SECTION 02910

IRRIGATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Trenching and other excavation.

B. Irrigation lines, valve control circuits and appurtenances.

C. Irrigation controllers and remote control valves.

D. Electrical service and service installation if required.

E. Testing.

F. Backfill and compaction of backfill.

G. Dust alleviation and control.

H. Cleanup and disposal.

I. Supplying all labor, materials, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are incidental and necessary to complete the work specified.

1.02 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the general designation only.

B. American Society for Testing and Materials (ASTM) Publications:

D - 1785	Pipe, Polyvinyl Cholride (PVC) Plastic Schedules 40, 80 and 120.

1.03 QUALITY ASSURANCE

A. Irrigation mains, lines and appurtenances shall be subject to successfully passing a leakage test as prescribed herein.

B. Irrigation lines shall be installed after satisfactory completion of roadway or landscape subgrade.

C. Submit catalogue cuts of irrigation valves, controllers, and associated equipment for approval.

1.04 JOB CONDITIONS

A. Contractor shall conduct operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, and any adjacent property owners or tenants.

B. Locations for proposed irrigation controllers and/or electrical service points shown on the plans are approximate only and the exact locations for such shall be as established in the field by the Engineer.

C. Damage resulting from movement of the sides or bottom of trenches or other excavation which is attributable to the Contractor's acts or omissions, whether sides are braced or not, and any portions of the area and work affected by such movement, shall be satisfactorily repaired or restored.

D. Contractor shall supply and deliver the following equipment and information prior to acceptance of the work:

1. Three (3) each (if applicable) quick coupler valve keys and hose swivel ells.
2. Two (2) sets of various special wrenches or tools that may be required for adjustment of sprinkler heads or equipment.
3. Three (3) (if applicable) keys or wheel handles required to operate hose bibs.
4. Two (2) copies of the instruction manual for each irrigation controller.

E. Comply and conform with conditions and requirements indicated under Section 02202, Trenching and Backfill, of these Specifications.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS FOR IRRIGATION MAINS

A. Pressure mains and non-pressure mains shall be polyvinyl chloride (PVC) Schedule 40 conforming to the requirements of ASTM Designation D1785 and shall be provided with solvent weld joints and fittings.

B. All plastic fittings shall be Schedule 40 polyvinyl chloride (PVC) conforming to the requirements of ASTM Designation D1785 and shall be specifically made for the type of pipe used.

C. All nipples and fittings for risers shall be Schedule 80 polyvinyl-chloride (PVC) conforming to the requirements of ASTM Designation D1785. Nipples, fittings and risers shall be same size as sprinkler head inlets.

D. All polyvinyl chloride (PVC) pipe and fittings shall be free from imperfections.

E. Metallic nipples and fittings for above-ground installation of backflow preventer systems shall be Schedule 40 brass nipples and class 125# bronze fittings. All brass nipples and bronze fittings shall be factory threaded.

2.02 JOINTS FOR POLYVINYL CHLORIDE (PVC) PIPE

A. Rubber ring seal joints shall be made in accordance with the manufacturer's instructions and as indicated on the plans.

B. Solvent weld joints shall be made using P-70 primer as manufactured by "Weld-On" or approved equal and "Weld-On" 710 joint cement or approved equal.

C. All threaded joints shall be factory formed. Field threading of pipe or fittings will not be permitted. Threaded joint connections shall be made with virgin teflon tape, or approved equal.

2.03 VALVES AND VALVE BOXES

A. Gate valves, where required on the plans, shall be the same size as the main line and shall be "Stockham", or approved equal. Size and type of valve shall be as indicated on the plans.

B. Quick coupling valves shall be as manufactured by "Rainbird", brass or bronze one piece body designed for a working pressure of 125 psi and equipped with metal covers, or approved equal. Contractor shall provide the Engineer with three (3) for each quick coupler keys and double lug hose swivel ells. Type and model of valve shall be as indicated on the plans.

C. Remote control valves shall be as shown on plans, normally closed, diaphragm actuated, electrically operated from remote location by means of 18/24V, 50/60H, 7.5VA coil, with brass bleed plug for manual operation. Substitutions for irrigation controllers and/or remote control valves shall be at the sole option of the Engineer and shall require prior written consent. Remote control valve sizes shall be the same as the supply runs on which they are to be installed.

D. Valve boxes for gate valves and remote control valves in turf, shrub and ground cover areas shall be fiberglass reinforced plastic, color green, as manufactured by "Ametek", "Carson" or approved equal.

1. Gate Valves Box Covers to be factory marked "Irrigation Control Valve" and shall have a valve number permanently stenciled on it with white exterior paint.
2. Remote Control Valve Boxes shall be rectangular with a minimum dimension of 10-1/2" x 17-1/4" at the base. Cover to be factory marked "RCV" and shall have a station number permanently stenciled on it with white exterior paint.
3. Valves shall be individually housed. Manifolding of valves in a single valve box shall not be permitted.

2.04 SPRINKLER HEADS

A. All bubblers and stationary shrub sprays on risers, pop-up spray heads and gear-driven stream rotors for ground cover, shrubs and turf shall be as manufactured

by "Toro" or approved equal. Type and model of such heads shall be as indicated on the plans.

B. All pop-up spray heads and gear-driven stream rotors for ground cover, shrubs and turf shall be as manufactured by “Hunter” or by "Toro", or approved equal. Type and model of such heads shall be as indicated on the plans.

2.05 IRRIGATION LINE INSTALLATION

A. Controllers for irrigation systems shall be solid state type controllers as manufactured by either Irritrol, Rainmaster or as shown. Controller installations shall consist of the following models to provide the required number of control valve stations to a maximum of twenty-four (24) stations per controller installation:

1. Irrritrol Model MCXX
2. Rainmaster Model SA6-MR8XX/RHG/PMR-CAC/FSAV-150P+200MV

Note: XX shall be substituted by the number of stations.

B. Substitution for irrigation controllers on an "or equal" basis shall be at the sole option of, and shall require the prior written consent from the Engineer.

C. Remote final strength shall be verified by the contractor in presence of the project inspector prior to final installation to determine the need of a high gain antenna assembly.

D. Irrigation controllers shall be mounted as specified in the Detail Drawings.

E. Controllers shall be 120V from a metered power supply, unless solar or battery operated systems are specified.

F. All electrical wires and cables, shall be placed in conduits (1” minimum diameter).

G. Controller enclosures shall be furnished with acceptable keyed locking mechanisms and furnished with keys.

2.06 BACKFLOW PREVENTION DEVICE

A. Backflow prevention devices shall be as required by Section 1003 of the Uniform Plumbing Code, and as approved by the County Public Health Department. Model and details of such devices shall be as indicated on the plans.

2.07 CONTROL VALVE CIRCUITS

A. Wire for valve control circuits shall be UL-approved for direct burial in ground, size #14-l. Common ground wire shall have white insulating jacket. Control wire shall have jacket of color other than white and the jacket color for any circuit shall be continuous between controller and valve. A circuit color code schedule shall be posted inside each controller enclosure.

B. Splices shall be made with #2006-S "Buchanon" splice caps and 3M #3576 "Scotchloc" seal packs or approved equal.

2.08 THRUST BLOCKS FOR RUBBER RING SEAL JOINTS

A. Thrust blocks shall be provided where necessary to resist pressure on rubber ring seal joints. Concrete for thrust blocking shall conform to the requirements of Section 02550 of these specifications.

2.09 PIPE COVER MATERIAL

A. Shall be in conformance to Section 02202, Trenching and Backfill, of these Specifications.

PART 3 - EXECUTION

3.01 TRENCHING, BACKFILLING AND COMPACTION

A. Shall be in conformance to Section 02202, Trenching and Backfill, of these Specifications.

3.02 IRRIGATION LINE INSTALLATION

A. Pipe, valves, fittings, and appurtenances shall be installed as accurately as possible in accordance with the locations shown on the plans. All polyvinyl chloride (PVC) pipe shall be installed with identification markings facing upward, visible from the top of the trench. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly. Where pipes pass through sleeves, provide removable non-decaying plug at ends to prevent entrance of earth. No irrigation lines shall be constructed before subgrade for roadway and median areas have been satisfactorily completed.

B. Depth of cover for pressure mains shall be twenty-four (24) inches below subgrade in areas to be paved and in landscape areas. Depth of cover for non-pressure lines shall be eighteen (18) inches below sub-grade in areas to be paved, eighteen (18) inches below subgrade for topsoil for mainlines and twelve (12) inches below subgrade for topsoil for lateral lines in landscape areas.

C. Pipe, valves and fittings shall be carefully handled during hauling, unloading, and placing operations, so as to avoid breakage or damage. All polyvinylchloride (PVC) pipe shall be stored carefully, and protected from prolonged sunlight. Broken or damaged pipe or appurtenances will be rejected and shall be replaced.

D. Irrigation lines shall be installed as accurately as possible in accordance with the locations shown on the plans. The plans are diagrammatic only, and where irrigation lines on the plans are shown under paved areas but running parallel and adjacent to planted areas, the intent is to install the irrigation lines in the

planted area. Irrigation lines shall have a minimum horizontal clearance of four (4) inches from each other, and a minimum horizontal clearance of twelve (12) inches from other underground lines (this requirement does not apply to any lines crossing at angles from 45 to 90 degrees with each other). A minimum of two (2) inches vertical clearance shall be maintained between lines which cross between these angles. No irrigation line shall be installed parallel to and directly over another line. Intermediate high spot along the irrigation line shall not be allowed.

E. All pipes shall be assembled free from dirt, shall be reamed and all burrs shall be removed. When pipe laying is not in progress, all open pipe ends shall be closed with watertight plugs in a manner satisfactory to the Engineer. Before installation of irrigation lines, the Contractor shall remove all stakes, debris, loose rock and other hard material from the bottom of the trench.

F. After the final positioning, the pipe shall be held in place in the trench with backfill material placed equally on both sides of the pipe at as many locations as are required to hold the pipe section in place. After joints are completed, the backfill material shall be redistributed and compacted as herein required.

G. At the end of each day and when work is not in progress, the open ends of pipe installed in the line shall be closed with watertight plugs, and openings for valves and other appurtenances shall be suitably covered.

H. Concrete thrust blocks of the form and dimensions shown or noted on the plans shall be provided as indicated on the plans. Form thrust blocks in such a manner to prevent any concrete from coming in contact with the pipe. Thrust blocks shall be constructed to completely fill the void between solid soil and the fitting, and shall be installed in strict conformance with the applicable details shown or noted on the plans.

3.03 JOINT AND FITTING INSTALLATION

A. Rubber Ring Seal Joints

1. Use factory made male ends or prepared field cut male end joints to exact specifications of factory made ends. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.
2. Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use hands only when inserting PVC pipe.
3. Thrust blocks shall be provided where necessary to resist system pressure on joints or fittings made with rubber ring seal joint pipe in accordance with the details shown on the plans.

B. Solvent Weld Joints

1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe of dirt, dust and moisture.

2. Dry-insert pipe into fitting to check for proper sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.

3. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with 711 primer manufactured by "Weld-On" or approved equal. Then, without delay, apply "Weld-On" 710 joint cement or approved equal liberally to the inside of the socket. At this time, apply a second coat of cement to the pipe end.

4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. The fitting shall be properly aligned without strain.

5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.

6. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

C. Threaded Joints

l. Field threading of plastic pipe or fittings is not permitted. Only factory formed threads and factory fabricated nipples or risers shall be permitted.

2. When assembling threaded plastic joints, take up joint no more than one full turn beyond hand tight.

3. Threaded joint connections shall be made up with virgin teflon tape, or approved equal.

3.04 VALVE AND VALVE BOX INSTALLATION

A. Valve boxes shall be grouped and located in shrub and ground cover areas wherever possible. Valves shall be installed no farther than twelve (12) inches from the main line and no closer than twelve (12) inches from walk edges, buildings and walls.

B. Thoroughly flush main line before installation. Valves shall be installed as indicated on the details shown on the plans.

C. All control valves shall be three (3) inches minimum and eight (8) inches maximum below finish grade to the top of the flow control stem.

D. Quick coupling valves shall be located as called for on the plans and installed as indicated on the details shown on the plans.

E. Valve boxes shall be set flush with finish grade in lawn areas and one and one-half (1-1/2) inches above grade in shrub areas.

3.05 SPRINKLER HEAD INSTALLATION

A. Lawn heads shall be located with a minimum of one (1) inch, a maximum of two (2) inches, clear from adjacent paving or headers, and flush with them where a

potential hazard may occur. Other lawn heads shall be installed as indicated on the details shown on the plans.

B. Pop-up heads of approved design shall be installed at edges of land-scaped areas adjoining paved areas as indicated on the details shown on the plans. Interior shrub heads shall be either pop-up heads set level with finish grade or fixed heads set six (6) inches above finish grade.

C. Individual heads shall be adjusted as required to obtain uniform coverage without overthrow onto buildings, paving, main walks, or other structures.

D. Each section of lateral pipe shall be thoroughly flushed out before the sprinkler heads are attached.

E. Sprinkler heads shall be located and installed as shown on the plans.

3.06 IRRIGATION CONTROLLER INSTALLATION

A. Controller enclosures shall be located, and irrigation controllers and enclosures shall be installed, as shown on the plans. The sprinkler controller chart shall be a photostatic reproduction of the sprinkler or irrigation plan, provided and installed by the Contractor. It shall be laminated permanently in plastic and securely attached to the inside lid of the controller cabinet and shall correctly relate each section to its respective system.

3.07 CONTROL WIRE INSTALLATION

A. Connection of control lines to controller shall be in sequential arrangement according to assigned identification number of valve. Connections shall be made by crimping bare wires with brass connectors and sealing with epoxy resin sealer packs. Control lines shall be labeled at the controller with permanent non-fading labels indicating identification number of valve controlled.

B. All control wiring shall be laid to minimum depth of eighteen (18) inches in common trenches with mainline piping wherever possible. Where control lines do not parallel mains, wires shall be strapped at intervals of at least ten (10) feet to the underside of two by four redwood boards.

C. Where control lines pass under paving, they shall pass through Schedule 40 PVC conduit sleeves. Where control wires pass through sleeves, Contractor shall provide removable non-decaying plug at ends of the sleeve to prevent entrance of earth.

D. Contractor shall loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire. All splices shall be made at a valve box only.

3.08 ELECTRICAL SERVICE INSTALLATION

A. Make all electrical connections to 120 Volt service at each controller location. Install a disconnect switch inside the pedestal of the controller cabinet. All electrical work and materials shall comply with these specifications and any

further requirements of the permit issued for the electrical service connection by the serving utility.

3.09 TESTING

A. Hydrostatic and leakage tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position with no fittings being backfilled.

B. All welded plastic pipe joints shall have cured for at least 24 hours. Provide all water necessary for filling and flushing at no additional expense to the Contract.

C. Pressure irrigation mains shall be subjected to a hydrostatic test of 125 psi. Each section being tested shall be slowly filled with water, care being taken to expel all air from the pipe by such means as are necessary. The pipes must be flushed before testing to remove any foreign material. The test pressure shall be applied for not less than four (4) hours. Any leakage discovered in consequence of the pressure test shall be corrected and the test shall be repeated until satisfactory results are obtained. Any defective pipe, fittings, valves, or joints shall be repaired or replaced.

D. Contractor shall provide water as necessary for hydrostatic testing.

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