

SECTION 28 IRRIGATION

28-1 GENERAL

- A. The work in this section related to Contractor furnishing and installing an irrigation system.

28-2 RELATED WORK

- A. Section 29, PLANTING.
- B. City of Palo Alto Water, Gas & Wastewater Utility Standards Details Drawings and Specifications.

28-3 PRODUCTS

- A. Pressure Main Line Pipe and Fittings: All Polyvinyl Chloride (PVC) shall bear the manufacturer's trademark name, material designation, size, applicable Iron Pipe Size (I.P.S.) schedule and National Standards Foundation (NSF) seal of approval.
 - 1. PVC Pressure Rated Pipe: ASTM D1785 NSF approved Type I, Grade I, PVC 1120 Schedule 40 with an appropriate standard dimension ratio (S.D.R.), schedule 80 for two-and-one-half (2-1/2) inches or larger.
 - 2. PVC Solvent-weld Fittings: ASTM D2466 Schedule 80, 1-2, II-I NSF approved.
 - 3. Solvent Cement and Primer for PVC solvent-weld pipe and fittings: Type and installation methods prescribed by the manufacturer.
 - 4. Connections between Main Lines and RCVs: Schedule 40 PVC (threaded both ends) nipples and fittings.
- B. Lateral Line Piping and Sleeving: All PVC shall bear the manufacturer's trademark name, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
 - 1. PVC Pressure Rated Pipe: ASTM D1785 NSF approved Type I, Grade I, PVC 1120 Schedule 40 with an appropriate standard dimension ratio (S.D.R.).
 - 2. PVC Solvent-weld Fittings: ASTM D2466 Schedule 40, 1-2, II-I NSF approved.

- C. Remote Control Valves (Standard Drawing 506): Rain Bird PEB series; PESB or shown on Drawings. *PESB-R used for recycled water applications.
- D. Controller (Standard Drawings 501, 502 & 511):
 - 1. Rain Bird ESP series or as shown on the project plans.
- E. Control Wires (Standard Drawing 505):
 - 1. Type: Copper with UL approved for direct burial (UF), size 14-1. Common ground wire with white insulating jacket; individual control wires with insulating jacket of color other than white.
 - 2. Splices: Splice-Kote, Dura-Seal heat shrink nylon wire connector, or 'DBY' by 3M.
- F. Box for Remote Control Valves: Black rectangular plastic valve box with ID tags inside valve box and lid – Rain Bird VB Series standard size or approved equal. Increase box size as required to fit. Use concrete box with steel lid in areas receiving vehicular traffic or in concrete paving. Install gravel at bottom.
- G. Spray Heads (Standard Drawing 509):
 - 1. Pop-up Rain Bird RD-1800-Series, or approved equal, or as listed on the project plans. (example of specification RD-06-P30-F-NP*--- *NP used for Non-potable applications)
 - 2. Shall have approximately 30 psi water pressure coming out of nozzle to prevent "fogging" or misting. Shall have pressure-compensating devices.
 - 3. Shall have ability to prevent low head drainage. Use heads with integral check valves.
 - 4. Shall not have spray blocked by shrubbery, twelve (12) inch pop ups in shrub area.
 - 5. Shrub material to be planted minimum thirty (30) inches clear from pop ups where possible.
- H. Quick Coupler Valves (Standard Drawing 507):
 - 1. Quick coupler valve shall be Rain Bird 44LRC (44NP if non-potable water source) or as listed on the Drawings.

- I. Backflow Prevention Device (Standard Drawing 512):
 - 1. Wilkins 975XL or approved equal as required by the City of Palo Alto Utilities Standards and as shown on Drawings.
 - 2. Riser assemblies from main line burial depth to backflow preventers shall be copper pipe.
 - 3. All metallic pipe and fittings installed below grade shall be painted with two coats of Koppers #50 Bitumastic, or approved equal. Pipes may be wrapped with an approved asphaltic tape in lieu of the liquid-applied coating.

- J. Backflow Prevention Device Enclosure
 - 1. Le Meur or approved equal.
 - 2. Coordinate size of enclosure with plumbing for minimum clearance and size. Enclosure to include hasp and staple to receive padlock. Padlock to be provided by City.
 - 3. Finish: Black powder coat or as listed on the project plans.

- K. Ball Valve (Standard Drawing 506): Spears PVC 'True Union' Industrial ball valve Locate before each remote control valve as shown on project plans. Size ball valve to match remote control valve.

- L. Gate Valve (Standard Drawing 508): Watts lead free gate valve bronze or as shown on the project plans.

- M. Miscellaneous Installation Materials
 - 1. Solvent Cement and Primers for Solvent-weld Joints: Make and type approved by manufacturer(s) of pipe and fittings. Maintain cement proper consistency throughout use.
 - 2. Pipe and Joint Compound: Permatex: Do not use on sprinkler inlet port.
 - 3. All metal fittings shall be lead free.

- N. Miscellaneous Equipment/Accessories
 - 1. Concrete Pads: Poured-in-place six (6) sacks mix concrete. See City Standard Specifications Section 16.

2. Thrust Blocks at each 90 degree turn in main line: Poured-in-place six (6) sacks mix concrete.
3. Six (6) sacks concrete mix shall contain six (6) sacks of Type II modified cement per cubic yard and shall provide a minimum of 3500 pounds per square inch at twenty-eight (28) days.

28-4 EXECUTION

A. Examination

1. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system g.p.m. to operate the irrigation system as indicated on the project plans. Contractor to report pressure below 70 psi to City Staff, Project Manager, or City Landscape Architect.
2. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on project plans.
3. Notification: Submit written notification within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

B. Connections to Services

1. Provide connection to water source and to the existing meters.

C. Layout

1. Mark shrub location on site using stakes, gypsum, or similar approved means and obtain location approval by the Engineer before spray head locations are set.

D. Excavating and Trenching (refer to Standard Drawings 503 & 504):

1. Dig trenches wide enough to allow a minimum of three (3) inches between parallel pipe lines. Do not bundle pipe together in trenches. Provide a minimum cover from finish grade as follows:
 - a. Twenty-four (24) inches Deep: Over pipe on pressure side of irrigation control valve, control wirers and quick-coupling valves, and all pipe/sleeves under roadways.
 - b. Eighteen (18) inches Deep: Over pipe on non-pressure side of irrigation control valve.

E. Pipeline Assembly

1. General

- a. Install pipe and fittings in accordance with manufacturer's current printed specifications.
- b. Clean all pipes and fittings of dirt, scale and moisture before assembly.

2. Solvent-welded Joints for PVC Pipes:

- a. Solvents: Use solvents and methods specified by pipe manufacturer.
- b. Curing Period: Minimum of one (1) hour before applying any external stress on the piping and at least twenty-four (24) hours before placing the joint under water pressure.

3. Threaded Joints for Plastic Pipes:

- a. Quick Coupler Valve Swing Joint Assembly: Use non-hardening pipe joint compound.
- b. Use Permatex on all other threaded PVC fittings.
- c. Joining: Use strap type friction wrench only. Do not use metal-jawed wrench. Assemble finger tight plus one or two turns.

4. Laying of Pipe:

- a. Bedding On-grade: Remove from trench all rocks or clods. Bed pipe in at least two (2) inches of soil excavated from trench. Backfill on all sides of piping to provide a uniform bearing.
- b. Snaking: Snake pipe from side to side of trench bottom to allow for expansion and contraction. Minimum allowance for snaking is one (1) additional foot per one-hundred (100) feet of pipe.
- c. Moisture Restrictions: Do not lay PVC pipe when there is water in the trench. Do not assemble PVC pipe unless the pipe is dry.

F. Control Valves (refer to Standard Drawing 506):

1. Install in valve box where shown on drawings and group together where practical. Install box flush with finish grade, not necessarily level.

2. Install ID tags on all valves.
 3. For connections/expansions to existing systems, coordinate with Parks Managers for capacity and continuation of valve ID tags.
 4. Install only one valve per box unless instructed otherwise by a city representative.
 5. Each remote-control valve needs to be supported during installation and backfilling to ensure the main line, valve, and lateral are straight, level and not buried at different angles putting stress on pipe and fittings.
- G. Sprinkler Head Installation (refer to Standard Drawings 509, 510, 513 and 513a):
1. Pop-up Heads:
 - a. Place all sprinkler heads in planting areas with top of heads set to finish grade or top of mulch as required.
 - b. Place part-circle pop-up sprinkler heads six (6) inches from edge of and flush with top of adjacent paved areas at time of installation.
 - c. See standard Drawings 513 (Bubbler on Flex Tube) and 513a (Drip Loop System) for more details.
 2. Refer to AB 1881 Guidelines for overhead irrigation near hardscapes for distances at top right of drawing. Overhead irrigation shall not be permitted within twenty-four (24) inches of any non-permeable surface. Allowable irrigation within the setback from non-permeable surfaces may include drip, drip line, or other low flow non-spray technology. The setback area may be planted or unplanted. The surfacing of the setback may be mulch, gravel, or other porous material.
- H. Automatic Controller (refer to Standard Drawings 501 & 502):
1. General: Install per local code and manufacturer's current printed specifications.
 2. Connection to Valves: Connect remote control valves to controller.
 - a. For two-wire decoder systems, coordinate decoder connection with Parks Managers and have addresses for each valve on a spreadsheet corresponding with valve number on plan.

- I. Control Wiring (refer to Standard Drawing 505):
 - 1. General: Install control wires in common trenches with sprinkler mains and laterals wherever possible. Lay to the bottom side of pipe line. Provide looped slack at valves. Snake wires in trench to allow for contraction of wires. Tie wires in bundles at ten (10) feet intervals.
 - 2. Extra Length: Provide thirty (30) inches extra control wire at remote control valve splice to facilitate the removal of the remote control bonnet to finish grade without cutting wires.
 - 3. Spare: Install one unconnected spare control wire running from the controller to control valve box.
 - 4. Splicing: Crimp control wire splices at remote control valves. Seal with specified splicing materials.

- J. Closing of Pipe and Flushing of Lines:
 - 1. Capping: Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.

- K. Testing of Irrigation System:
 - 1. Make hydrostatic tests with RCV and QC installed and when welded PVC joints have cured at least twenty-four (24) hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed. Contact City Landscape Architect and Parks Manager seventy-two (72) hours in advance to set up pressure test and site review.
 - 2. Pressure test valves and quick couplers for a minimum of six (6) hours at 10 psi higher than rated.
 - 3. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early the following day.
 - 4. Apply continuous static water pressure of 125 psi in accordance with Caltrans Standard Specifications Section 20-2.01A(4)(b)(ii) Method A.
 - a. For Method A pressure testing for leakage:
 - i. Calibrate pressure gauge from 0 to 200 psi in 5 psi increments. Pressure gauge must be accurate to within a tolerance of 2 psi.

- ii. Fill the supply line with water and connect the line to a pressure gauge. Place the pipeline under a pressure of 125 psi. Remove the source of pressure and leave the line under the required pressure.
 - iii. Test the supply line under the required pressure for a period of one (1) hour. The pressure gauge must remain in place until each test period is complete.
 - iv. Leaks that develop in the tested portion of the system must be located and repaired after each test period if a drop of more than 5 psi is indicated by the pressure gauge. After the leaks have been repaired, repeat the one (1) hour pressure test until the drop in pressure is 5 psi or less.
 - b. For a system consisting of a new supply line connected to an existing line, the new supply line must be isolated from the existing line and tested.
5. Once the leaks in the system have been repaired, contact City representatives (City Project Manager, Landscape Architect and Parks Managers) for static pressure test of 125 psi for a four (4) hour duration. Once system holds for four (4) hours without a drop in pressure, it will pass.
6. Contractor is to have backflow device tested and completed certification submitted to City Landscape Architect, Parks Managers, and Project Manager.

L. Adjustment of the System:

1. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings. Adjust the arc and radius as applicable. Adjustment to arc and radius to be max of 25% of intended design, greater adjustment requires review of overall irrigation design.
2. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the project plans.
3. When the landscape sprinkler system is completed and before planting, perform a coverage test to determine if the water coverage for planting areas is adequate. Contact City Landscape Architect seventy-two (72) hours in advance to set up coverage meeting.
4. Test controllers individually. Demonstrate that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process. Installation contractor to meet with City Staff & maintenance contractor to review operation of each device upon completion/turnover of project.

5. Demonstrate that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

M. Backfill and Compacting

1. General: After system is operating and required tests and reviews have been made, backfill excavations and trenches with clean soil, free of debris.
2. Backfill for All Trenches: Regardless of the type of pipe covered, compact to minimum 95% density under pavements and 85% under planted areas.
3. Finishing: Dress off areas to finish grades. Re-dress any areas which subsequently settle. Re-seed in the turf area.

N. Maintenance

1. The entire sprinkler irrigation system shall be under full automatic operation for a period of two (2) days prior to any planting.
2. Maintain/repair system for full duration of plant maintenance period.

O. Reviews Prior To Acceptance

1. No reviews will commence without record drawings, without completing previously noted corrections, or without preparing the system for review.

P. Final Review and Cleanup

1. Operate each system in its entirety at time of final review. Any items deemed not acceptable shall be reworked until deemed acceptable.
2. Warranty period will start after the end of the ninety (90) day plant establishment maintenance period and the issuance of substantial completion.

END OF SECTION