

CAPITAL WORKS IRRIGATION SPECIFICATION >> SPEC-PPL-CW-01

CONTENTS PART A – CONTRACT MANAGEMENT REQUIREMENTS PART B – DESIGN AND INSTALLATION SPECIFICATION PART C - APPENDICES





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PART A – CONTRACT MANAGEMENT REQUIREMENTS

1. INTRODUCTION

This document (Part A) details the procedures and requirements for the installation and hand-over to the Superintendent of irrigation systems constructed for The Superintendent as part of Capital Works Projects. It is to be read in accordance with associated contract documents.

2. **DEFINITIONS**

For the purposes of this document the following definitions apply:

Superintendent means – Townsville City Council.

For the duration of each project contract a delegated representative will be nominated on behalf of The Superintendent as the contact officer, typically the Project Manager for the project.

Constructor means – a Contractor or an internally resourced Council Capital Works Group.

Contractor means – a person or company who has entered into a contract with The Superintendent to supply and install an irrigation system.

ICC means - Irrigation Central Control

3. IRRIGATION DESIGN

The Irrigation Design Plan shall be approved by the Irrigation Planning Supervisor prior to the start of any works.

4. PROCEDURES - CONSTRUCTION PHASE

- 4.1 PRE START MEETING
- (a) A meeting for all interested parties involved in the project will be conducted prior to work commencing on site.



Items to be discussed and/or resolved at the meeting include but are not limited to:-

- (i) Relevant personnel contact details.
- (ii) Site Specific Workplace Health & Safety Management.
- (iii) Constructor to confirm required insurance/fees etc.
- (iv) Constructor to present a work and traffic plan for the project. A work Method Statement and Safety Plan if applicable.
- (v) Confirmation of location of existing services.
- (vi) Acid sulphate soil potential.
- (vii) Soil Erosion and Sediment Controls.
- (viii) Confirmation of project timetable
- (ix) Confirmation of time frame for The Superintendent to install components or supply materials if required
- (x) Clarification of any item relevant to the successful completion of the project.
- (xi) Minutes of meeting shall be recorded by the Superintendent.
- (xii) Review of the constructors Inspection Test Plan (ITP) previously submitted to The Superintendent.
- (xiii) Review of the constructors internal quality control documentation previously submitted to The Superintendent.
- (xiv) Review of the constructors internal pre-inspection check list documentation previously submitted to The Superintendent.

4.2 INSPECTIONS



(a) The Superintendent will undertake inspections of installation work carried out by the Constructor as construction progresses.

As a minimum, the following items shall be included in the constructors ITP & inspected by the Superintendent ;-

- All main line trenching After all pipe work, control conduit, control pits, warning tape & bedding sand is installed and before back filling the trench.
- (ii) All drip tube and drip feed/collector pipe work while drip system is running and before it is covered by mulch or soil.
- (iii) All envelopers after installation of enveloper pipe & marker tags and prior to back filling.
- (iv) Sprinkler laterals when pipe is installed and before back filling the trench.
- (v) Valve Assemblies when valve assemblies are installed & before back filling valve boxes.
- (vi) 240v electrical power pits & conduit when pits & conduit are installed and before back filling the trench.
- (vii) Water meter & backflow / hydrometer assembly before installation commences to confirm & approve the position & alignment.
- (viii) Controller assembly before installation commences to confirm & approve the position & rotation.
- (b) The Constructor is responsible for making requests for inspection to The Superintendent.
- (c) The Constructor shall provide a minimum of 24 hours' notice to the Superintendent prior to inspection.



- (d) Failure by the Constructor to notify the Superintendent of any inspection required, will result in the works being excavated at the Constructors cost to allow an inspection to be carried out.
- (e) Work on the next construction phase shall not proceed until the works inspected have been approved by the Superintendent.

4.3 INSPECTION DOCUMENTATION

- (a) Following each site inspection, a Site Inspection report will be issued by the Superintendent.
- (b) Work inspected that complies with the specification and the design plans will be accepted by the Superintendent.
- (c) Any work inspected, that does not comply with the specification or the design plans, will not be accepted by the Superintendent. Items not acceptable will be noted for rectification.
- (d) The constructor is required to rectify these items prior to proceeding to the next construction phase and shall apply for a re-inspection by the Superintendent on completion of the rectification work.

4.4 CHANGE TO THE SPECIFICATION AND/OR DESIGN

(a) Change to the Specification and or design shall not be made without approval of the Superintendent.

A written application for change to the specification and/or design plan must be made by the Constructor to the Superintendent and authorised by the Superintendent prior to commencement of work. Any such work shall be inspected by the Superintendent.

4.5 AS CONSTRUCTED DETAILS

(a) As constructed information shall be continuously recorded by the Constructor as installation or modification work progresses and



- (i) Shall include all items listed or referenced in section 7.2
- (ii) Shall include all pre-existing irrigation system components remaining in service, either previously installed or constructed during earlier "staged works"
- (iii) Shall include changes to existing As Constructed Drawings where components of an existing irrigation system have been removed, modified or added
- (b) The Constructor is required to supply As Constructed Drawings to The Superintendent.

5. PROCEDURES - POST CONSTRUCTION PHASE

- 5.1 PRACTICAL COMPLETION (ON MAINTENANCE)
- (a) Further to the Special Conditions of Contract. Before Practical Completion and prior to the commencement of the Defects Liability Period (On Maintenance Period), the Constructor is required to submit to the Superintendent the following completed documentation:-
 - (i) Irrigation Asset Data Collection Form (FORM-PPL-IP-02) This form contains information about asset construction, or
 - (ii) Irrigation Asset Change Form (FORM-PPL-IP-04) This form contains information about minor changes to existing asset.
 - (iii) Irrigation Network Controller Setup Request Form (FORM-PPL-IP-03) This form contains information enabling configuration of the controller onto the TCC Irrinet network. The form shall be submitted to The Superintendent a minimum of twenty-eight (28) days prior to installation on site.
 - (iv) Irrigation Program Setup Request Form (FORM-PPL-QS-01) This form is used contains information enabling setup of irrigation controller programs in ICC. The form shall be submitted to The Superintendent a minimum of eight (8) working days prior to the program start date. After program setup in ICC, The Superintendent will issue a copy of the program to the Constructor on request.
 - (v) Irrigation Control Cable Loop Resistance Test Report Form (FORM-PPL-IP-08)



- (vi) Irrigation Station Pressure & Flow Rate Test Report Form (FORM-PPL-IP-07)
- (vii) Irrigation Inspection Checklist (CKLIST-PPL-QS-02)
- (viii) Irrigation Pre Practical Completion Q.A Check List (CKLIST-PPL-QA-03)
- (ix) Warranty details for all irrigation components with a valve greater than \$500.00 excluding GST. This information is required by The Superintendent to assist in future warranty claims.
- (x) Form 7 Notification of responsible person as per Plumbing & Drainage Act 2018, must be completed by a licensed plumber and submitted to the Hydraulic Certification unit of the Townsville City Council by email
 <u>developmentassessment@townsville.qld.gov.au</u> & CC (carbon copy) also emailed to The Superintendent. Copies of Form 7 are available from the Queensland Government Web site.
- (xi) Form 9 Registration & report on inspection & testing of backflow prevention devices as per Plumbing & Drainage Act 2018, must be completed by a licensed plumber and submitted to the Hydraulic Certification unit of the Townsville City Council by email <u>developmentassessment@townsville.qld.gov.au</u> & CC (carbon copy) also emailed to The Superintendent. Copies of Form 9 are available from the Queensland Government Web site.

5.2 LODGEMENT OF AS CONSTRUCTED DRAWINGS

- (a) Prior to the Defects Liability Period (On Maintenance Period), As Constructed Drawings shall be submitted to the Superintendent. The Superintendent will review the drawings and carry out checks to confirm compliance to Clause 4.5.
- (b) Drawings requiring amendments or clarifications will be returned to the Constructor with any amendments or clarifications required clearly noted.
- (c) The Constructor shall resubmit amended drawings for approval and acceptance by the Superintendent.



 (d) As Constructed drawings must be approved and accepted by the Superintendent prior to commencement of the Defects Liability Period (On Maintenance Period).

5.3 DEFECTS LIABILITY PERIOD (ON MAINTENANCE PERIOD)

- (a) The Defects Liability period shall be undertaken in accordance with this Clause and the Special Conditions of Contract.
- (b) A minimum Defects Liability Period of 13 weeks applies to all irrigation systems installed by Constructors.
- (c) If applicable the Defects Liability Period for the irrigation system shall be concurrent with the Defects Liability Period for any associated Landscaping works.
- (d) The Defects Liability Period for an Irrigation system shall not commence until:-
 - (i) all of the documentation nominated in Clause 5.1 and Clause 5.2 is submitted and approved by the Superintendent; and
 - (ii) all requirements of the Special Conditions of Contract have been met; and
 - (iii) if applicable the associated Landscaping works are accepted "On Maintenance"; and
 - (iv) the irrigation system has been commissioned & is fully operational; and
 - (v) all irrigation programs are fully operating via TCC Irrinet ICC with automatic flow alarm activated; and
 - (vi) all irrigation programs have run free from any ICC generated alarms for a continuous period no less than fourteen (14) days; and
 - (vii) the site has been jointly inspected by the Superintendent and Constructor and the irrigation system is free of defects (items that do not comply with the specification or design plan) at the time of inspection.



 Following each inspection, the Superintendent will issue an Irrigation Inspection Defects Report detailing items that do not comply with the specification or design plan.

The Constructor is required to rectify these items and apply for a reinspection when all rectification work has been completed.

- (f) Where more than one reinspection (1 inspection + 1 reinspection) is required, a reinspection fee of \$500 for each further inspection will be issued to the contractor by The Superintendent.
- (g) After reinspection of the rectification work, and if the work is satisfactory to the Superintendent an Irrigation Inspection Defects Report will be issued with the status noted as "Ready to Proceed to On Maintenance".
- A Certificate of Practical Completion will be issued by the Superintendent when the Constructor has met all obligations under the Contract.

5.4 TESTING

- (a) During the Defects Liability Period, the Superintendent may access the site to undertake the following tests :-
 - Main lines Pressure Test The main line is pressurized to test for leaks. All valves are shut and the pressure is taken over a determined length of time.
 - Sprinkler Pressure Test The sprinkler pressure is taken at the nozzle using a pitot pressure gauge and is then compared to manufacturer recommendations.
 - (iii) Dripper Pressure Test Measurement at flushing valves are taken and the pressure gauged to make sure it conforms to the manufacturer recommendations. The inlet pressure is then tested under the same conditions to check it does not exceed 300Kpa.



(iv) Lateral Pressure Loss Test – The first and last sprinklers of the lateral line are pressure tested. The variation in precipitation is then calculated and compared with the limits nominated in the Specification.

6. FINAL COMPLETION (OFF MAINTENANCE)

Final Completion shall be managed in accordance with the Special Conditions of Contract and the provisions of this Clause 6.

6.1 FINAL INSPECTION

- (a) Final inspection shall not commence until all irrigation programs have run free from any ICC generated alarms for a continuous period no less than twenty-eight (28) days.
- (b) Following the Final Inspection, the Superintendent will issue an Irrigation Inspection
 Defects Report detailing items that do not comply with the specification or design plan.

The Constructor is required to rectify these items and apply for a reinspection when all rectification work has been completed.

- (c) Where more than one reinspection (1 inspection + 1 reinspection) is required, a reinspection fee of \$500 for each further inspection will be issued to the contractor by The Superintendent
- (d) After reinspection of the rectification work, and if the work is satisfactory to the Superintendent an Irrigation Inspection Defects Report will be issued with the status noted as "Ready to Proceed to Off Maintenance".
- (e) A Certificate of Final Completion will be issued by the Superintendent when the Constructor has met all obligations under the Contract.

7. DOCUMENTATION CONVENTIONS

- 7.1 DESIGN PLANS
- (a) Design plans submitted for approval shall be in Autocad format and as a minimum shall include the following:-



- (i) Project Name / Location
- Project Reference Number / Drawing Number / Sheet Number /Sheet SetNumber (i.e. 2 of 4)
- (iii) Date of Original Issue & date of revision with reference index letter (i.e. Rev A 13/6/18)
- (iv) Drawing Scale
- (v) IAA Certification number & stamp
- (vi) Designers Name and / or Company
- (vii) Drafters Name and / or Company
- (viii) Surveyors Name and / or Company
- (ix) All roadways are to be named
- (x) Standard Plan Legend as shown in Appendix 8.1, Figures 1. The symbols and line types shown in the Legend are the acceptable convention for design plans to be used to represent the components of the design. Additional symbols and line types may be introduced provided they are shown in the Legend on the drawing.
- (xi) Valve Key. Each valve must have a Valve Key displaying the relevant information as shown in Appendix 8.1, Figure 2.
- (xii) Sprinkler Key. Each valve must have a Sprinkler Key displaying the relevant information as shown in Appendix 8.1, Figure 3.
- (xiii) Irrigation Design Data. Displaying the relevant information as shown in Appendix 7.1.



- (xiv) Irrigation Cabling / Wiring Schedule displaying the relevant information as shown in Appendix 7.2.
- (xv) Design Notes. Relevant design criteria is to be nominated on the drawing: e.g.
 Sprinkler Type A is to be Hunter PGP. All Solenoid valves are to be Hunter ICV.
 Descriptions of the Symbols and Line Types used from the Plan Legend.
- (xvi) A Locality Plan scaled at 1:5000 shall be provided on the first sheet clearly showing the location of the work site & labelled with the suburb, street names & adjacent landmark locations (i.e. school, river or other well-known destination or community facility etc)
- (xvii) A site overview identifying areas of the work site contained within each sheet number shall be provided on the first sheet, wherever design plans contain more than 5 sheets in total
- (xviii) Intersection of irrigation pipe work. A dot shall be used to indicate a pipe joint wherever a pipe line intersects with another pipe line. Otherwise lines shall simply be shown to cross over – as shown in Appendix 8.1, Figure 4
- (xix) All parts of the irrigation system scaled in paper space such that all detail is clearly legible when printed to A3 size paper and at a scale no greater than 1:200.

7.2 AS CONSTRUCTED DRAWINGS

- (a) As constructed drawings submitted for approval shall be in Autocad & PDF format and shall include the following:-
 - (i) All items listed or referred to in section 7.1
 - (ii) All items listed or referred to in section 4.5
 - (iii) The location of all Controllers, Water Meter Assemblies, Main Lines, Lateral lines, Sprinklers, Drip tube, Drip Supply Header / Flush Collector Pipe, Valves, Electrical inspection Pits, Envelopers, Water taps, Drinking fountains & Soil



Sensors shall be accurately recorded and shown in the As Constructed drawing A tolerance of +/- 100mm is acceptable – Refer to Appendix 9.1, Figure 1

- (iv) The location of all low voltage (240V) electrical cables, pits, poles, pillars & switchboards.
- (v) A stamp on every sheet, with the business name & contact details of the Installation Constructor, name of the site Irrigation Construction Supervisor, Construction Completion Date and As Constructed Plan QA name & date – Refer to Appendix 9.1, Figure 2.
- (vi) Updated base plan reference drawings where changes to the soft/hard landscape or infrastructure has occurred
- (vii) Compliance with the Capital Works Irrigation CAD Specification (SPEC-PPL-IP-01).



PART B - DESIGN AND INSTALLATION SPECIFICATION

8. INTRODUCTION

This specification sets out the scope of work, workmanship standards and the Constructors responsibilities for the supply and installation of irrigation systems that will become a Council Asset on handover.

The Irrigation system within Townsville City Council exists solely for the purpose of providing water to maintain the soil moisture content above the horticultural assets permanent wilting point and below the soil field capacity. These conditions are required to maintain the health and growth of the horticultural assets. In addition to this requirement the Superintendent seeks to minimise maintenance and operational costs associated with the irrigation systems.

Product and Brand names for components are used is this document to define a standard and quality acceptable to the Superintendent, 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 of both quality and performance than those specified and an authorised change has been approved by the Superintendent. Refer Clause 4.4.

9. OBJECTIVES OF THIS SPECIFICATION

To ensure that irrigation systems are designed to the highest industry standards with the goal of maximising the efficient usage of water, energy & labour.

To ensure that irrigation systems and components are installed in accordance with the relevant industry standards and tradesman like workmanship.

To ensure that the irrigation systems and components are installed to a quality and performance standard acceptable to the Superintendent. Providing reliable & efficient irrigation systems with extended asset life, reduced maintenance and operational costs & serviceable components.



10. SCOPE

This specification sets out the requirements for design and installation of irrigation systems that are connected to the Townsville City Council water supply network.

Irrigation systems that will be connected to an alternative water supply have additional requirements to this Specification and require separate approval.

11. LIST OF RELEVANT DOCUMENTS

All design and documentation, materials supplied and work carried out shall be in accordance with the following:-

Australian Standards

AS 3500.0:2003	Plumbing and drainage – Part 0 Glossary of Terms
AS 3500.1:2018	Plumbing and drainage – Part 1 Water services
AS 3500.2:2018	Plumbing and drainage – Part 2 Sanitary plumbing and drainage
AS 2032 :2006	Installation of PVC pipe systems
AS 2033 :2008	Installation of polyethylene pipe systems
AS 2566.1 :1998	Buried flexible pipelines – Part 1 Structural design
AS 2566.2 :2002	Buried flexible pipelines – Part 2 Installation
AS 4129 :2008	Fittings for polyethylene (PE) pipes for pressure applications
AS 4130 :2018	Polyethylene pipes for pressure applications
AS 1432 :2004	Copper tubes for plumbing, gas fitting and drainage applications

AS 1477 :2017

PVC pipes and fittings for pressure applications

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Authorised by >> Brian Walters
Document Maintained by >> TCC/IPAF
Version No. >> 7 12/11/2019
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AS 2698.1 :1984	Plastic pipes and fittings for irrigation and rural applications – Part 1 Polyethylene Micro-Irrigation
AS 2698.2 :2000	Plastic pipes and fittings for irrigation and rural applications – Part 2 Polyethylene rural pipe
AS 2698.3 :1990	Plastic pipes and fittings for irrigation and rural applications – Part 3 Mechanical joint fittings for use with polyethylene micro irrigation pipes
AS 2845.1 :2010	Water supply – Backflow prevention devices – Part 1 Materials, design and performance requirements
AS 2845.2 :2010	Water supply – Backflow prevention devices – Part 2 Registered air gaps and registered break tanks
AS 2845.3 :2010	Water supply – Backflow prevention devices – Part 3 Field testing and maintenance of testable devices
AS 2129 :2000	Flanges for pipes and valves and fittings
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AS 3000 :2018	Wiring Rules
AS 3000 :2018 AS 3008.1.1 :2017	Wiring Rules 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 3000 :2018 AS 3008.1.1 :2017 AS 2053 :2001	 Wiring Rules Electrical Installations –Selection of cables - Part 1.1 Cables for alternating voltages up to and including 0.6/1 kV-Typical Australian installation conditions Conduits and fittings for electrical installations. (all Parts)
AS 3000 :2018 AS 3008.1.1 :2017 AS 2053 :2001 AS 3808 :2000	 Wiring Rules Electrical Installations –Selection of cables - Part 1.1 Cables for alternating voltages up to and including 0.6/1 kV-Typical Australian installation conditions Conduits and fittings for electrical installations. (all Parts) Insulating and sheathing materials for electrical cables
AS 3000 :2018 AS 3008.1.1 :2017 AS 2053 :2001 AS 3808 :2000 AS 3879:2011	 Wiring Rules Electrical Installations –Selection of cables - Part 1.1 Cables for alternating voltages up to and including 0.6/1 kV-Typical Australian installation conditions Conduits and fittings for electrical installations. (all Parts) Insulating and sheathing materials for electrical cables Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS pipes and fittings



Industry Guidelines

PIPA POP001

Electrofusion Jointing of PE Pipes & Fittings For Pressure Applications

Queensland Parliamentary Acts and associated Regulations

Water Act 2000 Electricity Safety Act 2002. Workplace Health and Safety Act 2011

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.

The following order of precedence shall apply:-

- I. Parliamentary Acts or associated Regulations
- II. Supply Authorities
- III. The Specification
- IV. Australian Standards
- V. International Standards

12. EXTERNAL APPROVALS

The Constructor is required to obtain all approvals or certifications necessary for the completion of works in accordance with the Laws of Australia, Laws of the State of Queensland, Townsville City Council By-Laws and Ordinances.

13. UNDERGROUND SERVICES



The Constructor is required to determine the location of all existing underground service locations before commencing any work where trenching, digging or excavation is to take place.

14. QUALIFIED PERSONNEL

14.1 DESIGN OF IRRIGATION SYSTEMS

All irrigation designs submitted to the Superintendent for approval shall be designed & endorsed by (CID) Certified Irrigation Designer (Commercial Turf) & include certification number issued by (IAL) Irrigation Australia Limited.

14.2 INSTALLATION OF IRRIGATION SYSTEMS

- (a) A Qualified Irrigation Installer must be nominated as the Irrigation Site Supervisor for the irrigation construction works at each location.
- A Qualified Irrigation Installer shall be qualified and competent in all aspects of irrigation work, shall have at least 5 years demonstrated experience in the installation of commercial irrigation systems and;
- (c) Shall be conversant with latest version of the Townsville City Council, Capital Works Irrigation Specification SPEC-PPL-CW.01 and relevant Australian Standards and;
- (d) Shall possess either:-
 - (i) (CII) Certified Irrigation Installer, issued by (IAL) Irrigation Australia Limited
 - (ii) (CIC) Certified Irrigation Contractor, issued by (IAL) Irrigation Australia Limited
 - (iii) (CID) Certified Irrigation Designer, issued by (IAL) Irrigation Australia Limited
- (e) The nominated irrigation Site Supervisor shall:
 - (i) Ensure that all irrigation site staff construct all assets to the approved irrigation construction plans and the specifications contained in this document.



- (ii) Attend all inspections outlined in Part A.
- (iii) Provide evidence of their qualification and experience to The Superintendent within 24 hours if requested to do so.

14.3 INSTALLATION OF ELECTRICAL COMPONENTS

 (a) The installation of electrical components shall comply with the requirements of AS3000 & Electrical Safety Act 2002.

14.4 INSTALLATION OF BACKFLOW DEVICES

(a) The installation of Backflow Devices shall comply with the requirements of AS3500.
 Where required under the Plumbing & Drainage Act 2018, Backflow Device installations shall be installed by a registered Plumber as defined by that Act.

14.5 INSPECTION OF IRRIGATION SYSTEMS

- (a) A Qualified Irrigation Inspector shall be appointed by the Superintendent & must attend all irrigation site inspections for irrigation construction works, Practical Completion and Final Completion inspections.
- (b) Qualified Irrigation Inspectors shall be qualified and competent in all aspects of irrigation work, shall have at least 5 years demonstrated experience in the installation of commercial irrigation systems and;
- (c) Shall be conversant with latest version of the Townsville City Council, Capital Works
 Irrigation Specification SPEC-PPL-CW.01 and relevant Australian Standards and;
- (d) Shall possess either:-
 - (i) (CII) Certified Irrigation Installer, issued by (IAL) Irrigation Australia Limited
 - (ii) (CIC) Certified Irrigation Contractor, issued by (IAL) Irrigation Australia Limited



(iii) (CID) Certified Irrigation Designer, issued by (IAL) Irrigation Australia Limited

15. GENERAL DESIGN REQUIREMENTS

15.1 GENERAL REQUIREMENT

Supply an Automatic Irrigation System as specified.

15.2 IRRIGATION TYPE REQUIREMENTS

- (a) All turf areas shall be irrigated with pop-up sprinklers, with the follow exclusions;
 - Subsurface drip irrigation or non-irrigated surface treatment shall be installed into traffic intersections containing roundabouts, median strips or road reserve areas instead of pop-up sprinklers, where risk assessment has shown it to be a health & safety requirement.
 - Where a site specific risk assessment has been issued to the Superintendent & the Superintendent has provided approval.
- (b) All garden areas shall to be irrigated with subsurface drip irrigation with the following exclusions;
 - Areas containing plants or tree species with known vigorous root systems that significantly shorten the functional life of drip irrigation such as certain Palms or Lillie's, shall be irrigated by pop-up sprinklers.
 - (ii) Garden beds without formal and hard surface garden edging, including concrete, paved, timber, recycled plastic, shall be irrigated by pop-up sprinklers.

15.3 AGRONOMIC REQUIREMENTS

(a) Pop-up sprinklers - The total time taken to deliver 7mm of equivalent precipitation where each station or group of stations (if operated simultaneously) within the irrigation program is operated consecutively, shall not exceed 7 hours. Maximum irrigation water window for pop-up sprinklers shall be no more than 7 hours.



- (b) Drip irrigation The total time taken to deliver 7mm of equivalent precipitation where each station or group of stations (if operated simultaneously) within the irrigation program is operated consecutively, shall not exceed 7 hours. Maximum irrigation water window for drip irrigation shall be no more than 7 hours.
- (c) The irrigation application rate shall not exceed the infiltration rate of the soil.

15.4 ENVIRONMENTAL REQUIREMENTS

(a) The system shall not have excessive runoff or overspray which may cause erosion, pollution or weed growth to adjacent native areas and / or storm water drains.

15.5 AUTOMATION REQUIREMENTS

- (a) The Irrigation Controller shall be chosen from the units outlined in Table 3, Section 17.3:-
- (b) Up to a maximum of six (6) stations may be operated simultaneously (by programming only) given the follow conditions;
 - Irrigation Type & Precipitation Rate of the stations to be operated simultaneously shall be the same or similar.
 - (ii) The soil type, vegetation, topography & micro-climate of the stations to be operated simultaneously shall be the same or similar.
 - (iii) All stations to be operated simultaneously shall supply all sprinkler or drip irrigation within manufacturers recommended operating pressures.
- (c) Only one valve per controller digital output is acceptable.



15.6 SEPARATION OF IRRIGATION ZONES

- (a) Irrigation Zones shall be classified in the following vegetation types:
 - (i) Turf Grass.
 - (ii) Garden Bed.
 - (iii) Tree's (not in a garden bed, i.e. street trees).
 - (iv) Native Planting.
- (b) A single irrigation valve shall water no more than one Irrigation Zone.
- 15.7 SAFETY REQUIREMENTS
- (a) 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 – refer section 15.2 Irrigation Type Requirements

16. IRRIGATION PIPEWORK

- 16.1 STANDARDS
- (a) All pipes shall be supplied, installed and joined in accordance with these specifications, the manufacturer's recommendations and all relevant Australian Standards.
- (b) All mainline pipe work shall be Installed with Pakaflex "Irrigation Main Below" warning tape or approved similar, typically 300mm above mainline pipe
- 16.2 CLASS OF PIPE
- (a) Main line pipes (pressurised) of nominal 80mm diameter and larger shall be no less than pressure rating PN12, made of material types PVC U, PVC M or PVC O and all Rubber Ring Jointed (RRJ).



- (b) Main line pipes (pressurised) of nominal diameter less than 80mm shall be no less than pressure rating PN12.5 and made of material type PE100 (Poly pipe).
- (c) All lateral line pipes (non pressurised) shall be no less than pressure rating PN8 and made of material type PE100 (Poly pipe).
- Supply line to a drinking fountain or a water tap shall be no smaller than 32mm nominal diameter, with pressure rating no less than PN12.5 and made of material type PE100 (Poly Pipe). Copper pipe is not acceptable.
- (e) Copper pipe to a Water meter, drinking fountain and water tap assemblies shall be minimum Type B

16.3 ENVELOPERS

- (a) All irrigation pipe work installed under pavements (road or other hard surface) shall be installed in an Enveloper.
- (b) All envelopers used to encase irrigation pipes shall be 100mm PN9 PVC SWJ Pipe as standard unless otherwise approved by The Superintendent.
- (c) Enveloper ends shall be sealed with duct tape prior to installation, to stop the ingress of soil & material from entering the enveloper.
- (d) Envelopers ends shall have the outer 50mm sealed with expanded foam after pipe work or electrical conduits have been installed, to stop the transportation of water and ingress of soil & material through the enveloper.
- (e) A stainless steel marker tag shall be used to easily identify location of envelopers ends. The tag shall be a minimum of 38mm diameter and 1.6mm thick. Marker tags shall be nailed, glued or set into the surface of the pavement and engraved with the word "Irrigation" and recorded on the As Constructed drawings.

16.4 PIPE FITTINGS

(a) All fittings for PVC Pipe shall be minimum Class 18 PVC SWJ.

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- (b) All fittings for Poly Pipe shall be metric compression fittings, Plasson or Philmac.
- All fittings for Low Density Pipe shall be barbed type with all joints fitted with Stainless Steel Cobra clamps – or approved equivalent.
- (d) All threaded fittings except sprinklers shall be sealed using PTFE thread tape and Liquid Teflon.
- 16.5 PIPE INSTALLATION GENERALLY
- (a) Interior of pipes shall be kept free of dirt and debris at all times.
- (b) Where pipe work is left unfinished during installation, the open ends of pipes shall be sealed off with duct tape or have end caps fitted.
- Pipes laid in a common trench shall be separated by a minimum of 100mm except where otherwise specified within this document – refer Clause 16.10 (d).
- (d) Refer to Appendix 13.1, Figures 1 to 6 for pipe alignments for all irrigation works in road reserves.
- 16.6 PVC RUBBER RING JOINTED PIPE INSTALLATION (i.e., Main line pipes of nominal 80mm diameter and larger).
- (a) All PVC Rubber Ring Jointed pipe work shall be installed in accordance with the manufacturer's recommendations and AS 2032:2006.
- (b) All PVC Rubber Ring Jointed pipe work shall be laid in a minimum of 100mm sand bedding and surround.
- (c) All connections and changes of direction horizontally and vertically in Rubber Ring Joint (RRJ) pipe work shall be installed with concrete thrust blocks.
- (d) 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 AS2032:2006 & AS2566.2. All thrust blocks are to be cast in situ against undisturbed ground and shall have neatly formed sides.

- (e) 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.
- (f) Each pipe length shall be laid in the following direction; water flow runs from the socket end to the spigot end of the pipe, with the exception of Ring Mains.
- (g) Trenches may be curved to avoid obstructions within the pipe manufactures limits of curvature of the pipe.

16.7 PVC SOLVENT WELDED JOINT INSTALLATION (Main line take-off PVC pipe fittings).

- (a) All PVC Solvent Welded Joint pipe work shall be installed in accordance with the manufacturer's recommendations and AS 2032:2006.
- (b) All PVC Solvent Welded Joints shall be primed and cemented.
- (c) Primer and solvent cement shall conform to AS 3879:2011.
- (d) Primer is to be "Priming Fluid (red)".
- (e) Solvent is to be "Christy's PVC Red Hot Blue Glue" or approved Type 'p' solvent cement.
- (f) All pipes shall be primed before cementing the joint.
- (g) Pipe ends shall be free of all burs and rough edges.
- (h) All PVC Solvent Welded Joints shall not be subjected to water pressure for at least twenty-four (24) hours after cementing the joint.



(i) All Mainline PVC Solvent Welded Joint pipes shall be laid in a minimum of 100mm sand bedding and surround.

16.8 POLYETHYLENE PIPE INSTALLATION

- (a) All Polyethylene Pipe work shall be installed in accordance with the manufacturer's recommendations and AS 2033:2008.
- (b) Poly pipe shall be laid with sufficient allowance for contraction and expansion of the pipe.
- (c) Pipe ends shall be free of all burs and rough edges and shall be chamfered with the appropriate tool before jointing.
- (d) Polyethylene Tapping Saddles shall only be used to:-
 - (i) Connect Sprinklers to polyethylene Lateral pipe or
 - (ii) Connect Drip Tube to polyethylene Header / Collector pipe.

16.9 TRENCHING

- (a) All pipe work shall be laid in trenches, with the exception of:-
 - (i) Pipes which are installed by underground boring or;
 - (ii) Pipes which are installed above ground due to obstacles i.e. bridges, walls, etc.
- (b) Trenches shall:-
 - (i) Be sufficiently wide to allow adequate working clearance; and
 - (ii) Be excavated in straight lines between bends or pits; and



- (iii) Have vertical sides and be a constant depth for the full length of the trench; and
- (iv) Be free of rocks, debris or clods of soil; and
- (v) Be of adequate depth to allow for pipe bedding and adequate cover to the pipe as specified.
- (c) Trenches for multiple pipes shall be sufficiently wide to allow adequate working clearance and maintain minimum separation distance between pipes.
- (d) Pipes shall be firmly and evenly supported with bedding material or approved backfill material in the centre of the trench.
- (e) Minor realignment to the irrigation system design layout may be required to clear underground obstructions.
- (f) Trenching Machinery shall not be used within 1.0m of existing services. Hand trench or hydro excavate to expose existing services.
- (g) Cover to pipes: The minimum and maximum depth of cover to pipes shall be as noted in Table 1.

Pipe	Minimum	Maximum
Main Lines in Road Reserves (UPVC & Polyethylene)	600mm	750mm
Main Lines all other locations (UPVC & Polyethylene)	400mm	600mm
Lateral Lines - All locations	300mm	500mm
Drinking Fountain and Water Tap supply lines. (except in land fill sites)	300mm	400mm
Drinking Fountain and Water Tap supply lines in land fill sites	450mm	600mm
Dripper Tube (Turf)	75mm	100mm
Dripper Tube (Garden)	Surface	25mm

TABLE 1 – DEPTH OF COVER TO PIPES



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 pavement. Refer Appendix 18.1 for Typical Pipe Trench details.

16.10 PIPE BEDDING

- (a) A minimum of 100mm sand bedding and surround is required for:-
 - (i) all main line pipes,
 - (ii) all enveloper pipe under road pavements,
 - (iii) all pipes laid on solid rock,
 - (iv) all pipes where rubble, rocks and /or debris is encountered in the trench,
 - (v) all potable water lines,
 - (vi) all electrical conduits.
- (b) Bedding sand shall be clean sand with rounded grains free of any rocks, debris and organic matter and graded such that 100% passes a 4.75mm sieve size.
- (c) Pipe work, other than those listed in Clause 16.10 (a) may be laid without sand bedding, provided the trench,
 - (i) is free of rubble, rocks and /or debris,
 - (ii) Is not a shared trench with 2 or more lateral pipes.
- (d) Pipe work, other than those listed in Clause 16.10 (a) and where 2 or more lateral pipes share a common trench containing only lateral pipe, shall be laid with a minimum 50mm pipe separation and 50mm of sand bedding and surround.

16.11 UNDERGROUND WARNING TAPE



- (a) All underground pipe work & control cable conduiting shall have irrigation underground marker tape installed so that a warning can be given to avoid damage to the service during subsequent excavation.
- (b) Marker tape as per AS 2648.1 1995, shall be installed at approximately 50% of the depth of cover above the service (pipe or conduit) or any additional mechanical protection provided for the service.
- (c) Irrigation marker tape text shall contain as a minimum the words "Caution" & "Irrigation"
 & "Below"
- (d) Irrigation marker tape for irrigation systems using potable water, ground water or river/lake water shall be light blue coloured
- (e) Irrigation marker tape for irrigation systems using recycled water shall be lilac coloured

16.12 APPROVED BACKFILL TO TRENCHES

- (a) 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.
- (b) Where material excavated from the trench is unsuitable for backfill, clean sand & loam shall be used as backfill.
- (c) Backfill to trenches shall be compacted with a sheep's foot roller or vibrating plate compactor. Completed backfill is to be mounded 25mm higher than the surrounding surface for the full length of the trench, to allow for further consolidation.
- (d) Backfill to trenches under road pavements and pathways shall be crusher dust material placed in 150mm compacted layers.
- (e) On completion of backfilling operations all excess material is to be either reused on site where possible or shall be removed from the site.



16.13 EXPOSED PIPES

- (a) Any exposed pipe shall be constructed of Stainless Steel or lagged copper and shall comply with AS3500 standards for exposed pipe.
 - (i) All above ground works are to Conform to Section 5.6 "Support and fixing above ground" AS3500 Part 1.
 - (ii) Bracing around the pipes is to be lined with an appropriate material to prevent damage to the pipe.
 - (iii) Pipes are to be labelled "potable" or "non potable" in accordance with Australian Standards.

16.14 PROXIMITY TO OTHER SERVICES

 (a) Table 2 lists the separation required between Water Pipes and Electricity and Gas Services. Separation for all other Services shall be as outlined in AS3500 Part 1 Section 5.2 entitled "Proximity to Other Services".

TABLE 2 – PROXIMITY TO OTHER SERVICES

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



17. CONTROL SYSTEM

17.1 SCOPE

(a) This section covers the furnishing of all labour, materials and services for the fabrication, factory testing, delivery and site installation of the irrigation controller and associated cabinets.

17.2 NETWORK REQUIREMENTS

- (a) Townsville City Council operates an irrigation control system that consists of a Mottech Irrinet Supervisory Control and Data Acquisition (SCADA) System. This system is commonly known as the Irrigation Central Control (ICC) System and is located at the TCC office in Wellington Street Mundingburra. The ICC System communicates to irrigation controllers throughout the Townsville region over UHF & mobile phone wireless telemetry communication networks.
- (b) All irrigation controllers shall be operated via the ICC System unless an alternative controller system is approved by The Superintendent
- (c) Constructors are required to provide an approved irrigation controller to adequately service the proposed irrigation system. The Controller shall be selected ensuring it has capacity & compatibility for both;
 - (i) Current irrigation system requirements plus any future planned expansion and
 - (ii) Master valves, pulse water meters, soil moisture sensors, water level sensors, fertigation or other additional control or monitoring equipment.
- (d) Irrinet Controllers listed in Table 3 are approved irrigation controllers.
- (e) 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 &/or modem and external antenna. The transceiver must have the correct frequency configuration to communicate on the network.



- (f) Each irrigation controller shall be allocated a network address & configuration by TCC for communication to the ICC System.
- (g) All irrigation controller system components shall operate within the ranges specified by the manufacturer.

17.3 IRRIGATION CONTROLLER SELECTION

(a) Irrigation Controllers are to be selected from Table 3.

TABLE 3 – CONTROLLER SELECTION LIST

Controller Name	Power Type /	Valve
	Source	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 DR 24 - 48	AC / 240V Mains	24 to 48
AC Irrinet ACE Decoder	AC / 240V Mains	254
AC Irrinet M Decoder	AC / 240V Mains	254
Solar Irrinet Piccolo XR 4	Solar DC / 6V Solar	4
Solar Irrinet Piccolo XR Plus 8	Solar DC / 6V Solar	8

- (b) AC powered irrigation controllers are the preferred option of The Superintendent. DC powered irrigation controllers are not acceptable unless approved by The Superintendent.
- 17.4 OPERATING ENVIRONMENT Ambient Conditions
- (a) 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.


(b) Where cabinets are to be mounted outdoors, particular consideration shall be given to minimise heating by direct solar radiation. Where required 304 stainless steel hoods shall be fitted to limit direct transfer of solar heat into the cabinet.

17.5 IRRIGATION CONTROLLER SPECIFICATIONS (GENERAL)

- (a) General Requirements
 - 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.
 - (ii) When mounting accessories to the back panel, use fine threaded tapped screws.
 - (iii) The irrigation controller cabinet shall be completely wired, and assembled, with all devices and controls installed as shown in Appendices 3.1 through 5.10 and 20.1 through 29.2 so that the entire assembly is an operating unit ready for installation and the wiring of field devices.
 - (iv) Wiring shall meet the latest requirements of the AS 3000 and applicable workplace safety codes.
- (b) Wiring
 - (i) All wire shall be 0.5 mm²/PVC-105/ stranded, insulated for 600 V.
 - (ii) 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.
 - (iii) 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.



- (iv) All multiple common connections shall be wired via bridging links on the terminal blocks.
- (v) Horizontal and vertical wiring between the terminal blocks and the devices shall be enclosed in ducts except wiring between duct and the device may run exposed for distances not exceeding 100 mm. Duct loading shall not exceed 75% rated fill at any point.
- (vi) All exposed wiring shall be formed neatly with square corners and where possible, grouped in packs. Each pack shall be bound with plastic cable ties and be substantially supported throughout its full length.
- (vii) Splicing of wires on electrical circuits is not acceptable.
- (c) Terminal Blocks
 - Terminal blocks shall be provided for all wiring which exits the panel. All terminal blocks shall be DIN rail mounted and of the colour as shown in Appendices 3.1 through 5.10 and 20.1 through 29.2.
- (d) Consumer Power
 - (i) 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 so as 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.
 - (ii) 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.



- (iii) Earthing of the enclosure & back panel from the consumers panel shall be made using 4 mm² stranded earth cable.
- (iv) 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 screw holes to the consumer panel.
- (v) Each device requiring 240 V AC power shall have an individual line plug and plug into an allocated GPO on the consumer panel.
- (vi) Power will be supplied as a single phase voltage at 50 Hz and 240 V \pm 10%.
- (vii) All 240V connections are to be tool proof and either housed in the consumer panel or behind a Protective Cover.

17.6 IRRIGATION CONTROLLER SPECIFICATIONS (SPECIFIC)

- (a) AC Irrinet M Slave, AC Irrinet M & AC Irrinet ACE DR.
 - (i) Each controller maximum valve output is listed in Table 3 including master and fertigation control.
 - (ii) The controller shall have as a minimum four (4) inputs, electronic pulse water meter, rain switch, soil sensor probe (with level 1 & level 2 sensors).
 - (iii) The general control voltage shall be 24 VAC for controller outputs used for water valve operation.
 - (iv) The 24 VAC power is via the PELV system with common tied to earth.
 - (v) The irrigation controller cabinet layout, dimensions and wiring are shown in Appendices 5.1 through 5.10 and 20.1 through 29.2.



- (vi) 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 Appendices 5.1 through 5.10 and 20.1 through 29.2. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green Colour.
- (vii) Control equipment shall be selected from the Preferred Equipment list Controller and Telemetry Components within Appendices 5.1 through 5.10 and
 20.1 through 29.2, unless otherwise specified by The Superintendent.
- (viii) All firmware incorporated in CPUs and other intelligent modules shall be the latest released version.
- (ix) The radio telemetry equipment involves the installation of the following equipment:-
 - TX-3600 GME Transceiver with blind front panel, programmed with TCC irrigation frequencies; and
 - YB6-61 Yagi Antenna, UNV2 mounting bracket and RG58 coax cable terminated with a N88 N type male connector; and
 - PS123 GME Power Supply or DC1224X Aeon UPS (for Irrinet M controllers); and
 - IS50NX Surge Arrestor flange mounted with N type female connectors; and
 - RG58 Coax Fly Lead terminated with N88 N type and BNC113 male connectors; and
 - Data Cable connecting controller to transceiver.
- (x) 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, Appendix 26.2, 26.4 & 5.10 refers.

- (xi) A Surge Arrestor shall be mounted on the cabinet earth lug and suitably earthed refer Appendix 27.1 & 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.
- (xii) 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.
- (xiii) The 'data cable' shall connect the controller to the transceiver and shall be secured and neatly run through the ducting.
- (xiv) PS123 GME Power Supply 240VAC to 12 VDC is to be mounted on the door bracket to supply power to the Transceiver and Interposing Relays refer Appendix 5.5.
- (xv) DC1224X Aeon UPS (uninterrupted power supply) 240VAC to 12 VDC is to be mounted on the door bracket to supply power to the Irrinet CPU memory & Transceiver, refer Appendices 20.1 through 29.2.
- (xvi) A separate 24 V AC power supply shall be provided as shown within Appendices5.1 through 5.10 and 20.1 through 29.2 :-
 - AC Irrinet M, AC Irrinet M Slave & AC Irrinet ACE controllers require 1 Powertech 240V/24V 150VA Transformer part No. MP3045 to be direct mounted to supply power to the controller and field solenoids.
- (xvii) The controller shall have no less than two conduits connecting the cabinet to the ground. The following conduit types and sizes shall be used:-



- M.D. 50mm Electrical Conduit (24V Control Cable)
- H.D. 25mm Electrical Conduit (240V Power Supply)
- (xviii) An Infrared Rain Switch or approved equivalent is to be installed on the controller pole. Construction details are given in Appendix 29.2. Configure device to "Tropical + Rain Front Off" refer appendix 29.2.
- (b) AC Irrinet ACE Decoder & AC Irrinet M Decoder System Controllers
 - (i) Irrinet ACE Encoder Controllers & Irrinet M Encoder Controllers are only suitable for large or complex systems with more than 48 valves
 - (ii) Detail & specifications for both Controllers, associated Decoder valve equipment and cabling are available on request to TCC.
- (c) Solar Irrinet Piccolo XR
 - (i) Piccolo XR controller maximum valve output is listed in Table 3 including master valve control.
 - (ii) The controller shall have as a minimum four (4) inputs, electronic pulse water meter, rain switch, soil sensor probe (with level 1 & level 2 sensors)
 - (iii) The output control voltage used is a DC Pulse through a 2 wire circuit suitable for activating DC latching coils used for solenoid valve operation - Hunter ICV with DC coil option or approved equivalent. Piccolo XR output voltage is adjustable to 18V (from the factory default of 12V).
 - (iv) The controller assembly is powered by a 6 volt sealed lead acid battery which is charged via a solar panel & regulating semiconductors. Refer Appendix 4.2.
 - (v) The irrigation controller cabinet layout, dimensions and wiring are shown in Appendices 4.1 through 4.4.



- (vi) The Irrigation controller cabinet shall be a B&R NI (NI03021/S) with single key lock (NI030) or approved equivalent as shown within Appendices 4.1 through 4.4. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green Colour.
- (vii) Control equipment shall be selected from the Preferred Equipment list -Controller and Telemetry Components within Appendices 4.5, unless otherwise specified by The Superintendent.
- (viii) All firmware incorporated in CPUs and other intelligent modules shall be the latest released version.
- (ix) The radio telemetry equipment involves the installation of the following equipment:-
 - Qty 1, CD51 Whip Antenna (cut to wave length) as per appendix 4.4 with .5M of RG58 coax cable terminated by a SMA type male connector or
 - Qty 1, CD93 whip antenna as per appendix 4.6, with 3.5M of RG58 coax cable terminated by a SMA type male connector; and
 - Qty 1, Antenna Mounting Bracket as appendix 4.4 or 4.6 respectively
- (x) The radio telemetry component is integrated within the XR Controller unit. So no external transceiver is required.
- (xi) The antenna coax SMA male plug shall be connected into the XR Controller SMA socket mounted on the top of the unit.
- (xii) 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.
- (xiii) A Kyocera Mini Module Solar Panel as detailed in Appendix 4.5 shall be fastened to the top of the enclosure refer Appendix 4.3. An external grade silicon base sealant shall be applied to the solar panel perimeter to maintain the enclosure IP rating.



- (xiv) The regulator components shall be installed as detailed in Appendix 4.2 and tested by an electronics technician prior to final connection of the battery & XR units.
- (xv) A 6V 12 AH SLA Battery is placed inside on the bottom of the enclosure and connected to the terminal blocks. Refer Appendix 4.1 & 4.2.
- (xvi) The controller shall have one 25mm conduit connecting the cabinet to the first electrical pit.
- (d) Solar Irrinet Piccolo XR Plus
 - (i) XR Plus controller maximum valve output is listed in Table 3 including master valve control.
 - (ii) The controller shall have as a minimum four (4) inputs, electronic pulse water meter, rain switch, soil sensor probe (with level 1 & level 2 sensors)
 - (iii) The output control voltage used is a DC Pulse through a 2 wire circuit suitable for activating DC latching coils used for solenoid valve operation - Hunter ICV with DC Coil option or approved equivalent. Piccolo XR Plus output voltage is adjustable to 18V (from the factory default of 12V).
 - (iv) The controller assembly is powered by a 6 volt sealed lead acid battery which is charged via a solar panel & regulating semiconductors. Refer Appendix 3.2.
 - (v) The irrigation controller cabinet layout, dimensions and wiring are shown in Appendices 3.1 through 3.4.
 - (vi) The Irrigation controller cabinet shall be a B&R NI (NI03021/S) with single key lock (NI030) or approved equivalent as shown within Appendices 3.1 through 3.4. The controller pole, mast and cross arms shall be coated with 2PAK Epoxy Paint in Heritage Green Colour.



- (vii) Control equipment shall be selected from the Preferred Equipment list Controller and Telemetry Components within Appendices 3.5, unless otherwise specified by The Superintendent.
- (viii)All firmware incorporated in CPUs and other intelligent modules shall be the latest released version.
- (ix) The radio telemetry equipment involves the installation of the following equipment:-
 - Qty 1, CD51 Whip Antenna (cut to wave length) as per appendix 3.4 with .5M of RG58 coax cable terminated by a SMA type male connector or
 - Qty 1, CD93 whip antenna as per appendix 3.6, with 3.5M of RG58 coax cable terminated by a SMA type male connector; and
 - Qty 1, Antenna Mounting Bracket as appendix 3.4 or 3.6 respectively
- (x) The radio telemetry component is integrated within the XR Plus Controller unit. So no external transceiver is required.
- (xi) The antenna coax SMA male plug shall be connected into the XR Plus Controller SMA socket mounted on the top of the unit.
- (xii) Before the XR Plus Controller is powered up a qualified radio technician shall fit the antenna coax plug and carry out a SWR / radio check on site.
- (xiii) A Kyocera Mini Module Solar Panel as detailed in Appendix 3.5 shall be fastened to the top of the enclosure refer Appendix 3.3. An external grade silicon base sealant shall be applied to the solar panel perimeter to maintain the enclosure IP rating.
- (xiv) The regulator components shall be installed as detailed in Appendix 3.2 and tested by an electronics technician prior to final connection of the battery & XR units.



- (xv)A 6V 12 AH SLA Battery is placed inside on the bottom of the enclosure and connected to the terminal blocks. Refer Appendix 3.1 & 3.2.
- (xvi) The controller shall have one 32mm conduit connecting the cabinet to the first electrical pit.

17.7 CONTROLLER LOCATION

- (a) 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 site controller to the ICC network.
 - (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 TCC personnel and equipment.
 - (iv) The location shall allow access by Motor Vehicle and Elevated Platform (Antenna Servicing).
 - (v) The Controller shall not be installed less than 3 metres from a roadway unless approved by The Superintendent.

17.8 CABINET INSTALLATION

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

(a) The pre-assembled Controller cabinet support post shall be embedded in a 200mm diameter x 600mm deep hole with a 400mm 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 1200mm from the finished ground level to the underside of the cabinet (1090mm for XR controllers Refer Appendix 4.4).

- (b) XR & XR Plus Controller Cabinets are to be orientated with the door side facing north to maximize the absorption of solar radiation into the solar panel, unless approved by The Superintendent.
- 17.9 CONTROLLER CABINET AND CONTROLLER WIRING
- (a) 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 25mm into the conduit to prevent vermin entering the controller cabinet.
- (b) Earth stakes shall be located in the electrical pit adjacent the controller. The location of the earth stake is to be indicated on the As Constructed drawing.
- (c) Earth stake connections are to be sealed with cold gal paint.
- (d) 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, Clause 17.9 (a) refers. From this point on, the double insulation shall be removed from the cable for ease of wiring to the terminal blocks.
- (e) 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.
- (f) 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.
- (g) All field cables inside the controller cabinet shall be of sufficient length to ensure that all cores will reach the upper & lower most termination points without any stress or joining of cables.



 (h) 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.

18. FIELD ELECTRICAL WIRING

- 18.1 CABLE TYPES
- (a) All electrical cabling shall conform to current Australian Standards.
- (b) All Cables shall be Tyflo multi-core Irrigation Cables or similar approved with a minimum core size of 1.5 mm. Table 3 details Cable Specification.

Nominal	Conductor	Amp	Resistance	Number of
Core Dia.	No. & Size	Rating	Ohms/Km	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

TABLE 4 – MULTICORE CABLE SPECIFICATIONS

- All cables shall have an outer sheath of flexible 75°C PVC to AS3808 : 1998, over an Inner core of a sheath of HDPE, over a multi-strand plain copper wire.
- 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.

18.2 CABLE INSTALLATION

- (a) Hydrometer Cabling A 5 core cable shall be run continuously from the controller to the water meter assembly solely for the operation of Master Valve & Pulse Meter. The black core shall be common, red core shall be Master Valve control and the blue and white shall be Pulse Meter & Pulse Meter common respectively.
- (b) Lateral Valve Solenoid Cabling 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.

- (c) All extra low voltage cables shall be installed inside a conduit. The conduit size used shall be a minimum size of 50mm or 2.5 times the combined size of all the cables being installed, whichever is the greater.
- (d) 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.
- (e) 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.
- (f) Where required individual cable cores shall be joined using appropriately sized insulated crimp links installed with a professional ratchet type crimping tool. To maintain a double layer of insulation at the joint, ES-2 heat shrink shall be installed over the insulated crimp link & cable core.
- (g) Bare conductors shall not be exposed.
- (h) Each individual cable core joint shall be waterproofed by using ES-2 resign filled heat shrink 3 times the length of the insulated crimp link.
- (i) All cut unused cables (spares) shall be sealed using ES-2 resign filled heat shrink.
- 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 Clause 7.1 and Appendix 7.2. Cable markers shall be round 38mm diameter aluminium identification tags or approved similar & commercially available. Numbering shall be clearly stamped onto one side of the tag using a punch set with 13mm 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.



- (k) The Black cable shall be used as the designated common.
- (I) All spare cable in electrical inspection pits shall be left full length, individually sealed with heat shrink and grouped together.
- (m) All continuous cable that passes through an electrical inspection pit shall have a loop of no less than 2m in length and be neatly coiled and tied.
- (n) A draw wire is to be left in the conduit from the controller cabinet to the first electrical inspection pit.
- (o) All electrical cable locations shall be recorded on the as constructed drawings.
- 18.3 ELECTRICAL INSPECTION PITS
- (a) Electrical Inspection Pits shall be Heavy Duty rectangular with rounded ends and fitted with a precast concrete lid, type P1 or P2.
- (b) The first electrical inspection pit shall be located a maximum of 1 metre from the Controller cabinet support base. A draw rope 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.
- (c) Electrical Inspection Pits shall be located adjacent to valve boxes and offset from the main irrigation line a maximum of 200mm as shown in Appendix 17.1 & 17.2.
- (d) Electrical Inspection Pits shall be located at changes in direction and no more than 50 metres spacing.
- (e) Electrical Inspection Pits shall be installed so that the top of the pit is flush with the finished surface level and matches the slope of the finished surface level.
- (f) All electrical inspection pit locations shall be recorded on the as constructed drawings.



- (g) All conduits shall enter at the end of an electrical pit. Side entry of conduits into electrical pits in not permitted.
- (h) All conduits shall enter an electrical pit at no greater than 45 Degrees of the horizontal centre.
- (i) Electrical pits shall not be installed in drainage swales or places where water is collected during rainfall and irrigation.
- (j) Electrical Pits shall not be installed less than 3 metres from the road kerb, unless approved by The Superintendent.
- 18.4 ELECTRICAL CONDUITS
- (a) All electrical conduit shall conform to current Australian Standards.
- (b) All conduit (extra low voltage electrical) buried in ground shall be white M.D.
- (c) 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 of conduit above ground and for a depth of 150mm minimum below ground.
- (d) All electrical conduits that are exposed above ground shall be fixed in place so that they are vertical and shall be secured firmly to the accessory.
- (e) Electrical Conduit above ground shall be adequately secured to avoid damage by grass cutting operations.
- (f) All electrical conduit ends shall be neatly cut and free of burrs or rough edges.
- (g) The final 1m of conduit entering an electrical pit shall be M.D. corrugated flexible conduit which is to be connected to the M.D. PVC Conduit by a Socket, refer Appendix 17.1 & 17.2 for typical construction drawing.

18.5 ELECTRICAL CONDUIT TRENCHING



- (a) All electrical conduits shall be laid in trenches and bedded in sand.
- (b) Low voltage conduits (240v) shall be installed with continuous electrical warning tape above the conduit for the entire length of the trench.
- (c) Low voltage conduit (240v) shall not be installed in the same trench as irrigation lines.
- (d) Extra low voltage conduits (24v) installed in the same trench as irrigation lines shall be bedded in sand and separated from the irrigation lines by a minimum distance of 100mm.
- (e) 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:-
 - (i) 300mm minimum for extra low voltage cables (24v).
 - (ii) 600mm minimum for low voltage cables (240v). Refer Appendix 18.1.
- (f) Electrical Conduits under roadways shall be a minimum 50mm M.D. Electrical Conduit encased in a 100mm PN9 PVC enveloper Pipe.

19. WATER METER ASSEMBLY

19.1 DESIGN AND INSTALLATION

Water meter assembly components:

- (a) Water Meter Assembly for drinking fountains and taps (potable water):-
 - (i) POS (point of supply), copper pipe,
 - (ii) Isolation valve,
 - (iii) Mechanical water meter.
- (b) For irrigation water meter assembly options refer Appendix 10.1 10.6

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TABLE 5 - ALLOWABLE WATER METER ASSEMBLY COMPONENT SIZECOMBINATIONS

Water	T'ville Water	Irrigation	Backflow	Master Valve
Service	Water Meter	Water Meter		
25mm	25mm	32mm Arad		25mm Hunter
		Multijet	25mm	
		(1 pulse/10L)		
		32mm Arad		25mm or 40mm
32mm	32mm	Multijet	32mm	Huntor IC\/*
		(1 pulse/10L)		
		Include in		50mm Arad
50mm	50mm	Master Valve	50mm	Hydrometer
		(1 pulse/10L)		
50mm	50mm	Honeywell	50mm	50mm Dorot 100
		H5000		
		(1 pulse/10L)		Genes
		Include in		80mm Arad
80mm	80mm	Master Valve	80mm	Hydrometer
		(1 pulse/10L)		riydrometer
		Honeywell		50mm Dorot 100
80mm	80mm	H5000	80mm	Series
		(1 pulse/10L)		Oches
100mm	100mm	Include in	100mm	100mm Arad Hydrometer
		Master Valve		
		(1 pulse/100L)		
100mm	100mm	Honeywell		50mm Dorot 100
		H5000	100mm	
		(1 pulse/10L)		00103

*External Master Valve

(c) All Water Meter Assemblies with a 25mm and 32mm Water Service are to have a master valve external to the main assembly. Refer Appendix 10.3 & 10.4.

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(d) Water Meter Assemblies with a Water Service sized, 50mm, 80mm and 100mm are to have a master valve as part of the main assembly. Refer Appendix 10.1, 10.2, 10.6 & 10.7.

19.2 WATER METERS

- (a) All water meters and pipe work from the town mains to the water meter shall be supplied and fitted by Townsville Water (A business unit of the Townsville City Council).
- (b) The water meter type is selected by the following criteria:-
 - (i) For Drinking Fountains and Water taps a standard mechanical Water Meters shall be used.
 - (ii) For irrigation refer to table 5 for water meter selection relative to the water service size.

19.3 MASTER VALVES

- (a) All irrigation systems shall be fitted with a Master Valve.
- (b) The master valve is to be selected by the following criteria:-
 - (i) All Water Service Assemblies sized 25mm and 32mm 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 Appendix 10.3 & 10.4. for installation details.
 - (ii) All Water Service Assemblies sized, 50mm, 80mm and 100mm shall be fitted with an assembly mounted Master Valve. The Master Valve as detailed in Table 5 is to consist of either; flange mounted Arad Hydrometer including water (flow) meter module c/w 24VAC solenoid actuator, or flange mounted Dorot 100 Series valve c/w 24VAC solenoid actuator, or approved equivalent. Refer Appendix 10.1, 10.2, 10.5, 10.6 & 10.7 for installation details.



19.4 BACKFLOW DEVICES DESIGN AND INSTALLATION

- Backflow prevention is to conform to Australian standards AS 2845.1, AS2845.2 and AS2845.3. Clause 11 refers.
- (b) The Backflow device shall be selected on the required size:-
 - (i) 25mm, 32mm, and 50mm ValvCheQ System DC03, RP03 or approved similar to the following specification. The assembly shall be connected with the "ring & tail" to allow easy removal or replacement of the device in accordance with AS3500. Main valve and internals shall be of stainless steel construction and to have pressure rating of 1600 kPa and a temperature rating of 90°C. 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 AS2845.3:2010.
 - (ii) 80mm and 100mm ValvCheQ Backflow System RP03 or approved similar to the following specification. The main valve shall be constructed from ductile iron and coated with Rilsan Nylon 11 to AS 4158:2003. All internals shall be constructed from stainless steel and to have pressure rating of 1600 kPa and a temperature rating of 60°C. 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 table C to AS4087. Valve shall also be fitted with test points with BSPT threads to allow testing to AS2845.3:2010.
- (c) The velocity through the Backflow device shall not exceed 2.2 m/s.
- (d) All Backflow devices shall be Double Check Valve (DCV) or Reduced Pressure Zone (RPZ) rating.

19.5 ISOLATION VALVES

 (a) All isolation valves fitted to the Water Service Assembly shall be tested and approved to Australian Standards.



- (b) All isolation valves fitted to the Water Service Assembly shall be selected on the following criteria:-
 - (i) All Water Meter Assemblies sized 25mm, 32mm and 50mm shall be fitted with Brass Ball Valves.
 - (ii) All Water Meter Assemblies sized 80mm and 100mm shall be fitted with Resilient Seated Gate Valves.

19.6 STRAINER

(a) All Water Meter Assemblies shall be fitted with a brass strainer immediately downstream of the isolation valve and upstream of the back flow prevention device. Refer Appendix 10.1 to 10.7 for details.

19.7 WATER METER ASSEMBLY INSTALLATION

- (a) The water meter assembly shall be supported by the appropriate size Support Stands as detailed in Appendix 10.5 and set into a concrete footing as detailed in Appendix 10.1 to 10.7. A minimum distance of 300mm from the underside of the back flow prevention assembly to the finished ground level is required.
- (b) A lockable stainless steel sheet metal cover shall be fitted over the water meter and master valve to prevent vandalism and weather damage. Water meter assembly covers shall be built from 316 Stainless Steel as detailed in Appendix 31.1 & 31.4.
 - (i) For Water Meter Assemblies sized 25mm, 32mm, the cover shall be held in place using U-bolts.
 - (ii) For Water Meter Assemblies sized 50mm, 80mm and 100mm the cover shall be fastened between each set of tightened flanges, using flange bolts.
- (c) Each cover shall be locked using a standard Council type "A" series keyed pad lock.



- (d) Stainless steel covers shall be manufactured to ensure "A" series locks can freely rotate allowing easy access for unlocking/locking and opening/closing of lid.
- (e) A minimum of two (2) 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 100mm diameter blue recycled plastic, embedded 450mm minimum into a 350 diameter concrete footing. The top of the bollards shall be 900mm above finished ground level.
- (f) All cables & conduit running from the water meter to the ground shall be encased in a protective outer polyethylene PE100 PN12.5 rated pipe to provide mechanical protection from grass cutting operations. The mechanical protection shall be installed vertical to the ground, with top 100mm above lowest part of the stainless steel cover & bottom 300mm section installed below ground.
- (g) Copper Pipes shall be Type B.
- (h) All fittings to the Backflow device shall be either copper of brass. PVC or Poly fittings are not acceptable.

20. VALVE ASSEMBLY

- 20.1 SOLENOID VALVE ASSEMBLIES
- (a) Refer standard drawing Appendix 11.1 11.7B, 14.3 & 14.5 14.6 for solenoid valve assembly details
- (b) Solenoid Valves assemblies shall be connected to the irrigation main line pipe via a PVC or Poly tee. Tapping band connections are not acceptable
- (c) Ball valve shall be tested and approved to AS 3500 2018 and installed on the upstream side of the Solenoid valve. A brass barrel union shall separate the Ball valve from the Solenoid valve to allow for ease of maintenance.
- (d) Solenoid valves used shall be sized in accordance with Table 6.



TABLE 6 – APPROVED SOLENOID VALVES

Manufacturer	Model	Size	Maximum Flow Rate
			litres per minute.
Hunter	ICV	25mm	100
Hunter	ICV	40mm	250
Hunter	ICV	50mm	360
Hunter	ICV	80mm	700

- (e) Electronic solenoids for AC systems shall be 24 volt coils.
- (f) Electronic solenoids for DC systems shall be 12 volt 2 wire latching coils.
- (g) Solenoid valves shall be wired in the following order;
 - (i) The first controller output shall be assigned to the Master Valve control,
 - (ii) Stations shall be wired to the controller outputs from output 2 onwards. 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 pattern from one side to another.
 - (iii) The same wire colour shall be maintained along the entire length of the cable run between the controller and each individual solenoid valve.
 - (iv) Only one valve shall be allocated per controller output.
 - (v) Doubling up of stations on the same output is not allowed.
- (h) Valve Boxes shall not be installed within 3 metres of the road kerb unless approved by The Superintendent.
- (i) The distance from a valve to the first sprinkler or first drip emitter shall not exceed 50 metres.



20.2 SOLENOID VALVE BOXES

- (a) The Valve assembly is to be housed in a Super Heavy-Duty "Hydrant" type lockable valve box assembly, with steel plate & clip down lock built into the lid.
- (b) Valve boxes shall be HR manufactured product or similar approved.
- (c) Valve 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.
- (d) Valve boxes shall not require removal to facilitate maintenance of the valve assembly.
- (e) All valve boxes shall be:-
 - (i) Supported on bricks so that the box does not rest on any pipes; and
 - (ii) Installed so that the top of the box is flush with the finished turf surface level for turf areas, or between 50mm to 100mm above the finished mulch surface level for garden areas; and
 - (iii) Installed so that the clearance from the underside of the valve box lid to the top of the stem of the solenoid valve is 100mm maximum – 45mm, refer Appendix 11.1 – 11.7B, 14.3 & 14.5 - 14.6; and
 - (iv) Installed so that the clearance from the underside of the solenoid valve to the bottom of the box assembly is at least equal to or greater than 50mm; and
 - (v) The pipe holes shall be sealed with Geofabric around the openings to prevent the ingress of foreign material in the valve box; and
 - (vi) Cutting of valve boxes for entry/exit of pipe work shall be keep to a minimum, boxes shall not be cut higher than 1/3 its height. Over cut boxes are not acceptable; and



- (vii) Installed in association with its housed components so as not to require excessive cutting of the valve box to the satisfaction of The Superintendent.
- (f) All valve box lids shall be clearly marked with the identification of the contents using the follow key:-
 - IV = Isolation Valve
 - AV = Air Valve
 - FV = Flush Valve
 - MV = Master Valve
 - QCV = Quick Coupling Valve
 - CLV = Cam Lock Valve

Lateral valve box lids shall be marked with:-

- The 3 digit "ICC number" as supplied by The Superintendent, for example "045" identifying the Irrinet System number.
- (g) Valve Box Lids shall be engraved by using a 50mm high Signet 14474 / 14494 zinc
 Stencil Set or approved equivalent as a template. The engraving finish shall be evenly
 1.5mm deep at its deepest point and between 4mm to 8mm wide by using an engraver or router power tool fitted with appropriate bit. Note excessively deep engraving will weaken valve box lids & is not acceptable.
- (h) The finished engraving shall then be painted with a Signet white or black ball marker or approved equivalent. Use white marker on green valve box lids & black marker on white box lids.
- (i) No valve boxes shall be installed in drainage swales or places where storm water is collected during rainfall.
- (j) Conduit connecting valve boxes with electrical inspection pits and other Valve Boxes is to be M.D. corrugated flexible conduit of a minimum 500mm and maximum 1500mm in length - refer Appendix 17.2.

20.3 VALVE NEST ENCLOSURES

(a) Refer standard drawings Appendix 33.1 through 33.4 for valve nest enclosure details.



- (b) Valve Nest Enclosures may be installed where groups of more than 3 valves can be located together.
- (c) Allowance must be made for larger lateral pipe sizes to offset increased friction losses where longer lateral pipe lengths are required.
- (d) Allowance must be made for increase lateral sizes & quantity leaving the one location.
- (e) Where 2 or more laterals leaving a Valve Nest Cover share a common trench, bedding sand must be used refer section 16.10.
- (f) Lateral pipes leaving a Valve Nest Cover must be run parallel in trenches (not twisted).
- (g) Valves inside a Valve Nest Cover must be clearly identifiable via round 38mm diameter aluminium identification tags or approved similar & commercially available. ICC numbering shall be clearly stamped onto one side of the tag using a punch set with 13mm high numerals. Tags shall be fastened to the appropriate solenoid valve using a quality grade plastic cable tie.
- (h) Electrical cables shall be cable tied to each solenoid valve control valve.
- (i) Enclosures shall be fitted with a pad lock & keyed to fit Council "F" series.
- (j) Solenoid valves shall be connected to a common copper manifold via individual brass barrel union & ball valve.
- (k) Copper manifolds (from 40mm to 80mm) must be of sufficient size to allow multiple stations to run simultaneously in program where required.
- (I) Copper manifolds pipe work connections must be braze welded.
- (m) Copper manifold pipe work crimp connections are not accepted.
- (n) Copper manifolds connecting to PVC mainline shall be done via Cop-A-Mate flange or approved similar, installed 25mm above ground level.
- (o) Copper manifolds connecting to Poly mainline shall be done via metric female compression fitting installed 25mm above ground level.
- Install Valve Nest Cover using 10mm 316 S.S dyna bolts fastened to 200mm diameter by 300mm deep concrete footings poured on site.
- (q) Top of concrete footings shall be installed level & 25mm above finished ground level.

21. SPRINKLER EQUIPMENT

- 21.1 SPRINKLER DESIGN
- (a) Sprinklers used shall be in accordance with Table 7.

TABLE 7 – APPROVED SPRINKLERS



Hunter	120	Gear Drive
Hunter	MPR	Rotating Nozzle**
Toro	570Z-P	Static
Rainbird	5000 Plus	Gear Drive
Rainbird	6504	Gear Drive
Rainbird	1800-SAM	Static
Rainbird	R-VAN	Rotating Nozzle**

** Use on Toro 570 or Rainbird 1800 Body.

- (b) Sprinkler Uniformity shall not exceed a Scheduling Coefficient of 1.3 (5% Window)
 Appendix 19.1, provides a definition of the Scheduling Coefficient and the process for calculation.
- (c) Where possible individual sprinkler stations shall be fitted with either all full circle sprinkler arcs or all part circle sprinkler arcs.
- (d) 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.
- (e) Sprinkler lateral piping shall be sized so that the pressure variation between any 2 like sprinklers on a single station shall be less than 20%. (Design loss shall be 10% as standard).
- (f) All sprinklers are to operate at the Manufacturers recommend pressure.
- (g) All sprinklers are be fitted with internal check valves from manufacturer.
- (h) No water shall be applied to locations where over spray is undesirable, including adjacent non irrigated areas, roads, footpaths, private property, fences, etc.
- (i) On roadway corners, no irrigation shall be applied to the road pavement whilst no unirrigated area shall exceed 1 metre from the road edge refer Appendix 16.1.



(j) Sprinklers are to be located to avoid direct & close stream contact with electrical switch board enclosures, irrigation control cabinets, Ergon transformers, water meter/backflow assemblies, park furniture, sign posts, tree's and the like.

21.2 SPRINKLER INSTALLATION

- (a) No sprinklers shall be fitted until all main lines, lateral lines and risers have been flushed clean.
- (b) Sprinklers shall be placed 150mm clear from walls, garden edges, pathways and the back face of concrete kerbs or concrete garden edges.
- (c) Sprinklers shall be installed as detailed in Appendix 12.1 Figure 2, slightly above the finished surface level.
- (d) Sprinklers shall be installed plumb unless placed on a slope in which case they shall match the slope of the surface.
- (e) Where directed by The Superintendent, sprinklers in turf areas shall be installed with a sod of turf (300mm square) placed around them at the finished surface level to help stabilise the sprinkler & minimise soil ingress into the sprinkler seal.
- (f) 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 Appendix 12.1.
- (g) In locations where soils may be of a corrosive nature, 316 stainless steel bolt & nuts shall be used on all tapping saddles.
- (h) The flexible swing hose riser used shall be either:-
 - (i) 25mm Safety Yellow industrial hose, with nylon type elbows secured with quality
 316 Stainless Steel Hose clamps; OR
 - (ii) HR Products E-Z riser tube and E-Z riser elbows. (for sprinklers with 15mm and 20mm inlets).



- (i) The length of the flexible swing hose riser shall be no less than 300mm and no greater than 500mm.
- Nozzle diffuser screws shall not reduce the wetted throw of a sprinkler by more than 20% of the un-diffused radius of a sprinkler.
- 21.3 BOLLARD SPRINKLER INSTALLATION
- (a) Bollard sprinklers shall be installed where approved by the Superintendent in locations where sprinklers may be obstructed by plants or plant growth.
- (b) Bollard sprinklers shall be assembled & installed as detailed in Appendix 12.2 & 12.3.

22. COUPLING VALVES

- 22.1 QUICK COUPLING VALVES (QCV)
- (a) QCV's shall be installed as per Appendix 30.3.
- QCV's shall be connected to the main line via a PVC or Poly tee coupling. Connecting QCV's to main line with tapping saddles is not allowed.
- (c) QCV's shall have the lid of the valve box clearly marked with an Engraving Tool and Paint with the letters "QCV".
- 22.2 CAM LOCK VALVES (CLV)
- (d) CLV's shall be installed as per Appendix 30.2.
- (e) CLV's shall be connected to the main line via a PVC or Poly tee coupling. Connecting CLV's to main line with tapping saddles is not allowed.
- (f) CLV's shall have the lid of the valve box clearly marked with an Engraving Tool and Paint with the letters "CLV".

23. DRIP IRRIGATION EQUIPMENT



23.1 DRIP IRRIGATION DESIGN AND INSTALLATION

- (a) All Drip Irrigation systems shall be installed with an RPZ Backflow device.
- (b) 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 drip tube inlet pressure shall be 300 Kpa.
- (c) All drip tube used shall be Netafim XR CNL 14.2mm I.D, 0.4m spacing @1.6lph or approved equivalent.
- (d) The maximum spacing for drip tube is as shown in Table 8.

TABLE 8 - DRIPPER SPACING

SOIL TYPE	LOCATION		
	Grassed areas	Gardens	
Loam and Clay Soil	400 mm maximum	500 mm maximum	
Sandy Soil	300 mm maximum	400 mm maximum	

- (e) Refer Appendix 14.1 and 14.2 for Typical Drip irrigation details.
- (f) Pressure compensation shall be fitted to each individual drip irrigation station. The following three (3) options are acceptable. Refer to the manufactures guideline & specifications to select the correct drip valve assembly & its components.
 - (i) Hunter Accu-Sync Pressure Regulator, for 25mm ICV refer Appendix 14.3;
 - (ii) Inline Pressure Regulation device, 25mm ICV refer Appendix 14.5.
 - (iii) Inline Pressure Regulation device, 40mm ICV refer Appendix 14.6
 - (iv) A Disc Filtration system shall be installed immediately up stream of the solenoid valve in accordance with the manufacturer's specifications to ensure that the correct filter area size is selected.



- All disc filters shall be 25mm or 40mm Arkal 120 mesh disc filters with inbuilt up & down stream pressure test ports.
- (g) The Filter, Pressure Regulator valve and Solenoid valve assembly shall be installed in valve boxes. Barrel Union/s shall be fitted to allow easy removal of the filter & valve for service or maintenance. Refer Appendix 14.3, 14.5 & 14.6. The constructor must ensure:-
 - (i) The filter disc cartridge can be easily replaced.
 - (ii) The pressure regulator can be easily replaced.
 - (iii) The solenoid valve can be easily serviced or replaced.
- (h) Drip Tube in Turf areas shall be installed:-
 - (i) As per Appendix 14.7
- (i) Drip Tube in Garden areas shall be installed;-
 - (i) As per Appendix 14.1 & 14.2
- (j) Drip Tube shall not be installed;-
 - (i) Directly into heavy clay or rocky soils & where site soil may cause damage to the drip tube.
 - (ii) In areas subject to significant vehicle or pedestrian traffic & where traffic may cause damage to the drip tube.
 - (iii) In areas where Clause 15.2 (a) & 15.2 (b) excludes its use.
- (k) All drip tube 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 metre based on twice the flow rate of that during normal operation. Each flushing line shall be fitted with a Ball Valve and 500mm of Industrial Vacuum & 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 & Delivery Hose from kinking. The hose is to be held in place with a stainless steel hose clip. See Appendix 14.1 and 14.2 for component layouts. The valve box shall be sized as follows;

- (i) 25mm Ball Valve Carson or approved equivalent Round Heavy Duty Valve Box.
- 40mm Ball Valves HR Super Heavy Duty "Hydrant" Type Rectangular Valve Box.
- (I) Air /Vacuum relief valves shall be Bermad Air /Vacuum Relief Valve (Model ARV) and installed at high point(s) in the dripper layout. The vacuum relief valve shall be installed in a Carson or approved equivalent round heavy duty 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 Appendix 14.1 and 14.2 for a typical Installation.
- (m) If the fall in a drip irrigation station exceeds 3 metres:-
 - (i) Netafim HCNL drip tube shall be used and/or
 - (ii) Hansen Check Valves (or approved equivalent) shall be fitted to later pipe work.
 Drip system sections on each side of the check valve shall be fitted with independent Flushing Valves and Air/Vacuum Relief Valves.
- (n) Each drip Irrigation station shall be fitted with operation indicators. The operation indicators consist of a Toro 570 150mm pop-up sprinkler fitted with an SST nozzle set to zero flow, sealed with silicon and installed level with the ground or top of mulch. Operation indicators shall be installed in each separate section of a drip station and as per appendix 14.1& 14.2.
- (o) Prior to the installation of the drip tube & pipe work, 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.



- (p) On slopes the drip irrigation tubes shall following the contour lines of the area.
- (q) "Snaking" of dripper lines shall be avoided.
- (r) The minimum size of supply header or flush collector manifold pipe work is 25mm Low Density (L.D) Poly Pipe.
- (s) Drip tube shall be laid in straight runs inside roundabouts.
- (t) For drip tube & pipe work off-set distances from edging & pavement refer Appendix 14.1.
- (u) Drip tube shall only be connected to 25mm Low Density Poly Feeder / Collector Pipe using FI Tees and either barbed straight, barbed elbow or barbed tee adapters from Tavlit (3/4inch BSP to 16mm double barbed) 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 The Superintendent.
- (v) Drip tube shall only be connected to 40mm PN 8 Poly Feeder / Collector Pipe using poly tapping saddles and either barbed straight, barbed elbow or barbed tee adapters from Tavlit (3/4inch BSP to 16mm double barbed). The use of grommet connectors is not approved by The Superintendent.
- (w) 25mm & 40mm drip feeder manifolders shall be connected to lateral pipe work via PN8 poly pipe & adapter. Connection shall be made at centre of manifold length.
- (x) 25mm L.D drip collector manifolders shall be connected to flush valves via 25mm L.D pipe & fittings. Connection shall be made at centre of manifold length
- (y) 40mm PN8 drip collector manifolders shall be connected to flush valves via 40mm PN8 poly pipe & fittings. Connection shall be made at centre of manifold length
- (z) In locations where soils may be of a corrosive nature, 316 stainless steel bolt & nuts shall be used on all tapping saddles.



24. SCOUR VALVES

24.1 SCOUR VALVE ASSEMBLIES

- Scour valves shall be installed on large irrigation systems containing mainline size
 80mm or greater and shall be:-
- (b) Strategically located at the end of mainline runs to allow flushing of pipe debris to protect solenoid valves, laterals & sprinklers/drip systems from contamination
- (c) Installed in a location to enable easy access & operation without causing damage (flooding) to adjacent facilities
- (d) Installed as per as per Appendix 30.5, 30.6 & 30.7.
- (e) Where Poly mainline is used, the poly equivalents to PVC pipe & fittings shown in Appendix 30.5, 30.6 & 30.7 shall be substituted
- (f) The lid of the cast iron valve cover shall be clearly marked with painted letters "F.V".

25. MAIN LINE AIR VALVES

- 25.1 MAIN LINE AIR VALVE ASSEMBLIES
- (a) Air valves shall be installed on large irrigation systems containing mainline size 100mm
 & greater and shall be:-
- (b) Strategically located to allow air release & vacuum relief of mainline pipe
- (c) Installed as per as per Appendix 30.1.
- (d) The lid of the valve box shall be clearly marked with an engraving tool and paint with the letters "A.V".

26. MAIN LINE ISOLATION



26.1 MAIN LINE ISOLATION VALVE ASSEMBLIES

- (a) Isolation valves shall be installed on large irrigation systems containing mainline size
 80mm & greater and shall be:-
- (b) Strategically located to allow segmentation of mainline pipe networks for constructability, operational and maintenance activities
- Installed as per the flanged RSGV sluice valve assembly detail shown in Appendix 30.5, 30.6 & 30.7.
- (d) The lid of the cast iron valve cover shall be clearly marked with painted letters "I.V".

27. TEMPORARY IRRIGATION

- 27.1 DESIGN & INSTALLATION
- (a) Temporary Irrigation is defined as Irrigation required for the establishment only of vegetation or landscaping for duration of no more than 12 consecutive months from date of installation.
- (b) Permanent Irrigation is defined as Irrigation required for vegetation or landscaping for duration of greater than 12 consecutive months from date of installation.
- (c) Irrigation that is required for more than 12 consecutive months from date of installation is defined as Permanent Irrigation and must be designed & installed as per the specification within this document.
- (d) Council will not accept or be held responsible for the operation & or maintenance of temporary irrigation.
- (e) Temporary irrigation must be operated & maintained by the constructor for the life of the temporary system.
- (f) All temporary irrigation shall be removed from site before an irrigation system is transferred to Council as an asset.
- (g) All temporary irrigation shall be designed, installed & operated in a professional manner& to best industry practices
- (h) Temporary irrigation shall not contravene Health & Safety, Environmental or related acts & standards.



(i) Excluding the aforementioned clauses, Temporary Irrigation is exempt from design and installation specifications contained in this document.

28. FERTIGATION

(a) Site specific design requirements for Fertigation will be issued by The Superintendent as required.

29. EFFLUENT REUSE SYSTEMS

- 29.1 DESIGN AND INSTALLATION
- (a) All works must comply with the Queensland Water Recycling Guidelines December
 2005 (EPA), current Health & Safety, Environmental and related acts.
- (b) Effluent reuse irrigation systems shall have:-
 - (i) Sprinklers fitted with lilac ID caps,
 - (ii) Lilac coloured drip tubing,
 - (iii) Lilac coloured valve box lids,
 - (iv) Lilac coloured solenoid valve stems,
 - (v) Mainline & lateral pipe material both PVC & Poly shall be lilac in colour or contain a lilac strip,
 - (vi) All above ground pipe work shall be lilac coloured and/or clearly labelled "Recycled Water", "Non Potable Water",
 - (vii) Minimum separation of Pipe work for Potable & Recycles water systems shall be maintained at 300mm for below ground pipe work & 100mm for above ground pipe work.



- (viii) Shall have an infra- red rain sensor & mechanical wind speed sensor installed, connected to the controller and programmed into the ICC control logic conditions for the site.
- (ix) Where requested by The Superintendent an AquaCheck soil moisture probe sensor or approved equivalent shall be installed, connected to the controller and programmed into the ICC control logic conditions for the site.

30. INSTALLATIONS LOCATED IN LANDFILL SITES

- 30.1 TRENCHING IN LANDFILL SITES
- (a) All excavated material must be removed from site & properly transferred to the local refuse dump.
- (b) All excavated material must be thoroughly removed from adjacent surrounding surfaces and satisfactorily inspected by the Superintendent.
- Bedding sand shall be used to backfill to 200mm below finished soil level. The final
 200mm shall be filled with an imported approved loam soil.
- (d) Site specific design requirements for works within landfill areas will be issued by The Superintendent as required.

31. PUMP, FILTRATION & STORAGE TANK SYSTEMS

- 31.1 BOOSTER PUMP SYSTEM
- (a) Shall be skid mounted vertical multistage with variable frequency drives mounted directly onto pumps
- (b) Where applicable, electrical control panel shall also be mounted via panel brackets to skid base.
- (c) Skid base & associated mounted brackets to be hot dip galvanised steel secured to concrete shed floor via 316 stainless steel anchors.


- Installation position & alignment shall provide easy access for maintenance service & repairs.
- (e) Shall be selected for energy efficiency.
- (f) Shall be selected to meet or exceed all system requirements & operate within BEP for majority of system life.
- (g) Selected with capacity for future expansion where required.
- (h) Selected for reliable operation & low maintenance over expected pump life of 15 years.
- Connected to Ergon off peak tariff where possible to minimise energy network peak loads & reduce operational costs.
- (j) Pump equipment shall be selected based on system data including:
 - Required maximum / minimum system pressures including pipe friction losses when system is running irrigation program/s,
 - (ii) Site elevation differentials including variable water extraction levels,
 - (iii) System flow rates including maximum / minimum irrigation program flow rates plus ICC system max high flow deviation allowance,
 - (iv) Suction line losses including extraction screen, foot valve, pipe & fitting friction loss, water quality & temperature,
 - (v) Automatic filtration requirements, including additional demand during filter flush.
- (k) Pump system selection will not be accepted by Council until documented pump system data & calculations are supplied to Council & approved by The Superintendent.
- (I) Shall have mechanical or ultrasonic water meter installed directly downstream of the booster pump.
- (m) Pump systems shall be commissioned on site by product manufacturer employed pump technician.

31.2 BORE PUMP SYSTEM



- (a) Bore hole / aquafer sustainability test shall be conducted over a 12 hour period before Council approve future works. The test will determine the max sustainable extraction rate at which point the ground water draw down level in the bore hole remains constant for no less than 6 hours. A test log recording metered extraction flow rate & measured bore hole water level at 30min intervals shall be issue to The Superintendent.
- (b) Water samples taken at the start of the bore hole / aquafer sustainability test & just before concluding the test shall be sent to TCC water laboratory at Douglas for water analysis report to access suitability for irrigation use.
- (c) Pumps shall be either submersible multistage with variable frequency drives or,
- (d) Turbine pump with motor mounted above ground at the bore head, underground drive shaft & submersed multistage wet end.
- (e) Shall be selected for energy efficiency.
- (f) Shall be selected to meet or exceed all system requirements & operate within BEP for majority of system life.
- (g) Selected with capacity for future expansion where required.
- (h) Selected for reliable operation & low maintenance over expected pump life of 15 years.
- Connected to Ergon off peak tariff where possible to minimise energy network peak loads & reduce operational costs.
- (j) Ventilated stainless steel bore pump control panel shall be installed adjacent the bore pump.
- (k) Control panel shall contain pump manufactures VFD, switching, control equipment and
- Pump start/stop input connected to Irrinet controller via digital output enabling Irrinet ICC system to automatically start/stop the pump,
- (m) Hi / Lo water level probes & probe module connected directly into the pump drive control.



- (n) Shall have analogue differential pressure transducer with inbuilt EC sensor installed inside the bore case & connected into Irrinet controller via digital/analogue inputs enabling Irrinet ICC system to display water column height & apply logic conditional control.
- (o) Analogue pressure transducer 4-20ma range shall be no greater than twice the max water height & provide accurate resolution of water column height.
- (n) Pump equipment shall be selected based on system data including:
 - (vi) Required maximum / minimum system pressures including pipe friction losses when system is running irrigation program/s,
 - (vii) Site elevation differentials including variable water extraction levels,
 - (viii) System flow rates including maximum / minimum irrigation program flow rates plus ICC system max high flow deviation allowance,
 - (ix) Losses including extraction screen, foot valve, pipe & fitting friction loss, water quality & temperature,
 - (x) Automatic filtration requirements, including additional demand during filter flush.
- (o) Pump system selection will not be accepted by Council until documented pump system data & calculations are supplied to Council & approved by The Superintendent.
- (p) Shall have mechanical or ultrasonic water meter installed directly downstream of the bore pump.
- (q) Pump systems shall be commissioned on site by product manufacturer employed pump technician.
- (r) As Constructed Plans for bore pump systems must include cross section detail shown bore hole depth, screen length & diameter, bore casing length & diameter, static water level, max flow draw down level, water level sensor positions, analogue sensor position, R.L ground level, pipe sizes and above ground equipment.

31.3 FILTRATION SYSTEM

(a) Where irrigation water extraction is required from lake, river, ground water a site specific fit for purpose filtration shall be installed.
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- (b) Where directed by the Superintendent irrigation water extraction from recycled water or potable water source shall have site specific fit for purpose filtration installed.
- (c) Filtration equipment shall be selected based on system data including maximum / minimum system pressures, system flow rates, water quality range, filter exhaust duration & volume.
- (d) Filtration selection will not be accepted by Council until documented filtration system data & calculations are supplied to Council & approved by The Superintendent.
- (e) Shall be fully automatic suction scanner or disc filters, unless otherwise approved by The Superintendent.
- (f) Filtration shall be controller & monitored via dedicated filter controller panel(controller) supplied from the filter manufacturer.
- (g) Controller shall pause flush events when not desired, electrically close down stream hydraulic valve to sustain manufactures recommended (not minimum) flush pressure including programable delay / duration time and interface with Irrinet controller via digital inputs enabling Irrinet ICC system to log flush interval & durations.
- (h) Control panel shall be mounted either directly to the filter assembly or on shed wall where required.
- (i) Installation position & alignment shall provide easy access for maintenance service & repairs.
- (j) Shall be secured in position via hot dip galvanised steel brackets fastened to concrete shed floor via 316 stainless steel anchors.
- (k) Filter flush events durations & exhaust water volumes shall be minimised.
- Shall be selected to meet or exceed all system requirements, including capacity for future expansion where required.
- (m) Selected for reliable operation & low maintenance over expected filter life of 15 years.



- (n) Filtration systems shall be commissioned on site by product manufacturer employed filter technician.
- 31.4 STORAGE TANK SYSTEM
- (a) Where irrigation water requires storage, storage tank/s shall be site specific fit for purpose & sized for system requirements.
- (b) Storage tank size shall be calculated using a water balance model based on proposed irrigation program/s to providing accurate inflow / outflow rates & durations.
- (c) Storage tank sizing will not be accepted by Council until the completed water balance model is supplied to Council & approved by The Superintendent.
- (d) Shall have analogue differential pressure transducer installed & connected into Irrinet controller via digital/analogue inputs enabling Irrinet ICC system to display & apply logic conditional control of system.
- (e) Analogue pressure transducer 4-20ma range shall be no greater than twice the max water height & provide accurate resolution of water column height.
- (f) Shall have two kelco Q series heavy duty float switches or approved similar installed & connected into Irrinet controller via digital inputs enabling Irrinet ICC system to display open / closed switch state and apply logic conditional control of the system.
- (g) One float switch shall be positioned to monitor tank water fill start/stop level & second switch positioned to monitor tank water overflow level.
- (h) All tanks shall have mosquito proof screens installed.
- (i) Tank concrete footings or concrete bases shall be approved by RPEQ.



PART C - APPENDICES

32. APPENDICES

- Appendix 1 N/A
- Appendix 2 N/A
- Appendix 3.1 XR Plus 8 Panel & Screw Hole Layout
- Appendix 3.2 XR Plus 8 Terminal Layout & Power Diagram
- Appendix 3.3 XR Plus 8 Control Enclosure
- Appendix 3.4 XR Plus 8 Base & Antenna
- Appendix 3.5 XR Plus 8 Preferred Equipment List Controller & Telemetry
- Appendix 3.6 XR Plus 8 Antenna Extension Pole & Mounting Brackets
- Appendix 4.1 XR 4 Panel & Screw Hole Layout
- Appendix 4.2 XR 4 Terminal Layout & Power Diagram
- Appendix 4.3 XR 4 Control Enclosure
- Appendix 4.4 XR 4 Base & Antenna
- Appendix 4.5 XR 4 Preferred Equipment List Controller & Telemetry
- Appendix 4.6 XR 4 Antenna Extension Pole & Mounting Brackets
- Appendix 5.1 AC Irrinet ACE DR 24 48 Panel Layout
- Appendix 5.2 AC Irrinet ACE DR 24 48 Terminal Layout
- Appendix 5.3 AC Irrinet ACE DR 24 48 Control Enclosure
- Appendix 5.4 AC Irrinet ACE DR 24 48 Base & Pole
- Appendix 5.5 AC Irrinet ACE DR 24 48 Electrical Diagram
- Appendix 5.6 AC Irrinet ACE DR 24 48 Screw Holes
- Appendix 5.7 AC Irrinet ACE DR 24 48 Preferred Equipment List Controller & Telemetry
- Appendix 5.8 AC Irrinet ACE DR 24 48 Panel Layout Photo
- Appendix 5.9 AC Irrinet ACE DR 24 48 Chassis Mounting Photo
- Appendix 5.10 AC Irrinet ACE DR 24 48 Door Layout Photo
- Appendix 6 N/A
- Appendix 7.1 Irrigation Design Data Example
- Appendix 7.2 Irrigation Cabling Wiring Schedule Example
- Appendix 8.1 Plan Conventions
- Appendix 9.1 As Constructed Dimensions & Stamp
- Appendix 10.1 Water Meter Assembly 50MM & Above Type A
- Appendix 10.2 Water Meter Assembly 50MM & Above Type B

Appendix 10.3 - Water Meter Assembly 25M-32MM Type A

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Appendix 10.4 - Water Meter Assembly 25M-32MM Type B Appendix 10.5 – Water Meter Stands Appendix 10.6 – Water Meter Assembly 50MM & Above Type C Appendix 10.7 - Water Meter Assembly 50MM & Above Type D Appendix 11.1 – Solenoid Valve Assembly 25mm - HDPE Mainline Appendix 11.2 – Solenoid Valve Assembly 25mm - PVC Mainline Appendix 11.3 - Solenoid Valve Assembly 40mm - HDPE Mainline Appendix 11.4 – Solenoid Valve Assembly 40mm - PVC Mainline Appendix 11.5 – Solenoid Valve Assembly 50mm - HDPE Mainline Appendix 11.6 – Solenoid Valve Assembly 50mm - PVC Mainline Appendix 11.7 – Solenoid Valve Assembly 80mm - PVC Mainline Appendix 11.7A – Gal Steel Valve Box to suit 80mm Solenoid Valve Assembly Appendix 11.7B – Gal Steel Valve Box Lid to suit 80mm Solenoid Valve Assembly Appendix 12.1 – Sprinkler Assembly & Installation Appendix 12.2 – Sprinkler Bollard Assembly & Installation 570 Standard & Tall Appendix 12.3 – Sprinkler Bollard Assembly & Installation PGP/5000 & 6504 Standard Appendix 13.1 – Subdivision Services Allocation (figure 1, 2, 3) Appendix 13.1 – Subdivision Services Allocation (figure 4, 5, 6) Appendix 14.1 – Garden Drip System Layout Installation & Detail Appendix 14.2 – Garden Drip System Component Installation & Detail Appendix 14.3 – Drip Valve Assembly 25MM Internal Reg Appendix 14.4 – N/A Appendix 14.5 – Drip Valve Assembly 25MM External Reg Appendix 14.6 – Drip Valve Assembly 40MM External Reg Appendix 14.7 – Turf Drip System Cross Section Installation Detail Appendix 15.1 – Drip Tube Holding Pin Appendix 16.1 – Curved Road Sprinkler Layout Appendix 17.1 – Electrical Pit P1 & P2 Assembly & Installation Appendix 17.2 – Electrical Conduit to Valve Boxes Assembly & Installation Appendix 18.1 - Typical Pipe Trench Details Appendix 19.1 – Scheduling Co-efficient Appendix 20.1 – AC Irrinet M Slave 12 – 24 Panel Layout Appendix 20.2 – AC Irrinet M Slave 12 – 24 Terminal Layout Appendix 20.3 – AC Irrinet M Slave 12 – 24 Control Enclosure Appendix 20.4 – AC Irrinet M Slave 12 – 24 Base & Pole



Appendix 20.5 – AC Irrinet M Slave 12 – 24 Electrical Diagram Appendix 20.6 – AC Irrinet M Slave 12 – 24 Screw Holes Appendix 20.7 – AC Irrinet M Slave 12 – 24 Preferred Equipment List – Controller & Telemetry Appendix 21.1 – AC Irrinet M Slave 36 – 48 Panel Layout Appendix 21.2 – AC Irrinet M Slave 36 – 48 Terminal Layout Appendix 21.3 – AC Irrinet M Slave 36 – 48 Control Enclosure Appendix 21.4 – AC Irrinet M Slave 36 – 48 Base & Pole Appendix 21.5 – AC Irrinet M Slave 36 – 48 Electrical Diagram Appendix 21.6 – AC Irrinet M Slave 36 – 48 Screw Holes Appendix 21.7 – AC Irrinet M Slave 36 – 48 Preferred Equipment List – Controller & Telemetry Appendix 22.1 – AC Irrinet M 12 – 24 Panel Layout Appendix 22.2 – AC Irrinet M 12 – 24 Terminal Layout Appendix 22.3 – AC Irrinet M 12 – 24 Control Enclosure Appendix 22.4 – AC Irrinet M 12 – 24 Base & Pole Appendix 22.5 – AC Irrinet M 12 – 24 Electrical Diagram Appendix 22.6 – AC Irrinet M 12 – 24 Screw Holes Appendix 22.7 – AC Irrinet M 12 – 24 Preferred Equipment List – Controller & Telemetry Appendix 23.1 – AC Irrinet M 36 – 48 Panel Layout Appendix 23.2 – AC Irrinet M 36 – 48 Terminal Layout Appendix 23.3 – AC Irrinet M 36 – 48 Control Enclosure Appendix 23.4 – AC Irrinet M 36 – 48 Base & Pole Appendix 23.5 – AC Irrinet M 36 – 48 Electrical Diagram Appendix 23.6 – AC Irrinet M 36 – 48 Screw Holes Appendix 23.7 – AC Irrinet M 36 – 48 Preferred Equipment List – Controller & Telemetry Appendix 24 – N/A Appendix 25 – N/A Appendix 26.1 – Door Bracket Appendix 26.2 – Door Bracket Position Appendix 26.3 – Door Bracket – Irrinet M Appendix 26.4 – Door Bracket Position – Irrinet M Appendix 27.1 - Enclosure Earth Wiring Appendix 28.1 – Transceiver Interface Cable Type 1

- Appendix 28.3 Aux Data Cable RJ45 Modified Crossover Cable
- Appendix 29.2 Infra-Red Rain Sensor Assembly
- Appendix 30.1 25mm PVC or Poly Mainline Air Valve Assembly

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Appendix 30.2 – 40mm – PVC or Poly Mainline Cam Lock Coupling Assembly Appendix 30.3 – 25mm – PVC or Poly Mainline Quick Coupling Valve Assembly Appendix 30.4 – N/A Appendix 30.5 – Scour Valve Assembly 80 – 100mm Series 1 PVC Mainline Appendix 30.6 – Scour Valve Assembly 150 – 200mm Series 2 PVC Mainline Appendix 30.7 – Scour Valve Assembly 150 – 200mm Series 1 PVC Mainline Appendix 30.7 - Scour Valve Assembly 100 Series 2 PVC Mainline Appendix 31.1 – Hydrometer Covers 50mm – 100mm Appendix 31.2 – Multijet Covers 25mm - 32mm Appendix 31.3 – Dorot Master Valve Covers 50mm – 100mm Appendix 31.4 – Honeywell H5000 Water Meter Covers 50mm – 100mm Appendix 32.1 - Controller Base & Pole Double Enclosure Appendix 32.2 – N/A Appendix 33.1 – Valve Nest Cover (sheet 1) Appendix 33.2 – Valve Nest Cover (sheet 2) Appendix 33.3 – Valve Nest Cover (sheet 3) Appendix 33.4 – Valve Nest Cover (sheet 4)

Note: Attached Appendices have been reduced to fit A4 sheets for documentation purposes. Scale A1 copies are available on request.





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IRRIGATION CONTROL SYSTEM PICCOLO XR PLUS 1-8 PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
PICCOLO XR PLUS, 8DO + 4DI	73200-041200	1
BATTERY, 6V, 12 AH	00035-003050	1
MINI MODULE SOLAR PANEL	KYOCERA MINI MODULE 2 X 6V 1W	2
ELECTRONIC COMPONENTS REFER APPENDIX 3.2	SOLEX COMPONENTS	MISC.
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
ANTENNA - STANDARD ANTENNA POLE	CD51 CUT TO WAVE LENGTH	1
ANTENNA – EXTENSION ANTENNA POLE	CD93 6db WHIP	1
ANTENNA BRACKET - STADARD ANTENNA POLE REFER APPENDIX 3.4	CMF BRACKET	1
ANTENNA BRACKET - EXTENSION ANTENNA POLE REFER APPENDIX 3.6	ANTSIG 653B & CUSTOM BRACKET	1
ANTENNA CABLE	.5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1











IRRIGATION CONTROL SYSTEM PICCOLO XR 1-4 PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
PICCOLO XR, 4DO + 4DI	73200-041200	1
BATTERY, 6V, 12 AH	00035-003050	1
MINI MODULE SOLAR PANEL	KYOCERA MINI MODULE 2 X 6V 1W	1
REGULATOR COMPONENTS REFER APPENDIX 4.2	SOLEX COMPONENTS	1
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
ANTENNA	CD51- CUT TO WAVE LENGTH	1
ANTENNA BRACKET REFER APPENDIX 4.4	CMF DOOR BRACKET	1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1
ANTENNA BRACKET REFER APPENDIX 4.4 ANTENNA CABLE	CMF DOOR BRACKET .5M RG58 COAX WITH & SMA PLUG FITTED BY RICOM	1 1















IRRIGATION CONTROL SYSTEM AC IRRINET ACE 24-48 DR PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
IRRINET ACE 3 SLOTS WITH 240VAC POWER SUPPLY / BATTERY CHARGER / 6.5AH BATTERY. CHASSIS MOUNT – CAS	77.0075	1
RADIO PORT FOR IRRINET ACE	79.0080	1
32 DO/DI FET MODULE FOR IRRINET ACE	77.0060	2
ETHERNET PORT ON ACE CPU (CPU3640)	79.0086	1
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
TRANSCEIVER	GME TX3600 WITH BLIND FRONT PANEL & DB25 DATA CABLE	2
FLY LEAD, RADIO TO ARRESTER	1 METER OF RG58 COAX TERMINATED WITH N88 N TYPE MALE PLUG & BNC113 PLUG	2
ARRESTER	IS50NX	2
YAGI ANTENNA	YB6-61	1
YAGI ANTENNA BRACKET	UNV2	1
YAGI ANTENNA CABLE	6 METER OF RG58 COAX TERMINATED WITH N88 N TYPE PLUG & N88 N TYPE MALE PLUG	1
WHIP ANTENNA	CD93-70-70	1
WHIP ANTENNA CABLE	6 METER OF RG58 COAX TERMINATED TO WHIP ANT BASE & N88 N TYPE MALE PLUG	1
12V DC POWER SUPPLY	GME PSA123	1
12VDC POWER LEAD AND INLINE FUSE	SUPPLIED WITH GME PS123	2
INTERFACE CABLE TYPE 1 REFER APPENDIX 28.1	1.8 METER FLAT 8CORE TELEPHONE CABLE TERMINATED WITH RJ45 PLUG & DB25 FEMALE PLUG	2
DOOR BRACKET REFER APPENDIX 26.1	CMF DOOR BRACKET	2







	IRRIGATION DESIGN DATA - HORSESHOE BAY														
	Note - II	rigation design da	ata below should	be used as	a theoretica	l guide & mu	ist be amend	ded by the in	stallation co	ntractor relat	ive to the a	ctual installat	ion & field co	onditions.	1
INSTALLATION	PROGRAM SCHEDULE	VALVE NO.	FLOW RATE LITRES	SPRINKLER TYPE	NOZZLE SIZE	AVERAGE PRESSURE	NOZZLE FLOW RATE <i>LITRES/MIN</i>	QUANTITY	1/4, 1/2, 3/4, FC	PRECIPITATION RATE <i>MM/HOUR</i>	RUN TIME <i>MINS</i>	APPLICATION DEPTH <i>MM</i>	NO. OF CYCLES	RUNS /WEEK	WEEKLY PRCIPITATION MM
			38.4	5000+	2.5	3 bar	9.6	4	1/4						
			136.8	5000+	3	3 bar	11.4	12	1/2						
NEW	A1	B1	175.2							11	40	7.33	1	3	22
			102.6	5000+	3	3 bar	11.4	9	1/2						
NEW	۸1	B0	15	5000+	4	3 bar	15	1	3/4	11	40	7 33	1	2	22
	~	62	19.2	5000+	2.5	3 har	9.6	2	1/4		40	7.55		5	22
			125.4	5000+	3	3 bar	11.4	11	1/4						
			15	5000+	4	3 bar	15	1	3/4						
			0.73	MPR	1000	3 bar	0.73	1	1/4						
			2.92	MPR	1000	3 bar	1.46	2	1/2						
NEW	A2	B3	163.25							11	40	7.33	1	3	22
			48	5000+	2.5	3 bar	9.6	5	3/4						
			102.6	5000+	3	3 bar	11.4	9	FC						
NEW	A2	B4	150.6	5000	0.5	0.1	0.0	0	4/4	11	40	7.33	1	3	22
	1		19.2	5000+	2.5	3 bar	9.6	2	1/4	1					
NEW	Δ1	B 5	133.2	5000+	3	3 Dai	11.4	10	1/2	11	40	7 33	1	3	22
NEW	N/A	B5 B6	133.2	0				0			40	7.55	•	3	22
		20	25.8	6504	8	3 bar	25.8	1	1/2						
			95.4	6504	10	3 bar	31.8	3	3/4						
			115.2	6504	12	3 bar	38.4	3	FC						
NEW	A3	B7	236.4							10	50	8.33	1	3	25
NEW	A4	B8	230.4	6504	12	3 bar	38.4	6	FC	10	50	8.33	1	3	25
			51.6	6504	8	3 bar	25.8	2	1/2						
			31.8	6504	10	3 bar	31.8	1	3/4						
NEW	۸3	Po	192 275 4	6504	12	3 bar	38.4	5	FC	10	50	8 33	1	2	25
	7.5	53	3.46	MPR	1000	3 har	1 73	2	22	10	50	0.55		5	23
			0.73	MPR	1000	3 bar	0.73	1	1/4						
			43.8	MPR	1000	3 bar	1.46	30	1/2						
			6.84	MPR	1000	3 bar	1.71	4	3/4						
			2.94	MPR	1000	3 bar	2.94	1	FC						
NEW	A5	B10	54.83							10	50	8.33	1	3	25
	D4		1050 1	0504	40	0 h a r	20.4	54	50	40		0.00	4		
	BI	A2, A4, A10	1958.4	6504	12	3 bar	38.4	51	FC	10	50	8.33	1	3	20
NEW	B3	ATT, ATS, AT4	1956.4	6504	12	3 bar	38.4	53	FC	10	50	8.33	1	3	25
		A1, A3, A0	307.2	6504	12	3 har	38.4	8	1/4		50	0.00	•	Ű	20
			1598.4	6504	14	3 bar	44.4	36	1/2						
			91.2	5000+	3	3 bar	11.4	8	1/2						
NEW	B4	A5, A9, A15	1996.8							20	25	8.33	1	3	25
			159	6504	10	3 bar	31.8	5	3/4						
			1881.6	6504	12	3 bar	38.4	49	FC						
NEW	B5	A7, A8, A12	2040.6							10	50	8.33	1	3	25
									WATER	WINDOW	425 7.08	MINUTES HOURS			

Appendix 7.1

Irrigation Design Data Example

IRRIGATION CABLING / WIRING SCHEDULE

LOCATION: CUTHERINGA PARK STAGE 1

DATE: 15/12/2007

CABLE E1						
NUM CORES:	1.5 x 13					
COLOUR	VALVE NUM					
BLACK	COMMON					
YELLOW	1					
BROWN	2					
RED	3					
WHITE	4					
GREEN	5					
LIGHT GREEN	6					
VIOLET	7					
ORANGE	8					
PINK	9					
TAN	10					
GREY	SPARE					
BLUE	SPARE					

CABLE E2						
NUM CORES: 1.5 x 13						
COLOUR	VALVE NUM					
BLACK	COMMON					
YELLOW	11					
BROWN	12					
RED	13					
WHITE	14					
GREEN	15					
LIGHT GREEN	16					
VIOLET	17					
ORANGE	18					
PINK	19					
TAN	20					
GREY	SPARE					
BLUE	SPARE					

CABLE E3						
NUM CORES:	1.5 x 13					
COLOUR	VALVE NUM					
BLACK	COMMON					
YELLOW	21					
BROWN	22					
RED	23					
WHITE	24					
GREEN	25					
LIGHT GREEN	26					
VIOLET	27					
ORANGE	28					
PINK	29					
TAN	30					
GREY	SPARE					
BLUE	SPARE					

CABLE E4						
NUM CORES:	1.5 x 7					
COLOUR	VALVE NUM					
BLACK	COMMON					
RED	100MM MVALVE					
WHITE	100MM PULSE					
BLUE	100MM PULSE					
BROWN	SPARE					
GREEN	SPARE					
YELLOW	SPARE					

Irrigation Cable / Wiring Schedule Example



Figure 1 PLAN LEGEND





Figure 1

AS CONSTRUCTED

Business Details: AA Irrigation Construction Business Address: PO Box 123 Townsville 4810 Contact Number: 0407 697 244 Site Irrigation Construction Supervisor: John Smith Construction Completion Date: 21/3/2019 Irrigation AC Plans Checked & Certified by: John Smith on 25/3/2019

AS CONSTRUCTED PLAN STAMP - EXAMPLE

Figure 2










	 *NOTE ALL EQUIPMENT TO BE FLANGE MOUNTED & SIZED TO SUIT 50MM, 80MM, 100MM OR 150MM 316 S.S ENCLOSURES TO BE AS PER TCC IRRIG. SPEC'S APPENDICES FIT TCC "A" SERIES LOCK TO ALL S.S ENCLOSURES 	RECYCLITEMADUCTILEBRSGV OFHONEYWHONEYWCMETER CPULSE ODDDOROT 1ACTUATOEFRP03 ORGDUCTILEHFLANGESERIES FIFLANGESUPPOR
()		

			REFERENCE DRAWINGS	DRAWING S	CALES (A1)	SURVEY				DES.	BZW
				0 0.05 0.1	0.15 0.2 0.25m	N.A	Ť	Brian Walters SENIOR IRRIGATION PLANNER	12-11-19 DATE	DRN.	BZW
						N.A	City of	Not Required	 DATE	снк.	RVP
REV.	REVISIONS	AP'D DATE				N.A	Townsville	Authorised for Issue	DATE	COORD.	N.A



CLED WATER IRRIG POS & HEAD WORKS DESCRIPTION E OR COPPER PIPE UP LEG ASSEMBLY R BALL VALVE (ISOLATION VALVE) WELL H5000 TOWNSVILLE WATER BILLING WATER C/W DUAL PULSE OUTPUT. 100L PULSE O/P FOR TW, 10L D/P FOR IRRIG CONNECTION 100 SERIES MASTER VALVE ASSEMBLY C/W ELECTRIC FOR ER FOR BACK FLOW PREVENTION DEVICE R DC03 BACK FLOW PREVENTION DEVICE E OR COPPER PIPE UP DOWN ASSEMBLY MOUNTED LOCKABLE 316 S.S ENCLOSURE C/W TCC "A" PAD LOCK

RT STAND - AS PER TCC IRRIG. SPEC'S APPENDIX 10.5



		TYPE C	
. • 1	SHEET	DRAWING NO.	REV.
I.A	1 OF 1	APPENDIX 10.6	

REV. REVISIONS	AP'D DATE				INDEX NO. N.A	WANAGER Authorised for Iss	DATE	COORD.	N.A
					N.A	Not Required		снк.	RVP
				0 0.05 0.1 0.15 0.2 0.25m	N.A	Brian Walters SENIOR IRRIGATI PLANNER		DRN.	BZW
		REFERENCE DRAWI	INGS	DRAWING SCALES (A1)				DES.	BZW
~~~ <u></u>	θ		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	J 	-300mm 			
					B			Ē	
								D DOR ACTI E STR/ F RP03 G DUC H IN GF WAT I FLAN SERI J SUPI	

*NOTE

APPENDICES

ALL EQUIPMENT TO BE FLANGE MOUNTED & SIZED TO SUIT 50MM, 80MM, 100MM OR 150MM
316 S.S ENCLOSURES TO BE AS PER TCC IRRIG. SPEC'S

• FIT TCC "A" SERIES LOCK TO ALL S.S ENCLOSURES

ITEM



DRAWING NO.

APPENDIX 10.7

REV.

SHEET

1 OF 1



I     GEOFABRIC       J     SUPER HEAVY DUTY HYDRANT       PART No. HR1419/12HYD (BOD)       K     BRICK CUT MAX 50MM CORRUC
NOTE
NOTE HREAD TAPE AND PASTE AS REQU
DES. BZW IRRIGA

1 OF 1 SHEET

APPENDIX 11.1 DRAWING

NO.

REV.

25MM - HDPE MAINLINE

IRRIGATION CONTROL SYSTEM DESCRIPTION

40MM POLY PN12.5 PIPE
 40MM POLY COMPRESSION ELBOW
 25MM × 40MM COMPRESSION MALE ADAPTER
 25MM TESTED BALL VALVE
 25MM BRASS NIPPLE
 25MM BRASS BARREL UNION (F-F)

Appendix 11.1



NO.

REV.

RRIGATION CONTROL SYSTEM
DESCRIPTION
C PN12 RISER PIPE
CELBOW
MM PVC REDUCING BUSH
C PN12 PIPE
MM PVC COUPLING SOCKET, 50MM x 25MM PVC
3 BUSH & 25MM × 25MM PVC VALVE ADAPTER
STED BALL VALVE
ASS NIPPLE
ASS BARREL UNION (F-F)
VTER ICV
MM COMPRESSION MALE ADAPTER
LY PN8 PIPE
lic
EAVY DUTY HYDRANT VALVE BOX (ENGRAVED)
HR1419/12HYD (BODY & LID)
T MAX 50MM CORRUGATED CONDUIT ENTRY
30 BRICK SUPPORTS TO PERIMETER OF VALVE BOX x 8
AND DARTE AS DECITIDED TO ALL THREADS

INREADS

Appendix 11.2



ΛP		ő	D	ZW	
1 OF 1	SHEET				
APPENDIX 11.3	DRAWING NO.		40MM - HDPE MAINLINE	IRRIGATION CONTROL SYSTEM	
	REV.				

Appendix 11.3

M 50MM CORRUGATED CONDUIT *NOTE THREAD TAPE AND PASTE AS REQUIRED TO ALL THREADS. GEOFABRIC SUPER HEAVY DUTY HYDRANT VALVE BOX (ENGRAVED) 200x100x50 BRICK SUPPORTS TO PERIMETER OF VALVE BOX x 8 BRICK CUT MAX 50MM CORRUGATED CONDUIT ENTRY PART No. HR1419/12HYD (BODY & LID) POLY COMPRESSION ELBOW **x** 63MM COMPRESSION MALE ADAPTER



VP		ВО	I.B	ZW				Ŧ	i	
1 OF 1	SHEET									-
APPENDIX 11.4	DRAWING NO.		40MM - PVC MAINLINE	IRRIGATION CONTROL SYSTEM						
	REV.									

>
>
>
> >
>

Appendix	11	.4
----------	----	----

DESCRIPTION
PVC PN12 PIPE
PVC ELBOW
X 50MM PVC REDUCING BUSH
PVC PN12 PIPE
X 50MM PVC COUPLING SOCKET, 50MM X 40MM PVC
CING BUSH & 40MM × 40MM PVC VALVE ADAPTER
TESTED BALL VALVE
BRASS NIPPLE
BRASS BARREL UNION (F-F)
HUNTER ICV
X 63MM COMPRESSION MALE ADAPTER
POLY PN8 PIPE
ABRIC
R HEAVY DUTY HYDRANT VALVE BOX (ENGRAVED)



RESSION ELBOW RESSION MALE ADAPTER VALVE E LUNION (F-F) ELUNION (F-F) EL
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

1 OF 1 SHEET

APPENDIX 11.5

DRAWING NO.

REV.

IRRIGATION CONTROL SYSTEM SOLENOID VALVE ASSEMBLY 50MM - HDPE MAINLINE

DESCRIPTION



REV.

IRRIGATION CONTROL SYSTEM
DESCRIPTION
VC PN12 RISER PIPE
VC ELBOW
50MM PVC REDUCING BUSH
VC PN12 PIPE
VC VALVE SOCKET
ESTED BALL VALVE
RASS NIPPLE
RASS BARREL UNION (F-F)
UNTER ICV
63MM COMPRESSION MALE ADAPTER
OLY PN8 PIPE
SRIC
HEAVY DUTY HYDRANT VALVE BOX (ENGRAVED)
<ol> <li>HR1419/12HYD (BODY &amp; LID)</li> </ol>
UT MAX 50MM CORRUGATED CONDUIT ENTRY
x50 BRICK SUPPORTS TO PERIMETER OF VALVE BOX x 8
ORRUGATED CONDUIT
HANDLE TO BE CUT TO SPECIFIED LENGTH. ALL ROUGH

Appendix 11.6







VP 2 0F 2	ZW I.B BO SHEET	280		390	280		390
APPENDIX 11.7B	IRRIGATION CONTROL SYSTEM GALVANISED STEEL VALVE BOX LID		C 50		50	ARTICLE AND	

Appendix 11.7B





1 OF 1	SHEET				25mm Ø	5 1/2 INC	4 1/2 INCH C	
APPENDIX 12.2	DRAWING NO. REV.	IRRIGATION CONTROL SYSTEM SPRINKLER BOLLARD ASSEMBLY AND INSTALLATION 570 STANDARD AND TALL	NOTE REMOVE ALL SHARP EDGES WHERE TUBING HAS BEEN CUT OR DRILLED PRIOR TO ASSEMBLY & INSTALLATION.	RAPID SET CONCRETE	/2 INCH MALE TUBE BUSH connect to lateral via poly socket & ezy tube/blue elbows) HOLE	CH COPPER ELBOW	OPPER TUBE	

Appendix 12.2

1 STAINLESS STEEL TUBE (316 Hand rail with 320 grit polished finish) 63.5MM OD (60.3MM ID @ 1.6MM WALL)

-2 570 SPRINKLER MOUNTED ON COPPER PIPE INSIDE TUBE

3 1/2 INCH MALE TUBE BUSH



JBE JBE IFE EDGES WHERE CUT OR DRILLED Y & INSTALLATION.	Appendix 1	Appendix	Appen
----------------------------------------------------------------------	------------	----------	-------

# TABLE OF OTHER SERVICES

Note: This Appendix is an approximate guide to the location of services in footpath allocations. The developer is required to get locations of all services located in the area. No reponsibility is taken for the locations shown on these drawings.

MINIMUM COVER	R TO SERVICES				
SERVICE	COVER				
Water	450mm				
Sewerage (pressure main only)	600mm				
Stormwater pipes	300mm				
Electricity	For recommended				
Telecommunications	covers to these services refer to the				
Gas	relevant authority				

All depths are from finished surface level (installation of underground services shall occur after any site filling required has been completed). Exceptions to the cover above may include where services clash.





Figure 2

Access Street











A				1		m	D	σ	 Ар	> Appendi	> Appendix
α	, III 04 - X0 III 107	DRIP VALVE ASSEMBLY		IRRIGATION	PROJECT:		Уе	oid Valve with built-in ure Regulator			
r	C. BRIODY		ΒZW	ΒZW			1 8 HD PE Pi	Solen			
	JV AL:	RUCTION:	<u>.</u>	IED:	÷		P				





			REFERENCE DRAWINGS	DRAWING SCALES (A1)	SURVEY LEVEL DATUM N.A COORD. DATUM		Brian Walters IRRIGATION AGRONOMIST	22-10-15 DATE	DES. DRN.	BZW N.B		IRRIGATION CONTROL SYSTEM DRIP FILTER & VALVE ASSEMBLY 40MM – HDPE OR PVC MAINLINE	
					INDEX NO.	Cityof	MANAGER	DATE			SHEET	DRAWING NO.	REV.
REV.	. REVISIONS	AP'D DATE			N.A	1011101110	Authorised for Issue		COORD.	WP	1 OF 1	APPENDIX 14.6	

REDUCING NIPPLE
00 x4 SPRING REGULATOR (FLOW 3.2m3-18m3)
ATURE FOR SPRING SELECTION
OMPRESSION MALE ADAPTER
PIPE (design to specify pipe size required)
PPORTS TO PERIMETER OF VALVE BOX x8
CORRUGATED CONDUIT ENTRY
NDUIT
SAP AROUND FITTING
TE AS REQUIRED TO ALL THREADS TO ENSURE

14.6

Appendix

- INSTALLATION NOTES
  Excavate to depth shown
  Install min 25mm base of compacted loam soil
  Install drip tube over 25mm base
  Peg drip tube in place with holding pins
  Install feeder & collector manifolds with additional 25mm cover
  Connect all drip tube system & test run
  Inspect drip system by TCC before proceeding
  Install of 75mm layer of loam soil over drip tube, ensuring drip tube is not damaged by machinery, wheel burrows or workman
  Ensure loam layer is at finish is level as shown
  Apply fertiliser & moisture retention mix as required
  Install new turf & hand water
  Temporary irrigation turf through establishment period & until root depth equals drip tube depth



INSTALLATION

			REFERENCE DRAWINGS	DRAWING SCALES (A1)	SURVEY				DES.	B
					LEVEL DATUM		Brian Walters	22-10-15		
				NITC	N.A	*	IRRIGATION AGRONOMIST	DATE	DRN	N
				NTS	COORD. DATUM			0,112	DINN.	
					N.A		Mark Wilkinson	22-10-15	снк.	CE
					INDEX NO.	Cityof	MANAGER	DATE		+
REV.	REVISIONS	AP'D DATE			N.A	10111311116	Authorised for Issue		COORD.	W

ZW		IRRIGATION CONTROL SYSTEM						
.В	С	ROSS SECTION INSTALLATION DETAIL						
30								
	SHEET	DRAWING NO.	REV.					
/P	1 OF 1	APPENDIX 14.7						





	PROVAL: N	AWN:	SIGNED:						
	1. BREWSTER	4: BZW	BZW						7
α	DRIP TUBE HOLDING PIN	TITLE:	PROJECT: IRRIGATION CONTROL						8
		-	ſ	Γ		0	ω	>	
								Appendix 1	5.1







WP 1	080	N.B	
OF 1	HEET	ELEC	
APPENDIX 17.2	DRAWING NO. REV.	IRRIGATION CONTROL SYSTEM CTRICAL CONDUIT TO VALVE BOXES ASSEMBLY AND ISTALLATION	Electrical Pit



### TOWNSVILLE CITY COUNCIL – PARKS SERVICES IRRIGATION SYSTEMS – STANDARD DETAILS

# SCHEDULING COEFFICIENTS

The scheduling coefficient is a measure of how much additional water must be applied to the driest 5% of a given sprinkler pattern in order to equal the average application of the entire area. In simple terms the scheduling coefficient is a measure of how much additional water must be applied to remove dry areas.

# Example

Take a Hunter PGP Full Circle Sprinkler on an 11 metre square pattern. The volume output at 344kpA is 16.05 LPM. The theoretical application rate is given by;

$$mm^{2}/hr = \frac{lpm \times 60}{m^{2}} = \frac{16.05 \times 60}{11^{2}} = 8mm^{2}/hr$$

If the sprinklers put out the same application rate across the whole pattern, 8mm² / hr would be the correct application rate for the entire pattern. Application patterns from sprinklers do not deliver perfect application rates. Using SPACE PRO© software the application pattern for the above example is shown in Figure 24.



**APPENDIX 19.1** 

### TOWNSVILLE CITY COUNCIL – PARKS SERVICES IRRIGATION SYSTEMS – STANDARD DETAILS

# Continued

Figure 24 represents the outputs of the 4 Hunter Sprinklers, 11 metres apart. The sprinklers are represented by the green dots at each corner of the Figure 24. The darker the blue, the more water applied, conversely the lighter the colour the less water applied. The more even the colour, the greater the uniformity of application. The Red Square represents the driest 5% of the pattern. SPACE PRO© calculates the scheduling coefficient automatically. For this example the scheduling coefficient was calculated to be 1.2. The application rate for the driest 5% of the pattern can therefore be calculated by;

$$mm^2/hr = \frac{8mm^2}{1.2} = 6.7mm^2/hr$$

The sprinkler run time would need to be increased by an additional 20% in order to apply the application rate of 8mm² / hr. If the sprinklers are run for 30 minutes per irrigation shift, the increased time is given by;

$$time = 30 \min \times 1.2 = 36 \min$$

The more efficient the system, the lower the scheduling coefficient, and hence the lower the run time required to fully irrigation dry areas.

No sprinkler system may exceed a scheduling coefficient of 1.3. Contact the Irrigation Planning Officer to obtain test results.

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**APPENDIX 19.1** 












## IRRIGATION CONTROL SYSTEM AC IRRINET M SLAVE 12- 24 - PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
AC IRRINET M 24 STATION	F4864A	1
AUX DATA CABLES INTERFACE CONNECTOR	RJ45 Double Adapter Female	0
AUX DATA CABLES	FKN5953A	0
POWERTECH TRANSFORMER	MP3045	1
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
	GME TX3600 WITH BLIND FRONT	1
	PANEL & DB25 DATA CABLE	'
		4
FLY LEAD, RADIO TO ARRESTER		1
ARRESTER		1
ΔΝΤΕΝΝΙΔ	YB6-61	1
		1
	6 METER OF RG58 COAX	1
ANTENNA CABLE	TERMINATED WITH N88 N TYPE	1
	PLUG & N88 N TYPE MALE PLUG	
POWER SUPPLY	GME PS123	1
12VDC POWER LEAD AND INLINE FUSE	SUPPLIED WITH GME TX3600	1
DOOR BRACKET REFER APPENDIX 26.1	CMF DOOR BRACKET	1













## IRRIGATION CONTROL SYSTEM AC IRRINET M SLAVE 36-48 - PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
AC IRRINET M	F4864A	2
AUX DATA CABLES INTERFACE CONNECTOR	RJ45 Double Adapter Female	1
AUX DATA CABLES	FKN5953A	2
POWERTECH TRANSFORMER	MP3045	1
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
TRANSCEIVER	GME TX3600 WITH BLIND FRONT	1
	PANEL & DB25 DATA CABLE	'
	1 METER OF RG58 COAX	
FLY LEAD, RADIO TO ARRESTER		1
ADDESTED		1
		1
		1
		I
		1
	PLUG & N88 N TYPE MALE PLUG	1
POWER SUPPLY	GME PS123	1
12VDC POWER LEAD AND INLINE FUSE	SUPPLIED WITH GME TX3600	1
DOOR BRACKET REFER APPENDIX 26.1	CMF DOOR BRACKET	1
		-













## IRRIGATION CONTROL SYSTEM AC IRRINET M 12-24 - PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
AC IRRINET M 24 STATION	F4864A	2
AUX PORT1 - PORT1 DATA CABLE APPENDIX 28.3	RJ45 MODIFIED CROSSOVER CABLE	0
POWERTECH TRANSFORMER	MP3045	1
UNINTERUPTED POWER SUPPLY	ALPHA ENERGY AEON DC 1224X WITH TEMPERATURE COMPENSATED BATTERY CHARGING & GEL ELECTROLYTE SLA BATTERY	1
TELEMETRY COMPONENTS	P.N/DESCRIPTION	QUANTITY
	GME TX3600 WITH BLIND FRONT	1
	PANEL & DB25 DATA CABLE	I
FLY LEAD, RADIO TO ARRESTER	1 METER OF RG58 COAX TERMINATED WITH N88 N TYPE MALE PLUG & BNC113 PLUG	1
ARRESTER	IS50NX	1
ANTENNA	YB6-61	1
ANTENNA BRACKET	UNV2	1
ANTENNA CABLE	6 METER OF RG58 COAX TERMINATED WITH N88 N TYPE PLUG & N88 N TYPE MALE PLUG	1
POWER SUPPLY	USE ABOVE UPS	0
12VDC POWER LEAD AND INLINE FUSE	SUPPLIED WITH GME TX3600	1
DOOR BRACKET REFER APPENDIX 26.3	CMF DOOR BRACKET	1
	1	













## IRRIGATION CONTROL SYSTEM AC IRRINET M 36-48 - PREFERRED EQUIPMENT LIST CONTROLLER AND TELEMETRY COMPONENTS

CONTROLLER COMPONENTS	P.N/DESCRIPTION	QUANTITY
AC IRRINET M 24 STATION	F4864A	2
AUX PORT1 - PORT1 DATA CABLE APPENDIX 28.3	RJ45 MODIFIED CROSSOVER CABLE	1
POWERTECH TRANSFORMER	MP3045	1
UNINTERUPTED POWER SUPPLY	ALPHA ENERGY AEON DC 1224X WITH TEMPERATURE COMPENSATED BATTERY CHARGING & GEL ELECTROLYTE SLA BATTERY	1
		OUANTITY
	GME TX3600 WITH BLIND FRONT	
TRANSCEIVER	PANEL & DB25 DATA CABLE	1
FLY LEAD, RADIO TO ARRESTER	1 METER OF RG58 COAX TERMINATED WITH N88 N TYPE MALE PLUG & BNC113 PLUG	1
ARRESTER	IS50NX	1
ANTENNA	YB6-61	1
ANTENNA BRACKET	UNV2	1
ANTENNA CABLE	6 METER OF RG58 COAX TERMINATED WITH N88 N TYPE PLUG & N88 N TYPE MALE PLUG	1
POWER SUPPLY	USE ABOVE UPS	0
12VDC POWER LEAD AND INLINE FUSE	SUPPLIED WITH GME TX3600	1
DOOR BRACKET REFER APPENDIX 26.3	CMF DOOR BRACKET	1





















# DIP SWITCH CONFIGURATION Tropical + Rain Front Off

ITEM	DESCRIPTION	SWITCH SETTING
S1	DIP SWITCH 1	ON
S1	DIP SWITCH 2	OFF
S1	DIP SWITCH 3	OFF
S1	DIP SWITCH 4	ON
S1	DIP SWITCH 5	ON
S1	DIP SWITCH 6	OFF
S1	DIP SWITCH 7	ON
S1	DIP SWITCH 8	ON

ITEM	DESCRIPTION	WIRE COLOUR
J1	RELAY COM	YELLOW WIRE
J1	RELAY N.C	GREEN WIRE
J1	RELAY N.O	NO CONNECTION
J1	POWER P1	RED 12V DC+
J1	POWER P2	BLACK 12V DC-

				REFERENCE DRAWINGS	DRAWING SCALES (A1)	SURVEY				DES.	B7W		IRRIGATION CONTROL SYSTEM	
					0 20.0 40.0 60.0 80.0 100mm	LEVEL DATUM		Brian Walters	8-6-18				I.R RAIN SENSOR ASSEMBLY	
					1:2	N.A	<b></b> Ť/_	IRRIGATION AGRONOMIST	DATE	DRN.	BZW		EXTENSION POLE MOUNTED	
						COORD. DATUM								
					0 0.1 0.2 0.3 0.4 0.5m	N.A		Mark Wilkinson	8-6-18	снк.	СВО			
						INDEX NO.	Cityof	MANAGER	DATE			SHEET	DRAWING NO.	REV.
REV.	REVISIONS	AP'D	DATE			N.A	101011241116	Authorised for Issue		COORD.		1 OF 1	APPENDIX 29.2	

# TERMINATION CONFIGURATION

	Turf & Tops   Backfill   Image: Description of the second sec	oil (1) (1) (2) (2) (2) (2) (2) (3) (4) (5) (4) (5) (5) (6) (6) (7) (6) (7) (7) (7) (7) (7) (7) (7) (7			ITEM A 50MM B 50MM C 25MM C 25MM E 25MM F GEOF G 200x1 H SUPE *NOTE THREAD TA INSTALL AIR	IRF I PVC P I x 50MI ICING E I x 25MI E I TESTE I A.R.I. I FABRIC 00x50 F R HEAN R VALV	
E		REFERENCE DRAWINGS	DRAWING SCALES (A1) SURVEY			DES.	В
			0 20.0 40.0 60.0 80.0 100mm N.A	Brian Walters IRRIGATION AGRONOMIST	 DATE	DRN.	
			COORD. DATU		-		
			N A	Mark Wilkinson	22-10-15	снк.	C
			N.A INDEX NO.	City of Townsville Manager	 DATE	снк.	С 

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## IGATION CONTROL SYSTEM DESCRIPTION

I12 PIPE OR 63MM PE100 PN12.5 PIPE PVC COUPLING SOCKET & 50MM x 25MM PVC JSH OR 63MM x 50mm POLY FI ADAPTER

JSH OR 63MM x 50mm POLY FI ADAPTER PVC VALVE ADAPTER OR 50MM x 25MM POLY

0 BALL VALVE -040 AIR VALVE

RICK SUPPORTS TO PERIMETER OF VALVE BOX x 8 Y DUTY HYDRANT VALVE BOX (ENGRAVED)

PASTE AS REQUIRED TO ALL THREADS.

ASSEMBLY CENTRAL TO VALVE BOX.

3ZW		IRRIGATION CONTROL SYSTEM	
N.B		AIR VALVE ASSEMBLY	
зво			
	SHEET	DRAWING NO.	REV.
WP	1 OF 1	APPENDIX 30.1	

		~~~& ackfi	~T°	JSOII Image: Constraint of the second of				ITEM A 50MM B 50MM C 40MM E 40MM F GEOI G 200x H SUPE *NOTE THREAD T. INSTALL C	IR M PVC M × 50N JCING M × 40N M TEST M ALUN FABRIO 100x50 ER HEA AM LO	
F				REFERENCE DRAWINGS	DRAWING SCALES (A1)	SURVEY	-		DES.	Т
F				-	0 20.0 40.0 60.0 80.0 100mm 1:2	N.A	Brian Walters	 DATE	DRN.	+
╞			\vdash	-		COORD. DATUM	Mark Wilkinson	22 40 45		+
E						INDEX NO.		22-10-15 DATE		+
REV	REVISIONS	AP'D	DA	:		N.A	Authorised for Issue		COORD.	

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RIGATION CONTROL SYSTEM

DESCRIPTION

N12 PIPE OR 50MM PE100 PN12.5 PIPE M PVC COUPLING SOCKET, 50MM x 40MM PVC

BUSH OR 50MM x 40MM POLY MI ADAPTER

M PVC VALVE ADAPTER

ED BALL VALVE

INUM FEMALE CAM LOCK COUPLING

BRICK SUPPORTS TO PERIMETER OF VALVE BOX x 8 VY DUTY HYDRANT VALVE BOX (ENGRAVED)

ID PASTE AS REQUIRED TO ALL THREADS.

CK COUPLING ASSEMBLY CENTRAL TO VALVE BOX.

3ZW	IRRIGATION CONTROL SYSTEM				
N.B	CAM LOCK COUPLING ASSEMBLY				
во					
	SHEET	DRAWING NO.	REV.		
WP	1 OF 1	APPENDIX 30.2			

Backfill	Topsoli ()) ()) () ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ()) ())) ()) ())) ())))) ()))))))))))))			ITEM A 50MM B 50MM C 25MM C 25MM E 25MM F GEOFA G 200x10 H SUPEF *NOTE THREAD TAU INSTALL QC	IRR PVC PI x 50MM DING B x 25MM TESTE QUICH ABRIC D0x50 E R HEAV PE ANI V ASSI	
	REFERENCE DRAWINGS	DRAWING SCALES (A1) SURVEY 0 20.0 40.0 60.0 80.0 100mm N.A	Brian Walters IRRIGATION AGRONOMIST	 	DES. DRN.	E
REV. REVISIONS AP'D D	DATE	COORD. DATUM N.A INDEX NO. N.A	City of Townsville Authorised for Issue	 DATEC	CHK.	(

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RIGATION CONTROL SYSTEM

DESCRIPTION I12 PIPE OR 40MM PE100 PN12.5 PIPE PVC COUPLING SOCKET & 50MM x 25MM PVC JSH OR 40MM X 25MM POLY MI ADAPTER

PVC VALVE ADAPTER

D BALL VALVE COUPLING VALVE

RICK SUPPORTS TO PERIMETER OF VALVE BOX x 8 Y DUTY HYDRANT VALVE BOX (ENGRAVED)

PASTE AS REQUIRED TO ALL THREADS.

EMBLY CENTRAL TO VALVE BOX.

3ZW	IRRIGATION CONTROL SYSTEM											
N.B	QUICK COUPLING VALVE ASSEMBLY											
во	SHEET	DRAWING NO.	REV.									
WP	1 OF 1	APPENDIX 30.3										
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≶	COORD.		Authorised for Issue	IOMIIONITE	N.A				P'D DATE	REVISIONS	×.	R
		DATE	MANAGER	City of	INDEX NO.							
ß	CHK.	23-10-15	Mark Wilkinson		N.A			1				
z	DRN.	DATE	IRRIGATION AGRONOMIST		COORD. DATUM		1:5					
		2000		*		0 0.05 0.1 0.15 0.2 0.25m						
		37-10-15	Brian Walters		LEVEL DATUM							
ΒZ	DES.				SURVEY	RAWING SCALES (A1)	REFERENCE DRAWINGS D					



*NOTE THREAD TAPE AND PASTE AS REQUIRED TO ALL THREADS.

BACKFILL UNDER BRICKS TO BE COMPACTED

BOTTOM OF STORM PRO PIPE TO BE CUT TO MATCH PROFILE OF MAINLINE PIPE AND VALVE. GEOFABRIC TO BE DOUBLE WRAPPED AROUND STORM PRO PIPE AT BASE TO PREVENT INGRESS OF SOIL / SAND INTO VALVE AREA.

z		LEVEL N COORD.	SUR					z		0	z	≤┌	$\overline{\mathbf{x}}$		· I	- D	ח ה	סוי	ဂ	BA	ITEM	
A	.A City of C NO. Townsville	DATUM	VEY	ţ						300 × 300 CAST IRC	300MM DIAMETER 3	200x100x50 BRICK	SUPER HEAVY DUT	25MM TESTED BAL	PVC SOLVENT JOIN	RSGV FLANGED SL	32MM PN12.5 POLY	32MM COMPRESS	32MM COMPRESSI	PVC PN12 PIPE MILNES TAPPING B		
Authorised for Issue	Manager Date	Brion Walters 23- Irrigation Agronomist date			Sand	80	Min 25mm clearant			IN VALVE COVER	SN8 STORM PRO PIPE	SUPPORTS TO PERIMETE	TY HYDRANT VALVE BOX	L VALVE	NT WELD PRESSURE ELB	UICE VALVE (SIZE TO SU	' PIPE II I FACE FLANGE WITH G	ON ELBOW	ON ADAPTER	AND - GUN METAL BRASS	D	IRRIGATION C
	10-15	10-15		1.01		-100MM \$	t Sluice V					R OF VAL	(ENGRAV	SPECIFIC	OW (SIZE	E	AI VANIS			S WITH 31	SCRIPTIC	ONTRO
	H.	ORN.	DES.			SERIE	ottom		\$			VEBO	D)	AIION	TOSL		-D ST			6 SS F	ž	LSY
WF	GBO	Z.B	BZW			:S 1 F	of					X X 8) T		FFL B			ASTE		STE
1 OF 1	SHEET	80				VC PIPE											ACKING			NERS. (S		Z
APPENUIX JU.J	DRAWING NO.	SCOUR VALVE ASSEMBLY - 100MM SERIES 1 PVC MAINLINE	IRRIGATION CONTROL SYSTEM		0.1M		0.1M										RING ISIZE TO SUIT)			IZE TO SUIT)		
	REV.																			Ap	pen	dix 30.

	to some the second seco	*NOTE THREAD TAPE AND PASTE AS REQU BACKFILL UNDER BRICKS TO BE CO BOTTOM OF STORM PRO PIPE TO E VALVE. GEOFABRIC TO BE DOUBLE PREVENT INGRESS OF SOIL / SAND
REFERENCE DRAWINGS	Turf & Topson Backfill 4.0	JIRED TO ALL THREADS. DMPACTED. BE CUT TO MATCH PROFILE OF MAINLINE PIP WRAPPED AROUND STORM PRO PIPE AT B. INTO VALVE AREA.
DRAWING SCALES (A1) SURVEY LEVEL DATUM 1:5 0.15 0.1 0.15 0.2 0.25m N.A COORD. DATUM		ASE TO
Brian Walters 23-10-15 DES. BZW IRRIGATION AGRONOMIST DATE DRN. N.B Mark Wilkinson 23-10-15 CHK. CBO	Image: Constraint of the second state of the second sta	IRRIGATION CONTROLITEMDESCRIPTIOAPVC PN12 PIPEBMILNES TAPPING BAND - GUN METAL BRASS WITH 316C32MM COMPRESSION ADAPTERD32MM COMPRESSION ELBOWE32MM PN12.5 POLY PIPEFSOCKET FLANGE TAPER (SIZE TO SUIT)GRSGV FLANGED SLUICE VALVE (SIZE TO SUIT)HPVC PRESSURE FULL FACE FLANGE WITH GALVANISEJ100MM PVC PN12 PIPEJ100MM PVC SOLVENT JOINT WELD PRESSURE ELBOWKTHRUST BLOCK AS PER T.C.C. IRRIGATION SPECIFICAL25MM TESTED BALL VALVEN200x100x50 BRICK SUPPORTS TO PERIMETER OF VALVEQ300MM DIAMETER SN8 STORM PRO PIPEQ300 x 300 CAST IRON VALVE COVER
IRRIGATION CONTROL SYSTEM SCOUR VALVE ASSEMBLY 150 – 200MM SERIES 2 PVC MAINLI		PL SYSTEM ON 6 SS FASTENERS (SIZE TO SUIT) ED STEEL BACKING RING (SIZE TO SUIT) ATIONS ED) .VE BOX x 8



REV.	1 OF 1 APPENDIX 30.7
	IRRIGATION SPECIFICATION SCOUR VALVE ASSEMBLY 150 - 200MM SERIES 1 PVC MAINLINE
	H 316 SS FASTENERS (SIZE TO SUIT)
Appendix 30.7	ROL SYSTEM

	ITEM	DESCRIPTION
Ī	А	PVC SERIES 2 PN16 PIPE
	В	MILNES TAPPING BAND - GUN METAL BRASS WITH 316 SS FA
	С	32MM COMPRESSION ADAPTER
	D	32MM COMPRESSION ELBOW
	Е	32MM PN12.5 POLY PIPE
	F	PVC SERIES 2 PIPE (RRJ) FLANGE SOCKET
	G	RSGV FLANGED SLUICE VALVE (SIZE TO SUIT)
	Н	PVC SOLVENT JOINT WELD PRESSURE ELBOW (SIZE TO SUIT
	Ι	THRUST BLOCK AS PER T.C.C. IRRIGATION SPECIFICATIONS
	J	25MM TESTED BALL VALVE
	Κ	SUPER HEAVY DUTY HYDRANT VALVE BOX (ENGRAVED)
	L	200x100x50 BRICK SUPPORTS TO PERIMETER OF VALVE BOX
	Μ	GEOFABRIC
	Ν	300MM DIAMETER SN8 STORM PRO PIPE
	0	300 x 300 CAST IRON VALVE COVER
	Ρ	PVC SERIES 1 PIPE (SWJ) FULL FACE FLANGE SOCKET WITH
ſ	-	



				REFERENCE DRAWINGS	DRAWING SC	CALES (A1)	SURVEY				DES.	B
							LEVEL DATUM		Brian Walters	23-10-15		
					0 0.05 0.1	1 0.15 0.2 0.25m	N.A	- Ť.	IRRIGATION AGRONOMIST	DATE		
					1:5		COORD. DATUM			5/112		
							N.A	City	MULK WIKINSON	23-10-15		
							INDEX NO.	Townsville	MANAGER	DATE		1
REV.	REVISIONS	AP'D	DATE				N.A		Authorised for Issue		COORD.	W
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T REVISIONS NTE DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION	E E L L L L L L L L L L L L L		2	
JTE: ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED. ALL MATERIALS ARE WELDED TOGETHER EXCLUDING ITEMS 7, 8 & 18 LID AND BASE ARE JOINED TOGETHER BY 2 HINGES ONLY: ALL MATERIALS ARE ALUMINIUM EXCEPT FOR ITEMS 7, 8 & 18	ID MATERIALS LIST ITEM ITEM IS) 11 1100 IS II ITEM ISI II ITEM ISI II III III ISI IIII IIEM ITEM ISI IIIII III III IIII ISI IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	<image/>	یں ج	
5 Sector 2 S	BODY MATERIALS LIST DESCRIPTION QTY UN 40 X 40 X 3 RHS (LEGS) 4 3 40 X 40 X 3 RHS (LEGS) 4 3 40 X 40 X 3 RHS (LEGS) 4 3 40 X 40 X 3 RHS (LEGAMS) 4 3 1200 X 3 RHS (BEAMS) 4 3 1200 X 3 PLTE (LADDING) 4 3 4 3 4 2 11 4 3 4 3 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 1 1 <th c<="" th=""><th></th><th>σ</th></th>	<th></th> <th>σ</th>		σ
Image: Project: IRRIGATION B: WALTERS TITLE: TON: VALVE NEST ENCLOSURE 7 8	TT		8	





