Land Application
Design Guide

re:SOURCE™
SUSTAINABLE WATER SOLUTIONS

NETAFIM™

INTRODUCTION

The purpose of this design manual is to detail the equipment and design considerations necessary for the effective application of drip technology to domestic onsite land applications systems.

Drip technology was originally developed for the agricultural industry as a technique to improve the efficient delivery of water to plants, especially in environments where the water supply was limited. The technique involves delivering water that plants actually use directly into the root zone and relying on horizontal as well as vertical movement through the soil to disperse the water evenly. Netafim is the world leader in drip applications and its drippers, filters, valves, automation and other products have become the industry standard in over 110 countries.

Sub-surface drip is the most efficient method of dispersing wastewater effluent into the soil which presents the designer a superior option for all soil types.

Drip The has the ability of drip to deliver effluent in the shallow subsurface and in the root zone of plants, plant uptake of nutrient, and slow dispersal into the soil medium for further treatment.

Government authorities in each state across Australia and regional councils across New Zealand have recognized that domestic onsite treatment systems is a permanent alternative to traditional centralised systems which aren't always feasible. Increasing public concern about issues related to the effective and reliable treatment and dispersal of wastewater effluent has created a climate for change beyond conventional septic tanks and drain fields. The onsite industry has responded with improved technology for wastewater treatment and regulations have become more explicit and scientifically based. These are the key reasons why interest in drip dispersal within the onsite wastewater treatment industry has rapidly increased.

As the demand increases for residential development in rural areas and in less than optional conditions for traditional onsite wastewater dispersal, the importance of alternative technologies increases. Advanced onsite wastewater treatment with drip dispersal is the best available strategy for a wide variety of the most demanding onsite wastewater design considerations.

Subsurface drip dispersal has a number of benefits;

- With proper design, drip technology can be applied in almost any climate or soil conditions
- Installation does not require major disruption to the drain field area, taking advantage of the natural or modified landscape plans
- Water can be re-used for dispersal of lawns, shrubs, or trees
- Beneficial wastewater nutrients are available for plant uptake.

This design manual provides basic guidelines for drip system design, installation, maintenance and operation. However, because such designs are subject to state and local regulations for all onsite systems, any regulatory specification must be given precedence over the recommendations included here. If local regulations allow design parameters which are more liberal than those expressed in this manual, the designer should bear in mind that the following conservative recommendations are based on actual design experience and analysis of both properly functioning and failed onsite systems.

Basic Assumptions

This design guide assumes highly pre-treated domestic strength effluent, 30/30 (ppm) BOD/TSS or lower with fats, oils and grease (FOG) less than 20 ppm and a design flow less than 7000 litres per day. This quality of effluent can be produced by a number of advanced onsite treatment technologies, including fixed-film system, bio-filter, constructed wetlands, mechanical aeration, peat filter, rotating biological contactor, sand filter, trickling filter, etc.

Effluent normally leaves one of the mentioned treatment devices and enters into an adequately designed storage tank. Storage tanks should allow for both a working level and reserve capacity above the high water level alarm. The drip system is designed to distribute the wastewater uniformly over the drip field and throughout a 24 hour day.

Since dripperline requires pressure to function, this design manual is built around commonly available pressure pumps, that operate at 30- 80 litres per minute and generally utilize a 240V, 50Hz, 1Kw motor. These pumps are generally larger than the traditional pumps (generally twin impeller) sold into treatment systems.

The dripperline is frequently installed at a depth of 50mm but 100mm to 150mm is recommended to minimize the human contact potential and ensure proper dispersal. Cold climates may require even deeper burial, or additional cover based on local conditions.

Most critical to a proper design is matching the soil capacity to absorb water with the hydraulic application rates and the demand for dispersal of the design high flow. In this regard the designer must take into account;

- Water flow over, into, and through the soil
- Soil morphology (structure, texture)
- Storage of water in the soil column
- The loss of water to the air through evaporation
- Exchange to the air through plant transpiration

This design guide shows how accurate information about daily wastewater flow, along with proper soil analysis and site evaluation, can lead to a properly sized, complete, and successful and cost-effective drip dispersal system.

WASTEWATER FLOW DETERMINATION

A drip dispersal system must accommodate the volume of wastewater effluent generated. The following table from the *AS/ NZS 1547:2000 Onsite domestic-wastewater management* can be used for estimating the daily wastewater product rates for various activities. Actual water usage data or other methods of calculating wastewater usage rates must be used by the system designer if it is determined that, for whatever reason, quantities may exceed standard estimates. In any case, estimates used for onsite wastewater treatment designs must be approved by local regulatory authories. The following table from the Australian/ New Zealand standards is widely used for wastewater flow estimations.

Table 1 Typical Domestic Wastewater Flow Design Allowances

Source	Typical Wastewater Flow Allowance in L/person/day (see Note 1)	
	On-site Roof Water Tank Supply	Reticulated Community or a Bore-water Supply
Households with standard fixtures (including automatic washing machine)	140	180
Households with standard water reduction fixtures (see Note 2)	115	145
Households with full water-reduction facilities (see Note 3)	80	110
Households with extra wastewater producing facilities	170	220
Households (blackwater only)	50	60
Households (greywater only)	90	120
Motels/hotels - guests, resident staff - non-resident staff - reception rooms - bar trade (per customer) - restaurant (per diner)	 140 30 20 20 20	 180 40 30 25 30
Community halls - banqueting - meetings	 20 10	 30 15
Restaurants (per diner) - dinner - lunch	 20 15	 30 25
Tea rooms (per customer) - without restroom facilities - with restroom facilities	 10 15	 15 25
School (pupils plus staff) Rural factories, shopping centres	30 30	40 50
Camping grounds - fully serviced - recreation areas	 100 50	 130 65

Notes:

1 These flows are minimum rates unless actual flows from past experience can be demonstrated.

2 Standard water-reduction fixtures include dual flush 11/5.5 litre water closets, shower-flow restrictors, aerator faucets (taps) and water-conserving automatic washing machines.

3 Full water-reduction fixtures include the combined use of reduced flush 6/3 litre water closets, shower-flow restrictors, aerator faucets, front-load washing machines and flow/pressure control valves on all water-use outlets.

Additionally, water reduction may be achieved by treatment of greywater and recycling for water closet flushing (reclaimed water cycling).[1]

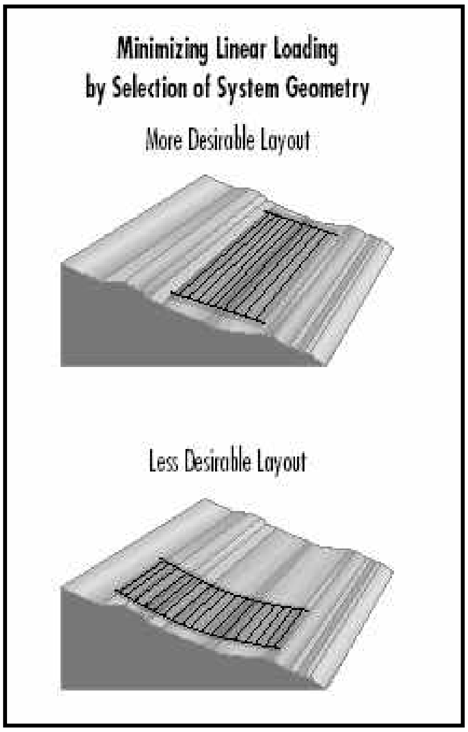
[1] *AS/ NZS 1547:2000 Onsite domestic-wastewater management* Appendix 4.2D Typical Domestic-wastewater Flow Design Allowances

SITE CONSIDERATIONS

Before doing any detailed design specification, it is necessary to evaluate specific site features. This assessment should include the following;

- **Site Boundaries:** Most state/ regional rules will have regulations as to how close dripperlines may be placed to property lines, home foundations, and other permanent property features. Follow local rules for set backs from these boundaries.
- **Special features:** Community water distribution lines, property and utility easements, bores, treatment systems, water lines from bores etc require setbacks; 30m is typical. Surface water, including ditches, ponds, lakes, streams, and even intermittent water courses also require specific setbacks. Follow local regulations for set backs.
- **Prior Land Use:** Research should be conducted to determine if there were any prior activities on the proposed site that would affect soil characteristics. These effects include compaction, foreign soils, buried materials etc.
- **Future Land Use Restrictions:** The drip field can be installed under a permanent lawn, among trees, or other landscape features, provided set backs are followed. Any future permanent structure that will affect soil texture and water flow through the soil must be avoided over a drip field, including but not limited to the following: out-buildings, parking areas, swimming pools, tennis courts, home additions, decks, etc. The designer should consult with the property owner regarding any anticipated improvements to the property and avoid these areas.
- **Precipitation and Landscape Position:** If the site is in an area that experiences seasonal, intensive, or even short duration precipitation events which cause collection of water from surrounding areas or ponding of water on the surface, then special attention should be directed toward regarding the soil surface to encourage direct precipitation run-off.
- **Slopes:** Drip dispersal encourages lateral not just vertical movement throughout the soil. This does not restrict dispersal fields to level areas, especially with the use of pressure compensating emitters and flow zoning.

Figure 1 - Showing it is desirable to increase the run length with fewer laterals over a slope rather than increase run of laterals and shorter runs.



Additional considerations about slopes include;

- o Whether there is a natural or artificial barrier down-slope from the proposed site that might provide opportunities for the water to run-off. (such as cuts in slopes or retaining walls)
- o Whether the dripperline can be laid out on the contours of the slope
- o Whether system geometry can be used that minimises linear loading rate
- o Whether the design can incorporate air release valves, check valves, zones, and other means to equalize flow and to prevent drain backs.

Other options when designing on sloping sites is CNL (compensated non-leakage) dripperlines which shut off the water inside the dripperline when the system stops. The standard option has the ability to hold 1.4m of head when the system is off... The dripperline has the added advantage of when the system starts all drippers open at the same time thus not having to wait for the dripperline to pressurise and fill before all dripper are equal in flow. In turn, this reduces pressure and wear on the pump and reduces the prospects of run-off from the dripperline.

With considerations of the above issues, and any similar issues that the designer believes may affect soil absorption rates, the designer is now ready to evaluate the specific soil characteristics.

SOIL CONSIDERATIONS

After the drip dispersal area has been identified, the designer must undertake a thorough study of the specific soil characteristics of the proposed field. Particular focus must be given to:

- Texture
- Site uniformity
- Compaction
- Native vs disturbed soils
- Soil depth to restrictions or water table
- Clay mineralogy

Sample Collection

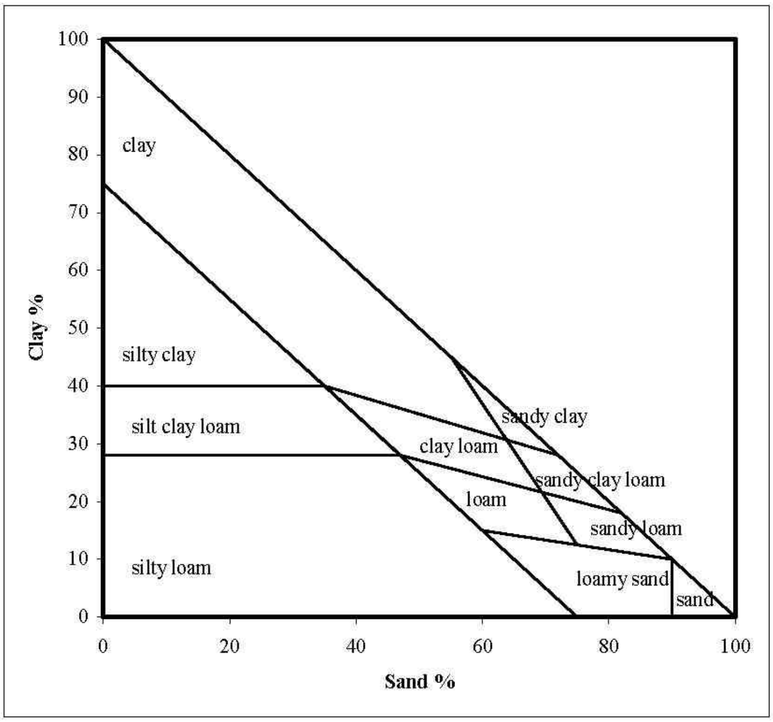
An accurate representation of the overall site conditions requires a determination of the underlying soil characteristics. A minimum of two samples per proposed zones is strongly recommended. The samples should be three dimensional soil core sample which extends into the soil a minimum of 600mm deeper than the proposed location of the dripperline. The analysis of the soil core must establish the morphology, structure and texture, determination of the presence of ground water, seasonal high water table, restrictive layers, etc. Soil maps or locally available geological maps should be consulted to determine consistency between observed and referenced conditions. Any inconsistencies should lead the designer to undertake further investigations of the site particulars and history.

Determining Soil Texture

Accurate analysis of several samples collected across the proposed site is critical to determining the absorptive capacity of the soil. If the samples from the different locations of the proposed site are different, the design must be based on the most restrictive sample. The system designer should always consult with a registered soil scientist, site evaluator or soil structure laboratory for assistance in determining an accurate soil texture classification.

The following Soil Texture Triangle chart, Figure 2, should serve as an outline to determining soil composition and texture, leading to suggested loading rates.

Figure 2 Soil Texture Triangle Chart



Restrictive Layers

Many soil evaluators are surrounded by other soils with less desirable characteristics. It should be recognized that water movement through multiple soil types will be determined by characteristics of the restrictive types. Therefore, whenever these restrictive types are encountered in a proposed drip field, they should provide the operative design criteria. In particular, soil absorptive capacities should be based on those of restrictive layers rather than those of the more absorptive soils. If the restrictive layers are present within 600mm below the dripperline, then the designer should use the reduced loading rates of the restrictive layer. The greater the soil depth to a restrictive layer, the better.

Considering the area 500mm to 1000mm below the tubing: if there is a soil classification change of one class or more, or if a restrictive boundary layer exists (rock, tight clays, etc) then the dispersal area should be increased.

Native Vs Distributed Soils

Native, non distributed soils are always the most desirable medium for drip application. However, if the soils are very poor, or the site conditions (e.g. available space) are so limited, then the designer may consider the introduction of fill material, if the regulations permit.

If the proposed drip field employs soil fill material, artificially compacted soils, or mixed soils, special considerations apply. Although the fill material may have a greater soil absorptive capacity, a design should not rely on the better soil classification if the underlying poor soil is still present and utilised in the drip system design. Mixing or tilling of the soil may increase the soil absorptive capacity. However, adding Class II soils to a Class IV site does NOT yield a Class III absorptive capacity. A proper analysis by a soil laboratory is necessary to determine the new soil characteristics. Any time a drip field is constructed with added soil, the overall field should be larger than otherwise called for in the design, and the loading rate should be determined by the restrictive layers and other site conditions rather than by the constructed soils.

Soil Hydraulic Loading Rate

The success of a drip dispersal system is largely due to how accurately the dose rate is matched to the ability of the wastewater to be hydraulically conveyed through the soil. The maximum hydraulic loading per unit area of soil should be determined by many different factors, including structure, slope, depth of restriction, and soil texture. As an estimation, we will consider soil texture and structure classification as the determinant for soil hydraulic loading rate. However, it is recommended that a more though analysis, including depth and slope, be incorporated into the design considerations. Different soil textures have different porosities and therefore enable different quantities of water to pass through the soil. In drip dispersal, the goal is shallow dispersal, not deep percolation or surfacing. Therefore soil textures both at the surface and below are important to enable wastewater flow both horizontally and vertically. Load the soil at an even rate in the biologically active zone near the surface. This will improve treatment (through better oxygenation), and enhance plant uptake through evapotranspiration. The recommended loading rates for each soil classification are in the *AS/ NZS 1547:2000 Onsite domestic-wastewater management, Table 2.*

Table 2 Loading Rates for Each Soil Classification

Soil Texture	Soil Structure	Dispersal Rate mm/ week	Dispersal Rate mm/ day	Area Required per 1L/ day
Gravel / Sand	Structureless Massive	35	5	0.200m²
Sandy Loams	Weakly Structured	35	5	0.200m²
	Massive	35	5	0.200m²
Loams	Highly/ Moderately Structured	28	4	0.250m²
	Weakly Structures or Massive	28	4	0.250m²
Clay Loams	Highly/ Moderately Structured	25	3.5	0.285m²
	Weakly Structured	25	3.5	0.285m²
	Massive Structured	25	3.5	0.285m²
Light Clays	Strongly Structured	20	2.9	0.345m²
	Moderately Structured	20	2.9	0.345m²
	Weakly Structured or Massive	20	2.9	0.345m²
Medium / Heavy Clays	Strongly Structured	15	2.14	0.467m²
	Moderately Structured	15	2.14	0.467m²
	Weakly Structured or Massive	15	2.14	0.467m²

Some local authorities may have regulations specifying loading rates that are sometimes more and sometimes less restrictive than the above standard. The designer must follow regulations, but otherwise should opt for the more conservative designs.

The basic rule for drip dispersal is:

Application Area= Daily Flow / Loading Rate

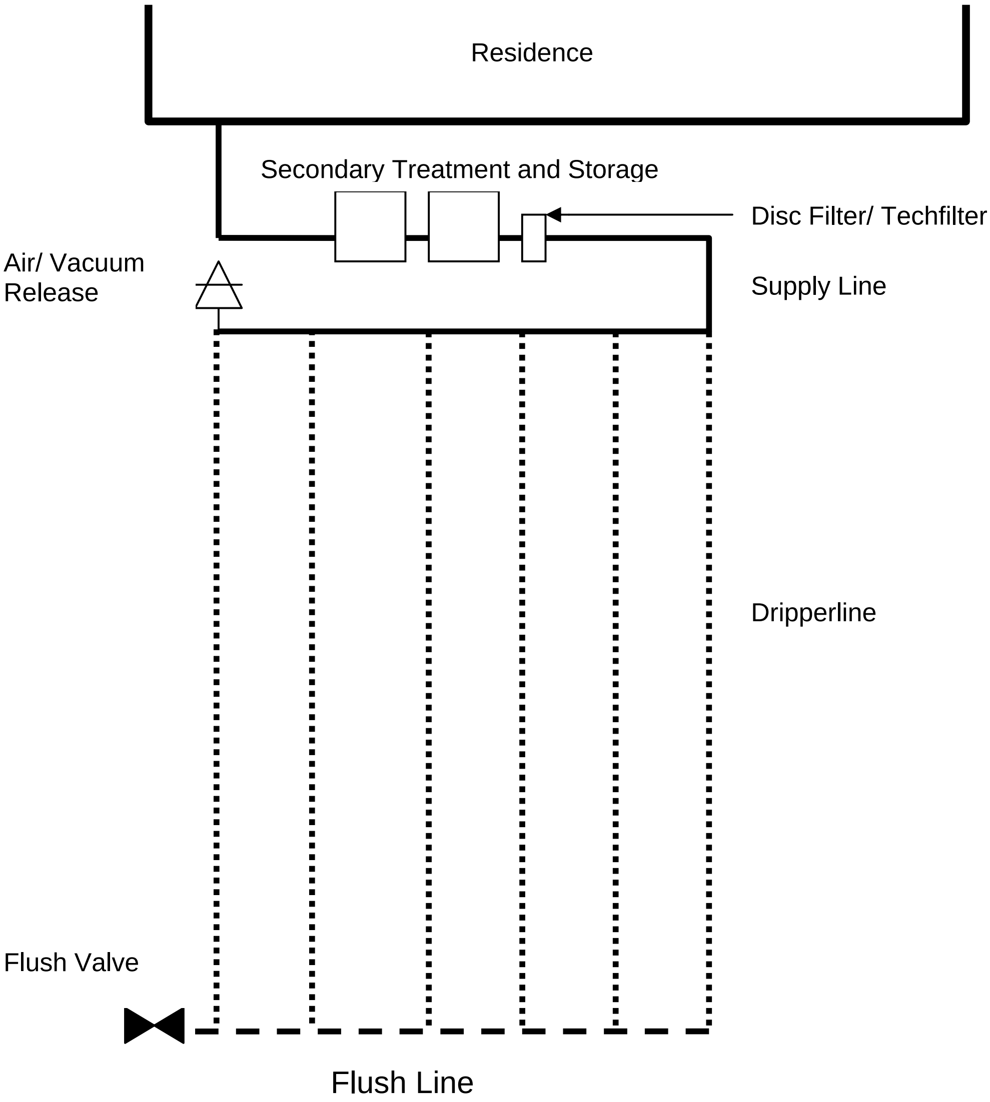
The designer should take into account that the proposed loading rates are the optimal soil conditions and any site- specific special circumstances including but not limited to: specific features, precipitation, slopes, prior and adjacent land uses, depth to limitation, vegetation etc., must be considered in the design. When it comes to design the more conservative the approach, the better. Remember, the least expensive part of the overall drip system is the dripperline itself.

SYSTEM DESIGN

System Components

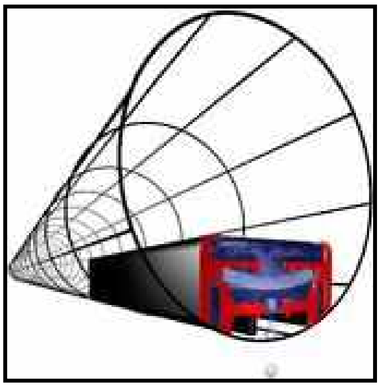
A simple schematic design for onsite wastewater dispersal using drip follows:

Figure 3 Standard Layout of a Drip Dispersal System



Dripperline

Figure 4 View of the inside of UniBioline CNL Dripperline showing the emitter



The dripperline is low volume tubing with integral and evenly spaced emitters at specific intervals. The two dripperline for this market are either;

1. UniBioline CNL (pressure compensating non-leakage)
2. Bioline AS (pressure compensating anti siphon)

These products are specifically manufactured for the use with onsite systems and are the heart of the system.

Pumps

The pump duties required to operate the dripperline and account for all friction loss are generally larger than the standard submersible sump pumps sold into treatment systems. Typically the duty is requires between 30 to 80litres per minute at 20m pressure. Figure 4 shows a list of pump manufacturers and models which are generally suited with a drip dispersal system. It is critical however in all cases that the exact pump duty is determined before sizing a pump.

Considerations when sizing the pump are:

- static head (height from pump to highest point on drip field),
- pressure loss in sub-mains, filters, dripperline and fittings
- operating pressure of dripperline (UniBioline requires 10m minimum)
- flow rate of the block

Pump Manufacturer	Model
Davey	D42A
Grundfos	Hi Lift
Claytech	BlueDiver 20, BlueDiver 30 & BlueDiver 40
Onga Pentair Water	Tank Buddy

Filtration

Every drip system must include a filter to prevent introduction of sediments and suspended organic materials into the dripperline. Without proper filtration, sediment can accumulate over time and cause plugging. A 130 micron disc filter (120 mesh) is strongly recommended for all Netafim UniBioline Dripperlines.

Figure 5 25mm Disc Manual Filter

Techfilter

The greatest threat to a subsurface irrigation system is the intrusion of roots into the drippers. A known preventative measure against root intrusion involves the application of small amounts of Trifluralin to the soil around the drippers. Netafim have developed the Techfilter that has filtration disks containing Trifluralin which is slowly released in minute quantities (parts per billion) into the soil immediately around the dripper. The Techfilter is a renewable, controllable and safe way of releasing Trifluralin into the soil around the dripper. This creates the required protection barrier preventing roots from impregnating the dispersal system and possibly causing damage.

The nature of Trifluralin is such that it does not move very far in the soil. The Trifluralin reacts to soil particles around the dripper. This is the key aspect of the nature of Trifluralin that makes this system so effective in protecting the drippers from root intrusion.

Netafim do not and will not recommend the Techfilter for any other application than the one described above, that is the protection of subsurface dripperline systems against root intrusion. The life expectancy of the Techfilter cartridge or disk element is 24 months under expected or average conditions and run times in Australia/ New Zealand. This is not to say that in some conditions it will not last longer or shorter periods of time given specific site conditions and flow rates through the filter.

It is important to note that the Techfilter is not required if the dripperline is laid on top of the soil profile in garden area’s as there is little chance of root intrusion.

Figure 6 Techfilter and Techfilter Cartridge

Zone Valves

When multiple zones are used, indexing valves are customarily used to turn zones on and off. These indexing valves have various zone capacity and inlet thread sizes.

Air / Vacuum Release

Drip system design should include a minimum of one air/ vacuum release valve per zone. Their purpose is to relieve the vacuum created on the system at the end of the dose cycle; this will minimise soil particles from being aspirated into the emitters.

They function to release the air at the beginning of the dose cycle to eliminate air-binding in the piping and to help ensure a more rapid filling of the lines. UniBioline has the added advantage of an anti- siphon mechanism in each dripper so this also ensures air can be released when the dosing cycle stops.

They should be located at the highest point of the zone and placed in a lilac lid valve box lined with gravel for protection.

Check Valves

In cases wear the dripperline excess's a maximum variation in slope from the extreme highest point of the system to the lowest a check valve can be installed. The Netafim DNL valve is a check valve and will hold water upstream once the system turns off. When the system starts the DNL opens at a critical level (number of models available) and allows water to pass. These are generally placed on the start of each dripperline lateral a critical points up the slope. The DNL features eliminate the need for the irrigation system refill at the beginning of each irrigation cycle by holding pressure in the irrigation lines and thus keeping them filled. This ensures the system reaches operating pressure in the minimum of time at the next irrigation cycle.

Supply Manifold

The supply manifold delivers water to each row of dripperline from the treatment plant. 25mm Purple LDPE is recommended however MDPE, HDPE and PVC can be used. It is recommended it is buried a minimum of 100mmm and lilac pipe is used to indicate effluent contained within the pipe.

System pressure drop must be minimised to ensure that a sufficient flushing velocity is maintained. The connections to the supply and flush manifolds should be minimised for system efficiency.

Dripperline

Effluent flows through the UniBioline dripperline and out into the soil through emitters (drippers). These emitters each have a specific flow rate of 1.6, 2.3 and 3.5l/hr at either 0.3, 0.4, 0.5, 0.6 or 1.0m spacings. These limited flow rates are designed to prevent overloading of the soil. The standard dripperline combination used is 1.6l/hr at 0.4m spacing. The lower the flow rate per emitter and more frequent the emitters along the dripperline the better the distribution and therefore reducing the hydraulic load on the soil.

Flush Manifold

The characteristics of the flush manifold are the same as the supply, with limited and equal number of connections. It is typical to use the same diameter pipe size as the supply manifold.

The flush manifold terminates either at the front end of the treatment system or into the dosing tank or in the field in a flush valve assembly. If it permeates into the dosing tank, periodic cleaning of the tank is recommended. The destination of the flush line is sometimes dictated by local regulations.

The flush line should have a conveniently placed manual valve to activate the field flush.

Zone Requirements

If total system flow exceeds 80 litres per minute per pump, or if there are significant topographic or other site constraints, it is recommended that multiple zones be considered in order to have sufficient system capacity for field flushing. For the most cost effective results, the designer should consider the use of mechanical or solenoid valves to dose different zones.

When using multiple zones, try to balance the zoned dispersal fields to equilise flows for both dosing and flushing.

Piping Layout

The basic principle of field layout is to arrange the tubing so the drip tube lengths are roughly equal and approximately maximum of 100m in length. (Please refer to pages 28 and 29 for maximum lengths runs for specific UniBioline Models) Lengths greater than these will require pumps to create more head and flow than the typical pumps outlined in the pump section previously. Horizontal spacing between tubes of 600mm to 1000mm is required by the Australian/ New Zealand Standards.

A standard, recommended pipe size to optimise flow and friction loss for drip distribution systems up to 1600 litres per hour is 25mm LDPE for supply and flush manifolds.

Drain Back Considerations

When the dispersal cycle ends, much of the effluent which remains in the system will drain out through the drip tubing. Effluent will drain to the lowest elevations of the system, and even on nominal slopes this can cause local soil overloading. Therefore, to design the system accordingly, it is important to anticipate where the effluent will flow when the dosing event is completed and pressure is released. There are a variety of design approaches that address this issue, several which follow:

Non-leakage Dripperline: Netafim offers a CNL (compensated non-leakage) dripperlines which shuts off the water inside the dripperline when the system stops. The standard option has the ability to hold 1.4m of head when the dosing has completed. The dripperline has the added advantage of when the system starts all drippers open at the same time thus not having to wait for the dripperline to pressurise and fill before all drippers are equal in flow. In turn, this reduces the back pressure on the pumps and the prospects of run-off from the dripperline.

Installed with the contour: Tubing must be installed along the contour of the slope (as level as possible), not up and down the slope. Otherwise, all the effluent in the drip tube (assuming CNL are not used) will drain rapidly to the lowest elevation emitters, which can overload the soil.

Feed from the bottom of the field: As a general rule, drip fields on a slope should be fed from the bottom and flushed from the top. This strategy will prevent the main lines and manifolds from draining to the field during rest periods. This strategy assumes that the filed is uphill from the supply line. The supply manifold should 'stair step' through a series of check valves (DNL's), with a limited number of lines between each check valve. Check valves limit the down gradient flow of the water when the pump shuts down.

Increase the spacings between dripperlines at bottom of slope: By increasing the spacing between dripperlines, there will be a decrease in the loading rate of the soil, therefore providing additional absorption potential for the water that does drain through the lower elevation dripperlines.

Increase drip field sizing: Where allowed, decreasing the overall loading rate by increasing the drip field size will actually result in the elevations receiving closer to their actual maximum daily loading rate once drain back flow is considered.

Less frequent, longer doses: In more highly permeable soils, with no restrictive conditions, longer dosing duration and decreased frequency of dosing can minimise the effects of drain back by a reduction in the number of cycles per day.

Zone valves: To prevent mainline and submain drainage into dosing fields, zone valves can be installed as close as possible to the distribution field to minimise the volume of water subject to drain back. Zoning prevents water from mains and submains from draining into the drip fields during periods of rest.

Deeper line burial: In the context of drain back issues, deeper tubing van be a strategy to minimise surfacing.

OPERATIONAL DESIGN PRINCIPLES

In addition to describing the key system components, it is necessary to discuss fundamental operational principals. These pertain to dosing, filtration, field flushing, and control of root intrusion. This is a general discussion. Other methodologies and engineering practices may achieve the goals of these operational principles.

Dosing and Controls

The fundamental principle of drip distribution is to take full advantage of the entire application area, over the course of the entire day. Although most wastewater flows have peaks and valleys, the goals of the effective distribution are to:

- Minimise soil saturation
- Encourage lateral (ie capillary) rather than gravitational flow
- Achieve uniform distribution
- Utilize the entire day (18- 24 hours)

All of these goals are accomplished through effective dosing controls of an integrated system. A sophisticated dosing system is especially important on tight, shrink- swell clay soils, since they are very sensitive to overloading.

The function and complexity of the control system will be determined both the wastewater demand and the limitations of the soil. The control system needs to take into account:

- Unusual loading conditions
- Storage capacity
- Emergency storage/ malfunction

A simple demand system configuration will generally be suitable; for example, a float switch with a 200 litre tether. The system must have adequate capacity to receive the flow and distribute it evenly over the course of a day, rather than merely distribute the effluent as it enters the system. This is the essence of time dosing, rather than demand dosing: pumping the effluent out at specified intervals throughout the day rather than simply letting it flow out for dispersal at the same time it is generated.

How to Dose

The following analysis provides the conceptual basis for sizing the drip field and setting up zones if required for delivering the desired quantities of wastewater to the desired places over the desired time periods.

1. **How many litres per day is the wastewater load**? Refer to *Table 1 Typical Domestic Wastewater Flow Design Allowances.* Ensure figure is based on the recommended flow per person x the number of persons for that dwelling.
2. **What is the soil loading rate in litres per m² per day?** Refer to *Table 2 Loading rates for each classification of soil.* Make sure you refer to the column Dispersal Rate mm/hr.
3. **Calculate Dispersal Area:** Litres per day/ loading rate per day
4. **Calculate total lineal meters of dripperline:** Divide the Application area by lateral spacing between dripperlines. The standards suggest between 600mm on sandy soils to 1000mm heavy clays.
5. **Select dripper flow rate and spacings based on soil types:** The standard flow and spacing available is 1.6l/hr @ 0.4m spacing.
6. **Calculate total flow rate of all dripperline:** Flow rate of dripper x total lineal length / dripper spacing. For example UniBioline 1.6l/hr @ 0.4m spacing between drippers: for 1000m total of dripperline, the flow rate would be 1.6 x 1000 / 0.4 = 4000 litres per hour = 66.6 litres per minute.
7. **Determine the number of zones needed by pump size considerations:** As mentioned previously generally pumps operate between 30- 80 litres per minute. It is recommended to check pump charts to select correct pump for the duty required.
8. **Calculate total flow per zone in litres per minute:** Total flow rate of all the dripperline / number of zones.
9. **Calculate number of minutes of total run time based on daily flow:** Total daily load / pump flow rate (refer to pump chart)
10. **Calculate number of minutes per zone**: Total minutes / number of zones

Filter Options

The filter is designed to capture particles larger than that which can safely pass through the drip emitter. Over time, particles will build up and cause the filter to clog. There are several filtration systems and methods that can be used to clean and restore the filter to normal flow.

Manual Filter: A filter is placed in the supply line after the treatment system, downstream of the dosing pump and upstream of the UniBioline. Cleaning the filter requires that the cartridge be removed and the disc and housing manually cleaned.

Timed Backflush: This is a more sophisticated filtration system which normally has multiple filters and valves used in a configuration to clean one another automatically. The frequency of the back wash is controlled using a timer clock or dosing counter to automatically flush the filter. Filtered water is sent through another filter backwards, therefore dislodging particles captured between the filter discs. This backwash water is then returned to the treatment system and reprocessed.

Pressure Differential Backflush: This system is similar to the timed backflush system, but has an added component, a pressure differential switch or sensor. As the filter starts to clog, the pressure differential across the filter increases. A pre-set pressure difference across the filter triggers an automatic backflush. This can be the primary trigger for the system backflush, or a back-up option for a regularly timed backflush.

Filter Cleaning

All filters from time to time require that the filter be taken apart, inspected, and cleaned if necessary. Each disc surface has grooves that capture particles as they try to pass through the filter. Therefore, it is necessary to separate the discs and clean the entire filter element using a garden hose, or pressurised stream of water. If deposits form on the discs that cannot be removed by mechanical means, acid can be used (in 10:1 ratio of water to acid, following safety instructions on the acid container).

Field Flush

Drip tubing is designed to last the lifetime of the system (twenty years, or more). Although filtration is taking place, small particles (under 130 microns) can still enter the tubing. Over time these particles may accumulate. Therefore, it is recommended to field flush the system.

Field flush is accomplished by periodically opening the flush line from the drip field to the pre-treatment, dosing tank or atmosphere. In this process, the velocity of water moving through the tubing should be at least 0.4 metres per second at the distal end of the flush manifold (to be consistent with the recommendations of most practitioners). The dirtier the water, the higher the recommended flush velocity. To prevent an accumulation of debris in the dripperline, it is recommended that field flushing take place on a regular basis. Field flushing should de done at least a few times per year. The required rate will depend on many factors. Among these are:

- Effluent quality and characteristics
- Filtration efficiency
- Length of tubing in each zone
- Local regulations for maintenance

INSTALLATION

Site Preparation

The drip field should be viewed as a wastewater dispersal filed and many of the same considerations for conventional septic drains fields should apply. These limitations should include:

- No future expectation of building(s), decks, or other impervious surfaces
- No long term storage of equipment or vehicles over the site
- A permanent vegetative cover

Drip Tubing Installation

The drip tubing should be installed 50mm to 150mm below the soil surface. Colder climates may require deeper placement or additional cover to avoid freezing during periods of inactivity.

Some local authorities may allow on-surface installation. In that case, stakes are recommended to be used every 1.5m along the lateral lines to ensure they are fixed in place.

Dig the manifold trenches wide enough to provide sufficient working room to cut and fit connectors between manifold and tubing. Give yourself enough room to work. Always avoid installing drip tubing in wet soil.

There are three common ways to install the UniBioline tubing:

1. **Plowing:** Installed the same way as telecommunication cable, plowing refers to the method of knifing, or using a vibratory plow, to insert the drip tubing. This method is increasing common as the equipment becomes more widely available. The use of a ripper inserting the UniBioline by a small machine such as a Dingo is an alternative to the vibrating plow. Either way this is the preferred method of installation due to the minimum impact on existing soil structure and texture.
2. **Trenching:** This method uses a commonly available chain trenching machine to cut a narrow trench for tubing installation. The advantages of this method are that these machines are widely available and easy to use. The disadvantage is that the trench may leave wall surfaces that are ‘slicked’ and therefore less receptive to horizontal water flow. The trench must be filled with original materials and watered in from the top down.

3. **Fill:** In this method, tubing is laid on the ground and fill material is placed over it. If there is any vegetative cover, it should be removed and the original soil scarified (plowed or deep raked) to minimise any inhomogeneity between soil types. If soils of different textures are used, the constraints discussed in the Soils Section must apply. It is recommended that the fill material be the same as the original, if possible.

For all methods of drip tube installation, it is very important that the disturbed soil above the dripperline be the approximate texture and compaction as the soil around the dripperline to avoid creating a preferential pathway of the effluent to the surface. Some careful, manual compaction of the soil above the dripperline may be advisable when the tube has been trenched or plowed in (local codes permitting).

Every effect must be made to avoid excessive mechanical stress on the tubing before, during and after installation. Sharp rocks should also not be placed next to the dripperline.

Manifold to Dripperline Connection

The supply and flush lines are installed using standard techniques for LDPE (low density Polyethylene), MDPE (Medium density Polyethylene- commonly known as Rural B), HDPE (High density Polyethylene commonly known as Metric Poly) or PVC piping.

When using PVC medium body (not fast dying) cement is generally recommended. When using PVC, HDPE or MDPE a grommet and take-off is the preferred method to connect the manifold to the dripperline. The installer should use a good quality ratcheting type PVC/ HDPE/ MDPE cutter to prevent the introduction of PVC/ HDPE/ MDPE filings to the distribution lines. It is also recommended the correct size hole saw is used with the correct grommet take-off. A minimum outside dimension of 40mm is recommended when using grommets to allow for the outside curve in the pipe to seal against the grommet.

If the manifold is LDPE a punch tool can be used to punch a hole into the LDPE. The fitting then is pushed directly into the LDPE and over the dripperline. It is important the LDPE is a minimum of 25mm to allow the fitting to seal and the ability of flow to easily pass through the fitting. It is also recommended that straight take-offs are installed perpendicular to the manifold again to ensure a seal.

Start-up

The designer should take special precautions to troubleshoot the system and insure that it is working properly over an initial start-up period, typically 2-3 weeks.

Do not start the system with a massive dose. This can cause preferential water passages, or chimneys, to the surface and saturate the soil and it could take a long time to recover the drip field.

- Construction debris (Mainline/ flush line scraps, soil, etc) found in the pipe network after the initial assembly need to be flushed. It is recommended that the initial flushing not be done through the dripperline to avoid plugging with large, unfiltered particles. If the dripperlines must be used for flushing, do not exceed the scheduled dosing cycle in the process.
- The pump tank or treatment system may be full of water after installation. Do not simply run it out through the drip tube. Either use the dosing schedule to empty the tank, or set up a sprinkler.
- If the dosing field is extremely dry, it can be advantageous to run a sprinkler on the surface for a while to initially dampen the field.

Routine Maintenance

Other service and maintenance of the system can be coordinated with regulatory requirements for monitoring of the onsite wastewater treatment system. Most states/ regions have regulations that specify a routine maintenance schedule for advanced wastewater treatment systems.

When a drip distribution system is properly sized, designed, and installed, it should operate with little maintenance and easy monitoring. In addition to the fundamental design considerations already outlined, several other installation steps will simplify maintenance. These are as follows:

- Provide simple nipples for Schrader valves (tire gauge stems) on critical piping elements (pump output, supply and flush manifolds, inlet and outlet of filters, etc.) in valve boxes to provide easy measurement of system pressure.
- Maintain access to a short length of drip tubing for inspection
- Keep a detailed as constructed drawing readily accessible
- Establish a service record chart to record

- Pressure at:
    - Pump
    - Supply manifold
    - Flush manifold
    - Other critical points
- Schedule
    - Dosing
    - Filter flushing
    - Field flushing
- Monitoring any changes in the number, activities, and water usage patterns of members of the household.

With this information framework, a system inspector can quickly and easily determine if the system is operating within specifications. If problems are identified by changes in pressure or flow, they can be located and corrected easily using information in the plans and locations of valve boxes.

Typical Layouts

The layout for a typical domestic onsite system is made-up of several components. In the following illustrations, each design scenario will contain all or part of the following components and systems:

- Secondary treatment system- aeration treatment unit, recirculation sand filter, peat system, fixed film, or wetland system, etc.
- Dosing pump
- Automatic or manual disc filter (130 micron) set in a buried valve box that is capable of automatic backflushing or manual cleaning
- Air/ vacuum relief valves
- Zone control valves- water actuated, motor driven or solenoid activated hydraulic valves
- Underground LDPE, MDPE, HPDE or PVC piping, typically minimum 25mm or larger
- Dripperline connectors to mainlines and flush manifolds
- Check valves
- UniBioline dripperline

The following layouts illustrate the various ways that drip dispersal fields might be laid out at a domestic onsite system. These are too used as guides only. Each individual system will have special requirements that will require the designer to modify these typical layouts in the order to adapt to the site. The following are basic considerations that should be taken prior to beginning any design:

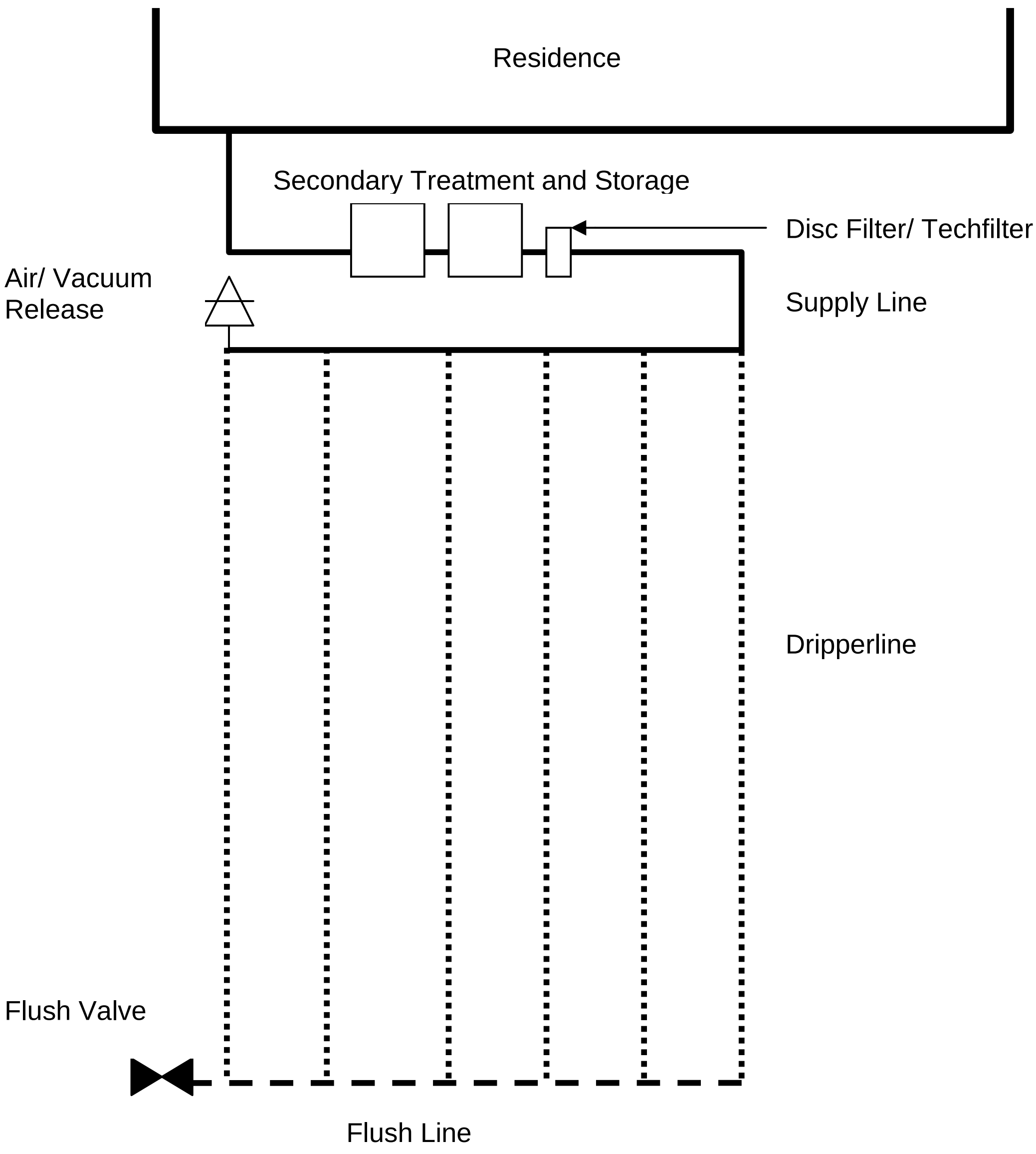
- Shape of the proposed drain field
- General slope or direction of rise and fall of the site
- Location of property lines, buildings, trees, bores, water lines, buried power lines, swimming pools etc.
- Soil type including profiling to determine depth to most restrictive layer and or water table
- Location of the treatment plant
- Location of power outlets
- Location of old drain field if new system is a retrofit

Opposing Manifold Layout

Rectangular field with supply and flush manifold at opposite ends of the dripperline;

- Can be used where UniBioline lengths will be long and drip field is narrow.

Figure 4 Opposing Manifold Layout

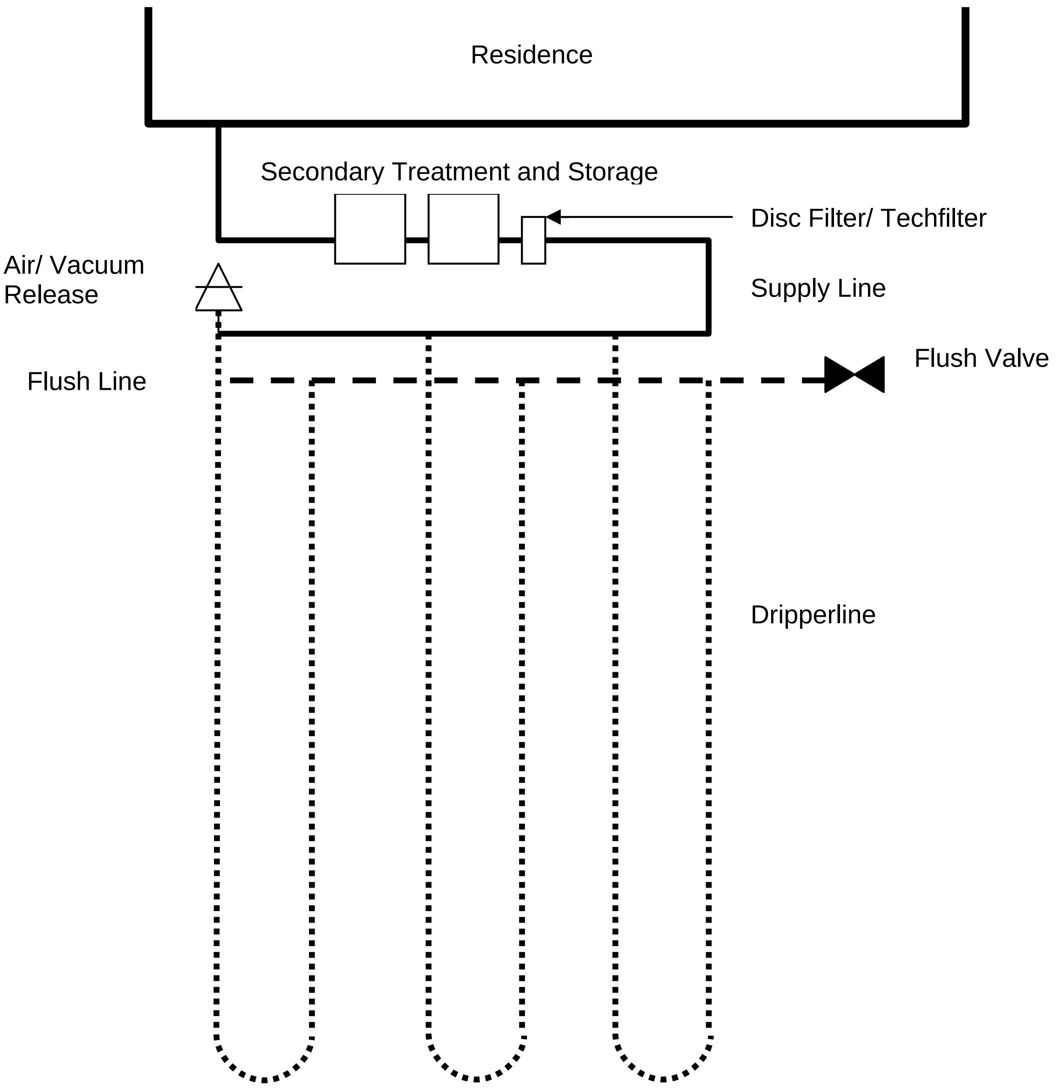


Single Trench Layout

Rectangular field with supply and flush manifold on the same side in the same trench;

- Locate supply and flush manifold in same trench.
- Dripperlines are looped at the end opposite the supply and flush manifolds
- The longest UniBioline length should not exceed maximum recommended run lengths.

Figure 5 Single Trench Layout

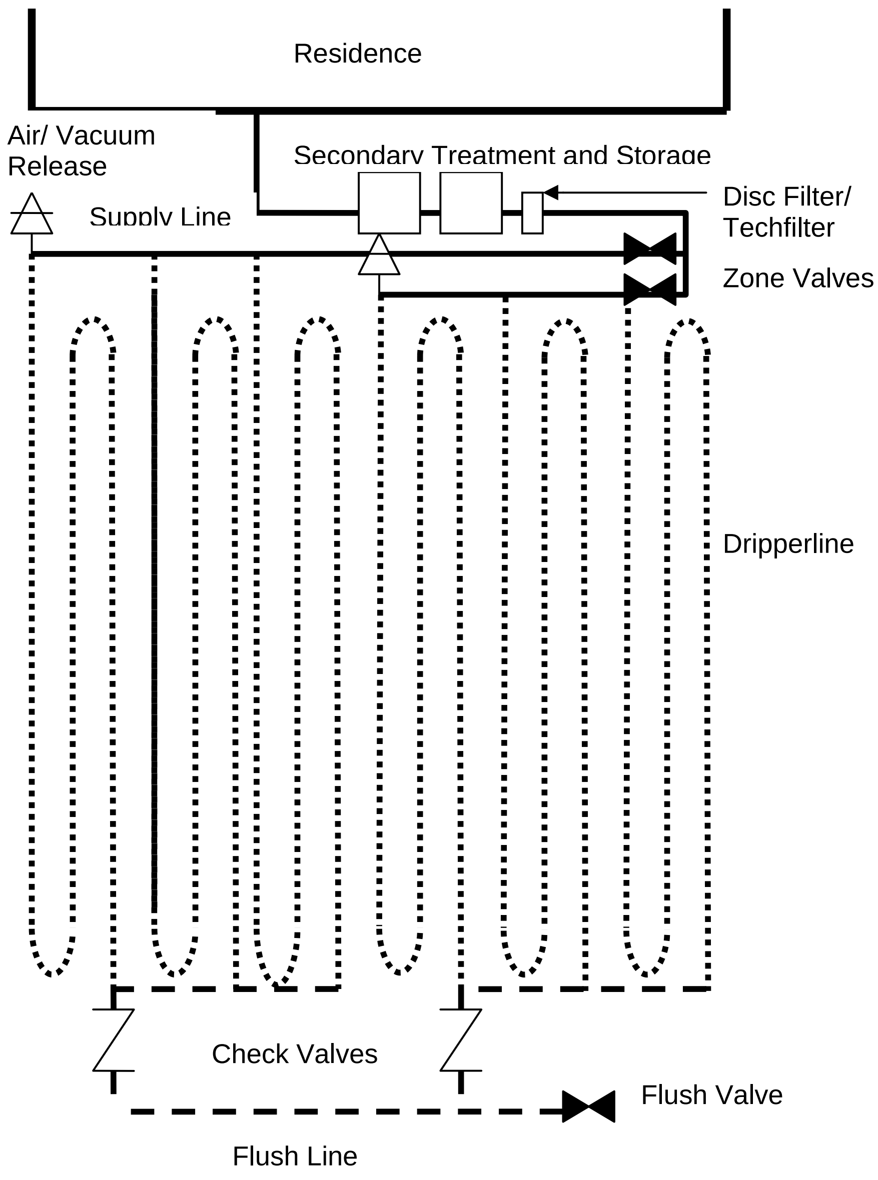


Multiple Zone Layout

Multi- zone system with looping laterals;

- Should be used when single zone accumulated UniBioline length exceeds pump duty capabilities.
- Should be used when soil require additional resting time between doses.
- Should be used when there is a potential need for expansion of the system, which is common in commercial systems. Second zone may be left out until needed.
- Additional check valves are needed to isolate each zone on the flush line side.
- Zone changes are typically accomplished using a electronic valve with a controller or index valve.
- Zone layouts must be parallel systems or may follow any of the scenarios discussed.
- Zones should have similar flow when possible.

Figure 6 Multi- Zone Layout



PERFORMANCE SPECIFICATION SAMPLES

UniBioline CNL (Compensating Non-Leakage)

Description

UniBioline CNL is low volume dripperline with integral and evenly spaced pressure compensating, non leakage drippers welded to the inside of the tubing at specified intervals.

UniBioline CNL is available with drippers in four discharge rates (1.0, 1.6, 2.3, 3.5 litres per hour LPH) evenly spaced at 0.3, 0.4 or 0.5m centres. UniBioline CNL is available in 200m coils. The standard options are 1.6l/hr at 0.4m, 1.6l/hr at 0.5m, 2.3l/hr at 0.6m and 3.5l/hr at 1.0m spacings in 100m and 200m coils.

Construction

UniBioline CNL shall consist of 17mm, nominal sized low-density linear polyethylene tubing with pressure compensating, continuously self-cleaning, integral drippers with internal check valve at a specified spacing, (0.3, 0.4 or 0.5m centres). The tubing shall be lilac in colour and conform to an outside diameter (O.D.) of 17mm and an inside diameter (I.D.) of 14.4mm.

Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the tubing assembly. These drippers shall be constructed of a 2-piece plastic dripper housing containing a continuously self-flushing silicone diaphragm capable of flushing any dirt or debris that may enter the dripper, extending the full length of the dripper. The dripper shall have a built-in check valve that will hold the pressure exerted by 1.4m to ensure that tubing will not drain water on zone shutdown, or allow outside contaminants to enter the dripperline through reverse siphonage. The dripper shall have its water inlet located in the centre of the tubing to ensure it draws water from the centre of the water stream thereby ensuring the dripper is always drawing water from the cleanest part of the stream of water flowing through the tubing.

The dripper shall also have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the tubing.

Operation

Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure of ten to thirty five (10- 35) meters (m), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 10- 35m.

The dripper discharge rate shall be 1.0, 1.6, 2.3 or 3.5 litres per hour (LPH) ulitising a combination turbulent flow/reduced pressure compensation cell mechanism and a diaphragm. The drippers shall be capable of continuously cleaning themselves while in operation. The dripperline shall be available with 0.3, 0.4 or 0.5m spacing between drippers unless otherwise specified. Maximum system pressure shall be 35m. Filtration shall be 120 mesh or finer. Bending radius shall be 175mm.

For on-surface or under mulch installations, 150mm metal wire staples shall be installed 1000mm to 1500mm on centre, (depending on soil type) and two staples shall be installed over every change-of-direction fitting.

UniBioline CNL 1.6l/hr at 0.4m spacing shall be Netafim Model Number 14110-003400 in 200m coils and Model Number 14110-003350 in 100m coils.
UniBioline CNL 1.6l/hr at 0.5m spacing shall be Netafim Model Number 14110-003500 in 200m coils and Model Number 14110-003680 in 100m coils.
UniBioline CNL 2.3l/hr at 0.6m spacing shall be Netafim Model Number 14110-006700 in 200m coils and Model Number 14110-066800 in 100m coils.
UniBioline CNL 3.5l/hr at 1.0m spacing shall be Netafim Model Number 14110-007200 in 200m coils and Model Number 14110-007180 in 100m coils.

Maximum Run Length Charts

At 11m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	65m	83m	100m	116m	172m
1.6l/hr	48m	61m	74m	85m	127m
2.3l/hr	38m	48m	58m	68m	101m
3.5l/hr	29m	37m	45m	52m	77m

At 15m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	113m	145m	175m	202m	303m
1.6l/hr	83m	106m	129m	149m	223m
2.3l/hr	65m	84m	102m	118m	177m
3.5l/hr	50m	64m	77m	90m	135m

At 20m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	143m	184m	222m	257m	386m
1.6l/hr	109m	140m	169m	196m	294m
2.3l/hr	86m	110m	133m	155m	233m
3.5l/hr	65m	84m	102m	118m	178m

At 25m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	165m	211m	255m	296m	445m
1.6l/hr	121m	155m	188m	218m	328m
2.3l/hr	95m	122m	148m	173m	260m
3.5l/hr	72m	93m	113m	131m	198m

At 30m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	182m	233m	282m	328m	492m
1.6l/hr	134m	172m	208m	241m	363m
2.3l/hr	105m	135m	164m	191m	287m
3.5l/hr	80m	103m	125m	145m	219m

At 35m inlet pressure on flat ground

	0.3m	0.4m	0.5m	0.6m	1.0m
1.0l/hr	196m	252m	305m	354m	532m
1.6l/hr	144m	185m	224m	261m	393m
2.3l/hr	113m	146m	177m	206m	310m
3.5l/hr	86m	111m	135m	157m	237m

UniBioline CNL Fittings

Description

UniBioline CNL fittings shall be constructed in one of the following end configurations:

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

Construction

All fittings shall be constructed of injection molded, plastic having a nominal inside dimension of 14.4mm. Female and male threaded ends shall be capable of mating to standard PVC pipe with tapered threads.

Operation

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

Maximum system pressure without clamps shall be 35m.

UniBioline fittings shall be Netafim Model Numbers;

o Start connector w/-Grommet (PVC, MDPE & HDPE)	32500-013770
o 16mm hole saw for grommet take-offs	45000-003200
o Start Connector (LDPE)	32500-013750
o Elbow start connector (LDPE)	00005-011500
o Punch Tool for LDPE Start Connector (LDPE)	45000-001650
o Joiner	32500-003800
o Elbow	32500-022400
o Tee	32500-023600
o Ratchet clamp	00005-002300

Bioline AS (Compensated Anti-Siphon)

Description

Bioline AS is low volume dripperline with integral and evenly spaced pressure compensating, anti-siphon drippers welded to the inside of the tubing at specified intervals.

Bioline AS is available with drippers in five discharge rates (1.0, 1.6, 2.0, 3.0 & 3.8 litres per hour LPH) evenly spaced at 0.5, 0.6 or 1.0m centres. Bioline AS available in 100m and 200m coils. The standard options are 1.6l/hr at 0.5m, 2.0l/hr at 0.6m and 3.0l/hr at 1.0m spacings in 100m and 200m coils.

Construction

Bioline AS shall consist of 15.4mm, nominal sized low-density linear polyethylene tubing with pressure compensating, continuously self-cleaning, integral drippers with anti siphon mechanism at a specified spacing, (0.5, 0.6 or 1.0m centres). The tubing shall be lilac in colour and conform to an outside diameter (O.D.) of 15.4mm and an inside diameter (I.D.) of 13.0mm.

Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the tubing assembly. These drippers shall be constructed of a 2-piece plastic dripper housing containing a continuously self-flushing silicone diaphragm capable of flushing any dirt or debris that may enter the dripper, extending the full length of the dripper. The dripper shall have its water inlet located in the centre of the tubing to ensure it draws water from the centre of the water stream thereby ensuring the dripper is always drawing water from the cleanest part of the stream of water flowing through the tubing.

The dripper shall also have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the tubing.

Operation

Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure of five to twenty five (5- 25) meters (m), at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less. Recommended operating pressure shall be between 5- 25m.

The dripper discharge rate shall be 1.0, 1.6, 2.0, 3.0 or 3.8 litres per hour (LPH) ulitising a combination turbulent flow/reduced pressure compensation cell mechanism and a diaphragm. The drippers shall be capable of continuously cleaning themselves while in operation. The dripperline shall be available with 0.5, 0.6 or 1.0m spacing between drippers unless otherwise specified. Maximum system pressure shall be 25m. Filtration shall be 120 mesh or finer. Bending radius shall be 175mm.

For on-surface or under mulch installations, 150mm metal wire staples shall be installed 1000mm to 1500mm on centre, (depending on soil type) and two staples shall be installed over every change-of-direction fitting.

Bioline AS 1.6l/hr at 0.5m spacing shall be Netafim Model Number 17390-002020 in 200m coils and Model Number 17390-002010 in 100m coils.
Bioline AS 2.3l/hr at 0.6m spacing shall be Netafim Model Number 17390-002510 in 200m coils and Model Number 17390-002500 in 100m coils.
Bioline AS 3.5l/hr at 1.0m spacing shall be Netafim Model Number 17390-003700 in 200m coils and Model Number 17390-003690 in 100m coils.

Maximum Run Length Charts

At 11m inlet pressure on flat ground with 7m end pressure

	0.3m	0.4m	0.5m	0.6m	1.0m
1.6l/hr	63m	81m	98m	114m	171m
2.0l/hr	54m	70m	85m	98m	148m
3.0l/hr	42m	54m	65m	76m	114m
3.8l/hr	36m	46m	56m	64m	98m

At 15m inlet pressure on flat ground with 7m end pressure

	0.3m	0.4m	0.5m	0.6m	1.0m
1.6l/hr	80m	103m	125m	145m	217m
2.0l/hr	69m	89m	107m	125m	188m
3.0l/hr	53m	68m	83m	97m	145m
3.8l/hr	45m	58m	71m	82m	124m

At 20m inlet pressure on flat ground with 7m end pressure

	0.3m	0.4m	0.5m	0.6m	1.0m
1.6l/hr	95m	122m	148m	172m	258m
2.0l/hr	81m	105m	127m	148m	223m
3.0l/hr	63m	81m	98m	114m	172m
3.8l/hr	53m	69m	84m	97m	147m

At 25m inlet pressure on flat ground with 7m end pressure

	0.3m	0.4m	0.5m	0.6m	1.0m
1.6l/hr	106m	136m	165m	192m	289m
2.0l/hr	91m	117m	142m	165m	250m
3.0l/hr	70m	90m	110m	127m	192m
3.8l/hr	60m	77m	94m	109m	165m

Bioline AS Fittings

Description

Bioline AS fittings shall be constructed in one of the following end configurations:

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

Construction

All fittings shall be constructed of injection molded, plastic having a nominal inside dimension of 13mm. Female and male threaded ends shall be capable of mating to standard PVC pipe with tapered threads.

Operation

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

Maximum system pressure without clamps shall be 35m.

Bioline AS fittings shall be Netafim Model Numbers;

o Start Connector (LDPE)	00005-003450
o Elbow start connector (LDPE)	00005-011400
o Punch Tool for LDPE Start Connector (LDPE)	45000-001650
o Joiner	00005-003500
o Elbow	00005-004100
o Tee	00005-005500
o Ratchet clamp	00005-001900

Techfilter

Description

Techfilter is the incorporation of a disc filter and a chemical root intrusion preventer (Trifluralin) with a required amount of UniBioline dripperline. Techfilter is available in 4 filter sizes, (19mm, 25mm, 40mm and 50mm). The mesh rating shall be 120, and maximum system pressure is 100m.

Construction

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

Operation

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

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

Flow rates that suit each model are as follows;

- 19mm Techfilter 0-2,000 l/hr
- 25mm Techfilter 2,000- 6,000 l/hr
- 40mm Techfilter 6,000- 8,000 l/hr
- 50mm Techfilter 8,000- 15,000 l/hr

The Techfilter system shall be Netafim Model Number;

- 19mm Techfilter 33500-001000
- 25mm Techfilter 33500-001200
- 40mm Techfilter 33500-001300
- 50mm Techfilter 33500-001400

Disc Filter

Description

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

Construction

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

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

Disc filter ring color-coding shall be: Yellow (80 Mesh / 200 Micron), Red (120 Mesh / 130 Micron), Black (140 Mesh / 100 Micron), or Green (200 Mesh / 70 Micron). It is recommended when using UniBioline a Red (120 Mesh / 130 Micron) cartridge is installed.

Operation

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

Flow rates that suit each Red (120 Mesh / 130 Micron) model are as follows;

- 19mm Disc Filter 0-2,000 l/hr
- 25mm Disc Filter 2,000- 6,000 l/hr
- 40mm Disc Filter 6,000- 8,000 l/hr
- 50mm Disc Filter 8,000- 15,000 l/hr

The Red (120 Mesh / 130 Micron) Disc Filter shall be a Netafim Model Number;

o 19mm 120 Mesh Disc Filter	70640-001200
o 25mm 120 Mesh Disc Filter	70640-002000
o 25mm 120 Mesh Disc Filter (super)	70640-002450
o 40mm 120 Mesh Disc Filter	70640-003400
o 50mm 120 Mesh Disc Filter (Leader)	70640-005340

Air / Vacuum Release Valve

Description

The air/vacuum relief valve serves two purposes:

- To evacuate air from the UniBioline laterals during system start-up and,
- To prevent a vacuum from occurring after the remote control valve has closed thus avoiding debris intrusion into the drippers at the higher locations in the zone.

Construction

The air/vacuum relief valve shall be constructed of black or gray plastic with a 13mm male pipe thread capable of mating with a threaded PVC reduction bushing.

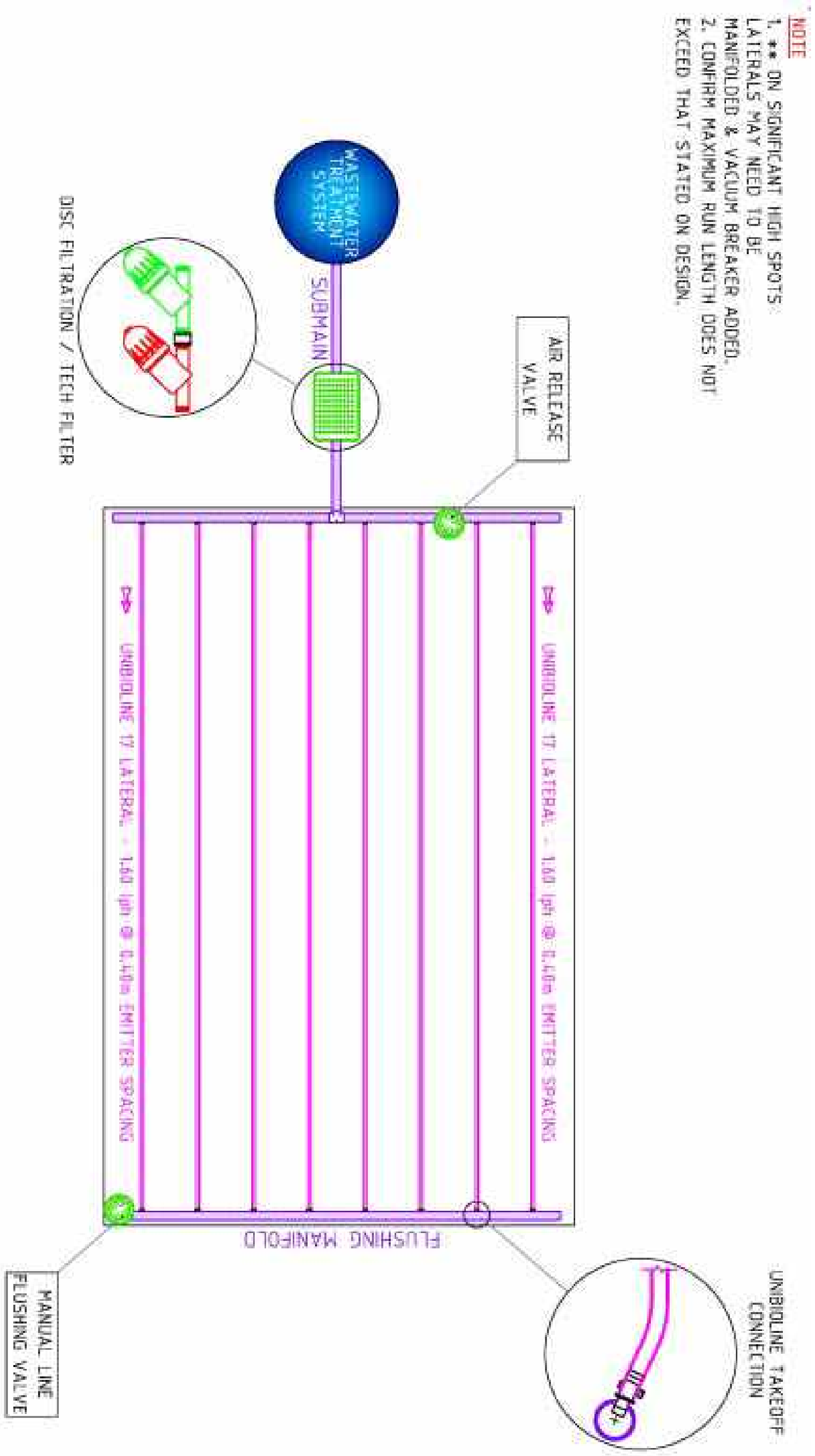
Operation

Design and installation techniques require that these valves be installed at the highest elevation in each zone (some zones may require more than one) in order to expel air and relief vacuum. In a zone where the highest elevation occurs between the intake and the exhaust headers (such as a mound), an air/valve relief lateral shall interconnect the UniBioline dripperlines to avoid the necessity of installing one air relief valve on each UniBioline lateral. Valves can be installed below grade in valve boxes to allow for periodic inspection.

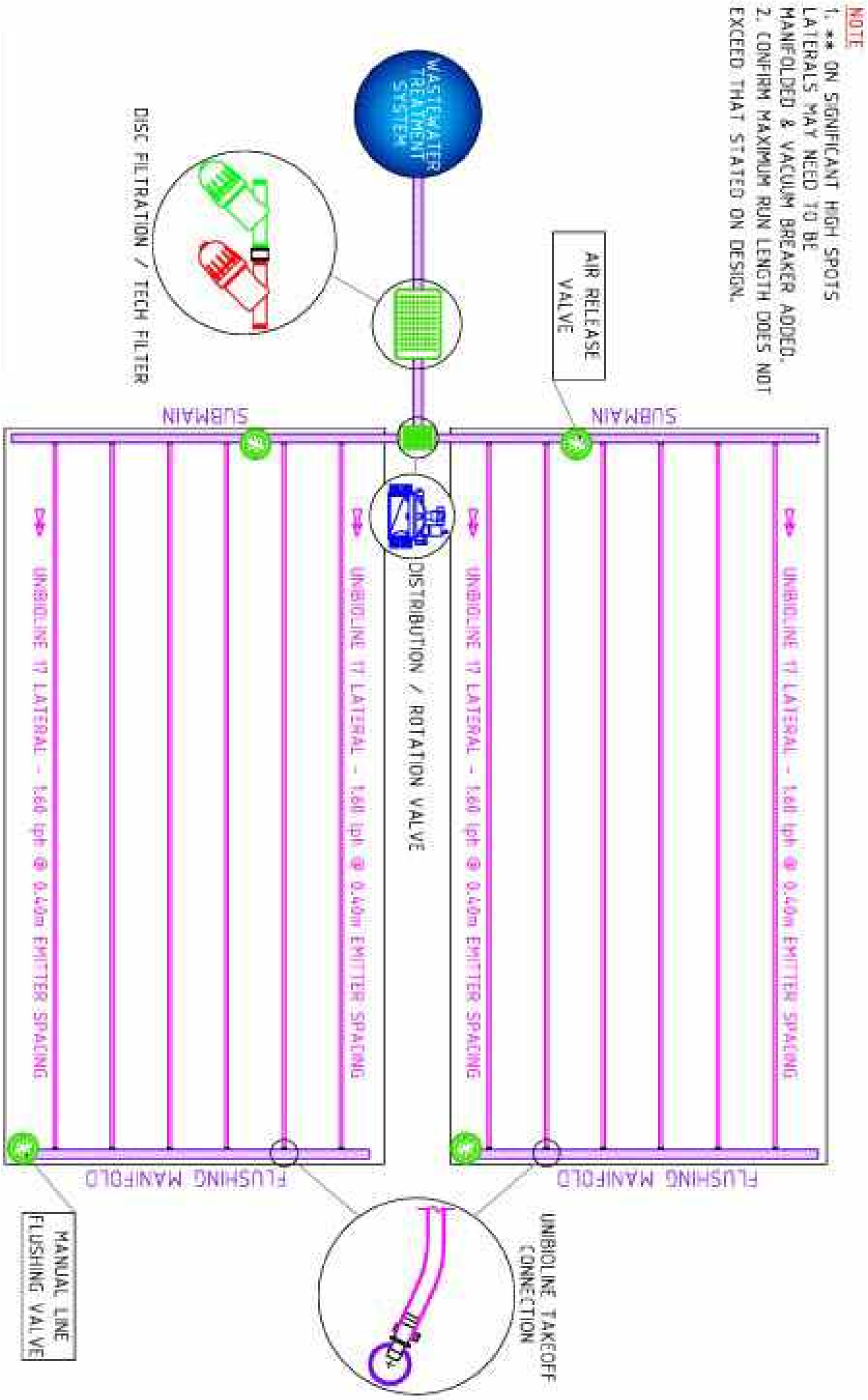
The air/vacuum relief valve shall be Netafim Model Number 71000-016700.

DETAILED DRAWINGS

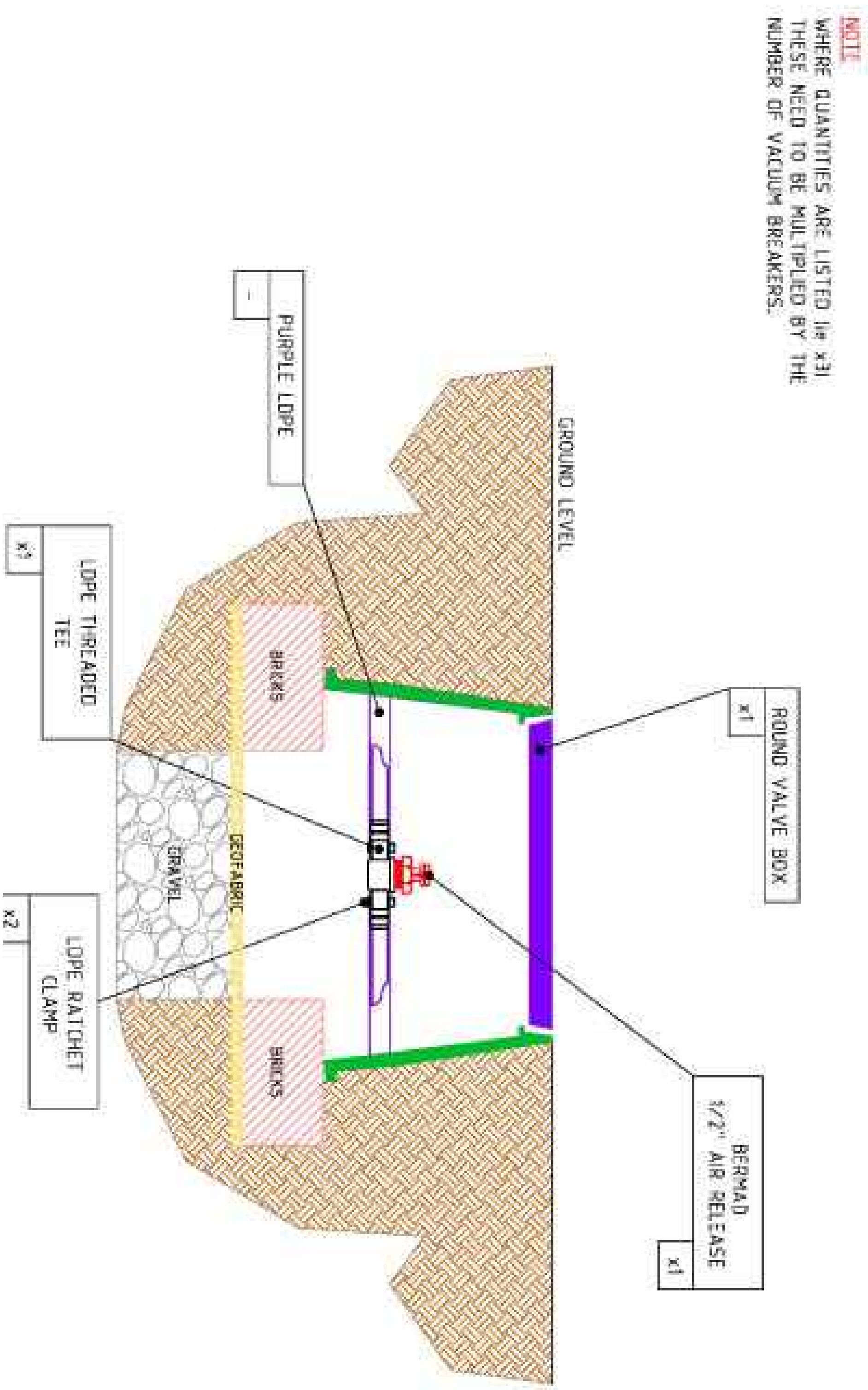
Single Zone Layout



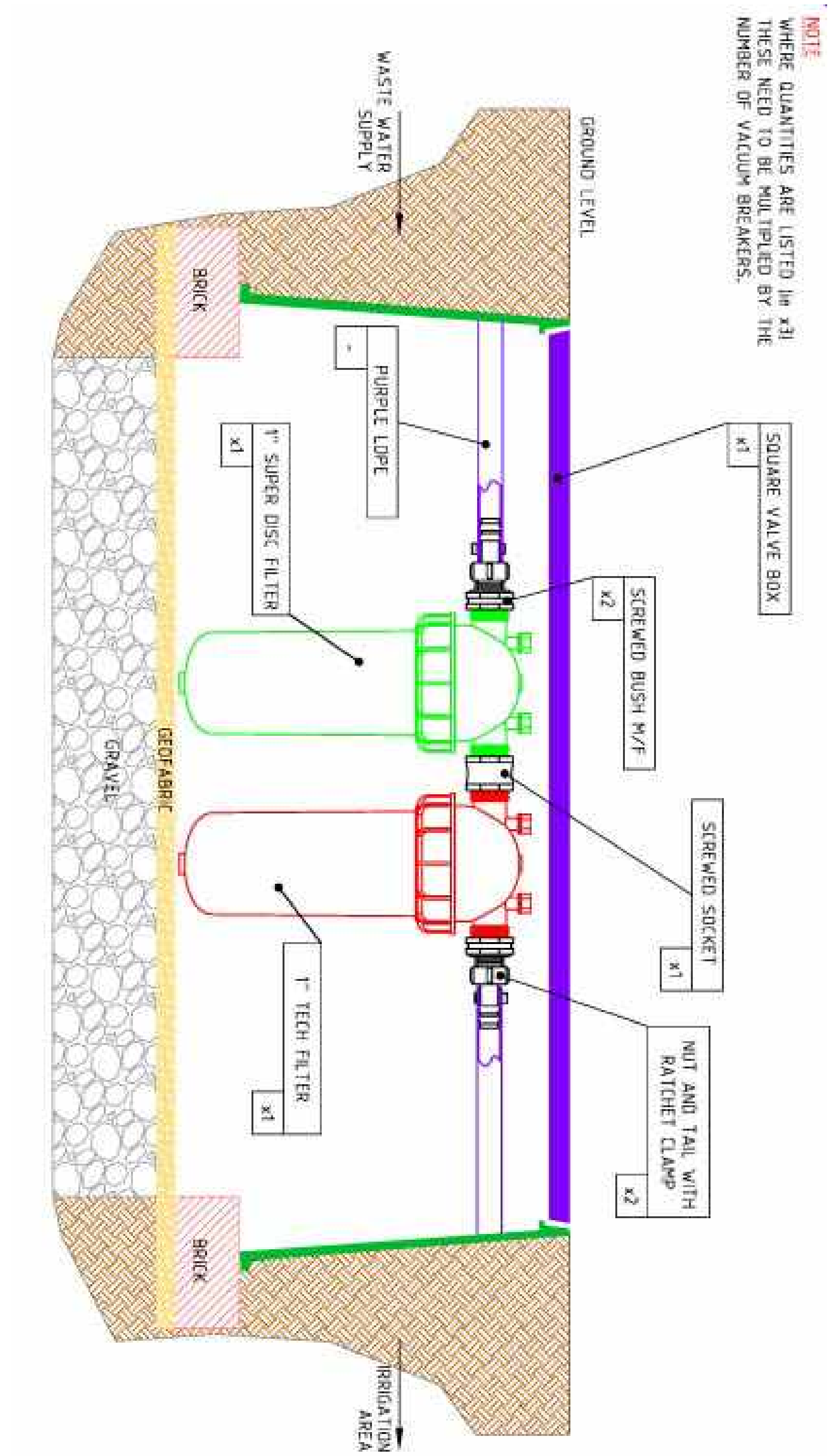
Multi Zone Layout



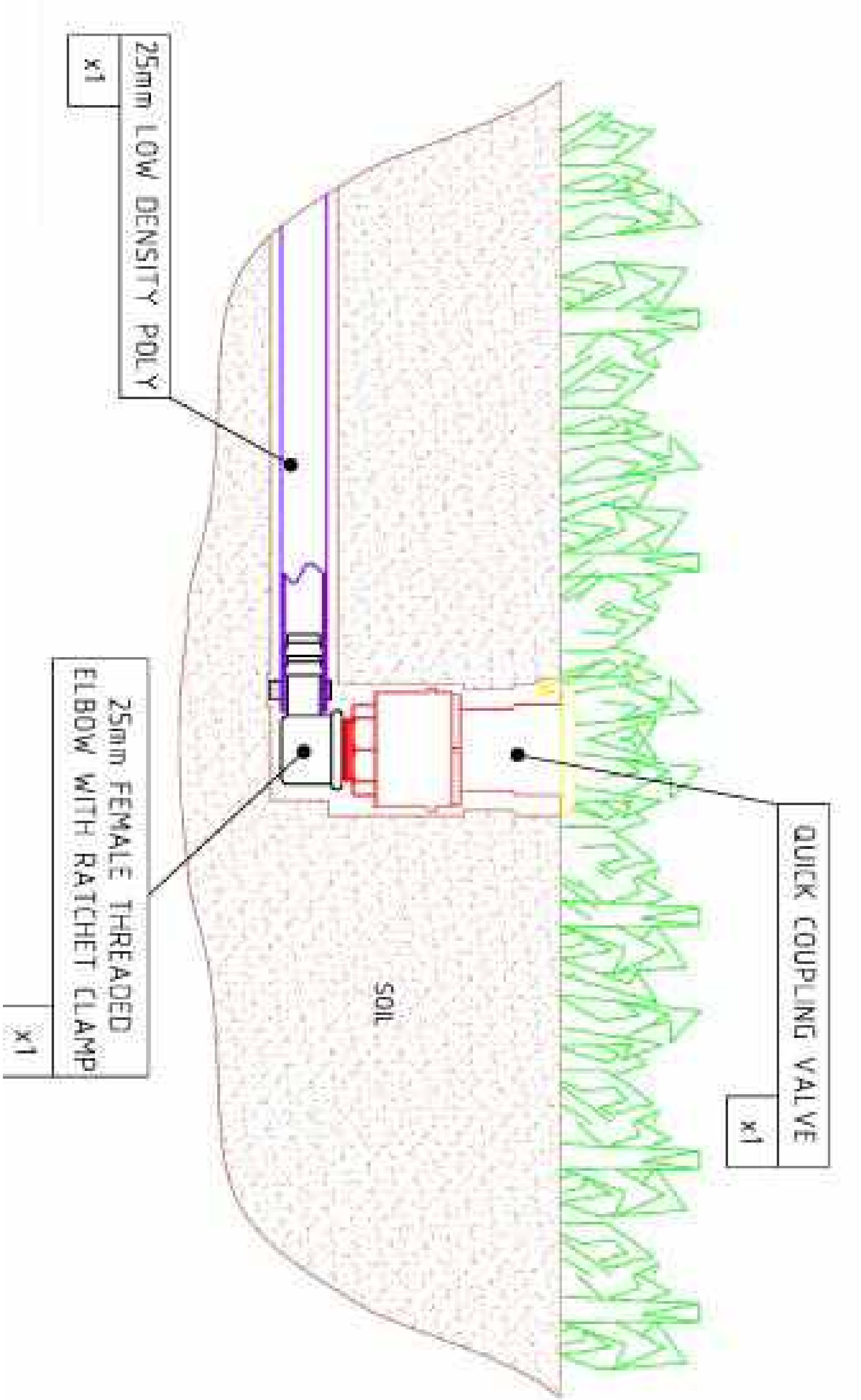
Air / Vacuum Release



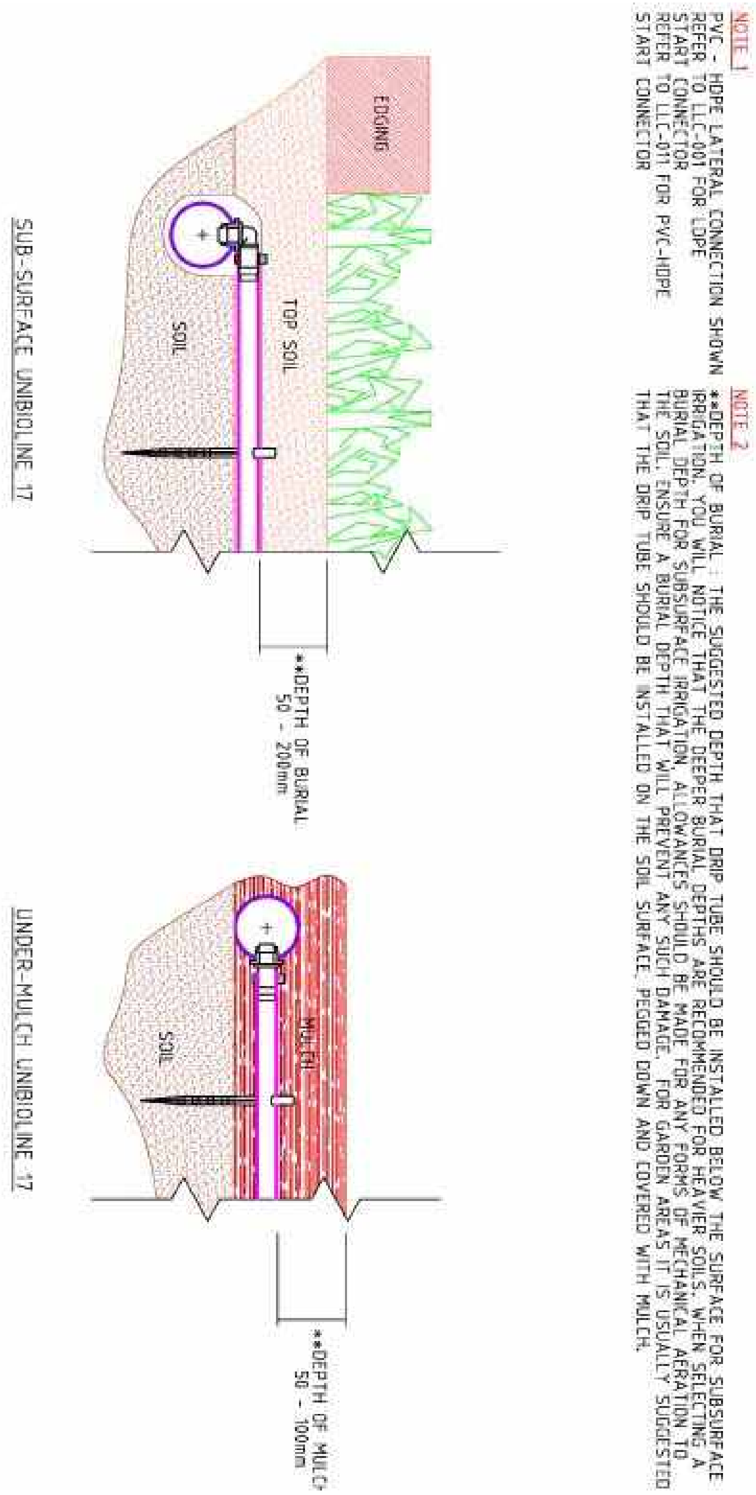
Filter Assembly



Flush Valve


25mm LOW DENSITY POLY
x1
25mm FEMALE THREADED ELBOW WITH RATCHET CLAMP
x1
SOIL
QUICK COUPLING VALVE
x1

Sub-Surface Turf / On-Surface Gardens



REGULATIONS AND LEGISLATION

Each state and council has regulations and by-laws concerning the dispersal of effluent which must be strictly complied with. This manual is intended to be an aid to installers and end users of the land application dispersal systems and according to local, state or federal law and regulation shall take precedence over this manual. You are accordingly advised and requested to check with your own council and state government as to their specific requirements for the installation of land application dispersal systems. Furthermore, the user of the land application dispersal systems is subject to all local conditions that prevail at the site and further subject to any appropriate expert tests including but not limited to soil tests and water tests, which may be required prior to the installation to determine the fitness for use.

In addition, other factors must be considered to determine fitness for use including but not limited to slope and landscape contours and acceptable hydraulic loading rates.

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