

## **IRRIGATION SPECIFICATIONS**

## **Section A: MISCELLANEOUS & GENERAL REQUIREMENTS**

The Irrigation Specifications forms an integral part of the contract documents listed in Item 1 hereof and supplements any standard referred to.

**In the event of any discrepancy with a part or parts of any of the documents listed in Item 1 hereof, the Irrigation Specifications shall take precedence, with the exception of: in the event of any discrepancy between the General Landscaping Specifications and the General Irrigation Specifications, the Landscaping Specifications shall take precedence.**

In the event of any discrepancy between the IRRIGATION SPECIFICATIONS and the Schedule/Bill of Quantities, the Schedule Bill of Quantities shall take precedence.

All work, where applicable, must be carried out according to this specification.

The Landscape Contractor must take note of the contents of this specification as well as the type and extent of the work, as no claims will be anticipated as a result of misinterpretation. Vagueness and discrepancies should be discussed with the Landscape Architect prior to tendering without delay.

The Landscape Contractor must only take the information/items of Section B: GENERAL IRRIGATION SPECIFICATIONS, which refer either directly or indirectly to items in the Schedule of Quantities for this project into account and must acquaint himself properly with the same, as no claims will be entertained as a result of negligence.

The Landscape Contractor shall supply with his tender a fully itemised breakdown of all items necessary for the installation of this contract.

**DEFINITIONS:** In the GENERAL LANDSCAPING SPECIFICATIONS, LANDSCAPING PLANS & TENDER DRAWINGS, IRRIGATION SPECIFICATIONS, IRRIGATION TENDER DRAWINGS & SCHEDULES OF QUANTITIES, the 'contractor' means the Landscape Contractor whether he is directly employed by the client or subcontractor to the main contractor

In the same documents as above, 'subcontractor' means a subcontractor to the Landscape contractor

**ABBREVIATIONS:** LA = Landscape Architect

1. The work shall be carried out by experienced tradesmen under the supervision of persons qualified to interpret and implement the contract drawings and specifications according to trade conventions as well as understand and be authorised to act on instructions issued by the Landscape Architect.
2. The onus is on the Contractor to produce work which conforms in quality and accuracy of detail to the requirements hereinafter specified.
3. The Contractor shall not cause any interference to traffic along public highways, private roads or footpaths, or cause any damage. They shall be kept free of soil, mud, vegetation or any other obstruction. Any damage caused shall be made good to the satisfaction of the Landscape Architect.
4. The Contractor shall take special care to avoid damage to existing vegetation including the root systems. Any damage caused shall be made good at the Contractor's expense.
5. The Contractor shall satisfy himself of the position of any services on site and make good any damage caused by him to such services at his own expense. Information is available from the Main Contractor & Landscape Architect.
6. The Contractor shall set out the Works according to his drawings and shall agree the setting out with the Landscape Architect, prior to installation.

## **Section B: GENERAL IRRIGATION SPECIFICATIONS**

### **9.1 GENERAL CLAUSES**

#### **9.1.1 Scope of Work**

The irrigation works comprise the installation of an automatically controlled irrigation system in the landscaped areas as shown in the General Layout Drawings, including equipping an existing borehole with a submersible pump and the installation of a delivery pipeline from the borehole, storage tanks and an irrigation booster pump. The Contractor shall be required to maintain the irrigation for a period of 6 months from the date of Practical Completion.

#### **9.1.2 Contract Drawing**

The Contract Drawings comprise part of the Contract Documents and shall be read in conjunction with the Specifications and Schedules of Quantities.

The Works shall be executed in accordance with the Specification and Drawings and any subsequently authorised variation, to the complete satisfaction of the Landscape Architect.

#### **9.1.3 Personnel on Site**

The work shall be carried out by experienced tradesmen under the supervision of persons qualified to interpret and implement the contract drawings and specifications according to trade conventions as well as understand and be authorised to act on instructions issued by the Landscape Architect.

#### **9.1.4 Existing Services**

The Contractor shall satisfy himself of the position of any services on site and make good any damage caused to such services at his own expense. Information is available from the Main Contractor or Professional Team.

#### **9.1.5 Setting Out**

The Contractor shall set out the Works according to the Drawings and shall agree the setting out with the Landscape Architect prior to installation.

### **9.2 CONSTRUCTION AND INSTALLATION**

#### **9.2.1 Pipes and Accessories**

9.2.1.1 Pipes shall be laid in the positions indicated in the General Layout Drawings or as directed by The Landscape Architect.

9.2.1.2 High density polyethylene (HDPE) and low density polyethylene (LDPE) pipes shall be laid in the bottom of the trench with sufficient "snaking" to accommodate normal expansion and contraction. Where solvent weld fittings are used with uPVC pipes, provision shall be made for expansion joints at intervals as recommended by the pipe manufacturers.

9.2.1.3 Changes in pipe diameter and/or class shall only be made in the positions shown in the drawings.

9.2.1.4 Notwithstanding the class of pipe which may be shown on the drawings, any piping to be buried directly under paving, tarmac or constructed areas shall be of a class as directed by the engineer on site.

9.2.1.5 Different classes of pipe of the same diameter shall be stored separately on the site, and



special attention shall be paid that the correct classes of pipe are installed according to the drawings.

- 9.2.1.6 Before laying, UPVC pipes shall be carefully examined to see that they are not cracked or otherwise damaged, especially at the spigot end, and that they are not obstructed on the inside.
- 9.2.1.7 Defective or damaged pipes, fittings or other material shall be laid aside for The Landscape Architect to inspect and to decide if these materials must be rejected or can be repaired.
- 9.2.1.8 Pipe fittings shall be installed in strict accordance with manufacturer's recommendations using approved lubricant in the case of fittings for uPVC pipes, and any special tools which may be necessary. All threads shall be properly waterproofed using teflon tape or other proprietary sealant.
- 9.2.1.9 No reductions in pipe diameter shall be made upstream of the positions specified but may be made downstream of such positions.
- 9.2.1.10 Holes drilled in pipes for saddles shall be of an equal size to that the saddle outlet, and unless the holes are drilled with the saddle bolted in its final position, a mandrel [the drill bit] shall be used to ensure that the positions of the holes fully coincide before the saddle is bolted up.
- 9.2.1.11 Where polyethylene pipes of 63 mm diameter or less are used no thrust blocks or support blocks are required.
- 9.2.1.12 For all other pipes thrust blocks and support blocks shall be constructed in class 15/19 concrete at all points where the flow in the pipes changes direction through a fitting in accordance with the respective irrigation detail.

## 9.2.2 Sprinklers and Sprayers

- 9.2.2.1 The positions of sprinklers which do not adjoin an identifiable feature like a kerb or mowing edge are to be pinpointed in the following way:
  - [a] Scaling off from the drawing and using a measuring tape to establish a preliminary position on the ground.
  - [b] Evening up the interval between the sprinklers in all directions so that they are approximately equidistant.
  - [c] Installation of sprinklers in close proximity to obstacles which may interfere with the intended pattern of coverage must be avoided. In such cases, the contractor shall seek the guidance of The Landscape Architect in repositioning the sprinklers.
- 9.2.2.2 If the landscape layout does not conform with that shown in the drawings, The Contractor shall seek guidance from the Landscape Architect who may instruct him to adjust the sprinkler positions to obtain the best coverage under the circumstances.
- 9.2.2.3 On flat ground, pop-up sprinklers shall be installed with the top horizontal to the finished surface. Where adjacent areas are higher than the sprinkler head, the sprinklers shall be tilted to obtain the best coverage.
- 9.2.2.4 Sprinkler riser pipes shall be installed in an upright position and the soil around the riser pipe shall be tamped down so that the riser pipe is held firmly in place.
- 9.2.2.5 Galvanised steel riser pipes shall, before or after installation, be painted in an approved shade of green with a grade of waterproof paint suitable for outdoors.

- 9.2.2.6 All sprinklers, sprayers or turf valves shall be fitted to the sprinkler pipe by means of a flexible swing arm as shown in the detail drawings so that they can be raised or lowered in relation to finished level.

### 9.2.3 Quick Coupling Valves

Quick coupling valves shall preferably be positioned in lawn areas. If in bed areas they must be installed within 500mm of a hard surface next to the bed for accessibility.

### 9.2.4 Control Valves

Control valves shall be installed either in lawn areas or within 500 mm of a hard surface if in beds. All underground valves shall be installed in valve boxes, and the valve shall be installed upright and square in the box, with not less than 50mm clearance between the top of the valve and the underside of the lid. For solenoid valves, a half metre length of control wire shall be coiled inside the valve box to facilitate maintenance. Threaded connections and the whole assembly shall be totally watertight.

### 9.2.5 Control Wires

- 9.2.5.1 Control wires shall be laid as far as possible in the same trenches with the mainline pipes, with at least 5% of slack. Where there is more than one control wire in a trench, the wires are to be bound together at intervals of 1.5 metres with nylon cable straps. For wires which lie in the same trenches as irrigation pipes, the wires are to be strapped to the underside of the larger of the pipes by the same method.
- 9.2.5.2 Wire which is laid in a separate trench to the irrigation pipes must be laid at a depth of at least 400 mm and not more than 700 mm below finished level.
- 9.2.5.3 If The Contractor is in doubt as to the positioning of the control wires he must seek guidance from The Landscape Architect.
- 9.2.5.4 All control wires laid under hard surfaced or constructed areas must be installed in sleeves.
- 9.2.5.5 If The Contract calls for the installation of the control wires in more than one work phase, the run of wires in each phase must terminate in junction box at the boundary of that phase with the ends of the cores connected into a terminal block.
- 9.2.5.6 Joints between the valve leads and the ends of the wires are to be made inside the valve boxes also using approved proprietary waterproof wire connectors.
- 9.2.5.7 Spare wires leading to the valve box are to have their ends sealed using the same method as that used for making joints.
- 9.2.5.8 Single core control wire layouts shall comprise of a single "common" wire linking the controller common output to all valves and a separate "live" wire between each controller output terminal and each valve.
- 9.2.5.9 More than one valve may not be connected to a single "live" wire unless stated to the contrary elsewhere in the contract. "Doubling up" in order that valves operate in parallel must be effected at the controller terminal block.
- 9.2.5.10 Joints between the common wire and branches of the common wire leading to individual valves or valve groups shall, as far as possible, be made in the nearest valve box or junction box, even if this procedure involves additional cabling. Only if this, in the opinion of the Landscape Architect, is impractical, may joints be buried directly, and then must be left open for his inspection until the control cable system has been tested for leakage in the prescribed manner.



## 9.2.6 Controller Enclosures and Accessories

- 9.2.6.1 Controllers which are sited outdoors shall be installed in lockable, weatherproof steel cabinets of an approved type and of sufficient size to comfortably accommodate the controller/s together with any additional control accessories and the wiring. Subject to the following requirements, controllers located indoors may be mounted directly on the wall.
- 9.2.6.2 Where the controller has no integral terminal block for the output and input leads, a terminal block must be provided, and must be properly labelled so that all the leads can be easily identified. In such cases, or where an additional transformer or other control accessories are required, the controller shall be installed inside a cabinet and the accessories must be mounted securely in a suitable position on a panel inside the cabinet.
- 9.2.6.3 All wiring inside the cabinet shall be finished in a professional manner and shall comply with the respective municipal code and all interior wires must be strapped and properly affixed to the panel. Wires between the cabinet and the point where they enter the ground shall be enclosed in approved conduit and the whole job finished in a professional manner.
- 9.2.6.4 Wall mounted cabinet or controllers shall be firmly affixed to the wall using wall plugs and screws. Pedestal mounted controllers or cabinets shall have a pedestal mounting of an approved type and of sufficient strength to withstand the presence of the public, and pedestal shall be securely anchored to a concrete block in the ground.

## 9.2.7 Excavation and Backfilling of Trenches

- 9.2.7.2 The alignment of the trench shall be determined by the shortest route between the points of change in direction shown on the drawings, with special consideration given to a route which will be easily recognisable from the "as built" drawings showing distances from salient features like buildings, kerbs and other identifiable physical boundaries.
- 9.2.7.3 Where the route of mainline pipes and/or control cables coincides with that of sprinkler pipes, the trench for the sprinkler pipe shall be excavated to the same specification of that for the mainline pipe, and both pipes shall be installed in the same trench. The quantity of trenching measured in the Schedule of Quantities is the net quantity of trenching required in the foregoing respect.
- 9.2.7.3 The excavations shall be straight and wide enough that the pipe can be laid along the centre of the trench with sufficient clearance on either side of it to accommodate the selected fill and permit proper compaction thereof. In all cases, any stones or other obstacles which would touch the pipe shall be removed from the base and sides of the trench.
- 9.2.7.4 Unless expressly stated elsewhere in The Contract, no distinction of any kind regarding the classification of soft and hard material will be made, and the rates tendered for earthworks shall make provision for excavation and backfilling in hard material if any and no claim for additional compensation in this regard shall be considered.
- 9.2.7.5 In soft landscaping, the procedure for backfilling and compaction of the trenches, and the material used shall result in the same degree of compaction as in the surrounding planting area such that no subsidence occurs afterwards in the backfilling.
- 9.2.7.6 In other than areas to be planted, backfilling shall be according to the specifications in the main contract or to site engineer's instructions.
- 9.2.7.7 If the backfill is not considered by the Landscape Architect to be moist enough for good compaction, water must be added to facilitate the process.
- 9.2.7.8 Joints in the mainline pipes and fittings must be left open for inspection by The Landscape Architect until pressure testing has been completed and the results have his approval.



9.2.7.9 Suitable material for filling around pipes shall, if deemed necessary by the Landscape Architect, be selected from that excavated by passing it through a 40mm sieve.

9.2.7.10 The Contractor shall make every effort to acquaint himself with the positions of existing services. Provided that these have been indicated to him, any damage to such services and utilities shall be repaired by the contractor at his own expense.

#### 9.2.8 Sleeves

9.2.8.1 Unless otherwise stated in The Contract, all sleeves under buildings and main access roads will be provided by others. Where sleeves are required to be installed by the contractor, the surface under which the sleeves are installed must afterwards be fully reinstated to its' former condition. The material used for the sleeves must be strong enough to withstand the degree of compaction required to achieve this.

#### 9.2.9 Practical Completion

9.2.9.1 A certificate of practical completion may only be issued once the following requirements have been met.

9.2.9.2 Before trenches are completely backfilled, The Contractor shall pressure test all pipework which may be subjected to full static pressure from the source, using equipment intended for this purpose and provided by him.

9.2.9.3 The pressure test shall determine that there are no partially fractured pipes in the network, that any thrust blocks have been properly constructed, and to determine the degree of leakage from the network if any.

9.2.9.4 The test shall be conducted by filling the pipe network upstream of the control valves with water until all air has been excluded from the pipes. Thereafter, under static conditions, the pressure shall be raised to 1.5 times the recommended maximum working pressure for the control valves. The allowable leakage rate shall be no perceptible pressure loss measured over a period of 1 hour.

9.2.9.5 Interpretation of the results of the pressure test as satisfactory or otherwise shall be at the sole discretion of The Landscape Architect.

9.2.9.6 If the results indicate an unacceptable degree of leakage from the system, the Contractor shall at his own cost, locate the leaks and effect the necessary repairs so that a repeat test can be concluded to the satisfaction of the Landscape Architect. All costs of repeat tests shall be borne by The Contractor, including those of the Landscape Architect if he is unable to receive compensation from the employer.

9.2.9.7 Upon satisfactory conclusion of pressure testing, the joints and fittings in the pipeline shall be backfilled and properly compacted.

9.2.9.8 After pressure testing, and before sprinkler heads and nozzles are finally installed, all pipes and equipment shall be systematically flushed, starting nearest the source, until no debris remains in the system.

9.2.9.9. All valves shall then be checked for correct closure and the bonnet removed for cleaning and further flushing if the valve contains stones or other foreign matter.

9.2.9.10 The pressure in the various zones shall be adjusted to that specified for the types of sprinklers concerned using the flow control on the valves.

9.2.9.11 All sprinklers shall be adjusted for distance of trajectory and sector of circle, according to the requirements on site.

9.2.9.12 Irrigation times shall be set according to the current irrigation requirements such that an adequate and economical watering regime is achieved and all plant material is maintained in optimum conditions of development.

9.2.9.13 Any other adjustments must be made as directed by the Landscape Architect.

9.2.9.14 The Contractor shall furnish the Main Contractor's representative or Landscape Architect with an operating and maintenance manual including the following items :

- \* Reproducible "As built" drawings of the system showing the location of all pipelines, control valves and sprinklers, with each valve on the drawing marked with the number of the controller station which operates it.
- \* A full set of operating instructions including technical literature provided by the manufacturers covering the operation, adjustment and maintenance of all equipment installed.
- \* A list of recommended spare parts together with the names and addresses of two alternative suppliers.
- \* A complete set of any specialised tools necessary for carrying out routine adjustments or maintenance work on the system shall be supplied.

### **9.3 GENERAL STANDARDS FOR MATERIALS AND EQUIPMENT**

#### **9.3.1 Quality General**

9.3.1.1 All materials and equipment used in The Contract shall be new and of a quality without defects to satisfy all the requirements as prescribed in the specifications, and to withstand the conditions under which the equipment will be operating. Full descriptions and specifications for materials used in the contract are given in the Detailed Specifications.

#### **9.3.2 Manufacturers Warranties and Servicing Facilities**

9.3.1.2 All materials and equipment shall carry a full guarantee by the manufacturer or distributor covering defective materials and workmanship, and the manufacturer or distributor of the equipment shall have a full and permanent facility in South Africa for replacing and repairing or servicing the equipment, such facility carrying a stock of all the necessary spares so that these services can be effected without delay.

#### **9.3.3 Pipes**

9.3.3.1 Pipe sizes, classes and quality shall correspond with those shown in the General Layout Drawings and given in the Detailed Specifications. The substitution of larger pipes or pipes of a higher pressure rating or quality to that specified may be accepted [at the rates tendered for this item] at the sole discretion of the Landscape Architect.

9.3.3.2 Low density polyethylene pipe Type I which is offered as a substitute to that specified shall be from an approved source and of an approved quality which, if it does not comply with the raw material specification of SABS 533 pipe, shall at least comply with the dimensional tolerances thereof.

9.3.3.3 In the case of non SABS pipe, The Contractor shall be required to supply the Landscape Architect with proof of the original source of the pipe. If the Landscape Architect is not satisfied that the source constitutes an "approved source", he reserves the right to have an analysis undertaken at the cost of the contractor in order to establish the quality of raw materials from which the pipe has been manufactured.



9.3.3.4 HDPE pipe used in the contract shall be in accordance with SABS specification No. 533 [revised] or ISO-4427.

9.3.3.5 uPVC pipe used in the contract shall comply with SABS 966 of 1977, and unless specified otherwise elsewhere in the contract document, shall be in 6.0 metre lengths, of a type with integral rubber ring or lip seal joints.

#### 9.3.4 Pipe Fittings

9.3.4.1 Where nylon insert fittings are specified for use with Type 1 LDPE pipe, hose clamps of a stainless steel or nylon shall be used. Clamps of materials other than these, whether coated or uncoated are not acceptable for use in the contract.

9.3.4.2 Fittings for use with uPVC pipes shall, unless otherwise specified, be of the rubber ring or lip seal type of at least the same pressure rating of the pipe, manufactured preferably of hot moulded uPVC to SABS 966 of 1977, or if not available in this specification, of cast iron. Aluminium fittings will not be accepted for use in the Contract unless specified elsewhere in the contract document.

9.3.4.3 All fittings used with HDPE pipe shall be "Plasson" or equivalent type compression fittings.

9.3.4.4 Malleable iron fittings for threaded steel pipes shall be galvanised and manufactured in accordance with SABS specification No. 509 of 1975.

#### 9.3.5 Sprinklers and Sprayers

9.3.5.1 The tenderer shall specify the make and model of all sprinklers and sprayers that he proposes to use in The Contract by submitting descriptive literature together with his tender. Such descriptive literature shall also include performance tables of the sprinklers or sprayers covering their discharge rates and wetted radii.

9.3.5.2 It shall be the expressed responsibility of the contractor to ensure that the delivery rates and wetted radius of sprinklers offered for use in the Contract conform with those shown in the General Layout Drawings and Detailed Specifications, at the operating pressures specified therein, subject to a tolerance of up to plus or minus 5.0%.

#### 9.3.6 Solenoid Valves

9.3.6.1 Solenoid valves shall be of an approved proprietary brand with 24 volt AC solenoids, purpose manufactured for landscape and turf irrigation fitted with flow control and rated for at least 900 kPa working pressure.

#### 9.3.7 Brass gate valves

9.3.7.1 Brass gate valves shall be of the female threaded type with non-rising spindle, rated for 1000 kPa pressure and manufactured to SABS 776.

#### 9.3.8 Single Core Control Wire

9.3.8.1 Single core control wire shall be of PVC covered, multiple strand copper conductor known in the trade as "house wire" and shall comply with SABS specification 1507.

#### 9.3.9 Valve boxes

9.3.9.1 Valve boxes shall be of an approved type manufactured in green plastic of sufficient strength to withstand normal pedestrian traffic.

#### 9.3.10 Wire connectors

9.3.10.1 Wire connectors shall be of an approved proprietary brand purpose manufactured for use in

irrigation. Wire connectors made "in house" are not acceptable for use in the contract.

#### 9.3.11 Irrigation Controllers

9.3.11.1 Irrigation controllers shall be equipped with at least the following basic features in addition to those listed in the detailed specifications:

- [1] Remote pump start.
- [2] A programmable irrigation time on each station from a minimum of not more than two minutes to a maximum of not less than one hour.
- [3] Provision for two or more irrigation cycles per day.
- [4] Provision to operate at least two 24 volt solenoid valves and a pump start relay simultaneously.
- [5] Water budgeting
- [6] Dual programme
- [7] Lightning and surge protection on the input and output sides of the controller.
- [8] Battery backup of both real time and the irrigation settings.

#### 9.3.12 Pumps and Ancillaries

9.3.12.1 The contractor shall, if the pump he is offering is different from that specified, submit with his tender full details of the alternative pump he is offering, including performance curves of flow versus head, power absorption and NPSH.

9.3.12.2 In offering an alternative pump to that specified, the contractor expressly guarantees that the pump will perform in accordance with the specifications, and if it does not, he shall be liable to replace it with a suitable substitute at his own cost.

9.3.12.3 Electrically powered pumps which are not of the Monoblock or close coupled type, shall be fitted with a motor of sufficient power that the pump cannot overload the motor within any part of the performance range of the pump. Motors shall be of the totally enclosed, fan cooled type with IP55 or IP 44 enclosure.

9.3.12.4 Pump units which have exposed drive shafts and coupling assemblies shall be fitted with an approved coupling guard.

#### 9.3.13 Pump Fittings

9.3.13.1 All pumps shall be fitted with a glycerine filled pressure gauge with a pressure reading range of not less than the pump shut-off pressure plus 100 kPa. The gauge shall be mounted where it can be easily read on the outlet side of the pump, upstream of any control valve, and shall be provided with a three way cock and bypass tube to the downstream side of the control valve.

9.3.13.2 Dry standing pumps with a flooded suction arrangement shall be fitted with a gate valve or butterfly valve of the same nominal size as the suction line between the source of water and the pump suction flange.

9.3.13.3 Unless otherwise specified, all pumps shall be fitted with a control valve and a non return valve for each pump unit on the discharge side, of the same nominal diameter as the pump discharge pipe.

9.3.13.4 All pumps shall be fitted with protection against no-flow conditions resulting from drops in



water level or failure of valves to open. The protection shall consist of a cut-out relay wired into the circuit of the magnetic contactor and activated either by a phase angle relay or a flow switch mounted in the pump discharge. In both cases, a time delay mechanism must be incorporated into the circuit so that the cut out is delayed for 5 minutes after activation to allow for temporary hydro-dynamic conditions while valves change over.

- 9.3.13.5 Pump starter panels containing 220 volt or 380 volt equipment shall comply with the respective municipal code for electrical works. Basic pump starting equipment for 380 volt motors shall include a direct on line magnetic contactor with standard overload protection and lightening/surge arrestors. All connections shall be clearly labelled and a circuit diagram of the equipment shall be affixed inside the door of the cabinet. Starter panels for automatic pump start shall include the necessary relays for remote pump starting together with a manual pump start/stop override which must operate through the protective devices previously described.

9.3.14 Submersible Pumps

- 9.3.14.1 All submersible pumps and other borehole pumps shall be supplied and installed in strict accordance with The Borehole Water Association of South Africa minimum code of practice.
- 9.3.14.2 Special attention shall be given to complying with manufacturer's recommendations as to wiring and cable sizes and clearance in the borehole for cooling of the pump.

**9.4 PROVISION OF ELECTRICAL POWER**

- 9.4.1 Unless otherwise stated in the contract, a suitable 220 volt 15 amp plug point will be provided by others at a point not more than 2 metres from the position of the irrigation controller.
- 9.4.2 A mains board of suitable capacity for the pump motor will be provided by others at a point not more than 5 metres from the specified position for the pump starter panel.

**9.5 MAINTENANCE**

9.5.1 Warranty

- 9.5.1.1 The Contractor shall be responsible for maintaining the system mechanically and electrically in a fully operational state, and free of any defects or malfunctions whatsoever at all times during the maintenance period stated in The Contract. The contractor shall be required to visit the site at least once a month and check the system thoroughly to see that it is operating according to The Specifications.

9.5.2 Operation

- 9.5.2.1 During the contract maintenance period, the Contractor shall be responsible for the following tasks.
- [a] Day to day operation of the system including necessary changes to controller settings such that the watering regime maintained is adequate and economical.
  - [b] Any landscape maintenance tasks which if not carried out could adversely affect the performance of the system, including trimming the grass around pop-up sprinklers so that they do not become overgrown and ensuring pop-up sprinklers in beds do not become covered with soil.
  - [c] Checking and adjusting the trajectory and spray radius of all sprinklers in relation to overspray onto pathways, car parks, buildings etc. consistent with effective coverage of the planted area.

[d] Cleaning any filters incorporated into the system.

#### 9.5.3 Contractors Personnel and Equipment

Maintenance work shall be undertaken by a team of at least two suitably qualified persons equipped with two way radio and all specialised tools necessary for testing equipment and effecting proper repairs.