

شركة تطوير العقبة  
AQABA Development Corporation



المملكة الأردنية الهاشمية

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المواصفات الفنية

Landscape Irrigation System Specification

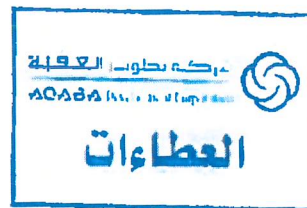


أيار 2023

شركة نتجي الرواشدة وشركاه  
المؤسسة الإقليمية للتجهيزات العامة

# Landscape Irrigation System Specifications and Quantities

Aqaba Town Park  
Aqaba – Jordan  
2021  
By  
MK Associates



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## Landscape Irrigation System Specifications

### 1 General:

The contractor shall comply with the requirements in the design requirements.

The system shall be controlled automatically by central control system.

#### 1.1 Work Included

- A. Supply and install test and maintain all pipe, fittings, valves, risers and caps, controllers, control wires, sprinklers, bubblers and emitters for a landscape irrigation system.
- B. Setting in operation, commissioning and user in operation and maintenance of the system.
- C. Provision of spare sprinklers, bubblers and emitters with a minimum number of 5 % for each type.
- D. Programing the irrigation controller to irrigate based on the weather station data.

#### 1.2 Requirements

- A. The irrigation contractor shall have an experience in similar projects.
- B. The irrigation contractor shall provide comprehensive installation records and Instructions, operation and maintenance guidelines to ensure that the system is Installed and operated as designed.
- C. An expert irrigation engineer (7 years experience) is to be made available on site, to supervise the installation of the system, towards the putting into operation.
- D. The irrigation contractor shall provide detailed information on the items on the B.O.Q which he proposes to use for the irrigation system.

#### 1.3 Shop Drawings and Product Data

- A. Drawings are indicative of the work to be installed. Eventual location of bubblers and emitters is important to give even distribution over each area. It is important to note that field changes can effect final operation and shall not be made without approval. Work shall be installed in the most direct and work manlike manner, so that conflicts on other utilities, eventual planting and architectural features should be avoided.
- B. Drawings should explain wiring the solenoid valves to the irrigation controller(s).
- C. As-built: Drawings should be updated daily by Contractor to reflect the work accomplished. These drawings will be subject to inspection through out the duration of the contract. Reproducible as-built drawings of the irrigation system will be submitted to and approved by the Supervising Engineer prior to final acceptance of the irrigation work.

#### 1.4 Suitability

- A. All equipment provided shall be suitable for operation under the ambient condition applying.
- B. All items shall be complete with all wiring, piping, controls, safety device and accessories necessary for proper, efficient and safe operation.

#### 1.5 Operation and Maintenance Data

- A. Submit operation and maintenance data in accordance with relevant Specification.
- B. Submit all Operation and Maintenance data and warranties at least 6 weeks prior to proposed hand over of facilities.
- C. At completion of work, provide a qualified and trained manufacturer's representative to demonstrate the operation of each item of equipment and instruct owner in the operating procedure and maintenance.

#### 1.6 Submittals

- A. Schedule for submittals shall be such as to allow adequate time for The Supervising Engineer's review immediately to the completion of works. Schedule for submittals shall be submitted at an early date and shall have the Supervising Engineer's approval.
- B. Submit operating and maintenance data and warranties at least six (6) Weeks prior to proposed hand-over of facilities.

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## 2 Materials

### 2.1 Pumping Station

The pumping station shall be factory assembled and consists of a set of electrical motor centrifugal multistage pumps with one frequency converter control to provide the required flow and pressure. Pump should have a water lubricated mechanical seal and water lubricated pump bearings, the pump shaft is stainless steel as well as impellers. The motor is totally enclosed fan cooled.

The pumping station should be selected according to the following specifications:

Flow = 30 m<sup>3</sup>/h and pressure = 5 Bar

Pump should be provided by pressure switches, pressure gauges, float high/low water level sensor, strainers. An isolated manual valve should be fitted to each side of pump. Non return valves should be fitted to each delivery side of pumps.

A. Isolating valves shall be fitted to suction and delivery connections with non-return valves adjacent to early pump delivery branch respectively and strainers fitted on each suction pipe.

B. Control panel shall be mounted in the pump room in a dust-tight, splash proof enclosure. The starter water proof panel shall include the following:

- Emergency stop
- Ammeters
- Voltmeters
- Contactors
- Selector switches
- Pressure switches
- Circuit breaker
- Over load protection
- Indicators

### 2.2 Filtration System

#### 2.2.1 Filters

##### 2.2.1.1 Fiberglass Sand Filters

Shall be made of steel, and epoxy coated in all parts.

Shall have a nominal flow of 35-40 m<sup>3</sup>/hr.

Shall be equipped with pressure gauges.

Shall be equipped with flushing valve.

Shall be equipped with air release and vacuum valve kit.



### 2.2.1.2 Automatic Spin Klean(Clean) Rotor Disc Filters Set

Shall be made of plastic.

Shall have a nominal flow of 35-40 m<sup>3</sup>/hr.

Shall be equipped with pressure gauges.

Shall be equipped with flushing valve.

Shall be equipped with air release and vacuum valve kit.

Shall be auto clean type.

### 2.2.2 Fertilizer Injector

- Shall have a nominal motive flow through injector of 2.5-3 m<sup>3</sup>/hr.
- Shall have plastic body and parts.
- Shall be equipped with pressure gages, built in screen filter, isolating and non-return valve.
- Mild steel construction.
- Coated from both inside and outside surface for protection against corrosion and weather effects.
- Turbulent inlet ensures thorough mixing of chemicals and / or fertilizers.
- Separate valves are provided on the inlet & outlet to control the injection rate.
- High pressure hose assembly inlet / outlet connection
- Drain port to flush the tank.
- Maximum working pressure 10 kg/cm<sup>2</sup> (142 psi).

### 2.3 Pipes

#### 2.3.1 PVC Pipes

All plastic pipes shall bear the following markings: manufacturer's name, nominal pipe size, schedule or class, type of material, pressure rating in PSI, NSF seal of approval, and date of extrusion." All sleeves under paving shall be Schedule 40 PVC. Pipes shall be Polyvinyl chloride (PVC) Schedule 40 conforming to ASTM Testing Procedure D-1785. They shall have dimensions as follow:

Nominal Diameter (inch)	Nominal Diameter (mm)	Outside Diameter (mm)	Inside Diameter (mm)	Wall Thickness (mm)
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0.5	15	21	16	3
0.75	20	27	21	3
1.0	25	33	27	3
1.25	32	42	35	4
1.5	40	48	41	4
2.0	50	60	53	4

### 2.3.2 Polyethylene Pipes:

Pipes shall be of HIGH DENSITY POLYETHYLENE PIPES (HDPE) pressure pipes, at working pressure class of (PN 16), conforming to ISO 4427-1996 E and ISO 161-

1:1996 designated as PE 100 (Melt flow test , dimension test and elongation at break test) and be jointed with push -fit coupling compression fittings (push fit jointing shall consist of a PVC grip ring and nitrile elastomeric "O" ring or equivalent material from the "O" ring , it shall be screwed connections with specification and dimensions: as shown below

Specification and dimensions: as shown below

<b>HDPE</b>		
<i>Nominal Diameter (mm)</i>	<i>Wall Thickness (mm)</i>	<i>Inside Diameter (mm)</i>
110	1.43	107.1
90	.98	88.0
75	6.8	61.4
63	5.8	51.4
50	4.6	40.8
32	3.0	26.0



Polyethylene pipelines of 15.5 - 16 mm inside diameter shall be made of 100% virgin materials according to DIN (8072/6

### 2.3.3 Fittings & Accessories

PVC Pipes



All plastic pipe fittings shall be standard weight schedule 40 and shall be injection molded of an improved PVC fitting compound. All threaded plastic fittings shall have injection-molded threads. No cut threads will be accepted on PVC pipe and fittings. All tees and ells shall be manufactured in injection molds that are side gated. All threaded nipples shall be standard weight schedule 80 with molded threads. The contractor shall use the solvent welding procedures and materials recommended by the manufacturer for the Schedule 40 pipes.

#### Polyethylene Pipes

- A. Mainline line fittings shall be electro fusion PE 100.
- B. All primary distribution pipe fittings shall be compression PE 16 bar
- C. Polyethylene pipes shall be manufactured from version raw material.

#### 2.3.4 Conduit pipe:

- Pipes according to ASTM D-1785, PVC Schedule 40. Nominal size 1 inch (25mm).  
Outside diameter: 33 mm. Inside diameter: 27 mm

#### 2.4. Solenoid Valve Station

The electric remote control valve shall be a normally closed 24 VAC 50/60 cycle Solenoid actuated globe pattern design.

There are two types of solenoid valve:

1. Remote Solenoid control valve for sprinkler irrigation (1", 1½", 2" size)
2. Remote Solenoid control valve for drip irrigation (1", 1½", 2" size) with self-cleaning flush filter, pressure regulator, and low flow ranging from 0.006-0.3 L/S

The valve shall house a fully-encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing and a leverage handle for easy turning. This 24 VAC 50/60 Hz solenoid shall open with 19.6 volt minimum at 200 psi (13, 80 bars). At 24 VAC, average inrush current shall not exceed 0.41 amps. Average holding current shall not exceed 0.23 amps.

An isolating valve should be installed upstream of the electric valve.

The electric valve and all related accessories shall be housed in a suitable valve box. A stop-isolating valve would be installed before the solenoid with pressure regulator if needed.

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The solenoid valve and associated fittings shall be housed in a GRP valve box of suitable size.

GRP valve boxes are to be designed to suit the site conditions and loading.

The inside surface of the valve box is to be hard, durable, free of tackiness and free of bulges, dents ridges or other defects that result in a variation of inside dimensions of more than 3 mm from that obtained in adjacent unaffected portions of the surface.

No glass fiber reinforcement is to penetrate the interior surface of the valve box wall, and any glass fiber reinforcement on the exterior surface must be thoroughly impregnated with resin.

The glass content will be determined by ignition loss analysis in accordance with Method D2584 or ISO Recommendation R 11172.

The valve box sizes should be similar to the following:

- Round valve box (10 inches diameter) Black Body & Green cover.
- Rectangular valve box, Black Body & Green cover, with the following dimension:
  - Length: 21.8 inches (55,4 cm)
  - Width: 16.6 inches (42,2 cm)
  - Height: 12.0 inches (30,5 cm)

#### C. Drain Valves

Shall be installed at low points for the main line flushing and network.

#### D. Air vent and vacuum release valve

Shall be installed at high points and pipes reductions, it shall be polypropylene.

Isolated valves shall be PVC ball valves and shall be installed for closing off sections of the mains.

#### 2.5 Emitters

Emitters shall have the following features:

- Pressure compensating.
- Nominal pressure 2.0 bars.
- Drip emitter: rate or as explained in irrigation details plan based on Plant and soil type.
  - 8 L/H
  - 24 L/H

#### 2.6. SMART Irrigation Controller System:



### 2.6.1 Irrigation System controller:

- Outdoor Irrigation controller (100 Stations).
- Internal 120VAC/230VAC transformer with plug and play pre-installed 6' line cord (removable for conduit-wired installations)
- LCD display
- Auto Adjust mode requires
- 4 programs: A, B, C; program D can operate concurrently
- Different start times per program
- Nonvolatile memory and real time clock/calendar to retain programs and current date and time -
- Zone run times from 1 min. to 9 hrs. 55 min. with operation countdown displayed in hours, minutes, and seconds
- Watering day selections of custom days of the week, odd/even, or interval days (1 - 30 days)
- Omit settings: omit time of day window, omit day(s) of week, and omit up to 7 calendar dates
- Seasonal % adjust by program



### 2.6.2 Flow Sensors and Flow Transmitters:

**Brass Flow Sensors** The flow sensor shall be an insertion type with a nonmagnetic, spinning impeller (paddle wheel) as the only moving part. The sensor sleeve will be brass (or 316 stainless steel) with the sensor housing being PPS. The impeller shall be glass filled nylon or Tefzel® with a UHMWPE or Tefzel sleeve. The shaft material shall be tungsten carbide. The sensor will be supplied with a 2" NPT adapter for installation into any commercially available weld-on fitting or pipe saddle. The adapter shall have two ethylene propylene O-Rings. The sensor electronics will be potted in an epoxy compound designed for prolonged immersion. Electrical connections shall be 2 single conductor 18AWG leads 48 inches long. Insulation shall be direct burial "UF" type colored red for the positive lead and black for the negative lead. Insertion of the sensor into any pipe size shall be 1/2" from the inside wall to the end of the sensor housing.

The sensor shall operate in line pressures up to 400 psi and liquid temperatures up to 220° F, and operate in flows of 1 foot per second to 80 feet per second.

**Plastic Flow Sensor** The flow sensor shall be an in-line type with a non-magnetic, spinning impeller (paddle wheel) as the only moving part. The electronics housing shall be glass-filled PPS. The impeller shall be glass-filled nylon or Tefzel with a UHMWPE or Tefzel sleeve bearing. The shaft material shall be tungsten carbide. The electronics housing shall

have two ethylene propylene O-Rings and shall be easily removed from the meter body. The sensor electronics will be potted in an epoxy compound designed for prolonged immersion. Electrical connections shall be 2 single conductor 18 AWG leads 48 inches long. Insulation shall be direct burial "UF" type colored red for the positive lead and black for the negative lead.

The sensor shall operate in line pressure up to 100 psi and liquid temperatures up to 140° F, and operate in flows of 1 foot per second to 20 feet per second with linearity of  $\pm 1\%$  and repeatability of  $\pm 1\%$ . The meter body shall be fabricated from Schedule 80 PVC Tees, available in 1 1/2", 2", 3", and 4" with socket end connections.

### 2.6.3 Pulse Decoders

Pulse decoders shall provide the means for recording, at the computer, such things as amount of flow in a given period of time and other desirable data within the system.

On the 2-wire path(s) indicated and where shown on the drawings and/or instructed, install PULSE decoder for integration with the following specified recording devices: The pulse decoder wires shall be connected to the contacts of the Momentary "Dry" Contact Switch of the recording device. The recording device (flow meter, etc.)

The decoders shall be of solid-state design and housed in a watertight molded plastic cylindrical housing. The decoder leads shall be 18-gauge, insulated, stranded copper conductors of colors as indicated above. Wire leads shall be not less than 12" long. All decoder wire connections shall be made using watertight electrical connections suitable for the wire type being connected, as recommended by the manufacturer.

The decoders shall be mounted in the pedestals of the field satellite units, in the NEMA enclosures, or inside a building, etc.

Decoders SHALL NOT be mounted underground unless ABSOLUTELY necessary. Where it is ABSOLUTELY necessary to place them underground, they shall be placed in a standard 12" x 18" valve box. The valve box shall be mounted on an 18" deep bed of pea gravel to provide adequate drainage for the valve box.

All decoders shall be for 28-Volt AC input service (provided by the 2-wire CCU communication path).

### 2.7 Electrical wire:

Underground shielded & armored copper cable, size: 14 AWG, one pair and each of them are isolated - low voltage

### 2.8 End closer:

HDPE cap for the 16 mm irrigation drip line. Size is 16 mm. UV radiation stabilized according to DIN 8074 standards. Easy to remove for flush.

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### **3. Execution:**

#### **3.1 Site and Material Handling**

- Deliver materials to site, unload and store in original manufactures.
- Wrap and crate finished components and assemblies at the factory in a manner to prevent damage or marring of assemblies on surface during shipping and handling.
- Coordinate size of access and route to place of installation.
- The contractor shall maintain adequate protection of all his work from damage.
- The contractor shall be responsible for correct storage of the system equipments and materials, and in accordance with manufacturer recommendations on loading, unloading and storage.
- The contractor shall securely plug all openings into the section of the system he is working on to prevent obstruction in the pipes and the breakage or misuse of the equipments.

#### **3.2 Installation**

- An expert irrigation engineer should be available to supervise the installation process.
- Before installation contractor shall carefully check the site and make workshop drawings.
- Installation of the PVC and PE pipes shall be in accordance with manufacturer instructions in trenches at 50cm below finished grade.
- Installation of all PVC pipes is in accordance with manufacturer instructions 30 cm below finished grade.
- Installation of irrigation cables shall be parallel to the pipe line.
- All sprinklers shall be installed as shown in detailed drawings. The sprinkler head shall be installed so that the top is slightly below the finished grade level.
- All automatic valve, isolating and controllers shall be installed following the recommendations of the manufacturers and as shown in detailed drawings.
- Contract all piping of full length sections of pipe wherever possible.
- Back filling material shall be free from rocks and large stones which could damage the pipe or create unusual setting problems.
- Identify and color pipe by applying plastic makers.

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### 3.3 Testing and System Acceptance Pressure Test:

At the end of network installation, and before emission devices and laterals installation, the pressure test should be applied as follows:

- 1.5 times the working pressure for 15 minutes.
- At the working pressure, for 12 hours.

### 3.4 System Flushing:

- Upon the completion of the irrigation network and before the installation the emissions devices, mains shall be flushed until the water is completely clean.
- Emission devices and laterals shall be flushed in each individual irrigation shift until the water is completely clean.
- Filtration unit shall be flushed.

### 3.5 Performance Test:

The contractor shall run an irrigation audit to estimate the irrigation uniformity for sprinkler system and emission uniformities for drip system. The irrigation uniformity should be more than 60% and emission uniformity should be more than 70%.

Increasing the irrigation efficiency includes adjustments of pressure regulators, pressure relief valve, pact circle sprinkler heads and individual station adjustments on the controllers.

Upon completion of the work, the contractor shall furnish the supervising engineer with a complete set of as-built drawing and irrigation schedule, over different time of the year and different stages of growth.

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