RESIDENTIAL IRRIGATION SYSTEMS FOR DUMMIES

Creative Roots guide to understanding the basics of residential irrigation systems

COURSE OVERVIEW

- Types of Irrigation Systems
- Basic Terminology and Parts Identification
- Step By Step Installation Guide (From start to finish)
- Basic Troubleshooting
- Hands on

TYPES OF IRRIGATION SYSTEMS

1. Overhead sprinkler System
2. Drip

OVERHEAD SPRAY SPRINKLER SYSTEM

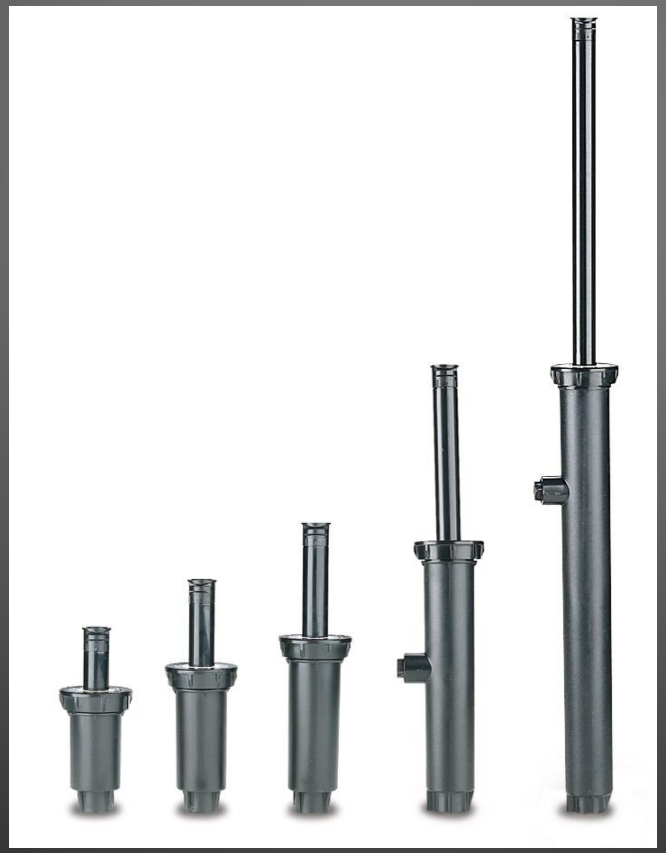
This is an irrigation system based on overhead sprinklers installed on permanent risers or buried in the ground. The sprinklers rise up when water pressure rises, which is a popular irrigation system for use on golf courses, parks and residential landscapes.

TYPES OF OVERHEAD SPRAY SPINKLERS

Fixed Spray Sprinklers

- Fixed spray sprinklers come in various sizes and styles. Choosing the proper sprinkler for your application is crucial.
- Standard nozzles come in 90, 180 and 360 sprays.
- There are also variable arc nozzles available that can be adjusted anywhere from 0-360 degrees for odd angles. (Note: these nozzles typically require more GPM's to operate.)
- Fixed spray sprinklers typically operate from the 2-20' radius range.

FIXED SPRAY SPRINKLERS



FIXED SPRAY NOZZLES

- Nozzles typically come with a small filter to keep debris from entering the nozzle and clogging it. (Note: Not all filters are the same so make sure you are choosing the proper filter for each nozzle.)

ROTARY SPRAY SPRINKLERS

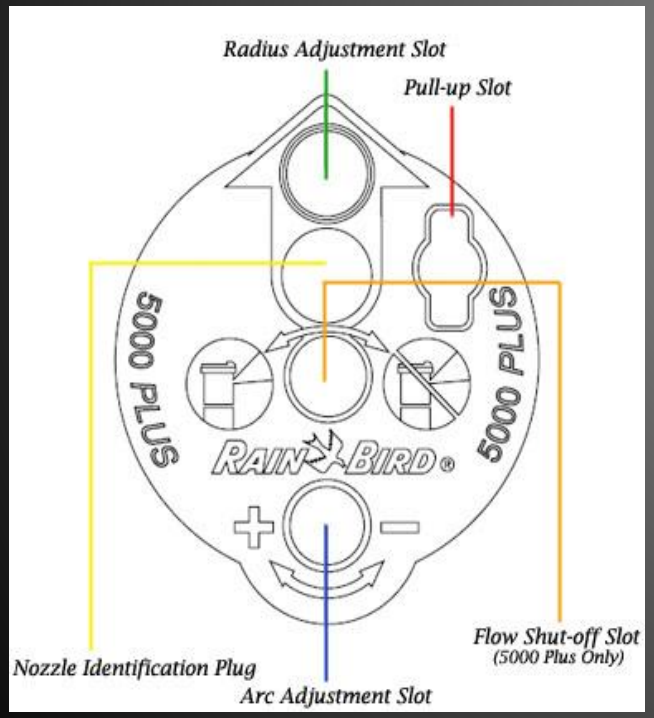
This method of irrigation is best suited for larger areas, for the sprinklers can reach distances of up to 100 feet. The word “Rotary” is indicative of the mechanical driven sprinklers moving in a circular motion, hence reaching greater distances. This system waters a larger area with small amounts of water over a longer period of time.

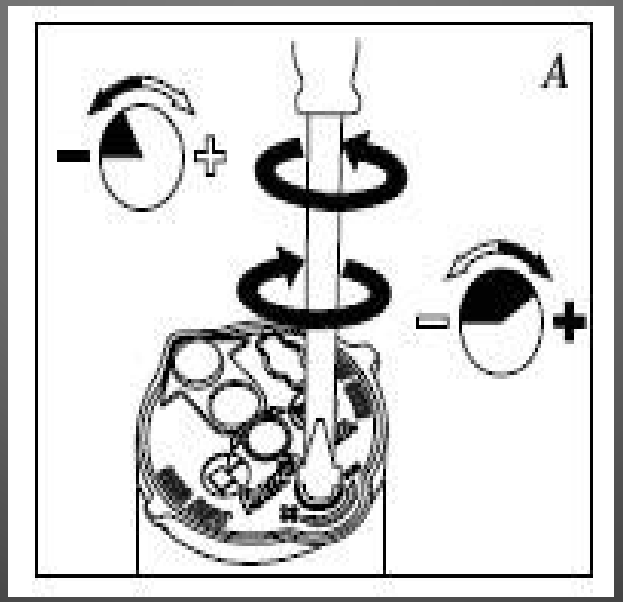
ROTARY SPRAY SPRINKLERS

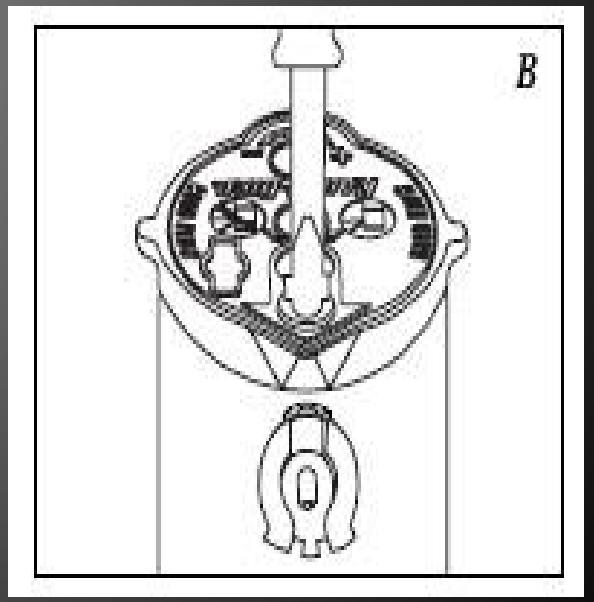
ROTARY SPRAY SPRINKLERS

- Rotary sprinklers are typically used for larger areas and in most cases be adjusted to rotate anywhere from 10 – 360 degrees.
- There are some rotors that are not adjustable and only rotate to certain radius's such as 90, 180 or 360 degrees.
- Because rotary sprinklers spray in a stream that rotates it requires a longer run time to achieve proper precipitation rates across an area.
- Adjustments to rotary sprinklers radius, arc and nozzle size are typically made via the top of the rotor head.

ROTARY SPRINKLER ADJUSTMENTS







NOZZLING ROTARY SPRINKLERS

When you buy a rotary sprinkler it typically comes with a variety of nozzles that allow you to adjust the precipitation rate of each sprinkler. For example it would have a .75 GPM nozzle, 1 GPM nozzle, 1.5GPM nozzle and so on depending on the size of the sprinkler.

When nozzling rotary sprinklers you must select the appropriate nozzle in order to match precipitation rates.

NOZZLING ROTARY SPRINKLERS

For Example:

Lets say you have 2 rotors on one irrigation zone and one is rotating a full circle, while
the other is only rotating a ¼ circle. Both sprinklers are rotating at the same speed regardless of their rotation setting. Therefore the stream from the quarter circle will pass over the same area 4 times by the time the full circle pass over the same area once.

Now, if both sprinklers have a 1 GPM nozzle in them that would mean the area being watered by the sprinkler rotating a quarter circle would receive 4 times the water by the time the full circle sprinkler rotates once around.

To match the precipitation rates of these two sprinklers the quarter circle sprinkler would need to be switch to a .25GPM nozzle. Now the full circle sprinkler rotates around once at 1 GPM. In that time the quarter circle sprinkler rotates 4 times back and forth at .25 GPM. .25 x 4 = 1GPM

DRIP IRRIGATION SYSTEM

- This is known as the most water efficient method of irrigation. Water drops right near the root zone of a plant in a dripping motion. If the system is installed properly you can steadily reduce the loss of water through evaporation and runoff.

DRIP IRRIGATOIN SYSTEM

Differences between Overhead spray and drip systems:

- **Water is Applied at a Low Flow Rate**
  Typical flow rates are measured in GPH as opposed to GPM like overhead spray systems.
- **Water is Applied for Long Periods of Time**
  Irrigation duration may be hours rather than minutes when the application rate is low.
- **Water is Applied Frequently**
  Irrigation events may occur daily, or even multiple times per day, when the application rate is low.
- **Water is Applied at Low Pressure**
  Operating pressures typically range between 10-30 psi, rarely exceeding 60 psi, for most emission devices.
- **Water is Applied Directly to the Soil and the Plant's Root Zone**
  Water drips, or sprays, directly onto the soil and into the targeted plant's root zone without wetting the plant or non-targeted areas, and without regard to the presence of wind. Depending on soil type and emission device, wetting patterns typically range from 0.5-6.0 feet for emitters and up to 4 feet for micro jets or sprays.
- **Water is Applied Through Numerous Emission Devices**
  In point source drip irrigation, each plant is fitted with at least one emission device to service the plant's water needs. In broadcast drip irrigation, a grid work of emission devices wets the entire area, servicing all plants within the wetted area.
- **Water is Filtered**
  To avoid plugging the relatively small passages inside drip emitters, 150-200 mesh filters are used to remove mineral or organic materials from the irrigation water.
- **Typical drip systems use poly pipe and not PVC**

DRIP IRRIGTATION SYSTEM

- There are three main types of drip systems used today
  - Drip emitters
  - Drip Line
  - Micro sprays (Micro-Jet Sprays)

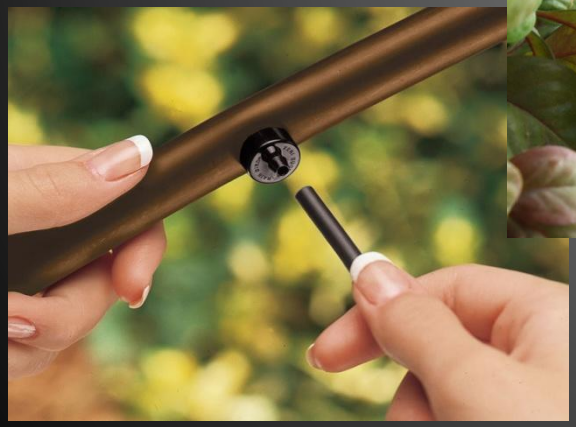
DRIP EMMITTERS

There are many different types of emitters available. The difference between each being how they regulate water pressure to achieve low flow rates

Installing Emitters:

- To install the emitters you create a hole in the drip tubing using a punch.
- Press the barbed emitter inlet into the hole and the barb locks it in place. Because the poly drip tube is elastic, it stretches around the barb and then seals itself around the stem of the barb.
- The key is that you don't want the hole you punch in the tubing to be bigger than the diameter of the barb stem. When the hole is larger than the barb stem, the hole won't seal and you will have a leak. If the emitter manufacturer makes a special punch I suggest you use it as it will create the proper size hole in the tube.

Installation of drip emitters



Goof Plugs

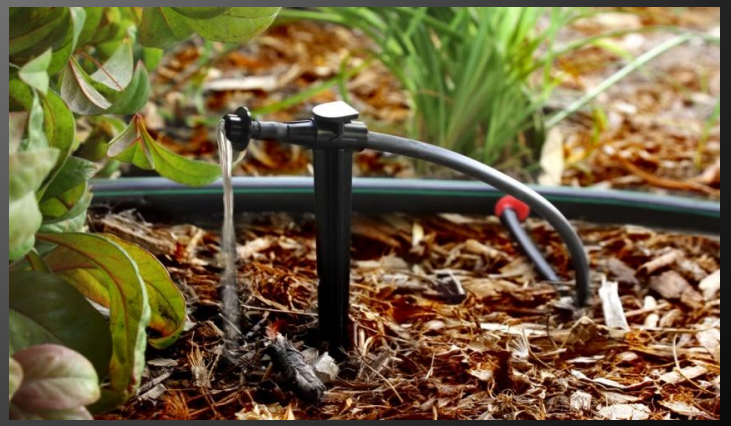
Goof plugs are small plastic barbed plugs used to fill the holes that get punched in the wrong place.

If you install an emitter in a place you don't want it, simply pull it back out and install a goof plug in the hole. If you try to put the emitter back in the same hole it will probably leak.

Once you have a goof plug installed in the tube don't pull it out! If you want to reinstall the emitter make a new hole in the tube. The goof plug has a larger barb and stem than most emitters, which is how it fills the old stretched-out holes without leaking. When you pull out a goof plug the barb is so large that often it rips the tubing and ruins it. The only cure then is to cut out a section of tubing and splice in a new piece of tube using two tubing couplings.

Bug Caps

- Also called an "Insect Plug", the **Bug Plug** is installed at the end of 1/4” solid poly tubing. It allows water out but prevents insects from entering and clogging the tubing.
- When installing, a bug plug is always used in conjunction with a drip emitter where ¼” tubing is used to extend the water from the emitter.
- Installing a bug plug is quick and easy.
- First, install the drip emitter that you want to attach 1/4” micro tubing too. Then, attach one end of the 1/4” tubing to the drip emitter and run the other end to desired watering area. Finally, cut the tubing and install the bug plug.
- To keep 1/4” tubing and bug plug in place, it’s recommended to install a stake



DRIP LINE

Drip line is perfect for row crops, close-spaced flowers or for plants that are spaced an equal distance apart in a row.
Heavy wall drip line is 1/2" Tubing with built-in drippers. Drip line saves you the work of attaching a great number of drippers to 1/2" Tubing.
There is no way to attach 1/4" Tubing to each built-in dripper to make an extension to a distant plant like you can with normal drippers. The plants served should all be within 9" of the drip line.
But you can punch a hole and install a dripper on heavy wall drip line in addition to all the built-in drippers and add a 1/4" Tubing extension to that dripper to reach a plant. Another example of how versatile drip irrigation can be.
Drip line is available with drippers spaced from 6" apart to 48" apart




MICRO-JET SPRAYS

- Micro-sprays and spray-jets are types of micro irrigation. These micro-sprinklers are low-volume overhead alternatives for areas where drip line is not practical. Flow rates for these types of micro-sprinklers can range from 5 to 30 gallons per hour.
- Usually attached to a stake and riser that can be assembled or can be purchased pre assembled as shown below.
- These micro-jet stakes and risers are simply punch into a ½" poly line the same way a drip emitter would be making them easy to install.
- Because of the small orifice of the spray heads all micro-jet spray zones should be filtered to keep debris from clogging the spray heads. (dental picks work great for unclogging spray heads)
- In most cases a PRV (pressure reducing valve) is used in conjunction with a filter to avoid over pressuring the micro-jets causing them to mist as opposed to spraying.
- Micro-jets are great for small shrub beds where large amounts of water are undesirable.

DRIP IRRIGATION SYSTEMS

Advantages and Benefits of Drip Irrigation System

- Water Efficiency
- Reduced Pest Problems and Weed Growth
- Versatility (great for large slopes and difficult areas where erosion could be an issue)
- Root Zone Watering
- Economical

Disadvantages of Drip Irrigation

- Drip tubing can be susceptible to damage
- A filter is required to guard against potential clogging of the small water passages of the drip emitters and micro sprinklers.
- You cannot see a drip system working as you can see a conventional sprinkler system.
- Each drip emitter creates a wetted area around each plant, so watering is more critical in replacing the water used by the plant to avoid stress.

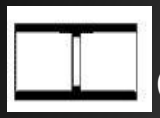
PARTS AND TERMINOLOGY

- **PVC –** Poly Vinyl Chloride. The material most plastic fittings are constructed out of. See SCH 40, SCH 80 above.
- **SCH 40, SCH 80 –**Terms used with PVC fittings and pipe that indicate the specification standard the fitting was constructed to meet. SCH 80 is usually a gray color and is stronger than SCH 40 which is usually a white color.
- **Marlex – P**lastic that some fittings are made of. Marlex is actually a brand name of a specific High Density Poly Ethylene. Normal PVC threaded joints "seize up" and will not turn freely. The HDPE has a oily surface which acts as a lubricant. HDPE fittings are used in situations where the threaded connection needs to remain flexible, such as swing joint risers.
- **Teflon Tape –** Most threaded joints need a sealer placed on the threads before the connection is made. The sealer serves two purposes. First it seals the joint (like you couldn't figure that out). Second, it lubricates the joint, which makes it much easier to thread the pieces together. Teflon tape is my preferred product , it is easy to use and clean. Wrap 3 layers around the male threads, wrapping in the same direction as the threads (so it doesn't unwrap when you start threading the fittings together).

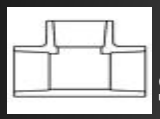
PARTS AND TERMINOLOGY

- **SSS, SST, SS, ST, etc...**These are terms used in describing the connections for PVC fittings.
- "S" stands for "SLIP" "socket", or "spigot", which means that the connection is a solvent weld (or glued) type. By the way, both sockets and spigots CAN be threaded also, which is why we use the term SLIP to specify that the connection is solvent welded.
- If you go to the hardware store to get a 3/4" tee with solvent weld inlet and outlet and a 1/2" threaded side outlet, you would ask for a "three quarter by three quarter by half tee, slip, slip, thread" and you would write it as "3/4x3/4x1/2 TEE SST".
- **Spigots, Sockets -** A spigot is the equivalent of a male end. A socket is a female end. In other words a spigot fits into a socket.
- **Male and Female -** Oh come on now. Surely you can figure this one out!
- **Solvent Weld -**You can say "glued" if your want, but that's not totally correct. The cement (glue) used for connecting PVC parts is sticky like standard glue, but in addition it actually melts the plastic, creating a true weld. Thus the term "solvent weld". By the way, the solvent for PVC is acetone (nail polish remover), so you can remove the PVC cement from your hands with acetone. You can also use acetone to clean PVC pipe, but be careful as the acetone will melt the pipe if you use too much!

PARTS AND TERMINOLOGY

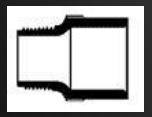


Coupler - A coupling connects two sections of pipe together. Couplings may have solvent weld socket ends or female threaded ends.



Tee - Available with all female thread sockets, all solvent weld sockets, or with opposed solvent weld sockets and a side outlet with female threads. Many configurations of "reducer tees" are available, meaning that one or more of the sockets is smaller than the others. Tees are always labeled as "NxNxN TEE with the side outlet as the last size. The largest of the other two sockets is always listed first.

Elbow 90 – Used to connect to sections of pipe together at a 90 degree angle. Can be found in SXS TXT SXT.



Female Adapter - Female adapters are used to add a female threaded pipe connection on a solvent weld pipe.

Male Adapter - Male adapters are used to add a male threaded pipe connection to a solvent weld pipe section.

Slip Fix – A telescopic repair coupling used to repair broken pipes without having to dig up large sections of pipe.

PARTS AND TERMINOLOGY

Elbow 45 - A 45 connects two sections of pipe together. 45's may have solvent weld socket ends or female threaded ends.

Nipple- A length of sch 80 PVC (usually threaded on both ends) used to make swing joints, or as a riser for shrub beds.

Shrub adapter – Allows you to attach a spray head nozzle to the top of a nipple or riser.

Micro-jet Adapter – Allows you to attach a micro-jet spray nozzle to the top of a nipple or riser.

Marlex Elbow -A street elbow made from high-density polyethylene (HDPE) and used to make swing joints and swing joint assemblies. There is no need for Teflon tape when using a marlex elbow.

Slip Fix – A telescopic repair coupling used to repair broken pipes without having to dig up large sections of pipe.

PARTS AND TERMINOLOGY

- **Swing Joint –** In addition to deflecting to prevent breakage, most swing risers also allow the sprinkler head location to be easily adjusted.