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1400 DESCRIPTION

This section is for all Town of Frederick construction projects. All landscaping irrigation for development projects and development review should refer to the Town of Frederick Land Use Code. Furnish all work, materials, appliances, tools, equipment, facilities, transportation, and services necessary for new and modification work incidental to performing all operations in connection with the installation of "landscape irrigation" complete, as shown on drawings and/or specified herein.

1401 GENERAL PROVISIONS

The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been known in design. Such obstructions or differences should be brought to the attention of the Town. In the event this notification is not performed, the Contractor shall assume full responsibility for any revisions necessary.

1401.01 Experience

1. All work shall be installed by skilled persons, proficient in the trades required, in a neat, orderly and responsible manner with recognized standards of workmanship. Project foreman shall be certified through the Certified Landscape Technician (CLT) program for irrigation as sponsored by the Associated Landscape Contractors of Colorado.

2. The Contractor shall have considerable experience and demonstrated ability in the installation of sprinkler irrigation systems of this type. To demonstrate ability and experience necessary for this project, the Contractor shall submit, prior to contract award, if requested by Town, the following:

   List of 3 projects completed in the last 2-years of similar complexity to this project. Description of projects shall include:

   a. Name of project

   b. Location

   c. Brief description of work and project budget

1402 SUBMITTALS

All submittals shall be accepted by the Town Engineer in writing before any irrigation installation commences.

1402.01 Material List

1. Prior to installation of any work, prepare a detailed list of all material proposed for use in the project and submit to the Town Engineer for approval.

2. Certificates

   Submit manufacturer's certification that plastic pipe and fittings comply with the specification requirements as directed by Town Engineer.

3. Prior Approval

   Equipment or materials installed or furnished without prior approval of the Town may be rejected and the Contractor required to remove such materials from the site at his own expense.

1402.02 Record Drawings (As-Built)

1. The Contractor shall supply the Town with a mylar as-built drawing of modifications approved by system designer, before final acceptance of the irrigation system.

2. The Contractor shall dimension from two (2) permanent points of reference, i.e., building corners, sidewalk, road intersections or any permanent structures, the location of the following items:

   a. Connection to existing water lines

   b. Routing of sprinkler pressure lines (dimension maximum 100-feet along routing)

   c. Sprinkler control valves

   d. Quick coupling valves

   e. Drain valves

   f. All gate valves

   g. Other related equipment as directed by the Town

   h. Sleeves

   i. Control wire routing outside mainline trench

1402.03 Controller Charts

1. Provide two (2) controller charts for each automatic controller. Do not prepare charts until record drawings have been approved by the Town Engineer. Charts must be completed and approved prior to final review of irrigation system.

2. Chart shall be a reproduction of the record drawing, if the scale permits, fitting the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.

3. Chart shall be a reproduction of the actual "as-built" system, showing the area covered by that controller with the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage.

4. Following approval of charts by Town Engineer, they shall be hermetically sealed between two layers of 10-mil. thick plastic sheet.

1402.04 Operations and Maintenance Submittals

1. Deliver the following items to the Town when work is completed and prior to final acceptance of work:

a. One (1) wrench for disassembly and adjustment of each type of sprinkler head supplied.

b. One (1) 30-inch sprinkler key for operation of manual drain valves.

c. Two (2) keys for each automatic controller.

d. Two (2) quick coupler keys and two (2) matching hose swivels for each type of quick coupling valve installed.

e. Two (2) keys for opening valve boxes.

f. Two (2) sprinkler heads of each size and type installed.

g. One (1) 72-inch steel tee wrench for operating gate valves with square nut.

1403 MATERIALS

1403.01 Delivery

Deliver, unload, store, handle materials, packaging, bundling, products in dry, weatherproof, waterproof condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer name, proprietary, volume, quantity, contents, instruction,

conformance to local, state, and federal law. Remove and replace cracked, broken, contaminated items or corrosive elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, and job site damage.

1403.02 Handling of PVC Pipe

The Contractor is cautioned to exercise care in handling, loading, and storing of PVC pipe. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping. Pipe should not be stored/exposed to prolonged sunlight exposure (6 months plus).

1403.03 Storage of Materials

All materials shall be carefully stacked or stored at an area designated by the Town Engineer, if available. Contractor must make prior arrangements with the Town Engineer before moving any materials on site for storage. Contractor is responsible for care and security of all stored materials.

1403.04 Products

1. Irrigation Mains:

    a. Purple PVC Pipe: Pipe shall be suitable for use at maximum hydrostatic working pressure of 200-psi. Pipe shall be made from clean, virgin, NSF approved, type 1, and grade 1 PVC conforming to Astin Resin specification D1784-60 and project standard D2241 for PVC SDR21. Gasketed pipe shall be of the type prescribed by manufacturer. No insert gaskets or insert gasket fittings shall be accepted. Install thrust blocks in accordance with pipe manufacturer's recommendations.

    b. Fittings: PVC gasketed fittings shall conform to ASTM D-3139-98. Gaskets shall conform to ASTM F-477-99.

2. General Piping:

    a. Pressure Supply Line: From point of connection through backflow prevention unit: Type K copper.

    b. Downstream Lines: Pressure supply lines downstream of backflow prevention units: CL-200 PVC.

    c. Non-pressure lines: CL-200 PVC.

    d. Sleeves: CL 160 PVC.

3. Brass Pipe and Fittings:

   a. Brass Pipe: Brass pipe shall be 85% red brass, American National Standard Institute (ANSI), Schedule 40 screwed pipe.

   b. Fittings: Fittings shall be medium brass, screwed 125-pound class.

4. Copper Pipe and Fittings:

   a. Copper Pipe: Copper pipe shall be type K, hard tempered, ASTM 13-88.

   b. Fittings: Fittings shall be wrought copper, solder joint type.

   c. Joints: Joints shall be soldered with silver solder, 45% silver, 15% copper, 16% zinc, 24% cadmium and solidus at 1125-degrees Fahrenheit and liquids at 1145-degrees Fahrenheit.

   d. Use a dielectric union whenever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).

5. Plastic Pipe and Fittings:

   a. Identify all pipe with the following indelible markings:

      i. Manufacturer's name

      ii. Nominal pipe size

      iii. Schedule of class

      iv. Pressure rating in psi

      v. NSF (National Sanitation Foundation) seal of approval

      vi. Date of extrusion

   b. Pipe (Solvent Weld Type): Manufactured from virgin polyvinyl chloride compound in accord with ASTM D 2241 and ASTM D 1784, cell classification 12454-B, Type 1, Grade 1 with the following:

      i. Fittings: Standard weight, Schedule 40, injection molded PVC. Comply with ASTM D 1784 and D 2466, cell classification 12454-B

      ii. Threads: Injection molded type

      iii. Tees and ells: Side gated

iv. Threaded nipples: ASTM D 2464, Schedule 80 with molded threads
v. Joint cement and primer: Type as recommended by manufacturer of pipe fittings

c. Sleeves: Class 160 BE PVC, minimum diameter two (2) sizes larger than pipe; 2-inches minimum diameter for wire.

d. Marking Tape: Standard, Type 1, non-detectable, 6-mil linear low density polyethylene.

e. Color blue to match APWA standards.

f. Printed surface, black ink with protective coating,"BW" (blue water).

6. Backflow Preventer:

Size and type as shown on plans, without protective cage. "Febco" 825Y.

7. Isolation Valves:

Isolation valves shall be resilient wedge gate valves, 2-inch and smaller shall be Nibco T-22 series, and 2-1/2-inch and larger shall be Nibco P-619-RW 200 psi push on gate valve with locking gasket or approved equal.

8. Quick Coupling Valves:

"Rain Bird" 44NP two-piece type brass body, 150–pound class, with female threads opening at the base. Valve design to permit operation with a special connection device (coupler) designed for this purpose:

a. Coupler threads: Lug type.

b. Hinge cover: Provide with "non-potable" rubber-like vinyl cover.

9. Remote Control Valves:

a. Valve Type: "Rain Bird" PESB Series spring-loaded, packless diaphragm activated, normally closed type with plastic body, equipped with flow control and pressure regulator. Equipped with bleeder valve to permit operation in the field without power at the controller.

b. Valve Solenoid: 24-volt AC, 4.5-watt maximum, 500-milliamp maximum surge, corrosion proof, stainless steel construction, epoxy encapsulated to form a single integral unit.

10. Valve Boxes:

a. Pressure Reducing Valves: For pressure reducing valves, use Ametek or Carson 12-inch Standard Box.

b. Control Valves: For control valves 3/4-inch through 2-inches, use Ametek or Carson 12-inch Standard Box or Jumbo as needed with extensions as required.

c. Control Wiring Splices: Carson #910-12, Brooks #1100 box or approved equal.

d. Valve manifolds (2 or more valves): Carson #1730-12B, Brooks #2436-18, or approved equal.

11. Electrical Control Wiring:

a. High Voltage:

i. Town will provide the necessary 110-volt electrical supply to point of hookup for irrigation controller. Contractor is responsible to connect line power to all system equipment. Enclose wiring in conduit.
ii. Meet all local codes and ordinances.

b. Low Voltage:

i. The electrical control wire shall be No. 14 direct burial copper wire AWG U.F.U.L. approved or larger, if required to operate system as designed.
ii. All control wires shall be red. All common wires shall be white. All spare wires to be different color from control wires.
iii. If multiple controllers are being utilized, and wire paths of different controller cross each other, both common and control wires from each controller to be of different colors.
iv. Control wire connections and splices shall be made with “Rain Bird” Pentite connectors, or similar dry splice method.
v. Control wire not installed in mainline trench to be installed in PVC Schedule 40 electrical conduit.

12. Automatic Controller:

Size and type as shown on approved plans. Mounted on exterior of existing pump house with protective case.

13. Sprinkler Heads:

a. General Requirements: All sprinkler heads shall be as shown on plans or as approved.

i. Riser units shall be fabricated in accordance with any details or approvals.

ii. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

b. Gear Driven Turf Rotor: “Rain Bird” 5000 Series.

i. Body and nozzle: Plastic material.

ii. Body threads: Female, 1-inch IPS.

c. Pop-up Turf Heads: “Rain Bird” 1800 SAM-PRS.

i. Plastic body and nozzle.

ii. Pop-up height 12-inches.

iii. Pre-set arc coverage.

iv. Standard trajectory.

1404 CONSTRUCTION STANDARDS

1404.01 Protection of Property

1. The Contractor shall be responsible for the preservation and protection of all trees, plants, monuments, structures, and paved areas from damage due to this work. In the event damage does occur, all damage to inanimate items shall be completely repaired or replaced to the satisfaction of the Town Engineer, and all injury to living plants shall be repaired by the Contractor or such persons as it may employ to accomplish this work. All the costs of such work shall be charged to and paid by the Contractor.

2. Buildings, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flared and barricaded by the Contractor. Damage caused by the Contractor to asphalt, concrete, or other building material surfaces shall be repaired or replaced at the Contractor’s expense. Contractor shall restore disturbed areas to original condition.

1404.02 Existing Trees and Shrubs

1. All trenching or other work near existing evergreens or low branching deciduous material shall be done by appropriate methods so that no limbs, branches or root structure are adversely damaged in any way.

2. Excavation, in areas where root damage could occur, shall be done by an approved method including hand trenching which will insure the least possible damage. Roots one inch or larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be protected to prevent scarring or excessive drying. Where a trenching machine is operated close to trees when small roots are cut, the wall of the trench adjacent to the tree shall be hand trimmed making clean cuts through roots. Trenches adjacent to trees should be closed within the same day.

3. Protection and Repair of Underground Lines

The Contractor shall be responsible for requesting the proper utility company to stake the exact location of any underground electric, gas, cable, water, or telephone lines. The Contractor shall take whatever precautions are necessary to protect these underground lines from damage, and, in the event damage does occur, all damage shall be repaired by the Contractor. All costs of such work shall be paid by the Contractor unless other arrangements have been made. The Contractor shall, at his expense, locate any private utilities (i.e. electrical service to outside lighting) before proceeding with any excavation. If, after such request and necessary staking, private utilities which were not staked are encountered and damaged by Contractor, they shall be repaired by the Contractor.

4. Replacement of Paving and Curbs

Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition. Saw cutting of pavements may be required. Sections will be removed to nearest joint when directed by Town Engineer or shown on plans. No paving shall be removed without prior written approval of the Town. Pavement will be replaced in accordance with Section 520 of these specifications.

1404.03 Staking and Layout

1. The Contractor shall provide all materials necessary for the staking of the irrigation system. Staking shall occur as follows:

   a. Contractor shall mark the routing of pressure supply line and flag heads for all zones.

   b. All piping and equipment shown diagrammatically on drawing, any irrigation equipment shown outside of planting areas shall be installed inside planting areas whenever possible.

   c. Lay out sprinkler heads and make any minor adjustments required due to differences between actual site conditions and the drawings. Minor adjustments shall be maintained within the original design intent.

   d. Lay out each system using staking method as approved by Town Engineer. Maintain and protect approved staking layout.

1404.04 Excavation, Trenching and Backfilling

1. Layout: Trench excavation shall follow, as much as possible, shortest layout possible at approved layout to required depths.

2. Pipe Support: Dig trenches straight and support pipe continuously on even grade continuously for full run of trench. Trench bottom shall be clean and smooth with all rock and organic debris removed.

3. Trench Width: For all piping smaller than three inches, trenches shall have a minimum width of seven inches, or as adequate to permit work space for installing connections and fittings.

4. Vibratory Plow: Not permitted.

5. Pipe and Wire Depth:

   a. Main Line Piping – 24-inches from top of pipe, maximum 3-feet.

   b. Non-pressure Piping (rotor) – 18-inches from top of pipe.

   c. Non-pressure Piping (pop-up) – 12-inches from top of pipe.

   d. Control Wiring – side of pressure main. Sleeved and at 18-inch depth when not in main line trench.

1404.05 Line Clearances

1. Provide not less than 4-inch clearance between each line and not less than 6-inch clearance between lines of other trades.

2. Do not install parallel lines directly over any other line.

1404.06 Installation

1. Solvent Weld PVC: All plastic to plastic joints shall be made and pipe laid following manufacturer's recommendations for same including cold weather protection.

2. Threaded fittings: Assemble using Teflon tape applied to male threads only. Tighten with strap-type friction wrench.

3. Tape all open ends to pipe during installation to prevent entry of any foreign matter into the system.

4. Pipe shall be snaked as much as possible to allow for expansion and contraction.

5. Cure for 30-minutes before handling, 24-hours before water carry.

1404.07 Wiring

1. Low Voltage:

   a. Controller will be required. Control wiring between existing controller(s) and electric valves shall be buried in main line trenches; or in a separate trench in

PVC sleeve from controller to main line. Use a continuous wire unless otherwise approved for a splice.

b. All 24-volt wires shall be bundled at 25-foot intervals and laid with pressure supply line pipe to one side below mainline in the trench.

c. An expansion loop shall be provided at every pressure pipe angle fitting and every 500-feet. Expansion loop shall be formed by wrapping wire at least eight (8) times around a 3/4-inch pipe and withdrawing pipe.

d. All splices and ECV connections shall be made using “Rain Bird” Pentite connectors, or similar dry splice method. Provide 24-inch loop of excess wire at each splice and connection to allow for future maintenance.

e. All control wire splices not occurring at control valves shall be installed in a separate splice valve box.

f. Install one (1) control wire for each control valve.

g. Run two (2) spare #14-1 wires from controller pedestal or terminal along entirety of pressure supply line to last electric control valve on each and every leg of main-line.

h. Label spare wires at controller and wire stub box.

i. Provide for four (4) additional valves to modify existing manual system.

2. High Voltage Wiring for Automatic Controller:

a. 110/120-volt power connection to the automatic controller shall be provided by the Contractor. Live power to point of controller by Town as per local codes.

b. All electrical work shall conform to local codes, ordinances and union authorities having jurisdiction. All high voltage electrical work to be performed by licensed electrician.

1404.08 Automatic Controller

1. Existing as shown on plan. Verify location with Town in coordination with power.

2. Contractor to connect any new remote control valves to Town’s controller in numerical sequence.

3. Contractor to install all valve wires to controller.

1404.09 Electric Control Valves

1. General: Install where shown on plans and as per details.

2. Grouping: When grouped together, allow at least 24-inches between valves.

3. Separate Boxes: Install each remote control valve in a separate valve box.

4. Low Points: Do not install at low points.

1404.10 Quick Coupling Valves

Install quick coupling valves per plans and details. All quick couplers shall be installed on double swing-joint risers of Schedule 40 PVC. Angled nipple relative to pressure supply line shall be no more than 45-degrees and not less than 10-degrees.

1404.11 Valve Boxes

1. Installation Details: Install one valve box for each type of valve installed as per details.

2. Gravel Sump: Gravel sump shall be installed after compaction of all trenches. Final portion of gravel shall be placed inside valve box after installation of valve.

3. Branding: Controller letter and station number are to be branded on the lid of each valve box. Letter and number size to be no smaller than 1-inch and no greater in size than 1-1/2 inch, depth of branding to be no more than 1/4-inch into valve box lid.

1404.12 Isolation Valves

Install main line isolation valve where shown on plans and as per detail.

1404.13 Sprinkler Heads

Install the sprinkler heads where designated or where staked as per plan details. Spacing of heads shall not exceed the maximum recommended by the manufacturer.

1404.14 Adjustment and System Coverage

1. Coverage and Performance:

   The Contractor shall install and adjust all sprinkler heads for optimum performance and to prevent over-spray onto walks, roadways, and buildings as much as possible. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to final acceptance at direction of Town at no additional expense. Adjustments may also include changes in nozzle sizes, degrees of arc and control valve throttling as required.

2. Valves:

   Adjust flow controls and pressure reducing valves to attain the required pressure (as shown on sprinkler head legend) at the sprinkler head.

3. Grade Set:

   All sprinkler heads shall be set perpendicular to finished grade unless otherwise designated.

4. Corrections:

   Any areas which do not conform to designed operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at the Contractor's expense.

1404.15 Training

Train the Town's maintenance personnel in proper operation of all major equipment, including recommended winterization procedures. Provide this training at the Town's convenience and submit written evidence that training has been successfully completed.

1404.16 Maintenance

After final acceptance, the Town will immediately assume maintenance responsibility.

1404.17 Clean-up

Clean-up shall be a continuous operation throughout the duration of the work. Contractor shall be responsible for disposing of, off site, at no additional expense, any trash or debris generated by the installation of the work. Upon completion of work, restore ground surfaces to required elevation and remove excess materials, debris and equipment from the site to satisfaction of the Town Engineer.

1405 TESTING AND INSPECTION

1405.01 Flushing

1. Flush all lines as follows:

   a. All pressure supply lines shall be flushed from dead end fittings for a minimum of 5-minutes under a full head of pressure.

   b. Before sprinkler heads are set, non-pressure lines shall be thoroughly flushed to clean all foreign matter in the lines.

1405.02 Pressure Supply Line Testing

1. The Contractor shall arrange for the presence of the Town 48-hours in advance of testing. Contractor must supply compressor and all other test equipment.

2. Testing Pressure:

   After backfilling, fill pressure supply line with water pressure 40-psi over the designated static pressure or 150-psi, whichever is greater, for a period of 2-hours.

3. Repairs:

   Any leaks which occur during the test period will be repaired immediately following the test. The pressure supply line will then be retested until accepted by the Town.

4. Testing Period:

   Before final acceptance, the pressure supply line must remain under pressure for a period of 48-hours.

1405.03 Manual Valves

1. Test all drain, isolation, quick coupler valves completely to insure proper operation and incorporation into system.

2. Operation Prior to Turf Installation: Do not seed or lay sod until all required zones are completely operational and fully tested for 2-minutes minimum.

1405.04 Preliminary Walk Through

1. Notification:

   The Contractor shall arrange for presence of Town Engineer 48-hours in advance of walk through.

2. Installation and Operation:

   Entire system shall be completely installed and operational prior to scheduling of walk through. Test shall be accomplished before any ground cover or turf is planted.

3. Zone Operation:

   The Contractor shall operate each zone in its entirety for the Town Engineer at time of walk through and will additionally open all valve boxes, if directed by the Town Engineer.

4. Punch List:

Town or his Engineer shall generate a punch list indicating all items to be corrected prior to final walk through. Final walk through to be within 7-days of generated punch list.

5. Corrections:

Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate or inappropriate, without bringing to the attention of the Town.

1405.05 Final Acceptance and Walk Through

1. Notification:

The Contractor shall arrange for presence of the Town Engineer 48-hours in advance of final walk through.

2. Submittal Evidence:

The Contractor shall show evidence that the Town has received all accessories, charts, record drawings and equipment as required before final acceptance will be scheduled.

3. Operation:

The Contractor shall operate each zone in its entirety for the Town Engineer at time of walk through to insure correction of all items on the punch list. Any items deemed not acceptable by the Town Engineer shall be reworked to the complete satisfaction of the Town Engineer.

1406 REFERENCES

Standards Referenced in Section 1400:	
Standard	**Title**
ASTM D 2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2464	Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80