

## ITEM 10615.0322 M - EXPANSION OF IRRIGATION SYSTEM

### DESCRIPTION

This work shall consist of furnishing all labor, materials and equipment necessary for the proper expansion of an existing automatic irrigation system to irrigate additional areas. The system shall be a combination drip/spray system automatically operated by the existing controller for the existing irrigation system. The work includes, but is not limited to, the following:

- 1) Shop drawings and materials list of proposed irrigation system for review and approval of the Regional Landscape Architect.
- 2) Trenching and backfill.
- 3) Provision of sleeves under pavement and structures for irrigation piping and electric wiring.
- 4) Proper backflow protection according to local codes, ordinances, related permits and fees if required.
- 5) Piping, manifolds, fittings, valves, valve boxes, valve box covers, electric zone valves and appurtenances as required to complete the system.
- 6) Provisions for draining/purging the system of water prior to freezing weather.
- 7) Electrical wiring and connections as required.
- 8) Testing all systems and making them operative, adjust as required.
- 9) "As-built" drawings and operation manual(s)
- 10) Winterization and Spring activation following the first year of use.
- 11.) Maintenance of the system for the duration of the contract (excluding water and electricity.)

### **Qualifications**

Prior to beginning any work under this item the Contractor shall supply the Engineer in Charge with proof that the firm performing this work has a minimum of three years experience in the construction of irrigation systems and is a Certified Irrigation Contractor by the Irrigation Association, Fairfax, Va. ([www.irrigation.org](http://www.irrigation.org))

**Permits and Fees.** The Contractor shall obtain all permits and pay all required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished by the Certified Irrigation Contractor to show that all work has been installed in accordance with the ordinances and code requirements.

**Approval.** Wherever the terms "approve", "approval" or "approved" are used in the specifications, they shall mean the approval of the Regional Landscape Architect in writing.

**Irrigation Design.** The contractor shall submit five sets of shop drawings for the irrigation system showing the layout of heads, circuits, distribution piping, backflow preventers, filters, valves, wiring, controllers and accessories to achieve adequate and even distribution of water to all the proposed landscape material as shown on the plans. The shop drawings shall be subject to the review and approval of the Regional Landscape Architect at least two months prior to the start of landscape work. The irrigation system shall be a drip system or a combination of a drip

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and spray head system. The system shall not wet any walkways, decks, recreation areas or adjoining structures either during normal operation or high wind conditions. An isolation valve shall be provided to separate the detention basin from the remainder of the irrigation system. The contractor shall be responsible for provision of a fully functioning irrigation system and review of the proposed plans shall not reduce the contractors responsibility for provision of a functional irrigation system.

**Conference.** Prior to the start of work, a conference shall be held between the Contractor and the Regional Landscape Architect concerning the work under this item.

**Coordination.** The Contractor shall coordinate and cooperate with all other contractors on site to enable the work to proceed as rapidly and efficiently as possible. The Irrigation system shall be designed to coordinate with the existing irrigation system. Installation of additional mains, control valves, plumbing fittings and electrical connections required to coordinate with the existing irrigation system will be at no additional cost to the state.

Access and work to connect with the existing irrigation system shall be coordinated with the property owner or their designated representative. This irrigation system may utilize up to two of the available zones on the irrigation controller for the existing irrigation system. The contractor may either expand the existing irrigation manifold or tie in to the irrigation main located near the utility vault provided a proper backflow device has been provided.

**Inspection of Site.** The contractor shall determine the location of utilities and irrigation stubouts in the area of work. Where utilities are encountered, the Contractor shall immediately notify the Engineer for direction prior to continuing work. The Contractor shall make necessary adjustments in the layout as required to connect to existing stubouts. Should such stubs not exist, the Contractor may be required to work around existing work at no increase in cost to the State.

**Existing Plants and Site Conditions.** The Contractor shall take all necessary precautions to protect existing site conditions. Should damage be incurred, the Contractor shall repair the damage to its original condition to the satisfaction of the Engineer/Regional Landscape Architect at no cost to the State.

**Substitution.** The State reserves the right to substitute, add or delete any material or work as the work progresses. Adjustment to the contract price shall be negotiated if deemed necessary by the Engineer.

**Rejection.** The State reserves the right to reject material or work which does not conform to the Contract Documents. Rejected work shall be removed or corrected immediately at no cost to the State.

**“As-Built” Drawings, Operation Manual and Special Tools for Operation.** The Contractor shall prepare an "As-Built" drawing on a mylar reproducible or an AutoCad or Microstation computer file on disk which will show the layout of the irrigation system “As-Built” including the main line pipe, controller locations, remote control valves, drip irrigation lines and all

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sprinkler heads. The drawing shall also indicate and show approved substitutions of size, material and manufacturer's name and catalog name and catalog number. The Contractor will also provide a complete operations manual, including manufacturer's specifications, catalogue cuts, etc. for all of the equipment installed for the system(s) along with the drawings. The Contractor shall also provide sets of any specialty devices or tools required for normal adjustment or maintenance of the system such as sprinkler head adjustment tools etc. Two sets of the drawings, operations manual and tools shall be delivered to the State and a third set shall be delivered to the organization responsible for continuing maintenance before final acceptance of work.

DISAPPROVED

BY EI 12-001

### MATERIALS

**General.** All materials throughout the system shall be new and in perfect condition. After award of the Contract, and prior to beginning the work, the Contractor shall submit for approval two copies of the complete list of materials which he proposes to install. Quantities of materials and equipment need not be included. No deviations from the specifications will be permitted without authorization of the Regional Landscape Architect.

**Plastic Piping.** All lateral (zone) line pipe 51mm and smaller may be polyethylene 689.475 kPa (100 psi) test, non-nsf, or Class 200; Type 1120-1220 polyvinyl chloride (PVC) pipe and shall conform to CS-256-63.

All main line pipe line pipe 63mm shall be Class 200; Type 1120-1220 polyvinyl chloride (PVC) pipe and shall conform to CS-256-63.

**Fittings.** Plastic fittings shall be Schedule 40, polyvinyl chloride (PVC) standard weight.

Only solvent weld, insert, threaded or soldered fittings are acceptable; no saddle type clamping of fittings or compression fittings will be used. Clamps shall be entirely stainless steel. Any connections to metal pipes shall be made with a like material.

**Solvent Cement.** Compatible with PVC pipe and of proper consistency.

**Isolation Valves.** 76mm and smaller isolation and drain valves shall be screwed bonnet, bronze body, solid-wedge type gate valves with threaded ends, non-rising stems, and shall be rated for a normal operating pressure (cold water) of at least 1379 kPa (200 psi). They shall be Kitz code 27 or approved equal.

**Valve Boxes.** Access to all main line isolation valves shall be standard rectangular boxes. The valve boxes shall be 305mm standard rectangular with green cover.

### **Remote Control Valves**

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### ***A. Specifications***

#### **1. Valves**

- a. Operating Pressure -68.9 to 1034 kPa (10 to 150 psi)
- b. Globe/angle configuration
- c. Rubber diaphragm
- d. Flow control and bleed screw
- e. Self cleaning metering pin (electric)
- f. Pressure regulation models (electric)
- g. 25.4mm (1"), flow Range – 19 to 152 LPM (5 to 40 GPM) NPT female threads  
38mm (1.5"), flow Range – 38 to 456 LPM (10 to 120 GPM) NPT female threads  
50mm (2"), flow Range – 38 to 684 LPM (10 to 180 GPM) NPT female threads
- h. Stainless steel diaphragm seat
- i. Manual shut-off/flow control feature.

### ***B. Bidding Specifications***

#### **1. Electric models and Pressure Regulating models:**

The valve shall be held normally closed by internal water pressure. A 14 gauge solenoid lead wire shall be attached to a 24 VAC, 50/60 Hz solenoid with waterproof molded coil capable of being removed. Valve shall have a self-cleaning metering pin to protect bleed ports and to purge contaminants.

#### **2. Pressure Regulating models:**

The pressure regulator shall be a manually operated, locking type and shall regulate precisely over a 46 to 862 kPa range. Regulator shall maintain the set pressure within 21 kPa (with a 69 kPa differential between inlet and outlet).

### ***C. Installation Instructions***

The globe/angle valve family is offered in several configurations. Installation shall be as follows:

Valve boxes shall be provided for all valves and mechanical fittings. They shall not rest on pipes or fittings. Valve boxes shall be located away from structures, potential hardscaping features (such as sidewalks), and large planting locations. Valve box locations should be in shrub beds and at right angles to structure locations.

The valve boxes shall be set on a 50 mm bed of “pea gravel” for drainage.

The pressure regulating model may be used to reduce a high available pressure, when running downhill, or to isolate a lateral at lower pressure than the main line.

Electric control valve instructions require direct burial of wire utilizing different colors for hot hookup to each remote location and one color for the common valves. Splices shall be made with an approved commercial waterproof connection. Expansion curls of 0.6 m shall be provided at each valve location and every 30 m of straight runs.

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**Control Wires.** Control wires from controller to valves shall be 24 volt solid wire U.L. approved for direct burial in ground. Minimum wire size: 14 gauge; 12 gauge for common wire.

**Sleeves for Control Wires.** Under all existing or proposed walks, paving and structures. where indicated on drawings. PVC Sch 40 or Sch 80 plastic pipe or galvanized heavy wall steel conduit shall extend at least 305mm beyond edges of paving or construction.

**Backflow Preventer.** The backflow preventer shall be approved by the local water district in writing. A copy of the approval shall be submitted by the Contractor to the Engineer prior to activation of the system.

### **Drip Irrigation**

**A. Dripperline.** The dripperline shall be 17 mm dripperline housing internal pressure compensating, self-cleaning, integral drip emitters or 17 mm, 12 mm or 8 mm non-pressure compensating dripperline composed of low density polyethylene tubing brown in color. The pressure compensating emitters shall have the ability to independently regulate discharge rates, with an input pressure of 48 to 480 kPa, at a constant flow. The emitter discharge rate shall may be either 1.5, 2.3 or 3.4 liters per hour appropriate for the soil type and spacing. Flow rates for all dripperline shall be subject to the approval of the Regional Landscape Architect and provide adequate soil moisture. These shall utilize a combination turbulent flow/reduced pressure compensation cell mechanism and a diaphragm to maintain uniform discharge rates. The emitters shall continuously clean themselves while in operation. The dripperline emitter spacing utilized on this project shall be either 457mm or 610 mm. Maximum system pressure shall be no greater than 310 kPa. When installing dripperline on-surface or under mulch install soil staples as listed below:

1. Sand soil: One staple every one (1) meter and two (2) staples at each change in direction (tee, elbow or cross).
2. Loam soil: One staple every 1.25 meters and two (2) staples at each change in direction (tee, elbow or cross).
3. Clay soil: One staple every 1.5 meters and two (2) staples at each change in direction (tee, elbow or cross).

Staples shall be galvanized wire approximately 120 mm in length manufactured for installing dripperline.

**B. Fittings.** All connections shall be made with fittings approved by the component manufacturer. Provide pipe fittings and accessories of the same material of an equal or greater strength than the pipe. Clamps shall be required when operating pressure exceeds specific dripperline fittings requirements. All pipe 25.4 mm and greater shall be clamped at connections.

**C. Accessories.** All systems shall utilize automatic line flush valves at the end of each independent zone area or dripperline as recommended by the manufacturer. This valve shall be capable of flushing at the beginning of each irrigation cycle. Each independent irrigation zone shall utilize a Air/Vacuum Relief Valve at its high point(s).

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The valve shall evacuate air from the zone at start-up, and to relieve vacuum at system shut-down. The valve shall be as recommended by the manufacturer

**D. Pressure Regulation Valve.** The pressure regulator shall have a built-in indicator that shows when the proper outlet pressure is reached. It shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating from 104 kPa to 276 kPa or as recommended by the manufacturer for the particular size line.

**E. Filter.** A 140 mesh disc filter shall be installed at each zone valve to ensure proper filtration. This filter shall be matched to the manufacturer of the dripperline and sized per manufactures recommendations.

**F. Recommended installation Instructions.** Dripperline may be used in surface and sub-surface applications utilizing a grid design or it may be installed as single or "snaked" lines where grids are not justified provided a complete wetted area occurs around the trees and shrubs. Dripperline may be installed beneath the mulch or at a greater depth per the manufacturer's recommendations subject to the approval of the Regional Landscape Architect.

A) the dripperline can be installed by:

A) Trenching;

B) laying it out on a sub-grade lower than finished grade and backfilling to the specified finished grade depth;

C) near-surface installation using Support Staples spaced no more than every 1.5 m to hold it in place followed by a 50 mm soil layer followed by a 50 mm minimum shredded bark mulch cover.

D) All valves, filters and regulators shall be enclosed in valve boxes as described above under Installation Instructions for Remote Control Valves.

**G. Accuracy.** Lay out work as accurately as possible to the drawings.

**H. Coverage.** The Contractor shall be responsible for full and complete coverage of all areas to be irrigated and shall make any necessary minor adjustments at no additional cost to the State. The Contractor shall be responsible for proper drip line placement and adjustment.

**Sprayheads.** Sprinklerheads for overhead irrigation will be considered subject to the approval of the Regional Landscape Architect for portions of the system that are impractical for drip and will not result in any overspray. They shall be on a separate zone from any drip system. The heads shall be fully adjustable arc with interchangeable nozzles of an appropriate size and gear drive. All above ground risers shall be PVC pipe, gray in color, permanently attached with plastic clamps to decay resistant wooden posts not less than 90 mm x 90 mm set not less than 1/3 of the overall height in ground.

**Revisions.** Any major revisions to the irrigation system must be submitted and answered in written form, along with any negotiated change in contract price.

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### **CONSTRUCTION DETAILS**

#### **Excavating and Trenching**

**A.** Restore all surfaces, shrub beds, turf, walks, existing underground installations, etc., damaged or cut as a result of the excavations to their original condition and in a manner approved by the EIC in coordination with the owners of impacted adjoining property. The cost shall be included under this item.

**B.** Trenches shall be made wide enough to allow a minimum of 50 mm between parallel pipe lines. Trenches for pipe lines shall be made of sufficient depths to provide minimum cover from finish grade as follows:

- 1) 460 mm minimum cover over main lines.
- 2) 300 mm minimum cover over control wires from controller to valves.
- 3) 300 mm minimum cover over lateral lines to supply headers.
- 4) 200 mm minimum cover over sprinkler zone lines, supply and exhaust headers.

#### **Pipe Line Assembly**

**A.** Install remote control valves where shown and group together where practical. Place no closer than 0.2 m to walk edges, buildings, and walls.

**B.** Plastic pipe and fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.

**C.** Pipe may be assembled and welded on the surface. Snake pipe from side to side of trench bottom to allow for expansion and contraction.

**D.** Make all connections between plastic pipe and metal valves or steel pipe with threaded fittings using plastic male adapters.

#### **Closing Pipe and Flushing Lines**

**A.** Cap or plug all openings as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

**B.** Thoroughly flush out all water lines before installing heads, valves and other hydrants.

**C.** Test in accordance with the following section on Hydrostatic Tests.

**D.** Upon completion of the testing, the Contractor shall complete drip assembly and adjust for proper distribution.

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**Automatic Controllers.** Connect remote control valves to controller in a logical sequence to correspond with the existing hookup.

### **Automatic Control Wiring**

- A.** Install control wires, mains and laterals in common trenches wherever possible.
- B.** Install control wires at least 300mm below finish grade and lay to the side and below main line. Provide looped slack at valves and snake wires in trench to allow for contraction of wires. Tie wires in bundles at 3M intervals.
- C.** Control wire splices will be allowed only in runs more than 150 M. Any splices must be installed in an existing valve box or separate valve box installed flush with finished grade.

### **Backfill and Compacting**

- A.** After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of rubbish.
- B.** Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 90% density.
- C.** Compact trenches in areas to be planted by thoroughly flooding the backfill.
- D.** Dress off all areas to finish grades.

**Cleanup.** Remove from the site all debris resulting from work of this section. Job site must be left clean and in good repair.

### **Hydrostatic Tests**

- A.** Request the presence of the Engineer in writing at least 48 hours in advance of testing.
- B.** Testing to be accomplished at the expense of the Contractor and in the presence of the Engineer.
- C.** Center load piping with small amount of backfill to prevent arching or slipping under pressure.
- D.** Apply a continuous and static water pressure of 431 kPa (60 psi) when welded plastic joints have cured at least 24 hours and with the risers capped as follows:
  - 1) Main lines and sub mains to be tested for 1 hour.
  - 2) Lateral lines to be tested for 1 hour. (If laterals and individual sub-mains downstream of control valves have less than 626.8 kPa (90 psi) working pressure or less than 38 liters per minute (10 GPM) flow, hydrostatic tests

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are waived for these laterals).

*E.* Repair leaks resulting from tests.

**Initial Operation.** The system shall be Winterized at the end of the first fall of operation. This shall involve purging all water from the system and any other incidental work required to insure the irrigation system and associated plumbing will not be damaged by freezing weather conditions. The contractor shall coordinate this work with the Regional Landscape Architect. The following Spring the system shall be reactivated. Any damage to the system shall be repaired and defects corrected by the Contractor at no additional cost to the state. All repairs to the system shall be subject to the approval of the Regional Landscape Architect and a representative of the party responsible for the entire irrigation system. The contractor will be responsible for operating and maintaining the system for the duration of the contract.

### **METHOD OF MEASUREMENT**

Payment will be made by lump sum. No field measurements will be taken.

### **BASIS OF PAYMENT**

The lump sum price bid shall include the cost of furnishing all labor, shop drawings, materials and equipment necessary for transporting, trenching and backfill, installing, testing, adjusting, making any needed equipment replacement, maintaining the system for the duration of the contract (excluding water and electricity) and Winterization and Spring reactivation following the first year of use. The cost of restoration of all surfaces, shrub beds, turf, walks, existing underground installations, etc., to their original condition shall be included under this item.

Progress payments will be made after the irrigation system has been constructed as specified in the contract documents. Payment will be made in the amount of 10% of the unit bid price upon approval of the irrigation system design, 60% of the unit bid price upon initial installation and satisfactory completion of all tests to the satisfaction of Engineer and the Regional Landscape Architect. Payment of an additional 10% of the unit bid price will be made following winterization of the irrigation system by the contractor to the satisfaction of Engineer and the Regional Landscape Architect. The balance will be paid 30 days after successful reactivation and repair of the system the following spring to the satisfaction of the Engineer and the Regional Landscape Architect.