CONTENT OF
'CONTROLS FOR DRIP IRRIGATION' SEGMENT

Before we get into the mechanics of installing a Drip System, we need to talk a little bit about the basic terminology. I know that if you go into a store and start asking for parts and pieces that go into the makeup of a system, you eventually are going to get everything you need to make it work. Hopefully, it will be a one-stop shop. Expressing yourself to an employee of such a shop, asking for items correctly, will make the trip a pleasant one and not one that leaves you hoping you got all the right parts. So, let's start out with some basics.

What could be more basic than the threads on parts and fittings and the treads that holds them all together. Some pipes, such as the old galvanized pipe systems, use threads to secure a tight, waterproof joint. These are called pipe threads and are either male or female, with the abbreviation MPT and FPT. They are a standard size and, in the US, are of a standard size, so many threads per inch at a certain angle and they are tapered. Copper and plastic pipe are call slip fittings and do not require threading, but are put together with either solder or glue. Then there are the "other" types of threads. For example, let's take hoses. You probably have already noticed that the fitting where you attach your garden hose, most likely to a hose bib, has a very different type thread on the business end where you attach the hose. This is a hose thread. It is not to be confused with a pipe thread. A hose thread needs a washer included when they are screwed together. When you go to purchase parts and pieces for your drip system you are going to need to know the difference. FHT and MHT are the designations for hose thread fittings. You will see labels with different designation: ¾"FPTx3/4"MHT. This means the fitting is a ¾"Female Pipe Thread by ¾" Male Hose Thread Adapter. Where would you use such a fitting? If you had a valve rather than a hose bib controlling your water, and there was a pipe nipple coming out of the valve, you could screw this fitting onto the nipple and the attach a hose to the Male Hose Thread end. The washer you need would be in the Female end of the garden hose. You cannot thread a hose thread fitting onto the end of a pipe thread. Well, I guess you could if you tried hard enough, but that is a leak waiting to happen. Some manufacturers are also color coding their fitting as to size and boldly labeling them with the correct thread designation.

Now we are going to start putting our simple system together. But, again, before we do that, let's talk a little about the soil in your garden. Are the emitters going to supply enough water for your plants? Will the water just drain straight through the soil? Will the water just sit there on the surface and not penetrate the soil enough? Well, without getting too technical, there is an easy way to test how emitters are going to act in your garden before you go out and spend your money on all the parts and pieces we are going to talk about. Find yourself an empty one - gallon plastic jug. Get a 1 GPH emitter and poke it through the bottom of the plastic jug. Fill the jug with one gallon of water and place it where you are going to put an emitter. Leave the jug for one hour. The water will drain out at the emitter rate of 1 GPH. You can then dig down and see just where the water went. You can check to see if the water percolated down to a sufficient depth for your planned plantings.

<u>The Starting Point:</u> You need a starting point to begin to put your system together. Most likely, the easiest and most accessible spot is going to be a hose bib where you have been attaching a garden hose. Now it may well be that you do not want to give up this location for a garden hose. You can have both. Install a Y hose fitting, most come with small ball valves for control to either side of the Y. Screw your garden hose on one side and start putting the pieces for your drip control assembly on the other. For a simple drip irrigation system there is no need for a huge control box mounted on the side of your house, with a 120 volt electric line run to it, as there was for the old sprinkler systems. These old boxes, that connected to solenoid valves, through step down transformers, can be adapted to drip systems. But we are trying to create a very simple, relatively inexpensive system.

Once you have found your convenient hose bib, the FIRST item to be installed before any other part, should be the Watts 8A Vacuum Breaker. There are other manufacturers making a similar vacuum breaker, I like the Watts and have been using this brand for years

Of the many pieces that comprise a control assembly for a simple drip irrigation system, one piece, the Watts 8A vacuum breaker, is probably the least expensive but most important part in this array of controls. This small, hard to notice piece

among larger parts, does more to protect you and your family, than any other part of the system. It is called a vacuum breaker, and it does that, but more importantly, it is a backflow preventer. How does it work? Let me give you an example:

Your wife is out in the backyard gardening and decides to water your new Washington Navel orange tree. Instructions when you purchased the tree told you to build a moat 3 feet away from the trunk of the tree and to fill the basin you made with water every week and a half or so. So, she lays the garden hose in the basin and turns on the garden hose and lets the water run to fill the basin around the tree. Then she goes off to pick some roses and other pretty ornamental flowers for the house. At the same time, you decide to fix that pesky dripping hose bib in front of the house just above the main water valve. You shut off the water and then turn on the hose bib to drain the water out of the house so you can take apart the stem assembly on the hose bib and replace the washer. Unbeknownst to you, you have created a syphon that is going to suck the water back into garden hose she has laying in the basin around the tree and into your house water supply system. Oh yes, I forgot to mention that your neighbor's cat peed and pooped in that nice soft dirt around your new orange tree. That pee and poop soup is also being sucked back into the hose also. It takes a while for all the water to drain down and finally it stops so you can replace the washer in the leaking hose bib. While you have been standing there watching the water drain down, your water lines inside your house have become contaminated with what is now called Black Water. You finish the repairs to the hose bib in the front of the house and turn the water back on. The contaminated water is going to be distributed to all outlets in your house. Being a hot day, you are a little warm from all your efforts and reward yourself with a nice, cold, glass of water from your kitchen tap.

By simply installing this cute, little, life saving, less than $10 piece of mechanical genius, where your garden hose attaches to the valve in the garden, you will protect your health and your families health. As soon as this piece of equipment senses a backflow situation occurring, the diaphragm opens up and breaks the syphon that is drawing the contaminated water into your house by allowing air into the hose, breaking the vacuum or syphon. There are some hose bibs manufactured now that have these backflow preventers built in. Anywhere there is a submerged supply, where Black Water can cross connect with clear water, there must be a backflow device existing. The valves that control the flow of water in your toilet tank also have these devices built in. They are called Anti-Syphon Ballcocks. Most times the distance from the water supply to the flood rim of a fixture is enough insurance that will be no possible cross connection. This is why kitchen sink faucets spouts must terminate at least one inch above the flood rim of that sink. There are some who scoff at the Watts 8A vacuum breaker and take them off and discard them when they leak, and sometimes, after years of service, the diaphragm does wear out and leak.

So, rather than bemoaning the fact that you have to buy yet again another piece, gizmo or gadget, be happy you can contribute so cheaply to your families health. Not only that, it is probably code that they must be installed. Be a fan of the Watts 8A vacuum breaker.

In my opening remarks I mentioned that the Watts 8A was an important part of a drip system control assembly. Along with all of the other parts and pieces it takes to install a simple drip system, you can include a fertilizer infuser in the control head. The same type of event could occur while the drip fertilizer infuser was operating, drawing the chemicals in the fertilizer back into your domestic water supply. Foul water

can also be drawn back through the emitters spread all around your garden. Again, all it would take to remedy the situation is a Watts 8A Vacuum Breaker. Pretty nifty, huh?The only other thing to add here is that there are 10 different versions of the Watts 8 line of vacuum breakers. They are all variations for different situations.

The Controller: This gizmo is the brains of the operation. There are many, many types. I have already mentioned the old box on the wall of your house. We are trying to install a simple, easy system, which is also relatively inexpensive. Controllers have been developed in the past few years that attach to your hose bib and most are run off two AA batteries. Two AA batteries usually last well over a year in these controllers. This controller uses two such batteries, and it was used to irrigate 36 tomato plants in containers last summer. The batteries are still going strong. There are even ones today which have small solar panels built in to them and do not need batteries at all. You must be careful with these and where you install them. If a plant grows up and covers the solar panel parts, well, you can see this would be quite an impairment. These new controllers have the ability to allow you to set the days of the week to water, how long each day to water, run twice a day if that is your need for morning and afternoon watering of tomato plants for example, and a manual setting to allow you to manually turn the water on to do additional watering on hot days, and just to check and see how the system is operating. We are going to pass out a Drip Works catalogue at the end of the Workshop for you to take home that shows samples of different controllers you can select. There are models that are simple wind-up timers, gravity-fed timers, LCD timers, High Flow, Easy Program timers, multi-station timers, etc. We are not suggesting you go out and buy these models, we are trying to show you what is available and this is one example.

Filters: It doesn't take much of an imagination to figure out that the orifice in a .5 GPH emitter can get plugged up rather easily, especially if you are on a well system. Probably the first step to keep your drip system working properly would be to include a filter in your system. There are two basic types of filters to use on a drip irrigation system. One type is the screen filter in which the price is usually determined by the size of the particles you are filtering out. Most screens are made up of Stainless Steel mesh. The finer the mesh the smaller the size of the

particles filtered out. The second type is the disc type filter. This type has a series of discs which filter the water through a series of perforations in the discs. Both types of filters are going to need regular cleaning of either the screens or the discs. There are other types of filters, it is possible to get a sand filter if sand in your water supply is your problem. These would be rare on a simple drip system. If you are on a city water supply that provides your drip system, you may not need a filter, as our Napa City water is pretty clear. But they are recommended. If you are on a well system, more than likely, you are going to need some sort of filter as the likelihood of impurities in the water are more possible than if you are on the cities well filtered water system. There are parts of the valley that do have some water impurities that tend to clog up emitters on a drip system. Certain areas up valley have a boron problem, there are also areas that have calcium problems. Again, filter maintenance is a regular part of taking care of your drip system.

Pressure Reducer: This fitting is essential to ANY drip system. This is the fitting that allows high-pressure water to be reduced to low pressure to avoid blowouts while using drip tubing. Again, it is going to be necessary, for a moment, to get into some terminology. Water supply from the city, or well, to your house is measured in GPM. It is possible with 65 pound of pressure supplied by the City, which is not unusual, to get 10 gallons of water per minute out of a ½" pipe. This would equate to 600 gallons per hour. Drip system emitters are rated in GPH. The ratings for the three most common size emitters are .5 gallons per hour, 1 gallon per hour, and 2 gallons per hour. These are the normal ratings. Drip system tubing is not threaded, glued, or soldered. Usually, the tubing is laid out in a long line of just one piece and there are usually no fittings. Fittings that are used, in tight situations, have the tubing shoved into a corresponding recess and held in by three methods of connection: compression, barbed fittings, or Universal Lock Nut fittings. Low water pressure does not cause them to come apart. If you do not use a pressure reducing valve or device, you are going to turn the water onto your system and create a onetime sprinkler system with water spraying out all over the place.

There are usually three different pressure ratings on PRVs: 20, 25, 30, GPH. 30 GPH would be the maximum you would want to use on any

drip system. This rating would be used if you are running a drip line up a hill more than 10 feet in elevation. Remember, you lose 5 pounds of pressure for every 10 feet of elevation. You would also need to use pressure-compensating emitters on this type of system so all the emitters supply the same rated amount of water. 20 GPH is the norm, 25 GPH if your system is running a long line with many emitters.

FHT Swivel adapter to Mainline Tubing: This would normally be the final part that goes into the makeup of the Controller Assembly. You have been dealing with hose threads on all the parts and pieces so far, now it is time to insert the irrigation tubing into your adapter and start stringing your ½" tubing around in your garden. Normally this will be ½" polyethylene tubing and it will come in either 50 or 100 foot rolls. The recommended flow rate for this tubing is 1-240 GPH. If you have a water source that can produce more water than that, you can use a ¾" tubing where the maximum recommended flow would be 480 GPH. You can install emitters right into the mainline tubing, or, if your plants are a ways away from the mainline, you can run ¼" "spaghetti" tubing from the mainline to the plants. The ¼" tubing will also come in a roll of 50, 100, 500, or 1000 feet.

Emitters: It seems like we have been doing a lot of talking about emitters, so I guess we should go into these items. There are many types of emitters, many ratings, but these are the gadgets that regulate just how much water plants in your garden are going to get. Emitters are usually color-coded. Most manufacturers use black, green and red to designate the flow rate of their emitters. How nifty, except for the fact that Rainbird uses blue for .5 GPH, black for 1 GPH, and red for 2 GPH. DripWorks uses red for .5 GPH and blue for 2 GPH. The Drip Store does not call them emitters. To them, they are drippers and they use the color green for 2 GPH and red for 4 GPH drippers. I guess the point is, make sure you know the manufacturer you are using and what color he uses to designate how much water is going to come out of that emitter/dripper/gizmo.

The emitters have a barbed inlet. You can push this barbed end directly into the main ½" drip line or insert it into ¼" spaghetti tubing. There are tools that help you with this part of the job and I strongly recommend using them to save your hands and fingers. (show hole

punch and magic tool)

Well, that's all you need to install an easy, simple, drip irrigation system in your backyard. There are other parts and pieces you are going to become familiar with as you struggle along. Goof plugs are for plugging mistakenly punched holes. There are ¼" transfer barbs used as couplings for joining two pieces of ¼" tubing or attaching ¼" tubing to a main ½" main line. There are wires in a U shape called soil staples or hold downs. Get lots of these! They hold your tubing where you want it to remain.

I would like to thank Netafim, Rainbird, The Drip Store, and DripWorks for providing catalogues for all of you today. I hope they are of value, giving you an idea of what is possible in the way of parts and pieces. There are other handouts for you, and one tells of a website called The Drip Depot. They do not have printed catalogues, they are adding products so fast that a catalogue would be obsolete before it was printed. But the reason I wanted to include their information is that they have a series of 5 calculator tools that help you figure out Flow Rate, Coverage, Pressure Loss, a Gravity PSI calculator, and a Liters to Gallons Calculator.

One more acknowledgement. I would like to thanks Robert Kourik for the inspiration from his two books to look into drip irrigation further.

And now we all will entertain your questions.