SECTION 328400 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

A. Section Includes:

1. Piping
2. Pipe Sleeve
3. Manual valves
4. Automatic control valves
5. Connection to Water supply
6. Miscellaneous piping specialties
7. Sprinklers
8. Quick couplers
9. Drip irrigation specialties
10. Controllers
11. Boxes for automatic control valves

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design 100 percent coverage irrigation system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated for each of the three roundabouts along Pine Cone Road that are part of the construction documents.

B. The Contractor shall take out all required permits, arrange all necessary inspections and shall pay any fees or expenses in conjunction with the work under this contract

C. Irrigation zone control shall be automatic and manual operation with controller and automatic control valves.

D. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

1. Irrigation Main Piping: 200 psig.
2. Circuit Piping: 100 psig.

1.4 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Coordination Drawings: Irrigation systems, drawn to scale, on which components are shown and coordinated with each other, using input from Installers of the items involved. Also include adjustments necessary to avoid plantings and obstructions such as signs and light standards. Drawings should also show water connections to buildings, and where exterior wall penetrations will be located.

C. Qualification Data: For qualified Installer.

D. Zoning Chart: Show each irrigation zone, type, precipitation rate and its control valve.

E. Controller Timing Schedule: Irrigation run times are the responsibility of the Irrigation Contractor until Owner assumes control of the site. Irrigation Contractor to determine run times and communicate these directly to Owner to be programmed by Owner.

F. Operation and Maintenance Data: For sprinklers, controllers and automatic control valves to include in operation and maintenance manuals.

G. As-Built Plan: After completion of the installation, the Contractor shall provide an AutoCAD drawing and drawing file (.dwg format, AutoCAD 2004 or greater). The drawing shall be to scale, showing all sprinkler heads, valves, piping, controller(s), zone numbers and all related equipment with dimensions where required.

H. Guarantee: The Contractor, for a period of one year from date of final acceptance, shall promptly repair or replace, at no cost to the Owner, any and all parts which prove to be defective from manufacturer or workmanship.

I. Acceptance: Before final acceptance is made, the Contractor must have in writing, from the Owner and Consultant that the system meets top quality installation and these plans and specifications have been executed 100%.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: As a prerequisite of qualification to bid, the irrigation construction company shall provide verifiable documentation that such person or company is licensed by the Minnesota State Board of Electricity as a Technology Systems Contractor and that company employs not less than one Power Limited Technician and that such licenses are considered “in good standing” by the Minnesota State Board of Electricity. “Verifiable Documentation” shall include but not be limited to submission of copies of Technology System Contractor and Power Limited Technician credentials and proof of insurance. The irrigation construction company selected to perform the work shall, prior to being awarded work, provide verifiable documentation of successful completion of not less than three projects of similar type, size, and scope to the project outlined herein and/or provide verifiable documentation of not less than five years experience undertaking projects of similar size, style, and scope. “Verifiable Documentation” shall include but not limited to contact names and current

telephone numbers of clients/owners of past projects cited as similar in type, size, and scope to the project outlined herein.

B. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

C. The Contractor shall provide and pay for all transportation required to deliver and remove from the site all materials and equipment as required for all the work shown and specified.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Minimize the disruption to the existing water service and irrigation system.

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

PRODUCTS

1.9 PIPES, TUBES, AND FITTINGS MATERIALS

A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. PVC Pipe: ASTM D 1785, PVC 1120 compound, Class 200 (Pressure) Class 160 all other.

1. PVC Socket Fittings: ASTM D 2466 Schedules 40 and 80.
2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
3. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.

C. PVC Pipe, Pressure Rated: ASTM D 2241, PVC 1120 compound, SDR 21 and SDR 26.

1. PVC Socket Fittings: ASTM D 2467, Schedule 80.
2. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

1.10 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

C. Pipe-Flange Gasket: On ALL PVC piping 3” and larger.

1.11 MANUAL VALVES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. NIBCO – Push on Ductile Iron – 3” and larger, provide joint restraints.
    b. NIBCO – Brass gate valve with wheel handles only.
    c. Kitz Corporation.
    d. Schedule 80 PVC Ball valves acceptable in Landscape/Turf Areas

2. Description:

    a. Standard: AWWA C800.
    b. Body Material: Brass, bronze and ductile with ball or ground-key plug.
    c. End Connections: Matching piping.
    d. Stem: With wide-tee head.

1.12 AUTOMATIC CONTROL VALVES

A. Plastic, Automatic Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Hunter Industries Incorporated (PGV).

2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, with flow control knob, and operated by 24-V AC solenoid.

B. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Harvel Plastics, Inc.
    b. Spears Manufacturing Company.
    c. Dura.

2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-socket or threaded end.

1.13 MISCELLANEOUS PIPING SPECIALTIES

A. Pressure Gages: ASME B40.1. Include 4-1/2” diameter dial, dial range of two times system operating pressure, liquid filled and bottom outlet.

1.14 SPRINKLERS - NIC

A. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

a. Hunter Industries Incorporated (I20-6P Turf & I20-HP Shrub).

2. Description:

a. Body Material: ABS.
b. Nozzle: ABS.
c. Retraction Spring: Stainless steel.
d. Internal Parts: Corrosion resistant.
e. Pattern: Fixed, with flow adjustment.
f. Minimum 5” pop-up height.

B. Plastic, Pop-up Spray Sprinklers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated:
a. Toro Company (The); Irrigation Division.

2. Description:

a. Body Material: ABS.
b. Nozzle: Toro Precision Series.
c. Retraction Spring: Stainless steel.
d. Internal Parts: Corrosion resistant.
e. Pattern: Precision Series Fixed, with flow adjustment.

3. Capacities and Characteristics:

a. Nozzle: Toro Precision Series.
b. Pop-up Height: 6” PR in turf and 12” PR in shrub areas.

1.15 QUICK COUPLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated:

1. Toro 474-00, match existing.

B. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

1. Locking-Top Option: Vandal-resistant locking feature. Include two matching keys with hose swivels).

1.16 DRIP IRRIGATION SPECIALTIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Rain Bird Corporation.

B. Application Pressure Regulators: Plastic housing, with corrosion-resistant internal parts; capable of controlling outlet pressure to approximately 40 psig.

C. Filter Units: “Basket Type” Plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.

D. Install one operation Indicator, in visible area, per landscape drip line zone.

E. All drip line in landscape areas shall be buried below mulch and staked to top of soil.

1.17 CONTROLLERS

A. Description:

1. Controller Stations for Automatic Control Valves: Each station is variable from approximately 1 minute to 6 hours. Include switch for manual or automatic operation of each station.

2. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.
   a. Body Material: Enameled-steel sheet metal, Stainless-steel sheet metal.
   b. Mounting: on concrete pad.
3. Control Transformer: 24-V secondary, with primary fuse.
4. Timing Device: Adjustable, 24-hour clock, with automatic operations to skip operation any day in timer period, to operate by day of week, true odd/even, skip days.
5. Independent day schedule options for each program.
6. Cycle and Soak capability by station.
7. Remote control shall be included to provide coverage of site.
8. Non-Volatile memory.
   a. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.
   b. Surge Protection.
9. Controller locations – on concrete pad at center of each roundabout.
10. Wiring: UL 493, Type UF multi-conductor, with solid-copper conductors; insulated cable; suitable for direct burial.

    a. Feeder-Circuit Cables: Sentinel 2 wire compliant, No. 12 AWG minimum, between building and controllers.
    b. Low-Voltage, Branch-Circuit Cables: Sentinel 2 wire compliant, No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
    c. Splicing Materials: 3M DBY-6 OR DBR-6; waterproof and suitable for direct burial.
    d. Flow sensor wiring information (manufacturer's recommendations)

1.18 BOXES FOR AUTOMATIC CONTROL VALVES

A. Plastic Boxes:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carson Industries LLC.

2. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.

   a. Size: As required for valves and service (minimum of 10" round).
   b. Shape: Round or Rectangular.
   c. Sidewall Material: PE, ABS.
   d. Cover Material: PE, ABS.

      1) Lettering: "VALVE NUMBER."

      2) Description of equipment contained: "Iso Valve"

B. Drainage Base: Cleaned gravel or crushed stone, graded from 2” minimum to 3” maximum.

PART 2 - EXECUTION

2.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

B. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Main Piping: Minimum depth of 18 inches below finished grade.
2. Circuit Piping: 12 inches.
3. Sleeves: 24 inches.

2.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Architect's approval before excavation.

2.3 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install groups of pipes parallel to each other, spaced to permit valve servicing.

C. Install fittings for changes in direction and branch connections.

D. Lay piping on solid sub base, uniformly sloped without humps or depressions.

E. Install ductile-iron piping according to AWWA C600.

F. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

G. Install piping in sleeves under parking lots, roadways, and sidewalks.

H. Install sleeves made of CLASS 200 PVC (minimum) pipe, 4” minimum, and socket fittings, and solvent-cemented joints.

2.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Flanged Joints: Select rubber gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

E. Ductile-Iron Piping Gasketed Joints: Comply with AWWA C600 and AWWA M41.

Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified

F. Copper-Tubing Brazed Joints: Construct joints according to CDA's "Copper Tube Handbook," using copper-phosphorus brazing filler metal.

G. Copper-Tubing Soldered Joints: Apply ASTM B 813 water-flushable flux to tube end unless otherwise indicated. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

H. PE Piping Fastener Joints: Join with insert fittings and bands or fasteners according to piping manufacturer's written instructions.

I. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
3. PVC Non-pressure Piping: Join according to ASTM D 2855.

2.5 VALVE INSTALLATION

A. Remote Control Valves: Install in valve boxes of adequate size (10” round minimum) to allow for ease of service.

B. Shall have globe/angle configuration with FPT inlet and outlet.

C. Shall have manual flow control and internal bleed for manual operation.

D. Provide a minimum of two feet of slack in control wires for each valve.

E. Refer to irrigation design for valve size and location.

2.6 SPRINKLER INSTALLATION

A. Install sprinklers after hydrostatic test is completed.

B. Install sprinklers at manufacturer's recommended heights.

C. Sprinklers shall be installed plumb and level (within 1/16”).

2.7 DRIP IRRIGATION SPECIALTY INSTALLATION

A. Install landscape drip line as per details and manufactures recommendations.

B. Drip line shall be installed directly on soil, with wood mulch on top, stapled every four feet and at every change in direction.

C. 1” PVC headers shall be used on all drip zones and drip lines shall be run in a straight line and connected to 1” PVC footer.

D. Install remote control valve, filter and pressure regulator in piping near drip line, and in rectangular valve box – 1 control valve assembly per valve box.

E. Install air relief valves and flush valves in piping (1 per zone), and in control-valve boxes.

F. Install operation indicators in each zone and in area that is easily visible.

G. Verify placement of all irrigation equipment, before placement, with Owner’s Representative to ensure compliance.

H. Drip irrigation shall be inspected before placement of plant material and medium to ensure compliance with manufacturer’s details & recommendations.

2.8 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

A. Equipment Mounting:

1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install control cable in same trench as irrigation piping above or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

C. All control wires will be contained in conduit at all times when above ground.

2.9 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Section "Facility Water Distribution Piping" for water supply from exterior water service piping, water meters, protective enclosures, and backflow preventer. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

C. Connect wiring between controllers and automatic control valves.

2.10 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

2.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Any irrigation product will be considered defective if it does not pass tests and inspections.

D. Demonstrate to Consultant and/or Owner’s Representative the operation of the irrigation system and controls. Contractor to make available a copy of the plan for the purposes of this test.

E. If repeated trips by the Consultant and/or the Owner’s Representative are required to successfully complete the demonstration the contractor will be liable for all related expenses.

2.12 STARTUP SERVICE

A. Contractor to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that controllers are installed and connected according to the Contract Documents.
3. Verify that electrical wiring installation complies with manufacturer's submittal.

2.13 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than ¼ inch above, finish grade.

2.14 CLEANING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

2.15 DEMONSTRATION AND TRAINING

A. Contractor to train Owner's maintenance personnel to adjust, operate, and maintain the automatic irrigation system. The contractor shall allow a minimum of 8 hours for this training.

2.16 WINTERIZATION AND SPRING START-UP OF IRRIGATION SYSTEM

A. The contractor shall prepare the entire irrigation system for one winter by removing all water within the mainline and lateral piping. Water shall be diverted so as not erode existing landscaping or final grades. If damage does occur, the contractor shall make repairs to the owner's satisfaction at no additional cost.

B. The contractor shall provide one Spring Start-up of the entire irrigation system by filling the mainline and lateral piping with water and operate all control valves with the automatic controller. The contractor shall also set the controller timing for spring irrigation.

D. During Wintering and Spring Start-up the contractor shall contact the owner and current landscape maintenance provider responsible for the project site and educate them to the operations of the system. Also, the contractor shall provide a written copy to the owner of the irrigation timing required for establishing plants during late spring, summer and fall schedules.

E. The contractor shall coordinate and assemble a written instruction manual that indicates step by step the winterizing and start-up operations. The instructions shall be included in the O & M manuals.

2.17 PIPING SCHEDULE

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control-valve boxes and aboveground may be joined with flanges or unions instead of joints indicated.

C. Aboveground irrigation main piping shall be one of the following:
1. Hard copper tube, wrought- or cast-copper fittings, and brazed and/or soldered joints.

D. Underground irrigation main piping, 3" and smaller shall be the following:
1. Class 200, SDR 21 PVC pipe and socket fittings, and solvent-cemented joints.

E. Underground irrigation main piping, 4" and larger, shall be one of the following:

1. NPS 6 and larger ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings, glands, bolts, and nuts; and gasketed joints.
2. PS 6N and larger ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings and gaskets; and gasketed joints.
3. PE pressure pipe; PE butt, heat-fusion fittings; and heat-fusion joints.
4. Schedule 40, PVC pipe - gasket seal; and ductile iron fittings with joint restraints.
5. Class 200, SDR 21, PVC, pressure-rated pipe; gasket seal; PVC socket fittings; and ductile iron fittings with joint restraints.

F. Circuit piping, 1 1/4" and smaller, shall be one of the following:

1. 100#, PE, controlled ID pipe; insert fittings for PE pipe; and fastener joints.
2. Class 160, SDR 26, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

G. Circuit piping, 1 ½" – 3", shall be one of the following:
1. Class 160, SDR 26, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.

H. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

1. Option: Plastic swing-joint assemblies, with offsets for flexible joints, manufactured for this application.

I. Risers to Aboveground Sprinklers and Specialties: Schedule 80, PVC pipe and socket fittings; and solvent-cemented joints.

J. Underground Sleeving: Schedule 40 PVC

2.18 VALVE SCHEDULE

A. Underground, Shut off-Duty Valves: Use the following:
1. NPS 3 and Larger: Iron gate valve, resilient seated; iron gate valve casing; and operating wrenches.

B. Aboveground, Shut off-Duty Valves:
1. NPS 2 and Smaller: Bronze gate valve.
2. NPS 2-1/2 and Larger: Iron gate valve.

2.19 ADDENDA

A. Addenda shall be prepared from the latest version of each section. Revisions shall be tracked as indicated in Article 3.4.

B. Preferably, addenda will include completely revised sections, instead of a listing of changes. Replacement sections provide a more positive approach to posting new documents than cross-referencing a list of changes.

2.20 REVISIONS

A. General: Revisions to sections may be made by tracking changes, depending on if the last version was issued to the field.

B. Tracking Changes: Changes shall be highlighted in the following manner:
1. Insertions: Bold type
2. Deletions: Strikethrough
3. All changes shall have a vertical line in the margin, drawing attention to the change.

C. Revision Dates: Revised sections shall include the original issue date and the latest revision date, regardless of the number of revisions.

END OF SECTION 32-8400