PART 1 - GENERAL

1.1 SUMMARY
A. Includes But Not Limited To:
   1. Furnish and install planting irrigation system as described in Contract Documents complete with accessories necessary for proper function.

B. Related Sections:
   1. Section 22 1116: Stop and waste valve.

1.2 SUBMITTALS
A. Product Data:
   1. Manufacturer's cut sheets for each element of system.
   2. Parts lists for operating elements of system.
   3. Manufacturer's printed literature on operation and maintenance of operating elements of system.

B. Quality Assurance / Control:
   1. Results of service pressure test before beginning work on system.

C. Closeout:
   1. Record Drawings:
      a. As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
         1) Detail and dimension changes made during construction.
         2) Significant details and dimensions not shown in original Contract Documents.
         3) Field dimensioned locations of valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, and both ends of sleeves.
         4) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
         5) Take and record dimensions at time of installation.
      b. Reduce copy of record drawing to half-size, color key circuits, and laminate both sides with 5 mil thick or heavier plastic. Mount on 1/4 inch 6 mm plywood board. Drill two 1/2 inch 13 mm holes at top of board and hang on hooks in Custodial Room.

   2. Operations And Maintenance Manual Data:
      a. Modify and add to requirements of Section 01 7000 as follows:
         1) Instruction manual that contains complete instructions for system operation and maintenance, including winterizing.
         2) Complete instructions on how to drain entire backflow preventer to prevent freezing.

1.3 QUALITY ASSURANCE
A. Qualifications:
   1. Use only trained personnel familiar with required irrigation system installation procedures.
   2. Perform installation under direction of foreman or supervisor with five years minimum experience in sprinkling system installations.
B. Regulatory Requirements: Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

C. Pre-Installation Conference: Schedule pre-installation conference before irrigation system installation begins. In addition to items listed in Division 01, demonstrate or describe method to be used to maintain head spacing from concrete and to stabilize heads.

1.4 DELIVERY, STORAGE, AND HANDLING

A. During delivery, installation, and storage, protect materials from damage and prolonged exposure to sunlight.

1.5 SEQUENCING

A. Install sleeves before installation of cast-in-place concrete site elements and paving.

1.6 WARRANTY

A. Standard one year guarantee stipulated in General Conditions Article 12.2 shall include:
   1. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
   2. Adjusting system to supply proper coverage of areas to receive water.
   3. Ensuring system can be adequately drained.

1.7 OWNER'S INSTRUCTIONS

A. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.

1.8 MAINTENANCE

A. Extra Materials:
   1. Furnish following items before Final Closeout Review:
      a. One heavy-duty key for stop and waste or main shut-off valve.
      b. One quick coupler key with brass hose swivel.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rock-Free Soil:
   1. Backfill soil around PVC pipe.
   2. Soil having rocks no larger than 1/2 inch 12 mm in any dimension.

B. Pea Gravel:
   1. For use around drains, valves, quick couplers, and impact heads.
   2. 1/2 inch 12 mm maximum dimension, washed rock.

C. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
D. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1-1/2 inches 38 mm.

E. Topsoil: Existing on-site topsoil material. Remove rocks, roots, sticks, clods, debris, and other foreign matter over 1-1/2 inches 38 mm longest dimension encountered during trenching.

2.2 COMPONENTS

A. Pipe, Pipe Fittings, And Connections:
   1. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
   2. Pipe sizes shown on Drawings are minimum. Larger sizes may be substituted if at no additional cost to Owner.
   3. Pipe:
      a. Pressure Lines: Schedule 40 PVC.
      b. Lateral Lines: Schedule 40 PVC.
      c. Backflow Assembly Piping: Galvanized steel.
      d. Quick Coupler Piping: Galvanized steel.
   4. Fittings: Same material as pipe, except where detailed otherwise.
   5. Pipe:
      a. Pressure Lines: Schedule 40 PVC.
      b. Lateral Lines: Series HDPE Polyethylene unless shown otherwise on Drawings.
      c. Backflow Assembly Piping: Galvanized steel.
      d. Quick Coupler Piping: Galvanized steel.
   6. Fittings: HDPE Polyethylene or as shown on Drawings. Provide clamp connections for polyethylene pipe with double clamps at valve connections.
   7. Sleeves:
      a. Under Parking Area And Driveway Paving: Schedule 40 PVC Pipe.
      b. All Other: Class 200 PVC Pipe.
      c. Sleeve diameter shall be two times larger than pipe installed in sleeve.

B. Sprinkler Heads:
   1. Each type of head shall be product of single manufacturer.
   2. Shrub Head Bubblers:
      a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Hunter: S-8A, S-16A series (stream spray), PCN, PCB, MSBN series.
         2) Orbit: 5400 series.
         3) Rainbird: 5 Series stream bubbler, FB series (flood bubbler).
         4) Toro: SB series (stream bubbler).
   3. Spray Heads in Shrub and Ground Cover Areas:
      a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Hunter: PROS 04, 06, and 12 Series with MPR nozzles or with shrub adapter on Schedule 80 PVC nipple. CV optional.
         2) Orbit: 5400 series with shrub adapter No. 54942.
         3) Rainbird: 1804, 1806, and 1812 Series with MPR nozzles or with PA-8S shrub adapter. SAM and PRS optional.
         4) Toro: 570 MPR series with shrub adapter.
         5) Weathermatic: LX series with MPR nozzle and LXS (shrub adapter)
   4. Spray Heads in Lawn Areas:
      a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Hunter: PROS 04, Pro-Spray Series with MPR nozzles, optional with CV; INST 04 Institutional Series with MPR nozzles, optional with CV.
         2) Orbit: 54457, 54459 with check valve, 54462, 54472, with 5400 series MPR nozzle
         3) Rainbird: 1804 Series with MPR nozzles, optional with PRS and SAM.
         4) Toro: 570 Z series/ 570PR series with MPR spray nozzles
         5) Weathermatic: LX series with MPR nozzles
   5. Stream Spray Heads, 16 to 22 foot in Shrub Areas:
6. Gear Driven Rotor Pop-ups:
   a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      1) Rainbird: PA-8S, 16F-SLA, 16H-SLA, 16Q-SLA, 22F-SS, 22H-SS, 22Q-SS
      2) Toro: SS series stream spray

   b. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      1) Hunter: PGS Series (shrub), PGP Series (30 to 52 feet), I-10 Shrub Series, I-20 Series
         (17 to 45 feet), I-25, I-40 Series (40 to 70 feet).
      2) Orbit: 5500 series PR, 5300 series
      3) Rainbird: 5000/5000 plus MPR series, 25'-35', R-50 series (21'-50'), 5500 Series (33'-
         55')
      4) Toro: Mini 8 series, Super 700 Series (21'52'), Super 800 (28'-50') series with 5 inch
         pop, TR50 Series with 5 inch pop.
      5) Weathermatic: T3, T3S series (28'-53'), CT-70 series, (49'-74')

C. Sprinkler Risers:
   1. Pop-up rotor sprinkler heads shall have adjustable riser assembly, three ell swing joint assembly,
      unless detailed otherwise on Drawings. These swing joint fittings shall be of schedule 40 PVC
      plastic and nipples schedule 80 gray PVC unless otherwise designated on Drawings. Horizontal
      nipple parallel to side of lateral line shall be 8 inches 200 mm long minimum. All other nipples on
      swing joint riser shall be of length required for proper installation of sprinkler heads.
   2. Pop-up sprinkler heads, shrub spray heads, bubbler heads, and stationary spray sprinkler heads
      shall have risers made up one of the following ways:
      a. Three schedule 40 street ells or Marlex street ells connected to lateral tee to form an
         adjustable riser or pop-up riser as detailed.
      b. Risers for sprinkler heads 14 inches 350 mm long minimum and 24 inches 600 mm
         maximum.
         1) Type Two Acceptable Products:
            a) Rainbird: Swing Pipe with barbed fittings.
            b) Hunter: SJ series with barbed fittings.
            c) Toro: Super Funny Pipe with barbed fittings, SPFA-5125, SPFA-51275.
            d) Orbit: Pro-flexx 37924, Blu-loc pipe with snap-loc fittings.
            e) Equal as approved by Architect before installation. See Section 01 6000.

D. Automatic Irrigation Control Wiring And Controller:
   1. Control wire shall be UF-UL listed, color coded PVC insulated copper conductor direct burial size
      14 or PE insulated 14 AWG color coded wire. Do not use green color coded wire.
   2. Waterproof Wire Connectors:
      a. Type Two Acceptable Products:
         1) DBY or DBR by 3M
         2) ‘One Step’ 20111SP by King Safety
         3) DB 57905, 57505 by Orbit.
         4) Equal as approved by Architect before installation. See Section 01 6000.
   3. Automatic controllers:
      a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Rainbird:
            a) 4 to 13 Stations: ESP Modular Series.
            b) 6 to 24 Stations: ESP-LX Plus and LXi Plus Series.
            c) 8 to 40 Stations: ESP-MC Series.
         2) Hunter:
            a) 3 to 15 Stations: PRO-C Series.
            b) 8 to 32 Stations: ICC Series.
         3) Weathermatic:
            a) 4 to 30 Stations: LMC Series.
         4) Toro:
            a) 9 to 48 Stations: TCC Series.
         5) Orbit:
            a) 6 to 12 Stations: Control Center Series.
   4. Automatic Rain Sensors:
      a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
         1) Rainbird: WRC (wireless rain sensor), RSD-BEx (w/bracket)
2) Hunter: MINI-CLIK, RAIN-CLIK, WRC, WRFC.
3) Weathermatic: 955 Rain Sense
4) Toro: TWR5 (wireless)
5) Orbit: RX-1, RX1.5, RX-2 (solar powered, remote)

E. Valves:
1. Manual Drain Valves:
   a. Category Four Approved Product. See Section 01 6000 for definitions of Categories.
      1) Apollo ConBraCo 3/4 inch, weld top brass ball valve, Model No. 78-154-01 with ‘T’-handle.
2. Automatic Valves:
   a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      1) Hunter: PGV, ICV series
      2) Orbit: 160 series, Production Series, Micro-valve (drip system)
      3) Rainbird: DVFUU Series, PGA series, PEB series, PESB series
      4) Toro: 252E Series,
      5) Weathermatic: 21000 CR series, 11000 CR series
3. Isolation Valves:
   a. Class Two Quality Standards. See Section 01 6000.
      1) Nibco T-113 non-rising stem gate valve.
      2) Salco PVC ball valve
4. Backflow Preventer: Make and Model shown on Drawings or as required by local code.
5. Pressure Reducing Valve:
   a. Category Four Approved Product. See Section 01 6000 for definitions of Categories.
      1) Wilkins Model 600 bronze PRV with pressure gauge.
6. Quick Coupling Valves and Keys:
   a. Category Four Approved Products. See Section 01 6000 for definitions of Categories.
      1) Hunter: HQ-3, HQ4 Series with HK-3, HK-4 key and HS-100 hose swivel,
      2) Orbit: 51029 with 51031 brass key
      3) Rainbird: 33DRC, 33DLRC, 33DK with SH-O swivel,
      4) Toro: 075-SLSC with 075-75-MHS
      5) Weathermatic: QV75 with CH-75 key and 10SHL hose swivel

F. Valve Accessories:
1. Valve manifolds:
   a. Type Two Acceptable Products.
      1) Orbit: Model 57955/2 port.
      2) Action
      3) Equals as approved by Architect before use. See Section 01 6000.
2. Valve Box Platforms:
   a. Type Two Acceptable Products:
      1) Orbit: 53000.
      2) Equal as approved by Architect before use. See Section 01 6000.
3. Plastic Valve Boxes And Extensions:
   a. Type Two Acceptable Products:
      2) Orbit: 53983, 53993, 53753, 53985, 53755, 53995 (with extension boxes).
      3) Carson-Brookes.
      4) Plymouth Products, Div Ametek.
      5) Equal as approved by Architect before use. See Section 01 6000.
4. Valve ID tags:
   a. Type Two Acceptable Products:
      2) Equal as approved by Architect before use. See Section 01 6000.
5. Valve Box Supports: Standard size fired clay paving bricks without holes.

G. Drip System
1. Category Four Approved Products. See Section 01 600 for definitions of Categories.
   a. Hunter: PCZ Series, ICZ Series drip assembly,
b. Orbit: Microvalve, Apollo 8 manifold, (irrigation drippers & fittings)
c. Rainbird: XBT series, SXB series, XB series multi outlet, Dripline series, X CZ-LF series, (low flow kits w/ filters)
d. Toro: DZK-EZF model.
e. Salco: PVC flex hose, drip emitters, multi-outlet emitters, wye strainers, filters.

H. Other Components:
1. Recommended by Manufacturer and subject to Architect's review and acceptance before installation.
2. Provide components necessary to complete system and make operational.

2.3 MANUFACTURERS

A. Contact Information:
11. 3M, Austin, TX  www.3m.com/elpd.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Type One Acceptable Installers:
1. <Insert Acceptable Installers>.
2. Equal as approved by Architect before bidding. See Section 01 6000.

B. Approved irrigation system installer shall be pre-approved included in Construction Documents by Addendum.

3.2 EXAMINATION

A. Site Verification Of Conditions: Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant. Notify Architect if pressures over 70 psi 480 kPA or under 55 psi 379 kPA are found to determine if some re-design of system is necessary before beginning work on system.

3.3 PREPARATION

A. Protection:
1. Repair or replace work of this Section damaged during course of the Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
2. Do not cut existing tree roots measuring over 2 inches 50 mm in diameter in order to install irrigation lines.
B. Layout of Irrigation Heads:
1. Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
2. During layout, consult with Architect to verify proper placement and make recommendations, where revisions are advisable.
3. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
4. Make certain changes from Contract Documents are shown on record drawings.

3.4 INSTALLATION

A. Trenching And Backfilling:
1. Pulling of pipe is not permitted.
2. Excavate trenches to specified depth. Remove rocks larger than 1-1/2 inch 38 mm in any direction from bottom of trench. Separate out rocks larger than 1-1/2 inch 38 mm in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
3. Cover pipe both top and sides with 2 inches 50 mm of rock-free soil as specified under PART 2 PRODUCTS. Remainder of backfill to within 5 inches 125 mm of finish grade shall be as specified in Section 31 2323. Top 5 inches 125 mm of backfill shall be topsoil as specified in Section 32 9113.
4. Do not cover pressure main, irrigation pipe, or fittings until Architect has inspected and approved system.

B. Sleeving:
1. Sleeve water lines and control wires under walks and paving. Extend sleeves 6 inches 150 mm minimum beyond walk or pavement edge. Cover sleeve ends until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

C. Grades And Draining:
1. In localities where winterization is required, grade piping so system can be completely drained or blown out with compressed air. If system is not designed to be blown out with compressed air:
   a. Slope pipe to drain to control valve box where possible.
   b. Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:
      1) 3/4 inch 19 mm brass ball valve for manual drain. Do not use automatic drain valves.
      2) Install 2 inch 50 mm Class 200 PVC pipe over top of drain and cut at finish grade.
      3) Provide rubber valve cap marker.
      4) Provide one cu ft 0.03 cu m pea gravel sump at outlet of each drain.
   c. Slope pipes under parking areas or driveways to drain outside these areas.
   d. Provide and install quick-coupling valve or valves in location for easy blowout of entire system. Install quick coupler valves with 4 lineal feet 1200 mm minimum of Schedule 80 PVC pipe between valve and main line.

D. Installation of Pipe:
1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 18 inches 450 mm based on finished grade. Install remaining lateral lines with minimum of 12 inches 300 mm of cover based on finish grade.
3. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches 450 mm below finish grade or as shown on Drawings.
4. Locate no sprinkler head closer than 12 inches 300 mm from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch 25 mm below top of mow strip, walk, or curb and have one to 3 inches 75 mm clearance between head and mow strip, walk, or curb.
5. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.

6. Make solvent weld joints as follows:
   a. Do not make solvent weld joints if ambient temperature is below 35 deg F 2 deg C.
   b. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
   c. Apply uniform coat of 711 solvent to outside of pipe.
   d. Apply solvent to fitting in similar manner.
   e. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
   f. Allow joints to set at least 24 hours before applying pressure to PVC pipe.

7. Tape threaded connections with teflon tape.

8. If pipe is larger than 4 inches 100 mm, install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines, unless otherwise detailed on Drawings.

E. Control Valves And Controller
   1. Install valves in plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within 12 inches of sidewalks and shrub bed edges with tops at finish grade. Do not install more than two valves in single box.
   2. Place 3 inches 5 mm minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.

3. Wiring:
   a. Tape control wire to side of main line every 10 feet 3 000 mm. Where control wire leaves main or lateral line, enclose it in Class 200 PVC conduit.
   b. Use waterproof wire connectors at splices and locate all splices within valve boxes.
   c. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one controller.
   d. Run one spare control wire from panel continuously from valve to valve throughout system similar to common wire for use as a replacement if a wire fails. Spare wire shall be different color than other wires, except use of green wire is not acceptable. Mark spare control wire in control box as an unconnected wire. Extend spare control wires 24 inches 600 mm and leave coiled in each valve box.

F. Backflow Preventer:
   1. Install 24 inches 600 mm minimum from structures or hardscaping.
   2. When installed adjacent to any structure, mount test cocks on side away from structure.
   3. After installation, remove handles and turn over to Owner together with extra maintenance materials.

G. Sprinkler Heads:
   1. Before installation of sprinkler heads, open control valves and use full head of water to flush out system.
   2. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
   3. Do not install sprinklers using side inlets. Install using base inlets only, unless approved otherwise in writing by Architect.
   4. Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference.

H. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.5 FIELD QUALITY CONTROL

A. Site Tests: Before backfilling main line, test pressure at 100 psi 690 kPA minimum for 2 hours minimum and make certain there are no leaks. Notify Architect 2 working days minimum before conducting test.
B. Inspections: Architect's irrigation design consultant, or certified water auditor recommended by consultant and approved in writing by Architect, will review irrigation system before substantial completion. Upon approval of irrigation system, reviewer will provide signed acceptance certificate to be included in Operations and Maintenance Manual. Certificate will include name and signature of reviewer, reviewer's company, date of review, and reviewer's telephone number.

3.6 ADJUSTING

A. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.

B. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.

C. Adjust watering time of valves to provide proper amounts of water to plants.

END OF SECTION