

- ITEM 11615.600001 M - Point of Connection Assembly**
ITEM 11615.600002 M - Line Flushing Valve
ITEM 11615.600003 M - Tree Drip Ring and Fittings
ITEM 11615.600004 M - Moisture Sensing Battery-Operated Control System
ITEM 11615.600005 M - PVC Pipe and Fittings

DESCRIPTION

Under these items, the Contractor shall furnish and install Point of Connection Assemblies; Line Flushing Valves; Tree Drip Rings and Fittings; Moisture Sensing Battery-Operated Control Systems; and PVC Irrigation Pipe and Fittings to provide in-ground irrigation systems for all trees in the highway median, in accordance with the plans, specifications, and directions of the Engineer. Work under these items includes, but is not necessarily limited to, the following:

- 1) Preparing Irrigation Shop Drawings
- 2) Trenching, excavating, and backfilling for the entire system
- 3) Installing fully operational irrigation system
- 4) Testing all systems to verify operation

Conference: Before any work is started, a conference shall be held between the Contractor, Irrigation Subcontractor, Route 9A Landscape Architect and the Engineer concerning the work to be performed under these items. All parties shall coordinate and cooperate with other on site contractors to enable the work to proceed as rapidly and efficiently as possible.

Permits: If required, the Contractor shall obtain all permits and pay required fees to any governmental agency having jurisdiction over the work, at no additional cost to the State. The Contractor as required shall arrange inspections required by local ordinances during the course of construction.

Rejection: The State reserves the right to reject any material or work which does not conform to the Contract Documents. Rejected work shall be removed or corrected at the Contractor's expense at the earliest possible time.

MATERIALS

For proper coordination of materials used in the irrigation system, all materials shall be purchased from the same supply source, although not necessarily the material of a single manufacturer. All materials shall be as manufactured by Netafim Irrigation Products, Fresno, California, distributed by Storr Tractor Company, Somerville, NJ, (908) 722-9830. All materials throughout the system shall be new.

POINT OF CONNECTION ASSEMBLY

Disc Filter: The filter shall be a 0.75 NPS multiple disc filter with color coded filter elements indicating the mesh size of the element being used. The discs shall be constructed of chemical resistant thermoplastic for corrosion resistance. The filter shall be a Techline/Netafim Model Number DF 075-140 with a maximum flow of 68 liters per minute and a maximum pressure loss of 34.5 kPa.

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Gate Valves: Three (3) NPS 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 1375 kPa. They shall be comparable to code 27, as manufactured by Kitz, or approved equal.

Valve Boxes: Access to all main line isolation, manual and remote control zone valves and filters shall be provided by standard valve boxes. The valve boxes shall be constructed of a unfoamed polymer resin which is chemically inert and normally unaffected by moisture, corrosion and the effects of temperature changes. The tensile strength of the material shall be between 21,000 and 38,000 kPa. The box shall be approximately 300 mm high with external top dimensions of 300 mm wide x 425 mm long, base dimensions of 400 mm wide x 525 mm long, and weigh approximately 3 kg.

A ring collar shall be mated to the box. The ring shall be constructed of a polymer concrete material with a compression strength of 75,000 kPa. The ring shall add 60 mm to the height of the assembly with external top dimensions now being approximately 350 mm wide x 475 mm long and have a weight of about 9 kg.

A cover constructed of a polymer concrete shall be utilized to enclose the box. The cover shall have a compressive strength of 75,000 kPa, shall be approximately 250 mm wide x 375 mm long x 45 mm high, and have a weight of approximately 7.25 kg. Two pentagon bolts, located at two corners diagonally across from each other, shall lock down the cover down to the ring and box.

The polymer box with polymer concrete ring and polymer concrete cover shall have a static vertical load rating of 4,700 kilograms.

The box shall be model # 1419-12 HDPE, the polymer concrete ring shall be model # 1419PR---100, and the polymer concrete cover shall be model # 1419PR as manufactured by Carson Industries Inc, Glendora, California or approved equal.

Vacuum/Air Relief Valve: Each independent irrigation zone shall utilize a Netafim vacuum/air relief valve such as TLAVRV Techline Air/Vacuum Relief Valve at its high point(s). The purpose of this valve is to evacuate air from the zone at start-up, and to relieve vacuum at system shut-down.

LINE FLUSHING VALVE

Line Flushing Valve: All Techline systems shall utilize Netafim Automatic Line Flush Valves at the end of each independent zone area or Dripperline (maximum flow per valve = 57 liters per minute). This valve shall be capable of flushing 3.785 liters at the beginning of each irrigation cycle. The valves to be used for the Techline system shall be Model Number TL050MFV (3.785 Liter Flush Valve with 0.5 NPS Male Pipe Thread Connection).

TREE DRIP RING AND FITTINGS

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Dripperline: The Dripperline shall be manufactured by Techline and shall consist of nominal sized 0.5 NPS low density linear polyethylene tubing, housing internal pressure compensating, self-cleaning, integral drip emitters. The tubing shall be brown in color and conform to an outside diameter (OD) of 17 mm and an inside diameter (ID) of 14.5 mm. The emitters shall have the ability to independently regulate discharge rates, with an input pressure of 48 kPa to 480 kPa, at a constant flow and with a coefficient of variation (Cv) of .03. Emitters shall have an output of 3.4 liters per hour each utilizing 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 0.5 meters.

Fittings: All connections shall be made with approved Techline 17 mm (.57") insert fittings.

Techline Staples. Irrigation staples shall be Techline Staples, model number TLS6 spaced no more than every 1.5 meters (two per ring minimum) to hold line in place followed by a 50 mm soil layer followed by a 50 mm minimum shredded bark mulch cover.

MOISTURE SENSING BATTERY-OPERATED CONTROL SYSTEM

A moisture sensing battery-operated control system shall be utilized. The system shall have a control pack to be located in the valve box, a DC volt valve to be located in the valve box, and a three prong sensor to be located in the root zone of the tree closest to the control pack. The wires connecting the sensor to the control pack shall be buried parallel to the lateral pipe to the drip tree ring.

The system shall operate automatically, with any 9-14 Volt DC pulse signal, to measure moisture every 20 minutes when zone is off, and shall turn valves on and off as required. While zone is operating, the system shall measure soil moisture every 5 minutes. The system shall have dial-in setting capabilities which can be shut off from 2 to 20 hours daily. The system shall be the Moisture Sensing System Model MSK100V as manufactured by Netafim, Fresno, California, and shall include the following:

- 1) Stand alone Sensor Probe, Valve, and Controller
- 2) Aquanet 1NPS FPT DC Valve
- 3) Flow range: 0.5 liters/minute – 100 liters/minute
- 4) Maximum operating pressure: 1000 kPa
- 5) Glass reinforced nylon body
- 6) Internal Bleed
- 7) 3-position control dial allowing automatic, manual operation or emergency shut-off
- 8) Black wire - Common
- 9) Red wire - Power
- 10) Control Pack to Valve Connection: Capable to 30 m
- 11) Control Pack to Sensor Connection: Capable to 30 m
- 12) One 9V Alkaline Battery for 1000 irrigation cycles minimum

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PVC PIPE AND FITTINGS

Plastic Piping: All main line and lateral (zone) line pipe shall be Class 200; S.D.R.-21, Type 1120-1220 polyvinyl chloride (PVC) pipe and shall conform to CS-256-63. Pipe shall be rated for 1375 kPa pressure and pipe size shall not be less than 0.75 NPS diameter.

Fittings: Plastic fittings shall be Schedule 40, polyvinyl chloride (PVC) standard weight as manufactured by Spears, Dura, or approved equal. Only solvent weld or insert fittings are acceptable; no saddle type clamping of fittings will be used.

Solvent Cement: Solvent cement shall be compatible with PVC pipe and of proper consistency.

CONSTRUCTION DETAILS

The irrigation Subcontractor shall lay out work as shown on the drawings as accurately as possible. The drawings are generally diagrammatic to the extent that swing joints, offsets and fittings are not shown. The Contractor shall be responsible for full and complete coverage of all irrigated areas and shall make any necessary minor adjustments as directed by the Route 9A Landscape Architect.

Work shall include all necessary work, including but not limited to Basic Maintenance and Protection of Traffic, Construction Signs, Flashing Arrow Boards, and Mobilization, for the construction of the Irrigation System. This work shall be performed in accordance with the appropriate sections of the Standard Specifications.

All excavation must be done by hand.

Existing Plant Material And Site Conditions: Contractor shall use extreme care when pipe trench is in close proximity to existing shrubs. The Contractor shall take necessary precautions to protect existing plant material and the site. Root pruning shall be kept to a minimum. If an existing shrub or groundcover plant interferes with the installation, the planting shall be removed and temporarily relocated to an area approved by the Engineer. These plants must be protected, watered and otherwise maintained until such time as they can be replanted in their original location or as directed by the Engineer at no additional cost. Any existing plant material which dies as a result of irrigation installation shall be replaced with new plant material of the same variety and maintained at no additional cost. The Engineer shall approve locations of all replanted material prior to completion of pipe installation.

All Backflow Preventers, Quick Coupling Valves and Water Main Lines either presently exist or will be installed by others. All distribution piping installation work shall be started after completion of soil installation and shall be completed prior to planting wherever possible

Protection of Site: The Contractor shall acquaint itself with all site conditions. If utilities are found during the hand excavation, the Contractor shall promptly notify the Engineer for instructions as to further action. Failure

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to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities.

Contractor shall make necessary adjustments in the layout as may be required to connect to existing irrigation piping. Should such piping not be located exactly as shown, Contractor may be required to modify his piping design to accommodate existing locations at no increase in cost to the State.

Excavating and Trenching: Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations to their original condition and in a manner approved by the Engineer.

Trenches for pipe lines shall be made of sufficient depths to provide minimum cover from finish grade as follows:

- 1) 200 mm minimum cover over lateral supply lines to tree driplines.

Recommended Installation: The drip irrigation system should be manufactured specifically for this use. The Techline drip rings shall be installed sub-surface at a uniform depth, as shown on the drawings.

The Techline drippers are designed to regulate flow at the specified output from 48 to 480 kPa with a maximum recommended pressure of 310 kPa when using Techline insert fittings (non-clamped).

It is important that all components of the drip system are compatible and it is suggested that the Contractor use materials from a single source. It is necessary to use Techline Insert Fittings for all Techline connections to ensure the integrity of the connection.

Techline shall be installed by trenching.

Pipe Installation: 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.

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

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

Closing Pipe And Flushing Lines: 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. Thoroughly flush out all water lines before installing drip rings, flush valves and other hydrants.

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Hydrostatic Testing: Before backfilling, the entire system shall be hydrostatically tested and inspected. The Contractor shall notify the Engineer in writing at least 48 hours in advance of testing. Testing to be accomplished at the expense of the Contractor and in the presence of the Engineer. Center load piping with small amount of backfill to prevent arching or slipping under pressure. Apply a minimum continuous and static water pressure of 690 kPa 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 620 kPa working pressure or less than 37 liters per minute flow, hydrostatic tests are waived for these laterals).

Leaks detected during tests shall be repaired and the system re-tested to the satisfaction of the Engineer.

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

Clean Up: Remove from the site all debris resulting from work of this section. Job site must be left clean and repaired to the satisfaction of the Engineer.

SUBMITTALS

The Contractor shall submit the following for the Engineer and Landscape Architect's review and approval prior to ordering materials:

Shop Drawings: Submit six paper copies of 550 mm x 850 mm shop drawings for approval. These shop drawings should include all information which differs from or supplements that shown on the Contract Drawings.

Catalog Cuts: The Contractor shall submit six copies of all Catalog Cuts of the drip irrigation materials, valves, valve boxes and all connected piping to the Engineer and must obtain approval prior to installation.

On completion of the work, satisfactory evidence shall be furnished by the Contractor to show that all work has been installed in accordance with the ordinances and code requirements.

METHOD OF MEASUREMENT

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POINT OF CONNECTION ASSEMBLY

The quantity of Point of Connection Assemblies to be paid for shall be the number of Point of Connection Assemblies satisfactorily installed.

LINE FLUSHING VALVE

The quantity of Line Flushing Valves to be paid for shall be the number of Line Flushing Valves satisfactorily installed.

TREE DRIP RING AND FITTINGS

The quantity of Tree Drip Rings and Fittings to be paid for shall be the number of Drip Rings satisfactorily installed.

MOISTURE SENSING BATTERY-OPERATED CONTROL SYSTEM

The quantity of Moisture Sensing Battery-Operated Control Systems to be paid for shall be the number of control systems satisfactorily installed in all locations required as directed by the Engineer.

PVC PIPE AND FITTINGS

The quantity of PVC Pipe and fittings to be paid for shall be the number of linear meters of PVC Pipe satisfactorily installed as measured along the top centerline of the pipe and fittings in the field.

BASIS OF PAYMENT

All unit prices shall include all costs necessary to complete the above items of work, including but not limited to the cost of removing/replacing all existing shrubs to accommodate installation of the in-ground irrigation system and the cost of preparation of shop drawings and catalogue cuts necessary for the construction of the irrigation system.

Payment will be made when the irrigation materials are installed, successfully tested and backfilled and the plantings are restored.

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The unit price bid for each Point of Connection Assembly shall include the cost of all labor, materials and equipment necessary to complete the work, including all connections to the existing water supply, disc filters, gate valves, air/vacuum relief valves, valve boxes, brick supports and gravel as shown on the plans, including excavation, necessary in all locations shown on the plans and as directed by the Engineer.

LINE FLUSHING VALVE

The unit price bid for each Line Flushing Valve shall include the cost of all labor, materials and equipment necessary to complete the work including excavation, installation, including all connections to PVC pipe, all valves, valve boxes, brick supports and gravel, backfill, restoration or replacement of bark chip mulch, cleaning up all excess debris and replacing all damaged plant material in all locations shown on the plans and as directed by the Engineer.

TREE DRIP RING AND FITTINGS

The unit price for each Tree Drip Ring shall include the cost of all labor, materials and equipment necessary to complete the work including excavation, installation of all dripperline, all necessary connections to the PVC pipe, backfill, restoration or replacement of bark chip mulch, cleaning up all excess debris and replacing all damaged plant material in all locations as shown on the plans and as directed by the Engineer.

MOISTURE SENSING BATTERY-OPERATED CONTROL SYSTEM

The unit price bid for each Moisture Sensing Battery-operated Control System shall include the cost of all labor, materials and equipment necessary to complete the work including excavation, installation of moisture sensing system including DC valve, Control Pack, batteries, probes, all equipment necessary to complete the system, backfill, restoration or replacement of bark chip mulch, cleaning up all excess debris and replacing all damaged plant material in all locations shown on the plans and as directed by the Engineer.

PVC PIPE AND FITTINGS

The unit price bid per linear meter of PVC Pipe includes the cost of all labor, materials and equipment necessary to complete the work including excavation, placing pipe with staples, making all connections, backfill and restoration or replacement of bark chip mulch, cleaning up all excess debris and replacing all damaged plant material in all locations shown on the plans and as directed by the Engineer.