QUEENSLAND

CONSTRUCTION SPECIFICATION

C273

LANDSCAPING

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Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirements clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
1	Multiple changes made throughout	ALL	A/M/O		
2	Insert Maintenance Procedures references	C273.12	A	GH	May 2007
3	Additional topsoil requirements C273.04 a) 2 to 6	C273.04	A	GH	July 2007
4	Additional turf requirements C273.04 a) 2 & 3	C273.04	A	GH	July 2007
5	Insert C273.13 Irrigation	C273.13	A	GH	July 2007
6	Pay Item C273(e) added	C273.18	A	GH	July 2007
7	Modified Topsoil Specification	C273.04 (g)	M	GH	August 2007
8	Modified Herbicide clause to Include Selective Herbicide Use	C273.04 (b)	M	GH	August 2007
9	Seed Application and Grass Coverage Clause Modified	C273.04 (c)	M	GH	August 2007

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10	Turf Topsoil Depth Increased	C273.04 (d)	M	GH	August 2007
11	Provision for Permanent Irrigation Included	C273.05 (g)	M	GH	August 2007
12	Include Soil Additive Provision	C273.09 (c)	M	GH	August 2007
13	Modified Plant Material Requirement	C273.09 (e)	M	GH	August 2007
14	Include Street Tree Provision	C273.09 (f)	A	GH	August 2007
15	Modified Bed Preparation Requirement	C273.10	M	GH	August 2007
16	Modified Provision for time of establishment and ongoing maintenance	C273.11	M	GH	August 2007
17	Include recycled plastic edge and fertilising details, grass cover and irrigation requirements	C273.12	M	GH	August 2007
18	Minor modifications	C273.13	M	GH	August 2007

AUS-SPEC #1

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SPECIFICATION C273 : LANDSCAPING

GENERAL

C273.01 SCOPE

1. The work to be executed under this Specification consists of:

   (a) The vegetation of cut and fill batters, median areas, pathway verges, open drains and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising, sowing of seed and may include surface protection works, hydroseeding, hydromulching and straw mulching.

   (b) The supply of plants, planting at locations as shown on the Drawings, fertilising, mulching, staking, watering and maintenance of plants.

2. Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are cited in the Specification Part for Quality Requirements. ***Quality***

C273.02 REFERENCE DOCUMENTS

1. Documents referenced in this Specification are listed in full below whilst being cited in the text in the abbreviated form or code indicated. ***Documents Standards Test Methods***

(a) Council Specifications

C211	-	Control of Erosion and Sedimentation.
C213	-	Earthworks.

(b) Australian Standards

AS 1160	-	Bitumen emulsion for construction and maintenance of pavements.
AS 2507	-	The storage and handling of pesticides.
AS 4419	-	Soils for landscaping and garden use.
AS 4454	-	Composts, soil conditioners and mulches.
AS 4843	-	Synthetic weed blocking fabric.
AS 3743	-	Potting mixes.

VEGETATION OF SLOPES AND DRAINS

C273.03 EXECUTION AND TIMING OF WORK

1. In association with the work to be executed under this Specification, the Contractor shall implement effective erosion and sedimentation control measures in accordance with the Specification for CONTROL OF EROSION AND ***Contractor's Responsibility***

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SEDIMENTATION.

2. The work to be executed under this Vegetation of Slopes and Drains includes the vegetation of cut and fill batters, pathway verges, median areas, open drains and other areas within the site. Vegetation includes the initial surface preparation, topsoiling, fertilising and either sowing of seed or turfing as shown on the Drawings. ***Vegetation***

3. Exposed ground shall be vegetated before the area exceeds one hectare or lesser area in compliance with Council requirements. ***Exposed Ground***

C273.04 MATERIALS

(a) Topsoil

1. The Contractor shall use topsoil stockpiled on site under the Specification for EARTHWORKS. Where imported topsoil is required it shall comply with AS 4419 and shall:- ***Quality***

- be of a friable, porous nature;
- be classified as a 'sandy-loam';
- be free of weeds and weed seeds, bulbs, corms and vegetable propagules;
- have less than 10% by dry mass of clay sized particles (<2 microns);
- contain no refuse or materials toxic to plant growth;
- have less than 5% by mass of 20mm stones;
- contain no stumps, roots, clay lumps or stones larger than 50mm in size;
- have an organic content of at least 10 per cent by volume;
- have a pH neither less than 6.5 nor more than 7.5;
- have a soluble salt content not exceeding 600ppm.

2. Topsoil shall be spread on the prepared subsoil and graded evenly, making the necessary allowances to permit the following:

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

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

4. Feather edges of spread topsoil into adjoining undisturbed ground.

5. Topsoil shall be lightly and uniformly compacted in 150mm maximum loose layers, Avoid differential subsidence and excess compaction. Produce a

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finished topsoil surface that has the following characteristics:

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

6. Surplus topsoil shall be spread on designated areas on site, if any. Otherwise dispose off site.

(b) Herbicide

1. Herbicide used shall be a glyphosate based herbicide listed in Annexure C273A.

2. Weed specific selective herbicides shall be used subject to prior approval.

(c) Seed

Seed Type and Supplier

1. All seed used shall be of the species and varieties listed in Annexure C273A. The Contractor shall submit to the Superintendent the name/s of the proposed seed supplier/s within two weeks of the acceptance of the tender. Grass seeding is to be a minimum application rate of 1 kg/ 100 m² consisting of the seed mix specified in Annexture C273A.

Lead Time for Native Seed

2. The Contractor's attention is drawn to the lead time that may be required to procure some native seed species. The native seed shall be delivered to the site in separate lots for each species and variety, clearly labelled to show species, variety and weight.

Certification

3. All seed must be accompanied by a "Certificate of Authenticity" which shall be furnished by the Contractor to the Superintendent upon request at any stage of the work. Grass and clover seed shall be pre-packed commercially with an accompanying certificate of germination. Age of the seed shall be a maximum of two (2) years from the date of harvest.

Storage

4. The Contractor shall not take possession of the seed more than seven days before sowing is to occur. The seed shall be stored in clean, air tight containers and kept away from direct sunlight. It shall not be exposed to the elements at any stage during storage.

Contractor's Cost

5. The Contractor shall replace at his own expense any exotic seed batch found not true to type.

6. Grass cover of less than 90% over the entire are at the time of the 'off maintenance' inspection will not be accepted and will cause an extension of the maintenance period until the required cover is achieved. Extensive bare patches are not acceptable. Determination of 90% cover will be established by random sampling over the grassed area.

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(d) Turf

1. Turf shall consist of 25mm depth of dense, well rooted, vigorous grass growth with minimum 15 mm and average 100 mm depth of topsoil. The type of grass turf to be used shall be selected from Annexure C273A and in accordance with the Drawings. Unless specified, Kikuyu grass shall not be used. Turf shall be free of weeds, soil pests and diseases. The turf shall be supplied as rolls in long lengths of uniform width, not less than 300mm, and shall be in sound unbroken condition.

2. Turf deliveries shall be within twenty four (24) hours of cutting and laid within thirty six (36) hours of cutting. Measures shall be taken to prevent it from drying out between cutting and laying.

3. Turf shall be laid in the following manner:

- In stretcher pattern with the joints staggered and close butted
- Parallel with the long sides of level areas and with contours on slope
- To finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

(e) Fertiliser

1. Fertiliser shall be as listed in Annexure C273A. ***Type***

(f) Vegetable Mulch

1. Vegetable mulch used in hydromulching shall consist of straw, bagasse, wood fibre, paper pulp or similar material all finely shredded to a maximum dimension of 10 mm. Meadow hay or weeds shall not be used and paper pulp if used shall not exceed 25 per cent by mass of the total mulch. ***Composition***

(g) Water

1. Water used shall be potable. ***Quality***

(h) Binder

1. The binder used in hydromulching and strawmulching shall be. a natural or synthetic colourless, polymer emulsion, specifically prepared for soil stabilisation, such as 'Curasol AE' or guar gum.

(i) Wetting Agent

1. The soil wetting agent added in hydromulching or hydroseeding shall be listed in Annexure C273A and applied at the application rate specified therein.

(j) Pesticide

1. Pesticide used shall be a liquid or powder listed in Annexure C273A. The storage and handling of pesticides shall be in accordance with AS 2507.

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C273.05 VEGETATION OF SLOPES 1 IN 3 OR FLATTER

(a) Preparation of Surface

1. If weeds are present, slopes shall be sprayed with herbicide applied at the rate specified in Annexure C273A to kill weed infestation. Sprayed areas shall remain undisturbed for a minimum of 10 days. ***Herbicide Treatment***

2. The surface shall then be tyned to a depth of 200 mm to produce a loose surface and all large stones, rubbish and other materials that may hinder germination shall be removed before topsoiling. ***Preparation***

(b) Topsoiling

1. Topsoil shall be uniformly applied to provide an average depth of 100mm with a minimum compacted depth of 75mm at any location. The topsoiled area shall be cultivated to a depth of 75mm to provide a roughened surface with soil lumps not exceeding 50mm dimension. ***Application***

(c) Mixing of Seed

1. The Contractor shall give the Superintendent two days' notice before each sowing operation. Seed shall be sown on the day of mixing with pesticide. ***Notice***

(d) Incorporation of Pesticide

1. Immediately before sowing, all grass and native seed shall be treated with pesticide. The pesticide shall be thoroughly mixed as a dry powder with the seed at the rate specified in Annexure C273A to the equivalent mass of seed to be spread on 1 hectare of the surface in accordance with Annexure C273A. ***Mixing***

(e) Sowing

1. Sowing shall be carried out with an appropriate mechanical seeder. Where practicable, passes shall follow finished surface contours. Seed shall be sown at a depth of 5mm or shall be raked or harrowed to provide 5mm cover. ***Seeder***

2. Seed and fertiliser shall be evenly distributed over the areas to be sown at the rates specified in Annexure C273A. Fertiliser shall be applied concurrently with the seeding operation. ***Sowing Rate***

(f) Turfing

1. Turf shall be placed on the prepared topsoiled surface. Runs of turf shall butt hard against each other and be placed perpendicular to the direction of water flow. Turf seams shall then be topdressed with topsoil. ***Placing***

2. Four to six weeks after placement, the turf shall be lightly topdressed with topsoil to correct any undulations or unevenness in the established turf. ***Topdressing***

(g) Watering ***Watering***

1. The Contractor shall water areas to be sown to a moist condition and shall rewater areas to a moist condition without surface runoff on a daily basis for a

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minimum of 15 days after sowing, or as otherwise directed by the Superintendent, to promote and maintain growth.

2. All watering shall be undertaken using permanently installed irrigation systems.

3. Thereafter, the grass shall be irrigated as required to maintain a healthy sward for the duration of the Maintenance Period.

C273.06 VEGETATION OF SLOPES STEEPER THAN 1 IN 3

(a) General

1. Where shown on the Drawings or directed by the Superintendent, slopes shall be vegetated by one of the following methods: ***Method***

   (i) Topsoiling and hydromulching;

   (ii) Topsoiling, hydroseeding and straw mulching;

   (iii) Hydroseeding.

(b) Preparation of Surface

1. Weeds shall be killed by spraying with herbicides as specified under Clause C273.05(a). ***Herbicide Treatment***

2. No more than seven days before seeding all loose material shall be removed from fill batters and cut batters, which are not stepped by methods approved by the Superintendent. ***Preparation***

(c) Topsoiling

1. Where batters have been stepped, the steps shall be loosely filled with topsoil. Elsewhere, topsoil shall be uniformly applied to provide an average thickness of 100mm with a minimum compacted thickness of 75mm at any location. ***Application***

(d) Hydromulching or Hydroseeding

1. The hydromulch or hydroseed shall comprise the materials shown in Table C273.1. The materials shall be applied at the application rates shown in Table C273.1. ***Application Rate***

2. Dry surfaces shall be watered by a fine spray before the application of the hydromulch. ***Watering***

3. The mixing and treatment of seed shall be carried out in accordance with Clause C273.05(c). ***Treatment of Seed***

4. During preparation of the hydromulch or hydroseed slurry, liquid form pesticide shall be added to the storage tank, to facilitate surface application, at a rate of 5 litres of pesticide to the equivalent volume of hydromulch or hydroseed slurry to be spread on 1 hectare of surface in accordance with Table C273.1. ***Pesticide***

5. Storage tanks, containers and equipment to be used in hydromulching or hydroseeding of slopes shall be clean and free of contamination from previous ***Equipment***

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operations.

6. A slurry mixture shall be produced by addition of the specified materials in the tank and agitated to maintain a uniform consistency during application. It shall be applied uniformly over the whole surface. ***Uniform Mix***

7. Hydromulch or hydroseed shall not be applied under the following weather conditions at the site: ***Weather Conditions***

- when temperature is higher than 35°C
- when winds exceed 15 km/hr;
- where, in the opinion of the Superintendent, the surface is too wet or
- during rain periods or when rain appears imminent.

8. Application rates shall be in accordance with Table C273.1

Material	Application Rate per Hectare	
	Hydromulching	Hydroseeding
i) Vegetable Mulch (kg)	4,500	Nil
ii) Water (l)	35,000	20,000
iii) Binder (kg)	100	100
iv) Fertiliser (kg)	350	350
v) Seed	See Annexure C273A	
vi) Wetting Agent (l)	35	20
vii) Pesticide (l)	5	5

Table C273.1 - Materials and Application Rates

(e) Straw Mulching

1. The mulch to be applied after hydroseeding shall comprise a matrix of straw and polymer emulsion binder. Meadow hay shall not be used. The straw mulch shall be uniformly applied by a suitable blower unit at a rate of 250 bales (each of 20 kilograms) of straw per hectare of surface. The binder shall be incorporated as a spray into the air stream of the mulch blower at a rate of not less than 200kg emulsion per hectare of surface. The finished straw mat shall have a minimum thickness of 20mm at any location. ***Method***

C273.07 VEGETATION OF OPEN DRAINS

(a) Preparation of Surface

1. The Contractor shall so execute the work that the excavation of open drains to the specified profiles is followed within seven days by the vegetation of the surface as specified in this Clause. Topsoil shall be spread to provide an average compacted thickness of 100mm with a minimum compacted thickness of 75mm at any location. ***Profile and Topsoil***

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(b) Sowing

1. Before sowing, the surface shall be watered. Seed and fertiliser shall then be applied uniformly at the rates specified in Annexure C273A by one of the following procedures as directed by the Superintendent: ***Procedure***

(i) Mechanical sowing.

(ii) Hydromulching or hydroseeding.

(iii) By hand.

(c) Surface Protection

1. Where shown on the Drawings or directed by the Superintendent, one of the following protective treatments shall be applied immediately to all or part of the sown surface. ***Methods***

(i) Spraying with Emulsion

A natural or synthetic polymer emulsion shall be sprayed over the surface at a rate of 200kg per hectare. ***Application Rate***

(ii) Lining with Organic Fibre Mat

The channel surface shall be lined with an organic fibre mat listed in Annexure C273A. The runs of matting shall be laid along the direction of water flow. The matting shall be laid loosely on the soil surface and not stretched. ***Laying***

The upstream end of the matting shall be slotted into a trench 150mm wide by 150mm deep and pinned to the base of the trench at 200mm centres. The trench shall be backfilled with soil and compacted by foot. ***Anchorage***

The pins shall be `U' shaped, 4mm gauge wire, 50mm wide and 150mm long legs. ***Pins***

Adjacent runs of matting shall be overlapped 100mm with the higher run lapped over the lower run. The matting shall be pinned along the sides of each run at 500mm centres and along the middle of each run at 1m centres. End overlaps shall be 150mm wide with the higher run end lapped over the start of the lower run and pinned at 200mm centres. ***Lapping***

(iii) Turfing

Turf shall be as specified under Clause C273.04(d). ***Quality***

Runs of turf shall butt hard against each other and be placed perpendicular to the direction of water flow in the drain, and pinned into position at 500mm centres. ***Placing***

Seams of turf shall be topdressed with topsoil. ***Topdressing***

(d) Watering

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1. The Contractor shall water treated areas in order to promote and maintain growth as specified under Clause C273.05(g).

LANDSCAPE PLANTING

C273.08 EXECUTION AND TIMING OF WORK

1. The work to be executed includes the ground preparation, the supply of plants, planting as shown on the Drawings, fertilising, mulching, staking, watering and maintenance of plants. ***Extent of Work***

2. The Contractor shall give the Superintendent a minimum of two days' notice of commencement of planting. Landscape planting shall not be carried out in extreme weather conditions (above 35°C or below 10°C). ***Notice of Commence-ment***

C273.09 MATERIALS

(a) Topsoil

1. Topsoil shall comply with the requirements of Clause C273.04(a).

(b) Herbicide/Weed Blocking Fabric

1. Herbicide shall comply with the requirements of Clause C273.04(b).

2. Synthetic weed blocking fabric shall comply with AS 4843.

(c) Fertiliser and Soil Additive

1. Fertiliser shall be a slow-release type in pellet form, listed in Annexure C273A. ***Quality***

2. Soil additive 'Terracottom' shall be used in accordance with manufacturers specifications shall be applied and mixed evenly throughout garden bed soil.

(d) Mulch

1. All mulches used for landscape planting shall consist of material complying with the requirements of AS 4454. Mulch shall be as indicated in Annexure C273A. The use of other non-organic materials as mulch shall be as indicated on the Drawings and approved by Council. ***Quality***

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2. A 5 kilogram sample of mulch proposed by the Contractor shall be submitted for approval to the Superintendent two weeks before its intended use. The mulch subsequently used shall be consistent in every respect with the sample approved by the Superintendent. ***Sample***

3. All mulched areas are to have minimum 100 mm settled depth cover of organic mulch. Hardwood chips are the preferred mulch in Mackay due to lack of pine mulch supplies.

4. Mulched interfaces to edge, e.g. turf, pathways etc, are to be formed with a vertical face so that immediate cover of 100 mm mulch can be established. Continuous concrete edge only to be installed within Council controlled land. Timber or Spade Edges are not acceptable.

5. All mulch is to be free of viable seed or plant material capable of sprouting and deleterious materials such as rocks or rubbish.

6. Inorganic mulch with specific maximum particle sizes may be utilised subject to approval.

7. Bagasse and Sugar cane trash are not permitted.

(e) Plant Material

1. The Contractor shall obtain all plants from a nursery located in an area having a similar climate to the site of the Works. ***Source***

2.

- Tube stock is only to be used in revegetation areas/ Buffer Planting. Generally 140 mm pot size for groundcovers and strappy plants and 200 mm pot size for shrubs.

- In areas of high visible impact, pedestrian use and activity, larger and more advanced stick may be continual upon the quality of stock selected.

- All Street Trees outside of the CBD are to be a minimum 45 Lt

- Within the CBD, a minimum 100 Lt pot size is required, with Preference to 200 Lt and ex-ground, space permitting. Plant to Mackay City Council Detail A4-177.

3. There shall be no substitution of any species without the Superintendent's approval. All plant material shall be true to species and sizes. Plants shall be healthy, of good form, not soft or forced and with large robust root systems. They shall not be rootbound and shall be free from disease and insect pests. All container potting mix shall conform to AS 3743. Trees shall have a single leading shoot. For hardening off purposes, all plants shall be delivered to a site within the locality of the Site at least four weeks before planting out. Plant root systems shall be maintained moist at all times with particular attention being paid to watering during the on-site period before and during planting. Plant stock shall be classified as indicated in Table C273.2, and planted in accordance with the Drawings. ***Quality***

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	Type or Stock				
	50mm Tube	**Gro-Tube**	**Semi Advanced**	**Advanced Stock**	**Super Advanced**
Plant Container: dia (mm)	50	75	140	200	300
depth (mm)	75	100	140	200	300
Plant Height (mm) (leaf & stem)	200 min 300 max	300 min 400 max	300 min 400 max	300 min 500 max	500 min 750 max
Planting Holes: side dia (mm)	200	200	300	400	600
depth (mm)	200	200	300	400	600

Table C273.2 - Plant Stock

(f) Street Trees

Particular notice should be taken of requirements for street trees specified in clause 2.4 of specification DB – Landscaping where minimum 45 Lt container size and 2 metres in height are required for street tree. In Mackay CBD a required minimum tree size is a 100 Lt container.

(g) Stakes

1. All stakes shall be 50 mm square by 2400 mm long hardwood and sharpened at one end. ***Size***

C273.10 PLANTING

(a) Mass Planting in Mulched Bed

1. The area to be planted shall be sprayed with herbicide, as specified under Clause C273.05(a). Sprayed areas shall remain undisturbed for a minimum of 10 days. ***Herbicide/ Weed Blocking Treatment***

2. The surface shall be ripped at 500 mm centres to a depth of 600 mm and the top 350 mm of the planting bed broken up by cultivation to achieve a course tilth. Mulch, 100 mm thick, shall be spread over the planting bed. After removal of the localised mulch, planting holes shall be excavated to the dimensions and depths as shown in Table C273.2 and any deterious material removed. ***Surface Preparation***

3. Alternatively if natural soils are unacceptable a minimum depth of 350 mm of topsoil will be required to be imported. ***Imported Topoil***

4. The planting hole shall be backfilled with in-situ topsoil complying with Clause C273.04(a) and compacted compressively to remove airpockets up to surface level, care being taken to avoid mixing mulch with topsoil. Two stakes shall be driven 400 mm deep and 100 mm clear of each 'Advanced' and 'Super ***Backfill and Staking***

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Advanced' rootball and the stock tied to it by two (2) 'knittex' knitted Tree Ties.

5. Each backfilled hole shall receive sufficient water to saturate the root zone before the mulch is respread. The mulch shall be left 50 mm clear of the plant stem immediately after planting. This spacing is to be maintained. ***Watering and Mulching***

(b) Individual Planting

1. Weed Infestation for a diameter of 800 mm for each plant location shall be treated by spraying with a herbicide as specified in Clause C273.05(a) Sprayed areas shall remain undisturbed for a minimum of 10 days. ***Herbicide Spray***

2. A planting area twice the diameter of the rootball shall be loosened to a depth of 400 mm. Planting holes shall be excavated to dimensions and depths as shown in Table C273.2 and the material spread evenly around each hole. These planting holes shall not be bored to prevent galzing of the hole sides. ***Planting Holes***

3. The planting hole shall be backfilled with in-situ topsoil complying with Clause C273.04(a) and compacted by foot up to surface level. Two stakes shall be driven 400 mm deep and 100 mm clear of each 'Advanced' and 'Super Advanced' size stock and the stock tied to it by two (2) 'knittex' knitted tree ties. ***Backfill and Staking***

4. Each backfilled hole shall receive sufficient water to saturate the root zone immediately after planting. ***Watering***

Herbicide Spray

5. Immediately after planting, mulch 100 mm thick, starting 80 mm clear of the plant stem, shall be spread over an area of 600 mm radius surrounding the plant. ***Mulch***

(c) Bed Preparation

- Drainage is to be provided to all garden beds particularly in centre medians and road reserves and connected to a Storm Water System, with flush points at 60 m intervals.

- A minimum 350 mm finished depth of topsoil is required for intensive urban landscapes, medians and roundabout landscapes, with minimum 250 mm ripped subgrade.

- A minimum 200 mm finished depth of topsoil is to be provided for broad acre landscaping.

- Garden bed areas are to be mounded to achieve adequate drainage, and facilitate root growth.

- All topsoil will comply with current Australian Standards AS4419 and be free of pests such as Fire Ants and soil borne viruses and disease.

- Generally, planting holes for trees (except for ex-ground stock) are to be a minimum 2 times the diameter of the rootball and will provide sufficient depth for sustainable growth (generally 300 mm – 400 mm deep).

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- All planting is to have associated fertilizer regimes incorporated as an integrated part of the growing and planting works program.

- Terracottem is to be incorporated into the planting soil mix in accordance with manufacturers specifications.

- Root barrier is to be installed where invasive roots may become an issue or as specified on Landscape Plans.

- A minimum 900 mm finish depth of combined topsoil coverage and drainage layer is to be provided for general podium planter bed landscaping.

C273.11 CARE OF LANDSCAPE PLANTING

1. The Contractor shall water all plants, from the time of planting, by approved means and at regular intervals as required to maintain plant growth free of water stress. ***Watering***

2. Missing plants, dead plants and plants nominated by the Superintendent as unhealthy shall be replaced by the Contractor. Replacement plants shall be of similar size and quality and of identical species and variety to the plant being replaced. The cost of replacement shall be borne by the Contractor. ***Replacement Plants Contractor's Cost***

3. Weed and grass growth in mulched areas shall be killed by treatment with herbicide in accordance with the manufacturer's instructions at monthly intervals during the construction period and contract maintenance period. Contact of the herbicide with the new plants shall be avoided and any damage repaired or damaged plant material replaced by the Contractor at no cost to the Principal. ***Weed Control*** ***Contractor's Cost***

4. All plants shall be established insitu for a minimum of one (1) month prior to the completion of the 'on maintenance' period. ***Time Insitu Prior to 'Off Maintenance***

5. Contractors are reminded of the requirement to develop and submit a detailed maintenance program for approval prior to commencement of the 'on maintenance' period as per clause 3.14 of specification 08. ***Maintenance Program***

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SPECIAL REQUIREMENTS

C273.12 MAINTENANCE PERIOD PROCEDURES

Any Landscape Works undertaken within Council Reserve as part of a development must be maintained by the developer for a period of twelve months. At this time, Council will inspect the landscape works before signing off and accepting any future maintenance. During the twelve month period, horticultural best practices must be undertaken to ensure quality workmanship throughout the development before Council will accept the works.
Council has certain expectations of acceptable landscape quality. Below is a list of procedures that the developer is expected to undertake during the maintenance period. This will ensure that once the twelve month period has been reached a quality, well maintained landscape is being given over to Council.

1. The design of a park should carefully consider long-term maintenance requirements. Mulched garden beds containing trees and shrubs are easier to mow around than numerous small trees and shrubs planted individually throughout the grassed areas.

2. Where single shade trees occur they should be mulched to 100mm depth in a minimum 1.2 metre diameter circle, thus avoiding damage to trunks by mowers or whipper snippers.

3. Tree Ties and stakes are to be regularly checked (once a month minimum) for tightness. Any tree stakes that interfere with the trees branching system are to be cut back to allow the canopy to branch without harm or prevent rubbing against the stake.

4. Mulch depths throughout the maintenance period are to be maintained at the required 100 mm depth. The developer is responsible for topping up as necessary.

5. A defined edge is required between all turf and garden bed areas. A spade edge is not acceptable, the preference is towards a recycled plastic or concrete edge. The use of a recycled plastic or timber edge is also acceptable within privately maintained areas only.

6. Access to the parks, drainage reserves and public open spaces for maintenance vehicles should be via a lockable gate or removable bollards.

7. A weed management plan is to be implemented to control weed growth throughout the maintenance period. Spraying of weeds is permitted under the correct environmental conditions and manufactures specification. At handover all garden beds are to be free of weeds.

8. All garden beds and trees are to be fertilised at least twice through the twelve month maintenance period (this is on top of the fertilizer given as specified at the time of planting). This is to sustain healthy growth and vigour and fight off any

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potential disease or insect attacks. Fertilising shall be undertaken in February and August. Similar treatments are to be undertaken for all turf areas.

9. At the first sign of any pest of disease attack treatment is to take place to eradicate the problem in an environmental and professional manner as recommended by the manufacture. Any dead, dying or diseased plants will not be accepted at handover and are to be replaced at the developers cost.

10. The need to prune or trim back may arise during the establishment period. A qualified horticulturist or arborist, where trees are involved, is to be employed to do all the necessary work. There are strict procedures to follow when undertaking any pruning work and bad workmanship that may lead to long term disfiguration or deformed growth (e.g. the unnecessary removal of a trees main leader) of trees and shrubs will not be accepted and the plant replaced at the developers cost.

11. All grassed areas within Council reserve is to be maintained during the maintenance period. Grass is to be regularly mowed to keep the finished height of 50 mm in height. Through summer this may involve weekly mowing (depending on grass species as specified in the original development plans), and through the cooler months maybe once every three weeks. All grass through this period is to receive at least two applications of fertilizer that best suits the time of year and site conditions and applied to the manufactures specification. As per C273.04 (c) 6 a minimum 90% grass cover is required to be achieved at the time of the 'off maintenance' inspection.

12. Rubbish or debris that builds up on site must be removed on a regular basis as part of any maintenance. Council will not accept at handover garden beds that are littered with rubbish and other debris.

13. Within new park areas designed as part of a development the developer is responsible for all upkeep of any furniture, water bubblers, bins etc for the first twelve months. This may include but is not limited to the sweeping of pathways and a regular checking of any play equipment that may have been installed as part of the development.

14. Where an irrigation system is installed regular maintenance is to be carried out to ensure it is on good working order. The necessary maintenance could include but is not limited to, cleaning of filters, correct timer settings, drip lines are not blocked, leaks etc. At handover, the developer must provide Council with the irrigation control manual, specialised programmers and any associated warranties and purchase certificates and a break down of run times and lengths. It is also the developers responsibility to provide a test certificate associated with the backflow prevention device and have made any other applications to Mackay Water associated with the irrigation system installation. The loss of plants due to lack of water will not be an acceptable excuse to Council.

15. The irrigation system installed shall be fully commissioned and accepted by Council prior to any plantings being undertaken.

16. A maintenance programme is required to be submitted to Council with the submission of the landscape designs. The programme should be prepared by

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the Landscape Architect / Designer or a qualified horticulturist and should detail all proposed maintenance works. A detailed as constructed irrigation plan must also be submitted for records of pipe location and all irrigation components.

C273.13 IRRIGATION

1. General

a. to Application shall be made to Mackay Water for connection of irrigation systems the water main. The contractor shall arrange with Mackay Water for the timing of the work. All works shall be carried out by the relevant local authority at the applicants cost.

b. Connections to water mains shall include the provision of suitable water meters and back flow prevention equipment.

c. Water meters utilised will be required to be fitted with a Reed Switch Assembly with a 10 or 100L per pulse output in order to match input requirements for Council's central irrigation control system, Toro "IrriNet' System. Water meters shall conform to the following specifications:

Construction Materials

Meters must be constructed from corrosion resistant, durable materials suitable for use with potable mains supply water. Any coatings of materials shall conform to AS4158. Parts in contact with water shall be non-toxic, biologically inactive and non-reactive.

Connections

Meters must be available in nominal sizes 15, 20, 25, 32, 40 and 50 mm BSPM. All meters shall be supplied with loose ring connections to facilitate installation, service and repair/ replacement.

Pressure Rating

The maximum working pressure rating shall be 16 Bar or higher.

Type

The water meters shall be of positive displacement type for 20 and 25 mm and for larger sizes of the Multi-jet turbine type.

Display Unit

The display unit shall be easy to read with units clearly specified. The display should indicate the accumulated flow in cubic meters with a minimum of 5 digit display (15, 20, 25, 32 mm) or a minimum 6 digit display for 40 mm and 50 mm.

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Accuracy

The meter shall be capable of a reading accuracy of ±2% of the actual flow over the expected flow range of the system. Meter size shall be selected to achieve this accuracy based on expected flow range.

Output

The meter shall be capable of being able to be easily fitted with reed contact switch to deliver a pulse output to the Irrinet system. The reed switch shall be order either factory fitted or retro-fitted on site. Pulse output required is 1 pulse per 10 or 100 litres. The reed switch shall be fitted with a minimum of 500 mm of cable. The cable shall be extended to the control system using twisted pair shielded communication cable.

Flow Direction Indicator

The meter shall be stamped to indicate the correct flow direction.

Installation

Meters must be installed only in the horizontal position. Minimum clear lengths of pipe (specified by the Manufacturer) shall be installed immediately upstream and downstream of the meter.

d. For 20 mm and 25 mm water meter connections water meters to be utilised shall be the Reliance Model WM201PD Water Meter with a 10l per pulse Reed Switch Pulse, see Appendix B.

e. For water meters of greater than 25 mm diameter. Water meters to be utilised shall be TOROMW Multijet with factory fitted Reed switch set at 1 pulse per 10 or 100 Lt dependent on the duty.

f. The installation and design of all watering systems including the installation of water meters, backflow prevention devices and isolation valves shall be in accordance with AS3500.1 "National Plumbing and Drainage Code", Water Supply.

g. The irrigation system shall be installed in accordance with Council Specifications and shall be installed to a standard compatible with Council's central irrigation control system, the Toro 'IrriNet' system. No alternative type is to be installed without prior written approval of Council. Reference should be made to construction specification C273 'Landscaping' for details of these requirements.

h. All irrigation pipework installed under roadways shall be laid in minimum 100 mm dia. uPVC Class 9 conduit which shall be of a diameter equivalent to the size of the irrigation pipe plus 50% minimum.

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i. The water connection and installation of the irrigation system shall be carried out by Mackay Water personnel or an approved contractor at the developers / applicants cost. The maintenance period for irrigation works shall be twelve (12) months and shall run concurrently with the 'on maintenance' / establishment period for landscaping works. Thereafter all maintenance and watering will be the responsibility of the Council.

2. Excavation

a. Do not excavate by machine within 500 mm of existing underground services.

b. The standard width of trench for pipes shall be 150 mm.

c. Unless noted otherwise on the approved Project Drawings or directed by Council all pipe work is to be installed with a minimum cover of 300 mm for laterals and 400 mm for mainlines.

3. Pressure Testing

a. All work shall satisfy a test pressure of the nominated working pressure for a period of two (2) hours. The test shall be carried out during the coolest part of the day. The point at which the test pressure is measured shall be at the lowest point in the profile of that section of main under test. Submission of a test certificate provided by a NATA registered testing authority is required to certify compliance.

b. All tests shall be carried out under the supervision and in the presence of the Council inspector.

c. Any defects that arise during the tests shall be repaired in an approved manner to manufacturers specification. Any leak however small will be classed as a defect. All such repair work shall be similarly tested and approved before acceptance.

d. The contractor shall give 48 hours notice to Council so that arrangements can be made for supervision of the testing.

e. The contractor shall accept all risks and expenses incurred during testing and shall provide all labour together with all pumps, engines, pipes, temporary valve plugs, flanges and all other equipment as may be necessary to undertake testing.

4. Flushing

After pressure testing has been carried out the new pipework shall be flushed as thoroughly as possible with the available water pressure to ensure pipes are cleaned thoroughly.

5. Controllers

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The irrigation system shall be installed with Council's preferred central irrigation control system, the Toro 'IrriNet' system. No alternative type is to be installed without prior written approval of Council. Details of the control system are provided in Annexure C. Each installed system must be capable of communicating with the Central Control System

6. Irrigation systems and installation

Supply and installation of the field system shall be undertaken in accordance with the specification included in Annexure D.

7. Backflow Prevention Devices

All Council landscaped areas, which require irrigation systems, shall have a backflow prevention device installed. This device should comprise of a stand constructed fully from hard drawn copper pipe (Type D) and should have an inline strainer both before and after the backflow preventer. This should comply with AS 2845. Required applications for installation of the backflow prevention devices shall be submitted to Mackay Water prior to installation.

8. Performance Test

a. On completion of the installation the system shall be tested in the presence of a Council inspector.

b. The system shall be operated to demonstrate that all components function as required by the design.

c. The contractor is responsible for making all necessary alterations to the system so that the performance is in accordance with the design specifications.

9. Backfilling of Trenches

a. Trenches shall be backfilled with the excavated material. If the excavated material is considered unsuitable for backfilling by the Council inspector, it shall be removed from the site and replaced with clean approved backfill material.

b. All trenches so backfilled shall be compacted and lightly raked to ensure that surface levels marry with adjacent surface levels, are free draining and free from mounds or depressions. All rocks or evidence or excavated subgrade shall be raked up and removed.

C273.14 RESERVED

C273.15 RESERVED

C273.16 RESERVED

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LIMITS AND TOLERANCES

C273.17 SUMMARY OF LIMITS AND TOLERANCES

1. The limits and tolerances applicable to the various clauses in this Specification are summarised in Table C273.3 below.

Item	Activity	Limits/Tolerances	Spec Clause
1.	**Topsoil**		
	a) Organic Content	>10% by volume	C273.04a
	b) pH	>6.5 <7.5	C273.04a
	c) Soluble Salt	<600ppm	C273.04a
	d) Clay content	<15% by dry mass	
	e) Stone Content	<5% by dry mass	
2.	**Turf**	Widths >300mm.	C273.04d
3.	**Vegetable Mulch**		
	a) Material	maximum size <10mm	C273.04f
	b) Paper Pulp	<25% by mass of total mulch	C273.04f
4.	**Topsoiling**	Minimum compacted thickness at any location of 75mm	C273.05b C273.06c C273.07a
5.	**Straw Mulching**		
	a) Straw Mat	Finished thickness >20mm.	C273.06e
6.	**Landscape Planting**		
	a) Temperature	Planting not to be undertaken when temperatures >35°C or <10 °C.	C273.08
7.	**Mulch**		
	a) Fines	Shall not exceed 5% by volume.	C273.09d
	b) Woodchip	Maximum size <50mm.	C273.09d
8.	**Plant Material**		
	a) Container Potting Mix	Comply with AS 3743	C273.09e

Table C273.3 - Summary of Limits and Tolerances

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MEASUREMENT AND PAYMENT

C273.18 PAY ITEMS

1. Payment shall be made for all activities associated with completing the work detailed in the Specification in accordance with Pay Items C273(a) to C273(d) inclusive.

2. A lump sum price for any of these items shall not be accepted.

3. If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

4. Notwithstanding any general statements to the contrary that may be made elsewhere in this Specification, in the context of landscape works all areas shall be measured in the plane of the surface and thicknesses specified shall apply perpendicular to the surface.

5. Erosion and sedimentation control measures are measured and paid in accordance with the Specification for CONTROL OF EROSION AND SEDIMENTATION.

6. Topsoil stockpiling is measured and paid in accordance with the Specification for EARTHWORKS.

Pay Item C273(a) VEGETATION OF SLOPES 1 IN 3 OR FLATTER

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the vegetation of such areas, including surface preparation, topsoiling, sowing and/or turfing, and watering.

Pay Item C273(b) VEGETATION OF SLOPES STEEPER THAN 1 IN 3

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the vegetation of such areas, including surface preparation, topsoiling, and as appropriate hydroseeding, hydromulching and/or straw mulching, and watering.

Pay Item C273(c) VEGETATION OF OPEN DRAINS

1. The unit of measurement shall be the square metre.

2. The schedule rate shall cover all costs associated with the vegetation of such areas, including surface preparation, topsoiling, sowing, surface protection by bitumen emulsion spraying, lining and/or turfing as appropriate, and watering.

Pay Item C273(d) LANDSCAPE PLANTING

Pay Item C273(d)(i) Provision of Mulched Bed for Mass Planting

1. The unit of measurement shall be the square metre.

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2. The schedule rate shall cover all costs associated with the preparatory work of the mulched bed before planting.

Pay Item C273(d)(ii) Mass Planting

1. The unit of measurement shall be `each' plant.

2. The schedule rate shall cover all costs associated with the planting in the mulched bed and subsequent care of each plant.

Pay Item C273(d)(iii) Individual Planting

1. The unit of measurement shall be `each' plant.

2. The schedule rate shall cover all costs associated with the preparatory work, planting and subsequent care of each plant.

Pay Item C273(e) Irrigation System

1. The unit of measurement shall be the 'Lump Sum' Irrigation System

2. The schedule and rate shall cover all costs associated with preparatory work, water main connections, control system and field irrigation supply and installation, backfill and subsequent restoration.

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ANNEXURE C273A

LANDSCAPING MATERIALS

(SAMPLE ONLY - TO BE COMPLETED BY COMPILER)

MATERIAL	TYPE	MINIMUM APPLICATION RATE
1. HERBICIDE *	'Roundup' Biactive	In accordance with manufacturers specifications
2. Selective Herbicide	None specified (subject to prior approval before use)	
3. SEED		
a) Grass	Winter Rye (Winter)	60%
	Japanese Millet (Summer)	
	Hulled Couch	20%
	Unhulled Couch	20%
(b) Hydromulch	Acacia dealbata	4 kg/ha
	Acacia buxifolia	1 kg/ha
	Acacia decurrens	1 kg/ha
	Acacia pravissima	1 kg/ha
	Leptospermum lanigerum	1 kg/ha
	Hardenbergia violacea	500 g/ha
	Kennedia prostrata	500 g/ha
	Acacia implexa	200 g/ha
	Banksia marginata	200 g/ha
	Bursaria spinosa	200 g/ha
	Callistemon pallidus	200 g/ha
	Dodonaea viscoca	200 g/ha
4. TURF GRASS		
(a) Medians	Couch/ Buffalo Blend	Refer to Drawings
(b) Verges/Footpaths	Couch/ Buffalo Blend	Refer to Drawings
(c) Other Areas	Couch/ Buffalo Blend	Refer to Drawings
5. FERTILISER *		
(a) Grass/ Turf	Initial - Granular slow release with N/P/K Ratio 18:8.6:4.1.	In accordance with manufacturers specifications.
	Maintenance Granular slow release with N/P/K Ratio 22:2.3:8.3 plus trace elements.	In accordance with manufacturers specifications.
(b) Landscape Planting	Initial – Controlled release with N/P/K Ratio 21:1.8:9 plus trace elements.	In accordance with manufacturers specifications.
	Maintenance – As above.	In accordance with manufacturers specifications.
6. WETTING AGENT *	Granulated 'Terracottem Hydraflo II	In accordance with manufacturers specifications.
7. PESTICIDE *	None specified (Subject to prior approval before use. Two (2) chemical treatments per pest or	
(a) Liquid		
(b) Powder		

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		disease is to be provided and rotated).	
8.	ORGANIC FIBRE MAT *	'Sta-firma' (light grade)	-
9.	MULCH	Composted/Pasteurized	100 mm thick

* Material shall be as listed or equivalent as approved by Council.

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ANNEXURE C273B

WATER METERS

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RMC™

METERS
METERS
METERS

Bullet Positive Displacement Meter - AS 3565

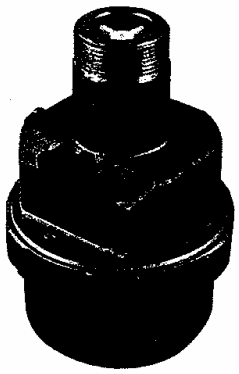
Description

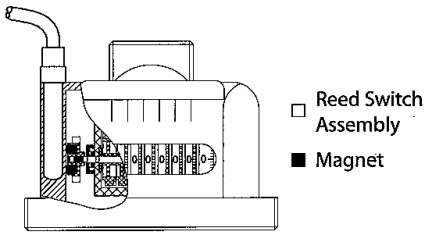
The Reliance *Bullet Positive Displacement Meter AS 3565* is a robust domestic meter suited to internal and external use.

The *Bullet Positive Displacement Meter* AS *3565* measures the volume of cold potable water passing through the pipeline. The *Bullet Positive Displacement Meter AS 3565* meter conforms to AS 3565 standard.

The meter is based on a calibrated chamber of known capacity and a rotary piston activated by the energy of the flow that passes through. The piston rotates while the chamber fills up and empties with a constant volume of water. By counting these cycles the register indicates the total volume that has been registered.

The *Bullet Positive Displacement Meter AS 3565* is available in 20 mm and 25 mm configurations.





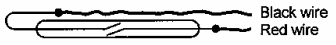
Features and Benefits

- Three component volumetric mechanism
  - » *High sensitivity and accurate registration throughout a wide flow range*
- Corrosion resistant body
  - » *High quality components are selected for corrosion resistance*
- Liquid sealed register
  - » *Easy and long term clear reading*
- Low starting flow rate
  - » *Accurate reading at a wider range of supply flow rates*
- Internal non-return valve and strainer
  - » *Integral dual check valve backflow to AS2845.1*
- Pulse capable
  - » *Optional reed switch allows remote reading without breaking the meter seal*
- Metrological Certification
  - » *NMI No. 14/3/9*

The optional reed switch pulser consists of a plastic housing with a reed switch to read the total consumption of water.

Reed Switch Pulse	2 Pulse for each
DN	1 Litre
20/25	●

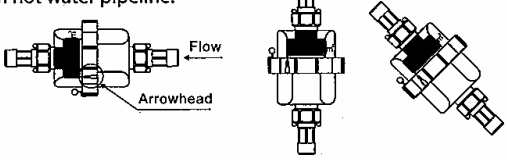
Electric data: V max: 24AV/DC
I max: 0.01A



Application

The Reliance *Bullet Positive Displacement Meter AS 3565* is a water meter suited to internal and external use. The product can be installed in any position. The meter must be installed with the direction of the flow as indicated by the arrow cast in the meter body. For ease of servicing it is recommended an isolating valve be installed before the meter.

Do not use cold water meter in hot water pipeline.



Reliance Worldwide • 27-28 Chapman Place Eagle Farm QLD 4009 • Tel: +61 7 3018 3400 • Fax: +61 7 3105 8128
Website: http://www.relianceworldwide.com.au • Email: info@relianceworldwide.com.au

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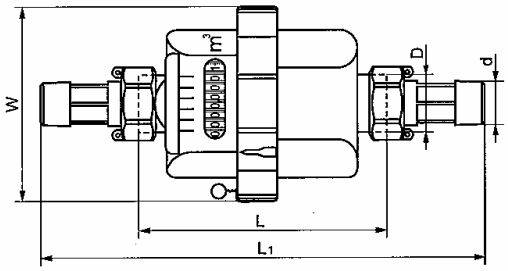
Bullet Positive Displacement Meter - AS 3565

Specification

	DN20	DN25
Overload flow rate (Q4):	5 kL/h	7.8 kL/h
Permanent flow rate (Q3):	4 kL/h	6.3 kL/h
Transition flow rate (Q2):	32 L/h	64 L/h
Minimum flow rate (Q1):	20 L/h	40 L/h
Maximum reading m^3:	9999.99998	
Minimum reading m^3:	0.00002	
Operating water temperature:	≤ 30° C	
Operating water pressure:	≤ 1.4 MPa.	

Maximum Permissible Error:

- In the lower zone from Q1 inclusive up to but excluding Q2 is ± 5%
- In the upper zone from Q3 inclusive up to and including Q4 is ±2%



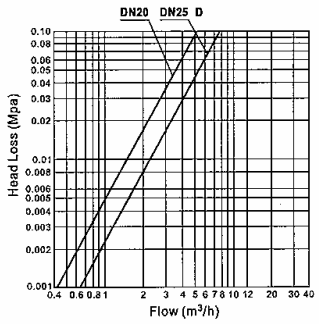
Dimensions

Nominal Diameter	DN 20		DN 25	
Body Thread (D)	Meter Thread	NSW Thread	Meter Thread	NSW Thread
Body Length in mm (L)	154	152	178	173
Total Length in mm (L_1)	242	276	282	316
Connector Thread (d)	R¾		R1	
Width in mm (W)	96		112	
Weight in kg (without connectors)	1.2		1.8	
Weight in kg (with connectors)	1.5		2.4	

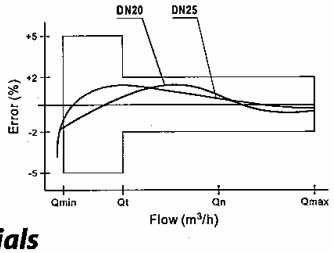
L_1 is the total length when coupling gaskets without compression.

Flow Characteristics

Head Loss Curve



Accuracy Curve



Materials

Body/ H Ring	DR Bass
Reading Face	Polycarbonate
Counter Mechanism	PSHI, Graphite
Check Valves	Acetal

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14/3/9
21 March 2006

Australian Government

National Measurement Institute

12 Lyonpark Road, North Ryde NSW 2113

Certificate of Approval

No 14/3/9

Issued by the Secretary under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the

Reliance Model WM201PD Water Meter

submitted by Reliance Worldwide
27-28 Chapman Place
Eagle Farm QLD 4009.

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

CONDITIONS OF APPROVAL

This approval becomes subject to review on 1 February 2011, and then every 5 years thereafter.

Instruments purporting to comply with this approval shall be marked with approval number 'NMI 14/3/9' and only by persons authorised by the submittor.

..../2

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14/3/9
21 March 2006

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

The National Measurement Institute reserves the right to examine any instrument or component of an instrument purporting to comply with this approval.

DESCRIPTIVE ADVICE

Pattern: approved 25 January 2006

- A Reliance model WM201PD class 2 displacement meter meter used to measure water for domestic or small commercial supply for trade.

Variant: approved 25 January 2006

1. With alternative connections.

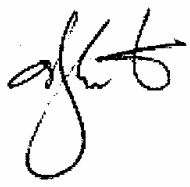
Technical Schedule No 14/3/9 describes the pattern and variant 1.

FILING ADVICE

The documentation for this approval comprises:

Certificate of Approval No 14/3/9 dated 21 March 2006
Technical Schedule No 14/3/9 dated 21 March 2006 (incl. Test Procedure)
Figure 1 dated 21 March 2006

Signed by a person authorised by the Secretary to exercise his powers under Regulation 60 of the National Measurement Regulations 1999.



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14/3/9
21 March 2006

TECHNICAL SCHEDULE No 14/3/9

Pattern: Reliance Model WM201PD Water Meter

Submittor: Reliance Worldwide
27-28 Chapman Place
Eagle Farm QLD 4009

1. Description of Pattern

A Reliance model WM201PD class 2 positive displacement meter (Figure 1) used to measure water for domestic supply for trade.

1.1 Field of Operation

The following characteristics determine the field of operation of the measuring system:

- Maximum continuous flow rate, Q_3 4 m^3/h
- Flow rate ratio, Q_3/Q_1 200
- Maximum working temperature 30°C
- Maximum admissible temperature 50°C
- Maximum working pressure 1400 kPa
- Accuracy class 2

1.2 Features/Functions

A positive displacement piston-type class 2 water meter of a size which is normally connected to a 20 mm pipe and is approved for metering domestic supplies and has features/functions as listed below:

- Threaded end connections as normally used in NSW and ACT (ball seat).
- A mechanical digital indicator having a series of eight aligned digits giving a maximum display of 9999.9999 kL in 0.0002 kL increments.
- Meter length of 154 mm.
- Single or dual check valves.

1.3 Verification/Certification Provision

Provision is made for the application of a verification/certification mark.

1.4 Sealing Provision

Instruments shall include one or more devices (Figure 1) which can be sealed so as to prevent dismantling or modification of the instrument without damaging the device(s). The device(s) may incorporate the verification/certification mark.

..../2

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14/3/9
21 March 2006

1.5 Markings

Instruments are marked with the following data, either grouped or distributed on the casing, the indicating device dial, an identification plate or the cover if it is not detachable:

Manufacturer's name or mark	Pacific Valves International HK
Serial number	...
Pattern approval mark	14/3/9
Numerical value of maximum continuous flow rate, Q_3	...
Flow rate ratio, Q_3/Q_1	...
Unit of measurement	m^3
Direction of flow	$\rightarrow$ or similar
Accuracy class	... (#)

(#) Optional for class 2 meters.

2. Description of Variant 1

Other models with certain alternative connections, namely:

- Model WM202PD with threaded end connections as normally used in QLD, VIC, TAS, WA and NT; and
- Model WM203PD with 1 inch BSP threaded end connections.

TEST PROCEDURE

Instruments tested for initial verification shall comply with the Certificate of Approval and Technical Schedule, and the maximum permissible errors for initial and subsequent verifications/certifications at the operating conditions in effect at the time of verification.

All meters shall be tested at flow rates of:

$Q_2(-0, +0.1\ Q_2)$, $0.1\ Q_3(\pm 0.01\ Q_3)$ and $Q_4(-0.1\ Q_4, +0)$

in the country of origin in a third party accredited facility which has reference standards traceable to primary national standards of the country of origin.

Each batch of meters and the results of the tests of these meters shall be supplied to the verifying authority. The verifying authority shall draw sample meters from the batch of meters supplied. The drawing of such sample meters shall be in accordance with the relevant National Measurement Institute (NMI) document.

All sample meters drawn shall be tested at flow rates of:

$Q_2(-0, +0.1\ Q_2)$ and $0.1\ Q_3(\pm 0.01\ Q_3)$.

A sample of the sample meters shall be tested at flow rates of:

$Q_1(-0, +0.1\ Q_1)$ and $Q_3(\pm 0.1\ Q_3)$.

The disposition of all meters from which the sample meters were drawn shall be determined in accordance with the relevant NMI document.

NOTE: NMI reserves the right to vary this procedure. Any such variation shall be notified in writing by NMI.

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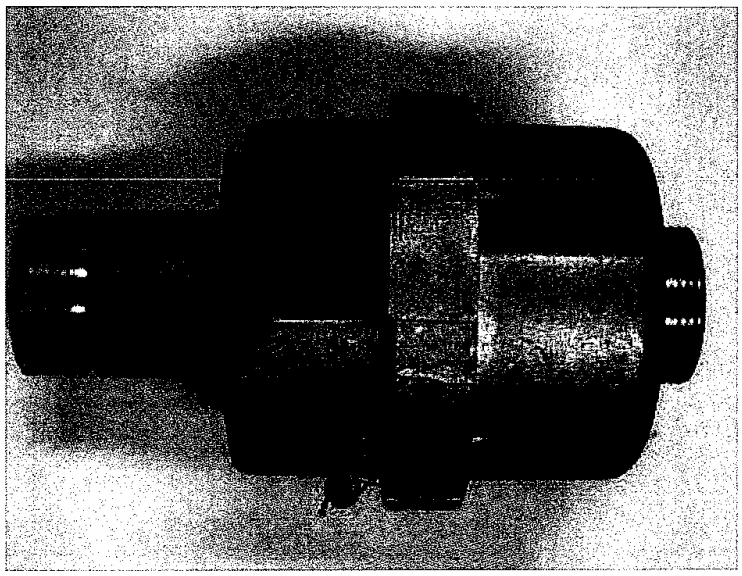
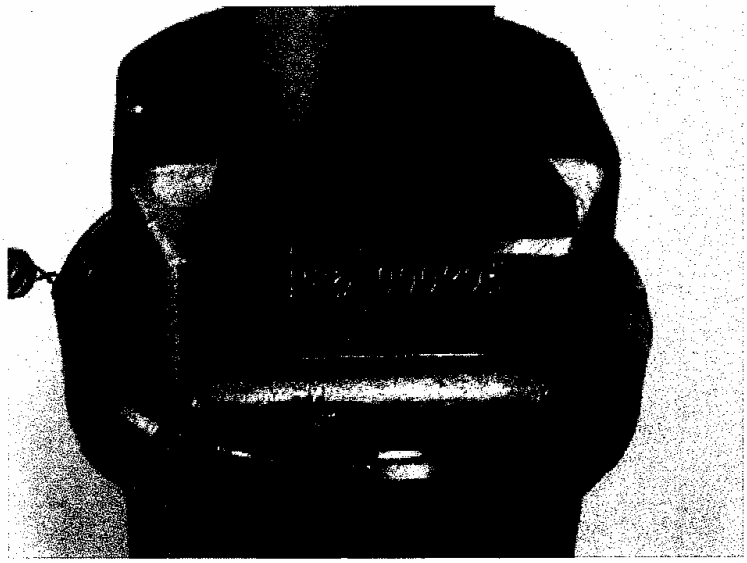
FIGURE 14/3/9 – 1





Reliance Model WM201PD Water Meter

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ANNEXURE C273C

CENTRAL IRRIGATION CONTROL SYSTEM

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Master General Specification
for the
Supply and Installation
of

Central Irrigation Control System –

Including for
Various Field Hardware

for

Mackay City Council

Queensland.

Prepared by:
Peter White – Toro Australia

October 2006

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Mackay City Council have identified to ensure best practice management for its irrigation and other site assets under its control, that a central control system is not only in need but will also enable the Council to provide water and other labour and cost savings by the installation of: a central control system and the necessary field hardware components to fully automate and integrate the Councils sites and assets.

Mackay City Council have settled on the Toro – "IrriNet" System as the most flexible and suitable system to fit their needs.

Following discussions with Toro Australia the following documentation shall serve as a base outline to the various central and site hardware, software and general installation requirements for commencement of the first stages of the system and also ongoing implementation of the system over the ensuing years.

All materials and equipment to be supplied and installed are to be new and of the latest technologies and the installing contractor shall be certified and trained in the application, installation and use by Toro Australia.

Any contractor awarded any work for the supply and or installation shall be responsible that any and all staff and or subcontractors are trained or recognised by Toro as trained and suitably able to install the necessary components to the highest level. The contractor shall be responsible to ensure the final design and workings of all the components installed by or under them and demonstrate to the Council that all components are installed for peak performance. The contractor is responsible for the completion of a radio survey to ensure peak performance.

Whilst every effort will be made by Council and Toro Australia to ensure that there is adequate and suitable information supplied for each component of work or "site package", the contractor shall ultimately be responsible to furnish a fully working, "site" including for all required cabinets, enclosures, electrical works, antennas and other minor and ancillary equipment or work to the satisfaction of both Council and Toro Australia.
No alternate items to those nominated shall be used without acknowledgement in writing by Council.

Council shall nominate and or approve the final location of all equipment prior to installation. Should any items be installed without approval the contractor may be requested to relocate and reinstall to the location nominated by Council at their own expense. This includes but is not limited to rain sensors, antennas, cabinets, enclosures, valve pits etc.

Council may withhold final or any payments until the works are completed to their satisfaction and proven to be operating at peak performance.

In General the System shall comprise of the following components. Such components will be used to automate each site back to the Central System to be located as nominated by Council.

System Components:

1.0 The Central

- The **Central** shall comprise a **PC computer** to the final configuration and specification as nominated by Toro Australia incorporating minimum 19" monitor, printer and IrriNet Software final commissioning to be by Toro Technicians and shall include initial Contractor and Council staff training (allow for 3 days).
- The contractor shall also allow for:
    - The PC is to be supplied by the Council.

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  - Include PC anywhere for remote diagnostics
  - Include suitable UPS (uninterruptible power supply) as necessary
  - The PC to be sent to Toro Brisbane for loading of IrriNet Software, Testing and software configuration
- The council is to provide a dedicated phone line connection point for remote access support.

- **Field Interface Unit IrriNet XL**
  - Placed in close proximity to PC
  - Housed in polyester enclosure
  - PC Cables to be included and supplied
  - Flashing the unit (programming between PC and Interface) will be performed by Toro as part of pre-delivery.

- **Base Antenna**
  - Proposed Col 7 Type Omni Directional
  - To be mounted on Admin building or at the direction of Council.

Contractor should engage the services of one of the local radio communication firms in Mackay to ensure professional and appropriate installation. Council can assist in identifying the current company performing such work for the council.

Field Hardware.

Different sites will require different "Field Hardware". The following items are to be selected as required for each field "Site" to service the site and enable automation, connection and communication with and to the Central Computer.

Contractors must engage the services of one of the local radio communication firms in Mackay to ensure professional and appropriate installation and a reliable radio survey conducted. The survey is to ensure successful communication between the site and the central of the Toro IrriNet system. Council can assist in identifying the current company performing such work for the council

All Irrigation plans need to be submitted to Mackay Council, Parkes and Facilities, for approval prior to commencement of any project.

Detailed "as Constructed" drawings are to be submitted to Mackay Council, Parkes and Facilities, prior to the "On Maintenance" period in hard copy and electronic copy on a suitably identified CD.

Enclosure

- If site requires pedestal mounting, the Toro Plastic satellite pedestal will be installed to Manufacturers specification on a suitable concrete slab with minimum dimensions 800 mm x 800 mm x250 mm thick or alternatively a polycarbonate pedestal of similar size.
- If the controller is to be wall mounted the enclosure will be a 316 stainless steel enclosure with padlockable handle

XL IrriNet Field Satellite.

- Supply and Install to manufacturer's specification including for
  - Communication Management unit to be supplied and installed
  - Modules typically I/O to be installed to station count as required by each site.
  - Mounted in lockable and locked, secure, ventilated, vandal proof enclosure to IP 56
  - Grounding as required or recommended by the manufacturer.

Antenna for XL IrriNet

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- "COL 7" Subject to and suitably mounted for site specific conditions ensuring peak performance.
    - Contractor should engage the services of one of the local radio communication firms in Mackay to ensure professional and appropriate installation. Council can assist in identifying the current company performing such work for the council.

Piccolo Interface Unit

- Supply and install a Piccolo interface module to a XL IrriNet where required or nominated.
    - Powered from XL IrriNet via cable
    - Separate external antenna to be installed site specific "COD 4" or equivalent.

Piccolo XR

- Battery Operated Devices
    - XR are to be mounted in residential electrical pillar box or Council approved enclosures. The pillars/enclosures shall be demonstrated not to collect water and where possible are to be positively drained and suitably ventilated so as not to build up or hold excess condensation or humidity.
    - Flashing (programming to interface) to be provided by suitably qualified installer trained by Toro
    - Antenna to be site specific installation either internally of the pillar box / enclosure or externally on suitable pole for site.
    - Antennas to be CD51
    - Battery to be 6 volt Lead acid 7 amp hour
    - Solar panel to be mounted on a suitable galvanised pole in good position for peak operation and performance. The pole is to be 63mm in diameter, 3m high. Each pole to be designed for safe operation. Cable needs to be installed in such a way not to be damaged.
    - Solar panel will be 6 volt.
    - Solar panels will be encaged in 25mm mesh for protection with anti bird prongs attached to the top edge of the solar panel.

Scorpio

- AC Scorpios are the preferred option for stand alone controllers on sites for up to 32 stations. They shall be minimum 8 station base unit and up to 32 stations as the site may require.
- Allow as each site may require to:
    - Add expansion boards to 16, 24 & 32 station utilising a shared radio configuration as
    - Antennas are proposed to be Yaggi directional installed for peak performance
    - Mount units in lockable and locked, secure, ventilated, vandal proof enclosure to IP 56
    - Enclosures are not to be mounted against private property walls.
    - Grounding as recommended by the manufacturer.

- DC option
    - Same configuration available as per AC model
    - Solenoid and or Master Valves will require latching solenoids
    - Solar panels required for trickle recharging for battery. Solar panels shall be securely affixed to suitable galvanised pole free and clear of trees and shadows and suitable height to be resistant to vandalism.
    - The pole is to be 63mm in diameter, 3m high. Each pole to be designed for safe operation. Cable needs to be installed in such a way not to be damaged.
    - Solar panels will be encaged in 25mm mesh for protection with anti bird prongs attached to the top edge of the solar panel.
    -
        - 8 or 16 station configuration:

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        - ❖ 20 watt panel with regulator, 30 amp battery Lead acid 12 volt
      - 24 or 32 station configuration
        - ❖ 30 watt panel with regulator. 50 amp battery Lead acid 12 volt
    - Mount units and battery in lockable and locked, secure, ventilated, vandal proof enclosure to IP 56
    - Enclosures are not to be mounted against private property walls.
    - Grounding as required or recommended by the manufacturer.

Water Meters (For Irrigation Purposes Only)

- Existing site water meters are to be removed and returned to Council.
- Water meters are to be replaced with a Council provided NCS water meter with suitable pulse output, up to and including 25 mm. Council has identified water meters by Meter Company Aus P/L, Oakley. Vic. 3166 or Reliance Manufacturing Company, Newstead Qld. 4006
- Meters of larger size will be Toro Mw Series Multijet water meter with dial totaliser and pulse output. Pulse outputs are to be connected to an input on the site field hardware device and programmed into the central.
    - All meters are to be first approved by Council and must also be compatible with the IrriNet System.
      - Pulse rate suitable for the type of irrigation emitters. Typical pulse rate
        - pop up and higher flow rate sites one pulse per 100 lt
        - drip only and lower flow rate systems one pulse per 10 lt
        - Final meter size and pulse output installation to be according to maximum water delivery for the site and with approval of Mackay City Council or approved Irrigation Consultant.

Rain Switch

- Toro Remote Rain Switch to be installed at each controlling device. Rain switches are to be fitted to a black gal pipe 50mm in diameter and capped. Height shall be no higher than 3 metres. Rain switches are to be located within reasonable proximity of the controller but with vandalism protection in mind. Where rain switches are in a visual location they shall also be housed in a suitable protective cage to eliminate any vandalism.
    - Wiring and programming of rain switches is to be covered in by Toro in the controller training sessions.

Valve Box

- Refer Irrigation Speciification.

Master Valves

- Century Plus solenoid valves with pressure regulators or equivalent are to be fitted after the meter in a separate valve box with a preceding isolation ball valve. The Master Valve shall be at a minimum, the same size as the meter unless special circumstances dictate otherwise. Seek advice from Council where this may be the case or if unsure.
    - Master valves are to be wired to the site control device and programmed to the central. Wiring and programming of Master Valves is to be covered in by Toro in the controller training sessions.

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QCVs

- Refer Irrigation Specification

Pressure Reducing Valves

- Refer Irrigation Specification

Wiring.

- All wiring is to be laid in a suitably sized heavy duty electrical conduit. Sweep bends are to be used at changes of direction or pits are to be used. Final cable size will be determined on a case by case basis but shall generally be minimum 1.5 mm active and common.
- Cable and conduit depth shall be minimum 450 mm below finished ground level and Blue “Irrigation” ID tape to be laid in the trench in the final 200 mm of back fill.
- Conduits to external walls shall be given Council approval shall be metal and firmly affixed to such walls and painted the same colour as the wall so as to “blend in”.
- Cable joins are only to be soldered & covered with waterproof heat shrink definitely installed ass per manufacturer specifications.. No cable join are to be made outside of pits or valve boxes. Where possible cables are not to have any joins from the controller to the valve/ sensor etc.
- Individual cables are to be marked to identify to which solenoid valve they are connected.

Programming

- The contractor shall allow to include for the initial general summer program for the irrigation system to be entered onto the new controller field hardware and also to ensure that the field hardware and the Central system are communicating to peak performance. This shall include the programming to the central of all inputs as well such as rain sensors, flow meters and valve box sensors.
- Allow where and as nominated from time to time to also update the “System tree” of the central or the graphical interface of the system with site reference details of sprinklers, controllers, meters, valves, sensors etc. for each site or completed or upgraded section of a site.

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ANNEXURE C273D

IRRIGATION SYSTEM SPECIFICATION

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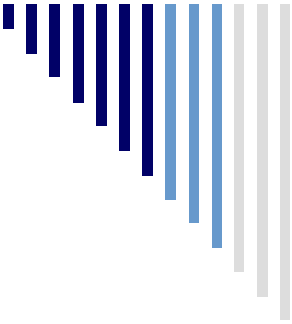

MASTER GENERAL SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF LANDSCAPE AND TURF IRRIGATION SYSTEMS FOR MACKAY CITY COUNCIL

PREPARED BY ALAN PICKERING
CID Landscape/Turf Commercial LTC 2061
Dowdens Pumping Sales and Services Pty Ltd

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SCOPE

The intention of this document is to provide the irrigation designer and installer a guideline for the provision of irrigation systems to Mackay City Council (MCC).
By providing a standard for all irrigation works MCC can be assured that all works will be compliant to their existing system.
All works should be carried out to current industry standards and all relevant Australian Standards, including but not limited to:

- Mackay City Council By-laws, regulations and policies
- Mackay Water By-laws, regulations and policies
- AS/NZS 3500.1 – Plumbing and Drainage - Water Services
- AS 2033 – Installation of Polyethylene Pipe Systems
- AS 4130 – Polyethylene Pipe for Pressure applications
- AS/NZS 4129 – Fittings for Polyethylene (PE) Pipe for Pressure Applications
- AS/NZS 2053.1 – Conduit and fittings for Electrical installations – General Requirements
- AS/NZS 3000 Electrical Installations

These specifications should be considered a minimum standard.
Any instructions from the manufacturer of specific irrigation components should be followed.
Any instructions from the irrigation designer or relevant MCC staff, for specific work, through extra specifications or drawings, should be followed.
Materials listed under “preferred item” should be used wherever practical. Materials listed under “approved alternative item” can be used without further approval. Any items not listed may not be used unless a request is submitted and approved.

DESIGN

All designs to be done by Landscape/Turf Certified Irrigation Designers
Designs to include any additional specifications relating to the work above and beyond this general specification
Designs to include scaled working drawings suitable for the installer to work from.
Drawings are to be adhered to, however minor variations may be considered appropriate due to site conditions. Any proposed changes should be submitted for approval to MCC before implementing the change.
Designers are to incorporate correctly selected pipe and wire sizing to suit the design and as per current industry standards.
Maximum velocities in mainline pipes not to exceed 1.0 metres/second.
Maximum velocities in lateral pipes not to exceed 1.5 metres/second.
The maximum pressure difference between any two outlets on a lateral is not to exceed 10% of the highest pressure.
Maximum voltage drop from controller to valves is not to exceed 2.4 volts.
Due to the large variation in available pressures in Mackay, all designs must have a flow and pressure test done on the site before commencement of installation.
Designs must include a maximum flow and minimum pressure required.
The installation contractor is to verify the available flow and pressure on site and report if the design parameters are exceeded.
Areas of different irrigation requirements should be separated into separate zones. In particular, lawns and gardens should not be irrigated on the same zone.
Overspray onto surrounding areas is undesirable and should not occur on paths, roads, fences and buildings. Part circle sprinklers should be used on these edges to ensure even coverage of all the irrigation area without overspray.
Sprinklers are to be placed to provide a minimum of head to head coverage

APPROVED CONTRACTORS

All work to be carried out by suitably qualified irrigation installers
Irrigation installers should have a minimum of 5 years experience in urban irrigation
All work should be performed under the supervision of a competent person acceptable to MCC
All work should be carried out according to the relevant Australian Standard, manufacturer’s instructions, this specification and any other job specific specifications issued

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CONTROLS

Refer attached Master General Specification – Central Irrigation Control System

REMOTE CONTROL ACTUATOR

USE

- To allow an operator to manually activate irrigation wirelessly

DESCRIPTION

- Hand held remote transmitter – 9 volt operated
- Mobile Receiver

PREFERRED ITEM

- TRC Commander System

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Receiver to be temporarily connected to controllers via a permanent connector
- In specified cases a receiver may be requested to be installed permanently inside the controller enclosure
- If a receiver is permanently mounted an appropriate antenna will be permanently connected in such a position to allow activation from all areas within that controller's irrigation area
- The antenna should be mounted in a capped PVC pipe bolted to the controller enclosure for protection against vandalism
- Refer to Drawing A4-190 for typical installation details

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REMOTE CONTROL PERMANENT CONNECTOR

USE

- To attach a remote actuator receiver to an existing controller for manual activation of irrigation

DESCRIPTION

- Plastic body construction
- Gold plated connector pins

PREFERRED ITEM

- TRC permanent connector

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed on outside of controller cabinet for access without keys
- Number of stations on connector to be equal to or greater than the number of stations on the controller

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ALTERNATIVE SMALL SITE CONTROLLER

USE

- To control irrigation on small sites where it is deemed not appropriate (by relevant Council staff) to use a centrally controlled controller

DESCRIPTION

- Solar powered controller
- No batteries required
- Non-volatile memory
- Rain or moisture sensor compatible

PREFERRED ITEM

- LEIT-2 two station controller for one or two station systems
- LEIT 4000 four station controller for more than two station systems

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed on 40 mm galvanised steel pole concreted into the ground
- Each alternative controller must be connected to a rainswitch
- Coils on solenoid valves (connected to alternative controller) to be replaced with DC latching coils as specified by controller's manufacturer
- Refer to Drawing A4-191 (1-2 stations) & A4-192 (>2 stations) for typical installation details
- Permission to use an alternative controller must be requested and gained in writing from MCC

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BACKFLOW PROTECTION DEVICES

- Submission and approval of applications to Mackay Water for backflow device installation.
- All systems to incorporate necessary backflow protection device as per Council specifications
- Refer Mackay Water Policies Policy No. MW03
- Backflow devices to be mounted above ground and painted black

MAIN FILTERS

USE

- To avoid contaminants entering an irrigation system at the main connection point

DESCRIPTION

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

PREFERRED ITEM

- Amiad Super screen filter

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- One filter should be installed at each potable water connection point immediately after the backflow protection device and prior to the master valve
- Filters 40 mm and larger to be installed above ground with sufficient clearance from ground and nearby pipe to allow filter element to be removed for cleaning
- Above ground filters to be housed in lockable enclosure
- Filters installed underground the filter to be housed in rectangular valve box
- Swivel unions either side of filter for maintenance
- Filter element housing to be pointing downwards to avoid contaminants falling back into body when filter is removed
- Refer to Drawing A4-193 & A4-194 for typical installation details

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BACK-UP FILTERS

USE

- To avoid contaminants entering an individual irrigation zone
- To be used on micro and drip zones (main filter required) or on sprinkler lines where no main filter is installed

DESCRIPTION

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

PREFERRED ITEM

- Amiad polypropylene screen filter

APPROVED ALTERNATIVE ITEM

- PPI threaded screen filter

INSTALLATION

- One filter should be installed immediately before each solenoid valve operating drip irrigation and prior to the inlet manifold
- One filter should be installed immediately before each solenoid valve operating micro irrigation or sprinklers prior to the first outlet
- Filter to be installed underground and housed in rectangular valve box
- Swivel unions either side of filter for maintenance
- Filter element housing to be pointing downwards to avoid contaminants falling back into body when filter is removed
- Refer to Drawing A4-201 & A4-202 for typical underground installation details

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TRENCHING

USE

- For underground installation of pipes and wiring

DESCRIPTION

- Trenches can be dug by hand, trencher, backhoe, excavator etc

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Unless specified otherwise, turf and/or mulch removal is not required before trenching
- All nearby services to be identified and located prior to commencement of trenching
- Trenches to be in straight lines and uniform grades
- Pipe to be surrounded in minimum 50 mm of sand in all directions
- A minimum of 50 mm clearance is required between pipe and trench wall
- A minimum of 50 mm is required between pipes in shared trenches
- A minimum of 50 mm is required between pipes and control wiring
- Detectable marker tape to be placed above pipes at approx. 200 mm below grade
- Original material to be used for final backfill over sand bedding providing that it is free of all rocks and debris larger than 25 mm
- Trenches to be compacted to the same density as adjacent soil to eliminate any subsequent subsidence
- Final level of compacted material to be on same grade as surrounding surface
- Any excess material to be removed from site
- Unless specified otherwise, turf and/or mulch reinstatement is not required after trenching
- Refer to Drawing A4-195 for typical installation details

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ACCESS SLEEVES

USE

- To allow irrigation pipes and wiring to pass under roads, paths, etc

DESCRIPTION

- Sleeves to be uPVC PN9 pipe
- Sleeves to be large enough to accommodate expected irrigation components plus 50% (eg 63 mm poly requires a 95 mm sleeve or larger)

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed with maximum 450 mm cover under paths, 600 mm cover under roads
- Sleeves to be surrounded in minimum 50 mm sand
- Sleeves to protrude a minimum of 300 mm from edge of path or road

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MAINLINE PIPE

USE

- To distribute water from supply connection to valves

DESCRIPTION

- PE80 or PE100 blue line polyethylene pipe with minimum pressure rating of PN12.5 (lilac striped if effluent water is used)
- PVC pipe will not be accepted

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- To be installed as per manufacturer's instructions
- Elbows and bends to be used (rather than bending pipe) where a change in direction is required
- Use thread tape and sealing compound on threads
- All mains to be installed in trenches with minimum cover of 400 mm
- Installed in trench as per trenching details (Refer A4-195)
- Pipes to be flushed from ends furtherest from source
- Pipe ends left over night to be covered to avoid mud, rocks and vermin entering
- Mainlines to be pressure tested to 175% of nominal operating pressure

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LATERAL PIPE

USE

- To distribute water from solenoid valves to sprinklers and drip manifolds

DESCRIPTION

- PE80 or PE100 blue line polyethylene pipe with minimum pressure rating of PN12.5 (lilac striped if effluent water is used)
- PVC pipe will not be accepted

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- To be installed as per manufacturer's instructions
- Elbows and bends to be used (rather than bending pipe) where a change in direction is required
- Use thread tape and sealing compound on threads
- All laterals to be installed in trenches with minimum cover of 300 mm
- Installed in trench as per trenching details (Refer A4-195)
- Pipes to be flushed from ends furtherest from source
- Pipe ends left over night to be covered to avoid mud, rocks and vermin entering

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POLY PIPE FITTINGS

USE

- For all poly pipe joints

DESCRIPTION

- Metric compression fittings for sizes 16-110 mm
- Electrofusion fittings for all sizes
- 1600 KPa pressure rating
- Tapping saddles will not be accepted

PREFERRED ITEM

- Philmac metric compression fittings
- Plasson electrofusion fittings

APPROVED ALTERNATIVE ITEM

- Plasson metric compression fittings
- Philmac electrofusion fittings

INSTALLATION

- To be installed as per manufacturer's instructions

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ISOLATION VALVES

USE

- To isolate sections of pipe or irrigation items for maintenance
- For manual control of irrigation systems

DESCRIPTION

- Chrome plated brass construction
- Ball valve operation
- Full through bore
- 20, 25, 40 , 50 & 80 mm FBSP inlet and outlet

PREFERRED ITEM

- Dixon

APPROVED ALTERNATIVE ITEM

- Maxiflo

INSTALLATION

- Sizing to be identical to matched irrigation item or pipe
- Housed underground in round valve box if independent of other irrigation items
- Housed underground in rectangular valve box if installed with other irrigation items
- The handle of the valve must maintain a minimum of 50 mm clearance from the valve box, gravel layer and other irrigation components in all positions from fully shut to fully open
- Typical installation as per drawing MCC IS-07 for mainline valves and MCC IS-08 for lateral valves

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AIR VALVES

USE

- To remove air from pipes

DESCRIPTION

- Reinforced nylon body construction
- 25 mm inlet

PREFERRED ITEM

- Ari Segev S-050 automatic air release valve

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- To be installed at high points in main line pipes
- Isolating ball valve installed prior to air valve
- Housed underground in round valve box
- Typical installation as per drawing A4-198

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PRESSURE REGULATORS

USE

- To reduce downstream pressure of solenoid valve to optimum operating pressure of attached irrigation system
- To be included on all solenoid valves operating drip irrigation where upstream pressure is above 300 KPa
- To be included on all solenoid valves operating any other irrigation where upstream pressure is more than 200 KPa higher than the nominal operating pressure of the irrigation outlets

DESCRIPTION

- Glass filled nylon body
- Stainless steel and brass internals
- Attaches to solenoid valve so valve acts as pressure reducing valve

PREFERRED ITEM

- Irritrol OMNI-REG pressure regulator

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed on solenoid valve as per manufacturer's instructions

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PRESSURE REDUCING VALVES

USE

- To reduce downstream pressure on manually controlled irrigation system to optimum operating pressure
- To be included on all drip irrigation where inlet pressure is above 300 KPa
- To be included on any other irrigation where inlet pressure is more than 200 KPa higher than the nominal operating pressure of the irrigation outlets

DESCRIPTION

- Plastic and/or plastic/brass construction
- 20, 25 or 40 mm inlet and outlet
- Sizing to be identical to preceding valve and suitable for nominal system flow and pressure

PREFERRED ITEM

- Bermad pressure regulator

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- To be installed after manual ball/gate valves as per manufacturer's instructions
- Typical installation as per drawing A4-199

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SOLENOID VALVES

USE

- To automatically operate irrigation via a 24VAC signal from a controller

DESCRIPTION

- 25, 40, 50 or 80 mm inlet and outlet
- 1400 KPa rating
- Glass reinforced nylon body
- Nylon reinforced Buna-N diaphragm
- Stainless steel metering system
- Captive plunger in solenoid coil
- Moulded in studs for bonnet attachment
- Brass flow control stem on 50 & 80 mm

PREFERRED ITEM

- Irritrol Century Plus 24 VAC solenoid valve

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

VALVES CONTROLLING SPRINKLERS
- Mounted on double o-ring riser attached to mainline pipe
- Isolating ball valve (and filter if required) installed prior to solenoid valve
- Back-up filter required where there is no main filter at the main irrigation connection point
- Swivel unions installed either side of solenoid valve
- Housed underground in rectangular valve box
- Identified with attached laser etched plastic tag
- Typical installation for valves without back-up filters as per drawing A4-200
- Typical installation for valves with back-up filters as per drawing A4-201

VALVES CONTROLLING MICRO OR DRIP
- Mounted on double o-ring riser attached to mainline pipe
- Isolating ball valve and filter installed prior to solenoid valve
- Swivel unions installed either side of solenoid valve
- Housed underground in rectangular valve box
- Identified with attached laser etched plastic tag
- Typical installation for as per drawing A4-202

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PLASTIC TAG

USE

- To identify solenoid valves, master valves, water meters, filters, controllers, ball valves, quick coupler valves and any other irrigation components

DESCRIPTION

- Exterior grade plastic label
- Blue background colour with white writing
- Writing to be laser engraved into tag
- Minimum size 70 x 45 x 1.6 mm

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Attached to irrigation component with plastic (underground) or stainless steel (above ground) zip tie
- Label to show component type, active controller and input/output number
- Quick couplers and manual valves to also show relevant master valve
- Components without a master valve or controller to show location (eg Twosticks Park)
- Labelling of irrigation components on tags to match information on as built drawings

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QUICK COUPLER VALVES

USE

- To provide manual water access points along mainlines
- To be included in all new works – one immediately after backflow protection device and prior to master valve – one every 50 metres of mainline – one at other strategic points as required (eg near BBQ's, tables, playgrounds

DESCRIPTION

- Brass construction
- Single lug
- Brass spring loaded lid

PREFERRED ITEM

- TR 25mm MBSP brass quick coupler valve

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Mounted on double o-ring riser attached to mainline pipe
- Housed underground in round valve box
- Identified with attached laser etched plastic tag
- Typical installation as per drawing A4-203

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QUICK COUPLER KEYS

USE

- To allow access to water via quick coupler valves
- To be included in all new works – one supplied to MCC upon hand-over

DESCRIPTION

- Brass construction
- Single lug
- Key to include swivel elbow on outlet

PREFERRED ITEM

- TR 25mm MBSP brass quick coupler valve key

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Supplied to MCC upon hand-over

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SWIVEL ELBOW

USE

- To allow free movement of hoses attached to quick coupler keys
- To be included in all new works – one supplied, attached to QC key, to MCC upon hand-over

DESCRIPTION

- Brass construction
- Swivel to allow full 360 degree rotation of elbow when fully tight

PREFERRED ITEM

- Rainspray 25 mm F x M swivel elbow

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Supplied, attached to QC key, to MCC upon hand-over

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VALVE BOXES

USE

- To house irrigation components such as valves and wire joints underground

DESCRIPTION

- Green high density polyethylene (HDPE) base and lid construction
- Stainless steel locking bolt
- Overlay lids
- Lavender lids installed when effluent water is used
- Various sizes available

PREFERRED ITEM

- DURA 910
- DURA 1419-12
- DURA 1723-12
- NDS 809

APPROVED ALTERNATIVE ITEM

- HR Products
- Carson

SIZES

- 16 x 230 mm round boxes (809) to house drip vacuum relief and flush valves
- 250 mm round boxes (910) to house quick couplers, air valves, single gate or ball valves, wire joints
- 475 x 350 x 300 mm rectangular boxes (1419-12) to house ball and solenoid valve combinations, filters etc
- 575 x 425 x 300 mm rectangular boxes (1723-12) to house larger items as required

INSTALLATION

- Boxes supported on all sides by bricks or pavers
- Boxes lined with geo textile fabric to avoid ingress of soil
- Base of box lined with min 50mm gravel for drainage
- Minimum 50 mm clearance between gravel layer and irrigation item (eg valve)
- Minimum 50 mm clearance between bottom of lid and irrigation item (eg valve)
- Final height of top of box to be flush with soil surface in lawn areas and 50 mm higher than finished grade in gardens
- Horizontal alignment to be parallel with surrounding ground
- Box not to come in contact with irrigation item or pipe
- Typical installation as per drawing A4-204

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DOUBLE O-RING ARTICULATED RISERS

USE

- To allow connection of valves and valve-in-head sprinklers to mainline
- To allow valve to be set at serviceable depth irrespective of mainline depth
- To allow alignment of valve irrespective of mainline direction

DESCRIPTION

- Schedule 80 PVC construction
- 1800 KPa rating
- Double o-ring seal per swivel
- 25 or 40 mm MBSP ends x 300 mm long
- Single swivel elbow at one end and double elbow at other

PREFERRED ITEM

- Dura double o-ring articulated riser

APPROVED ALTERNATIVE ITEM

- Spears double o-ring articulated riser

INSTALLATION

- Installed prior to solenoid valves, quick coupler valves, valve-in-head sprinklers
- Refer typical installation drawings A4-197, A4-200, A4-201, A4-202, A4-203

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ARTICULATED RISERS

USE

- To allow connection of pop-up sprinklers to lateral pipes
- To allow sprinkler to be set at serviceable depth irrespective of pipe depth
- To allow vertical alignment of sprinkler irrespective of pipe direction
- To minimise damage to sprinklers and pipe from vehicles

DESCRIPTION

- 15 or 20 mm Rigid grey PVC risers 200 long
- 25 mm Rigid grey PVC risers 300 long
- 15, 20 or 25 mm Polypropylene MF elbows x 3

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed prior to sprinklers
- Riser should be installed less than 45 degrees to horizontal
- Thread tape to be used on riser ends
- Typical installation as per drawing A4-205

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FLEXIBLE RISERS

USE

- To allow connection of pop-up sprinklers to lateral pipes
- To allow sprinkler to be set at serviceable depth irrespective of pipe depth
- To allow vertical alignment of sprinkler irrespective of pipe direction
- To allow positioning of sprinkler irrespective of pipe location
- To minimise damage to sprinklers and pipe from vehicles

DESCRIPTION

- 12.5 ID 17.3 OD flexible polyethylene tube 300- 1000 mm long
- 15 or 20 mm MBSP x twist elbows x 2
- 15 or 20 mm Polypropylene MF elbows x 1 (Note: This elbow is in addition to normally recommended manufacturer's installation instructions)

PREFERRED ITEM

- Olson EZ-EL tube and elbows

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed prior to sprinklers
- Thread tape to be used on all threads
- Typical installation as per drawing A4-206

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RIGID RISERS

USE

- To allow connection of shrub head sprinklers to lateral pipes
- To allow shrub head sprinklers to be set at required height above surrounding vegetation

DESCRIPTION

- 50 mm galvanised steel pipe x 3 metres long
- All pipe and galvanised fittings above ground to be etched and painted black
- 50 mm galvanised bend at base
- Pipe concreted at base

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed prior to sprinklers
- Thread tape to be used on all threads
- Typical installation as per drawing A4-207

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SWIVEL UNIONS

USE

- To allow easy removal of valves, filters or other items for maintenance

DESCRIPTION

- Polypropylene body and swivel
- EPDM o-ring seals
- 25, 40 or 50 mm MBSP x F swivel union ends

PREFERRED ITEM

- Tavlit swivel adaptor

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed either side of solenoid valves and filters
- Thread tape used on male threads only

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SPRINKLERS

FIXED SPRAY SPRINKLERS

USE

- To irrigate areas with overhead watering
- Mainly used in areas up to 5 metres wide

DESCRIPTION

- Zero flush on pop-up
- Flushing on pop-down
- In built check valve
- In built flow shut off valve to restrict water loss if nozzle is removed
- Spray pattern dependent on nozzle selected
- 15 mm FBSP inlet
- Ratcheting riser for easy arc adjustment

PREFERRED ITEM

- Toro 570 XF series sprinklers
- Toro 570 MPR PLUS fixed arc nozzles
- Toro 570 TVAN variable arc nozzles
- Nelson MP Rotator nozzles

APPROVED ALTERNATIVE ITEM

- Toro 570 PRX series sprinklers

INSTALLATION

- 15 mm articulated or flexible risers to connect sprinklers to pipe on pop-up sprinklers
- Shrub head sprinklers mounted on rigid risers
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas
- Pop-up sprinklers mounted with tops (with riser retracted) flush with mulch level in garden areas
- Sprinkler spacings not to exceed sprinkler throw (minimum head to head coverage)
- Typical Installation as per drawings A4-208, A4-205, A4-206, A4-207

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MID RANGE GEAR DRIVEN SPRINKLERS

USE

- To irrigate areas with overhead watering
- Mainly used in areas between 5 - 9 metres wide

DESCRIPTION

- Adjustable arc setting
- 15 mm FBSP inlet
- Ratcheting riser for easy arc adjustment
- 95 mm pop-up riser

PREFERRED ITEM

- Toro Mini 8 series sprinklers

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- 15 mm articulated or flexible risers to connect sprinklers to pipe on pop-up sprinklers
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas
- Pop-up sprinklers mounted with tops (with riser retracted) flush with mulch level in garden areas
- Sprinkler spacings not to exceed sprinkler throw (minimum head to head coverage)
- Typical Installation as per drawing A4-208, A4-205, A4-206

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LONG RANGE GEAR DRIVEN SPRINKLERS

USE

- To irrigate areas with overhead watering
- Mainly used in areas larger than 9 metres wide

DESCRIPTION

- Adjustable arc setting
- In built check valve
- 20 mm FBSP inlet
- Automatic arc return to pre-sep arc if tampered with
- Heavy duty retraction spring
- Continuous rotation provides even coverage when set at 360 degree
- 125 mm pop-up riser

PREFERRED ITEM

- Toro 800 series sprinklers

APPROVED ALTERNATIVE ITEM

- Toro TR50 series sprinklers
- Toro TR50XT series sprinklers
- Hunter PGP sprinklers
- Hunter I21 sprinklers

INSTALLATION

- 20 mm articulated or flexible risers to connect sprinklers to pipe on pop-up sprinklers
- Shrub head sprinklers mounted on rigid risers
- Pop-up sprinklers mounted with tops (with riser retracted) flush with ground level in lawn areas
- Pop-up sprinklers mounted with tops (with riser retracted) flush with mulch level in garden areas
- Sprinkler spacings not to exceed sprinkler throw (minimum head to head coverage)
- Typical Installation as per drawing A4-208, A4-205, A4-206, A4-207

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DRIP PIPE

USE

- To irrigate gardens and lawns with a network of sub-surface in-line drippers

DESCRIPTION

- 14 mm ID 16 mm OD polyethylene tubing
- In-built root intrusion protection impregnated in drip emitter
- 2.4 l/hr pressure compensated emitters
- Standard spacings of 0.4 metres between emitters unless design requires closer spacing

PREFERRED ITEM

- Toro DRIP-IN with ROOTGUARD 16 mm 2.4 l/hr PC 0.4 m spacing

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed with 100 mm soil coverage in lawns
- Installed on soil surface and covered with 100 mm of mulch in garden beds
- Drip pipe in gardens to be held in place with stakes at minimum of 5 metre intervals and at every fitting
- All fittings to be multi barbed fittings with stainless steel clips
- Typical row spacings of 0.4 m unless specified otherwise by designer
- Installed as per manufacturer's specifications
- Typical installation as per drawing A4-209

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DRIP PIPE MANIFOLDS

USE

- To distribute water from the source to the drip pipe network
- To collect water from the drip pipe network for flushing
- To ensure even pressures throughout the drip network

DESCRIPTION

- 32 or 25 mm low density polyethylene LDPE

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Installed at same level as drip pipe in lawns
- Installed with 50 mm soil coverage in garden areas
- All fittings to be multibarbed fittings with stainless steel clips.
- Fittings from manifold to drip pipe to be multi barbed start connectors with stainless steel clamps

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DRIP PIPE FITTINGS

USE

- To join manifold pipe and drip pipe

DESCRIPTION

- Black polypropylene fitting construction
- Minimum of 2 barbs on each connection
- Grade 304 stainless steel clamp construction

PREFERRED ITEM

- Philmac rural compression fittings
- Toro Drip-In 16 mm triple barbed fittings
- Netafim 16 mm double barbed fittings
- Cobra 16.5-18.0 mm stainless steel clamps
- Netafim landscape stakes

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Compression fittings used on manifold pipes
- Multi barbed fittings used on manifold to drip, and drip pipe
- Stainless steel clamps used on all multi barbed fittings
- Installed as per manufacturer's specifications

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DRIP VACUUM RELIEF VALVES

USE

- To relieve air from drip systems on start up
- To avoid vacuum forming in drip systems on shut down

DESCRIPTION

- 15 mm MBSP inlet
- Plastic body construction

PREFERRED ITEM

- Netafim 15 mm air release valve

APPROVED ALTERNATIVE ITEM

- Bermad 15 mm vacuum air release valve
- Toro 15 mm air vacuum breaker

INSTALLATION

- Located at high points in drip system
- Installed in round valve box
- Installed as per manufacturer's specifications
- Typical installation as per drawing A4-209 & A4-210

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DRIP FLUSH VALVES

USE

- To automatically flush drip systems on start up and shut down

DESCRIPTION

- 15 mm MBSP inlet
- Plastic body construction

PREFERRED ITEM

- Netafim 15 mm flush valve

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Located in drip system flush manifold at furtherest point from source
- Installed in round valve box
- Installed as per manufacturer's specifications
- Typical installation as per drawing A4-209 & A4-211

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MAINTENANCE

USE

- To ensure irrigation system and components are working as expected

DESCRIPTION

- Regularly visit site and maintain irrigation system
- Test each station for controller operation and programming, valve operation, sprinkler operation, height adjustment of sprinklers, valve boxes, and subsidence of trenches
- Repair any defects found
- Defects to be fixed by the irrigation installer

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Maintenance period and number of visits to be determined as stated in individual contracts

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WARRANTY

USE

- To ensure irrigation components and workmanship are covered against defects

DESCRIPTION

- Any materials found to be faulty during the warranty period will be repaired or replaced
- Any workmanship found to be faulty during the warranty period will be repaired or replaced

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Warranty period will be as per manufacturer's warranty for materials and 12 months for workmanship
- The warranty period will commence from the date of final practical completion of the total contract

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AS CONSTRUCTED DRAWINGS

USE

- To provide detailed drawings of as constructed services

DESCRIPTION

- Drawings to show position of all valves, controllers, pipes, sprinklers and any other irrigation components

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- All as constructed drawings shall be drawn and provided in accordance with specification D20 – Drawings and documentation.
- Presented in paper and transparency format of size A1 to allow reasonable interpretation.
- Supplied electronically in AUTOCAD .dwg format in accordance with Specification D20.
- Labelling of irrigation components on drawings to match information on plastic tags.

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MANUALS

USE

- To provide a binder of all relevant information of the irrigation system for future reference

DESCRIPTION

- Binder to include the following for all equipment used;
- Operating and installation manuals
- Product brochures
- List of all equipment installed
- As constructed drawings on paper and CD

PREFERRED ITEM

-

APPROVED ALTERNATIVE ITEM

-

INSTALLATION

- Presented in A4 3 ring binder
- Binder to have site description, contractors name and date of installation included on front cover and spine
- Provide 2 copies

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