

**SECTION 01120 - IRRIGATION SYSTEMS**

*(Follow all instructions and make all edits with "Track Changes" turned on. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the Project. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)*

Comply with Section 01120 of the Standard Specifications modified as follows:

**01120.10 General** - Replace this subsection, except for the subsection number and title, with the following:

Furnish only commercial quality Materials and Equipment. All items proposed for use are subject to testing to ensure compliance with the Specifications. Furnish Materials of the same function that are of the same type and the same manufacturer.

Submit a list of proposed materials for approval as soon as practicable after Award and before arranging for procurement of any materials, especially those materials or products not shown or specified. If any initially proposed materials are not approved, submit substitutes for approval. Any materials installed without approval are subject to removal and replacement with acceptable material at no additional cost to the Agency.

Materials may be designated by trade name or by manufacturer's catalogue information as shown or specified. The use of a substitute material may be allowed if a written request for substitution and proof of equivalent quality and suitability are provided. Make any request for substitution with ample time for approval without delaying the Work.

When alternate Equipment, such as sprinkler heads, is proposed for use with hydraulic characteristics differing from that originally shown, provide the following:

- A redrafted, legible plan that shows the redesigned layout, location, or sizes of every affected system element as required for proper operation as originally designed. Provide a plan showing every relevant system element, site feature, and plan element that was shown on the original plan. A plan made by marking up the original plan will not be accepted.
- A hydraulic calculation table for the alternate Equipment. At a minimum, show a complete calculation for one average sprinkler zone (section) and a complete calculation for the "worst case" sprinkler zone (i.e., the section that is farthest from the point of connection (P.O.C.), is the largest, or otherwise presents the most challenging hydraulics). Starting from the P.O.C., show the calculation with a step-down method with flow and loss at each piece of Equipment and length of pipe run between Equipment. Show the new total water required for each zone and the total for all zones to ensure that maximums for meter size, pipe sizes, and watering times will not be exceeded.

- Where any controller run-time change is required, submit a separate page showing the total timing per controller required for each section, to show that timing changes will still allow all zones to be run within a reasonable time period.
- A cost page showing the Contractor's actual discount cost from the Suppliers, comparing the original plan costs versus the proposed Equipment costs for each type of item, such as pipe by size, where there is a change required. Show the line total of each type of item and the grand total for the proposed change.

**01120.11 Pipe, Tubing, and Fittings** - Replace this subsection, except for the subsection number and title, with the following:

Furnish galvanized iron or steel, PVC, or polyethylene pipe as shown or specified that meets the following requirements:

**(a) Galvanized Pipe and Fittings** - Furnish pipe of standard weight, hot-dip galvanized iron or steel, standard threaded, coupled, and that meets the requirements of ASTM A53. Non-standard threaded fittings are rejected.

**(b) Polyvinyl Chloride Pipe and Fittings** - Furnish PVC pipe and fittings of PVC compound Type 1, Grade 1, according to ASTM D2241 and certified approved by the National Sanitation Foundation. Furnish pipe and fittings free from defects caused by poor materials, low quality of Work, or rough handling. Dimensional and quick burst tests of pipe and fittings may be required after arrival at the Project Site before materials are accepted.

Furnish pipe and fittings as follows:

<u>Used for</u>	<u>Class or Schedule</u>
<u>Main and lateral lines .....</u>	<u>Class 200 or Schedule 40 PVC</u>
<u>Irrigation sleeves .....</u>	<u>Schedule 40 PVC</u>
<u>Caps .....</u>	<u>Schedule 80 PVC</u>
<u>Direct bury pipe, not in sleeves, placed under road beds or other paved areas .....</u>	<u>Schedule 40 PVC</u>

Unless otherwise specified, furnish entire Project with one pipe class or schedule type.

Furnish PVC threaded pipe of PVC 1120, schedule 80 material according to ASTM D1785.

Furnish PVC solvent-weld pipe of PVC 1120 materials having a 200-psi minimum pressure rating with SDR 21 walls according to ASTM D2241.

Furnish PVC pipe fittings according to ASTM D2466, Type I, Grades 1 or 2.

Pipe may be belled on one end with the dimensions of the tapered bell according to ASTM D2672.

Install PVC pipe with walls heavier than SDR 21 when shown or specified.

**(c) Non-Potable Colored Coded Pipe** - Wherever non-potable, reclaimed or reuse water is used, furnish PVC pipe that is tinted purple and imprinted with the warning "Caution: Reclaimed Water - Do Not Drink". Furnish pipe meeting the same AWWA and ASTM specifications as the potable water pipe sizes that they are based on.

**(d) Polyethylene Pipe** - Furnish polyethylene pipe of Class 80, SDR 15, medium density, meeting the requirements of ASTM D2239, conforming to U.S. Commercial Standard CS-255, and approved by the National Sanitation Foundation (NSF).

**(1) Micro Tubing and Fittings** - Where drip emitters are not required, furnish a blank type and furnish any connections necessary. Furnish tubing consisting of nominal-sized linear, low-density, minimum 1/4 inch outside diameter (OD) polyethylene.

**(2) Low Volume (Drip) Tubing** - Furnish drip tubing manufactured from specially formulated, chemical-resistant, low to medium density, virgin polyethylene or polybutylene that is selected for excellent weatherability and stress cracking resistance, and is designed specifically for use in drip irrigation systems. Furnish drip tubing having a minimum wall thickness of 0.044 inch.

**01120.12 Automatic Controllers** - Replace the paragraph that begins "Provide Underwriter's Laboratories ..." with the following paragraph:

Furnish Underwriter's Laboratories (UL) approved controllers as shown or specified. Furnish each outdoor controller with either a pedestal or wall mount brackets when appropriate. Furnish and install the controller in a weatherproof and vandal-proof cabinet of corrosion-resistant metal. Furnish the controller housing or cabinet with hasp and lock or locking device. Furnish locks or locking devices that are master-keyed and include three sets of keys for the locks. If the irrigation system serves both lawns and planting beds, furnish a controller that has a dual programming capability. Furnish controllers that are compatible with and capable of operating the irrigation system as constructed.

**01120.13 Quick-Coupling Equipment** - Replace this subsection, except for the subsection number and title, with the following:

Furnish quick coupling Equipment with a body of cast leaded semi-red brass alloy No. C84400 according to ASTM B584, and a service rating not less than 125 psi for non-shock cold water. Furnish couplers having standard male pipe threads at the top and standard female pipe threads at the base. Ensure that the valve is designed to open only upon inserting a coupler key and close completely after removing the key, with absolutely no leakage of water between the coupler and valve body. Furnish valve bodies to receive couplers that are designed with double worm slots to allow smooth opening and closing action with a minimum of effort. Ensure that slots notched at the base hold the coupler firmly in the open position. Furnish couplers of one piece construction with steel reinforced side handles attached, a locking top of the same material as the valve body, and stainless steel double guide lugs to fit the worm slots. Furnish two couplers and two hose swivels for operation of the valves, and two keys for the locking caps if quick-coupling valves are required. For non-potable water systems, furnish a color-coded, purple tinted cap that bears the printed warning "Caution: Reclaimed Water - Do Not Drink".

**01120.15 Cross-Connection Control Devices** - Replace this subsection, except for the subsection number and title, with the following:

Cross-connection control devices are shown. Furnish and install cross-connection control devices meeting the requirements of the Oregon Health Division and the local water authority.

**01120.16 Water Meter** - Replace this subsection, except for the subsection number and title, with the following:

Water meter procurement, installation, and associated costs are the responsibility of the Agency. Be responsible for coordinating water meter needs in a timely fashion with the Agency.

**01120.17 Valves:** Replace this subsection, except for the subsection number and title, with the following:

**(a) Gate Valves** - Furnish gate valves of heavy-duty bronze according to the requirements of ASTM B62. Furnish valves of the same size as the connecting pipes and install with union or flange connections. The service rating for non-shock cold water is 150 psi. Furnish valves of the double disk, taper seat type, with rising stem, union bonnet and hand wheel or suitable cross wheel for standard key operation, with the manufacturer's name, type of valve, and size clearly cast on them.

**(b) Drain Valves** - Furnish bronze or brass drain valves, 1 inch or 3/4 inch in size, manual angle globe type, with rising stem, hex brass union, removable bonnet and stem, and adjustable packing gland. Ensure that valves are designed for underground installation with a suitable cross wheel operable with a standard key and the minimum service rating is 150 psi non-shock cold water. Furnish three standard operating keys.

**(c) Check Valves** - Furnish heavy duty bronze or steel check valves that function by means of a hinged disc suspended from the body, and is able to close of its own weight. Furnish valves that are of the same size as the connecting pipes, unless otherwise specified, and with union or flanged connections. Furnish valves that are rated for non-shock cold water service of not less than 150 psi and have the manufacturer's name, valve type, and size cast on them.

**(d) Pressure-Reducing Valves** - Furnish pressure-reducing valves with a minimum of 150 psi working pressure and an adjustable outlet range of 20 psi to 70 psi, rated for non-shock cold water service up to 175 psi. Furnish factory set valves as shown or specified.

**(e) Isolation Valve** - Furnish isolation valves as shown or as specified. If no isolation valves are shown, furnish ball valves as indicated below.

**(f) Ball Valves** - Furnish bronzed-bodied ball valves according to ASTM B62 and with a hard, chrome plated ball according to ASTM B124. The minimum non-shock cold water service-rating is 400 psi. Plastic valves will not be accepted.

**(g) Air Relief Valve** - The air relief valve automatically relieves air pressure to break an air vacuum in the pipe section where it is located. Install air relief valves at the exact high point of each pipe section where relief is needed. (Note: air relief valves are not associated with backflow prevention).

**(h) Control Valves:**

**(1) Manual Control Valves** - Furnish manual valves of bronze or brass, angle type, with hex brass union, and with a service rating not less than 150 psi non-shock cold water. Furnish valves for underground installation designed with a cross wheel suitable for operation with a standard key. Furnish three suitable operating keys per irrigation system. Furnish valves that have removable bonnet and stem assembly, with adjustable packing gland housing for the long acme-threaded stem to ensure full opening and closing. Furnish valves with discs that are full floating with replaceable seat washers.

**(2) Automatic Control Valves** - Furnish automatic control valves of a normally closed design, operated by an electric solenoid of the required rating, but not more than 6.5 W and operating on 24 V AC power. Ensure that solenoids directly attached to the valve bonnets or bodies have completely internal control parts. Furnish bodies that are not less than 150 psi if brass or bronze and not less than 125 psi if plastic, with a manual control bleed cock to operate the valve without electric current. Ensure that the closing speed is not less than 5 seconds and the opening speed is not less than 3 seconds. A constant rate of opening and closing is required so the water flow is completely stopped when the valve is either manually or electrically closed. Furnish valves having manual shutoff stems with cross handles that will adjust the valve from fully closed to wide open with the valve automatically operable in the adjusted position.

**(3) Automatic Control Valves with Pressure Regulator** - Furnish valves of the same manufacture as the automatic control valves, capable of reducing the inlet pressure to a constant lower pressure regardless of supply fluctuations, and are fully adjustable.

**01120.18 Valve Boxes and Protective Sleeves** - Replace this subsection, except for the subsection number and title, with the following:

Furnish automatic control valves, flow control valves, pressure reducing valves, backflow preventers, filters and other serviceable fixtures with valve boxes that are extendable to obtain the depth required. Furnish boxes constructed of thermoplastic, with locking lids, green in color, and of the type shown or specified. Include a protective sleeve and cap with all manual drain valves and manual control valves.

**01120.19 Electrical Wire and Splices** - Replace the paragraph that begins "Provide and Install..." with the following paragraph:

Furnish and install an extra wire with all wiring runs that is the same gauge, but of a different color than the hot wire and common wire. The extra wire is reserved for future use or modifications to the system.

**01120.21 Detectable Wire and Marking Tape** - Replace this subsection, except for the subsection number and title, with the following:

Furnish a detectable wire using continuous No. 14 gauge, single strand locator wire that is blue in color. Furnish marking tape consisting of inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents, and solvents likely to be encountered in the Soil. Furnish color-coded tape with the type of line buried below and the word "Caution" imprinted continuously over its entire length in permanent black ink. Furnish tape of the width recommended by the manufacturer for the depth of installation used.

**01120.40 General** - Replace the paragraph that begins "The irrigation Plans are ..." with the following paragraph:

The irrigation Plans are a schematic design and may require adjustment. Do not install the sprinkler system as shown if it is evident that obstructions, grade differences, or differences in area dimensions create conditions different than anticipated in the design. Bring all such obstructions or differences to the attention of the Engineer. In the event this notification is not performed before construction begins on a part of the system where discrepancies exist, any revisions necessary to make the system operate as designed is the Contractor's responsibility.

**01120.40(a)(1) Double Check Valve Assembly** - Replace this subsection, except for the subsection number and title, with the following:

Install, inspect, and test the double check valve assembly (DCVA) according to applicable regulations of the Oregon Health Division and the local water authority. Provide test records on forms approved by the Oregon Health Division. Provide forms filled out by a State-licensed Backflow Device Tester documenting that the DCVA is in good operating condition before any flushing and testing of downstream water lines. During the life of the Contract, test the DCVA annually, or more often if successive inspections indicate repeated failure. Repair or replace the DCVA whenever it is found to be defective.

**01120.40(b) Electrical Service** — Replace this subsection, except for the subsection number and title, with the following:

Install electrical service according to the *National Electrical Code* and all State and local laws. Power sources will be as shown or as directed. Be responsible for coordination and installation of electrical service. Furnish and install meter bases at the power source ~~conforming according~~ to the requirements of the power supplier. Give the power supplier's representative notice before making any installation. ~~Provide~~ Furnish a separate, dedicated circuit for the controller.

**01120.43 Piping** - Replace the paragraph that begins "Place all live mains ..." with the following paragraph:

Place all live mains to be constructed under existing Pavement in sleeves jacked under the Pavement, unless otherwise shown. Place all PVC pipe installed under Pavement in pipe sleeves of Schedule 40 PVC, unless steel sleeving is shown or specified. Furnish pipe caps of Schedule 80 PVC. Install sleeves 2 feet below Subgrade when passing under Roadways. Extend sleeves 2 feet beyond the edge of Gravel, edge of sidewalk or back of curbs. Mark sleeves with a 2 feet piece of No. 4 rebar driven flush with the ground or other adjacent surface. Place PVC caps over both ends of sleeves but do not glue. Solvent-weld sleeve sections. Use pipe bedding and backfill according to Section 00405. Extend the sleeve a minimum of 12 inches beyond the edge of Pavement. Perform all jacking operations according to an approved jacking plan. If obstacles are encountered during required jacking, notify the Engineer, who may authorize corrective measures according to 00140.60. Provide for complete drainage of all pipelines with manual drain valves installed at section low points. Drain valves may not be shown.



**01120.46 Low Voltage Electrical Installation** - Replace this subsection, except for the subsection number and title, with the following:

Use direct burial wiring between the automatic controller and automatic valves. Install waterproof splices according to the manufacturer's recommendations. The wiring may share a common neutral. When more than one automatic controller is required, provide a separate common neutral for each controller and the automatic valves it controls. Run separate control conductors from the automatic controller to each valve. Furnish and install an extra wire according to 01120.40.

Install wire adjacent to or beneath the irrigation pipe. Use plastic tape or nylon tie-wraps to bundle wires together at 10-foot intervals. Snake the wire from side to side in the trench to provide slack in the wire run. When it is necessary to run wire separate from the irrigation pipe, bundle and place the wire under detectable marking tape. Splices are allowed only at junction boxes, valve boxes, pole bases, or control Equipment. Leave a minimum of 2 feet of excess conductor at all splices, terminals and control valves to facilitate inspection and future splicing.

**01120.47(e) Main Line Testing** - Replace this subsection, except for the subsection number and title, with the following:

Purge all main supply lines of air and test with static water pressure of at least 150 psi for 60 minutes without introduction of additional service or pumping pressure. Test with one pressure gauge installed on the line where directed. Install an additional pressure gauge at the pump when directed. Lines showing loss of pressure exceeding 5 psi at the end of the specified test period are rejected. Correct rejected installations and retest for leaks.

**01120.47(g) Lateral Line Testing** - Replace this subsection, except for the subsection number and title, with the following:

Purge all lateral lines of air and test under operating line pressures with risers capped and drain valves closed. Maintain operating line pressures for 30 minutes through open valves and pressure regulating devices. Lines showing leaks when visually inspected at the end of the specified test periods are rejected. Correct and retest lateral line installations that have been rejected.

**01120.47(h) Lateral Line Alternate Test Method** - Replace this subsection, except for the subsection number and title, with the following:

When conditions prevent effective visual inspection of lateral lines, the Engineer may require that the lines be tested by use of pressure gauges. In that event, maintain the static water pressure equal to the operating line pressure in the lines for 30 minutes, with valves closed and without introduction of additional service pressure. Lateral lines showing loss of pressure exceeding 5 psi at the end of the specified test period are rejected. Correct and retest lateral line installations that have been rejected.

**01120.47(i) Testing of Micro Tubing** - Replace this subsection, except for the subsection number and title, with the following:

Micro tubing is tested by visual inspection while operating and before burial. Tubing that has obvious leaks or that doesn't operate as designed is rejected. To fully test micro tubing, a

water collection procedure recommended by the manufacturer may be required. Correct all faults before retesting.

**01120.49 Backfill** - Replace the paragraph that begins "Pipe bedding Material ..." with the following paragraph:

Pipe bedding Material according to 00405.12 may be authorized in quantities determined by the Engineer. When authorized to proceed, fill the bottom 2 inches of the trench with approved bedding before laying pipe. After the pipe is in position, add enough bedding Material to bring the backfill height to 2 inches above the pipe. Continue backfilling as usual.

Replace the paragraph that begins "If sufficient suitable backfill Material..." with the following paragraph:

If sufficient suitable backfill Material is not available from trench excavation or other sources on the Project, notify the Engineer. Provide an estimate of imported backfill required, if possible. Unless otherwise shown or specified, imported pipe bedding Material ~~will be~~is authorized according to 00140.30.

**01120.60 System Operation** - Replace the paragraph that begins "This responsibility includes, but is not..." with the following paragraph:

This responsibility includes, but is not limited to, draining the system before the first freeze and reactivating the system in early May and at other times as directed.

Replace the paragraph that begins "In the spring, when the..." with the following paragraph:

In early May, when the drip irrigation system is in full operation, make a full inspection of all emitters. This involves visual inspection of each emitter under operating conditions. Make all adjustments, flushing or replacements to the system at this time to ensure the proper operation of all emitters.

**01120.70 As-Built Plans and System Orientation** - Replace the paragraph that begins "Notify the Engineer ..." with the following paragraph:  
Notify the Engineer in writing not less than 2 weeks before the proposed date of the training and orientation session and obtain mutual agreement.

**01120.90 Payment** - Replace the paragraph that begins "Payment will be..." with the following paragraph:  
Payment will be payment in full for furnishing and placing all Materials, and for providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.