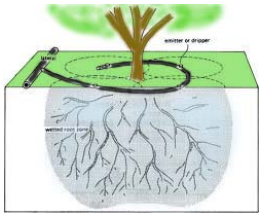
Water Whys



INTRODUCTION

DEFINITION

Drip irrigation is the slow application of water, providing proper soil moisture in the root zone over extended periods of time. Low volume, low pressure drip irrigation is endorsed by the City of Santa Fe as a water conserving method of outdoor watering.

DESCRIPTION

Drip irrigation uses polyethylene tubing for distribution and devices called emitters for dripping the water. The emitters, with flow rates ranging from ½ to 2 gallons per hour (gph), are punched onto or built into the tubing and are placed so that water is delivered only where desired.

CURRENT USES

Drip irrigation is proven technology that has been used in arid areas around the world for 60 + years. It is widely used in commercial agriculture on vineyards, row crops, and greenhouses. It is well suited for establishing native grasses; and is ideal for residential landscaping and gardens.

ADVANTAGES

WATER SAVINGS

Almost all the water used goes to the roots of the plants, keeping non plants areas dry. There is virtually no runoff and evaporation loss is minimal. Less water percolates past the root zone and is wasted. Water usage is generally 50% of traditional hose based watering methods.

TIME SAVINGS

All that is required is to turn the system on and off. Battery or electrically operated controls can automate the system; ideal for busy homeowners and watering when you are away.

BETTER GROWTH

The slow application of water increases the depth of penetration into the soil and makes more water available at the root zone. Drip irrigation systems water more frequently so plants suffer less dehydration between waterings. Growth and plant health can increase significantly.

PARTS

HEAD

The head connects the water source and the irrigation system. Most systems connect to a hose faucet. The system head includes a vacuum breaker or back flow preventer, a filter, a pressure regulator, and adapter to the polyethylene tubing. It may also include automatic valves. The filter prevents small particles from clogging emitters, and the pressure regulator reduces system pressure down to the range of 20 or 30 psi.

DISTRIBUTION LINES

Tubing carries water out to the plants. These main lines and branch laterals are usually ½" polyethylene with larger sizes used for longer runs. The tubing is very resistant to the damaging effects of the sun's ultraviolet rays. It can lay on the surface, or under mulch, or other ground covers including plastic/gravel, or it can be buried a few inches underground.

EMITTERS

Emitters are a critical part of any drip irrigation system. They meter the desired amount of water to each plant. Because the metering orifices in the emitter are very small, the emitter may occasionally become clogged. The emitter is either replaced, or some emitters can be opened and cleaned out.

Elevation changes affect pressure in the lines causing emitters to put out more or less water. Where elevation changes exceed 8' use a *pressure compensating* emitter. These are slightly more expensive, but are not affected by elevation changes.

Emitters can be built into the water distribution tubing. They are usually spaced at intervals between 6" – 18" in the tubing. This is ideal for row crops or densely planted areas.

Also available are low volume sprayers and micro sprinklers for various applications and are particularly good for establishing native grasses.

CONTROLS

A timer makes your system fully automatic. It can mount inside or outside the house, controlling both frequency and length of watering. Wire runs from the timer to the irrigation valves. Timers can control multiple valves, and have different schedules for each valve. EX: one valve might water trees, a second the garden, & a third other plants; all with different watering schedules.

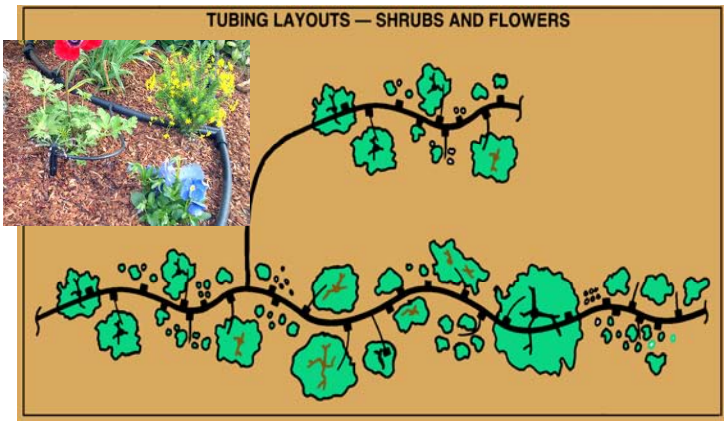
Rain, freeze, and weather sensors can be attached to a timer. These use local conditions to adjust the timer's established schedules. This makes the system even more water efficient, and helps insure plants are not over or under watered.

A battery operated timer can control a simple system and attaches easily to your hose faucet.

SPECIFIC APPLICATIONS

LANDSCAPING

Drip irrigation is ideally suited to landscaping and ornamental applications. Specific amounts of water are applied to the root zones of each plant. Weed problems are reduced, water is kept off windows and sidewalks, and individual plants receive the water they need to flourish. The flexibility of drip irrigation makes it easy to modify the system as your needs change.



Lines can be buried slightly or mulched to hide them from view.

VEGETABLES

Closely spaced emitters can be used to thoroughly wet an area of soil without wetting the leaves. A 1/2 gallon per hour emitter will generally suffice for an area 16" in diameter. If plants are more widely spaced and deeper rooted (tomatoes, squash, etc.), a single emitter can be placed at the base of each plant.

For row crops a line with emitters placed every 12" or a line with built-in emitters will give complete watering down the rows. Crops such as carrots, onions and radishes can be planted two or more deep on each side of the line.

With plants such as corn, strawberries and peppers, one row on each side of the line is preferred. Others such as tomatoes and bush squash require one line per row. For intensive plantings, the system is set up on a grid system with lines 16" apart and emitters every 12" on the lines. In a 4' wide bed, 3 lines will give complete coverage and one does not have to change the system if the planting changes.

TREES

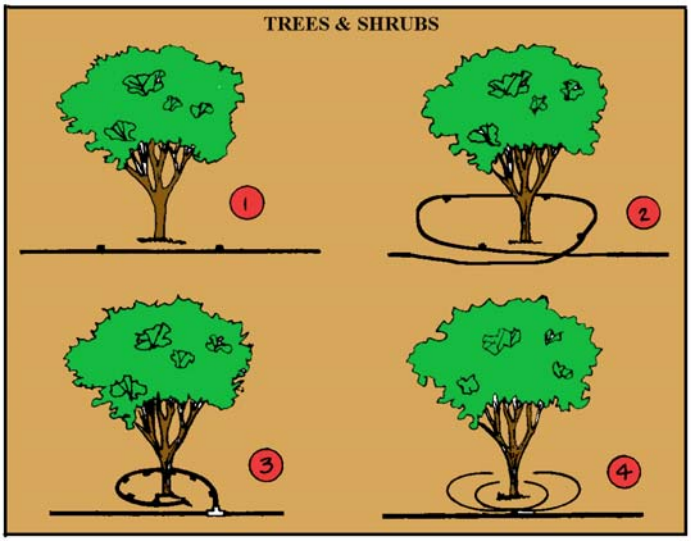
The roots below a tree trunk act to support the tree, while the water absorbing roots are spread around the edge of the canopy of the tree. The edge of the canopy is also referred to as a tree's drip line.

Use the guide below and based on your watering schedule, determine how many emitters to use.

Trees	Total gallons per week per inch of trunk diameter
First Year	10
Established	5

Space the emitters equally around the drip line of the tree. Young trees will require moving the emitters outward every other year as the tree grows. There are four common ways to set up emitters:

1) Run a line by the tree with emitters placed on the line.
2) Loop the line around the tree.
3) Tee off the line with a loop around the tree.
4) Put emitters around the tree using 1/4" tubing.

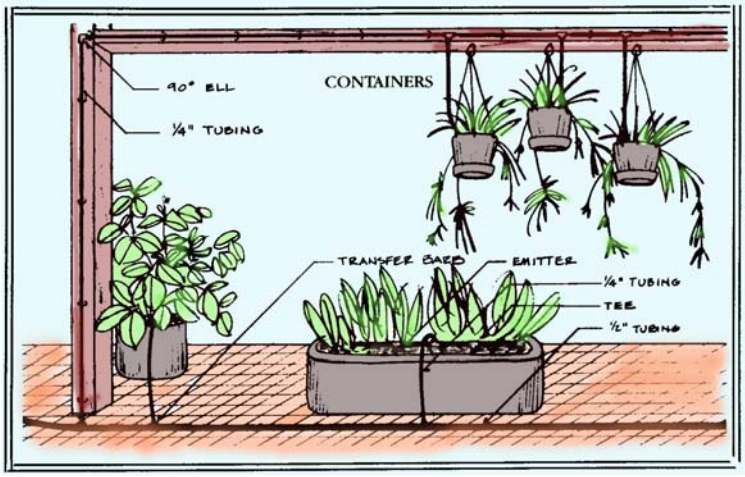


Plan the lines for future expansion & adding more emitters later.

CONTAINERS

Containers and pots can be easily watered using a 1/2" line running below or behind the plants with transfer barbs attached to it and ¼" tubing going up to the plant with the emitter placed on the end. ¼" tees and elbows can be used to arrange the tubing.

Insulated staples are excellent for attaching the small tubing to decks and wood planters.



PLANNING AND DESIGN

INTRODUCTION

Many homes will use less water than the hose faucet can supply, and so they can be run as a single zone. If the system needs more water than the faucet can deliver, it can be divided into as many zones as necessary. Determine the faucet capacity by running water full force into a measured bucket and time how long it takes to fill. For example, if a 5-gallon bucket takes 30 seconds to fill, the capacity of the faucet is 600 gallons per hour. Also, be sure each zone does not exceed the water carrying capacity of the tubing. Typical 1/2" tubing will carry 300gph; 3/4" tubing 540gph. To maintain a safety margin, design your system so that it doesn't use more than 75%-80% of the faucet's capacity.

SCALE DRAWINGS

Sketch out a drawing, roughly to scale, of your yard and major planting areas. Use this to plan out your tubing lines. This will help you calculate the amount of tubing and fittings needed. Keep the plan of your drip system for future reference.

EMITTER PLACEMENT

The chart below shows the suggested spacing and number of emitters for common types of planting. Several factors affect the placement of emitters. In sandy soils water penetrates downward faster than it spreads, so emitter spacing should be closer. Clay soils are the opposite; water will tend to move laterally before penetrating very deeply.

Full sun and/or wind will dry the soil faster and may need more closely spaced or larger emitters. The opposite applies to very shady or protected areas.

You can check water penetration by digging down into the soil, away from the obvious wet area on the surface, to see the true area moistened.

FLOW, NUMBER, & SPACING OF EMITTERS

Based on 1 hour run time, 3 days per week

Plant Type	Flow (gph)	Number	Placement
Low Shrubs (2-3')	1	1	at plant
Shrubs (3-5')	1	2	6-12" either side
Shrubs & trees (5-10')	2	2 - 3	2' from trunk equally spaced
Shrubs & trees (10-20')	2	3 - 4	3' apart equally spaced
Shrubs (20' or over)	2	6 or more	4' apart equally spaced
Containers (potted plants)	½ - 1	1	at plant
Flower Beds	1	1	at plant
Ground Cover	1	1	at plant
Vegetables, closely spaced	½ - 1	1	every 16"
Vegetables, widely spaced	1 - 2	One per plant	at plant

SIZE CONSIDERATIONS

After you have determined the number, output and placement of emitters, put them on your sketch. You can put in lateral lines where emitters need to be placed, noting length of tubing, connectors needed and total flow of the system.

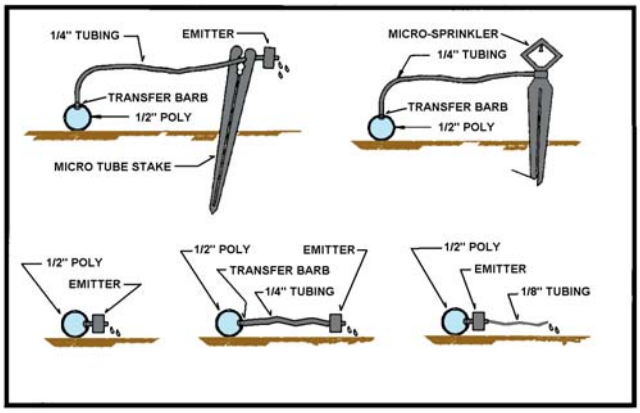
The total system flow is simply the sum of the gallons per hour (gph) of all the emitters and sprays on the system. This must be within the capacity of both the tubing and the amount provided by the hose faucet. If not, the system can be divided into two or more sub systems, or zones, and each zone watered sequentially.

The pressure in the drip system is affected by elevation and friction. Each 1' of elevation changes psi by about .43psi. If elevation changes by more than 8', be sure to use pressure-compensating emitters. Larger elevation changes may require larger tubing or higher system pressures. Consult us.

There is friction loss in long runs of tubing and also in each connecting fitting, tee, and elbows.

Good system design generally balances tubing length and fittings, without using excessive amounts of either. If the layout of your distribution lines looks unreasonably complicated, it probably is.

Leave in a safety factor and capacity for future growth of your system.



ASSEMBLY

THINGS TO REMEMBER

1) Take care to keep dirt out of tubing ends during assembly.

2) Allowing the tubing to sit in the sun will make it easier to handle. Dipping the end of the tubing into hot water will make it easier to connect fittings.

3) Install system from the water source and work out to the laterals.

4) When threaded connections are made, wrap threads with Teflon tape before connecting. Don't over tighten plastic fittings with a wrench.

5) When installing pipe under a sidewalk, water can dig for you. Slip the garden hose through a stiff piece of pipe. Turn the water on and work the pipe under the walk.

6) Under a garden path or gravel drive, slip the poly tubing through a piece of rigid PVC so the tubing doesn't crush over time.

7) Many parts for the head assembly have an arrow on them. Install so that the arrow is pointing in the direction of the flow of water.

8) If you want to use your hose faucet for other purposes, connect a Siamese or Y-valve. This turns a faucet into two, each with its own shutoff.

9) Be aware of the type of thread in your fittings. Coarse ¾" hose thread fittings do NOT connect to fine ¾" pipe thread fittings.

HEAD ASSEMBLY

All home systems should include three essential items in this order: **1)** A vacuum breaker to prevent potentially dirty water from getting back into the house. **2)** A fine mesh screen filter to trap small particles that can clog emitters. **3)** A pressure regulator to reduce pressure down to the range of 20–30 psi.
Various fittings are used to connect these items together.
A battery operated timer or electrical valves can be added to automate the system.

These components are sized to match the expected flow of the system or zone. Freezing can cause damage, so they must be drained or taken indoors for the winter.

LINES

Poly tubing uses either compression or barbed fittings that simply push fit over or into the tubing. Lateral lines connect with tee fittings. Bend the tubing (be sure not to kink it) or use elbow fittings to make sharp turns. Terminate lines with an end cap or figure eight fitting.
As lines are laid out, try to use the natural curve of the tubing. Either bury the tubing slightly or use tubing stakes. Leave a little slack in the lines to allow for expansion and contraction and help prevent emitters from moving out of place.

EMITTERS

Once the lines are in place, emitters can be installed. To install emitters first make a hole in the tubing with a hole punch, and then push the barbed end of the emitter into the hole. If a hole is not needed, it can be sealed with a *goof plug*.

There are three basic ways to install emitters:
- The most common method is to place the emitter directly on the line. Simply punch the hole and push in the emitter.
- Second is put a transfer barb into the line, run 1/4" tubing to where the emitter is wanted, and then to put the emitter in the tubing end.
- Third is place the emitter directly on the line, and run 1/8" tubing from the emitter to the desired watering location.

After the emitters are installed, open the line ends, and run water through the system to flush out any dirt and plastic particles.

Watering Times & Frequency

The goal is to maintain root zone moisture at a satisfactory level, avoiding over saturation that cuts off necessary oxygen. Many factors affect watering; type of soil, depth of roots, temperature, humidity and the plant's stage of growth.
A good basic schedule is to water on alternating days three or four days per week for an hour each time, then adjust as needed. The frequency of days is important to keep the soil from drying out excessively between waterings. Adjust the run times to match current weather conditions and plant requirements.

Maintenance

Periodically inspect emitter flows, flush the lines, and clean & inspect the filter. Replace clogged emitters. If the problem is more widespread, look for a break in the lines. If you still have issues, it may be design and/or water pressure problems; consult us.

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