

PT SAHABAT AGRITAMA

Rain Bird
Authorized Dealer in Indonesia



RAIN BIRD®

Basic Irrigation Design

Alex Angileri

The Intelligent Use of Water™

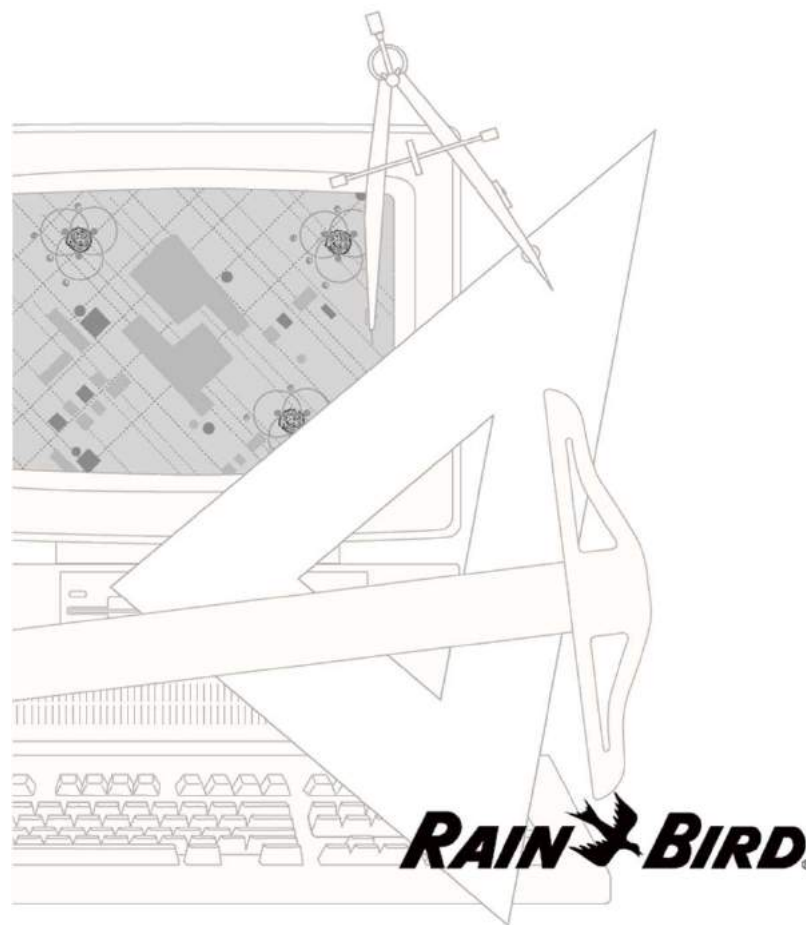
Leadership · Education · Partnerships · Products

Landscape Irrigation – Why design matters?

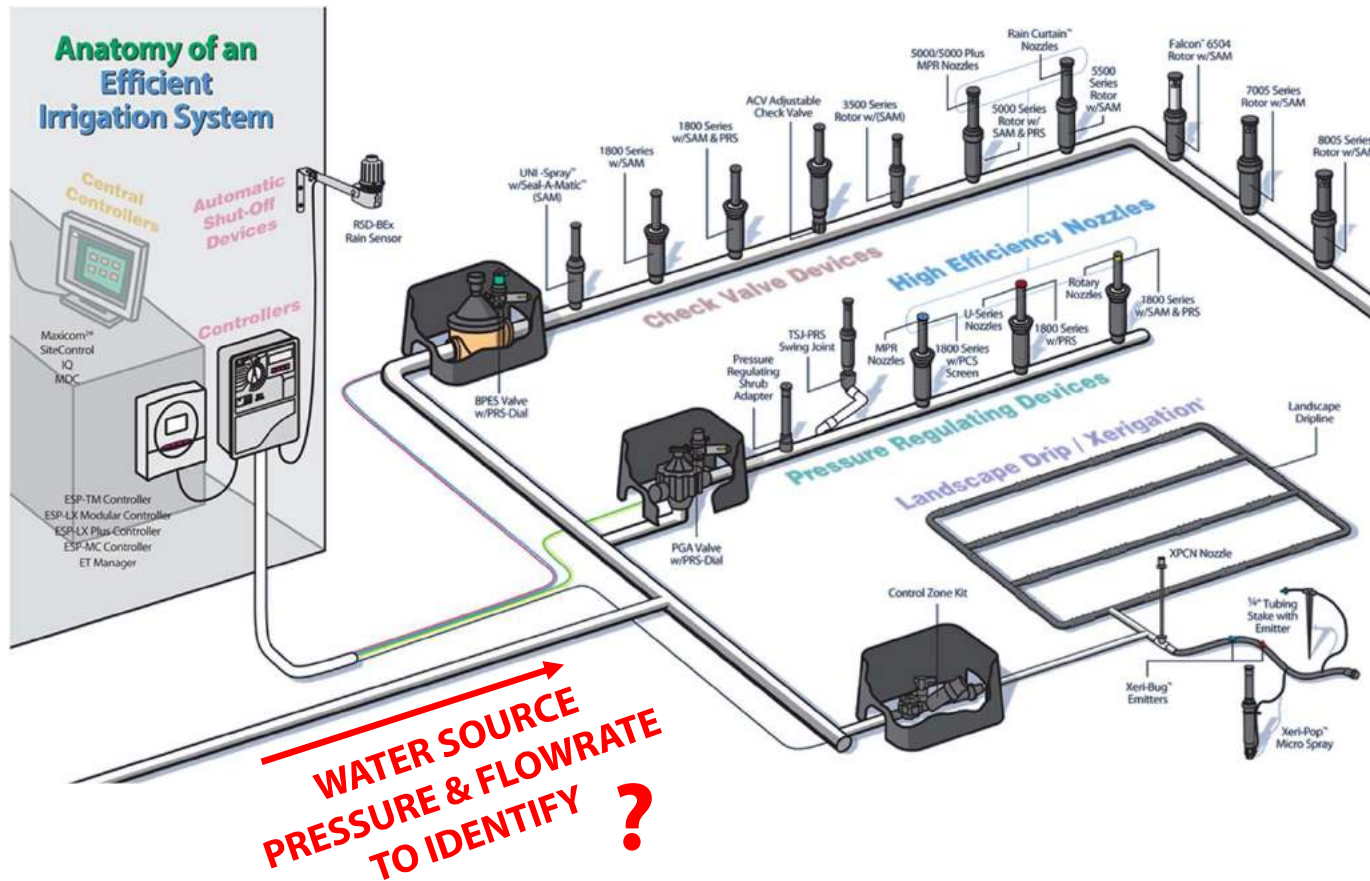


A quality Landscape Irrigation Design allows you to :

- provide adequate soil moisture content in the plants root zone, as a supplement to rainfall.
- protect the landscape investment.
- minimize financial risk of a costly under or over designed system.
- optimize the amount of water the system will need to use.
- minimize the amount of labor required to efficiently operate the system.
- provide a system that will last for years with as little maintenance as possible.



Hydraulic Requirements



The relationship between available **pressure** and **flowrate** will influence :

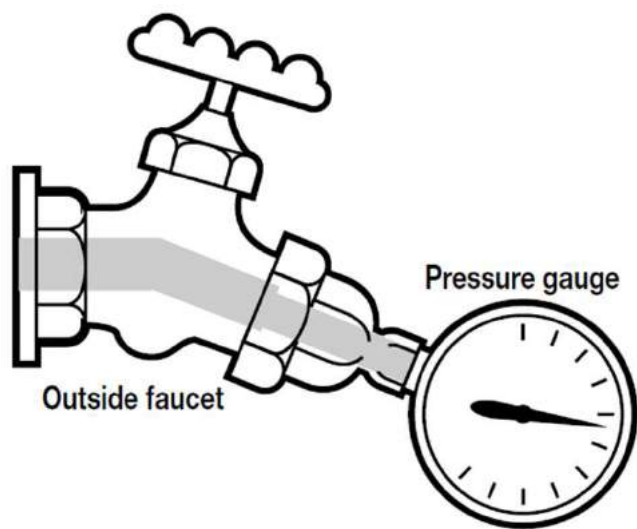
- Number of sprinklers per valve
- Length of dripline per valve
- Nozzle size
- Valve size
- Number of valves
- Sprinkler type/model
- Controller type/size
- etc

Basics of Hydraulic : Pressure and flowrate



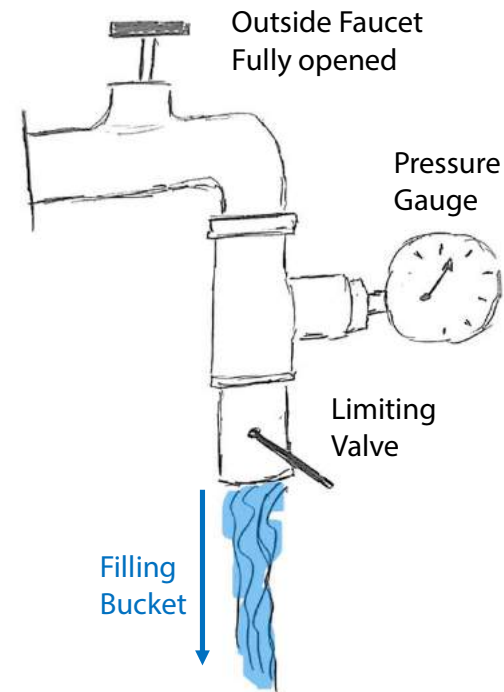
- FLOW RATE, measured in Litre per Minute (LPM)
- PRESSURE, measured in Bar

Static Pressure :



Ideally you want to measure the
« **dynamic pressure** »

- Pressure while the water is running = real life use.
- Limiting valve to get 2.5bar on the gauge and timing how long it takes to fill a 20L bucket.
- Repeat again by limiting the valve a bit more with 3.0bar and 3.5bar if pressure is good enough.
- Send data to designer with other information and schematics.



Basics of Hydraulic : quick flowrate calculation



- FLOW RATE, measured in Litre per Minute LPM or Litre per Hour LPH

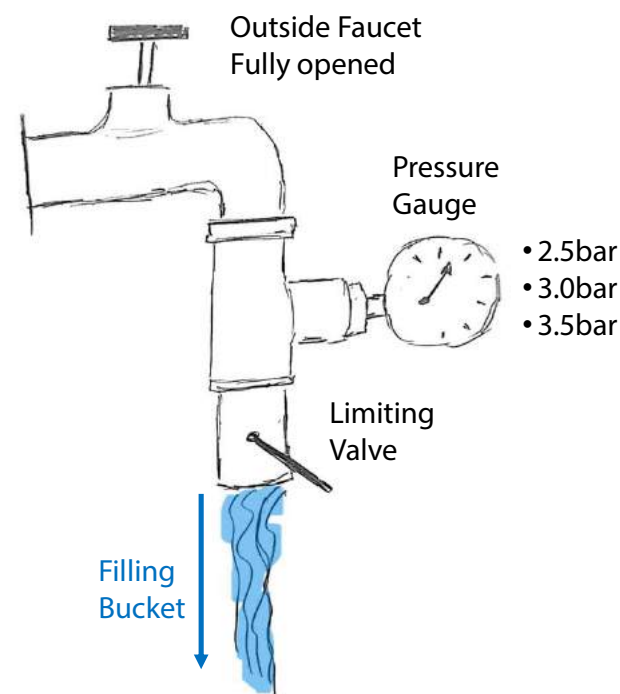
FORMULA : Time in MMSS, Volume in Litre

$$\text{FLOWRATE (LPM)} = \frac{\text{Volume Bucket}}{\text{MM} + (1/(60/\text{SS}))}$$

EXAMPLE : 1min5sec (MMSS) to fill 20L bucket

$$\text{FLOWRATE (LPM)} = \frac{20}{1 + (1/(60/5))} = 18.46 \text{ LPM}$$

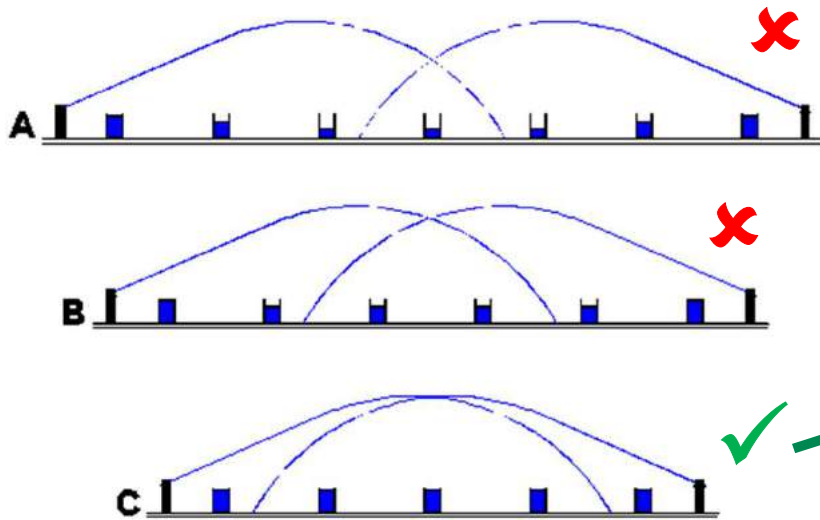
Typically per valve : 5-6 spray heads 1800 series with R-VAN14 nozzle
2-3 spray heads 1800 series with R-VAN24 nozzle



Selecting Sprinklers & Spacing Ranges



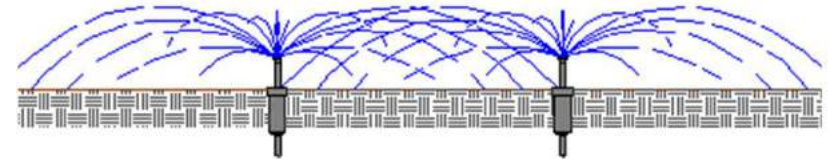
- Efficient Irrigation Design is to target and eliminate water waste to promote the intelligent use of water.
- **Solution** : Choosing high uniformity sprinkler and high quality irrigation design, important to avoid overwatering : Head-to-Head coverage.



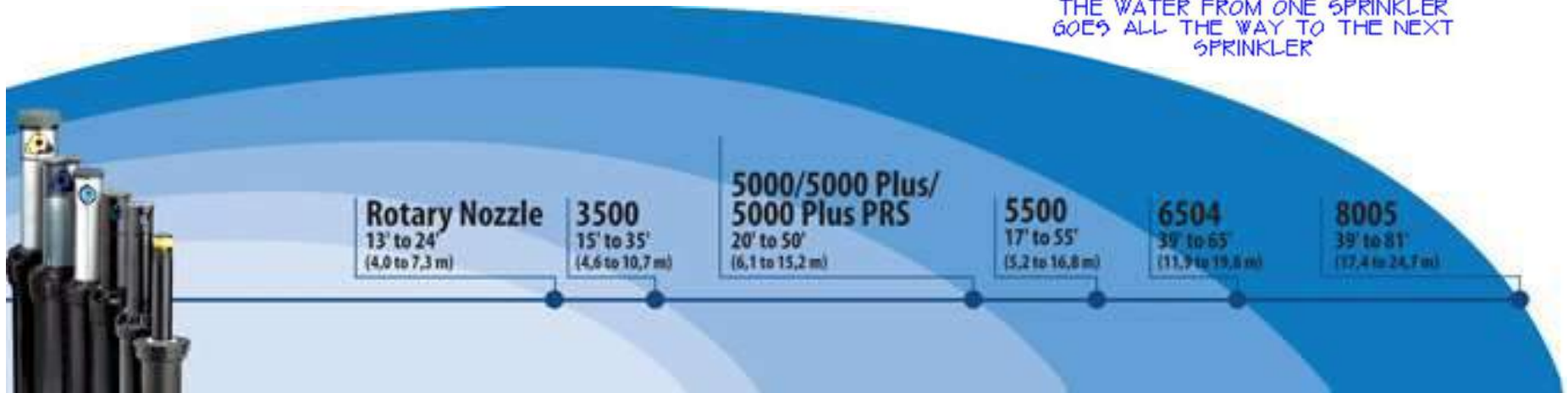
Selecting Sprinklers & Spacing Ranges



- Choosing the right sprinkler for the right range.
- 90-100% overlapping necessary = Head-to-Head coverage.



"HEAD-TO-HEAD COVERAGE"
THE WATER FROM ONE SPRINKLER
GOES ALL THE WAY TO THE NEXT
SPRINKLER



Selecting Sprinklers and emitters



Anatomy of a Water-Efficient[®] Residential System

This residential design guide highlights Rain Bird product and technology solutions for a healthy landscape that uses less water.

Sprays

- In-Stem Pressure Regulation
- High Efficiency Nozzles
- Seal-A-Matic[™] (SAM) Check Valve Devices
- Non-Potable Spray Heads



Controllers and Sensors

- Automatic Controllers with Water Efficient Features
- Smart Controller Technologies
- Automatic Shut-Off Devices



Landscape Drip

Direct-to-Plant-Root Watering Devices



Valves



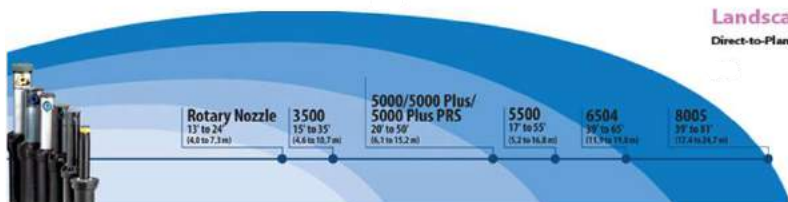
Rotors

- In-Stem Pressure Regulation
- High Efficiency Nozzles
- Check Valve Devices

Source



Rotary Nozzles



The Intelligent Use of Water[™]

Selecting Sprinklers & Reading Specs



R-VAN14 2.4 to 4.6m		METRIC			
Nozzle	Pressure bar	Radius m	Flow l/m	Precip mm/h	Precip mm/h
270° 	2.1	4.0	3.18	16	19
	2.4	4.0	3.29	17	19
	2.8	4.3	3.48	15	18
	3.1	4.3	3.56	16	18
	3.4	4.6	4.20	16	19
210° 	3.8	4.6	4.43	17	20
	2.1	4.0	2.46	16	19
	2.4	4.0	2.57	17	19
	2.8	4.3	2.73	15	18
180° 	3.1	4.3	2.76	16	18
	3.4	4.6	3.26	16	19
	3.8	4.6	3.44	17	20
	2.1	4.0	2.12	16	19
90° 	2.4	4.0	2.20	17	19
	2.8	4.3	2.31	15	18
	3.1	4.3	2.38	16	18
	3.4	4.6	2.80	16	19
	3.8	4.6	2.95	17	20



5000 Series Std. Angle Nozzle Performance							METRIC
Pressure bar	Nozzle	Radius m	Flow m³/h	Flow l/m	Precip mm/h	Precip mm/h	
1.7	1.5	10.10	0.25	4.2	5	6	
	2.0	10.70	0.34	5.4	6	7	
	2.5	10.70	0.41	6.6	7	8	
	3.0	11.00	0.51	8.4	8	10	
	4.0	11.3	0.66	10.8	10	12	
	5.0	11.90	0.84	13.8	12	14	
	6.0	11.90	0.97	16.2	14	16	
	8.0	11.00	1.34	22.2	22	26	
2.0	1.5	10.20	0.28	4.8	5	6	
	2.0	10.80	0.36	6.0	6	7	
	2.5	10.90	0.44	7.2	7	9	
	3.0	11.20	0.55	9.0	9	10	
	4.0	11.6	0.71	12.0	11	12	
	5.0	12.10	0.91	15.0	12	14	
	6.0	12.40	1.05	17.4	14	16	
	8.0	11.80	1.45	24.0	21	24	
2.5	1.5	10.40	0.31	5.4	6	7	
	2.0	11.00	0.41	6.6	7	8	
	2.5	11.30	0.50	8.4	8	9	
	3.0	11.20	0.62	10.2	9	11	
	4.0	12.3	0.81	13.2	11	13	
	5.0	12.70	1.03	17.4	13	15	
	6.0	13.20	1.21	20.4	14	16	
	8.0	13.30	1.63	27.0	19	21	
3.0	1.5	10.60	0.34	6.0	6	7	
	2.0	11.20	0.45	7.8	7	8	
	2.5	11.30	0.56	9.6	9	10	
	3.0	12.10	0.69	11.4	9	11	
	4.0	12.7	0.89	15.0	11	13	
	5.0	13.50	1.13	18.6	12	14	
	6.0	13.90	1.34	22.2	14	16	
	8.0	14.10	1.79	30.0	18	21	

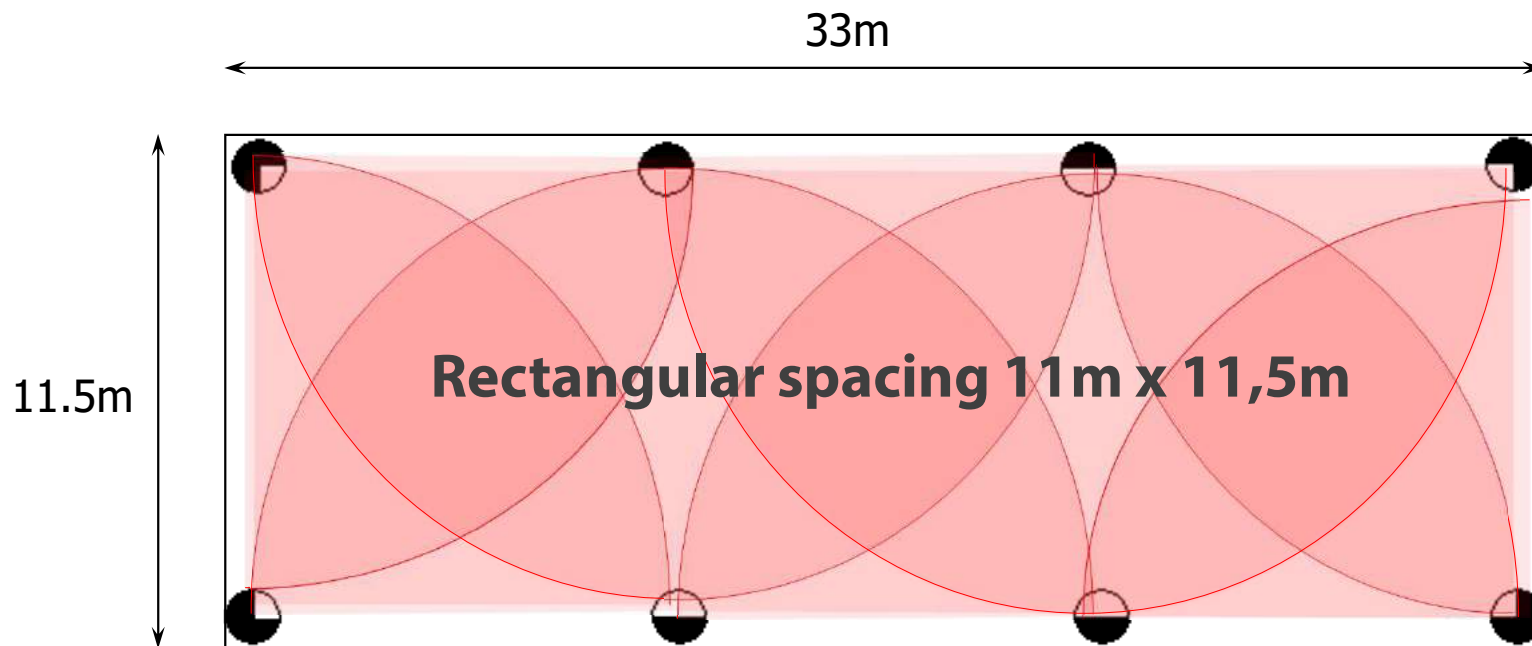
3.5	1.5	10.70	0.37	6.0	7	8
	2.0	11.30	0.49	8.4	8	9
	2.5	11.30	0.60	10.2	9	11
	3.0	12.20	0.74	12.6	10	12
	4.0	12.8	0.97	16.2	12	14
	5.0	13.70	1.23	20.4	13	15
	6.0	14.20	1.45	24.0	14	17
	8.0	14.90	1.93	32.4	18	20
4.0	1.5	10.60	0.40	6.6	7	8
	2.0	11.10	0.52	9.0	8	10
	2.5	11.30	0.64	10.8	10	12
	3.0	12.20	0.80	13.2	11	12
	4.0	12.8	1.04	17.4	13	15
	5.0	13.70	1.32	22.2	14	16
	6.0	14.90	1.55	25.8	15	17
	8.0	15.20	2.06			21
4.5	1.5	10.40	0.42			9
	2.0	10.70	0.55			11
	2.5	11.30	0.68			12
	3.0	12.20	0.84			13
	4.0	12.8	1.10			15
	5.0	13.70	1.40			17
	6.0	14.60	1.64			18
	8.0	15.20	2.19			22



Selecting Sprinklers & Spacing Ranges



- Select a sprinkler spacing range that will best fit the area while minimizing overspray (light wind).



Selecting Dripline & Reading Specs



XFS Dripline Maximum Lateral Length (Meters)

Inlet Pressure bars Maximum Lateral Length (meters)
30.5 cm Spacing

	Nominal Flow (l/h):		
	1.6	2.3	3.5
1.0	107.2	83.2	47.2
1.4	121.6	96.9	51.5
2.1	136.2	109.7	70.1
2.8	148.7	120.4	77.7
3.5	153.9	127.1	86.9
4.1	174.6	140.2	88.4

45.7 cm Spacing

	Nominal Flow (l/h):		
	1.6	2.3	3.5
1.0	114	95.7	76.2
1.4	127.1	107.6	89.6
2.1	146.6	125.9	106.7
2.8	161.5	141.7	122.5
3.5	185.9	160.9	128.0
4.1	223.7	181.7	138.7

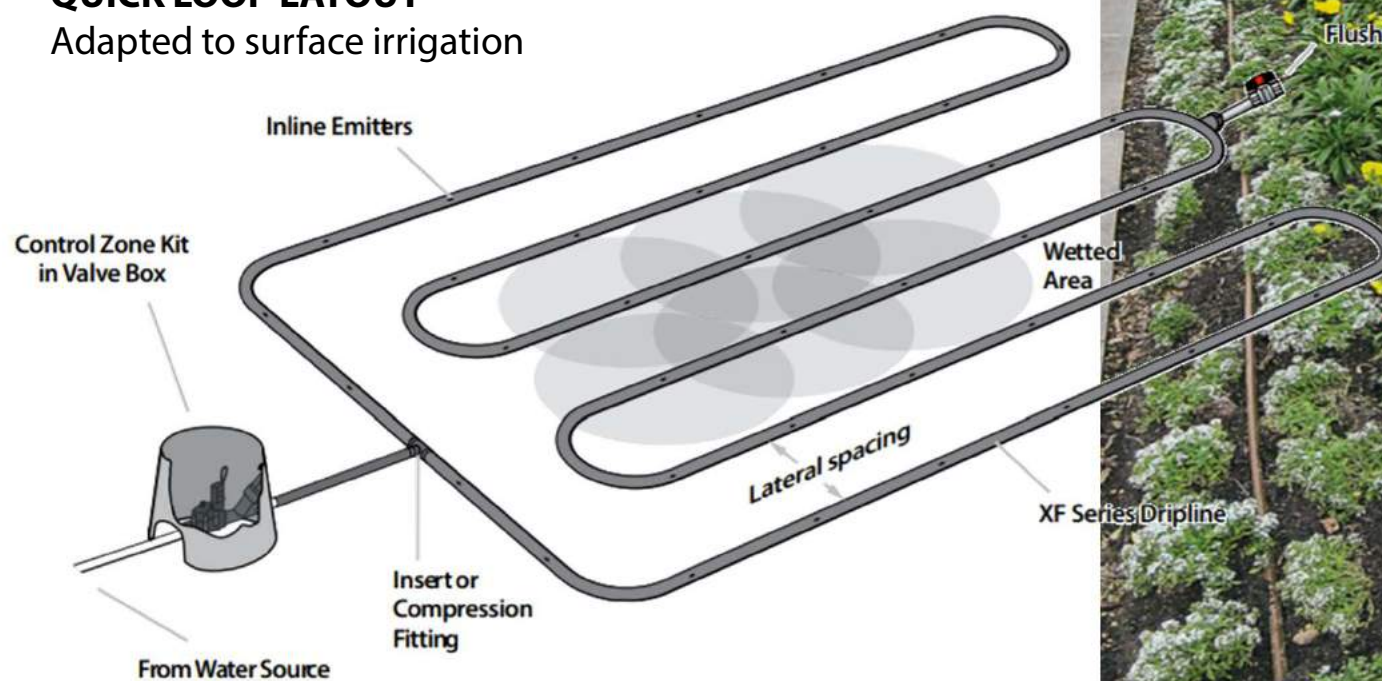


Selecting Dripline & Layouts

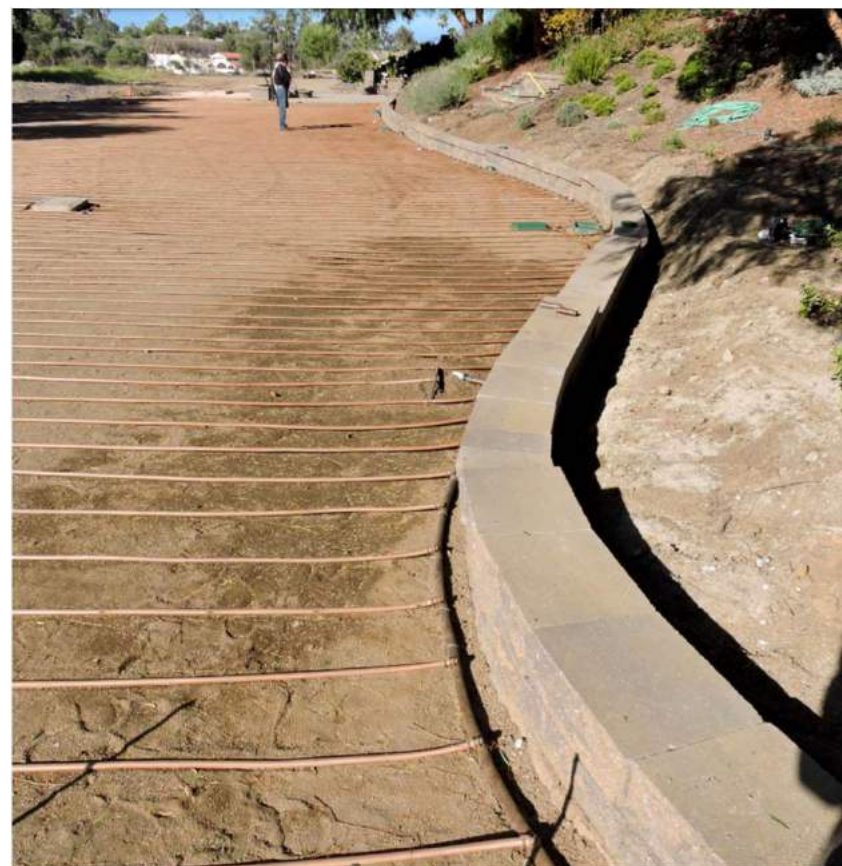
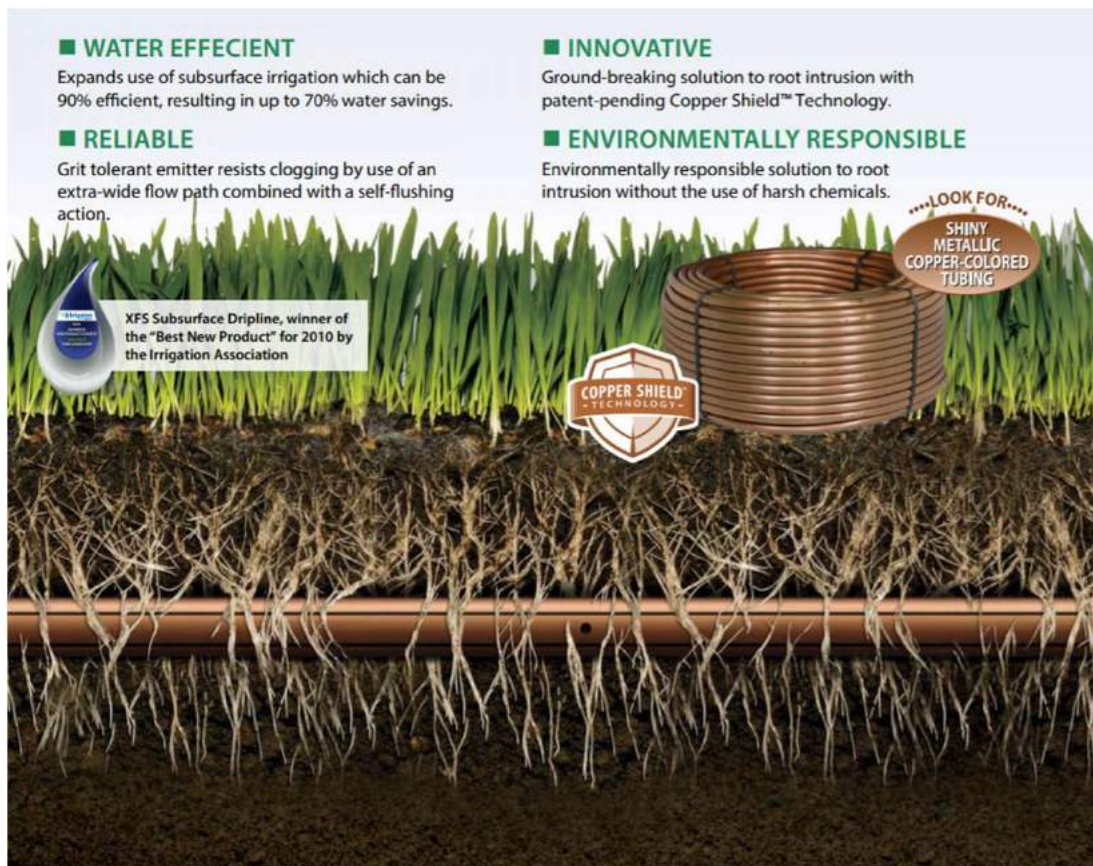


QUICK LOOP LAYOUT

Adapted to surface irrigation



Subsurface Dripline Applications

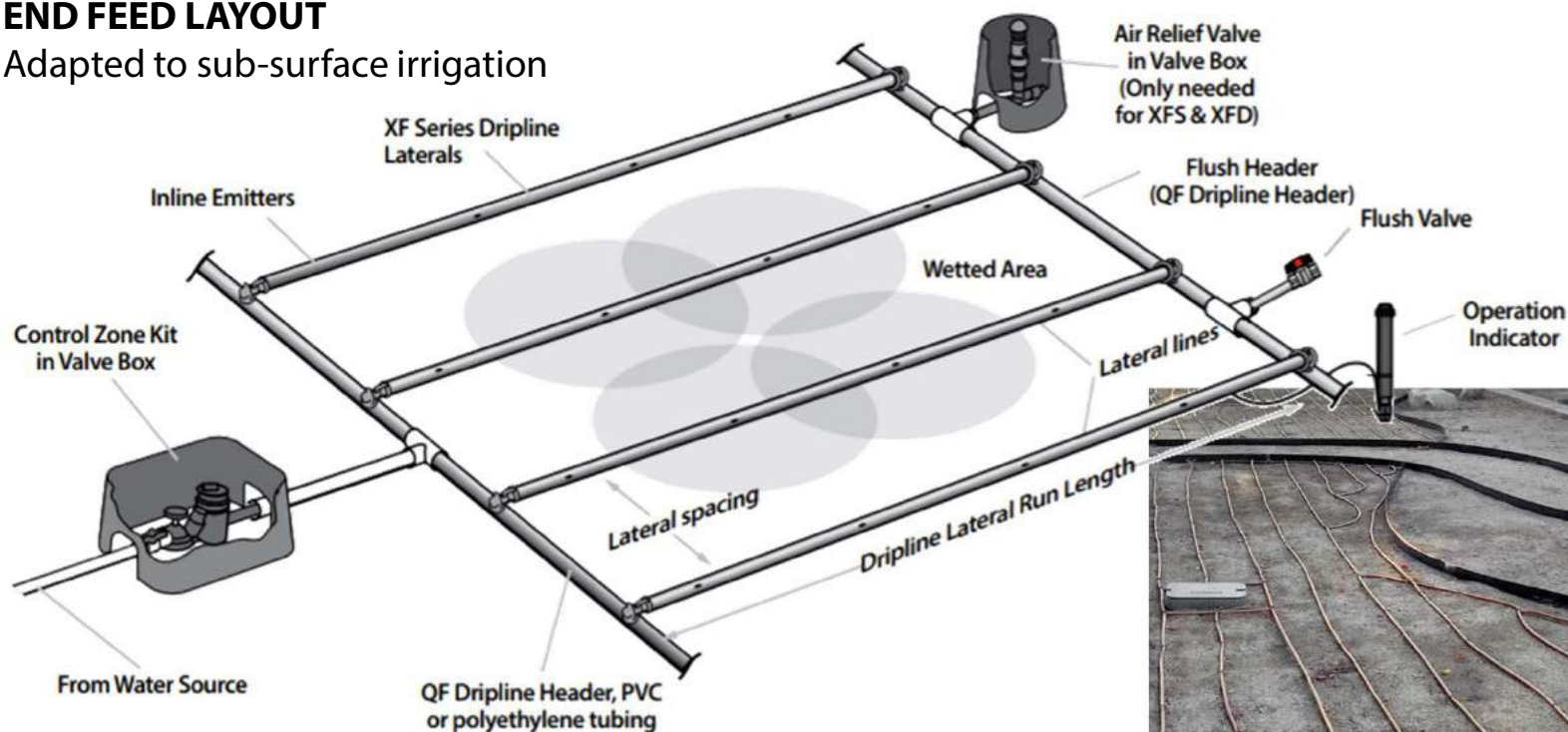


Selecting Dripline & Layouts



END FEED LAYOUT

Adapted to sub-surface irrigation



Selecting Dripline & Layouts



Recommended

The tree is on a separate zone and there is full separation between the tree and the turf grass.



Acceptable

Although the tree and turf grass are on the same zone, the buried dripline should be placed far enough away from the trunk so that tree roots do not push the dripline to the surface.



Not recommended

There is no additional water for the tree. The dripline is close to the trunk and the tree roots will probably push the buried dripline up to the surface.

Selecting best watering solution for trees



Root Watering System (**RWS**) : Provides the adequate irrigation and aeration for the plant

RWS Key Benefits

Investment Protection

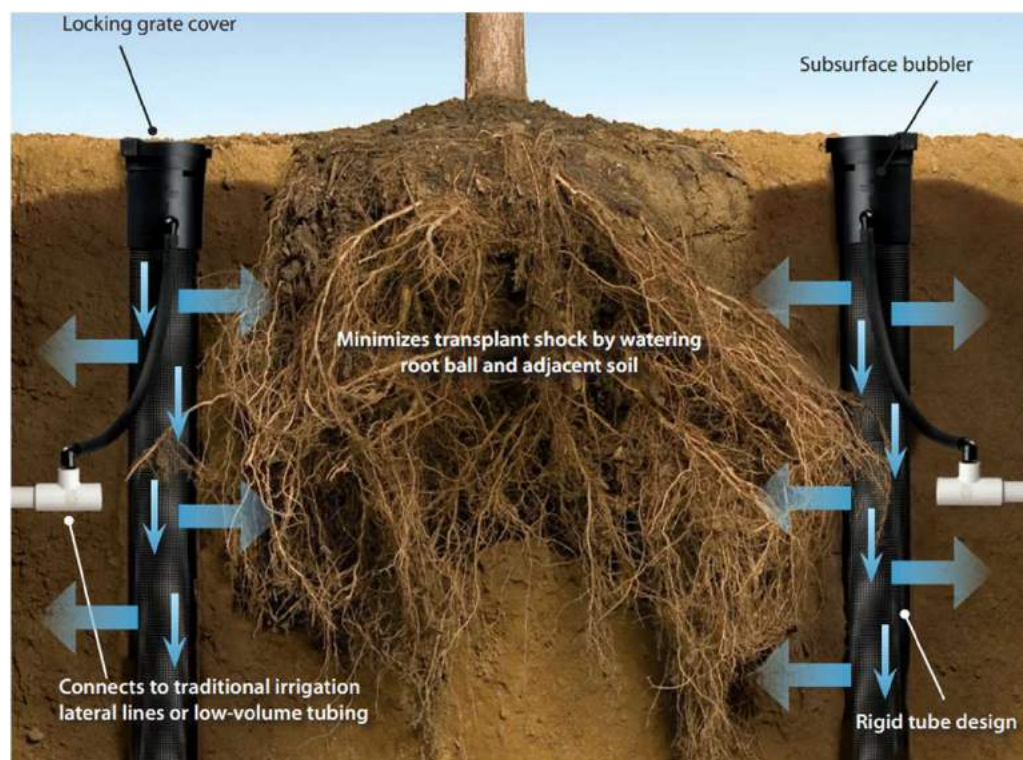
- Deep and broad roots yield transplantation survivability, stability in high winds, fast and healthy growth.

Watering Efficiency

- Subsurface irrigation minimizes run-off and evaporation.

Landscape Aesthetics

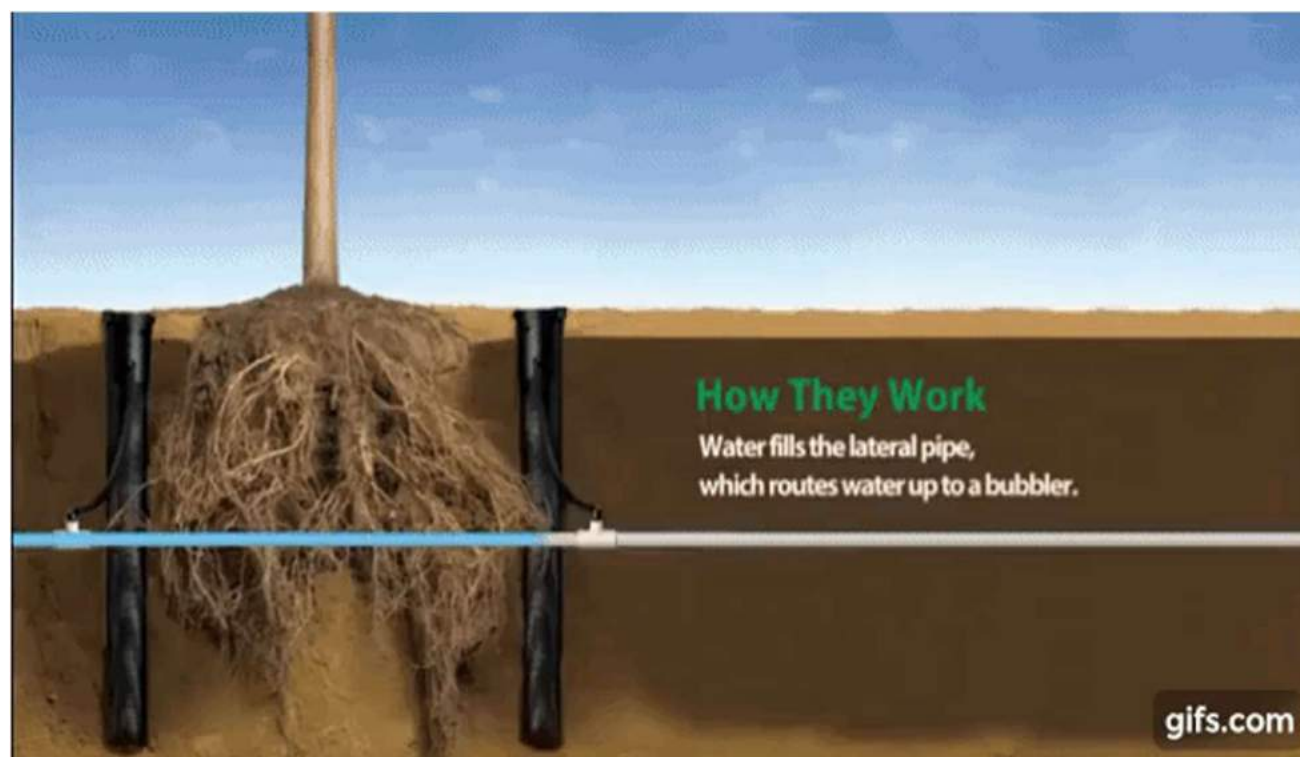
- Installs at grade and helps minimize damage to hardscapes.



Selecting Dripline & Layouts



Root Watering System (**RWS**) : Provides the adequate irrigation and aeration for the plant

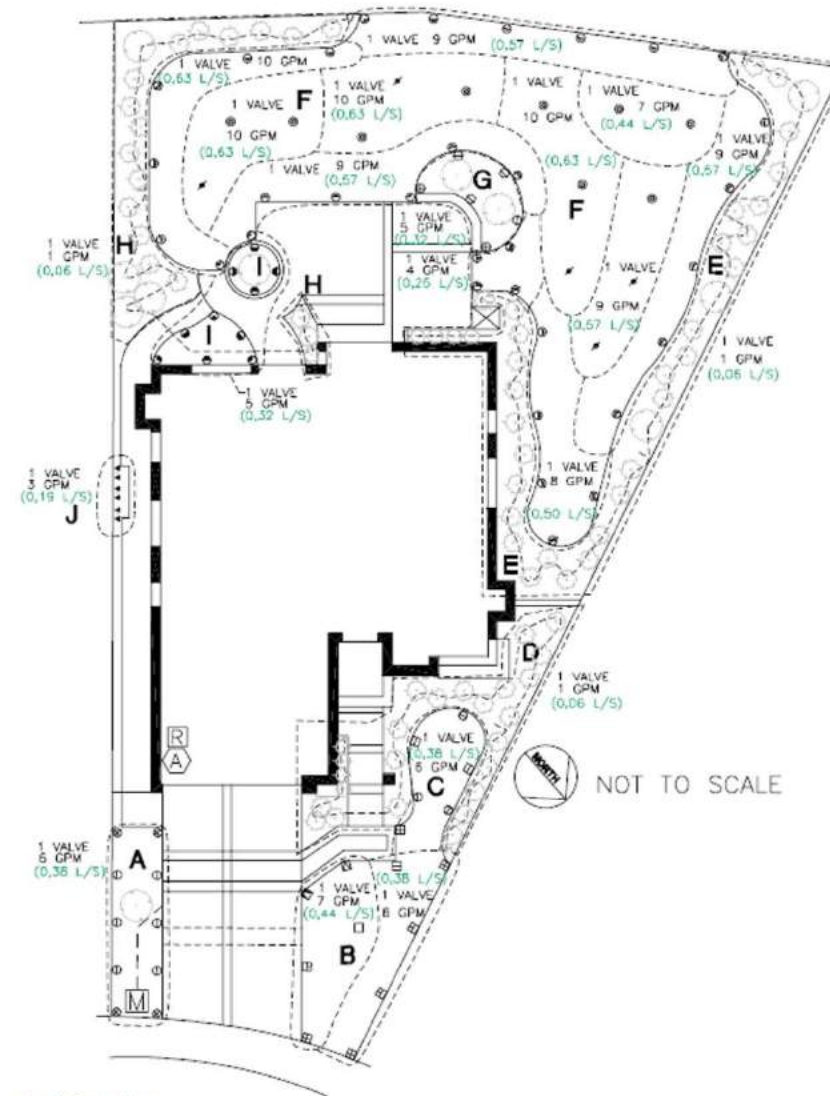


Creating Valve Groups

- Select sprinklers with common precipitation rates, nozzle, operating pressure, plant material and exposure to combine into valve groups.

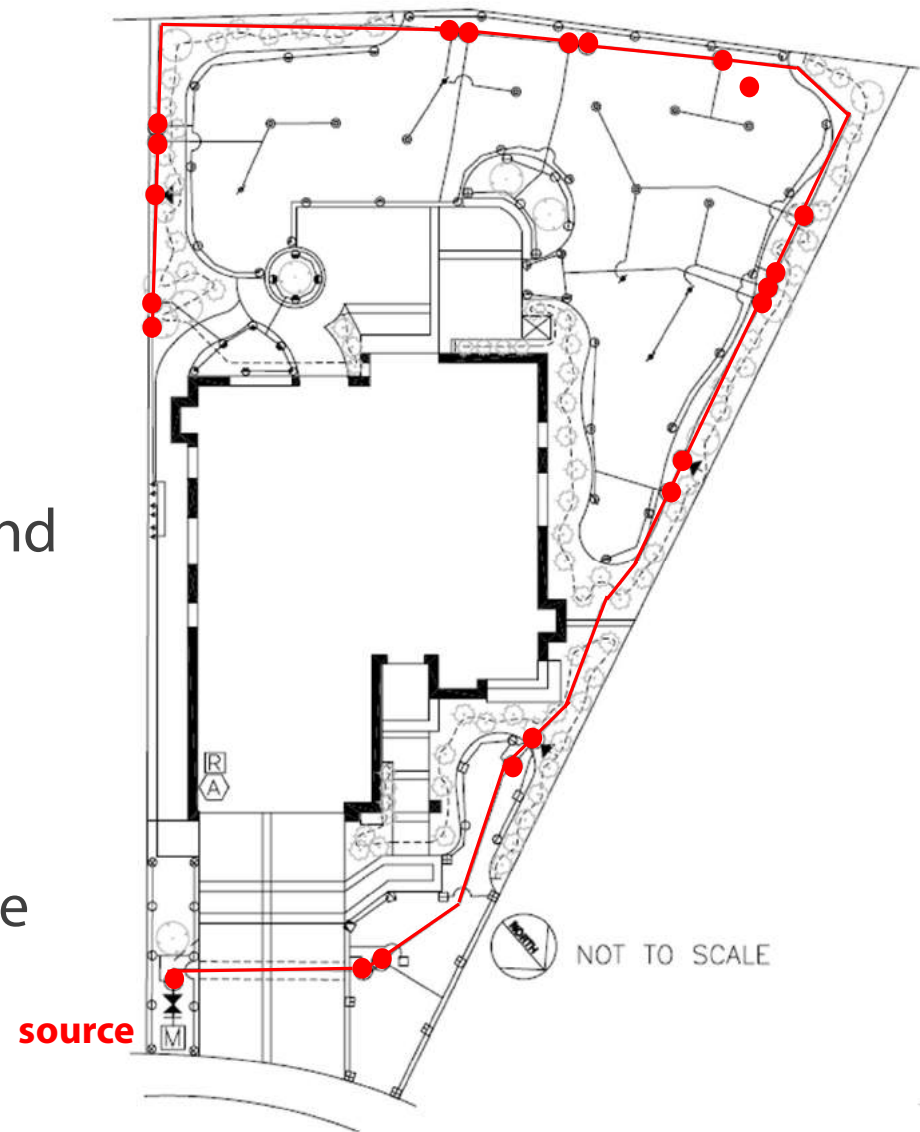
Example :

- Valve groups = 1804 Spray head + 12 VAN nozzle **ONLY**
 - Valve groups = Only 5004 PLUS Rotors **ONLY**
 - Valve groups = Only XFS dripline **ONLY**
- Add up the Flowrates (LPM) of all sprinklers in a group and divide the total by the maximum LPM available from the water source at an acceptable pressure
 - This tells you the number of valves you will need to supply water for this group of sprinklers.



Lateral & Piping Layout

- Draw lateral pipe lines between all sprinklers on a common valve.
- Center feed the zone if possible to reduce friction losses. (rather than end feed)
- Utilize split-length lateral circuit design whenever possible.
- Circuit main and spread valves where needed to save on lateral pipes



Lateral & Mainline Piping Layout



- Pipe should be sized so that:
 - the desired flowrate (lpm) & pressure bar can reach each sprinkler.
 - the pressure differential between any two sprinklers in a zone is limited to 5% to 10% maximum.
 - water travels through the piping system at a safe velocity, limiting the possibility of water hammer & damaging surge pressures.
- the smallest size pipe possible is used to accomplish the task (for economic reasons).
- Pipe friction loss/velocity charts are used to select the appropriate size pipe. (velocity max 1.5m/s)



Lateral & Mainline Piping Layout



Bar loss per 100 meter of pipe (bar/100 m)

PVC CLASS 200 IPS PLASTIC PIPE

Sizes 20 mm through 160 mm. Flow 0,06 L/s (0,23 m³/h) through 37,85 L/s (136,08 m³/h)

SIZE	20 mm	25 mm	32 mm	40 mm	50 mm
OD	27	33	42	48	60
ID	24	30	38	44	55
Wall Thk	2	2	2	2	3

flow l/s	flow m³/h	velocity mps	bar loss	velocity mps	bar loss	velocity mps	bar loss	velocity mps	bar loss	velocity mps	bar loss
0,063	0,227	0,143	0,014	0,085	0,005	0,055	0,002	0,040	0,000		
0,126	0,454	0,287	0,050	0,174	0,016	0,110	0,005	0,082	0,002	0,052	0,000
0,189	0,680	0,433	0,104	0,262	0,032	0,165	0,009	0,125	0,005	0,079	0,002
0,252	0,907	0,576	0,179	0,351	0,054	0,219	0,018	0,168	0,009	0,107	0,002
0,315	1,134	0,719	0,271	0,439	0,081	0,274	0,027	0,207	0,014	0,134	0,005
0,378	1,361	0,863	0,380	0,527	0,115	0,329	0,036	0,250	0,018	0,162	0,007
0,442	1,588	1,006	0,504	0,616	0,151	0,384	0,050	0,293	0,025	0,186	0,009
0,505	1,814	1,149	0,644	0,701	0,194	0,439	0,063	0,335	0,032	0,213	0,011
0,568	2,041	1,295	0,802	0,789	0,242	0,494	0,077	0,378	0,041	0,241	0,014
0,631	2,268	1,439	0,974	0,878	0,294	0,549	0,095	0,418	0,050	0,268	0,016
0,694	2,495	1,582	1,164	0,966	0,353	0,604	0,113	0,460	0,059	0,296	0,020
0,757	2,722	1,725	1,367	1,055	0,414	0,661	0,133	0,503	0,068	0,323	0,023
0,883	3,175	2,012	1,819	1,231	0,549	0,771	0,176	0,588	0,090	0,375	0,032
1,009	3,629	2,301	2,328	1,405	0,703	0,881	0,226	0,671	0,118	0,430	0,038
1,135	4,082	2,588	2,895	1,582	0,875	0,991	0,280	0,756	0,145	0,485	0,050
1,262	4,536	2,874	3,521	1,759	1,064	1,100	0,341	0,838	0,176	0,536	0,059
1,388	4,990	3,164	4,199	1,932	1,270	1,210	0,407	0,924	0,210	0,591	0,072
1,514	5,443	3,450	4,934	2,109	1,492	1,323	0,479	1,006	0,246	0,646	0,084
1,640	5,897	3,740	5,722	2,286	1,729	1,433	0,556	1,091	0,287	0,698	0,097
1,766	6,350	4,026	6,563	2,463	1,984	1,542	0,637	1,177	0,330	0,753	0,111
1,892	6,804	4,313	7,458	2,637	2,255	1,652	0,723	1,259	0,375	0,808	0,127
2,208	7,938	5,032	9,924	3,078	2,999	1,926	0,963	1,469	0,497	0,942	0,170
2,523	9,072	5,752	12,708	3,517	3,842	2,204	1,232	1,679	0,637	1,076	0,215
2,839	10,206			3,956	4,778	2,478	1,532	1,890	0,793	1,210	0,269
3,154	11,340			4,395	5,808	2,755	1,862	2,100	0,963	1,344	0,325
3,469	12,474			4,837	6,929	3,030	2,222	2,310	1,150	1,478	0,389
3,785	13,608			5,276	8,141	3,307	2,610	2,521	1,349	1,615	0,457
4,100	14,742			5,715	9,440	3,581	3,028	2,731	1,566	1,750	0,531



Thank-you!

Any question kindly contact :

PT. SAHABAT AGRITAMA

JALAN GUNUNG SAHARI RAYA, NO. 1 BLOK B1-2,
JAKARTA 10720, INDONESIA
T + 62 21 6594011 F + 62 21 6594005

www.sahabatagritama.com

