

# Irrigation or Irritation The Choice is Yours!

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## Irrigation Questions

- What is my water source?
- What is my gallons per minute?
- What is my water pressure?
- What is my water window?
- How much landscaping and turf am I going to irrigate?
- What is my budget?

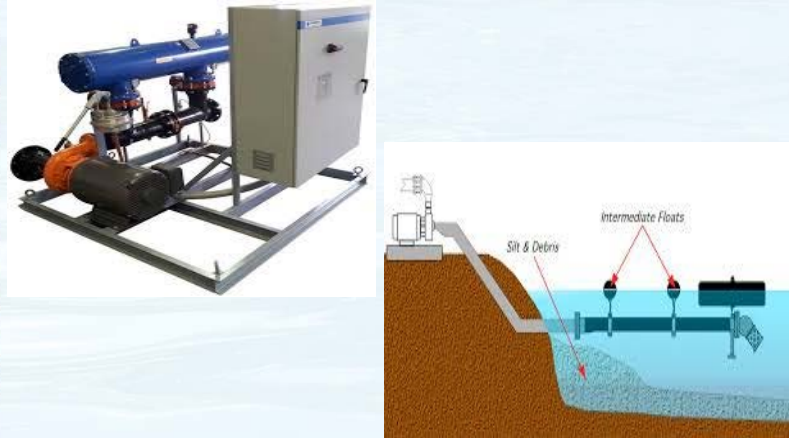
## Water Source

- .Water Meter
- .Well
- .Pond or Lake
- .River
- .Retention Pond

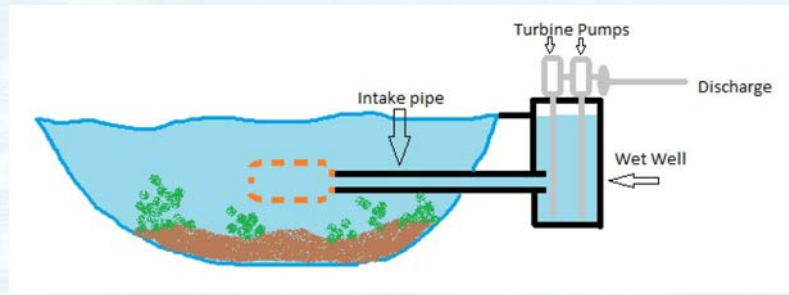
## Storm Water Management



## Pump Station With Filtration



## Wet Well for Irrigation



## GPM and Pressure

- .Sprays- Operating pressure range is 15-70 psi
- .Rotors- Operating pressure range is 25-65 psi
- .Large Rotors- Operating pressure range is 30-100 psi
  
- .Sprays- Operating range is 0-5 gpm
- .Rotors- Operating range is 0.76-9.63 gpm
- .Large Rotors- Operating range is 2.9- 36.3 gpm

## What is my Water Window?

- .The amount of time to irrigate without interrupting the ability to use the area for play.





## How much area are you irrigating?



## What is my Budget?

- .Football/Track \$18,000 - \$21,000
- .Typical Baseball Field \$13,500 - \$15,500
- .Soccer Field \$8500 - \$9500
- .Premium Baseball Field \$19,000 - \$22,000
- .Premium Soccer Field \$12,000 - \$14,000
  
- .General rule of thumb is \$350 - \$400 per rotor installed.

## Avoid Potential Design Flaws

- .Pipe Sizing
- .Back Flow Sizing
- .Valve Sizing
- .Wire Sizing
- .Site Conditions
- .Matched Precipitation Rate
- .Determining Pressure Requirements
- .Determining Water Supply Requirements

## Pipe Sizing

- .What size pipe do I need?
- .What type of pipe will I use?
- .Why am I using various sizes of pipe?



- .Rule of Thumb: Obey the Speed Limit.

## Why should you obey the speed limit?

- .When water travels faster than 5 feet per second, it becomes extremely turbulent.
- .Excessive water hammering can cause damage to piping
- .Pressure loss increases can affect system performances.
- .Valves can have problems opening and closing properly.

## Velocity

- .Velocity refers to the speed that water travels inside the pipe.
- .Do not exceed flows of 5 feet per second.





**PVC CLASS 40 IPS PLASTIC PIPE**

Sizes ½ in through 6 in. Flow 1 through 600 gpm.

SIZE	½ in	¾ in	1 in	1¼ in	1½
OD	0.840	1.050	1.315	1.660	1.90
ID	0.622	0.824	1.049	1.380	1.61
Wall Thk	0.109	0.113	0.133	0.140	0.14

flow gpm	velocity fps	psi loss	velocity fps	psi loss	velocity fps	psi loss	velocity fps	psi loss	velocity fps
1	1.05	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.15
2	2.11	1.55	1.20	0.39	0.74	0.12	0.42	0.03	0.31
3	3.16	3.28	1.80	0.84	1.11	0.26	0.64	0.07	0.47
4	4.22	5.60	2.40	1.42	1.48	0.44	0.85	0.12	0.62
5	5.27	8.46	3.00	2.15	1.85	0.66	1.07	0.18	0.78
6	6.33	11.86	3.60	3.02	2.22	0.93	1.28	0.25	0.94
7	7.38	15.77	4.20	4.01	2.59	1.24	1.49	0.33	1.10
8	8.44	20.20	4.80	5.14	2.96	1.59	1.71	0.42	1.25
9	9.49	25.12	5.40	6.39	3.33	1.97	1.92	0.52	1.41
10	10.55	30.54	6.00	7.77	3.70	2.40	2.14	0.63	1.57
11	11.60	36.43	6.60	9.27	4.07	2.86	2.35	0.75	1.73
12	12.65	42.80	7.21	10.89	4.44	3.36	2.57	0.89	1.88
14	14.76	56.94	8.41	14.48	5.19	4.47	2.99	1.18	2.20
16	16.87	72.92	9.61	18.55	5.93	5.73	3.42	1.51	2.51
18	18.98	90.69	10.81	23.07	6.67	7.13	3.85	1.88	2.83
20	21.09	110.23	12.01	28.04	7.41	8.66	4.28	2.28	3.14
22			13.21	33.45	8.15	10.33	4.71	2.72	3.46
24			14.42	39.30	8.89	12.14	5.14	3.20	3.77
26			15.62	45.58	9.64	14.08	5.57	3.17	4.09

## Types of PVC Pipe Used In Irrigation Systems

- Pressure Rated PVC
- Scheduled PVC



## Pressure Rated PVC

- .Most Common Ratings are 160# and 200#
- .Usually have thinner wall than Schedule 40 in sizes
- .Usually have thicker wall than Schedule 40 in sizes 6" and larger

## Scheduled Pipe

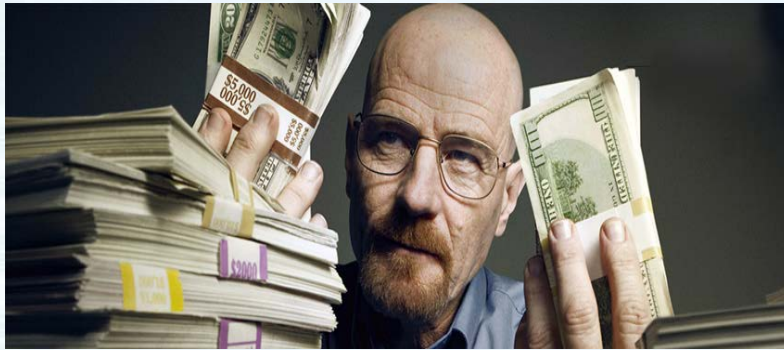
- .Scheduled pipe must meet certain wall thickness requirements
- .Pressure rating changes each pipe size
- .Schedule 40 and 80 are most common

Why do we use different sizes or down size pipe in an irrigation system?

## Downsizing Pipe

- We are able to downsize pipe in a system as the required flow for a pipe changes. As irrigation heads use water, the flow rate changes in the pipe.
- As flow rate decrease, pipe diameter also decreases.
- Downsizing also allows us to:

## Save Money!



## Irrigation Myth

“By downsizing pipe, I will increase the pressure in my irrigation system.”



As pipe diameter decreases, velocity increases and pressure decreases.

Pressure cannot be created in a system unless you have a booster pump or water travels down hill.

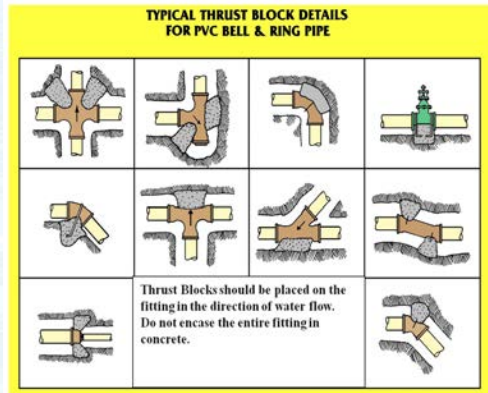
Your pressure will only decrease as water travels through piping, valves, fittings, and sprinklers.

## Irrigation Fittings

- .Sizes 3" and smaller should have PVC fittings
- .Sizes 3" and larger should have ductile iron fittings.

.Conventional PVC fittings are prone to fail when subjected to the pressure surges that occur in irrigation systems. Ductile iron fittings are extremely robust and are immune to the cracking, breaking, and blowouts that occur so often in PVC fittings.

## Thrust Blocking



## Irrigation Valve Sizing

- When sizing a valve, we should know our irrigation zone requirements. How many heads are we running?
  - Light Commercial Valves- 15-150 psi range 2-150 gpm
  - Heavy Commercial Valves- 15-150 psi range 2-200 gpm
  - Brass Valves- 20-200 psi range 5-300 gpm
- Example: A football field has a water meter that provides 80 gpm at 90 psi. The field will have 12 Rain Bird 8005 rotors on it. Each head will use 20 gpm.

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•We are going to break the heads up into 4 zones. Three heads per zone

Flow gpm	100- PGA Globe 1"	100- PGA Angle 1"	150- PGA Globe 1½"	150- PGA Angle 1½"	200- PGA Globe 2"	200- PGA Angle 2"
1	5.1	4.3	-	-	-	-
5	5.5	5.0	-	-	-	-
10	5.9	5.5	-	-	-	-
20	6.0	5.6	-	-	-	-
30	6.4	5.5	1.9	1.3	-	-
40	7.0	7.5	3.2	2.0	1.2	1.0
50	-	-	4.8	3.0	1.5	0.9
75	-	-	11.1	6.5	3.0	1.7
100	-	-	19.2	11.7	5.5	3.0
125	-	-	-	-	8.6	4.8
150	-	-	-	-	12.0	6.5

•1" - \$15

•1.5" - \$45

•2" - \$65

## Wire Sizing

- As wire length or run increases, size of wire also increases
- The lower the number, the bigger the wire size.
- By increasing the size of the common wire you can increase the wire run distance
- Most common sizes are 18, 16, 14, and 12 gauge wire





## Site Conditions

- .Soil Type
- .Sun or shade
- .Plant Type
- .Wind Conditions



## Site Conditions



## Matched Precipitation Rate

•Matched Precipitation is a term that refers to matching various nozzles in sprinklers based on arc settings to achieve uniform water distribution.

•As the arc setting increases, so does the gpm of the nozzle

•Example:

- 90 degree arc will use 1 gpm nozzle
- 180 degree arc will use 2 gpm nozzle
- 270 degree arc will use 3 gpm nozzle
- 360 degree arc will use 4 gpm nozzle

## Determining System Pressure

•There are two types of pressure readings associated with irrigation systems.

- Static Pressure
- Dynamic or Working Pressure



## Static vs. Dynamic Pressure

Static Pressure is the reading taken with no water in motion. Can be thought of as potential pressure.

This should not be used for basing irrigation system operating pressure.

Working Pressure refers to system pressure with water in motion. Working pressure is affected by friction loss through piping, fittings, valves, etc.

It is more indicative of the pressure your irrigation system will operate at.

## Irrigation Example

I have a commercial site that has 2 acres of landscaping. During the hottest months of the year, I lose .25 inches of water due to evapotranspiration or ET. I can only water at nights due to owner's request. This gives me an 8 hour water window per day. How much water will I need to supply the irrigation system?



Useful Formula- It takes 27,146 gallons to put 1 inch of water over an entire acre.

If I have 2 acres of landscaping, then it will take 54,308 gallons of water to put an inch of water over all of my landscaping.

$$2(\text{acres}) \times 27,154(\text{gallons/acre}) = 54,308 \text{ gallons}$$



If I am trying to replace .25 inches of water in my landscape due to the ET, then I will need to apply 13,577 gallons back to the landscape.

$$.25(\text{inches lost to ET}) \times 54,308(\text{gallons over 2 acres}) = 13,577 \text{ gallons}$$



If I have an 8 hour watering window, then I have 480 minutes to run my irrigation.

$$8(\text{hrs}) \times 60(\text{minutes per hour}) = 480 \text{ minutes}$$



## Conclusion

I need to replace 13,577 gallons of water in my landscape and I have 480 minutes to do it in. I need a water source that supplies 28 gallons per minute.

$$13,577 \text{ gallons} / 480 \text{ minutes} = 28 \text{ gallons per minute}$$







## Rain Sensors



## Soil Moisture Sensors





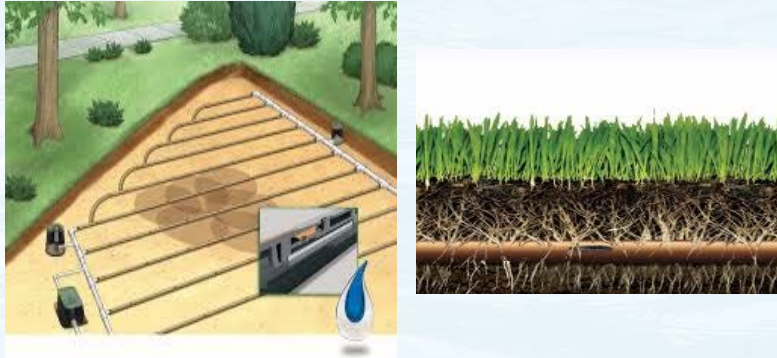
## Drip Irrigation



## Root Watering System



## Subsurface Drip Irrigation



## Rotary Nozzles

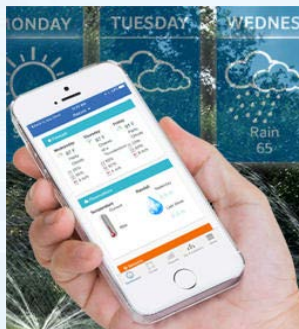


## Pressure Regulating Heads



## Central Control Systems

- Flow Sensing
- Daily Reports
- Water Usage Log
- Alerts
- Water Savings
- Weather Adjustments





## Irrigation Control from Anywhere

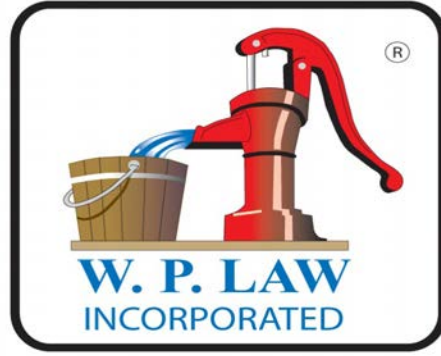


## Recap

- ✓Water Source
- ✓Irrigation Design
- ✓Budget Set
- ✓Contractor Chosen
- ✓Work is done
- ✓Require an As Built
- ✓Enjoy your irrigation system



# Questions?



Pumping & Piping Systems

