultaneously.

(iii) The irrigation application rate shall not exceed the infiltration rate of the soil.

(iv) The operation of irrigation systems must avoid operating in strong winds, excessive or poor irrigation mains pressure, poor irrigation design or lack of maintenance, which all contribute to system delivery inefficiency.

(v) All irrigation systems that are to become Council assets to maintain must be fully commissioned and operating efficiently in accordance with the approved irrigation design plans for a minimum of 3 months prior to acceptance “Off Maintenance”.

(f) Environmental requirements

The system shall not have excessive runoff which causes erosion or pollution of surrounding native areas and/or storm water drains.

(g) Automation requirements

(i) The irrigation controller shall be chosen from the units outlined in Table SC6.4.13.2.

Table SC6.4.13.2 - Controller Selection List

Controller Name	Power Type / Source	Valve Capacity
AC Irrinet M Slave 12 - 24	AC / 240V Mains	12 to 24
AC Irrinet M Slave 36 - 48	AC / 240V Mains	36 to 48
AC Irrinet M 12 - 24	AC / 240V Mains	12 to 24
AC Irrinet M 36 - 48	AC / 240V Mains	36 to 48
AC Irrinet ACE 24 - 48	AC / 240V Mains	24 to 48
XR 1 - 4	DC / 6V Solar	1 to 4

(ii) A maximum of three stations may be operated simultaneously (by programming only) given the following:

1. irrigation type and precipitation rate of the stations to be operated simultaneously shall be the same;
2. the soil type, vegetation, and topography of the stations to be operated simultaneously shall be the same; and
3. all stations to be operated simultaneously shall be able to supply the manufacturer’s recommended pressure.

(iii) Only one valve per controller output is acceptable.

(h) Separation of irrigation zones

(i) Irrigation zones shall be classified in the following vegetation types:

1. turf grass;
2. garden bed; and
3. native vegetation or revegetation plantings.

(ii) A single irrigation valve shall water no more than one irrigation zone.

(i) Safety requirements

The system shall not have runoff onto roadways, footpaths, or other pedestrian areas to such an extent that it may result in a hazard to traffic and/or pedestrians.

(j) Temporary irrigation design

Temporary irrigation is exempt from the technical design and installation conditions outlined in this document provided it meets all other legislated requirements.

(i) All temporary irrigation installed in the public realm must be removed and terminated in accordance with Council requirements prior to the area being accepted “off maintenance”. All terminations and disconnections of temporary irrigation must be inspected by a Council officer prior to backfilling.

(k) Existing council irrigation assets

(i) Council’s Irrigation Operations Unit must be notified of any disruptions to Council owned irrigation assets prior to works commencing on these assets;

(ii) Works in areas containing existing Council irrigation assets are required to have plans for the deconstruction and isolation of the existing irrigation to ensure the system is not unnecessarily damaged and account for the ongoing watering requirements of the soft landscaping serviced by that irrigation;

(iii) All existing Council irrigation affected by development works must be reinstated to standards current at the time of the works;

(iv) Any extensions to existing mainline require the installation of an isolation valve;

(v) Council shall charge costs for water usage based on agreement with the developer. Options include the installation of a sub-metering device or use of Irrinet flow data; and

(vi) Upon activation of any additions to Council owned irrigation, revised flow data must be provided to Council’s Irrigation Operations Unit.

Editor’s Note - For further information on the construction of all irrigation systems, refer to Clause SC6.4.13.5 Irrigation construction.

SC6.4.13.3 Water features and water play areas

(1) Water features and water play areas will only be permitted in limited circumstances, at specific locations, and where all relevant considerations are reasonably satisfied, and will be considered on a case-by-case basis.

(2) Where the proposed water features and water play areas are associated with public open space, Council owned land, or will involve potential future Council assets, the infrastructure may only be permitted at approved locations and in accordance with Council’s Public Open Space Embellishment Framework. Approval from the relevant Council asset owner/s will also be required.

(3) In order to properly assess any such proposals, Council may request the provision of a maintenance plan and a life-cycle costing as part of the development application, as per Section SC6.4.2 Development application guidelines.

(4) Where water features are proposed as a development entry statement, applications may only be approved where the water feature will be within private property and the developer will remain, for the life of the asset, solely responsible for all aspects relating to the water feature (including ongoing maintenance and water costs).

(5) All water features and water play areas must be designed and installed to comply with all relevant Australian Standards.

Editor’s Note - Due to the place specific, custom nature of water features and water play areas, no further specifications are currently developed. Proposals will be considered on a case-by-case basis in accordance with necessary requirements defined by all applicable engineering, electrical, drainage, swimming pool and water safety standards, legislation, local laws and Council’s overarching design and management principles. Engagement and approval from other stakeholders/authorities may additionally be required as part of any development proposal.

SC6.4.13.4 Attachments

Attachment A - Adopted Master Plans

Thuringowa Riverway Master Plan Stage 1: Pioneer Park and Loam Island February 2003

Riverway Sustainable Development Policy

City of Thuringowa Planning Scheme Policy 2003

SC6.4.13.5 Construction

(1) Introduction

(a) Scope

(i) This section sets out the standards for design, installation and construction of irrigation systems that will become a Council asset.

(ii) Irrigation systems that will be connected to an alternative water supply have additional requirements to this section.

(b) Reference and source documents

Reference and source documents that must be read in conjunction with this section are as follow:

(i) Australian Standards

AS 1432	*Copper tubes for plumbing, gas fitting and drainage applications*
AS/NZS 1477	*PVC pipes and fittings for pressure applications*
AS 2032	*Installation of PVC pipe systems*
AS 2033	*Installation of polyethylene pipe systems*
AS 2053	*Conduits and fittings for electrical installations (all Parts)*
AS 2129	*Flanges for pipes and valves and fittings*
AS 2698.2	*Plastics pipes and fittings for irrigation and rural applications – Part 2: Polyethylene rural pipe*
AS 2698.3	*Plastics pipes and fittings for irrigation and rural applications –Part 3: Mechanical joint fittings for use with polyethylene micro irrigation pipes*
AS 2845.1	*Water supply – Backflow prevention devices – Part 1: Materials, design and performance requirements*
AS 2845.2	*Water supply – Backflow prevention devices – Part 2: Air gaps and break tanks*
AS 2845.3	*Water supply – Backflow prevention devices - Part 3: Field testing and maintenance of testable devices*
AS 3000	*Electrical installation (known as the Australian/New Zealand Wiring Rules)*
AS/NZS 3008.1.1	*Electrical Installations –Selection of cables - Part 1.1: Cables for alternating voltages up to and including 0.6/1 kV - Typical Australian installation conditions*
AS/NZS 3500	*Plumbing and drainage (Set)*
AS/NZS 3500.0	*Plumbing and drainage - Part 0: Glossary of terms*
AS/NZS 3500.1	*Plumbing and drainage – Part 1: Water services*

AS 3500.1.1	*National plumbing and drainage - Part 1.1: Water supply – Performance requirements*
AS 3500.2.1	*National plumbing and drainage – Part 2.1: Sanitary plumbing and drainage - Performance requirements*
AS/NZS 3808	*Insulating and sheathing materials for electrical cables*
AS/NZ 3879	*Solvent cements and priming fluids for PVC (PVC-U and PVC-M) ABS and ASA pipes and fittings*
AS/NZS 4129	*Fittings for polyethylene (PE) pipes for pressure applications*
AS/NZS 4130	*Polyethylene (PE) pipes for pressure applications*
AS/NZ 4158	*Thermal bonded polymeric coatings on valves and fittings for water industry purposes*

(ii) Legislation:

Water Act 2000

Electricity Safety Act 2002

Work Health and Safety Act 2011

(iii) Other:

Queensland Government

Queensland Water Recycling Guidelines, December 2005

(iv) Authorities:

The rules and regulations of the relevant local electricity supply authority

The rules and regulations of the relevant local water supply authority.

The requirements of any other Authority having jurisdiction over the installation.

(2) Irrigation pipework

(a) Standards

All pipes shall be supplied, installed, and joined in accordance with the manufacturer's recommendations and all relevant, current Australian Standards.

(b) Class of pipe

(i) Main line pipes (pressurised) of nominal 80 mm diameter and larger shall be minimum Class 12 uPVC rubber ring jointed (RRJ) or PN12.5 (Poly pipe).

(ii) Main line pipes (pressurised) of nominal diameter less than 80 mm shall be minimum Class 12 uPVC solvent welded joint (SWJ) or PN12.5 (Poly pipe).

(iii) All lateral line pipes (non-pressurised) shall be minimum Class 6 (uPVC) or PN8 (Poly pipe), except for lateral line pipe work under road pavements which shall be Class 12 (uPVC) or PN12.5 (Poly pipe).

(iv) Supply line to a drinking fountain or a water tap shall be a minimum of 32 mm Class 12 uPVC or PN12.5 (Poly Pipe). Copper pipe is not acceptable.

(v) Copper pipe to a water meter, drinking fountain and water tap assemblies shall be minimum Type B.

(vi) All irrigation pipe work under pavements (road or otherwise) shall be encased in a conduit.

(c) Conduit crossings

(i) All conduits used to encase irrigation line pipes shall be 100 mm Class 9 PVC SWJ Pipe as standard unless otherwise approved by the Superintendent. Storm water or wastewater pipe used as conduit is not acceptable.

(ii) Conduit crossing ends shall be sealed with expanding foam to stop the ingress of soil and material from entering the conduit.

(iii) Conduit crossings within road reserves and medians are to have the outer 50 mm of conduit sealed with expanded foam, to stop the transportation of water through the conduit.

(iv) Where underground bores or conduits crossings have been installed, a stainless-steel tag shall be used to mark the start and finish of the conduit. The tag shall be a minimum of 38 mm diameter and 1.6 mm thick. It is to be nailed, glued, or set into the surface of the crossing. The marker shall be engraved with the words “Irrigation Water”, given a unique number, and recorded on the as constructed drawings.

(d) Pipe fittings

(i) All fittings for uPVC pipe shall be minimum Class 18 PVC SWJ.

(ii) All fittings for poly pipe shall be metric compression Plasson fittings.

(iii) All fittings for low density pipe shall be barbed type, with all joints fitted with stainless steel cobra clamps – or approved equivalent.

(iv) All threaded fittings, except sprinklers, shall be sealed using PTFE thread tape and Liquid Teflon.

(e) Pipe installation generally

(i) Interior of pipes shall be kept free of dirt and debris at all times.

(ii) Where pipe work is left unfinished during installation, the open ends of pipes shall be sealed off with plastic secured to the end of the pipe or have end caps fitted.

(iii) Pipes laid in a common trench shall be separated by a minimum of 100 mm.

(iv) Refer to Section SC6.4.3 Standard drawings SD-131, Figures 1 to 6 for pipe alignments for all irrigation works in road reserves.

(f) UPVC rubber ring jointed pipe – installation

(I.e., Main line pipes of nominal 80 mm diameter and larger).

(i) All uPVC rubber ring jointed pipe work shall be installed in accordance with the manufacturer’srecommendations and AS 2032.

(ii) All uPVC rubber ring jointed pipe work shall be laid in a minimum of 100 mm sand bedding and surround.

(iii) All connections and changes of direction horizontally and vertically in rubber ring joint (RRJ) pipe work shall be installed with concrete thrust blocks.

(iv) Thrust block design and size shall follow pipe manufacturers recommendations (“Thrust Block Design –Pressure Pipeline Fittings” Iplex uPVC Design Manual). Thrust blocks shall be 15 MPA concrete in accordance with AS 2032. All thrust blocks are to be cast in situ against undisturbed ground and shall have neatly formed sides.

(v) The ends of pipes used for rubber ring joint (RRJ) connections shall have a smooth chamfer 15 degrees to the outer edge and shall be free of all burrs and rough edges. Rubber rings and lubricant used shall be in accordance with the pipe manufacturer's recommendations.

(vi) Each pipe length shall be laid in the following direction; water flow runs from the socket end to the spigot end of the pipe, except for ring mains.

(vii) Trenches may be curved to avoid obstructions within the limits of the curvature of the pipe.

(g) UPVC solvent welded joint pipe installation.

(I.e., main line pipes of nominal diameter less than 80 mm or lateral line pipes).

(i) All uPVC Solvent welded joint pipe work shall be installed in accordance with the manufacturer'srecommendations and AS 2032.

(ii) All uPVC solvent welded joints shall be primed and cemented.

(iii) Primer and solvent cement shall conform to AS/NZ 3879.

(iv) Primer is to be "Priming Fluid (red)".

(v) Solvent is to be "Christy's PVC Red Hot Blue Glue" or approved Type "p" solvent cement.

(vi) All pipes shall be primed before cementing the joint.

(vii) Pipe ends shall be free of all burs and rough edges.

(viii) All uPVC solvent welded joints shall not be subjected to water pressure for at least 24 hours aftercementing the joint.

(ix) All mainline uPVC solvent welded joint pipes shall be laid in a minimum of 100 mm sand bedding and surround.

(h) Polyethylene pipe installation

(i) All polyethylene pipe work shall be installed in accordance with the manufacturer's recommendations and AS 2033.

(ii) Poly pipe shall be laid with sufficient allowance for contraction and expansion of the pipe.

(iii) Pipe ends shall be free of all burs and rough edges and shall be chamfered with the appropriate tool before jointing.

(iv) Polyethylene tapping saddles are only to be used to connect sprinklers and dripper tube to polyethylene pipe work.

(i) Trenching

(i) All pipe work shall be laid in trenches, except for:

1. pipes which are installed in underground conduits; or
2. pipes which are installed above ground due to obstacles I.e., bridges, walls, etc.

(ii) Trenches shall:

1. be sufficiently wide to allow adequate working clearance;
2. be excavated in straight lines between bends or pits;
3. have vertical sides and be a constant depth for the full length of the trench; and
4. be of adequate depth to allow for pipe bedding and adequate cover to the pipe as specified.

(iii) Trenches for multiple pipes shall be sufficiently wide to allow adequate working clearance and a minimum of 100 mm separation between pipes.

(iv) Pipes shall be firmly and evenly supported with bedding material or approved backfill material in the centre of the trench.

(v) Minor adjustment to the irrigation systems design layout will be permitted to clear undergroundobstructions.

(vi) Trenching machinery shall be avoided within 1 m of existing services. Hand trench to expose existing services, prior to connection or use of trenching machinery.

(vii) Cover to pipes

The minimum and maximum depth of cover to pipes shall be as noted in Table SC6.4.13.3.

Table SC6.4.13.3 - Depth of Cover to Pipes.

Pipe	Minimum	Maximum
Main lines in road reserves (UPVC and Polyethylene)	600 mm	750 mm
Main lines all other locations (UPVC and Polyethylene)	400 mm	600 mm
Lateral lines - all locations	300 mm	500 mm
Drinking fountain and water tap supply lines. (except in land fill sites)	300 mm	400 mm
Drinking fountain and water tap supply lines in land fill sites	450 mm	600 mm
Dripper tube (turf)	75 mm	100 mm
Dripper tube (garden)	Surface	Surface

Editor's Note - Depth of cover is defined as the distance from the top of the pipe to the finished surface level or from the top of the pipe to the underside of paving, concrete, or road pavement. Refer to Section SC6.4.3 Standard drawings SD-18.1 for Typical Pipe Trench details.

(j) Pipe bedding

(i) A minimum of 100 mm sand bedding and surround is required for:

1. all main lines;
2. all uPVC Rubber Ring Jointed pipes;
3. all pipes under road pavements;
4. all pipes laid on solid rock;
5. all pipes where rubble, rocks and/or debris is encountered in the trench;
6. all potable water lines; and
7. all electrical conduits.

(ii) Bedding sand shall be clean sand with rounded grains free of any rocks, debris and organic matter and graded such that 100 per cent passes a 4.75 mm sieve size.

(iii) Pipe work, other than those listed in Clause SC6.4.13.5 (2)(j) above may be laid without sand bedding, provided the trench is free of rubble, rocks and /or debris.

(iv) Pipe work, other than those listed in Clause SC6.4.13.5 (2)(j) above in locations where the natural earth contains rocks, debris and any materials that may damage pipes over time or where excessive ground movement is likely to occur shall be laid in a minimum of 75 mm sand bedding and surround.

(k) Approved backfill to trenches

(i) Excavated material may be used as backfill, provided that the material is free of rubble, rocks, debris,organic material and any sharp or solid objects and/or materials that may damage the pipe over time.

(ii) Where material excavated from the trench is unsuitable for backfill, clean sand, garden loam, shall be used as backfill.

(iii) Backfill to trenches shall be compacted with a wheel roll or plate compactor. Completed backfill is to be mounded 50 mm higher than the surrounding surface for the full length of the trench, to allow for further consolidation.

(iv) Backfill to trenches under road pavements and pathways shall be crusher dust material placed in 150 mm compacted layers.

(v) On completion of backfilling operations, all excess material is to be either reused on site where possible or shall be removed from the site.

(l) Exposed pipes

(i) Any exposed pipe shall be constructed of stainless steel or lagged copper and shall comply with AS/NZS 3500 standards for exposed pipe.

(ii) All above ground works are to conform to AS/NZS 3500.1, Section 5.7 “Support and fixing aboveground”.

(iii) Bracing around the pipes is to be lined with an appropriate material to prevent damage to the pipe.

(iv) Pipes are to be labelled “potable” or “non potable” in accordance with Australian Standards.

(m) Proximity to other services

Table SC6.4.13.4 below lists the separation required between water pipes and electricity and gas services. Separation for all other services shall be as outlined in AS/NZS 3500.1 Section 5.3 entitled “Proximity to other services”.

Table SC6.4.13.4 - Proximity to Other Services

Service	Separation
Electrical Cables with Warning Tape or Mechanical Protection (Water Pipes DN65mm and below)	100 mm
Electrical Cables with Warning Tape or Mechanical Protection (Water Pipes larger than DN65mm)	300 mm
Electrical Cables with no Warning Tape or Mechanical Protection	600 mm
Consumer Gas Pipe with Marker Tape 150mm above complying with AS2648.1 (Water Pipes DN65mm)	100 mm
Consumer Gas Pipe with Marker Tape 150mm above complying with AS2648.1 (Water Pipes larger than DN65mm)	300 mm
Consumer Gas with no Marker Tape or Mechanical Protection	600 mm

(3) Control systems

(a) Scope

This section covers the furnishing of all labour, materials, and services in connection with the fabrication, factory testing, delivery and site installation of the irrigation controller and associated cabinets.

(b) Network requirements

(i) Council operates an irrigation control system that consists of a Motorola Irrinet Supervisory Control and Data Acquisition (SCADA) System. This system is commonly known as the Irrigation Central Control (ICC). The ICC System communicates to irrigation controllers throughout the Council's region over UHF wireless telemetry communication networks.

(ii) All irrigation controllers shall be operated via the ICC System unless an alternative controller system is approved by the Superintendent.

(iii) Contractors are required to provide an approved irrigation controller to adequately service the proposed irrigation system. The controller shall provide for the number of stations including master valve and fertigation control valve required for:

1. the current irrigation system to be installed; and

2. defined future requirements of the controller.

(iv) Irrinet M Slave, Irrinet M and Irrinet ACE controllers by Motorola are the approved irrigation controllers.

(v) All irrigation controllers must be capable of communicating with the ICC System across the telemetry communication network. Each controller must be fitted with an approved radio transceiver and/or modem and external antenna.

The transceiver must have the correct frequency configuration to communicate on the network.

(vi) Each irrigation controller shall be allocated a logical address by Maintenance Services – Irrigation Design Unit for communications to the ICC System.

(vii) All irrigation controller system components shall operate within the ranges specified by the manufacturer.

(c) Irrigation controller selection

(i) Irrigation controllers are to be selected from Table SC6.4.13.5.

Table SC6.4.13.5 - Controller Selection List.

Controller Name	Power Type / Source	Valve Capacity
AC Irrinet M Slave 12 - 24	AC / 240 V Mains	12 to 24
AC Irrinet M Slave 36 - 48	AC / 240 V Mains	36 to 48
AC Irrinet M 12 - 24	AC / 240 V Mains	12 to 24
AC Irrinet M 36 - 48	AC / 240 V Mains	36 to 48
AC Irrinet ACE 24 - 48	AC / 240 V Mains	24 to 48
XR 1 - 4	DC / 6 V Solar	1 to 4
XR Plus	DC / 6 V Solar	1 to 8

(ii) AC powered irrigation controllers are the preferred option of the Superintendent. DC powered irrigation controllers are not acceptable unless approved by the Council.

(d) Operating environment – ambient conditions

(i) All equipment mounted inside cabinets and cubicles shall be suitable for operation in temperatures up to 60 °C. Measures shall be taken to ensure that high ambient temperatures and full load operation do not cause temperatures to exceed maximum allowed operating temperatures.

(ii) Since all cabinets are to be mounted outdoors, consideration shall be given to minimise heating by direct solar radiation.

(e) Irrigation controller specification – general

(i) General requirements

1. The irrigation controller cabinet and component parts shall conform in all respects to the highest standards of design and workmanship and appropriate requirements of the latest applicable state or local codes.

2. When mounting accessories to the back panel, use fine threaded tapped screws.

3. The irrigation controller cabinet shall be completely wired, and assembled, with all devices and controls installed as shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1through SD-29.1 so that the entire assembly is an operating unit ready for installation and the wiring of field devices.

4. Wiring shall meet the latest requirements of the AS 3000 and applicable workplace safety codes.

(ii) Wiring

1. All wire shall be 0.5mm²/PVC 105/ stranded, insulated for 600 V.

2. A "bootlace ferrule" shall be used on wires connected to terminals which have only a screw for securing the wire. Ferrules shall be properly crimped using a professional crimping tool.

3. All manufacturer terminal block wiring shall be restricted to the panel side of the blocks. The manufacturer shall connect no more than two wires to any terminal point. The field side of the terminal blocks shall be left completely free of wires and jumpers. Wiring on terminal blocks shall be so arranged that not more than one wire to the field side of any terminal point will be connected with the exception of the earth.

4. All multiple common connections shall be wired via bridging links on the terminal blocks.

5. Horizontal and vertical wiring between the terminal blocks and the devices shall be enclosed inducts except wiring between the ducts and the devices may run exposed for distances not exceeding 100 mm. Duct loading shall not exceed 75 per cent rated fill at any point.

6. All exposed wiring shall be formed neatly with square corners and where possible, grouped in packs. Each pack shall be bound with plastic ties and be substantially supported throughout its full length. Cabled wire is not acceptable.

7. Splicing of wires on electrical circuits is not acceptable.

(iii) Terminal block

Terminal blocks shall be provided for all wiring which exits the panel. All terminal blocks shall be mounted and of the colour as shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-24.8.

(iv) Consumer power

1. The irrigation control cabinet shall be equipped with a (Clipsal 4CC6 or approved equivalent) enclosed consumer panel. Consumer power shall be wired direct into the consumer panel. The consumer panel shall enclose a neutral link and an earth bus with the panel structure connected to the bus to effectively earth the entire structure. A solder-less clamp type terminal lug shall be provided at the end of the earth bus for a 6 mm² stranded earth cable to be attached from the external earth stake.
2. Whenever the electrical diagrams indicate an earth for a circuit at the panel, a single wire for each circuit earthed shall be run independently to the earth bus and fastened thereto using a ring lug and a machine screw inserted in a tapped hole.
3. Earthing of the enclosure and back panel from the consumers panel shall be made using 4mm^2 stranded earth cable.
4. The consumer panel shall be wired with a main isolation switch an RCD/MCB and a suitably rated“ Isatrol" mains filter unit, din-rail mounted within the consumer panel to provide power to the GPOs. One double GPO and one single GPO are to be mounted on the face cover of the consumer panel. Care shall be taken when positioning the GPOs not to cover the access screwholes to the consumer panel.
5. Each device requiring 240 V AC power shall have an individual line plug and plug into an allocated GPO on the consumer panel.
6. Power will be supplied as a single-phase voltage at 50 Hz and 240 V ± 10 per cent.
7. All 240 V connections are to be tool proof and either housed in the consumer panel or behind a protective cover.

(f) Irrigation controller specifications (specific)

(i) Irrinet M Slave, Irrinet M and Irrinet ACE

1. Each controller’s maximum valve output is listed in Table SC6.4.13.5 including master and fertigation valves. The controller shall have as a minimum, two inputs from electronic pulse water meter and rain switch.
2. The general control voltage shall be 24V AC for controller outputs used for water valve operation.
3. The 24 VAC power is via the PELV system with common tied to earth.
4. The irrigation controller cabinet layout, dimensions and wiring are shown in Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD 29.1.
5. The irrigation controller cabinet shall be a B&R NI (NI06062/S) or (NI06063/S) with dual key lock (NI030) or approved equivalent as shown within Section SC6.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-29.1. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green colour.
6. Control equipment shall be selected from the Preferred Equipment list - Controller and Telemetry Components within Section SC6.4.3 Standard drawings SD-5.1 through SD 5.10 and SD-20.1 through SD-29.1, unless otherwise specified by the Superintendent.
7. All firmware incorporated in CPUs and other intelligent modules shall be the latest released version.
8. The radio telemetry equipment involves the installation of the following equipment:

a) TX-3600 GME Transceiver with blind front panel, programmed with Parks Services frequencies;

b) YB6-61 Yagi Antenna, UNV2 mounting bracket and RG58 coax cable terminated with a N88N type male connector;

c) PS123 GME Power Supply or DC1224X Aeon UPS (for Irrinet M controllers) ;

d) IS50NX Surge Arrestor flange mounted with N type female connectors;

e) RG58 Coax Fly Lead terminated with N88 N type and BNC113 male connectors; and

f) Data cable connecting controller to transceiver.

9. The transceiver shall be mounted on the door such that the indicator lights are visible when the door to the panel is opened. The antenna cable and data cable are to be feed from the controller via the cabinet ducting towards the door hinge and onto the door bracket. The transceiver shall be mounted in such a way to allow for its easy removal. The mounting bracket is to be securely fastened to the back of the door. All cabling on the door shall be neat and fastened in place by cable ties, Section SC6.4.3 Standard drawings SD-26.2, SD-26.4 and SD-5.10 refers.

10. A Surge Arrestor shall be mounted on the cabinet earth lug and suitably earthed refer Section SC6.4.3 Standard drawings SD-27.1 and SD-5.10. The coax fly lead shall be connected from the transceiver BNC connector to the “Equipment” side of the surge arrestor. The coax cable from the antenna will enter the panel and be terminated on the “Antenna” side of the surge arrestor.

11. Before the transceiver is powered up a qualified radio technician shall fit the antenna coax plug and carry out a SWR / radio check and set the modulation level.

12. The “data cable” shall connect the controller to the transceiver and shall be secured and neatly run through the ducting.

13. PS123 GME Power Supply 240 VAC to 12 VDC is to be mounted on the door bracket to supply power to the Transceiver and Interposing Relays refer Section SC6.4.3 Standard drawings SD-5.5.

14. DC1224X Aeon UPS (uninterrupted power supply) 240V AC to 12V DC is to be mounted on the door bracket to supply power to the Irrinet CPU memory and Transceiver, refer Section SC6.4.3 Standard drawings SD-20.1 through SD-29.1.

15. A separate 24V AC power supply shall be provided as shown within Section SC.4.3 Standard drawings SD-5.1 through SD-5.10 and SD-20.1 through SD-29.1:

    a) Irrinet M, Irrinet M Slave and Irrinet ACE controllers require 1 Powertech 240 V/24 V 150 VA Transformer part No. MP3045 to be direct mounted to supply power to the controller and field solenoids.

16. The controller shall have two conduits connecting the cabinet to the ground. The following conduit types and sizes shall be used:

    a) M.D. 50 mm electrical conduit (24 V Control Cable); and

    b) H.D. 25 mm electrical conduit (240 V Power Supply).

17. A Mini-Clik II Rain Switch or approved equivalent is to be installed on the controller pole. Construction details are given in Section SC6.4.3 Standard drawings SD-29.1. The device is to be set on a 13 mm setting.

(ii) Piccilo XR

1. The output control voltage used is a DC Pulse through a 2-wire circuit suitable for activating DC latching coils used for water valve operation - Hunter ICV with DC Coil option or approved equivalent. With the Piccilo XR output voltage adjusted to 18 V (from the factory default of 12 V).
2. The controller assembly is powered by a 6-volt sealed lead acid battery which is charged via a solar panel and regulating semiconductors. Section SC6.4.3 Standard drawings SD-4.2.
3. The irrigation controller cabinet layout, dimensions and wiring are shown in Section SC6.4.3 Standard drawings SD-4.1 through SD-4.4.
4. The Irrigation controller cabinet shall be a B&R NI (NI03021/S) with single key lock (NI030) or approved equivalent as shown within Section SC6.4.3 Standard drawings SD-4.1 through SD-4.4. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green colour.
5. Control equipment shall be selected from the Preferred Equipment list - Controller and Telemetry Components within Section SC6.4.3 Standard drawings SD-4.5, unless otherwise specified by the Superintendent.
6. All firmware incorporated in CPUs and other intelligent modules shall be the latest releasedversion.
7. The radio telemetry equipment involves the installation of the following equipment:
    a) Qty 1, CD51 Whip Antenna (cut to wavelength) with 0.5 m of RG58 coax cable terminated bya SMA type male connector;
    b) Qty 1, Antenna Mounting Bracket; and
    c) the radio telemetry component is integrated within the XR Controller unit, so no externaltransceiver is required.
8. The antenna coax SMA male plug shall be connected into the XR Controller SMA socket mounted on the top of the unit.
9. Before the XR Controller is powered up a qualified radio technician shall fit the antenna coax plug and carry out a SWR / radio check on site.
10. A Kyocera Mini Module Solar Panel as detailed in Section SC6.4.3 Standard drawings SD 4.5 shall be fastened to the top of the enclosure refer Section SC6.4.3 Standard drawings SD-4.3. An external grade silicon base sealant shall be applied to the solar panel perimeter to maintain the enclosure IP rating.
11. The regulator components shall be installed as detailed in Section SC6.4.3 Standard drawing SD-4.2 and tested by an electronics technician prior to final connection of the battery and XR units.
12. A 6 V 12 AH SLA Battery is placed inside on the bottom of the enclosure and connected to the terminal blocks. Refer Section SC6.4.3 Standard drawings SD-4.1 and SD 4.2.
13. The controller shall have one 25 mm conduit connecting the cabinet to the first electrical pit.

(g) Controller location

The final location of the controller shall be determined by taking into consideration all of the following factors:

(i) radio path tests (to be carried out by a qualified radio technician) to ensure reliable communications from the controller to the ICC System Base Station;

(ii) the location shall be clear of large trees or structures that may interfere with the performance of radio communications, or solar panel. In newly planted areas the location shall make allowance for future tree growth;

(iii) safe 24-hour access for maintenance, by maintenance services personnel and equipment;

(iv) the location shall allow access by motor vehicle and elevated platform (antenna servicing); and

(v) the Controller shall not be installed less than 3 m from a roadway unless approved by the Superintendent.

(h) Cabinet installation

The pre-assembled Controllers shall be installed in the ground as follows:-

(i) The pre-assembled Controller cabinet support post shall be embedded in a 200 mm diameter x 600 mm deep hole with a 400 mm deep concrete footing (N25 concrete minimum). The concrete shall be poured up to the underside of the conduits entering the support post. Covering the conduits in concrete is not acceptable. The Cabinet shall be installed at a height of 1200 mm from the finished ground level to the underside of the cabinet (1090 mm for XR controllers Refer Section SC6.4.3 Standard drawings SD-4.4).

(ii) XR Controller Cabinet is to be orientated with the door side facing north to maximise the absorption of solar radiation into the solar panel, unless approved by the Superintendent.

(i) Controller cabinet and controller wiring

(i) All conduits shall be terminated at the controller cabinet with a suitable conduit adaptor. All conduits shall be sealed with an external grade Butyl Mastic sealant, such as “Selleys Butyl Mastic” or similar approved to a depth of 25 mm into the conduit to prevent vermin entering the controller cabinet.

(ii) Earth stakes shall be located in the electrical pit adjacent to the controller. The location of the earth stake is to be indicated on the as constructed drawing.

(iii) Earth stake connections are to be sealed with cold gal paint.

(iv) All field wired cables entering the controller cabinet shall be made secured – in this instance only by the application of sealant to the conduit end inside the enclosure (see Clause (i) (i) above). From this point on, the double insulation shall be removed from the cable for ease of wiring to the terminal blocks.

(v) All single insulated cables inside control cabinets shall be loomed together and cable tied in a neat orderly manner to the panel so that the connections into the terminal strip are not stressed.

(vi) All cables inside the controller cabinet shall be of sufficient length to ensure that all cores will reach their termination point without any stress or joining of cables.

(vii) All field cables inside the controller cabinet shall be of sufficient length to ensure that all cores will reach the upper and lower most termination points without any stress or joining

of cables.

(viii) All cables to be connected within the controller cabinet shall be terminated with a bootlace ferrule, CABOC BLP 150 or similar approved. Pin lugs are not acceptable.

(j) Field electrical wiring

(i) Cable types

1. All electrical cabling shall conform to current Australian Standards.

2. All cables shall be Tyflo multi-core irrigation cables or similar approved with a minimum core size of 1.5 mm. Table SC6.4.13.6 details cable specifications.

Table SC6.4.13.6 - Multicore Cable Specifications.

Nominal core dia.	Conductor no. and size	Amp rating	Resistance Ohms/Klm	Number of cores
1.5 mm	7/0.50	16	13.6	3,5,7,9,13
2.5 mm	7/0.67	23	7.4	2,7
4 mm	7/0.85	30	4.6	2

3. All cables shall have an outer sheath of flexible 75 C PVC to AS/NZS 3808, over an Inner core of a sheath of HDPE, over a multi-strand plain copper wire.

4. Inner cores are to be readily available in 13 colours namely- Black, Blue, Green, Dark Brown,Brown, Grey, Light Blue, Orange, Pink, Red, Violet, White and Yellow.

(ii) Cable installation

1. A 7 core, cable shall be run continuously from the controller to the water meter assembly solely for the operation of Master Valve, Pulse Meter and Fertigation. The black core shall be common, red core shall be Master Valve control, brown core shall be Fertigation control and run to the Fertigation Venturi Point and the blue and white shall be Pulse Meter and Pulse Meter common, respectively.

2. An additional 20% of the total number of cables or 2 extra cores (whichever is the greater) shall be provided as spares. Designated spares shall run from the controller to the furthest most point from the controller in the cable run. The spares are to be marked at the controller. At the furthest point all spares shall be connected together and sealed with heat shrink so that a continuity test can be performed at the controller to confirm the total number of spares.

3. All extra low voltage cables shall be installed inside a conduit. The conduit size used shall be a minimum size of 50 mm or 2.5 times the combined size of all the cables being installed, whichever is the greater.

4. The single insulation on the cable core shall not be cut or damaged when the outer sheath (double insulation) is removed. All cables shall have the insulation removed from the cores using appropriate cable strippers. Use of a knife or other sharp blade is not acceptable practice.

5. Cables shall be continuous between electrical inspection pits. Cable joints located between electrical inspection pits are not acceptable. Cable joints shall be kept to a minimum and shall only occur at valve take off points.

6. Where required each individual cable shall be joined using the appropriately sized insulated crimp links, to maintain a double layer of insulation at the joint after the heat shrink is installed and shall be installed with a professional ratchet type crimping tool.
7. Bare conductors shall not be exposed.
8. Each individual cable joint shall be waterproofed by using ES-2 resin filled heat shrink three times the length of the insulated crimp link.
9. Multiple cables shall not be joined or heat “shrinked” together.
10. All cut unused cables (spares) shall be sealed using ES-2 resin filled heat shrink.
11. Cable markers shall be attached to each cable at every electrical inspection pit indicating the individual cable number as shown on the design plan; refer Section SC6.4.3 Standard drawing SD-7.2. Cable markers shall be round 38 mm diameter aluminium identification tags commercially available. Numbering shall be clearly stamped onto one side of the tag using a punch set with 13 mm high numerals. Tags shall be fastened to the appropriate cable using a quality grade plastic cable tie attached at the mid-point of the cable loop.
12. The Black cable shall be used as the designated common.
13. All spare cable in electrical inspection pits shall be left full length, individually sealed with heatshrink and grouped together.
14. All continuous cable that passes through an electrical inspection pit shall have a loop of at least 1.5m in length and be neatly coiled and tied.
15. A draw wire is to be left in the conduit from the controller cabinet to the first electrical inspection pit.
16. All electrical cable locations shall be recorded on the as constructed drawings.

(iii) Electrical inspection pits

1. Electrical inspection pits shall be heavy duty rectangular with rounded ends and fitted with aprecast concrete lid, type P1 or P2.
2. The first electrical inspection pit shall be located a maximum of 1m from the controller cabinet support base. A draw wire together with the electrical cables is to be installed in the conduits from the controller to the first electrical pit to allow for future works.
3. Electrical inspection pits shall be located adjacent to valve boxes and offset from the main irrigation line a maximum of 200 mm as shown in Section SC6.4.3 Standard drawing SD-17.2 (Plan View).
4. Electrical inspection pits shall be located at changes in direction and no more than 50 m spacing.
5. Electrical inspection pits shall be installed so that the top of the pit is flush with the finishedsurface level and matches the slope of the finished surface level.
6. The location of all electrical inspection pit locations shall be recorded on the as constructed drawings.
7. All conduits shall enter at the end of an electrical pit. Side entry of conduits into electrical pits is not permitted.
8. All conduits shall enter an electrical pit at no greater than 45 degrees of the horizontal centre.

9. Electrical pits shall not be installed in drainage swales or places where water is collected during rainfall and irrigation.

10. Electrical pits shall not be installed less than 3 m from the road kerb, unless approved by the Superintendent.

11. An earthing stake is to be provided in the inspection pit nearest to the controller cabinet.

(iv) Electrical conduits

1. All electrical conduits shall conform to current Australian Standards.

2. All conduit (extra low voltage electrical) buried in ground shall be Grey M.D.

3. All electrical conduits that are exposed above ground shall have a protective outer sheath of polyethylene pipe rating PN12.5. The sheath is to encase the conduit for the entire length ofconduit above ground and for a depth of 150 mm minimum below ground.

4. All electrical conduits that are exposed above ground shall be fixed in place so that they arevertical and shall be secured firmly to the accessory.

5. Electrical conduit above ground shall be adequately secured to avoid damage by grass cutting operations.

6. All electrical conduit ends shall be neatly cut and free of burrs or rough edges.

7. The final 500 mm of conduit entering an electrical inspection pit shall be M.D. corrugated flexible conduit, which is to be connected to the M.D. PVC Conduit by a Socket. Section SC6.4.3 Standard drawing SD-17.2 (Electrical Pit), gives a typical construction drawing of the assembly.

(v) Electrical conduit trenching

1. All electrical conduits shall be laid in trenches and bedded in sand.

2. Low voltage conduits (240 V) shall be installed with continuous electrical warning tape laid over the conduit for the entire length of the trench.

3. Low voltage conduits (240 V) shall not be installed in the same trench as irrigation lines.

4. Extra low voltage conduits (24 V) installed in the same trench as irrigation lines shall be bedded in sand and separated from the irrigation lines by a minimum distance of 100 mm.

5. Depth of cover to electrical conduits from finished surface level or from the underside of finished pavement level (e.g., pavers or concrete) shall be:

   a) 300 mm minimum - for extra low voltage cables (24 V); and

   b) 600 mm minimum - for low voltage cables (240 V). Refer section SC6.4.3 Standard drawings SD-18.1.

6. Electrical conduits under roadways shall be a minimum 50 mm M.D. Electrical conduit encased in a 100 mm Class 9 PVC Pipe.

(4) Water meter assembly

(a) Design and installation

(i) Water meter assembly components vary, as follows:

1. For drinking fountains and water taps (potable water) the water meter assembly includes:

a) isolation valve; and

b) mechanical water meter (supplied by Council).

2. For irrigation, the water meter assembly includes:

a) isolation valve;

b) mechanical water meter (supplied by Council);

c) master valve and electronic flow meter unit;

d) RPZ back flow prevention device with two isolation valves;

e) screen filter;

f) lockable cover;

g) cable and conduit; and

h) protective bollards (depending on location).

Table SC6.4.13.7 - Allowable Water Meter Assembly Component Size Combinations

Water Service	Townsville Water Water Meter	Irrigation Water Meter	Backflow	Master Valve
25 mm	25 mm	32mm Arad Multijet (1 pulse/10L)	25 mm	25 mm Hunter ICV*
32 mm	32 mm	32mm Arad Multijet (1 pulse/10L)	32 mm	25 mm or 40mm Hunter ICV*
50 mm	50 mm	Include in Master Valve (1 pulse/10L)	50 mm	50 mm Ultraf Hydrometer
80 mm	80 mm	Include in Master Valve (1 pulse/10L)	80 mm	80 mm Ultraf Hydrometer
100 mm	100 mm	Include in Master Valve (1 pulse/100L)	100 mm	100 mm Ultraf Hydrometer

* External Master Valve

3. All water meter assemblies with a 25 mm and 32 mm Water Service are to have a master valve external to the main assembly. Refer to Section SC6.4.3 Standard drawings SD-10.3 and SD-10.4.

4. Water meter assemblies with a water service sized 50 mm, 80 mm and 100 mm are to have a master valve as part of the main assembly. Refer to Section SC6.4.3 Standard drawings SD-10.1 and SD-10.2.

(ii) Water meters

1. All water meters and pipe work from the town mains to the water meter shall be supplied and fitted by Townsville Water.

2. The water meter type is selected by the following criteria:

   a) for drinking fountains and water taps a standard mechanical water meters shall be used.

   b) for irrigation, refer to Table SC6.4.13.7 for water meter selection relative to the water service size.

(iii) Master valves

1. All irrigation systems shall be fitted with a master valve.

2. The master valve is to be selected by the following criteria:

   a) all water service assemblies sized 25 mm and 32 mm shall have an external master valve installed in a valve box and shall be fitted to the copper tail pipe of the backflow device. Refer to Section SC6.4.3 Standard drawings SD-10.3 and SD-10.4 for installation details; and

   b) all water service assemblies sized, 50 mm, 80 mm and 100 mm shall be fitted with an assembly mounted master valve. The master valve is to consist of a flange mounted Ultraf Hydrometer including water (flow) meter module as detailed in Table 5 and 24V AC Solenoid actuator; or approved equivalent. Refer to Section SC6.4.3 Standard drawings SD-10.1 and SD-10.2 for installation details.

(iv) Backflow devices design and installation

1. Backflow prevention is to conform to AS 2845.1, AS 2845.2 and AS 2845.3.

2. The Backflow device shall be selected on the required size:

   a) 25 mm, 32mm, and 50 mm - Tyco Backflow System RP03 or similar to the following specification. The assembly shall be connected with the “ring and tail” to allow easy removalor replacement of the device in accordance with AS/NZS 3500.1. Main valve and internals shall be of stainless-steel construction and to have pressure rating of 1600 kPa and a temperature rating of 90ºC. All internal parts and elastomers are to be accessible through a top entry point of the main valve to allow inline maintenance. Valve shall also be fitted with test points with BSPT threads to allow testing to AS 2845.3; and

   b) 80 mm and 100 mm - Tyco Backflow System RP03 or similar to the following specification.The main valve shall be constructed from ductile iron and coated with Rilsan Nylon 11 to AS/NZ 4158. All internals shall be constructed from stainless steel and to have pressure rating of 1600 kPa and a temperature rating of 60ºC. Main valve body shall not form part of the wetted check valve sealing area or mechanism. All internal parts and elastomers are to be accessible through a top entry point of the main valve to allow inline maintenance. Valve connection shall be flanged to AS/NZS 4087. Valve shall also be fitted with test points withBSPT threads to allow testing to AS2845.3.

3. The velocity through the backflow device shall not exceed 2.2 m/s.

4. All backflow devices shall be reduced pressure zone (RPZ) rating.

5. All backflow devices sized 25 mm, 32 mm, and 50 mm shall be fitted with a locking mechanism, which prevents the two isolation valves and the three test cocks from

unauthorised opening. The backflow device is to be lockable at a single point. A Council standard series A padlock is to be fitted to the locking mechanism.

(v) Isolation valves

1. All isolation valves fitted to the water service assembly shall be tested and approved to AustralianStandards.
2. All isolation valves fitted to the water service assembly shall be selected on the following criteria:
    a) all water meter assemblies sized 25 mm, 32 mm and 50 mm shall be fitted with brass ballvalves; and
    b) all water meter assemblies sized 80 mm and 100 mm shall be fitted with resilient seated gate valves.

(vi) Strainer

All water meter assemblies shall be fitted with a brass strainer immediately downstream of the isolation valve and upstream of the back flow device. Refer Section SC6.4.3 Standard drawings SD-10.1 to SD-10.4 for details.

(vii) Water meter assembly installation

1. The water meter assembly shall be supported by the appropriate size Support Stands as detailed in Section SC6.4.3 Standard drawing SD-10.5 and set into a concrete footing as detailed Section SC6.4.3 Standard drawings SD-10.1 to SD-10.4. A minimum distance of 300 mm from the underside of the assembly to the finished ground level is required.
2. A lockable stainless steel sheet metal cover shall be fitted over the master valve/hydrometer/flow meter to prevent vandalism and weather damage.
    a) 25 mm, 32 mm, the cover shall be held in place using U-bolts; and
    b) 50 mm, 80 mm, and 100 mm, the cover shall be fastened between each set of tightenedflanges, using flange bolts.
3. Each cover shall be locked using a 40 mm KA1 series lock.
4. A minimum of two recycled plastic bollards shall be provided at each water meter assembly as directed by the Superintendent, to protect the assembly from vehicle damage, except in garden beds.

    Bollards shall be nominal 100 mm diameter blue recycled plastic, embedded 450 mm minimum into a 350 mm diameter concrete footing. The top of the bollards shall be 900 mm above finished ground level.
5. All cables running from the water meter to the ground shall be encased in a protective outer sheath of polyethylene pipe rating PN12.5. The conduit shall be firmly installed vertical to theground so as not to be easily damaged by grass cutting operations.
6. Copper pipes shall be Type B.
7. All fittings to the backflow device shall be either copper or brass. PVC or Poly fittings are notacceptable.

(b) Valve assembly

(i) Design and installation

1. The valve assembly includes:

a) solenoid valve;

b) ball valve;

c) brass barrel union; and

d) valve box.

2. Refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD-14.4 for standard details. Valves shall be connected to the main line via a tee.

(ii) Solenoid valves

1. Refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD-14.4 for solenoid valve assembly details.

2. Solenoid valves used shall be sized in accordance with Table. SC6.4.13.8.

Table SC6.4.13.8 - Approved Solenoid Valves

Manufacturer	Model	Size	Maximum Flow Rate (Litres per Minute).
Hunter	ICV	25 mm	100
Hunter	ICV	40 mm	250
Hunter	ICV	50 mm	360
Hunter	ICV	80 mm	700

3. Electronic solenoids for AC systems shall be 24-volt coils.

4. Electronic solenoids for DC systems shall be 12-volt 2 wire latching coils.

5. Solenoid valves shall be wired in the following order:

a) the first controller output shall be assigned to the master valve control;

b) stations are to be wired to the controller outputs from output 2 on. Station 1 (Controller output 2) is to be located on one side of the site. The last station is to be located on the opposite side of the site. The controller outputs are to follow a logical geographical patternfrom one side to another; and

c) the same wire colour shall be maintained along the entire length of the cable run betweenthe controller and each individual solenoid valve.

6. Only one valve shall be allocated per controller output.

7. Doubling up of stations on the same output is not allowed.

8. Valve boxes shall not be installed within 3 m of the road kerb unless approved by the Superintendent.

9. The distance from a valve to the first sprinkler or first drip emitter shall not exceed 50 m.

(iii) Gate and ball valves

1. A ball valve shall be installed on the upstream side of the solenoid valve. A brass barrel unionshall separate the ball valve from the solenoid valve to allow for ease of maintenance. Refer to Section SC6.4.3 Standard drawings SD-10.6, SD-14.3 and SD 14.4.
2. Ball valves shall be tested and approved to AS 3500.1.

(iv) Valve boxes

1. The valve assembly is to be located in a heavy-duty lockable valve box fitted with a stainless steel lock-down bolt in the lid.
2. Valve boxes shall be heavy duty boxes used are to be of adequate size to ensure that there is sufficient space around the valve assembly to allow for ease of maintenance.
3. Valve boxes shall not require removal to facilitate maintenance of the valve assembly.
4. All valve assembly boxes shall be:
    a) supported on bricks so that the box does not rest on any pipes;
    b) installed so that the top of the box is flush with the finished turf surface level for turf areas, or 50 mm to 100 mm above the finished mulch surface level for garden areas;
    c) installed so that the clearance from the underside of the valve box lid to the top of the stem of the valve is; 150 mm maximum – 50 mm minimum for non-drip valves and 75 mm maximum – 50 mm minimum for drip valves, refer Section SC6.4.3 Standard drawings SD-10.6, SD-14.3, and SD-14.4;
    d) installed so that the clearance from the underside of the valve housed within the valve box to the bottom of the box is at least equal to or greater than 50 mm;
    e) the pipe holes shall be sealed with Geofabric around the openings to prevent the ingress offoreign material in the valve box;
    f) cutting of valve boxes for entry/exit of pipe work shall be keep to a minimum, boxes cannot be cut higher than 1/3 its height. Over cut boxes are not acceptable; and
    g) installed in association with its housed components so as not to require excessive cutting of the valve box to the satisfaction of the Superintendent.
5. All valve box lids shall be clearly marked with the identification of the contents using the followkey:
    a) IV = Isolation Valve;
    b) MV = Master Valve;
    c) A1 = Controller A Station 1 (Refer Section SC6.4.3 Standard drawings SD-8.1) for valve key; or
    d) 3-digit DTMF number as supplied by the Superintendent, for example “045” identifying the Irrinet System number.
6. Valve box lids shall be engraved by using a 50 mm to 75 mm high Signet 14474 / 14494 zinc Stencil Set or approved equivalent as a template. The engraving finish shall be evenly 1.5 mm deep at its deepest point and between 4 mm to 8 mm wide by using an engraving power tool fitted with aspherical engraving bit. The finished engraving

shall then be painted with a Signet 12205 White Marker or approved equivalent. Note excessively deep engraving will weaken valve box lids and is not acceptable.

7. No valve boxes shall be installed in drainage swales or places where water is collected duringrainfall.
8. Stainless steel re-enforcing plates may be fitted to valve box lids to repair damaged threads only.
9. Conduit connecting valve boxes with electrical inspection pits and other valve boxes is to be M.D. corrugated flexible conduit of a minimum 500 mm and maximum 1500 mm in length. Section SC6.4.3 Standard drawings SD-17.2 gives a typical construction drawing of the assembly.

(v) Valve nest enclosures

1. Refer to Section SC6.4.3 Standard drawings SD-33.1 through SD-33.4 for valve nest enclosure details.
2. Valve nest enclosures may be installed where groups of more than three valves can be located together.
3. Allowance must be made for larger lateral pipe sizes to offset increased friction losses wherelonger lateral pipe lengths are required.
4. Allowance must be made for increase lateral sizes and quantity leaving the one location.
5. Where three or more laterals leaving a valve nest cover share a common trench, bedding sandmust be used to back fill trenches.
6. Lateral pipes leaving a valve nest cover must be run parallel in trenches (not twisted).
7. Valves inside a valve nest cover must be clearly identifiable via round 38 mm diameter aluminium identification tags commercially available. DTMF numbering shall be clearly stamped onto one side of the tag using a punch set with 13 mm high numerals. Tags shall be fastened to the appropriate solenoid valve using a quality grade plastic cable tie.
8. Electrical cables shall be cable tied to each solenoid valve control valve.
9. Enclosures shall be fitted with a pad lock and keyed to fit Council “F” series.
10. Solenoid valves shall be connected to a common copper manifold via individual brass barrel union and ball valve.
11. Copper manifolds (from 40 mm to 80 mm) must be of sufficient size to allow multiple stations to run simultaneously in program where required.
12. Copper manifolds connecting to PVC mainline shall be done via Cop-A-Mate flange or approved similar, installed 25 mm above ground level.
13. Copper manifolds connecting to Poly mainline shall be done via metric female compression fitting installed 25 mm above ground level.
14. Install Valve Nest Cover using 10mm 316 S.S dyna bolts fastened to 200 mm diameter by 300 mm deep concrete footings poured on site.
15. Top of concrete footings shall be installed level and 25 mm above finished ground level.

(5) Sprinklers, turf valves, and drip irrigation

(a) Sprinkler design

(i) Sprinklers used shall be in accordance with Table SC6.4.13.9.

Table SC6.4.13.9 - Approved Sprinklers

Manufacturer	Model	Type
Hunter	PGP	Gear
Hunter	MPR	Rotating Nozzle**
Hunter 120		
Toro	570	Static
Rainbird	3500	Gear
Rainbird	5000 Plus	Gear
Rainbird	5505	Gear
Rainbird	6504	Gear

** Use on Toro 570 Body.

(ii) Sprinkler uniformity shall not exceed a scheduling coefficient of 1.3 (5 per cent Window). Section SC6.4.3 Standard drawings SD-19.1, provides a definition of the scheduling coefficient and the process for calculation.

(iii) Where possible, individual sprinkler stations shall be fitted with either all full circle sprinkler arcs or allpart circle sprinkler arcs.

(iv) All sprinklers on the same valve shall provide “matched precipitation”. The ratio of water supplied shall be even across all arcs of coverage. Sprinklers of different pressure and / or precipitation rate on the same station are not acceptable.

(v) The variation in flow between any sprinklers on a single station is not to exceed 10 per cent.

(vi) All sprinklers are to be run at the manufacturer’s recommended pressure.

(vii) All sprinkler heads on each individual station shall be the same type.

(viii) Locations which are susceptible to low head drainage shall be fitted with either internal check valves, or Hunter or similar approved external check valves.

(ix) No water shall be applied by design to locations where over spray is undesirable, (I.e., adjacent non-irrigated areas, roads, footpaths, private property etc.). The manufacturer’s published throw distance shall govern for design purposes.

(x) On roadway corners no water shall be applied by design to the road pavement whilst no unirrigated areasshall exceed 1m from the road edge. The manufacturers published throw distance shall govern. Examples of acceptable sprinkler layouts are given in Section SC6.4.3 Standard drawings SD-16.1.

(xi) All static sprinklers are to be fitted with “fixed pattern” nozzles.

(xii) Sprinklers are to be designed and installed in such a way that no electrical boxes, control cabinets, transformers, meter assemblies and the like are hit by direct water streams.

(b) Sprinkler installation

(i) No sprinklers shall be fitted until all main lines, lateral lines and risers have been flushed clean.

(ii) Sprinklers shall be placed 150 mm clear from walls, garden edges, pathways and the back face of concrete kerbs or concrete garden edges.

(iii) sprinklers shall be installed as detailed in Section SC6.4.3 Standard drawings SD-12.1 Figure 2, slightly above the finished surface level.

(iv) Sprinklers shall be installed plumb unless placed on a slope in which case they shall match the slope of the surface.

(v) Where directed by the Superintendent sprinklers in grassed areas shall be installed with a sod of turf (300 mm square) placed around them at the finished surface level to help stabilise the sprinkler.

(vi) Sprinklers shall be connected to pipes (lateral lines) via either a tapping saddle or a BSP/F Tee and a flexible swing hose riser. All swing hose risers shall face downstream of the solenoid valve. Refer to Section SC6.4.3 Standard drawings SD-12.1 Figure 1.

(vii) In locations where soils may be of a corrosive nature, 316 stainless steel bolt and nuts shall be used on all tapping saddles.

(viii) The flexible swing hose riser used shall be either:

1. 25 mm safety yellow industrial hose, with nylon type elbows secured with stainless steel hose clamps; or

2. HR Products E-Z riser tube and E-Z riser elbows. (For sprinklers with 15 mm and 20 mm inlets).

(ix) Nozzle diffuser screws shall not reduce the wetted throw of a sprinkler by more than 20 per cent of the undiffused radius of a sprinkler.

(c) Bollard sprinkler installation

(i) Bollard sprinklers shall be installed where approved by the Superintendent in locations where sprinklers may be obstructed by plants or plant growth.

(ii) Bollard sprinklers shall be assembled and installed as detailed in Section SC6.4.3 Standard drawings SD-12.2.

(d) Turf valves

(i) All turf valves shall be Plasson.

(ii) Turf valves shall be installed with an articulated riser connected to the main line via a tee coupling. Connecting turf valves to main line with tapping saddles is not allowed.

(iii) Turf valves that are to be used as a hose watering point for garden establishment shall be installed in a valve box.

(iv) Turf Valves Systems where sprinklers are directly inserted into the turf valves may be installed without a valve box flush with the soil surface.

(v) Turf valves located under valve box lids shall have the lid of the valve box clearly marked with anengraving tool and paint with the letters “TV”.

(e) Dripper irrigation design and installation

(i) All drip irrigation systems shall be installed with an RPZ backflow device.

(ii) The length of the drip tube shall be determined, based on all drippers along the line having sufficient pressure to operate 100 kPa above the pressure compensation point as nominated by the dripper manufacturer. The maximum allowable inlet pressure shall be 300 kPa.

(iii) All drip tube used shall be Netafim Uni Ram 16 - 0.4 m spacing @1.6 lph or approved equivalent.

(iv) The maximum spacing for drip tube is as shown in Table SC6.4.13.10.

Table SC6.4.13.10 - Dripper Spacing

Soil Type	**Location**	
	Grassed areas	**Gardens**
Loam and Clay Soil	400mm maximum	500 mm maximum
Sandy Soil	300mm maximum	400 mm maximum

(v) Refer Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for typical drip irrigation details.

(vi) Pressure compensation shall be fitted to each individual drip irrigation station. The devices used shall be retro fitted to the solenoid valve. The following two options are acceptable:

1. Hunter Accu-Set pressure regulator, refer Section SC6.4.3 Standard drawings SD-14.3; and

2. inline pressure regulation device as specified by the Superintendent, refer to Section SC6.4.3 Standard drawings SD-14.4.

(vii) A 120 mesh Disc Filtration system shall be installed immediately up stream of the solenoid valve in accordance with the manufacturer's specifications to ensure that the correctly sized filtration system is used. The following two filtration systems are acceptable:

1. Netafim Tech Filter, (rated at 120 mesh by Netafim); and

2. Arkal 120 mesh Disc Filter fitted into a Netafim Tech filter housing, may be used during construction and for a period no greater than 1 month after installation of the drip tube.

(viii) The filter, pressure regulator valve and solenoid valve assembly shall be installed in a valve box. Barrel Union/s shall be fitted to allow for easily removal of the filter, refer section SC6.4.3 Standard drawings SD-14.3 and SD-14.4. The order of component installation from upstream to downstream is to be Barrel Union,Filter, Barrel Union, Solenoid valve and Pressure Regulator. The fitting of these devices and the size of the valve box shall allow for:

1. the filter cartridge to be easily serviced and changed; and

2. the pressure regulator to be easily adjusted and serviced.

(ix) Drip tube shall be installed:

1. in turf with 75 mm cover to the finished surface level.
2. drip tube laid on the surface shall be fitted with holding pins placed every 1.5 m along the tube. Holding pins are to be constructed from 2.3 mm minimum diameter Stainless Steel wire of 304 grade. Refer to Section SC6.4.3 Standard drawing SD-15.1 for details.

(x) Drip tube shall not be installed:

1. directly into heavy clay or rocky soils where conditions may cause damage to the drip tube. In these soil types, the drip tube must be installed between a 50 mm surround of imported loan soil; and
2. in areas subject to significant vehicle traffic, where these conditions would cause damage to the drip tube.

(xi) All dripper lines shall terminate to a flushing manifold on the downstream side of the line. The head loss in the manifold shall be sized to lose no more than 1 m based on twice the flow rate of the flow during normal operation. Each flushing line shall be fitted with a ball valve and 1 m of industrial vacuum and delivery hose. The ball valve shall be installed to provide easy operation. The ball valve shall be positioned in the valve box to prevent the industrial vacuum and delivery hose from kinking. The hose is to be held inplace with a stainless-steel hose clip. See Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for component layouts. The valve box shall be sized as follows:

1. 25 mm ball valve – Carson or equivalent round valve box; and
2. 40 mm and 50 mm ball valves – Carson or equivalent rectangular valve box.

(xii) All high point(s) in the dripper layout shall be fitted with a Bermad vacuum relief valve (Model ARV). The vacuum valve is to be installed in a valve box. A section of drip tube shall cross connect all drip tubes to the vacuum relief valve. The vacuum relief valve shall not be fitted to the supply manifold. See Section SC6.4.3 Standard drawings SD-14.1 and SD-14.2 for a typical installation.

(xiii) Netafim HCNL drip tube and/or Hunter adjustable check valves (or approved equivalent) shall be fitted if the fall in the drip irrigation system exceeds 3 m. Each side of the check valve shall be fitted with independent Flushing Valves and Vacuum Relief Valves. The check valves shall be set to 3 m. The two methods for installation of the check valves are:

1. check valves fitted to each drip tube; and
2. check valves fitted to both the supply manifold and the flushing manifold.

(xiv) Each drip irrigation station shall be fitted with operation indicators. The operation indicators consist of a Toro 570 100 mm pop-up sprinkler fitted with an SST nozzle set to zero flow, sealed with silicon and installed level with the ground. The operation indicators are to be installed in a garden bed or next to atree (not be a tripping hazard) and be visible from the drip valve assembly. Additional operation indicatorsshall be installed at the ends of each station and connected using a HR Products E-Z riser tube and 15mm E-Z riser elbows.

(xv) Prior to the installation of the drip irrigation system the area to be drip irrigated shall be soaked with water and allowed to dry. Any resulting subsidence or soil shrinkage shall be filled with soil up to the finished surface level. The process of soaking with water and filling to a finished surface shall be repeated until the required surface level is achieved. Drip tubes may then be laid with the correct cover.

(xvi) On slopes the drip irrigation tubes shall following the contour lines of the area.

(xvii) “Snaking” of dripper lines shall be avoided.

(xviii) The minimum size of the header manifold is to be 25 mm low density poly pipe.

(xix) Drip tube shall be laid in straight runs inside roundabouts.

(xx) No drip tube shall be installed within 150 mm from walls, garden edges, pathways and the back face of concrete kerbs or concrete garden edges.

(xxi) Drip tube shall only be connected to low density poly pipe 25 mm and 32 mm using FI Tees and Netafim elbow adapters (3/4 inch to 17 mm) with all low-density pipe fittings clamped using Cobra stainless steel clamps or similar approved type. The use of quick start connectors is not approved by Council.

(xxii) Drip tube shall only be connected to PN 6.3 Poly Pipe using poly tapping saddles and Netafim elbow adapters (3/4 inch to 17 mm). The use of grommet connectors is not approved by Council.

(xxiii) In locations where soils may be of a corrosive nature, 316 stainless steel bolt and nuts shall be used on all tapping saddles.

(6) Drinking fountain and water tap.

(a) Drinking fountain

(i) A drinking fountain assembly includes:

1. bowl - cast alloy, powder coated white;
2. turret - Ex 219 OD stainless steel tube powder coated "Heritage Green";
3. tap - BUB228C cam action Enware;
4. bubbler - Enware Type 61 push button bubbler with 3/8th - 1/2"x 3" male BSP tail;
5. copper tube connection – 13mm Annealed Copper;
6. isolation valve;
7. precast concrete plinth base;
8. precast concrete pipe and aggregate backfill;
9. potable water supply line and water meter; and
10. Section SC6.4.3 Standard drawings SD-32.1 contains the construction drawings for the fountain assembly.

(ii) All pipe work to a drinking fountain shall comply with AS 3500. All pipe work installation to a drinking fountain, shall be carried out by a licensed plumber.

(iii) The supply line to a drinking fountain shall be a “standalone” potable water line with its own water meter. Pipe work shall be a minimum 32 mm PN12.5 Poly Pipe (from meter to isolation valve) laid in a trench with sand bedding and surround to the pipe and with 300 mm minimum cover over the pipe. Drinking fountains and water taps may be installed on the same potable water line.

(iv) The drinking fountain turret shall be installed on a precast concrete plinth base set on top of a 600 dia x 1.2m long reinforced concrete pipe embedded into the ground and backfilled with 20 mm aggregate for drainage. Details of the base are given in Section SC6.4.3 Standard drawing SD-32.2. Alternately, the drinking fountain may be connected into an

existing sewer drainage line.

(v) The drinking fountain shall be isolated by a 15 mm ball valve. The isolation valve shall be located a nominal 600 mm from the drinking fountain adjacent to the concrete plinth base and shall be installed in a circular valve box.

(vi) The drinking fountain tap, and bubbler shall be connected to the isolation valve with a flexible stainless-steel hose.

(vii) All bolts, screws and masonry anchor bolts fitted to the drinking fountain assembly shall be stainless steel.

(viii) On completion and at commissioning of the drinking fountain the pressure shall be adjusted so the stream of water exiting the bubbler does not spill over the bowl

(ix) Refer standard drawing for drinking fountain assembly.

(b) Water tap

(i) A water tap assembly includes:

1. tap with vacuum breaker;
2. stainless steel support post;
3. concrete splash pad; and
4. potable water supply line and water meter.

(ii) All pipe work to a water tap shall comply with AS 3500. All pipe work installation to a water tap shall be carried out by a licensed plumber.

(iii) The supply pipeline to a water tap shall be a “standalone” potable water line with its own water meter. Pipe work shall be a minimum 32 mm PN12.5 Poly Pipe (from the meter to copper tail pipe) laid in a trench with sand bedding and surround to the pipe and with 300 mm minimum cover over the pipe. Water taps and drinking fountains may be installed on the same potable water line.

(iv) Tap shall be a 15mm brass hose cock or similar approved connected to a 20 mm copper tail pipe installed inside the support post.

(v) Support posts shall be 40 mm x 40 mm x 1.6 mm stainless steel SHS fitted with a plastic cap and cast 350 mm minimum into a 350 mm dia. x 450 mm deep concrete footing.

(vi) Splash pads shall be either:

1. 600 mm square x 100 mm thick N25 concrete cast insitu; or
2. 600 mm square x 50mm thick precast concrete.

(vii) Refer standard drawing for water tap assembly.

(c) Fertigation

A fertigation point consisting of 25 mm tested ball valve connected to the irrigation main line close downstream from the back flow assembly must be installed unless advised by the Superintendent. The fertigation point is tobe housed in a round enclosure with the lid marked “FRT” for identification.

(7) Effluent reuse systems

(a) Design and installation

(i) All works must comply with the *Queensland Water Recycling Guidelines*, current health and safety, environmental and related acts.

(ii) Effluent reuse irrigation systems shall have:

1. sprinklers fitted with lilac ID caps;
2. lilac coloured drip tubing;
3. lilac coloured valve box lids;
4. mainline and lateral pipe material (plastic) shall be lilac in colour or contain a lilac strip;
5. all above ground pipe work shall be lilac coloured and/or clearly labelled “Recycled Water”, “Non-Potable Water”; and
6. minimum separation of pipe work for potable and recycles water systems shall be maintained at 300 mm for below ground pipe work and 100 mm for above ground pipe work.

(8) Installations located in landfill sites

(a) Trenching in landfill areas

When excavating in landfill sites or areas containing rock the trench shall be excavated to a minimum depth of 600 mm.

(i) All trenching material removed from the trench shall be removed to the local refuse dump.

(ii) All trenching spoil shall be totally removed from the surrounding surfaces and site and inspected by the Superintendent.

(iii) Bedding sand shall be used to backfill to 200 mm below finished soil level. The final 200 mm shall be filled with an approved loam.