

# DIVISION 32 – EXTERIOR IMPROVEMENTS

## 32 80 00 IRRIGATION

### PART 1 - GENERAL

#### 1.01 DESIGN REQUIREMENTS

- A. Design shall be square or triangular spacing and head to head coverage.
- B. Electrical Design: Consultant is responsible for informing the Electrical Engineer or coordinating the electrical design, with the requirements for the control system power during the design phase of the project.
- C. Areas to be Irrigated: All planted areas adjacent to major buildings shall have automatic underground sprinkler systems. All new planting and turf is to be scheduled for irrigation unless specifically designed to thrive without supplementary watering.
- D. System shall be designed with balanced precipitation rates within each zone and zoned to accommodate the horticultural requirements of different plant material, wind, terrain, site exposure and slope. (i.e., lawn vs. shrub or ground cover, sloped vs. flat, and northern vs. southern exposure.)
- E. Pipe:
  - 1. Design piping plans with 45 degree and 90 degree angles only.
  - 2. Bends in pipe shall not exceed 18 degrees in 20 feet.
  - 3. Install no more than two lines per trench.
  - 4. When laying two lines in a trench, they shall be laid side by side and never stacked, with a minimum of 2–inches between lines.
  - 5. Install fittings at least 6–inches apart.
- F. Sleeving and Conduit:
  - 1. Show required sleeving and conduit on Irrigation drawings. Coordinate with Prime Consultant and Civil Engineer to ensure cross-referencing with Architectural and Civil drawings.
- G. Valves:
  - 1. Isolation Valves: Provide main line isolation valves to divide the main line into manageable segments. Select locations to isolate major branches of the system or individual athletic fields where possible.
    - i. Isolation valves shall be installed in vertical Schedule 40 PVC pipe (minimum 6–inch diameter) within a 10–inch round valve box.

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2. Check Valves: Provide check valves only on lateral lines for every 12 feet of elevation change.
3. Shrub zones and lawn zones shall have separate valves.
4. Each automatic valve shall be installed in a valve box.
5. Automatic valves shall be installed in-line, with no valves closer than 24–inches apart.
6. Provide unions on both sides of valves.

#### H. Sprinkler Heads:

1. Maximum sprinkler head height shall be 6–inches.
2. Sprinkler heads shall be installed on 3-way swing joints.
3. Sprinkler heads shall be located no closer than 3–inches from walkway or curb.

#### I. Winterization:

1. Design and install  $\frac{3}{4}$  inch or 1 inch quick couplers to enable system "blow out."
2. Provide manual drain valves at all major low points in the system. When feasible, connect to the storm drainage system.

#### 1.02 MAINTENANCE SCHEDULE

- A. Consultant shall provide a schedule of proposed maintenance for approval by the WSU Grounds Department. Maintenance schedule shall include, but not be limited to:
  1. Seasonal winterization and start-up of the system.
  2. Monitoring and adjusting automatic controller scheduling.
  3. Checking and adjusting elevation of valve boxes and irrigation heads.
- B. The Contractor shall continue to be responsible for maintaining all irrigation systems and equipment for a period of 120 days after Landscaping Substantial Completion. See PART III – EXECUTION.

## **PART 2 - PRODUCTS**

### 2.01 MATERIALS

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#### A. Pipe:

1. Laterals: PVC Schedule 40
2. Main Lines: PVC Schedule 40
  - i. High-Density Polyethylene (HDPE) shall not be used on mainlines.
3. Repair of existing galvanized steel pipe will typically require matching existing pipe in lieu of PVC. Clarify requirements with WSU Grounds Shop.
4. Quick Couplers: Schedule 40 galvanized steel, painted and wrapped
5. Swing Joints: All swing joints shall be Schedule 40, 90-degree street elbow (HDPE material) with Schedule 80 PVC nipples.
  - i. Swing joints shall consist of the same size pipe as the inlet on the head.
  - ii. Swing joints shall be made with pipe standard length of 6-inches (+/- 2-inches depending on site conditions).
  - iii. All swing joints at end of line shall be installed on a PVC 90 degree slip thread Schedule 40 PVC elbow.
6. Sleeves: All pipe and wire installed under any paved surface (roads, walks, paths, curbs, walls, stairs, etc.) shall be sleeved.
  - i. Schedule 40 PVC, minimum 6-inch diameter.
  - ii. Specify service line polyethylene pipe in sleeve runs greater than 20 feet.
  - iii. No glued fittings in a sleeve; only solid lines.

#### B. PVC Cement and Primer:

1. Primer: Weld-On P-70 Primer
2. Cement: Weld-On 711 PVC Solvent Cement, gray

#### C. Valves:

1. Valve - Auto Control:
  - i. Acceptable Manufacturers: Rain Bird model PEB
2. Curb Stop Ball Valves:

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- i. Material: Bronze
- ii. Acceptable Manufacturers:
  - 1) Meuler
  - 2) Ford
- 3. Check Valves:
  - i. Acceptable Manufacturers: King Brothers
- 4. Master Valves:
  - i. Acceptable Manufacturer: Rain Bird EFA/EFB, brass
- D. Flow Meter:
  - 1. Flow meter and the required dimensional straight pipe run shall be sized one pipe size smaller than the main line diameter.
  - 2. Acceptable Manufacturer: Calsense FM series, brass
- E. Vaults and Boxes:
  - 1. Install no more than one valve per valve box.
  - 2. Valve boxes shall be set with top at grade in lawns and 1–inch above grade in shrub zones.
  - 3. Automatic valves between 1 – 2 inches:
    - i. Install in a Carson or Rain Bird Valve Box, 11 x 17 inches.
  - 4. Automatic valves larger than 2–inches:
    - i. Install in a Jumbo Carson Valve Box, 14 x 21 inches.
  - 5. Install Hose Bibs and Quick Couplers in 10–inch round Carson Valve Boxes.
- F. Irrigation Heads:
  - 1. Materials:
    - i. Plastic
    - ii. Stainless Steel

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2. Provide additional spare heads of each model equal to 10 percent of the quantity to be installed.
  3. Pre-Approved Manufacturers:
    - i. Sprayheads:
      - 1) Rain Bird 1800 Series (without SAM or PRS)
      - 2) Hunter
    - ii. Rotors:
      - 1) Hunter
- G. Automatic Controller:
1. All controllers shall be Calsense ET2000e series with LR (internal local radio modem) and RRe (enhanced radio remote receiver board) components.
- H. Automatic Controller Enclosure:
1. The controller shall be housed in a factory pre-assembled, UL-listed, weather proof, lockable, powder-coated steel enclosure (by Calsense) suitable for wall mounting or freestanding pedestal mounting.
    - i. Wall mount: Specify stainless steel backboard (Calsense SSBP option); top of board shall be 6 feet above ground level.
    - ii. Pedestal mount: Specify 38–inch height with flip top to provide easy access for programming from a standing position under normal installations.
    - iii. Controller enclosure shall be mounted outdoors.
    - iv. Enclosure shall come complete with lightning and surge protection.
    - v. All terminals shall be factory labeled.
    - vi. On/Off switch shall be provided to isolate controller along with GFI receptacle.
    - vii. Optional radio antenna premounted and connected on SSE-R enclosure shall be included.
  2. Ten year warranty on enclosure and Calsense installed equipment within shall be provided.
- I. Control Wires:

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1. All control wire shall be copper, type UF, single strand, UL approved for 24-50 volts, rated for direct burial.
    - i. Lengths up to and including 1000 feet: #14
    - ii. Lengths greater than 1000 feet: #12
  2. Provide one spare wire to each valve group manifold.
  3. Insulation colors on control wires:
    - i. Positive: Red
    - ii. Common: White
    - iii. Spares: Orange
    - iv. Flow Meter wire: Red and Black
    - v. Master Valve wire: Yellow
- J. Wire Splices:
1. Splices shall be made with Spears DS-400 or approved equivalent.
  2. No splices allowed on flowmeter wiring.
  3. No splices allowed in sleeves.
  4. Any splice shall be protected in a 10–inch round valve box.
- K. Pumps:
1. See technical requirements in Section 22 06 10 13 “Plumbing Pumps.”
  2. Pumps shall be housed on a concrete pad above grade and protected from the elements in a weather-tight and insulated protective encasement or housing.
  3. Pumps shall not be installed in a buried or below-grade vault or structure.
- L. Backflow Prevention Assemblies:
1. See Section 33 12 13.13 “Water Supply Backflow Prevention Assemblies.”
  2. Wherever possible, install Backflow Prevention Assemblies in the nearest adjacent building, preferably in the Mechanical Room.

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3. When indoor installation is not feasible, install Backflow Prevention Assemblies in a concrete vault, 30 wide x 36 long x 32 high inches.
  - i. Vaults shall be bottomless, with a minimum 6–inches of 5/8– inch minus gravel for drainage.
- M. Quick Couplers and Hose Bibs:
  1. All hose bibs shall be brass, with 45 degree angle.
    - i. Pre-Approved Manufacturer: Champion HB2M
  2. All quick couplers and hose bibs shall be put on 3-way swing joints.
  3. Quick couplers for irrigating shall be 3/4–inch (Rainbird 33D).
  4. Quick couplers for system winterization shall not exceed 1–inch (Rainbird 44D).

### **PART 3 - EXECUTION**

#### 3.01 QUALIFICATIONS

- A. Irrigation Contractor/Installer shall be a company specializing in irrigation work, with a minimum 5 years of documented experience in irrigation installation of a similar nature.

#### 3.02 INSTALLATION

##### A. Layout:

1. Contractor shall advise Consultant and WSU Project Manager of any discrepancies between drawings and actual ground measurements prior to beginning installation.
2. Contractor shall check correlation between heads and any trees, hydrants, signs, street lights, etc., and notify Project Representative of any potential conflict.

##### B. Pipe:

1. PVC pipe shall be snaked slightly in trenches.
2. Buried pipe depth:
  - i. Main lines: 18–inches
  - ii. Lateral lines: 12–inches

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3. Backfill pipe with debris-free native soil.
  4. Install fittings no closer than 6–inches apart.
  5. Swing joints shall not be installed until after pressure tests.
  6. Follow manufacturer's instructions for gluing of joints. Allow PVC joints to set up between gluing and application of water pressure per manufacturer's recommendation.
  7. Weld PVC pipe in temperatures following manufacturer's recommendation.
  8. In rainy or wet conditions, weld PVC pipe under cover.
- C. Sleeves:
1. All sleeve locations shall be marked on new concrete using WSU Facilities Services concrete stamp for Irrigation Sleeve. Stamp is available at no charge to the Contractor for temporary use. Coordinate with WSU Construction Manager or WSU Grounds Staff.
- D. Flow Meter:
1. Install per manufacturer's specifications.
  2. Assembly includes flow meter and required runs of pipe before and after the meter.
  3. Provide one extra orange wire in flowmeter / master valve harness.
- E. Sprinkler Heads:
1. Use bottom inlet of sprinkler heads only.
  2. All heads next to sidewalk or curbs shall be ½ – 1 inch below level of walk or curb.
  3. All heads in the center of shrub beds shall be 1 - 1½ inches above final grade.
- F. Wiring:
1. Contractor shall provide power to the controller locations.
  2. Control wire shall be installed in rigid PVC conduit from the base of the controller to one foot below grade. Flowmeter and master valve wire shall be installed in rigid 1–inch PVC conduit. All other control wire shall be direct buried.



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3. Lay wire in trenches under pipe.
4. All buried wires shall be taped into bundles (taped every 15 feet), except if installed in conduit or sleeve.
5. Provide a coil of wire minimum 24–inches long at valve.
6. Provide 24–inches of uncoiled wire inside controller cabinet.
7. Provide a 12–inch expansion and contraction loop at every valve box, corner, and every 100 feet of wire length in the trench.
8. There shall be no splices in the wire in new systems except at valves. Any splicing required to connect with existing systems must be first approved by the WSU Grounds Department.

#### **3.03 FIELD QUALITY CONTROL**

- A. Pressure Testing: Pressure testing shall be observed by the WSU Construction Manager and WSU Grounds Staff as follows:
  1. Contractor shall notify WSU Construction Manager at least 24 hours prior to pressure testing.
  2. The Contractor shall use test equipment in good condition and test equipment shall have no leaks at couplings which might compromise test procedure.
  3. After zone valves are installed, pressure test main at 100 psi. System will pass when it maintains test pressure for the 30 minute test period.
  4. Any leaks will be corrected and the test will begin anew. The process will be complete when systems hold with no noticeable drop in pressure for 30 minutes.
  5. Lateral Lines: With lateral tees capped, pressure test by pumping system to 100 psi. The system testing will be accepted when it maintains 100 psi for 30 minutes with no noticeable drop in pressure.
  6. Test shall be performed with all fittings, valves, connections, couplings and all other connection points exposed until the completion and acceptance of the pressure test.
- B. Flushing System: Flushing shall be observed by the WSU Construction Manager and WSU Grounds Staff as follows:
  1. All lines shall be flushed after swing joints are installed.

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2. After all new irrigation piping and risers are in place and connected, all necessary division work has been completed and prior to installation of irrigation heads, all control valves shall be opened and a full head of water used to flush out the system completely. Flush until water flows clear and no debris is caught in a fine mesh strainer placed over each of several outlets - including all outlets at end of lines.
  3. All heads shall be installed immediately after flushing.
- C. Coverage Testing: Coverage testing shall be observed by the WSU Construction Manager and WSU Grounds Staff as follows:
1. Contractor shall notify the WSU Construction Manager at least 24 hours prior to the performance of the Coverage Test.
  2. After system is 100 percent installed, a water coverage test will be performed to determine whether water coverage and operation of the system is adequate for planting, without areas of excessive flooding, dry spots, areas of insufficient overlap, or excessive over spray. If the WSU Construction Manager determines the system inadequate due to poor workmanship or materials, it shall be rejected or repaired at the Contractor's expense and both pressure and coverage tests repeated until accepted.

#### **3.04 CLEAN UP**

- A. Area shall be kept reasonably free of debris at all times.
- B. Upon completion, all debris and excess materials shall be removed and all walks and roadways shall be swept and washed. Contractor shall ensure sediments are not carried into the storm drain system.

#### **3.05 120-DAY MAINTENANCE PERIOD**

- A. The Contractor shall continue to be responsible for maintaining all irrigation systems and equipment for a period of 120 days after Landscaping Substantial Completion.
- B. The Contractor shall supply all labor, supervision, materials, and equipment to meet all specifications during this period. After completion of the Maintenance Period, the Contractor shall turn over management of the site to WSU Grounds, using a written agreement coordinated through the WSU CM.

#### **3.06 WARRANTY PERFORMANCE**

- A. Throughout the one-year Landscaping Warranty Period (see Section 32 90 00 "Landscaping"), Contractor shall monitor and maintain the new irrigation

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system in an operational and water-efficient condition. Contractor shall ensure balanced irrigation rates, no excessively wet or dry areas, and properly functioning equipment including pump, controller, backflow prevention, valves and heads.

**END OF SECTION**