NETAFIM

AUSTRALIA

NETAFIM LANDSCAPE DRIPLINE MANUAL

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INTRODUCTION

Since 1965, Netafim has pioneered the science of drip irrigation systems, from manufacture of drip irrigation products, through to irrigation system design, and is recognised as the world leader in drip and subsurface irrigation. Netafim have been designing, developing and manufacturing subsurface drip irrigation systems since 1978.

Over this time Netafim have been able to introduce technology into drip irrigation components that will apply water to landscape gardens and turf areas with excellent accuracy and uniformity. Problems previously faced by dripline irrigation users included root intrusion and suck-back. These issues have been overcome and today Netafim is able to provide professional, reliable and long lasting drip irrigation systems to suit all applications.

This manual details Netafim's current irrigation technology, and will include information on correct dripline selection and component selection plus complete system installation, start-up and operational guidelines.

FEATURES AND BENEFITS OF A DRIPLINE SYSTEM

Subsurface or On-surface drip irrigation involves the application of water to plants or turf via pipes and emitters installed totally underground or under mulch. This process of has several features which gives the user significant benefits over conventional above ground irrigation. These features and benefits are as follows:

Low Application Rates

A truly distinctive feature of Netafim drip irrigation is the very low application rate used. Drip irrigation systems are designed to supply an individual plant's water requirement by a daily application of a longer duration. Compare this to a high-volume sprinkler system, which may apply a week's water requirement in one hour. A low application rate often means smaller and a more efficient use of pumps, filters and pipelines, because these system components may be sized for lower flow rates and used for longer periods. In short, a lower water application rate often means lower capital costs and lower operating costs.

Low application rates also presents distinct advantages when dealing with slopes or effluent water. With lower application rates water runoff in slopes can be minimised and in most cases eliminated. The creation of pools of stagnating effluent water is a major health concern when irrigating with effluent water on heavy soils. The Low application rates provided by the drip line system prevents such occurrences.

Uniformity of Water Application

Another highly desirable feature of drip irrigation is the excellent uniformity of water application, which is achieved. Uniform water application means that all plants receive the same amount of water. With poor irrigation uniformity, it is necessary to over-irrigate in order to ensure a proper coverage of the dryer zones. Therefore, good uniformity results in more efficient irrigation, and consequently large savings in water and fertiliser.

High recovery factor

Where spray systems are used a major part of the irrigation system is lost to wind drift, evaporation, over-spray and runoff. With drip irrigation systems theses losses are eliminated with a "water recovery" factor of nearly 100%.
Drip irrigation applies water directly to the root zone of the plant which means that no water is able to evaporate to atmosphere prior to application. If not properly scheduled, deep percolation losses, or water lost by passing through the soil profile out of reach of plants, may occur.

It has been estimated that a drip irrigation system saves between 35% and 45% of the water that would normally have been applied using a sprinkler system. Under well-managed conditions some users have been able to reach a saving of 60%. This is a valuable saving given the rising cost of urban water.

Controlled root zone environment

One of the most important aspects of Netafim drip irrigation is the fact that in many instances a totally new and more favourable root zone environment is created, wherein a relatively constant soil moisture content is maintained. This fact has important implications for users of drip irrigation systems, because it bears upon questions of plant water requirements, tolerance to salinity, and control of disease.

Improved disease control

Although difficult to quantify, it appears from a number of reports that disease control is enhanced under a Netafim dripline irrigation regime. This is because the soil moisture and chemical additive levels can be closely controlled, and the frequency and timing of chemical applications are easily managed. In addition, the spread of any existing disease organisms by water movement is much less likely since surface water run-off is eliminated. Fungal diseases such as 'Dollar Spot' are less likely to occur in turf as there is no water sprayed onto the turf blades.

Application in "problem soils"

Netafim dripline irrigation systems are often ideally suited to "problem soils". The low application rate that Netafim dripline irrigation systems is ideal for tight clay soils with low infiltration rates, as the water can be applied slowly enough for the soil to absorb it without surface run-off occurring. On the other hand, very sandy soils frequently cannot store large amounts of water, and under conventional irrigation systems, much of the applied water is lost to deep percolation. Netafim dripline irrigation is ideal for such soils as it allows for a more effective use of the pulse irrigation method.

More effective fertiliser and chemical application

A Netafim dripline irrigation system is an effective means of placing fertiliser and other chemicals into the root zone where they are needed. Netafim dripline irrigation systems can easily be fitted with fertiliser injection units, to which fertilisers can be applied in a soluble form directly to the root zone of the plants. Hence removing the need for mechanical application followed by "watering-in".

The ability to apply fertiliser frequently and directly to the turf assists in efficient vegetative growth. Improved control over fertiliser placement and timing leads to greater fertiliser efficiency, and less fertiliser is lost to leaching, weed growth and water run-off. These improved efficiencies apply to other chemicals introduced via the Netafim drip irrigation system.

The growth of weeds is also dramatically reduced when water is applied directly to the root zone. Seeds to do not easily germinate with the subsurface drip system and hence the growth of weeds is not encouraged. Prevention of weed growth can also lead to savings in labour and chemicals.

Increased plant growth

Under traditional irrigation methods, plants extract water from the soil from field capacity down towards permanent wilting point. During this transition in soil moisture, it becomes harder for the plant to extract water from the soil, and therefore the consumptive water use rate decreases. As moisture stress increases, physiological changes within the plant cause a reduction in the growth rate.

Ideally, an irrigation system maintains the soil moisture level slightly below field capacity to achieve maximum health and growth. A Netafim dripline irrigation system, with its controlled application of water, makes this possible. With most plants, there is a noticeable increase in growth when soil moisture is maintained at an optimum level.

Increased energy efficiency

The Netafim dripline irrigation system operates at a much lower pressure than the conventional spray method (typically 80 to 200 and up to 400 kilo Pascal's). This means that systems can easily operate off water mains even under very low-pressure conditions. In situations where a pump is required, the operating pressure being smaller means that the pump size required is lower. This will result in lower energy consumption and consequently a lower running cost.

Reduced risk of injury

There is an increasing concern over liability resulting from injury to the public, from such hazards as sprinkler heads on playing fields and slippery pavements and roadways. The Netafim subsurface solution eliminates those concerns, by providing a system with no exposed parts and no over-spray.

Reduced exposure to vandalism

For most councils, the problem of vandalism has become an incredible maintenance nightmare and a source of great expense. The Dripline irrigation option has proven to be an ideal solution to such a problem. Today, reduced vandalism is one of the major driving force to the adoption and the spread of the subsurface system around Australia.

Flexible watering time

In sports turf, gardens, pools and other public facilities, watering time is a major concern and needs to be limited to hours when public is not present. This restriction of the watering time means that water has to be applied at a much higher rate in order comply with the imposed time restriction. With the dripline solution this limitation is eliminated as the system does not interfere in any way with regular use of the turf areas. This means that a subsurface system provides a much longer (24 hours) irrigation time window, which allows for lower application rates, better use of a restricted water supply, and lower investment and operating costs.

Effluent water re-use

The most exciting application of dripline irrigation is in the area of effluent water re-use. Netafim dripline irrigation resolves many of the health issues associated with spraying of effluent water onto landscapes via the conventional sprinkler systems. When the effluent water is applied underground through a dedicated effluent system the chances of harmful bacteria coming in contact with humans is minimised. This form of effluent water disposal allows for a much less expensive and a more environmental friendly treatment level of the sewage. This method of effluent disposal has been used for over ten years in Israel and is considered by Israelis today as the cheapest, most effective, and most environmental friendly way to dispose of their effluent water.

Some of the more evident advantages provided by the sub-surface irrigation system in effluent water use are:

- Eliminates health hazard from air-born bacteria
- Eliminates unpleasant odours
- Reduces public liability on the roads, in parks and gardens
- Does not require an expensive tertiary level of sewage treatment
- Eliminates the health issues involved with ponding of the effluent water associated with high application rates on soils with low infiltration rates.
- Reduces the need for additional chemical fertilisers as effluent water already contains most of the nutrients required for plant growth

Netafim can provide technical support for users of effluent water re-use systems, particularly in the areas of filtration, application rates and water and system management.

Ability to use with more saline water

One of the major problems associated with high saline water and overhead irrigation, is the scaling and burning of the leaves. The fact that with the subsurface drip system the water does not come in contact with the leaves means that more saline water can be used. When irrigating with saline water it is necessary to keep a constant high moisture level in the soil in order to produce a "micro-leaching" effect, which will keep the salts away from the root zone.

COMPONENTS

Driplines
Non-Pressure Compensated Drip lines

- Flow rate through dripper varies with increases or decreases in water pressure.
- Double the pressure does not mean double the flow rate. A 100% pressure increase will only result in a 38% flow rate increase. (Netafim drippers only)
- Molded emitter that is in-seated into the pipe at the time of pipe extrusion, therefore there is no stretching of the flow path during drip line manufacture.
- Drippers have a short turbulent flow path labyrinth with inlet to dripper located above wall of the pipe to allow flushing by water flow in pipe.
- Each dripper has own inlet filter, with every filter orifice being smaller than the dripper labyrinth, allowing particles to pass right through dripper.

Miniscape

Wall Thickness	-	1mm
Flow Rate @ 11m	-	1.3 & 1.9 L/hr
Pressure Range	-	5-30m
Diameter I.D.	-	6mm
Diameter O.D.	-	8mm
Emitter Spacings	-	0.15, 0.30 or 0.50m
Colour	-	Brown

Maximum Run Lengths @ 11m (for a 10% flow variation)

Flow	**0.15m**	**0.30m**	**0.50m**
1.3L/hr	9.9m	19.5m	32.7m
1.9L/hr	6.4m	12.6m	21.1m

Fittings: As supplied by Netafim 5mm fittings.

Scapeline

Wall Thickness	-	1.2mm
Flow Rate @ 11m	-	2.0 L/hr
Pressure Range	-	15-30m
Diameter I.D.	-	13.2mm
Diameter O.D.	-	16mm
Emitter Spacings	-	0.30, 0.40 or 0.50m
Colour	-	Brown & Black

Maximum Run Lengths @ 15m (for a 10% flow variation)

Flow	**0.30m**	**0.40m**	**0.50m**
2.0L/hr	69m	87m	105m

Fittings: As supplied by Netafim 13mm fittings.

Pressure Compensated Drip lines

The flow rate of pressure compensating dripline remains constant over pressure range of 5m – 40m. The molded emitter, which is welded to inside of the pipe wall at time of pipe extrusion, eliminates any possibility of stretching of the flow path during drip line manufacture. The drippers are constructed with wide, but short turbulent flow path with a free-floating diaphragm over. They are designed to regulate the water volume in relation to pipe pressure.

The diaphragm is activated by a continual differential pressure created by the labyrinth, which maintains the constant dripper flow over a wide pressure range. The diaphragm also allows the dripper to be self-flushing in the event of particle blockage.

Each dripper has screen filter at the inlet to the dripper. The cross sectional area of the filter is smaller than the cross sectional area of the dripper flow path. The emitter inlet is at highest level of dripper approximately 6.5mm from the pipe wall, thus water entering the dripper is from the cleaner free-flowing water in the centre of the pipe.

Techline 16
Drip line Performance

Wall Thickness	-	1.2mm
Flow Rates	-	1.6 & 2.3L/hr
Pressure Range	-	5-40m
Diameter I.D.	-	13.2mm
Diameter O.D.	-	16mm
Emitter Spacings	-	0.3, 0.4 or 0.5m
Colour	-	Brown & Purple

Maximum Run Lengths

Inlet Pr	**15m**	**30m**	**15m**	**30m**	**15m**	**30m**
Spacing	**0.3m**	**0.3m**	**0.4m**	**0.4m**	**0.5m**	**0.5m**
1.6 L/hr	68m	110m	88m	142m	107m	172m
2.3 L/hr	54m	86m	69m	112m	84m	136m

Fittings: As supplied by Netafim Australia Pty. Ltd.

Dripmaster 17

Wall Thickness	-	1.0mm
Flow Rate	-	1.2, 1.6, 2.3 & 3.5L/hr
Pressure Range	-	5-40m
Diameter I.D.	-	14.4mm
Diameter O.D.	-	17mm
Emitter Spacings	-	0.3, 0.4, 0.5, 0.6, 0.75, 0.9 or 1.0m
Colour	-	Black or Purple

Maximum Run Lengths

Inlet Pr	15m	30m	15m	30m	15m	30m
Spacing	**0.3m**	**0.3m**	**0.4m**	**0.4m**	**0.5m**	**0.5m**
1.2l/hr	102m	164m	130m	210m	157m	254m
1.6l/hr	84m	136m	108m	174m	130m	210m
2.3l/hr	66m	107m	85m	137m	103m	166m
3.5l/hr	50m	81m	65m	104m	78m	126m

Fittings: As supplied by Netafim Australia Pty. Ltd.

Backflow Prevention Devices

Irrigation Contractor will need to check with the Local Government Water Services Division for determination of Back Flow Prevention Requirements.
AS 3500.1 – 'National Plumbing & Drainage Code'

Low Hazard
- Require Dual Check Valve
- These are non-testable units

Medium Hazard
- Requires Double Check Valve
- These are testable units

High Hazard
- Requires Reduce Pressure Zone Device
- These are testable units

Both Double Check Valves and Reduce Pressure Zone Devices are to be testable. They must be tested on day of installation and must be tested annually by a suitable licensed contractor. Test data is to be lodged with the relevant Local Government Water Department.

Main-Lines, Sub-mains & Flush-lines

Supply and flush manifolds can be either PVC or polyethylene (high or low density dependent upon local authority regulations) and must be sized to accommodate the flow of the zone without exceeding 1.5 meters per second velocity.

The supply manifold delivers water to each lateral run of drip line.

The flush manifold forms a continuous loop system so all lateral runs of drip line are being supplied with water from both ends. (Similar to a car radiator).

As with any irrigation design, always use loops as they:
- Even out flows;
- Greatly reduces friction losses;
- Extends the number of drippers that can be used in a zone; and
- Allows for cleaner and easier repairs for line breaks.

Filtration

The type of filtration system to be used with a drip irrigation system will be dependent upon the source and quality of the water to be used for irrigation. While potable water is used in most urban irrigation systems, and has been thoroughly filtered, further filtration is an inexpensive safeguard against the occasional flak of pipe scale, rust, or a break in the water supply line.

A 120 mesh Arkal disk filter as supplied by Netafim Australia is adequate for the Landscape range of drip lines utilising potable water.

While it is possible to use bore water, water from lakes, creeks, or effluent ponds as an irrigation source for drip irrigation, it is advisable to consult with a Netafim representative to determine the required filtration type when using these water sources.

Disk filters use stacks of grooved plastic disks to capture debris inside a housing. The contact between the grooves of the disks forms a net on which debris is retained as water enters and flows through the stacks. The structure of the disks provides uniform in-depth, multi-intersecting paths, and it is these multiple intersections of the disk grooves which provides a three-dimensional, in-depth filtration, thereby offering a depth of filtration which is far superior to screen filters.

System Protection Unit (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 Trifluralin to the soil around the drippers. The most effective way to introduce the Trifluralin to the soil is through the irrigation system itself. Netafim have developed the Techfilter, a filter 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 which creates the required protection barrier preventing roots from impregnating the irrigation system and possibly causing damage.

The Techfilter is available in one of six sizes. The product is installed at the “head: or beginning of an irrigation system after the required backflow prevention devices, flow meters and other standard equipment. Water from a pump or other pressurised source is allowed to pass through the “head works” and then the Techfilter. The water moves through the “filter element” which is the set of disks that contain Trifluralin and some Trifluralin is then incorporated into the water as it passes through the system. This water, which now contains Trifluralin, passes through the hydraulic network of pipes and then out the drippers and into the soil immediately around the drippers. The nature of Trifluralin is such that it does not move very far in the soil. The Trifluralin binds to soil particles very quickly after exiting 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 Australia do not and will not recommend the Techfilter for any other application that the one described above, that is the protection of subsurface drip irrigation systems against root intrusion.

The concentration of Trifluralin for all of the filters manufactured is 13% so in terms of filter and dripper concentrations the following table should be refereed to for information. Please note that all the calculations of concentration for the drippers is based on the system operating for 121 days per year with an average run time of 3 hours per day and a recommended filter life of 2 years.

Filter Size	¾'	1' Short	1' Long	1 ½'	2'	3'
Trifluralin gms	8	35	58	58	109	218
Flow m^3/hr	3	6	7.5	12	23	48
Conc. Ppbg.	3.6	8	10.6	6.7	6.5	6.3

The higher concentration of the 1" long filter is due to hydraulic design issues of the filter, it has a larger filter element without having a correspondingly larger flow as compared with other filters.
The concentration of Trifluralin given is an average concentration over the life of the Techfilter with the flow conditions and run times given

Due to the very low concentrations of Trifluralin that are being used in the system there is very little movement of the chemical in the soil. The anticipated movement is approximately 3 centimetres in the soil from the point of departure from the drip system.
The life expectancy of the Techfilter cartridge or disk element is two years under expected or average irrigation conditions and run times in Australia. 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.

Netafim recommend that the Techfilter element be replaced every two years. It is important to note that the Techfilters is not required if the dripline is laid on top of the soil profile in garden areas as there is little chance of root intrusion.

Pressure Regulating Valves

As dripline irrigation systems generally operate at pressures lower than conventional irrigation systems, it is important to install pressure regulators into the irrigation systems.

Netafim Australia offers two types of pressure regulators:
i) non-adjustable
ii) adjustable

Non- Adjustable

Have a pre-set pressure, and will work adequately if sized correctly for the irrigation zone
.
Adjustable

Allow adjustment of down stream pressure based on local site conditions. Need to check adjustment at time of installation to ensure pressure regulation is set to what is required.

Line Flushing Valves

With scheme water the line flush valve does not need to be automatic. A simple ball valve is more than adequate for a yearly flush program.

With bore fed water, however, an automatic line flush valve is recommended. This valve allows the system to self- flush at each start-up to wash any debits in the system through this valve, rather than be flushed through the individual drippers.

Automatic line flush valves activate every time the irrigation zone is switched on to provide a cleaning action in the drip line. The ability of the line flush valve to dump water at system start-up prior to closing, allows the water velocity inside the drip line to increase momentarily, and this action moves any sediments to and out of the line flush valve from the drip line. These valves require a minimum pressure of 80 kPa to work correctly.

Air/ Release Vacuum Valves

Air Release/Vacuum Valves are used for two reasons:

- To provide a means of releasing air from the drip line laterals when the system is turned on, thus eliminating air pockets.
- To freely allow air into a zone after shut down. This ensures a vacuum does not draw debris into the drip line laterals via the dripper outlet. (This condition is known as suck back).

Like Line Flush Valves, the Netafim Australia Air Release/Vacuum Valve requires a minimum operating pressure of 80 kPa.

Ancillary Items

There are several ancillary components to a surface drip irrigation project. These components are considered to be ancillary as they do not necessary form part of the permanent irrigation system, but should be utilised during the system maintenance.

The items include:

Pressure Gauge

Provides information as to whether the system is operating within its working parameters.

Flow Meters

Used to measure the amount of water that flows through the entire system, or each zone.

Chemical Injector

Used to inject both chemicals during irrigation system maintenance and liquid/water soluble fertilisers into the irrigation system.

Automation
Controllers

Selection of controller type depends upon a number of factors:

- Level of automation required
- Power source availability
- The number of station to be irrigated
- Location of the controller

For irrigation systems that have to be expanded over a period of time, then it may be more cost effective to install a controller with enough stations for the final system, or install a controller that allows for modular expansion. This also requires the need for provision for wiring for the final system.

Valves

The basic function of a valve is to operate ‘gates’ to control the flow of water through the lateral lines.

The two types of valves on the market are:

- Manual- simple ball valve, gate valve and require an operator to active the scheduling
- Automatic- Hydraulic or electric

Hydraulic valves require a hydraulic command to open and close. They use a small water pipe (command tube) operating on the changes in water pressure through the command tube to open and close the valve.

Electric valves require an electrical input from the controller to operate the valve. Inrush current is the power required to open a valve and the holding current is the power required to keep the valve in either the opened or closed position. Irrigation valves are normally closed, that is, requires an inrush current to open and thus allowing water to flow through the valve.

Latching valves only require a current to open or close the valve and do not require a holding current thus increasing wire run lengths.

The valve configuration can be:

- Angle- water enters through the base of the valve
- Globe- water enters the valve through the side

The internal operation of the valve is hydraulic requiring venting of the water on or off the internal diaphragm to open or close the valve.

Wiring

Wiring for valves should be laid along side the pipe work. The wiring size will depend upon the maximum run length between he controller and the valve. Each valve for a multi-core system will require a common and active to each solenoid. Black is the industry standard used for the common wire.

DESIGN & INSTALLATION

Dripline Layout

The selection of the appropriate drip line will depend upon:
area to be irrigated;

- maximum run length of drip line lateral
- type of plant material to be irrigated
- soil type
- ground form. Undulating ground form and ground which has a gradient greater then 3% (3m elevation over 100m length) will require the use of a pressure compensating drip line to ensure uniform water applications along the entire drip line lateral.

With dripline irrigation, it is recommended that a Netafim dripline system be installed using a 'GRID' layout. There are many benefits both horticulturally and from a maintenance view point that make a 'GRID' installation highly recommended. Dripline may be installed as a single or "snaked" line when the area is too small to justify a grid installation. The dripline in garden beds can be installed either on top of the soil profile-underneath the mulch or below the soil usually 50mm to 100mm.

When designing a Netafim dripline irrigation system, the two critical components to be considered are the plant material to be irrigated, and the soil medium that the plants will be growing in.

For subsurface systems to turf areas, it is essential that the drippers and drip line laterals are not spaced too far apart, otherwise a green and brown striping pattern will become evident in the turf. This is due to the turf on the limits of the wetted area struggling to obtain sufficient water to maintain healthy growth. The following table provides a general guideline to the selection of the drippers and drip line spacing and depth with different soil conditions:

Type of Soil	Clay	Loam	Sand
Dripper spacing	40-50cm	30-40cm	25-30cm
Lateral spacing	50-60cm	40-50cm	30-40cm
Depth of dripline	15-20cm	10-15cm	5-10cm

While water quality is also a major consideration, a water quality test undertaken prior to the system design will influence the filtration type (i.e. disk, gravel, sand) to be used in the irrigation system. The quality of water being used in the irrigation system will also have a bearing on the maintenance of the irrigation system and the type of flush valve to be used.

When new turf is to be installed, the entire subsurface system is laid about 15 centimetres below the final grade, prior to the import of the additional layer of soil. The new layer of soil is then laid over the system using some type of light machinery (e.g Bobcat). In some sandy soils it is possible to lay only the Miniscape drip line just below the roll on turf without any additional layer of soil. The establishment of the turf requires overhead irrigation for the fist 10 to 15 days.

It is possible to install drip lines in established turf areas with minimal disruption to the turf surface, thereby reducing the length of time when the turf area is unavailable for use. For small and flat areas where the Miniscape drip line is used, a simple hedger will dig a furrow 10-cm deep and 10 mm wide just large enough for the installation of the Miniscape drip line. When using Techline or other type of drip line, a specially modified plough unit is able to inject the drip line below the turf surface to a pre-set depth. Depending upon the size of the tractor used to tow the plough unit, it may be possible to inject up to five drip lines simultaneously.

When installing a subsurface system, the drip lines are injected prior to the installation of the supply and flush manifolds. The trenches for the manifolds can however be dug before the installation of the drip lines.

It is usual to install the supply and flush pipes deeper than the dripline laterals. The dripline is then connected to the supply and flush manifolds (which can be either low-density Poly pipe or PVC pipe) using approved start connectors.

Prior to back-filling the trenches containing the supply and flush pipes, it is advisable to flush the system to check for any possible leaks that will require firing, plus to flush out any debris that may be in the pipe system following connection of the lateral drip lines. The trenches should be back-filled while the system is operating to eliminate the possibility of the drip line collapse.

Filters

Filters should be located immediately down-stream of the irrigation zones solenoid valve. It is important that the filter be located in the valve box in a manner that allows both easy access to and removal of the disk filter elements from the filter housing.

System Protection Units (Techfilters)

The Techfilter is manufactured as stated to fit into the body of standard filters as manufactured by Arkal. The cartridge will not fit into any other filter body and by design will only be able to be used correctly inside and Arkal filter body.

The Techfilter body is a standard irrigation filter body, which is manufactured by Arkal filtration systems for Netafim. The component part of the filter, which contains the Trifluralin, is only the set of filtration disks. As described above the Techfilter is available in six sizes and hence there are six cartridges or disk elements manufactured. All of the cartridges or disk elements when manufactured are sealed in a heavy-duty foil packet, which contains a label as described below.

<u>Techfilter Warning</u>

READ INSTRUCTIONS FIRST BEFORE INSTALLATION

FILTER CONTAINS TREFLURALIN
INSERT CARTIDGE INTO FILTER
BODY AND TIGHTEN SEALING RING.

USE RUBBER GLOVES AND KEEP FILTER
ELEMENT FROM CONTACTING EYES OR FACE

WASH HANDS AND FACE THOURGHLY WITH
WATER IF CONTACT IS MADE WITH SKIN.

DO NOT INHALE VAPOUR FROM ELEMENT.

Netafim irrigation equipment is sold through a Netafim Dealer Network. Netafim are industry leaders in the education and support of their dealerships. The Techfilter will only be sold through the Netafim Dealer Network and all dealers will be asked to complete a product-training course on Techfilters, which will cover correct application and use of the product.

Pressure Regulating Valves

Pressure regulator valves should be located immediately down-stream of the filter.

Note: This is the best sequence i.e. valve-filter-pressure reducing valve as this allows for the desired pressure to be set at the start of the supply manifold without any head losses caused by valves and filters.

If using an adjustable Pressure Reducing Valve, ensure that is has been adjusted to the desired pressure.

Line Flushing Valves

This is mandatory on all drip line systems. Line Flushing Valves should be installed with the inlet horizontal, and at both the lowest points and furthest points away from the inlet as possible.

Use one 1/2" Netafim line Flushing Valve for every 55 litres per minute of flow into each zone or if using scheme water a simple ball valve will suffice. Locate Line Flushing Valves in a buried valve box with a gravel sump of a size adequate to drain the flushed water, which is approximately 4 litres.

Air Release Valves

This is mandatory for all dripline systems. Need to be installed with the inlet vertical and above the drip line laterals at the highest point of the irrigation zone. In order to ensure all of the dripline laterals can take advantage of the Air Release Valve, install it on a line that runs perpendicular to the run of drip lines. This may be a flush manifold, or a lateral run of blank tubing connecting all of the rows of dripline.

For systems that are essentially flat, install the Air Release Valve following the Pressure Reducing Valve. For systems on steep slopes, an Air Release Valve needs to be installed below any check valves in both the supply and flush manifolds.

Ancillary Items

Connection points for the Ancillary items as listed in a previous section and need to be allowed for when installing a drip line system.

Pressure Gauge

- Allow for connections point downstream of Pressure Regulation Valve e.g. Schrader Valve.
- Ensure Pressure Gauge has screw base connection to suit screw fittings of both Air Release Valve and Line Flushing Valve.

Flow Meter

- Install two take off points for flow meter, one point being immediately upstream of station valve, and the second point after the pressure regulator.

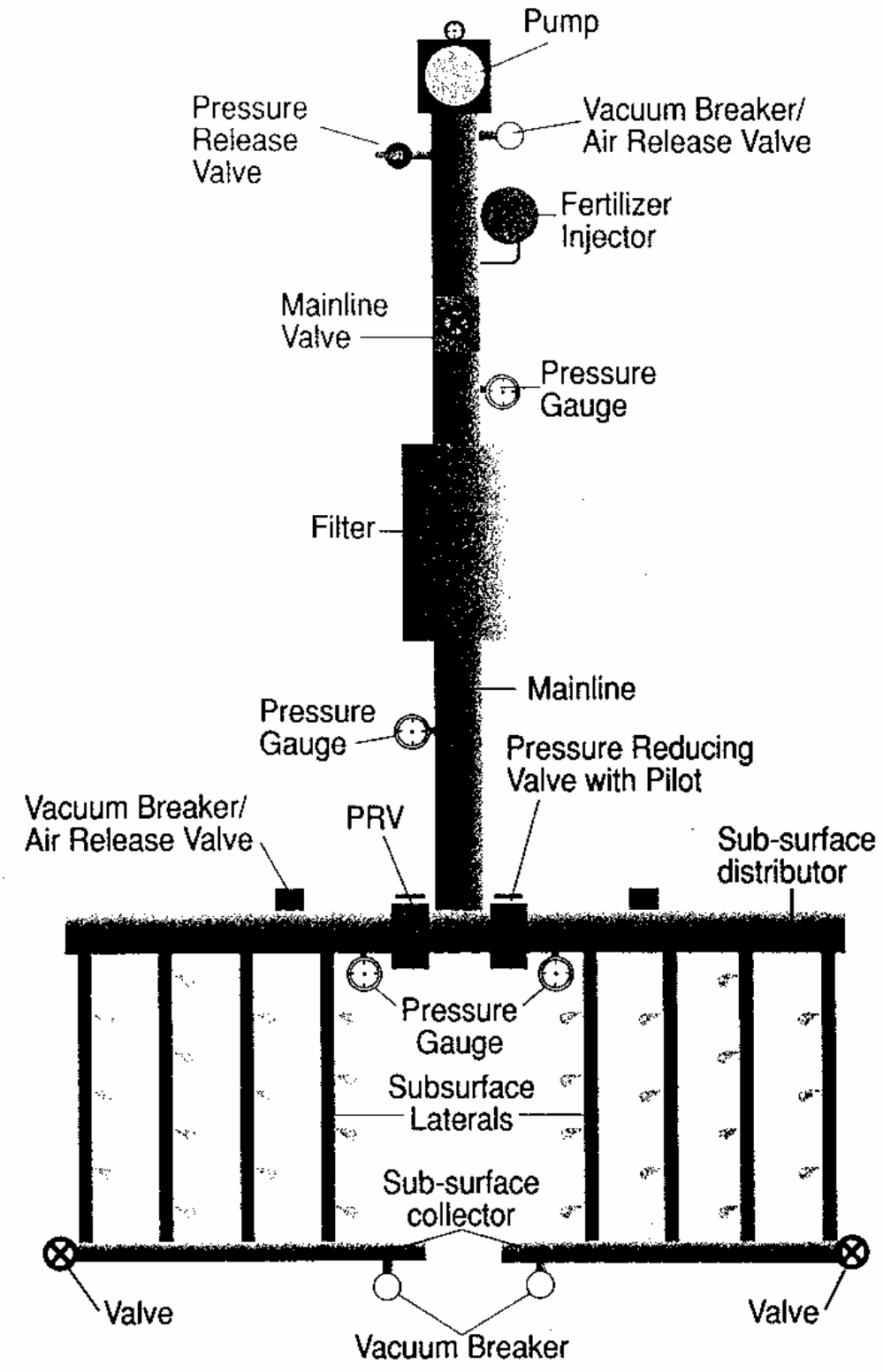
Chemical Injector

It is possible to use same inlets and outlets as for Flow Meter connection.

- Need to ensure that there is sufficient pressure differential on the line stream for proper functioning of the Venturi Pump.

Figure 1: shows a typical design for a dripline system. The supply and flush manifolds allow the water to uniformly pressurise across the system. With any Netafim subsurface system, it is imperative that both the line flushing valve and air/vacuum valves are installed.

Figure 1 : **Subsurface Drip System Layout**



System Start-up

Following completion of the installation of the complete irrigation system, the following procedures should be undertaken as part of the Irrigation System Start-Up:

- Check, clean and back-flush the fitter. If a media filter is being used, back flushing is advisable even if the filter body has just been filled with new media, as the media tends to be dusty and can cause blockages.

- If using an automatic back-flushing filter, ensure that there is sufficient pressure and that the duration of the flushing cycle is sufficient for adequate cleaning.

- The initial backwash should be done manually, making sure the duration and pressure meet the system requirements stipulated in the instructions prior to operating automatically.

- At system start-up, fill the system gradually, one sub-main at a time. Open the flushing points and flush the entire system thoroughly.

- Once the system is fully operational, check all pressures and flow rates, paying particular attention to the furthest points of the system. Make sure all operational pressures are met.

Check and record the pressure in the system at the following points:
- immediately downstream of Pressure Regulating Valve
- at the Air Release Valve
- at the Line Flushing Valve
- Ensure pressure readings are within prescribed system operational range.

- Check and record the water flow through each valve station. Compare this reading against design flow rate for each station.

To determine flow rate for each station:

- Station Flow Rate = $\frac{\text{Total length of drip line}}{\text{Dripper Spacing}} \times \text{Dripper Flow Rate}$

- If flow rate is higher than station design flow rate, check the system for any leaks at connection/join points. Rectify as required.

- Walk the field checking for damage, leaks and / or blockages in the system.

- Program the irrigation controller to meet the system requirements, and test the operation.

INSTALLATION CHECKLIST			
Project			
Client:			
Date:		**Zone Number**	#
Valve Stations			
	Valve	Size	
		Power Source	
	Filter	Size	
		Mesh Type	
	Pressure Regulator	Size	
		Spring Rating	m
		Pressure Setting (Adjustable only)	m
	Air Release Valves	Number required	No
Supply Manifold			
	Pipe Type		
	Pipe Diameter		m
	Fitting Type Required		
Flush Manifold			
	Pipe Type		
	Pipe Diameter		
	Fitting Type Required		
	Fitting for Line Flushing Valve		

DRIP LINE

- Pipe type _____
- Dripper spacing _____ m
- Dripper flow rate _____ L/hr
- Lateral spacing _____ m
- Stakes/pins required _____ YES / NO

- Assemble and install valve station
- Install supply manifold with fittings and connect to valve station
- Plug all openings
- Install dripper line laterals
- Install Air Release/Vacuum Valve to highest point of drip line system
- Connect drip line laterals to supply manifold while system is operational
- Connect drip line laterals to flush manifold while system is operational
- Install Line Flushing Valve to flush manifold

TAKE THE FOLLOWING READINGS

- Pressure at valve station (outlet side of PRV) _____ kPa
- Pressure at Line Flushing Valve _____ kPa
- Flow at valve station _____ L/hr
- Pressure loss across filter _____ kPa

MAINTENANCE

ALL DRIPLINE IRRIGATION SYSTEMS WILL REQUIRE AN ONGOING COMMITMENT TO A MAINTENANCE PROGRAM TO ENSURE THE SYSTEM OPERATES AT ITS OPTIMUM LEVEL.

The maintenance program is based on a series of inspections that can be undertaken on a regular cycle following the complete installation and start-up of the irrigation system.

The quality of the water being used in the irrigation system will dictate the level of maintenance that the system will require. For all non-scheme water supplies, it is recommended that water tests be undertaken to determine water quality. A water quality analysis should include the following:

- pH
- Free carbon dioxide
- Total alkalinity
- Total hardness
- Magnesium
- Carbonate hardness
- Total iron
- Iron in solution
- Suspended iron
- Total manganese
- Total dissolved solids
- Hydrogen sulphide

Scheme Water Systems

Annually

- Check operation of valves (electric, air/vacuum and line flushing) and
- Controller
- Check primary filtration unit for any build-up and type of deposits. Wash disks thoroughly.
- Check water pressure at end of the flush manifold. An increase in pressure will indicate a problem caused by blockages while a marked decrease in pressure will indicate a line break. Inspection of the system will be required to determine the location of the problems.
- Check primary filtration unit for any build-up and type of deposits. Wash disks thoroughly.

Bi-annually

- Replace Techfilter cartridges to maintain correct application rates of Triflurilan.

Non-Scheme Water Systems

Monthly

Filters

- Disk filters need to be inspected and cleaned periodically, with frequency being dependent upon water source.
- Remove disk spine from housing.
- Disks will decompress on spine
- Clean disks by washing in a bucket of water, or by spraying them with a hose. If algae block disks, wash in chlorine solution, and if disks are blocked by mineral build-up, wash in acid solution.
- When reassembling disk filter, ensure compression spring is located at the bottom of the cover. Do not over tighten cover as this will damage 'O' ring and will not improve sealing.
- If facilities to connect pressure gauge both immediately upstream and downstream of filter have been installed, then filter should be cleaned when pressure loss across the filter is between 35 and 70 kPa.

Dripline

Operate system for 5-10 minutes and check operational flow rate of each zone. An excessively high flow rate will indicate possible leaks in the system, while flow rates lower than designed indicate clogged drippers or kinked drip line. Walk each zone looking for excessively wet areas or excessively dry areas.

If excessively wet areas are found, expose dripline and inspect tubing for damage. When damaged section is found, either cut through the tubing, cleaning the cut, or cut and remove the damaged section of dripline. With the system running, insert joiner fitting and new section of dripline if required and rejoin sections of pipe. Install ratchet clamps, inspect for a proper fit, and recover drip line.

If excessively dry areas are found, check operating pressure of system at the valve system to ensure system is operating within the required pressure. Check operation of filter and pressure reducing valve and rectify if required. Check for leaks in the dripline or kinks in the dripline upstream of the dry area. Locate these and repair.

Air Release Valves

Operate irrigation system and observe closing action of Air Release Valve. If valve fails to close completely:

- Check to see if diaphragm has any holes in it. Replace if necessary.
- Check water pressure. If over 350 kPa or lower than 80 kPa, then check operation/adjustment of Pressure Reducing Valve.

Turn water off at valve station and listen for opening of the valve.

Line Flushing Valves

Operate irrigation station and observe closing action of Flushing Valve.
If valve fails to close completely:

- Check to see if diaphragm has any holes in it. Replace if necessary

- Check water pressure at valve. If over 350 kPa or under 80 kPa, then check operation/adjustment of Pressure Reducing Valve.
- Remove Line Flush Valve and allow system to manually flush for 30-60 seconds prior to replacing.

Pressure Regulating Valves

If Pressure Regulating Valve is leaking water out of the spring housing, then replace seal.

- Check downstream pressure with pressure gauge.

Annually

Remove 2 or 3 dripper from each irrigation zone and inspect. Drippers should be removed from the centre of each zone, as this will be indicative of the condition of all drippers.

Presence of slime, silt and other contaminants should be determined and identified and system treated accordingly as follows:

Acid Treatment

- Acid Treatment will remove the build-up of mineral deposits.
- Water analysis is required to determine mineral, and acid selection, based upon type of mineral causing build-up, soil type and plant material being irrigated.
- Rate of injection is determined by finding out quantity of acid required to being water pH to 2.
- When acid treating, operate the system for ten minutes to wet the soil, inject acid to bring water pH down to 2 for ten minutes, disconnect acid injection and run system for three times as long as acid treatment to flush system clean.

Acids are dangerous and can cause harm. Correct system analysis should be done in conjunction with an experienced Netafim dealer or Netafim field representative. Correct injection equipment must be used for the safe handling of the acid.

Chlorine Treatment

Required to prevent build up of organic matter in drip lines. Used to kill the organic matter and stop it from joining together and blocking drip lines. The amount and type of chlorine used will depend on the type of system constraints and in particular the water quality used in the irrigation system.

It may be necessary at times to inject chlorine and acid at the same time, but not mixed together. The acid is used to lower the water pH so that the chlorine can be effective in cleaning the system.

Chlorine is dangerous and should only be handled by experienced people. Consult your Netafim dealer or Netafim field representative or guidelines on chlorine requirements.

Check operation of Air Release/Vacuum Valves in cases of silt in dripper emitters, as silt maybe being sucked into drippers at system shut down.

Bi-annually

Replace Techfilter cartridges to maintain correct application rates of Triflurilan.

MAINTENANCE CHECK LIST (Sample)

PROJECT:

CLIENT:

DATE:

ITEM	YES / NO	SIGN
1. Controller function		
2. Zone flow		
3. Zone pressure		
4. Pressure Regulator Valve		
5. Filter Pressure		
Remove and clean		
Acid treatment		
Chlorine treatment		
6. Valve operation		
7. Air valves		
8. Line Flushing Valve Operation		
9. Cut open drippers from random zones		

SYSTEM OPERATION

	Pressure kPa	Flow l/hr	Filter	PRV	Air Release	Line Flush Valve
Design/Install Requirements	kPa	L/hr	kPa	kPa	kPa	kPa
Zone 1						
Zone 2						
Zone 3						
Zone 4						
Zone 5						
Zone 6						
Zone 7						
Zone 8						
Zone 9						
Zone 10						
Zone 11						
Zone 12						

PERFORMANCE SPECIFICATIONS

SCAPELINE 16 SELF- CLEANING, NON PRESSURE-COMPENSATING TUBING

Description

Scapeline tubing is a low volume dripline with integral and evenly spaced non-pressure compensating drippers at specified intervals with a flow rate of 2.0 L/hr. Scapeline tubing is available in 50 or 200 meter coils.

Construction

Scapeline shall consist of nominal sized 16mm low-density linear polyethylene tubing. The Scapeline tubing is available with internal non-pressure compensating, continuous self – cleaning, integral drippers at a specified spacing (0.3, 0.4 or 0.5 centres). The tubing shall be brown in colour and conform to an outside diameter (O.D.) of 16mm and an inside diameter (I.D.) of 13mm. Individual non-pressure compensating drippers shall be welded as an integral part of the tubing assembly. These drippers shall be a self contained one piece constructed of plastic with a large efficient turbulent flow path extending the full length of the dripper.

Operation

The drippers shall have the ability to independently self-flush, with an inlet pressure of 50 – 300 kPa, and with a manufacturer coefficient of variation (CV) of 0.03. Recommended operating pressure shall be between 50 and 300 kPa. The dripper discharge rate of 2.0 L/hr utilizing a combination turbulent flow and a reduced pressure compensation cell mechanism. The drippers shall continuously clean themselves while in operation. The dripline shall be available in 0.3, 0.4 and 0.5 m spacing between drippers unless otherwise specified.
Scapeline pipe depth shall be 100mm unless otherwise specified. For on-grade installations, Scapeline dripline stakes are recommended to be installed on 1.5 – 2.0 m intervals.
The Scapeline tubing shall be Netafim Scapeline Model Number _____ or equivalent.

TECHLINE 16 SELF- CLEANING, PRESSURE-COMPENSATING TUBING

Description

Techline tubing is a low volume dripline with integral and evenly spaced pressure compensating drippers at specified intervals with a flow rate of 1.6 or 2.3 L/hr. Techline tubing is available in 50 or 200m coils.

Construction

Techline shall consist of nominal sized 13-mm low-density linear polyethylene tubing. The Techline tubing is available with internal pressure compensating, continuous self – cleaning, integral drippers at a specified spacing (0.3, 0.4 & 0.5 centres) or blank tubing without drippers. The tubing shall be brown in colour and conform to an outside diameter (O.D.) of 16 mm and an inside diameter (I.D.) of 13.2 mm. Individual pressure compensating drippers shall be welded as an integral part of the tubing assembly. These drippers shall be constructed of plastic with a hard plastic diaphragm retainer and a soft rubber diaphragm
extending the full length of the dripper.

Operation

The drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of 50 – 400 kPa, at a constant flow and a constant flow and with a manufacturers coefficient of variation (CV) of 0.03. Recommended operating pressure shall be between 100 and 350 kPa. The dripper discharge rate of 1.6 or 2.3 L/hr utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripline shall be available in 0.3, 0.4 and 0.5m spacing between drippers unless otherwise specified.
Techline pipe depth shall be 100mm unless otherwise specified. For on-grade installations, Netafim dripline stakes are recommended to be installed on 1.5 – 2.0 m intervals.
The Techline tubing shall be Netafim Techline 16 Model Number _____ or equivalent.

TECHLINE 16 (PURPLE) SELF- CLEANING, PRESSURE-COMPENSATING TUBING

Description

Techline tubing is a low volume dripline with integral and evenly spaced pressure compensating drippers at specified intervals with a flow rate of 1.6 or 2.3 L/hr. Techline tubing is available in 50 or 200m coils. Techline 16 Purple shall be purple in colour to indicate re-use water being used in the system

Construction

Techline shall consist of nominal sized 13-mm low-density linear polyethylene tubing. The Techline tubing is available with internal pressure compensating, continuous self – cleaning, integral drippers at a specified spacing (0.3, 0.4 & 0.5 centres) or blank tubing without drippers. The tubing shall be purple in colour and conform to an outside diameter (O.D.) of 16 mm and an inside diameter (I.D.) of 13.2 mm. Individual pressure compensating drippers shall be welded as an integral part of the tubing assembly. These drippers shall be constructed of plastic with a hard plastic diaphragm retainer and a soft rubber diaphragm
extending the full length of the dripper.

Operation

The drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of 50 – 400 kPa, at a constant flow and a constant flow and with a manufacturers coefficient of variation (CV) of 0.03. Recommended operating pressure shall be between 100 and 350 kPa. The dripper discharge rate of 1.6 or 2.3 L/hr utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripline shall be available in 0.3, 0.4 and 0.5m spacing between drippers unless otherwise specified.
Techline pipe depth shall be 100mm unless otherwise specified. For on-grade installations, Netafim dripline stakes are recommended to be installed on 1.5 – 2.0 m intervals.
The Techline tubing shall be Netafim Techline 16 Model Number _____ Purple or equivalent.

DRIPMASTER 17 (BLACK) SELF- CLEANING, PRESSURE-COMPENSATING TUBING

Description

Dripmaster tubing is a low volume dripline with integral and evenly spaced pressure compensating drippers at specified intervals with a flow rate of 1.2, 1.6, 2.3 or 3.5 L/hr. Dripmaster tubing is available in 400m coils.

Construction

Dripmaster shall consist of nominal sized 14.6-mm low-density linear polyethylene tubing. The Dripmaster tubing is available with internal pressure compensating, continuous self – cleaning, integral drippers at a specified spacing (0.3, 0.4, 0.5, 0.6, 0.75, 0.9 or 1.0m centres) or blank tubing without drippers. The tubing shall be black in colour and conform to an outside diameter (O.D.) of 17 mm and an inside diameter (I.D.) of 14.6 mm. Individual pressure compensating drippers shall be welded as an integral part of the tubing assembly. These drippers shall be constructed of plastic with a hard plastic diaphragm retainer and a soft rubber diaphragm extending the full length of the dripper.

Operation

The drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of 50 – 400 kPa, at a constant flow and a constant flow and with a manufacturers coefficient of variation (CV) of 0.03. Recommended operating pressure shall be between 100 and 350 kPa. The dripper discharge rate of 1.2, 1.6, 2.3 or 3.5 L/hr utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripline shall be available in 0.3, 0.4, 0.5, 0.6, 0.75, 0.9 or 1.0m spacing between drippers unless otherwise specified.
Dripmaster pipe depth shall be 100mm unless otherwise specified. For on-grade installations, Netafim dripline stakes are recommended to be installed on 1.5 – 2.0 m intervals.
The dripline tubing shall be Netafim Dripmaster 17 Model Number _____ or equivalent.

DRIPMASTER 17 (PURPLE) SELF- CLEANING, PRESSURE-COMPENSATING TUBING

Description

Dripmaster tubing is a low volume dripline with integral and evenly spaced pressure compensating drippers at specified intervals with a flow rate of 1.2, 1.6, 2.3 or 3.5 L/hr. Dripmaster tubing is available in 400m coils. Dripmaster 17 Purple shall be purple in colour to indicate re-use water being used in the system

Construction

Dripmaster shall consist of nominal sized 14.6-mm low-density linear polyethylene tubing. The Dripmaster tubing is available with internal pressure compensating, continuous self – cleaning, integral drippers at a specified spacing (0.3, 0.4, 0.5, 0.6, 0.75, 0.9 or 1.0m centres) or blank tubing without drippers. The tubing shall be purple in colour and conform to an outside diameter (O.D.) of 17 mm and an inside diameter (I.D.) of 14.6 mm. Individual pressure compensating drippers shall be welded as an integral part of the tubing assembly. These drippers shall be constructed of plastic with a hard plastic diaphragm retainer and a soft rubber diaphragm extending the full length of the dripper.

Operation

The drippers shall have the ability to independently regulate discharge rates, with an inlet pressure of 50 – 400 kPa, at a constant flow and a constant flow and with a manufacturers coefficient of variation (CV) of 0.03. Recommended operating pressure shall be between 100 and 350 kPa. The dripper discharge rate of 1.2, 1.6, 2.3 or 3.5 L/hr utilizing a combination turbulent flow/reduced pressure compensation cell mechanism and diaphragm to maintain uniform discharge rates. The drippers shall continuously clean themselves while in operation. The dripline shall be available in 0.3, 0.4, 0.5, 0.6, 0.75, 0.9 or 1.0m spacing between drippers unless otherwise specified.
Dripmaster pipe depth shall be 100mm unless otherwise specified. For on-grade installations, Netafim dripline stakes are recommended to be installed on 1.5 – 2.0 m intervals.
The dripline tubing shall be Netafim Dripmaster 17 Model Number _____ or equivalent.

MINISCAPE 8 FITTINGS

Description

Miniscape 8 fittings shall be constructed in one of the following end configurations:

- Barbed insert fittings only,
- Male parallel base with barbed insert fittings, or
- Female parallel base with barbed insert fittings.

Construction

All fitting shall be constructed of molded plastic having a nominal outside dimension (O.D) of 8 mm.

Operation

Miniscape connections shall be mated with Netafim Miniscape 8 tubing by pushing the tubing and twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop. The Miniscape fittings shall be Netafim single barbed fittings.
The fittings shall be Netafim Miniscape fitting Model Number _____ or equivalent.

SCAPELINE 16 FITTINGS

Description

Scapeline 16 fittings shall be constructed in one of the following end configurations:

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

Construction

All fitting shall be constructed of molded plastic having a nominal outside dimension (O.D) OF 16 mm. Female and male threaded ends shall be capable of mating to standard PVC pipe threads with tapered threads.

Operation

Scapeline connections shall be mated with Netafim Scapeline 16 tubing by pushing the tubing and twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop. The Scapeline 16 fittings shall be Netafim double barbed fittings or 13mm Poly fittings with ratchet clamps.
The fittings shall be Netafim Scapeline fitting Model Number _____ or equivalent.

TECHLINE 16 FITTINGS

Description

Techline 16 fittings shall be constructed in one of the following end configurations:

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

Construction

All fitting shall be constructed of molded plastic having a nominal outside dimension (O.D) OF 16 mm. Female and male threaded ends shall be capable of mating to standard PVC pipe threads with tapered threads.

Operation

Techline connections shall be mated with Netafim Techline 16 tubing by pushing the tubing and twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop. The Techline 16 fittings shall be Netafim double barbed fittings or 13-mm Poly fittings with ratchet clamps.
The fittings shall be Netafim Techline fitting Model Number _____ or equivalent.

DRIPMASTER 17 FITTINGS

Description

Dripmaster 17 fittings shall be constructed in one of the following end configurations:

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

Construction

All fitting shall be constructed of molded plastic having a nominal outside dimension (O.D) OF 17 mm. Female and male threaded ends shall be capable of mating to standard PVC pipe threads with tapered threads.

Operation

Dripmaster 17 connections shall be mated with Netafim Dripmaster 17 tubing by pushing the tubing and twisting side to side until the tubing abuts to either adjoining tubing or a fitting stop. The Dripmaster 17 fittings shall be Netafim double barbed fittings or 13-mm Poly fittings with ratchet clamps.
The fittings shall be Netafim Dripmaster 17 fitting Model Number _____ or equivalent.

LINE FLUSHING VALVE

Description

Line flushing Valves are used to reduce sediment build-up within the Techline tubing and to pass sediments or debris, which may have not been captured by the disc filter.

Construction

The line-flushing valve shall be constructed of molded plastic with one of the following end configurations:

- ½ " MPT
- Insert barbed fitting

Operation

The line-flushing valve shall operate at the beginning of the irrigation cycle as the system begins to pressurize, but before drip operation begins, and shall be capable of flushing approximately four litres of water at a minimum pressure of 100 kPa.

Note: Permanent damage could be sustained to the line-flushing valve where incoming pressures exceed 350kPa. Pressure regulations are recommended even with pressure compensating remote control valves, which tend to pause for a brief period of time before pressure compensation occurs.

Line flushing Valves are to be installed in a valve box with a gravel sump to allow for periodic inspection and are to be installed with the dome portion of the flushing valve facing upward.
The line Flushing Valve shall be Netafim Model Number _____ or equivalent.

AIR/VACUUM RELIEF VALVE

Description

The air/vacuum relief valve serves two purposes:

1. To evacuate air from the Techline laterals during system start-up and,
2. 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 ½" 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 or berm), an air/valve relief lateral shall interconnect the Techline dripper lines to avoid the necessity of installing one air relief valve on each Techline 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 _____ or equivalent.

PRESSURE REGULATION VALVE

Description

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

Construction

The pressure regulator shall be a Netafim spring-operated piston-type unit with an externally accessible regulation unit that can be serviced without removing the valve from the system. The body shall be molded of black plastic with a combination of male/female pipe threaded inlet and outlet. Removable and interchangeable springs shall be colour-coded to denote varying pressure ranges.

Operation

The regulator shall have a built-in indicator that shows when it is operating.
It shall be able to respond immediately to any inlet pressures variation. The regulator shall be capable of regulating from 100 to 350kPa.
The pressure regulator valve shall be a Netafim Model Number _____ or equivalent.

NETAFIM DRIPLINE STAKE AND INDICATOR FLAG

Description

The Netafim dripline stakes are used to hold dripline down to the soil surface. The stake shall be installed at 1-2 meter intervals. The Netafim indicator flags are used to indicate the operation of an irrigation zone. The flags are to be installed at the end of the laterals and are activated by pressure in the system to indicate operation.

Construction

The stake and flag are constructed of molded plastic.

Operation

The stakes are to be installed as per specification and flag operate within a pressure range of 100-350 kPa. The irrigation zones are to be protected from pressure fluctuations by installation of Netafim pressure regulation valves.

The indicator flag shall be a Netafim indicator flag model number LIF or equivalent.

DISC FILTER

Description

The purpose of the disc filter is to capture and retain water-transported debris or sediments that could reduce the efficiency of the Techline Drippers.

Construction

The filter shall be a multiple disc filter with colour-coded filter elements indicating the size of the element being used. The disc shall be constructed of the chemical resistant thermoplastic for corrosion resistance.
The disc filter body shall be molded of black plastic with pipe threads for both inlet and outlet. A portion of the disc filter shall be capable of periodic servicing by unscrewing a threaded cap or unlatching the band. The ¾'' mode shall have an integral manual shut-off value option.

Operation

Typical installation of the disc filter shall be per the enclosed details or based or regional practices. Disc filters can be installed downstream of the remote control valve to allow for periodic servicing when the remote control valve is not operating or upstream of the remote control valve if the disc filter is specified with manual shut-off valve or when a line size ball valve is also specified to allow for periodic servicing with a pressurized mainline.
Recommended installation of disc filters shall be below grade positioned in a large enough valve box to remove the cap and internal disc element. A gravel sump in the bottom of the valve box is recommended to drain off water during periodic maintenance procedures. The filters can be installed above ground when security enclosures are provided.

The filter shall be a Netafim Model Number _____ with a maximum flow of _____L/min and a maximum pressure loss _____kPa or equivalent.

TECHFILTER

Description

The purpose of the disc filter is to capture and retain water-transported debris or sediments that could reduce the efficiency of the Techline Drippers and inject Trifluralin into the system to prevent root intrusion.

Construction

The filter shall be a multiple disc filter with colour-coded filter elements indicating the size of the element being used. The disc shall be constructed of the chemical resistant thermoplastic for corrosion resistance. The disc shall be impregnated with a low concentration of Trifluralin to be transmitted throughout the system.
The disc filter body shall be molded of brown plastic with pipe threads for both inlet and outlet. A portion of the disc filter shall be capable of periodic servicing by unscrewing a threaded cap or unlatching the band.

Operation

Typical installation of the disc filter shall be per the enclosed details or based or regional practices. The techfilter cartridge is recommended to be changed every two years as to replace the Trifluralin in the discs. Disc filters can be installed downstream of the remote control valve to allow for periodic servicing when the remote control valve is not operating or upstream of the remote control valve if the disc filter is specified with manual shut-off valve or when a line size ball valve is also specified to allow for periodic servicing with a pressurized mainline.
Recommended installation of disc filters shall be below grade positioned in a large enough valve box to remove the cap and internal disc element. A gravel sump in the bottom of the valve box is recommended to drain off water during periodic maintenance procedures. The filters can be installed above ground when security enclosures are provided.

The techfilter shall be a Netafim Techfilter Model Number _____ or equivalent.

NETAFIM REMOTE CONTROL VALVE

Description

The Netafim Remote Control Valve is used to control the flow of water to drip irrigation zones within a landscape area. The Netafim valve is available in 25 mm, 40mm and 50mm BSP threaded ports and can be actuated by 24-volt AC or 12 volt DC signals.

Construction

The Netafim Remote Control Valve shall be constructed of fiberglass reinforced nylon, with EPDM diaphragms and no springs. The body shall be held together by four stainless steel screws with counter sunk ports to prevent the screws falling out when bonnet is removed. The actuation mechanism shall be totally sealed and shall not come into contact with the irrigation water. The valve shall be capable of being installed under water for prolonged periods of time without fear of actuator failure. The valve shall have an in-built flow control mechanism, which does not release on diaphragm restriction. The flow control shall be like an internal “ball Valve” which controls flow and hence there shall no possibility of cavitating the valve.
The valve shall have a protective coloured top, which prevents excessive heat transmission into the top of the valve if it is installed out side of a valve box. The valve shall be available with AC or DC actuation, have three way water control with internal bleed and have internal ports of 2.0 mm or larger.

Operation

It is recommended that there be a gravel base in the valve box to allow any water that enters the box to drain away quickly.

The valve shall have an inrush current of 150 milli Amps and a holding current of 0.1 to 0.2 milli Amps at all pressure ranges.

The valve shall be set to run automatically or manually by setting the desired mode on the top of the valve. The valve shall be capable of operating within a flow range of 25 L/hr to 6m^ 3/hr and a pressure range of 20 to 1000 kPa.
The valve shall be a Netafim Model Number _____ with a maximum flow of _____L/min and a maximum pressure loss _____kPa or equivalent.

WEATERMATIC 25mm VALVE

Description

Remote control valve shall be No. 12024EF series Valves as manufactured by Weathermatic Sprinkler Division for Netafim with hand operated manual internal bleed and flow control. Valve shall be solenoid operated, diaphragm, reverse flow type, with 125 psi CWP rating, having BSP threads and suitable for underground burial without protection.

Construction:

Valve shall be of a PVC solvent weld type with glass filled high strength plastic cover and stainless steel spring. Cover shall be secured to body with stainless steel cover bolts having mating brass body inserts. Diaphragm shall be chlorine resistant Santoprene and shall utilize conical base to reduce water hammer.

Design shall be reverse flow causing automatic closure in event of diaphragm wall failure. Valve shall be packless without sliding seals, and completely serviceable without removing body from pipeline. Design shall be “normally closed” requiring solenoid to be energized to open valve, thereby causing automatic closure in event of power failure. Solenoid when operating, requires a maximum of 6.2 VA at 24 volts AC. Solenoid shall be integrally mounted in valve cover and encapsulated in molded – resin to form a corrosion and moisture – proof unit with exposed metal components of non- corrosive material. Flow control shall be adjustable from outside the valve for permanent throttling or complete closing of valve. Flow control is non rising.

Operation

Solenoid shall be energized to open the valve hydraulically and de-energized to close. Pressure to the hydraulic chamber shall be supplied internally through non-metallic, corrosion free orifices in the diaphragm causing a cleansing action of the orifices. Contamination resistance shall be provided without the use of screen, filters or strainers. In event of tear in diaphragm wall valve shall remain in the closed position. Minimum flow range shall be no greater than 4.5L/hr.

The valve shall be a Netafim Model Number _____ with a maximum flow of _____L/min and a maximum pressure loss _____kPa or equivalent.

NETAFIM FLORI VALVE

Description

The Netafim Flori valve is a control valve is a control valve combining the features of a Netafim Remote control valve with a unique soil moisture sensor. The Flori sensor shall be powered by a 9-volt DC battery or a transformer from a 240-volt AC power point.

After installation the operator shall set the desired moisture level that they would like to have in the soil via the dial face of the Flori controller. When operational, the Flori controller shall receive a moisture status report from the sensor every 20 minutes of the day. If the moisture level in the soil is below the desired moisture then the Flori controller shall instruct the Netafim valve to open and irrigation will commence. During irrigation the sensor shall receive a moisture level update every five minutes and will turn the valve off when the desired water level in the soil is reached. The Flori shall be able to work within strict water windows so that the irrespective of the soil moisture reading irrigation will not occur if there is a water window restriction placed on the placed on the running of the irrigation system. The Flori sensor, controller and valve shall be factory built into a kit ready for use.

Construction

The Flori is constructed from Netafim Valve, a sensor and a small control box.
The Flori is assembled in the Factory and is waterproof. All parts are construct from molded plastic except the sensor, which has a patented coating over the mold probe and the electronics components.

Operation

The operation of the Flori is via AC or DC power and the probe must be inserted in a HORIZONTAL position into undisturbed soil. The Flori is capable of being operated for the period of 12 months with on 9V alkaline battery. The Flori can operate in a temperature range of 0 to 60 degrees. The sensor can be up to 30 meters from controller. 5 meters is standard. The water window interruption interval can be set between 2 and 20 hours per day.
The controller shall be a Netafim Flori controller model number _____ or equivalent.

NETAFIM MIRACLE CONTROLLERS

Description

The controller is used to sequence the operation of irrigation zones within the landscape. The controller shall operate via AC or DC power supply.

Construction

The miracle controller shall be constructed of molded plastic and have a Motor electronics circuit board and componentry.

Operation

The controller shall be available in 6, 9 or 12 station configurations and have three independent programs, which if required will operate concurrently. The controlled will be capable of four start times per program per day, which will be total of 4 possible start times per day. The valve run time will be variable between 1 minute and 9 hours 59 minutes. The schedule will be based on a 7 day weekly cycle with the option to skip days up to 7 days between irrigation intervals. The controller shall have a water budget feature which will enable pre set run times to be vary between 10 and 200% for seasonal variation in water requirement. The controller shall be available in AC an DC power configurations with the DC version being capable of 1 years operation powered by a 9-Volt alkaline battery. The controller shall have an in-built fail-safe program, which will operate every station for 10 minutes everyday stating at 7.00 am. The controller shall have a rain delay face sensor input over ride, which can be a Flori moisture sensor or a rain sensor. The controller shall have Alarm display features, which indicate to the operator when there is no power, short circuit or general hardware failure. The controller shall also be capable of identifying a short circuit in the field and then locking out that zone without shutting down the controller operation. The controller shall have manual override features and real time monitoring.

The controller shall be a Netafim Miracle controller model number _____ or equivalent.

OUTDOOR DOME TYPE CABINET

Description

Miracle Controller shall be installed into an outdoor dome type cabinet in-conjunction with a domestic indoor cabinet. The dome type cabinet shall be cylindrical in shape, green in colour with an anchoring galvanised pier.

Construction

Cylindrical dome shall be made out of ABS plastic resistant to all weather conditions and solar radiation. The diameter of the plastic cylinder shall be 275mm and height 538mm with a wall thickness of not less than 5mm and weight of 9.1kg. The lid shall be molded to the walls and have 6 breather holes to reduce condensation. The lid shall have raised printing stating; Channel Commercial Corporation, Telecommunications, Signature Series Broadband. The powder coated galvanised channel shape pier shall be attached with 2 stainless steel nuts and bolts fixed to the walls of the cylinder. A powder-coated bracket shall be fixed to the galzanised pier where the domestic indoor cabinet L25-MPR-CAB is mounted with two screws.

Operation

The Outdoor dome type cabinet shall be fixed to the ground with concrete. The pier and the wall of the dome to the ground level (indicated on the wall of the dome) shall be concrete both internally and externally as to stabilize the unit and prevent vandalism or theft. The domestic indoor cabinet shall be mounted to the bracket of the cabinet and Miracle controller to be mounted inside. The dome lid shall be attached by sliding the lid over the indoor cabinet and locking it into position to the base. A key shall be provided to unlock the lid of the dome from the fixed base.
The outdoor dome cabinet shall be Netafim Model Number L70004 and the domestic indoor cabinet shall be Netafim Model Number L25-MRP-CAB or equivalent.

P200 SERIES SPRAY

Description

Lawn spray head shall be a P200 (Options: -CV and/or –NP) as manufactured by Weathermatic Sprinkler Division for Netafim. Heads shall pop up not less than 75mm with spring retraction. Heads shall accept a plastic matched precipitation rate nozzle, a fixed arc milled brass nozzle, or an adjustable plastic nozzle. Heads shall have ratcheted flow tube for arc location purposes and shall be check valve adaptable.

Construction

Body, cover and flow tube shall be high-impact ABS. A Stainless steel spring shall provide retraction force. Outside entry of sand and dirt shall be prevented with a pressure-activated wiper seal. Arc location shall be by means of a positive stop-ratcheting device permitting the arc to be located by depressing flow tube while sprinkler is in operation. (Option: The sprinkler shall be equipped with factory installed check valve and shall hold back 2.9m with minimum pop up and seal pressure of 120kpa and/or a model LX-NP purple, snap on non-potable alert ring shall be provided on all installations requiring the use of non-potable water supplies.

Operation

The nozzles shall either provide adjustable flows and areas of coverage at rated pressure requirements in both full-circle and part circle types. All nozzles series must have matched precipitation to the extent that full and part circle nozzles can be valved together.
The spray body shall be a Netafim Model Number _____ and the nozzle shall be Netafim Model Number _____ or equivalent.

P2000 GEAR DRIVE ROTOR

Description

Rotary head sprinklers shall be the P2000 (Options: N and /or XVT) as manufactured by Weathermatic Sprinkler Division for Netafim. Sprinkler shall be a 100mm pop-up type with positive gear drive for full-circle and part circle coverage and 19mm BSP riser connection.

Construction

Head shall be made of high strength, non-corrosive plastics and metals to ensure long-life performance. The sprinkler head shall have a sealed, lubricant-packed drive housing to assure long-life performance. Sprinkler head shall have a threaded screw on cover and include an option of a Non-potable Alert rubber cover. Sprinkler head shall utilize a double lip pressure activated wiper seal in conjunction with a stainless steel spring to assure positive head retraction. A slip clutch shall be included to protect gear train from damage. Reversing mechanism shall utilize an independent filtration system to prevent stalling. A check valve shall be provided to prevent low head drainage. Arc degree settings shall be clearly marked on adjustment ring to permit ease of adjustment.

Operation

The arc adjustment ring on nozzle flow tube shall permit quick adjustment of arc size from 40 degrees to 360 degrees without the use of tools or the removal of the inner assembly. A set of field changeable nozzles shall be provided with each sprinkler to adapt performance to site conditions. The sprinkler shall have an automatic adjusting stator to correctly match flow required at the impeller with the nozzle selected and to regulate speed rotation. Sprinkler shall momentarily dwell at the end of both arcs to provide uniform precipitation to border areas. Sprinkler head shall accept the vandal cover lock (XVT3) to lock cover to body.
The rotor shall be a Netafim Model Number _____ or equivalent.

P2040 GEAR DRIVE ROTOR

Description

Rotor sprinkler head shall be the P2040 (options: - N and or XVT) as manufactured by Weathermatic Sprinkler Division for Netafim. Sprinkler shall be a 100mm pop-up type with positive gear drive for full circle and part- circle coverage and 25mm BSP riser connection.

Construction

Head shall be made of high-strength, non-corrosive plastics and metals to ensure long-life performance. The sprinkler head shall have a sealed, lubricant-packed drive housing to assure long life performance. Sprinkler head shall have a threaded screw on cover and included an option of a Non-potable Alert rubber cover. Sprinkler head shall utilize a double lip pressure activated wiper seal in conjunction with a stainless steel spring to assure positive head retraction. A slip clutch shall be included to protect gear train from damage. Reversing mechanism shall utilize an independent filtration system to prevent stalling. A check valve shall be provided to prevent low head drainage. Arc degree settings shall be clearly marked on adjustment ring to permit ease of adjustment.

Operation

The arc adjustment ring on nozzle flow tube shall permit quick adjustment of arc size from 40 degrees to 360 degrees without the use of tools or the removal of the inner assembly. A set of field changeable nozzles with a flow range of 36.5 to 126 L/min, shall be provided with each sprinkler to adapt performance to site conditions. The sprinkler shall have an automatic adjusting stator to correctly match the flow required at the impeller and to regulate speed of rotation. Sprinkler shall momentarily dwell at the end of both arcs to provide uniform precipitation to border areas. Sprinkler head shall accept the vandal cover lock (XVT3) to lock cover to body.
The rotor shall be a Netafim Model Number _____ or equivalent.

1.0 TENDER SPECIFICATION

SCOPE OF WORKS

The Contractor shall design, supply, install and commission an automatically operated irrigation system to cover all turfed and garden areas as indicated below. The irrigation system shall be designed and constructed to ensure uniformity and sufficient water to achieve optimum plant growth. Items not specified, but normally required to conform to such intent, are to be considered part of the irrigation works. Ensure that the irrigation system provides a minimum precipitation rate to all areas of 50mm per week. Provide proof of achieving desired rates if requested.

Provide a full irrigation design and product specifications, to the superintendent for approval prior to construction. Provide proof of achieving desired flow rates.
Note:

- All irrigation must comply with AS-NZS. 3500.98.
- All irrigation on the road reserve is to be approved by the local authority with proposed irrigation plans submitted and any fees paid by the contractor prior to construction.

Provide the name of the proposed irrigation contractor to be used on the project and a list of five (5) similar projects undertaken in the last (3) years, for approval and acceptance of the Superintendent.

Regulations and permits

The contractor shall comply with the regulations and by-laws of the local authority, and all other relevant authorities and ensure that all approvals and permits are obtained. The contractor must pay all necessary fees for, and submit a copy of, all permits and approvals to the superintendent prior to acceptance of the system.

Protection of works

The contractor shall be responsible for the protection of the irrigation works throughout the contract period against damage by storm, flood, theft or negligence, and shall allow making good any such damage.

System design

The automatic irrigation shall consist of **'NETAFIM'**, drip irrigation system to all turf and garden areas. All conduits required for pipe access beneath pathways and podium planters and the like are to be 100 mm diameter (only less when space is restrictive) PVC Class 12 and to be shown on the irrigation as built drawings. Sleeve and waterproof all planter wall penetrations and the like to superintendent's satisfaction.

Backflow prevention

A water supply point and RPZ valve has been included under the hydraulic consultant's documentation for the purpose of irrigation as indicated on the drawings. The sizing of all

pipe-work shall be determined by the design parameters set out in this specification and the available water pressure on site. The contractor is responsible for providing any additional backflow prevention devices required.

Controller

The system shall be controlled by a fully automatic controller which is to be located at the indicated point on the plan. The size and type of control system will be appropriate for the irrigation for the total landscape area. All wiring from the Controller in the ground shall be contained within a conduit. The Controller is to have an approved 240 VAC transformer, dual programming, multiple start times per day, 7 day programmer ability, manual override facility and is to be capable of full automatic unattended operation.

All electrical work shall be designed in accordance with the relevant Australian standards and power authority design guidelines. All controllers shall be housed in freestanding lockable waterproof IP rated cabinets. A rain sensor for automatic shut off during periods of high or prolonged rainfall is also to be included in the system.

The controller shall be a Netafim Miracle AC 12 Station or equivalent. The Netafim part no. shall be LMIRACLE-12-AC

Control Valves

All automatic control valves for each garden section must be installed within planting areas and located close to path or bed edges for ease of access. All valves shall be unobtrusively located in covered pits in such a way that all parts of the valve can be reached for servicing.

Valves shall have 24 VAC solenoid operation, with manual bleed, pressure regulating, manual shut-off and flow control and be constructed of engineering plastic and stainless steel and have a minimum pressure rating of 1000kpa. Manually operated Isolating Valves shall be included throughout the system to permit isolation of areas for maintenance purposes. Allow for one Isolating Valve to be located on the up-stream side of each Automatic Control Valve. All valves are to be placed in a suitable valve box.

The valves shall be a Netafim 25mm Weathermatic Valve with flow control or equivalent. The Netafim Part No. shall be L12024EF-10-ISO.

Dripline

The inline drip irrigation system in all garden areas shall be designed in a grid pattern suited to the soil, plant types and plant spacing. The Maximum operating pressures and run length (as per the manufacturer specifications) should not be exceeded.

Appropriate Air/vacuum release valves shall be installed at the highest points of each zone located within a 150mm round valve box. Flush manifolds and automatic flush valves (located within a 150mm round valve box) shall be used on all sub-surface installations regardless of the water quality. Disk filters with a minimum 120 mesh shall be sized according to flow and installed as the main filtration system for each station. Techfilter shall be sized according to flow and installed downstream of the disk filtration

system for each station

The inline drip tube shall be Netafim Techline 16 or equivalent. The Netafim Part No. shall be LR16-16B040.
The Air/vacuum release shall be Bermad Vacuum Release or equivalent. The Netafim Part No. shall be L45430-05.
The Flush Valve shall be Netafim Flush Valve or equivalent. The Netafim Part No. shall be L23N00-04-05.
The Disc filter shall be a 25mm Arkal Disc Filter or equivalent. The Netafim Part No. shall be L1311-1120.

Pipe Work

Ensure all piping is sized so that water velocities do not exceed 1.0m/sec in mainlines and 1.5m/sec in lateral lines. Arrange and support pipe work as necessary so that it remains free from vibration while permitting necessary movements. Mainline trenches shall be a minimum width of 200mm. Backfill material shall be free of rocks, sticks, debris and the like. Ensure a minimum cover to all pipe work of 350mm. Spacing between multiple pipes in common trenches shall be not less than 50mm. Main line piping shall be sand bedded a minimum of 50mm all round. Ensure head feeder lines and the like are within mulch layer or planters.

Control Cabling

Common, active and sensor cabling shall be insulated building wire as required. Light duty grey conduit shall be used for exposed areas such as ceilings, walls, etc and shall be used wherever wires are required to go under paths and the like within the 100mm conduits specified. Paint all exposed conduits to match surrounding surfaces. Ensure all wire joints are thoroughly waterproof.

Valve Boxes

Ensure all valve boxes as required are to foot traffic grade. All lids shall be secured with a stainless steel bolt. Finish top of boxes flush with surrounding mulch. Boxes are not to be located in turf areas unless otherwise directed. Number all boxes clearly to coincide with station numbers shown on as built irrigation drawings. Place minimum 100mm depth 20-25mm nominal diameter gravel to base of valve boxes.

Final Inspection

The irrigation shall be inspected after completion by the Superintendent and approved only after the following items have been achieved or attended to:

- System has been run for seven (7) consecutive fully programmed cycles over a period of seven (7) days.
- Repair of damage or vandalism caused during construction.
- Submission of ‘AS CONSTRUCTED DRAWINGS’ to the Superintendent (1 set of black and white photocopies).
- Submission of Warranties and operation manuals
- Training of operators.

- Correct Programming of controller.
- System fully covers all landscaping as required.
- Correct operation of valves to ensure last sprinkler in line operates at design pressure.
- Proof that the local Authority has approved the irrigation system
- The non-existence of water hammer during system operation.
- The irrigation system has been maintained and suitably adjusted during the establishment Period.