SECTION 02810 - LANDSCAPE IRRIGATION SYSTEM

City of San Diego, CWP Guidelines

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NTS: Refer to the Consultant Guide at the time this Specification is used to find an up-to-date list of manufacturers and models approved by the City.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing a landscape irrigation system which consists of all pipes, fittings, sprinklers, valves, automatic control valves, controllers, valve boxes, drain valves, hose bibb valves, operating wrenches, riser assemblies, direct burial wires, electrical connections, wiring and other appurtenances, piping, connections, testing, clean-up, maintenance and adjustments necessary for a complete operating system, ready for immediate use upon completion.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 02200 Earthwork
2. Section 02900 Landscaping
3. Section 03300 Cast-in-Place Structural Concrete
4. Section 15010 Mill Piping - Exposed and Buried
5. Section 15430 Plumbing Specialties
6. Section 16050 Basic Electrical Materials and Methods

1.3 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01090 - REFERENCE STANDARDS.

B. The City of San Diego Landscape Technical Manual (LTM), current edition.

1.4 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Shop drawings of the complete irrigation system [and irrigation structures].

2. Complete lists of irrigation materials and equipment, including manufacturer's name and address, specific trade names, catalog numbers complete with illustrations and/or necessary descriptive literature. The proposed items shall be clearly marked or underlined.

3. Controller literature, specifications, installation wiring diagram, and circuit breaker information.

1.5 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:

1. Operating and maintenance manuals for all irrigation system equipment such as automatic controllers.

1.6 MAINTENANCE SERVICE

A. The WORK of this Section includes service and maintenance of landscape irrigation system [90] [60] [ ] days from Date of Substantial Completion.

1.7 INSTRUCTIONS TO OWNER'S PERSONNEL

A. The CONTRACTOR shall, upon completion of the maintenance period of the irrigation system, instruct the OWNER'S personnel as to the proper operation and maintenance of the system.

1.8 EXISTING UTILITIES AND CONDITIONS

A. Prior to cutting into the soil, the CONTRACTOR shall locate all cables, conduits, sewers, septic tanks, and other such underground utilities, and shall take proper precautions not to damage or disturb such utilities. If a conflict exists between such utilities and the proposed work, the CONTRACTOR shall promptly notify the CONSTRUCTION MANAGER.

B. The CONTRACTOR shall be responsible for coordinating its work with the operation of existing utilities and new utilities on the Project. The CONTRACTOR shall notify the CONSTRUCTION MANAGER or its representative when utilities which are in operation require shut-off.

C. Due to the scale of Drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. The CONTRACTOR shall carefully investigate the structural and finished conditions affecting all work, and plan work accordingly, furnishing such fittings, and other appurtenances, as may be required to meet such conditions. The Contract Documents are generally diagrammatic and indicative of the work to be installed. The work shall be installed in the most direct and workmanlike manner, so that conflicts between sprinkler systems, planting, structures, and other piping will be avoided.

D. The CONTRACTOR shall verify the water pressure available at the site before installation of the system to make sure there is adequate pressure to properly operate sprinkler heads and valves, and shall also provide pressure reducing valves if required. If the pressure provided at job site or any other job condition will create problems that will prevent proper operation of the irrigation system, the CONSTRUCTION MANAGER shall be notified before commencement of any work. Minor additions and adjustments of heads, piping, and circuits shall be made at no additional cost to OWNER where it is necessary to make the irrigation system operate properly.

1.9 STORAGE OF MATERIALS

A. The CONTRACTOR shall be responsible for storage of materials and for damage to the WORK covered by these Contract Documents before final acceptance of its work. The CONTRACTOR shall securely cover openings into the system, and shall cover all apparatus, equipment, and appliances both before and after being set in place to prevent obstruction in the pipes and the breakage, misuse, or disfigurement of said apparatus, equipment, or appliances.

1.10 SCHEDULING AND COORDINATION

A. The CONTRACTOR shall contact Underground Services Alert (USA) in accordance with SSPWC Subsection 5-1.

B. The CONTRACTOR shall be responsible for making arrangements for the coordination of its construction operations with those of all others on the project. The CONTRACTOR shall permit others engaged in work to accomplish their portion of the WORK without undue interference or delay.

C. The CONTRACTOR shall be responsible for the scheduling and coordination of the electrical and water connections and the installation of the piping and equipment in a manner that will complete the WORK in conformance with the construction schedule.

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NTS: The DESIGN CONSULTANT and the CONSTRUCTION MANAGER may need to coordinate with the Water Utilities Department to facilitate the three-month notice period.

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D. The water capacity charges and the wet tap fees shall be prepaid by the OWNER. The CONTRACTOR shall pay all other fees for the water meter and shall coordinate with the Water Utilities Department for services. Allow three months' notice to the Water Utilities Department.

1.11 PROJECT RECORD DRAWINGS

A. The following shall be included in the PROJECT RECORD DRAWINGS in compliance with Section 01300.

1. Record drawings, showing locations of all valves, pipes (lines), heads, dimensions, controllers, control lines, and electrical wires. The drawings shall be accurately dimensioned to indicate location including depths of all piping, valves and control equipment as installed. Record drawings shall show manufacturer names and model numbers of all products.

2. A reduced copy (17" x 11") of the as-built irrigation plan(s), color coded by stations and laminated in plastic, shall be mounted on the inside of each controller enclosure.

1.12 FIELD TESTING

A. After completion of the irrigation system and a thorough flushing to remove dirt, scale, or other material, a pipeline pressure test, a sprinkler coverage test and an operational test shall be performed in accordance with SSPWC, Subsection 308-5.6.

1.13 GUARANTEE

A. The CONTRACTOR'S guarantee shall comply with General Conditions, Article 13, and the following:

The entire irrigation system shall be guaranteed against defects in materials and workmanship for a period of one year from the date of acceptance of WORK. Should the CONTRACTOR fail during the guarantee period to expeditiously correct a defect upon written notification by the OWNER, the OWNER shall cause the WORK to be corrected and bill the actual costs incurred to the CONTRACTOR. Defect corrections shall include the complete restoration of existing improvements that were damaged as a result of the defect.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Unless indicated otherwise, irrigation system materials shall be in accordance with SSPWC, Subsection 212-2 and the following requirements.

2.2 PIPING

A. All pressure pipe to be installed underground shall be Schedule 40 PVC for 1-1/2-inch diameter and smaller. For 2-inch and larger pressure pipe, use ASTM D2241 rated, Class 315 IPS PVC, bell and gasket type pipe, with [Schedule 80 PVC] [cast iron fittings].

B. All pressure pipe installed above ground shall be [galvanized steel Schedule 40 pipe] [UV resistant PVC pipe].

C. All lateral, non-pressure pipe shall be Schedule 40 PVC, 3/4-inch minimum.

D. Pipe sleeves shall be schedule 40 PVC pipe.

2.3 VALVES AND VALVE BOXES

A. Remote control valves shall have 24-volt electrically controlled solenoids, AC or DC operation, and shall be housed in a concrete valve box of adequate size.

2.4 CONDUCTORS

A. **Direct Burial Control Wires**: All control wires shall be solid copper, 600 volt, type UF, conforming to SSPWC, Subsection 212-3.2.

2.5 AUTOMATIC CONTROLLER UNIT

A. The automatic controller shall be an electrically-timed device for automatically opening and closing remote control valves. All controllers and remote control valves supplied under this contract shall be of the same manufacturer and have similar operational and adjustment features.

B. Each station shall be capable of 7 independent days of programming and selective repeatability.

C. Each controller shall be provided with 115-volt and 24-volt circuit breakers.

D. Each controller shall contain a station index, a 24-hour time index, and a 7-day index that changes at 6:00 a.m.

E. Each controller shall have the capability of programming 0- to 60-minute watering periods for each station.

F. The station index shall advance directly to stations programmed to water without delay and shall not repeat until the next scheduled starting time.

G. The panel controller shall be capable of being operated manually, semiautomatically, and automatically.

H. The panel assembly shall be removable from the 115-volt AC source by a quick-disconnect plug.

2.6 SPECIAL TOOLS AND SPARE PARTS

A. **Tools**: [Two] complete sets of the following keys shall be provided. All keys shall be identified by equipment number by means of stainless steel or solid plastic tags.

1. Controller enclosure key.
2. Remote control valve box key.
3. Gate valve (3-inch and larger) key.
4. Manual control valve key.
5. Hose bibb and locking cap key.

B. **Spare Parts**: The WORK includes the following spare parts:

One sprinkler valve with solenoid operator for each size installed.

One sprinkler head for each type and size installed, or 10 percent of the number of each identical type and size, whichever is greater.

One set of all O rings, washers, backup rings, nozzles and flexible risers.

Spare parts shall be stored in toolboxes and identified by means of stainless steel or plastic name tags attached to the box.

2.7 MANUFACTURERS

A. **Manufacturers**: Products shall be of the following manufacture and model (or equal):

1. Pipe: Epco; Pacific Plastic; PW Pipe; J-M Mfg.

2. PVC Fittings: Dura; Lasco; Sloan

3. Cast Iron Fittings: Dayton Foundry; Tyler Pipe and Foundry

4. Swing Joints: Dura; Marlex; Toro [850 Series]

5. Flexible risers, 1/2-inch: Flex-nipple, Model No. [UP-90, UP-180]

6. Emitter distribution tubing: Salco [CT-125] (1/8-inch) PVC flex hose; Hardie Dura-pol (1/4-inch)

7. Remote control valves: Rainbird [EFA-CP Series]; Rainmaster [RCV Series]; [Toro 216-26 Series]

8. Anti-drain/excess flow valve: Valcon [ADV-x5] [ADV]

9. Quick-coupling valves: Rainbird, Model [44 LRC]; Buckner, [Model 25016]

10. Quick-coupling valve keys: Rainbird [44K]; Buckner [25012]

11. Valve boxes: Brooks [3-HL (PB & RCV)] [1-R Series (QCV)]

12. Controls: [ ]

13. Automatic controller: Irritrol [MC Plus] [12] [24] [ ] station; ISC [12] [24] [ ] station

14. Controller enclosures (stainless steel): La Meur; La Max; Strong Box

15. Rotor Pop-up sprinkler head: Rainbird, Model [41-51A SAM-RC] [R-70-PC] [31A RC] [ ]; Buckner, Model [11360-06] [10600-06] [ ]

16. Shrubbery spray heads with standard nozzles: Rainbird [Series 1800]; Buckner [13040]; Toro [570]

17. Spray heads: Rainmaid, No. [RK-78]; Rainbird, No. [ ]

18. Emitters for drip irrigation: Rainbird [EMT6-M101] [EM6-M101]

19. Wire connectors for splices: Rainbird; Pen-Tite; Scotch-Pac

20. Pressure vacuum breaker: FEBCO Model [775]

21. Teflon thread sealant: Rectorseal No. [5]

[22. Anti-vandalism apparatus: King Bros. "Head Loc"]

23. Moisture sensors: Rainbird Aquamiser

24. Trench marker tap: Alarmatape by Paul Potter Warning Tape, Inc. (for pressure pipe); Allen Marking Tape (for direct burial wire)

[25. Bubblers (flood type): Rainbird [1400 Series]; Buckner [13002] [13030]; Thomson [700A]

[26. Bubblers (stream type): Rainbird [1800 Series] [1500 Series]; Buckner [13000 Series]

27. Drip pressure regulator valves (pilot operated, stainless steel trim): CLA-VAL [90-01BS]; Baily [400]; Rainbird [PS1-HLA or HMB]

PART 3 -- EXECUTION

3.1 GENERAL

A. Irrigation system installation shall be in accordance with SSPWC, Subsection 308-5 and the requirements specified herein.

B. Installation of the irrigation system shall be performed after the finish grading, but prior to landscaping, except that plants in boxes 24 inches and larger shall be planted before installation of lateral irrigation lines.

C. The total number of sprinkler heads and circuits and size of pipes shall be not less than indicated unless otherwise approved. The indicated maximum spacings for each type of sprinkler head shall not be exceeded.

3.2 VALVE BOXES

A. Concrete valve boxes shall be set in clean gravel. The CONTRACTOR shall paint the identification number of the valve and the controller clock on the cover of the valve box. The paint shall be aluminum asphaltic-base waterproof paint.

B. The CONTRACTOR shall adjust the locking toggles of the concrete valve boxes by replacing the existing clevis pin and sheet metal clip with a marine-type stainless steel machine bolt and self-locking nut. Apply oil to lubricate and to prevent rust.

3.3 ANTI-DRAIN/EXCESS FLOW VALVES

A. An anti-drain/excess flow valve shall be installed under each sprinkler head which is not equipped with an internal check valve, or where changes in elevation exceed 5 feet on a lateral circuit.

3.4 AUTOMATIC CONTROLLER UNIT

A. The controllers shall be contained in a weatherproof, stainless steel enclosure with an integral lock. Keys for covers shall be interchangeable. Controllers shall be installed "free standing" but not bolted to the enclosure wall.

B. In multiple controller installations, enclosures shall be sized accordingly. No 110 volt wire runs shall pass from controller cabinet to cabinet. Each controller shall have a separate electrical service through a raceway. Provide one power Off-On switch for each controller.

3.5 MOISTURE SENSORS

A. Provide moisture sensors as indicated. Moisture sensors shall be included in all renovated and new irrigation systems.

3.6 ANTI-VANDALISM APPARATUS

A. Provide anti-vandalism apparatus for each irrigation head in areas accessible to the public.

3.7 CONTROL WIRING

A. Control wires shall conform to the following wire colors and installation requirements:

Neutral Wires: White (#12 AWG) do not interconnect neutral wires between controllers.

Pilot Wires: (#14 AWG) (Use as many as necessary).

Valve No.	Valve No.
1 Yellow	10 White w/red stripe
2 Orange	
11 Yellow w/red stripe	
3 Blue	12 Blue w/red stripe
4 Black	13 Orange w/red stripe
5 Brown	14 Purple w/white stripe
6 Purple	15 Brown w/white stripe
7 Yellow w/black stripe	16 Yellow w/white stripe
8 Orange w/black stripe	17 Blue w/white stripe
9 Red w/black stripe	18 Red w/white stripe

Spare Wires: Two red (#14 AWG) from furthest valve or manifold to each controller.

B. Direct burial control wire and electrical conduit shall be buried in plaster or mortar sand as per SSPWC Subsection 200-1.5.3, with a minimum sand equivalency of 50.

C. **Wire Connections**: Neutral, pilot and spare wires shall be installed with a 2-foot coiled excess wire length at each end enclosure. Each and every wire splice shall be soldered together (using 60-40 solder), then encased in the waterproof epoxy of the connectors. Wire splices shall be made only in valve or pullboxes.

D. **Wire Bundles**: Each individual controller clock's control wires shall be bundled and taped together with colored tape at intervals not exceeding 10 feet. Controller identification tape colors shall be as follows (use as many as necessary):

Controller	Color
"A"	Black
"B"	Red
"C"	White
"D"	Blue

E. All wires in pullboxes shall be loose and shall not come within 3 inches from lid. Boxes shall be sized accordingly to accommodate this requirement.

3.8 THRUST BLOCKS

A. All pressure pipe 4 inches and smaller shall have the correct sized concrete thrust block installed at every abrupt change of alignment; at gate valves, at tees, elbows and crosses, and at ends of pipe runs; or wherever required as determined by the CONSTRUCTION MANAGER.

3.9 PIPE SLEEVES

A. PVC pipe sleeves shall be provided under all paving and where necessary for passage under finish surface material, future replacement and for protection of PVC piping and control wire.

B. Sleeves shall be two times the pipe size diameter and extend 12 inches beyond each side of pavement. The letters "E" for electrical or "W" for water shall be stamped or chiseled on the pavement directly above the sleeve.

3.10 TRENCH MARKER TAPES

A. All pressure pipe shall have a continuous blue colored trench marker metallic tape placed 9 inches below finished grade directly above the buried pipe.

B. All direct burial wires shall be marked with a continuous red colored trench marker plastic tape placed 9 inches below finished grade directly above the buried wires.

3.11 TESTING

A. All wiring shall be tested for continuity, open circuits and unintentional grounds prior to connecting to equipment. The minimum insulation resistance to ground shall be 50 megaohms. Any wiring not meeting this requirement shall be replaced, at the CONTRACTOR'S expense.

B. CONSTRUCTION MANAGER shall perform an independent irrigation system check with the CONTRACTOR at a mutually acceptable time prior to the backfilling of trenches. Any defects or deficiencies found in the system shall be corrected by the CONTRACTOR at no additional cost to the OWNER.

** END OF SECTION **