MADERA HIGH VARSITY BASEBALL IRRIGATION SYSTEM AND FIELD IMPROVEMENT

PART 1 GENERAL

SCOPE OF WORK

1. The contractor shall furnish all labor, materials, equipment, and services necessary to complete the work as specified in the Contract Documents. This includes, but is not limited to, furnishing, installation, testing, and maintenance of a complete Irrigation System and related components. All work shall be performed in accordance with industry standards, local codes, and the requirements outlined in the project specifications.

2. Infield and Outfield irrigation system
    a. Supply and installation of a fully functional irrigation system to provide complete and uniform water coverage for the infield and outfield turf area.
    b. Abandon the existing irrigation in place and install new irrigation.
    c. System components shall include mainline and lateral piping, valves, sprinkler heads, pop-up heads, quick couplers, zone control mechanism (coaches controls) to allow flexible watering, fittings, control wiring, backflow prevention devices, and any other accessories required for a complete system.
    d. Attention shall be given to minimizing overspray onto the infield dirt areas and ensuring coverage along transitions between turf and dirt.
    e. Irrigation controllers shall be installed in a weatherproof enclosure and programmed according to site-specific requirements.
    f. The system shall be tested, adjusted, and commissioned to ensure proper operation coverage and compliance with water efficiency standards.
    g. Zone maps and operational manuals shall be provided upon completion.

3. Field Improvement of outfield and infield
    a. The outfield area shall be regraded to achieve proper field drainage, consistent surface contours.
    b. Apply a selective herbicide to all turf areas.
    c. Laser grade the collar and infield
    d. Install Tifway 419 Bermuda Large sod rolls at infield square, collar and 15’ into the outfield.

e. Install new infield material, pitcher's mound and batter's box
f. Verticut/Fraise now and aerate outfield turf grass.
g. Install a mix of sand, organics, Bermuda seed and fertilizer to outfield turf grass.
h. Sod cut and off haul existing infield square, collar Work includes stripping of existing turf or topsoil, rough and fine grading, laser leveling, compactions and preparation for turf or sod.
i. Final grade shall promote positive drainage away from key play areas and prevent standing water.
j. The infield surface, including turf and dirt areas, shall be regraded to restore proper playability, safety, and drainage characteristics.
k. Work includes removal of existing material, rough grading, laser-guided fine grading, and compaction to meet the specified cross slope and crown requirements.
l. Special care shall be taken to maintain proper transition between turf and dirt and ensure smooth level playing areas.
m. and 15' of outfield turf grass. Remove and haul off infield skin material, halo batting circles and coaches' box.

4. Halo
    a. Concrete Installation:
        i. Nail a string to the back tip of home plate, and proceed out 13 feet in a semi-circle extending to 3 feet from foul (or requested distance by customer). Please see the approved drawing submitted for turf/halo production.
        ii. Repeat step for outside dimension at 18 or 23 feet, respectively.
        iii. Mark inside and outside edges accordingly and then excavate all material to a depth of 4-6 inches.
        iv. Start the Bender board forms at 1 1⁄2 feet from the foul line and bend around the halo. The width between the inside of bender boards should be exactly 5 or 10 feet across.
        v. Pour concrete to the optimal depth for your region. (Average 4-6 inches with wire mesh support, like building a sidewalk)
        vi. Pour concrete to match EXACTLY 5 FEET OR 10 FEET TO PREVENT TRIMMING OR SHORTAGE. (Average level of concrete to be 3/8- 5/8 inch below dirt line) Unitary turf = 1/4 inch tall and Foam Turf = 5/8 inch
        vii. Concrete needs to have a broom finish. Not too smooth, and not too rough.
        viii. Let concrete cure for TWO WEEKS for proper adhesive bond, (Wash off two-three days before installation to remove acid residue)

b. Turf Installation:
    i. (Make sure all watering systems are turned off 24 hours before and after installation!)
    ii. 9. Match pieces to fit the diagram, and weigh the center piece down first (behind home plate)
    iii. 10. Use heavy weight to make sure turf remains PERFECTLY STILL in place. Then
    iv. proceed to fold each piece in half (fold each half of one piece over, keeping one half of
    v. the piece weighted down.)
    vi. 11. Use recommended glue below and 1/8 inch trowel size for each type on the label. Cure times
    vii. will vary and will be affected if overnight temperatures drop below 60 degrees.
    viii. 12. Roll with 50-100 pound carpet or lawn rollers to ensure glue transfer; repeat the next day.
    ix. 13. Make sure glue has 24 hours to dry by covering with plastic and COVERING with a tent
    x. if wet weather is projected within 24 hours.
c. Recommended Glue:
    i. Best: Wet and Cold weather areas (Nordot 34–g for 50 degrees and up by SSI # 908-233-6803 by direct only)
    ii. Good: Any polyurethane-compatible adhesive
    iii TURN OFF ALL WATERING SYSTEMS for 48 hours!

CODES AND REGULATIONS

1. All work and materials shall comply with applicable codes and regulations as adopted and amended by the authority having jurisdiction. Where specifications call for higher standards than the codes, the more stringent requirements shall govern. Applicable codes include, but are not limited to:
    a. California Plumbing Code
    b. California Electrical Code
    c. California Administrative Codes (Title 8 & 19)
    d. California Green Building Standards Code, Section 5.304
    e. California Department of Water Resources - MWELO
    f. Relevant utility provider standards
    g. Industry standards (e.g., ASTM)

QUALITY ASSURANCE

1. All irrigation work shall be performed by a single firm holding a valid California Contractor's A or C-27 License, with proven experience in irrigation systems installation.

2. Worker Qualifications
    a. The contractor shall employ skilled, trained personnel familiar with all specified irrigation methods and requirements. A qualified foreman shall provide continuous on-site supervision throughout the duration of the work.

SUBMITTALS

1. Materials & Equipment
    a. Provide a complete list of proposed materials and equipment, including manufacturer names and model numbers. If substitutions are proposed, include full product data and catalog cut sheets. Substitutions require prior written approval and must be proven equal in quality and performance.
    b. Specified brand names are preferred standards only. Alternatives may be accepted only with written approval and must be demonstrated to be equivalent.

TESTING

1. General: Unless otherwise directed, tests shall be witnessed by the Owner. Work to be concealed shall not be covered until prescribed tests are made. Should any work be covered before such tests, the Contractor shall, at his expense, uncover, test, and repair his work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired, and entire work retested. Tests may be made in sections, however, all connections between previously tested sections and the new section must be included in the test.

2. Main Line Piping: Maintain 125 psi water or air pressure in new main line piping for a duration of twenty-four (24) hours. There shall be no drop in pressure during test except that due to ambient temperature changes (+/- 5psi).

OBSERVATION

1. All irrigation installation and operation must be approved by the Owner. No work shall be concealed without prior inspection and approval. Any covered work requiring excavation due to missed inspection must be corrected at the Contractor's expense. The contractor must notify the Owner Representative at least 48 hours in advance for any required inspections.

2. Coverage & Operations Review
    a. Before soil prep, the contractor and Owner shall conduct a full system coverage test.
    b. Prior to maintenance, the system must be reviewed and approved by the Owner, and training on equipment must be completed. Submit a pump start-up test and training report to be included in the O&M manual.

3. Final Acceptance
    a. Final written acceptance will be issued once all work meets contract requirements. Early occupancy by the owner does not guarantee acceptance.

WORK AREA AND SAFETY

1. The contractor shall provide and maintain all necessary temporary facilities and keep the site clean, safe and orderly at all times.

2. All work must comply with applicable safety regulations, including state and local safety orders.

3. Adequate safety measures must be in place to protect workers and the public. Cleanup is required throughout the project and upon completion.

GUARANTEE

Irrigation system consisting of materials, equipment, and workmanship shall be guaranteed for proper operation for a minimum of one year from the date of Final

1. Acceptance of the Work or the Notice of Substantial Completion of the Project, whichever is later. Manufacturer's warranty periods may be longer and shall be noted in the close-out documents.

2. The Contractor shall be held responsible for repair and/or replacement of damages to new or existing improvements resulting from the defects of materials, equipment or workmanship one year from the date of Final Acceptance of the Work or the Notice of Substantial Completion of the Project, whichever is later.

3. The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the Guarantee as herein specified.

PART 2 PRODUCTS

PIPE AND FITTINGS

1. Schedule-rated white rigid PVC Pipe shall be made from NSF-approved Type 1, Grade I, PVC compound conforming to ASTM D-1785.

2. Class rated (Standard Dimension Ratio) white rigid PVC Pipe shall be made from NSF approved Type 1, Grade I, PVC compound conforming to ASTM D-1784.

3. PVC pipe shall be of the Class or Schedule as follows:
    a. PVC pipe shall meet ASTM D-2241 for solvent weld, plain end, ASTM D-2672 for solvent weld, bell end, and ASTM D-3139 for gasketed bell end.
    b. Pipe sleeves under paving shall be PVC Schedule 40 for 3-inch and smaller or SDR 35 for 4-inch and larger pipes.
    c. Riser and/or manifold pipe connecting valves to main line fittings shall be Schedule 80 PVC.

4. All pipes shall be continuously and permanently marked and conform with the following information: manufacturer's name or trademark, nominal pipe size, Schedule or Class of pipe, pressure rating in PSI, ASTM designation and (NSF) seal of approval.

5. White rigid polyvinyl chloride (PVC) Fittings:
    a. Schedule 40 type I and II grade 1, solvent weld socket fittings ASTM D-2466 for all lateral lines 2-1/2 inches and smaller.
    b. Schedule 80 type I and II grade 1 solvent weld socket fittings ASTM D-2464 for all main line less than 2 inches in diameter, and lateral lines 3 inches and larger.
    c. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable (IPS) schedule, and (NSF) seal of approval.
    d. All plastic fittings and connectors shall be injection molded of an improved polyvinyl chloride compound featuring high tensile strength, high chemical resistance and high impact strength in terms of current ASTM standards for such fittings. Where threads are required in plastic fittings, these shall be injection molded also.

6. PVC Solvent Weld Adhesive:
    a. All socket and bell type connections shall be joined with primer and PVC solvent cement which shall meet the requirements of ASTM F656 for primer and ASTM D2564, "Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings." Solvent cement joints for plastic pipe and fittings will be made as prescribed by manufacturer. The high chemical resistance of the pipe and fitting compounds specified in the foregoing sections makes it mandatory that an aggressive colored primer, which is a true solvent for PVC be used in conjunction with a solvent cement designed for the fit of pipe and fittings specified. A heavy-bodied, medium-set solvent cement, e.g. Weld-On 711 gray, shall be used for all classes and schedules of pipe and fittings.

7. PVC Pipe Thread Sealant:
    a. A nonhardening all-purpose sealant and lubricant similar to Permatex #51 or Lasco blue pipe thread sealant which is certified by the manufacturer to be harmless to PVC pipe and fittings. Apply sealant to clean male threads, brushing into grooves and to the first three threads of the female threads. A good quality grade of Teflon tape recommended by the manufacturer for use with plastics may be used in lieu of sealant. The minimum width of tape to be used is 3/4". A minimum of two wraps and a maximum of three wraps shall be used.

8. PVC Swing Joints:
    a. Connections to sprinkler heads from lateral lines shall be made with swing joints as detailed. Preassembled swing joints from Hunter, King Brothers or Spears are acceptable.
    b. Use 6” length nipples for 1/2 inch inlet heads.
    c. Use 12” length nipples for 3/4 or 1 inch inlet heads.

9. Coated Ductile Iron pipe and fittings:
    a. Ductile Iron pipe shall be centrifugally cast pipe conforming to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, thickness Class 50, with cement mortar lining and seal coating per ANSI/AWWA C104/A21.4.
    b. Ductile Iron flanged pipe shall conform to ANSI/AWWA C115/21.15.
    c. Ductile Iron flanged fitting to PVC pipe shall use a ‘Megalug’ mechanical joint restraint Series 2000PV by EBAA Iron per either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, or equal.
    d. Joints shall comply with the following standards:
    e. Rubber gasketed/mechanical joints: ANSI/AWWA C111/A21.11.
    f. Flanged joints: ANSI/AWWA C110/A21.10, B16.1, B16.2.

10. Coated ductile iron push-on fittings meeting ANSI/AWWA C110 or C153/A21.10 shall be used for:
    a. Mainline connections for pipe 2 inches and greater in diameter.
    b. New main line service tee at valve connections where a service saddle is not acceptable.
    c. Self-restrained fittings or joint restraints (Leemco LH or equal) shall be used for all elbows, tees, bends, etc fittings.

11. Coated ductile iron service saddles with stainless steel double straps, Smith-Blair 317, Romac Industries 202NS, or equal, shall be used for remote control/quick coupler valve service connections on main lines 1.25 inch or greater, and where the available outlet size can match the largest lateral line size downstream of the remote control valve.

12. Galvanized pipe and fittings:
    a. Galvanized Pipe shall be hot-dip galvanized continuous welded, seamless steel SCH 40 pipe conforming to current ASTM A53 standards.
    b. Galvanized Fittings shall be galvanized, threaded malleable iron SCH 40 conforming to current ASTM A865 standards.

VALVES

1. Electric Control Valves:
    a. Globe valves operated by low-power solenoid, normally closed, manual flow adjustment.
    b. Provide a pressure regulating module on all control valves, or other pressure regulating components as part of the operating spray head or low volume head zones when the dynamic system pressure is, or may be greater than 45 psi.

2. Control Valve Marking: Christy's valve identification tag (or equal), yellow color (purple color for recycled water) with text designating controller and valve station number, e.g., "A12", or equivalent.

3. Isolation Valves:
    a. Cast bronze, coated ductile iron, or coated cast iron gate valve with resilient wedge, nonrising stem, and two-inch operating nut for main line 2-inch size or greater. Match size of mainline.
    b. Cast bronze threaded gate valve with bronze cross handle for main line less than 2 inch size.

4. Quick Coupling Valve: Two-piece quick coupling valve.

VALVE BOXES

1. Control Valve/Master Valve/Flow Sensor boxes:
    a. Shrub/Ground Cover areas: Carson 1419 body with lockable tan plastic cover, or equivalent. Drip Valve Kits shall use a Jumbo body with lockable tan plastic cover.
    b. Turfgrass areas: Carson 1419 body with lockable green plastic cover, or equivalent.
    c. Hardscape areas: Christy B16 concrete box (11.75" x 22.25") with N16R composite solid flush lid, or equivalent.
    d. Boxes in a sports venue's field of play that are noted to be installed below grade shall use a metal lid with a nonwoven geotextile of a minimum 0.5 lb./sq. yd. covering the lid and box frame.

2. Quick Coupler Valve boxes:

a. Shrub/Ground Cover areas: Carson 910 body with lockable tan plastic cover, or equivalent.
b. Turfgrass area: Carson 910 body with lockable green plastic cover, or equivalent.
c. Skinned ballfield areas: Christy F08 round concrete valve box (8” ID) with F08R concrete lid, or equivalent.

3. Isolation Valve boxes:
    a. Gate Valve box in hardscape: Christy G05 round concrete valve box (10.375” ID) with cast iron G05C lid, or equivalent.
    b. Gate Valve box in planting areas: Christy F08 round concrete valve box (8” ID) with F08R concrete lid, or equivalent. Use F14 ADS adapter and extension for sizes 2.5 inches and larger.
    c. Ball Valve box: Same as 2.04, A.

4. Control Valve box marking: Plastic lids shall have branded markings, and concrete lids shall have painted markings on the top of lid with minimum 2 inch high stenciled letters showing controller letter and station number.

CONTROLLER

1. The irrigation Controller is existing and shall remain in place. Verify open stations and spare wire, if any in the area of work.

CONTROL AND TRACER WIRE, COMMUNICATION CABLE

1. Connections between the automatic controllers and the electric control valves, and tracer wire shall be made with direct burial AWG–UF 600-volt copper wire manufactured for irrigation system use.

2. Hot control wires for the first controller shall be red. If multiple controllers are installed, the hot wire color shall be orange, yellow, purple in order for each controller. Common ground wire shall be white, with a color stripe corresponding to the hot control wire color when multiple controllers are installed. Spare control wires shall be black and spare common wire blue. Tracer wire shall be green.

3. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14. Common wire shall be a minimum #12 size.

4. All control wire splices/caps shall be made with direct bury rated, waterproof wire connectors with silicone sealant, Spears DS-500 Dri-Splice, 3M DBR/DBY or approved equal. Use one splice per connector sealing pack.

5. Apply waterproof numbered wire markers or sleeves at both sides of all splices and at the controller terminal board corresponding to the controller (A, B, etc.) and station number (02, 14, etc.). If multiple valves are connected to one station, add a single-digit identifier (1, 2, etc.) to the station number (XX), e.g., A02-1, A02-2, etc.

6. Communication/flow sensor cable shall be a shielded and jacketed, minimum 16-gauge twisted pair with drain wire, Paige P7162D or equal, compliant with the controller manufacturer's specifications.

7. Below grade conduit for control wires and/or cables shall be PVC for electrical use with long radius sweeps at direction changes and at valve/splice/pull box terminations.

IRRIGATION HEADS

1. Spray/Bubbler Pop-up Head: Molded plastic body with pop-up plastic riser and nozzle.

2. Rotor Pop-up Head: Molded plastic body with plastic riser and nozzle, gear-driven rotation with memory arc, balanced nozzle sets.

CONCRETE

1. Cast-in-place Portland cement concrete used for pipe encasement, cover, thrust blocks, pipe support or other below-grade use shall at minimum comply with 2,800 psi 28-day strength.

Miscellaneous

2. Tifway 419 Hybrid Bermuda
3. Sand & Organics
4. Fertilizer
5. Infield Clay
6. Surface Soil conditioner
7. Surface Mound Packing Clay
8. Surface Clay Bricks

PART 3 - EXECUTION

PIPING INSTALLATION

1. General:
    a. Any equipment installed by the Contractor and deemed to be for the use of the Owner in various situations (i.e., control valves, control panels, etc.) shall be so installed to be readily accessible and quickly operable. Equipment deemed by the Owner to be inoperable for its intended purpose shall be reinstalled by the Contractor in an operable position before approval will be given. Any changes made by the Contractor shall be done without any additional cost to the Owner.
    b. The Contractor shall be responsible for layout of proposed facilities and any minor adjustments required as needed. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on nonplanted areas. Where head spacing is not specifically noted, Contractor shall install sprinkler heads evenly along the irrigation area's perimeter. Flush all lines prior to installation of heads.
    c. Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance to manufacturer's recommendations to allow for expansion. Lay on solid bedding, at uniform depth.

2. Excavations:

    a. Excavations shall be open vertical construction, sufficiently wide to provide clear working space around the work installed and to provide ample space for backfilling and tamping.

b. The use of a vibratory plow or methods other than open vertical trenching will not be allowed without the written approval of the Owner. To obtain such approval, a field test must be performed, at the proposed site, with the equipment to be used in the presence of the Owner and Owner. The field test is to indicate if the proposed site is favorable to the plowing method. Approval for plowing at one location does not allow the use of plowing at another location. Approval for plowing must be obtained for each location where the use of plowing is proposed. If, at previously approved plowing locations, conditions for plowing become unfavorable as determined by the Owner, plowing shall be terminated.
c. Trenches for pipe and equipment shall be cut to required grade lines, and compacted to provide an accurate grade and uniform bearing for the full length of the line.
d. Unless written approval for using native soils as bedding material is given by the Owner, main line pipe shall be placed on a minimum 6 inch depth of granular bedding material.
e. Excess trench soil with rocks greater than 1⁄2 inch diameter shall be removed from the planted area and spread as directed by the Owner.
f. When two pipes/conduits are to be placed in the same trench, it is required to maintain a minimum six-inch (6”) horizontal separation between pipes/conduits.
g. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
    i. 24-inch minimum over main lines and wire conduit.
    ii. 18-inch minimum over non-pressure (rotary pop-up) lateral lines.
    iii. 12-inch minimum over non-pressure (pop-up spray head) lateral lines.
    iv. 24-inch minimum from subgrade over any lines located in a paved vehicle area.
    v. Maximum cover above the top of the pipe shall not exceed twelve inches (12”) greater than the required minimum cover.
    vi. 12-inch minimum cover over drip line non-pressure lateral and manifold pipe, and main distribution tubing.
    vii. 3-inch minimum cover over in-line emitter tubing.

3. Assemblies:
    a. Install lines and associated assemblies in accordance with standard industry practices and as required to suit actual site conditions.
    b. Install all assemblies specified herein in accordance with applicable specifications and requirements necessary to complete the work. Perform all work in accordance with best standard practices.
    c. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
    d. All threaded pipe and fittings shall be assembled using an approved Teflon tape, or equivalent, applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved Teflon tape will be required.
    e. No main line elbows, branch tees or isolation valves are to be located closer than five (5) feet to each other without prior approval of the Owner.

4. Line Clearance:
    a. All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades. Parallel lines shall not be installed directly over one another.

5. Plastic to Steel Connections:
    a. 1. At all plastic (PVC) pipe connections, the Contractor shall work the steel connections first. Connections shall always be plastic into steel, never steel into plastic. An approved Teflon tape shall be used on all threaded (PVC) connections to steel, never steel into plastic. An approved teflon tape shall be used on all threaded (PVC) to steel pipe joints applied to the male threads only, and light wrench pressure is to be applied. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved 3/4" wide Teflon tape will be required.
    b. A nonhardening sealant and lubricant similar to Permatex #51 or LASCO blue pipe sealant may be used in lieu of Teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

6. Plastic Pipe:
    a. The Contractor shall exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings shall be stored under a weatherproof roofed structure before using and shall be transported in a vehicle with a bed long enough to allow the length of pipe

b. to lie flat so as not to be subject to undue bending or concentrated external load at any point.
    i. All lumber, rubbish, rubble, concrete and rocks shall be removed from the trenches by the Contractor. Pipe shall have a firm uniform bearing for the entire length of each pipeline to prevent uneven settlement. Wedging or blocking under riser tees shall be done only if specified on the plans. Pad trenches with soil as necessary to provide uniform bearing surfaces.
    ii. Where extensive lengths of pipe are installed, snake pipe in trench from side to side to allow for expansion and contraction. One additional foot per one hundred (100) feet of pipe is the minimum allowance for snaking. Never lay pipe when there is water in the trench or when the temperature is 32 degrees F or below.
    iii. All changes in direction of pipe shall be made with fittings, not by bending. No main line fittings for changes in direction shall be greater than 45 degrees. Provide a minimum five (5) feet between changes in direction elbows.
    iv. Safely handle primers and cements per ASTM F-402. Make solvent weld joints per ASTM D-2855 with a non-synthetic bristle brush in the following sequence:
        1. Make sure the pipe is cut square and all rough edges and burrs are removed. All connecting surfaces are properly cleaned and dry prior to application of pipe Primer.
        2. Apply an even coat of colored primer to pipe and fitting prior to application of Solvent.
        3. Apply an even coat of solvent to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
        4. Apply an even light coat of solvent to the inside of the fitting.
        5. Apply a second coat of solvent to the pipe.
        6. Insert the pipe quickly into the fitting and turn pipe approximately one-eighth to one-quarter turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen seconds so the fittings do not push off the pipe.
        7. Using a clean rag, make sure to wipe off all excess solvent to prevent weakening at joint.
        8. Exercise care in going to the next joint so that pipe is not twisted, thereby disturbing the last completed joint.

9. Allow at least fifteen minutes setup time for each welded joint before moving.
10. Repairing plastic pipe when damaged shall be done by replacing the damaged portion of pipe.

7. Concrete
    a. Thrust Blocks: Concrete anchors or thrust blocks shall be provided on pressure main pipelines 2 inches or greater in diameter at abrupt changes in pipeline grade, changes in horizontal alignment (bends, tees and crosses), reduction in pipe size (reducers, reducing tees or crosses), end line caps or plugs, and/or inline isolation valve to absorb any axial thrust of the pipeline. The pipe manufacturer's recommendation for thrust control shall be followed. Thrust blocks must be formed against solid unexcavated earth (undisturbed). Do not enclose entire joint in concrete. Provide a minimum of three cubic feet of concrete for each thrust block.
    b. Concrete thrust blocks may be eliminated if the main line piping system uses self-restrained fittings and bell joint restraints per manufacturer's specifications throughout.

8. PIPE DEPTH AND BACKFILL
    a. Backfill shall not be placed until the installed system has been inspected, pressure tested and approved by the Owner.
    b. Backfill for first 6 inches underneath, and 4 inches around and above main line pipe and control wires shall be granular bedding material, unless the Owner approves in writing that native soil may be used for initial backfill in lieu of granular bedding material. Backfill material for the upper portion of the trench shall be approved soil. Unsuitable martial, such as pipe remnants and wire including clods and rocks over two inches (2") in size, shall be removed from the premises and disposed of legally at no cost to the Owner. C. Backfilling for all pipe shall be carried out in two basic stages.

9. Stage One Backfilling:
    a. This shall be accomplished as soon as possible after the pipe is laid. A bedding of uniform depth with no voids must be provided along the entire length of the pipe. The bedding material should be placed in the trench and tamped into the areas under the pipe, using a suitable tool. Joints should be left exposed until hydrostatic tests are completed. Cover only those portions of the pipe necessary to prevent movement or damage.

10. Stage Two Backfilling:
    a. This shall be completed after all hydrostatic tests are completed and the piping system has been thoroughly checked for leaks or other defects. Continue to add backfill material in four-inch (4") layers and hand tamp to achieve density similar to adjacent soil. After twelve inches (12") in main line trenches and eight inches (8") in lateral line trenches of hand tamped soil is in place over the pipe and fittings, backfilling can be continued, using light machinery to place dirt in the trenches in six inch (6") layers and to compact the dirt to conform to adjacent soil. Extreme care should be taken to avoid damage to the pipe from machinery that is too heavy. All trenches shall then be water jetted to assure uniform settling and compaction. Backfilling operations will not be considered complete until the top surface has been graded to conform to the adjacent soil. All rocks uncovered and not used as backfill must be collected and removed from the site.
    b. All backfilling shall be done carefully and shall be properly tamped. All soil shall be tamped and puddled to eliminate any voids.
    c. Surplus earth remaining after backfilling shall be disposed of as directed by the Owner.
    d. PVC piping and fittings shall not be backfilled during periods of extreme heat or when a sudden lowering of temperature of the pipe may cause separation of joints or fittings.
    e. The contractor shall fill with properly amended topsoil any irrigation trench that subsides during the warranty period. The contractor shall assume all costs associated with the trench repair, including but not limited to plant replacement of a size of plant disturbed at the time of the repair.

CONTROL AND TRACER WIRE, AND COMMUNICATION CABLE

1. Install control wires alongside main line piping. Do not tape wires together when encased in sleeve or conduit. Minimum cover shall be 24 inches. Crimp wires together at valve manifold with Scotchlok connector. Conventional valve wire splices shall use a 3M DBY splice kit. Tag all control wire at splices with approved control wire markers.

2. Wire size shall be determined by the number of valves operating on a given wire and the distance from the controller to the farthest valve, as specified by the charts furnished by the remote control valve manufacturer. Splices are only allowed when rerouting or repairing existing wire. All splice connections must be provided in a valve box.

3. Communication/sensor cable shall be installed in electrical conduit with long radius sweeps at direction changes and at valve/splice/pull boxes. Maintain a minimum six-inch clearance to adjacent pipe. Minimum cover shall be 24 inches.

4. Install tracer wire along the top of pipe at the following locations:
    a. All pipe sleeves.
    b. Mainline pipe without adjacent control wire.

VALVES

1. The Contractor shall make all necessary connections for operation, and shall be connected and aligned to provide the most efficient flow of water to the irrigation heads. Where pressure-regulating electric control valves are specified, the Contractor shall adjust the valve so a uniform distribution of water is applied by the heads and that the most remote heads operate at the pressure recommended by the head manufacturer.

2. Each valve is to be enclosed in a separate valve box. The valve box shall be secured on firm soil clear of valves and wiring connections. Valve boxes and lids shall be set to finished grade. Use valve box extensions of the same material as the box to the proper depth below the pipeline. Valve boxes shall be supported by common bricks at each corner and at the long side of the box. Use a minimum of six bricks to support rectangular boxes and four bricks to support round boxes. Backfill carefully and properly compact in order to prevent settlement and subsequent damage.

3. Install a concrete collar around valve boxes when located in asphaltic concrete pavement or in turfgrass areas.

4. Remote control valve boxes within the field of play at sports venues shall be buried with a minimum of 8 inches of cover over the box lid in turfgrass, and a minimum 3 inches in skinned infield or warning track surfacing.

5. When existing valve and/or splice boxes are within the area of work, replace in kind any damaged boxes and/or lids, unless noted otherwise. Adjust the elevation of all existing boxes within the area of work to final grade.

6. Locate valve boxes in ground cover/shrub planting areas instead of turfgrass areas whenever possible. Locate valve boxes 18” from and perpendicular to adjacent paving. When grouped together, provide equal spacing of at least 36" between boxes.

7. Permanently attach the plastic valve identification tag to the remote control valve body and locate so it’s clearly visible in an open valve box.

8. Permanently secure the control valve identification label to the top of concrete valve box lids with noncorrosive connectors.

AUTOMATIC CONTROLS

1. Connect operational control wires or accessory components to the controller, and program valve schedules appropriately for the new planting.

2. The Owner shall review the fully functional operation of the irrigation control system prior to acceptance of the system, and as a requirement for the start of maintenance.

3. Install automatic controller chart in a laminated or watertight plastic envelope inside the controller cover showing which valves are connected to which stations on controller in the work area.

SPRINKLER HEAD INSTALLATION

1. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on nonplanted areas. Flush all lines prior to installation of heads.

Overhead distribution sprinkler heads shall be installed as detailed, set adjacent to the edge of hardscape elements (2 - 4 inches for spray heads, 6 - 8 inches for rotary heads) and perpendicular to the finish grade. Sprinkler spray heads

1. directed toward a building shall be a minimum 7 feet from building walls, and a minimum 2 feet when directed away from the building. Sprinkler heads in turfgrass areas shall have a minimum 10-foot radius except for corners.

2. The top of the nozzle in pop-up bodies shall be flush to the finish grade in areas to receive turfgrass seed/stolons, and in ballfield-skinned infields. The top of the nozzle shall be one half inch (1/2”) above the finish subgrade in areas to receive standard cut turfgrass sod.

3. High-speed or other sprinkler heads in dust control zones at ballfield skinned infields shall be installed in turfgrass areas where directly adjacent to the skinned infield.

4. Where individual shrub bubblers are installed, each plant shall have a bubbler within 10 - 14 inches of the shrub center.

5. Upon completion of the installation, the Contractor shall adjust or change sprinkler head nozzles to uniformly distribute water without overspray and shall place entire irrigation system in first-class operating condition without any additional cost to the Owner.

6. Sprinkler heads shall be adjusted in order by fully opening the sprinkler furthest from the control valve and working back toward the control valve. Adjust sprinkler heads which spray toward buildings or adjacent hardscape so that water spray does not contact the side of buildings or significantly overspray onto hardscape.

COMPLETION AND MAINTENANCE

1. After the system has been completed but prior to the start of maintenance, the Contractor shall operate the automated system with the Owner, shall instruct the Owner in the operations and maintenance of the system and controls, and shall program the controller for each station.

2. If site satellite controller(s) for a central control system is installed, an authorized central control distributor/installer shall program the central base station to communicate with the site satellite controller(s), and shall verify that proper communication protocols are operational.

3. The irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the maintenance period or until Final Acceptance of the project, whichever is greater. Irrigation system maintenance shall commence upon an acceptable review following the completion of irrigation installation, planting operations and general clean-up.

REPAIR AND CLEAN UP

1. All areas shall be maintained in a neat and orderly condition at all times. All reasonable precautions shall be taken to avoid damage to new planting and improvements. Disturbed and/or damaged areas shall be restored to their original condition to the satisfaction of the Owner.

2. Where trenching or other work disturbs existing and/or newly planted turfgrass and/or planting, the Contractor shall reinstall the existing sod if viable, or install a full width of new turfgrass sod or new planting to match the existing turfgrass/planting species, variety and size, after first conditioning the top 6 inches of soil per the Landscape Planting specification. Adjust finish grades to account for the new turfgrass sod’s soil mat so that the new sod is flush to the adjacent turfgrass.

3. After the irrigation operations are completed, the Contractor shall remove all trash, excess materials, empty containers or any other debris accumulated by the work from the site. All damage caused by the work shall be repaired or material replaced at the Contractor's expense. The site shall be left in a neat and orderly condition to the satisfaction of the Owner.