NETAFIM

Agriculture Dept.

TECHNICAL INSTRUCTIONS

2003

Http://www.netafim.com
K.Hazerim, D.N Negev 85420; Tel: +972-8-6473728; Fax: +972-8-6473017
E-mail: haia@netafim.com

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PLEASE NOTE

This instruction manual takes precedence over all earlier ones.

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K.Hazerim, D.N Negev 85420; Tel: +972-8-6473728; Fax: +972-8-6473017
E-mail: haia@netafim.com

Preventing sand penetration in drip systems

1) Sand is the most dangerous element for drippers. If sand is stuck in a dripper, it is impossible to remove or decompose it.
   This is true in all types of drippers.
2) Sand can penetrate into the system with the water flow or directly from the local sandy soil. Local sandy soil is the biggest danger since the sand, which penetrates with the water, is not filtered before entering the dripper.
3) Sand cannot be dissolved and doesn't decompose with chemical treatment.
4) Preventative action is the only way to avoid sand damage.

Sand penetration during installation

* Make sure that the main & sub main pipes remain clean.
* Do not leave pipe inlets and outlets open, even for a short period of time. Bend the 2 ends of each lateral.
* When drilling holes, immediately install the start connector and connect the lateral. Never leave a pipe in the field with open holes.
* After installing the laterals, immediately plug the ends.
* When the installation is complete, flush the system with the maximum water flow. Start with the mains and then the laterals.
* Laterals should be flushed in groups of 6 at the time.
* The filter system should be checked as another possibility for sand penetration.
* From any water source the water should be pumped from the highest level (depth of 0.5 m to 1 m below water surface).
* Make sure that the installers are aware of the above points.

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Requested data for problems such as clogged drippers, sedimentation, and filtration difficulties.

Mark the relevant point.

1. Define the problem: clogging, problematic flow-rate, routine test.
2. Relevant equipment type: … .....Dripper flow-rate:..... Equipment age:.....
3. Water source: Well, River, Lake, Dam, reservoir, etc.
4. In the reservoir data, state the following:

   Reservoir size:.....Maximum water depth:.....

   Pumping type:.....

   ” floating suction point” State pumping depth in relation to the water surface:.....

   “ permanent suction point” Pumping point location. Indicate the distance from the surface and from the bottom:.....

   Suction direction:

   suction vertical up

   suction horizontal

   suction vertical down

5. Indicate the distance between the water inlet and the pumping point in dam, pond, etc.
6. Indicate pipe length from reservoir to field:..... Pipe diameter:.....

   Pipe type: Steel, asbest cement, PVC, others.

7. Filter type: Reservoir:..... Field:.....

   Hydrocyclon: Netafim cyclons, Others.....

   Automatic / manual filters: Sand filter, Spinklin, Screen filters.....

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Control filters: Arkal disk, Odis disk/screen, Amiad disk/screen, others.

State the operating quality of the above mentioned filters:

Works well / clogs frequently / flushes frequently.

The filtration system (automatic & control) works properly.

The automatic filter is OK but the control filters rapidly become blocked.

The automatic filter is rapidly blocked and back flushed very often.

8.Type of fertilizer & chemicals injected into the system:.....

Indicate all fertilizers you use, a formula is greatly preferable than a generic name:..... .....

Take one teaspoonful of the fertilizer you use in a transparent glass, add tap water, and mix thoroughly. Check the glass after one hour, if you identify a sediment do not use this fertilizer.

Indicate other chemicals you inject into the drip systems:.....

9.Water treatments:.....

Mark the relevant treatment you use: Chlorination, Acid treatment, others.

10. Sampling of the dripper lines

* Take samples in one representative plot only, Follow the instruction in the enclosed sheet "How to take samples from drip system"

* If there are clogged drippers, estimate the amount (many, some)

* Indicate the location of the cogged drippers:

a) At the last laterals b) At the last drippers c) Uniform dispersion in the plot.

11. Take a sample of water, do per the water sampling instructions.

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How to take samples

General data

1) Indicate the sampling purpose: Routine test, clogged drippers, other.
2) Indicate the type and the age of the system.
3) Indicate the water source: Well, river, dam, pond etc.

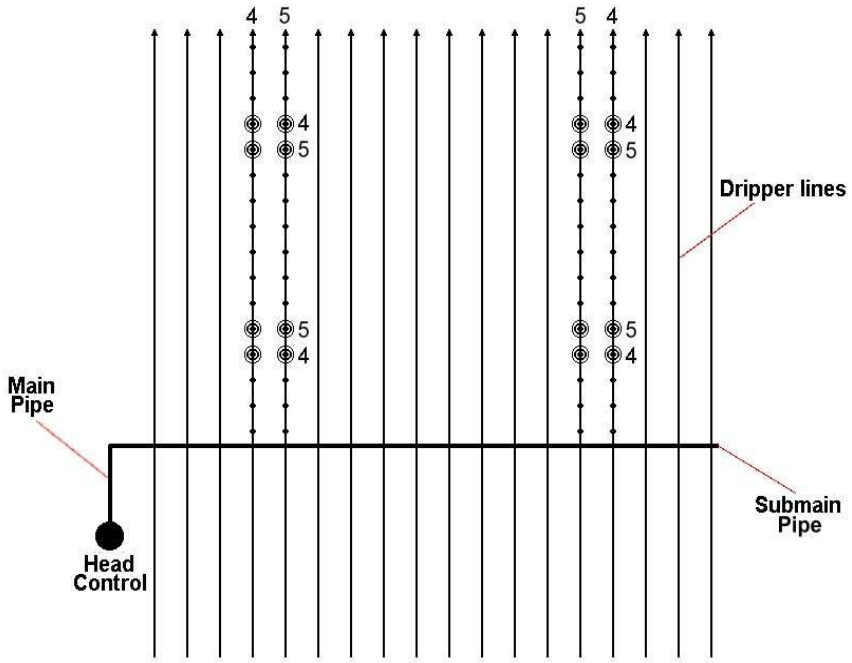
Instructions

1) Sample lateral sections of 30 cm length, the dripper's hole in the center.
2) When the area is large with several plots, select one plot only.
3) Sample on the base of 4 & 5:

*Laterals 4 & 5 from the beginning and the end of the submain

*Drippers 4 & 5 from the beginning and the end of the lateral.

See the following:



Notes

1) Wrap the lateral sections tightly with wet paper and put in a plastic bag.
2) These instructions are suitable for button drippers also.3) Sample button drippers with a piece of tube, 30 cm length.

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water sampling for analysis

1) Take a water sample in a clean plastic one liter bottle. Flush the bottle with the tested water before sampling!
2) Open water and let it run for a few seconds before sampling.
3) Write the following details on the sample bottle: Customer name, location, water source, and sampling date. Once taken keep the sample in a cool, shaded place.
4) Never take samples directly from the water source (dam, river etc.) sample after the pump only, as close as possible to the pump.
5) To analyze the effect of fertilizers in the water, sample the water from after the fertilizer tank, before main filtration point.
6) Ensure that the sample reaches (Netafim or other) laboratory as sun as possible after sampling. The Netafim laboratory conducts other test in addition to chemical analysis.
7) **Ask the laboratory to analyze the following:**
   Electrical conductivity (EC), Ph, Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K),Bicarbonate (HCO_3), Carbonate (CO_3) Chloride (Cl), Sulfate (SO_4), Phosphate (PO_4), Nitrogen- Ammonium ($N\text{-}NH_4$), Nitrogen- Nitrate ($N\text{-}NO_3$), Boron (B), Iron (Fe), Manganese (Mn),
   TSS and TDS (if possible).

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Fertigation - Technical aspect

1) Make sure that your fertilizer is completely soluble and free of impurities
2) Never use fertilizers containing calcium (such as calcium nitrate), or basic fertilizer, when the irrigation water is neutral or basic (pH > 7).
3) In case of acid water (pH < 5) it is recommended to use basic fertilizers available, and calcium nitrate if calcium concentration in the soil is low.
4) Never inject ionic iron into the drip system. Remember, ionic iron endangers the system.
5) Use iron chelate only. Make sure that the chelate you use is high quality (stable & strong). Avoid cheap products which can decompose into the system. This can cause ineffective feeding for plants and plugged drippers.
7) Phosphoric fertilizers can cause serious difficulties:
   * Avoid high concentration in the water.
   * Never turn off irrigation & fertilization at the same time. Turn off the fertilization pump 30 minutes before the end of the irrigation, to flush Phosphate remains from the system.
   * Never use P fertilizers based on polyphosphate, use orthophosphate only!
   * When the irrigation water is basic or the water hardness is high, use Acidic phosphoric fertilizer only!
8) In greenhouses under condition of heavy fertilization, the pH of the solution (water + fertilizer) should be reduced to 6.0

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Acid treatment for drip systems

Warning! Danger!

Acids are poisons, dangerous to humans. Before use read the safety instructions provided by the manufacturer of the acid. All instructions for acid treatment should be regarded as subordinate to all legal provisions and to the instructions of the acid manufacturer.

Warning! Contact of acid with skin can cause burns. Contact of acid with the eyes can cause blindness, Swallowing acids or inhaling their fumes can be fatal. Use protective goggles, gloves, long pants and sleeves and high shoes.

Always be present in the treated area during the entire duration of the treatment and keep unauthorized persons out of the area.

The acid must be added to the water, not visa- versa!!

Corrosion

Acids are very corrosive to materials such as steel, aluminum, asbestos-cement, etc. PE & PVC pipes are resistant to acids. Consider these factors before planning the treatment. Always consult Netafim in case of doubt.

Objective

Dissolving & decomposing carbonate, phosphate & hydroxide scales.

Remember, Acid treatment is ineffective in cases of organic matter, sand, silt, etc.

Type of acid & acid concentration

Most mineral - technical acids are suitable and relatively cheap.

The acid should be free of insoluble impurities, such as gypsum, etc.

The level of acid concentration in the irrigation water depends on the acid type, it's percentage, and it's valence.

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Acid percentage	Recommended concentration in the treated water
Hydrochloric acid, 33%	0.6%
Phosphoric acid, 85%	0.6%
Nitric acid, 60%	0.6%
Sulfuric acid, 65%	0.6%

If your acid has a different percentage adjust the injection level to the percentage of your acid, according to the table above.

Example: Your acid is Sulfuric acid, 98%

The required adjustment is: (65% * 0.6%)/ 98% = 0.4%

Application

1) Flush the system prior to the treatment, flush all components thoroughly with maximum flow.

Remember, performing acid treatment without a previous flush endangers the system!

2) Make sure that the injection pump is high capacity and is acid resistant.

3) The acid treatment takes place in 2 stages:

a) Acid injection. b) Acid distribution into the system.

4) Inject the acid for 10 -12 minutes and then turn off the injection pump.

Continue to irrigate for 30-60 minutes after the end of the acid injection.

Example:

* The flow rate of the treated plot is 50 cubic meters per hour.
* Place 50 liters of the acid in a resistant tank (1 liter per c.m of the water flow)
* Inject the acid into the system over a period of 10 -12 minutes, if you calculate correctly, the acid concentration will be 0.6%.

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Chlorination of drip irrigation systems

Warning!

Chlorine material (liquid, solid or gas) is dangerous to human beings and animals. Manufacturers' instructions must be followed very carefully. Avoid contact with skin or eyes; avoid swallowing the material.

While handling chlorine material, proper protection for the eyes, hands and body parts must be worn, i.e. goggles, gloves, shoes, etc.

Before filling any tank with chlorine solution, be sure to wash it very carefully in order to remove any fertilizer remains.

Remember! Direct contact between chlorine and fertilizers may cause an explosive thermal reaction. This is extremely dangerous!

Note: Injection of chlorine into irrigation water containing fertilizer is not hazardous.

Objectives

Chlorine is a strong oxidizer and as such is useful for the following purposes:

1) Preventing & eliminating the growth of organic slime, iron slime, sulfur slime.
2) Oxidation of elements such as Iron, Sulfur, Manganese, etc.
3) Cleaning systems of organic sedimentation and bacterial slime.
4) Improving filtration efficiency, especially sand/media filtration.

Note: Chlorine has no effect on inorganic sediments such as sand, silt, scale, etc.

Materials

There are several sources of chlorine materials on the market:

Liquid chlorine as sodium hypochlorite; gaseous chlorine as Cl_2; solid chlorine as calcium hypochlorite and others.

Each source has its advantages and disadvantages. You should consider the

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convenience, availability and price of each material.

When the calcium level and alkalinity of the water is above medium and the pH is above 8.0, consult a Netafim expert for advice on whether calcium hypochlorite can be used.

Liquid chlorine is unstable and decomposes spontaneously in the storage tank, according to time & temperature. Do not store liquid material for a long period of time. Keep it in the shade, and paint the storage tank white if you must keep it in direct sunlight.

Methods of chlorination

Generally, there are three methods of chlorination:

1) Continuous chlorination

   Chlorine should be continuously injected from the beginning up to the end of each irrigation. This is the most efficient method, but chlorine consumption is higher than in the other methods.

   Chlorine residue in the most distant part of the treated area should be around 0.5 – 1ppm.

1) Chlorination in the last hour or according to plot size or irrigation time of each irrigation.

   Usually, both chlorine consumption and efficiency are lower than in the previous method. Chlorine residue in the most distant part of the treated area should be 2-3 ppm.

2) Intermittent chlorination:

   This method is recommended in cases of very long irrigations (tens of hours) or pulse irrigations. Chlorine residue in the most distant part of the treated area should be 2-3 ppm.

In these cases, please contact your Netafim agent.

Note: Chlorine residue should be checked at the most distant part of the system. Open the end of the third lateral from the edge and let water flow for 10 seconds before sampling.

Chlorine injection point

Two options exist, each with its advantages and disadvantages:

A) The injection point is placed as close as possible to the main pump of the water source (river, dam, well). This option prevents the growth of bacterial slime in the main pipe and protects the drip system much better.

B) The injection point is placed far from the main pump and as close as possible to the treated plot. This option does not protect the main pipe and is not recommended in cases of effluent, sulfur, iron & manganese.

Chlorine dosing, chlorine demand and chlorine residue

1) Make sure that you have a "chlorine test kit" to measure chlorine concentration.

2) Normally, chlorine concentration in the treated system is not uniform It is higher near the injection point and lower at the end of the system . This gap is called the "chlorine demand" of the water.

3) The "chlorine demand' depends upon the water quality, the cleanness of the pipes and laterals, and the size of the system.

4) "Chlorine demand" cannot be calculated or controlled. Therefore, the dosing pump should be adjusted according to the chlorine residue at the end of the system.

Follow-up

Control of chlorine residue is an integral part of the treatment :

1) Check chlorine residue every week, and adjust the dosing pump if needed.

2) Check chlorine concentration at the head of the system. This should not be higher than 15 ppm..

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- It's essential to check chlorine regulary, at least once or twice a week and to correct the injected amount accordingly.
- The chlorine test kit has two reagents for measuring general chlorine and free chlorine.
- In case of Municipal supply, free chlorine should be measured.
- In case of drain water + waste water, general chlorine should be measured.
- In case of permanent injection of ammonia fertilizer in the system "general chlorine" should be measured.
- Residue chlorine is tested from the farthest point in the system.

3) Flush the treated system once a month. Note changes in the color of the flushed water.

Note: When the chlorine concentration of the treated water is higher than your test kit capacity, dilute the water sample with distilled water only!

Calculations for Chlorine gas treatment

The dosage is based on a chlorinator which controls the gas flow. The calculation is simple because the material is pure (100%): 1 gr' of chlorine gas in 1 m3/h of water equals 1 ppm.

Example: Flow rate of the treated system = 100 m3/h

Desired chlorine residue at the end = 1 ppm

"Chlorine demand" in the system = 4 ppm

Required conc. at the injection point = 1 + 4 = 5 ppm

Rate of chlorine gas flow into the system = 5 *100 = 500 g/h

Inject the desired quantity of chlorine into the system, check the residue after several hours of injection, and adjust the injection pump if necessary.

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Liquid & solid chlorine

The stability of liquid chlorine is much lower than that of solid chlorine.

Therefore, liquid chlorine should not be stored for long periods of time.

Example:

Flow rate of the treated system = 100 m3/hour

Chlorine concentration of the injected solution = 25%

Chlorine residue at the end = 1 ppm

"Chlorine demand" in the system = 4 ppm

Desired concentration at the beginning of the system = 1 + 4 = 5 ppm

Rate of pure chlorine flow into the system = 5 *100 = 500 g/h

Rate of 25% chlorine solution flow into the system = 500*100/25 = 2000 g/h = 2 liter/h.

Formula to calculate chlorine solution injection:

$$\text{Hourly flow-rate of injected chlorine solution (l/h)} = \frac{\text{Required chlorine concentration (ppm)} * \text{Plot flow-rate (c.m/h)}}{\text{Chlorine solution concentration by percentage} * 10}$$

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Guidelines for Terflan Treatment for Subsurface Drip Systems

Treatment Objective

To prevent root intrusion into the dripper lines by using the soil cover surrounding the dripper lines, which contains Treflan.

During the fertilization and irrigation period, the Treflan must be concentrated only in the area surrounding the dripperline, and not be shifted to other areas

Terflan treatment is not recommended under the following conditions:

a) When the soil is sandy and contains less than 8% clay.
b) When plants are very young, close to planting, seeding, and in all cases in which the volume of roots is very small or in Soil less bedding.
c) When the soil is wet above field capacity due to rain or irrigation.
d) When dripperlines are not properly buried.
e) When relevant authorities do not authorize Treflan treatment.

Number of Treflan Treatments for Various Crops

The number of treatments per season depends on the soil type, summer rains and length of the irrigation and fertilization season.
For example:
If the irrigation season is 4 months long and the soil is heavy, one treatment is sufficient; if the soil is medium to light, 2 treatments are required.
See the following table:

Irrigation season	Crop	Light-medium soil	Medium-heavy Soil
Up to2-3 months	All crops	1	1
Up to 3-4 months		2	1
Up to 5-8 months		3	2
All year		4	3

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Water Stress situations:
Any water stress means a danger of root intrusion into dripper lines, and therefore requires that Treflan treatment will preface the start of water stress period.
Water stress can be: a) Planned according to the grower's discretion.
b) Due to a fault or failure in the water supply.
c) Due to an un expected increase in the plant's water consumption.

When should the first Treflan treatment be applied ?
Orchards: Six months after planting of any type of crop.
During this period, the root intrusion threat is that of wild weeds that must be treated anyhow.
From the second year onwards, 4 weeks after the commencement of the irrigation season.

Lawns: Four weeks after planting and two to three weeks after laying the grass.

Field crops and perennial vegetables such as Asparagus Alfalfa etc':
1st year - 4 weeks after planting or 6 weeks after seeding.
2nd year and onwards- 4 weeks after the commencement of "routine and systematic irrigation".

Annual field crops and vegetables:
Approximately 5 weeks after the commencement of the irrigation.
Preparations for Treatment
Perform the following tests several days before the planned treatment:
1) Turn on the water for 20 minutes. If puddles are formed, the plot is not suitable for Treflan treatment. (The soil is too moist)
2) Check for leaks and dis-connections, and repair all faults before treatment.
3) For lawns, check that the dripperlines are inserted in the soil and are not lodged between the soil's surface and the grass carpets.
4) Check that the pump and connectors are in proper working condition, and calibrate the pump.
Prior to the treatment the plot must be partially dried by doubling or tripling the intervals between routine irrigation.

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Treatment (3 stages)

- Filling in the system until the pressure stabilizes.

Stage A) Injecting Treflan for 10 minutes.

Stage B) Distribution of the Treflan in the system.
(See the following table of distribution by dripperline length.)

Stage C) Turn off the water supply. Do not delay turning off the water supply after Stage B.

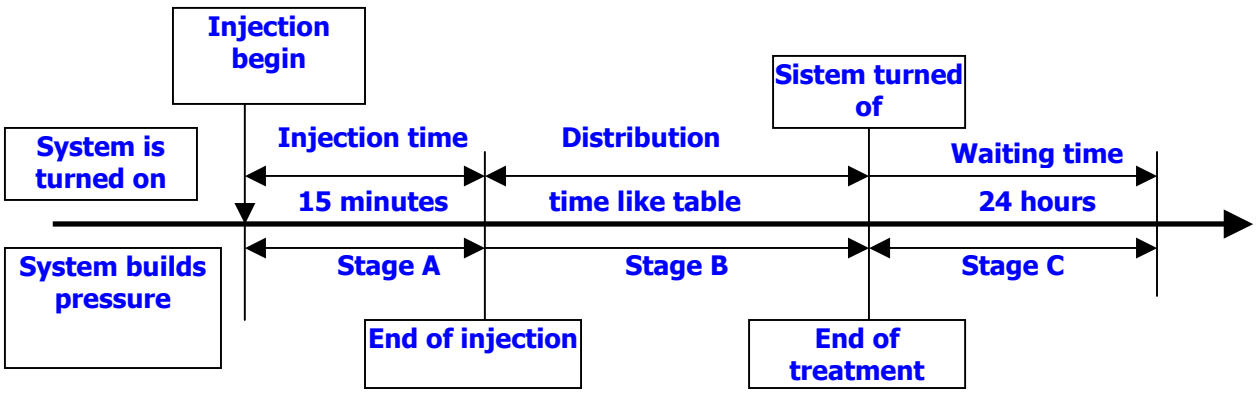
Irrigation should not be resumed on the treatment day. Wait 24 hours before the next irrigation.

Injecting Treflan

Any fertilizer pump is suitable for performing Treflan treatment.
Fill a clean tank with a volume equal to 10 injection minutes, add the Treflan and mix.
Begin to inject immediately upon stabilization of the pressure. If you correctly calculated the water quantity, injection will end in 10 minutes.

Amount of Treflan per Treatment

The quantity is calculated based on the number of drippers in the treated plot. 1/8 (0.125) /ml. per dripper.
For example: for a treated plot with 8000 drippers, the required quantity 8000/8=1000 ml= 1 Liter
This amount refers to a preparation composed of 480 gr. Treflan per liter.



See the table at the next page:

Http://www.netafim.com
K.Hazerim, D.N Negev 85420; Tel: +972-8-6473728; Fax: +972-8-6473017
E-mail: haia@netafim.com

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Time Of Flow In Dripperline (minutes) **For Treflan Aplication only** 20/10/2001

Ram 17

I.D. (mm) 14.6

Distance (m)	0.3	0.3	0.5	0.5	0.8	0.8	1.0	1.0
Flowrate (l/h)	1.2	1.6	1.2	1.6	1.2	1.6	1.2	1.6
Length (m)								
50	14.3	10.7	17.4	16.3	22.2	17.8	26.4	19.8
100	16.0	12.0	19.7	18.4	25.4	20.4	30.4	22.8
150	17.0	12.8	21.0	19.7	27.2	21.9	32.8	24.6
200	17.7	13.3	22.0	20.6	28.6	23.0	34.4	25.8
300			23.3	21.8	30.5	24.5	36.8	27.6

Distance (m)	0.3	0.3	0.5	0.5	0.8	0.8	1.0	1.0
Flowrate (l/h)	2.3	3.5	2.3	3.5	2.3	3.5	2.3	3.5
Length (m)								
50	7.5	4.9	11.3	7.4	16.5	10.8	19.7	12.9
100	8.4	5.5	12.8	8.4	18.9	12.4	22.7	14.9
150	8.9		13.7	9.0	20.3	13.3	24.4	16.0
200			14.3	9.4	21.3	14.0	25.7	16.9
300					22.7	14.9	27.4	18.0

Ram 20

I.D. (mm) 17.5

Distance (m)	0.3	0.3	0.5	0.5	0.8	0.8	1.0	1.0
Flowrate (l/h)	1.2	1.6	1.2	1.6	1.2	1.6	1.2	1.6
Length (m)								
50	20.5	15.4	21.8	17.6	31.8	23.9	37.9	28.4
100	23.0	17.3	24.7	19.9	36.4	27.3	43.7	32.8
150	24.5	18.3	26.4	21.2	39.1	29.4	47.1	35.3
200	25.5	19.1	27.6	22.2	41.1	30.8	49.5	37.1
300	26.9	20.2	29.3	23.5	43.7	32.8	52.8	39.6
400			30.5	24.5	45.7	34.2	55.2	41.4
500			31.4		47.1	35.4	57.1	42.8

Distance (m)	0.3	0.3	0.5	0.5	0.8	0.8	1.0	1.0
Flowrate (l/h)	2.3	3.5	2.3	3.5	2.3	3.5	2.3	3.5
Length (m)								
50	10.7	7.0	16.3	10.7	17.8	15.6	19.8	18.6
100	12.0	7.9	18.4	12.1	20.4	17.8	22.8	21.4
150	12.8	8.4	19.7	12.9	21.9	19.2	24.6	23.1
200	13.3	8.7	20.6	13.5	22.9	20.1	25.8	24.2
300			21.8	14.3	24.5	21.4	27.6	25.9
400					25.5	22.4	28.8	27.0
500					26.4		29.8	

tiran 17

I.D. (mm) 14.6

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0
Length (m)								
50	10.7	8.6	16.3	13.0	18.0	18.0	19.8	22.6
100	12.0	9.6	18.4	14.8	20.6	20.6	22.8	26.1
150	12.8	10.2	19.7	15.8	22.1	22.1	24.6	28.1
200			20.6	16.5	23.2	23.2	25.8	29.5

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	4.0	8.0	4.0	8.0	4.0	8.0	4.0	8.0
Length (m)								
50	4.3	2.1	6.5	3.3	9.0	4.5	11.3	5.7
100	4.8		7.4	3.7	10.3	5.2	13.0	6.5
150			7.9		11.1		14.0	7.0
200							14.8	

Tiran 20

I.D. (mm) 17.5

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.6	2.0	1.6	2.0	1.6	2.0	1.6	2.0
Length (m)								
50	15.4	12.3	19.9	15.9	22.7	18.1	28.4	22.8
100	17.3	13.8	22.5	18.0	25.9	20.7	32.8	26.2
150	18.3	14.7	24.1	19.2	27.8	22.3	35.3	28.2
200	19.1	15.3	25.1	20.1	29.2	23.3	37.1	29.7
300	20.2		26.7	21.3	31.1	24.8	39.6	31.7

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	4.0	8.0	4.0	8.0	4.0	8.0	4.0	8.0
Length (m)								
50	6.2	3.1	9.4	4.7	13.0	6.5	16.3	8.1
100	6.9	3.5	10.6	5.3	14.8	7.4	18.7	9.4
150	7.3		11.3	5.7	15.9	7.9	20.2	10.1
200			11.8		16.7		21.2	10.6
300					17.7		22.6	

Dripline 2025

I.D. (mm) 20.8

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.2	1.8	1.2	1.8	1.2	1.8	1.2	1.8
Length (m)								
50	21.8	19.4	44.1	22.0	42.7	28.5	53.6	35.7
100	24.4	21.7	49.9	25.0	48.8	32.6	61.7	41.1
150	25.9	23.0	53.3	26.7	52.4	34.9	66.5	44.3
200	27.0	24.0	55.7	27.9	54.9	36.6	69.9	46.6
300	28.5	25.4	59.1	29.6	58.5	39.0	74.6	49.8

Distance (m)	0.3		0.5		0.75		1.0	
Flowrate (l/h)	2.90		2.90		2.90		2.90	
Length (m)								
50	12.0		18.2		18.9		22.2	
100	13.5		20.7		21.6		25.5	
150	14.3		22.1		23.2		27.5	
200	14.9		23.1		24.4		28.9	
300			24.5		25.9		30.9	

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K.Hazerim, D.N Negev 85420; Tel: +972-8-6473728; Fax: +972-8-6473017
E-mail: haia@netafim.com

Dripline 2000

I.D. (mm) 15.2

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.3	2.0	1.3	2.0	1.3	2.0	1.3	2.0
Length (m)								
50	14.3	9.3	16.3	14.1	21.1	19.6	26.4	20.8
100	16.0	10.4	18.5	16.0	24.1	22.4	30.4	24.0
150	17.0	11.1	19.7	17.1	25.8	24.0	32.8	25.9
200	17.7		20.6	17.9	27.1	25.1	34.4	27.2

Distance (m)	0.3		0.5		0.75		1.0	
Flowrate (l/h)	3.00		3.00		3.00		3.00	
Length (m)								
50	6.2		9.4		13.0		16.3	
100	6.9		10.7		14.9		18.8	
150	7.4		11.4		16.0		20.3	
200			11.9		16.8		21.3	

Super Typhoon 125

I.D. (mm) 15.9

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	0.8	1.1	0.8	1.1	0.8	1.1	0.8	1.1
Length (m)								
50	20.4	18.5	27.1	19.7	37.4	27.2	47.0	34.2
100	22.8	20.7	30.6	22.3	42.8	31.1	54.1	39.3
150	24.2	22.0	32.7	23.8	45.9	33.4	58.3	42.4
200	25.2	23.0	34.2	24.9	48.2	35.0	61.2	44.5

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.65	2.60	1.65	2.60	1.65	2.60	1.65	2.60
Length (m)								
50	12.3	7.8	18.7	11.9	20.7	16.5	22.8	20.6
100	13.8	8.8	21.2	13.5	23.7	18.8	26.2	23.8
150	14.7	9.3	22.7	14.4	25.5	20.2	28.3	25.6
200	15.3	9.7	23.7	15.0	26.7	21.2	29.7	26.9

Python

I.D. (mm) 22.2

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	0.8	1.05	0.8	1.05	0.8	1.05	0.8	1.05
Length (m)								
50	37.2	26.5	52.7	40.2	73.0	55.6	91.6	69.8
100	41.7	29.6	59.7	45.5	83.4	63.6	105.5	80.4
150	44.3	31.5	63.8	48.6	89.5	68.2	113.6	86.6
200	46.1	32.8	66.7	50.8	93.9	71.5	119.4	91.0
300	48.8	34.7	70.7	53.9	100.0	76.2	127.5	97.2
400	50.6	36.0	73.6	56.1	104.3	79.5	133.3	101.6

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.60	2.55	1.60	2.55	1.60	2.55	1.60	2.55
Length (m)								
50	18.6	15.6	26.4	16.5	36.5	22.9	45.8	28.7
100	20.8	17.4	29.8	18.7	41.7	26.2	52.7	33.1
150	22.1	18.5	31.9	20.0	44.8	28.1	56.8	35.6
200	23.1	19.3	33.3	20.9	46.9	29.4	59.7	37.5
300	24.4	20.4	35.4	22.2	50.0	31.4	63.8	40.0
400	25.3		36.8	23.1	52.2	32.7	66.7	41.8

Ozline

I.D. (mm) 25

Dripper flowrate- the actual flowrate of the last dripper in field pressure.

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	0.7	1.1	0.7	1.1	0.7	1.1	0.7	1.1
Length (m)								
50	50.3	32.0	76.4	48.6	105.8	67.3	132.7	84.4
100	56.4	35.9	86.5	55.1	120.9	76.9	152.9	97.3
150	59.9	38.1	92.4	58.8	129.8	82.6	164.7	104.8
200	62.4	39.7	96.6	61.5	136.0	86.6	173.0	110.1
300	66.0	42.0	102.5	65.2	144.9	92.2	184.8	117.6
400	68.5	43.6	106.7	67.9	151.2	96.2	193.2	122.9
500	70.4	44.8	109.9	70.0	156.0	99.3	199.7	127.1

Distance (m)	0.3	0.3	0.5	0.5	0.75	0.75	1.0	1.0
Flowrate (l/h)	1.60	2.50	1.60	2.50	1.60	2.50	1.60	2.50
Length (m)								
50	22.0	20.1	33.4	21.4	46.3	29.6	58.1	37.2
100	24.7	22.5	37.8	24.2	52.9	33.9	66.9	42.8
150	26.2	24.0	40.4	25.9	56.8	36.3	72.0	46.1
200	27.3	25.0	42.3	27.0	59.5	38.1	75.7	48.4
300	28.9	26.4	44.8	28.7	63.4	40.6	80.9	51.8
400	30.0		46.7	29.9	66.1	42.3	84.5	54.1
500			48.1	30.8	68.3	43.7	87.4	55.9

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K.Hazerim, D.N Negev 85420; Tel: +972-8-6473728; Fax: +972-8-6473017
E-mail: haia@netafim.com