SECTION 328424 – IRRIGATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide underground landscape irrigation system at locations indicated on the Drawings and as herein specified.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A53: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM D1784: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   3. ASTM D1785: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   4. ASTM D2466: Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   5. ASTM D2564: Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
   6. ASTM F656: Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

1.3 SUBMITTALS

A. Product Submittals:
   1. Submit product data showing manufacturer's name, catalog number, technical data, and photo or drawing for each component of the irrigation system.
   2. Submit product data 10 days prior to beginning work.

B. Water Pressure Tests:
   1. Submit report of water pressure tests at irrigation water supply connection.
   2. Submit report of irrigation pressure tests for main line prior to backfilling.

C. Submit Record Drawings at closeout of contract to include:
   1. Variations or changes to system.
   2. Main and lateral line locations.
   3. Automatic control valves.
   4. Quick coupling valves.
   5. Drain valves.
   6. Operating and Maintenance information for:
      a. Control valves
      b. Spare parts list.
      c. Local source of replacement parts.

1.4 SITE CONDITIONS

A. Weather Requirements:
   1. Do not solvent weld polyvinyl chloride pipe when ambient temperature is below 40ºF or above 95ºF.
   2. Do not solvent weld polyvinyl chloride pipe in wet conditions.

B. Schedule for Installing Pipe, Sleeves and Sprinkler Heads:
   1. Schedule installation of pipe sleeves below paving and walks prior to construction.
   2. Schedule installation of sprinkler heads after pressure testing and final grading.

1.5 DAMAGES

A. Restore structures or facilities damaged by irrigation work to original condition.
B. Repair damage caused by leaks or breaks in equipment and materials furnished or installed in this contract for one year after date of final acceptance.

1.6 EXISTING UTILITIES

A. Locate and identify, with visible marking, existing underground utilities in areas of work. Utilities to remain in place shall be protected during excavation operations.
B. Consult with utility owner for instructions if uncharted piping or other utilities are encountered during execution of work before proceeding.
C. Cooperate with Owner and public or private utility companies in keeping their respective services and facilities in operation. Coordinate temporary interruptions to existing services and facilities and provide temporary utility services.

1.7 REGULATIONS

A. Work to be accomplished in accordance with applicable Local, State and Federal codes and regulations.

1.8 RECORD DRAWINGS

A. Maintain a current record of pipe and equipment placement, and record variations or changes.
B. Include Record Drawings in Operating and Maintenance Manual.

1.9 WARRANTIES

A. Equipment Warranty: Provide equipment manufacturer’s standard Warranty for:
    1. Irrigation controller
    2. Control valves
    3. Quick couplers
    4. Sprinkler heads
    5. Isolation valves
B. Installer's Warranty:
    1. Warranty all irrigation pipes to be free of leaks for one year from the date of final acceptance.
    2. Warranty shall include repair of trench backfill that settles more than 1/2" and repair of plantings, paving, and improvements damaged by settlement of trench backfill soils during warranty period.

1.10 QUALIFICATIONS

A. Irrigation Installer: The landscape construction professional as defined in ORS 671.520 and performing work under this section of the contract shall hold a valid landscape contractor’s license in accordance with ORS 671.510 to 671.760.

PART 2 - PRODUCTS

2.1 PVC PIPE

A. Polyvinyl Chloride Plastic (PVC) Pipe: PVC 1220, Type 1, normal impact, I.P.S., N.S.F. approved or accepted substitute.
    1. Main and Lateral (Zone) Lines: Schedule 40 PVC pipe, conforming to ASTM D1784, ASTM D1785 and PS22.

2. PVC pipe to be new, defect free, continuously and permanently marked with manufacturer's name or trademark, size, schedule and type of pipe.

2.2 PVC PIPE FITTINGS

A. PVC Fittings: PVC 1220, schedule 40, type 1, normal impact, I.P.S., N.S.F. approved meeting requirements of ASTM D2466 or accepted substitute.
B. PVC nipples to be standard weight schedule 80, with molded threads.

2.3 PVC SOLVENT CEMENT

A. For pipe diameter up to 1-1/2”: Weld-On 721 blue color, or accepted substitute, meeting N.S.F. approval for Type I and II PVC and requirements of ASTM D2564.

2.4 PVC CLEANER AND PRIMER

A. Weld-On P-70, purple color, or accepted substitute, meeting requirements of ASTM F656.

2.5 PVC SLEEVES

A. Schedule 40 PVC, sized two times the diameter of the pipes scheduled to be contained in the sleeve. Minimum sleeve size is 4” diameter, unless otherwise noted on the Drawings.

2.6 GALVANIZED STEEL PIPE AND FITTINGS

A. Pipe: Schedule 40, hot-dipped galvanized, conforming to ASTM A53.
B. Fittings: Hot-dipped galvanized, malleable iron.

2.7 IRRIGATION HEADS

A. See schedule on the Drawings.

2.8 VALVES AND ACCESSORIES

A. Control Valves: See schedule on the Drawings.
B. Main Line Isolation Valves:
   1. Type: Brass ball valve with 150-PSI min. rating.
   2. Size: Same size as line on which it is installed.
C. Valve Boxes for Control, Isolation and Ball Valves: 12" minimum size box, one box for each valve, with locking lid and with 3" and/or 6" extensions as needed to facilitate required installation.
   1. Valve boxes shall be no closer than 12 inches apart, when multiple valve boxes are placed together.
   2. Boxes to be Carson, Armor, or approved equal.
D. Manual Angle Valves: Brass manual angle valve with unions and “T” stem, same size as line on which it is installed.
E. Manual Drain Valves: Brass manual angle valve with “T” stem. Valves shall be 1" size.
F. Quick Coupling Valves: See schedule on the Drawings.
G. Valve Boxes for Quick Coupling Valves and Manual Drain Valves: Carson, Armor, or approved equal, round valve boxes, 10” diameter, one box for each valve.

2.9 IRRIGATION CONTROLLER

A. Controller: See schedule on the Drawings.

2.10 IRRIGATION CONTROL WIRE

A. Controller to Control Valves: No. 14 AWG, single strand insulated copper wire, designed for 24 volts or greater, Type UF, UL approved for direct burial in NEC Class II circuits.
   1. Common wire: white color.
   2. Control wire: red color.

2.11 BACKFLOW PREVENTION DEVICE

A. Existing backflow prevention device as indicated on the Drawings.

2.12 WATER SOURCE

A. Existing on-site domestic water service dedicated for landscape irrigation as indicated on the Drawings.

2.13 OTHER MATERIALS

A. Keys:
   1. 2 keys for each type of locking valve box, cover, or valve with integral locking lid.
   2. 2 valve-operating keys of type and length required to operate manual drain valves.
B. Electrical Connectors: Water-tight electrical connectors.
   1. 3-M DBY.
   2. RainBird DB Series.
   3. Or accepted substitute.
C. Locator Wire: All main lines to be marked with continuous 14-gauge, single-strand locator wire, with light blue color coating.
D. Pipe Joint Tape: Minimum of 1/2" Teflon tape intended for use in wrapping threaded PVC and/or galvanized pipe fittings and joints, as required.
E. Drain Rock: 1/4" round clean, washed pea gravel.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not allow work to be covered or enclosed until it has been inspected, pressure tested, and approved by the Landscape Architect.
B. Code Requirements:
   1. Installation of materials and equipment shall be in accordance with manufacturer's written specifications and recommendations, and all local and state codes.
   2. Contractor is responsible for identifying conflicts between manufacturer's written specifications and recommendations, local and state codes, and the Contract Documents.
   3. Contractor shall correct work installed to meet manufacturer’s or local and state requirements at no additional cost.
C. Minor changes necessary to conform to ground conditions may be made without the Landscape Architect's approval. Changes shall be recorded on the Record Drawings.
D. Obtain written permission to shut off any water lines prior to work. Keep disruptions in service to a minimum.
E. Maintain system and protect it from damage, including damage caused by vandalism or adverse weather conditions, until date of final acceptance. Repair damage at no additional cost to the Owner.

3.2 PIPE TRENCHING

A. Minimum depth of cover to top of irrigation piping shall be as follows:
   1. Lateral Lines: Minimum of 12" deep.
   2. Mainline: Minimum of 18" deep.
   3. Sleeves under pavement: Minimum of 18” deep

B. Backfill trenches in cool part of day to minimize expansion and contraction of PVC pipe.
C. Remove debris, trash, rocks, and other foreign material from irrigation trenches.
   1. Irrigation lines to have a firm, uniform bearing surface for entire length of each line.
   2. Wedging or blocking of pipe other than specified thrust blocking is not permitted.
D. Before backfilling trenches, pipe shall be flushed clear and clean of dirt and foreign material. (See 3.12 FLUSHING AND TESTING)
E. Backfill trenches in layers of not more than 6" in depth and compact each layer.
   1. Fill trenches to finish grade with planting soil.
   2. Restore disturbed surfaces to original or better condition.
F. Repair or replace materials and equipment damaged or destroyed while backfilling.

3.3 PIPE

A. Exercise care in handling and storing pipe and fittings.
   1. Store materials under cover before using.
   2. Transport materials in a vehicle of adequate size and capacity to prevent bending or concentration of an external load at any point on materials.
   3. Materials or portions of materials that are damaged shall be discarded and replaced.
B. Remove foreign matter and dirt from inside pipe or fittings before lowering into trench.
C. Install pipe and fittings per manufacturer's specifications with specified materials. Use Teflon tape on threaded joints.
D. Install locator wire on top side of pipe.
   1. Tape locator wire to pipe at no less than 20'-0" intervals.
   2. Sections of locator wire to be spliced together with watertight splice connectors, to provide a continuous run.
E. Snake pipe in trenches to allow for expansion and contraction as recommended by manufacturer.
F. Cut pipe ends square and remove burrs.
G. Repair settling of backfilled trenches during warranty period and completely restore and repair plantings, paving and other site improvements disturbed by irrigation construction.

3.4 BACKFLOW PREVENTION DEVICE

A. Verify that backflow prevention device is tested and approved by authorities having jurisdiction.

3.5 CONTROL VALVES

A. Valve boxes to be installed with top of box flush with planting area grade.
B. Install valves in box allowing room to perform ongoing maintenance by the Owner.
C. Place drain rock in valve box to within 2" of bottom of valve assembly.
D. Install one control valve assembly per valve box. Provide jumbo valve box only if necessary to allow room for maintenance.

3.6 DRAIN VALVES

A. Install complete with fittings, valve boxes and extensions. Install a minimum of one cubic foot of drain rock at each drain valve location.

3.7 ISOLATION AND BALL VALVES

A. Install complete with fittings, valve boxes and extensions.

3.8 QUICK COUPLING VALVES

A. Install quick coupling valves on double swing joint assemblies plumb and flush to grade. Angle of nipple relative to main line shall be no more than 45 degrees and no less than 10 degrees. Install quick coupling valves as detailed on the Drawings.

3.9 IRRIGATION HEADS

A. Install irrigation heads of types, sizes and coverage called for in Irrigation Legend at locations shown on the Drawings.
   1. Minor changes in head location may be necessary to achieve the required coverage.
   2. Make changes at no additional expense to the Owner.
   3. Notify the Landscape Architect for approval prior to making major changes.
   4. Document changes on the Record Drawings.

B. Locate heads no closer than 6" from any adjacent walk, wall, or fence.

3.10 IRRIGATION SLEEVES

A. Install sleeves for irrigation lines and/or control wire under pavement prior to placing pavement materials.
   1. Extend sleeves beyond pavement edge a minimum of 12".
   2. If length of required sleeve is greater than the length of a single piece of pipe, solvent weld joints, otherwise sleeves to be of one continuous length of pipe.

B. Tape ends of sleeve closed to keep soil out of sleeve until irrigation lines and/or control wire are installed.

C. Permanently attach a single length of 14-gauge locator wire to the entire length of the sleeve.

D. Stake both ends of sleeves with a readily visible stake extending 12" above grade and below grade to the bottom of sleeve.
   1. Mark above grade portion of stake with words 'Irrig. Sleeve'.
   2. Remove stakes after sleeves are recorded on Record Drawings and after irrigation lines and/or control wires are installed and inspected.

3.11 IRRIGATION CONTROL WIRING

A. Lay control wires in trench under mainline and/or lateral lines whenever they occur in same trench. Place control wires in sleeves when under paving, and when not in common trench with mainline and/or lateral lines.

B. Wire splices to be moisture proof using specified electrical connectors.
   1. Make splices only in valve boxes.
   2. Provide minimum of 1'-0" of coiled slack between wire splices.

C. Control wires shall be bundled together and wrapped with electrical tape at intervals of no more than 10'-0". Wires shall be placed below mainline and/or laterals when in same trench.

D. Clearly mark both ends of wiring, on a permanent tag, with number of corresponding valve and controller station. Locate one tag at each control valve and one tag per wire in controller.

E. Sharp bends or kinks in wiring not permitted.
   1. Wires to be unreeled in place alongside of or in trench and carefully placed along bottom of trench.
   2. Do not unreel wire and pull into trench from one end.

3.12 FLUSHING, TESTING, AND ADJUSTING

A. Thoroughly flush all main and lateral (zone) lines before testing and installation of irrigation heads and before backfilling trenches.

B. Do not install irrigation heads until after main line pressure testing and lateral line leak testing has been completed and approved.

C. Do not backfill irrigation trenches before main line pressure testing and lateral line leak testing has been completed and approved.
   1. Soil may be placed in trenches between fittings and couplings to insure stability of line under pressure.

2. Fittings and couplings must be left uncovered for visual inspection for full period of test.
3. Do not test until last solvent welded joint has had a minimum of 24 hours to set and cure, or longer if required by manufacturer's instructions.

D. Before testing, fill main lines with water and expel air from pipes.

E. Main line pressure testing:
1. Minimum Pressure Test On Main Lines, Valves, Joints and Fittings: 100 pounds per square inch without losing more than 3 pounds per square inch for a period of 1 hour. Provide airless paint sprayer with compressor, or other equipment, to achieve required hydraulic test pressure without injection of air into main lines.
2. Close all valves and cap all piping and fittings as necessary to isolate main line and conduct pressure testing.
3. Perform preliminary test and repair any leaks or defects.
4. Testing to be performed with a certified liquid-filled pressure gauge.
5. Perform final pressure test in the presence of the Landscape Architect.
6. Contractor shall provide minimum 24-hour notice to Landscape Architect requesting observation of final pressure test.
7. Piping may be pressure tested in sections if approved by Landscape Architect.

F. Lateral (zone) line leak testing:
1. Perform lateral line leak testing for each control valve in numerical sequence, immediately after main line pressure testing has been approved, in the presence of the Landscape Architect.
2. Open each control valve, one at a time, under main line dynamic pressure to demonstrate the absence of leaks at valves, pipe joints, and fittings.

G. Where inspected work does not comply with specified requirements or if pressure tests fail, replace rejected work until compliance is achieved.

H. Adjust and balance irrigation system to provide uniform coverage.
1. Change, reset or adjust heads and/or nozzles as required to provide uniform coverage and match final grades.
2. Perform final coverage test by operating each control valve in the presence of the Landscape Architect when the irrigation system has been completely installed and adjusted.

I. Locator wires must be tested and approved. Wire tests to be conducted by Owner or their designated representative.

3.13 IRRIGATION CONTROLLER

A. Connect controller to power supply according to all code requirements and manufacturer's installation instructions.

3.14 CLEAN-UP

A. Remove packaging, excess materials, and trash, and dispose of in a legal manner.

3.15 FINAL SUBMITTAL

B. Clean print of final Project Record Drawing, reduced by 50% with zones clearly color-coded, for delivery to Owner's Representative.

C. Provide a minimum of one (1) hour of training and orientation with Owner's Representative to demonstrate adjustment and maintenance of irrigation system. Review spring activation and winterization operations as part of the Owner's training and orientation procedures.

END OF SECTION