

DELCASTLE HIGH SCHOOL
NATURAL GRASS SOCCER PLAYING FIELD SYSTEM
Specifications – Mar. 24, 2013

General

- A. Description: Native soil playing field with modified Cambridge-type drainage system and automated irrigation system. Complete the system as indicated in below specifications and technical requirements.
1. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for the proper installation and completion of the work, whether or not each necessary item is mentioned herein. The plans and specifications are intended to be cooperative and any item called for in one and not the other shall be binding as if called for in both.
 2. All work required by the plans and specifications shall be accomplished by the Contractor even though minor items required may not be specifically mentioned in the above listing.
- B. Drawings: The field system layout is diagrammatic. Exact locations of drainage piping, sprinkler heads, valves, and other components may need to be modified by the Contractor in the field at time of installation to allow for actual on site conditions. Minor adjustments in the design layout will be permitted to clear fixed obstructions. Any major revisions to the field system shall be submitted in writing to the Owner's Representative for approval. The final playing field system layout must be acceptable to the Owner.
- C. Verification of Plans and Specifications: It shall be the responsibility of the Contractor to carefully examine the plans and specifications relating to this work for completeness, accuracy, and clarity. It is the Contractor's responsibility to obtain the most current site survey, utility plans, landscape plans and any other document necessary to complete the installation of the playing field system in cooperation with the site improvements. These documents may be obtained through contact with the Owner's Representative. Any conflict, errors or clarifications request shall be immediately brought to the attention of the Owner's Representative for written interpretation or instructions. No claim for increased compensation for additions, changes, or alterations will be considered unless written authorization is granted by Owner's Representative.

Otherwise any additional materials and/or labor due to existing conditions shall be furnished under this contract.

- E. The Contractor is responsible for obtaining all permits required for installation of this work.
- F. Work and materials shall be in accordance with the latest rules, and other applicable state or local laws. Nothing in the Contract Documents is to be construed to permit work not conforming to these codes.
- G. Contractors Qualifications: Bidding Contractors shall:
 - 1. Have been actively engaged in the business of constructing and renovating secondary, collegiate and professional level natural grass sports field surfaces for a minimum of five (5) years as their PRIMARY business.
 - a. Provide the Owner's Representative a list of five equivalent field construction projects, performed in the last three years, incorporating the following information:
 - i) Name and address of field.
 - ii) Name and address of Owner.
 - (1) Contact person
 - iii) Name and address with whom contract was with.
 - (1) Contact person
 - 2. Have at least one senior staff member/owner who carries a current "Certified Field Builder - Natural Turf" certification as issued by the American Sport Builders Association.
 - 3. Have successfully installed a minimum of four (4) Cambridge-style sand slit drainage systems
 - a. Provide the Owner's Representative a list of four relevant and equivalent field construction projects, performed in the last five years, incorporating the following information:
 - i) Name and address of field.
 - ii) Name and address of Owner.
 - (1) Contact person

- iii) Name and address with whom contract was with.
 - (1) Contact person
- 4. Three-quarters of the staff on this project must have worked for the Contractor for at least one-and-a-half (1 1/2) years and been involved in above-referenced projects (please provide employment verification for each individual).
- 5. Have in-house capabilities to perform automated precision laser-grading of the playing surface that will conform with the specifications set forth in this document. Subcontracting for drainage work will not be allowed.
- 6. Perform 100% of the drainage installation and grading in-house.
- 7. Certify all equipment operators have a minimum of two (2) years sports field construction industry experience, with finish laser-grading operators having a minimum of three (3) years experience.
- 8. Shall provide a listing of all sub-contractors intended to do work on this project. Subcontractors shall have at least five (5) years experience with equipment and systems related to their field of work, and have successfully completed at least five (5) equivalent projects, performed in the last three years, incorporating the following information:
 - i) Name and address of field.
 - ii) Name and address of Owner.
 - (1) Contact person
 - iii) Name and address with whom contract was with.
 - (1) Contact person
- 9. Shall provide with proposal, a listing with approximate explanation regarding the status of Contractor's resolved or unresolved legal disputes within the last six calendar years.

H. Requirements of regulatory agencies and utilities:

- 1. System shall comply with the latest requirements of all state and local codes and ordinances.

2. System shall comply with the latest rules and requirements by all utility companies involved.
 3. Nothing in the contract documents is to be constructed to permit work not conforming to these rules, codes and ordinances.
- I. All electrical devices shall carry Underwriter's Laboratory labels.
 - J. Materials, equipment, and methods of installation shall comply with the following codes and standards:
 1. National Fire Protection Association (NFPA)
 2. National Electric Code (NEC)
 3. American Society for Testing and Materials (ASTM)
 4. The Irrigation Association (IA)
 5. American Water Works Association (AWWA)

Materials Submittals

All materials must be submitted to the owner's testing agent for approval prior to commencement of construction. The sources of material must meet the specifications. Samples should be sent in one-gallon containers at field contractors' expense. All submittals will be at the field contractor's expense. Once approved by Owner's Representative in writing, all additional testing will be at the expense of the owner. No materials or products allowed on the field until approved by Owner's Representative in writing. All drainage rock (pea gravel) shall be tested to ensure compatibility with drainage sands. Testing agent shall be:

Mr. Norm Hummel
Hummel & Company, Inc.
35 King Street
P.O. Box 606
Trumansburg, NY 14886
607-387-5694

All submittal of pea gravel, topsoil and sands to be shipped in one-gallon containers. Gravel to be clean and washed without debris, in the same state as will be used for actual installation.

TOPSOIL

2.02 ATHLETIC FIELD PRODUCTS

Materials Testing and Inspection

- A. Topsoil stockpiled from on site stripping may be utilized for reuse if in compliance with the requirements for new topsoil.
- B. NEW TOPSOIL: Shall be natural or manufactured, fertile, friable loam or sandy loam as classified by the U.S. Department of Agriculture Soil Classification system, and typical of the cultivated topsoils of the locality. The soil shall contain not less than 4% or more than 8% by weight, of decayed organic matter (humus), as determined by ASTM F - 1647. The topsoil shall be taken from a well drained, arable site, free from sub-soil, large stones, earth clods, sticks, stumps, clay lumps, roots, or other objectionable, extraneous matter of debris. Topsoil shall also be free of Quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of Nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Topsoil shall not have a pH of less that 6.0 or greater than 7.5. Topsoil shall not be delivered or used for planting while in a frozen or muddy condition. If determined by a soil test the existing topsoil that was stripped does not meet these specifications, the topsoil shall be amended with a washed screened sand. The sand shall be approved by the Owner's Testing Agent and Owner's Representative prior to use and after review of a test report.

Topsoil shall conform to the following particle size distribution, as determined by pipette method in compliance with ASTM F-1632:

Sand (0.05 to 2.0 mm)	65 - 75% with no less than 70% of the sand in the medium through very coarse sand fractions (0.25 - 2mm)
Silt (0.002 to 0.05 mm)	15 - 25%
Clay (< 0.002)	10 - 20%
Gravel (> 2.0 mm)	< 15%

Maximum size shall be three eights (3/8") inches largest diameter.

If sand is needed to amend a soil to achieve the specifications, the sand shall be an ASTM C-33 concrete sand, with the following addendums: the sand shall have a fineness modulus of 2.5 to 3.2 and

a coefficient of uniformity (D60/D10) of less than 4. Any sands deviating from this shall be used only with the approval of the architect, engineer, or testing agent.

If organic amendments are needed to obtain the specified organic matter content of the topsoil, the organic matter source may be a peat or compost material. The peat shall be Canadian sphagnum peat having an ash content not exceeding 15%, as determined by ASTM D-2974. Composts may be used, provided that the material has been composted in an in-vessel system and has the following properties:

An organic matter content of no less than 30% as determined by ASTM D2974.

A moisture content of 35 – 70%, as determined by ASTM D2974.

A carbon/nitrogen ratio of 15:1 to 30:1.

Soluble salts not to exceed 3 dS/m.

A Solvita Index of 6 to 8.

95 – 100% passing a 3/8" screen.

A pH of 6 to 8.

Non-phytotoxic.

- c. The Contractor shall submit representative samples of topsoil they intend to bring onto the site, and samples of topsoil that were stockpiled from on-site stripping, to a Soil Plant Testing Laboratory acceptable to the Owner's Representative. All reports shall be sent to the Owner's Representative for approval. Samples of topsoil to be brought to the site must be approved prior to delivery. Deficiencies in the topsoil shall be corrected by the Contractor, as directed by the Owner's Representative after review of the testing agency report. Testing reports shall include the following tests and recommendations.

1. Particle size analysis of the topsoil as determined by ASTM F-1632 shall be performed and compared to the USDA Soil Classification System.
2. Percent organic matter shall be determined by an Loss on Ignition or Walkley/Black Test (ASTM F - 1647).
3. Tests for gradation and organics shall be performed by the Owner's Testing Agent as listed above.

Tests for soil chemistry and pH shall be performed by:

Logan Labs, LLC
620 North Main Street
Lakeview, OH 43331

4. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium, Magnesium, cation exchange capacity, base saturation percentages, micronutrients, and acidity (pH).
5. Soil analysis tests shall show recommendations for soil additives or fertilizers to correct soils deficiencies as necessary.
6. Initial approval testing costs shall be the Contractors responsibility.

Phase Two - Quality Control During Construction: All gravel drainage materials (pea stone) and soil samples shall be tested and approved prior to delivery to or placement on the field site.

Topsoil: After approval of the topsoil, a one gallon sample of the topsoil for every 500 tons shall be submitted for testing, to include particle size analysis and organic matter content. Upon approval of the soil, the material shall be released for placement on the athletic field. No soil may be placed on the field until it has been tested and approved by the testing agent and engineer. In the event that unacceptable soil is placed on the field, the soil will be removed and disposed of at the contractor's expense.

Inspection costs: The owner shall bear all costs for first quality-control submittals including testing and shipping of soil. The contractor shall pay for subsequent testing and shipping on rejected samples.

Sample Authentication: An owner's representative must be present during the sampling and packaging soil. The sample shall consist of a sub-sample taken from a composite of samples taken from cross sections from the top, bottom, and sides of the stockpile. A one-gallon sample in a sealed plastic bag or container shall be packaged and sent to the Owners Testing agent by overnight delivery.

Soil: Every load of soil delivered to the site will be visually inspected for excessive contamination and obvious clumps of peat, compost, or other extraneous material.

Spread the soil over the subsoil to a uniform depth and to the finished grades shown on the drawings. Only low ground pressure equipment may be used for the placement and grading of the soil. The soil shall be installed within 1/4 inch in 25 feet in either direction plus or minus of elevations shown in drawings when compacted. Contractor shall move the soil from the stockpile in such a manner that contaminated materials are not tracked onto the field from the tracks or tires. Any contamination or over compacted conditions will require immediate action by the Contractor to satisfy the intent of the specifications. Under no circumstance are trucks loaded with soil to drive over topsoil already placed on the field.

Compaction of Topsoil: The soil shall be spread on the field and firmed to a compaction level not to exceed 85% maximum standard proctor density. Topsoil shall be compacted to minimize any settling or movement. Fill in low spots to finish grade with topsoil. Finish grades shall be verified by survey instruments via an independent engineering survey, cost to be paid for by Owner.

Compaction of Subsoil: Prior to placement of the topsoil, the subgrade shall be prepared per the specifications. It shall be compacted to 95% maximum standard proctor density. Finish sub grades shall be verified by survey instruments via an independent engineering survey, cost to be paid for by Owner.

UNDER DRAINAGE SYSTEM

I. Execution

A. Install Main Collector Drain

1. Excavate main collector using laser guided equipment (depths and width will be determined by sizing of HDPE pipe) per the drawings
2. Bed the bottom of the trench with a minimum of 2 inches of 3/8" washed aggregate
3. Install double walled, perforated, smooth flow HDPE pipe (pipe diameters to be determined by athletic field engineer or contractor)
4. Backfill trench and pipe with a minimum of 2 inches on either sides of pipe with 3/8" washed aggregate. Backfill above pipe, with a minimum of 6 inches above pipe, and 6 inches below final elevation.
5. Backfill the remaining 6 inches with specified clean sand

B. Install Sand Slit Lateral Field Drains

1. Excavate trenches 2 1/2 inches wide, enough to obtain a 50 mm O.D pipe, and 14 inches deep (distance on center per construction drawings)
 - i. Trenching is to be performed by a specialized trencher with the capability to automatically convey trench spoils directly into a dump trailer.
 - ii. The bottom of trench shall be free of any loose material. Any material left behind should be cleaned out by hand.
2. Install specified 50mm O.D. HDPE single wall perforated pipe to clean trench

3. Backfill trench with 3/8" washed aggregate to a depth of 6 inches below final elevation
4. Backfill remaining 6 inches with specified clean sand
 - i. Backfilling should be performed by specialized hopper, with material conveyed from a Tycrop MH400 (or similar) directly into hopper
 - ii. Trench backfill is to be performed during same day of digging and pipe installation
 - iii. No trench is to remain open overnight
5. Lateral field drains are to be tied in/terminated directly into main collector with appropriate fittings per pipe manufacturer's recommendations

II. **Products**

A. Sand

1. Meet current USGA Sand Particle Size and Sieving Requirements and be acceptable for the intended use
2. Washed Sand
3. Gradations will be determined by owner's testing agent
4. Must bridge properly with approved drainage aggregate per Owner's Testing Agent

B. Aggregate

1. 3/8" standard angular (78M, 14M, VDOT 8)
2. Washed and free of fines
3. Selected aggregate must bridge with specified sand
4. Specific material must be approved by owner's testing agent for use with approved sand material

C. Pipe

- A. Collector Drain approved manufacturer/ distributor:
 1. Hancor
 2. ADS
 3. Haviland
 4. Must pass all performance standards set forth in AASHTO M-252 and ASTM specifications
 5. All pipe must be connected with approved manufacturer's fittings
 6. All joints and fittings to be approved by owner's agent prior to covering. Wash test to be performed at each drain to ensure pipe was not damaged after the gravel layer was installed.

7. Lateral drainage pipe: 50mm O.D, perforated

General

1. All joints and fittings to be approved by owner's agent prior to covering. Wash test to be performed at each drain to ensure pipe was not damaged after the gravel layer was installed.
2. It is the field contractor's responsibility to note all drainage installations to "as built plans" following completion of phases.

SUBMITTALS

A. Manufacturer's Data:

1. Submit copies of manufacturer's specifications and instructions for all manufactured materials and products if other than those specified herein.

B. Record Drawings:

1. After completion of the work and before final acceptance, a set of scaled, reproducible record drawings, and two sets of prints showing the location of the complete work shall be submitted to the Owner. Final payment and any retainage will not be released until these drawings are submitted and accepted by the Owner.

C. Construction Schedule:

1. Submit a construction schedule to be approved by the Owner.

WARRANTY

- A. All work shall be warranted for a period of one full year from the date of final acceptance by the Owner.

IRRIGATION SYSTEM

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS:

- A. The site plan, draining plan, grading plan, utility plan and landscaping plan will affect the installation of the irrigation system. Coordinate to avoid conflicts.

I.2 INSPECTION OF SITE

- A. All prospective Bidders are urged to visit the project site and to examine existing conditions and make note of any conditions which may pertain to his class of work. Failure to do so will not relieve bidder of responsibility in connection with his work.

1.03 DESCRIPTION OF WORK

A. General:

1. The extent of base field irrigation as shown on the drawings.
 2. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for the proper installation and completion of the work, whether or not each necessary item is mentioned herein. The plans and specifications are intended to be cooperative and any item called for in one and not the other shall be binding as if called for in both.
- B. The system shall provide 100% coverage and uniformly irrigate all areas and perform as required by these plans and specifications:
1. Provide an underground irrigation system as shown on the drawings and specifications and as required by these plans and specifications.
 - a) Automatic irrigation system including piping, fittings, sprinkler heads, control wire, quick coupler valves, controllers, and accessories.
 - b) Excavating and backfilling irrigation system work.
 - c) Testing and adjusting of system.
 - d) "As-Built" drawings.
 - e) Winterization - shutdown - spring start-up.
 2. All work required by the plans and specifications shall be accomplished by the Contractor even though minor items required

may not be specifically mentioned in the above listing.

- C. Drawings: The system layout is diagrammatic. Exact locations of piping, sprinkler heads, valves, and other components may need to be modified by the Contractor in the field at time of installation to allow for actual on site conditions. Proper spacing of sprinkler heads will be required to obtain satisfactory coverage. Minor adjustments in the system layout will be permitted to clear fixed obstructions. Any major revisions to the irrigation system shall be submitted in writing to the owner for approval. The final system layout must be acceptable to the owner.
- D. Verification of Plans and Specifications: It shall be the responsibility of the Contractor to carefully examine the plans and specifications relating to this work for completeness, accuracy, and clarity. It is the Contractor's responsibility to obtain the most current site survey, utility plans, landscape plans and any other document necessary to complete the installation of the irrigation system in cooperation with the site improvements. These documents may be obtained through contact with the owner's authorized representative. Any conflict, errors or clarifications request shall be immediately brought to the attention of the Architect for written interpretation or instructions. No claim for increased compensation for additions, changes, or alterations will be considered unless written authorization is granted by Owner's Representative. Otherwise any additional materials and/or labor due to existing conditions shall be furnished under this contract.
- E. The Contractor is responsible for obtaining all permits required for installation of this work.

1.04 QUALITY ASSURANCE

- A. Manufacturing Qualifications:
 - 1. Provide the field irrigation system as a complete unit produced by acceptable manufacturers for all portions of the working equipment which includes heads, valves, controls and accessories. All irrigation products shall be purchased from a local authorized irrigation supply company.
- B. Work and materials shall be in accordance with the latest rules, and other applicable state or local laws. Nothing in the Contract Documents is to be construed to permit work not conforming to these codes.

- C. Contractors Qualifications: Bidding Contractors shall have a minimum of five years experience in the construction of a job of similar size and complexity.
 - 1. Provide the Owner's Representative a list of five equivalent irrigation system installations, performed in the last three (3) years, incorporating the following information:
 - a) Name and address of project.
 - b) Name and address of Owner.
 - (1) Contact person
 - (c) Name and address with whom contract was with.
 - (1) Contact person
- D. Requirements of regulatory agencies and utilities:
 - 1. System shall comply with the latest requirements of all state and local codes and ordinances.
 - 2. System shall comply with the latest rules and requirements by all utility companies involved.
 - 3. Nothing in the contract documents is to be constructed to permit work not conforming to these rules, codes and ordinances.
- E. Electrical devices shall carry Underwriter's Laboratory labels.
- F. Required pressure testing shall be the responsibility of the Contractor.
- G. Materials, equipment, and methods of installation shall comply with the following codes and standards:
 - 1. National Fire Protection Association (NFPA)
 - 2. National Electric Code (NEC)
 - 3. American Society for Testing and Materials (ASTM)
 - 4. The Irrigation Association (IA)
 - 5. American Water Works Association (AWWA)

1.05 SUBMITTALS

A. Manufacturer's Data:

1. Submit copies of manufacturer's specifications and instructions for all manufactured materials and products if other than those specified herein.

B. Record Drawings:

1. After completion of the work and before final acceptance, a set of scaled, reproducible record drawings, and two sets of prints showing the location of the complete work shall be submitted to the Owner. Final payment and any retainage will not be released until these drawings are submitted and accepted by the Owner.

C. Construction Schedule:

1. Submit a construction schedule to be approved by the Owner.

1.06 WARRANTY

- A. The Contractor shall furnish a manufacturer's written warranty to the effect that all heads, valves, and controllers will be warranted for a period of no less than two years to be free from defects and faulty workmanship, and that any defective heads, valves, or controllers shall be promptly repaired or replaced without additional cost to the Owner in accordance with that warranty.

- B. All materials other than those referred to in Paragraph A above shall be warranted for a period of one full year from the date of final acceptance by the Owner.

- C. All installation labor used on this project will be warranted for one full year from date of final acceptance by the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. The materials chosen for the design of the sprinkler system have been specifically referred to by manufacturer so as to

enable the Owner to establish the level of quality and performance required by the system design. After award of contract and prior to beginning work, the Contractor shall submit for approval (3) copies of the complete list of materials which he proposes to install. No deviations from the specifications will be allowed.

2. Standard of Quality Acceptable Manufacturers:

Rain Bird Sales, Inc. - Glendora, CA (Rotor Heads, Spray Heads, Control Valves, Valve Boxes & Quick Couplers, Drip, Controller, Rain Sensor)

Hydro-Rain- North Salt Lake, UT (Wireless Rain Sensor, Battery Controller)

Walla Walla Sprinkler Co. – Walla Walla, WA (MP Rotator)

Wilkins Division - Paso Robles, CA (Backflow Preventer)

Carson - Glendora, CA (Valve Boxes)

Cresline - Evansville, IN (Piping)

Lasco - Brownsville, TN (Fittings)

Leemco, Inc.- Mount Vernon, CA (Joint Restraints)

Nibco - Elkhart, IN (Isolation Valves)

Sta-Rite – Delavan, WI (Booster Pump)

Watertronics- Hartland, WI (Pump Station)

Regency- Sikeston, MO (Wire & Cable)

Acclima- Meridian, ID (Controller System, Soil Moisture Sensors)

Baseline- Meridian, ID (Soil Moisture Sensor)

B. Substitutions

1. Proposed substitutions for materials or equipment must be submitted for approval within (10) days of the project bid date with complete drawing documents for consideration as approved equals. Otherwise, such substitutions will not be permitted. Proposals for substitutions shall be made only by the prime bidders. Manufacturers, distributors, and Sub-Contractors shall not make proposals to the Owner's Representative for substitutions. All proposed substitutions must be approved in writing by the Owner's Representative prior to being used on the project.
2. No substitution shall be made unless authorized in writing by the Owner's Representative. Should a substitution be accepted, and should the substitute material prove defective or otherwise unsatisfactory for the service intended, and within the guarantee period, the Contractor shall replace this material or equipment with material or equipment specified,

at his own expense, and to the satisfaction of the Owner's Representative.

3. Contractors submitting bids on substitute materials and equipment must also provide a written performance guarantee certifying that the substitute materials and equipment will provide the specified irrigation requirements.

C. Backflow Preventer

The backflow preventer shall be a Wilkins 720A PVB or 975XL RP or 375 RP type (as required) and shall meet or exceed specifications and standards set by the State and USC Foundation for Cross-Connection Control and Hydraulic Research. The Contractor shall check with local authorities for code compliance. The backflow shall be sized as shown on drawings. All exposed standpipe and fittings shall be copper or galvanized pipe to 18" below grade. The backflow preventor shall be mounted inside a weatherproof cover on a concrete pad. The manufacturer shall be Strong Box, Model SBBC-___-AL, install per detail and manufacturers recommendations.

D. Booster Pump (pressure unknown)

The existing water pressure was not available at the time of design development. The Contractor is required to determine the existing pressure at the irrigation point of connection prior to installation of the system. Report any deviation between the existing pressure and the required pressure in writing to the owners authorized representative. If the required 90 psi minimum is not available at the point of connection then a booster pump, protective cover, pump start relay and a RP backflow device shall be required and submitted as a change order to the Owner's representative. The irrigation consultant shall determine the appropriate manufactures and models. The booster pump shall be installed per manufacturer's specifications on a concrete pad. The Contractor shall extend all power to the booster pump location. The Contractor shall have the exact power and voltage verified for coordination with the pump prior to installation. A Munro Startbox pump start relay shall activate and control the pump. The booster pump shall be winterized during the off-season. Submit a change order to the owner for approval if it is determined that a booster pump is required.

F. Main Line Piping

All main line piping shall be CI 160 PVC SDR 26 standard weight as manufactured by Cresline or equal. All mainline 1" - 2 1/2" shall be solvent weld. All mainline 3" and larger shall be PVC gasketed type. Pipe shall carry the N.S.F. seal of approval and meet the following specifications: ASTM 1120/1220, C.S. 256-63, or latest revisions. Size as indicated on drawings.

G. Lateral Line Piping

All lateral lines down stream of the valves shall be CL 200 PVC SDR 21 for 1" pipe, CI 160 PVC SDR 26 for 1 1/4" and larger pipe, standard weight as manufactured by Cresline. Pipe shall carry the N.S.F. seal of approval and meet the following specifications: ASTM 1120/1220, C.S. 256-63, SDR 26 or latest revision. Size as indicated on drawings.

H. Pipe Fittings

All PVC fittings 1" - 3" shall be solvent weld schedule 40 standard weight. Attachment shall be made with both a primer and a solvent cement as approved by the manufacturer. Glue type saddles may be used so long as they are 3/4 round type units which grip the pipe. Saddles are to be bored or cut with appropriate equipment and holes are not to be burned into the pipe. All fittings 4" and larger shall be ductile iron with PVC gasket and hub configuration and retaining rings as manufactured by Harco or Leemco. Provide Leemco joint restraints or concrete thrust blocks where necessary on all 3" and larger fittings. Install per manufactures recommendations.

I. Automatic Valves

The remote control valves shall be a Rain Bird PEB Series, normally closed, 24 VAC 50/60 cycle solenoid actuated globe design capable of having a flow rate of the gallons per minute (GPM) indicated in the drawings. The valve pressure rating shall not be less than 200 psi.

J. Valve - Controller Communication

Communication between the controller and the valves shall be accomplished with copper wire with an exterior jacket which is U.L. listed for direct burial and sprinkler control. The Contractor shall be responsible for correct wire sizing for distance and voltage loss.

A minimum of 14 gauge wire will be used and larger gauges used where voltage loss dictates. Common wire color shall be white. Station wires shall be all the same color for the entire run and number marked at all splices and connections. All field connections will be accomplished with wire nuts and will be made water tight and oxidation resistant through the use of 3M Skotch Kast "400" or DBY electrical insulating resin packs. Other brands are not acceptable. Use of sealant without container package is not permissible. A minimum of three (3) spare zone wires shall be installed to all valve locations. These shall be purple in color and made available for future use as needed.

K. Valve Enclosures

All single automatic valves shall be enclosed in a 10" round, commercial grade, fiberglass valve box with locking cover such as Rain Bird, Carson or Hydro-Rain. All valve boxes are to be filled with a minimum of 6" of washed pea gravel below pipe level to ensure adequate drainage. Controller station numbers shall be marked on the valve box cover in a permanent manner.

L. Master Valve

The master valve shall be a Rain Bird PEB Series, normally closed, 24 VAC 50/60 cycle solenoid actuated globe design capable of having a flow rate of the gallons per minute (GPM) indicated in the drawings. The valve shall be installed in a valve box near the water source. The valve shall be wired to the controller. The valve pressure rating shall not be less than 200 psi.

M. Isolation Valves

All isolation valves shall be brass, threaded gate valves as manufactured by Nibco. Line size. Enclose in 10" round, commercial grade, fiberglass valve box with locking cover such as Rain Bird, Carson or Hydro-Rain.

N. Automatic Controller

The automatic controller shall be Rain Bird Model ESP-LX Modular Controller with the number of stations as indicated on the drawing. The controller shall be an 8 station base model, expandable to 32 stations with hot-swappable modules in four or eight station increments without powering down. The cabinet shall be a heavy-duty key-locking cabinet (NEMA 3R rated) with internal junction box. Flexible programming shall include cycle/soak, programmable

valve delay, sensor override by station, master valve by station, calendar day off and total program and valve run times. Other options shall include Contractor programming default, seasonal adjust and battery back-up protection. All 120 VAC power to the controllers will be extended by the Contractor. Confirm a ground of 15 OHMS or less. Lightning protection devices are to be installed on the primary, secondary and two wire path as required by the manufacturer. Place in the approximate area as shown on the drawings, with final location to be determined by the Owner at time of installation.

O. Sprinkler Heads

Sports Turf Rotors

The full or part circle sports turf rotor shall be a Rain Bird 8005-SS, stainless steel riser, single stream, water lubricated, gear drive type capable of covering a radius as indicated on the drawings at a minimum base pressure of 60 psi. The sprinkler shall be capable of full or part circle operation in one unit, have a factory installed check valve, standard rubber cover and arc memory. The overall pop-up height shall be 4-5 inches.

R. Quick Coupling Valves

Quick coupling valves (QCV) shall be Rain Bird Model #7. All brass construction with metal cover. All quick coupling valves are to be enclosed in a 6" round fiberglass valve box such Rain Bird, Carson or Hydro-Rain Specification Grade. Secure quick coupler by mounting on a 1 1/2" Lasco brass insert Snap-Lok Swing Joint with stabilizer elbow Model # G-36S-212. Provide two (2) matching valve key and swivel adapters.. The quick couplers are to be set at such height that the valve box will not interfere with the operation of the valve key. They shall be stabilized in the box by strapping the QCV with two stainless steel hose clamps to a piece of 18" galvanized angle iron pounded into the ground. The box shall then be backfilled with drainage stone to a level 2" below the top of the QCV.

S. Sprinkler Risers

A Rainbird TSJ-PRS pressure-regulating swing joint in the appropriate size shall be used for all heads.

PART 3 - EXECUTION

3.01 WATER SUPPLY

The water supply shall be from an existing service line. The tap and meter shall be the responsibility of the Contractor. Install per local code and in accordance with the water purveyors requirements. Approximate locations shown on plan, verify in the field with owners authorized representative.

3.02 SYSTEM DESIGN

- A. Lay out work as accurately as possible to the drawings. The drawings, though carefully drawn, are generally diagrammatic to the extent that all offsets, fittings, and finished site conditions may not be shown.
- B. The Contractor shall be responsible for full and complete coverage of all irrigated areas as to spacing and precipitation rates being matched and shall make any necessary adjustments to the system at no additional charge to the Owner. Head spacing as shown on the drawings is predicated on the water supply being a minimum of **65** static psi at the point of connection. **Contractor shall verify said pressure before beginning the installation.** Report any deviation between the said pressure and the specified pressure to the owners authorized representative. Head spacing shall not exceed 55% of manufacturer's stated diameter.
- C. Any major revisions to the irrigation system must be submitted to the Owner's representative and answered in written form, along with any change in the contract price.

3.03 TRENCHING AND BACKFILLING

A. General:

1. Pulling, Excavating, and Trenching:

- a. Perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins.
- b. All lateral pipe (2" and smaller) shall be pulled with a vibratory plow.
- c. If trenching, trenches shall be wide enough to allow a minimum of 6" between parallel pipe lines. If pulling, the same lateral distance shall be observed.

- d. All trenching and line installation shall occur prior to placement of the 6" topsoil cap. Swing joints shall be installed and capped off, then uncovered, with the heads being installed to proper elevations once the finish grade has been achieved and certified.

2. Underground Obstructions:

- a. Any unforeseen underground obstructions which might be encountered during the installation shall be brought to the attention of the owner immediately and work on that portion of the installation shall be suspended.
- b. Any additional expense involved in removing those obstructions or the re-routing of lines shall be submitted to the Owner in writing and approved prior to continuing the installation.

3. Underground Utilities:

- a. It shall be the responsibility of the Contractor to locate or have located all existing public underground utilities on that portion of the site which is affected by his work. All private underground utilities shall be located and marked by the Owner. The Contractor shall contact the Owner's representative for verification that all private utilities have been located prior to construction. The Contractor will be responsible for the repair of any cuts, which are made by him in these utilities.

B. Minimum Cover

1. A minimum of 18" cover shall be held over all main lines and control lines. A minimum of 12" of cover shall be maintained over all lateral lines.

C. Backfill

1. All irrigation trenches shall be back-filled and compacted by mechanical means in 6" lifts to a minimum of 90% of the original density. Backfill material shall be of the same soil mix as excavated and free of any rocks or debris larger than 3/4" in diameter. It shall be the Contractor's responsibility to remove all

larger debris from the premises and to furnish any additional soil which may be necessary to level the trenches.

2. Field contractor shall be responsible for repair of any irrigation trench settling which occurs during the first year after final acceptance by the Owner.
3. Where pipe is pulled into the ground, all domes will be compacted to original grade after pulling.

D. Sleeving Pavements, Walks, Etc.

1. All mainline and lateral piping under any pavement (walks, roads etc.) and structures shall be installed in separate sleeves (min. Schedule 40 PVC) unless noted otherwise. Sleeves to be a minimum of twice (2x) the diameter of the pipe to be sleeved unless otherwise noted. Mainline sleeves shall be a minimum of 24" below subgrade and lateral sleeves shall be a minimum of 18" below subgrade. Extend sleeves into landscape area 12" minimum. Backfill material shall be free of rubbish, plant matter, frozen materials and stones larger than 3/8" in maximum dimensions. Provide less than 6" of clearance between each lateral line and not less than 18" of clearance between lateral lines and mainlines.
2. All piping under existing pavement and walkways will be bored with appropriate equipment unless otherwise noted. Where roadway cuts are required, the asphalt is to be saw cut, the sleeve installed, and surface restored to original by professionals engaged in this business.
3. All communication wire will be placed in separate sleeving under all pavement, walks, etc. in excess of 10' in width.
4. All sleeving called for in the drawings shall be sized according to the drawings and/or general notes. If sleeving is necessary in areas other than shown on the drawings, than size two sizes larger than the pipe being sleeved. Sleeving shall be a minimum of Schedule 40 PVC material.
5. If sleeving is not immediately used, than securely cap the ends with duct tape and mark with wooden stakes for future designation.

3.04 INSTALLATION

A. General

1. Unless otherwise indicated, comply with requirements of the Local Plumbing Code.

B. Sprinkler Heads

1. Install heads at proper grade level as per manufacturer's recommendation.
2. Use manufacture's recommended procedure for sealing all heads and riser assemblies.

C. Circuit Valves

1. Install in valve box, arranged for easy adjustment and removal.
2. Adjust automatic control valves to provide flow at rated operating pressure required for each sprinkler circuit. If an over pressure condition exists, Contractor shall install, at his expense, such pressure compensation devices as are necessary to bring the circuit or heads into proper operating range.

D. Piping

1. Lay pipe on solid sub-base, uniformly sloped without humps or depressions.
2. When pipe is pulled into the ground, all PVC pipe shall be solvent welded at least 24 hours before pulling.
3. All trenches shall be snaked, or the pipe snaked within the trench to allow for expansion and contraction.
4. A single strand of 14-1 wire, yellow in color, shall be run with all main line from the point of connection to the end of the main line. This single strand of wire shall be available for main line tracking.
5. Install thrust blocks or Leemco Joint Restraints behind elbows/tees and gate valves along 3" or larger mainlines.

E. Dielectric Protection

1. Use dielectric fittings at connection where pipes of dissimilar metal are joined.

F. Closing of Pipe and Flushing Lines

1. Cap or plug all openings as soon as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of the installation.
2. Thoroughly flush out all main water lines before installing valves.
3. Thoroughly flush out all lateral lines after installation and before attaching heads.

G. Communication Circuitry

1. All communication circuitry shall be run, wherever possible, with the main pipe line.
2. All splices shall be made at a valve box for easy access.
3. A minimum of 12" of either control wire shall be coiled at each valve & decoder.

3.05 TESTING AND TRAINING

A. Operational Testing

1. Perform operational testing after backfill is completed and sprinkler heads are adjusted to final position.
2. Demonstrate to the owner that the system meets coverage requirements and that automatic controls function properly.
3. Coverage requirements are based on operation of one circuit at a time.

B. Personnel Training

1. Contractor shall be responsible for the training of as many personnel as the Owner shall deem necessary.
2. Contractor shall be responsible for one starting and one winterizing of the system during the appropriate times of the year after final acceptance by the Owner as part of the training of the Owner's personnel.

3. Contractor shall include general troubleshooting and operation of the system with reference to head, valve, and controller operation.
4. Contractor shall furnish a complete operation and maintenance manual to the Owner's personnel. This manual shall include repair parts lists, assembly instructions, trouble-shooting guides, programming instructions, and recommended precipitation rates.

3.06 ADJUSTMENT

- A. After completion of grading, seeding, sprigging or sodding, if applicable, Contractor shall return to the job site to perform any final adjustments to the system which might be deemed necessary.
- B. The Contractor will be responsible for any pressure testing and start up of the system when construction is complete. The Contractor will also be responsible for the winterization of the system after the first season of operation.

Rootzone Fertilization and Testing for Sprigs

In order to provide the optimum growing medium for the turf, once the rootzone blend has been installed, a fertility test will be submitted by the contractor to Owner's representative and field contractor will be responsible for adjustments as needed to insure sprigs are successful during establishment. At a minimum, a pre-plant starter fertilizer (per recommendations of laboratory) shall be applied and lightly raked/worked into soil prior to sprigs being installed.

ROOTZONE GRADING

Firm grading of material will require laser-leveling equipment. Finish grade elevations shall not vary more than a 1/8 inch in 25 feet of the designed and approved elevations. Coordinate with Owner's representative scheduling of final elevation check of graded rootzone before sprigging.

SPRIGGING FIELD

Sod to be certified Riviera Bermudagrass that shall be run through a sod-to-sprig planting unit, such as a Sprigger's Choice Sprigmaster II or approved alternate (exact machine to be approved in writing by Owner's representative prior to use), for sprig planting. Sprigs shall be installed at

a converted rate of 1800 square feet of sod per acre. Field shall be immediately be rolled with a 1 to 2 ton roller (pull-behind tractor type, 6' - 8' wide) in a manner which shall not disrupt the finish grade PRIOR to beginning irrigation.

Sod shall be provided by:

Collins Wharf Sod
25361 Collins Wharf Road
Eden, MD 21822
(410) 334-6676
www.cwsod.com

Sod should be a minimum of 10 months old at time of harvest, older if possible. Turf is to be mowed at no greater than 1 1/2" height at sod farm and free of undulations, stones, wood chips, weeds or other organic or inorganic debris.

Sod shall be harvested with the least amount of soil possible, ideally 1/8" or less. It shall be sprigged within 6 hours of harvest. It shall be tarped and protected during shipping and delivery. Water shall be applied immediately upon completion of sprigging to the point of puddling the soil, ideally as each irrigation zone is able to be operated without interfering with the remaining sprig installation.

Submittals

A "test harvest" of 10 linear feet of the sod to be used on the field shall be performed 5 to 10 days prior to sod installation at the sod farm to insure the sod is viable for harvest.

FINAL INSPECTION

Following construction, a walk through will be performed by the owner's consultant and field contractor to insure the field meets elevation and irrigation operation and is fully functional. A full measurement of all field dimensions will also be performed.

The field contractor is responsible for mowing the grass of the field at 1" height. In addition, the initial set up of the irrigation control system will be the responsibility of the field contractor in consultation with the Owner's representative. The new sprigs MUST NOT be allowed to dry out at all until well established. This process usually takes approximately 7 to 10 days post-planting depending upon weather. During that time, the field should be kept extremely wet to the point of puddling. Water will be reduced once establishment takes

place and approval is given by the Owner's representative. The playing field contractor will perform all operations necessary to maintain the playing fields from the date of completion as described in the above playing field specifications.

Questions:

Who's doing grow-in? Contractor or district or district separate contract?

pre-plant specs