

Drip Irrigation for Raised Beds

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Irrigation

- Application of water to soil
 - Rain-fed
 - Artificial irrigation
- Rain-fed irrigation, natural application of water through rain
- Artificial irrigation, application of water through tubes, pumps, and sprays
- Watering garden is a must in the southwest



Home Irrigation

- Urban irrigation accounts for 50-65% of annual municipal water use
- Typically applied in excess
- Best practices
 - Group plants with similar water needs together
 - Schedule irrigation depending on needs
 - Examine irrigation monthly to repair any breaks and clean clogs



Types of irrigation

- Surface irrigation
- Localized irrigation
- Drip irrigation
- Sprinkler irrigation
- Center pivot irrigation
- Lateral move irrigation
- Sub-irrigation
- Manual irrigation



What is drip irrigation?

- Technology that uses a network of plastic pipes to carry water directly to plants
- Efficient use of water
- Can be automated
- Sometimes can be costly
- Must be managed to avoid leaking and/or plugging
- Precise application of water to reduce water use
- Salt build up



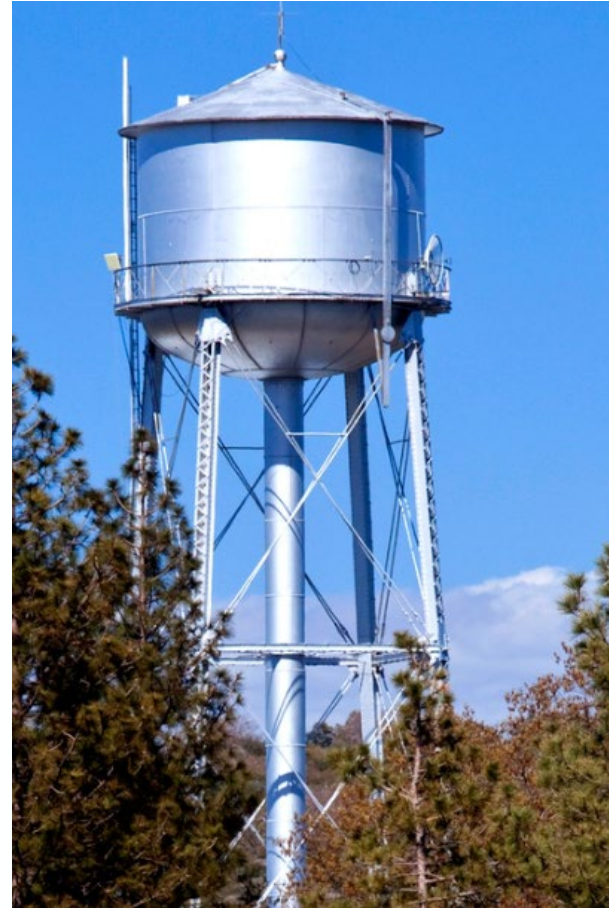
What do you need to set up a drip irrigation system?

- What water source will you be using?
 - Municipal water
 - Well water
 - Collected rain water
- What type of hardware do you want? What do you have access to?
 - Micro tubes
 - Drip tape
 - PC drip line with emitters
 - PC drip line without emitters
- What type of system do you want?
 - Gravity fed



Water Source

- Municipal water
 - Particulate free
 - High pressure
 - Calcium
- Well water
 - Pressure depends on the well
 - Calcium and salt levels
- Collected rain water
 - Low pressure
 - No calcium and/or salt
 - May have particulates

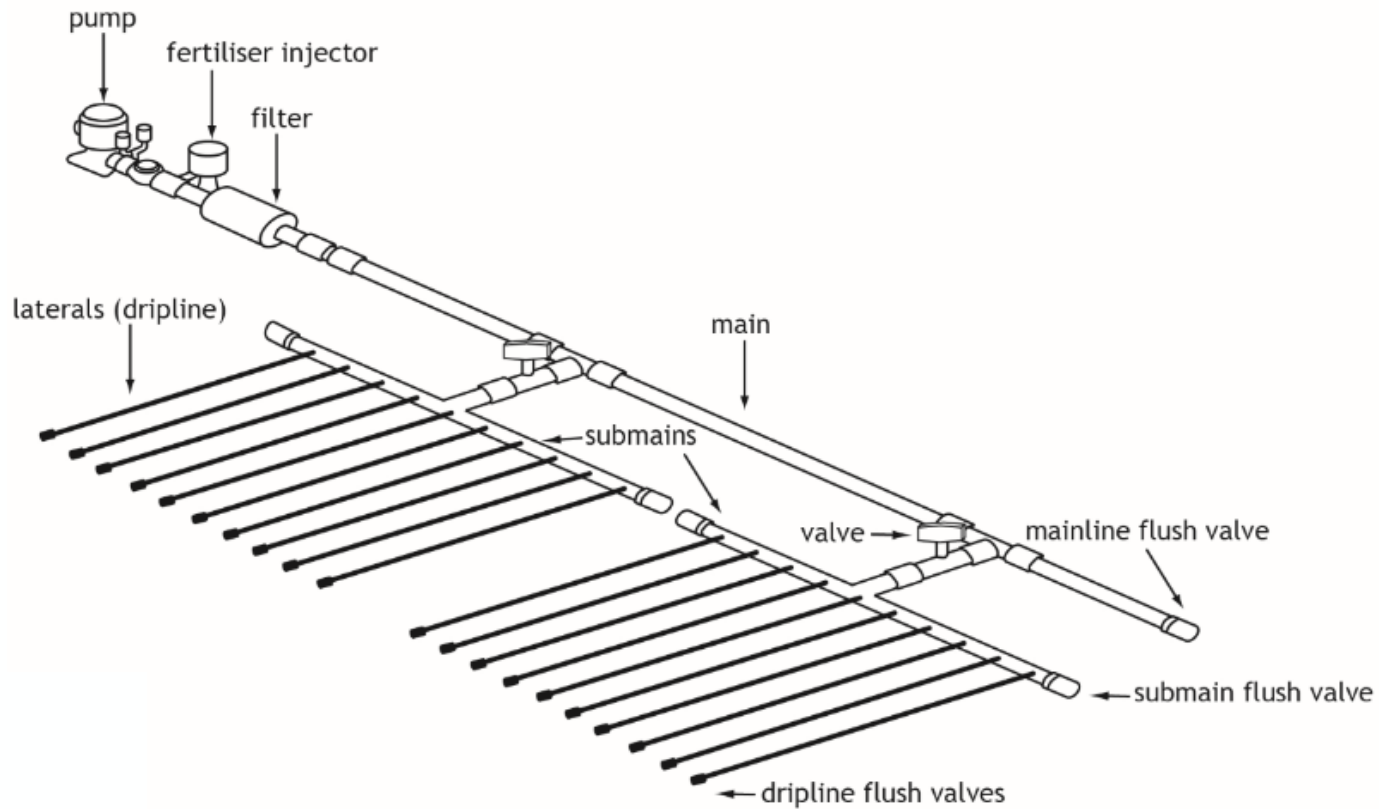


Terminology

- PSI = pounds per square inch, force exerted over an object or surface area
- Flow rate, amount of water that moves through or is emitted from your water source. Measured in GPH = gallons per hour or GPM = gallons per minute
- Emitter, end devices which deliver water to plants in a specific manner
 - On-line emitters
 - Inline drippers



Terminology



Tubing



- 1 GPH pressure compensating drip emitters at 12 inch spacing
- Adjusts incoming pressures of 10-45 psi
- Total flow rate for 100 ft is 100 GPH (1.7 GPM)
- ½ inch diameter
- 200 ft maximum



- No emitters, add your own
- ½ inch diameter
- 200 ft maximum

Drip Tape



Wall Thickness	Life Expectancy
5 mil	1 year
6 mil	1 year
8 mil	2-3 years
10 mil	2-4 years
12 mil	2-4 years
15 mil	5-10 years

Emitter Spacing (in inches)	Crops or Application	Other Considerations
4"	Flowers, Peppers, Greenhouses	Good for Sandy Soil, Short Runs
6"	Germination, Onions, Garlic	Tight Plant Spacings
8"	Germination, Strawberries, Vegetables	High Flow for Sandy Soil
12"	Good all around choice	If Low Flow Emitter Used - Great for Long Runs
60"	Blueberries, Hops	Long Runs of Plants Spaced Far Apart

Drip Tape



- Emitters facing up
- Can be buried, thicker walls
- Best for long straight runs
- Too much pressure can cause the tape to burst

Wall Thickness (mil)	5/8" Tape	7/8" Tape	1 1/8" Tape	1 3/8" Tape
5	8 PSI			
6	10 PSI	8 PSI		
8	15 PSI	10 PSI	8 PSI	
10	15 PSI	15 PSI	10 PSI	
12	15 PSI	15 PSI	12 PSI	
15	15 PSI	15 PSI	15 PSI	15 PSI

Soaker Hose



- ½-1 gallon per hour
- Inconsistent results

Micro-Tubes



- ¼ diameter
- Pressure rating 25 psi
- Can be used with gravity and low pressure systems
- 0.5 GPH emitters
- 30 feet maximum



- ¼ diameter
- 25 psi pressure rating
- Better results than ½ diameter soaker hose

Design

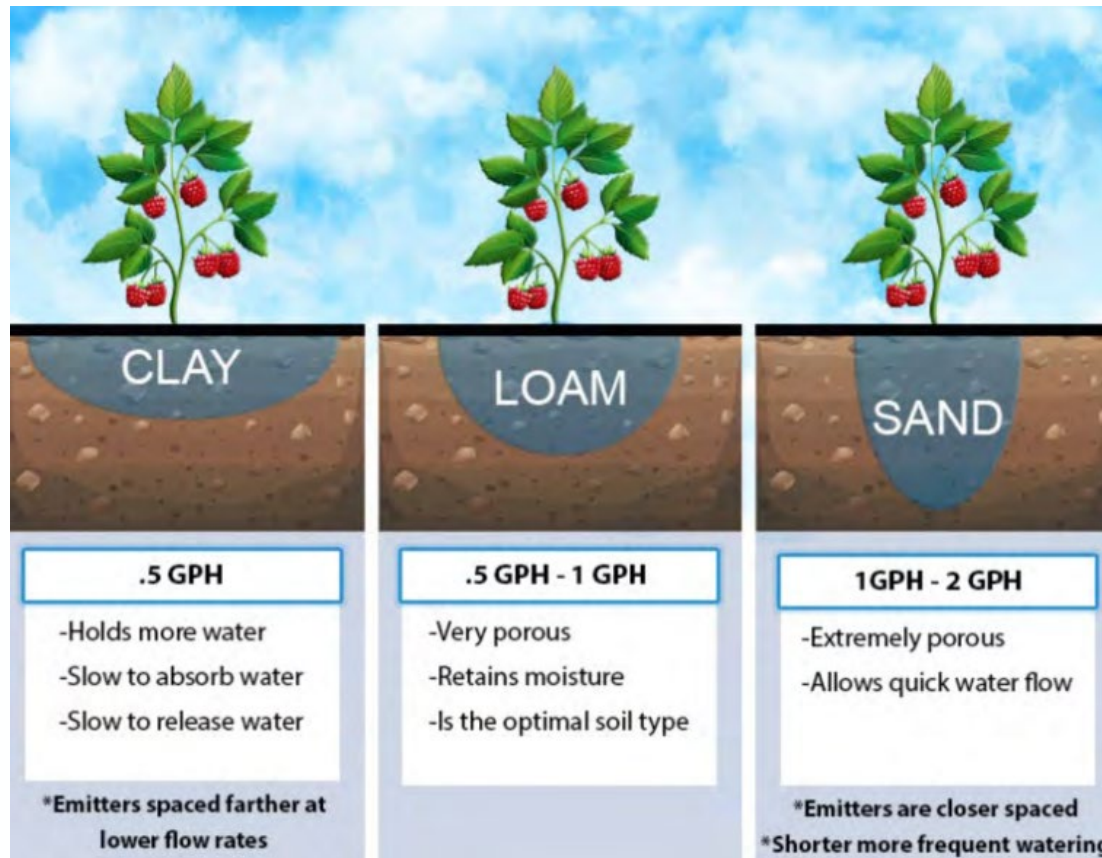
- Point of connection
 - Faucet
 - Tap
 - Spigot
 - Gate valve
- Flow rate

Seconds to fill a *1 Gallon Container	5	6	7	8	9	10	11	12	13	14
GPH	720	600	514	450	400	360	327	300	277	257

*** If filling a 5 gallon container multiply the GPH x 5**

- Example: 5 seconds to fill 1 gallon container
- 720 GPH/60 minutes= 12 GPM

Flow Rates and Soil Type





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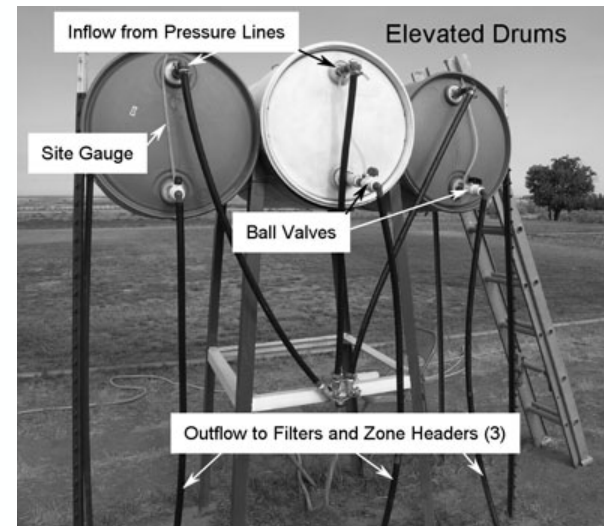
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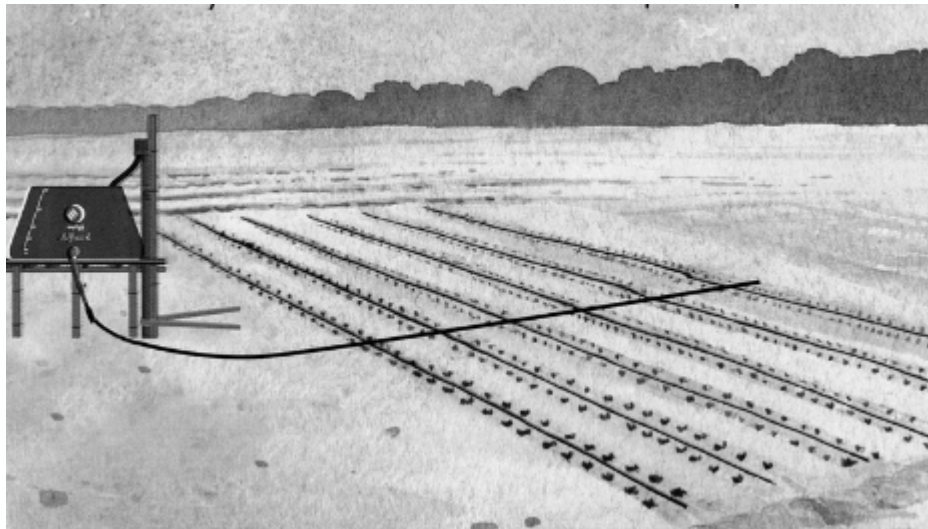
Gravity Fed Drip Irrigation

- For each 2.3 ft elevation, 1 psi is gained
- For 5 ft high, 2.2 psi



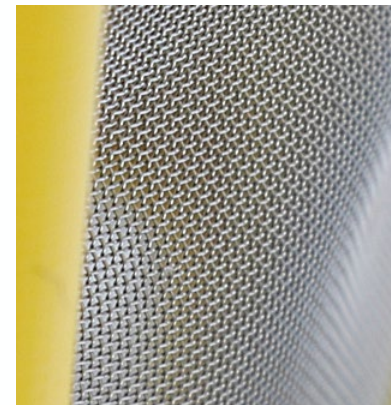
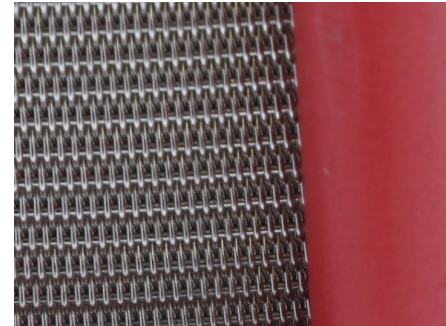
Gravity Fed Drip Irrigation Design

- Ultra-low pressure drip irrigation
- Tanks with 3 ft elevation, 1.3 psi
- Lateral lengths of 100 feet or less
- Use low flow rate drip tape for laterals with thin walls (5 mm)



Filtration

- Dirty water vs clean water
- Drip emitters and sprayers need 120 mesh
- Drip tape requires 155 mesh
- Check monthly and clean
- Canister filter
 - Make sure you have enough clearance



Municipal Drip Irrigation Design

- Usually high pressure, typically 80 psi or above
- Need 25 psi for poly tubing and 10 psi drip tape



PRLG

PRODUCT SPECS	PRLG
Flow Range	0.5 - 7 gpm (114 - 1590 L/hr)
Preset Operating Pressure	10 - 40 psi (0.69 - 2.76 bar)
Maximum Inlet Pressure*	90 - 120 psi (6.20 - 8.27 bar)
Inlet Sizes	3/4" F hose, 3/4" F NPT
Outlet Sizes	3/4" M hose, 3/4" M NPT



PRL

PRODUCT SPECS	PRL
Flow Range	0.5 - 8 gpm (114 - 1817 L/hr)
Preset Operating Pressure	6 - 40 psi (0.41 - 2.76 bar)
Maximum Inlet Pressure*	90 - 120 psi (6.20 - 8.27 bar)
Inlet Sizes	3/4" F NPT, 3/4" F hose
Outlet Sizes	3/4" F NPT

Tube Lengths

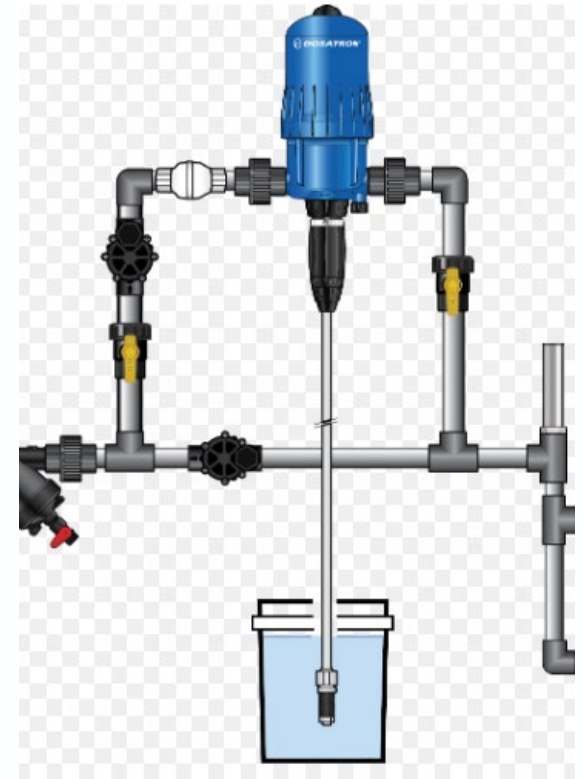
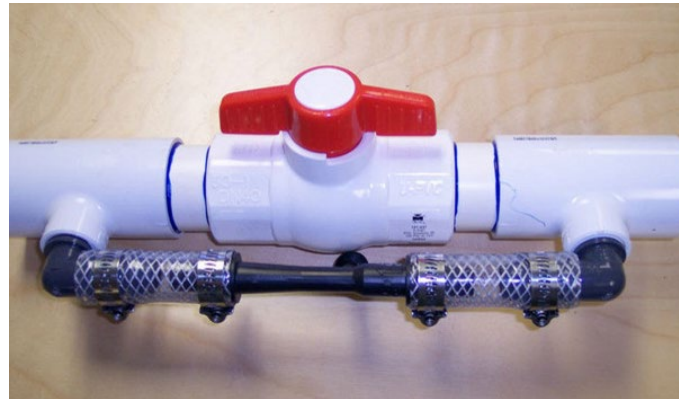
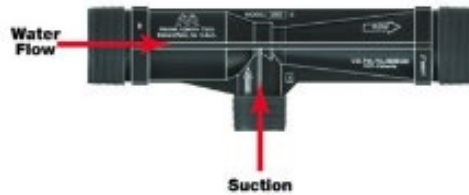
- Maximum tube lengths, add output of all emitters
- If you have a long straight run of over 200 ft, use thick walled drip tape and pressure regulator
- 40 x .5 GPH drippers = 20 GPH



Tubing Size	Maximum Run Length	Maximum GPH Supplied
<u>1/4"</u>	30 feet	30 GPH
<u>1/2"</u>	200 feet	200 GPH
<u>3/4"</u>	480 feet	480 GPH
<u>1"</u>	960 feet	960 GPH

Fertilizer Injector

- Simple (less expensive) to more complicated (more expensive)



Backflow Preventer

- Back flow preventer, protect water supply from fertilizers



What are you watering?



Staked Drippers

- Purpose: Point-to-point watering of individual plants.
- Ideal for squash, peppers, tomatoes, cabbage, cauliflower
- Watering rates available: 0.5, 1, 2 and 5 GPH

What are you watering?



Emitter Tubing with Built-In Drippers

- Purpose: Watering of row plants
- Ideal for carrots, radishes, strawberries, onions, celery, peas, potatoes
- ½" emitter tubing: 0.9 GPH every 12" or 18"
- ¾" emitter tubing: 1.0 GPH every 6" or 12"



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What are you watering?






Micro Bubblers

- Purpose: Watering of slightly larger plants and plant groupings
- Ideal for beans, cucumbers, other larger plants and densely planted clusters
- Watering rates are adjustable: 0 to 13 GPH

Make a Plan

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

	.5 gph	12 x .5 gph = 6 gph
	1.0 gph	12 x 1.0 gph = 12 gph total = 42 gph
	2.0 gph	12 x 2.0 gph = 24 gph

Tubing Size	Maximum Run Length	Maximum GPH Supplied
1/4"	30 feet	30 GPH
1/2"	200 feet	200 GPH
3/4"	480 feet	480 GPH
1"	960 feet	960 GPH



THINGS YOU WILL NEED



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Punchers



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Cutters and Gloves



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Automatic Timers



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Hose Thread



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Compression Fittings



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Barbed Fittings



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Tri-Locking Ring Fittings



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Perma-loc Tape and Barb Tubing Takeoff



End Caps



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1/4 inch Fittings



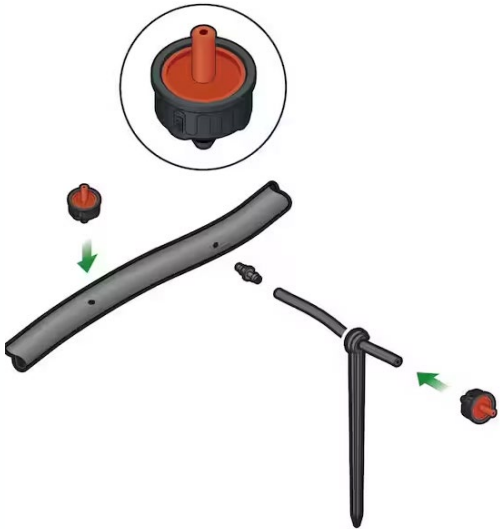
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Stakes



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On-line Drip Emitters



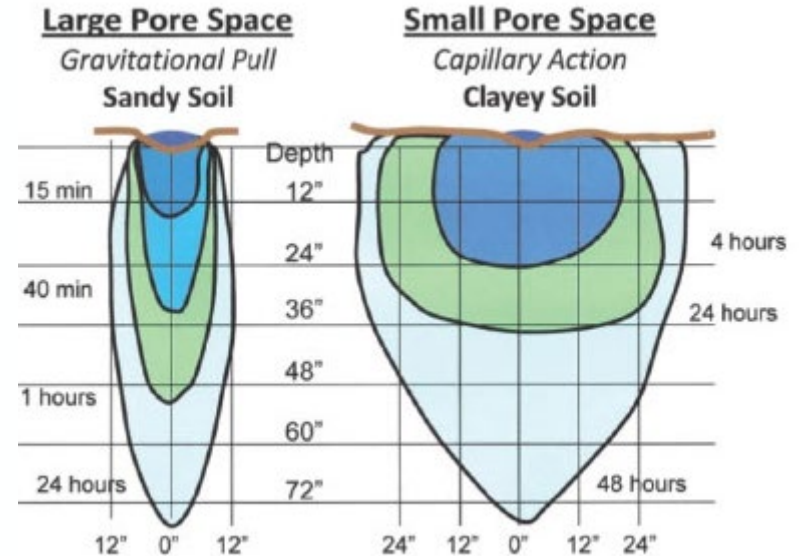
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Drip Irrigation Bubbler



When To Irrigate

- Feel method
 - Squeeze soil in hand
 - If you can make a ball wait to irrigate (depending on soil type)
 - If the soil crumbles and is dry, time to irrigate
- Do not wait until it is very dry, plants will go past the wilting point
- Irrigation time, long enough to go to 1 ft depth, but not too long for deep percolation
- Water early in the day or evening



(IWM - 10 a)

Appearance of fine sand and loamy fine sand soils at various soil moisture conditions.



25-50 percent available
0.9-0.3 in./ft. depleted

Slightly moist, forms a very weak ball with well-defined finger mark



50-75 percent available
0.6-0.2 in./ft. depleted

Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.



75-100 percent available
0.3-0.0 in./ft. depleted

Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon

Appearance of sandy loam and fine sandy loam soils at various soil moisture conditions.



25-50 percent available
1.3-0.7 in./ft. depleted

Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.



50-75 percent available
0.9-0.3 in./ft. depleted

Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not slick.



75-100 percent available
0.4-0.0 in./ft. depleted

Wet, forms a ball with wet outline left on hand, light to medium staining on fingers, makes a weak ribbon between the thumb and forefinger.

(IWM - 10 b)

Appearance of sandy clay loam, loam, and silt loam soils at various soil moisture conditions.



25-50 percent available
1.6-0.8 in./ft. depleted

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.



50-75 percent available
1.1-0.4 in./ft. depleted

Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.



75-100 percent available
0.5-0.0 in./ft. depleted

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.

Appearance of clay, clay loam, and silt clay loam soils at various soil moisture conditions.



25-50 percent available
1.8-0.8 in./ft. depleted

Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.



50 - 75 percent available
1.2-0.4 in./ft. depleted

Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.









75-100 percent available
0.6-0.0 in./ft. depleted

Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.

How To Irrigate

Plant Types	Watering Devices		Water Needs per week	Cool Climate	Warm/Humid Climate	Hot/Arid Climate
Row Plants: Cauliflower, celery, corn, lettuce, parsnips, peas, potatoes, radishes, spinach 	 ½" Emitter Tubing 0.9 GPH 12-inch or 18-inch spacing	2 gallons	45 min. (2x/wk)	60 min. (2x/wk)	90 min. (2x/wk)	
	 ¼" Emitter Tubing 1.0 GPH 6-inch or 12-inch spacing Best for shorter tubing runs, less than 30 feet.					
Onions 	 Dripper 0.5 GPH	.5 to 1 gallons	45 min. (1x/wk)	60 min. (1x/wk)	90 min. (2x/wk)	
Broccoli, brussel sprouts, squash 	 Dripper 1.0 GPH	1 to 1.5 GPH	45 min. (1x/wk)	60 min. (1x/wk)	75 min. (1x/wk)	

How To Irrigate Continued

Beets 		Dripper 2.0 GPH	1 gallon	45 min. (1x biweekly)	60 min. (1x biweekly)	75 min. (1x biweekly)
Tomatoes, peppers 		Dripper 2.0 GPH	2 gallons	45 min. (2x/wk)	60 min. (2x/wk)	75 min. (2x/wk)
Cucumbers 		Micro Bubblers Adjustable 0-13 GPH	1 gallon	45 min. (1x/wk)	60 min. (1x/wk)	90 min. (2x/wk)
Beans 			2 gallons	45 min. (1x/wk)	60 min. (1x/wk)	75 min. (1x/wk)

Things to Remember

- Make a plan or do not make a plan
 - Review what you have
 - Decide what you want
- Zone crops with similar water needs
- Best to irrigate when the plants need it versus a regular schedule
- Many online resources
- Have fun!



Thank You and Questions

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