City of Bridgeton
Parks & Recreation Department

IRRIGATION SPECIFICATIONS
BERRY HILL GOLF COURSE
CITY OF BRIDGETON, MISSOURI

A. GENERAL SPECIFICATIONS AND CONDITIONS

1.0 Objective

a) The objective of this specification is to provide an assembled and installed new Rain Bird Integrated Control "IC" irrigation system and pump update which will operate in an efficient and satisfactory manner so that the finished system shall efficiently irrigate all areas to be covered and shall prove satisfactory in all aspects to the Owner. This specification, detail drawings and irrigation drawings shall be considered as a part of the irrigation system contract.

2.0 Schedule

a) Plans and Specs become available electronically, 11/21/22.
b) Pre-bid meeting, Berry Hill Golf Course, 12/06/22 1:00 p.m.
c) Bids due/bid opening 12/14/22 by 2:00 p.m.
d) Bid review week of 12/14.
e) First reading 1/4/23.
f) Final approval 1/18/23.
g) Notice to proceed 1/19/23 (pending fully executed contract).
h) Construction must end by May 1st, 2024

3.0 Definition of Terms

a) "Contractor" is the party which executes the contract to perform the material supply and installation of the irrigation system. Contractor shall state to Owner in writing all persons who will represent the Contractor during any portion of the contract period.
b) "Owner" shall mean Berry Hill Golf Course or City of Bridgeton. Owner shall state to Contractor in writing all persons who will represent the Owner during

any portion of the contract period. The specific areas of the Owner's representative's authority shall be clearly defined by Owner to Contractor.

c) "Designer" shall mean Turfwerks and their representatives.

4.0 Special Constraints and Considerations

a) There is no prevailing wage for this project.

b) The Contractor shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract Price as security for the faithful performance of this Contract and also a Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Price in a penal sum not less than that prescribed by State or local law, as security for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The surety shall be a company licensed to do business in the State of Missouri and shall be acceptable to the Owner. The Performance Bond and the Labor and Material Payment Bond may be in one or in separate instruments.

c) Owner will acquire and provide all permits necessary for the project.

d) The Contractor will be required to keep all but 1 hole open during construction.

e) Before moving on to the next hole the previous hole must be finished. It will be acceptable to complete main line then return to complete lateral piping.

f) The existing irrigation system will need to remain operational on an as needed basis determined solely by the Golf Course Superintendent. Each day the Contractor will need to get permission if the irrigation system will not be functional for the nightly irrigation cycle.

g) Control of the system requires the central computer to be operational and functional with wiring installed to the interface. Special consideration should be made and considered on where the Contractor should begin installation.

h) The City of Bridgeton will be flexible with the start date of the project. However, once the project is started the Contractor must make every effort to finish within the timeline they submitted as part of the bid. The project must be completed no later than May 1st, 2024.

5.0 Insurance

a) Insurance Requirements:
   a) Bodily injury liability insurance
      - general and automobile - $500,000/person, $2,000,000/occurrence
   b) Property Damage Insurance
      - General and automobile - $500,000/occurrence
      - General - $2,000,000 aggregate
   c) Vendor will be required to list “The City of Bridgeton” as an additional insured under their policy.

6.0 Scope of Work

The work shall consist of the provisions of labor and material, equipment and services required for all work as described in this irrigation specification, instructions to bidders, contract drawings and as briefly summarized below:

a) Install complete new irrigation system per the irrigation plans and specifications.
b) Install new HDPE piping system with isolation valves, air relief valves, and drains per plans and specifications.
c) Install new Rain Bird IC sprinklers and control system per plans and specifications.
d) Removal of __240_____ sprinklers, and ____6___ controllers.
e) Pump Station update.

The contract drawings and specifications are intended to include everything obviously required and necessary for the proper installation of the work. The Contractor shall provide each necessary item, whether it is mentioned herein or not, unless otherwise specified.

All work herein specified or called for on the drawings, in the specifications or in the detail drawings shall be executed in accordance with all governing ordinances, laws and regulations and shall meet all location conditions; and any changes and/or additions in work necessary to meet ordinances, laws, regulations and/or conditions will be made without additional expense to the Owner. However, such changes shall have the prior written approval of the Owner.

7.0 Definition of Intent of Documents

All documents including irrigation drawings and all written specifications shall constitute the contract documents and all modifications thereof incorporated in the documents before their execution.

What is called for in one document shall be binding as if called for by all. The intent of the documents is to include, unless otherwise stated, all labor, materials, and equipment necessary for the completion of the work required for a complete irrigation system in a workmanlike and proper manner.

All discrepancies between any of the contract documents or any omissions shall be brought to the attention of the Owner for his resolution as to which document shall govern.

8.0 Contractor Qualifications

Contractors bidding this project shall have the following minimum qualifications. These qualifications must be submitted in written form with your bid. These qualifications will be strictly followed, and it is at the sole discretion of the Owner to allow or disallow Contractors based on these qualifications.

a) The primary business of the Contractor shall be golf course construction and or golf course irrigation.
b) The Contractor must provide references for a minimum of **3** successful projects

of similar size and scope in the past **5** years.

c) The Contractor must provide references for a minimum of **3** successful HDPE pipe installations or hybrid installations in the last **5** years.

d) The Contractor must provide all HDPE certifications they have with their references.

e) The Contractor must provide references for at least **2** successful Rain Bird IC system or **3** Rain Bird Golf Decoder systems in the last **5** years.

9.0 Knowledge of Work

The Contractor warrants that he has fully informed himself of the conditions under which the work will be performed and is thoroughly familiar with the contract drawings, the specifications, all applicable codes and standards and the other contract documents. Failure to have done so will not relieve the Contractor of his obligation to furnish all supervision, labor, tools, materials (other than Owner furnished), equipment and supplies necessary to perform the provisions of the work detailed in this specification and the other contract documents.

10.0 As Built Plan

a) The Contractor will be provided with as-staked plans from the Designer. The Contractor will use these sheets to hand draw the pipe routing, wire routing, splices, etc. The drawing shall be kept clean, easy to read and drawn with the same skill and accuracy as the original design drawing.

b) Contractor shall indicate the following: The location, dimensioned from two (2) fixed points of reference of main line isolation valves, green and tee isolation valves, control valves, air relief valves, quick coupling valves and manual drain valves.

c) Wire routing other than with the main pressurized line, all electrical controls, connections, and splices.

d) All changes and/or additions to the assignment of sprinkler heads to stations from that shown on the original design drawings.

e) The "as-built" plan shall be kept clean, dry, and safe from damage always. It shall be maintained and kept current. The final submitted drawings shall be in electronic format and hard copy and be done by the Designer.

11.0 Codes and Standards

When this specification refers to specific codes or standards, or when they are deficient or inconclusive as to requirements, the latest editions of the codes and standards of the following agencies shall be considered complimentary to this specification and similarly binding to the Contractor:

MDLS – Missouri Division of Labor Standards

ASTM - American Society of Testing Materials

AWWA - American Water Works Association

NSF - National Sanitary Foundation

NEC - National Electric Code

OSHA - Occupational Safety and Health Act

UBC - Uniform Building Code

12.0 Changes in Scope of Work

Additions or deletions in the quantity of work as set forth in this specification and contract drawings may be ordered by the Owner after the contract price or estimate has been adjusted accordingly to the satisfaction of both the Contractor and the Owner and they have been accepted in writing by the Owner.

13.0 Work During Adverse Weather

Actual construction on the site shall cease during heavy rains or other inclement weather that will adversely affect the quality of the work or cause damage to the site or when, in the opinion of the Owner, damage to the site may result.

14.0 Training of Owner's Personnel

a) Upon completion of the work and acceptance by the Owner, the Designer shall be responsible for the training of golf course personnel in the operation, maintenance and repair of the system.
b) The Designer shall be responsible for the initial programming of the central computer. The Contractor will not be responsible for programming.
c) Changes in the schedules and programming of the irrigation system during the warranty periods shall be the responsibility of the Owner.

15.0 Final Testing of Installation

a) The Contractor shall perform a final test of the work in accordance with Section "D", testing, of this specification and in accordance with applicable codes, regulations, and accepted practices of the industry.
b) When, in his opinion, the work is completed and successfully tested and therefore ready for acceptance, the Contractor shall so advise the Owner who will monitor the final acceptance tests. The Owner will respond within two working days after the notice of completion is received for the purpose of making a final inspection of the system; and, if final acceptance is not given, a "punch list" will be prepared which, upon completion by the Contractor, will signify final acceptance by the Owner.
c) All equipment that is necessary for the testing shall be furnished by the Contractor.

16.0 Guarantees

a) All work included under this contract shall be guaranteed by the contractor against defects and malfunctions due to faulty workmanship or defective material for a period of one **(1)** year from the date of final acceptance by the Owner.

Neither the final certificate of payment nor any provisions in the Contract Documents shall relieve Contractor of responsibility for faulty materials or workmanship during the warranty period. Any warranties extended beyond one year which are offered by the equipment manufacturers shall be stated and transferred to Owner at the completion of the project.

b) Upon being informed by the Owner of any defects or malfunctions, the Contractor shall make all necessary repairs and/or replacements in a reasonably expedient manner at no additional cost to the Owner during the warranty period.

c) Emergency repairs, when necessary, may be made by the Owner without relieving the Contractor of his guaranteed obligation.

d) The Contractor is obligated for all damaged plantings, pavement, and to repair any settling of backfilled trenches which may occur during the construction and guarantee periods.

e) If the Contractor does not respond to the Owner's repair work within a period of two (2) working days, the Owner may proceed with such necessary repairs and charge the Contractor for all expenses incurred during the repair work.

f) It will be the Owner's responsibility to maintain the system in working order during the guarantee period, performing necessary minor repairs, keeping grass from obstructing the sprinkler heads, protecting against vandalism, and preventing damage during landscape maintenance operations.

17.0 Payment and Retainage

a) The Irrigation Contractor shall submit request for payment in accordance with the Contract Agreement. The Owner will pay directly to the Contractor one hundred percent (100%) of invoices for material invoices submitted by the Contractor. The Irrigation Contractor shall be fully responsible for the security and safety of all materials, whether paid for until the material is installed, operational, and accepted as such by the Owner.

b) For request of payment for installation progress, the Owner shall pay approved amounts less ten percent (10%) retainage. Upon final acceptance of the irrigation system by the Owner, one-half of the retainage (5%) will be paid to the Irrigation Contractor. Upon satisfactory operation of the system for a period of sixty (60) days, the Owner will pay the remaining retainage amount.

c) The Irrigation Contractor is not responsible for any damage caused by others during this sixty (60) day maintenance check period.

d) The installation of the sprinkler heads will not be considered 100% installed for billing purposes until the heads are fully operational from the central control computer. Sprinkler heads installed but are not operational will only be approved for payment at a completion level of 80 percent.

e) for progress payments shall require the progress line items below and the noted progress of each line item.

a. Sprinkler Heads installed and backfilled

b. Sprinkler Heads wired and fully operational

c. Approved submittal graphical log and depiction of the IC digital address

d. As built field notes including field verified satellite station assignments

e. The station operation and sequence has been confirmed by the Owner's Representative or by the Designer.

B. MATERIALS

1.0 Materials - General

The specific materials to be used shall be as designated on the Irrigation drawings and this Specification. All materials to be incorporated in this work shall be new and of the best quality, meeting the requirements for such materials and for the purpose intended. Pipe routing, sprinkler heads, control valves, quick coupling valves, isolation valves and controllers are shown on the contract drawings. Quantities of air/vacuum relief valves and manual drain valves are required and are to be field located. Since the irrigation lines on the contract drawings are essentially diagrammatical, the Contractor shall be responsible for computing and supplying the required pipe, fittings, control wires and electrical accessories according to the contract documents.

a) Material and Equipment Substitutions

All material shall be supplied and installed according to the Irrigation Drawings and the Specifications shown in these drawings. No substitutions of materials will be allowed. By prior agreement, the Contractor shall purchase materials from Turfwerks. This ensures materials are new, uniform and come from a known sources and are backed by all manufacturer's warranties.

b) Material Storage

The Owner shall provide a specific area in which all materials to be used on the project shall be stored when not in use. Provision of this land is for the purpose of keeping the property neat and orderly and in no way waives any requirements of the Contractor to protect his equipment and materials from damage by the elements, from theft or from vandalism. The Contractor shall provide a minimum 40' storage container that can be locked and keep non pipe materials stored.

2.0 HDPE Pipe

a) All HDPE products shall be manufactured from high performance bi-modal

PE4710 resin with a PENT value > 2000 hours and a chlorine resistance classification of CC3 (under TN- 43/2014).

b) HDPE products for 3" and smaller pipe shall meet the requirements of AWWA C901.

c) Polyethylene pipe shall be made from HDPE material having a material designation code of PE 4710. The material shall meet the requirements of ASTM D 3350 and shall have a minimum cell classification of PE345464C. In addition, the material shall be listed as meeting NSF-61.

d) All 3" and larger HDPE pipe shall be in straight lengths. Coils of 2" HDPE pipe may be used. If used, the 2" coiled pipe shall always be straightened in full accordance with the pipe manufacturer's recommendations and instructions.

e) All HDPE pipe shall be provided with written minimum manufacturer warranty of 5 years covering both product and workmanship of the HDPE pipe.

3.0 Fittings

HDPE Fittings

a) Butt Fusion Fittings - Fittings shall be PE4710 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 and approved for AWWA use. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Fabricated fittings shall have a pressure rating one DR rating higher than that of the pipe being used with a minimum rating of DR11. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure, and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting. Harco or approved equal.

b) Electro fusion Fittings - Fittings shall be PE4710 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02. Electro fusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating one DR rating higher than that of the pipe being used with a minimum rating of D11. All electro fusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting. Harco or approved equal.

c) Socket Type Fittings – Contractor will need approval from the Designer prior to using socket type fittings.

d) All fittings from 2" to 6" will be molded fittings and one DR rating higher than the pipe that is being installed, with a minimum rating of DR11 with 13.5 ends.

HDPE Sprinkler Feeds

a) All sprinkler feeds on 2" shall be made with an ACME service connection, Lasco HDPE saddles, or Dura HDPE saddles.

4.0 Swing Joints

All sprinklers and quick coupling valves shall be connected to the irrigation piping with swing joints. The swing joint assembly shall be rated for 315 psi at 73 degrees F. All threaded joints shall have pre-lubricated buttress threads and two "O" ring seals. All

inlet and outlet sockets and threads of the swing joint fittings (i.e., 90-degree ells) shall meet schedule 80 requirements of ASTM Standards D 2467 and D 2464 respectively. Swing joints to be Acme threads. Swing Joints for sprinklers shall be manufactured by Rain Bird models SJ08125R3TS, SJ0815033TS.

5.0 Sprinklers

a) Fairway Full and Part Circle Sprinkler Heads

Rain Bird Model A900IC8052 and A950IC8024. Sprinkler shall be closed case with internal drive snap ring at the top of case to reduce interference and protect the internal drive from dirt and debris. Head shall have a rock screen removable from the top without having to detach sprinkler. Sprinklers shall be spaced at 75' square spacing.

b) Green Part Circle Sprinkler Heads

Rain Bird Model A752IC80xx. Sprinkler shall be closed case with internal drive snap ring at the top of case to reduced interference and protect the internal drive from dirt and debris. Head shall have a rock screen removable from the top without having to detach sprinkler. Greens sprinklers shall be spaced at 55-65' according to the plans.

c) Perimeter and Tee Part Circle Sprinkler Heads

Rain Bird Model A752IC8036. Sprinkler shall be closed case with internal drive snap ring at the top of case to reduced interference and protect the internal drive from dirt and debris. Head shall have a rock screen removable from the top without having to detach sprinkler. Perimeter sprinklers shall be spaced at 55-65' spacing and field adjusted.

6.0 Valves and Boxes

a) Lateral Isolation Valves

All lateral isolation valves shall be Harco 2" or 3" swivel type with the appropriate stiffener. Other acceptable ways of feeding lateral lines and valves may be approved such as branch saddles and poly valves. Note this change on the bid form if applicable.

b) Main Line Isolation Valves

All mainline valves shall be Nibco or Clow P619 Push-on style valves or approved equal with Harco PJ adapter and restraint kits.

c) Manual Drain Valves

Manual drain valves shall be 2", bronze construction, and non-rising stem Nibco model T-113 with cross handle or approved equal. Use a branch saddle or other method to ensure the isolation valve is far enough from the main line to operate.

d) Air/Vacuum Relief Isolation Valves

Bronze gate valves shall be 1", bronze construction, and non-rising stem Nibco model T-113 with bronze hand wheel.

e) Quick Coupling Valve

The quick coupling valve shall be 1" Rain Bird 5RC. Quick coupler valves shall be stabilized from rotation with a Harco stabilizer or Lasco swing joint with stabilizer.

f) Air/Vacuum Relief Valves

Air/vacuum relief valves shall be Bermad Model C30 and have a 1" inlet.

g) Valve Boxes-Rain Bird

1) Quick Couplers-Rain Bird 7" round green lid
2) Isolation Valves including lateral isolation valves-Rain Bird 10" round green lid.
3) Air Relief Valves-Rain Bird standard valve box green lid.
4) Central Ground Grid-Jumbo valve box green lid.
5) Electrical splices at sprinklers with ICSD-7" round green lid.
6) ICSD at Lateral Valves-10" round green lid (can be in same box as LIV)

7.0 Irrigation Control System

a) Computer Central Control

1) Control System shall be Rain Bird Stratus LT Central Control System P/N H92001G1. System shall include computer with sufficient memory to optimally run manufacturer's latest version control software. Current flat screen monitor, irrigation control software and interface and other features and equipment as provided in the manufacture's latest specification.
2) A 2-year GSP extension PN: 001351 shall be included in the base bid.
3) Furnish and install APC model SMC1500 smart UPS back up power supply.

b) Integrated Control Interface "ICI"

1) Furnish and install (1) Rain Bird ICI+ PN: HS6020.

c) ICSD

1) Furnish and install ICSD surge protectors with grounding to 50 ohms or less. Locations shown on the irrigation drawing.

d) Rain Shut Off

1) Furnish and install Rain Can Model #F69400 and IC sensor. This shut-off will be located somewhere on or near the maintenance building and requires maxi communication to the sensor.

8.0 IC Control Cable/Connections

a) All Integrated Control wiring shall be #14/2-gauge Maxi Wire as specified by Rain Bird and Regency Wire. Colors are shown on the Irrigation Plan.
b) All electrical connections shall be waterproof so that there is no chance for leakage of water and corrosion build-up in the joint. Low voltage connections shall be made with Rain Bird or King Industries DBR/Y approved direct bury splice kits. No other connectors shall be used.

C. INSTALLATION

1.0 General Operations

a) The Contractor shall be responsible for the continuous operation of the irrigation system during the construction and warranty periods of the work unless specified by the Owner. Contractor shall keep a technically qualified person and adequate labor and equipment on the job during construction, testing and inspection to correct any failures which might occur during these periods.
b) The Contractor shall insure that his equipment, materials, tools, excavations, backfills, any obstruction and in general, the job site, are properly barricaded, posted, and lighted to prevent unnecessary risk to the public, municipal or construction employees that may encounter the job site.
c) The Contractor shall comply with the safety regulations and restrictions of all public and private authorities when routing or gaining access through public or private properties. All expenses required to gain access to, or cross property shall be borne by Contractor as part of this Contract.
d) The Contractor shall not willfully install any portion of the irrigation system as shown on the contract drawings when it is obvious that any obstruction, dimensional error or grade distances will cause poor sprinkler (sprinkler system) performance. All such differences and restrictions shall be brought to the attention of Owner prior to installation.
e) The Contractor is responsible for having the appropriate One Call Service locate all underground utilities. The Owner shall be responsible for locating and marking all other known underground utilities. In the event the Contractor damages any known (properly located) underground utilities the cost to repair the utility shall be borne solely by the Contractor. In the event the Contractor damages un-located or improperly marked underground utilities he shall not be responsible for the repair costs. Further, the Contractor may be entitled to increased performance costs associated with delays and or out of sequence performance resulting from the same.
f) Main Line piping will be trenched and re-sodded back to satisfactory condition of the Owner.
g) All lateral lines shall be vibratory plowed where possible.

2.0 Staking and Pipe Routing

a) Turfwerks will stake the irrigation system using RTK equipment. The Contractor will provide one representative to help in staking.

b) Once the system has been staking the Contractor shall mark each staked location and be responsible to re-locate that for final head placement using marking whiskers.

c) Routing of pipe shall be in accordance with the irrigation plan, except that the Owner's representative and or Contractor reserves the right to change the routing from that shown on the plans if obstacles are encountered in the field. If a change in routing needs to occur that may affect the quantities of materials ordered the Contractor must have approval from the Owner.

d) In areas where trees are present, trench lines will be adjusted on the site to keep trenches outside of the tree drip line and to avoid damage to the tree's root system. Owner shall be notified of any alternate routing required prior to excavation.

3.0 Excavation

a) Trenches for pipe shall be excavated to a sufficient width and depth to permit proper handling and installation of the pipe and fittings. All main lines shall be installed at a minimum cover depth of twenty-four (**24**) inches. All lines supplying water to greens and tees shall have a minimum cover depth of eighteen (**18**) inches. Bottom of trench grade shall be continued past grade surface deviations to avoid air pockets and low collection points in the line. The minimum cover specifications shall govern regardless of variations in ground surface profile and the occasional deeper excavations required at banks and other field conditions. Excavation shall be such that a uniform trench grade variation will occur in all cases where variations are necessary. In no case shall the angle of deflection from one pipe length to another exceed 5 degrees for two (2) inch diameter pipe and larger or that recommended by the pipe manufacturer. Appropriate fittings shall be provided to ensure that the required depths (not excessive depth which would preclude maintenance of the pipe) of coverage are maintained throughout the stream crossing profile. Irrigation consultant will be consulted by Contractor as to the proposed type and configuration of crossing to be made.

b) All bridge crossings shall be done per local codes. The Contractor will be responsible for engineering and fabricating a proper support structure for the pipe and wiring as needed. Boring method may be done but it shall be at the Contractors expense.

c) All trenches shall be excavated wide enough to allow two (2) inches of clearance between adjacent pipes when more than one pipe is laid in a trench.

d) Trench sidewalls shall be excavated with nearly vertical walls except for side bells required for installation of valves and swing joints. Care shall be taken to ensure the bottom of the trench is uniformly graded to provide uniform bearing and support for each section of the pipe. Stones shall be removed as necessary to avoid high point bearing loads.

e) All water, sewer, drainage, electrical and all other utility lines shall be protected where encountered in trenching and, where cut or damaged by Contractor, shall be repaired at the expense of the Contractor according to local codes and to the satisfaction of the Owner.

f) Concrete and asphalt cart path crossings may be bored or cut. However, the cut shall be accomplished with concrete or asphalt cutting equipment such that a straight and uniform section can be removed. The minimum concrete or asphalt section removed shall be two (2) feet. Replacement of the section shall be accomplished with appropriate construction techniques, such as proper compaction of the fill and expansion joints, to ensure that the new section will remain level and even with the existing path. Asphalt hot patch may be used on asphalt paths.

g) All roads or streets that require cutting shall be cut, repaired, and restored to their original condition according to the regulations and requirements of the owner of the road, whether public or private.

h) Rock and or hard excavation of any material is not included in the base bid. Excavation shall be considered "rock trenching" when an 80-horsepower trencher equipped with a 50/50 rock chain cannot efficiently trench the required excavation to full depth. The unit of measurement will be by the cubic yard, lineal foot or at a cost-plus fee basis whichever is mutually agreed to by the Contractor and Owner. All material from the excavation will be considered "rock" in determining the pay quantity. No segregation or differentiation of the excavated materials will be required or performed for measurement purposes. A suitable backfill material such as sand or topsoil may be required as backfill. Import backfill material would be paid for in a similar manner as the excavation. Any and all handling, processing or hauling of unsuitable spoils will be performed on a cost-plus fee basis.

4.0 Backfill

a) All trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, soft shale, or other approved materials, free from large clods of earth or stone. Rock, broken concrete or pavement, and large or sharp rock or rocky materials shall not be used as backfill material.

b) The backfill shall be placed and compacted in a minimum of three (3) lifts or layers. The first lift shall not extend more than eight (8) inches above the pipe before it is compacted. Additional lifts shall be no more than twelve (12) inches each before compacting. Proper compaction methods, both manual and mechanical, shall be used to prevent future settlement. After the backfill is thoroughly compacted, the soil shall be evened off with the adjacent soil level, except as modified by any plan requirement to replace sod or planting bed materials.

c) Whenever sod replacement is called for in the Contract Documents, Contractor shall use a sod cutter to cut a path along the trench line to remove an appropriate depth and width to permit sod roll(s) to be laid evenly and flush with the surrounding grade.

d) The fill dirt or sand shall be used in filling four (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three (3) inches. The top six (6) inches of backfill shall be free of rocks over one (1) inch, subsoil, or trash. Open trenches or partially backfilled trenches shall be kept to a minimum and effort shall be made to completely backfill that trench opened each day. The Contractor will be responsible for restoration of all trench settlement for a period of **one** year from acceptance.

5.0 HDPE Pipe

a) HDPE Pipe and fittings shall be installed per the manufacturer recommendations.
b) Trenches shall be excavated in accordance with the plans and specifications. OSHA standards or City standards regarding safety shall be followed regarding trench safety. Shoring of the trench, where required is the responsibility of the Contractor.
c) Foundation & Bedding. Install pipe on grade and on a stable foundation. Unstable soil shall be removed from the trench bottom. A 4" foundation or bedding of compacted native material shall be in the bottom of the trench. The bedding material shall be free of rock and organic debris and trash. Water shall be removed from the trench before bringing the bedding material and pipe to grade and backfilling. When a trench is cut through rocky material, it shall be excavated to 4" below the pipe bottom grade and bedded with rock free material.
d) Backfilling. Class l and II backfill shall be used for pipe embedment backfill. This material shall be compacted to at least 90% Standard Proctor Density in 6" lifts.
e) Final Backfilling. Final backfill shall be placed in the trench and compacted to finished grade. Native soils without roots, limbs, large rocks, boulders, clumps, frozen soil or any object that could damage the pipe cannot be used.
f) All personnel fusing HDPE pipe will have completed a HDPE fusion training course held by ISCO, High Country Fusion or other approved HDPE manufacturer. A Certificate of course completion will be required as part of the bid submittal.
g) Any personnel fusing pipe is required to have a minimum of **300** hours of verifiable fusing experience.
h) The Contractor will keep on site a shop-vac type vacuum to remove any debris that has been deposited in the pipe during the mainline and lateral saddle installation process.
i) Flanged fittings will only be used transition from the HDPE pipe to a mainline isolation valve or in situations as detailed on the construction documents. Flanged connections will not be allowed from fitting to fitting.
j) All fused fittings will be allowed to cure for the minimum time defined by the fitting manufacturer before any valves or apparatus is attached to the fused component.

6.0 Electrical

a) Control wiring may be installed in the same trenches with the irrigation piping. Wiring shall be installed on the north or east side of the pipes. Wire shall not be taut in the trench and expansion loops shall be provided to prevent the wire from being tensioned by backfilling or other subsequent construction.
b) The side of the trench in which the wires are located shall be free of stones and other hard material which might injure the wire insulation. Backfill material placed against the wires shall be select material especially free from stones or other material with might injure the insulation. If rock is encountered, all wire shall be encased in a six-inch (6") envelope of sand or select rock free soil.
c) Use a King Industry tool for stripping of the Maxi wire. No other tool will be allowed for splicing of the Maxi wire. Great care must be taken when splicing

the Maxi wire. The Contractor must not compromise the inner wire of the 2-pair. Twist wires together before installing the wire nut and fully insert into waterproof connector.

d) A minimum of 24" of wire for an expansion loop shall be allowed at each valve-in-head sprinkler for contraction of wire or tightening of wire due to back-filling of trenches or possible valve replacement or maintenance.

e) Twist all wires together and fully insert into DBR/Y connection. Splices at sprinklers should be lightly wrapped (3-4 wraps) with electrical tape beneath the selector valve and have a minimum of 24" expansion above grade.

f) When wire runs do not follow pipe trenches, lay them in a straight line which will be carefully located on the "as-built" drawing. If a change of direction is required in these runs, make it as an angle between two straight runs, and not as a sweeping curve. Install a 10" diameter valve box, as described above, at the angle point and leave sufficient slack in all wires to allow them to be raised at least 24 inches above grade. Contractor shall accurately locate the valve boxes with measurements on the "as-built" drawing.

g) All electrical connections including splices shall meet local codes and as a minimum shall be water-proofed with the system specified in Section B, "Materials".

h) All electrical equipment and wiring shall comply with local and state codes and be installed by those skilled and licensed in the trade. Unless governing codes specify otherwise, low-voltage (29.5 VAC) control wire will be installed by the Contractor.

7.0 Grounding

a) Central Grounding System

1) Grounding system consisting of 4" x 96" x 0.064 copper grounding plates, 5/8"diameter x 8' copper clad grounding rods and #6 bare copper wire shall be required to achieve manufacturer's recommended resistance to ground of **10 ohms** or less. Bare wire shall be connected to rods and plates with Cad weld Plus "One-Shot" connectors.

2) (1) MGP-1 will be required and (1) MSP-1 surge devices.

b) Wire used to connect equipment to grounding rods shall be #6 bare copper.

c) ICSD surge protection. All ICSD surge devices shall be grounded to **50 ohms** or less. This may require a ground rod, ground plate, and GEM (ground enhancement material). It is the Contractors responsibility to insure **50 ohms** or less at each ICSD.

d) Earth ground readings using a Megger type instrument shall be noted on the as-built plan. It will be the Contractors responsibility to test each ground after installation and report the findings to the Designer and Owner.

8.0 Sprinklers

a) All sprinklers shall be installed on swing joints with no more than 30–45-degree angle and shall be set level to grade.

b) Flushing should be done as much as possible through swing joints without the sprinkler installed. If flushing through a sprinkler is used a UHA must be

connected with a length of hose and all debris removed from the sprinkler case. Failure to do so may cause weeping and it will be the Contractors responsibility to resolve weeping issues due to contamination.

9.0 Valves and Valve Boxes

a) Valve Boxes

Valves and valve boxes shall be installed where shown or directed and shall be set plumb and level with the soil surface utilizing extension boxes as required. Valve boxes shall be centered on the valves. Where feasible, valves shall be located outside the area of natural walkways or paths. Earth fill shall be carefully tamped around each valve box. Valve boxes should be supported and blocked with 1" thick blocks such that any surface loads on the valve boxes will not be transmitted below to the pipe or valves. There shall be a minimum of 8" of 3/4" washed river gravel under each valve.

b) Air/Vacuum Relief Valves

Air/vacuum relief valves shall be installed according to the detail drawings at high points in the piping system. The locations shall be field verified by Owner prior to installation.

10.0 Cleanup

a) Upon completion of the work, Contractor shall remove from Owner's property all equipment, unused and damaged material, and all other property used in the Contractor's operations.

11.0 Leave Behind Equipment

The Contractor shall provide the Owner the following extra equipment at project completion:

a) Two (2) complete sets of sprinkler tools for both 752 and 900 series sprinklers.
b) 1 (1) operating key for both main line and lateral isolation valves.
c) Two (2) quick coupling keys with 1" x 3/4" MHT swivels.
d) Two (2) extra ICSD.
e) Five (5) extra ICM’s.

D. IRRIGATION TESTING

1.0 General

The Contractor is responsible for furnishing a completed system ready to operate. All costs for testing the system and repairs of any leaks or deficiencies of any kind shall be borne by the Contractor.

2.0 Testing of the IC System

a) Before final acceptance the Designer will perform a certified system start up per the Manufacturers recommendations with the Contractors help.
b) Each ICI has been accessed through the ICI diagnostic screen to observe the current graph and the milliamp (mA) draw of each wire path has been monitored and recorded.
c) Each ICM will "Fast Connect" and shows as "Pass" in diagnostics. Internal voltage of each ICM shall be above 20 volts.
d) Voltage test between ICM's show less than .5 volts.
e) The actual mA draw of each wire path measured with a clamp meter with current measuring resolution of 0.01 mA, does not exceed 0.4 mA times # of ICMs on the wire path.
f) Inspect each wire path with a clamp meter to compare mA draw between the black and red wires of each Maxi cable. Record mA readings for black and red wire on each wire path.
g) Each wire path has been tested for current leakage to ground by placing clamp meter around both red and black wires (common and hot). This reading should be less than 50 mA.
h) Each conductor in the Maxi wire path has been tested for resistance to ground by touching one probe of an Ohm meter to the red conductor and the other to ground. Repeat for the black conductor. Readings should be greater than 750,000 Ohms (0.75 M Ohms).
I) Each wire path has been inspected for ICM internal voltage at the ICI, approximately 1/3 of way-out wire path, 2/3 of way-out wire path, and at last ICM on wire path.

E. PUMP STATION UPDATES

a) The new pump shall have the capability to produce 400 GPM @ 120 PSI.
b) The current City water pressure sits at 55 PSI and 400 GPM is available.
c) Remove the old pump and controls and replace with new high-performance HP VFD and AG Series 20 HP pump or approved equal.
d) Replace 2 butterfly valves.
e) Install new 140 PSI relief valves.
f) Install new pressure transducer for PID control.
g) Install new 30" x 48" Enclosure with thermal controls.
h) Electrical hooks ups to the new pump will be required.
i) Include all plumbing necessary to connect to the existing City water line.
j) A new 6" flange connection will be provided inside the pump house for the connection to the new irrigation system.
k) Provide a minimum of 3-year warranty.

END OF IRRIGATION SPECIFICATIONS