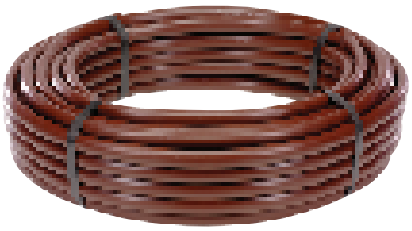
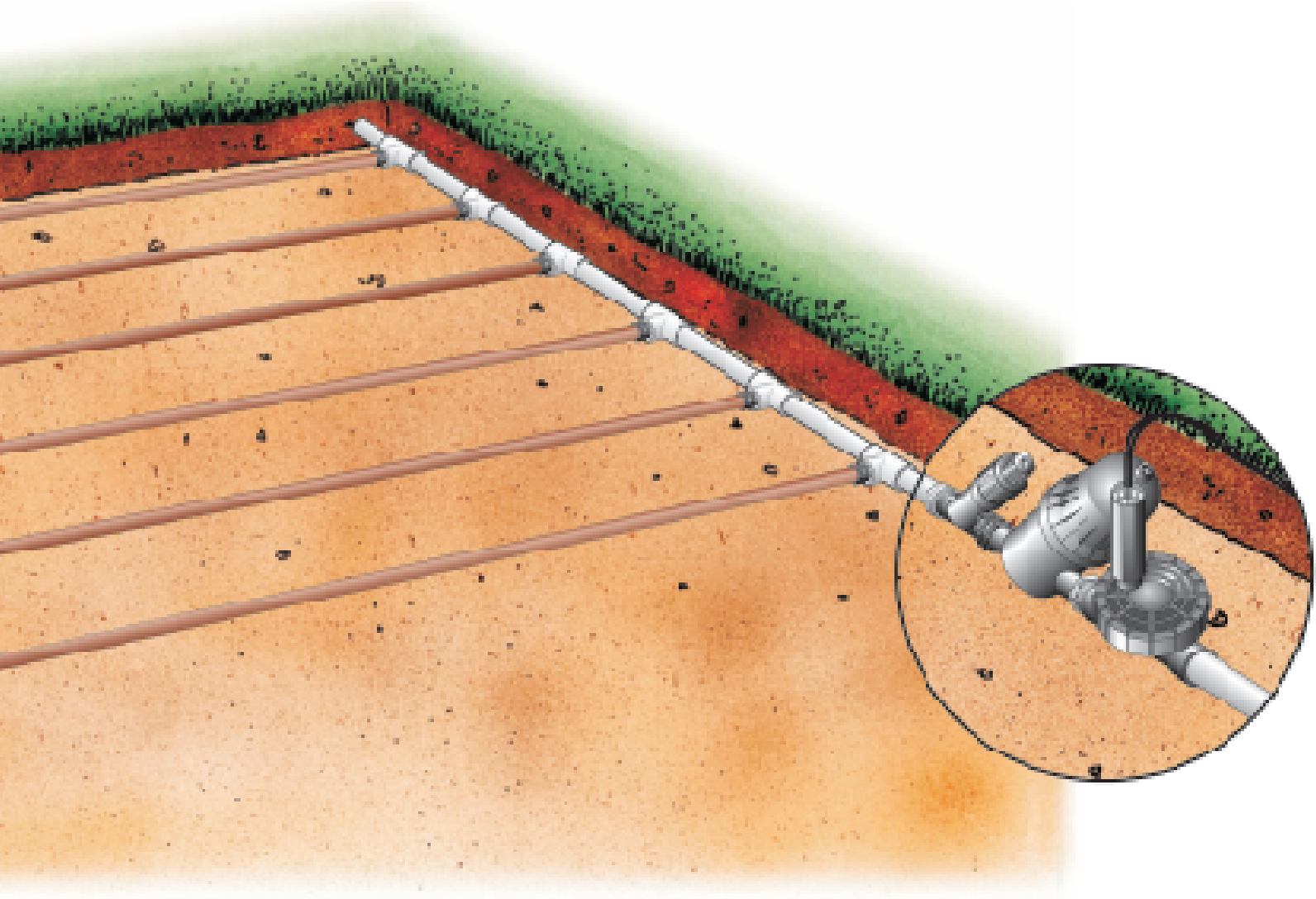
N E T A F I M

Techline® CV Design Guide





Subsurface or On-Surface
Pressure Compensating Dripperline
with Check Valve

NETAFIM™

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INTRODUCTION

This manual covers the basics of design, installation, and maintenance of Techline CV integral dripperline. Included are design steps, technical data, design layouts, as well as some design and installation details and checklists using both the “Grid” and “LITE” layout methods.

OVERVIEW:

- Netafim is the world leader in low volume irrigation. Since the early 1960’s Netafim has pioneered the science of subsurface, on-surface and point source irrigation and manufacturing. Serving more than 100 countries worldwide, Netafim products are sold into the Landscape & Turf market, as well as agriculture, greenhouse and nursery, wastewater, mining and forestry.
- The Techline family of products have been used successfully in landscape since 1987 in North America. Techline CV allows for even more water conserving designs because check valves are built into every dripper.
- Landscape Architects, Contractors, Nurserymen, Designers and Consultants recognize the benefits of using low volume and drip irrigation for new plantings because of its accelerated plant growth compared to overhead spray and rotor irrigation. Coupling the rapid growth with dramatic water savings and low volume irrigation becomes an important part of any irrigation system.
- With the flexibility and quality of Netafim products, architects, designers, and contractors have highly sophisticated solutions to client and installation issues by bringing drip and subsurface components together to grow plants, trees, shrubs, groundcover, and yes, even turf.

DESIGN CRITERIA

- Designing with Techline CV follows the same basic rules as designing with Techline, sprays and rotors.
- 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 products with different application rates is just like sprinkler design.
- The essential differences include knowing the type of soil you are working with, and the method of layout you use in the design.

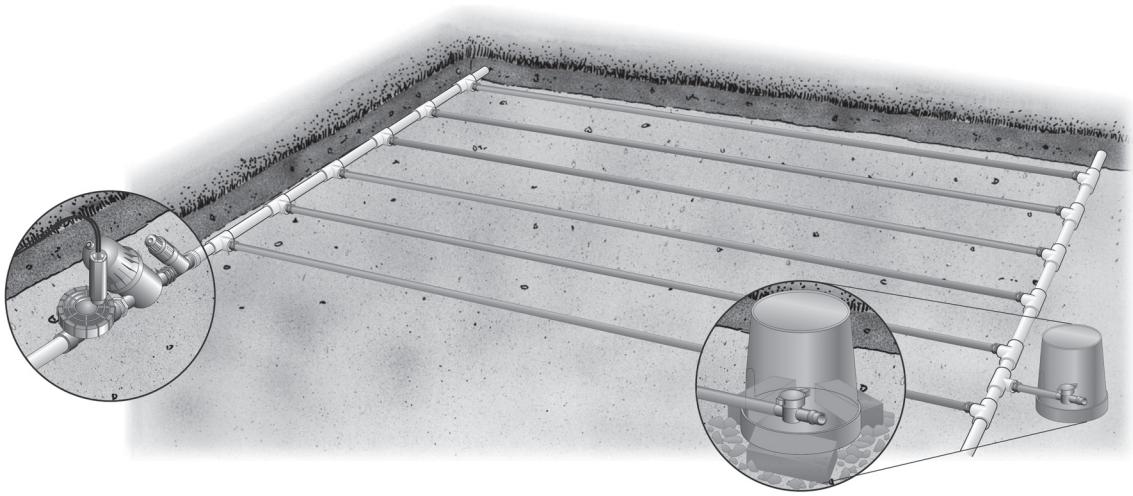
SITE SURVEY:

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

POINT OF CONNECTION:

- Type of water, potable, well, pump, effluent, etc.
- Pressure & volume available - Static and operating tests.

Note: *For Techline CV Technical Product Application & Specifications, see page 22.*



BASIC DESIGN STEPS

WHEN SHOULD YOU USE TECHLINE CV?

- Anytime you want to create an even wetted pattern of water throughout an area.
- Since the object of sprinklers is also to create an even wetted pattern, you can use Techline CV anytime you can use sprinklers.

CHOOSING THE PROPER TECHLINE CV:

- From Table 1, answer two questions:
  1. Are you irrigating a Shrub & Groundcover area or Turf?
  2. Is the soil Clay, Loam or Sandy?
- Follow the proper column listed under TURF or SHRUB & GROUNDCOVER to identify the proper Techline CV. Example - If you choose Shrub & Groundcover, with loam soil, 0.4 GPH/18" Techline CV is the proper choice. *(Each dripper will deliver 0.4 GPH and the drippers, mounted inside the tubing, are spaced 18" apart.)*
- What other information is in the General Guidelines Chart?
  1. How far to spread out the laterals is listed on the "Lateral (Row) Spacings" line. *(For this example, rows should be evenly spaced anywhere from 18" - 24" apart.)*
  2. The corresponding application rates and time to apply are listed under the Lateral Spacings line. *(With rows of 0.4 GPH/18" Techline CV every 18" apart, the application rate is 0.29 inches per hour and it will take 52 minutes to apply 1/4" of water. If the rows are 24" apart, the application rate is 0.21 inches per hour, and it will take 71 minutes to apply 1/4" of water. For other row spacings, see page 26.)*

TECHLINE® CV *General Guidelines*

TABLE 1

	TURF			*SHRUB and GROUND COVER*		
	Clay Soil	*Loam Soil*	*Sandy Soil*	*Clay Soil*	*Loam Soil*	*Sandy Soil*
Dripper Flow	0.26 GPH	0.4 GPH	0.6 GPH	0.26 GPH	0.4 GPH	0.6 GPH
Dripper Interval	18"	12"	12"	18"	18"	12"
Lateral (Row) Spacings	18" - 22"	18" - 22"	12" - 16"	18" - 24"	18" - 24"	16" - 20"
Burial Depth	On-surface or bury evenly throughout the zone to a maximum of 6 inches					
Application Rate (in./hr.)	.19 - .15	.43 - .35	.96 - .72	.19 - .14	.29 - .21	.72 - .58
Time to Apply 1/4" of Water (in minutes)	79 - 100	35 - 43	16 - 21	79 - 107	52 - 71	21 - 26

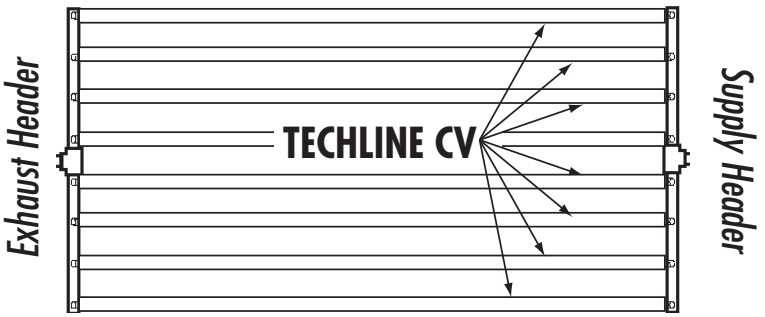
Maximum spacing recommendations: Following these spacing guidelines, dripper flow selection can be increased if desired by the designer.

BASIC DESIGN STEPS *(continued)*

TYPES OF LAYOUTS:

There are two layout methods we recommend - “GRID” and “LITE”. Both accomplish the same goal, but one method will be the preferred method based on what and how you are irrigating.

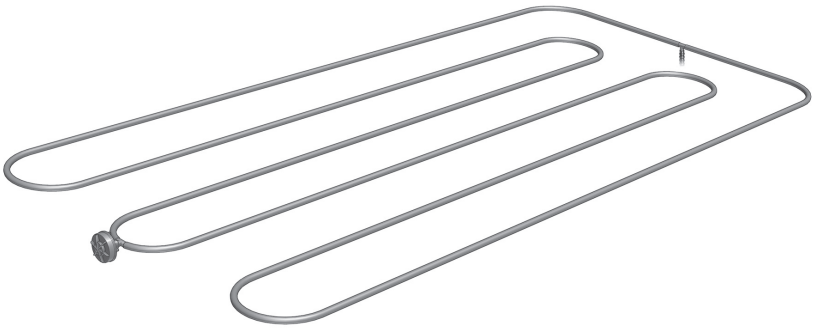
Basic Techline CV Grid Layout



“GRID”:

- This is the preferred method for installing Techline CV subsurface
- This method uses supply and exhaust headers with rows of Techline CV connected at each end
- The Supply Header delivers water to each row of Techline CV
- The Exhaust Header forms a continuous loop, or return leg, so all rows of Techline CV are being supplied from both ends
- This interconnection of the piping network comprises the term “Grid layout.” This evens out the flow, helps ensure water is being delivered downstream of any break in the laterals, and allows for much easier repairs of any line breaks.

Basic Techline CV Lite Layout



“LITE”:

- The LITE layout is used exclusively on-surface
- It is the fastest and easiest layout method because no supply and exhaust headers are used
- The dripperline simply weaves back and forth throughout the zone in evenly spaced rows.

WHAT DO THESE LAYOUTS HAVE IN COMMON?

- Both methods assume even row spacings will be maintained
- Both methods are designed to flow water in a loop manner

BASIC DESIGN STEPS *(continued)*

BASIC "GRID" LAYOUT:

- Headers should be indented 2" - 4" from hardscapes and planting areas.
- Headers may be PVC, polyethylene or in zones under 5-GPM, Techline CV or Techline CV Blank Tubing.
- Headers must be sized to accommodate the flow of the zone without exceeding 5 feet per second velocity. *(Zone Water Requirement calculations are on page 10).*
- Start rows of Techline CV 2" - 4" away from the edge of hardscapes, and move across the area with equal row spacing that 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 hardscapes such as asphalt).* Start rows about 4" away from planting beds.

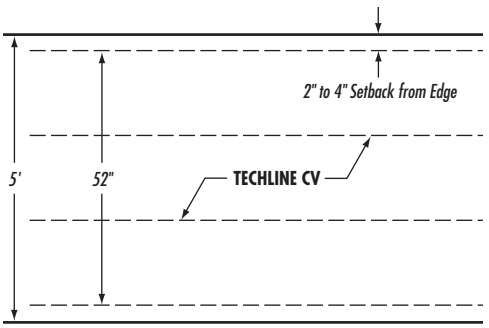
BASIC "LITE" LAYOUT:

- Water being supplied to the zone is split with a Techline fitting into two directions. Use a TL075FTEE or TL2W075MA fitting.
- Weave the Techline CV back and forth throughout the planting area with evenly spaced rows.
- Indent the tubing 2" - 4" from hardscapes and planting areas.
- Because water is being split into two separate paths that meet in the middle, the maximum length of the lateral can be twice the stated limit in Table 2.
- Therefore, to determine the maximum amount of Techline CV you can use in the zone, simply double the maximum length stated in Table 2.

How to Calculate Equal Techline CV Row Spacing

Example:

- 5 feet x 12 inches = 60 inches
- 60 inches - 8 inches (2 edges x 4" setback) = 52"
- Following recommended Techline CV Row Spacing for this example, assume 18 inches from Table 1
- 52" ÷ 18" = 2.89 spaces between Techline CV rows
- 2.89 is not a whole number, so round up to the next whole number, which is 3 (spaces)
- Add 1 (one) to the number of spaces to determine the number of Techline CV rows
- Determine equal spacing between Techline CV rows. 52 inches ÷ 3 = 17.3 inches



NOTE

HOW TO QUICKLY DETERMINE THE AMOUNT OF TECHLINE CV IN A ZONE
(Square Footage of Zone x 12) ÷ Minimum Recommended Row Spacing

BASIC DESIGN STEPS *(continued)*

LENGTH OF TECHLINE CV ROWS:

- As with overhead irrigation, friction losses through pipe determine how long a length of pipe can be.
- You do not need to go through friction loss calculations for Techline CV laterals. It has already been done for you.
- Table 2 shows the maximum length of a single Techline CV lateral within a zone.
- The chart also determines what the operating pressure of the zone needs to be. Example - If you have a 322' lateral of 0.6 GPH/12" Techline CV, it will need 35 psi to operate properly. If it is from 323'- 369', it will need 45 psi. ***Note:*** *We will discuss how to regulate your pressure in the Pressure Regulating Valve section on page 14.*
- Once the zone is laid out, note the pressure you will need somewhere on the design. We will need this information later to size the Pressure Regulating Valve.

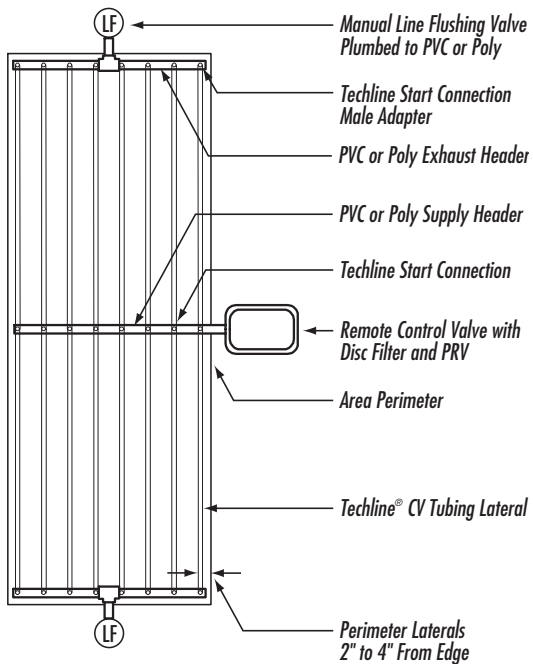
TABLE 2 **TECHLINE® CV *Maximum Length of a Single Lateral*** *(feet)*

	TECHLINE CV DRIPPER SPACING									
INLET PRESSURE *(psi)*	*12"*				*18"*				*24"*	
15	127	109	86	65	177	151	120	91	152	116
25	427	325	256	194	604	459	361	274	458	348
35	539	409	322	244	763	579	456	346	580	440
45	618	469	369	280	877	664	523	397	666	506
Dripper Flow Rate *(GPH)*	0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9

CENTER FEED GRID LAYOUTS:

- You can increase the length of laterals by center-feeding the zone. By doing so, you can have a length of Techline CV as called out in Table 2 going in each direction, effectively doubling the maximum lateral length. This is just like we discussed with the LITE layout on page 6.
- Where layout flexibility exists, Center Feed layouts are an excellent design method.
- They allow for the most even flow of water through the zone.
- They are an excellent option for median strips and other large, homogenous areas.

Techline CV Center Feed Layout



BASIC DESIGN STEPS *(continued)*

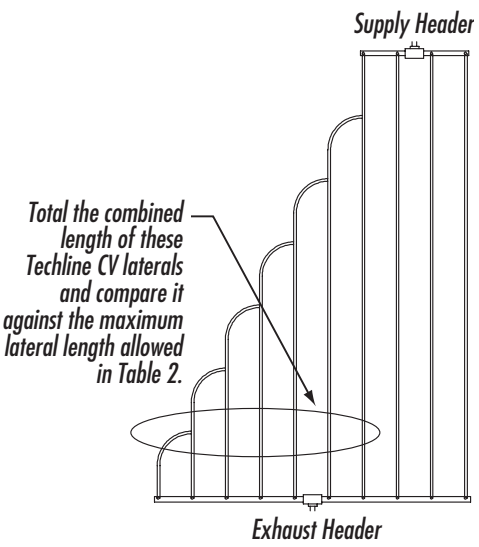
OTHER GRID LAYOUT CONSIDERATIONS:

- When branching out or joining rows of Techline CV, one of two rules apply:

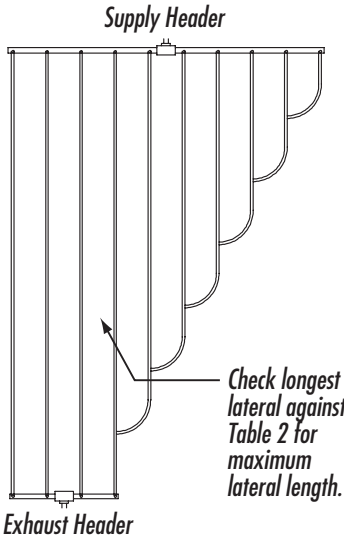
  Rule #1: When branching out Techline CV from the supply header, add up all "branched out" dripperline and check it against the maximum lateral length listed in Table 2.

  Rule #2: When joining laterals from the supply header, check only the longest lateral against the maximum allowable in Table 2.

Branching Out Techline CV Laterals

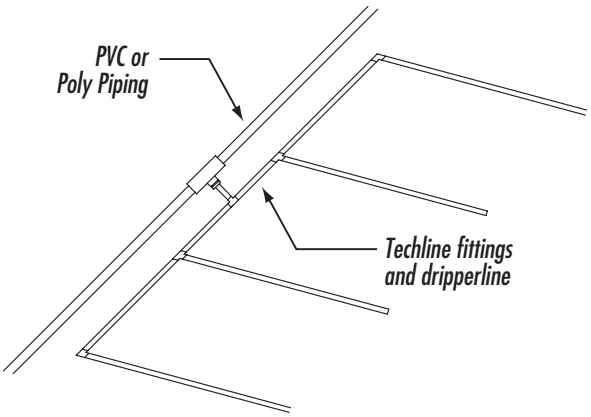


Joining Techline CV Laterals



- To reduce the number of glue joints, saddles or insert fittings in a header, transition to Techline CV and Techline fittings to make up subheaders.
- Make sure to follow the guideline of not exceeding 5 GPM in the "sub-header" zone.

Creating Sub-Headers to Reduce Glue/Saddle Joints



BASIC DESIGN STEPS *(continued)*

ZONE WATER REQUIREMENTS:

- Once the Techline CV is laid out, we need to identify total zone flow. This will help determine mainline, submain as well as supply and exhaust header sizing, valve, filter, and pressure regulator selection.
- There are two ways to determine the flow in a Techline CV zone.
- Because Techline CV is pressure-compensating, the flow rate per 100' is the same over a wide pressure range.
- Table 3 shows an easy way to determine total zone flow:
  - Add up the amount of Techline CV *(in hundreds of feet)* and
  - Multiply that figure by the corresponding dripperline GPM to determine zone flow.

Calculating Total Zone Water Demand

- Multiply Total Feet x 12" = Total inches of Techline CV
- Total Inches of Techline CV ÷ Dripper Spacing = Number of Drippers
- Multiply Number of Drippers x Dripper Flow Rate (GPH) = Total GPH Flow
- Total GPH Flow ÷ 60 = Total GPM in the Zone

Example:

Ten 100' rows of Techline CV with Dripper Spacing of 18", Flow Rate is 0.6 GPH.

100' x 10 = 1,000'

1,000' x 12" = 12,000" 12,000" ÷ 18" = 667 Drippers

667 Drippers x 0.6 GPH = 400 GPH Total Flow

400 GPH ÷ 60 = 6.67 GPM Flow in the Zone

TABLE 3 **TECHLINE® CV *Flow*** *(per 100 feet)*

DRIPPER SPACING	*0.26 GPH Dripper*		*0.4 GPH Dripper*		*0.6 GPH Dripper*		*0.9 GPH Dripper*	
12"	26.40 GPH	0.44 GPM	40.00 GPH	0.67 GPM	61.00 GPH	1.02 GPM	92.00 GPH	1.53 GPM
18"	17.58 GPH	0.29 GPM	26.67 GPH	0.44 GPM	41.00 GPH	0.68 GPM	61.00 GPH	1.02 GPM
24"	Not Available	Not Available	Not Available	Not Available	31.00 GPH	0.51 GPM	46.00 GPH	0.77 GPM

BASIC DESIGN STEPS
(continued)

TL075MA 3/4" Male Adapter

TL050MA 1/2" Male Adapter

TLIAPE

TLIAPVC

FITTINGS:

When laying out Techline CV, you will need to use fittings. If you have chosen a GRID layout, you may need a transition fitting from the supply piping to the Techline CV. Further, you will use Techline CV fittings to connect the rows of Techline CV to the headers. If you are using a LITE layout, you will also use a transition fitting from the supply piping, as well as a fitting at the end or midpoint of the zone so that a flush point can be installed.

Netafim 17mm barbed insert fittings are designed to speed the installation as well as offer you a broad range of choices, *(see page 38).*

The barbed end(s) of all Techline CV fittings is raised and sharp. This allows the fitting to be used with operating pressures up to 50-psi without clamps. If pressures are expected to exceed 50-psi, a clamp is recommended. Ensure that the clamp is secured over the raised barb.

Fittings are simply pressed into the tubing. No special tools are required. As with all polyethylene pipe, do not heat the tubing before inserting the fittings. It is not necessary and it can damage the pipe.

STAPLES:

Techline CV staples (TLS6) are used to hold dripperline in place.

TLS6

NOTE

While most commonly used when Techline CV is laid on-surface or under a mulch cover, staples are also valuable when a layout is being assembled sub-grade before being covered with dirt.

Rule of Thumb: Use a minimum of one staple for every:

- 3 feet of dripperline in sand
- 4 feet of dripperline in loam
- 5 feet of dripperline in clay

Further, use 2 staples “x’ed” over each other with any change-of-direction fittings such as tees, elbows or crosses.

LINE FLUSHING VALVES:

NOTE

Techline CV has a check valve in each dripper designed to hold back a 4 1/2 foot column of water (2-psi dripper closing pressure). Therefore, it may not be desirable to use an automatic Line Flushing Valve with Techline CV, since it could allow water to drain from the dripperline after zone shutdown.

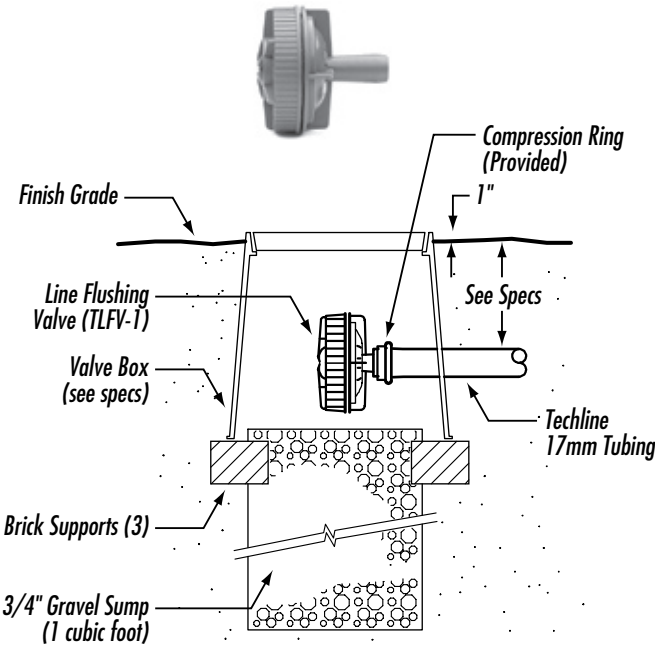
- Line Flushing Valves are used to provide a cleansing action in dripperline each time the zone is turned on.
- When the zone is turned on, the flush valve begins dumping water into a sump located under it.
- The dumping of water *(additional flow)* allows the velocity of water inside the dripperline to increase momentarily helping to clean the inside walls of the tubing.
- This action moves sediments out of the zone and into the sump.

BASIC DESIGN STEPS *(continued)*

IF AN AUTOMATIC LINE FLUSHING VALVE IS DESIRED:

- It is because the desire to have a cleansing action outweighs the desire to hold the water inside the tubing when the zone is off.
- As such, place a Line Flushing Valve (one per each 15 GPM of zone flow) as far away from the source as possible. This will typically be somewhere along the exhaust header in a GRID layout and at the midpoint of the tubing in a LITE layout.
- When Center Feed layouts are used, install at least 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.
- *See Air/Vacuum Relief Valves on page 13.*

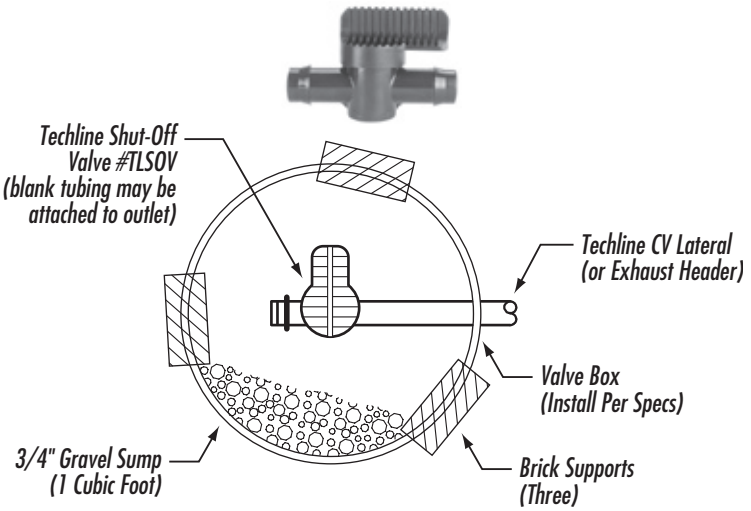
Netafim Line Flushing Valve



IF AN AUTOMATIC LINE FLUSHING VALVE IS NOT DESIRED:

- It is because holding the water in the Techline CV is desired and,
- Procedures have been established to manually flush the lines during the season.
- In this case, Techline Shut-Off Valves *(TLSOV)* or Figure 8 Line Ends *(TLFIG8)* should be located along the exhaust header, or at the midpoint of a LITE layout.

Techline CV Manual Line Flush Valve



BASIC DESIGN STEPS *(continued)*

AIR/VACUUM RELIEF VALVES:

Because Techline CV is designed to keep water in the tubing, an A/VRV would only be used in conjunction with an automatic Line Flushing Valve as described in the previous section.

If you want to hold the water inside the dripperline after zone shutdown, (you are using a TLSOV or FIG8 in lieu of an automatic Line Flushing Valve) disregard this section.

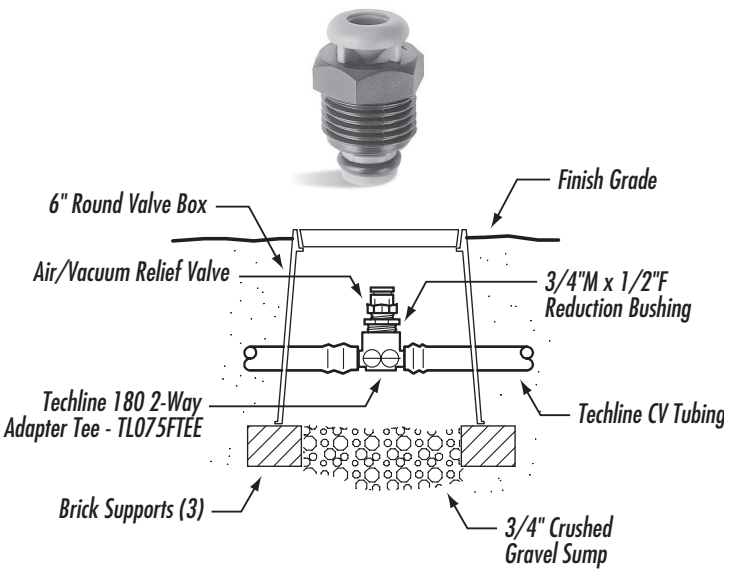
An Air/Vacuum Relief Valve *(A/VRV)* freely allows air into a zone after shutdown. It also ensures a vacuum doesn't draw debris into the dripperline. Further, they also provide a means of releasing air from the dripperline when the zone is turned on, thus eliminating air pockets and speeding up dripperline operation. *(Because water stays in a Techline CV zone anytime the elevation across the zone is less than 4 1/2 feet, this is not an issue).*

- On zones where an Air/Vacuum Relief Valve is desired, they are installed at the highest point*(s)* in the zone.
- To ensure that all of the rows of the dripperline can take advantage of the Air/Vacuum Relief Valve, ***install it/them along a lateral that runs perpendicular to the dripperline laterals.*** This may be an exhaust header, or a special lateral connecting all the rows of dripperline, such as going over a berm.

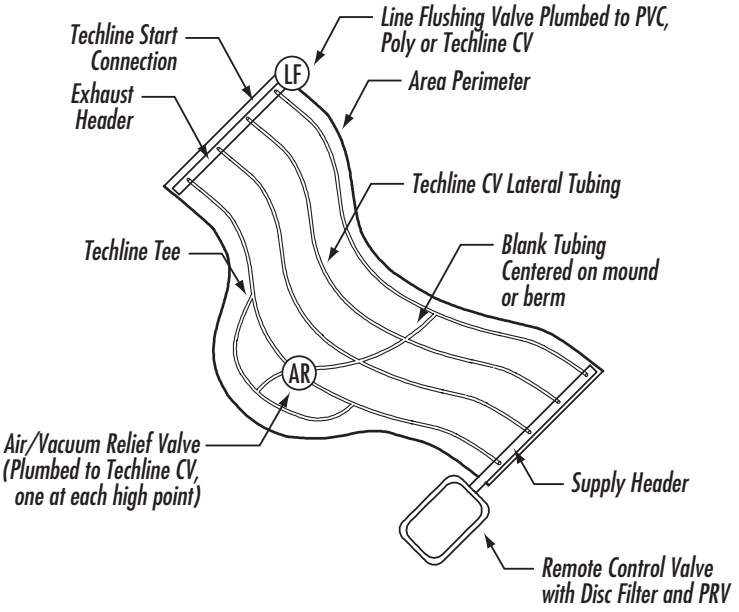
NOTE

In large scale irrigation systems where pumps and large diameter pipe are used, air that has been created must be expelled. As such, the use of Continuous Air Vents may be required on continuously and non-continuously pressurized lines.

Netafim Air/Vacuum Relief Valve (TLAVRV)



Installing A/VRV To Laterals



BASIC DESIGN STEPS *(continued)*

FILTERS:

- Just like overhead irrigation, dripperline needs protection against dirt and debris. *(In sprinkler heads, filters are placed under the drive assembly or nozzle. With drip and dripperline, one filter is placed at the beginning of the zone, or at the POC).*
- Filters are normally installed immediately downstream of the remote control valve.
- Netafim uses a non-collapsing stack of flat grooved discs that effectively 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 120 or 140 mesh filters for Techline CV designs. Techline CV only requires 120 mesh filtration. If a finer mesh filter is used, it may require more frequent cleanings.
- Refer to “DISC FILTER SIZING CHART” on page 28 to properly size the filter.

PRESSURE REGULATING VALVES (PRV’S):

Pressure Regulating Valves reduce the operating pressure so that Techline CV zones operate between 15 and 45 psi.

- PRV’s are normally installed immediately downstream of the disc filter and remote control valve. Often all three components are in the same valve box, and the distance from the PRV to the Techline CV is limited so additional friction is not incurred.
- The two most popular sizes of PRV are both 3/4" units. One is a **Low Flow** version that has a flow range of 0.25 - 4.4 GPM. The **High Flow** version has a flow range of 3.5 - 17.6 GPM. Other sizes from *1 1/2*" - 3” are also available for zones with flows up to 200 GPM.
- To select the correct PRV, choose the model that has the correct flow range based on total zone flow.
- **Then** select the correct pressure rating based on the following:

1. If you used the “Maximum Length of a Single Techline CV Lateral” chart, *(Table 2)* match the PRV to the same pressure rating you used for your maximum lateral length calculation,

OR

2. Simply use a 45 psi PRV. *(Because Techline CV is pressure-compensating, there is no reason to intentionally reduce the pressure below 45 psi).*

NOTES:

1. If the PRV is remotely located from the supply header, remember to account for any friction loss that occurs through the piping to the supply header.
2. Low Volume Control Zone Kits:
   - These preassembled kits speed installation and have all of the components needed for a low volume zone.
   - Kits are sized for a specific flow range

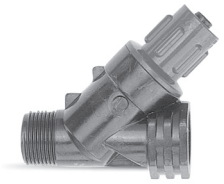
BASIC DESIGN STEPS
(continued)

LOW VOLUME CONTROL ZONE - LOW FLOW
LVCZ10075-LF
- Hunter 24VAC PGV-100JT-G 1" valve
- Netafim DF075-140 Filter
- Netafim PRV075LF45V2K PRV
- For zones ranging from 0.25 - 4.4 GPM

Low Volume Control Zone Kit (LVCZ10075-LF) 0.25 - 4.4 GPM

Flow Selection for PRV

Low Flow PRV Operates from 0.25 to 4.4 GPM



High Flow PRV Operates from 3.5 to 17.6 GPM

LOW VOLUME CONTROL ZONE - HIGH FLOW
LVCZ10075-HF
- Hunter 24VAC PGV-100JT-G 1" valve
- Netafim DF070-140 Filter
- Netafim PRV075HF45V2K PRV
- For zones ranging from 3.5 - 17.6 GPM

Low Volume Control Zone Kit (LVCZ10075-HF) 3.5 - 17.6 GPM

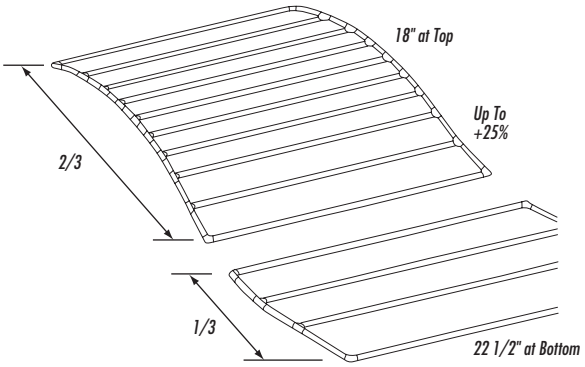
BASIC DESIGN STEPS *(continued)*

SLOPES AND BERMS:

Techline CV has a check valve built into each dripper. This allows the dripperline to hold back up to a *4 1/2* feet column of water. As such, designing Techline CV on slopes and berms is very easy.

- Techline CV should be installed perpendicular to (across) slopes
- In the upper 2/3 of the slope, space Techline CV per TABLE 1, page 5, 27 or 39.
- In the lower 1/3 of the slope, increase the distance between rows by 25%.
- For every *4 1/2* feet of elevation change, either:
  - Split the slope into separate zones, or
  - Install a Netafim "TLCV" inline check valve.

Taller Slope Irrigation Method



Techline Check Valve (TLCV):

- Designed to hold back up to a 13' column of water
- **Rule of Thumb:** Every 1' of water exerts 0.433 psi of pressure at the base of the column. As such, a 100' column of water exerts 43.3 psi at the base.

TLCV Specifications:

- Flow Range: 0.9 - 4.4 GPM (200 - 1,000 l/h)
- Closing Pressure: 5.7 psi (4m)
- Opening Pressure: 7.1 psi (5m)
- Can hold back a 13' column of water (5.7 ÷ .433)
- Connection: 17mm insert

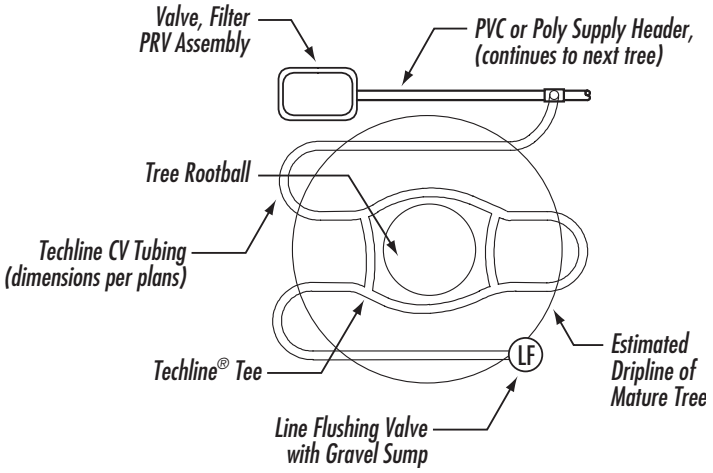
TREES:

- It is important to provide trees with adequate water at the rootball, while also planning for the tree's needs as it grows.

NOTE: When trees are transplanted, the soil in the rootball and the native soil are different. You must ensure that there are sufficient drippers irrigating both soils because water will not migrate from one soil type to the other.

- A loop of Techline CV close to the rootball, with more Techline CV surrounding the estimated dripline of the tree when mature will provide sufficient water.

Techline CV Tubing and Accessories for Tree Planting



BASIC DESIGN STEPS *(continued)*

PRESSURE & FLOW CHECKS:

- One of the best means of ensuring a Techline CV zone is operating properly is to test the pressure at regular intervals.
- By taking and recording the pressure while the zone is running, you can ensure 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.
- Record the information at least once per year on a "System Inspection Checklist" *(an example is provided on page 37).*

CALCULATING PRECIPITATION RATES:

- **Method 1:** See the "Techline CV Application Rate Tables" on page 26.
- **Method 2:** If there is some variation in your design, *(for instance, when we had to decrease the distance between the rows in our earlier example)* then rely on the formula below.

CAUTION: Though the precipitation rates of rotors, fixed sprays and Techline CV can be very close in many situations, we do not recommend tying dripperline into spray or rotor zones. Techline CV has an irrigation application rate efficiency greater than sprays or rotors. Even when calculations make it appear that the application rates are the same, a Techline CV zone will actually be delivering more water since none of it is evaporating or landing where it can't be used.

Determining Techline CV Application Rate

Application Rate *(inches per hour)* =

$$\frac{231.1 \times \text{Dripper Flow Rate (GPH)}}{\text{Dripperline Row Spacing } \textit{(inches)} \times \text{Techline CV Dripper Spacing } \textit{(inches)}}$$

Example:
- Dripperline Row Spacing = 17.3" apart
- Techline CV Dripper Spacing = 18"
- Dripper Flow Rate = .6 GPH

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

TECHLINE CV IN TURF

TECHLINE CV IN TURFGRASS:

Background: Netafim products have been used successfully in turfgrass since the 1980's. It is a popular choice for a variety of residential and commercial general-use and specialized-use turf areas, and has been used very successfully in sports turf, as well as composition and grass tennis courts.

WHERE AND WHY TO USE TECHLINE CV IN TURF:

- Long, odd-shaped or narrow areas:
  - Allows greater landscape design freedom to use curvilinear layouts that cannot be utilized when overhead irrigation is used
  - Eliminates wet roads and sidewalks
  - Helps save water
  - Reduces slipping and tripping hazards
  - Reduces wet surface hazards to vehicle traffic
  - The ability to irrigate areas with less water in long narrow areas where either getting the water is hard, or zoning the area is difficult
  - Overspray is eliminated
- Areas close to buildings and at-grade windows:
  - Stops windows from getting wet
  - Allows the use of turfgrass close to a building without damage to facades
  - Reduces deterioration and discoloration of building facades
- Athletic fields:
  - No exposed sprinklers reduces impact injuries
  - On tight-soil fields:
    - Can be irrigated and softened prior to play without wetting the surface
    - Helps reduce impact injuries from hard soil surfaces
  - Because water window issues are eliminated, time of play increases
- Auto dealerships and other parking areas:
  - No overspray reduces the cost of auto detailing
  - Reduces slipping and tripping hazards
  - Reduces wet surface hazards to vehicle traffic
- High wind, or constant wind areas:
  - Overspray and wasted water is eliminated
  - Water gets where it is supposed to be regardless of wind
- High liability areas:
  - Tripping and other liability issues are significantly reduced
  - Maintenance costs to repair broken sprinkler heads are greatly reduced
- Vandal-prone areas:
  - “Out of sight, out of mind”
  - Maintenance costs and potential liability of unrepaired problems is greatly reduced

TECHLINE CV IN TURF

- Wood hardscapes:
  - Bleaching of hardscapes such as wooden fences is eliminated
  - Aesthetics of the wood hardscapes is maintained
- Steep slopes:
  - Allows turf to be used on slopes
  - Water is easily managed on slopes with dripperline
  - Wash outs are eliminated
- Locales where the cost of water is too expensive for overhead irrigation:
- Unlike spray or rotor irrigation, which does not have an even application rate across its pattern, Techline CV has an extremely well-balanced application rate in the entire area. As such, you do not need to overwater to make sure the driest area receives enough water.
  - Techline CV uses about half of the water of an overhead system
  - Techline CV is about 90% efficient vs. overhead irrigation, which is about 60% efficient
- Techline CV seals in 1.3 gallons of water for every 100', saving water from draining out of the dripperline each time the zone shuts off.
- Water window issues:
  - Irrigate whenever necessary because there is no exposed spray
- Recycled/reclaimed water or fertigation applications where spraying water is illegal:
  - Allows for use of nutrient-rich water, often at a greatly reduced cost
  - Saves potable water supplies

TIPS FOR USING TECHLINE CV IN A NEWLY-SODDED LAWN:

- Follow Table 1 General Guidelines recommendations for turf, *see pages 5, 27 or 39.*
- Bury the Techline CV approximately 4” below final grade
- In areas where mechanical aeration will be used, bury the Techline CV 6” below final grade and ensure aeration does not exceed 4"
- When installing the sod:
  - It is important that the final grade is smooth, ensuring that the sod makes solid contact with the soil
  - Properly “knit” the edges together
  - Thoroughly wet the sod with overhead irrigation
  - Roll the sod to ensure good contact
- If the irrigation system is automatic:
  - Set the zone to run several times daily
  - Keep wetted from above as necessary until the roots establish
- Once you cannot pull the edges of the sod up, discontinue overhead watering
- Irrigate on a daily or every-other-day basis
- Protection against root intrusion
  - For years of trouble-free system performance, and a limited lifetime warranty against root intrusion, use Netafim Techfilter with Techline CV, *see pages 29 - 33.*

SPECIAL APPLICATIONS AND TIPS

PARKING LOT ISLANDS:

If 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 CV and spacing.
- Use one Low Volume Control Zone kit at the source, and install a TLSOV or TLFIG8 either at the end of the last island or, if the islands dead-end, 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 more effective than in dry soil.
- One method of ensuring moist soil is to install a length of Techline CV along a length of unclad copper wire being used for grounding purposes. The Techline CV is installed in the usual method. Run it from a separate station on the controller to give you maximum control.
- Techline CV can also be installed over the top of a grounding plate or ground rod.

TECHLINE CV ABOVE AND BELOW GRADE:

Techline CV is designed to be used in a variety of ways:

- It can be laid on the surface, *(it's UV resistant!)* and held in place with Techline Staples *(TLS6),*
- It can be laid on the surface, stapled into place and covered with mulch, or
- It can be buried below grade.

NOTE: When using Techline CV above grade with staples, use enough staples to firmly hold the tubing in place, especially in freezing climates.

TECHLINE CV WINTERIZING INSTRUCTIONS

TECHLINE CV WINTERIZING INSTRUCTIONS:

Winterizing an irrigation system involves removing enough water to ensure that components do not crack or break during freezing weather.

Because Techline CV is designed to keep water sealed inside the tubing between irrigations, it is important that these simple steps be followed.

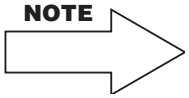
MANUAL WINTERIZATION (no compressed air blow-out)

- A drain port must be present at all low points in the zone.
- Ports may be a tee or elbow with a threaded plug, a Netafim TLFIG8 or TLSOV which, when opened, will allow water to drain. If a Netafim "automatic" Line Flushing Valve has been used, disassemble it.
- If the Techline CV zone is a grid or closed system, the supply and exhaust headers may contain a significant amount of water because they are either blank Techline CV tubing, PVC, or poly pipe. It is important to provide drain ports for these components.
- If the Techline CV laterals dead-end, and are not connected to an exhaust header, the lateral ends should be opened to drain at the lowest point(s).
- In the event that some water remains in the system, the disc filter should be disassembled, and the discs removed to allow any water to exit. Leave the filter disassembled in the event that some water remains in the system.
- In systems where elevation is a concern, install a drain port upstream of the filter to ensure as much water as possible is drained.
- Follow manufacturer instructions for any automatic zone valves.

COMPRESSED AIR WINTERIZATION

Follow the same initial procedures for a Techline CV zone as you would for a zone of overhead sprinklers.

Note: Techline CV fittings are rated to 50 psi without clamps, so the air pressure must be adjusted according. It is air volume, not pressure that is effective when winterizing in this manner.



- The pressure regulator, which is normally installed in the valve box along with the zone valve and filter regulates water, not air pressure. *Air pressure should be regulated to 50 psi or less.*
- The drain ports, (a fitting with a threaded plug, a Netafim TLSOV, TLFIG8, or Netafim Line Flushing Valve), which are normally installed as far away from the water source of the zone as possible, must be open. Unscrew and disassemble any "automatic" Line Flushing Valves.
- With all drain ports open, compressed air should be applied until no water is seen exiting the zone.

TECHNICAL DATA

Techline CV Dripperline

APPLICATIONS:

- Subsurface or on-surface installations
- Slopes
- Curved, angular or narrow areas
- High traffic/high liability areas
- Areas subject to vandalism
- High wind areas
- Turf, shrubs, trees, flowers
- At-grade windows
- Sports turf
- Tennis courts

SPECIFICATIONS:

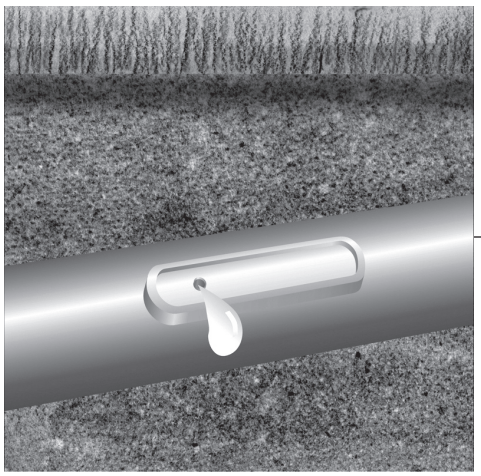
- Dripper Flow Rates *(GPH):* 0.26, 0.4, 0.6, 0.9
- Dripper Spacings:, 12", 18", 24" *(24" is available in 0.6 & 0.9 GPH flow rates)*
- Pressure Compensation Range: 14.7 to 70 psi
- Maximum System Pressure: 50 psi
- Tubing Diameter: 0.66” O.D., 0.56" I.D.
- Coil Lengths: 100', 250', 1,000'

FEATURES/BENEFITS:

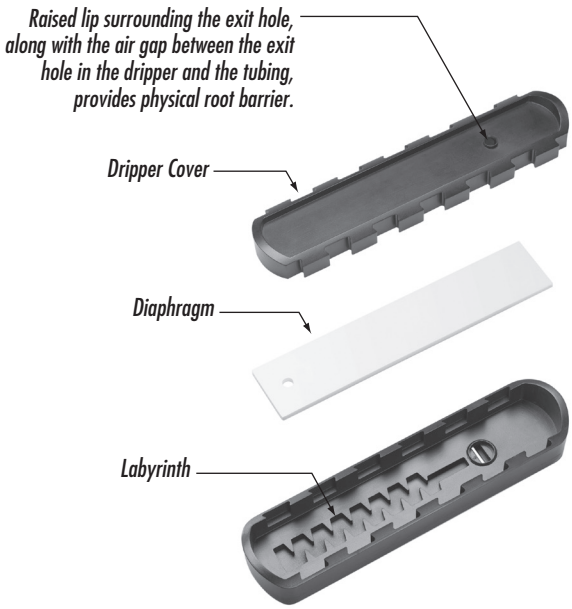
- Each Dripper has a built-in, 2 psi Check Valve:
  - All drippers turn on and off at the same time
  - Minimizes water loss
  - Holds back up to $4^1/_2$ feet of water
  - No low drainage; great on slopes
  - More precise watering - Entire lateral begins operating at the same time
- Built-in Physical Root Barrier: Drippers are protected from root intrusion without chemical reliance
- Dark Brown Color: Visually identifies Techline CV, better blending into surrounding colors of the landscape
- Pressure Compensation: All drippers deliver equal flow across the length of the lateral
- Unique Flow Path: Turbonet technology allows for better control of water flow and less chance of clogging
- Single hole dripper outlet from tubing:
  - Better protection against intrusion
  - Allows the dripperline to be used in subsurface applications without chemical protection
- Water is captured from the center of the tubing, ensuring that only the cleanest water is used
- No Air/Vacuum Relief Valve is required: Installations are faster and less expensive
- No Automatic Line Flushing Valve is required: Because the dripperline is designed to hold water in the tubing after shut-down, a manual flush may be used *(TLSOV or TLFIG8)*
- Techline Compatible: Same ID/OD as Techline, works with all Techline fittings and no pipe clamps are needed under 50 psi
- Installations are faster and less expensive
- Techfilter Compatible: Provides a limited lifetime warranty against root intrusion

TECHNICAL DATA

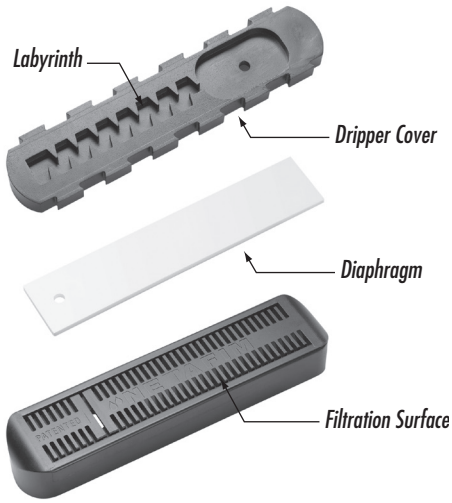
Techline CV – Exploded View of Dripper from Above and Below



Above View



Below View



TECHNICAL DATA

DESIGN FORMULAS

Formula 1.1

Estimated Total Length of Dripperline =

$$\frac{\text{Irrigated Area} \times 12}{\text{Minimum Recommended Lateral Spacing } \textit{(inches)}}$$

In Which:
Estimated Total Length of Dripperline = Total Footage of Dripperline in a Zone
Irrigated Area = Total Area in Square Feet
Minimum Recommended Lateral (Row) Spacing = The minimum row spacing from the General Guidelines Chart in inches

Formula 1.2

Application Rate *(inches per hour)* =

$$\frac{231.1 \times \text{Dripper Flow Rate (GPH)}}{\text{Dripperline Row Spacing } \textit{(inches)} \times \text{Dripper Spacing } \textit{(inches)}}$$

In Which:
Application Rate is = Inches per Hour of Water Being Applied
Dripper Flow Rate = Gallons per Hour Flow of One Dripper
Dripper Spacing = Spacing in Inches of Drippers Inside Tubing
Dripperline Row Spacing = Inches Between Techline CV Laterals (Rows)

Formula 1.3

Number of Drippers in a Zone =

$$\frac{\text{Total Dripperline} \times 12}{\text{Dripper Spacing}}$$

In Which:
Number of Drippers = Number of Drippers
Total Dripperline = Length of All Dripperline in a Zone in Feet
Dripper Spacing = Spacing in Inches of Drippers Inside Tubing

Formula 1.4

Flow per Zone =

$$\frac{\text{Number of Drippers} \times \text{Dripper Flow Rate (GPH)}}{60}$$

In Which:
Flow per Zone = Total Gallons per Minute
Number of Drippers = Number of Drippers
Dripper Flow Rate = Gallons per hour of one dripper
GPH = Gallons per Hour Flow of One Dripper

Formula 1.5

Estimated Total Zone Flow =

$$\left(\frac{\text{Irrigated Area (square feet)} \times 144}{\text{Dripper Spacing (inches)} \times \text{Dripperline Spacing } \textit{(inches)}}\right) \times \text{Dripper Flow Rate (GPH)} \div 60$$

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

TECHNICAL DATA

Specifications

TECHLINE CV *Specifying Information*

TLCV	**XX**	**XX**	**XX**
Techline CV Dripperline	**Dripper Flow Rate**	**Dripper Spacing**	**Coil Length**
TLCV	26 = 0.26 GPH 4 = 0.4 GPH 6 = 0.6 GPH 9 = 0.9 GPH	12 = 12" 18 = 18" 24 = 24"	01 = 100 feet 025 = 250 feet 10 = 1,000 feet

For blank tubing use: TLCV010=1,000', TLCV0025=250', TLCV001=100'

Techline CV Ordering Example:
TLCV26-12025 is Techline CV, .26 GPH, 12" Spacing, 250' Coil.
TLCV010 is Techline CV Blank Tubing, 1,000' Coil.

TECHLINE CV *Dripper Flow Passage and Filtration Recommendations*

Dripper Flow	*Depth*	*Width*	*Length*	*Minimum Filtration*
0.26 GPH	0.029"	0.033"	1.57"	120 Mesh
0.4 GPH	0.028"	0.050"	1.57"	120 Mesh
0.6 GPH	0.039"	0.050"	1.57"	120 Mesh
0.9 GPH	0.063"	0.045"	1.57"	120 Mesh

TECHLINE CV *Tubing Dimensions*

Inside Diameter	*Outside Diameter*	*Wall Thickness*
0.560"	0.660"	0.050"

TECHLINE CV *Minimum Bending Radius*

7 Inches

TECHNICAL DATA

Techline CV Application Rate Tables

TECHLINE CV *0.26 GPH Dripper Flow* (in inches per hour)

	Techline CV Row Spacing										
Dripper Spacing	*12"*	*13"*	*14"*	*15"*	*16"*	*17"*	*18"*	*19"*	*20"*	*22"*	*24"*
12"	0.42	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.25	0.23	0.21
18"	0.28	0.26	0.24	0.22	0.21	0.20	0.19	0.18	0.17	0.15	0.14

TECHLINE CV *0.4 GPH Dripper Flow* (in inches per hour)

	Techline CV Row Spacing										
Dripper Spacing	*12"*	*13"*	*14"*	*15"*	*16"*	*17"*	*18"*	*19"*	*20"*	*22"*	*24"*
12"	0.64	0.59	0.55	0.51	0.48	0.45	0.43	0.41	0.39	0.35	0.32
18"	0.43	0.40	0.37	0.34	0.32	0.30	0.29	0.27	0.26	0.23	0.21

TECHLINE CV *0.6 GPH Dripper Flow* (in inches per hour)

	Techline CV Row Spacing										
Dripper Spacing	*12"*	*13"*	*14"*	*15"*	*16"*	*17"*	*18"*	*19"*	*20"*	*22"*	*24"*
12"	0.96	0.89	0.83	0.77	0.72	0.68	0.64	0.61	0.58	0.53	0.48
18"	0.64	0.59	0.55	0.51	0.48	0.45	0.43	0.40	0.39	0.35	0.32
24"	0.48	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.29	0.26	0.24

TECHLINE CV *0.9 GPH Dripper Flow* (in inches per hour)

	Techline CV Row Spacing										
Dripper Spacing	*12"*	*13"*	*14"*	*15"*	*16"*	*17"*	*18"*	*19"*	*20"*	*22"*	*24"*
12"	1.44	1.33	1.24	1.16	1.08	1.02	0.96	0.91	0.87	0.79	0.72
18"	0.96	0.89	0.83	0.77	0.72	0.68	0.64	0.61	0.58	0.53	0.48
24"	0.72	0.67	0.62	0.58	0.54	0.51	0.48	0.46	0.43	0.39	0.36

TECHNICAL DATA

TECHLINE® CV *General Guidelines*

TABLE 1

	TURF			*SHRUB and GROUND COVER*		
	Clay Soil	*Loam Soil*	*Sandy Soil*	*Clay Soil*	*Loam Soil*	*Sandy Soil*
Dripper Flow	0.26 GPH	0.4 GPH	0.6 GPH	0.26 GPH	0.4 GPH	0.6 GPH
Dripper Interval	18"	12"	12"	18"	18"	12"
Lateral (Row) Spacings	18" - 22"	18" - 22"	12" - 16"	18" - 24"	18" - 24"	16" - 20"
Burial Depth	On-surface or bury evenly throughout the zone to a maximum of 6 inches					
Application Rate (in./hr.)	.19 - .15	.43 - .35	.96 - .72	.19 - .14	.29 - .21	.72 - .58
Time to Apply 1/4" of Water (in minutes)	79 - 100	35 - 43	16 - 21	79 - 107	52 - 71	21 - 26

Maximum spacing recommendations: Following these spacing guidelines, dripper flow selection can be increased if desired by the designer.

TECHLINE® CV *Maximum Length of a Single Lateral (feet)*

TABLE 2

INLET PRESSURE (psi)	*TECHLINE CV DRIPPER SPACING*									
	12"				*18"*				*24"*	
15	127	109	86	65	177	151	120	91	152	116
25	427	325	256	194	604	459	361	274	458	348
35	539	409	322	244	763	579	456	346	580	440
45	618	469	369	280	877	664	523	397	666	506
Dripper Flow Rate (GPH)	0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9

TECHLINE® CV *Flow (per 100 feet)*

TABLE 3

DRIPPER SPACING	*0.26 GPH Dripper*		*0.4 GPH Dripper*		*0.6 GPH Dripper*		*0.9 GPH Dripper*	
12"	26.40 GPH	0.44 GPM	40.00 GPH	0.67 GPM	61.00 GPH	1.02 GPM	92.00 GPH	1.53 GPM
18"	17.58 GPH	0.29 GPM	26.67 GPH	0.44 GPM	41.00 GPH	0.68 GPM	61.00 GPH	1.02 GPM
24"	Not Available	Not Available	Not Available	Not Available	31.00 GPH	0.51 GPM	46.00 GPH	0.77 GPM

TECHNICAL DATA

Disc Filter Sizing

DISC FILTER *Recommended Filter Sizing*					
Filter Size	*3/4"*	*1"*	*1 1/2"*	*1 1/2" Super*	*2"*
Filter Volume (cubic inches)	5.8	26.8	26.8	36.1	75
Filtration Area (square inches)	24.8	48.9	49	77.8	148
Flow Rate (GPM)	*Friction Loss (psi)*				
4.4	0.40	0.14	–	–	–
8.8	1.46	0.54	–	–	–
13	3.40	1.34	–	–	–
17	–	2.10	–	–	–
22	–	3.24	1.10	1.10	–
26	–	–	1.30	1.20	–
31	–	–	1.70	1.20	–
35	–	–	2.30	2.50	–
44	–	–	–	4.20	0.30
66	–	–	–	–	0.63
88	–	–	–	–	1.03
110	–	–	–	–	1.47
132	–	–	–	–	2.13

Losses shown are for a 140 mesh filtration element tested in potable water. The maximum recommended flow for each filter is listed. Example: The maximum recommended flow for a 3/4" filter is 13 GPM. The maximum recommended flow for a 1" filter is 22 GPM.

Mesh	*40*	*80*	*120*	*140*	*200*
Micron	400	200	130	115	75
Disc Color	Blue	Yellow	Red	Black	Green*

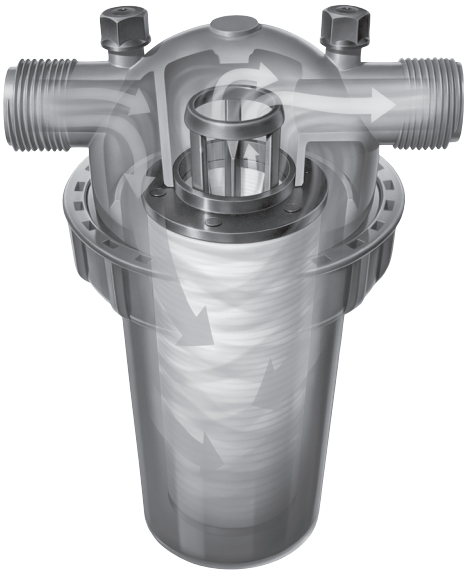
**Green not available for 3/4".*

TECHNICAL DATA

TECHLINE CV WITH 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 drippers. Netafim's Techfilter serves a secondary purpose of protecting against roots invading the system.

Triflurex® is incorporated into the replaceable disk 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 dripper 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 and replacement of the rings at the end of their affectivity. The filter should be mounted so the cover can be easily disassembled and the ring set, when removed, will not drop dirt or particle contaminants back into the filter body. Do not install the filter in direct sunlight. The Techfilter should be mounted to avoid direct sunlight. Mounting in an irrigation valve box, meter box or inside a building is preferred.

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 replacing the filter cartridge following the above guidelines.

Triflurex® is manufactured by Agan Chemical Manufacturers Ltd.

NOTE

Techfilter with Techline CV is sold together for use on a new installation as a part number as shown on pages 31 - 33. Techfilter cannot be sold without the proper amount of Techline CV.

TECHNICAL DATA

TECHFILTER *Specifying Information*

TF	XXX	X	XX	XXXCV
Techfilter	**Filter Size**	**Dripper Flow**	**Dripper Spacing**	**Quantity of Techline CV**
TF	075 = 3/4" 10 = 1" 10L = 1" Long 15L = 1 1/2" Long 20 = 2"	26 = 0.26 GPH 4 = 0.4 GPH 6 = 0.6 GPH 9 = 0.9 GPH	12 = 12" 18 = 18" 24 = 24"	Length of Techline CV supplied with each filter ordered. *See chart below.*

TECHLINE CV *Minimum & Maximum Feet for Each Filter Size*

		0.26 GPH		*0.4 GPH*		*0.6 GPH*			*0.9 GPH*		
Model	Flow (GPM)	12"	18"	12"	18"	12"	18"	24"	12"	18"	24"
3/4"	Min. - 1	213	345	149	227	98	147	196	65	98	130
	Max. - 7	1,489	2,413	1,044	1,590	686	1,029	1,373	458	686	909
1"	Min. - 3	638	1,034	448	682	294	441	588	196	294	390
	Max. - 22	4,681	7,586	3,284	5,000	2,157	3,235	4,314	1,438	2,157	2,857
1" Long or 1 1/2" Long	Min. - 8	1,702	2,758	1,194	1,818	784	1,176	1,569	523	784	1,039
	Max. - 40	8,511	13,799	5,970	9,090	3,922	5,882	7,843	2,614	3,922	5,195
2"	Min. - 14	2,979	4,827	2,089	2,181	1,373	2,059	2,745	915	1,373	1,818
	Max. - 90	19,149	31,034	13,433	20,454	8,824	13,235	17,647	5,882	8,824	11,688

Use the flow rate of the zone or the number of feet of Techline CV to determine what size filter to use. **Example:** If you have a 7.37 GPM zone of .4/12" Techline CV (7.37 GPM = 1,100' of dripperline) use the 1" Techfilter. **Note:** One or more Techfilter sizes may work for your application.

TECHNICAL DATA

TECHFILTER *with* TECHLINE CV *Model Number Descriptions*

Filter Size	*Model Number*	*Description*
3/4"	TF075912-100CV	3/4" Techfilter w/100' .9 gph 12" Techline CV
3/4"	TF075912-1000CV	3/4" Techfilter w/1,000' .9 gph 12" Techline CV
3/4"	TF075918-100CV	3/4" Techfilter w/100' .9 gph 18" Techline CV
3/4"	TF075918-1000CV	3/4" Techfilter w/1,000' .9 gph 18" Techline CV
3/4"	TF075612-100CV	3/4" Techfilter w/100' .6 gph 12" Techline CV
3/4"	TF075612-1000CV	3/4" Techfilter w/1,000' .6 gph 12" Techline CV
3/4"	TF075618-200CV	3/4" Techfilter w/200' .6 gph 18" Techline CV
3/4"	TF075618-1000CV	3/4" Techfilter w/1,000' .6 gph 18" Techline CV
3/4"	TF075412-100CV	3/4" Techfilter w/100' .4 gph 12" Techline CV
3/4"	TF075412-1000CV	3/4" Techfilter w/1,000' .4 gph 12" Techline CV
3/4"	TF075418-200CV	3/4" Techfilter w/200' .4 gph 18" Techline CV
3/4"	TF075418-1000CV	3/4" Techfilter w/1,000' .4 gph 18" Techline CV
3/4"	TF0752612-100CV	3/4" Techfilter w/100' .26 gph 12" Techline CV
3/4"	TF0752612-1000C	3/4" Techfilter w/1,000' .26 gph 12" Techline CV
3/4"	TF0752618-200CV	3/4" Techfilter w/200' .26 gph 18" Techline CV
3/4"	TF0752618-1000C	3/4" Techfilter w/1,000' .26 gph 18" Techline CV
1"	TF10912-200CV	1" Techfilter w/200' .9 gph 12" Techline CV
1"	TF10912-1000CV	1" Techfilter w/1,000' .9 gph 12" Techline CV
1"	TF10918-300CV	1" Techfilter w/300' .9 gph 18" Techline CV
1"	TF10918-1000CV	1" Techfilter w/1,000' .9 gph 18" Techline CV
1"	TF10612-300CV	1" Techfilter w/300' .6 gph 12" Techline CV
1"	TF10612-1000CV	1" Techfilter w/1,000' .6 gph 12" Techline CV
1"	TF10618-350CV	1" Techfilterw/350' .6 gph 18" Techline CV
1"	TF10618-1000CV	1" Techfilter w/1,000' .6 gph 18" Techline CV
1"	TF10412-400CV	1" Techfilter w/400' .4 gph 12" Techline CV
1"	TF10412-1000CV	1" Techfilter w/1,000' .4 gph 12" Techline CV
1"	TF10418-600CV	1" Techfilter w/600' .4 gph 18" Techline CV
1"	TF10418-1000CV	1" Techfilter w/1,000' .4 gph 18" Techline CV
1"	TF102612-400CV	1" Techfilter w/400' .26 gph 12" Techline CV
1"	TF102612-1000CV	1" Techfilterw/1,000' .26 gph 12" Techline CV
1"	TF102618-600CV	1" Techfilter w/600' .26 gph 18" Techline CV
1"	TF102618-1000CV	1" Techfilter w/1,000' .26 gph 18" Techline CV

TECHNICAL DATA

TECHFILTER *with* TECHLINE CV *Model Number Descriptions*

Filter Size	*Model Number*	*Description*
1" Long	TF10L912-500CV	1" Long Techfilter w/500' .9 gph 12" Techline CV
1" Long	TF10L912-1000CV	1" Long Techfilter w/1,000' .9 gph 12" Techline CV
1" Long	TF10L918-800CV	1" Long Techfilter w/800' .9 gph 18" Techline CV
1" Long	TF10L918-1000CV	1" Long Techfilter w/1,000' .9 gph 18" Techline CV
1" Long	TF10L612-800CV	1" Long Techfilter w/800' .6 gph 12" Techline CV
1" Long	TF10L612-1000CV	1" Long Techfilter w/1,000' .6 gph 12" Techline CV
1" Long	TF10L618-900CV	1" Long Techfilter w/900' .6 gph 18" Techline CV
1" Long	TF10L618-1000CV	1" Long Techfilter w/1,000' .6 gph 18" Techline CV
1" Long	TF10L412-1100CV	1" Long Techfilter w/1,100' .4 gph 12" Techline CV
1" Long	TF10L412-1000CV	1" Long Techfilter w/1,000' .4 gph 12" Techline CV
1" Long	TF10L418-1700CV	1" Long Techfilter w/1,700' .4 gph 18" Techline CV
1" Long	TF10L418-1000CV	1" Long Techfilter w/1,000' .4 gph 18" Techline CV
1" Long	TF10L2612-1000C	1" Long Techfilter w/1,000' .26 gph 12" Techline CV
1" Long	TF10L2618-1000C	1" Long Techfilter w/1,000'.26 gph 18" Techline CV
1 1/2" Long	TF15L912-500CV	1 1/2" Techfilter w/500' .9 gph 12" Techline CV
1 1/2" Long	TF15L912-1000CV	1 1/2" Techfilter w/1,000' .9 gph 12" Techline CV
1 1/2" Long	TF15L918-800CV	1 1/2" Techfilter w/800' .9 gph 18" Techline CV
1 1/2" Long	TF15L918-1000CV	1 1/2" Techfilter w/1,000' .9 gph 18" Techline CV
1 1/2" Long	TF15L612-800CV	1 1/2" Techfilter w/800' .6 gph 12" Techline CV
1 1/2" Long	TF15L612-1000CV	1 1/2" Techfilter w/1,000' .6 gph 12" Techline CV
1 1/2" Long	TF15L618-900CV	1 1/2" Techfilter w/900' .6 gph 18" Techline CV
1 1/2" Long	TF15L618-1000CV	1 1/2" Techfilter w/1,000' .6 gph 18" Techline CV
1 1/2" Long	TF15L412-1100CV	1 1/2" Techfilter w/1,100' .4 gph 12" Techline CV
1 1/2" Long	TF15L412-1000CV	1 1/2" Techfilter w/1,000' .4 gph 12" Techline CV
1 1/2" Long	TF15L418-1700CV	1 1/2" Techfilter w/1,700' .4 gph 18" Techline CV
1 1/2" Long	TF15L418-1000CV	1 1/2" Techfilter w/1,000' .4 gph 18" Techline CV
1 1/2" Long	TF15L2612-1000C	1 1/2" Techfilter w/1,000' .26 gph 12" Techline CV
1 1/2" Long	TF15L2618-1000C	1 1/2" Techfilter w/1,000' .26 gph 18" Techline CV

TECHNICAL DATA

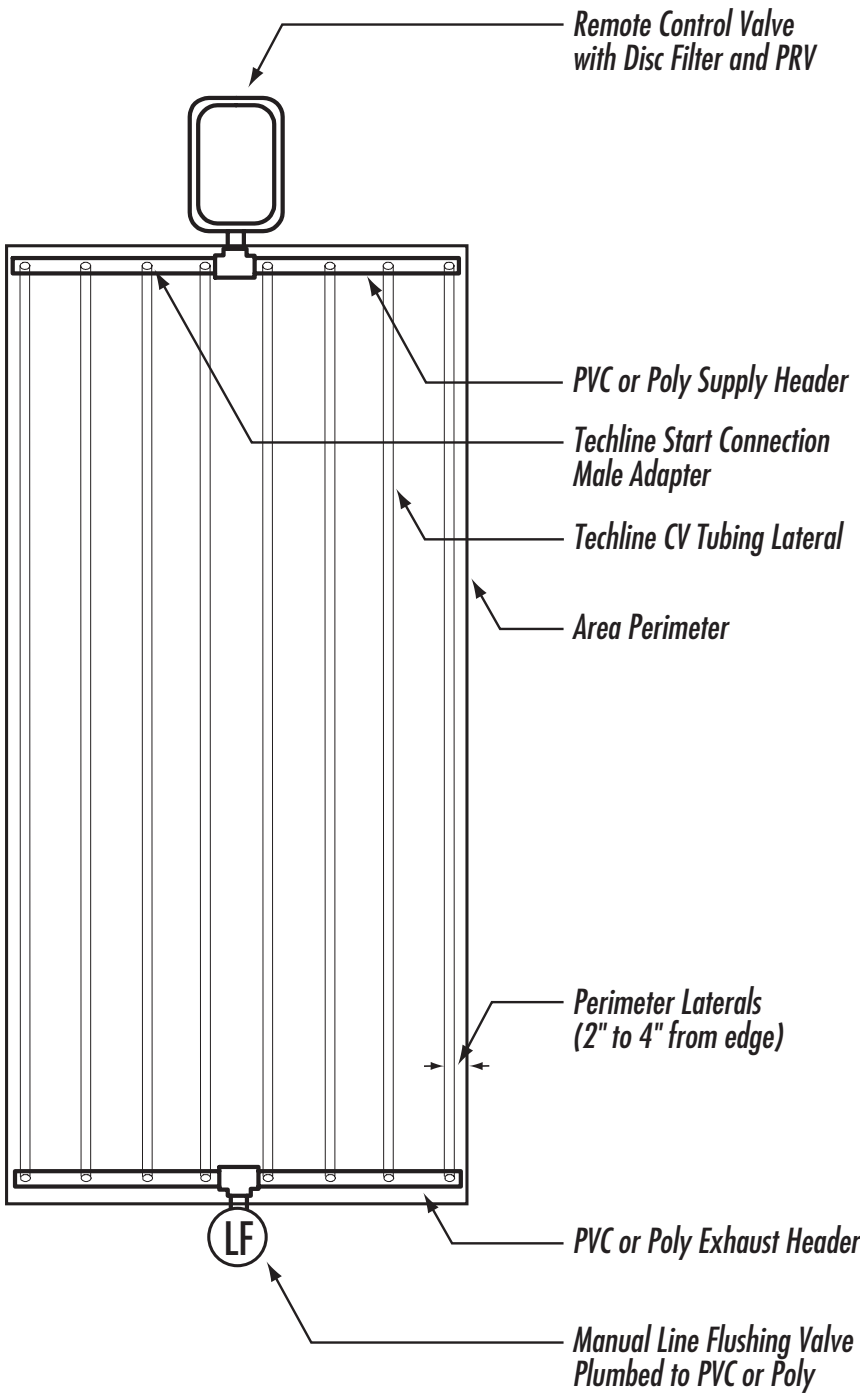
TECHFILTER *with* TECHLINE CV *Model Number Descriptions*

Filter Size	*Model Number*	*Description*
2"	TF20912-1000CV	2" Techfilter w/1,000' .9 gph 12" Techline CV
2"	TF20918-1400CV	2" Techfilter w/1,400' .9 gph 18" Techline CV
2"	TF20918-1000CV	2" Techfilter w/1,000' .9 gph 18" Techline CV
2"	TF20612-1400CV	2" Techfilter w/1,400' .6 gph 12" Techline CV
2"	TF20612-1000CV	2" Techfilter w/1,000' .6 gph 12" Techline CV
2"	TF20618-1600CV	2" Techfilter w/1,600' .6 gph 18" Techline CV
2"	TF20618-1000CV	2" Techfilter w/1,000' .6 gph 18" Techline CV
2"	TF20412-2000CV	2" Techfilter w/2,000' .4 gph 12" Techline CV
2"	TF20412-1000CV	2" Techfilter w/1,000' .4 gph 12" Techline CV
2"	TF20418-3000CV	2" Techfilter w/3,000' .4 gph 18" Techline CV
2"	TF20418-1000CV	2" Techfilter w/1,000' .4 gph 18" Techline CV
2"	TF202612-2000CV	2" Techfilter w/2,000' .26 gph 12" Techline CV
2"	TF202618-3000CV	2" Techfilter w/3,000' .26 gph 18" Techline CV

	TF075	3/4" Techfilter Replacement Cartridge
	TF100	1" Techfilter Replacement Cartridge
	TF100L	1" Long and 1 1/2" Techfilter Replacement Cartridge
	TF200	2" Techfilter Replacement Cartridge

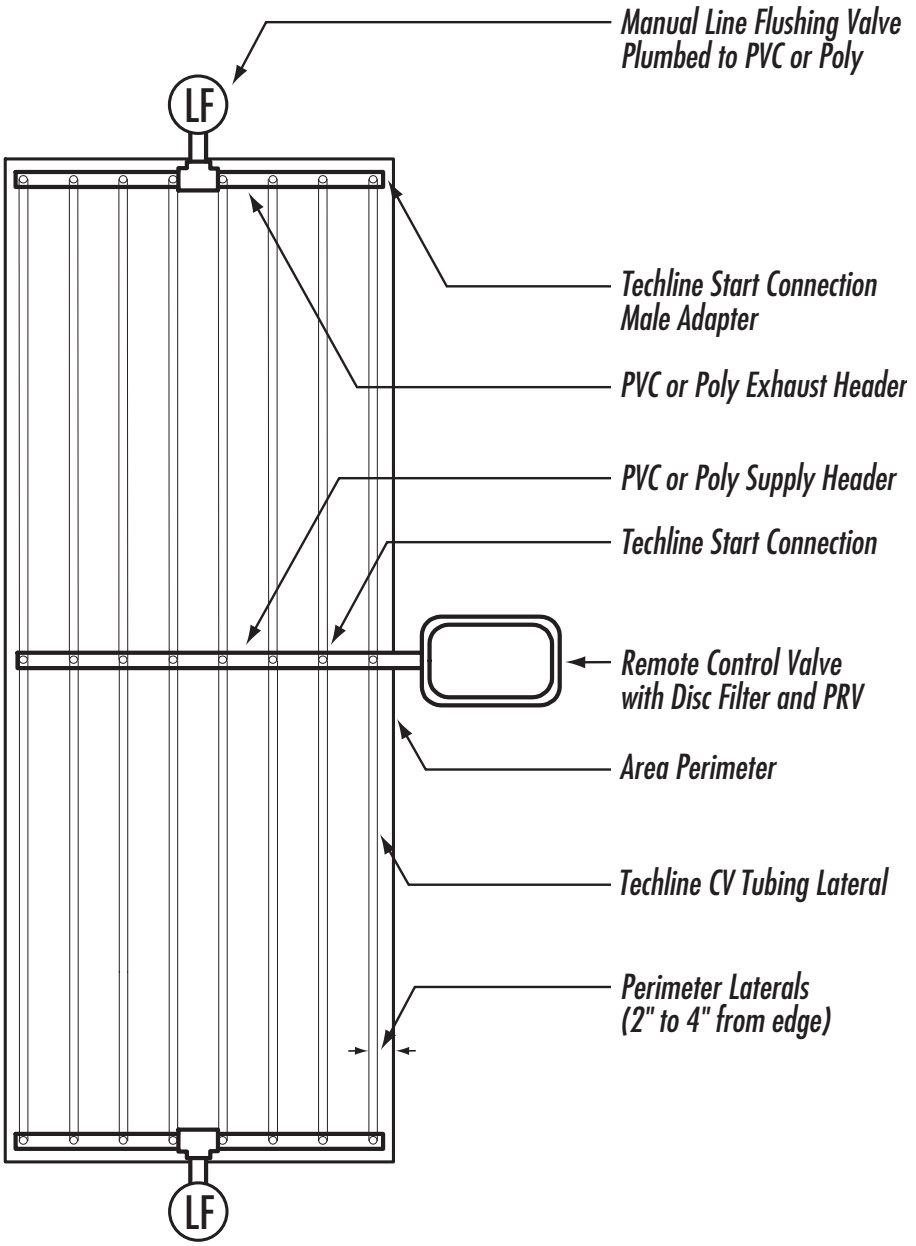
TECHNICAL DATA

Techline CV End Feed Layout



TECHNICAL DATA

Techline CV Center Feed Layout



INSTALLATION CHECKLIST

Project: _____

Date: _____

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

SYSTEM INSPECTION CHECK LIST

Project: _____

Date: _____

Techline CV Dripper Spacing ☐ 12” ☐ 18” ☐ 24”

Techline CV Lateral Spacing ☐ 12” ☐ 18” ☐ 24” ☐ Other _____"

Dripper 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” Low Flow (0.25 to 4.4 GPM) ☐ 3/4” High Flow (3.5 to 17.6 GPM)
☐ 1 1/2” ☐ Other _____
☐ 15 psi ☐ 25 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

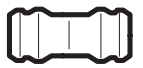
If More Than One Flush Valve _____ psi _____ psi _____ psi

Controller Data

Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM
Station # _____ Frequency_____ x Per Week _____ Run Time: _____ Minutes Flow ____ GPM

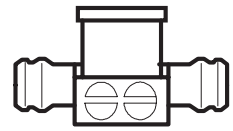
FITTINGS

Techline TELL
Elbow

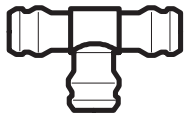


Techline TLCOUP
Coupling

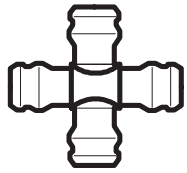
Techline TL075MA or TL050MA
Male Adapter



Techline TL075FTEE
2-Way Adapter Tee



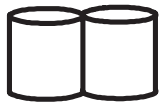
Techline TLTEE
Tee



Techline TLCROSS
Cross

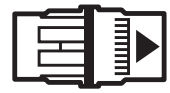
Techline TLW075MA
"V" 2-Way Adapter

Techline TLPLUG
Dripper Plug Ring

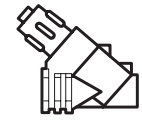


Techline TLFIG8
Line End

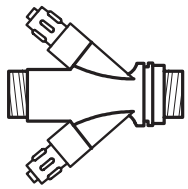
Techline TLTUBEADP
Micro-Tubing Adapter



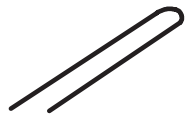
3/4" Low Flow PRV
Pressure Regulating Valve



3/4" High Flow PRV
Pressure Regulating Valve

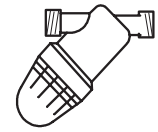


1 1/2" PRV
Pressure Regulating Valve



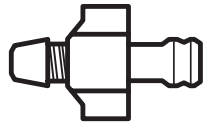
TLS6
6" Wire Staple

TLSOV
Shut-Off Valve (Barb x Barb)



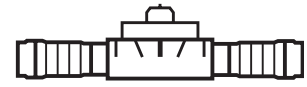
DF-075
3/4" Disc Filter

TLAVRV
Air/Vacuum Relief Valve



TLIAPE
Insert Adapter for 1" or Larger PE to Techline

TLIAPVC
Insert Adapter and Grommet for 1 1/2" or Larger PVC to Techline



TLCV
Inline Check Valve

MOST FREQUENTLY USED CHARTS

TECHLINE® CV *General Guidelines*

TABLE 1

	TURF			*SHRUB and GROUND COVER*		
	Clay Soil	*Loam Soil*	*Sandy Soil*	*Clay Soil*	*Loam Soil*	*Sandy Soil*
Dripper Flow	0.26 GPH	0.4 GPH	0.6 GPH	0.26 GPH	0.4 GPH	0.6 GPH
Dripper Interval	18"	12"	12"	18"	18"	12"
Lateral (Row) Spacings	18" - 22"	18" - 22"	12" - 16"	18" - 24"	18" - 24"	16" - 20"
Burial Depth	On-surface or bury evenly throughout the zone to a maximum of 6 inches					
Application Rate (in./hr.)	.19 - .15	.43 - .35	.96 - .72	.19 - .14	.29 - .21	.72 - .58
Time to Apply 1/4" of Water (in minutes)	79 - 100	35 - 43	16 - 21	79 - 107	52 - 71	21 - 26

Maximum spacing recommendations: Following these spacing guidelines, dripper flow selection can be increased if desired by the designer.

TECHLINE® CV *Maximum Length of a Single Lateral (feet)*

TABLE 2

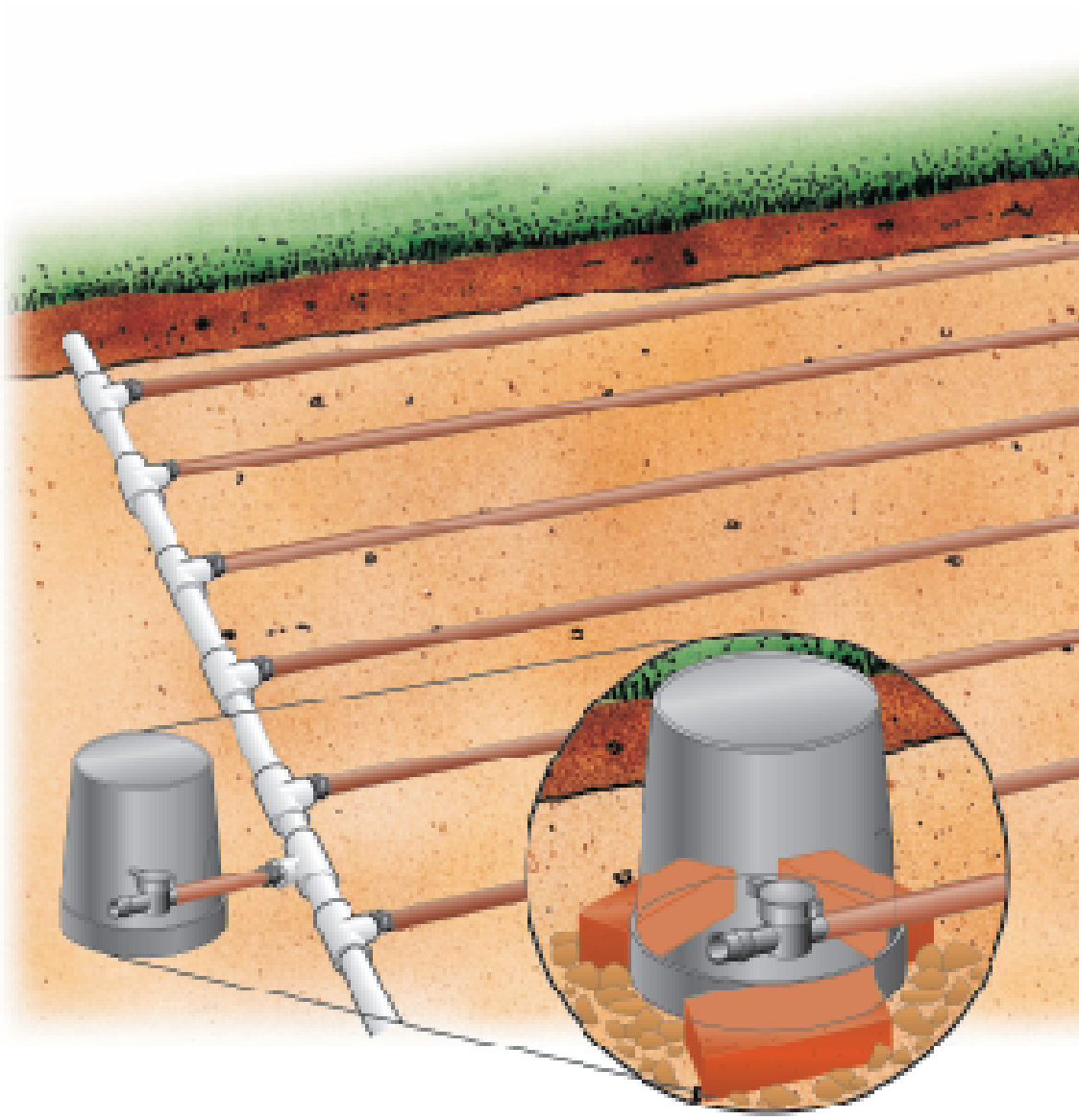
INLET PRESSURE (psi)	*TECHLINE CV DRIPPER SPACING*									
	12"				*18"*				*24"*	
15	127	109	86	65	177	151	120	91	152	116
25	427	325	256	194	604	459	361	274	458	348
35	539	409	322	244	763	579	456	346	580	440
45	618	469	369	280	877	664	523	397	666	506
Dripper Flow Rate (GPH)	0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9

TECHLINE® CV *Flow (per 100 feet)*

TABLE 3

DRIPPER SPACING	*0.26 GPH Dripper*		*0.4 GPH Dripper*		*0.6 GPH Dripper*		*0.9 GPH Dripper*	
12"	26.40 GPH	0.44 GPM	40.00 GPH	0.67 GPM	61.00 GPH	1.02 GPM	92.00 GPH	1.53 GPM
18"	17.58 GPH	0.29 GPM	26.67 GPH	0.44 GPM	41.00 GPH	0.68 GPM	61.00 GPH	1.02 GPM
24"	Not Available	Not Available	Not Available	Not Available	31.00 GPH	0.51 GPM	46.00 GPH	0.77 GPM

NOTES



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