SECTION 328000

IRRIGATION COMPONENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials equipment and related items necessary to complete the work identified in these Specifications. Provide a complete and operable, automatic irrigation system with complete and uniform water coverage for all new landscape areas identified on the Landscape Plan. The items of work to be performed include, but are not limited to:

1. Provide trenching and backfilling for piping/wiring.

2. Provide and install irrigation sleeving.

3. Provide and install pipe, sprinkler heads, fittings, valves and valve boxes.

4. Provide and install valve control wire and controller.

5. Guarantee, maintenance, protection and system testing.

6. All other related items required to complete the work in the best-accepted trade practices.

1.2 SYSTEM COVERAGE CRITERIA

A. Coverage: The irrigation system shall provide 100% coverage of all and tree planting areas and shrub/groundcover planting areas as directed. Irrigation heads shall be located and adjusted to avoid over-spray on paved surfaces.

B. Zoning: Number of zones shall be determined by designer and shall be based on available water pressure at the site. Contractor shall inform Landscape Architect of any and all problems with pressure and/or flow to site.

1.3 PROTECTION OF WORK, PROPERTY, UTILITIES AND PERSONS

A. Provide protection of all property, persons, work in progress, structures, utilities, walls, walks, curbs and paved surfaces from damages incurred arising from this Contract. The Contractor shall pay for any repair of such damage at no additional cost to the Owner. Verify locations of all underground utilities prior to commencement of work. Existing known utilities have been shown on the Architectural/Engineering or Survey Drawings. The Contractor shall be responsible for the protection of said utilities. Promptly notify the General Contractor and Owner of any conflict between proposed work and obstruction(s).

B. Notify local utility companies a minimum of 48 hours prior to beginning work.

1.4 SUBMITTALS

A. At least 30 days prior to beginning work described in this section submit the following data for products submitted for review.

1. Manufacturer's descriptive data including operating materials used in products, test certificates, special features, guarantees and other data required to completely describe the product.

2. Samples of the proposed substitution when requested. Samples will be returned to Contractor whether or not approval is given.

B. Product Data: Material and equipment composite data sheets shall be submitted for the following:

1. Galvanized pipe

2. PVC pipe

3. Gate valves

4. Double check assembly

5. Pressure gauges

6. Manual drain valve

7. Quick coupling valves (inc. key and hose swivel)

8. Master valve

9. Flow sensor

10. Control valves

11. Communication, control, and trace wire

12. Wire splices (all types)

13. Swing joints

14. Sprinkler heads/nozzles

15. Landscape Drip system

16. Valve boxes

17. Controller

18. Frost Free Yard Hydrant

C. Submit the number of copies required by the Contract Documents. Clearly index, label, and highlight products to be utilized.

1.5 VERIFICATION OF SITE CONDITIONS

A. Before proceeding with any work, the Contractor shall verify all dimensions pertaining to the location of irrigation equipment. Contractor shall verify location and depth of service lines, existing irrigation mainline and available static water pressure. Should any error or conflicts in the Drawings and/or Specification be found, the Contractor shall immediately notify the Owner's Representatives.

B. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner no fewer than (2) working days in advance of any proposed interruption of water service. Do not proceed with interruption of water service without Owner's written permission.

C. Utilities and Existing Structures: The exact location of existing structures and overhead or underground utilities, shall be determined by the Contractor and he shall conduct his work so as to prevent interruption of service or damage to them. Protect existing structures and utility services and repair damages.

D. Finish Grades: Verify the correctness of all finish grades within the work area to insure the proper soil-coverage depth over pipe lines.

1.6 CLEANUP

A. All paved surfaces shall be kept clean of soil and debris on a daily basis.

B. Contractor shall be responsible for cleaning all paved surfaces affected by irrigation work prior to final acceptance.

1.7 GUARANTEE AND REPLACEMENT

A. All materials and workmanship shall be guaranteed for a period of one year. Guarantee period shall commence when written Final Acceptance is granted. This guarantee does not apply to work or damage done to the system by others after Final Acceptance. Guarantee shall also cover repair of damage to any part of the premises (including planting) resulting from leaks, settlement or other defects in materials, equipment and workmanship to the satisfaction of the Owner.

1.8 SYSTEM PROTECTION

A. During the one-year guarantee period, the Contractor shall be responsible for deactivating and draining the system prior to freezing weather. A compressor shall be used to blow the

system dry. Contractor shall reactivate the system at the onset of the Spring growing season. Both operations shall be performed once during the guarantee period.

B. Contractor shall notify the Owner in writing of the dates the system was winterized and reactivated, and shall be held responsible for any damages resulting from the failure to comply with the above procedure.

C. When using compressed air to winterize the system, do so in two (2) short cycles at no more than 75-psi pressure. Do not allow pipe to compressor to get hot to the touch. The Contractor shall winterize the system prior to irrigation system substantial completion approval and acceptance if freezing weather occurs or is forecast. In such an event, the Contractor shall, as directed by the Landscape Architect, reactivate the system for final inspection and acceptance.

D. Winterization and reactivation prior to final acceptance will not satisfy the warranty period requirement to deactivate (winterize) and reactivate the irrigation system.

E. Fill and repair depressions and replace construction materials damaged from settlement or repair of irrigation trenches, throughout the warranty period.

F. Adjust sprinkler heads as necessary to maintain complete, 100% overlap coverage, and to keep spray off structures, out of roadways, and off pavements throughout the warranty period.

G. Replace defective parts throughout the warranty period.

1.9 SYSTEM MAINTENANCE

A. Provide maintenance of the irrigation system until Final Acceptance including head and nozzle adjustment, setting and adjusting controller times, and replacing defective materials.

B. Operations and Maintenance Manual:

1. At, or before, Substantial Completion review of irrigation system, submit for review one (1) manual, bound in hardback, 3-ring notebook, to Owner’s Representative. At a minimum, the following information/items are required to be in the manual:

    a. List of authorized distributors and service representatives for each item of irrigation equipment, including names, addresses and telephone numbers.
    b. Guarantee/warranty certificates for all equipment used and Contractor's written warranty for entire system one (1) year guarantee.
    c. Instruction manuals for all equipment used.
    d. Parts lists for each item with exploded views of each item showing part numbers.
    e. A pocket for one (1) blue-line print of the reviewed mylar record drawings laminated in clear plastic. This print shall be added at time of Final Inspection.
    f. Controller cabinet keys.

1.10 PERMITS, CODES AND ORDINANCES

A. Obtain and pay for all necessary permits and fees as required by applicable codes and ordinances for this work.

B. Comply with all applicable codes, regulations and ordinances.

C. City of Port Angeles shall inspect and approve the backflow prevention device.

1.11 SUBSTITUTIONS

A. Specific reference to manufacturer's' names and products specified in the Section are used as standards, but this implies no right to substitute other material or methods without written approval of the Owner’s Representative.

B. Installation of any approved substitution is Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of the Owner’s Representative and without additional cost to Owner.

C. No substitutions will be permitted which the Owner’s Representative has not submitted for prior review and comment.

D. Review by Owner’s Representative of substituted equipment and/or dimensional drawings do not waive these requirements.

1.12 REVIEWS

A. Contractor shall coordinate all review processes and dates with Owner’s Representative. Contractor shall give the Owner’s Representative 48 hours notice prior to any inspection. Contractor is responsible for uncovering/unearthing any sections of installation upon request from Owner’s Representative. Contractor is responsible for providing inspections of trench depths, head layout, pressure tests and performance tests.

B. Contractor shall provide a written Irrigation Installation plan summarizing proposed sequences of installation, methods of installation and estimated dates of completion. This work plan shall accompany requested Submittals and will be approved prior to installation of Irrigation System.

C. Mainline trench depth, component placement and pressure tests may be accomplished concurrently. Mainline may be installed and tested in sequences, three (3) sequences maximum. Each section shall remain uncovered at all connections and valve assemblies. Each subsequent section shall be tested in conjunction with preceding section (not isolated).

1.13 OWNER TRAINING

A. Prior to Final Acceptance of work, Contractor shall provide the Owner with all keys, tools and maintenance manuals necessary to operate/deactivate the irrigation system. The Contractor shall train and instruct the Owner’s Representative as to the operation and maintenance of the irrigation system.

1.14 RECORD DRAWINGS

A. Furnish Record Drawings of the complete irrigation system in accordance with the following conditions:

1. Contractor will be provided with CD/USB drive with PDF showing irrigation work as designed under this contract.

2. Maintain the blue-line prints on site at all times during construction. Make a daily record of all work installed on the prints.

3. On the prints, show actual locations of valves, master valves, gate valves, risers, piping and sleeving. Dimension from easily identified permanent features such as buildings, curbs, fences, walks or property lines.

4. Show approved manufacturer's name and catalog number on prints.

5. Make drawings to scale with all notations neat in appearance.

6. After testing and review of mainlines and laterals for backfill, transfer all information noted on blue-line prints to the mylar in a neat, orderly way.

7. Turn the Record Drawings over to the Owner’s Representative in PDF format on CD/USB for review after Final Inspection of the Project. Record Drawings must be submitted, reviewed and corrected if required prior to final payment.

1.15 EXTRA MATERIALS

A. Prior to final acceptance, the Contractor shall provide to the Owner (at no additional cost to the Owner), the keys and/or other tools necessary to activate, operate, and drain the system, including:

1. Two (2) quick coupling valve keys w/ hose swivels.

2. Two (2) quick coupling valve cover keys.

3. Two (2) manual gate valve keys.

4. Two (2) of each type of rotor head installed.

5. Five (5) of each type of spray head installed.

6. All extra nozzle sets not utilized during the installation.

7. Two (2) valve box cover keys.

PART 2 - PRODUCTS

2.1 PLASTIC PIPE

2

A. Polyvinyl Chloride Pipe (PVC):

1. Pressure Mains and Sleeving - All Sizes: Polyvinyl chloride (PVC) 1120, 1220, Schedule 40, solvent weld and shall conform to ASTM D1785.

2. Laterals - All Sizes: Polyvinyl chloride (PVC) Schedule 200 SDR 21, solvent weld and shall conform to ASTM D2241.

3. Threaded Pipe, Adapters and Nipples: PVC 1120 or 1220, Schedule 80, conforming to ASTM D1785.

B. Pipe shall be marked with manufacturer's name, class of pipe, NSF seal and date and shift of manufacturing run. Pipe shall bear no evidence of interior or exterior extrusion marks.

C. Pipe walls shall be uniform, smooth and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.

D. Fittings shall be PVC Schedule 40, full size unless otherwise noted. Fittings shall be of brand(s) recommended by manufacturer of pipe.

2.2 DUCTILE IRON PIPE

A. Ductile iron pipe shall comply with WDOTSS 9-30.1(1).

2.3 GALVANIZED PIPE AND FITTINGS

A. Galvanized Pipe shall be Schedule 40, domestic manufacture, and shall conform to ASTM A 53. Fittings shall be malleable galvanized.

1. All galvanized pipe and fittings installed below grade shall be painted with Fields A470 “Rainstop”, nonfibered, asphalt coating.

2. All galvanized pipe fittings installed above grade shall be painted with one coat of galvanized metal primer followed by one coat matte black alkyd oil enamel.

2.4 PIPE THREAD TAPE / COMPOUND

A. All galvanized pipe threads shall be wrapped at least three (3) times, but no more than four (4), with Teflon tape. A thin coat of Rector Seat T+2, Teflon paste shall be applied on top of the Teflon tape prior to assembly

2.5 PIPE AND WIRE SLEEVES

A. Pipe sleeves shall be twice the diameter of the pipe passing through it, but no smaller than 4 inches (4”) in diameter. No more than one pipe shall be installed in each sleeve.

B. Control and communication wire shall be installed in separate 2 inches (2") diameter CL-200 PVC sleeves.

C. Sleeve under all paved surfaces and where indicated on Drawings.

D. Extend sleeves minimum 24 inches (24") past both sides of pavement edge.

E. Mark sleeve ends with a 2x4 wooden stake driven 18 inches (18") into grade with 24 inch (24") exposed. "IR Sleeve" shall be imprinted in on each stake in black, waterproof ink. The top of each stake shall be painted with fluorescent pink marking paint and shall be further marked with three wraps of fluorescent pink flagging tape. Remove stakes after irrigation lines are installed.

F. No additional payment shall be made under any circumstances for locating sleeves.

G. Mainline and lateral piping shall be sleeved using Ductile Iron Pipe.

2.6 SOLVENT WELD COMPOUND

A. Two-step application using Weld-on P-70 purple primer and Weld-on 727 Clear, fast setting PVC glue or as recommended by pipe manufacturer to meet site conditions encountered. Submit product information for approval.

2.7 REMOTE CONTROL VALVES

A. Valves shall be Rainbird 100-PEB-Series: size as shown on the Drawings. Supply each valve with PRS pressure-regulating valve and adjust pressure as shown on plan.

B. Each Remote Control Valve shall be supplied with an identification tag . Each valve shall be numbered as shown on Plan.

C. Master Control Valve shall be Hunter IBV-201G-FS-As-R brass body, 24 Volt solenoid mechanism, normally closed.

2.8 QUICK COUPLER VALVE

A. Quick coupler valves located on Pressure Mainline shall be Rainbird 44 LRC with locking rubber cover. Provide with valve key and hose swivel for each quick coupler valve.

2.9 MANUAL DRAIN AND CONTROL VALVE

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A. Manual On/Off Valves shall be PVC true union ball valves. Size to match mainline size.

2.10 AUTOMATIC CONTROLLERS

A. Refer to Irrigation Plan for controller location and specifications. Coordinate exact location with Building Electrician and Construction Manager.

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B. Rain Bird ESPLXME 2 12-station traditionally wired commercial controller with indoor / outdoor plastic wall mount enclosure

2.11 COMPATIBLE SENSORS & VALVES

A. Flow Meter: Hunter Flow-Click FCT-200.

B. Solar Sensor: Hunter WSS-SEN Wireless Solar Sensor. Not shown on plans. Provide at Location Determined by Owner.

2.12 IRRIGATION HEADS

A. Spray heads for landscape areas shall be Rainbird 1800 Series with 6” pop-up heights. Nozzles as indicated on Plan.

2.13 CONTROL WIRE

A. Control Wire shall be Hunter Two-Wire. Valve wire shall be direct burial wire, Copper, insulated. Wire to be twisted red/blue pair.

B. Splice: Watertight electrical splices shall a dry splice 3M-DBYconnector or approved equal. Submit sample for approval.

C. Electrical Tape: Black plastic, 3/4" wide, spec. grade, minimum .007" thick, all weather type.

D. Duct Tape: All weather cloth tape.

E. Plastic Ties: Clear plastic locking ties. Size to allow for pipe diameters.

F. Locator wires for below-grade piping shall be #14 bare copper, U.L. approved as UF, ASTM B-3 rated.

2.14 BACKFLOW PREVENTION DEVICE

2

A. Double Check Valve Assembly: Febco #850U, bronze valve body with union end ball valves or approved equal.

2.15 METER

A. Irrigation Meter per the City of Port Angeles. See Civil Drawing Utility Plan for additional information.

2.16 VALVE BOXES AND VAULTS

A. Valve Boxes shall be a combination of polyolefin and fibrous material. Extensions may be required to bring the valve box to the proper level. Utilize drop in style covers unless specified otherwise. Boxes shall be as follows:

1. Double Check Valve Assembly: Carson 17”x30” Super Jumbo Rectangular Box, model #1730-24 HDPE w/1730-24 Purple “RCWDNDES” label reading Reclaimed Water-Do Not Drink (English and Spanish) with Locking Bolt.

2. Manual Drain Valve, Quick Coupler Valve, Master Control Valve, and Flow Meter : Carson 10” Diameter Valve Box, model #0910-18 HDPE w/6” extension #910T Cover Purple, “RCWDNDES” label reading Reclaimed Water-Do Not Drink (English and Spanish) with Hex Bolt.

3. Automatic Control Valve: Carson 14”x19” Standard Rectangular Box, model #1419-12 HDPE Purple wit 12” extension w/ #1419T Purple “RCWDNDES” label reading Reclaimed Water-Do Not Drink (English and Spanish) with Hex. Bolt.

4. All Valve Boxes on Green Roof: Carson 6” Round Valve Box 6” Extension, model #38005610 w/Purple Lid.

5. Concrete pavers for Valve Box support shall be Contractor’s choice; confirm with OWNER’S REPRESENTATIVE

2.17 YARD HYDRANT

A. Woodford Y34 Freeze less Iowa Yard Hydrant

1. Manufacturer: Woodford, or approved equal

2. Model: Woodford Y34, or approved equal/ 2 – 3 ft model

3. Size: ¾” inch inlet with ¾ inch hose thread outlet

4. Bury Depth: Per local frost depth (12 inches for Port Townsend)

5. Flow: Full port design suitable for hose filling and irrigation

6. Finish: Factory Finish

7. Install on a 12” minimum washed drain rock sump beneath the drain port

8. Separate Shut-off Valve in an accessible valve box upstream

9. 4 inch concrete collar around the hydrant

10. Hose hanger and hose

11. All materials and connections should comply with local code requirements

12. All work shall be done per Plumbing requirements. See Plumbing drawings for additional information

2.18 MISCELLANEOUS KEYS

B. Provide three (3) of each of the following keys: Manual drain key, valve box cover lock key, controller cabinet key.

2.19 DRAIN ROCK

A. Gravel Backfill for Drains.

2.20 ELECTRICAL CONDUIT

A. This specification pertains only to low voltage wiring. All 120-volt power specifications are referred to Section 16000 – Electrical.

B. Conduit above finish grade shall be rigid galvanized steel with zinc-protected threads. Fittings shall be of the same material with hot dipped galvanized finish.

C. Conduit within a building shall be EMT where permitted by Code. Fittings shall be suitable for this product.

D. Conduit within the ground shall be Schedule 40 Rigid PVC. Fittings shall be suitable for this product.

E. Conduit for underground communication cable for centrally-controlled systems, when not buried with irrigation piping, shall be Schedule 40 gray PVC, 1-1/2” diameter, with pre-manufactured sweeps. Above grade conduit for PE89 shall be rigid steel as described above.

F. All equipment furnished and installed shall be in accordance with National, State, and City Electrical Codes, established safety codes and applicable local codes and ordinances.

G. Conduit runs shall be a maximum 400 feet without a pull box. Pull boxes shall be located every 400 feet.

H. Pull boxes shall be as noted in herein with “ELECTRICAL” permanently branded on the lid.

I. Flow sensor cable (PE-89) shall be enclosed in a separate 1-1/2” Schedule 40 conduit.

2.21 MAINTENANCE EQUIPMENT

A. Provide two (2) manufacturer's service wrenches for each head type requiring wrenches for servicing or adjustment.

PART 3 - EXECUTION

3.1 VERIFICATION

A. Prior to installation, verify that adequate gallonage and pressure is available to properly operate the irrigation system. Immediately notify Owner's Representative of inadequate conditions.

3.2 LAYOUT

A. Layout work as accurately as possible to Drawings. Contractor will be provided with electronic drawing to accurately place Turf Rotors. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. No changes to irrigation system will be made by the Contractor without approval of the Landscape Architect.

B. Accurately stake head locations, following the design shown on the Drawings. Do not exceed manufacturer's recommended spacing. Alterations and changes to the layout may be expected in order to conform to ground conditions and to obtain full and adequate coverage of water. No changes or alterations in the Irrigation Plan shall be made without the prior authorization of the Owner's Representative.

C. Adjust layout as necessary to install around existing work. Where piping is shown to be under paved areas, but running parallel and adjacent to planted areas, intention is to install piping in planted areas. Do not install piping directly over another line in common trench. Offset piping to opposite sides of the trench.

D. Install irrigation to avoid proposed and existing tree and root locations. Plant locations will be field adjusted to avoid irrigation equipment, at direction of Owner's Representative.

3.3 TRENCHING

A. Provide all excavations as required for installation of work included in this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavation, to their original condition.

B. Contractor shall submit a written schedule of Trenching and Irrigation Pipe installation for approval by Owner's Representative prior to beginning trenching. This schedule shall include, at the very least the proposed dates of beginning of mainline trenching, completion of mainline pipe installation, beginning of lateral pipe trenching and completion of lateral pipe installation. Trenching and installation may be phased to facilitate Pressure Testing, 2 phases only permitted.

C. Dig trenches wide enough to allow a minimum of 4" between parallel pipe lines. Trenches shall be of sufficient depth to provide minimum cover from finish grades as follows:

1. Over PVC mainline pipe and control wires: 18" minimum cover.

2. Over PVC lateral lines: 12" minimum cover.

3. Over all sleeving: 18" minimum cover.

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4. Excavate to depth required in any material encountered with no extra compensation. Backfill all irrigation trenches with clean sand.

5. Install pipe with manufacturer's markings facing up (12 o'clock).

6. Where multiple irrigation pipes share a common trench, trench shall be sufficiently wide (or piping shall be arranged) to allow four inches (4") minimum of horizontal separation and six inches (6") minimum of vertical separation between piping, while maintaining specified minimum and maximum cover over piping. Irrigation pipes shall be located in a separate trench from any domestic water piping.

D. Dispose of all surplus suitable excavation from trenches off-site.

3.4 SLEEVING

A. Install sleeves under all paved surfaces as required to facilitate installation of the irrigation work.

B. Irrigation mainline and lateral sleeves shall have one sleeve per irrigation pipe. Wire chase sleeves are not shown on the drawing but shall be installed adjacent to all mainline sleeves. Wire chase sleeves shall be a minimum of 2" in diameter.

C. Extend sleeves a minimum of 24" beyond the edge of curbs, walks, walls and/or other paved surfaces. Cap and identify sleeve ends.

D. Plug ends of sleeves around insert piping with fiberglass insulation material to prevent soil from entering ends. Complete this prior to backfilling of trenches.

E. Compact backfill to a minimum of 92% per ASTM D1557.

F. Bore underneath existing pavements to install sleeves for wiring and mainline. Minimum depth of top of sleeve to pavement elevation is twenty four inches (24").

3.5 QUICK COUPLERS

A. Install on triple swing joints as detailed and specified. Set top of all quick coupler valve boxes flush with final finish grade. Set all quick coupler valves perpendicular to finish grade. Valve box shall be no closer than 12" to pavement except as noted.

B. Quick Coupling Valve shall be installed a minimum of twelve inches (12"), and maximum of thirty-six inches (36") from pavement or lawn edge (except at point of connection). The maximum distance from the top of the quick coupler to the top of the valve box shall be three inches (3"). Make sure quick coupler key easily passes the top of the valve box when fully engaged. The valve shall be installed inside a ten inch (10") round valve box. Care must be taken to prevent excessive water backup within the valve box.

C. A six-inch (6") layer of washed gravel backfill for drains shall be placed in the bottom of the valve box, encased in a layer of geotextile fabric.

D. Thoroughly flush mainline before installing Quick Coupling Valves.

3.6 DRAIN VALVES

A. Install manual drain valve per detail and as described herein.

B. All valves to be installed at locations shown on plans, verify with OWNER'S REPRESENTATIVE prior to installation.

3.7 CONTROL WIRING

A. Wiring between automatic controller and automatic control valve shall comply with National Electric Code, latest edition.

B. Splices will be permitted only at junction boxes, valve boxes, or at control equipment. A minimum of 2' of excess conductor is to be left at all splices, terminal and control valves. Encapsulate all splices with approved connectors.

C. All control wire that is not installed within mainline trench shall be buried at 24" depth minimum and sleeved with appropriately sized Schedule 40 PVC conduit (or better). Sleeve shall be continuous from mainline trench to mainline trench and from mainline trench to controller. All control wire installed above ground shall be encased (sleeved) within intermediate metal conduit and fittings (or better). All such sleeves shall be marked on "as-built" drawing.

3.8 AUTOMATIC CONTROLLERS

A. Coordinate location of Controller with Owner.

B. Contractor is responsible for providing 120/230 VAC power to Controller if necessary. All electrical modifications shall be approved by Owner's Representative prior to installation.

C. Mount Controller per manufacturer's specifications. Final installation shall be plumb, secure and with finished appearance. All conduit shall be secured to wall or framing with galvanized pipe clamps. Provide material descriptions and shop drawings for all mounting procedures.

D. Mount Solar Sensor at location determined by Owner's Representative.

3.9 COMPATIBLE SENSORS AND VALVES

A. Flow Meter

1. Connect Flow Meter to Mainline with as detailed.

2. Provide individual control and common wires to Controller with spare common. Splice wires as detailed.

3. Control wires from Flow Meter to controller shall be sized and colored as specified by Flow Meter manufacturer. There shall be no other buried splices allowed between controller and Flow Meter.

B. Master Valve

1. Install Master Valve similar to typical Electric Control Valve. Provide spare common wire continuous from Controller to Master Valve and signal wire.

3.10 DOUBLE CHECK VALVE ASSEMBLY

A. Install Double Check Valve Assembly securely and level. Provide adequate clearance as detailed or per manufacturer's specifications (whichever is greater).

B. Shall be certified by Sate of Washington Backflow Assembly Tester, after installation.

3.11 REMOTE CONTROL VALVES

A. Install in approximate locations shown on plan, outside of paved areas and grouped together where possible.

B. Where valves occur adjacent to paved areas, install so that the valve box will be no closer than 12" to paving and perpendicular or parallel to it. Grouped valves shall be spaced evenly to present a neat appearance. Valve boxes shall be installed 1/2 inch above finish grade.

C. Enclose all valves in individual valve boxes. Use valve box extensions as required. Install as per detail and locate precisely by dimensions from two (2) fixed objects on Record Drawings.

D. Valve bonnet packing and bolts shall be checked and tightened.

E. Provide sufficient room within valve box to service or replace all equipment. Place Valve Boxes on concrete pavers on all four corners. Valve Boxes shall be level and exhibit zero movement. Backfill around boxes and compact to 95%.

3.12 PIPE AND FITTINGS

A. Transport and store pipe on a flat and even surface.

B. Seal all threaded joints with 3 wraps minimum of Teflon tape. No PVC pipe shall be threaded or connected to a threaded fitting without an adapter.

C. Prior to construction of this project, Contractor shall provide the Owner's Representative with written evidence that all Contractor staff assigned to solvent welding duties of PVC pipe or fittings are in possession of an up-to-date certification card issued by manufacturer representative of specified solvent cement. If Contractor's staff are not in possession of current certification cards, the Contractor shall schedule and complete a training seminar (conducted by solvent cement manufacturer representative) and provide written evidence of training completion for each staff member, to the Owner's Representative prior to construction. Only staff that are certified shall be permitted to solvent weld pipe and fittings.

D. All gasketed and solvent weld plastic pipe shall be installed in accordance with manufacturer's installation instructions. Great care shall be taken to ensure that the inside

of the pipe is absolutely clean. Pipe ends (not being worked) shall be protected and not left open. Cleaning of cutting burrs is mandatory.

E. For solvent weld pipe, PVC pipe ends shall be cut at a 90-degree angle to the pipe length and shall be cleaned (use approved reaming tool) of all burrs prior to cementing. Pipe ends shall be wiped clean with a rag that has been lightly wetted with PVC thinner. Joints shall be completely free of moisture or condensation.

F. Cement shall be applied with a light coat on the inside of the fitting and a heavier coat on the outside of the pipe (no further back from the end of pipe than the fitting would slip). Application of cement on the interior of the fittings shall be quantified to ensure no cement shall be pushed into the flow stream of the pipe. Pipe shall be inserted into the fitting and given a quarter turn to seat the cement. Excess cement shall be wiped from the outside of the pipe. Cement that becomes unduly thick or heavy shall not be thinned and re-used. CONTRACTOR SHALL DISPOSE OF SAME. Pipe shall be tested as indicated elsewhere in these specifications.

G. Allow 15 minutes (minimum) set-up time for solvent weld joints before moving or handling. Pipe shall be partially center-loaded to prevent arching or slipping. No water shall be permitted in the pipe for at least 10 hours to permit solvent weld set and cure. Backfilling shall be done when the pipe is not in an expanded condition due to heat or pressure. Cooling of the pipe can be accomplished by operating the system for a short period of time before backfilling, or by backfilling in the early part of the morning before the heat of the day. Before pressure testing, allow 24 hours cure time for solvent weld joints.

H. Lateral line pipe may be longitudinally bent at a ratio of 200 times the outside diameter (o.d.) of the pipe over the length of one (1) full stick of pipe [i.e.: 1-1/2″ pipe (1.9″ o.d.) can be bent to a minimum radius of 1.9 x 200 or 380 inches (31.7′) over 20′].

3.13 FLUSHING

A. Flush all mainlines once prior to the installation of valves, and again after the installation of valves and prior to pressure testing.

B. Flush all lateral lines prior to the installation of sprinkler nozzles.

3.14 PRESSURE TEST

A. General:

1. To be valid, all tests must be observed by the Owner’s Representative.

2. Submit verbal requests for review to Owner’s Representative at least 48 hours prior to anticipated testing. Do not request testing until satisfied that work will pass test.

B. Preparation:

1. Prior to request for preliminary testing, accomplish the following:

a. Install all piping, valves and other equipment except sprinkler heads.
b. (Cap all risers except first riser downstream from valve on each lateral.
c. Purge all air from mainlines.

C. All joints and connections shall be left exposed until after completion and acceptance of pressure test.

D. Entire mainline shall be capped and pressurized to 100 PSI for a period of 30 minutes without introduction of additional service or pumping pressure. Lines that show loss of pressure exceeding 5 PSI at the end of specified test period shall be rejected.

E. Test of Laterals:

1. Purge all air from laterals and cap all risers. Open valves and bring system to available static line pressure. Lateral lines will be visually reviewed. Lines that exhibit visible leakage shall be rejected.

2. Rejected systems or portions of system shall be repaired and retested until testing requirements are met. Do not request retest until satisfied that system will pass testing requirements.

3. Plug all test cocks on double-check valves after testing by Water Department. Plugs shall be brass and threads shall be sealed with Teflon tape.

3.15 SPRINKLER HEADS

A. Install pop-up sprinklers flush with finish grade in landscape areas. Adjust radii of sprinklers to obtain optimum coverage.

B. Backfill around heads shall be approved native or import topsoil, well compacted. Sprinklers shall be installed flush with sidewalks and curbs and no closer than three inches (3") from any paved edge. All heads shall be set perpendicular to finish grade unless otherwise specified on the plans. Refer to details.

C. Thoroughly flush lines before installing sprinkler heads.

D. Refer to installation details on Drawings for all sprinkler heads.

3.16 SPRINKLER AND QUICK COUPLING VALVE SWING JOINTS (RISERS)

A. On spray and quick coupling valve flexible swing joints, apply two wraps of Teflon tape around threaded outlet connection (to sprinkler or quick coupling valve). Threaded connections shall be watertight. Do not over tighten.

3.17 VALVE BOXES

A. Install valve boxes plumb and flush with finish grade, so that a reel type mover may pass over without interference. Box shall be supported on continuous brick foundation per

detail. Valve box archway shall not rest on piping – provide a minimum of one-inch (1") clearance around any piping.

B. Provide filter fabric cover over all below grade openings to prevent debris from contaminating the drain rock.

C. If construction debris washes into the automatic valve or quick coupling valve boxes prior to project completion, remove existing gravel and replace with new gravel.

3.18 BACKFILLING

A. Backfill:

1. After system is operating and the required tests and review have been made, backfill excavations and trenches with the specified backfill.

2. Backfill when PVC pipe is not in an expanded condition due to heat or pressure. Cooling the pipe can be accomplished by operating the system a short time or by backfilling in the early part of the morning.

B. Compaction:

1. Trenches shall be thoroughly water-settled. No sluicing will be permitted. Trenches shall be backfilled uniform flush with the surrounding grade, raked and rolled with a roller weighing minimum 90 lbs. per linear foot.

2. Trenches or tunnels under roads or paved areas shall be backfilled and tamped with a mechanical tamper in successive 6" lifts.

3. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 95% density under pavements, 85% under planted and lawn areas.

4. Dress all areas to surrounding finish grades.

3.19 RESTORATION AND CLEANUP

A. All roots, rocks and debris shall be removed from site.

B. Sweep and wash all walks, pavement and steps.

3.20 PERFORMANCE TESTS

A. Notification: Submit verbal request for reviews to Owner's Representative at least 48 hours prior to anticipated review.

B. All Performance Tests shall be accomplished prior to installation of any landscape material. Exceptions to this shall be Trees and landscape boulders with approval of Owner's Representative.

C. Prior to request for preliminary review and Coverage Check, accomplish the following:

1. Complete all work including balancing, adjusting the system (pressure-reducing valves, flow-adjustment keys, nozzles, etc.) to provide optimum coverage without fogging.

2. Adjust sprinkler heads to finish grade as specified.

3. Clean out all sediment from valve boxes so that drain rock is exposed below bottom of valve, and all wiring (including spare wires) is visible.

4. Complete the Operations and Maintenance Manual for review by Owner's Representative.

5. Present Owner's Representative with a preliminary Record Drawing (on paper with pencil) showing location of all changes to Irrigation Plan to facilitate Review and Coverage tests.

6. Obtain all miscellaneous keys, spare parts and tools required under this contract for review by Owner's Representative and delivery to Owner.

D. Preliminary Review: Owner's Representative shall review Irrigation system for accuracy of layout to Plan and finish height of sprinkler heads in relation to finish grade and clearance of sprinkler heads from curbs, walks, walls and buildings. In addition all other aspects of finish presentation shall be reviewed prior to placement of landscape material.

E. Coverage Check: Remove all valve box covers and operate each zone of the system at direction of Owner's Representative. Owner's Representative shall mark with flagging any sprinkler heads not spaced correctly. Large areas not receiving proper coverage shall be identified through similar means. Corrections to layout shall be made accordingly and/or by recommendation of Owner's Representative.

3.21 FINAL INSPECTION

A. Prior to final inspection of work, Contractor shall have completed all punch list items and shall submit signed and approved sprinkler/plumbing/health/electrical permits as applicable to the work.

B. At the time of, and as part of, the Final Inspection, conduct a training and orientation session for the Owner covering the operation, adjustment and maintenance of the irrigation system. The Record Drawings and Operations and Maintenance Manual shall be reviewed and all features explained. Notify the Owner in writing two (2) weeks prior to the training and orientation session. The date and time of the session shall be subject to approval of the Owner.

C. Operations Test: Test is acceptable if system operates through at least one (1) complete cycle in a satisfactory manner, with uniform coverage of areas to be irrigated, and automatic controls functioning properly.

D. Provide Owner's Representative with complete Mylar Record Drawing for review and approval. Upon approval Contractor shall supply copy of Record Drawing to be attached to Controller cabinet (inside if possible)

E. Acceptance of work establishes beginning of one (1) year warranty period for irrigation system.

END OF SECTION