

Sprinklers and Equipment






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Sprinkler Irrigation

- 4 types of sprinklers
 - Spray
 - Flood
 - Rotary
 - Micro-Irrigation



Flood Sprinklers

- High flow devices used to saturate soil where sprinkler application is not wanted
- Usually installed below plant height
 - (trees, shrubs, flower beds)
- Concern over runoff or flooding
- Most common version are for micro applications



Spray Sprinklers



Fixed Angle Spray Nozzles



PRO ADJUSTABLE NOZZLES

Adjustable Angle Spray Nozzles



Rotary “Impact” Sprinklers



Nursery Systems



Impact Rotor



Gear-Driven Rotary Sprinklers



Single Stream Rotator






Multi-Stream Rotators



Drip/Micro Irrigation

- Highest equipment costs per area and usually highest water use efficiency
- Allows for precise water management in small areas
- Facilitates daily or more frequent irrigation to reduce plant moisture stress
- Low pressure requirements (10-15 psi)
- low flow rates (gph not gpm)




Impact Sprinklers on Risers Micro-Bubbler

Pop-up Rotator Micro-Spray

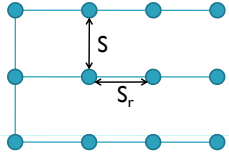



Using which? Where?

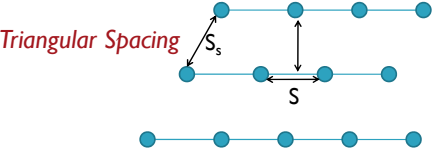
- Rotary
 - Large turf areas
- Spray
 - Small lawn & planting bed areas
- Micro/Bubbler
 - Small planting beds, shrubs, trees



Sprinkler Spacing



Square Spacing

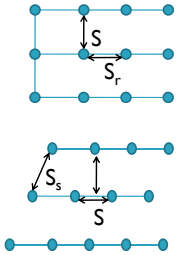




Triangular Spacing

Compensating for Wind

- 0 – 3 mph winds
 - S_s & S_r = Diam. * 0.55
- 4 – 7 mph winds
 - S_s & S_r = Diam. * 0.50
- 8+ mph winds
 - S_s & S_r = Diam. * 0.45







Gross Precipitation Rate

Theoretical precipitation rate; does not account for losses from sprinkler to soil

$$PR = \frac{Q}{A}$$

PR = Gross Precipitation Rate
Q = Flow; A = Area



$$PR_{in/hr} = \frac{96.3 \times Q_{gpm}}{A_{ft^2}}$$



Net Precipitation Rate

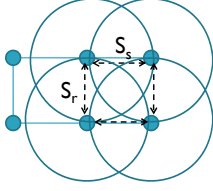
Measure of the amount of water that reaches the soil; Gross Precipitation Rate minus losses from the sprinkler to the landscape



$$PR_{net} = \frac{V_u \times 3.66}{t \times A_{cd}}$$

PR = Net Precipitation Rate (in/hr)
 V_u = Average catch volume for area (mm)
 t = testing time (minutes)
 A = Catch device throat area (in²)

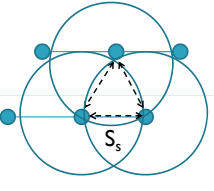





PR for Square Spacing



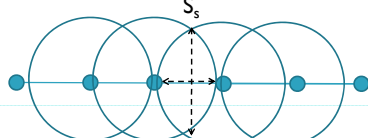
$$PR_{in/hr} = \frac{96.3 \times Q_{gpm}}{S_s \times S_r}$$





PR for Triangular Spacing



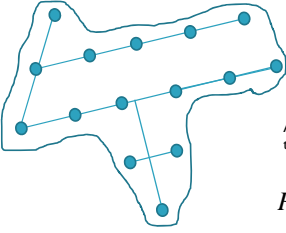
$$PR_{in/hr} = \frac{96.3 \times Q_{gpm}}{S_s^2 \times 0.866}$$



PR for Single Row of Sprinklers





$$PR_{in/hr} = \frac{96.3 \times Q_{gpm}}{S_s \times 0.8 \text{ Diameter}}$$



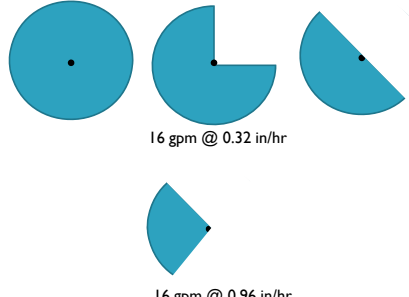
PR for Irregularly Shaped Areas





Add up the gpm and estimate the total area being watered

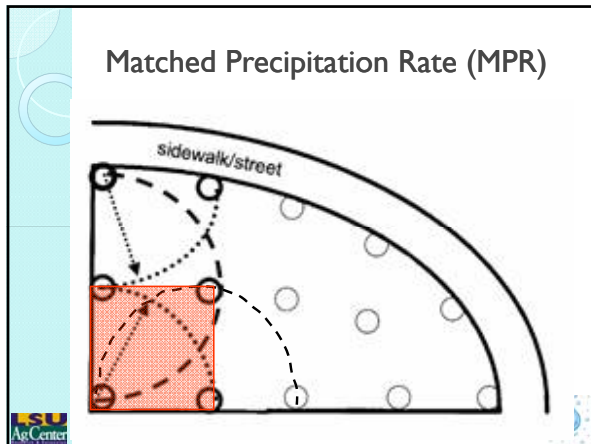
$$PR_{in/hr} = \frac{96.3 \times Q_{gpm}}{A_{ft^2}}$$



Changing sprinkler arcs



16 gpm @ 0.24 in/hr (Full circle)
 16 gpm @ 0.48 in/hr (3/4 arc)
 16 gpm @ 0.32 in/hr (1/2 arc)
 16 gpm @ 0.96 in/hr (1/4 arc)



Matched Precipitation Rate (MPR)

- Matched precipitation heads have flow rates that are proportional to the degree of arc
 - 8 gpm @ 360°
 - 4 gpm @ 180°
 - 2 gpm @ 90°
 - 1 gpm @ 45°



Irrigation Controllers

- Programmable
- Flexible
- Multi-zone
- Manual modes
- 24-volt

Single Station Controllers

- Battery operated
- Single zone
- Adding new zones
- Faucet or below ground


Rain Sensors

- Conserves irrigation water
- Reduces over-irrigation
- Works with all 24VAC controllers
- Interrupts, doesn't change irrigation programs. Automatically returns to normal watering.
- Most with adjustable rainfall shutoff amount

Operation of irrigation systems


Irrigation Scheduling, Soil Moisture Based:

- **TDR (time domain reflectometry)**
 - Relatively expensive – requires special instrumentation to read sensors
 - Relatively easy to use and maintain
 - Affected by temperature (slightly, should read at the same time on a daily basis)
 - Good life expectancy (will last many years if properly maintained)
 - Can be integrated into a computer based operating system
 - Does a good job of integrating soil moisture conditions across a range of depths, does not do a good job of indicating how deep water has penetrated the soil
 - Readings are affected by ions in the soil water




Flow Check Sensors

- Reduced costs for rupture-related repairs
- “Overflow watchdog” provides constant update for any system
- Customized calibration for precise system control




Valves

- Controller and manual operation
- Designed for specific flow, pressure, and water quality
- 24 VAC
- Some allow pressure regulators



Weather Stations

- Can provide operational shut-offs
 - Wind
 - Rain
- Single home or community
- Calculate and compensate for changes in ET



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