

Town of Gawler Irrigation Design Standards



Revision: A
Date Released: October 2021
Copyright of: Town of Gawler

CONTENTS

1	DOCUMENT PURPOSE.....	4
2	GENERAL.....	4
2.1	Responsibilities.....	4
2.1.1	General:	4
2.1.2	Administrative:.....	4
2.2	Cross References	5
3	designers.....	5
3.1	Certified Irrigation Designers (IAL)	5
3.2	Design/Drawing Requirements	5
3.3	Landscape Architects.....	6
4	Design criteria	7
4.1	Geotechnical Data.....	8
4.1.1	Ground Encountered.....	8
4.2	Abbreviations and Irrigation Jargon	8
5	irrigation system design technical requirements.....	9
5.1	Water Source.....	9
5.2	New SA Water Meters.....	9
5.3	Backflow Prevention.....	9
6	EQUIPMENT, BRAND NAMES AND APPROVALS	10
6.1	Use of trade names	10
6.2	Anomalies.....	10
6.3	Certification for use.....	10
6.4	Recycled Water – Product Identification.....	10
6.5	Pipes and Fittings.....	10
6.5.2	Polyvinylchloride (PVC) pipes and fittings.....	10

6.5.2	Polyethylene pipes and fittings (HDPE).....	10
6.5.3	Depth of cover from finished grade to top of pipes:	11
6.5.4	Other pipes and fittings	11
6.6	Isolating valves.....	11
6.7	Solenoid Valves	12
6.8	Valve Boxes.....	12
6.8.1	Installation of solenoid valves	12
6.9	Excavation of Trenches.....	13
6.9.1	Alignment of Trenches	13
6.9.2	Trench Topping and Maintenance	13
6.10	Trees	13
6.11	Flow Sensors	14
6.12	Sprinklers	14
6.12.1	Turf Sprinklers	14
6.12.2	Installation of sprinklers.....	14
6.13	Drip Irrigation Systems	15
6.13.1	Garden bed drip systems.....	15
6.13.2	Turf Sub-surface drip systems.....	15
6.14	Control System	16
6.14.1	Controllers.....	16
7.5.2	Rain Sensor/Switch.....	16
6.15	Electrical	17
6.15.1	General.....	17
6.15.2	Lighting Protection / Grounding.....	17
6.16	Solenoid wiring	17
6.16.1	Spare Cables	18

6.17 Decoder Systems	18
6.17.1 Grounding and lightning protection (Decoder Systems).....	18
7 PRACTICAL COMPLETION.....	18
7.1 Preparation for Practical Completion inspection	18
7.2 Mainline pressure test.....	19
7.3 As constructed drawings.....	19
7.4 Manuals and documentation	20
8 FINAL INSPECTION	20

1 DOCUMENT PURPOSE

Irrigation infrastructure represents considerable capital value and requires a substantial and ongoing operating and maintenance commitment from the Town of Gawler. It is therefore vital that all prospective project developers understand and comply with irrigation design, installation and product requirements set out in this document. Items noted in this document apply to all landscaped areas of all projects within the Town of Gawler.

This irrigation design standards document supersedes all previous versions of irrigation system design requirements issued by the Town of Gawler.

The irrigation design standards document is to be used during early planning, costing and design stages by all project developers, landscape architects and certified irrigation designers for all projects within the Town of Gawler which are to be vested to Council.

Developers, landscape architects, certified irrigation systems designers and irrigation installation contractors should be familiar with and comply with the contents of this document.

This document should be read in conjunction with the Town of Gawler's Open Space Guidelines, Verge Fact Sheet and other policies.

All design and construction cost are to be borne by the developer.

2 GENERAL

2.1 Responsibilities

2.1.1 General:

Provide automatically controlled fixed irrigation systems as follows.

- Design to conform to available design pressure and flow rate.
- Meet statutory requirements for backflow prevention.
- Provide irrigation designs that are in accordance with relevant standards and SA Water, OTR & IPOS requirements.

2.1.2 Administrative:

Provide the following services prior to Council accepting handover of irrigation assets.

- Fulfil SA Water requirement for Irrigation Monitoring and Performance Reporting as per the Code of Practice – Irrigated Public Open Space, for the duration of the agreed maintenance period.
- Developers/Contractors are to setup SA Water meters in "Town of Gawler" name however they must advise the Town of Gawler 14 days prior.
- The Developer/Contractor will be responsible for water usage during the 12-month maintenance period between Practical Completion and Final Completion. Council will invoice the Developer/Contractor for these costs.

- The Developer/Contractor will be responsible for irrigation controller electricity usage during the 12-month maintenance period between Practical Completion and Final Completion. Electricity meters should be registered in the developers name with an electricity retailer during any defects liability period and transferred to Council at final completion.

Design, supply, install, commission and maintain the irrigation system until the "Certificate of Final Completion" is issued by the Town of Gawler. The construction of the system will include all materials, relevant services, machinery, labour and the freight of materials and machinery to cover the scope of the project detailed within this document and associated detail drawings.

2.2 Cross References

Conform to "The Code of Practice for Irrigated Public Open Space (IPOS)".
Conform to SA Water approvals and restrictions when applicable.
Urban Irrigation Best Practice Guidelines (2006)

Conform to "Guidelines for non-drinking water in South Australia" (OTR).

3 DESIGNERS

3.1 Certified Irrigation Designers (IAL)

All irrigation systems must be designed by an Irrigation Australia Limited "Certified Irrigation Designer Landscape/Turf".

The Certified Irrigation Designer's official Irrigation Australia Limited (IAL) stamp must be applied to each drawing sheet for identification.

The designer must be independent of any irrigation product manufacturer, supplier or installation contracting business.

Irrigation designers must provide proof of current professional indemnity insurance.

All irrigation systems must be designed using AutoCAD 2020 (or later).

Designs must be printable on A1 sheets.

3.2 Design/Drawing Requirements

Intricate landscaped projects with planted beds and streetscapes Scale 1:100, 1:200 or 1:250.

Turf areas larger than 0.8ha Scale 1:250 or 1:500.

Multi-sheet drawings must include sheet numbers and clearly labelled sheet join lines.
All drawings must include:

- Title block with project title, drawing number and revisions table, fields for designer, reviewer and approval initials, design and revision dates
- Scale bar with original sheet size
- Legend of symbols and line types
- Installation detail drawings and notes
- Calculated, theoretical Distribution of Uniformity (for turf sprinkler systems larger than 0.5ha)

- Valve table that includes (as a minimum) station number, station flow (L/m), valve diameter, nominated operating pressure, precipitation rate (mm/hr), runtime to achieve 10mm of precipitation (minutes), area (m² for drip stations), type of irrigation for each valve.
- Installation details for all principal devices and assemblies.
- Irrigation industry accepted symbols, line types and terminology.

All drawings must be georeferenced to the MGA2020 coordinate system with a "North" pointer on the drawing. Drawings should be oriented with North to the top of the page, whenever practical.

Irrigation designers must provide prior to design approval (to Council):

- Densogram printout of the Distribution Uniformity calculation that includes sprinkler model, nozzle, base pressure and spacing. Theoretical DU's must be $\geq 85\%$ (for turf sprinklers).
- Draft designs in PDF format for client review.
- Tender ready drawings and technical specifications in PDF format.
- Construction issue drawings in PDF format.

Prior to Practical Completion Inspection:

- Geo-referenced, surveyed as-constructed drawings in PDF and bound (eTransmit) AutoCAD format.
- Complete as-constructed documentation including product spec sheets, manuals, spare parts, accessories, Backflow Prevention Device registration confirmations, name and contact details of installation contractor, date of practical completion.

3.3 Landscape Architects

Landscape architects should, wherever practical, design turf areas and shapes that will suit the Town of Gawler nominated preferred pop-up sprinkler (Rain Bird 6504). This product has proven, over time to be very vandal resistant and requires little maintenance. The minimum radius of the 6504 series sprinkler is approximately 12m.

Rain Bird 6504 series sprinklers shall be designed for ALL turf areas $\geq 12\text{m}$ wide (wherever they can be made to fit).

Rain Bird model 5004-+-PC-SAM-R sprinklers shall be designed for areas between 5m and 12m wide.

No fan spray type sprinklers shall be designed into new irrigation systems unless specifically approved by Council.

Product selections for various turf areas shall be agreed with Council prior to commencing designs.

4 DESIGN CRITERIA

General

Irrigation systems must be designed to ensure the efficient, uniform application of water to the site.

Designs should be aimed at conserving and protecting water resources. Designs should take into consideration agronomic, climatic and water supply issues to ensure that the system can operate effectively. Guidelines for the design of urban irrigation systems have been developed by Irrigation Australia Limited and can be accessed in the IAL publication, Urban Irrigation Best Practice Guidelines (2006).

Council may require water efficiency to be considered as part of project upgrades, which may include flow meters, moisture sensors probe, etc. This will be evaluated as part of the design review stage.

Council welcomes and encourages developers to discuss these requirements with the Landscape Coordinator and Irrigation Technician, to ensure the requirements are understood by all parties early in the planning stage.

Issues considered in the design should include:

- Water source(s) i.e., Drinking water, recycled, etc.
- Impact on existing Council recycled water network infrastructure.
- Existing services.
- Possible future development (clubroom extensions etc.)
- Soil type and structure.
- Infiltration rate.
- Plant species.
- Existing trees.
- Root zone depth.
- Average and forecasted climatic data (ETo/rainfall).
- Water quality, pressure and flow rate parameters.
- IPOS Code of Practice approved Turf Quality Visual Standard ratings.
- Scheduling restrictions.
- Use of technology to enhance water management such as, weather stations, moisture sensors, rain sensors.
- Connection to Council's existing central irrigation control system (Rain Bird IQ4)

New systems should be designed to meet following standards:

- A system application rate of between 15 – 17mm per hour.
- Lower Quarter Theoretical Distribution Uniformity (DU) measure of >85%.
- DU is the unit of measure used to determine the performance of turf irrigation systems. DU is defined as “the average water applied in the 25% of the area receiving the least amount of water, regardless of location within the pattern, divided by the average water applied over the total area.”
(Refer IAL – Certified Irrigation Audit Manual, 2004.)

Design documentation shall include:

- Irrigation plans.
- Design parameters (flow, pressure, DU, precipitation rate).
- Installation specification including component specification to meet appropriate Australian standards.
- Quality control inspection procedures.
- Water budget.
- Irrigation schedule.
- Schedule of Rates for tender purposes
- Project handover process
- Note conduit(s) locations. This is to be coordinated with the developer's civil and landscape consultants.

4.1 Geotechnical Data

4.1.1 Ground Encountered

The irrigation contractor will be deemed to have satisfied themselves, including by site inspection, as to the different kinds of ground likely to be met during the progress of the work, including the extent and nature of wet or bad ground and the nature of any rock, roads, pathways or paving to be encountered.

4.2 Abbreviations and Irrigation Jargon

Where abbreviations and jargon are used in this specification, interpretations shall be in accordance with normal usage in the irrigation industry, or as ruled by the Superintendent.

Table 1: Abbreviations and Irrigation Jargon

PVC	Unplasticised Poly Vinyl Chloride
HDPE poly	High Density Polyethylene, AS4130/AS2033
QCV	Quick Coupling Valve
solenoid	solenoid valve (automatic control valves)
control valves	Valves that connect mains to laterals or submains, on/off and pressure control.
common	common wire to valves, normally earthed
active	switching wire to each valve, normally 24V AC.
shift	group of valves that are operated together
station	output terminal of the automatic controller, valve or valve group
L/s, L/min, L/h	Litres per Second, -per Minute, -per Hour (flow rate)
m ³ /h, kL/h	Cubic Metres per Hour (flow rate), Kilolitres per Hour
kL, ML	Kilolitre (1,000 Litres), Mega litre (1,000,000 Litres)
MPR	Matched Precipitation Rate
CU	Christensen's Coefficient of Uniformity
DU	Coefficient of Distribution Uniformity
mainline	pipes that are constantly pressurised during irrigation pipes that feed water to control valves
lateral	intermittently pressurised pipe work with outlets attached, downstream from control valves
submain	manifold of controlled pressure to feed laterals
PRV,PSV	Pressure Reducing Valve, Pressure Sustaining Valve

pitot	pressure gauge attachment to measure velocity head at sprinkler nozzles
BPD	Backflow prevention device
OTR	Office of the Technical Regulator
Recycled Water	Any non-drinking reclaimed, recycled or reused water. This may include recycled stormwater, recycled effluent, native groundwater or any combination of these waters. It may also include any combination of recycled water with drinking water or rainwater. It is generally used for purposes such as irrigation and industrial process water. While it is safe to use, it is NOT suitable for drinking.

5 IRRIGATION SYSTEM DESIGN TECHNICAL REQUIREMENTS

5.1 Water Source

Indicate the proposed water source for the irrigation project, indicating the location of existing equipment and the connection diameter.

5.2 New SA Water Meters

Where possible, Contractors should utilise existing TOG SA Water meters. This will require a slave meter for billing during the defects/maintenance period.

Any new water meters must include a digital output module, to be supplied and fitted to the meter. All water meters must be located on Council land, not private land.

5.3 Backflow Prevention

Where mains water is used in the irrigation system, an approved backflow prevention device must be connected downstream of the water meter as per to the drawings. New installations must be installed by a licensed backflow installer and must comply with AS3500, SA Water and OTR requirements. All existing back-flow prevention devices removed from sites must be de-registered with the OTR and returned to the Town of Gawler.

All new back-flow prevention device installations must be tested and registered with the OTR, with documentation provided in the as-constructed documentation package.

Where recycled water is used for irrigation and drinking water is present on the site, a cross-connection audit must be carried out by a licensed backflow installer and must comply with AS3500, SA Water and OTR requirements. A cross-connection audit certificate must be included in the "as-constructed" documentation.

All As-Constructed documentation must be provided at the Practical Completion inspection.

Any backflow prevention device assemblies installed above ground (RPZ's) must be enclosed within a pad-lockable galvanised steel framed, vandal resistant cage, dyna-bolted to a 100mm thick reinforced concrete slab.

6 EQUIPMENT, BRAND NAMES AND APPROVALS

6.1 Use of trade names

Where trade and brand names, catalogue or reference numbers are referred to, they shall indicate the product required. Alternatives may not be used without the written approval of Council.

6.2 Anomalies

The Contractor shall carefully study and compare all drawings, specifications and other instructions, and check all plans by the Landscape Architects and consultants, for dimensions, quantities and coordination with all other parts of the work under the contract. The Contractor is to immediately notify the Superintendent and Council of all errors and omissions that they may discover.

6.3 Certification for use

All equipment incorporated into a design and installed must be approved for connection by relevant utilities, verify that certification/approval is current for the brand, model, style and class of equipment proposed for use. Evidence of approval shall be provided to the Council on request.

6.4 Recycled Water – Product Identification

Where it is intended for a project to use non-drinking water, products including sprinklers, valves, valve box lids, pipes, tubes, handles etc. shall include lilac colouring in accordance with local water supply and health authority requirements.

6.5 Pipes and Fittings

6.5.2 Polyvinylchloride (PVC) pipes and fittings

- PVC pipes and fittings may only be used for lateral pipes, down-stream of zone solenoid valve assemblies.
- PVC pipe is not to be used for main line pipes up-stream of zone valve assemblies.
- All PVC pipes and fittings shall conform to AS1477 and shall be installed according to AS2032. Solvent weld joints shall be made using cement to AS3879.
- All fittings shall be PVC to class 18 and solvent weld jointed.
- Lateral pipes (down-stream of a zone control valve) must be a minimum class-9 SWJ, regardless of nominal diameter.
- All mainline trenches to have MARKER DETECTION TAPE installed 250mm below surface level.
- All irrigation pipes must be lilac coloured, regardless of the water source.

6.5.2 Polyethylene pipes and fittings (HDPE)

- All high-density polyethylene pressure pipes shall conform to AS/NZS 4130 Polyethylene (PE) pipes for pressure applications and be installed to AS2033.

- All high-density polyethylene pipes shall be minimum PE100 PN12.5 and use electro-fusion, or butt-welded joints in accordance with manufacturer's specifications.
- All irrigation pipes must be lilac coloured, regardless of the water source.

6.5.3 Depth of cover from finished grade to top of pipes:

- 450mm depth for mainline pipework
- 350mm depth for lateral pipework
- 50mm depth for all garden drip tubes and LDPE

6.5.4 Other pipes and fittings

Table 3: Other pipes and fittings, must conform to current standards and,

- AS/NZS 2280 Ductile Iron pressure pipes and fittings
- AS 2129 Flanges for Pipes, Valves and Fittings
- AS 1572 Copper and Copper Alloys - Seamless Tubes for Engineering Purposes
- AS 1432 Copper Tube for Plumbing, Gas Fitting and Drainage Applications
- AS 1074 Steel tubes and tubulars for ordinary service
- AS 1628 Water supply - Copper alloy gate, globe and non-return valves
- AS 1830 Iron Castings - Grey Cast Iron
- AS/NZS 2566 Buried flexible pipelines – Installation
- AS/NZS 4765 Modified PVC (PVC-M) pipes for pressure applications
- AS 2698 Plastics pipes and fittings for irrigation and rural applications – Polyethylene micro-irrigation pipe
- AS 2698 Plastics pipes and fittings for irrigation and rural applications – Polyethylene rural pipe
- AS 2698 Plastics pipes and fittings for irrigation and rural applications – Mechanical joint fittings for use with polyethylene micro-irrigation pipes
- AS/NZS 4129 Fittings for polyethylene (PE) pipes for pressure applications
- AS/NZS 4130 Polyethylene (PE) pipes for pressure applications
- AS/NZS 4131 Polyethylene (PE) compounds for pressure pipes and fittings
- AS 4181 Stainless steel clamps for waterworks purposes

6.6 Isolating valves

Valves with Nominal Diameter greater than 50 mm:

- Valves shall be to AS2638.2 (and approved by local authorities)
- Resilient seat lugged sluice gate valve equal to or better than AVK model 57/40
- For valves 80mm and above, use flanged connections with 316 stainless steel backing rings, nuts and bolts
- Install the valve assembly within Rainbird 250mm round valve box, with approved hex bolt lock, supported away from the pipes with brick supports on a gravel base.
- Install an inner 200mm diameter PVC sleeve to allow access to the valve hand-wheel device.
- Provide one (1) "T-Bar" device per project, to the Town of Gawler at the PC inspection to operate sluice valves.

Valves with Nominal Diameter 50mm or less:

- Valves shall be De-Zincification Resistant approved ball valve including stainless steel handle and fittings, sized to suit the pipe diameter.
- Install the valve assembly within a Rainbird -JMB valve box, supported away from the pipes as indicated on the detail drawing.
- For systems connected to recycled water, valve boxes shall include a lilac lid.

6.7 Solenoid Valves

All solenoid valves shall be Rain Bird model “PEB” with valve diameters to suit designed flow rates.

Master solenoid valves shall be installed at the point of connection for each system and shall be the same diameter as the largest zone valve in that system.

Rain Bird “PRS-Dial” pressure regulating modules must be including on master valves where static supply pressure is $\geq 700\text{kPa}$.

All valves shall be approved by SA Water Corporation. A minimum of 450mm of straight pipe shall be installed on the discharge side of every valve assembly to facilitate removal of the valve body.

The valve assembly shall be installed centrally within the box to allow easy access for manual operation and maintenance.

Flow controls on each solenoid valve must be tuned so that valve closure occurs within 10 seconds of control signal, without affecting sprinkler performance.

6.8 Valve Boxes

All valve boxes shall be heavy duty HR Products commercial series with a stainless-steel bolt locking kit, installed on a pre-cast concrete base and a single row of bricks, supported away from the pipes. The valve(s) shall be installed in the valve box to allow easy access for servicing and manual operation.
All locking nuts and bolts must be stainless steel.

All valve boxes unless otherwise specified, shall be mounted using bricks on a pre-cast concrete base, with a high- density plastic skirt (200um) around the valve chamber to minimise soil intrusion. All valve boxes shall be backfilled using bedding sand. Valve boxes set below grade shall include a 100mm x 100mm piece of galvanised steel plate permanently attached to the under-side of the lid to allow use of a metal detector.

All valve boxes for systems connected to recycled water must include Lilac lids.

6.8.1 Installation of solenoid valves

- Install the valve assembly within a HR Products commercial valve box (refer to detail drawings for specific valve box models), supported away from the pipes, as indicated on the detail drawings. The valve shall be installed in the box to allow easy access for servicing and manual operation. Allow a minimum 25mm

clearance between the bottom of solenoid assembly and top of concrete slab unless shown differently on the valve detail drawings

- Install upstream of the solenoid valve a dezincification resistant approved ball valve including stainless steel handle, sized to match solenoid valve diameter.
- Install the assembly according to the detail drawings.
- Cables shall include 3M DBY/R-6 connectors and a service loop that allow cables to be extended 1.5m outside the valve box. The valve box and pipework must not rest on cables
- Each solenoid must include a 50mm diameter coloured, aluminium tag, professionally engraved with the valve number and permanently tethered to the valve flow control handle.
- All non-drinking supplies will include recycled water identification tags.

6.9 Excavation of Trenches

- The contractor shall excavate and maintain all trenches to enable pipes to be laid to the correct level and grade shown in the drawings forming part of the specification.
- All main pipe trenches must allow for a minimum of 450mm depth of cover over all pipes unless indication otherwise on the drawings. Where depth of cover cannot be achieved due to local conditions, the Contractor must notify the Superintendent who will advise the Contractor on how to proceed.
- Trenches shall be a minimum of 150mm width.

6.9.1 Alignment of Trenches

- Trenches shall be aligned with surface visible items such as kerbs, paths and landscaping.
- The Contractor shall peg all mainline and lateral paths using a stringline for straight line trenching. The trench shall not vary by more than one trench width from the string line.

6.9.2 Trench Topping and Maintenance

- Subsidence of trenches after completion of the works shall be the responsibility of the Contractor. The Contractor shall ensure trenches are kept 'topped up' and compacted with suitable, Council approved sandy loam topdressing material, for the duration of the defects liability period.
- The Contractor shall visit the site regularly and provide the Council Supervisor a monthly site inspection report detailing the Contractors examination of all trenches and undertaking of ongoing top-dressing during the defects liability period.
- Random site inspections of trenches will be undertaken to ensure topdressing maintenance is completed to the satisfaction of the Council Supervisor.

6.10 Trees

- No excavation shall be carried out beneath the canopy of a tree without written clearance from Council or their nominated qualified representative. The Contractor shall allow for hand digging near mature trees as nominated by Council.
- Where roots >50mm in diameter are encountered and pruning is needed, City Operations or the project arborist shall be contacted for approval and permit

issuance prior to ANY root pruning activity. If approved, roots shall be properly pruned using approved arboricultural techniques. An alternative construction process may be required if reasonably practicable.

- It is a requirement that all attempts to reduce any detrimental damage to the trees by utilizing sound tree management practices in accordance with AS4373-2007 Pruning of Amenity Trees.
- Prolonged droughts have had severe impacts on many mature trees across the Town of Gawler, typically resulting in the loss of a considerable proportion of the fine root hairs, which are responsible for moisture and nutrient uptake. Resulting stresses are evident through canopy thinning within some existing trees throughout the Town of Gawler. Noting this, any further impacts by trenching through tree roots will increase further decline.
- The Town of Gawler's nominated representative shall be notified prior to any trenching or excavation known or suspected to involve cutting of roots over 50mm in diameter. The roots must be clean cut with no tearing behind the cut.
- Council's representative will visit the site and inspect tree roots and determine the best approach for the tree root(s) which may require a combination of:
 - Hydrovac excavation around roots
 - Hand digging where appropriate
 - Tree roots being cut back

6.11 Flow Sensors

A CST model "FSI-XXX" is required to be installed down-stream of the master valve at all points of connection to a water source (refer to CST literature for actual product codes for required diameters). Refer to detail drawing. Include all necessary connecting control cables, and connectors. Connect sensors to controller sensor input terminals using PE39 shielded communications cable (24vac systems only).

6.12 Sprinklers

6.12.1 Turf Sprinklers

Rain Bird 6504 series sprinklers shall be designed for ALL turf areas $\geq 12\text{m}$ wide (wherever they can be made to fit).

Rain Bird model 5004-+-PC-SAM-R sprinklers shall be designed for areas between 5m and 12m wide.

No fan spray type sprinklers shall be designed into new irrigation systems unless specifically approved by Council.

Product selections for various turf areas shall be agreed with Council prior to commencing designs.

6.12.2 Installation of sprinklers

Pop-up sprinklers shall be installed to finished grade and perpendicular to the surface.

Where a part circle sprinkler is positioned adjacent to a hard edge (concrete path, paving etc.), the body of the sprinkler shall be no less than 50mm and no greater than 100mm from the hard edge (unless instructed otherwise by the Superintendent).

Sprinklers shall be installed on polyethylene 300mm articulated risers using three threaded elbows. Install/adjust correct arc to each sprinkler to match site conditions.

Nominal diameter of adjustable risers is to be the same as nominal diameter of sprinkler inlet.

Install sprinklers as per the installation detail drawing.

6.13 Drip Irrigation Systems

6.13.1 Garden bed drip systems

Polyethylene micro-irrigation pipe: - Standard: To AS 2698.1 Class IRRIG.

All garden beds are to be irrigated using Netafim Techline AS XR dripper tube.

Dripper tube shall be installed a minimum of 50mm below finished soil grade (sub-surface).

All LD poly pipe and dripper tube fittings shall be secured using stainless steel "Cobra clamps" installed using a compatible crimping tool.

All connections between LDPE header /flushing tubes and drip-tube must be made using tees or elbows secured with "Cobra" clamps. No push-in type off-take fittings are allowed.

Header and flushing pipes shall be designed for each zone.

A 15mm air release / flush valve assembly shall be as installed at the farthest point from the solenoid valve of each zone; in a Rain Bird 250mm round valve box (refer to detail drawing).

6.13.2 Turf Sub-surface drip systems

Polyethylene micro-irrigation pipe:
- Standard: To AS 2698.1 Class IRRIG.

Only where turf areas are too small to accommodate pop-up sprinklers and with prior written approval of Council.

All nominated turf areas are to be irrigated using Netafim Techline AS XR dripper tube.

Dripper tube shall be installed 150mm below finished turf level (sub-surface).

All connections between LDPE header /flushing tubes and drip-tube must be made using tees or elbows secured with "Cobra" clamps. No push-in type off-take fittings are allowed.

All LD poly pipe and dripper tube fittings shall be secured using stainless steel "Cobra clamps" installed using a compatible crimping tool.

Header and flushing pipes shall be designed for each zone.

Flush valves shall be installed at the lowest end of the flushing sub-main in a Rain Bird 250mm round valve box (refer to detail).

A 15mm air release / flush valve assembly shall be as installed at the farthest point from the solenoid valve of each zone; in a Rain Bird 250mm round valve box .

6.14 Control System

All new irrigation systems shall be fully automatic and connected to an approved 240vac electrical source.

6.14.1 Controllers

Early discussions with Council staff will help determine the most appropriate irrigation control system to be used.

All new irrigation controllers must be Rain Bird “ESP-LXMEF” models for conventional (24vac) systems or “ESP-LXIVM” for decoder systems, depending on site conditions and expansion potential.

Each controller must include an internal Rain Bird 4G communications module and connecting cables. Controllers shall be installed within a Lai Industries wall/pole mount ICB3VP control enclosure (including a long leg kit and concrete footings if pole mounted). Where applicable the SAPN meter and 240vac supply must be installed in a secondary Lai Industries 'MSB' switchboard enclosure the same dimensions and bolt the enclosures back-to-back and seal the join with a commercial sealant. Face the irrigation enclosure to the south if practical.

The 240vac power feed shall be through a separate 50mm diameter galvanised steel conduit, into the base of the Lai Industries 'MSB' enclosure. The cabinet, supporting legs and conduits shall be powder coated in Pale Eucalypt colour. Refer to detail drawing.

All gaps and conduit openings within the enclosure shall be fully sealed using a commercial grade sealant, to guard against vermin, ants, dust, etc.

Field cables shall include a 1.5m service loop behind the enclosures internal mounting board to allow full opening of the mounting board. Drill a 25mm diameter hole through the back of the controller and backing board using a hole saw and insert a rubber grommet. Feed the field cables through the grommet and connect directly to the controller terminals. All cables shall be clearly and permanently marked with its station number or sensor, using "Critchley Z-Type Cable Markers". Cable markers shall be placed on the cable insulation, as close as practical to the controller terminal (25mm).

Controllers must be grounded to manufacturer requirements. The enclosure shall include a double GPO.

7.5.2 Rain Sensor/Switch

At each controller location provide a Hunter "Rain-Clik" sensor including a Hunter stainless steel sensor guard (model: SG-MC) mounted on the controller enclosure or wireless version to a location approved by the Town of Gawler.

6.15 Electrical

6.15.1 General

All electrical installations shall be in accordance with AS3000.

A certificate of compliance must be supplied by the electrician and included in the as-constructed documentation package.

All installations shall be in accordance with requirements of the local electrical authority.

All new installations of low or medium voltage (240V/415V) shall be installed by an electrician who is experienced and licensed for such work.

Each Lai Industries MSB enclosure shall, as a minimum, include a safety switch and a dedicated circuit breaker for the irrigation double GPO.

6.15.2 Lighting Protection / Grounding

All electrical grounding shall comply with SAPN requirements. Very low voltage systems (less than 32V) shall include grounding methods and devices to achieve less than 8 ohms resistance to the ground. The controller circuit board must be separately grounded, to Rain Bird requirements.

6.16 Solenoid wiring

All wire joints shall be made using 3M-DBR/Y-6 connectors. No alternate cable connectors are acceptable. Allow a minimum of 1.5 metre of loose wire above the valve box lid at each solenoid valve coil or sensor device to allow removal of the coil for maintenance without cutting cables.

- Minimum wire size for low voltage cables shall be 1.5mm², except when using Rain Bird “Max-Cable” for “IVM” systems.
- All cable shall be polyethylene insulated and multi-stranded suitable for direct burial.
- Common cable (black) shall be 2.5mm² multi-strand, single-core.
- Station cables shall be minimum 1.5mm² multi-strand, multi-core cable with colour coding which must not change between the controller and the solenoid valve. Provide expansion loops at intersections, bends and pipe crossovers.
- **Cable runs shall be continuous between the controller and its destination valve.**
- **Intermediate cable joins are unacceptable.**

All common cables shall be black. All station cables shall be colour coded in any colours excluding the common colour.

Shielded “PE39” Data Cable must be used between the flow sensor and Rain Bird controller terminals.

6.16.1 Spare Cables

All spare cables shall be installed in continuous lengths from the controller to the location noted on the drawings and shall be terminated using resin-lined heat-shrink capsules.

All spare cables shall include permanent labels at both ends indicating the field termination location (e.g., "Spare Cables to Valve Box 12").

6.17 Decoder Systems

6.17.1 Grounding and lightning protection (Decoder Systems)

Rain Bird "ESP-LXIVM" field cable shall be grounded strictly according to Rain Bird technical installation instructions. Grounding locations must be indicated on the drawings.

As a minimum, grounding assemblies shall include a Rain Bird grounding device connected to the Maxi-Cable using 3M DBR/Y-6 connectors. Connect the earth cable of the grounding device to a copper grounding plate using 3M DBR/Y-6 connectors. Install the grounding plate in a separate, minimum 300mm deep trench to the decoder cable (either parallel or at 90° to the decoder cable), fully extending the supplied cable.

Resistance must be less than 10 Ohms to ground. Additional grounding methods may be required to achieve 10 Ohms resistance. Grounding methods must be checked for compliance by the contractor prior to the Practical Completion inspection. The contractor will be required to replace any non-compliant grounding systems.

The grounding method shall be tested and validated in writing by a licensed electrician at the first grounding site installed to verify that the resistance to ground is acceptable for the soil type on the site.

7 PRACTICAL COMPLETION

Practical completion includes commissioning, testing and site clean-up. Following a successful inspection and compliance with the drawings and specification, a Certificate of Practical Completion shall be issued by Council.

7.1 Preparation for Practical Completion inspection

Prior to calling for the inspection, the Contractor shall:

- complete several automatic cycles without fault, including flow sensors
- test all components to ensure proper function
- Set-up the controller data-base to Council requirements
- submit the documentation required by contractual specifications
- completely clean-up the site to the satisfaction of Council
- reinstate all surfaces affected during construction
- remove machinery and all surplus equipment/materials
- be satisfied that the system is ready for final inspection
- arrange for a pre-inspection walk through with Town of Gawler field personnel prior to booking a PC inspection

If the system fails Practical Completion inspection more than once, the Council may deduct inspection costs from the final payment.

The contractor is to provide Council two (2) weeks minimum notice prior to the Practical Completion inspection.

The Practical Completion inspection by the Contractor and a nominated Council representative shall include checks for compliance with the specification and in particular:

- nozzle size and arc setting
- sprinkler positioning
- vertical alignment
- height relative to finished grade
- pop-up and retract function
- drip tube configuration and installation
- valve pressure/flow control settings
- valve diameters
- cable installation and labels
- valve box type and installation method
- controller and sensor installation
- "K" factor has been set correctly
- Backflow Prevention Device installations and registration with OTR
- Trenches must be compacted, and filled to match the surrounding finished soil levels
- Certificates of compliance for any electrical and plumbing works
- The contractor must provide Council with a schedule indicating dates when site inspections will occur to review trench finished levels and carry out remedial works. This must extend for the duration of the defects liability period.

7.2 Mainline pressure test

The Contractor shall conduct a pressure test on all installed mainline pipework.

When instructed, the Contractor shall run a successful pressure test in the presence of the Superintendent. The pressure test shall be deemed successful if after applying a pressure of 1,000 kPa to all mainline pipework, the pressure has not dropped over fifteen minutes. Pressure tests must not be performed earlier than 48 hours after pouring thrust blocks. Pressure testing may be done for separate sections of pipework. The contractor will be required to rectify any faults at his expense. The contractor shall perform a pre-test, prior to booking the witnessed test, to satisfy himself that the witnessed test will pass.

The contractor shall provide all testing equipment, pumps and gauges.

7.3 As constructed drawings

The Contractor will be required to supply accurate "as-constructed" drawings of the completed system to Council at least two weeks prior to the "Practical Completion" inspection. The "as-constructed" information for the drawing shall be obtained using "Total Station" or GPS survey (to +/- 10 cm accuracy) and shall be professionally labelled and include all installed equipment locations. The "as-constructed" drawings must be presented to Council at the same drawing standard as applied for the

construction drawings. As Constructed drawings shall be provided in PDF and AutoCAD (Release 2020 or later) format.

Sprinklers, valves, pipes and cables, etc., shall be represented on separate layers.

As-Constructed drawing shall be compatible with the Town of Gawler GIS system.

7.4 Manuals and documentation

The Contractor shall produce one (1) soft copy (USB device using PDF files) of the operating, service manuals and spare parts lists of the primary equipment two weeks prior to the Practical Completion inspection. It shall include details of all certificates of compliance, registrations, water meter numbers and diameters, cross-connection audit certificate, approvals and guarantees relating to materials or services included in the works. The Contractor is required to submit all electrical wiring diagrams and operation manuals. One (1) set of controller instructions including any wiring diagrams shall be placed in a suitable holder in the control cubicle, with a copy included in the soft copy document set.

PDF files must be clearly named and placed in a logical order within a dedicated folder on the soft copy memory device.

8 FINAL INSPECTION

A final inspection shall be carried out at the end of the nominated Defects Liability Period and shall include the Contractor and a nominated Council representative.

The contractor is to provide Council two (2) weeks minimum notice prior to the Practical Completion inspection.

Final inspection shall include checks for compliance with the specification and in particular:

- general system operation
- controller scheduling
- nozzle size and arc setting
- vertical alignment
- height relative to finished grade
- pop-up and retract function
- drip tube installation
- valve pressure settings
- valve box installation method
- control cabinet cleanliness
- Trenches must be compacted, and filled to match the surrounding finished soil levels

Following a successful inspection and compliance with the specification, a Certificate of Final Completion shall be issued by Council.

If the system fails final inspection test more than once, the Council may deduct inspection costs from the final payment.