



August 14, 2020

VIA EMAIL
(15) Page(s) Inclusive

To: Prospective Bidders

Re: Village of Hoffman Estates
Village Green Improvements – Phase I
Architect's Project Number: 19-068.1
Addendum #1

This addendum forms part of the bidding and contract documents and modifies the original bidding documents dated August 11, 2020. Acknowledge receipt of this addendum on the bid form. Failure to do so may disqualify the bidder.

Revise **SPECIFICATIONS** as follows:

1. Table of Contents.
 - a. **REVISE** the number of pages for Document 02441 - Irrigation to be 14 pages.
2. Document 02441 – Irrigation.
 - a. **ADD** attached Document 02441 in its entirety.

Sincerely,

A handwritten signature in black ink, appearing to read "Ron McGrath", with a long horizontal flourish extending to the right.

TRIA ARCHITECTURE, INC.

Ronald McGrath, AIA
Principal Architect

REM/rm

Attachments: Document 02441 - Irrigation, (14) Page(s)

File Name: 19068.1AD1081420.docx

TRIA ARCHITECTURE

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SECTION 02441

IRRIGATION

PART 1 – GENERAL

1.1 SCOPE OF WORK:

- A. Furnish all design, labor, materials and equipment for the proper installation of an irrigation system to service all lawn areas in Phase I Construction. The Contractor shall design all zones for water supply, electrical service, and controllers. The Contractor shall provide layout and design coordinated with the landscape requirements within the Phase I lawn locations. Systems design shall include individually programmable sub-zones tailored to the watering requirements. Irrigation contractor shall comply with all requirements of the drawings and specifications. Spacing of all sprinkler equipment selected shall not exceed the manufacturer's recommendations as published. "Head to head" coverage is required in all turf areas. No single row coverage of turf areas will be permitted unless approved by the Landscape Architect.

The existing irrigation zones located outside of Phase I Construction need to remain and be operable. To keep these zones functioning, adjustments may need to happen outside of the Phase I Construction limits.

For operation and management questions on the existing Hunter system please contact Curtis Hall, Curtis.hall@acresgroup.com, 224-531-3575 or Darroll Miller, 224-575-4248, both with the Acres Group. For product information discussed onsite, please contact Kevin Battistoni, kevin.battistoni@hunterindustries.com, 630-818-1282 or Eric Simmons, eric.simmons@hunterindustries.com, 630-200-7581, both representatives with Hunter Industries.

- B. Irrigation Contractor shall participate in coordination meetings as required with the General Contractor and related parties prior to commencement of construction.

1.2 RELATED SECTIONS:

- A. Section 02260 - Finish Grading
- B. Section 02480 - Landscaping
- C. Section 02480 - Seeding
- D. Section 02487 - Sod
- E. Section 02513 - Paving
- F. Division 15 - Plumbing
- G. Division 16 - Electrical Power

1.3 QUALITY ASSURANCE:

- A. **Referenced Standards:** American Society for Testing and Materials, Annual Book of ASTM Standards, latest edition. The irrigation contractor shall have either a C.I.C. or C.I.D. certification from the irrigation association. In addition, the irrigation contractor shall have a minimum of five (5) years experience.
- B. Irrigation system is to be designed and installed by a contractor in the irrigation business having installed at least five projects of equal or comparable size. A single firm, specializing in irrigation system design and installation, shall perform irrigation work.
- C. **Codes and Standards:** Irrigation design and installation shall comply with all applicable federal, state and local governing agency requirements and to industry standards. Notify Architect immediately in writing of any discrepancies, inconsistencies, or contradictory requirements.
- D. **Substitutions:** No substitutions will be permitted without the review and approval by the Architect. In the event the Contractor desires to make substitutions of materials, sufficient descriptive literature and material samples must be furnished to establish the material as an equal substitute. In addition, the Contractor must state the reasons for desiring to substitute materials. Lastly, the proposed material substitution must equal or exceed the original design intent as it pertains to water conservation and sustainable design if applicable. Submit request in accordance with Section 01340.

SECTION 02441

IRRIGATION

- E. **Approval and Selection of Materials and Work:** The selection of all materials and the execution of all operations required under this Performance Specification is subject to the approval of the Architect, who have the right to reject any and all materials and any and all Work which, in their opinion, does not meet the requirements of the Contract Documents at any stage of the operations. Remove rejected Work and or materials from Project Site and replace promptly.
- F. **Workmanship:** Install materials and equipment in a neat and professional manner following manufacturer's recommendations.

1.4 SUBMITTALS:

- A. Irrigation Design Drawing:
 - 1. Irrigation design is to be prepared and drawn by the Irrigation Contractor in the form of an "Irrigation Design Shop Drawing." It is preferred that The Irrigation Design Shop Drawing be submitted in an electronic format, but a clearly and neatly drawn plan on a reproducible base of the original landscape design is also acceptable. Submit copy of the design drawings for approval prior to the commencement of any work in accordance with Section 01340 for review by the Landscape Architect.
 - 2. All components of the irrigation system shall be shown. Show sprinkler piping, including plan layout and locations, types, sizes, capacities, and flow characteristics of sprinkler piping components. Include water meters, backflow preventer(s), booster pumps, valves, piping, sprinklers and devices, drains, accessories, controls, and wiring as necessary. All components shall be labeled with the component type, manufacturer, and model, or shall be symbols referenced to a legend or key. All components shall be shown with dimensions to reference points. Show areas of sprinkler spray and over spray. Drawing shall be scaled no smaller than 1" = 30'-0". Review of the Irrigation Design Drawing shall precede commencement of any work.
- B. Product Data:
 - 1. Irrigation Contractor shall submit three (3) sets of manufacturer's technical data to the Architect including, but not limited to valves, controller, quick couplers, sprinkler heads, etc.
- C. As – Built Drawing:
 - 1. Irrigation Contractor shall record and submit an "As-Built Drawing" which records actual installed conditions. The As - Built Drawing shall be clearly and neatly drawn on a reproducible base of the original landscape design. An AutoCAD electronic version is preferred.
 - 2. All components of the system shall be shown with dimensions to reference points, as indicated above under "Irrigation Design Drawing." Drawing shall be scaled no smaller than 1" = 30'-0".

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials and equipment in such a manner as not to damage the parts or decrease the useful life of equipment.
- B. Store materials away from detrimental elements. Coordinate with General Contractor, and Landscape Contractor, as appropriate, to secure a safe staging area.
- C. Handle, load, unload, stack, and transport materials carefully to avoid damage. Handle pipe in accordance with manufacturer's recommendations.

1.6 JOB CONDITIONS:

- A. Prior to commencing any work required under the Contract, the Contractor shall locate all utilities, subsurface drainage, and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements.
- B. Water service and electric service will be supplied by the General Contractor to a designated area in landscape planting for the purpose of the automatic irrigation system. It is the responsibility of the Irrigation Contractor to coordinate the location of the waterline and electric service.

SECTION 02441

IRRIGATION

- C. Irrigation System is to operate under the water pressure and flow rates prevailing at the project site. Irrigation Contractor shall be responsible for determining these parameters, and shall design the irrigation system in accordance with the existing or anticipated conditions.
- D. Insurance on irrigation materials or equipment stored or installed is the responsibility of the Irrigation Contractor. Such insurance shall cover fire, theft, and vandalism. Should the Irrigation Contractor elect not to provide such insurance the Owner shall in no way be responsible for any losses incurred by the aforementioned acts. The Irrigation Contractor is responsible for all costs incurred in replacing damaged or stolen materials or equipment prior to Substantial Completion of the Work.
- E. Obtain all required permits and pay all required fees at no additional cost to the Owner. Any penalties imposed due to failure to obtain permits or pay fees are the responsibility of the Irrigation Contractor.
- F. Provide and maintain all passageways, guard fences, warning lights, and other protection devices required by local authorities or others having jurisdiction.
- G. Irrigation Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.
- H. **Existing Site Improvements:** Perform Work in a manner that avoids damage to existing site improvements. The Irrigation Contractor is responsible for any damage of mechanical nature as well as damage resulting from leaks in the irrigation system whether due to negligence or otherwise.
- I. **Test water conditions:** It shall be the responsibility of the Irrigation Contractor to measure or analyze the existing or anticipated water pressure at the tap and design the irrigation system accordingly.
 - 1. In the event water pressure is insufficient to operate the system at an adequate design pressure and flow, the Irrigation Contractor shall be responsible for designing, specifying, supplying, and installing a booster pump capable of increasing the pressure and flow as required. A magnetic starter, flow, or pressure transducer/switch shall operate booster pump. If a booster pump is required, coordinate provision of adequate electrical service for the pump with General Contractor. Booster pump (if required) should be provided in a lockable enclosure on a WWF reinforced concrete pad 5" thick, over 6" CA6 base if it is to be installed outdoors.
 - 2. In the event the water pressure significantly exceeds an appropriate operating pressure, it shall be the Irrigation Contractor's responsibility to provide and install a pressure regulator downstream from the backflow preventer. Pressure regulation may be accomplished via a master valve with a pressure-reducing dial, or may be accomplished at the individual zone valve locations with a pressure-reducing dial and/or at each sprinkler emission device via built in pressure regulators.
- J. Sleeves for irrigation piping and wiring shall be located by the irrigation contractor and coordinated/installed by the General Contractor.
 - 1. It shall be the Irrigation Contractor's responsibility to submit the Irrigation Design Drawing, showing these sleeves, in a timely manner, such that the General Construction Contractor is able to install sleeves within an appropriate sequence of work, i.e., without undoing, damaging, or otherwise compromising work that has already been installed.
 - 2. Irrigation sleeves shall be PVC pipe, minimum 2X pipe size of proposed irrigation pressure pipe. Ends of all irrigation sleeves shall be marked with 2 x 2 wooden stakes or white PVC pipe, indicating in indelible marker "Irrigation Sleeve." General Contractor shall expose any irrigation sleeves that are not marked for the Irrigation Contractor prior to start of irrigation work. Coordination and scheduling for excavation of sleeve ends is the responsibility of the Irrigation Contractor.
- K. Coordinate and schedule all Work with General Contractor, and/or Landscape Contractor, as appropriate.
- L. Damages resulting from irrigation installation to work of other trades must be repaired at the expense of the Irrigation Contractor in a timely fashion.
- M. Make minor adjustments to system layout as may be required and requested at no additional cost to the Owner.

SECTION 02441

IRRIGATION

N. Keep Project Site clean and orderly at all times during construction.

1.7 WARRANTY:

- A. Warranty all Work for a period of two (2) years, starting on the Date of Substantial Completion, against defects in materials, equipment, workmanship, and any repairs required resulting from leaks or other defects of workmanship, material, or equipment.
- B. Repair unsatisfactory conditions promptly at no cost to the Owner.
- C. The Owner, General Contractor, or Landscape Contractor may make emergency repairs, as appropriate, without relieving the Irrigation Contractor of any warranty obligations.
- D. Repair settling of backfilled trenches occurring during the warranty period, including restoration of damaged plantings, paving, or improvements resulting from settling of trenches or repair operations.
- E. Repair costs shall include the cost to restore or replace plant material, which may die due to dehydration and the cost of any supplemental watering deemed appropriate by the Owner's Representative.
- F. Respond to Owner's request for repair work within forty-eight (48) working days. If Irrigation Contractor does not respond in this time frame, Owner's may proceed with any necessary repairs at the Irrigation Contractor's expense

PART 2 – PRODUCTS

2.1 GENERAL:

- A. Material specified by name and/or model number in the Specifications, on the site, or detailed drawings are used for the purpose of identification of materials and to ensure specific use of that material in the construction of the system. No substitutions will be permitted without approval.
- B. All materials used in the system must be new and without flaws or defects of any type and be the best quality available. All materials shall have a minimum three (3) year warranty against material defects or defective workmanship.

2.2 PIPE AND FITTINGS:

- A. All PVC pipe from sizes 3" and above shall be Class 200, SDR 26, unplasticized rigid polyvinyl chloride (PVC) pipe with integral bell and rubber ring gasket unless otherwise specified. Pipe from sizes 2-1/2" to 1-1/4" shall be Class 200, solvent weld PVC pipe. Pipe sizes 1-3/4" shall be Class 200, solvent weld PVC pipe. 1/2" pipe shall be Class 315 solvent weld PVC pipe. All pipes shall be supplied in standard 20' lengths and shall be from one of the following manufacturers: No polyethylene pipe will be accepted unless prior written approval is obtained from the landscape architect
 - 1. Certainteed Corporation
 - 2. Crestline
 - 3. Dura.
 - 4. Or approved equal
- B. All pipe that is exposed or not below grade shall be Schedule 80 PVC.
- C. Fittings for integral bell with rubber ring gasket pipe shall be of the gasket type and shall be ductile iron fittings as manufactured by (LEEMCO Corporation, Corona, CA or The Harrington Corp., Lynchburg, VA, or approved equal. Fittings for solvent weld pipe shall be Schedule 40 PVC fittings rated for 200psi (ASTM D-3139) as manufactured by Lasco Plastic Pipe Fittings, Orlando, Florida or approved equal.
- D. **All pipe fittings:** size 3" and greater shall be ductile iron. All fittings 2-1/2" and under shall be Schedule 40 solvent weld PVC.
- E. Solvent weld PVC pipe, if and when used in construction of this system, shall be rigid PVC pipe and shall be assembled using appropriate PVC pipe cleaner/primer and solvent cement in accordance with the manufacturer's recommendations.

SECTION 02441

IRRIGATION

- F. All solvent weld fittings shall conform to Schedule 40 or Schedule 80 PVC dimensions and specifications for solvent weld fittings, as manufactured by Lasco, Spears, or approved equal.
- G. Expansion joints shall be installed every 300' of solvent weld piping.
- H. Runs of pipe over 20' in length must be installed with standard 20' length sections. Unnecessary joints or couplings are not acceptable.
- I. Landscape Drip Line shall conform to, and be installed according to, manufacturer's recommendations.
- J. **PVC Pipe Couplings Located Within Sleeves:** PVC pipe couplings 4" and smaller shall be solvent weld. PVC pipe couplings 6" and larger shall be mechanical joints. Upon exiting sleeves, pipe solvent weld or integral bell and rubber gasket, as described in Section 2-02-A, must be adhered to.
- K. **Risers:** Provide threaded Schedule 80 PVC risers. All risers above grade shall be either dark gray or black PVC pipes.

2.3 ELECTRIC WIRING:

- A. 120 Volt AC Wiring: 120volt service to controller shall consist of three wires: one black, one white, and one ground. Electrical service is to be provided by the General Contractor unless otherwise directed by Owner's Representative. It is the Irrigation Contractors responsibility to coordinate the location of electrical service to be provided for controller.
- B. Splices in controller wiring shall be waterproof using 3M-DBY wire connectors or approved equal
- C. Provide junction box, flush-mounted and gasketed per code as required.
- D. Control Wiring shall be 24volt solid wire Underwriter's Laboratory (UL) approved for direct burial in ground. Minimum wire size shall be 14gauge. All control wiring and wiring connections from the controller to the valves is included in this Contract.
 - 1. 2-Wire Decoder Systems:
 - a. In the event that a 2-wire decoder system is proposed, all wiring shall meet the following specification: Valve/Decoder – Controller Communication Wire Path.
 - 2. The MAXI Type Communication wire for the Two-Wire path(s) shall be double jacketed, two- (2) conductor cable intended for control of the communications signal and feedback signal for the Rain Bird Central Computerized Control Systems. The cable shall be suitable for direct burial in the earth and also may be installed in ducts or conduits.
 - a. **Conductors:** The conductors shall be tin coated (for good mechanical bonding), soft drawn, annealed solid copper conforming to the requirements of ASTM-33. Each conductor shall be insulated with 4/64" (minimum) thick PVC conforming to the requirements of UL Standard #493 for thermoplastic insulated underground feeder cables (TYPE UF).
 - b. The two (2) conductors shall be color coded with one conductor BLACK and the other RED. Both conductors shall be of the same size and shall be of sizes as specified and/or shown on the drawings and a required for the proper operation of the MDC and decoder units connected to it.
 - 3. The wire manufacturer shall certify in writing, for each shipment, that the insulated conductors have been tested for and meet the requirements of UL Standard #493 for thermoplastic-insulated, underground feeder cables (Type UF). He shall also certify in writing that the individual conductors have a minimum insulation thickness of 4/64" throughout the entire length of the cable and that the finished cable meets the following requirements of the same standard:
 - a. Dielectric Voltage Withstand Test = 5000V for 60 seconds.
 - b. Tension and Elongation Test = 300lbf, no separation
 - c. Impact Test = 6000V after the impact
 - d. Crushing Resistance Test = an average of no less than 4500lbf flat, and an average of no less than 1200lbf edge
 - e. Cold Bend Test = no cracks

SECTION 02441

IRRIGATION

4. In addition, each shipment of cable shall included a current dated listing card from the Underwriters, showing the manufacturer's UL ID Number as evidence that the manufacturer is approved to manufacture thermoplastic insulated underground feeder cable in accordance with the UL Standard #493.
5. **Outer Jacket:** The two (2) conductors shall be laid parallel and covered with a solid color, high density, sunlight resistant polyethylene outer jacket, of the color coding specified and conforming to the requirements of ICEA S-61-402 and NEMA WC 5. The minimum jacket thickness, when measured at any point in contact with the PVC insulations of the copper conductor and to the outer surface of the outer jacket, shall be 3/64" thick. The outer jacket shall be pressure extruded so as to completely fill the interstices between the two insulated wires.
 - a. The entire outer polyethylene jacket shall be of the color specified for easy identification of the Two-Wire path. Each two-wire path on the system shall have a different color outer jacket for easy identification after installation and for easily distinguishing between the various two-wire paths on the system. Standard colors for the outer jacket color-coding shall be – White, Red, Green, Blue, Yellow, Orange and Black.
6. The Maxi type cable shall be marked on the jacket as follows – MAXI TYPE COMMUNICATION CABLE – 2/C XXAWG, along with the manufacturer's name and identification number (which is mandatory) and other designations, such as voltage rating, etc. as appropriate. The wire shall not be marked with the name Rain Bird or any other similar designation, except as noted above. The manufacturer shall also certify in writing that the polyethylene outer jacket is of minimum thickness (3/64") throughout the entire length of the cable and that it does meet and conform to the requirements of ICEA S-61-402 and NEMA WC 5 as outlined above for both electrical and physical properties.
7. The MAXI type communication cable for the two-wire path(s) of the various control systems shall meet or exceed the above specifications in all respects and all written certifications from the manufacturer shall be supplied with the wire as outlined and called for in these specifications.
8. All field connections will be accomplished with wire nuts and will be made water tight and oxidation resistant through the use of 3M Scotch Kast "400" or DBY electrical insulating resin packs. Other brands are not acceptable. Use of sealant without container package is not permissible.

2.4 SRINKLER HEADS:

- A. **Fixed Spray Sprinkler Head:** Sprinkler shall be of the fixed spray type designed for in - ground installation. Sprinkler shall be capable of covering a maximum of fifteen (15) foot radius at thirty (30) psi and maximum delivery of 3.7gpm.
- B. **Pop-Up Spray Sprinklers:** shall also include a pressure regulating device to prevent high pressure fogging to the nozzle stream. This regulating device shall be an integral part of the pop-up stem, removable through the top of the case. The pressure regulating device shall regulate the nozzle pressure to 30 PSI for inlet pressures from 35 to 70 PSI. Below 35 PSI the pressure loss shall not exceed 6 PSI. These units shall be identifiable from the top with "PRS" markings on the cap.
 1. Nozzle shall be comprised of one (1) or more orifices at two (2) radius ranges and shall be adjustable from fully on to fully off. Nozzle shall elevate to the desired height when in operation. Retraction shall be achieved by a heavy-duty stainless-steel spring. Nozzle piston shall have a smooth external surface operation in a resilient guide. Riser wiper shall be included in the sprinkler for continuous operation in the presence of sand and other foreign material. Coverage shall be full or part circle. Part circle coverage shall be available in arcs of 90, 120, 180, 240, and 270 degrees or adjustable part circle. A center strip head shall also be included for coverage. Nozzle delivery shall allow circle patterns to match full circle patterns in precipitation rates.

SECTION 02441

IRRIGATION

2. Fixed arc nozzles shall have dual orifices for both in-close watering and standard pattern watering except where not applicable as in the case of full circle nozzles. The lower orifice shall be a labyrinth type orifice to assure correct distribution of water close to the spray-head. The fixed arc nozzle shall be constructed of UV-resistant plastic. The radius adjustment screw shall be of stainless steel. The fixed arc nozzle shall accept the 32-mesh blue screen to protect nozzle against clogging and to allow for radius adjustment. The nozzle shall have a precipitation rate matched with other 1800SAMPRS Series with MPR nozzles. If the job site is flat, the SAM feature can be eliminated. The fixed arc nozzle shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California or approved equal.
 3. The body of the sprinkler shall be constructed of non - corrosive heavy duty Cicolac. A filter screen shall be in the nozzle piston. All sprinkler parts shall be removable through the top of the unit by removal of a threaded cap.
- C. Intermediate Turf Rotors:
1. The full or part circle sprinkler shall be Rain Bird 5000PL-SAM-PRS Series utilizing the MPR Nozzle sets. In the event that the job site is flat, the SAM feature can be eliminated. Sprinkler shall be a single stream, water lubricated, gear drive type capable of covering the areas between 25' and 35' at a minimum base pressure of 45psi. The part circle sprinkler shall have adjustable arc coverage of 40 to 360 degrees. The sprinkler shall have a thread-on nozzle assembly whose installation shall not require any tools. The sprinkler shall include an integral pressure regulator to reduce operating pressure to 45psi for optimal nozzle performance. The pressure regulator shall be located downstream of the sprinkler's filter basket and shall require no field adjustment. The sprinkler shall have a flow shut-off device (5000 Plus PRS only) that is integrated into the flow path of the rotor as well as adjustable arc coverage of 40 to 360 degrees. Arc adjustment can be performed with or without the sprinkler in operation and shall require only a flat-blade screwdriver.
 2. The sprinkler shall have a smoothed flow path entrance to enhance the flow characteristics of the rotor. In addition, the sprinkler shall feature a flow path to nozzle bore transition radius to minimize pressure loss and assure peak nozzle radius is achieved (5000 Plus PRS only).
 3. The sprinkler shall have a pressure activated, multi-function wiper seal that positively seals against the pop-up stem to keep debris out of the rotor and to clean debris from the pop-up stem as it retracts. This wiper seal shall prevent sprinkler from sticking up, and be capable of sealing the sprinkler cap to sprinkler body under normal operating pressures.
 4. The sprinkler shall have a screen installed in the pop-up stem to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system. It shall have a 3/4" (FNPT) bottom inlet.
 5. The sprinkler shall have a standard rubber cover and a strong stainless steel retract spring for positive pop down. Pop-up height as measured from the top of the cap, at normal installation, to the middle of the nozzle orifice shall be 4 inches. The rotors overall height shall be 7-3/8" with an exposed surface diameter of 1-5/8". The sprinkler shall have 12 interchangeable nozzles: 8 Rain Curtain nozzles for superior coverage and 4 Low Angle nozzles for reduced radius of throw and superior wind resistance with all nozzles containing Micro-Ramp technology for superior close-in watering. The angle of trajectory shall be 25 degrees for the Rain Curtain nozzles and 10 degrees for the low angle nozzles. The sprinkler shall come with a stainless steel adjusting screw capable of reducing the radius up to 25%.
- D. Long Range Rotors: 5505, 7005 and 8005 Full or Part circle Rotors
1. The full- or part-circle sprinkler shall be a single stream, water lubricated, gear drive type capable of covering a radius of 17' to 80' at a base pressure of a minimum of 45 pounds per square inch (psi) for the 5505 and a minimum of 50psi for the 7005 & 8005 to a maximum of pressure of 90psi for the 5505, 7005 and 8005.

SECTION 02441

IRRIGATION

2. The sprinkler shall be capable of both full circle and part circle operation in the same unit. Inserting a flat blade screwdriver in the top of the rubber cap and turning selector approximately 45 degrees shall select the mode of operation. The sprinkler shall not reverse direction during continuous operation in the full circle mode.
3. The part-circle sprinkler shall have adjustable arc coverage of 50 to 330 degrees. Arc adjustment can be performed with or without the rotor in operation and shall require only a flat blade screwdriver. The arc adjustment can be performed on both the right and left trip of the sprinkler.
4. The sprinkler shall have a rotating nozzle turret independent of the riser stem. The portion of the riser stem that is in contact with the wiper seal shall be non-rotating. The sprinkler shall have a non-strippable drive mechanism and permit manual rotation of the pop-up stem in any direction. This shall have no effect on either the drive or the set arc. Once the manual rotation is terminated, the sprinkler shall automatically return the water stream to its preset arc.
5. The sprinkler shall have a pressure activated, multi-function, soft elastomeric wiper seal. This wiper seal shall prevent the sprinkler from sticking in the up position, and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system.
6. The sprinkler body shall have a 1" (26/34) female (NPT or BSP) bottom inlet. The sprinkler shall have a standard rubber cover, which designates each adjustment opening from the top. The sprinkler shall have a two piece, front-load nozzle assembly which will allow the nozzle to be installed without a stator bushing change. The primary and secondary nozzle ports shall be contained in one of the parts and shall be unique to each nozzle size. The tertiary nozzle port shall be common to all of the other primary/secondary nozzle assemblies.
7. The sprinkler shall have a selection of eight color-coded nozzles. All but the #4 and #6 nozzles shall have three ports for optimal close-in, mid-range and long-range water distribution. The sprinkler shall have a stainless-steel nozzle retention screw. The angle of trajectory shall be 25 degrees from horizontal.
8. The sprinkler shall have a strong stainless steel retract spring for positive pop-down.
9. The sprinkler shall have a standard Seal-A-Matic™ (SAM) device capable of holding up to 10' of head. Pop-up height as measured from the top of the cover to the centerline of the nozzle orifice shall be at least 5". The sprinkler's overall height shall be 101.8" and the exposed diameter shall be 17.8".
- E. Xerigation Control Zone kits shall be Rainbird part no. XCZ-LF-075-BF, XCZ-LF-100-BF, XCZ-100-B-COM or XCZ-150-COM or approved equal. Control zone kit selection will be based on the demand of the drip irrigation zone. Provide back flush filter.
- F. Landscape Drip Line shall be Rain Bird model XFD-09-12, XFD-09-18, or XFD-09-24 or approved equal.
- G. Approved manufacturer:
 1. Hunter Industries

2.5 AUTOMATIC CONTROLLER:

- A. Controller location(s) must be easily accessible for maintenance. Provide for the possibility of making minor timing adjustments to the controller in the field. Provide concrete pad as required.
- B. Provide electromechanical controllers capable of fully automatic as well as manual operation of the system. Controller housing is to be a wall or pedestal mounted, weatherproof, lockable cabinet.
- C. Provide controller, which operates on a minimum of 110 volts AC power input and is capable of operating 24volt AC electric remote control valves, with a reset circuit breaker to protect from overload. Irrigation Contractor is responsible for connection of 120V AC power to controller.
- D. Each station shall have a time setting knob, which can be set for variable timing in increments from six (6) to sixty (60) minutes, or set to omit the station from the irrigation cycle.

SECTION 02441

IRRIGATION

- E. Controller shall have a fourteen (14) day calendar dial with captive three position pins for setting the programmed start days, and a twenty – four (24) hour clock dial with twenty – three (23) captive hour pins for programming the irrigation cycle start time. A master “on – off” switch shall allow the valve power output to be interrupted without affecting the controller.
- F. Controller must be constructed so that all internal parts are accessible through the controller door without disturbing the cabinet installation.
- G. Approved manufacturer:
 - 1. Hunter Industries

2.6 METER: submit product data as required.

2.7 BACKFLOW PREVENTER:

- A. To be supplied and installed by the Irrigation Contractor. Backflow preventer shall be a RPZ reduced pressure backflow assembly type, capable of having an adequate flow rate in gallons per minute (gpm) without excessive pressure loss, and shall be suitable for supply pressure of up to 150 psi. Backflow preventer body shall be bronze with corrosion-resistant interior components and check assemblies shall be tight seating rubber. Working pressure shall be 150psi minimum with a maximum pressure loss of 12psi through middle 1/3 of flow range. Backflow preventer shall be installed within enclosure with sufficient clearance to permit periodic testing and maintenance. Provide a lockable enclosure on a concrete pad 5” thick with WWF reinforcement, over 6” CA6 base for the backflow preventer. Backflow preventer assembly must include (2) gate valves for isolating unit, and two (2) ball valve test cocks for testing unit to ensure proper operation. Provide concrete pad as required. Backflow preventer(s) shall comply with requirements of local codes, ordinances, and regulations. Provide for winterizing the system on both sides of the backflow preventer. This may include provision of 1” tees with caps inside the backflow preventer enclosure.
- B. Approved manufacturer:
 - 1. Febco
 - 2. Watts
 - 3. Wilkins Regulator

2.8 VALVE BOXES:

- A. Control Valves and Quick Coupling Valves shall be Rain Bird VB-10RND or VB-STD for multiple valves/box, Carson Series 1419 rectangular valve box with non - hinged cover or approved equal.
- B. Isolation Valves and Wire Splices shall be Carson Series 910 with cover.
- C. Color of Valve Boxes shall match existing.

2.9 SLEEVES:

- A. Class 200 PVC Pipe Type II20 or 1220 coordinate with and installed by the General Contractor.

2.10 QUICK COUPLING VALVES: One (1) per zone, located adjacent to remote solenoid valve.

- A. Quick Coupling Valves (QCVs) will be used for manual access to the pressurized main line so that a hose can be attached and used for hand watering. QCVs shall be constructed of brass with a spring loaded seal that will keep the valve in a closed position until the key is inserted into the valve. Valve shall also have a hinged aluminum cap to prevent any debris getting into the internal mechanism of the valve. QCVs shall be installed on a triple elbow swing joint.
- B. QCV keys shall be of the single lug variety. Attached to the key will be a hose swivel adapter sized to the hose commonly used on the project. Irrigation Contractor to contact Owner's Representative to determine hose type. Key and swivel shall both be constructed of brass.
- C. Approved manufacturer:
 - 1. Hunter Industries

SECTION 02441

IRRIGATION

2.11 CONTROL VALVES:

- A. Provide Rainbird Electric Remote Control Valve model PGA or PEB series or approved equal. Valve shall conform to Manufacturer's specifications concerning performance at given pressures.
- B. Approved manufacturer:
 - 1. Hunter Industries

2.12 SURGE PROTECTION EQUIPMENT:

- A. Provide General Electric Lightning Arrestor No. GL15-CC B007 for controllers not equipped with primary surge protection.
- B. Irrigation Contractor is responsible for determining whether the above mentioned surge protection equipment is provided in the controller as a "built – in" unit or if it must be supplied and installed separately.

2.13 ISOLATION VALVES:

- A. Provide all gate valves for isolation purposes, allowing full diameter opening when in full open position.
- B. Manually operated valves shall be the same size as the line.
- C. Valves 3" or smaller shall be brass construction, threaded, and rated for 200psi WOG.
- D. Valves 4" or larger shall be cast iron fitted with a rubber ring, slab - type gasket.

2.14 AUTOMATIC RAIN SHUT OFF DEVICE:

- A. Provide automatic rain shut off device by Rainbird Corporation, model WRC or approved equal. The rain shut off device shall be set to shut off the system in the event of an approximate accumulation of ¼" of rainfall. The rain shut off device shall reset itself within a reasonable amount of time to allow the system to activate at its regular programmed run time.
- B. The rain shut off device shall be mounted a minimum of 10' above grade in a location unobstructed by typical rainfall for that location, and protected against vandalism. Wiring shall be installed in heavy wall rigid steel conduit and fastened securely to structures with stainless steel fasteners.

2.15 MICELLANEOUS SYSTEM COMPONENTS:

- A. Provide risers, reducers, couplings, adapters, fittings, and ancillary equipment as necessary to complete the irrigation

2.16 ET- BASED CONTROLLERS:

- A. ET based control of the irrigation system is also acceptable. The ET device shall be either Rain Bird model ETM-LXM or ETMi. Rain Bird model ETMRG shall also be used in conjunction with the ETM-LXM or ETMi for recording local rainfall.

PART 3 – EXECUTION

3.1 GENERAL:

- A. **Supervision:** Provide a full – time superintendent and necessary assistants on the job while Work is in progress. The Superintendent represents the Irrigation Contractor in all functions, and directives given to him by the Owner's Representative, Landscape Architect, General Contractor, and / or Landscape Contractor are binding as if given to the Irrigation Contractor in person.
- B. **Inspection of Work in progress:** During installation the Owner's Representative or the Landscape Architect may review and observe the Work on a regular or random basis, and may reject any work and / or materials that do not meet the requirements of the Contract Documents. Rejected Work must be promptly corrected. No time extension will be allowed replacement or repair of rejected work.

SECTION 02441

IRRIGATION

- C. **REVIEW IN ADVANCE OF CONSTRUCTION:** The Irrigation Contractor shall review the Project Site prior to start of Work to determine that all site conditions are acceptable for Irrigation Work to begin. Inform the General Contractor and the Architect of any and all unsuitable conditions. Do not proceed with installation of irrigation system until unsatisfactory conditions have been corrected in an acceptable manner.
- D. **PREPARATION:** Flag all existing underground utilities prior to trenching and/or boring operations. Obtain locations of any new utilities from the General Contractor. Irrigation Contractor is solely responsible for contacting the utility locating service(s) and locating on – site utilities in advance of installation.

3.2 SLEEVING (by General Contractor):

- A. Location of sleeves shall be coordinated with the General Contractor. Make adjustments necessary to accommodate existing vegetation, utilities, and other existing conditions.
- B. Repair of damage to existing utilities, structures or other construction resulting from installation of sleeves is the responsibility of the Contractor installing the sleeves.

3.3 PIPE:

- A. Pipe joints:
 - 1. Follow Manufacturer's recommendations and use pipe and bell from the same manufacturer. Pipes 2-1/2" and smaller use solvent weld system. Pipes 3" and larger use approved compression type push - on joints as manufactured by:
 - a. J-M PVC
 - b. Ring Tite
 - c. Certaineed Corporation
 - 2. Trenching under the drip line of trees is not allowed.
 - 3. Solvent welds PVC Pipe, assemble according to Manufacturer's recommendations, using appropriate PVC pipe cleaner/primer and solvent cement.

3.4 PIPES AND FITTINGS:

- A. Install according to Manufacturer's recommendations including snaking - in of PVC pipe to prevent excessive strain when contracting in cold weather.
- B. Solvent weld fittings shall conform to Schedule 40 or Schedule 80 PVC dimensions and specifications for solvent weld fittings, and shall be as manufactured by Lasco, Inc. or approved equal.

3.5 LATERAL LINES AND RISERS:

- A. Install according to Manufacturer's recommendations.
- B. Install risers such that no excessive movement occurs while sprinkler head is in operation. Height of risers to be in accordance with planned plant material. Height of all risers is subject to approval of Architect.
- C. Plug lines immediately upon installation to minimize infiltration of foreign matter.
- D. Flush lateral lines and risers prior to installation of sprinkler heads.

3.6 TRENCHING:

- A. All mainline to be installed in separate trenching process from lateral lines.
- B. The initial backfill will always be placed by hand and shoveled in evenly along both sides of the pipe and hand tamped into place. Care will be exercised to insure that soil does not bridge and final to go under the pipe. The soil in the trench shall be backfilled to the point of the same condition of the density of the surrounding soil.
- C. In backfilling trenches, the addition of water should be limited to achieving optimum moisture content for tamping procedures. The contractor shall not crown the backfill on the trench area with the thought that it will eventually settle; this will not be accepted as a finished job. All excess materials shall be removed from the site in a satisfactory manner.

SECTION 02441

IRRIGATION

- D. During the entire prosecution of the work, the Contractor will be responsible for all open excavations and as a means of protection, shall keep such protective devices buried at proper intervals along the excavation to protect the public from injury.
- E. **Trenching and excavation in newly sodded areas:** Prior to trenching and excavation remove sod, preserve, and replace after backfilling is completed.
- F. **Trenching and excavation in established grass or newly seeded areas:** After trenching, excavation and backfilling are completed, re-grade trenched area consistent with surrounding area and reseed with turf seed matching existing grass or seed. Mulch seed after broadcasting.
- G. **Trenching and excavation through existing asphalt or concrete:** Cutting, removal and replacement of asphalt or concrete is the responsibility of the Irrigation Contractor.
- H. **Trenching and excavation near existing trees:** Irrigation Contractor shall paint proposed trenching or excavation which occurs within the "drip line" or within 50' of the trunks of the existing trees, whichever is greater. Irrigation Contractor must contact the Architect for review of the proposed trenching and excavation lines prior to proceeding with the work. Owner's Representative may adjust proposed trenching and excavation lines in order to avoid damage to tree root systems and other plants. The Irrigation Contractor at no additional cost shall make such adjustments to the Owner.

3.7 BACKFILLING:

- A. Backfill material shall be free from rocks, large stones, and other unsuitable material which could damage pipe or create settling problems. Backfill in six (6) lifts and tamp after each lift to prevent excessive settling.
- B. Backfill trenches with plastic pipe when pipe is cool to avoid excessive contraction in cold weather. Backfilling during summer season or on other warm days may be done in the early morning hours, or pipe may be water cooled prior to backfilling.
- C. Minimum depth of cover of pipe is as follows:
 - 1. ½" to 1":..... 12"
 - 2. 1 ¼" to 2":..... 15"
 - 3. 3" & 4": 24"

3.8 SPRINKLER HEADS:

- A. Sprinklers shall be installed on swing joints, minimum 3" off inside edge of curbs, drives and sidewalks. Consistency in placement must be maintained throughout the project in all cases.
- B. **Low Pop – up Sprinkler Heads:** Install in such manner that top is flush with finish grade. Where finish grade has not been established extend riser a minimum of twelve (12) inches above existing grade to mark location of head. After finish grade is established install heads at specified height.
- C. **High Pop – up Shrub Heads:** Finish height to be proposed by Irrigation Contractor as a function of plants specified on landscape plans and noted on irrigation design submittal.
- D. Backfill around sprinkler head assembly in such manner as to stabilize the sprinkler head so that no lateral motion occurs during operation.
- E. **Sprinkler Heads on Risers:** Utilize a schedule 80 T.O.E. nipple. If greater than 24" height is required, provide fitting in the ground with a solvent weld 90 degree elbow with the appropriate length of pipe glued to it and coming out of the ground to the desired height. Glue male adapter to the riser to allow for the connection of the sprinkler head. Stabilize riser by fastening it to rebar as required. Height of all heads in bed areas to be proposed by Irrigation Contractor as a function of plants specified on landscape plans.
- F. Landscape Drip Line shall be located in a manner that will provide optimum concentration of water to plant material.

3.9 ELECTRIC CONTROL WIRES:

- A. Install control wires in orderly fashion, locate in main line trench. Bundle wires together and tape at 10' intervals. Position wires to the right of the water supply line in the direction of the water flow.
- B. Provide looped slack at directional changes in supply line to allow for contraction of wires.

SECTION 02441

IRRIGATION

- C. Keep wire splices to a minimum and provide 10" round valve box at each splice location.
- D. Pass wires under existing or future paving, construction, etc., through PVC sleeves provided by General Contractor.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. Ground electric-powered controllers, valves, and devices.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- G. Arrange for electric-power connections to controllers, control valves, and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 16 Sections.

3.10 CONTROL EQUIPMENT:

- A. All automatic valves and controllers shall be installed following the recommendations of the manufacturer of said equipment and in accordance with any detailed drawings, which may accompany these specifications as part of the Contract Documents. The Architect prior to installation shall approve the location of controller(s).

3.11 VALVE BOXES:

- A. All valves are to be housed in valve boxes. Install according to Manufacturer's recommendations and any detailed drawings, which may accompany these specifications as part of the Contract Documents. Position boxes at a height where they will not interfere with maintenance machinery (e.g., mowers) and such that soil and mulch do not wash into the box. In essence, valve boxes to be installed flush with grade.

3.12 BACKFLOW PREVENTER:

- A. Installation in accordance with manufacturer's recommendations and all federal, state and local codes.

3.13 BALANCING AND ADJUSTMENT:

- A. Balance and adjust the various components of the sprinkler system so that the overall operation of the system is most efficient. This includes synchronization of the controllers, adjustments to pressure regulators, part circle sprinkler heads, and individual station adjustments on the controllers. The Irrigation Contractor may call in the Architect to aid in the balancing and adjustment of the system.

3.14 OPERATION TESTING:

- A. Upon completion of the irrigation system, and after head installation, test the entire system for proper operation. Flush all air from the system and check components for proper operation.

3.15 AS – BUILT DRAWINGS:

- A. As – Built Drawings shall include locations of all valves (automatic and manual), with triangulated measurements to each location, as well as any deviations in location of piping and heads as represented by the irrigation design submittal.

3.16 OWNER ORIENTATION:

- A. Upon completion of the Work and final acceptance by the Owner's Representative and the Landscape Architect, the Irrigation Contractor shall be responsible for the orientation of maintenance personnel in the operation, maintenance, and repair of the system. Furnish copies of all available parts lists, trouble shooting lists, instruction sheets, and specification sheets to the Owner prior to final payment.
- B. Set initial watering schedules and programming of the automatic controllers at direction of the Landscape Contractor. Changes in the schedules, programming and instruction on how to make such changes is the responsibility of the Landscape Contractor.

SECTION 02441

IRRIGATION

- C. Provide a complete written description and schedule of annual maintenance requirements to the Owner's Representative at the final inspection.

3.17 WINTERIZING SYSTEM:

- A. If the Owner's Representative so requires, irrigation piping must be winterized by blowing the system clear of water using compressed air (80psi maximum) admitted into the piping at a quick coupling valve or hose bib located at a higher elevation on the system piping. Activate individual zones, higher zones first, then proceed successively through the system towards lower elevations. Proceed through all zones twice. The air compressor used to winterize the system must have an engine separate from the compressor tanks to prevent high temperature air from being injected directly into the PVC piping. Irrigation Contractor shall provide a complete spring start up at no additional charge. Owner's maintenance staff must be present at the time of the winterizing.

3.18 CLEAN UP AND PROTECTION:

- A. During irrigation Work keep Project Site clean and orderly.
- B. Upon completion of Work clear grounds of debris, superfluous materials and all equipment. Remove from site to the satisfaction of the Owner's Representative and the Landscape Architect.
- C. Protect Irrigation Work and materials from damage due to irrigation operations, operations by other contractors and trades, and trespassers. Maintain protection until Date of Substantial Completion.
- D. Cover all openings in the system as it is being installed to prevent obstructions in the pipe and the breakage, misuse, or disfigurement of the equipment.
- E. **Theft:** Irrigation Contractor shall be responsible for theft of equipment and material at the job site before, during, and after installation, until Date of Substantial Completion of the Work in total.

3.19 COMMISSIONING:

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
- B. Verify that specialty valves and their accessories are installed and operate correctly.
- C. Verify that specified tests of piping are complete.
- D. Verify that sprinklers and devices are correct type.
- E. Verify that damaged sprinklers and devices are replaced with new materials.
- F. Verify that potable-water supply connections have backflow preventers.
- G. Energize circuits to electrical equipment and devices.
- H. Adjust operating controls.

END OF SECTION