

SECTION 02441

IRRIGATION SYSTEM

NOTE: THESE SPECIFICATIONS ARE FOR USE ON CITY OF MESQUITE PROJECTS ONLY

PART 1 GENERAL

1.01 DESCRIPTION

Provide an underground irrigation system as shown and specified. The work includes:

- A. Automatic irrigation system, including piping, fittings, sprinkler heads, and accessories.
- B. Valves, and fittings.
- C. Meters provided and installed by the contractor
- D. Controller, sensors, control wire, flow meter, and air cards.
- E. Testing.
- F. Excavating and backfilling irrigation system work.

1.02 QUALITY ASSURANCE AND APPLICABLE STANDARDS

- A. Installer's qualifications:
 1. Minimum of 5 years experience installing irrigation systems of comparable size.
 2. Contractor shall employ a licensed Texas Irrigator.
 3. Contractor shall also employ a licensed Texas Irrigation installer or licensed Texas Irrigator as a continuous on-site representative to the Contractor.
- B. Materials, equipment, and methods of installation shall comply with the following codes and standards:
 1. The City of Mesquite Ordinances and Building Codes.
 2. National Electrical Code.
 3. American Society for Testing and Materials, (ASTM).
 4. National Sanitation Foundation, (NSF).
 5. Texas Commission on Environmental Quality rules and regulations.
- C. Excavating, backfilling, and compacting operations:
- D. Obtain Park Planner's acceptance of installed and tested irrigation system prior to installing backfill materials. Notification must precede requested inspection by 24 hours.

1.03 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each of the system components to be installed.
- B. "As-Built" Drawings: Contractor shall submit a set of reproducible "As-Built" drawings on a Mylar base or a vector based electronic file (AutoCAD 2006 or compatible format) upon completion of the project. The Park Project Manager will provide a base sheet for temporary use by contractor. "As-Built" drawings shall give dimensions to objects from two permanent objects. Dimensions shall be 300' or less unless approved by the Park Project Manager. Permanent objects are considered non-perishable and not likely to be moved i.e., buildings, street curbs, fire hydrants, tennis/basketball court corners, concrete footings or slabs around facilities, street signs, etc. (plant material is perishable). If permanent objects are not close enough to take measurements from, consult with the Park Project Manager. Objects to be dimensioned include but are not limited to: electric valves, routing of wiring, mainline, double check valve assembly, any deviations from the plan (including any and all lateral lines). Prior to taking measurements, consult with the Park Project Manager as to what other objects, if any, are to be dimensioned. Identify field changes and Change Order changes by dimension and detail.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, either threaded or plain.
- C. Store and handle materials to prevent damage and deterioration. Do not store P.V.C. pipe in direct sunlight for more than 48 hours.

D. Remove uninstalled components and construction debris each day from site. No storage will be permitted.

1.05 PROJECT CONDITIONS

- A. Known underground and surface utility lines are indicated on the drawings. Contractor shall request utility locating services provided by utility companies.
- B. Water Service - The Contractor shall connect the proposed system into existing stub-out as indicated on the plans.
- C. Protect existing trees, plants, lawns, and other features designated to remain as part of the final landscape work. Restore turf and planting area to original condition after trenching, backfilling, and cleaning.
- D. Promptly repair damage to adjacent facilities caused by irrigation system work operations. Cost of repairs shall be contractor's expense.
- E. Promptly notify the Park Project Manager of unexpected sub-surface conditions.
- F. Irrigation system layout is diagrammatic. Exact locations of piping, sprinkler heads, valves, and other components shall be established by contractor in the field at time of installation. Obtain Park Project Manager's approval of head layout prior to installation.
- G. Space sprinkler components as per manufacturer's recommendations.
- H. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. The Park Project Manager shall approve final system layout.
- I. A pre-construction inspection will be conducted by Park Project Manager with the Contractor to observe original site conditions.
- J. Electric power supply shall be furnished by the City to a location indicated on the plans. A ten-amp breaker box will be provided to irrigation contractor at park sign. Contractor shall be responsible for directly wiring the automatic controllers into 120 V power supply. NOTE: NO plug in devices will be accepted.

1.06 WARRANTY AND GUARANTEE

- A. Materials and workmanship shall be fully guaranteed for one (1) year following Owner's final acceptance of project at 100% completion. Manufacturer's warranty shall extend beyond 1 year if applicable.
- B. Backfilling of all excavation shall be guaranteed for the one (1) year guarantee period.
- C. Provide a one (1) year warranty against material, installation and operation defects. Repairs, adjustments and replacement of defective irrigation system materials, including materials that have been installed on the work during the warranty period shall be at Contractor's expense.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Parts List: Materials provided and installed by irrigation contractor

DESCRIPTION	MANUFACTURER / MODEL NO.
Controller	Weathermatic Smartline: SL4800 (12 station base model) 12 Station Module: SLM12 (up to 3 needed depending on station quantity) Aircard: SL-AIRCARD1
Flow meter	Data Industrial #IR220p-? (Match size to mainline) w/ all necessary wiring and accessories for proper operation
Electric Valve	Weathermatic 11000 series (size as noted on drawings)
Wire Splice Kit	King One Step socket seal
Freeze Sensor	Weathermatic Wireless Weather Station: SLW15 (this one product is satisfies both sensors)
Rain Sensor	Weathermatic Wireless Weather Station: SLW15 (this one product is satisfies both sensors)
Pop-up Spray Head (turf & bed areas)	Rainbird 1800 SAM/PRS w/ MPR nozzles (arc & radius as shown on the plans)
Small Rotary Head (turf areas)	Rainbird 5004 + PRS 3/4" inlet
Large Rotary Head (turf areas)	Rainbird 8005, 1" inlet (50' – 70' radius)
Large Rotary Head (turf areas)	Rainbird 8005, 1" inlet (70' – 80' radius)

Rotary Head (clay infield)	Rainbird 6504 HS Falcon, stainless steel, ¾" inlet (arc & radius as shown on the plans)
Low pressure rotor, 40 operating PSI	Rainbird 6504 Falcon, (20' – 70' radius)
Golf / large turf rotors 80'+ radius	Toro 690 Golf Course Rotor / Rainbird Eagle 700 & 900
Tree / shrub bubbler	Rainbird RWS - M – BG02 Root Watering System
Quick Coupler Valve	Weathermatic V-100
Ball Valve (at remote Valve, Q.C.V.)	Spears Schedule 80 PVC (size to match valve)
Valve Box, and lid, 12" x 17" (for remote valve, and Q.C.V.)	DFW Plastics D-1200
Valve Box Extension	DFW Plastics D-600
Wire splice box	DFW Plastics 10" round
Concrete Valve Box	Brooks #65 concrete box with 2 piece cast iron cover
Reduced Pressure Zone Assembly (RPZ)	Febco Model 860 or Watts Regulator Series 009 (sized for optimum system performance)
RPZ device enclosure	HB-1 (1" RPZ) HB-2 (2" RPZ)
Main Line PVC	Class 200 PVC
Lateral PVC	Class 200 PVC
Swing Joint Assembly, 1" size	Lasco G-132-212
Drip (4' and narrower)	Netafim
Sleeves	Schedule 40 PVC 4" or 6" (size as noted on drawings)

B. Manufacturers:

TORO
523 Camp Wisdom Rd.
Duncanville, TX 75116
972-709-3528

Weathermatic, Inc.
Telsco Industries
Bill Savelle 214.243.6697 cell
P. O. Box 180205
Dallas, TX 75218-0205
972-278-6131, office

Rainbird Corporation
Kirk Biddle
972-217-5961

2.02 MATERIALS

- A. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.
- B. Comply with pipe sizes indicated. No substitution of smaller pipes will be permitted. Remove damaged and defective pipe.
- C. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (NSF) approval.
- D. Plastic pipe, fittings, and connections:
 1. Polyvinyl chloride pipe: ASTM D2241, rigid, unplasticized PVC, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents. SDR21, Class 200.
 2. PVC pipe fittings: ASTM D2241 schedule 40 PVC molded fittings suitable for solvent weld, slip joint ring tight seal, or screwed connections. Fittings made of other materials are not permitted. PVC Pipe Fittings - All PVC fittings shall be Type I, medium weight Schedule 40, as manufactured by LASCO Manufacturing Company, or approved equal. Provide 24" minimum dimensions between fittings (exception: threaded couplings).
- E. Size slip fitting socket taper to permit a dry unsoftened pipe end to be inserted no more than halfway into the socket. Saddle and cross fittings are not permitted.
- F. Schedule 80 PVC pipe may be threaded.

- G. Use male adapters for plastic to metal connections. Tighten male adapters by hand plus one turn with a strap wrench.
- H. Copper pipe, fittings, and connections of RPZ device: Refer to Water Utilities specifications. Contact Ron Self, City Backflow Inspector, for details at 972-216-6973.
 - 1. Water piping, fittings and connectors: ASTM B88 Type "L" hard tempered copper tubing. Fittings shall be 150 pound working water pressure standard, solder end type, constructed of wrought copper, bronze, or brass.
 - 2. Joints made with tin-lead solder, approximately 50/50 composition. Thoroughly polish joints and use proper flux to provide sound joints.
- I. Associated equipment:
 - 1. Electric control: Type UF 12/2 gauge or 14/3 gauge insulation. UL listed approved for direct underground burial when used in National Electrical Code Class II Circuit,
 - 2. Wire color code: Provide control or "hot" wires red in color. Provide common or "ground" wires white in color.
 - 3. Ground Rod and Wire for Controller
 - a. Ground shall be 6 gauge uncoated copper bus wire.
 - b. Ground rod shall be a copper coated steel rod or as per local code. Length and diameter shall be as per local code.
 - c. Refer to manufacturer's requirements for wire sizing to valves, and sensors.
- J. Valve box to enclose electric valves shall be a 12" rectangular valve box with a snap in lid. Valve box to be installed with 6" extension (as needed), and supported with bricks around the entire base of the box
- K. Automatic sprinkler controllers shall be capable of operating the number of stations specified. Power source shall be standard 120V AC, 60 Hz., @1.0A for 5 valves. Output for operation of companion solenoid-operated valves shall be 24/28V AC, 2.5A (60/70VA). All conduits shall be ridged type for controller wire and electrical to breaker box. The controller shall be of solid-state construction. The operation of the controller shall be a fully automatic, incorporating the following features: pump start/master valve relay with flow sensing, telephone modem, internal surge protection for AC input and valve outputs, & program information memory during power outages. A computer chip bypass switch for the rain sensor shall be installed inside the controller housing.
- L. Paco LC Model 15705 Simplex Booster System . Each system is pre-wired, skid mounted and assembled as a packaged system requiring only suction and discharge field connection and field wiring to panel. Each system consists of:
 - 1. Paco LC close-coupled bronze fitted pump with mechanical seal, bronze impeller, bronze case wear ring and bronze shaft sleeve. Full load capacity of pump to be 160 GPM at 147' TDH. Motor to be a 10HP/3500 RPM/1PH/220 VAC/TEFC.
 - 2. Nema 3R enclosure control panel containing fusible disconnect switch with control power transformer, 220/110 volt. Starter with hand/off/auto switch, ambient compensated overload and run light. Also mounted on panel is external duplex receptacle for 110 volt service minimum 1KVA capacity and circuit breaker. Panel to have alarm system to indicate a non-flow condition and shut pump down. Pump on/off to be controlled by 24 volt signal provided by others. Controller and pump system to be wired and tested.
 - 3. Accessories and fittings to include ball valve and check valve on discharge piping, and ball valve flow switch on suction piping. Suction and discharge gauges to be furnished. Galvanized pipe to connect fittings. Only galvanized pipe should be connected to the pumps galvanized fittings. Thermostatically controlled tape furnished for freeze protection of piping, valve and pump case, etc., inside fiberglass enclosure. Drain valves to be included on suction and discharge side of pump.
 - 4. Unit to have fiberglass lockable enclosure with external gel coat color green. Commercial grade resin and reinforcing material furnished. Enclosed to have 2" flat flange lip plate. Bottom side with replaceable rubber gasket. Flange suitable to accept padlock device and with two (2) padlocks keyed alike. Two (2) lifting handles, six (6) 3" vents also furnished. Fiberglass enclosure designed 1/4" thick and for 300# line load. Enclosure includes electric fan ventilation system .
 - 5. Unit with heavy duty galvanized steel skid with four (4) anchor bolts holes. Holes inside enclosure. Suction and discharge openings provided through skid.
 - 6. Start-up assistance and operation and maintenance instructions to be furnished by contractor to Park Supervisory personnel.

2.03 ACCESSORIES

- A. Drainage fill: 1/2" washed pea gravel.
- B. Fill: Clean soil free of stones larger than 1" diameter, foreign matter, organic material, and debris.
- C. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the Park Project Manager's review and acceptance.
- D. Concrete Thrust block: 3000 psi, 5 sack concrete mix.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.
- B. The contractor shall verify existing and proposed locations of all site utilities (i.e. gas, water, electric, telephone, sanitary and storm sewers etc.) prior to any trenching and laying of pipe. In addition, this contractor shall request for inspection of reduced pressure zone assembly (RPZ) with the Water Utilities Division in connection to City provided meter and exhaust.

3.02 PREPARATION

Lay out and stake the location of each pipe run and all sprinkler heads and sprinkler valves. Obtain Park Project Manager's acceptance of layout prior to excavating.

3.03 INSTALLATION

- A. Excavating and backfilling:
 - 1. Excavation shall include all materials encountered, except materials that cannot be excavated by normal mechanical means.
 - 2. Excavate trenches of sufficient depth to provide 18" maximum and 12" minimum cover over installed pipe.
 - 3. Fill to match adjacent grade elevations with approved earth fill material. Place and compact fill in layers not greater than 8" depth. Backfill all voids in soil. Material shall not be placed to cause shifting or compression of pipe and valve boxes.
 - 4. Provide clean original material fill free of rocks, concrete and debris for backfill.
 - 5. Provide drainage fill aggregate around each valve and double check assembly.
 - 6. Irrigation mainline: The mainline shall be installed in a 6" wide (minimum) trench with all electric wire to valves laid directly below mainline (upon inspection the wires should be hidden from sight). Trench shall allow a minimum of 12" of cover. All mains and laterals up to and including 4" shall have a maximum 18" of cover. Mainline shall be flushed before attaching valves. If splices are made in mainline, use gasket repair fittings. Compression fittings are not allowed. Mainline may be backfilled except at joints prior to inspection by the Owner. Mainline shall be tested for leaks under pressure for a 6 to 8 hour period. Joints may be backfilled after Park Project Manager verifies and approves that no leaks exist.
 - 7. Thrust block shall be required at all 3" or larger fittings.
 - 8. Lateral Piping - Shall be installed in a 4" wide (minimum) trench 12" deep. Excavate trenches and install piping and fill during the same working day. Do not leave open trenches or partially filled trenches open overnight. Fill at joints in pipe may remain open.
 - 9. Sleeves installed to accommodate irrigation piping shall be installed with 18" of cover, as measured from finished grade. Costs for providing and installing these sleeves shall be included in the irrigation system bid item.
- B. Plastic pipe:
 - 1. Install plastic pipe in accordance with manufacturer's installation instructions. Provide for thermal expansion and contraction.
 - 2. Saw cut plastic pipe to ensure a square cut. Remove burrs and shavings at cut ends prior to installation.
 - 3. Make plastic-to-plastic joints with solvent weld joints or slip seal joints. Use only solvent recommended by the pipe manufacturer. Install plastic pipe fittings in accordance with pipe manufacturer's instructions. Solvent primer is required on all joints/fittings. Excess primer and/or solvent dripped on pipe or squeezed from fitting is not permitted and shall be grounds for removal and replacement of the joint.
 - 4. Make plastic to metal joints with plastic male adapters.

5. Maintain a minimum of 24" between all glued joints.
 6. Allow joints to set at least 24 hours before pressure is applied to the system.
 7. Maintain pipe interiors free of dirt and debris. Close open ends of pipe by acceptable methods when pipe installation is not in progress.
 8. Inspection of all fittings and coupling will be made by the Park Project Manager. Backfill of approved soil is not permitted until Park Project Manager has inspected all fittings, valves, and couplings.
 9. Install in-ground control valves in valve box as indicated. Valve boxes shall be installed in accordance with the manufacturer's installation instructions and with an 8" layer of washed pea gravel under the valve. Each valve box shall be supported by bricks around the entire perimeter of the box. Install valve boxes on a suitable base to provide a level foundation. Set the top of the box 2" below surrounding grade and cover to protect from vandalism.
 10. Seal threaded connections on both sides of the control valves with Teflon tape.
 11. Install freeze and rain sensors as directed by the Park Project Manager.
- C. Sprinklers, fittings, valves, and accessories:
1. Install fittings, valves, sprinkler heads, risers, and accessories in accordance with manufacturer's instructions, except as otherwise indicated. Maintain a minimum of 24" between all glued fittings. All fittings shall be installed in a horizontal manner. Fittings that join pipe vertically or at angles other than horizontal will be subject to removal. Use of fittings that appears excessive and inappropriate for normal installation and not in compliance with standard industry practice, shall be rejected.
 2. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated.
 3. Set top of quick coupler, gate, and isolation valve boxes flush to finish grade.
 4. Set top of electric valve box at 2" below finish grade.
 5. Provide pop-up spray heads with 1/2" flex cut-off nipples joint assembly.
 6. Install reduced pressure zone (RPZ) backflow device above grade in an insulated aluminum or stainless steel enclosure appropriately sized for the RPZ device. The enclosure shall be securely anchored and vandal resistant. The concrete pad for the enclosure shall be a 3000 PSI 4" concrete slab that extends 6" beyond the enclosure on all sides. Reinforce the concrete pad with #3 rebar @ 12" on-center, both ways.
 7. Install the specified controller in the location shown on the drawings. Install per manufacturer's recommendations.
 8. The contractor shall pull valve wires, program controller by labeling station position for zones and put controller in operation.
- D. Control wiring:
1. Contractor shall run a single wire to each solenoid, for the control and a common neutral wire to all solenoids from the controller. Wire shall be sized and color-coded according to device requirements of manufacturer.
 2. Install enough wire to allow raising the valve bonnet or splice to the surface without disconnecting the wires when repair is required.
 3. Pull each remote control valve wire through rigid conduit in base, which shall then be connected to controller.
 4. Make wire connections to remote control electric valves and splices of wire in 10" valve boxes. All wire splices must be properly insulated and waterproofed. Splices shall be made with a King One-Step in accordance with manufacturer's recommendations. Provide 2" of soil cover to protect from vandalism. Show location of any and all splices on the "As-Built" drawings
- E. Sensors: Install rain, freeze and flow sensors as noted on the plans (or as directed by the Park Project Manager) with control wire enclosed in 1/2" rigid conduit (above grade).
- F. RPZ device/enclosure shall be installed according the construction details shown on the plans and the heater shall be wired directly to the breaker box/disconnect. A licensed electrician shall perform all electrical connections.
- G. Flushing, testing, and adjustment:
1. After sprinkler piping and main are installed and before sprinkler heads are installed, open control valves and flush out the system with full head of water until pipes are clear of debris.
 2. Perform system testing upon completion of each section. Make necessary repairs and re-test repaired sections as required. Trench and pipe must be dry at inspection. System must be under operating pressure for 24 hours prior to observation of every joint and coupling, by the Park Project Manager. Backfill is permitted after inspection and approval by Park Project Manager.

3. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.
 4. Tighten nozzles on spray type sprinklers after installation. Adjust sprinkler-adjusting screw on lateral line or circuit as required for proper radius. Interchange nozzle patterns as directed by the Park Planner, to give best arc of coverage.
 5. Adjust all electric remote control valve flow control stems for system balance.
 6. Adjust all rain and temperature sensors as directed by the Park Project Manager. Test as required to obtain satisfactory operating conditions. Demonstrate correct operation of sensors to the Park Planner.
 7. Test and demonstrate the controller by operating appropriate day, hour, and station selection features as required to automatically start and shut down irrigation cycles to accommodate plant requirements and weather conditions.
- G. Spare Parts: Provide to the City of Mesquite additional parts as per noted on plan, including installation and operations manuals to all products.
- H. Booster Pump: Install Paco LC model 15705 Simplex Booster System according to manufacturer recommendations.

3.04 DISPOSAL OF WASTE MATERIAL

- A. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris. Debris must be removed at the end of work time each day.
- B. Maintain pavement and curb clear, clean, and free of debris and soil. Pavement and curb shall remain clear, clean and free of debris.

3.05 SUBSTANTIAL COMPLETION:

An inspection of the irrigation system will be made by the Park Project Manager upon request for Application of Substantial Completion by the Contractor. The irrigation system must be sufficiently complete so that all plant material can be sustained by the system and all valve boxes are properly installed. All electric valves shall have 2" of fill over the top of the box. Contractor shall deliver complete "As-Built" drawings (section 1.03B) to Park Project Manager for review and comment prior to application of final payment.

3.06 CLEANING:

Perform daily cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from irrigation system installation. Restore site to the original condition prior to damage caused by construction activities.

3.07 FINAL COMPLETION:

The Park Planner, upon written request, will make an inspection of the irrigation system for Final Completion by the Contractor. Provide notification of at least two (2) working days before requested inspection date. Contractor shall submit on forms approved by the Park Planner, a Waiver of Release of Lien, Affidavit of Payment of Debts and Claim, and a fully executed "Consent of Surety for Payment".

END OF SECTION 02441