

SECTION 32 80 00 – IRRIGATION SYSTEM

PART 1 – GENERAL

1.1. SUMMARY:

- A. This standard applies to Campus Landscape Irrigation systems and related components installed during new construction or as part of any renovation and improvement project.
- B. This Standard is intended to provide a summary and guidance regarding the installation of refrigerant monitoring and leak detection systems to provide a high level of safety, to comply with applicable National and State Ordinances as well as other applicable University Design Criteria.
- C. Related Sections:
 - 1. Section 01701 - Building Systems Identification and Labeling
 - 2. Section 01771 - Contract Record Documents

1.2. SUBMITTALS:

- A. Submit the following documents for reference and/or approval:
 - 1. CADD-based Site Plan detailing proposed irrigation system and all interconnections
 - 2. Irrigation system Piping layout
 - 3. Electrical interconnection wiring
 - 4. Equipment list including model numbers and quantities.
 - 5. Installation and operating instructions for all equipment

1.3. WARRANTY:

- A. One year for overall system after Owner acceptance.
- B. Sprinkler Heads; 3 year exchange warranty.
- C. As part of the one-year system warranty, the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.

1.4. IRRIGATION SYSTEM DESIGN CRITERIA – GENERAL:

- A. Brown University's irrigation scheme is to irrigate in areas of minimum size of one city block, with one controller and one water tap per block. Future expansion of the irrigation system to all Brown properties on the block needs to be taken into account on all projects that do not encompass the whole block.
- B. Water conservation, energy efficiency, reliability, operability, maintainability, expected service life, and future replacement costs shall be taken as factors in the irrigation system design.
- C. Brown University utilizes a Hunter Genesis centralized computer control system operated from the Grounds Department located in the Facilities Management Building

via radio communication. All irrigation controllers shall be compatible and interface with this system. The computer control of the system shall not be circumvented, other than for maintenance.

- D. All proposed controller locations shall have a radio site survey performed to ensure communication with the central control system computer located at the Grounds Department.
- E. Irrigation equipment shall be configured to allow other Brown University standards requirements to be met. Examples – Plumbing and Electrical standards.
- F. Brown University utilizes city mains to provide water. Relevant exclusion meter rebate requirements shall be incorporated into all work and project requirements.
- G. Coverage: Water coverage for turf areas and planting areas shall be 100 percent, unless approved by Brown Grounds Department.
- H. Drip irrigation shall only be used in areas approved by the Brown Grounds Department.
- I. Variable speed drives shall be used on all Irrigation system booster pumps.

1.5. IRRIGATION SYSTEM DESIGN CRITERIA – DETAILED:

A. Water Services:

- 1. All water taps exiting the building shall terminate in a landscape area. No connections shall be under hardscape.
- 2. PVC is not allowed until a minimum of 2 feet from the building foundation.
- 3. All systems shall include an emergency shut off immediately outside the building in the landscaped area.
- 4. Provide exclusion meters for irrigation system at city water connection.
- 5. Provide separate back-flow protection system on irrigation system connections to water mains.

B. Foundation Penetrations:

- 1. All wall and foundation penetrations shall be done by coring.
- 2. All penetrations shall include LinkSeal for waterproofing.

C. Controllers:

- 1. Controllers shall be pedestal mounted, installed outside in a location that is able to receive a clear radio signal.
- 2. Controllers shall be mounted on concrete pads with electrical sweeps in and out of controller through the pad. Separate sweeps shall be provided for power, ground and 24 volt wiring.

D. Irrigation Zones:

- 1. Different precipitation rate heads shall not be on the same zone.
- 2. Pressure regulating devices shall be used on all spray sprinklers and where necessary on zone valves.

3. Check valves shall be used to prevent low head drainage.
 4. Five foot per second (fps) water velocity shall not be exceeded in any plastic pipe, 7.5 fps in metal pipes.
 5. All irrigation valves shall have manual isolation valves in front of them.
- E. Valves:
1. Electric Control Valves: one, one and one half and two-inch remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating.
 2. Quick Coupling Valves: Cast brass valve body construction with a working pressure of 125 psi, spring loaded so that the valve is normally closed under all conditions when the key is not inserted. Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.
 3. Isolation Valves: Mainline isolation valves shall be cast iron epoxy coated inside and outside, long bell length ring-tite valves, 200 psi rated, ductile iron gland flange, bronze stem-seal box, o- ring stem seal replaceable under pressure.
- F. Valve Boxes:
1. All valve boxes shall be resin-type with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. All boxes and covers shall be green in color, use only "T" type lids.
 2. All valve boxes shall have metal detection.
 3. All valve boxes except emergency shut offs and quick couplers shall have bolt down covers.
 4. All valve boxes with the exception of emergency shutoff or quick couplers in lawn areas shall be buried 4 inches.
 5. All valve boxes shall be installed in mulched areas wherever possible.
- G. Piping:
1. All pipe and equipment supports shall be placed in such a way that they do not interfere with the installation or removal of other serviceable components including meters and valves.
 2. Provide pipe sleeves wherever piping is going under a non-soil area, such as sidewalks, driveways and streets. Minimum cover over all sleeves is 24 inches. Sleeves shall extend 24 inches beyond edges of pavement.
 3. PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads are not acceptable.
 4. Fittings for PVC main line pipe, for all directional changes, pipe reductions and plugs shall be deep bell push-on gasket joint ductile iron fittings for PVC pipe.
 5. Main line pipe to zone valve / lateral pipe connections shall utilize push-on gasket joint ductile iron service tees; saddles (strap, bolt down or snap) are not acceptable. All nipples to be schedule 80 PVC.
 6. Quick couplers shall be mounted on brass swing joints or PVC swing joints with brass inserts.

7. Polyethylene pipe shall be used for 1 inch and 1-1/4 inch laterals only, and only for use in landscape areas. Polyethylene fittings shall have double clamps, Saddles shall not be used.
8. Smallest pipe size shall be 1 inch.

H. Swing Joints:

1. Spray sprinklers, small rotary sprinklers and medium rotary sprinklers shall be installed on swing pipe assemblies, minimum length 6 inches, maximum 18 inches.
2. Large rotary sprinklers shall be installed on 1-inch prefabricated PVC unitized swing joint assemblies with double o-ring seals, and minimum length of 12 inches.

I. Irrigation Sprinkler Heads:

1. Spray sprinklers: pressure regulating, plastic construction with ratcheting riser, removable nozzle and check valve. Pop-up height shall be 4 inches for turf and 12 inches for ground cover, shrubs and annual beds.
2. MP Rotator Sprinklers: Full and part circle pop up spray sprinklers with multi-stream rotary nozzles shall be pressure regulating (40-psi), plastic construction with ratcheting riser, removable nozzle and check valve.
3. Small/Medium Rotary Sprinklers: Gear-driven, rotary type heads, designed for in-ground installation with integral check valves and in-riser flow shut-off capability. Sprinkler shall be capable of covering a 25-44 foot radius and flow range of 0.9-7.0 gpm at 50-55 pounds per square inch of pressure.
4. Large Rotary Sprinklers: Gear-driven, rotary type heads with drain check valve and stainless steel riser designed for in-ground installation. The nozzle assembly shall elevate three inches when in operation and retraction shall be achieved by a stainless steel spring. Check valve shall be capable of holding up to 10 feet of elevation. Sprinkler shall be capable of covering a 49-61 foot radius and flow range of 7.5 to 15.7 gpm at 60 pounds per square inch of pressure.

1.6. IRRIGATION SYSTEM ELECTRICAL DESIGN CRITERIA :

A. Conduit:

1. Conduit for underground wiring beneath non-soil areas: PVC, SCH-80 conduit with solvent- weld joints.
2. Sweep ells: PVC schedule 80 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
3. Conduit for above-ground wiring to rain sensors or controllers: galvanized, rigid steel conduit.

B. Wiring:

1. Control Valve Wiring:

- a. All valve control wire shall be minimum #14-awg, common #12-awg, single strand, solid copper, UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service.
- b. Individual circuits shall be used for each zone valve.
- c. Common wire shall be white in color,

- d. Control wire for spray and rotor zones shall be red in color,
 - e. Spare wires, installed where required, shall be blue in color.
2. Splice Kits:
 - a. In ground wire connections shall be UL listed, manufactured by 3M, model DBY-6 splice kits.
 - b. All wire splices shall be made in valve boxes, at controller, or at valves.
 - c. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volts A.C. or less.
- C. Grounding Equipment:
1. Irrigation controller shall include factory-installed and recommended lightning protection and surge suppression equipment.
 2. Irrigation controller to be grounded to a 3/4-inch diameter x 10-foot long copper clad grounding rods and a 4-inch x 96-inch x 0.0625-inch copper grounding plates with minimum #6 AWG, solid, bare copper wire. Maintain minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod.
 3. All grounding connections to be with Cadweld.
 4. Ground plate shall be installed in ground enhancement material.

PART 2 – MATERIALS:

2.1. CONTROLLERS:

- A. Hunter Genesis System with rain-shut off bypass, stainless steel cabinet, pedestal mount.
1. Controller shall be capable of interfacing by radio with a central computer controller and shall be capable of responding to commands issued by a hand-held transceiver w/DTMF keypad. The hand-held radio shall be capable of timed station operation or semi-automatic operation.
 2. Controller shall be housed in manufacturer's standard stainless steel pedestal, NEMA 4X construction (gasketed, water-tight, and corrosion-resistant).
 3. Controller shall be equipped with an Intermatic #AG2401 surge arrester on the 120v incoming power.
 4. Automatic Rain Sensors: with adjustable interruption point, 1/2 inch IPS threads and stainless steel vandal resistant guard, Hunter model SG-MC.

2.2. PVC IRRIGATION PIPE FOR LATERALS AND MAINLINES:

- A. Mainline pipe shall be PVC, Class 200, Type 1120, SDR 21, Gasket-Joint PVC, conforming to ASTM No. D1784.
- B. Lateral pipe shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241.
- C. Manufacturers:
1. JM
 2. Cresline

3. Certainteed
- 2.3. PVC PIPE FITTINGS:
 - A. 2-1/2 inches and below: Schedule 40 solvent weld
 1. Manufacturers:
 - a. Dura
 - b. Lasco
 - c. Spears
 - B. Gasketed - 3 inches and above
 1. Manufacturers:
 - a. Harco
 - b. Lasco
- 2.4. PVC PIPE SLEEVES:
 - A. Class 160 water pipe, minimum size to be 3-inch.
 1. Manufacturers:
 - a. Certainteed
 - b. Cresline
 - c. JM
- 2.5. PVC PIPE FITTINGS:
 - A. PVC pipe fittings shall be ductile iron, grade 70-55-05 per ASTM A536 and gaskets per ASTM F477. All nipples to be schedule 80 PVC.
 1. Manufacturers:
 - a. Harrington Corporation
 - b. Harco
- 2.6. POLYETHYLENE IRRIGATION PIPE:
 - A. Polyethylene (PE3408) pipe, SDR 15, Class 100, Type III, Grade 3, Class C per ASTM D2239, with a minimum pressure rating of 100 psi.
 1. Manufacturers:
 - a. Oil Creek
 - b. Polystar
- 2.7. POLYETHYLENE IRRIGATION FITTINGS:
 - A. Fittings for polyethylene pipe shall be insert PVC or Nylon type fittings per ASTM D2609. Fittings shall conform to NSF standards and be attached with two (2) dog-eared stainless steel clamps.
 1. Manufacturers:
 - a. Dura
 - b. Lasco
 - c. Spears
- 2.8. POLYETHYLENE CLAMPS:
 1. Manufacturers:
 - a. Oetiker

2.9. SWING JOINTS:

- A. 1 inch and above:
 - 1. Manufacturers:
 - a. Dura
 - b. Lasco
 - c. Spears
- B. ½ inch and ¾ inch:
 - 1. Manufacturers:
 - a. Hunter
 - b. Lasco
 - c. Spears

2.10. VALVES:

- A. Electric Control Valves:
 - 1. Manufacturers:
 - a. Hunter model PGV series, or approved equal.
- B. Quick Coupling Valves:
 - 1. Manufacturers:
 - a. Hunter HQ-44RC-AW, or approved equal.
 - b. Hunter HK-44, or approved equal.
 - c. Hunter HS-1, or approved equal.
- C. Isolation Valves: Mainline isolation valves shall be cast iron epoxy coated inside and outside, long bell length ring-tite valves, 200 psi rated, ductile iron gland flange, bronze stem-seal box, o- ring stem seal replaceable under pressure.
 - 1. Manufacturers:
 - a. Nibco, Model P-619- RW, or approved equal.
- D. Ball Valves:
 - 1. Manufacturers:
 - a. Apollo
 - b. Boston
- E. Gate Valves:
 - 1. 2-1/2 inches and below:
 - a. Manufacturers:
 - i. Nibco T-113-irr with cross handle, or approved equal.
 - 2. 3 inches and above:
 - a. Manufacturers:
 - Kennedy Ken-seal Series
 - ii. Clow 2630 Series
- F. Valve Boxes:
 - 1. Manufacturers:
 - a. Armor, or approved equal.

2.11. SPRINKLERS:

- A. Flow type sprinkler heads:

1. Manufacturers:
Hunter , or approved equal.

PART 3 – EXECUTION

3.1. PIPING:

- A. Mainline pipe shall have minimum 16 inches of cover; Lateral pipe shall have minimum 10 inches of cover.
- B. In installing irrigation pipe, route the pipe as necessary to prevent damage to tree roots. Where trenching must occur near trees, provide proper root pruning and sealing methods to all roots 1-inch and larger.
- C. Provide thrust blocks for piping over 3” at all piping changes of direction.

3.2. VALVES AND VALVE BOXES:

- A. Finish elevation of all boxes shall be at grade, with a crushed stone base installed before valve box; Crushed stone shall not be poured into previously installed valve boxes.
- B. Valves shall be set plumb with adjusting handle and all bolts, screws and wiring accessible through the valve box opening.
- C. Check and tighten valve bonnet packing before valve box and backfill installation.
- D. Adjust zone valve operation after installation using flow control device on valve.

3.3. ELECTRICAL:

- A. Wiring shall be installed along with the main irrigation lines. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches.
- B. Provide suitable slack loops for expansion and contraction; Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.
- C. All wiring shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves.
- D. Install magnetic warning tape over all main wiring runs.
- E. Wiring shall have a minimum of 12 inches of cover.
- F. Electrical conduit sleeves shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controllers and rain sensor. Conduit sleeves shall extend 12 inches beyond edges of walls and pavement.
- G. Label all control wiring for zones served at each end.
- H. Label Controller with power source panelboard location, name and circuit number.

3.4. IRRIGATION SYSTEM FLUSHING, TESTING AND ADJUSTMENTS:

- A. Flushing:
 - 1. Open the control valves and flush out the system under a full head of water after all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals.
 - 2. Sprinkler internals, and nozzles shall be installed only after flushing of the system has been successfully accomplished.
 - 3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles for thirty (30) days after substantial completion of the landscape irrigation system.
- B. Testing:
 - 1. Leakage test: test all lines for leaks under operating pressure. Repair all leaks and re-test. Brown project manager must observe test.
 - 2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Owner's Representative at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate. Readjust heads and/or head locations as necessary or directed to achieve proper coverage.
 - 3. System Test: Perform operational test to ensure that controller is properly operating from local and remote controls. Test controller to ensure that zones are properly programmed for sequence and run times. Readjust and calibrate as required.

END OF SECTION