CITY OF LATHROP

Department of Public Works

Design & Construction Standards

2022

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SECTION 9
IRRIGATION SYSTEM STANDARDS

9-1 GENERAL

Irrigation system shall include all appurtenances, incidentals and accessories required for proper installation and operation of the system.

All irrigation systems shall be designed in accordance with the State of California Model Water Efficient Landscape Ordinance and LMC 17.92.

9-2 MANUFACTURER'S WARRANTIES

Manufacturer's warranties, guarantees, instruction sheets and parts lists furnished with articles or material incorporated in the work, shall be delivered to the City Engineer prior to acceptance of the product.

9-3 GUARANTEE

The sprinkler system shall be guaranteed for a period of one (1) year from date of project acceptance. Should any trouble develop within the time specified above due to faulty workmanship or materials, the problem shall be corrected by the Contractor, without expense to the City.

Any settling of backfilled trenches during the one (1) year period after acceptance shall be repaired by the Contractor, at no expense to the City, including the restoration of all damaged property.

9-4 RECORD DRAWINGS

The Contractor shall furnish the Engineer with "As-Built" Record drawings showing any changed or differing site conditions, locations and depths of pipes and valves, etc. The irrigation system will not be accepted until "As-Built" Record drawings are furnished and accepted by the City.

9-5 WATER TAPS ON CITY MAINS

All taps into existing City mains or active service lines shall be "hot taps" made by approved personnel/Contractor at Contractor expense. No taps will be made until tap fees have been paid to the City (refer to the City's Comprehensive Fee Schedule).

Contractor shall provide traffic controls, to the City's satisfaction, when a tap is occurring in the road right-of-way.

The Contractor shall excavate and fully expose the water main to be tapped and the Contractor will provide all material approved via submittals necessary to perform the water tap. The Contractor shall be responsible for trench shields (as required), backfill compaction, final grading, and pavement replacement (if applicable) over the water main.

The Contractor shall make the necessary arrangements with the City to have City crews available to make all hot taps into the city systems.

9-6 CONNECTIONS TO EXISTING LANDSCAPE MAINS

Connections to existing park landscaping water mains will be witnessed by the City. The contractor, with proper license, shall perform excavation, expose the main, and provide and install necessary trench safety.

The Contractor shall pay all costs associated with making taps to an existing water line.

City crews will make necessary shutdowns of existing facilities as required.

9-7 SALVAGE

Unless otherwise specified, all salvageable material and equipment removed from the present installations which are not to be reinstalled shall be delivered in good and clean condition to the Parks and Recreation Department at the City Municipal Corporation Yard.

9-8 CONDUIT

Conduits shall be either mild steel, rigid, hot dipped galvanized or Schedule 40 polyvinyl chloride (PVC). The same type of conduit shall be used for the entire system.

A. Requirements for Mild Steel, Rigid Conduit: The rigid steel conduit shall be thoroughly cleaned and all burrs removed. The use of thin-wall conduit is specifically prohibited for underground installation.

Exterior and interior surfaces of all conduit and fittings shall be uniformly and adequately zinc coated by the hot-dipped galvanizing process. The interior and exterior of a six inch (6") sample cut from the center of a standard length of conduit when tested shall not show a fixed deposit of copper after four, one-minute immersions in the standard copper sulfate solution.

The interior of the conduit shall have a continuous coating of lacquer or enamel. Each length shall bear the label of Underwriters' Laboratories, Inc. Installation shall conform to appropriate articles of the Code.

Rigid steel conduits shall be not less than two inches (2") in diameter. Contractors, at their own expense and discretion, may be allowed to use larger size conduit, upon request. Where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings shall be permitted in any run. All conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit shall be bent, with approved hydraulic bender, without crimping or flattening, using the longest radius practicable. All conduit ends shall be sealed with a slip on cap until wiring is started. When caps are removed, conduit ends shall be provided with approved conduit bushings.

Conduit stubs, caps, exposed threads and all standard screw joints shall be painted with zinc rich paint or an equal rust preventative paint.

All mild steel, rigid conduits, where exposed to a corrosive environment, must be OCAL or approved equal. All conduit openings mild steel, rigid and PVC whether used or spare must be identified and sealed with duct seal.

B. Requirements for Schedule 40 Polyvinyl Chloride Conduit: Polyvinyl Chloride conduit (PVC) shall be ninety degrees (90°) C rated and listed by Underwriters' Laboratories. Conduit shall conform to NEMA Standards and be in conformance with Article 347 of the California Electrical Code. Conduit, fittings and cement shall be produced by the same manufacturer, who shall have at least five (5) years' experience manufacturing the product. Material shall have a minimum tensile strength of 7,000 psi at 73.4°F; flexural strength of at least 11,000 psi and a minimum compressive strength of 8,600 psi. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

All PVC conduits shall be not less than two inches (2") in diameter. Contractors, at their own expense and discretion, may be allowed to use larger size conduit, upon request. Where larger size conduit is used, it shall be for the entire length of the run. All conduit ends shall be sealed with a slip on cap until wiring is started. The slip on cap shall have a slot large enough for a pull rope. Unless otherwise specified, all PVC conduits shall contain one No. 10 green ground conductor.

C. Conduit Installation: The installation of conduit in lawn areas shall be by approved boring method or by trenching. If trenching is used, Contractor shall first remove the sod prior to trenching. The removal of sod over jack holes or over trenches shall be done by a sod cutting machine. Removal of sod by other means shall not be accepted. Each strip of sod removed shall be rolled into a neat roll without damage. All sod removed shall be replaced within forty-eight (48) hours. Conduits in existing paved streets shall be installed by approved jacking, drilling or trenching methods.

Minimum cover for conduits is twenty-four inches (24”) to finish grade.

Conduit runs to be located under street pavement shall be installed within a minimum of twelve inches (12") and a maximum of eighteen inches (18") from and parallel to the lip of gutter, by using the "Trenching Installation of Conduit in Paved Streets" method (see sub-section D below). Installation of additional conduits at street intersections may be required, at the discretion of the City Engineer, to support known and potential future telecom requirements. All pull boxes shall be located behind sidewalks or as shown on the Plans.

When a conduit is shown on the Plans as lying in a straight line parallel to the curb line, sidewalk, or pavement edge, it shall not deviate more than six inches (6") to either side of that parallel line.

In order to verify that conduit is laid to the correct depth and in as straight a line as possible, the Contractor shall trace the route and mark the horizontal and vertical location of the conduit at regular intervals. For open trench installations, leave conduit exposed at regular intervals not to exceed seventy-five feet (75'). Backfill trenches after city inspection and approval.

The bending of PVC conduit shall be by a hot box bender.

Before any wire is pulled in the conduit system, all conduits shall be swabbed out to remove any foreign material that is in the conduit. The removal of foreign material from the conduit with compressed air is acceptable. A pull rope and one bare copper conductor shall be installed in all empty conduits.

Conduit entering controller or service cabinets shall be sealed to prevent the entrance of gases by the use of paraffin or other sealing compound approved by the City Engineer.

Five inch (5") conduit nipples shall be attached by use of a coupling to any conduit run which terminates inside signal standards. Top of nipple shall be two inches (2") above the finished grade of the signal standard foundation.

D. Trenching Installation of Conduit in Paved Streets: Conduit shall be placed under existing pavement in a trench approximately two inches (2") wider than the outside diameter of the conduit to be installed. Trench shall not exceed six inches (6") in width. Place conduit a minimum of six inches (6”) below the top of the aggregate base or subgrade (if no AB) or twenty-four inches (24”) below finish pavement grade, whichever is deeper.

All pavement to be removed shall be cut full-depth with a diamond blade saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area.

The trenching machine shall be shielded to prevent loose material from being thrown away from the machine. Loose material deposited on the pavement behind the cutting machine shall be removed from the pavement immediately and the pavement cleared to allow the passage of traffic. Only those traffic lanes occupied by the cutting machine and the cleanup operation shall be closed and they shall be opened as soon as the work has moved sufficiently to clear them.

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with commercial quality concrete containing not less than 590 pounds of cementitious material per cubic yard to 0.15 foot below the pavement surface. The concrete shall be tamped or vibrated to provide a dense material free from excessive voids and rock pockets.

The top 0.15 foot shall be backfilled with HMA. Apply tack coat to the edges of the existing asphalt pavement immediately prior to paving.

Spreading and compacting of HMA shall be performed by any method which will produce a uniformly dense, smooth finish surface.

Excavation, installation of conduit and concrete backfill shall be completed within the same working day. HMA placement shall be completed within twenty-four (24) hours after excavation off trench. Apply seal coat to new pavement overlapping existing pavement by two to three inches.

9-9 BACKFLOW PROTECTION ASSEMBLIES

Backflow prevention assemblies shall conform to Section 4, Engineering Design Standards.

Original backflow test results are to be provided to the City's Engineering Department immediately following installation.

9-10 IRRIGATION CONTROL VALVES AND VALVE BOXES

Irrigation control valves and valve boxes shall be of the type shown on the Plans and shall conform to the Standard Specifications or as indicated in this section.

Installation shall be in the location indicated on the Plans and shall conform to the Standard Details of these Specifications, unless otherwise approved by the City Engineer.

Valves shown in-groups shall be in individual valve boxes, set in an orderly manner to provide easy access and accessibility to each valve.

Valve boxes shall be installed in accordance with the Standard Details or as shown on the approved plans.

9-11 VALVE MANIFOLDS

Valve manifolds shall be constructed of Polyvinyl Chloride (PVC) Schedule 80 nipples and fittings.

9-12 SWING JOINT ASSEMBLIES

A. For rotors, risers and elbows shall be Schedule 80 PVC. The horizontal nipple shall be Schedule 80. Optionally, rotor swing joints may be pre-made assemblies as manufactured by Rainbird, Hunter or other as approved by the City Engineer.

B. For spray heads, all Swing joint shall be pre-made assemblies as made by Rainbird, Hunter or other as approved by the City Engineer.

9-13 SPRINKLERS

Sprinklers (spray heads and rotors and bubblers) shall be as listed below and shall conform to the drawings shown in the Standard Details, unless otherwise shown and approved on the plans.

A. Spray Heads: shall be Rain Bird 1800 MPR series with check valve with 6" risers where located in turf areas and 12" risers where located in shrub areas.

B. Rotor Heads: shall be Hunter I-20, 25, 35 or 40 series with stainless steel risers and check valves.

C. Tree Bubblers: shall be Rain Bird RWS (Root Watering System) with 1300 or 1400 series bubbler, or approved equal. Two bubblers shall be provided per tree.

D. Shrub Bubblers: shall be Rain Bird 1300 or 1400 series bubblers. One bubbler shall be provided per shrub.

Installation shall conform to the drawings shown in the Standard Details of these Specifications, unless otherwise shown and approved on the plans.

9-14 TRENCHES

Trenches shall be straight with vertical sides and smooth bottoms, with a consistent and even laying grade and depth that follows the contour of the surface.

Provide a minimum twenty-four inches (24") of cover for all pressure lines three-inches (3") in diameter and larger and eighteen inches (18") of cover for all pressure lines two-inches (2") in diameter and smaller.

Provide minimum twelve inches (12") of cover for all lateral lines.

Provide a minimum eighteen inches (18”) cover for all control wiring. If in the same trench as an irrigation line, tape bundled wires to the water main at ten-foot intervals.

Provide a minimum twenty-four inches (24”) of cover for all sleeves crossing pavement and drives, and extend a minimum of twelve-inches (12”) past edge of concrete, asphalt or other finish surface ways into the planting area.

All trenches shall be wide enough to permit easy access for installing pipe, wire, etc. and allow enough width for snaking of PVC pipe, to allow for expansion and contraction. Trench width shall be a minimum of 2-1/2 times the size of the pipe.

Daily trench excavation shall be limited by the amount of pipe laying that can be completed that day or as is permitted by the City Engineer. Excavated material shall be stored in a manner that will not endanger pedestrians, the work and will avoid obstructing the traveled right-of-way, sidewalks and driveways. Open trenches and mounds of dirt and debris will be so marked and lighted as to provide safety to pedestrians and vehicles.

Any open excavations along a sidewalk or other type of public travel way shall be plated or covered and barricaded as necessary to prevent access to the area.

Trenches shall be of sufficient width to permit snaking in of all plastic piping in bottom of trench not connected by ring or gasket joint pipe. Pipe connected with ring or gasket joint pipe need not be snaked.

9-15 INSTALLATION OF IRRIGATION PIPE

Plastic pipe, including fittings, shall be installed according to the Manufacturer’s directions and as directed by the Engineer.

Concrete thrust blocking shall be Portland Cement Concrete for minor concrete (550lbs) 6 sack and shall conform to Section 90 of the latest Caltrans Standard Specifications.

The quantity of concrete used shall be sufficient to provide adequate monolithic bracing against undisturbed soil.

Installation of irrigation pipe shall be as shown on the Plans and in accordance with these Specifications.

In all situations where an irrigation pipe is to be installed under concrete, asphalt pavement or any type of pedestrian or vehicle-traveled finish surface, an irrigation sleeve shall be installed. The sleeve shall be Schedule 40 PVC. The sleeve shall be 2.5 times the outside diameter of the proposed irrigation pipe to be installed.

Installation shall be in the location indicated on the plans and shall conform to the drawings in the Standard Details of these Specifications, unless shown and approved otherwise on the plans.

Plastic irrigation pipe shall be placed in trenches on level, undisturbed or well compacted earth and shall be snaked from side to side in the trench at intervals of approximately fifty feet (50'). Pipe shall be held down between joints with minimal mounds of earth to adequately prevent movement.

Foreign material shall be prevented from entering the irrigation system during installation. Immediately prior to assembling all pipes, valves and fittings, all valves shall be plugged or capped pending the attachment of additional pipe or fittings. All lines shall be thoroughly flushed out prior to attachment of terminal fittings.

Pipe shall be cut with a fine tooth hacksaw and all burrs removed. The outside surface of the pipe and the inside surface of the fittings shall be wiped with a clean cloth to remove all dirt and moisture before the cement solution is applied. The cement solutions shall be applied to the pipe and fitting socket with a brush having a width approximately three-quarters (3/4) of the depth of the socket. The cement solution shall be applied freely with a light wiping acting to spread the cement uniformly over the surface. The pipe surfaces or fitting socket shall not be rubbed with the brush any more than is necessary to spread the cement. If the cement thickens before parts are connected, the coated fittings shall be discarded. Solvent weld connections on the supply side of valves shall first be cleaned with Weld-on Solvent No. P-70 or equal. Cement solution shall be Weld-on Solvent No. 2711, or approved equal.

Immediately after the cement has been applied to the surface to be joined, the pipe shall be inserted into the fitting with a twisting motion to the full depth on the fitting socket. Immediately after joining is completed, any excess cement shall be thoroughly wiped from the pipe and fitting. The jointed members shall be allowed to cure for at least five (5) minutes before they are handled. An additional fitting or pipe section may be added to the completed joint within three (3) minutes if care is exercised in handling so that strain is not placed on the previous joint.

The male pipe threads of all threaded connections on PVC plastic pipe shall be coated with a joint compound suitable for use with plastic pipe.

Contractor shall install #10 bare copper tracer wire, taped using PVC tape, to the mainline per the Standard Detail W-36.

9-16 TESTING OF IRRIGATION SYSTEM

After laying and before backfill and compaction, irrigation mains and laterals shall be tested for leakage.

Once heads are placed and adjusted by Contractor, layout of sprinklers shall be tested for head to head coverage.

Authorized City personnel or Landscape Architect shall monitor and record all pressure testing and verify sprinkler coverage.

A. Pressure Test for Irrigation Main: Mains shall be tested and proven watertight under hydrostatic pressure at 125 lbs per square inch.

Sustain pressure in lines for at least two (2) hours without pressure drop. If pressure drop occurs within two (2) hours, identify and replace deficient area and repeat test until such time as no pressure drop occurs.

The Contractor shall provide the necessary pump and other testing equipment required for this test. The test gauge shall be a sealed oil filled gauge.

B. Pressure Test for Irrigation Laterals: Laterals shall be tested as specified above, except that the test period shall be a minimum of thirty (30) minutes. The pipe shall be plugged or capped where sprinklers are to be installed while making this test.

C. Sprinkler Coverage Test: The risers for sprinklers on slopes shall be set approximately perpendicular to the slope. Each series of sprinklers shall be installed and test operated. Nozzles of all sprinklers and bubblers shall be adjusted for proper rate of flow and coverage. Sprinklers or bubblers shall be relocated as required to produce uniform coverage.

9-17 BACKFILL OF IRRIGATION PIPELINES

All lumber, rubbish, and rocks shall be removed from trenches and backfill material. Ensure that the pipe will have a firm, uniform bearing for the entire length of each pipeline, to prevent uneven settlement.

In rocky areas, the pipe shall be laid on a minimum of four inches (4") of sand and covered with four inches (4") of sand to prevent rock damage to pipe.

Trenches shall not be backfilled until all required pressure tests are performed, and then carefully backfilled after pipe and wire have been installed. Excavated

materials approved for backfilling, consist of earth, loam, sandy clay, and sand, free from large clods or stones. All backfill shall be compacted by mechanical compaction method to the same relative compaction as the surrounding soil. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.

A fine granular material backfill shall be initially placed on all lines. No foreign matter larger than one-half inch (1/2") in size shall be permitted in the initial backfill.

If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the City.

The top six inches (6") of backfill in planting areas shall consist of select excavated material, free of rocks, debris, vegetative material, and other unsuitable material.

Backfill in street sections shall be per City Standards.

Special backfill requirements may be set forth and noted on the plans as approved by the City Engineer.

9-18 RE-PAVING

Re-paving over trenches shall be as specified in these Design and Construction Standards, unless otherwise shown and approved on the plans.

9-19 PLASTIC IRRIGATION PIPE

Plastic pipe for irrigation systems shall be polyvinyl chloride (PVC) plastic pipe extruded from one hundred percent (100%) virgin material and shall conform to ASTM Designation D2241.

All pipes that carry recycled water shall be per Section 7, Recycled Water Standards, of these Standards.

Plastic pipe on the supply side of the irrigation side of the irrigation control valve shall be one or more of the following types:

A. 1-1/2" or smaller shall be Schedule 40, PVC solvent weld pipe.

B. 2 - 3" shall be PVC, Class 315 solvent weld pipe.

C. 4" and larger shall be Class 200, PVC Gasket Joint.

Plastic pipe on the discharge side of the irrigation control valve shall be Schedule 40, PVC Class 200 solvent weld pipe.

9-20 PLASTIC IRRIGATION PIPE FITTINGS

Fittings for PVC plastic pipe shall be rigid polyvinyl chloride, Schedule 80 high impact fittings and shall be solvent weld type or threaded as shown in the plans and details. Plastic fittings shall have a higher bursting pressure rating than the adjoined pipe.

All joints utilizing ring type fittings and pipe shall be sealed with rubber rings. Fittings shall be of the joint design as recommended by the manufacturer. Ring type plastic pipe and fittings shall be assembled with a non-toxic lubricant as recommended by the manufacturer.

9-21 ELECTRIC AUTOMATIC CONTROLLER

Contractor shall program a base watering schedule into the irrigation controller that accommodates the City watering window.

The controller shall be capable of being operated manually at any time. A manual "single station" operation for programmed time or new time setting shall be possible without affecting the original program.

Controller shall have a factory preset back-up program for standby operation in the event of a program loss and a battery back-up circuit to maintain power during power loss.

The controller shall be as manufactured by Calsense, or approved equal.

Electric Controller Enclosure Cabinet shall be fabricated from stainless steel as manufactured by Calsense, or approved equal.

Irrigation controllers shall be installed by a licensed electrician.

9-22 ELECTRIC CONTROL WIRES

Conductors shall be buried directly in the ground a minimum of eighteen inches (18") below the surface and shall follow irrigation supply lines whenever possible. Where conductors pass under paved areas, conductors shall be installed in conduit.

Conductors shall be run continuous without splices from controller enclosure to the valve boxes. At valve boxes, splices shall be clamped and sealed with waterproof connectors.

At least one foot (1') of slack shall be left in each conductor at each splice.

Conductors from controllers to Valves shall be wrapped together with electrical tape at ten-foot (10') intervals.

Extend ends of any conduit and conductors one-foot (1') minimum from under any concrete, asphalt or other surface item.

Contractor shall provide (2) two spare yellow or blue wires throughout the entire system.

9-23 IRRIGATION CONTROL WIRES

Irrigation Control Conductors shall be underground feeder type (U.F.) with 4/64" minimum thickness of TW grade polyvinyl chloride insulation.

Control conductors shall be No. 14 AWG. Insulation shall be any color except white.

Neutral conductors shall be No. 12 AWG. Insulation shall be white.

9-24 ELECTRIC REMOTE CONTROL VALVES - SIZES 3/4" TO 2"

Electric remote control valves shall have a straight or angle pattern. Valves shall be normally closed and shall be the same size as the pipeline, which they control, unless otherwise indicated on the plans and approved by the Engineer.

Electric remote control valves shall be capable of withstanding a working pressure of one hundred pounds per square inch (100 psi).

Valves shall be completely serviceable from the top without removing the valve body from the system and shall have a wheel or nut type manual adjustment feature to regulate flow from fully open to closed. The adjustment shall remain in set position when the valve is operated manually or automatically. The adjustment feature shall regulate automatic closing time to not less than four (4) seconds. Each valve solenoid shall be designed for operation on a 24-volt 60-cycle AC circuit at a 3.1-watt maximum.

9-25 MANUAL CONTROL VALVES

Manual control valves shall be straight or angle pattern globe valves of brass or bronze construction with replacement compression discs and shall be of the same size as the pipeline which said valve serves, unless otherwise shown on the Plans. Control valves shall be capable of withstanding a working pressure of two hundred pounds per square inch (200 psi).

9-26 IRRIGATION VALVE BOXES

Irrigation valve boxes shall be one of the following types; as indicated on the Plans or in the Special Provisions, or directed by the Engineer:

A. Portland Cement Concrete boxes with a one-piece concrete or cast iron cover, rated for an H2O traffic loading shall be as manufactured by Christy, or approved equal.

B. Plastic boxes conforming to ASTM Designation D638, tensile strength 3400 psi and impact strength of 1.5 pounds per inch shall be as manufactured by Carson Box, or approved equal.

Valve box extensions shall be of the same type as the valve box. All covers shall be lockable and be legibly marked with the valve ID.

9-27 QUICK COUPLING VALVES

Quick coupling valves shall be of one (1) piece brass or bronze construction, single slot type with one inch (1") threaded pipe connection and one and one-quarter inch (1-1/4") key connection guaranteed to withstand normal working pressure of one hundred and fifty-pounds per square inch (150 psi) without leakage. Quick couplers shall be installed with swing joint assembly and shall be installed a minimum of one foot (1') from curbs and walks where applicable. Refer to "Testing of Irrigation System," B.17, of this section.

9-28 BOOSTER PUMPS

Booster pumps for use shall be by Custom Pump and Power or approved equal.

9-29 RECORD DRAWINGS AND IRRIGATION STATION CHART

Contractor shall regularly update drawings of the irrigation system and mark any changes made to the system during construction. Below ground features shall be indicated with measurements from at least two surface features. All changes to below ground features shall be recorded before trenches are backfilled. A completed record set shall be submitted to the City upon completion of the project.

In addition to the record drawings the contractor shall provide the City with an 11x 17 laminated color coded irrigation station chart.

END OF SECTION