

IRRIGATION SPECIFICATIONS

PART 1 - GENERAL

DESCRIPTION

Provide a complete design and installation for an underground irrigation system as specified herein. The work includes:

- 1. The design of an underground irrigation system using irrigation industry best practices
2. Automatic irrigation system including piping, fittings, sprinkler heads, and accessories.
3. Pump (if necessary), valves, and fittings.
4. Irrigation Meter and reduced pressure backflow preventer. (Provided by the General Contractor)
5. Controller, control wire.
6. Testing.
7. Excavation and backfilling irrigation system work.
8. Associated interior and exterior plumbing, and accessories to complete the system.

Pipe sleeves are generally indicated to be supplied and installed by the General Contractor. The Irrigation Contractor shall coordinate with the General Contractor to ensure that sleeving is available in the preferred locations and that the irrigation site drawing reflects the actual installed locations of the sleeves. Sleeve locations are also shown on the Utility Plan by the Civil Engineer.

QUALITY ASSURANCE

Installer's qualifications: Minimum of 3 years experience installing irrigation systems of comparable size. All plumbing within the building shall be installed by a licensed plumber.

Materials, equipment, and methods of installation shall comply with the following codes and standards.

- 1. National Fire Protection Association, (NFPA); National Electrical Code.
2. American Society for Testing and Materials, (ASTM).
3. National Sanitation Foundation, (NSF).
4. The Irrigation Association, (IA).

The Irrigation Contractor shall coordinate with the sodding and landscape contractors to insure 100% irrigation coverage of all sod and plant material. The Contractor shall verify water pressure at the site. If pressure is below 40 psi, the Landscape Architect shall be notified immediately for a redesign. The final zone design flow and operating pressure shall guarantee 100% coverage for all sod and landscape areas.

SUBMITTALS

Upon irrigation system acceptance by Landscape Architect or RaceTrac Project Manager, submit manufacturer's product manuals and any site specific operating and/or maintenance instructions.

- 1. Provide one (1) copy of irrigation system as-built directly to the Landscape Architect and on site Project Manager. Legibly mark drawings to record actual construction, valve locations, zoning/installation numbering, main line locations, etc.
2. Provide all manufacturers manuals.

DELIVERY, STORAGE AND HANDLING

Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

Protect existing trees, plants, lawns and other features designated to remain as part of the final landscape work.

Promptly repair damage to adjacent facilities caused by irrigation system work operations. Cost of repairs at Contractor's expense. Promptly notify the Landscape Architect of unexpected sub-surface conditions. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to the Landscape Architect.

CODES, INSPECTIONS AND PERMITS

The entire installation shall fully comply with all local and state laws and ordinances, and with all the established codes applicable thereto. The Contractor shall take out all required permits, arrange for all necessary inspections and shall pay any fees and expenses in conjunction with the same as a part of the work under this Section. If required, the Owner will provide the City and utility companies with a "Hold Harmless" agreement for sprinklers on public lands and easements.

GUARANTEE

For a period of one (1) year from date of final acceptance of work performed under this Section, the Contractor shall promptly furnish and install any and all parts and equipment which prove defective in material, workmanship or installation at no additional cost to the Owner.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

Manufacturers: ONLY - Rain Bird, Contractor Division, Glendora, CA

MATERIALS

General:

- 1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.
2. Comply with pipe sizes indicated. No substitution of smaller pipes will be permitted. Remove damaged and defective pipe.
3. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (NSF) approval.
4. All materials subject to acceptance of the Landscape Architect and Owner.

Plastic pipe, fittings, and connections:

- 1. Polyvinyl chloride pipe: ASTM D2241, rigid, unplasticized PVC, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and dents.
a. SDR 21, Class 200.
2. Polyethylene pipe: ASTM D2239 flexible polyethylene pipe rated at 100 PSI minimum working pressure.
3. PVC pipe fittings: ASTM D2241 schedule 40 PVC molded fittings suitable for solvent weld, slip joint ring tight seal, or screwed connections. Fittings made of other materials are not permitted.
a. Slip joint fitting socket taper to permit a dry unsoftened pipe end to be inserted no more than halfway into the socket. Saddle and cross fittings are not permitted.
b. Schedule 80 PVC pipe may be threaded.
c. Use male adapters for plastic to metal connections. Hand tighten male adapters plus one turn with a strap wrench.
4. Insert fittings: ASTM D2466 insert type fittings.
5. Saddle lines for lateral lines:
a. Kwik-soal saddle tee as manufactured by Dawn Industries, Inc. 4410 Washington Street, Denver, CO 80216, or approved equal.
b. Brass Saddle with stainless steel screws.
6. Sprinkler Risers:
a. Call-off polyethylene riser mounted on saddle tees.
b. Riser height as required.
7. Swing joints: See detail.

Interior copper pipe, fittings and connections:

- 1. Interior water piping, fittings and connectors: ASTM B88 Type "L" hard tempered copper tubing. Fittings shall be 150 pound working water pressure standard, solder end type, constructed of wrought copper, bronze or brass.
2. Joints made with tin-lead solder, approximately 95-5 composition. Thoroughly polish joints and use proper flux to provide sound joints.

Sprinkler heads, pumps, valves and associated equipment:

- 1. The following items are as specified on the Drawings unless noted otherwise.
a. Spray type sprinkler heads, rotary type sprinkler heads
b. Pressure compensating drip line
c. Manual isolation valves - gate valve for lines 2" and under, mechanical lines for valves greater than 2"
d. Electric remote control valves (ensure water tight connections)
e. Quick couples valves - each with key having 3/4" male top pipe thread for hose connection
f. Backflow preventer - comply with codes of local or county agency
g. Pump if necessary
h. Irrigation meter - comply with codes of local or county agency. (Provided by General Contractor)
i. Mainline and associated lateral lines with sizes

Controls:

- 1. The following items are as specified on the Drawings unless noted otherwise.
a. Controller as specified on the drawings.
b. Pump starter (if necessary)

Electrical control wire:

- 1. Electrical control and ground wire: Type UF direct burial 600 volt AWG control cable #12 neutral and #14 control "hot" wire. No aluminum wire allowed.
2. Wire color code: Provide control or "hot" wires either black or red in color. Provide common or "ground" wires white in color.

ACCESSORIES

Drainage fill: 1/2" to 3/4" washed pea gravel.

Fill: Clean soil free of stones larger than 2" diameter foreign matter, organic material and debris.

- 1. Provide imported fill material as required to complete the work. Obtain receipts and pay all costs for imported materials.
2. Suitable excavated materials removed to accommodate the irrigation system may be used as fill material subject to the Landscape Architect's review and acceptance.

Clamps: Stainless steel, worm gear hose clamps with stainless steel or ear type.

Low voltage wire connectors: Socket seal type wire connectors and 3M DGT 1000 Heavy Duty Epoxy Kit.

Valve access boxes: Tapered enclosure of high density polyethylene material comprised of fibrous glass fibers chemically inert and unaffected by moisture corrosion and temperature changes. Provide lid of same material, green in color.

- 1. 12" deep x 18" long x 2" wide base enclosures.
2. 9" deep x 10" diameter base enclosures.

PART 3 - EXECUTION

INSPECTION

Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.

PREPARATION

Layout and stake the location of each pipe run and all sprinkler heads and sprinkler valves.

Coordinate with the General Contractor to expose the irrigation sleeves. Irrigation sleeves installed by the General Contractor.

INSTALLATION

General: Prior to any work, the Contractor will test the pressure and flow of the existing water line and make necessary adjustments to the system design.

Excavating and backfilling:

- 1. Excavation shall include all materials encountered, except materials that cannot be excavated by normal mechanical means.
a. Rock excavation: Submit a unit cost per foot of trench for rock excavation. Include in price additional backfill materials required to replace excavated rock.
2. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings.
3. If the pulling method is used, the pipe "low" shall be a temporary pipe. Starting and finishing holes for pipe pulling shall not exceed a 12" x 24" opening.
4. Excavate to depths required to provide 2" depth of earth fill or sand bedding for piping when rock or other unsuitable backfill materials are encountered.
5. Fill to match adjacent grade elevations with approved earth fill material. Place and compact fill in layers not greater than 6" depth.
a. Provide approved earth fill or sand to a point 4" above the top of pipe.
b. Fill to within 2" of final grade with approved excavated or borrow fill materials free of lumps or rocks larger than any dimension of the pipe.
c. Provide clean topsoil fill free of rocks and debris for top 6" of fill.
6. Except as indicated, install irrigation mains with a minimum cover of 18" based on finished ground and install irrigation laterals with a minimum cover of 12" based on finished grades. In roadways or parking areas, minimum cover of 24" based on top of pavement.
7. Excavate trenches and install piping and fill during the same working day. Do not leave open trenches or partially open trenches open overnight.

Plastic pipe:

- 1. Install plastic pipe in accordance with manufacturer's installation instructions. Provide for thermal expansion and contraction.
2. Saw cut pipe ends to square. Remove burrs and shavings at cut ends prior to installation.
3. Make plastic pipe joints using solvent weld joints as specified on the drawings. Use only solvent recommended by the pipe manufacturer. Install plastic pipe fittings in accordance with pipe manufacturer's instructions. Contractor shall make arrangements with a manufacturer for all necessary field assistance.
4. Use plastic to metal adapters with male adapters in accordance with manufacturer's recommendations.
5. Allow pipe to set for 24 hours before pressure is applied to the system.
6. Uncoil pipe and install at depth. Secure poly-pipe to insert fittings with stainless steel clamps. Double clamp pipe 1" diameter or greater.
7. Maintain clean interior of pipe and debris. Close open ends of pipe by acceptable methods when pipe installation is not in progress.

Sprinklers, fittings, valves and accessories:

- 1. Install fittings, valves, sprinkler heads, risers, and accessories in accordance with manufacturer's instructions, except as otherwise indicated. Provide concrete thrust blocks where required at fittings and valves.
2. Install sprinkler heads perpendicular to finished grades, except as otherwise indicated.
3. Install pop-up spray heads with polyethylene "cut-off" nipples.
4. Locate sprinkler heads to assure proper coverage of indicated areas. Do not exceed sprinkler head spacing distances indicated.
5. Install isolation ball valves in a 10" valve box according to the plans.
6. Install quick-coupling valves on an adjustable 360 degree swing joint riser assembly. Install quick-coupling valves in a 10" valve box according to the plans.
7. Install backflow prevention valve, pump, suction line, booster pump, fittings, and accessories as shown or required to complete the system.
8. Install controller.
a. Located in back of store.
b. Ground Controller in accordance with manufacturer's recommendations.
c. Connect to 120v outlet on separate circuit.
9. Install in-ground control valves in a valve access box as indicated.
10. Install valve access boxes on a suitable base of gravel (minimum 4") to provide a level foundation at proper grade and to provide drainage of the access box.
11. Seal threaded connections on pressure side of control valves per manufacturer's recommendations.
12. Install self-cleaning pressure compensating drip line per manufacturer's recommendations (where specified). Provide all fittings, accessories, valves and filters for a finished, complete functioning system.
13. Install drip line where specified on finished grade in plant beds using Techline staples to hold in place, and cover with a 3" depth of specified mulch. Coordinate installation with shrub and groundcover placement.

Control wiring:

- 1. Install electric control cable in the piping trenches wherever possible. Place wire in trench adjacent to pipe. Install wire with slack to allow for thermal expansion and contraction. Expansion joints in wire may be provided at 200-foot intervals by making 5-6 turns of the wire around a piece of 1/2" pipe instead of slack. Where necessary to run wire in a separate trench, provide a minimum cover of 12".
2. Provide sufficient slack at site connections at remote control valves in control boxes, and at all wire splices to allow raising the valve bonnet or splice to the surface without disconnecting the wires when repair is required.
3. Connect each remote control valve to one station of a controller except as otherwise indicated.
4. Connect remote control valves to a common ground wire system independent of all other controllers.
5. Make wire connections to remote control electric valves and splices of wire in the field, using wire connectors and sealing cement in accordance with manufacturer's recommendations.
6. Provide tight joints to prevent leakage of water and corrosion build-up on the joint.
7. A separate common neutral wire is required from controller along entire mainline.
8. Provide one spare control wire from controller along entire mainline.

Interior plumbing:

- 1. Install piping to provide complete drainage of the system, toward the source wherever possible. Provide drain valves at all drainage points on pipes. Cut pipe accurately to measurements established at the building and installed without springing or forcing. After cutting and naming, and before assembling, remove interior scale, dust and foreign matter. Installed pipe shall follow building lines, clearing all doors and other openings. No diagonal piping will be accepted. Install piping to allow installation of 1" thickness pipe installation covering. Provide for thermal expansion and contraction of pipe.
2. Insulate piping with 1" thickness of fibrous glass insulation, 35 degree service, with white Kraft paper jacket and .001" aluminum foil vapor barrier.
3. Stub-out from mechanical room floor to turf or planting area at 18" below finish grade and install a male pipe thread connection at the turf end.

Sleeves: (TO BE INSTALLED BY GENERAL CONTRACTOR)

- 1. Utilize existing sleeves for installation of the irrigation system.
2. Provide new sleeves for all locations where existing sleeves are not indicated. Install new sleeves prior to paving installation.
3. Install pipe sleeves under existing concrete or asphalt surface by jacking, boring or hydraulic driving of the sleeve. Obtain Owner's permission before cutting existing concrete and asphalt surfaces. Where piping is shown under paved areas which are adjacent to turf areas, install the piping in the turf areas.
4. Install permanent benchmark in the top of curbs and other hardscapes for reference of sleeve locations.

Flashing, testing and adjustment.

- 1. After sprinkler piping and risers are installed and before sprinkler heads are installed, open control valves and flush out the system with full head of water.
2. Perform system testing upon completion of each section. Make necessary repairs and re-assemble required sections as required.
3. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.
4. Tighten nozzles on spray type sprinklers after installation. Adjust sprinkler adjusting screw on lateral line or circuit as required for proper radius. Interchange nozzle patterns as directed by the Landscape Architect, to give best arc of coverage.
5. Adjust all electric remote control valve pressure regulators and flow control stems for system balance and optimum performance.
6. Test and demonstrate the controller by operating appropriate day, hour and station selection features as required to automatically start and shut down irrigation cycles to accommodate plant requirements and weather conditions.

DISPOSAL OF WASTE MATERIAL

Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rock, trash, and debris. Maintain disposal route clear, clean, and free of debris.

ACCEPTANCE

Test and demonstrate to the Landscape Architect and Owner the satisfactory operation of the system free of leaks. Instruct the Owner's designated personnel in the operation of the system, including adjustment of sprinklers, controller, valves and pump controls. Upon acceptance by Landscape Architect, the Owner will assume operation of the system.

CLEANING

Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair all damage resulting from irrigation system installation.

SPECIAL INSTRUCTIONS

The Contractor shall coordinate and cooperate with the Landscape Architect, General Contractor, Mechanical/Electrical Contractors, and all subcontractors, during the installation of this system. Installation of sleeves to be coordinated between the Irrigation Contractor and the General Contractor.

During the bidding period the Irrigation Contractor shall inform the RaceTrac Construction Manager of any system items or elements that are required for operation of the system specified herein, but installed or finished by others.

It is the intent and mandatory requirement that the irrigation system be installed and fully operational before planting operations begin. (Except for drip tubing which shall be installed after planting but prior to mulch installation.)

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CONTACT RACETRAC PETROLEUM, INC. PROJECT MANAGER PRIOR TO ANY REVISIONS TO THE PLAN SUPPLIED BY RACETRAC PETROLEUM, INC.

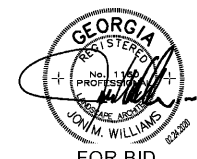


Table with columns for IRRIGATION DETAILS, RACETRAC 316@81, 839 Loganville Highway, Bethlehem, Georgia, Barrow County, DRAWN-BY, DATE, SCALE, DRAWING NAME, SHEET NO., VERSION, and DATE.