SECTION 02900

LANDSCAPE IRRIGATION SYSTEM

PART 1 GENERAL

1.01 IRRIGATION SYSTEM SPECIFICATIONS

The general and specific conditions of these specifications are an integral part of the landscape construction documents and must be complied with.

1.02 SCOPE OF WORK

Provide all labor, materials, equipment, and services necessary to furnish and install Irrigation System as shown on the drawings and described herein.

1.03 QUALITY ASSURANCE AND REQUIREMENTS

A. Permits and Fees

The Contractor shall obtain and pay for any and all permits and all inspections as required.

B. Manufacturer's Directions

Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of materials and articles used in this contract furnish directions covering points not showing in the drawings and specifications.

C. Ordinances and Regulations

All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the conditions of these specifications and drawings shall take precedence.

D. Explanation of Drawings

Contractor is responsible for all offsets, fittings, sleeves, etc., which may be required, but are not indicated. Contractor will carefully investigate the structural and finished conditions affecting all of the work and plan the work accordingly, furnishing such fittings; etc., as may be required to meet such conditions. Drawings are generally diagrammatic & indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting and architectural features.

The contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that unknown obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the County's authorized representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary at no additional cost to the County.

1.04 SUBMITTALS

A. Material List

Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Landscape Architect.

Prior to installation, submit for review 3 copies of a complete materials list, including manufacturer's name and number, covering all material required under this contract, together with 3 copies of descriptive literature on all items listed. Commence no irrigation system construction prior to receipt of Landscape Architect's determination.

Substitute equipment or materials installed or furnished without prior approval of the Landscape Architect may be rejected and the Contractor required removing such materials from the site at his own expense.

Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

B. Record Drawings

1. Refer to Division 1, Section 01700.
2. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the locations of the following items:
   - Connection to existing water lines.
   - Connection to existing electrical power.
   - Gate valves.
   - Routing of sprinkler pressure lines (dimension max. 100' along routing)
   - Sprinkler control valves.
   - Routing of control wiring.
   - Quick coupling valves.
   - Other related equipment as directed by the Landscape Architect.
3. On or before the date of the final inspection, the Contractor shall deliver the corrected and completed mylars to the Landscape Architect. Delivery of the mylars will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.

C. Controller Charts

1. Record drawings shall be approved by the Landscape Architect before controller charts are prepared.
2. Provide one controller chart for each controller supplied.
3. The chart shall show the area controlled by the automatic controller and shall be the maximum size, which the controller door will allow.
4. The chart is to be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.
5. The circuits shown on the chart shall be color-coded and a different color shall be used to indicate the area of coverage for each controller station.
6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 mils thick.

7. These charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals

Prepare and deliver operation and maintenance manuals as specified in Division 1 and as follows:

1. Catalog and parts sheets on every material and equipment installed under this Contract.
2. Guarantee statement.
3. Complete operating and maintenance instructions on all major equipment.
4. In addition to the above-mentioned maintenance manuals, provide the County's maintenance personnel with instructions for major equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.

E. Equipment to Be Furnished

Supply as a part of this Contract the following tools:

1. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.
2. Two three-foot valve keys for operation of gate valves.
3. Two keys for each automatic controller.
4. Two quick coupler keys and matching hose swivels for quick coupling valves installed.
5. Two sets of operation manuals for automatic controllers and valves.
6. Any other equipment deemed necessary by the Manufacturer's instructions to the proper operation of the irrigation system.

The above-mentioned equipment shall be turned over to the County's representative at the conclusion of the project. Before final inspection can occur, evidence that the County has received material must be shown to the Landscape Architect.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. Do not subject PVC pipe to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

1.06 GUARANTEE

The guarantee for the sprinkler irrigation shall be made in accordance with the form shown below. A copy of the guarantee form shall be included in the operations and maintenance manual. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect excepted. We agree to repair or replace any defects in material or workmanship, which may develop during the period of one year from date of acceptance, and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the County. We shall make such repairs or replacements within a reasonable time, as determined by the County,

after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the County, we authorize the County to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand

PROJECT: _____

LOCATION: _____

SIGNED: _____
Contractor

ADDRESS: _____

PHONE: _____

DATE OF ACCEPTANCE: _____

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.

B. PVC Pressure Main Line Pipe and Fittings

1. Pressure main line piping for all sizes shall be PVC Class 315 for 2" size and larger and PVC Schedule 40 for 1-1/2" size and smaller.
2. Pipe shall be made from NSF approved Type 1, Grade 1 PVC compound conforming to ASTM resin specification 1785. All pipes shall meet requirements as set forth in Federal Specification PS-21-70. (Solvent-well pipe).
3. PVC solvent-weld fittings shall be PVC Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
5. All PVC pipe shall bear the following markings:
   - Manufacturer's name
   - Nominal pipe size.
   - Schedule or class.
   - Pressure rating in PSI.
   - NSF (National Sanitation Foundation) approval.
6. All fittings shall bear the manufacturer's name or trademark material designation, size, applicable I.P.S. schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping

1. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent weld joints.
2. Pipe shall be made from NSF approved, Type 1, Grade II PVC compound conforming to ASTM resin specification D1784. All pipes shall meet requirements set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio.
3. Except as noted in Section B-1, 1 & 2, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in Section 2.01-B of these specifications.

D. UVR / PVC Pine on Grade

1. All pipes on grade shall be UVR / PVC pipe.
2. All pipe and fittings shall bear a permanent identifiable label of "Brownline" UVR / PVC. The piping and installation shall be in accordance with the requirements of the latest edition of the International Association of Plumbing and Mechanical Officials (IAPMO) Standard 1S-8.
3. All lateral piping shall be installed on the surface and anchored at 10' O.C. by a #3 rebar with a "J" hooked radius driven 24" into solid ground.
4. Horizontal piping stakes shall be within 12" of the sprinkler riser.
5. Each pipe riser serving a sprinkler head shall be anchored by a riser stabilizer assembly constructed of#4 rebars driven 24" into solid ground and fastened to the riser by two (2) galvanized or stainless steel bands.
6. All risers and fittings used on UVR IPVC pipe shall be IFS schedule 40 or 80 as manufactured by "Brownline Pipe Co".

E. Brass Pipe and Fittings

1. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

F. Gate Valves

1. Gate valves shall be as shown on plans.
2. All gate valves shall be installed per installation detail.

G. Quick Coupling Valves

Quick coupling valves shall have a brass two-piece body designed for working pressure of 150 P.S.I. operable with quick coupler. Key size and type shall be as shown on plans.

H. Backflow Prevention Units

1. Backflow prevention units shall be of size and type indicated on the irrigation drawings, Install backflow prevention units in accordance with irrigation constructions details, and local prevailing codes.
2. Wye Strainer shall be as shown on plans.

I. Check Valves

Anti-drain valves shall be of heavy-duty virgin PVC construction with F.I.P. thread inlet and outlet. Internal parts shall be stainless steel and neoprene. Anti-drain valve shall be field adjustable against drain out from 5 to 40 feet of head. The anti-drain valve shall be similar to the KBI or approved equal.

J. Control Wiring

1. Connections between the automatic controllers and the electric control vales shall be made with direct burial copper wire AWG-U.F. 600 volt. Pilot wires shall be a different color wire from each automatic controller.

2. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
3. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
4. Where more than one (1) wire is placed in a trench, wiring shall be taped together at intervals of ten (I0) feet.
5. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
6. All splices shall be made with Scotch-Lok #3576 Connector Sealing Packs, Rainbird snap-rite wire connector, or approved equal. Use one splice per connector sealing pack.

K. Automatic Controllers
1. Automatic controllers shall be of size and type shown on the Plans.
2. Final location of automatic controllers shall be approved by the County's authorized representative.
3. Unless otherwise noted on the plans, the 120 volt electrical power to the automatic controller location to be furnished by the General Contractor. The final electrical hook-up shall be the responsibility of the irrigation contractor.

L. Electric Control Valves
1. All electric control valves shall be as shown on plans.
2. Provide and install one control valve box for each electric control valve.

M. Control Valve Boxes
1. Use 12-inch round plastic box for all gate valves. NDS Pro-Series or approved equal. Green color in lawn areas, Tan color in shrub areas.
2. Use 10 x 17 inch rectangular plastic box for all electrical control valves. NDS Pro-Series or approved equal. Green color in lawn areas, Tan color in shrub areas.

N. Sprinkler Heads
1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans and/or specified on these special provisions.
2. Riser units shall be fabricated in accordance with the details.
3. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler head.
4. Sprinkler heads shall be as shown on plans.

PART 3 EXECUTION

3.01 INSPECTION

Site Conditions

A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Landscape Architect's approval prior to proceeding with work under this Section.

B. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operation or neglect. Check existing utilities drawings for existing utility locations.

C. Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs and ground covers.

3.02 PREPARATION

A. Physical Layout
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layouts shall be approved by Landscape Architect prior to trenching.

B. Water Supply

Sprinkler irrigation system shall be connected to water supply points of connection as indicated on the drawings.

C. Electrical Supply
1. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Contractor is responsible for minor changes caused by actual site conditions.

3.03 INSTALLATION

A. Trenching
1. Dig trenches straight and support pipe continuously on sand or native bedding at bottom of trench. Remove all stones or sharp objects from trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
2. Provide for a minimum of eighteen (18") inches cover for all pressure supply lines.
3. Provide for a minimum cover of twelve (12") inches for all non-pressure lines.
4. Provide for minimum cover of eighteen (18") inches for all control wiring.

B. Backfilling
1. The trenches shall not be backfilled until all required tests are preformed. Trenches shall be carefully backfilled with the excavated material approved by the Soils Engineer for back-filling consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
2. No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill.
3. Flooding of trenches will be permitted only with the approval of the Soils Engineer and Landscape Architect.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the County.

C. Trenching and Backfill Under Paying
1. Trenches located under areas of paving, asphaltic concrete or concrete shall be backfilled with sand (a layer six inches below the pipe and three inches above the pipe) and compacted in layers to 90%. Trenches for piping shall be inspected by the Soils Engineer prior to installing the pipes. All trenches shall be left flush with the adjoining grade. The Contractor shall set, cap and pressure test all piping under paving prior to the paving work.

2. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the Contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the County's representative.
3. Provide for a minimum cover of twenty-four inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

D. Assemblies
1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform to details shown on drawings.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Landscape Architect.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fittings manufacturer.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape or approved equal shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required use threaded PVC adapters into which the pipe may be welded.

E. Line Clearance

All lines shall have a minimum clearance of six inches from each other. Parallel lines shall not be installed directly over one another. No other trades allowed in same trench with irrigation pipe.

F. Automatic Controller
1. Automatic controllers shall be of size and type shown on the Plans. Install per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequences shown on the drawings.
2. Final location of automatic controllers shall be approved by the County's representative.
3. Unless otherwise noted on the plans, the 120 volt electrical power to the automatic controller location to be furnished by the General Contractor. The final electrical hook-up shall be the responsibility of the irrigation contractor.

G. Remote Control Valves

Install where shown on drawings and details. When grouped together, allow at least twelve inches between valves. Install each remote control valve in a separate valve box.

H. Flushing of System
1. After all new sprinkler pipelines and risers are in place and connected, and all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Landscape Architect.

I. Sprinkler Heads

1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be equivalent in all respects to those itemized.
2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

3.04 TEMPORARY REPAIRS

The County reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the County shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.05 FIELD QUALITY CONTROL

A. Adjustment of the System
1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined those adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in head re-location, nozzle size and arc. All adjustments shall be made by the Contractor with no additional costs to the County.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within ten days after notification by County.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.

B. Testing of Irrigation System
1. The Contractor shall request the presence of the Landscape Architect in writing at least 48 hours in advance of testing.
2. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch and prove watertight. Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 pounds per square inch and proved watertight prior to paving.
4. Sustain pressure in lines for three hours. If leaks develop, replace joints and repeat test until entire system is proven water-tight.
5. All hydrostatic tests shall be made only in the presence of the County's representative. No pipe shall be backfilled until it has been inspected, tested and approved in writing and shall be re-tested after backfill operations are complete.
6. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Landscape Architect to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Landscape Architect. This test shall be accomplished before any groundcover is planted.
7. Upon completion of each phase of work, entire system shall be tested and adjusted to meet site requirements.

3.06 OPERATION

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days prior to any planting.

B. The Landscape Architect reserves the right to waive or shorten the operation period.

3.07 CLEAN-UP

Clean up shall be made daily as work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained to the site or the work of others shall be repaired to its original condition.

3.08 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. The Contractor shall operate each system in its entirety for the Landscape Architect at time of final observation. Any items deemed not acceptable by the County shall be reworked to the complete satisfaction of the Landscape Architect.

B. The Contractor shall show evidence to the Landscape Architect that the County has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.09 OBSERVATION SCHEDULE

A. Contractor shall be responsible for notifying the County representative in advance for the following observations according to the time indicated:
   1. Pre-Job Conference - 7 days
   2. Pressure supply line installation and testing - 4 days
   3. Automatic Controller installation - 4 days
   4. Control wire installation - 4 days
   5. Lateral line and sprinkler installation - 4 days
   6. Coverage test - 4 days
   7. Final observation - 7 days

B. When inspections have been conducted by other than the Landscape Architect, show evidence of when and by whom these inspections were made.

C. No observation shall commence without as-built drawings. In the event the Contractor calls for an observation without as-built drawings, without completing previously noted corrections, or without preparing the system for observations, he shall be responsible for reimbursing the Landscape Architect at the hourly rate in effect at the time of the observation, portal to portal, plus transportation cost. Subsequent inspections will not be performed until this charge is paid.

END OF SECTION