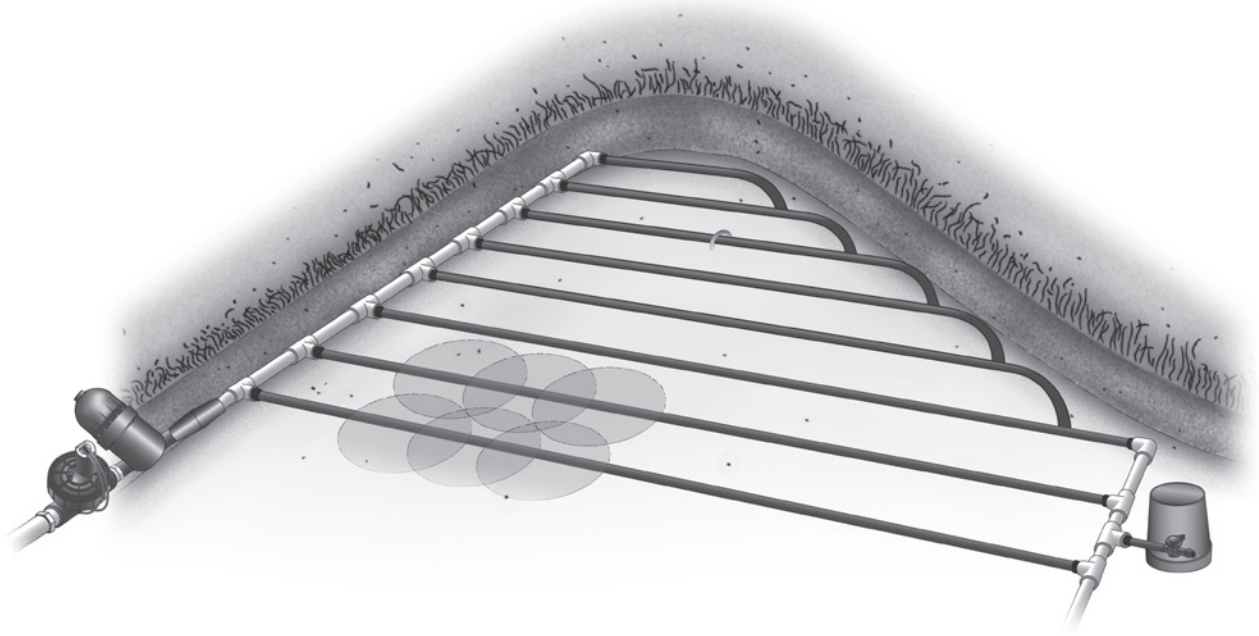
NETAFIM USA

Techline® DL Design Guide



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Techline® DL Design Guide

FOREWORD

PURPOSE:

To cover the basics of design, installation, and maintenance of Techline DL integral Dripline utilizing the "grid" layout method to produce a complete wetted area. This type of design is intended for subsurface applications but can be applied to on-surface installations as well.

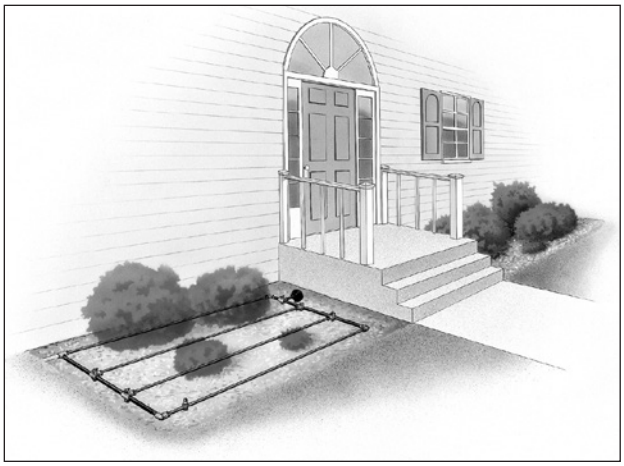
This manual includes design steps, technical data, design layouts, as well as some design and installation details and checklists.

OVERVIEW:

- Netafim is the world leader in drip irrigation. Since 1965 Netafim has pioneered the science of subsurface, on-surface and point source drip irrigation and manufacturing. Serving more than 80 countries worldwide, sales in 2003 will approach $300 million.
- Techline DL has been used successfully in landscape since 1987 in North America. It has been field tested at the Center for Irrigation Technology in Fresno, California since 1989.
- Landscape Architects, Contractors, Nurserymen and Designers recognize the benefit of using low volume and drip irrigation for new plantings, because of its accelerated plant growth compared to overhead spray and rotor irrigation. Couple the growth proliferation with the dramatic savings of water and drip becomes a technology that is being demanded by customers.
- With Netafim USA landscape products, Architects, Designers and Contractors have a new, highly sophisticated way of solving client and installation problems by bringing high quality drip and subsurface components to growing plants, trees, shrubs, groundcover, and yes, even turf!

DESIGN CRITERIA:

- Designing with Techline DL follows many of the same rules as designing with standard overhead irrigation.
- Point of connection, static and operating pressures, flow rates, and type of materials being irrigated are the same.
- Designing similar areas into a zone and not mixing emitter output and dripline spacing is just like sprinkler design.
- The essential differences include knowing the type of soil you are working with, and the use of a "grid" layout in the design.



Techline® DL Design Guide

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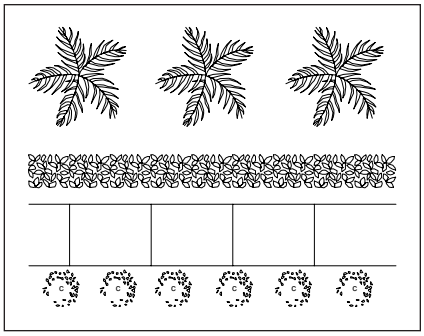
BASIC DESIGN STEPS

SITE SURVEY:

- Obtain or draw a scaled plan of the site to be irrigated. Identify all slopes on the plan.
- Identify type of soil *(sand, loam, or clay).*
- Determine plant materials to be irrigated: i.e. turf, groundcover, shrubs, plants, and trees.



POINT OF CONNECTION:

- Type of water: i.e. potable, well, pump, effluent, etc.
- Pressure and volume available - static and operating tests.

Table 1

TECHLINE DL ROW SPACING RECOMMENDATION TABLE

	TURF												SHRUB & GROUNDCOVER											
	CLAY SOIL			LOAM SOIL			SANDY SOIL			COARSE SOIL			CLAY SOIL			LOAM SOIL			SANDY SOIL			COARSE SOIL		
EMITTER FLOW	0.26 GPH			0.4 GPH			0.6 GPH			0.9 GPH			0.26 GPH			0.4 GPH			0.6 GPH			0.9 GPH		
EMITTER SPACING	18"			12"			12"			12"			18"			18"			12"			12"		
LATERAL (ROW) SPACING	18"	20"	22"	18"	20"	22"	12"	14"	16"	12"	14"	16"	18"	21"	24"	18"	21"	24"	16"	18"	20"	16"	18"	20"
BURIAL DEPTH	Bury evenly throughout the zone from 4"to 6"												On-surface or bury evenly throughout the zone to a maximum of 6"											
APPLICATION RATE (INCHES/HOUR)	0.19	0.17	0.15	0.30	0.27	0.25	0.98	0.84	0.73	1.48	1.27	1.11	0.19	0.16	0.14	0.30	0.26	0.23	0.73	0.65	0.59	1.11	0.99	0.89
TIME TO APPLY ¼" OF WATER (MINUTES)	80	89	97	50	55	61	15	18	20	10	12	13	80	93	106	50	58	66	20	23	26	13	15	17
Following these maximum spacing guidelines, emitter flow selection can be increased if desired by the designer. 0.9 GPH flow rate available for areas requiring higher infiltration rates, such as coarse sandy soils.																								

Note: 0.4, 0.6 and 0.9 GPH are nominal flow rates. Actual flow rates used in the calculations are 0.42, 0.61 and 0.92 GPH.

Techline DL LAYOUT:

- Select the correct emitter flow rate, emitter interval, and row spacing from Table 1, based on type of soil and what you are irrigating.

BASIC LAYOUT:

- The Supply Header delivers water to each row of Techline DL.
- The Exhaust Header forms a continuous loop system so all rows of Techline DL are being supplied from both ends. This interconnection of the piping network is called "Grid Layout." This evens out flow, and allows for much easier repairs of line breaks.
- Headers should be indented 2"-4" from hardscapes and planting areas.
- Headers may be PVC, Polyethylene or in some cases Techline DL or Netafim USA Blank Tubing *(Techline DL without emitters).* Headers must be sized to accommodate the flow of the zone without exceeding 5 feet per second velocity. *(Zone Water Requirement calculations can be found on page 6).*
- Techline DL can be used for supply and exhaust headers for zones of up to 5 GPM flow.

Basic Techline DL Layout

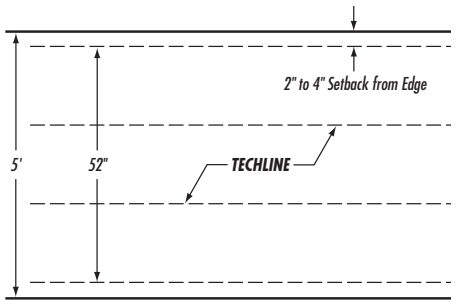
BASIC DESIGN STEPS *(continued)*

- Lay out Techline DL beginning 2”-4” from the edge of hardscapes, and move across the area with equal row spacing which does not exceed the recommendations of Table 1. *(The 2” setback will help provide enough moisture to prevent heat damage to plant material generated by hardscape).* **Note:** Start rows 2” away from hardscapes such as asphalt and 4” away from planting beds.

How to Calculate Equal Techline DL Row Spacing

Example:

- 5 feet x 12 inches = 60 inches.
- 60 inches (2 x 4 inches) = 52 inches.
- Follow recommended Techline DL Row Spacing for this example, assume 18 inches from Table 1.
- 52” / 18” = 2.89 spaces between Techline DL rows.
- Add one to the number of spaces to determine the number of Techline DL rows, then:
- Determine equal spacing between Techline DL rows 52 inches / 3 = **17.3 inches.**



LENGTH OF Techline DL ROWS:

- As with overhead irrigation, friction losses through pipe determine how long a length of Techline DL can be.
- You do not need to go through friction loss calculations on the actual Techline DL runs. It has already been done for you.
- Table 2 shows the maximum length of one Techline DL lateral within a zone. The chart will also help you determine what the operating pressure of the zone needs to be. For instance, if you have a run of 12”, 0.6 GPH Techline DL that is 312 feet long, you would need 25 psi to have it operate properly. If the run of Techline DL was between 313 and 365 feet, you would need 35 psi. How much Techline DL you can incorporate into a zone is a function of the capacity of supply. **Note:** We will discuss how to regulate your pressure in the Pressure Regulating Valve section on page 8.
- You can increase the length of the runs by center-feeding the zone. By doing so, you can have a length of Techline DL as called out in the chart going in each direction, effectively doubling the maximum length.

  Once you have laid out the zone, note the pressure you will need somewhere on the design. We will need to have this value later to properly size the Pressure Regulating Valve.

Table 2

MAXIMUM LENGTH OF A SINGLE LATERAL (FEET)

EMITTER SPACING		12”				18”				24”	
EMITTER FLOW (GPH)		0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9
INLET PRESSURE	20 psi	444	326	256	194	631	463	365	277	465	353
	25 psi	496	364	287	217	706	518	409	310	519	395
	35 psi	578	423	333	253	821	604	476	361	605	461
	45 psi	641	470	370	281	913	670	529	401	673	513

BASIC DESIGN STEPS *(continued)*

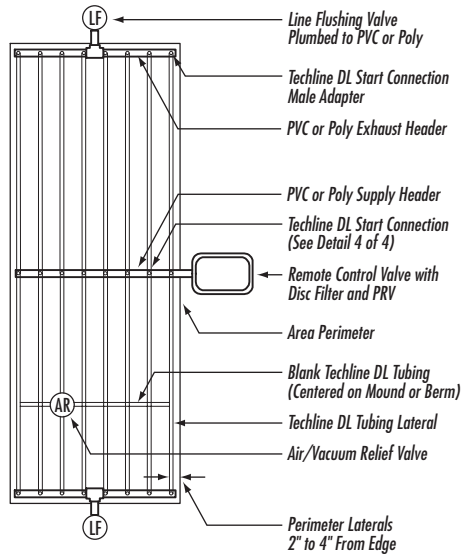
CENTER FEED LAYOUTS:

- Where layout flexibility exists, it is recommended that Center Feed layouts be used. This allows for the most even flow of water through the zone.
- Center Feed layouts also allow you to maximize the lengths of Techline DL that can be run.

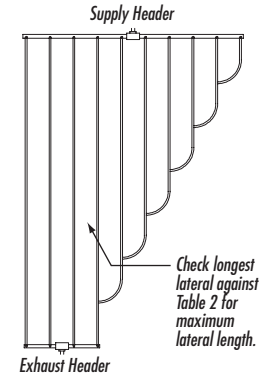
OTHER PIPING LAYOUTS:

- When branching out, or joining Techline DL, one of two rules apply. Rule 1 – when branching out Techline DL from the supply header, total all "branched out" driplines and check the sum against the maximum lateral length in Table 2. Rule 2 – when joining dripline laterals from the supply header, check only the longest lateral against the maximum allowable in Table 2.
- To reduce the number of glue joints, saddles or insert fittings in a header, transition to Techline DL and Techline DL fittings to make up sub-headers, making sure to follow the guideline of a maximum of 0.5 GPM in the "sub-header" zone.

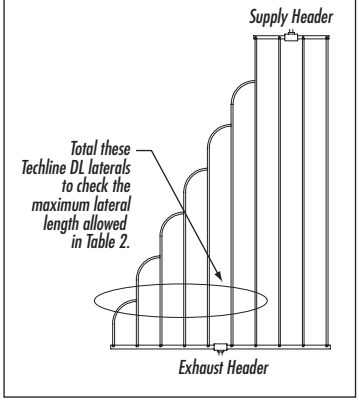
Techline DL Center Feed Layout



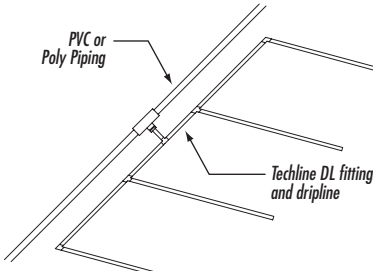
Joining Techline DL Tubing



Branching Out Techline DL Tubing



Creating Sub-headers to Reduce Glue/Saddle Joints



ZONE WATER REQUIREMENTS:

- Once you have laid out the Techline DL, you need to identify how many emitters there are, and their total output. This will help you determine mainline, submain and supply/exhaust header sizing, valve, filter, and regulator selection.

BASIC DESIGN STEPS *(continued)*

- Table 3 shows an easier method of calculating total zone flow. Total the quantity of Techline DL *(in hundreds of feet)* in your design and multiply that figure by the corresponding dripline GPM to get an estimate of zone flow.

How to Calculate Total Flow Within a Zone of Techline DL

- Calculate the Total Feet of Techline DL in the Zone.
- Multiply Total Feet x 12" = Total inches of Techline DL.
- Divide Total inches of Techline DL / Emitter spacing = Number of Emitters.
- Multiply the Number of Emitters x Emitter flow rate (GPH) = Total GPH Flow.
- Divide Total GPH flow / 60 = Total Gallons per minute in Zone.

Example:

- 10 rows of Techline DL each 100 feet long. Emitter spacing 18", .6 GPH.

100' x 10 = 1,000'
1,000' x 12" = 12,000'
12,000" / 18" = 667 Emitters
667 Emitters x .6 GPH = 400 GPH total flow
400 GPH / 60 = 6.67 GPM flow in the zone

Table 3

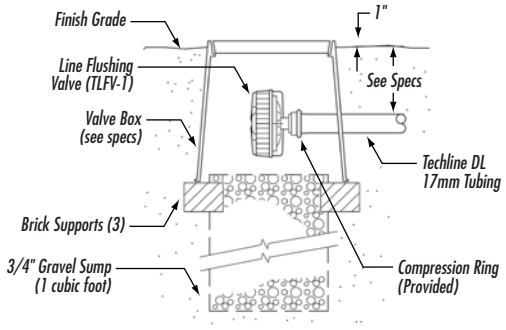
FLOW PER 100 FEET

EMITTER SPACING	0.26 EMITTER		0.4 EMITTER		0.6 EMITTER		0.9 EMITTER	
	GPH	GPM	GPH	GPM	GPH	GPM	GPH	GPM
12"	26.4	0.44	42.3	0.71	60.8	1.01	92.5	1.54
18"	17.6	0.29	28.2	0.47	40.5	0.68	61.6	1.03
24"	13.2	0.22	21.2	0.35	30.4	0.51	46.2	0.77

LINE FLUSHING VALVES:

- Line Flushing Valves are used to provide a cleansing action in the Techline DL each time the zone is turned on. The ability of the Line Flushing Valve to dump water allows the velocity of water inside the Techline DL to in crease momentarily during turn-on. This action moves sediments out of the system through the Line Flushing Valve.
- Place a Line Flushing Valve *(one per 15 GPM of zone flow)* as far away from the source as possible. This will typically be somewhere along the exhaust header. **Note:** Where Center Feed layouts are used, install one Line Flushing Valve on each exhaust header.
- Line Flushing Valves should be buried in a valve box with a gravel sump adequate to drain approximately one gallon of water.
- **Rule of Thumb:** Install the Line Flushing Valve in an inconspicuous area as far away from the source as possible.

Netafim USA Line Flushing Valve (TLFV-1)

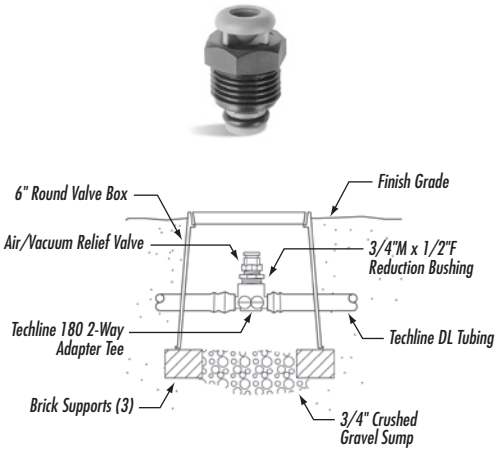


BASIC DESIGN STEPS *(continued)*

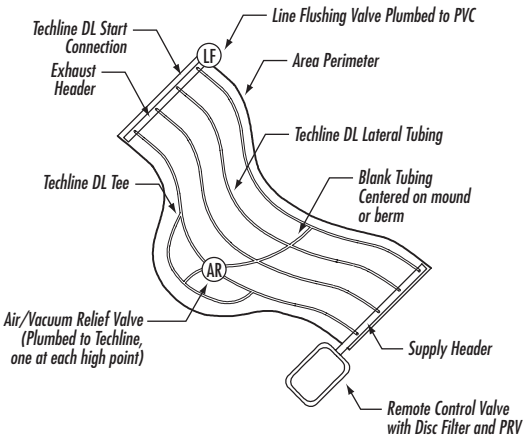
AIR/VACUUM RELIEF VALVES:

- Air/Vacuum Relief Valves are used for two reasons:
  1. To freely allow air into a zone after shutdown. This ensures a vacuum doesn't draw debris into the Techline DL.
  2. To provide a means of releasing air from the Techline DL when the zone is turned on, thus eliminating air pockets.
- Air/Vacuum Relief Valves are installed at the highest point*(s)* of a subsurface installation.
- To ensure all rows of Techline DL can take advantage of the Air/Vacuum Relief Valve, install it on a line perpendicular to the Techline DL rows. This may be an exhaust header, or a special lateral connecting all the rows of Techline DL such as going over a berm.

Netafim USA Air/Vacuum Relief Valve (TLAVRV)



Irregular Areas (Odd Curves)



DISC FILTER SIZING:

- Disc Filters are normally installed immediately downstream of the remote control valve. See Techline DL Design details 3.03. Their purpose is to filter out debris in the water supply.
- Netafim USA disc filters incorporate a non-collapsing stack of flat grooved discs that capture contaminants. They are easily removed from the filter body and flushed clean under a faucet or in a pail of clean water.
- Disc filters come in a variety of sizes and filtering capacities.
- **Rule of Thumb:** Use 140 mesh filters for Techline DL designs, and you will be well protected. Techline DL requires 120 mesh filtration, but since there is no price difference between the two filters, the use of a finer filter offers a little more protection.
- Refer to "Disc Filter Sizing Chart, on page 14 to properly size the filter.

BASIC DESIGN STEPS *(continued)*

PRESSURE REGULATORS:

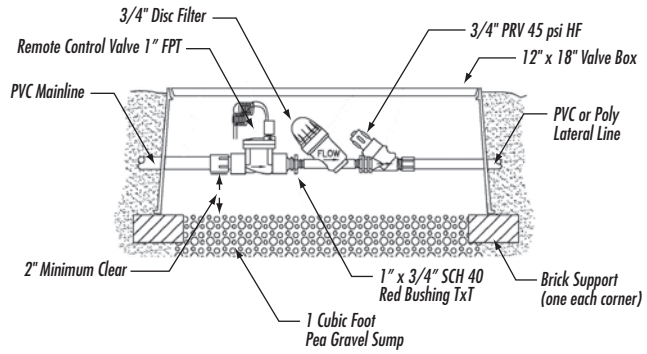
- Pressure Regulating Valves *(PRV)* reduce the operating pressure so the Techline DL zones operate between 15 and 45 psi.
- They are installed immediately downstream of the disc filter and remote control valve. Often all three components are in the same valve box.
- To select the correct PRV choose the model that has the correct flow range for the Total Zone Flow.
- To select the correct pressure rating select one of the following:

  1. If you used the Maximum Techline DL Lateral length chart, use a PRV with the same pressure rating as you used for your lateral length calculations.

OR

  2. If your lateral length is less than the 15 psi Inlet Pressure recommendation from the chart, use a 15 psi Regulator. **Note:** In either case, if the PRV is remote from the supply header remember to adjust for any friction loss that occurs in the piping to the supply header.

Control Valve with 3/4" PRV HF & 3/4" Disc Filter



Flow Selection for PRV

PRV High Flow Model (4.5 to 17.6 GPM)

Inline PRV Low Flow Model 0.25 to 4.4 GPM

Pre-Assembled Low Volume Control

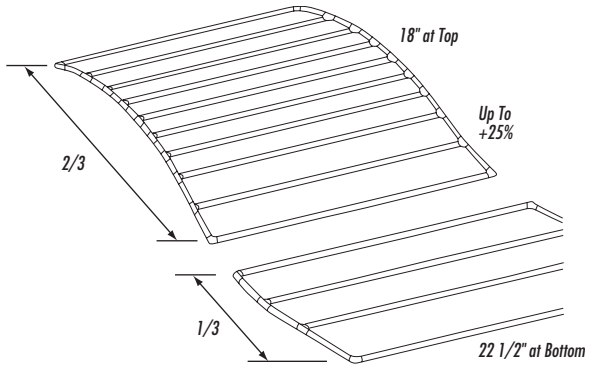
LVCZS8010075-LF 45psi

BASIC DESIGN STEPS *(continued)*

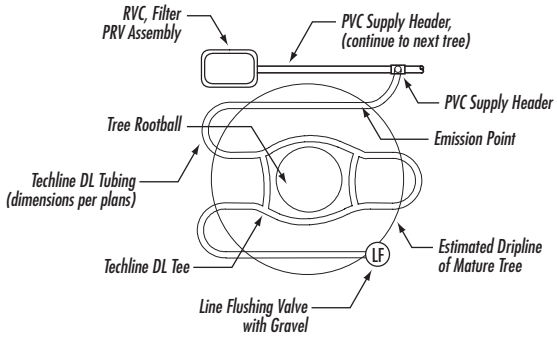
SLOPES:

- Techline DL should be installed perpendicular to slopes *(more than 4%).*
- Slopes present special circumstances because of how water moves through the soil.
- In slope applications, run the Techline DL perpendicular to *(across)* the slope.
- In the upper 2/3rd's of the slope, space the Techline DL per Table 1, page 2.
- In the lower 1/3 of the slope, increase the distance between rows by 25%.
- In conditions where the elevation change is greater than 10', zone the two areas separately.
- Installations such as long medians usually have a slope of 1% to 4%. In these cases you may wish to use inline check valves to prevent drainage of the water inside the piping network to the lower elevations.

Taller Slope Irrigation Method



Techline DL Tubing & Accessories for Tree Planting



TREES:

- It is important to provide trees with adequate water at the rootball, while also planning for the tree's needs as it grows.
- A loop of Techline DL close to the rootball with more Techline DL surrounding the estimated drip line of the tree when mature will provide sufficient water.

BASIC DESIGN STEPS *(continued)*

PRESSURE & FLOW CHECKS:

- One of the best means of ensuring a Techline DL zone is operating properly is to test the pressure at regular intervals.
- By taking a pressure reading while the zone is running, and recording the pressure, you can conclude that the zone is working as installed.
- Take the reading as far away from the source as possible to ensure that pressures throughout the rest of the zone are at least that high.
- If readings are lower than normal, a line break, clogged filter, dirty remote control valve, clogged PRV, or reduced line pressure are possible causes.

  Note: Always take the readings at the same time of day, from the same spot. This reduces the chance of faulty readings due to other factors.
- If a water meter is available, check the flow of each zone as the system operates.
- Record the information using the System Inspection Checklist provided in the maintenance section of this manual, page 22. Then on an annual basis check the system's performance to that standard.

10-F-01
Operation/Pressure Indicator

- ***See when the system is running***
- ***Check pressure***

At 10 psi the indicator flag rises to indicate system operation and the minimum pressure to operate the system.

CALCULATING PRECIPITATION RATES:

- **Method 1** - See "Techline DL Row Spacing Recommendation", Table 1, on page 2, and refer to the row "Application Rate *(in/hr).* This method is correct if you laid out the zone exactly as the Techline DL Lateral Spacing dimensions that are shown.
- **Method 2** - If there was some variation in your design *(for instance, where we had to decrease the distance between the rows as our earlier example),* then rely on the formula stated in this example. The results proves a precipitation rate much like many rotors. Precipitation of rotors, fixed sprays and Techline DL can calculate to be the same in many situations. It is possible to mix Techline DL with sprinklers in these cases, as long as all the principles of Techline DL installation are adhered to. Dripline selection is based on soil type, filters, regulators, flush valve, air vents are used. **Note:** Some professionals however believe that because of the dramatic differences in irrigation efficiency between Techline DL and sprinklers that they should not use them in combination.

Techline DL Application Rate

$$\textbf{Application Rate}\ \textit{(inches per hour)} = \frac{231.1 \times \text{Emitter Flow Rate (GPH)}}{\text{Dripline Row Spacing } \textit{(inches)} \times \text{Techline DL Emitter Spacing } \textit{(inches)}}$$

Example:
- Dripline Row Spacing = 17.3" apart
- Techline DL Emitter = 18" spacing
- Emitter Flow Rate = .6 GPH

$$\frac{231.1 \times .6\ \text{(GPH)}}{17.3\ \text{inches} \times 18\ \text{inches}} = .45\ \text{inches per hour}$$

SPECIAL APPLICATIONS AND TIPS

PARKING LOT ISLANDS:

- Since many islands are small, consider tying several of them together on the same zone.
- Once you have determined that the conditions of the islands are similar enough to interconnect them, design each for the same precipitation rate by using the same Techline DL and spacing.
- Use one remote control valve, disc filter and PRV at the source, but install a separate Air/Vacuum Relief Valve *(if the zone is subsurface)* and Line Flushing Valve on each island.
- Connections between the islands should be PVC, or as called out by the designer or local codes.

ELECTRICAL GROUNDING:

- The effectiveness of electrical grounding is dependent on the soil and its moisture content. In moist soil, grounding is far more effective than in dry soil.
- One method of ensuring moist soil is to install a length of Techline DL along the unclad copper wire. Often this wire is fed form the controller location into the fairway at a preset depth. The Techline DL is installed in the usual method. Run it from a separate station if possible.
- The Techline DL can be installed along the grounding wire, or above it. Simply ensure that the Techline DL is creating a wetted area across the length of the ground wire.

Techline DL ABOVE AND BELOW GRADE:

Techline DL is designed to be used in a variety of ways. It can be laid on the surface, *(it's UV resistant!)* held in place with Techline DL Staples *(TLS6),* it can be laid on the surface and covered with mulch, or it can be buried below grade. **Note:** When using Techline DL above grade with staples, ensure that enough staples are used to firmly hold the Techline DL in place, especially in freezing climates. The looser the soil, the more staples you will need. **Rule of Thumb:** One staple every 3'-5' and two for every time you change the direction of a Techline DL lateral, even if a mulch cover is being used. **Note:** When burying Techline DL in a turf application, it is important to maintain a consistent depth of anywhere up to 6".

TECHNICAL DATA

DESIGN FORMULAS

Formula 1.1

Application Rate *(inches per hour)* =

$$\frac{231.1 \times \text{Emitter Flow Rate (GPH)}}{\text{Dripline Row Spacing } \textit{(inches)} \times \text{Techline DL Emitter Spacing } \textit{(inches)}}$$

In Which:
Application Rate is = Inches per Hour
Emitter Flow Rate = Gallons per Hour Flow of One Emitter
Emitter Spacing = Spacing in Inches of Emitter Inside Tubing
Dripline Row Spacing = Inches Between Techline DL Laterals

Formula 1.2

Number of Emitters in a Zone

$$\frac{\text{Total Dripline} \times 12}{\text{Emitter Spacing}}$$

In Which:
Number of Emitter = Number of Emitters
Total Dripline Length = Length of All Dripline in a Zone in Feet
Emitter Spacing = Spacing in Inches of Emitter Inside Tubing

Formula 1.3

Flow per Zone

$$\frac{\text{Number of Emitters} \times \text{GPH}}{60}$$

In Which:
Flow per Zone = Total Gallons per Minute
Number of Emitters = Number of Emitters
GPH = Gallons per Hour Flow of One Emitter

Formula 1.4

Estimated Total Zone Flow =

$$\left(\frac{\text{Irrigated Area (square feet)} \times 144}{\text{Emitter Spacing (inches)} \times \text{Emitter Spacing (inches)}}\right) \times \text{Emitter Flow (GPM)} \div 60$$

In Which:
Estimated Total Zone Flow = Gallons per Minute in Zone
Irrigated Area = Total Area in Square Feet
Emitter Spacing = Distance Between Dripline in Inches
Dripline Spacing = Distance Between Dripline in Inches
Emitter Flow = Flow of One Emitter in Gallons per Hour

Formula 1.5

Estimated Total Length of Dripline =

$$\frac{\text{Irrigated Area} \times 12}{\text{Emitter Spacing (inches)}}$$

In Which:
Estimated Total Length of Dripline = Total of Dripline in a Zone
Estimated Area = Total Area in Square Feet
Dripline Spacing = Distance Between Dripline in Inches

TECHNICAL DATA

Techline DL MODEL NUMBER DESIGNATION

SPECIFYING MODEL NUMBER

Reference for Ordering Information Chart

SAMPLE MODEL NUMBER

A Techline DL Dripline = **TLDL**

1 EMITTER FLOW RATE
- 0.26 GPH = **26**
- 0.4 GPH = **4**
- 0.6 GPH = **6**
- 0.9 GPH = **9**

2 EMITTER SPACING
- 12″ = **12**
- 18″ = **18**
- 24″ = **24**

3 COIL LENGTH
- 100′ = **01**
- 250′ = **025**
- 500′ = **05**
- 1,000′ = **10**

BLANK TUBING MODEL NUMBERS:
1,000′ = TLDL010
500′ = TLDL005
250′ = TLDL0025
100′ = TLDL001

TUBING DIMENSIONS

INSIDE DIAMETER	OUTSIDE DIAMETER	WALL THICKNESS
0.560″	0.660″	0.50″

MINIMUM BENDING RADIUS

BENDING RADIUS
7 Inches

ORDERING INFORMATION

FLOW RATE	EMITTER SPACING	COIL LENGTH	MODEL NUMBER
0.26 GPH	12″	1,000′	TLDL26-1210
		250′	TLDL26-12025
		100′	TLDL26-1201
	18″	1,000′	TLDL26-1810
		250′	TLDL26-18025
		100′	TLDL26-1801
0.4 GPH	12″	1,000′	TLDL4-1210
		250′	TLDL4-12025
		100′	TLDL4-1201
	18″	1,000′	TLDL4-1810
		250′	TLDL4-18025
		100′	TLDL4-1801
0.6 GPH	12″	1,000′	TLDL6-1210
		500′	TLDL6-1205
		250′	TLDL6-12025
		100′	TLDL6-1201
	18″	1,000′	TLDL6-1810
		500′	TLDL6-1805
		250′	TLDL6-18025
		100′	TLDL6-1801
	24″	1,000′	TLDL6-2410
		250′	TLDL6-24025
		100′	TLDL6-2401
0.9 GPH	12″	1,000′	TLDL9-1210
		500′	TLDL9-1205
		250′	TLDL9-12025
		100′	TLDL9-1201
	18″	1,000′	TLDL9-1810
		500′	TLDL9-1805
		250′	TLDL9-18025
		100′	TLDL9-1801
	24″	1,000′	TLDL9-2410
		250′	TLDL9-24025
		100′	TLDL9-2401
BLANK TUBING		1,000′	TLDL010
		500′	TLDL005
		250′	TLDL0025
		100′	TLDL001

TECHNICAL DATA

Techline DL APPLICATION RATE TABLES

APPLICATION RATES 0.26 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
0.26	12	12	0.42	36
0.26	12	14	0.36	42
0.26	12	16	0.31	48
0.26	12	18	0.28	54
0.26	12	20	0.25	60
0.26	12	22	0.23	66
0.26	12	24	0.21	72
0.26	18	12	0.28	54
0.26	18	14	0.24	63
0.26	18	16	0.21	72
0.26	18	18	0.19	81
0.26	18	20	0.17	90
0.26	18	22	0.15	99
0.26	18	24	0.14	108
0.26	24	12	0.21	72
0.26	24	14	0.18	84
0.26	24	16	0.16	96
0.26	24	18	0.14	108
0.26	24	20	0.13	120
0.26	24	22	0.11	132
0.26	24	24	0.10	144

APPLICATION RATES 0.4 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
0.4	12	12	0.64	23
0.4	12	14	0.55	27
0.4	12	16	0.48	31
0.4	12	18	0.43	35
0.4	12	20	0.39	39
0.4	12	22	0.35	43
0.4	12	24	0.32	47
0.4	18	12	0.43	35
0.4	18	14	0.37	41
0.4	18	16	0.32	47
0.4	18	18	0.29	53
0.4	18	20	0.26	58
0.4	18	22	0.23	64
0.4	18	24	0.21	70
0.4	24	12	0.32	47
0.4	24	14	0.28	55
0.4	24	16	0.24	62
0.4	24	18	0.21	70
0.4	24	20	0.19	78
0.4	24	22	0.18	86
0.4	24	24	0.16	93

APPLICATION RATES 0.6 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
0.6	12	12	0.96	16
0.6	12	14	0.83	18
0.6	12	16	0.72	21
0.6	12	18	0.64	23
0.6	12	20	0.58	26
0.6	12	22	0.53	29
0.6	12	24	0.48	31
0.6	18	12	0.64	23
0.6	18	14	0.55	27
0.6	18	16	0.48	31
0.6	18	18	0.43	35
0.6	18	20	0.39	39
0.6	18	22	0.35	43
0.6	18	24	0.32	47
0.6	24	12	0.48	31
0.6	24	14	0.41	36
0.6	24	16	0.36	42
0.6	24	18	0.32	47
0.6	24	20	0.29	52
0.6	24	22	0.26	57
0.6	24	24	0.24	62

APPLICATION RATES 0.9 GPH EMITTER

FLOW RATE (GPH)	EMITTER SPACING (IN.)	LATERAL SPACING (IN.)	APPLICATION RATE (IN./HR.)	TIME TO APPLY 1/4" (MIN.)
0.9	12	12	1.44	10
0.9	12	14	1.24	12
0.9	12	16	1.08	14
0.9	12	18	0.96	16
0.9	12	20	0.87	17
0.9	12	22	0.79	19
0.9	12	24	0.72	21
0.9	18	12	0.96	16
0.9	18	14	0.83	18
0.9	18	16	0.72	21
0.9	18	18	0.64	23
0.9	18	20	0.58	26
0.9	18	22	0.53	29
0.9	18	24	0.48	31
0.9	24	12	0.72	21
0.9	24	14	0.62	24
0.9	24	16	0.54	28
0.9	24	18	0.48	31
0.9	24	20	0.43	35
0.9	24	22	0.39	38
0.9	24	24	0.36	42

Application Rate = (231.1 x GPH) / (Emitter Spacing x Lateral Spacing)

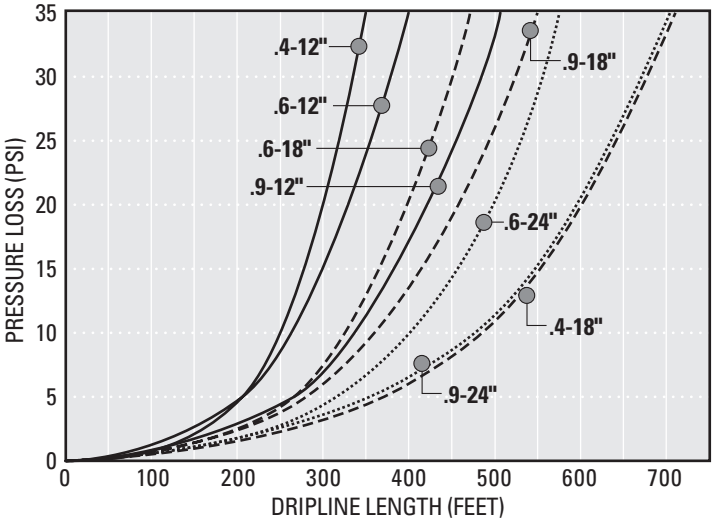
TECHNICAL DATA

Table 2

MAXIMUM LENGTH OF A SINGLE LATERAL (FEET)

EMITTER SPACING		12"				18"				24"	
EMITTER FLOW (GPH)		0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9
INLET PRESSURE	20 psi	444	326	256	194	631	463	365	277	465	353
	25 psi	496	364	287	217	706	518	409	310	519	395
	35 psi	578	423	333	253	821	604	476	361	605	461
	45 psi	641	470	370	281	913	670	529	401	673	513

PSI LOSS VS. DRIPLINE LENGTH



DISC FILTER RECOMMENDED FILTER SIZING

Filter Size	3/4"	1" & 1 1/2"	1 1/2" Long	2"
Filter Volume (cubic inches)	5.8	26.8	31.7	75
Filtration Area (square inches)	24.8	49	61.4	148

FLOW RATE (GPM)	FRICTION LOSS (PSI)			
5	0.56	–	–	–
10	1.99	0.78	–	–
17	1.99	0.78	–	–
20	–	2.34	0.69	–
30	–	5.20	1.30	–
40	–	9.53	2.42	0.69
50	–	–	3.90	0.87
60	–	–	–	1.17
70	–	–	–	1.56
80	–	–	–	1.99
90	–	–	–	2.51
100	–	–	–	3.03
110	–	–	–	3.68
120	–	–	–	4.33

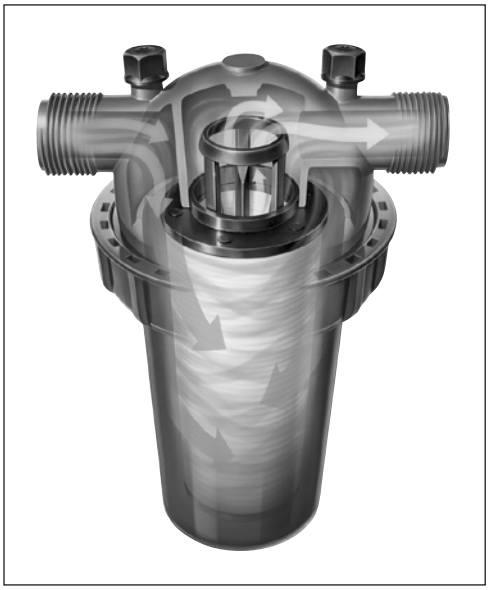
Looses shown are for 140 mesh filtration element tested in potable water.

TECHNICAL DATA

TECHFILTER™

Filters are an integral part of every drip system. No system should be designed or assembled without proper filtration. The primary function is to filter out contaminants that could plug the small orifices of the emitters. Netafim USA's Techfilter serves a secondary purpose of protecting against roots invading the system.

Triflurex® is incorporated into the replaceable disc ring assemblies inside the filter housing. When water passes through the filter, a very low concentration of Trifluralin *(parts per billion level)* is transmitted throughout the system. The operation of this technology provides very precise and even distribution of Trifluralin through the piping network which will inhibit root growth into the emitter outlets. No other uses or claims are made for the use of this product beyond the protection of the system from root intrusion.



TECHFILTER INSTALLATION AND MOUNTING INSTRUCTIONS

The installation of the Techfilter is no different than any other filter. It is advisable to install the filter so the filter rings are easily removed for periodic cleaning of contaminants back into the filter body. Do not install the filter in direct sunlight.

EFFECTIVE USE AND REPLACEMENT GUIDELINES

The Techfilter can effectively protect the system from root intrusion for 200 hours of use, but not longer than 2 years of service. We recommend the replacement of the filter cartridge following the above guidelines.

Triflurex® is manufactured by Agan Chemical Manufacturers Ltd.

TECHNICAL DATA

SPECIFYING MODEL NUMBER

Reference for Ordering Information Charts

A Techfilter = **TF**

SAMPLE MODEL NUMBER

TF075912-100DL

(A) (1) (2) (3) (4)

1 FILTER SIZE

¾" = **075**
1" = **10**
1" Long = **10L**
1 ½" Long = **15L**
2" = **20**

2 EMITTER FLOW

0.26 GPH = **26**
0.4 GPH = **4**
0.6 GPH = **6**
0.9 GPH = **9**

3 EMITTER SPACING

12" = **12**
18" = **18**

4 QUANTITY OF DRIPLINE

The length of Techline DL is supplied with each filter ordered. See Minimum and Maximum Dripline Length Chart.

MINIMUM AND MAXIMUM TOTAL DRIPLINE LENGTH PER FILTER SIZE (FEET)

	EMITTER FLOW	0.26 GPH		0.4 GPH		0.6 GPH		0.9 GPH	
	EMITTER SPACING	12"	18"	12"	18"	12"	18"	12"	18"
¾" FILTER	MIN. FLOW 1 GPM	220	328	143	213	98	114	65	98
	MAX. FLOW 7 GPM	1,534	2,300	1,000	1,489	686	795	458	686
1" FILTER	MIN. FLOW 3 GPM	657	986	429	638	294	341	196	294
	MAX. FLOW 22 GPM	4,823	7,234	3,143	4,681	2,157	2,500	1,438	2,157
1" LONG OR 1 ½" LONG FILTER	MIN. FLOW 8 GPM	1,753	2,630	1,143	1,702	784	909	523	784
	MAX. FLOW 40 GPM	8,770	13,153	5,714	8,511	3,922	4,545	2,614	3,922
2" FILTER	MIN. FLOW 14 GPM	3,070	4,603	2,000	2,979	1,373	1,591	915	1,373
	MAX. FLOW 90 GPM	19,730	29,596	12,857	19,149	8,824	10,227	5,882	8,824

TECHNICAL DATA

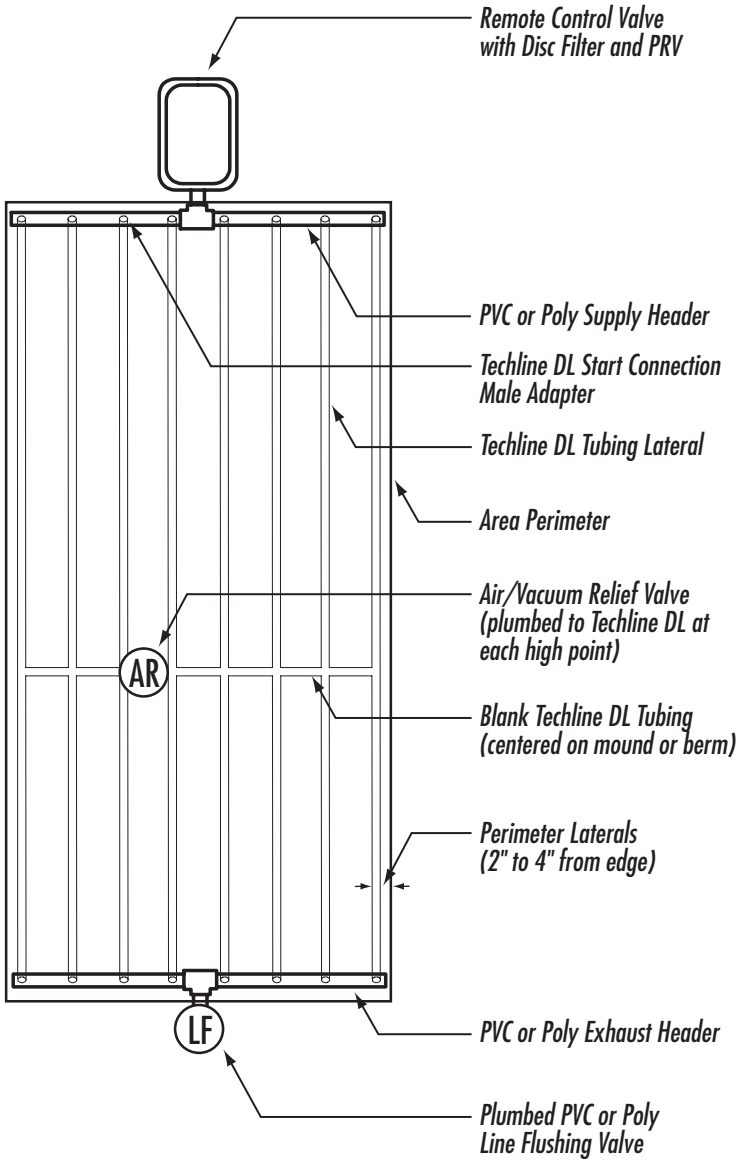
TECHFILTER WITH TECHLINE DL

MODEL NUMBER	EMITTER FLOW RATE (GPH)			EMITTER SPACING		ROLLS SUPPLIED		
	0.4	0.6	0.9	12″	18″	100′	250′	1,000′
TF075412-100	✓			✓		1		
TF075412-1000	✓			✓				1
TF075418-200	✓				✓	2		
TF075418-1000	✓				✓			1
TF075612-100		✓		✓		1		
TF075612-1000		✓		✓				1
TF075618-200		✓			✓	2		
TF075618-1000		✓			✓			1
TF075912-100			✓	✓		1		
TF075912-1000			✓	✓				1
TF075918-100			✓		✓	1		
TF075918-1000			✓		✓			1
TF10412-400	✓			✓		4		
TF10412-1000	✓			✓				1
TF10418-600	✓				✓	1	2	
TF10418-1000	✓				✓			1
TF10612-300		✓		✓		3		
TF10612-1000		✓		✓				1
TF10618-350		✓			✓	1	1	
TF10618-1000		✓			✓			1
TF10912-100			✓	✓		1		
TF10912-200			✓	✓		2		
TF10912-1000			✓	✓				1
TF10918-300			✓		✓	3		
TF10918-1000			✓		✓			1
TF10L412-1100	✓			✓		1		1
TF10L418-1000	✓				✓			1
TF10L418-1700	✓				✓	2	2	1
TF10L612-800		✓		✓		3	2	
TF10L612-1000		✓		✓				1
TF10L618-900		✓			✓	4	2	
TF10L618-1000		✓			✓			1
TF10L912-100			✓	✓		1		
TF10L912-500			✓	✓			2	
TF10L912-1000			✓	✓				1
TF10L918-800			✓		✓	3	2	
TF10L918-1000			✓		✓			1

MODEL NUMBER	EMITTER FLOW RATE (GPH)			EMITTER SPACING		ROLLS SUPPLIED		
	0.4	0.6	0.9	12″	18″	100′	250′	1,000′
TF15L412-1000	✓			✓				1
TF15L418-1000	✓				✓			1
TF15L418-1700	✓				✓	2	2	1
TF15L612-800		✓		✓		3	2	
TF15L612-1000		✓		✓				1
TF15L618-900		✓			✓		2	
TF15L618-1000		✓			✓	4		1
TF15L912-100			✓	✓				
TF15L912-500			✓	✓		1	2	
TF15L912-1000			✓	✓				1
TF15L918-800			✓		✓		2	
TF15L918-1000			✓		✓	3		1
TF20412-1000	✓			✓				1
TF20412-2000	✓			✓				2
TF20418-1000	✓				✓			1
TF20418-3000	✓				✓			3
TF20612-1000		✓		✓				1
TF20612-1400		✓		✓		4		1
TF20618-1000		✓			✓			1
TF20912-1000			✓	✓				1
TF20918-1000			✓		✓			1
TF20918-1400			✓		✓	4		1

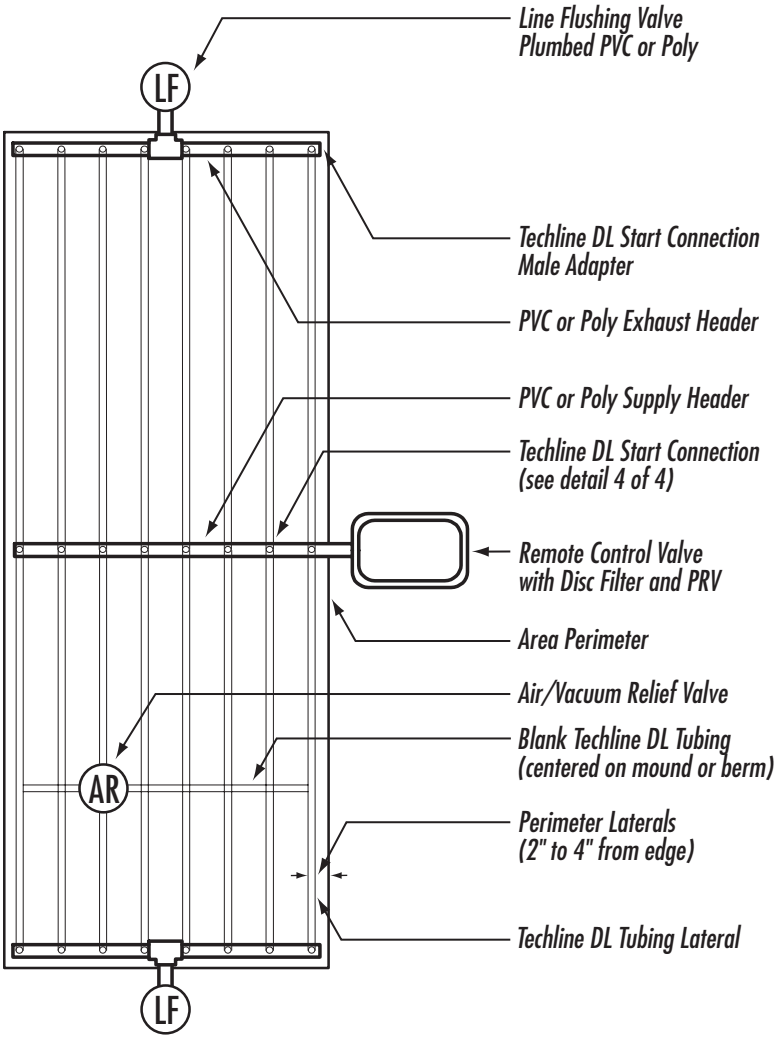
TECHNICAL DATA

Techline DL END FEED LAYOUT



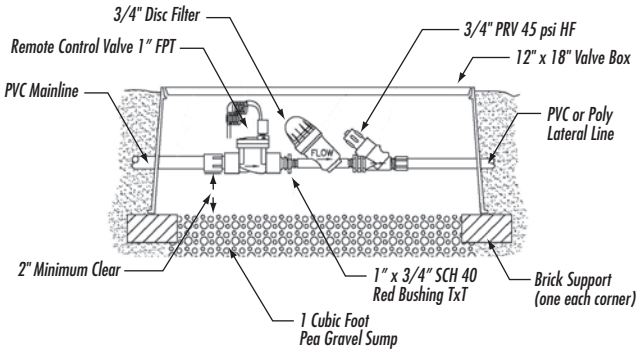
TECHNICAL DATA

Techline DL CENTER FEED LAYOUT

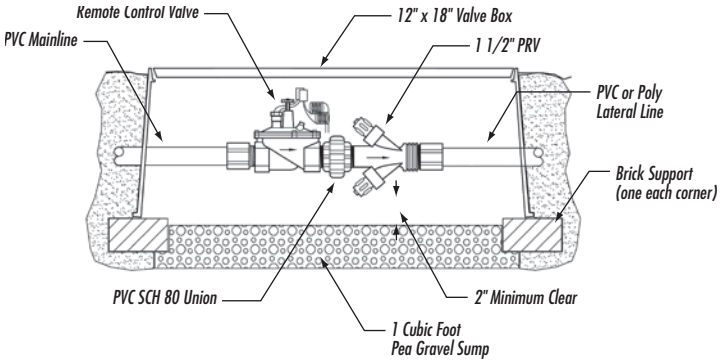


TECHNICAL DATA

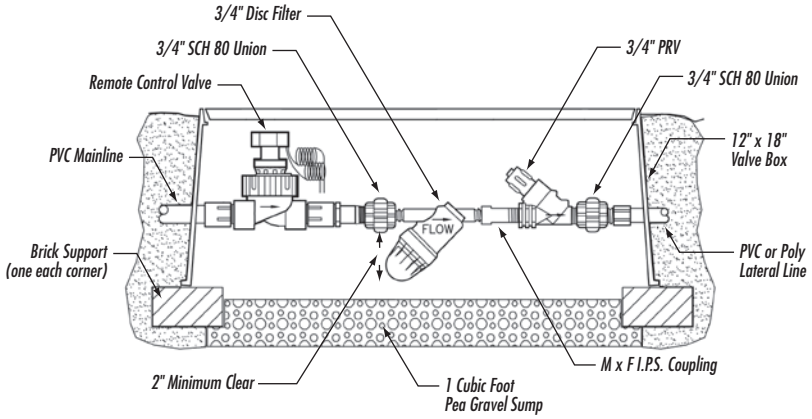
Control Valve with 3/4" PRV HF and 3/4" Disc Filter



Control Valve with 1 1/2" PRV and 1" Disc Filter



Control Valve with 3/4" PRV and 3/4" Disc Filter



INSTALLATION CHECK LIST

Project: _____

Date: _____

1. Assemble and install remote control valve, and pressure regulator as indicated in Netafim USA detail(s) _____.
2. Assemble and install supply header as indicated in Netafim USA detail(s) _____ .Tape or plug all open connections.
3. Assemble and install exhaust header as indicated in Netafim USA detail(s) _____ .Tape or plug all open connections.
4. Install Techline DL laterals beginning at the start connection(s) indicated in Netafim USA detail(s) _____. Type and layout of Polyethylene laterals are to be installed as specified, and/or as indicated in Netafim USA detail(s) _____ . Tape or plug all open ends.
5. Install an air/vacuum relief valve at the highest elevation in the zone as indicated in Netafim USA detail(s) _____.
6. Make all polyethylene to fitting connections while flushing the system. Make connections as indicated in Netafim USA detail(s) _____.
7. While flushing, connect polyethylene laterals to the exhaust header as indicated in Netafim USA detail(s) _____.
8. Install line flushing valve(s) as indicated in Netafim USA detail(s) _____.
9. Install other Netafim USA Accessories as indicated in Netafim USA detail(s) _____.
10. Operate and inspect the system. Record system data for historical record. Use Netafim USA System Inspection Checklist, page 22.

NETAFIM™
GROW MORE WITH LESS

SYSTEM INSPECTION CHECK LIST

Project: _____

Date: _____

Techline DL Emitter Spacing ☐ 12" ☐ 18" ☐ 24"

Techline DL Lateral Spacing ☐ 12" ☐ 18" ☐ 24" ☐ Other

Emitter Flow Rate ☐ 0.26 GPH ☐ 0.4 GPH ☐ 0.6 GPH ☐ 0.9 GPH

Type of Installation ☐ On-Surface ☐ Subsurface Depth below grade (inches) _____

Type of Pressure Regulator ☐ 3/4" (0.25 to 4.4 GPM) ☐ 3/4" (4.5 to 17.6 GPM)
☐ 1 1/2" ☐ Other _____
☐ 15 psi ☐ 20 psi ☐ 24 psi ☐ 35 psi ☐ 45 psi

Disc Filter Size ☐ 3/4" ☐ 1" ☐ 1 1/2" ☐ 2"

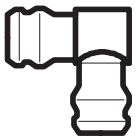
Disc Filter Mesh ☐ 80 ☐ 120 ☐ 140 ☐ 200

Operating Pressure _____ psi

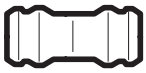
Pressure at Flush Valve _____ psi

If More Than One Flush Valve _____ psi

Controller Data
Station #_____ Run Time_____ X/Week_____ Flow_____
Station #_____ Run Time_____ X/Week_____ Flow_____
Station #_____ Run Time_____ X/Week_____ Flow_____
Station #_____ Run Time_____ X/Week_____ Flow_____

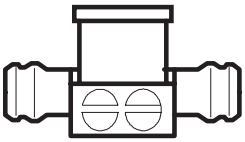


17mm TELL
Elbow

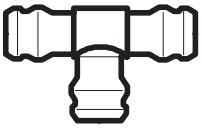


17mm TLCOUP
Coupling

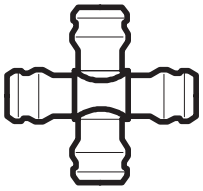
17mm TL075MA or TL050MA
Male Adapter



17mm TL075FTEE
2-Way Adapter Tee

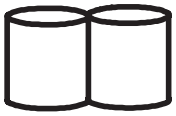


17mm TLTEE
Tee



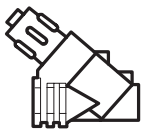
17mm TLCROSS
Cross

17mm TL2W075MA
"V" 2-Way Adapter

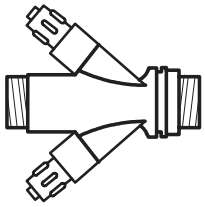


17mm TLFIG8
Line End

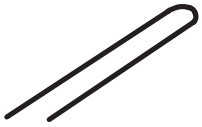
17mm TLMTUBEADP
Micro-Tubing Adapter



3/4" PRV
Pressure Regulating Valve

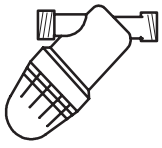


1 1/2" PRV
Pressure Regulating Valve



TLS6
6" Wire Staple

17mm TLSOV
Shut-Off Valve (Barb x Barb)



3/4" Disc Filter

TLAVRV
Air/Vacuum Relief Valve

MOST FREQUENTLY USED CHARTS

TECHLINE DL ROW SPACING RECOMMENDATION TABLE

	TURF												SHRUB & GROUNDCOVER											
	CLAY SOIL			LOAM SOIL			SANDY SOIL			COARSE SOIL			CLAY SOIL			LOAM SOIL			SANDY SOIL			COARSE SOIL		
EMITTER FLOW	0.26 GPH			0.4 GPH			0.6 GPH			0.9 GPH			0.26 GPH			0.4 GPH			0.6 GPH			0.9 GPH		
EMITTER SPACING	18"			12"			12"			12"			18"			18"			12"			12"		
LATERAL (ROW) SPACING	18"	20"	22"	18"	20"	22"	12"	14"	16"	12"	14"	16"	18"	21"	24"	18"	21"	24"	16"	18"	20"	16"	18"	20"
BURIAL DEPTH	Bury evenly throughout the zone from 4"to 6"												On-surface or bury evenly throughout the zone to a maximum of 6"											
APPLICATION RATE (INCHES/HOUR)	0.19	0.17	0.15	0.30	0.27	0.25	0.98	0.84	0.73	1.48	1.27	1.11	0.19	0.16	0.14	0.30	0.26	0.23	0.73	0.65	0.59	1.11	0.99	0.89
TIME TO APPLY ¼" OF WATER (MINUTES)	80	89	97	50	55	61	15	18	20	10	12	13	80	93	106	50	58	66	20	23	26	13	15	17
Following these maximum spacing guidelines, emitter flow selection can be increased if desired by the designer. 0.9 GPH flow rate available for areas requiring higher infiltration rates, such as coarse sandy soils.																								

Note: 0.4, 0.6 and 0.9 GPH are nominal flow rates. Actual flow rates used in the calculations are 0.42, 0.61 and 0.92 GPH.

MAXIMUM LENGTH OF A SINGLE LATERAL (FEET)

EMITTER SPACING		12"				18"				24"	
EMITTER FLOW (GPH)		0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9
INLET PRESSURE	20 psi	444	326	256	194	631	463	365	277	465	353
	25 psi	496	364	287	217	706	518	409	310	519	395
	35 psi	578	423	333	253	821	604	476	361	605	461
	45 psi	641	470	370	281	913	670	529	401	673	513

FLOW PER 100 FEET

EMITTER SPACING	0.26 EMITTER		0.4 EMITTER		0.6 EMITTER		0.9 EMITTER	
	GPH	GPM	GPH	GPM	GPH	GPM	GPH	GPM
12"	26.4	0.44	42.3	0.71	60.8	1.01	92.5	1.54
18"	17.6	0.29	28.2	0.47	40.5	0.68	61.6	1.03
24"	13.2	0.22	21.2	0.35	30.4	0.51	46.2	0.77

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