XF SERIES DRIPLINE

DESIGN, INSTALLATION AND MAINTENANCE GUIDE

The Intelligent Use of Water™

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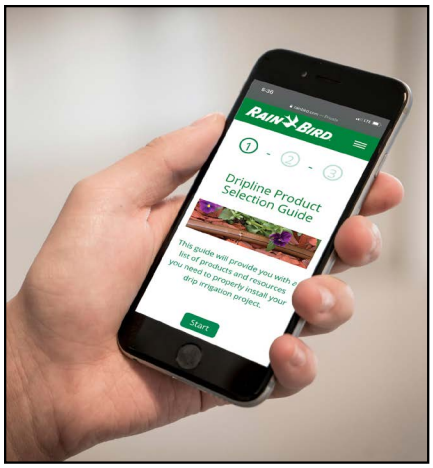
SECTION 1: Introduction

This guide covers the basics of design, installation, and maintenance for Rain Bird's XF Series Dripline. Included are design steps, technical data, installation layouts and design details to assist in the design of the more common dripline applications.



For help selecting the proper XF Series Dripline products, visit: **www.rainbird.com/calculator**
Access from your laptop, tablet or smart phone.

For more in-depth resources, visit:
www.rainbird.com/drip

SECTION 1: INTRODUCTION

This guide covers the basics of design, installation, and maintenance for Rain Bird's XF Series Dripline. Included are design steps, technical data, installation layouts and design details to assist in the design of the more common dripline applications.

A low volume irrigation system typically applies water slowly, at low pressure, at or near the root zones of plant material. Whether referred to as Drip, Xerigation®, micro irrigation, or low volume, these systems feature emission devices that apply water in gallons per hour (GPH) or liters per hour (L/HR) as opposed to the gallons per minute (GPM) or liters per minute (L/MIN) of a conventional overhead spray irrigation system. Low-volume irrigation can greatly reduce or eliminate water waste while promoting healthier plant growth because you can:

- Match the amount of water applied to the specific need of each plant
- More closely match the application rate to the soil's infiltration rate
- Apply water directly to the root zone, reducing overspray and evaporation

Low-volume systems also reduce or eliminate runoff on walks and paved areas, and overspray onto windows, fences, pavement and walls. The Rain Bird Xerigation® line of drip products offer a full range of water-saving choices for both turf and non-turf landscape applications, including control zone components, dripline, fittings, blank tubing, emission devices and tools.

Use of dripline is a preferred method in many low-volume irrigation applications. Rain Bird's XF Series Dripline has Rain Bird designed and manufactured emitters that provide pressure compensation for precise flow control throughout the zone. XF Series Dripline is made with advanced polymers that provide kink-resistance and reduce coil memory for easier installation. With emitter flow rates of 0.4 GPH, 0.6 GPH, and 0.9 GPH (1.6 L/HR, 2.3 L/HR, and 3.4 L/HR) and emitter spacing of 12" and 18" (0.30 m and 0.45 m) the XF Series provides a full product line to meet the needs of any application.

The Rain Bird XF Series of dripline products consists of:

- XFD –for on-surface applications
- XFCV for on-surface, sloped applications
- XFS with Copper Shield™ Technology – for subsurface applications
- XFS-CV with Heavy Duty Check Valve – for on-surface, subsurface and sloped applications

For complete performance and technical specifications, please see Rain Bird's Landscape Irrigation Products Catalog or visit Rain Bird's website at www.rainbird.com. The website provides specifications and detail drawings in downloadable files.

XFCV for on-surface, sloped applications.

ABOUT RAIN BIRD AND THE INTELLIGENT USE OF WATER

A privately held company founded in 1933, Rain Bird Corporation is the leading manufacturer and provider of irrigation products and services. Since its beginnings, Rain Bird has offered the industry's broadest range of irrigation products for farms, golf courses, nurseries, sports arenas, commercial developments and homes in more than 130 countries around the world. With the broadest product line in the industry, architects, designers and contractors recognize Rain Bird as the industry leader in irrigation solutions.

Rain Bird is committed to The Intelligent Use of Water™. It is our legacy to design and manufacture only those products of the highest value, quality, and efficient application of water. We work for long-term, responsible partnerships with our customers and our suppliers. This is who we are, and this is how we wish to be perceived in the irrigation industry and our communities.

Please visit The Intelligent Use of Water section of our website to explore additional resources to help you design the most water-efficient projects.

http://www.rainbird.com/landscape/resources/IUOW.htm

Water Source

Need

Preserve potable water through alternative sourcing that taps into underutilized supplies such as underground well water, grey water and rain water.

Rain Bird Solution

- Non-potable-water-ready:
  - Drip products
  - Valves
  - Rotors
  - Sprays

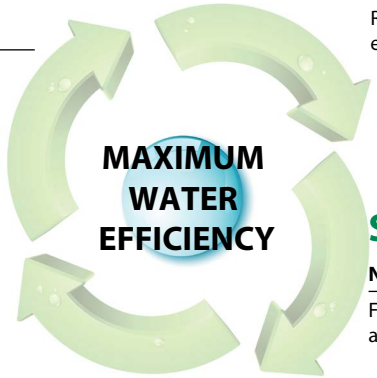
Design & Manage

Need

Receive support from a certified professional trained to design, install, operate and maintain a water-efficient system.

Rain Bird Solution

Rain Bird's Contractor Referral Program helps you quickly and easily find a qualified irrigation contractor in your area.



Apply

Need

Distribute water to your landscape as efficiently as possible.

Rain Bird Solution

- Xerigation®/Landscape Drip: Direct-to-plant-root watering devices.
- Water-smart rotor and spray features:
  - Pressure Regulating Stem (PRS) technology
  - Seal-A-Matic™ (SAM) check valves
- High-efficiency Nozzles:
  - Rain Curtain™ Nozzles
  - U-Series Nozzles
  - Matched Precipitation Rate (MPR) Nozzles
  - Square Pattern Nozzles (SQ)
  - R-VAN Series Nozzles
  - HE-VAN Series Nozzles

Schedule

Need

Flexible programming schedules that help you customize a watering schedule based on the needs of your landscape.

Rain Bird Solution

Our controllers offer:

- Cycle+Soak feature allowing for the most efficient water delivery
- Easy, push-of-the-button adjustments for seasonal changes
- Weather-based controllers which adjust based on hourly weather data

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

LEED LIBRARY
DESIGN & TECHNICAL RESOURCES

WHAT IS LEED?

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a point rating system devised by the United States Green Building Council (USGBC) to evaluate the environmental performance of a building over its life cycle and to encourage market transformation towards sustainable design. LEED is the nationally recognized benchmark for the design, construction, and operation of high performance green buildings. LEED provides building owners and operators with the tools they need to have an immediate and measurable impact on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable sites, water savings, energy efficiency, materials selection, and indoor environmental quality.

Detailed information on obtaining credits and the project certification process is available from the USGBC on their website: www.usgbc.org.

- **WATER EFFICIENCY CREDIT 1.1**
- **WATER EFFICIENCY LANDSCAPING: Reduce by 50% 2 points**

Intent
Limit or eliminate the use of potable water, or other natural surface water resources available on or near the project site, for landscape irrigation.

Requirements
Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case. Reductions shall be attributed to any combination of the following items:

- Plant species factor
- Irrigation efficiency
- Use of captured rainwater
- Use of recycled wastewater
- Use of water treated and conveyed by a public agency for non-potable uses.

Rain Bird Notes
The designer on the LEED project will need to provide an irrigation plan and legend, as well as calculations, a description of the baseline, and cut sheets of the irrigation system demonstrating how water consumption is reduced by 50%.

Learn more at: http://www.rainbird.com/landscape/resources/LEEDlibrary.htm

BENEFITS OF DRIPLINE IRRIGATION

Dripline irrigation can greatly reduce or eliminate water waste while promoting healthier plant growth for the following reasons:

- Match the water application to the specific needs of each plant
- More precisely match the application rate to the soil's infiltration rate
- Apply water directly to the root zone to reduce overspray and evaporation
- A properly designed and installed dripline irrigation system can be over 90% efficient

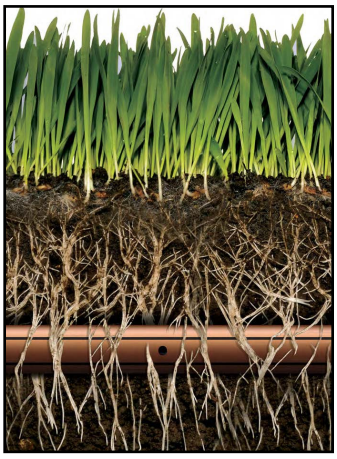
There are many advantages of dripline irrigation that can provide solutions for difficult-to-irrigate landscape areas including:

- Narrow turf areas
- Curved narrow landscape areas
- Sloped areas
- Subsurface turf irrigation applications
- Parking lot islands
- Steep sloped areas

Other benefits of on-surface or subsurface Drip Irrigation:

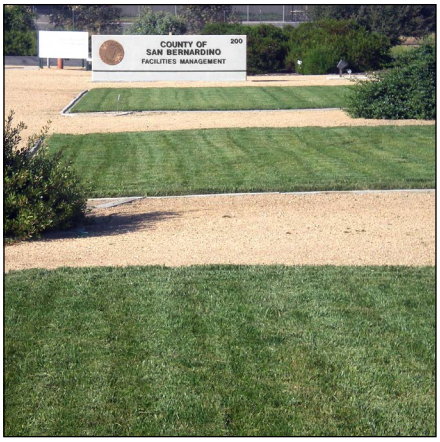
- Eliminate runoff on walks and paved areas
- Prevent overspray onto windows, walls and fences
- Increase watering uniformity
- Reduce susceptibility to vandalism
- Promote healthy plant growth

To view all dripline models online, visit:
http://www.rainbird.com/drip



SECTION 2: PREPARATION FOR DESIGN

XF SERIES DRIPLINE | WHERE IS IT USED?



Turf Grass (XFS, XFS-CV)


Curved Landscapes


Flower Beds


Small Confined Areas


Shrub & Ground Cover Beds


Narrow Landscapes


Eliminate Overspray on Buildings


Sloped Areas


Potted Plants (¼" Dripline)

PREPERATION FOR DESIGN

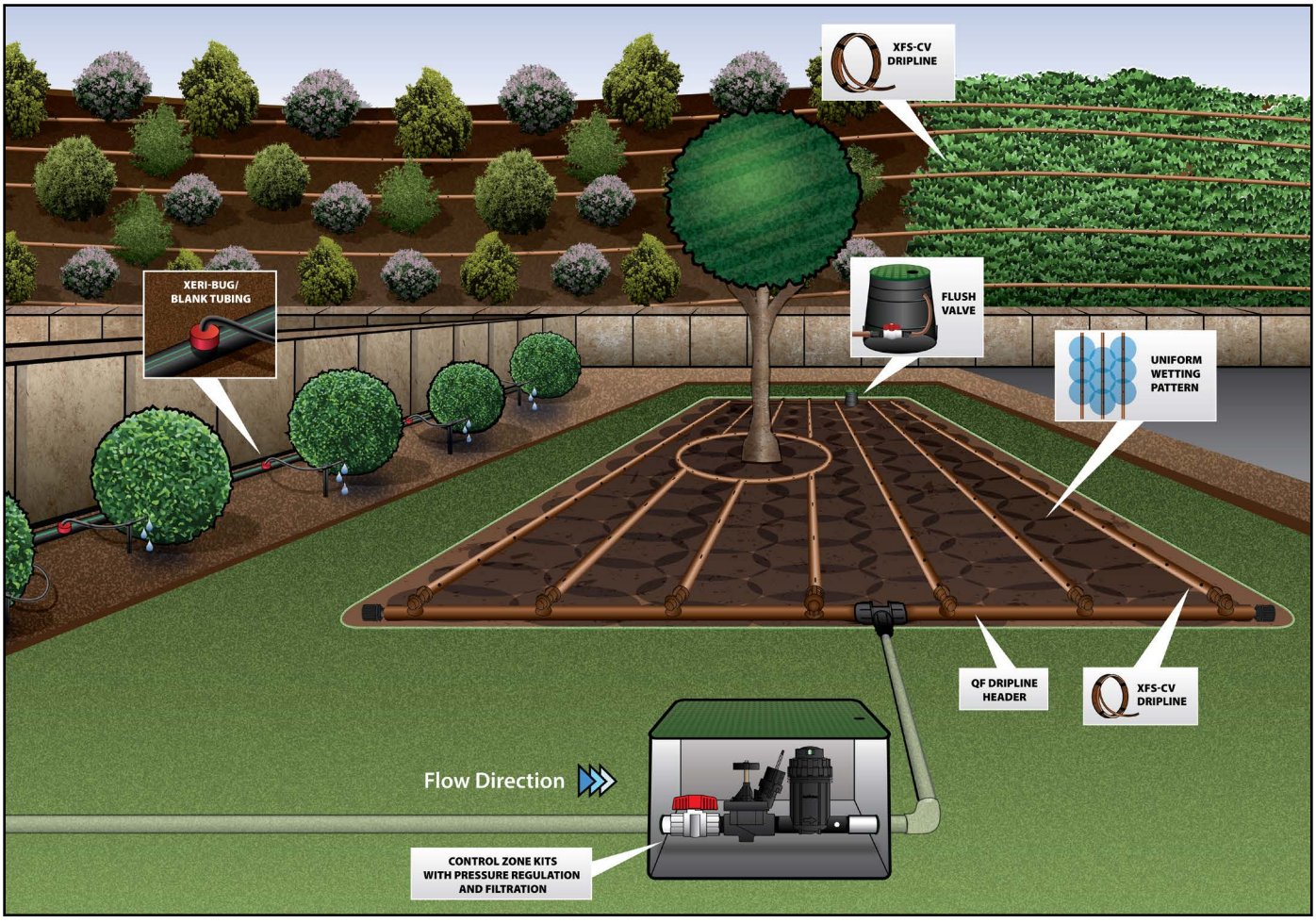
Dripline system design follows many of the same rules as spray and rotor design. Similar design factors must be considered, such as point of connection, static and operating pressures, flow rates, and plant material.

A dripline system when properly designed and installed will deliver full irrigation coverage to the planted area. A dripline system is normally divided into zones. A typical zone contains a water source, a control zone (valve, filter, and pressure regulator), and the dripline with connection fittings.

During the preparation for design you will gather essential information to design the dripline system:

- Obtain or draw a scaled plan of the site to be irrigated
- Identify all of the slopes on the plan
- Determine the types of plants to be irrigated (groundcover, shrubs, turfgrass, and trees)
- Identify the type of soil (Clay, Loam, Sand)
- Identify the type of water from the water source (potable, non-potable, well, surface water, etc)
- Identify static and operating pressures, and volume available from the water source
- Select appropriate system components for installation

EXAMPLE OF A SUBSURFACE DRIPLINE SYSTEM LAYOUT



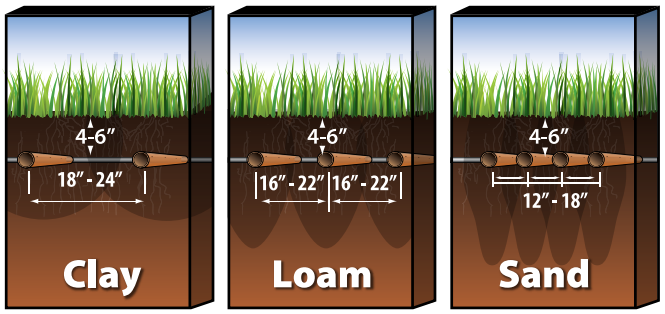
DETERMINE SOIL TYPE | WHAT IS YOUR SOIL TYPE?

OVERALL DESIGN PLAN FOR THE SITE

Soil Infiltration Rates (in Inches per Hour)			
Percent of Slope	Clay	Loam	Sand
0% - 4%	0.13 - 0.44	0.44 - 0.88	0.88 - 1.25
5% - 8 %	0.1 - 0.35	0.35 - 0.7	0.7 - 1

Soil Infiltration Rates (in cm per Hour)			
Percent of Slope	Clay	Loam	Sand
0% - 4%	0.33 -1.12	1.12 - 2.24	2.24 - 3.18
5% - 8 %	0.25 - 0.89	0.89 - 1.78	1.78 - 2.54

Note: As the slope increases, infiltration rates will continue to decrease.
These values are derived from USDA information.



These illustrations show water movement in a subsurface application.
These guidelines apply to on-surface as well as subsurface installations.

The objective of a well-designed dripline system is to create an even wetting pattern of water in the soil throughout the planting zone. There are four factors to consider for planting areas to create an even wetting pattern:

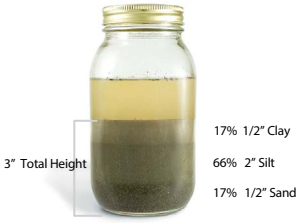
- Soil type (Clay, Loam, Sand)
- Emitter flow rate: 0.4 GPH, 0.6 GPH or 0.9 GPH (1.6 L/HR, 2.3 L/HR or 3.4 L/HR)
- Emitter spacing: 12" or 18" (0.30 m or 0.45 m)
- Lateral spacing (distance between the dripline rows)

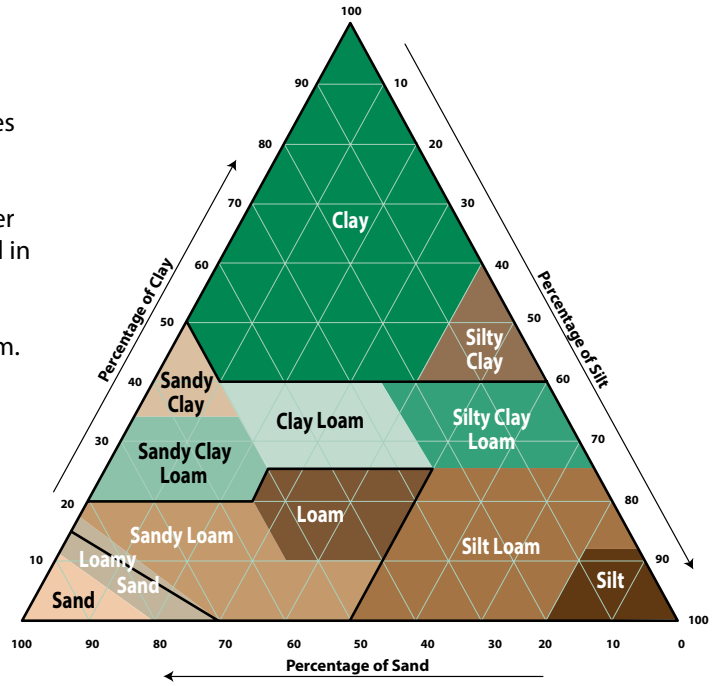
SOIL TYPE TEST

1. Remove 1 to 2 cups of soil from the zone to be irrigated.
2. Place into a glass jar, like a mason jar.
3. Fill the jar half way with water. Shake and let sit for 2 hours so the particles can settle. The heavier sand particles will settle to the bottom, then silt, then clay on top.
4. Measure the combined height of all three layers of the soil then the height of each layer; divide the height of each layer by the total height to figure out the percentage of each soil in the jar.
5. Apply these figures to the "Soil Classification" chart. In the example, now you know the landscape soil is silt loam.

Measure total height and layer heights

For Example:





SECTION 3: Determine Dripline Specifications

SECTION 3: DETERMINE DRIPLINE SPECIFICATIONS

■ CHOOSE THE EMITTER FLOW RATE, SPACING BETWEEN EMITTERS, AND SPACING BETWEEN ROWS

To determine the specification for the emitter flow rate and emitter spacing for the XF Series Dripline, follow the column under the proper soil type for your application to find the emitter flow and emitter spacing.

Table 2 gives recommended emitter flow rates and spacing for three basic soil types. If the soil type is not known, or if there is a good chance that there will be many different types of soil at the site, use the shortest distance between emitters and rows from the table to be sure that the root zone is well irrigated. If there is heavy loam or clay subsoil, these soil types will reduce the downward flow of water in the soil and allow for wider lateral spacing between rows.

■ TABLE 2: XF SERIES DRIPLINE RECOMMENDATION TABLES

XF Series Dripline Recommendations (English)			
Soil Type	**Clay**	**Loam**	**Sand**
Emitter Flow Rate (gallons per hour)	0.4 GPH	0.6 GPH	0.9 GPH
Emitter Spacing (inches)	18″	18″	12″
Dripline Lateral Spacing (inches)	18″ - 24″	16 - 22″	12″ - 18″

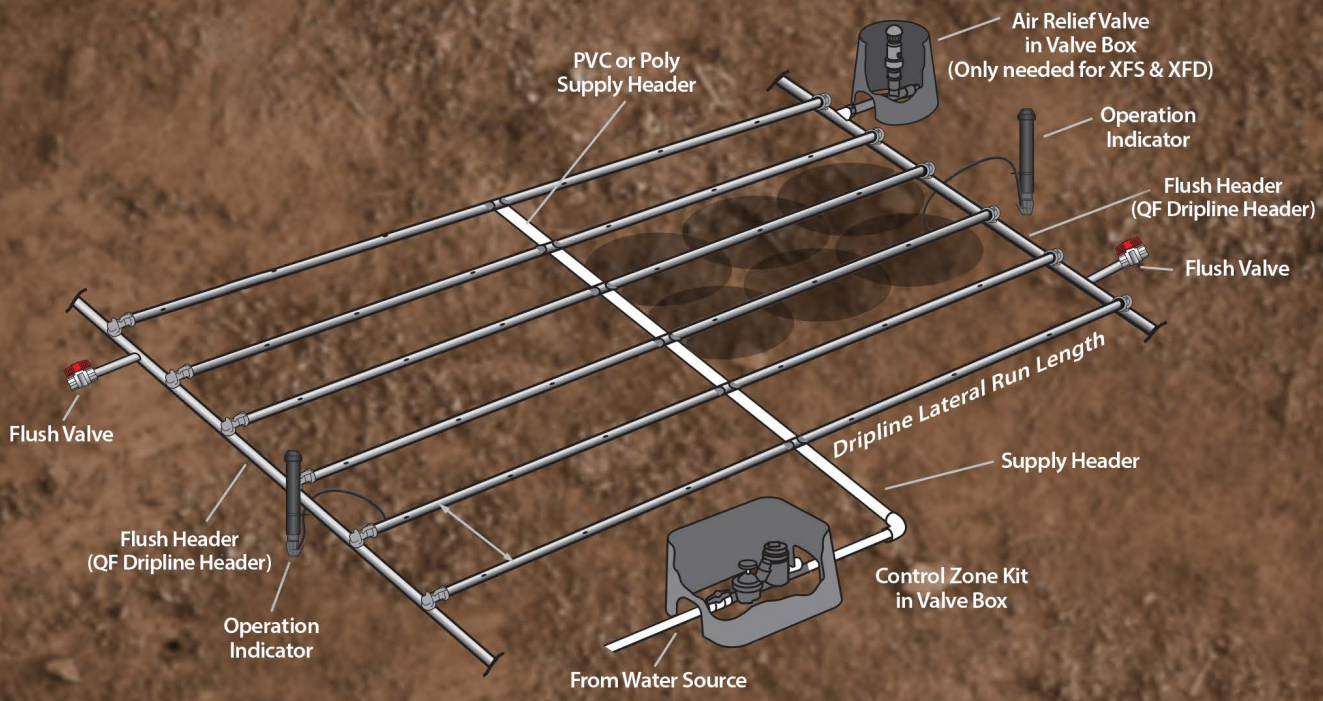
XF Series Dripline Recommendations (Metric)			
Soil Type	**Clay**	**Loam**	**Sand**
Emitter Flow Rate (liters per hour)	1.6 L/HR	2.3 L/HR	3.4 L/HR
Emitter Spacing (meters)	0.45	0.45	0.3
Dripline Lateral Spacing (meters)	0.45 - 0.61	0.41 - 0.56	0.3 - 0.45

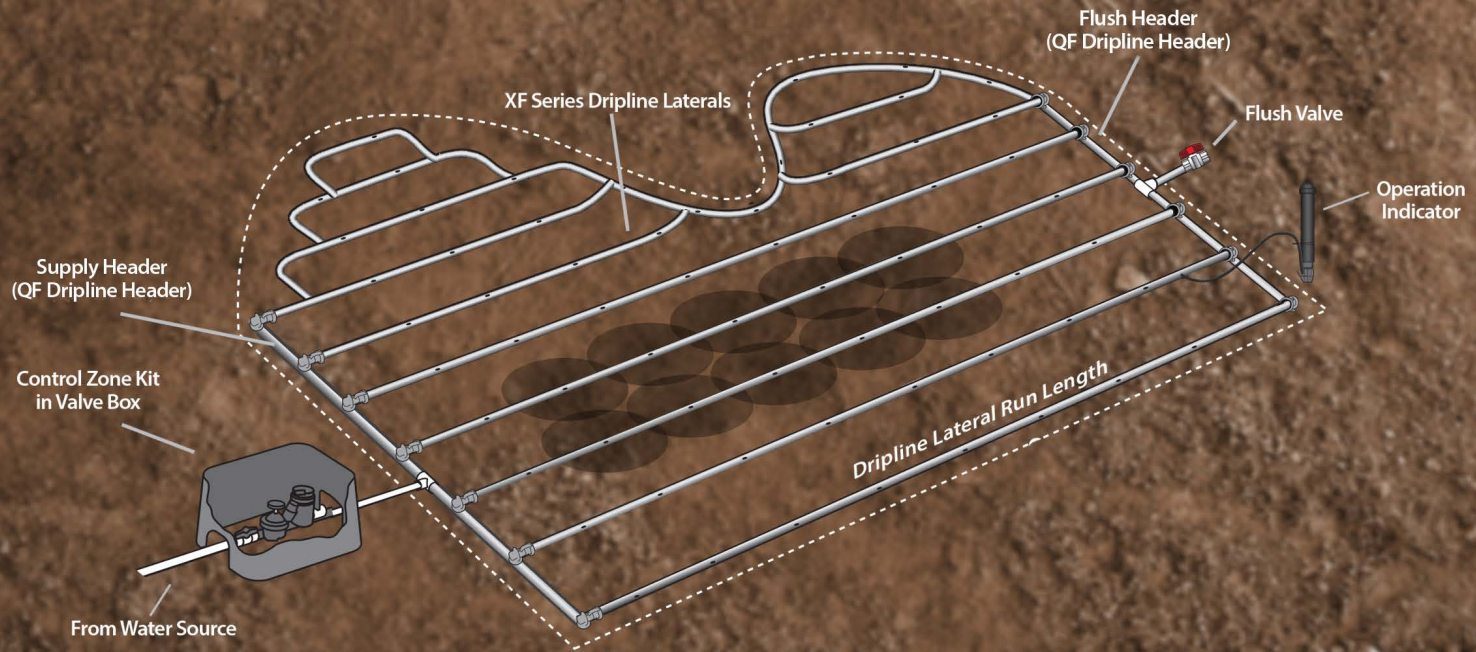
Note: These are general guidelines, field conditions may require modification to emitter flow rate, emitter spacing and lateral spacing. XF Series Dripline is to be installed at a depth of 4″-6″ (10.2-15.24 cm) in subsurface and groundcover applications. Use only XFS or XFS-CV dripline in subsurface applications. XF Series Dripline may also be installed on-surface under mulch in shrub and groundcover applications.

If you are not quite sure of the soil type, here is a test you can use by squeezing the soil in your hand:

Clay - When dry it forms hard clumps. When damp it is flexible and can be molded into shapes.
Loam - A moderate sand or dirt and very little clay. When dry it breaks easily. When wet it forms a lump.
Sand - Soil particles are loose, sandy grains. When dry it will fall apart when you open your hand. When damp it will form a lump but it will crumble easily when touched.

SECTION 4: Determine Type of Dripline Layout

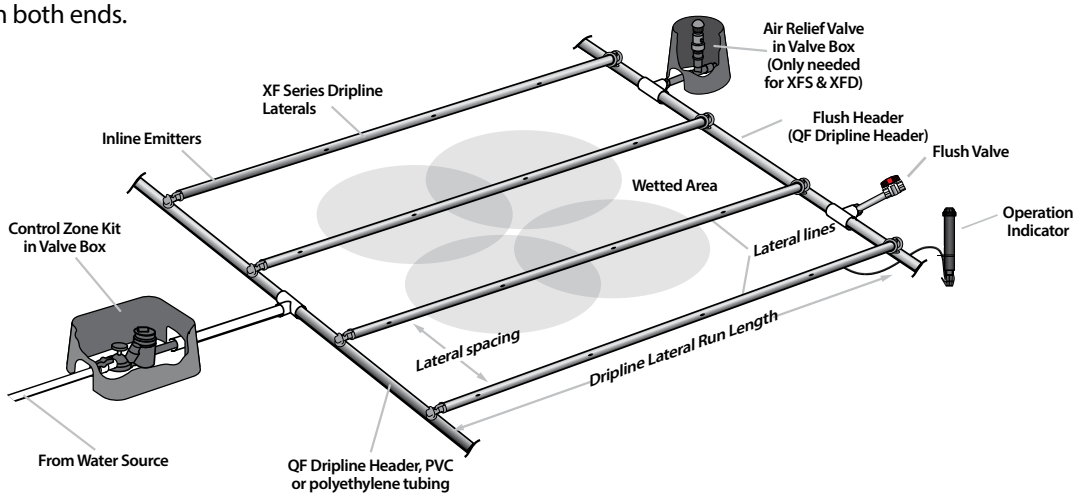




SECTION 4: DETERMINE TYPE OF DRIPLINE LAYOUT | SUBSURFACE

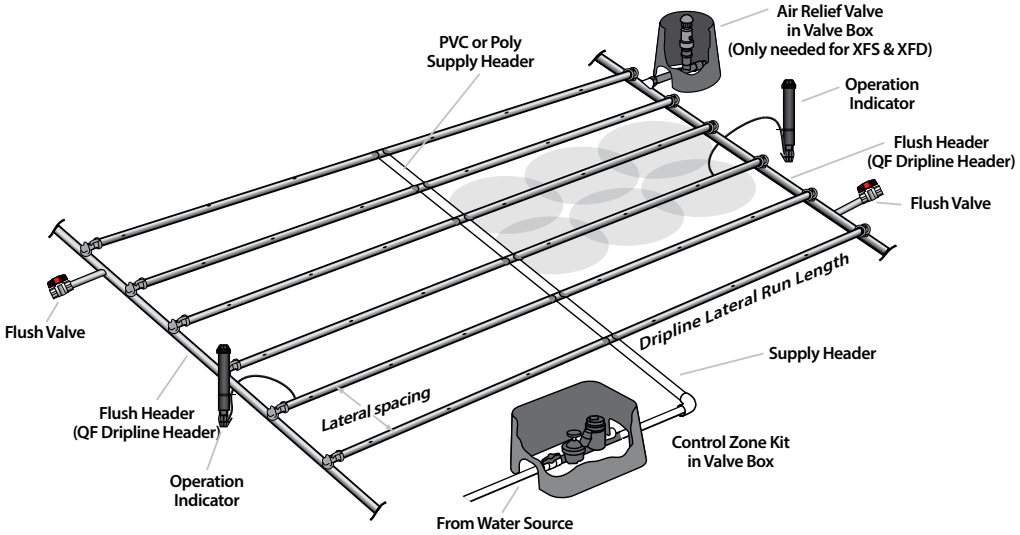
■ END FEED LAYOUT

This Grid layout is primarily used for dense plantings. The layout uses supply headers and flush headers with rows of dripline connected at each end. The supply header and flush header form a continuous loop where all rows of dripline are being supplied from both ends.



■ CENTER FEED LAYOUT

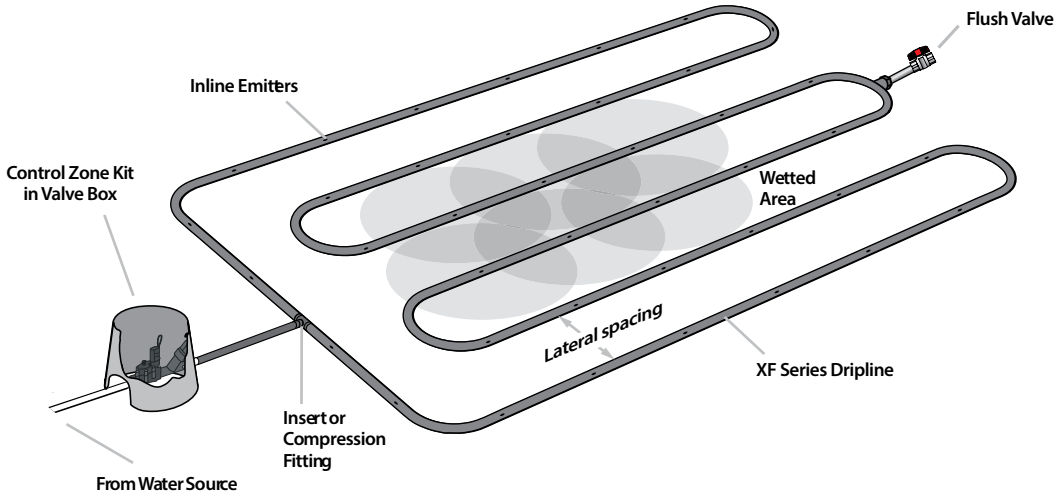
Where layout flexibility exists, it is recommended that Center Feed layouts be used. This allows for the most even flow of water through the zone. Center Feed layouts also potentially allow you to increase the size of the zone by providing lateral runs on both sides of the supply header. Center Feed layouts are an excellent option for median strips, road sides, and other homogenous planting zones.



DETERMINE TYPE OF DRIPLINE LAYOUT | ON-SURFACE

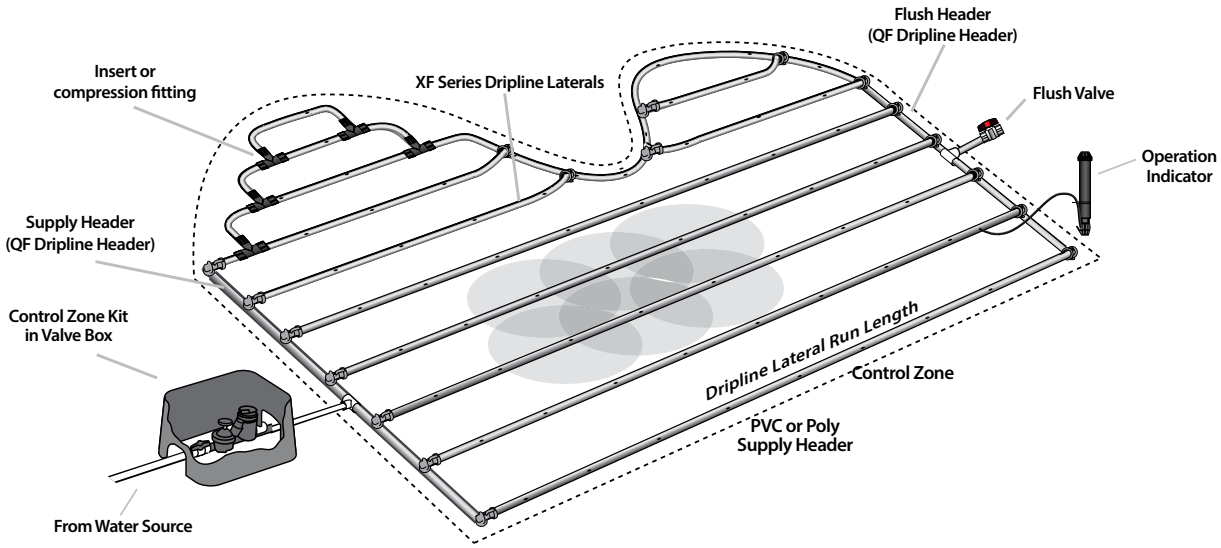
■ QUICK LOOP LAYOUT

The Loop layout is one continuous loop that weaves back and forth throughout the zone in evenly spaced laterals (rows).



■ CURVED EDGE LAYOUT

The Curved Edge layout is primarily used for dense planting areas. The layout uses supply and flush headers with rows of dripline connected at the end. The supply and flush header form a continuous loop and the dripline can be attached to the adjacent driplines with "tee" fittings to accommodate curved applications.



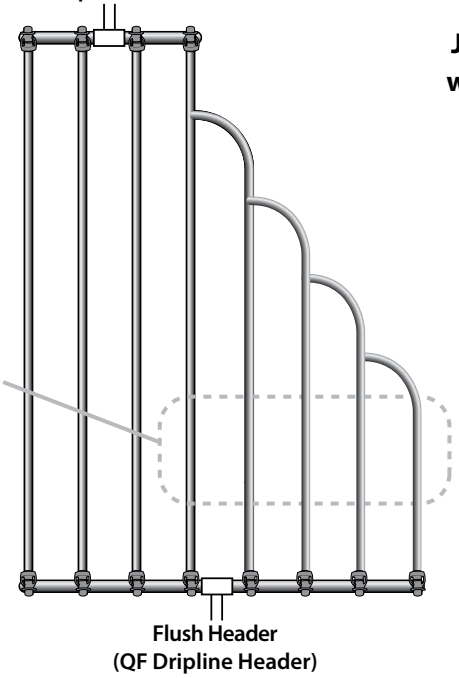
OTHER COMMON GRID LAYOUTS

■ BRANCHING OUT OR JOINING LAYOUTS

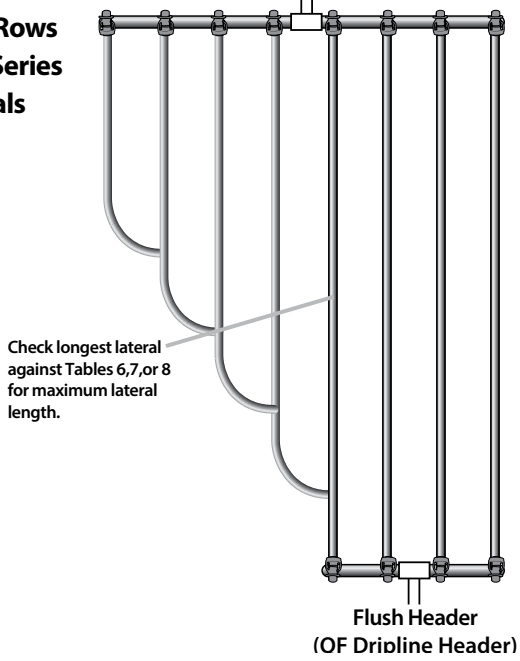
When branching out from a supply header with XF Series dripline, maximum lateral run length should be considered. Add up all the "branched out" dripline and check it against the maximum lateral run lengths listed in Tables 6, 7, 8, or 9. This will vary depending on the type of tubing being used.

When joining lateral rows from a supply header, check only the longest lateral against the maximum lateral run length listed in Tables 6, 7, 8, or 9.

Branching Out with XF Series Laterals



Joining Rows with XF Series Laterals



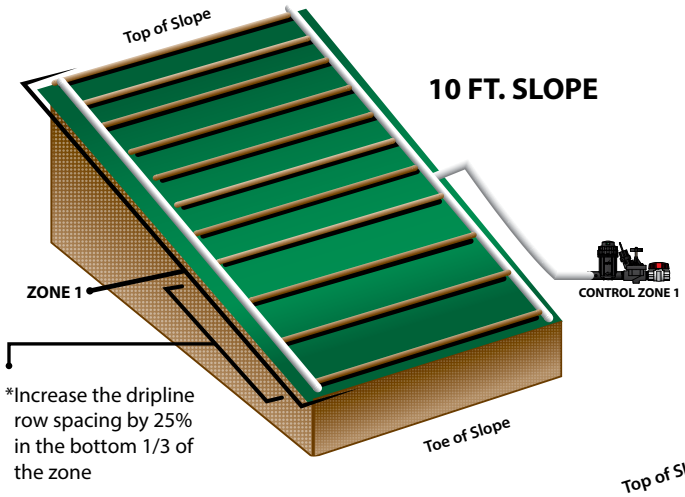
■ DESIGN CONSIDERATIONS

- Header should be spaced 2" - 4" (5cm-10.2 cm) from hardscape or other planting areas
- Headers may be QF Header, PVC, blank poly tubing or dripline
- Lateral spacing is a design consideration and can be calculated as shown on page 19 in "How to Calculate Equal Lateral (Row) Spacing"
- The lateral run length should not exceed the maximum lateral run length shown in Tables 6, 7, 8, or 9
- When using "Center Feed Layout" the run length should be measured from the supply header to the flush header and should not exceed the maximum run length shown
- When using "Loop Layout", because water is split into two separate paths that meet in the middle, the total continuous loop length of dripline should not exceed twice the maximum lateral length
- In subsurface applications an air vacuum relief valve should be installed at the highest point in the system to avoid back siphoning debris into the emitter
- Flush valves should be installed at the low point in the flush header or at the mid point of the loop layout

SLOPES

- The design of the dripline system should account for slopes on the site since runoff may occur at low points
- Slopes less than 3% do not require special design considerations
- Slopes greater than 3% should increase the dripline spacing by 25% in the bottom 1/3 of the zone
- Dripline should run perpendiculur (across) the slope when possible

ELEVATION CHANGES - SLOPE LAYOUT



10 FT. SLOPE

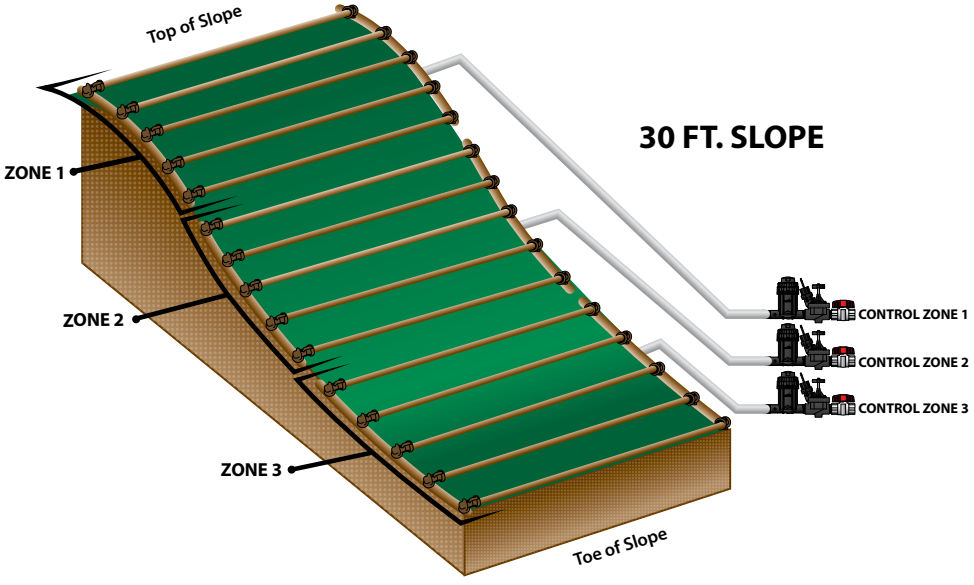
*Increase the dripline row spacing by 25% in the bottom 1/3 of the zone

SLOPES UP TO 10 FT. USING XFS-CV DRIPLINE:

- With sloping landscapes up to 10 ft. of elevation change, no seperate zones or check valves are required

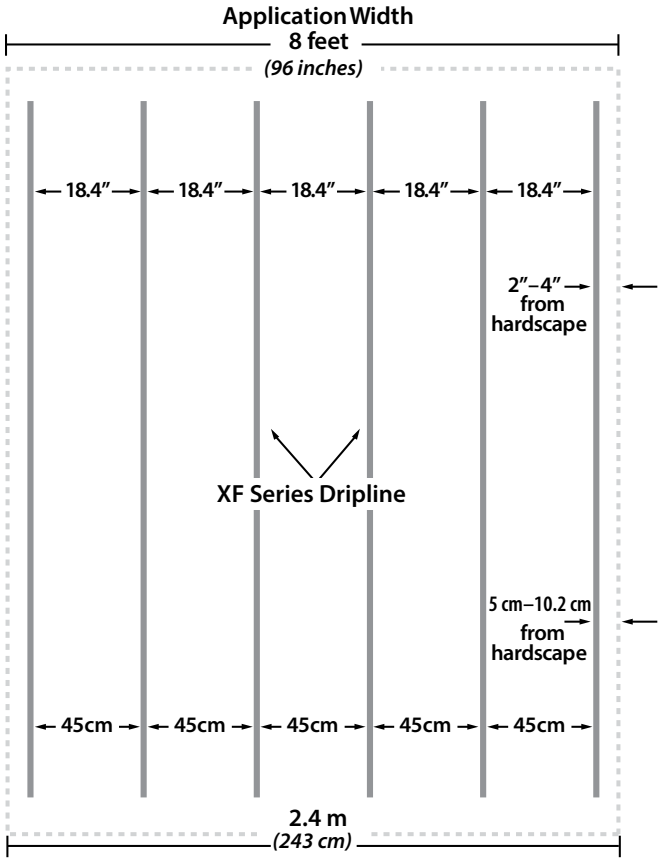
SLOPES GREATER THAN 10 FT USING XFS-CV DRIPLINE:

- With steep sloping landscapes greater than 10 ft., it is recommended that additional zones are installed to reduce runoff
- The use of XFS-CV can eliminate low emitter drainage



30 FT. SLOPE

DETERMINE LATERAL ROW SPACING



HOW TO CALCULATE EQUAL LATERAL ROW SPACING WHEN MAKING CUSTOM PVC HEADERS

Loam soil is assumed for the example below with a recommended lateral row spacing of 16"-22" as shown in Table 2 on Page 13. To calculate the specific lateral row spacing within this range, you need to know the width of the zone being irrigated and then use the calculation as show in Example 1.

Example 1: How to Calculate Equal Lateral (Row) Spacing

- Application width = 8' (2.4 m)
- Convert into inches: 8' x 12" = 96"
  or (Convert into centimeters: 2.43 m x 100 = 243 cm)
- It is recommended to space dripline 2" (5 cm) from hardscapes and 4" (10.2 cm) from separate planting zones

  In this example there are hardscapes on each side of the planting zone. Remove the hardscape spacing on each side from the total width:
  96" - (2x2") = 92" (243 cm - (2x5 cm) = 233 cm)
- For loam soil, the range of lateral row spacing is 16"-22" (40.6 cm - 55.9 cm). Choosing 18", calculate the number of spaces between rows: 92" ÷ 18" = 5.1 (233 cm ÷ 0.45 m = 5.1). Round to get whole spaces. Round up if the decimal is 0.5 or higher, round down if it is less than 0.5. In this case you should round down to 5 whole spaces between rows.
- Calculate the equal lateral row spacing: 92" ÷ 5 = 18.4" (233 cm ÷ 5 = 45 cm)
- Calculate the number of dripline rows by adding 1 to the number of spaces between rows: 5 + 1 = 6 dripline rows

SECTION 5: Zone Water Calculations

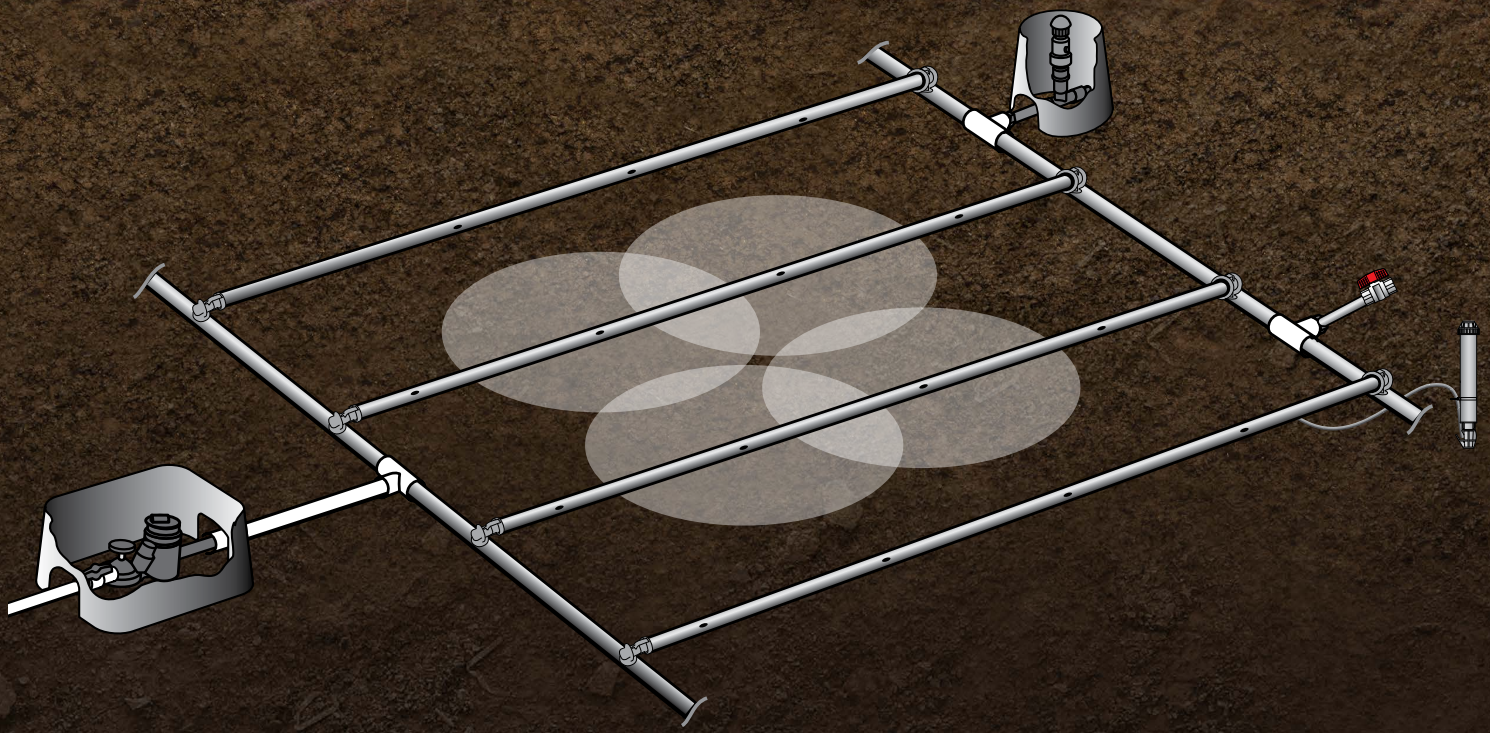
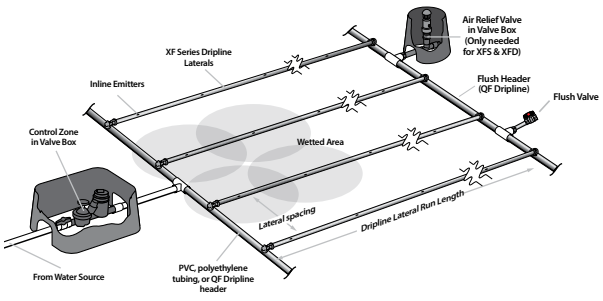


TABLE 3: CALCULATING ZONE WATER REQUIREMENTS

XF Series Dripline Flow (per 100 feet)						
Emitter Spacing	**0.4 GPH Emitter**		**0.6 GPH Emitter**		**0.9 GPH Emitter**	
Inches	**GPH**	**GPM**	**GPH**	**GPM**	**GPH**	**GPM**
12″	42	0.70	61	1.02	92	1.53
18″	28	0.47	41	0.68	61	1.02

XF Series Dripline Flow (per 100 Meters)						
Emitter Spacing	**1.6 L/HR Emitter**		**2.3 L/HR Emitter**		**3.4 L/HR Emitter**	
Centimeters	**L/HR**	**L/MIN**	**L/HR**	**L/MIN**	**L/HR**	**L/MIN**
30cm	533	8.89	767	12.78	1133	18.89
46cm	348	5.80	500	8.33	739	12.32



Note: This example represents approximately 650′ of dripline.

After the dripline layout design is complete, you will need to identify total zone flow. This is used to help select mainline, supply and flush headers, and control zone kit (valve, filter, and regulator).

1. Calculating zone water requirements can be done by adding up the total length of dripline in the zone. Convert the total dripline length to hundreds of feet (meters). 650 feet (198 m) would be 6.5 in hundreds of feet (1.98 m).
2. Multiply total dripline length in hundreds of feet (meters) by the flow per 100 feet (meters) for your specified dripline. This can be found in Table 3. To read the table, select the emitter flow rate in the row across the top (0.4 GPH (1.6 L/HR), 0.6 GPH (2.3 L/HR), or 0.9 GPH (3.4 L/HR) and then select the emitter spacing in the left column (12″ (0.30 m) or 18″ (0.46 m). Follow emitter flow rate down and emitter spacing across to find the flow per 100 feet (meters) for the XF Series dripline specified.
3. For example, for a zone that has 650 feet (198 m) of 0.9 GPH (3.4 L/HR) emitters and 18″ (0.46 m) emitter spacing, the calculation would be 6.50 x 1.02 GPM = 6.6 GPM (1.98 m x 12.32 L/MIN = 24.4 L/MIN) for the zone.
4. Supply lines and headers should be sized to provide the flow to the zone without exceeding 5 feet (meters) per second velocity. This can be done using the zone water requirement and referencing information on the appropriate piping located at www.rainbird.com/reference or in the back reference section in the Rain Bird catalog.

TABLE 4: DETERMINE MAXIMUM FLOW PER ZONE

Maximum Flow Per Zone (English)					
Sch. 40 PVC or QF Header Size	**Max. Flow* GPM**	**psi Loss****	**Poly Pipe Header Size**	**Max. Flow* GPM**	**psi Loss****
½″	4.7 GPM	7.7 psi	½″	4.7 GPM	8.8 psi
¾″	8.3 GPM	5.6 psi	¾″	8.3 GPM	6.3 psi
1″	13.5 GPM	4.2 psi	1″	13.5 GPM	4.8 psi
1-¼″	23.1 GPM	3.1 psi	1-¼″	23.1 GPM	3.1 psi
1-½″	33.9 GPM	2.9 psi	1-½″	33.9 GPM	2.9 psi
2″	52.4 GPM	1.9 psi	2″	52.4 GPM	1.9 psi

* Based on maximum velocity of 5′ per second
** Per 100′ of tubing

Maximum Flow Per Zone (Metric)					
Sch. 40 PVC or QF Header Size	**Max. Flow* L/MIN**	**psi Loss****	**Poly Pipe Header Size**	**Max. Flow* L/MIN**	**psi Loss****
1.27 cm	17.8	0.53	1.27 cm	17.8	0.61
1.91 cm	31.4	0.39	1.91 cm	31.4	0.43
2.54 cm	51.1	0.29	2.54 cm	51.1	0.33
3.18 cm	87.4	0.21	3.18 cm	87.4	0.22
3.81 cm	128.3	0.20	3.81 cm	128.3	0.20
5.08 cm	198.4	0.13	5.08 cm	198.4	0.13

* Based on maximum velocity of 1.52 m per second
** Per 30.5 meters of tubing

CALCULATING APPLICATION RATES

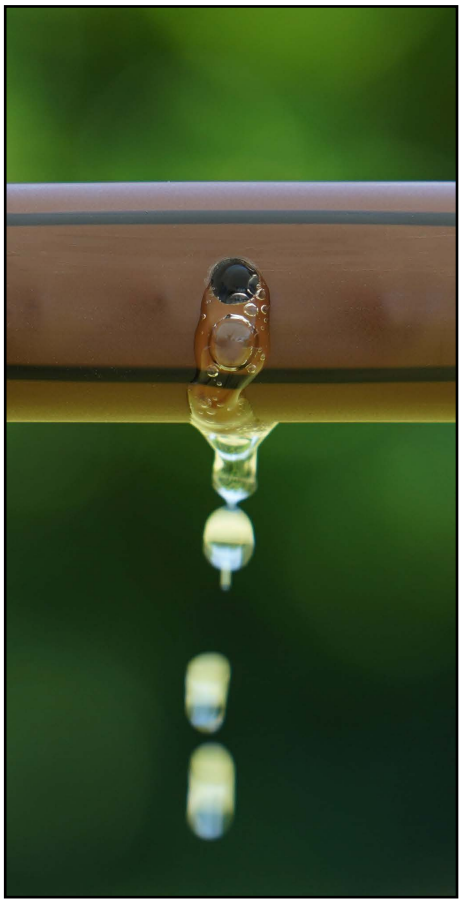
APPLICATION RATE

The application rate is the rate that XF Series Dripline applies water to the soil. This is used to determine run times for the zone based on the plant watering requirements. Table 5 is provided to make it easy to determine application rates for every model of XF Series Dripline when using common row spacing (12"-24" / 30cm-61cm). The table is divided into three sections, a 0.4 GPH (1.6 L/HR) emitter flow section, a 0.6 GPH (2.3 L/HR) emitter flow section and a 0.9 GPH (3.4 L/HR) emitter flow section. Go to the section for the specified emitter flow rate and find in the left hand column the specified emitter spacing. Next, find the lateral row spacing across the top of the table. Follow the lateral row spacing column down and the emitter spacing row across until the two meet. This is the application rate in inches per hour (centimeters per hour). For example, a 0.6 GPH (2.3 L/HR) emitter flow rate with 18" (46 cm) lateral row spacing and 18" (46 cm) emitter spacing has an application rate of 0.43 (1.09 cm/hr) inches per hour.

TABLE 5: APPLICATION RATE

Emitter Spacing	Lateral Row Spacing (in Inches)										
	12"	13"	14"	15"	16"	17"	18"	19"	20"	22"	24"
0.4 GPH Emitter Flow (Inches per hour)											
12"	0.67	0.62	0.58	0.54	0.51	0.48	0.45	0.43	0.40	0.37	0.34
18"	0.45	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.27	0.25	0.22
0.6 GPH Emitter Flow (Inches per hour)											
12"	0.96	0.89	0.83	0.77	0.72	0.68	0.64	0.61	0.58	0.53	0.48
18"	0.64	0.59	0.55	0.51	0.48	0.45	0.43	0.41	0.39	0.35	0.32
0.9 GPH Emitter Flow (Inches per hour)											
12"	1.44	1.33	1.24	1.16	1.08	1.02	0.96	0.91	0.87	0.79	0.72
18"	0.96	0.89	0.83	0.77	0.72	0.68	0.64	0.61	0.58	0.53	0.48

Emitter Spacing	Lateral Row Spacing (in Centimeters)										
	30	33	36	38	41	43	46	48	51	56	61
1.6 LPH Emitter Flow (cm per hour)											
30cm	1.78	1.62	1.48	1.40	1.30	1.24	1.16	1.11	1.05	0.95	0.87
46cm	1.16	1.05	0.97	0.92	0.85	0.81	0.76	0.72	0.68	0.62	0.57
2.3 LPH Emitter Flow (cm per hour)											
30cm	2.44	2.26	2.11	1.96	1.86	1.73	1.63	1.55	1.47	1.35	1.22
46cm	1.63	1.50	1.40	1.30	1.22	1.14	1.09	1.02	0.99	0.89	0.81
3.4 LPH Emitter Flow (cm per hour)											
30cm	3.66	3.38	3.15	2.95	2.74	2.59	2.44	2.31	2.21	2.01	1.83
46cm	2.44	2.26	2.11	1.96	1.83	1.73	1.63	1.55	1.47	1.35	1.22



At this point the emitter flow rate and spacing between emitters and rows has been selected.
Use the tables to determine the overall water application rate for the landscape area.

CALCULATIONS FOR DRIPLINE IRRIGATION

HOW DO I DETERMINE THE APPLICATION RATE?

$$\frac{\text{Emitter Flow Rate in GPH} \times 231.1}{\text{Lateral Row Spacing in Inches} \times \text{Emitter Spacing in Inches}}$$

Example:

Emitter Flow Rate	0.6 GPH
Emitter Spacing	12 inches
Lateral Row Spacing	18 inches

$$\frac{0.6 \times 231.1}{12 \times 18} = 0.64 \text{ inches/hour}$$

(METRIC)

$$\frac{\text{Emitter Flow Rate in L/HR} \times 1000}{\text{Lateral Row Spacing in cm} \times \text{Emitter Spacing in cm}}$$

Example:

Emitter Flow Rate	2.3 L/HR
Emitter Spacing	30 cm
Lateral Row Spacing	41 cm

$$\frac{2.3 \times 1{,}000}{30 \times 41} = 1.86 \text{ cm/hr}$$

WHAT IS THE TOTAL FLOW WITHIN THE DRIP ZONE?

$$\frac{\text{Irrigated Area in Sq Ft.} \times \text{Emitter Flow in GPH} \times 2.4}{\text{Lateral Row Spacing in Inches} \times \text{Emitter Spacing in Inches}}$$

Example:

Irrigated Area	2500 Sq Ft
Emitter Flow Rate	0.6 GPH
Emitter Spacing	18 inches
Lateral Row Spacing	18 inches

$$\frac{2500 \times 0.6 \times 2.4}{18 \times 18} = 11.11 \text{ GPM}$$

$$\frac{\text{Irrigated Area in Sq Meters} \times \text{Emitter Flow in L/HR} \times 166.7}{\text{Lateral Row Spacing in cm} \times \text{Emitter Spacing in cm}}$$

Example:

Irrigated Area	800 Sq Meters
Emitter Flow Rate	3.4 L/HR
Emitter Spacing	46 cm
Lateral Row Spacing	48 cm

$$\frac{800 \times 3.41 \times 166.7}{46 \times 48} = 206 \text{ L/MIN}$$

HOW MUCH DRIPLINE DO I NEED BASED ON SIZE OF IRRIGATED AREA?

$$\frac{\text{Area in Sq Ft.} \times 12}{\text{Lateral Row Spacing in Inches}}$$

Example:

Irrigated Area	2165 Sq Ft
Lateral Row Spacing	18 inches

$$\frac{2165 \times 12}{18} = 1443 \text{ feet of dripline needed}$$

$$\frac{\text{Area in Sq. Meters} \times 100}{\text{Lateral Row Spacing in cm}}$$

Example:

Irrigated Area	425 Sq Meters
Lateral Row Spacing	36 cm

$$\frac{425 \times 100}{36} = 1180 \text{ meters of dripline needed}$$

HOW MANY FEET OF DRIPLINE CAN I USE IF I KNOW THE AVAILABLE FLOW

$$\frac{\text{Available Flow}}{\text{Flow per 100 Foot Length}} \textit{ x 100 = Maximum Feet}$$

Obtain "Flow per 100 Feet"

Example:

You have 11 GPM available flow

0.6 GPH emitters on 18" spacing - See table 3

$$\frac{11 \text{ GPM}}{0.68 \text{ GPM}} \times 100 \text{ feet} = 1618 \text{ maximum feet of dripline}$$

$$\frac{\text{Available Flow}}{\text{Flow per 100 Meter Length}} \textit{ x 100 = Maximum Meters}$$

Obtain "Flow per 100 Meters"

Example:

You have 130 L/MIN available flow

2.3 L/HR emitters on 0.46 meter spacing - See table 3

$$\frac{130 \text{ L/MIN}}{2.31 \text{ L/HR}} \times 100 \text{ meters} = 5628 \text{ maximum feet of dripline}$$

IRRIGATION FORMULAS

PLANT WATER REQUIREMENT FOR A DENSE PLANTING SCHEME

The water requirement for a densely planted hydro-zone is measured in inches per day.

Plant Water Requirement = PET x K_C

Potential Evapotranspiration (PET) - The amount of water that us used by the combination of evaporation from the soil and transpiration from plants growing in the soil. PET is generally expressed in inches per day.

K_C - Adjustment factor to PET that accounts for the needs of a specific plant in growing conditions. It is also known as the "crop coefficient" or the "plant factor."

Example: The PET for a day in the summer for Las Vegas is: 0.30" (0.76 cm)
The K_C or "plant factor" for a certain type of plant and it's surroundings is 0.84 (2.13 cm)

Plant Water Requirement = 0.30" x 0.84 = 0.25"/day (0.76 cm x 2.13 cm = 1.62 cm per day)

SYSTEM RUN TIME

The formula for system run time for dense plants is based on a measurement of flow in inches per day.

System Run Time = (PWR / Application Rate x Application Efficiency) x 60

Example: (0.25" / 0.64" x 0.90) x 60 = 26 minutes (0.63 cm/1.62 x 0.90) x 60 = 26 minutes

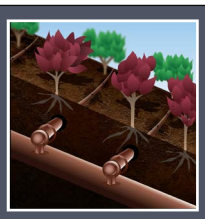
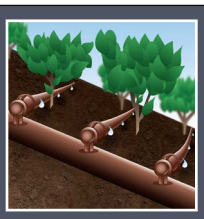
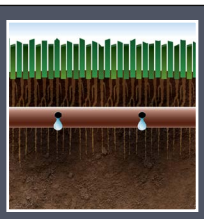
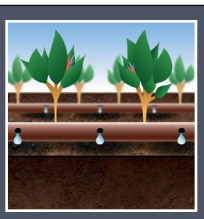
Example:

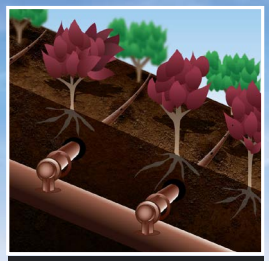
Plant Water Requirement: 0.25"/day (0.63 cm/day)
Application Rate: 0.64" (1.62 cm)
Drip Application Efficiency: 90%
System Run Time = (0.25/0.64 x 0.90) x 60 = 26 minutes (0.63 cm/1.62 x 0.90) x 60 = 26 minutes

More detailed information on calculating Plant Water Requirement and System Run Time can be found in the Low-Volume Landscape Irrigation Design Manual; Chapters 4 & 5. This manual is only available for download on our website:

https://www.rainbird.com/sites/default/files/media/documents/2018-02/LowVolumeGuide.pdf

SECTION 6: Dripline Models for Every Application

DRIPLINE PRODUCT	 XFS-CV DRIPLINE	 XFCV DRIPLINE	 XFS DRIPLINE	 XFD DRIPLINE	 1/4" DRIPLINE
LANDSCAPE CHALLENGES	**ON-SURFACE AND SUBSURFACE** Sloped and Level Grade	**ON-SURFACE** Sloped and Level Grade	**SUBSURFACE** Level Grade	**ON-SURFACE** Level Grade Installations	**ON-SURFACE** Potted/Small Bed Installations
SUB SURFACE APPLICATIONS	X		X		
SLOPED AREAS	X	X			
SHRUB & GROUND COVER BEDS	X	X	X	X	X
CONTAINER PLANTS	X	X	X	X	X
CURVED LANDSCAPES	X	X	X	X	X
NARROW LANDSCAPED AREAS	X	X	X	X	X
MEDIANS OR PARKING ISLANDS	X	X	X	X	
TURF GRASS	X		X		
DRIPLINE FEATURES	 **XFS-CV DRIPLINE** • Heavy-Duty 4.3 psi Check Valve provides 10 ft. of holdback • Copper Shield™ emitter root intrusion • Longer lateral runs • Exceptional durability • Available in purple and purple stripe for non-potable water	 **XFCV DRIPLINE** • 3.5 psi Check Valve provides 8 ft. of holdback • Longer lateral runs • Exceptional durability	 **XFS DRIPLINE** • Copper Shield™ emitter root intrusion • Exceptional durability • Available in purple and purple stripe for non-potable water	 **XFD DRIPLINE** • Greater flexibility • Longer lateral runs • Exceptional durability • Available in purple and purple stripe for non-potable water	 **1/4" DRIPLINE** • In-line non-pressure compensated emitters • Perfect for pots and small beds • Easy installation



On/Sub Surface
Sloped Applications

XFS-CV DRIPLINE FOR ON/SUB SURFACE ELEVATED APPLICATIONS

ELEVATED PERFORMANCE

With a patented check valve in every emitter that holds back 10' of elevation change, XFS-CV dripline eliminates low-point drainage and provides uniform irrigation throughout the zone.

COPPER SHIELD™ TECHNOLOGY

Only XFS-CV dripline includes a pure copper chip in every emitter to protect against root intrusion. Others use diluted copper compounds encapsulated in plastic.

LOW-PROFILE FLAT EMITTER

Rain Bird's low-profile flat emitter design reduces in-line pressure loss, allowing longer lateral runs, simplifying design and reducing installation time.

GREATER FLEXIBILITY

Rain Bird's proprietary blend provides industry-leading flexibility allowing for tighter turns with fewer elbows for fast and easy installation.

EASY IDENTIFICATION

All dripline models feature color coded stripes to easily identify the flow rate:

Black stripes = 0.9 GPH
Tan **stripes** = 0.6 GPH

LEED COMPLIANT

Contains at least 20% post consumer recycled polyethylene which qualifies for LEED credit 4.2.

XFS-CV DRIPLINE - SPECIFICATIONS

Applications

Rain Bird® XFS-CV dripline features Copper Shield™ Technology and a heavy-duty 4.3 psi check valve, making it perfect for subsurface and on-surface applications with level grades or slopes. A check valve in every emitter keeps the dripline charged in elevation changes up to 10 feet, XFS-CV can be used where no other dripline will work.

Keeping water in the dripline at all times helps for better irrigation uniformity throughout the zone. The check valve also helps prevent puddling and oversaturated soil at the low point in the zone.

Features

Industry-Leading Protection

- Rain Bird's XFS-CV dripline with patented Copper Shield™ Technology protects the emitter from root intrusion. Unlike other manufacturers who use harsh chemicals or diluted copper compounds encapsulated in plastic, the Copper Shield™ Technology from Rain Bird provides root intrusion protection with a pure copper chip at each emitter

- Rain Bird's industry leading 4.3 psi emitter check valve technology keeps the dripline charged with water when elevation changes are up to 10 feet, increasing uniformity of watering and conserving water by eliminating the need to recharge the line at the beginning of each irrigation cycle

Easy to Use

- Through the use of a proprietary tubing material, the XFS-CV dripline is the most flexible dripline tubing in the industry, making it the easiest dripline to design with and install

- It accepts Rain Bird® XF dripline barbed insert fittings and other 17 mm barbed insert fittings

- Rain Bird's low-profile emitter design reduces in-line pressure loss, allowing longer lateral runs, simplifying design and reducing installation time

- A variety of industry standard emitter flow rates, emitter spacing and coil lengths provide design flexibility for applications with or without elevation changes

Reliable

- The pressure-compensating emitter design provides a consistent flow over the entire lateral length, ensuring higher uniformity for increased reliability in the pressure range of 20 to 60 psi

Durable

- Dual-layered tubing (copper over black) provides unmatched resistance to chemicals, algae growth and UV damage

Grit Tolerant

- Rain Bird's proprietary emitter design resists clogging by use of an extra wide flow path combined with a self-flushing action

Made with Recycled Content

- All Rain Bird XF Dripline products qualify for LEED credit 4.2 because they contain at least 20% polyethylene post-consumer recycled material by cost

Operating Range

- **Opening Pressure:** 14.5 psi (1,0 bar)
- **Pressure:** 20 to 60 psi (1,38 to 4,14 bar)
- **Flow Rates:** 0.6 and 0.9 GPH (2,3 and 3,5 L/HR)
- **Filtration Requirement:** 120 mesh
- **Temperature:**
  – Water: Up to 100° F (37,8° C)
  – Ambient: Up to 125° F (51,7° C)

Specifications

- **OD:** 0.634" (16 mm)
- **ID:** 0.536" (13.61 mm)
- **Thickness:** 0.049" (1.25 mm)
- **Emitter spacing:** 12" & 18" (30,5 & 45,7 cm)
- **Coil lengths:**
  100', 250', 500', and 1000' (special order)
  (30,5, 76,5, 152,4, and 304,9 m)
- **Coil color:** Copper, Purple and Purple Stripe

1,000' coils available via special order

Models

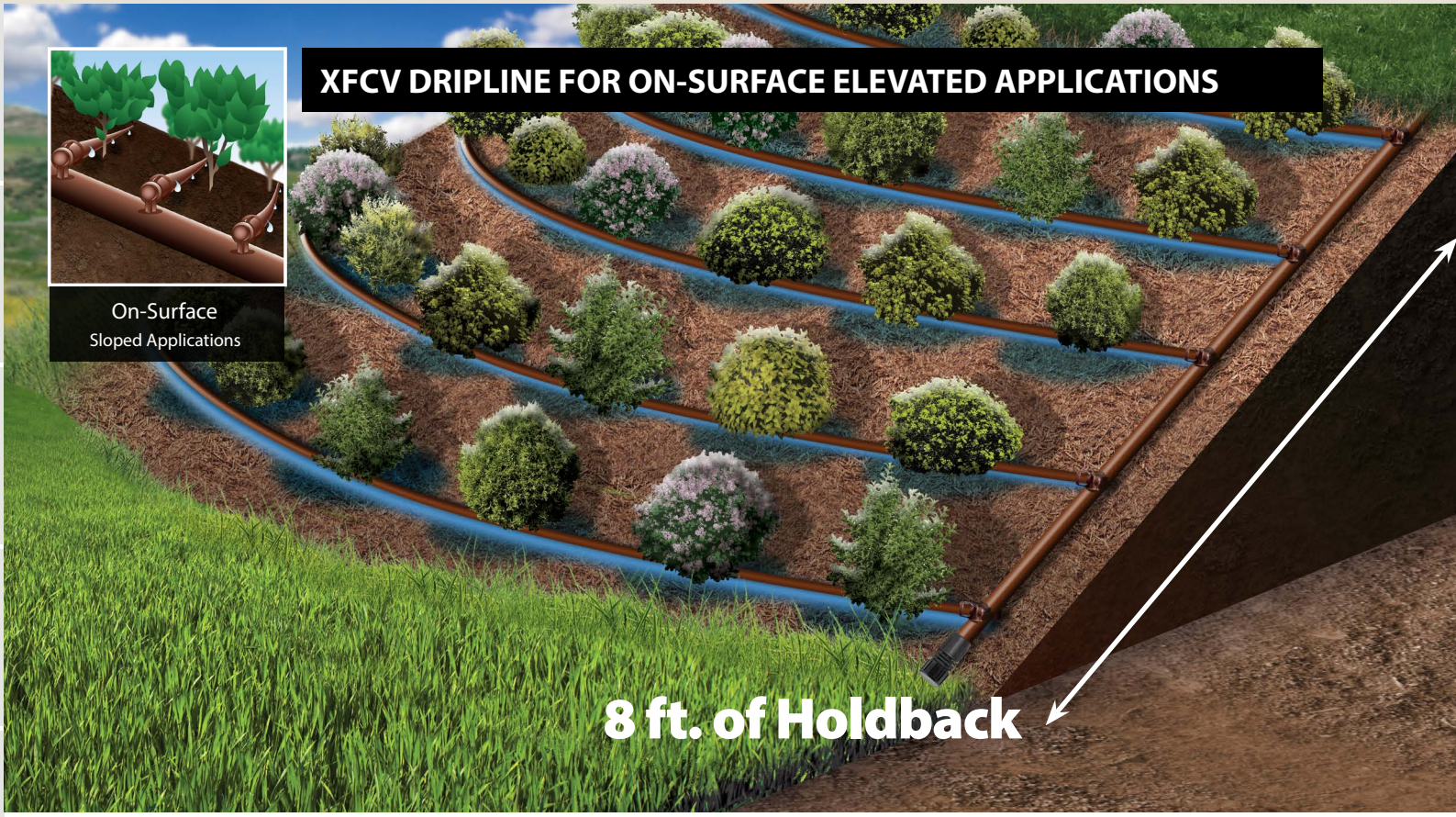
- XFSCV0612100
- XFSCV0612250
- XFSCV0612500
- XFSCV0618100
- XFSCV0618250
- XFSCV0618500
- XFSCV0912100
- XFSCV0912250
- XFSCV0912500
- XFSCV0918100
- XFSCV0918250
- XFSCV0918500
- XFSCVP612500
- XFSCVP618500
- XFSCVP912500
- XFSCVP918500
- XFSCVPS612500
- XFSCVPS618500
- XFSCVPS912500
- XFSCVPS918500

TABLE 6: LATERAL RUN LENGTHS

XFS-CV Dripline Maximum Lateral Lengths (Feet)				
	12" Emitter Spacing		18" Emitter Spacing	
psi	0.6 GPH	0.9 GPH	0.6 GPH	0.9 GPH
20	192	136	254	215
30	289	205	402	337
40	350	248	498	416
50	397	281	573	477
60*	436	309	637	529

XFS-CV Dripline Maximum Lateral Lengths (Meters)				
	30,5 cm Emitter Spacing		45,7 cm Emitter Spacing	
Bar	2.3 L/HR	3.4 L/HR	2.3 L/HR	3.4 L/HR
1,38	58,5	41,5	77,4	65,5
2,07	88	62,5	122,5	102,7
2,76	107	75,6	151,8	126,8
3,45	121	85,6	174,7	145,4
4,14*	133	94,2	194,2	161,2

* When using 17mm insert fittings with design pressure over 50 psi (3.5 bar), it is recommended that stainless steel clamps be installed on each fitting.



Elevated Performance

Keeps dripline charged with water even with elevation changes to 8 feet. The check valve also helps to prevent over-watering at the low-point in the zone, avoiding puddling from water draining from the dripline.

Conserves Water

Prevents puddling and water loss at the low point in the zone.

LEED Compliant

Contains at least 20% post consumer recycled polyethylene which qualifies for LEED credit 4.2.

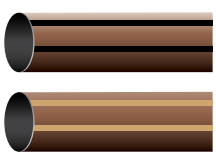
Low-Profile Flat Emitter

Rain Bird's low-profile flat emitter design reduces in-line pressure loss, allowing longer lateral runs, simplifying design and reducing installation time.

Greater Flexibility

Rain Bird's proprietary blend provides industry-leading flexibility allowing for tighter turns with fewer elbows for fast and easy installation.

Easy Identification



All dripline models feature color coded stripes to easily identify the flow rate:

Black stripes = 0.9 GPH
Tan **stripes** = 0.6 GPH

XFCV DRIPLINE - SPECIFICATIONS

Applications

Rain Bird® XFCV Dripline with a heavy-duty 3.5 psi check valve for on-surface applications is a valuable addition to the Rain Bird XF Series dripline family. Rain Bird's patent-pending emitter check valve keeps the dripline charged in elevation changes to 8 feet.

Keeping water in the dripline at all times improves irrigation uniformity for plants throughout the zone. The check valve also helps to prevent over-watering at the low-point in the zone, avoiding puddling from water draining from the dripline.

Features

Simple

- Rain Bird's patent-pending 3.5 psi check valve technology keeps the dripline charged with water at all times, increasing uniformity of watering, and conserves water by eliminating the need to recharge the zone at the beginning of each watering cycle
- Through the use of a proprietary tubing material, the XFCV Dripline with heavy-duty check valve is the most flexible dripline tubing in the industry, making it the easiest dripline to design with and install
- It accepts Rain Bird Easy Fit Compression Fittings, XF Dripline Barbed Insert Fittings and other 17 mm barbed insert fittings
- Rain Bird's low-profile emitter design reduces in-line pressure loss, allowing longer lateral runs, simplifying design and reducing installation time
- Variety of emitter flow rates, emitter spacing and coil lengths provide design flexibility for on-surface areas with or without elevation changes

Made with Recycled Content

- All Rain Bird XF Dripline (XFD, XFS, XFCV, and XFS-CV) qualify for LEED credit 4.2 because they contain at least 20% post consumer recycled polyethylene. These come in an assortment of coil sizes, flow rates and emitter spacing

Reliable

- The pressure-compensating emitter design provides a consistent flow over the entire lateral length ensuring higher uniformity for increased reliability in the pressure range of 20 to 60 psi

Durable

- Dual-layered tubing (brown over black) provides unmatched resistance to chemicals, algae growth and UV damage

Grit Tolerant

- Rain Bird's proprietary emitter design resists clogging by use of an extra wide flow path combined with a self-flushing action

Operating Range

- **Opening Pressure:** 14.5 psi (1,0 bar)
- **Operating Pressure:** 20 to 60 psi (1,38 to 4,14 bar)
- **Flow rates:** 0.6 and 0.9 GPH (2,3 and 3,5 L/HR)
- **Temperature:**
  Water: Up to 100° F (37,8° C)
  Ambient: Up to 125° F (51,7° C)

Specifications

- **OD:** 0.634" (16 mm)
- **ID:** 0.536" (13.61 mm)
- **Thickness:** 0.049" (1.25 mm)
- **Emitter spacing:** 12" & 18" (30,5 & 45,7 cm)
- **Coil lengths:** 100', 250, and 500' (30,5, 76,2, and 152,4 m)
- **Coil color:** Brown

Models

- XFCV0612100
- XFCV0612250
- XFCV0612500
- XFCV0618100
- XFCV0618250
- XFCV0618500
- XFCV0912100
- XFCV0912250
- XFCV0912500
- XFCV0918100
- XFCV0918250
- XFCV0918500

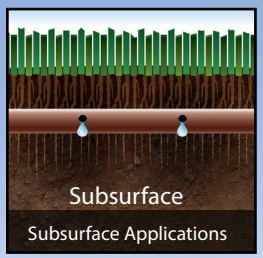
TABLE 7: LATERAL RUN LENGTHS

XFCV Dripline Maximum Lateral Lengths (Feet)				
	12" Emitter Spacing		18" Emitter Spacing	
psi	0.6 GPH	0.9 GPH	0.6 GPH	0.9 GPH
20	192	136	254	215
30	289	205	402	337
40	350	248	498	416
50	397	281	573	477
60*	436	309	637	529

* When using 17 mm insert fittings with design pressure over 50psi, it is recommended that stainless steel clamps be installed on each fitting.

XFCV Dripline Maximum Lateral Lengths (Meters)				
	30.5 cm Emitter Spacing		45.7 cm Emitter Spacing	
Bar	1.6 L/HR	2.3 L/HR	1.6 L/HR	2.3 L/HR
1.4	59	41	77	66
2.1	88	63	123	103
2.8	107	76	152	127
3.5	121	86	175	145
4.1*	133	94	194	161

* When using 17 mm insert fittings with design pressure over 3.5 bar, it is recommended that stainless steel clamps be installed on each fitting.



XFS DRIPLINE FOR SUBSURFACE APPLICATIONS

Rain Bird's XFS Subsurface Dripline with Copper Shield™ Technology is the first subsurface dripline to effectively protect the emitter from root intrusion without the use of Trifluralin. Copper Shield™ Technology is the environmentally-responsible alternative to chemical inhibitors.

XFS can be used on turf grass or shrub and groundcover areas. It's also perfect for small, narrow and tight planting areas, as well as areas with tight curves or many switchbacks. It accepts Rain Bird Easy Fit Compression Fittings, XF Dripline Barbed Insert Fittings and other 17 mm barbed insert fittings.

■ WATER EFFECIENT

Expands use of subsurface irrigation which can be 90% efficient, resulting in up to 70% water savings.

■ RELIABLE

Grit tolerant emitter resists clogging by use of an extra-wide flow path combined with a self-flushing action.

■ INNOVATIVE

Ground-breaking solution to root intrusion with patent-pending Copper Shield™ Technology.

■ ENVIRONMENTALLY RESPONSIBLE

Environmentally responsible solution to root intrusion without the use of harsh chemicals.

XFS Subsurface Dripline, winner of the "Best New Product" for 2010 by the Irrigation Association

XFS DRIPLINE - SPECIFICATIONS

Applications

Rain Bird® XFS Dripline includes the patent-pending Copper Shield™ technology only available from Rain Bird. The Copper Shield™ Technology protects the emitter from root intrusion, creating a long-lasting, low maintenance subsurface drip irrigation system for use under turf grass or shrub and groundcover areas. XFS Series Dripline with Copper Shield™ is perfect for small, narrow and tight planting areas, as well as areas with tight curves or many switchbacks.

Features

Simple

- Rain Bird's patent pending copper-colored XFS dripline with Copper Shield™ Technology protects the emitter from root intrusion with out requiring EPA-approved handling procedures - unlike some manufacturers who use harsh chemicals or treated filters to protect the emitter from root intrusion
- Through the use of a proprietary tubing material, the copper-colored XFS Dripline with Copper Shield™ is the most flexible dripline tubing in the industry making it the easiest subsurface dripline to design with and install
- Accepts Rain Bird XF Dripline Insert Fittings and Easy Fit Compression Fittings
- Rain Bird's low-profile emitter design reduces in-line pressure loss, allowing longer lateral runs, simplifying design and reducing installation time
- Variety of emitter flow rates, emitter spacing and coil lengths provide design flexibility for either subsurface turf grass or subsurface shrub and groundcover applications

Reliable

- XFS emitters are protected from root intrusion by Rain Bird's patent-pending Copper Shield™ Technology resulting in a system that does not require maintenance or replacement of chemicals to prevent root intrusion
- The pressure-compensating emitter design provides a consistent flow over the entire lateral length ensuring higher uniformity for increased reliability in the pressure range of 8.5 to 60 psi

Durable

- Dual-layered tubing (copper over black) provides unmatched resistance to chemicals, algae growth and UV damage
- Grit Tolerant: Rain Bird's proprietary emitter design resists clogging by use of an extra-wide flow path combined with a self-flushing action

Operating Range

- **Pressure:** 8.5 to 60 psi (,58 to 4,14 bar)
- **Flow rates:** 0.42, 0.6, and 0.9 GPH (1,6, 2,3, and 3,5 L/HR)
- **Temperature:**
  Water: Up to 100° F (37,8° C)
  Ambient: Up to 125° F (51,7° C)
- **Required Filtration:** 120 Mesh

Specifications

- **OD:** 0.634" (16 mm)
- **ID:** 0.536" (13.61 mm)
- **Thickness:** 0.049" (1.25mm)
- **Emitter Spacing:** 12", 18", 24" (30,5, 45,7, and 61,0 cm)
- **Coil lengths:** 100' and 500' (30,5 and 152,4 m)
- **Coil Color:** Copper, purple, purple stripe

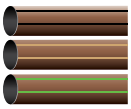
Models

- XFS-04-12-100
- XFS-04-12-500
- XFS-04-18-100
- XFS-04-18-500
- XFS-06-12-100
- XFS-06-12-500
- XFS-06-18-100
- XFS-06-18-500
- XFS-09-12-100
- XFS-09-12-500
- XFS-09-18-500

Non Potable Purple (XFSP) or Purple Stripe (XFSPS)

- XFSP-04-12-500
- XFSP-04-18-500
- XFSP-06-12-500
- XFSP-06-18-500
- XFSP-09-12-500
- XFSP-09-18-500
- XFSPS-04-12-500
- XFSPS-04-18-500
- XFSPS-06-12-500
- XFSPS-06-18-500
- XFSPS-09-12-500
- XFSPS-09-18-500

All dripline models feature color coded stripes to easily identify the flow rate:



Black stripes = 0.9 GPH
Tan **stripes** = 0.6 GPH
Green **stripes** = 0.4 GPH

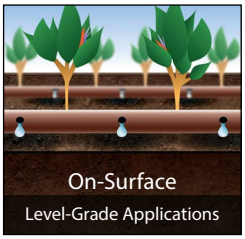
TABLE 8: LATERAL RUN LENGTHS

XFS Dripline Maximum Lateral Lengths (Feet)						
	12" Emitter Spacing			18" Emitter Spacing		
psi	0.4 GPH	0.5 GPH	0.9 GPH	0.4 GPH	0.5 GPH	0.9 GPH
15	352	273	155	374	314	250
20	399	318	169	417	353	294
30	447	360	230	481	413	350
40	488	395	235	530	465	402
50	505	417	285	610	528	420
60*	573	460	290	734	596	455

* When using 17 mm insert fittings with design pressure over 50psi, it is recommended that stainless steel clamps be installed on each fitting.

XFS Dripline Maximum Lateral Lengths (Meters)						
	30.5 cm Emitter Spacing			45.7 cm Emitter Spacing		
Bar	1.6 L/HR	2.3 L/HR	3.4 L/HR	1.6 L/HR	2.3 L/HR	3.4 L/HR
1.03	107.2	83.2	47.2	114	95.7	76.2
1.38	121.6	96.9	51.5	127.1	107.6	89.6
2.07	136.2	109.7	70.1	146.6	125.9	106.7
2.76	148.7	120.4	77.7	161.5	141.7	122.5
3.45	153.9	127.1	86.9	185.9	160.9	128.0
4.14*	174.6	140.2	88.4	223.7	181.7	138.7

* When using 17 mm insert fittings with design pressure over 3.5 bar, it is recommended that stainless steel clamps be installed on each fitting.



XFD DRIPLINE FOR ON-SURFACE LEVEL-GRADE APPLICATIONS

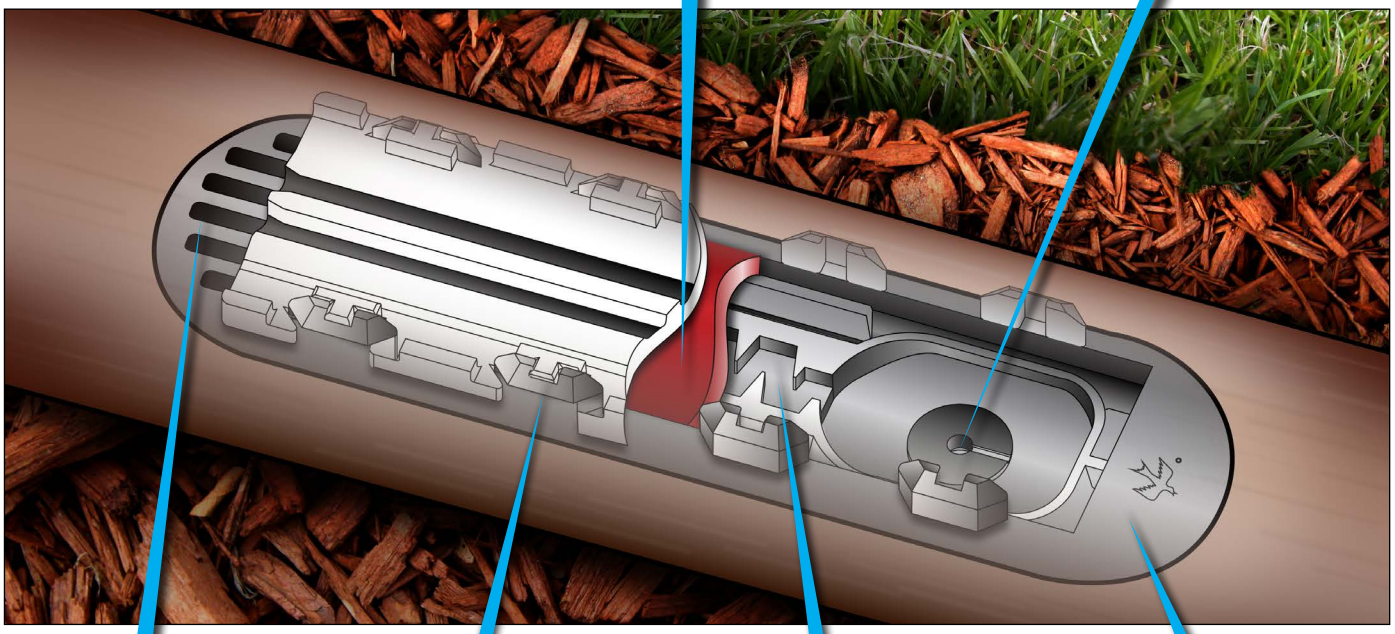
RAIN BIRD FLAT EMITTER TECHNOLOGY

Superior Design for Superior Reliability

State-of-the-art assembly technology helps resist bending and collapsing under extreme field use

Chemical-resistant silicone diaphragm for longer life

Self-flushing emitter design clears grit and debris to provide a reliable supply of clean water to plant roots



Larger inlet holes let debris pass instead of plugging emitter filter

Reinforcing members make emitter structurally more robust

Widest emitter flow channel in the industry let debris pass instead of internally plugging emitter

Low-profile design draws cleanest available water and reduces friction loss

ADDITIONAL FEATURES

XFD Dripline Coil

- Unique, extra-flexible tubing material allows for tighter turns with fewer elbows for fast and easy installation
- Dual-layered tubing (brown over black or purple over black) provides unmatched resistance to chemicals, UV damage and algae growth
- Low-profile emitter design results in reduced friction loss, allowing longer maximum lateral runs and more cost-effective system designs
- Continuous flushing action and wide flow path ensure that water will keep flowing, thus minimizing maintenance, and saving you time and money

XFD DRIPLINE - SPECIFICATIONS

Applications

Rain Bird® XFD Dripline is the most flexible, kink-resistant tubing available in the marketplace today, making it ideal for irrigating areas where traditional drip tubing is difficult to install. XFD Dripline is perfect for small, narrow and tight planting areas, as well as areas with tight curves or many switchbacks. XFD Dripline is simple, reliable and durable.

Features

Simple

- Unique material offers significantly greater flexibility and kink-resistance for fast, easy installation
- Greater flexibility assures design capability for tight curves and spaces
- Rain Bird's self-dispensing coils make it easy to use exactly what is needed while keeping the balance of the coil ready for the next job
- Accepts Rain Bird XF Dripline Insert Fittings and Easy Fit Compression Fittings
- Variety of flow rates, spacings, and coil lengths provides design flexibility for many non-turfgrass applications

Reliable

- Pressure-compensating emitter design provides consistent flow over the entire lateral length, ensuring higher uniformity for increased reliability in the pressure range of 8.5 to 60 psi

Durable

- Dual-layered tubing (brown over black or purple over black) provides unmatched resistance to chemicals, algae growth and UV damage

Operating Range

- **Pressure:** 8.5 to 60 psi (.58 to 4.14 bar)
- **Flow rates:** 0.6, and 0.9 GPH (2.3 and 3.41 L/HR)
- **Temperature:**
  Water: Up to 100° F (37.8° C)
  Ambient: Up to 125° F (51.7° C)
- **Required filtration:** 120 mesh

Specifications

- **OD:** 0.634" (16 mm)
- **ID:** 0.536" (13.61 mm)
- **Thickness:** 0.049" (1.25 mm)
- **Emitter spacing:** 12" or 18" (30.5 or 45.7 cm)
- **Coil lengths:** 100', 250', and 500' (30.5, 76,5, and 152.4 m)
- **Coil color:** Brown, purple or purple stripe

Models

0.6 GPH Emitters
- XFD-06-12-100
- XFD-06-12-250
- XFD-06-12-500
- XFD-06-18-100
- XFD-06-18-250
- XFD-06-18-500

0.9 GPH Emitters
- XFD-09-12-100
- XFD-09-12-250
- XFD-09-12-500
- XFD-09-18-100
- XFD-09-18-250
- XFD-09-18-500

Non Potable Purple (XFSP) or Purple Stripe (XFSPS)
- XFDP-06-12-500
- XFDP-06-18-500
- XFDP-09-12-500
- XFDP-09-18-500
- XFDPS-06-12-500
- XFDPS-06-18-500
- XFDPS-06-12-500
- XFDPS-09-18-500

All dripline models feature color coded stripes to easily identify the flow rate:

Black stripes = 0.9 GPH

Tan **stripes** = 0.6 GPH

TABLE 9: LATERAL RUN LENGTHS

XFD Dripline Maximum Lateral Lengths (Feet)				
	12" Emitter Spacing		18" Emitter Spacing	
psi	0.6 GPH	0.9 GPH	0.6 GPH	0.9 GPH
15	273	155	314	250
20	318	169	353	294
30	360	230	413	350
40	395	255	465	402
50	417	285	528	420
60*	460	290	596	455

XFD Dripline Maximum Lateral Lengths (Meters)				
	30.5 cm Emitter Spacing		45.7 cm Emitter Spacing	
Bar	2.3 L/HR	3.4 L/HR	2.3 L/HR	3.4 L/HR
1.03	83.2	47.2	95.7	76.2
1.38	96.9	51.5	107.6	89.6
2.07	109.7	70.1	125.9	106.7
2.76	120.4	77.7	141.7	122.5
3.45	127.1	86.9	160.9	128.0
4.14*	140.2	88.4	181.7	138.7

* When using 17mm insert fittings with design pressure over 50 psi (3.5 bar), it is recommended that stainless steel clamps be installed on each fitting.

¼" LANDSCAPE DRIPLINE FOR POTTED/SMALL BED APPLICATIONS

Rain Bird non-pressure compensating ¼" Dripline is a perfect choice for small-sized areas such as planter boxes, container gardens, loops around trees, vegetable gardens and shrubs.

Features

- Simple to use, as the flexible tubing makes watering pots and container gardens easy
- 1/4" tubing size complements the aesthetics of any garden
- Emitters are clog-resistant through built-in filtration and two outlet holes, 180 degrees apart
- Brown "colored" tubing aesthetically matches XFD and XFCV Dripline
- Unobtrusive size and flexibility provide a low-profile, aesthetically pleasing means to irrigate plants
- Works with Rain Bird 1/4" barbed Fittings
- Available with 6" (15.25 cm) or 12" (30.5 cm) spacing, and a coil length of 100' (30.5 m) for design flexibility

Operating Range

- 10 to 40 psi (0.7 to 2.7 bar)
- Flow rate at 30 psi (2.0 bar): 0.8 GPH (3.0 L/HR)
- Required filtration: 200 mesh (75 microns)

Specifications

- **OD:** 0.250" (6 mm)
- **ID:** 0.170" (4 mm)
- **Wall thickness:** 0.040" (1 mm)
- **Emitter spacing:** 6" or 12" (15.25 and 30.5 cm)
- **Coil length:** 100' (30.5 m)
- **Coil color:** Brown

Models

- LDQ-08-06-100
- LDQ-08-12-100

Flow Characteristics						
Model	Flow at 30 psi (GPH)	(L/HR)	Spacing (in.)	(cm)	Coil Length (ft.)	(m)
LDQ-08-06-100	0.8	3.0	6	15.25	100	30.50
LDQ-08-12-100	0.8	3.0	12	30.5	100	30.5

¼" Landscape Dripline Performance

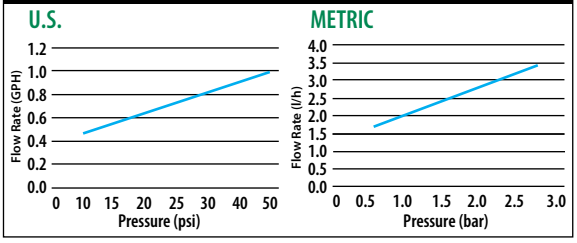


TABLE 10: LATERAL RUN LENGTHS

Maximum Length of Run (Feet)		
Emitter Spacing	Maximum Length of Run	Flow per Ft. @ 15psi
6"	19 feet	1 GPH/ft
12"	33 feet	0.5 GPH/ft