

# Netafim Performance Specifications

## Sample Only

### **TECHLINE® CV CONTINUOUS SELF-CLEANING, RECYCLED CONTENT, PRESSURE COMPENSATING DRIPPERLINE WITH BUILT-IN CHECK VALVE**

#### **Description**

Techline® CV is a low volume dripperline with integral and evenly spaced pressure compensating, check valve drippers welded to the inside of the tubing that contains recycled content. Techline® CV is available with drippers in four discharge rates (0.26, 0.42, 0.61, and 0.92 gallons per hour [GPH]) evenly spaced at 12", 18", or 24" centers. Techline® CV is available in 100', 250', and 1,000' coils. Techline® CV Blank Tubing is available in 100', 250', and 1,000' coils.

#### **Construction**

Techline® CV shall be nominally sized to 17mm (½") low-density linear polyethylene tubing with recycled content qualifying for maximum LEED credits. Techline® CV shall be constructed with pressure compensation, continuously self-cleaning, integral drippers with an internal check valve at these spacings (12", 18", or 24" centers). Techline® CV may also be manufactured without drippers installed. The exterior of the tubing shall be brown in color and conform to an outside diameter (O.D.) of 0.66 inches and an inside diameter (I.D.) of 0.56 inches. Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the manufacturing process. These drippers shall be constructed of a two (2) piece plastic dripper housing containing a continuously self-flushing molded silicone diaphragm. The dripper shall have a built-in check valve that will hold back a 4.6' column of water. The dripper shall be installed into the tubing so that the inlet to the dripper is toward the center of the tubing cross section. The dripper shall also have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the exit bath of the dripper. Techline® CV shall be Netafim Model Number TLCV - \_\_\_ - \_\_\_ - \_\_\_\_\_. Techline® CV Blank Tubing shall be Netafim Model Number TLCV0\_\_\_.

#### **Operation**

Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure range of fourteen point five to seventy (14.5 - 70) pounds per square inch (psi), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 14.5 - 50 psi. The dripper discharge rate shall be 0.26, 0.42, 0.61, or 0.92 gallons per hour (GPH) utilizing a combination of turbulent flow and reduced pressure compensation by molded silicone diaphragm. The drippers shall be capable of continuously cleaning themselves while in operation. The dripperline shall be available with 12", 18", and 24" spacing between drippers unless otherwise specified. For subsurface installation, Techline® CV pipe depth shall be 6" or less. Maximum system pressure shall be 50 psi for maximum fitting integrity. Filtration shall be 120 mesh or finer. Bending radius shall not be smaller than 7" or tubing kinking may result.

For on-surface or under mulch installations, 6" metal wire staples (TLS6) shall be installed 3' - 5' on center, (depending on soil type) and two staples shall be installed over every change-of-direction fitting.

## **TECHLINE® SELF-CLEANING, PRESSURE COMPENSATING DRIPPERLINE**

### **Description**

Techline® is a low volume dripperline with integral and evenly spaced pressure compensating drippers welded to the inside of the tubing that contains recycled content. Techline® is available with drippers in four discharge rates (0.26, 0.42, 0.61, and 0.92 gallons per hour [GPH]) evenly spaced at 12", 18", or 24" centers. Techline® is available in 100', 250', and 1,000' coils. Techline® Blank Tubing is available in 100', 250', and 1,000' coils.

### **Construction**

Techline® shall be nominally sized to 17mm (1/2") low-density linear polyethylene tubing with recycled content qualifying for maximum LEED credits. It shall be constructed with pressure compensation, and be continuously self-cleaning. It is manufactured at these spacings (12", 18", or 24" centers). Techline® may also be manufactured without drippers installed. The exterior of the tubing shall be brown in color and conform to an outside diameter (O.D.) of 0.66 inches and an inside diameter (I.D.) of 0.56 inches. Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the manufacturing process. These drippers shall be constructed of a two (2) piece plastic dripper housing containing a continuously self-flushing molded silicone diaphragm. The dripper shall be installed into the tubing so that the inlet to the dripper is toward the center of the tubing cross section. The dripper shall also have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the exit bath of the dripper. Techline® shall be Netafim Model Number TLDL - \_\_\_-\_\_\_-\_\_\_\_. Techline® Blank Tubing shall be Netafim Model Number TLDL0\_\_\_\_.

### **Operation**

Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure between seven to seventy (7 - 70) pounds per square inch (psi), at a constant rate of flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 7 - 50 psi. The dripper discharge rate shall be 0.26, 0.42, 0.61, or 0.92 gallons per hour (GPH) utilizing a combination of turbulent flow and reduced pressure compensation by molded silicone diaphragm. The drippers shall be capable of continuously cleaning themselves while in operation. The dripperline shall be available with 12", 18", and 24" spacing between drippers unless otherwise specified. For subsurface installation, Techline® pipe depth shall be 6" or less. Maximum system pressure shall not exceed 50 psi for maximum fitting integrity. Filtration shall be 120 mesh or finer. Bending radius shall not be smaller than 7" or tubing kinking may result.

For on-surface or under mulch installations, 6" metal wire staples (TLS6) shall be installed 3'-5' on center, (depending on soil type) and two staples shall be installed over every change-of-direction fitting.

## **TECHLINE® FOR RECLAIMED WATER (RW) - CONTINUOUS SELF-FLUSHING, PRESSURE COMPENSATING DRIPPERLINE**

### **Description**

Techline® for Reclaimed/Recycled Water Use (Referred to as "RW") is a low volume dripperline with integral and evenly spaced pressure compensating drippers welded to the inside of the tubing.

Techline® RW is available with drippers in four discharge rates (0.26, 0.42, 0.61, and 0.92 gallons per hour [GPH]) evenly spaced at 12", 18", or 24" centers. Techline® RW is available in 1,000' coils. Techline® RW Blank Tubing is available in 1,000' coils.

### **Construction**

Techline® for Reclaimed Water (Referred to as "RW") shall be nominally sized to 17mm (½") low-density linear polyethylene tubing with recycled content qualifying for maximum LEED credits. It shall be constructed with pressure compensation, and be continuously self-cleaning. It is manufactured at these spacings (12", 18", or 24" centers). Techline® RW may also be manufactured without drippers installed. The exterior of the tubing shall be brown in color and conform to an outside diameter (O.D.) of 0.66 inches and an inside diameter (I.D.) of 0.56 inches. Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the manufacturing process. These drippers shall be constructed of a two (2) piece plastic dripper housing containing a continuously self-flushing molded silicone diaphragm. The dripper shall be installed into the tubing so that the inlet to the dripper is toward the center of the tubing cross section. The dripper shall also have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the exit bath of the dripper. Techline® RW shall be Netafim Model Number TLDLR - \_\_\_ - \_\_\_ - \_\_\_\_\_. Techline® RW Blank Tubing shall be Netafim Model Number TLDLR0\_\_\_\_\_.

### **Operation**

Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure between seven to seventy (7 - 70) pounds per square inch (psi), at a constant rate of flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 7 - 50 psi. The dripper discharge rate shall be 0.26, 0.42, 0.61, or 0.92 gallons per hour (GPH) utilizing a combination of turbulent flow and reduced pressure compensation by silicone diaphragm. The drippers shall be capable of continuously cleaning themselves while in operation. The dripperline shall be available with 12", 18", and 24" spacing between drippers unless otherwise specified. For subsurface installation, Techline® RW depth shall be 6" or less. Maximum system pressure shall be 50 psi for maximum fitting integrity. Filtration shall be 120 mesh or finer. Bending radius shall not be smaller than 7" or tubing kinking may result.

For on-surface or under mulch installations, 6" metal wire staples (TLS6) shall be installed 3'-5' on center, (depending on soil type) and two staples shall be installed over every change-of-direction fitting.

## **TECHLINE® CV and TECHLINE® FITTINGS (0.56")**

### **Description**

Techline® CV and Techline® fittings shall be constructed in one of the following end configurations:

- Barbed insert fittings only,
- Male pipe threads (MPT) with barbed insert fittings, or
- Female pipe threads (FPT) with barbed insert fittings.

### **Construction**

All fittings shall be constructed of injection molded, brown plastic having a nominal outside dimension of 17mm (0.56"). Female and male threaded ends shall be capable of mating to standard PVC pipe with tapered threads.

## **Operation**

Techline® CV and Techline® fittings shall be mated with Netafim Techline® CV and Techline® dripperline by pushing the fitting into the tubing while twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop.

Maximum system pressure without clamps shall be 50 psi.

Techline® CV and Techline® fittings shall be Netafim Model Numbers TLTEE, TLCOUP, TL2W075MA, TLELL, TLCROS, TL050MA, TL075MA, TL075FTEE, TLIAPE, and TLIAPVC.

## **TECHLINE® CV and TECHLINE® SPECIALTY FITTINGS**

### **1. Techline® Insert Adapter for Polyethylene**

#### **Description**

The Techline® Insert Adapter for Polyethylene is a 2-piece threaded-connection fitting designed to transition from 1" or larger polyethylene pipe to Techline® CV or Techline®.

#### **Construction**

The Techline® Insert Adapter for Polyethylene shall be a 2-piece threaded-connection fitting constructed of an injection-molded plastic.

#### **Operation**

The fitting shall unthread to allow the inlet end to be pressed into a pre-drilled 11mm, 15/32" or 1/2" hole created using a forstner drill bit in 1" or larger medium or high density PE pipe. Tightening the fitting by threading the 2 pieces together shall create a waterproof connection. Maximum system pressure without clamps shall be 50 psi.

The Techline® Insert Adapter for Polyethylene shall be Netafim Model Number TLIAPE-B.

### **2. Techline® Insert Adapter for PVC**

#### **Description**

The Techline® Insert Adapter for PVC is a two-piece fitting designed to transition from rigid 1 1/2" or larger CL160, CL200 or Sch. 40 PVC pipe to Techline® CV or Techline®.

#### **Construction**

The Techline® Insert Adapter for PVC shall consist of a rubber grommet and an injection molded plastic insert adapter.

#### **Operation**

The rubber grommet shall fit into a hole drilled with a Netafim TDBIT16.5 drill bit or other pre-drilled 16.5mm (21/32") hole in rigid 1 1/2" or larger CL160 or Sch. 40 PVC pipe. The flared top of the grommet shall seat against the outside of the PVC pipe. The short end of the insert adapter is then press-fit into the seated rubber grommet. Maximum system pressure without clamps shall be 50 psi.

The Techline® Insert Adapter for PVC shall be Netafim Model Number TLIAPVC-B.

## **DRIPPER PLUG RING**

### **Description**

The Netafim Dripper Plug Ring is a pre-formed plastic ring with a rounded inside plug that can be used to plug a Techline® CV or Techline® dripper outlet.

### **Construction**

The Dripper Plug Ring shall be constructed of an injection-molded plastic of a diameter slightly larger than the outside diameter of the Techline® CV or Techline® tubing. The circular design shall be open on one end to enable it to be slipped over the tubing. Within the interior of this ring (opposite the open end) is a rounded plug made to press-fit into the water outlet of the dripper to prevent water emission.

### **Operation**

Slip the Dripper Plug Ring over the Techline® CV or Techline® tubing and push the plug into the tubing outlet hole until it seats securely in the hole.

The Dripper Plug Ring shall be Netafim Model Number TLDPLUG.

## **DRIPPER MICRO-TUBING ADAPTER**

### **Description**

The Netafim Dripper Micro-Tubing Adapter is a pre-formed plastic saddle with a micro-tubing adapter outlet that can be attached over a Techline® CV or Techline® dripper outlet. This allows water to be moved via micro-tubing to a specific area away from the dripperline location.

### **Construction**

The Dripper Micro-Tubing Adapter shall be constructed of molded plastic and shall have the ability to be tightened over the Techline® CV or Techline® dripper outlet hole. It shall have an outlet fitting capable of accepting 0.160" x 0.220" micro-tubing.

### **Operation**

The Dripper Micro-Tubing Adapter shall fit over the Techline® CV or Techline® dripper outlet hole and be squeezed until the fitting is securely attached to the tubing. Insert 0.160" x 0.220" micro-tubing onto the outlet end of the fitting and place the micro-tubing adjacent to the area to be irrigated.

The Dripper Micro-Tubing Adapter shall be Netafim Model Number TLMTUBEADP.

## **STAINLESS STEEL CLAMPS (for operating pressures in excess of 50-psi)**

### **Description**

Stainless steel clamps are used to secure Techline® CV/Techline® to barbed insert fittings. Clamps shall be manufactured by "Oetiker" and shall be one "ear" type. Nominal size that is recommended for use with Techline® CV/Techline® is 13/16", Part No. 210SS.

## **Construction**

Oetiker clamps shall be constructed of 304 AISI stainless steel. Clamps shall be one "ear" type and formed with a "dimple", allowing for thermal expansion and contraction properties without loosening the clamp.

Interior clamp wall shall be smooth to prevent crimping or pinching of tubing. Wall thickness of clamps shall be 0.0236" (0.6 mm) with an overall band width of ¼" (7 mm).

## **Operation**

Stainless steel clamps are used to secure Techline® CV/Techline® over barbed insert fittings when design-operating pressures exceed 50 psi. Clamps are to be slipped over the tubing before being fitted to barbed insert fittings. Place the clamp between the first and second ridge of the barbed insert fittings. Crimp the "ear" of the clamp tightly with an Oetiker pincer tool. Crimp twice to ensure proper seating.

## **TECHFILTER®**

### **Description**

Techfilter is the incorporation of a disc filter and a chemical root intrusion preventer (trifluralin) with a required amount of Techline® or Techline® CV dripperline. Techfilter is available in 5 filter sizes, (¾", 1", 1" Long, 1½" Long, and 2") with dripper flow rates of, (0.4, 0.6, and 0.9 GPH for Techline® and 0.26, 0.4, 0.6, and 0.9 GPH for Techline® CV) spaced at 12", 18", or 24" centers, and a specific amount of Techline® or Techline® CV with each Techfilter ordered. The mesh rating is 120, and maximum system pressure is 140 psi.

### **Construction**

**Filter:** The filter shall be a multiple disc filter with trifluralin incorporated into the replaceable disk ring assembly inside the filter housing. The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be capable of periodic servicing and replacement of the chemically treated disk ring set by unscrewing a threaded cap or unlatching the band.

**Dripperline:**

**Techline®:** The Techline® drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of seven to seventy (7-70) pounds per square inch (psi), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 15 - 50 psi. The dripper discharge rate shall be 0.4, 0.6, or 0.9 gallons per hour (GPH) utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and a diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripperline shall be available in 12", 18", and 24" spacing between drippers unless otherwise specified. Techline® pipe depth shall be \_\_\_\_\_ unless otherwise specified. Maximum system pressure shall be 50 psi.

**Techline® CV:** The Techline® CV drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of fourteen point seven to seventy (14.7 - 70) pounds per square inch (psi), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 20 - 50 psi. The dripper discharge rate shall be

0.26, 0.4, 0.6, or 0.9 gallons per hour (GPH) utilizing a combination turbulent flow/reduced pressure compensation cell mechanism with a check valve and a diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripperline shall be available in 12", 18", and 24" spacing between drippers unless otherwise specified. Techline® CV pipe depth shall be \_\_\_\_\_ unless otherwise specified. Maximum system pressure shall be 50 psi.

### **Operation**

When water passes through the filter, a very low concentration of trifluralin (parts per billion) is transmitted throughout the Techline® or Techline® CV piping network. This provides for precise and even distribution of trifluralin throughout the piping network and effectively inhibits root growth into the dripper outlets.

The trifluralin-treated filter ring set shall be replaced every two (2) years, or two hundred (200) hours of operation, whichever occurs first.

The Techfilter system shall be Netafim Model Number TF \_\_\_\_\_ - \_\_\_\_ for Techline® and TF \_\_\_\_\_ - \_\_\_\_\_ CV for Techline® CV.

## **TECHLINE® CHECK VALVE**

### **Description**

Techline® Check Valves are designed to hold water back in dripperline to help prevent low drainage. When used in every 4½' elevation change in Techline® CV zones, it allows all drippers in the dripperline to begin operating at the same time by helping keep the dripperline full of water.

### **Construction**

The Techline® Check Valve shall be constructed of molded plastic with an insert inlet and discharge w/collar.

### **Operation**

The Techline® Check Valve shall have an opening pressure of 7.3 psi (5m) and a closing pressure of 5.7 psi (4m). It shall have a flow range of 0.9-4.4 GPM (200 - 1,000l/h).

The Techline® Check Valve shall be Netafim Model Number TLCV.

## **LINE FLUSHING VALVE**

### **Description**

Line Flushing Valves are used to reduce sediment build-up in Techline®/8mm Techlite and to pass sediment or debris that has not been captured by the disc filter.

### **Construction**

The Line Flushing Valve shall be constructed of brown molded plastic with one of the following end configurations:

- ½" MPT
- Insert inlet w/collar

## **Operation**

The Line Flushing Valve shall automatically operate at the beginning of the irrigation cycle as the system begins to pressurize, and flush approximately one gallon of water at 57 psi maximum, or 1.5 psi minimum. **Note:** Permanent damage could occur to the Line Flushing Valve if incoming pressure exceeds 57 psi. Netafim Pressure Regulators are recommended even when using pressure regulating remote control valves, since these valves may allow full line pressure into the piping network for a brief period of time before pressure regulation occurs.

Line Flushing Valves are to be installed below grade, as detailed, in a valve box to allow for periodic inspection and are to be installed in one of two ways:

- Vertically: Dome portion facing upward, installed on a 90 degree elbow.
- Horizontally: Dome portion facing sideways.

One (1) Line Flushing Valve shall be installed for every fifteen (15) GPM of zone flow, and shall be installed at a point farthest away from the source (typically on an exhaust header) as possible.

Automatic Line Flushing Valves shall not be required on zones of Techline® CV dripperline, however, some accommodation must be made for manual flushing by the installation of a ball valve or a figure-eight end closure fitting at a point farthest from the source. Use TISOV or TIFIG8.

The Line Flushing Valve shall be Netafim Model Number TL\_\_\_\_\_.

## **AIR/VACUUM RELIEF VALVE**

### **Description**

The Air/Vacuum Relief Valve serves two purposes:

- To evacuate air from the Techline® laterals during system start-up and,
- To prevent a vacuum from occurring after the remote control valve has closed, thus preventing debris intrusion into the drippers via back siphonage.

### **Construction**

The Air/Vacuum Relief Valve shall be constructed of black and/or grey plastic with a ½" male pipe thread capable of mating with a threaded PVC reduction bushing or ½" FPT fitting.

### **Operation**

Subsurface Techline® installations require that air/vacuum relief valves be installed at the highest elevation in each zone (some zones may require more than one) in order to expel air and relieve vacuum. In a zone where the highest elevation occurs between the intake and exhaust headers (such as a mound or berm), an air/vacuum relief lateral shall interconnect all the Techline® dripperlines to avoid the necessity of installing one air/vacuum relief valve on each Techline® lateral. Air/Vacuum Relief Valves can be installed below grade in valve boxes to allow for periodic inspection.

Air/Vacuum Relief Valves shall not be required on zones of Techline® CV dripperline.

The Air/Vacuum Relief Valve shall be Netafim Model Number TLAVRV.

## **OPERATION/PRESSURE INDICATOR STAKE**

### **Description**

The Pressure Indicator Stake provides a visual confirmation of a Techline® system operation.

### **Construction**

The Pressure Indicator Stake shall be constructed of molded black plastic, with a yellow indicator flag and flexible tubing with adapter.

### **Operation**

When visual confirmation of a subsurface Techline® system operation is desirable, the operation/pressure indicator stake should be installed. When the zone is on, pressure causes the flag to rise. At a pressure of 10 psi and higher, it is at a 90-degree angle. When the pressure drops below 4.5 psi or the system is off the flag is in a down position.

The Operation/Pressure Indicator Stake shall be Netafim Model Number 10-F-01.

## **PRESSURE REGULATOR: HIGH FLOW PRESSURE REGULATOR**

### **Description**

The purpose of the Pressure Regulator is to control downstream pressure at or below the specified system operating pressure. Unregulated pressures in excess of the recommended operating ranges can diminish and disable line flushing valves or cause the integrity of the Techline®/Techlite fittings connection to weaken and/or fail.

### **Construction**

The Pressure Regulator shall be a Netafim spring-operated piston-type regulator with an externally accessible regulation unit that can be serviced without removing the valve body from the piping. The body shall be molded of black plastic with a combination of male/female pipe threaded inlet and outlet.

### **Operation**

The Pressure Regulator shall have a built-in indicator that indicates when it is operating. It shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating downstream pressure to 15 psi, 20 psi, 25 psi, 35 psi, or 43 psi in  $\frac{3}{4}$ " or  $1\frac{1}{2}$ " configurations. The Pressure Regulator shall operate in a flow range of 3.5 - 17.6 GPM in the  $\frac{3}{4}$ " configuration and 7 - 35 GPM in the  $1\frac{1}{2}$ " configuration. Maximum pressure at inlet shall be 145 psi.

The Pressure Regulator shall be a Netafim Model Number PRV \_\_\_\_\_.

## **PRESSURE REGULATOR: IN-LINE LOW FLOW PRESSURE REGULATOR**

### **Description**

The purpose of the Pressure Regulator is to control downstream pressure at or below the specified system operating pressure. Unregulated pressures in excess of the recommended operating ranges

can diminish and disable line flushing valves or cause the integrity of the Techline®/Techlite fittings connection to weaken and/or fail.

### **Construction**

The Pressure Regulator shall be a Netafim spring-operated, in-line piston-type regulator. The body shall be molded of black plastic with ¾" female/female pipe threaded inlet and outlet. Directional arrows shall show flow direction of water.

### **Operation**

The Pressure Regulator shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating downstream pressure to 15 psi, 20 psi, 25 psi, 35 psi, or 43 psi. The Pressure Regulator shall operate in a flow range of 0.25 - 4.4 GPM. Maximum pressure at inlet not exceed 145 psi.

The Pressure Regulator shall be a Netafim Model Number PRV075LF\_\_\_\_V2K.

## **DISC FILTER**

### **Description**

The purpose of the Disc Filter is to capture and retain water-transported debris or sediment.

### **Construction**

The filter shall be a multiple disc filter with color-coded filter elements indicating the mesh size of the element being used. The discs shall be constructed of chemical-resistant thermoplastic for corrosion resistance.

The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be capable of periodic servicing by unscrewing a threaded cap or unlatching the band. The ¾" DFV model shall have an integral manual shut-off valve.

Disc filter ring color-coding shall be: Yellow (80 Mesh), Red (120 Mesh), Black (140 Mesh), or Green (200 Mesh).

### **Operation**

Installation of the Disc Filter shall be as detailed. Disc filters can be installed downstream of the remote control valve to allow for periodic servicing when the remote control valve is not operating. It can be installed upstream of the remote control valve if the disc filter is specified with manual shut-off valve or when a line size shut-off valve is also specified to allow for periodic servicing with a pressurized main line. Recommended installation of disc filters shall be below grade positioned in a valve box large enough to remove the disk filter cap and internal disc element, or above grade. A gravel sump in the bottom of the valve box is recommended to drain water during periodic maintenance.

The Disc Filter shall be a Netafim Model Number DF \_\_\_\_\_.

## **1" SCREEN FILTER**

### **Description**

The purpose of the screen filter is to capture and retain water-transported debris or sediment. The filter shall have a maximum flow rate of 19 GPM @ 3 psi friction loss and 26 GPM @ 6.6 psi friction loss. Maximum temperature shall not exceed 140°F (60°C) and maximum pressure shall not exceed 115 psi (7.93 bars).

### **Construction**

The filter shall be a screen-type filter with a polyester, 120 mesh (130 micron) screen with 15 square inches of surface area and a polypropylene spine.

The filter body shall be molded of black polypropylene with 1" FPT swivel threads inlet and outlet ends. The inlet and outlet shall be constructed like a "union-style" fitting to allow for easy installation and disassembly of the filter without disturbing other assemblies in-line. The body shall incorporate a captured EPDM o-ring on the body to cup connection and on the inlet and outlet ends to help ensure a watertight connection. The filter cup shall have a 3/4" MPT end with cap and EPDM o-ring to allow for periodic servicing by unscrewing the threaded cap for flushing.

### **Operation**

Installation of the filter shall be as detailed with water flow directed by the molded directional arrow in the body of the filter. The filter may be installed downstream of the remote control valve to allow for periodic servicing when the remote control valve is not operating. It may be installed upstream of the remote control valve if the filter is specified with manual shut-off valve or when a line size shut-off valve is also specified to allow for periodic servicing with a pressurized main line. Recommended installation of screen filters shall be below grade positioned in a valve box large enough to remove the filter cup and internal screen element, or above grade. A gravel sump in the bottom of the valve box is recommended to drain water during periodic maintenance.

The 1" Screen Filter shall be a Netafim Model Number SF100-120.

## **PCDj PRESSURE COMPENSATING, CONTINUOUS SELF-CLEANING DRIPPERS WITH CHECK VALVE**

### **Description**

PCDj point source drippers are used in areas where very precise watering is required. They may be used alone or in combination to irrigate specific plants, trees, or areas.

### **Construction**

Drippers shall be pressure compensating, continuous self-flushing with a built-in 1.5 psi check valve to prevent low-pressure drainage. They shall be constructed of molded plastic and have colored bodies to denote flow-rate. A red body shall denote 0.5 GPH, (2 l/h) grey shall denote 1.0 GPH, (4 l/h) and green shall denote 2.0 GPH (8 l/h). The dripper shall utilize a pressure differential mechanism with EPDM diaphragm to continually regulate each dripper's flow rate. A check valve feature shall prevent contaminants from being drawn into the dripper.

The barbed inlet hole of the dripper shall be shaped like a cross to identify it as the inlet. The inlet shall be installed directly into poly tubing after a hole has been created using a 5mm punch tool, or be inserted into 0.160" x 0.220" micro-tubing. The outlet end of the PCDj dripper shall be barbed to accept 0.160" I.D. micro-tubing.

Individual drippers shall have color-coded bodies.

### **Operation**

The PCDj dripper shall have a pressure-compensating operating range of 7 - 60 psi. The dripper shall be able to flush debris that could cause plugging at any time during the irrigation cycle. The dripper shall be installed at-grade, above grade, or below grade. Filtration shall be 120 mesh or finer.

Pressure Compensating Drippers shall be Netafim Model Number PCDj \_\_\_\_\_.

## **TECHFLOW PRESSURE COMPENSATING, CONTINUOUS SELF-CLEANING DRIPPERS WITH CHECK VALVE**

### **Description**

Techflow point source drippers are used in areas where very precise watering is required. Techflow drippers are used alone or in combination to irrigate specific plants, trees, or areas.

### **Construction**

Techflow drippers shall be pressure compensating, continuous self-flushing with a built-in 5 psi check valve to prevent low pressure drainage. They shall be constructed of thermoplastics, be brown in color with color-coding for flow rate and shall utilize a pressure differential mechanism with EPDM diaphragm to continually regulate each dripper's flow rate. Anti-siphon operation shall prevent contaminants from being drawn into the dripper.

The inlet of the dripper shall be barbed, and be installed directly into poly tubing after a hole has been created using a 5mm punch tool, or be inserted into 0.160" x 0.220" micro-tubing. The outlet end of the Techflow WPC dripper shall have a raised smooth nipple to accept 0.160" x 0.220" micro-tubing. The Techflow PC dripper shall have an outlet end that does not accept micro tubing. The Techflow WPCT shall have a 1/2" FPT inlet end and nipple outlet.

Individual drippers shall be color-coded. Red shall denote 0.5 GPH, Black shall denote 1.0 GPH, and Green shall denote 2.0 GPH. The hole in the inlet end of the dripper shall be shaped like a cross to denote it is the inlet end of the dripper.

The Techflow WPC and WPCT drippers shall be able to accept either a WPBC Bug Cap or WPBA Barbed Adapter for Nipple on the outlet end.

### **Operation**

The Techflow WPC and PC dripper shall have a pressure-compensating operating range of 7 - 60 psi. The Techflow Dripper shall be installed at-grade, above grade, or below grade. Filtration shall be 120-mesh or finer.

Techflow Drippers shall be Netafim Model Number \_\_\_\_\_.

## **BD AND WP SERIES NON-PRESSURE COMPENSATING DRIPPERS**

### **Description**

BD and WP point source drippers are designed to be used in piping networks with limited pressure variation. BD and WP drippers are used alone or in combination to irrigate specific plants, trees or areas.

### **Construction**

BD and WP drippers shall be non-pressure compensating drippers. They shall be constructed of thermoplastics, be black in color with color-coding for flow rate and shall utilize a wide turbulent flow passage to resist clogging.

The inlet of the dripper shall be barbed, and be installed directly into poly tubing after a hole has been created using a 5mm punch tool, or be inserted into 0.160" x 0.220" micro-tubing. The outlet end of the WP dripper shall be barbed to accept 0.160" x 0.220" micro-tubing. The BD dripper shall have an outlet end that does not accept micro tubing.

Individual drippers shall be color-coded to denote nominal flow rates. Red shall denote 0.5 GPH, black shall denote 1.0 GPH, and green shall denote 2.0 GPH. The hole in the inlet end of the dripper shall be shaped like a cross to denote it is the inlet end of the dripper.

### **Operation**

The BD and WP dripper shall operate to a maximum pressure of 40 psi. Recommended operating pressure shall be 10 - 40 psi. The BD and WP Dripper shall be installed above grade, or at-grade. Filtration shall be 120 mesh or finer.

BD and WP Drippers shall be Netafim Model Number \_\_\_\_\_.

## **¼" POLYETHYLENE DISTRIBUTION TUBING (0.160" x 0.220")**

### **Description**

Distribution tubing delivers water to a location away from a piping network. Point source drippers may be attached upstream of the dripper, downstream of the dripper, (if available with a downstream connection) or both.

### **Construction**

The distribution tubing shall consist of low-density linear polyethylene tubing with an I.D. of 0.160" (4 mm) and an O.D. of 0.220" (6 mm).

### **Operation**

The tubing shall be capable of flowing a maximum of 18 GPH (68,1-l/h) based on C=150 and a velocity that does not exceed 5.0 ft./sec (1,5 m/s). The tubing shall work with all 4 mm insert fittings. The tubing shall either connect to a larger piping network and move water to a remote location, connect to a larger piping network and move water to drippers in a remote location, or move water from the outlet of a dripper to a remote location.

Distribution tubing shall be Netafim Part Number EDTUBE-01 (100' coil) or EDTUBE-10 (1,000').

## **LOW-VOLUME CONTROL ZONE KITS**

### **1. Low Flow 0.25 - 4.4 GPM:**

#### **Description**

The Low-Volume Control Zone Kit is a completely assembled assembly comprised of a 1" 24VAC valve, 3/4" filter and low-flow pressure regulator. It is designed to operate zones ranging from 0.25 - 4.4 GPM, provide filtration of 140 mesh (115 microns), and downstream outlet pressure of 43 psi.

#### **Construction**

**Valve:** The valve shall be a 1" Hunter model PGV-100JT with FPT x FPT inlet and outlet ends. The valve shall be a normally closed, electronically actuated, diaphragm-operated, remote control valve. The body and cap shall be manufactured from corrosive and UV-resistant PVC, and shall be rated 20 – 150 psi (1.4 - 10.3 bars; 138 - 1034 kPa). The bonnet shall unthread from the body without tools. The solenoid shall be fully encapsulated and held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction and shall have a double-beaded diaphragm with support to prevent stress failure.

The solenoid shall be a 24VAC, 50/60 cycles, 400-mA inrush current and 270 mA holding current. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open.

The valve shall be manufactured by Hunter Industries Incorporated, San Marcos, California.

**Filter:** The filter shall be a multiple disc filter with color-coded filter elements indicating the mesh size of the element being used. The discs shall be constructed of chemical-resistant thermoplastics for corrosion resistance.

The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be capable of periodic servicing by unscrewing a threaded cap.

Disc filter ring set shall be black (140-Mesh).

**Pressure Regulator:** The Pressure Regulator shall be a Netafim spring-operated, in-line piston-type regulator. The body shall be molded of black plastic with 3/4" FPT x FPT threaded inlet and outlet. Directional arrows shall show flow direction.

#### **Operation**

**Valve:** The valve shall be capable of operating from 0.25 - 30 GPM with a 150 psi maximum pressure rating.

The Valve shall be a Hunter Model Number PGV-100JT.

**Filter:** The filter shall be capable of operating in a range of flows up to 18 GPM. The filter shall be capable of providing 25 square inches of filtering surface.

The Disc Filter shall be a Netafim Model Number DF075-140.

**Pressure Regulator:** The Pressure Regulator shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating downstream pressure to 42 psi. The Pressure Regulator shall operate in a flow range of 0.25 - 4.4 GPM. Maximum pressure at the inlet shall be 145 psi.

The Pressure Regulator shall be a Netafim Model Number PRV075LF42V2.

The complete assembly shall be a Netafim Model Number LVCZ10075-LF.

## **2. High Flow 3.5 - 17.6 GPM:**

### **Description**

The Low-Volume Control Zone Kit is a completely assembled assembly comprised of a 1" 24VAC valve, 3/4" filter and low-flow pressure regulator. It is designed to operate zones ranging from 3.5 - 17.6 GPM, provide filtration of 140 mesh (115 microns), and downstream outlet pressure of 43 psi.

### **Construction**

**Valve:** The valve shall be a 1" Hunter model PGV-100JT with FPT x FPT inlet and outlet ends. The valve shall be a normally closed, electronically actuated, diaphragm-operated, remote control valve. The body and cap shall be manufactured from corrosive and UV-resistant PVC, and shall be rated 20 – 150 psi (1.4 - 10.3 bars; 138 - 1034 kPa). The bonnet shall unthread from the body without tools. The solenoid shall be fully encapsulated and held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction and shall have a double-beaded diaphragm with support to prevent stress failure.

The solenoid shall be a 24VAC, 50/60 cycles, 400-mA inrush current and 270-mA holding current. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open.

The valve shall be manufactured by Hunter Industries Incorporated, San Marcos, California.

**Filter:** The filter shall be a multiple disc filter with color-coded filter elements indicating the mesh size of the element being used. The discs shall be constructed of chemical-resistant thermoplastics for corrosion resistance.

The disc filter body shall be molded of black plastic with male pipe threads for both inlet and outlet. The disc filter shall be capable of periodic servicing by unscrewing a threaded cap.

Disc filter ring set shall be black (140-Mesh).

**Pressure Regulator:** The Pressure Regulator shall be a Netafim spring-operated, in-line piston-type regulator. The body shall be molded of black plastic with ¾" FPT x MPT threaded inlet and outlet. Directional arrows shall show flow direction.

### **Operation**

**Valve:** The valve shall be capable of operating from 0.25 - 30 GPM with a 150 psi maximum pressure rating.

The Valve shall be a Hunter Model Number PGV100-JT.

**Filter:** The filter shall be capable of operating in a range of flows up to 18 GPM. The filter shall be capable of providing 25 square inches of filtering surface.

The Disc Filter shall be a Netafim Model Number DF075-140.

**Pressure Regulator:** The Pressure Regulator shall be able to respond immediately to any inlet pressure variation. The regulator shall be capable of regulating downstream pressure to 45 psi. The Pressure Regulator shall operate in a flow range of 3.5 - 17.6 GPM. Maximum pressure at the inlet shall be 145 psi.

The Pressure Regulator shall be a Netafim Model Number PRV075HF45V2.

The complete assembly shall be a Netafim Model Number LVCZ10075-HF.

## **AQUANET DC VALVES**

### **Description**

The Aquanet DC valve is a "latching solenoid" valve designed to be turned on and off using a momentary 12VDC pulse. The valve is extremely debris resistant through the use of large ports and non-continuous porting of water above the diaphragm. It is an FPT x FPT valve.

### **Construction**

The valve shall be a 9 - 14 VDC (12 VDC nominal) electronically actuated, diaphragm-operated, remote control valve. The body and bonnet shall be molded of glass reinforced nylon plastic. The bonnet screws shall be serviceable with a Phillips screwdriver. The diaphragm assembly shall be molded from chemically altered EPDM for added resistance against chlorine and other chemicals for fertigation and chemigation applications. The valve shall operate so that water is only allowed above the diaphragm on the closing cycle. The valve shall have 2 mm metering orifices to operate in very dirty water applications.

The motorized actuator shall be 9 - 14 VDC (12 VDC nominal). The motorized actuator shall be encapsulated in a watertight compartment. It shall be equipped with a 3-position manually operated dial on top of the valve to allow, OFF, AUTO, or ON operation. A flow control handle shall be mounted on the bottom of the valve body and have a 170 degree turn from full open to full close.

Wiring to the motorized actuator shall be color-coded to indicate polarity. The black wire shall be Common and the red wire shall be Power.

The 1½” and 2” valve shall be constructed to allow for the addition of an optional, field installed pressure regulating module that shall have a pressure regulation range of 5 - 70 psi (0.5 - 7.0 bar).

### **Operation**

The ¾” and 1” valve shall have an operational pressure range of 3 - 150 psi, (0.2 - 10 bar) with a maximum operating pressure rating to 150 psi (10 bar). Flow range shall be 0.1 - 28 GPM (0.025 - 7 m<sup>3</sup>/h).

The 1½” and 2” valve shall have an operational pressure range of 6 - 150 psi, (0.4 - 10.0 bar) with a maximum operating pressure rating of 200 psi (14 bar). Flow range shall be 1 - 175 GPM (0.1 - 34 m<sup>3</sup>/h).

The valve shall be able to be operate with a wire run length back to a controller and a 13.5 VDC pulse of 3,150’ with #12 gauge, 1,950’ with #14 gauge, 1,250’ with #16 gauge, 780’ with #18 gauge and 495’ with #20 gauge.

The Aquanet Valves shall be Netafim Model Number 26-EV-DCN-\_\_\_\_\_.

## **MIRACLE DC CONTROLLER**

### **Description**

The controller is a battery operated irrigation controller for use in areas without existing power. Power is provided through a 9VDC alkaline or lithium ion battery, 6VDC storage battery, or 4 “C” cell batteries. The controller operates with 12 VDC, 2-wire, latching or DC-pulse type valves.

### **Construction**

The controller shall be a 6, 9, or 12-station controller. It shall have 3 independent irrigation programs with Programs A and B tied to the sensor. It shall be capable of up to four start times per day and each station shall be able to run from 1 minute to 9 hours, 59 minutes in one-minute increments. It shall have a programmable 99 day rain delay, as well as a seasonal adjust feature that allows for station run times to be changed globally from 10% to 200% in 10% increments to adjust for seasonal or weather changes. It shall have a 7 day calendar or interval schedule. It shall be able to perform self-diagnostic testing of individual stations to detect, skip over and notify of short circuits in the valve or valve wiring. The controller shall have a power conserving “sleep” mode that turns off the display 5 minutes after the last input. It shall come with a sheltered location cabinet. It shall have an operating temperature range of 20°F to 122°F (-10°C to +50°C). It shall be able to measure battery strength and will not send an “on” signal to the valves if there is not enough battery life to send an “off” signal to the valves.

The controller shall have (or be capable of) a rain/soil moisture sensor input. The rain sensor input shall be normally open. Sensor type shall by dry contact (closed = <3KΩ, open = >100KΩ).

### **Operation**

The controller shall perform a diagnostic check when the battery is installed to ensure each zone has been sent an “off” signal. The controller shall send a 13.5 VDC (4,700 μF capacitor) signal for 100 milliseconds to actuate solenoids/relays when operated either manually or automatically.

The Miracle DC Controller shall be Netafim Model Number 25-MR\_\_\_\_\_.

## **MIRACLE PROFESSIONAL CABINET**

### **Description**

The Miracle Professional Cabinet provides commercial quality, waterproof housing, for the Miracle controller. It shall be locking and gray in color.

### **Construction**

The Miracle Professional Cabinet shall be constructed of molded gray plastic. It shall have a waterproof seal around the entire inside of the cabinet. It shall be constructed in a manner where the Miracle controller will fit in the top portion, with a bottom panel for wires. It shall be a locking, vandal-resistant cabinet.

### **Operation**

The Miracle Professional Cabinet shall house the Miracle controller in a dry, locking environment.

The Miracle Professional Cabinet shall be Netafim Model Number 25-MRP-PROF-CAB.

## **AQUAPRO SINGLE STATION CONTROLLER AND VALVE**

### **Description**

AquaPro is a single-station irrigation valve and controller combination. It utilizes a single 9VDC battery and provides irrigation system control where power is unavailable or where an extra valve or controller is needed.

### **Construction**

The AquaPro shall consist of a Netafim Aquanet  $\frac{3}{4}$ " or 1" valve combined with a single station battery-operated controller. Operating temperature shall be 32°F - 122°F. Storage temperature shall be 14°F - 140°F.

**Controller:** The body of the controller housing shall be ABS plastic; the display window shall be Satoprene. It shall be capable of four irrigation programs. These programs shall be (A) one run time, one start time, everyday, (B) one runtime, one start time with the ability to choose which days of the 7 day calendar to irrigate, (C) three run times, 3 start times, with the ability to choose which of the of the 7 day calendar to irrigate, and (D) manual operation. It shall have a minimum running time of 1 minute and a maximum running time of 11 hours, 59 minutes. It shall have a rubber-sealed battery compartment for the 9VDC alkaline battery. The controller shall be shipped standard with 2 each 1.5 volt LR1130 batteries to capable of maintaining the irrigation controller's program for up to 5 years. Programming shall be via 4 buttons on the face of the controller. Controller shall be waterproof and dustproof to IP67 standard and shall be capable of being mounted in a valve box, or above grade. It shall be capable of operating a valve up to 330 feet from the controller when using #16 gauge wire. The irrigation controller shall include mounting brackets for  $\frac{3}{4}$ " PVC and a wall mount adapter.

**Valve:** The valve shall be a 9 - 14 VDC (12 VDC nominal) electronically actuated, diaphragm-operated, remote control Netafim Aquanet valve. The body and bonnet shall be molded of glass reinforced nylon. The bonnet screws shall be serviceable with a Phillips screwdriver. The diaphragm assembly shall be molded from chemically altered EPDM for added resistance against chlorine and other chemicals for fertigation and chemigation applications. The valve shall operate so that water is only allowed above the diaphragm on the closing cycle. The valve shall have 2mm metering orifices. The motorized actuator shall be 9 - 14 VDC (12 VDC nominal). The motorized actuator shall be encapsulated in a watertight compartment. It shall be equipped with a 3-position manually operated dial on top of the valve to allow, OFF, AUTO, or ON operation. A flow control handle shall be mounted on the bottom of the valve body and have a 170 degree turn from full open to full close. Wiring to the motorized actuator shall be color-coded to indicate polarity. The black wire shall be Common and the red wire shall be Power. Maximum operational pressure shall be 150 psi (10 bar); minimum operational pressure shall be 3 psi (0.2 bar). Flow range shall be between 0.1 - 28 GPM (25-7,000 l/h).

### **Operation**

The AquaPro controller shall send a 13 VDC (400 µF capacitor) signal for 200 milliseconds to actuate the valve's motorized actuator when operated either manually through the controller or automatically.

The AquaPro Controller shall be Netafim Model Number AP\_\_\_\_\_.

## **AQUAPRO CONTROLLER WITHOUT VALVE**

### **Description**

AquaPro is a single-station irrigation controller. It operates on a 9VDC battery and provides irrigation system control where power is unavailable or where an extra valve or controller is needed.

### **Construction**

The AquaPro shall controller operates the Netafim Aquanet valves or DC Solenoid Valves. Operating temperature shall be 32°F - 122°F. Storage temperature shall be 14°F - 140°F.

**Controller:** The body of the controller housing shall be of molded ABS plastic; the display window shall be Satoprene. It shall provide for the operation of four irrigation programs. These programs shall be (A) one run time, one start time, everyday, (B) one runtime, one start time with the ability to choose which days of the 7 day calendar to irrigate, (C) three run times, 3 start times, with the ability to choose which of the of the 7 day calendar to irrigate, and (D) manual operation. It shall have a minimum running time of 1 minute and a maximum running time of 11 hours, 59 minutes. It shall have a rubber-sealed battery compartment for the 9VDC alkaline battery. The controller shall be shipped standard with 2 each 1.5 volt LR1130 batteries capable of maintaining irrigation controller's program for up to 5 years. Programming shall be via 4 buttons on the face of the controller. Controller shall be waterproof and dustproof to IP67 standards and shall be capable of being mounted in a valve box, or above grade. It shall be capable of operating a valve up to 330 feet from the controller when using #16 gauge wire. It shall include mounting brackets for ¾" PVC and a wall mount adapter.

### **Operation**

The AquaPro controller shall send a 13 VDC (400 µF capacitor) signal for 200 milliseconds to actuate the valve's motorized operator when operated either manually through the controller or automatically.

The AquaPro Controller shall be Netafim Model Number AP-CONTROLLER.

# Netafim Bid Specifications

## Sample Only

### 02810 - IRRIGATION SYSTEM

#### PART 1 - GENERAL

##### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. The following related items of work included under other sections:
  - 1. Earthwork - Section 02200
  - 2. Water Distribution - Section 02660
  - 3. Landscape - Section 02900

##### **1.02 SUMMARY**

- A. The work required under this Section consists of furnishing all labor materials, equipment, services and related items necessary to complete all irrigation system work, and all related work, complete as indicated on the drawings or specified herein.
- B. The major items of work include, but are not limited to the following:
  - 1. Verify underground utility locations.
  - 2. Removal, protection and/or restoration of all existing improvements.
  - 3. Trenching and backfilling.
  - 4. Furnishing and installing a fully operational automatically controlled irrigation system, including all mains, laterals, fittings, quick coupling valves, gate valves, and drain valves, backflow preventer, etc.
  - 5. Testing of system and making it operative.

##### **1.03 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturing irrigation systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer's Qualifications: Firms who have successfully completed execution of a minimum of five (5) contracts involving the installation of irrigation and piping work similar in size and scope to that required for this project. Such experience should be able to be demonstrated through references.
- C. Codes and Standards:
  - 1. Comply with all applicable state and local ordinances and codes.
  - 2. All materials and work shall meet the requirements of the A.W.W.A., A.S.S.E. and the USC Foundation for Cross Connection Control.

##### **1.04 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for irrigation system materials and products.

- B. Record Drawings: At project closeout, submit record drawings of installed irrigation system piping and products, in accordance with requirements of Division 1.
- C. Maintenance Data: Submit maintenance data and parts lists for irrigation system materials and products. Include these data, product data, shop drawings and record drawings in maintenance manual, in accordance with requirements of Division 1.

#### **1.05 UTILITIES AND PROTECTION**

Existing Utilities:

- A. Contractor shall acquaint himself/herself with all site conditions. Should utilities not shown on the plans be found during excavations, contractor shall promptly notify the Owner for instructions as to further action. Failure to do so will make Contractor liable for any and all damage there to arising from his/her operations subsequent to discovery of such utilities not shown on plan.
- B. Contractor shall necessary adjustments in the Layout as may be required to connect the existing stubouts. Should such stubs not be located exactly as shown, Contractor may be required to work around existing conditions at no increase in cost to the Owner.

#### **1.06 PERMITS AND FEES**

Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Owner to show that all work has been installed in accordance with the ordinances and code requirements.

#### **1.07 DRAWINGS, SPECIFICATIONS AND DETAIL SHEETS**

Scale and Dimensions:

- A. Consider drawings and specifications as being compatible and therefore work called for by one and not the other shall be furnished and installed as though called for by both. When discrepancies exist between scale and dimension or between the work to be accomplished by each trade, they shall be called to the Project Consultant's attention immediately. The Project Consultant's decision regarding such discrepancies shall be final and binding.
- B. Where diagrams have been made to show piping connections, etc., Contractor is cautioned that these diagrams must not be used for obtaining lineal runs or number and type of fittings.
- C. All measurements shall be verified at the site. Drawings may not be exactly to scale.

#### **1.08 PIPING ARRANGEMENT**

Suggestions for changes in location of piping, etc., advisable in the opinion of the Contractor, shall be submitted to the Project Consultant for approval before proceeding with the work, with written assurance that such changes will not cause any extra cost on their part or alteration of design requirements.

#### **1.09 GUARANTEE**

- A. Guarantee all work done for one (1) year from date of acceptance against all defects in material, equipment and workmanship. Guarantee shall cover repair of damage to any part of the premises resulting from leaks, or other defects in material, equipment and

- workmanship to the satisfaction of the Owner. Repairs, if required, shall be done promptly, at no cost to the Owner.
- B. Guarantee will include spring start-up and winterizing of system within the one (1) year time and development of approved water application schedule. Winter damage due to improper winterization is the responsibility of the Contractor.
  - C. All repairs and servicing required under the guarantee period shall be made under the observation of the maintenance crew to help train them in the proper operation and repair of the system.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. General:
  - 1. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.
  - 2. All materials throughout the system shall be new and in perfect condition.
- B. Piping: Provide pipes of one of the following materials of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.
  - 1. Polyvinyl Chloride (PVC): Sized as shown on the drawings. All PVC pipe shall be continuously and permanently marked with manufacturer's name, material and schedule or type. Pipe shall conform to U.S. Department of Commerce Commercial Standard CS 256-63, or latest revision. All PVC pipe shall be SDR 21.
  - 2. Fittings: Schedule 40, polyvinyl chloride (PVC) weight as manufactured by Spears or approved equal. Solvent weld or insert fittings are acceptable. No saddle type clamping or fittings shall be used. Fittings to conform to ASTM D-2466.
- C. Valves:
  - 1. Gate/Drain Valves: Shall be sized for mains. The valves shall be all bronze solid wedge, screw bonnet rated at 200 WOG.
  - 2. Quick Coupling Valves: Shall be as noted on drawings and shall be 1" brass with locking top, and located up stream of all remote control valves.
  - 3. Remote Control Valves: Electrically operated solenoid valves installed in valve boxes of appropriate size and type for valves specified with manual shut-off valve to match pipe size.
- D. Dripperline and Integral Dripperline Components:

The dripperline shall be Techline® CV or Techline® pressure compensating dripperline or 8mm Techlite non-pressure compensated dripperline as manufactured by Netafim Irrigation, Inc. Dripper flow rate and spacing shall be as indicated on drawings.

  - 1. Techline® CV/Techline®/8mm Techlite Fittings: All Techline® CV/Techline®/8mm Techlite connections shall be made with approved Techline® CV/Techline®/8mm Techlite insert fittings.
  - 2. Soil Staples (TLS6): All on-surface/under mulch Techline® CV/Techline®/8mm Techlite installations shall be held in place with Techline® Soil Staples spaced evenly every 3' - 5' on center, and with two staples on each change of location.

3. Line Flushing Valves: All Techline®/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves as indicated on drawings. Techline® CV zones do not require an automatic line flushing valve but must have a manual flushing port(s) in the position that an automatic flush valve would be positioned.
  4. Air/Vacuum Relief Valves: Each independent Techline® subsurface irrigation zone shall be installed with an Air/Vacuum Relief Valve at the zone's highest point(s). Techline® CV zones do not require an Air/Vacuum Relief Valve.
  5. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator. Model number as indicated on drawings.
  6. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter. Model number and mesh as indicated on drawings.
- E. Reduced Pressure or other Backflow Prevention Units: Reduced pressure backflow prevention units or any unit as required by local codes shall be provided as indicated on drawings and shall comply with local codes.
  - F. Solvent Cement: Compatible with PVC pipe and or proper consistence ASTM D-2564.
  - G. Control Wires: 24 Volt solid wire, UF/UL approved for direct burial in ground. Minimum wire size shall be 18 gauge. All wire to be Paige wire or approved equal. All wire splices are to utilize waterproof splicing systems.
  - H. Expansion Curls: Expansion curls shall be provided within three (3') feet of each wire connection to solenoid and at least every three hundred (300') feet in length. (Expansion curls are formed by wrapping at least five (5) turns of wire around a rod or pipe 1" or more in diameter, then withdrawing the rod).
  - I. Sleeves for Control Wires: Under all walks and paving and where indicated on drawings, PVC 1220-160 psi pipe or galvanized heavy wall steel conduit. Minimum size 1½" I.D.
  - J. Sleeves for Irrigation Pipe: Under all walks and paving and where indicated on drawings, Schedule 80 PVC pipe or as otherwise approved by the Project Consultant. To be two (2) times the O.D. of sleeved pipe.
  - K. Valve Boxes: Valve boxes shall be of appropriate size and type for valves specified, or as otherwise indicated on the drawings. All valve boxes in roadways or sidewalks shall be cast iron or poly concrete construction with locking lid. All valve boxes to have 6" pea gravel; with blocking, and wrapped with filter fabric.
  - L. Drains: Air hose connections of approved design shall be provided for winterizing at several locations so that the entire system can be drained by blowing it out with compressed air. The compressor shall be capable of varying pressures.
  - M. Rubber Hose: A quantity of two (2) approved heavy duty rubber hoses, 100 feet long, for use with quick coupling valves shall be furnished by the Contractor.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

General: Examine areas and conditions under which irrigation system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### 3.02 INSTALLATION OF IDENTIFICATION

General: Maintain all warning signs, shoring, barricades, flares and red lanterns as required by safety orders of the Division of Industrial safety and local ordinances.

### 3.03 INSTALLATION OF PIPING AND FITTINGS

#### A. Excavating and Trenching:

1. The Contractor shall perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins. The contractor shall trench, each day, only as much as required for that day's work.
2. Trenches shall be made wide enough to allow a minimum of two (2") inches between parallel pipe lines. Trenches for pipelines shall be made of sufficient depth to provide minimum cover from finish grade as follows:
  - a. 15" minimum cover over main lines.
  - b. 12" minimum cover over control lines from controller to valves.
  - c. 4" - 6" cover over dripperline.

#### B. Pipe and Assembly:

1. Install remote valves where shown and group together where practical. Place valves no closer than six (6") inches to walk edges, buildings and walls. Locate all valve boxes in planting beds unless otherwise directed or noted.
2. No pipe shall be laid when, in the opinion of the Project Consultant, trench or weather conditions are unsuitable. When pipe laying is not in progress, the open ends of the installed pipe shall be closed by approved means to prevent entrance of trench water and other foreign material into the line(s). Enough backfill shall be placed in the center sections of the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid.
3. PVC pipe and fittings shall be solvent welded using solvents and methods as recommended by the manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.
4. Pipe may be assembled and welded on the surface. Snake pipe from side to side in the trench to allow for expansion and contraction.
5. Make all connections between plastic pipe and metal valves or steel pipe with threaded fittings using plastic male adapters.

#### C. Dripperline Installation:

1. Install all dripperline as indicated on drawings. Use only Teflon tape on all threaded connections.
2. Clamp Techline®/Techlite fittings with Oetiker clamps when operating pressure exceeds specific dripperline fitting requirements.
3. When installing Techline® CV, Techline®, or 8mm Techlite dripperlines on-surface, install soil staples as listed below:
  - a. Sandy Soil - One staple every three (3') feet and two (2) staples on each change of direction (tee, elbow, or cross).
  - b. Loam Soil - One staple every four (4') feet and two (2) staples on each change of direction (tee, elbow, or cross).
  - c. Clay Soil - One staple every five (5') feet and two (2) staples on each change of direction (tee, elbow, or cross).

4. Cap or plug all openings as soon as lines have been installed to prevent the intrusion of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
  5. Thoroughly flush all water lines before installing valves and other hydrants.
  6. Test in accordance with Paragraph on Hydrostatic Tests.
- F. Automatic Controllers: Connect remote control valves to controller in a logical sequence to correspond with specification of the Owner or Project Consultant.
- G. Automatic Control Wiring:
1. Install control wires, sprinkler mains and laterals in common trenches whenever possible.
  2. Install control wires at least six (6") inches below finish grade and lay to the side and below main line. Provide expansion curls as described herein.
  3. Control wire splices will be allowed only in runs more than five hundred (500') feet. Connections of all underground wires shall be by the use of wire nuts, covered with waterproof splice for each wire per installation instructions provided by the manufacturer, or as otherwise required by local ordinance.
  4. All wires passing under existing or future paving, construction, etc., shall be encased in plastic or galvanized steel conduit extending at least twelve (12") inches beyond edges of paving or constructions at a depth of at least eighteen (18") as required by the National Electric Code.
- H. Backfilling and Compacting:
1. After the system is operating, and required tests and inspections have been completed, backfill excavations and trenches with clean soil free of rubbish.
  2. Backfill for all trenches, regardless of type of pipe covered, shall be compacted to minimum ninety (90%) percent density.
  3. Compact trenches in areas to be planted by thoroughly flooding the backfill.
  4. Dress off all areas to finish grades.

### **3.04 FIELD QUALITY CONTROL**

#### Hydrostatic Test:

1. Request the presence of the Owner and/or Project Consultant at least forty-eight (48) hours in advance of testing.
2. Testing to be accomplished at the expense of the Contractor, and in the presence of the Owner.
3. Center load piping with small amount of backfill to prevent arching or slipping under pressure.
4. Apply a continuous and static water pressure of sixty (60) psi when welded plastic joints have cured at least twenty-four (24) hours and with the risers capped as follows:
  - a. Main lines and sub mains to be tested for one (1) hour.
  - b. Lateral lines to be tested for one (1) hour.
5. Repair leaks resulting from tests.
6. The lines shall then be retested until satisfactory.

### **3.05 INSTRUCTIONS**

After completion and testing of the system, the Contractor will instruct the Owner's personnel in the proper operation and maintenance of the system.

### **3.06 PROTECTION**

Contractor shall be responsible for work until finally inspected, tested and accepted. After delivery, and before and after installation, protect work against theft, injury or damage. Protect open ends of work with temporary covers or plugs during construction, to prevent entry of obstruction material.

END OF SECTION 02810

# Netafim Bid Specifications

## Sample Only

### Section 02905

#### PART 1

1. **SUBMITTALS** *(fill in the appropriate paragraph number)*

Submit (qty) copies of manufacturer's catalog cuts or current catalog of the following listed items:

1.\_.\_ Manufacturer's Catalog Data

- a. Dripperline
- b. Barbed insert fittings
- c. Disc filter
- d. Pressure regulators
- e. PVC or Poly pipe
- f. Line flushing valves
- g. Air/Vacuum relief valves
- h. Stainless steel clamps
- i. Remote control valves
- j. PVC threaded and inserts fittings
- k. Metal ground stakes

*(add or subtract to the following list as necessary)*

1.\_ **SPARE PARTS**

Upon completion of the installation, turn over the following spare parts and specialty tools to the owner's authorized representative. Include with the following quantities of items a list of each part with appropriate part number (for ordering replacement products) and local supply store of where these parts can be purchased.

- (1) Plastic handled 5mm and/or 8mm punch depending on size of holes made
- (10') of dripperline for each dripper interval and discharge rate
- (10') of blank dripperline tubing if used
- (6) barbed couplings
- (6) barbed 90° elbow fittings
- (6) barbed tee fittings
- (6) 180° 2-way adapter tees
- (6) male adapters with 3/4" FPT
- (1) spare filter element of the mesh size indicated on the irrigation legend
- (1) line flushing valve
- (2) regulator springs of the color and regulating pressure indicated on the irrigation legend
- (6) dripper plug rings
- (6) dripper micro-tubing adapters

## **PART 2. MATERIALS**

### **2.1 PIPING MATERIALS**

#### **2.1.1 Dripperline with Pressure Compensating Emitters and Built-In Check Valves**

Dripperline shall be of nominal sized one-half (½") inch low density, ultra-violet-resistant, linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral drippers with built-in check valves at a specified interval. The tubing shall be brown in color throughout and shall conform to an outside diameter (O.D.) of 0.66" and an inside diameter (I.D.) of 0.56". The dripperline shall be capable of a discharge rate of 0.26, 0.4, 0.6, or 0.9 gallons per hour (GPH) between operating pressures of 14.7 - 70 psi for each individual dripper.

The individual continuous self-cleaning, pressure compensating drippers shall be welded to the inside of the tubing wall. The drippers shall be constructed of three individual pieces:

- 1) a black-colored dripper base containing a filtration system, compensation chamber and labyrinth on the inlet side,
- 2) a black colored dripper cover containing a secondary flow path and raised outlet port and,
- 3) a flexible elastomer diaphragm that allows pressure to build up within the chamber to purge sediment or other debris

Dripper spacings shall be available in the following on-center intervals - 12", 18", and 24".

#### **2.1.1a Dripperline with Pressure Compensating Emitters**

Dripperline shall be of nominal sized one-half (½") inch low density, ultra-violet-resistant, linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral drippers at a specified interval. The tubing shall be brown in color throughout and shall conform to an outside diameter (O.D.) of 0.66" and an inside diameter (I.D.) of 0.56". The dripperline shall be capable of a discharge rate of 0.4, 0.6, or 0.9 gallons per hour (GPH) between operating pressures of 7 - 70 psi for each individual dripper.

The individual continuous self-cleaning, pressure compensating drippers shall be welded to the inside of the tubing wall. The drippers shall be constructed of three individual pieces:

- 1) a black-colored dripper containing a filtration system on the inlet side, compensation cell, and recessed chamber with a water outlet,
- 2) a hard plastic diaphragm retainer with color denoting discharge rate, with chamfered edges and a recessed groove in the center extending the full length of the diaphragm and,
- 3) a flexible elastomer diaphragm that allows pressure to build up within the chamber to purge sediment or other debris that may not have been captured by the disc filter.

Dripper spacings shall be available in the following on-center intervals - 12", 18", and 24".

#### **2.1.1b Dripperline with Non-Pressure Compensating Emitters**

Dripperline shall be low density, linear, ultra-violet-resistant, polyethylene tubing with internal non-pressure compensating integral drippers at a specified interval. The tubing shall be brown in color throughout and shall conform to a 0.26" outside diameter (O.D.) and a 0.24" inside diameter (I.D.). The dripperline shall be capable of individual dripper discharge rates of 0.5 GPH @ 15 psi. The individual drippers shall be welded to the inside of the tubing wall. Dripper spacings shall be available 6" or 12".

### **2.1.2 Barbed Insert Fittings**

All barbed insert fittings shall be constructed of molded, ultra-violet-resistant, black colored plastic having a nominal inside dimension (I.D.) of 0.24”

Each fitting shall have a minimum of two ridges or barbs per outlet with a raised barb nearest the fitting outlet. All fittings shall be of one manufacturer and shall be available in one of the following end configurations:

- barbed insert fittings,
- male pipe threads (MPT) with barbed insert fittings, or
- female pipe threads (FPT) with barbed insert fittings.

### **2.1.3 Non-Pressure PVC Pipe**

#### **Class 200 PVC**

Non-pressure (downstream of the remote control valve) PVC pipe shall be rigid, un-plasticized polyvinyl chloride PVC 1220, (Type 1, Grade 2), conforming to ASTM D 1785. Pipe shall have the following markings continuously along one side of the pipe:

- pipe O.D.
- type and grade
- NSF rating
- burst pressure rating
- product standard ps-21-70 & ASTM number
- date of manufacture

### **2.1.4 PVC Insert and Threaded Fittings**

All PVC fittings shall be un-plasticized polyvinyl PVC I, or PVC II material for threaded or slip fitting tapered socket solvent weld fittings. The type of plastic material and schedule size shall be indicated on each fitting or coupling with raised or recessing markings. Fittings and couplings shall comply with the following specifications:

<u>Socket Fittings</u>		<u>Threaded Fittings</u>	
Schedule 40	ASTM D2466	Schedule 40	ASTM D2464
Schedule 80	ASTM D2467	Schedule 80	ASTM D2464

## **2.2 LINE FLUSHING VALVE**

The line flushing valve shall be constructed of brown molded plastic and shall be a normally open hydraulic valve which flushes based on volumetric quantities of water. Inlet and outlet configurations shall be of one of the following configurations:

- ½” MPT, or
- barbed insert fitting with collar

The line flushing valve shall be serviceable by removing a threaded cover from a base, exposing the internal components. The internal components of the line flushing valve shall consist of:

- a molded diaphragm retainer,
- a high density plastic flush regulator, and
- a diaphragm 2” in diameter.

The line flushing valve shall be capable of automatically operating during initial system pressure build-up to discharge approximately one gallon of water. One line flushing valve shall be used for each 15 GPM of zone flow, and be able to operate at 57 psi maximum, or 1.5 psi minimum pressure at line ends. When using dripperline with integral check valves built-in to each dripper, the dripperline may

not require the use of an automatic line flushing valve. In those instances, a manual flush port shall be installed in its place.

### **2.3 PRESSURE REGULATOR VALVES**

The pressure regulator valve(s) shall be a spring-operated piston type. The regulator shall be constructed from molded black plastic with six pressure settings available. The HF regulator shall have a built-in indicator that shows when the proper outlet pressure is reached. Operating ranges for the regulators shall be from 15 - 45 psi. Inlet and outlet ports of the ¾" HF regulator FPT x MPT. The LF regulator shall be ¾" FPT x FPT.

### **2.4 DISC FILTER**

The disc filter body shall be molded of black plastic with male pipe threads (MPT) for both the inlet and outlet ports. A threaded cap on one end of the body shall be capable of periodic servicing by unscrewing the cap or releasing the latched band from the main filter body. On one ¾" model, a manual shut-off valve shall be co-molded to the opposing end of the removable cap as part of the main body. This device shall be capable of closing off the inlet port so the disc element can be removed when the main line is still pressurized.

The filter elements shall be disc-type. The disc-type filter rings shall be color-coded and available in one of four colors denoting filtration of 80, 120, 140, or 200 mesh.

### **2.5 AIR/VACUUM RELIEF VALVES**

Air/vacuum Relief Valves shall be constructed of grey and/or black plastic with an internal sliding poppet valve that is capable of venting air or preventing vacuum. The main body shall have a ½" male pipe thread (MPT). The operating pressure range for the air/vacuum relief valve shall be 7 psi minimum to 140 psi maximum.

### **2.6 STAINLESS STEEL CLAMPS**

Tubing clamps shall be constructed to 304 AISI stainless steel and shall be one "ear" type. This "ear" shall be capable of being pinched with a pinching tool to secure the tubing around the barbed insert fitting. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing. Wall thickness of clamps shall be .0236" (0.6 mm) with an overall band width of ¼" (7 mm).

## **PART 3 - EXECUTION**

### **3.1 STAKING**

#### **Lateral Dripperline Layout**

Verify existing field dimensions of the area to be irrigated with the irrigation plans for accuracy. Begin dripperline layout 2" away from hard surfaces; i.e., concrete sidewalks, curbs, asphalt, and/or undefined edges; i.e., shovel-cut headers, and 4" away from softscape transitions. Mark tubing intervals on the ground with flags, paint, or some other method that can be maintained throughout the installation.

### **3.2 INSTALLATION**

#### **3.2.1 Piping Installation**

### **3.2.1.1 Methods of Installing Dripperline**

Dripperline can be installed in one of the four following methods:

1. **Over-excavation:** Over-excavate the entire area to a depth of 4" - 6" below finish grade. Plant all specimen trees and shrubs 15 gallon size and larger, then place dripperline at the row spacing interval indicated on the plans.
2. **Pipe Pulling:** Where ground disruption is to be minimized, pneumatic tire, pipe-pulling machinery shall be used. Potholes shall be used at the ends of each run for making connection to supply and exhaust headers of rigid PVC pipe or polyethylene pipe.
3. **Trenching:** Hand or mechanically trench to the pipe depth indicated on the plans or in these specifications and backfill flush with finish grade. Avoid mechanically trenching within the dripline of existing trees. Hand-trench around existing tree roots when roots of 2" and larger are encountered. Remove all rock 1½" and larger when excavating and remove from site. Do not backfill trenches with rock that will come in direct contact with tubing or rigid PVC piping.
4. **On-Grade Installation:** For on-surface or under mulch installation, place tubing at the lateral spacing indicated on the plans and place soil staples on 3'-5' intervals depending on terrain. Do not install tubing on surface without soil staples. Backfill with mulch or topdressing as noted in the Section 029\_\_, "Landscaping".

### **3.2.1.2 Polyvinyl Chloride Pipe (PVC)**

#### **3.2.1.2.1 Solvent-Welded Joints**

Shall conform to ASTM D2855

#### **3.2.1.2.2 Threaded Joints**

Full-cut with a maximum of three threads remaining exposed on pipe and nipples. Make threaded joints tight without recourse to wicks or filters, other than polytetrafluoroethylene (Teflon) tape. Avoid over-tightening of PVC-threaded connections.

#### **3.2.1.2.3 Placement of Rigid PVC Piping**

Install pipe in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Install pipes at temperatures over 40° F. Pipe markings shall face upward out of the trench whenever possible.

#### **3.2.1.2.4 Dripperline**

Dripperline can be installed with the water outlets facing up, down, or sideways. In irregular areas, some water outlets could end up too close to fixed improvements and may have to be capped off with a dripper plug ring.

### **3.2.2 Cover**

Install underground piping horizontally and as evenly as possible to a maximum depth of 6", unless otherwise specified. (Typical pipe depth is 4" unless periodic aeration is anticipated, and then pipe depth should be lowered to 6".)

### **3.2.3 Barbed Insert Fittings**

Connect dripperline to barbed insert fittings by pushing the tubing on and over both barbs of the fitting until the tubing has seated against another piece of tubing or has butted against another portion of the barbed fitting. For water pressures in excess of the 50 psi, or the

maximum stated system pressure for the dripperline, whichever is less, use stainless steel clamps as noted in paragraph 3.2.4, "Pipe Clamping" on all barbed fittings.

### **3.2.4 Pipe Clamping**

When design-operating pressure exceeds 50 psi, or maximum stated system pressure for the dripperline, whichever is less, stainless steel pipe clamps shall be used. Slip clamps over tubing before slipping tubing over barbed insert fitting. Place clamp between the first and second ridge of the barbed fittings and crimp the "ear" of the clamp tightly. Crimp the "ear" twice to ensure proper seating.

### **3.2.5 Pressure Regulators**

Install a pressure regulator below grade, in-line with, and downstream of the remote control valve. Whenever possible, place the pressure regulator in the same valve box to allow for periodic inspection. Place the regulator with the arrow (molded into the side of the body) pointing in the direction of the flow of water. Provide straight piping on the outlet side of regulator for a dimension not less than three lengths of the overall body dimension.

### **3.2.6 Remote Control Valves**

Install remote control valves level and below grade with a minimum of 4" clearance to the top of the inside of the valve box cover. The arrow cast or molded into the side of the remote control valve should be pointing in the direction of the flow of water. Place a minimum of 1 cubic foot of  $\frac{3}{4}$ " gravel in the bottom of the valve box before backfilling with native soil around the exterior of the valve box. Support the four corners of the valve box with a common red brick (wood blocks tend to decay and allow valve boxes to settle over time) on each corner. At finish grade, the top of the valve box shall be 2" above surrounding grades in turf areas or in shrubs where a mulch layer is specified.

### **3.2.7 Disc Filter**

Install the disc filter, horizontally level, below grade, and either before or after the remote control valve as indicated in the installation details. The position of the disc filter in the valve box shall be off-center to allow for removal of the disc element for periodic servicing. Refer to the installation details for the size of the valve box. Include a minimum of 1 cubic foot of  $\frac{3}{4}$ " gravel in the bottom of the valve box. Valve box support and placement shall conform to the installation methods described in paragraph 3.2.5, "Remote Control Valve".

### **3.2.8 Air/Vacuum Relief Valve**

Install the air/vacuum relief valve at the highest elevation(s) within each zone of subsurface dripperline. Depending on the site conditions and tubing layout, more than one air/vacuum relief valve may be required. Place the valve in a round valve box with a locking cover and a sump of 1 cubic foot of  $\frac{3}{4}$ " gravel as noted on the details. Additional blank tubing may be necessary when placing dripperline on mounds or berms with more than a 3' elevation difference. Blank tubing shall be connected perpendicular to the dripperline with barbed tees and crosses from the lowest elevation of dripperline to the highest point of the mound berm where the air/vacuum relief valve is located. The air/vacuum relief lateral serves to collect and transport trapped air bubbles or relieve vacuum in lower elevation dripperline parallel to the dripperline located at the highest point in the system. Locate an air/vacuum relief lateral for each berm (high point) in the zone. Ensure the dripperline being used requires an air/vacuum

relief valve. Some dripperlines with integral check valves built-in to each dripper do not require air/vacuum relief valves.

### **3.2.9 Flushing**

Prior to backfilling and before connection of the line flushing valves, flush the entire system to remove any dirt or sediment that may have entered the system during the installation.

### **3.2.10 Line Flushing Valve**

Install the line flushing valve(s) below grade at the hydraulic termination point(s) in each system, normally at the point farthest away from the source. Locate in a valve box with the top of the line flushing valve facing horizontally or vertically. Include a minimum of 1 cubic foot of  $\frac{3}{4}$ " gravel in the bottom of the valve box. Valve box support shall conform to the installation methods described in paragraph 3.2.5 "Remote Control Valve".

### **3.2.11 Testing**

Prior to backfilling, open the remote control valve and operate each circuit to check for leakage around both barbed and threaded PVC fittings. Make necessary corrections to stop leaks.

### **3.2.12 Retest**

Retest those systems where leaks were corrected before commencing backfilling operations.

**END OF SECTION**