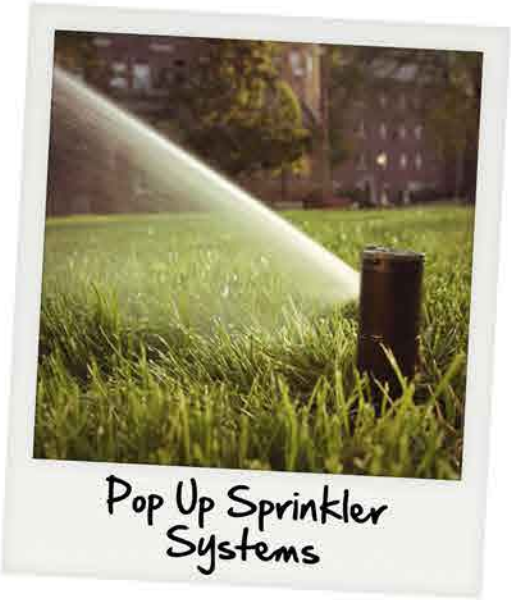
Pop Up Sprinkler Systems for Beautiful Gardens

What are Pop Up Sprinkler Systems?

Pop up sprinkler systems are the ultimate in automatic irrigation and are fast becoming the popular choices amongst homeowners in the UK for maintaining a picture perfect landscape. The pipework and sprinklers are all buried underground meaning they are completely hidden from view. The pop up sprinklers rise from the ground whenever the system is in operation, and retract back down when the system is turned off. Pop up sprinkler systems are ideal for many different types of gardens, and are used primarily for watering grass areas, but can also be used for watering flower beds and borders too.



Where to Start

If you haven't already done so, complete the Garden Irrigation Design Pack. This will help you prepare all the required information for planning an irrigation system.

When you have a map of you garden and the locations of all the areas in the garden, we can start to collect more detailed information required for planning a pop up sprinkler system.

The key is careful site assessment on all projects, and being armed with accurate facts and measurements enables you to specify a professional system. Keep this in mind throughout your entire project .

Measuring & Mapping - Extended

Factoring wind and slope

Add the compass points - N, S, E, and W - and indicate the direction of prevailing winds that may affect sprinkler placement. Mark the position of all underground utilities as well. Call the utility companies for help with this.

Because water flow and pressure are affected by slope, it's important to indicate any slopes in the landscape that exceeds 10%. To measure slope, use a spirit level or a level line, a long string with a weight attached to one end, a tape measure, and a helper. Make a loop at one end of the string and attach it to the highest point, using a marking stake. Have your assistant stand at the bottom of the slope and raise the string, holding it taut, until it is even with the higher ground. Check it with the level. Then your assistant can feed out the weighted end of the string until it just reaches the ground and forms a 90-degree angle.

Measure both the strings horizontal stretch (the run), and the vertical distance to the ground (the rise). To find the slope, simply divide the rise by the run and multiply the result by 100. For example, if the rise is 2 metres and the run is 12 metres, the slope would be 17% (2 / 12 = 0.166). Sketch the slope on the plan, and record the incline you measured.

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Measuring & Mapping - Extended cont.

Basic Hydraulics

To maintain good water flow and water pressure, an effective irrigation system must be designed in accordance with sound hydraulic principles.

There are two types of water pressure: static pressure and dynamic pressure. Static pressure refers to the pressure exerted on pipes and fittings when no water is flowing. It indicates the amount of water pressure that is potentially available to the system. Dynamic pressure is the force exerted by water when a valve or tap is open. In technical terms, it is the static pressure minus the losses caused by the pipe friction and any elevation changes in the system. Because the dynamic pressure is dependent on where you measure it, it is important to measure it as close as possible to the point where your irrigation system will connect to the water supply.

Dynamic water pressure is affected by friction and elevation. Frictional loss occurs whenever water flows through any sort of pipe, valve, fitting, or fixture. All of these create a drag on the water flow that is cumulative and can cause significant pressure loss. The best way to reduce friction loss is to use the fewest fittings and connections you can. Right-angle elbows are particularly frictional.

Elevation changes can add or subtract pressure too. If the water flow is downhill, the elevation change will add pressure; if it runs uphill, the change will reduce the pressure. For the sake of calculations, this loss is defined as 1 bar pressure per 10 metres of elevation change (near enough). This would be a positive or negative amount depending on whether the slope is up or down relative to water flow.

You will need to calculate your systems litres per minute (LPM) rate, which measures the rate at which water flows through the system. Again, measure it at a point as close as possible to where your irrigation system will be connected to the water supply.

Read the next section for an explanation of how to measure water pressure as well as LPM. If you are using a pump, the technical data provided from the manufacturer will provide the information required.

Pressure and Flow

If you are planning a whole garden irrigation system with more than one sprinkler, it is vital to determine the correct water pressure and flow of your home's water supply.

Some experts advocate measuring the system at the same time of day that you will be watering. Because your watering times may change (or be at 4a.m.), it is best to measure it several times over the course of a day. Use only the lowest readings in your planning. If possible, take readings in summer, when local water levels are at their lowest and demand for water is at its highest.

You will need to determine the static and the dynamic pressure as well as the water flow, measured in LPM.

Determining static pressure: Borrow or rent a water pressure gauge from a plumbing supplier or contractor. To take a reading, find the tap (tap 1) that is closest to your main water supply line where you plan to attach your irrigation system. Attach the pressure gauge. Select a different tap inside the house (tap 2). For the tests

Pop Up Sprinkler Systems for Beautiful Gardens

Measuring & Mapping - Extended cont.

to be accurate, use taps that are close together and, if possible, on the same water line. Open tap 1 all the way to activate the gauge. Record the pressure reading that appears on the gauge dial. This is the static pressure.

Determining the dynamic pressure: Open tap 2 all the way so the water is flowing at full force. Check and record the dynamic pressure reading on the gauge at tap 1. Note: If your water pressure is above 5.5 bar pressure, you will need to install a pressure regulator/reducer when installing your irrigation system.

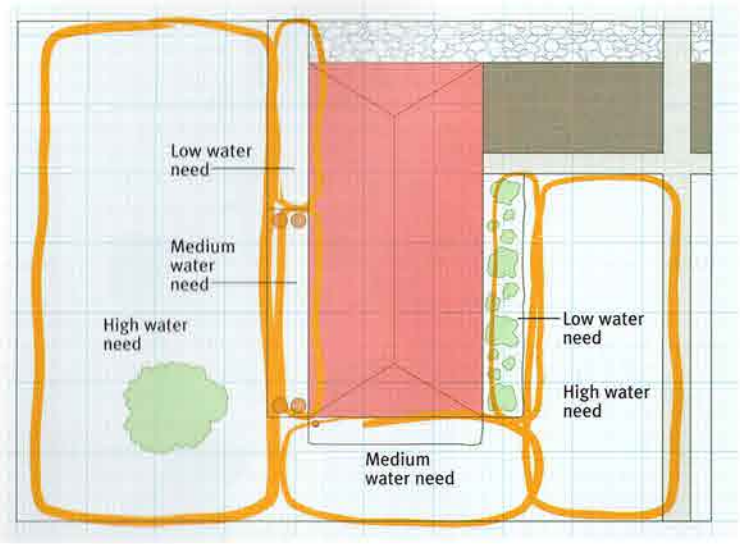
Determining the flow: If the dynamic pressure reading is less than 2.5 bar pressure, adjust the water flow from tap 2 until the pressure gauge reads 2.5 bar. Place a 15 litre bucket under tap 2 and time how long it takes to fill. Use the chart below to determine the water system's flow rate in LPM. This will be the flow at 2.5 bar pressure. Repeat this procedure at 3 bar pressure and 3.5 bar pressure and record results.
If you don't have a 15 litre bucket, time how long it takes to fill your bucket. Then figure out the flow in LPM using the formula:

60 / Fill time (seconds) x Bucket Size (litres) = Flow (LPM). For example, a 2 litre bucket that fills in 15 seconds indicates an available flow of 8 LPM (60 / 15 * 2 = 8 LPM).

Dividing your Garden

If your garden is extremely small and you are watering only one type of plant such as grass, you might be able to water it all at once. More likely, you will need to water in stages. This requires that you divide your garden into areas with different watering needs.

Using coloured pencils or markers, first divide your garden according to the plantings in it. Lawns, flower beds, trees, and patio planters all have different needs and should be watered separately. Outline the different plant areas on your property plan.



Next, look at any areas that receive heavy sun or shade, and include areas that get substantial reflected solar heat. Also mark areas exposed to frequent wind.
Lawns should be divided into separate areas, because they usually require more frequent watering than most other plants. To keep the irrigation piping design simple, it is usually easier to designate the front, back, and side lawns as separate areas, even if they are small.
Plants that need infrequent, deep watering, such as trees and shrubs, should be watered separately from plants that require frequent, shallow watering, such as annuals and vegetables.
Trees and shrubs planted individually in a lawn can be watered using the lawn system, but check to be sure they receive adequate moisture from all sides and don't block spray patterns. Container plants dry out more

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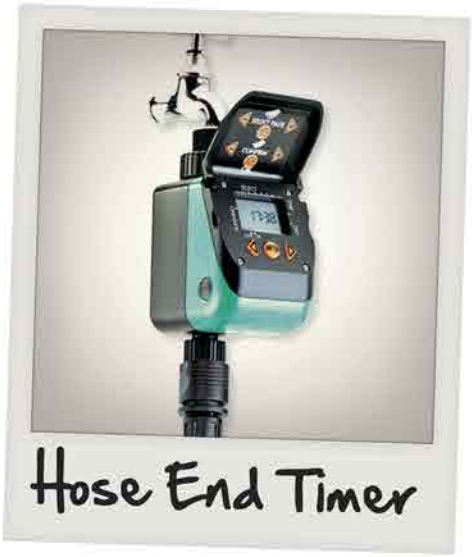
Measuring & Mapping - Extended cont.

quickly than plants in the ground and need separate watering. Keep plantings with special needs separate too. Roses, for example, should not have their leaves moistened. It's a good idea to provide a separate micro-irrigation zone for a rose bed, typically using drip irrigation.
Problem areas, such as slopes, should be watered separately as well, although good design can compensate for this.

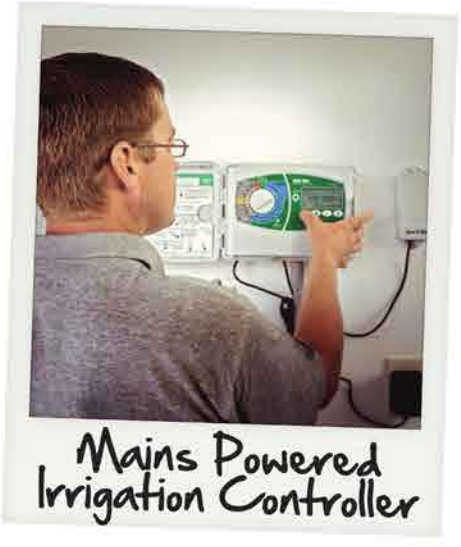
Understanding Sprinkler System Components

Understanding Irrigation Timers



The brains behind an irrigation system is the irrigation timer. An irrigation timer is essentially a clock that tells the irrigation control valves to open and close at pre-set times for a pre-set number of minutes. Though composed of only a clock and a few circuits, these devices can do amazing things. It is possible to install an irrigation system without a timer, but the advantages of having one make up for the modest additional cost. A manual system requires a person to be there to turn it off and on, and this system cannot deliver water as efficiently as a system run by even a basic hose-end timer.

Hose-end timers: Hose-end timers (aka battery powered tap timers) fit either to hose fittings or directly to a garden tap outlet. The hose-end method of irrigation offers a unique advantage to people with small urban gardens: Because the basic components are above ground and removable, the entire system can be picked up and stored for the winter. Unfortunately most battery timers only offer control for one zone, and only in some instances two. This makes them ideal for drip irrigation and other micro irrigation systems, but not for complex multi-zone irrigation systems.



Programmable timers: Programmable timers (aka mains powered irrigation timers) have become the norm for pop up sprinkler systems. Most have similar capabilities and functions. Multi-zone programmable timers are the most widely available.

Programmable timers are designed to be as autonomous as possible. Once you've entered the irrigation scheduling information, you've done your part and the timer will do the rest. Programmable timers are a huge step forward from mechanical models because they can "remember" complex scheduling information and deliver water according to daily, weekly, or monthly cycles. The newest models even have 365-day calendars built into them, making it possible for them to deliver water in respect to seasons.

Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.

The timer interacts with the zone control valves by sending an electrical signal to the valves and telling them when to open and close. Most programmable timers will also start irrigation pumps or open master valves. Many can make automatic adjustments based on information from rain and moisture sensors.
Be sure the timer you choose has the capacity to cover the number of zones you've planned (more on this later in the guide). It's a good idea to buy a timer that exceeds your current needs; an unused station or two makes it easy to add new zones later.

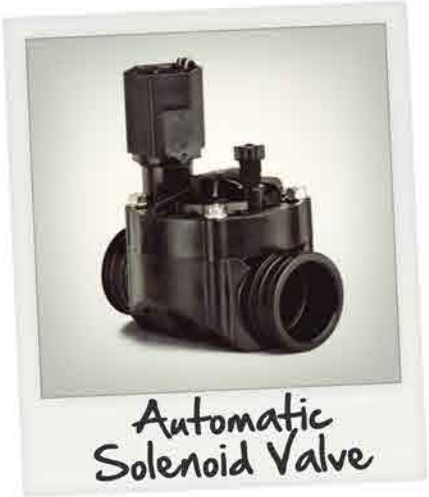
Programmable timers are fully electronic, with digital or liquid crystal screens to display your irrigation program information. To program, please follow the manufacturer's instructions.
Look for a timer that can run multiple programs, will allow you to put all your zones or any combination of them on different schedules, depending on plant needs, time of year, and other watering factors. With multiple programs, you can also have one set of zones watered three times a week, another set watered on a different day. In any case, remember that only one zone can run at any given moment.

Understanding Valves

Depending on the type of irrigation system you have, you will use either manual valves, automatic valves, or a mix of both. Because most systems today are automatic, they use mostly automatic irrigation valves to control the flow of water to the sprinklers.


Gate Valve

Manual valves: Manual valves are essentially the same as any other shutoff valve in your home. They consist of a valve body and a valve stem that you operate by turning the handle on the end of the stem. When the handle of a gate valve is turned, it slowly raises and lowers a metal flange inside the valve that resembles a gate and controls the flow of water through the valve. Gate valves are good for preventing water hammer effects because their slow operation - it typically takes six or seven twists to turn one on or off - allows time for excess pressure to be normalised. Ball valves, on the other hand, are convenient because they work fast. A quarter turn is usually all that is needed to fully open or close one of these valves. But this fast operation can cause pressure surges in the pipes. Systems need to be designed with that in mind.

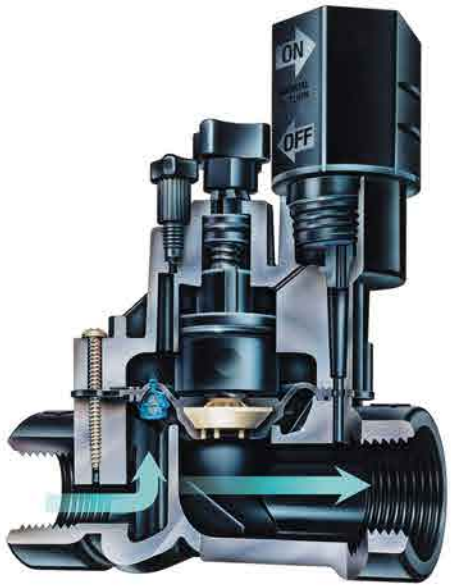

Automatic Solenoid Valve

Automatic Valves: Automatic valves operate without direct human contact. Anytime you use an irrigation timer, you must use automatic irrigation valves to control the water flow to the sprinklers. If your timer also controls master valves, these will also be automatic valves.

Most automatic valves operate using a solenoid controlled by the timer, a plunger, and a rubber diaphragm to start and stop the water flow. In the

Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.



closed position, the solenoid pushes the plunger down, blocking a tiny port in the diaphragm. This allows a small chamber to fill with water. The pressure from the water keeps the diaphragm pressed against the valve seat so no water can pass through the valve. When the timer tells the valve to open, the solenoid pulls the plunger up, letting the water escape through the port, emptying the chamber and flowing through the lines. This lowers the pressure on the diaphragm, which them lifts off the valve seat, letting water flow freely through the valve.

Automatic valves must be installed in the proper orientation to the flow, and care should be taken to size them correctly. These valves can also be operated manually usually by a quarter turn of the solenoid coil.

Backflow Prevention: Backflow is the unwanted flow of water in an irrigation system back into the household water supply. Most water authorities consider the water in an irrigation system to be contaminated. Because your irrigation system is connected to the freshwater supply for your house and the community, backflow represents a real contamination concern to you and your neighbours. For that reason, every irrigation system requires a backflow prevention device connected to the mains water supply. A simple backflow preventer to install is a double check valve. Make sure you install it prior to the master valve, and ensure that it has a large flow through to prevent pressure and flow loss (1" BSP and up). You must ensure that you check the level of protection you require based on your local water authority. You can read our Interpretations of regulations relating to domestic and commercial irrigation installations at the back of this guide.

Understanding Sprinklers

Sprinkler Basics

Sprinklers make the final delivery of water to the ground. It is important to choose sprinkler heads that send the right amount of water to the areas that need coverage. The major sprinkler types are fixed sprays and rotary sprays. Choosing the best sprinkler is a matter of deciding which of the available options best suits your needs. Choose among these variables.

Patterns: The spray pattern, or arc, of a sprinkler is the portion of a circle that it covers. It is described by a specific angle (for example 90 degrees) or as a fraction of a circle (quarter-circle). These refer to the same pattern. You can usually fine-tube a pattern by adjusting the head or changing the nozzle.

Trajectory: The trajectory of a given sprinkler or sprinkler nozzle refers to the angle above the horizon of the spray that it spray that it throws. This can be an important consideration if you plan to install sprinklers in windy locations because the wind affects the trajectory of the water. That has a big impact on the pattern and the amount of water lost to evaporation. In windy locations, a lower trajectory is needed. The trajectory is typically adjusted by replacing the standard nozzles on the sprinkler or by placing the heads closer together.

Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.

Radius: The radius of a sprinkler is the distance it throws water. This determines how closely spaced the sprinkler must be to achieve proper water coverage. For instance, a sprinkler with a radius of 15 metres will cover 30 metres if it is a full-circle pattern but must be placed no more than 15 metres from other sprinkler heads. You will learn more about how to lay out your sprinkler heads correctly later in the guide (Sprinkler Head Placement). The radius of some sprinklers is somewhat adjustable but can be reduced by no more than 25%.

Matching the sprinkler to the water pressure: Most sprinklers are designed for a range of water pressure between 1.5 bar to 4.0 bar. Low-flow heads are intended for areas where water pressure is low (less than 2.5 bar static pressure) or where water conservation is a priority. Because these heads apply water at a slower rate, they are ideal where the soil is mostly clay and subject to runoff.

Precipitation Rate

The amount of water a sprinkler applies to the ground in a given amount of time is its precipitation rate, usually expressed as millimetres of water per hour (mm/h). For instance, sprinkler heads in a front garden that deliver 50mm of water over the entire garden after running 1 hour have a precipitation rate of 50mm/h. Each plant has a water requirement that can be expressed in mm per week. Knowing the precipitation rate of your sprinklers enables you to figure out how long to run them to supply the right amount of water.

Matched precipitation rate (MPR): In a given irrigation zone, all sprinkler heads need to run at the same precipitation rate, regardless of the pattern, to achieve even water distribution within the zone. Manufacturers have addressed this need by creating MPR nozzles. These ensure that no matter which pattern you are using, each nozzle will produce the same precipitation rate as any other MPR sprinkler nozzle produced by that manufacturer.

For instance, if you are using half-circle fan spray sprinklers alongside full-circle fan spray sprinklers made by the same manufacturer, you know that the half-circle sprinklers will produce the same number of mm/h of water as the full-circle sprinklers. With MPR nozzles, the precipitation rate is the same for any pattern within that zone. Before MPR nozzles were introduced, the only way to get even coverage was to measure and adjust flow from each sprinkler head. The MPR feature allows you to mix quarter, half, three-quarter, and full-circle patterns with the assurance that you will get even distribution of water on all plants. A few high-end makers are now offering adjustable-pattern MPR heads.

Although patterns can be mixed using MPR heads, different types of sprinklers such as spray or rotary heads should not be mixed because they have different precipitation rates. Spray heads have precipitation rates ranging from about 20 to 45 mm/h, whereas rotary heads have precipitation rates ranging from 6 to 15 mm/h. Mixing them would result in uneven coverage, with some areas under watered and some overwatered.

Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.

Sprinkler Types

Sprinklers come in two basic heads - fixed spray and rotary.

Fixed Spray heads, called sprays or fan sprays, are easy to recognise. They have no moving parts and emit a stationary spray of water that covers an entire are - for example, a half or full circle - at one time. The radius of the spray is usually 1.5 to 5 metres, making these heads well suited to medium-size areas.

These heads are usually used in conjunction with pop-up bodies that retract back down when not in use. Pop-up bodies are available in various heights ranging from about 2 to 12 inches to accommodate various plant heights. Some spray heads are flush mounted, meaning they are low to the ground; these work only if there is no neighbouring foliage or if they are set in a lawn with short grass. Typically a 4 inch pop up sprinkler is used. For taller, water-saving grass, a 6 inch pop up should be used.


Fixed Head
Pop Up Sprinkler

Rotary heads, also known as stream heads or rotary sprinklers cover the largest area of any sprinkler. Rather than irrigating the entire pattern at once, rotary heads send out a high-velocity stream of water in one or more directions while rotating slowly to cover a minimum radius of about 5 metres and a maximum radius of about 15 metres.


Rotary Head
Pop Up Sprinkler

Rotary heads apply water more slowly than spray heads, which makes them suitable for slow-to-drain clay soils. However, this means they need to run longer than spray heads and may lose more water to evaporation. If your area is subject to strong winds, rotors are a good choice. The large droplets they produce are not as prone to pattern deformation unlike fan sprays. Another benefit is that you will need fewer sprinklers, and therefore less trenching and plumbing, to cover a given space. The typical rotary head used in sprinkler systems are gear-driven rotary heads. They use a water-powered gear drive to turn the rotary stream in a smooth, nearly noiseless pattern. Choose one with a closed-case design, which keeps out dirt. Most gear drives are fully adjustable from full to part circle patterns.

Pop Up Sprinkler Systems for Beautiful Gardens

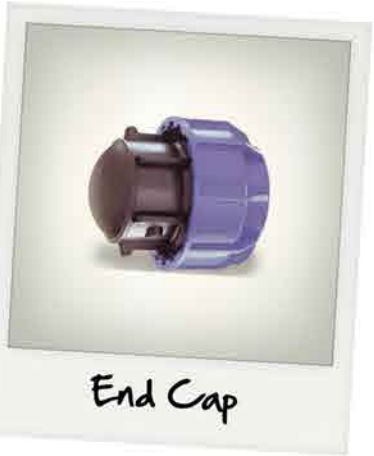
Understanding Sprinkler System Components cont.

Irrigation Supply Pipe and Fittings

Mainline Pipe: We use MDPE pipe as the mainline pipe in pop up sprinkler systems. MDPE pipe is designed to be installed below ground, is tough and rated for water pressure up to 12 bar. The mainline pipe acts as the main carrier of water from the water source to the control valves, and then to the pop up sprinklers in the system. Use in conjunction with MDPE fittings to navigate around the garden, and to make connections to lateral pipe lines.

MDPE Fittings: Pipe fittings for irrigation systems include sometimes bewildering array of small parts. Here are the common ones.

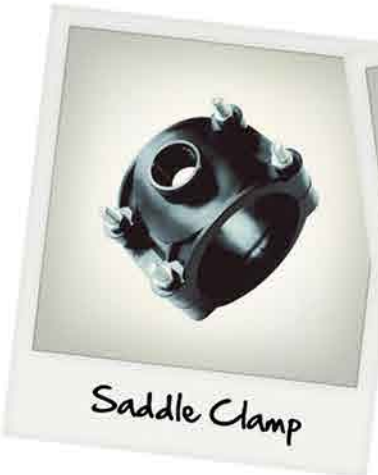
Standard MDPE Fittings: These fittings are used to navigate the garden. Use the Elbow to turn corners and navigate obstacles, the Tee to split the pipe in two directions, the Joiner to extend or fix pipe and the End Cap to terminate a pipe line.



Saddle Clamps: The Saddle Clamps are used to quickly and easily create a threaded outlet from MDPE pipe. Ideal for connecting the swing pipe (mentioned later) to the mainline.

To use, start by clamping these around the outside of the pipe, then drill a hole through the pipe where the threaded fitting is.

Self tapping versions do not require the use of a drill, and pierce a hole by hand using the tap.



Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.

Threaded MDPE Fittings: Used to adapt other fittings and components to the MDPE pipe line. For instance, the male threaded connectors is used with the solenoid valves, and the female threaded connectors to attach the automatic drain valves.


Male Threaded Connector


Male Threaded Elbow


Female Threaded Elbow

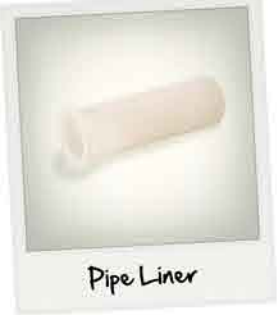

Male Threaded Tee Connector


Female Threaded Tee Connector


Female Threaded Connector


Plastic Stop Cock

Plastic Stop Cock: This is used to isolate certain zones within the MDPE pipe line. Ideal for creating a manual drain valve, or for isolating the irrigation system from the mains water supply.


Pipe Liner

MDPE Pipe Liners: These are used to stiffen the MDPE pipe at the point of connection with any of the fittings. By doing so, it ensures a tight connection and reduces the risk of leaks and disconection.


MDPE Wall Pipe Clamp

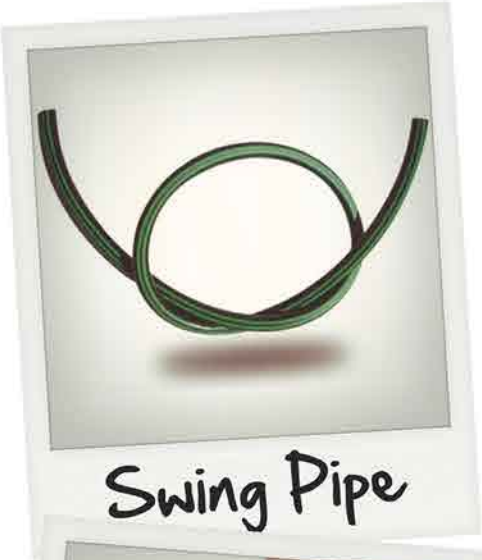
MDPE Pipe Clamps: Use these to secure MDPE pipe to walls, fences and posts.


Pipe Reducing Set

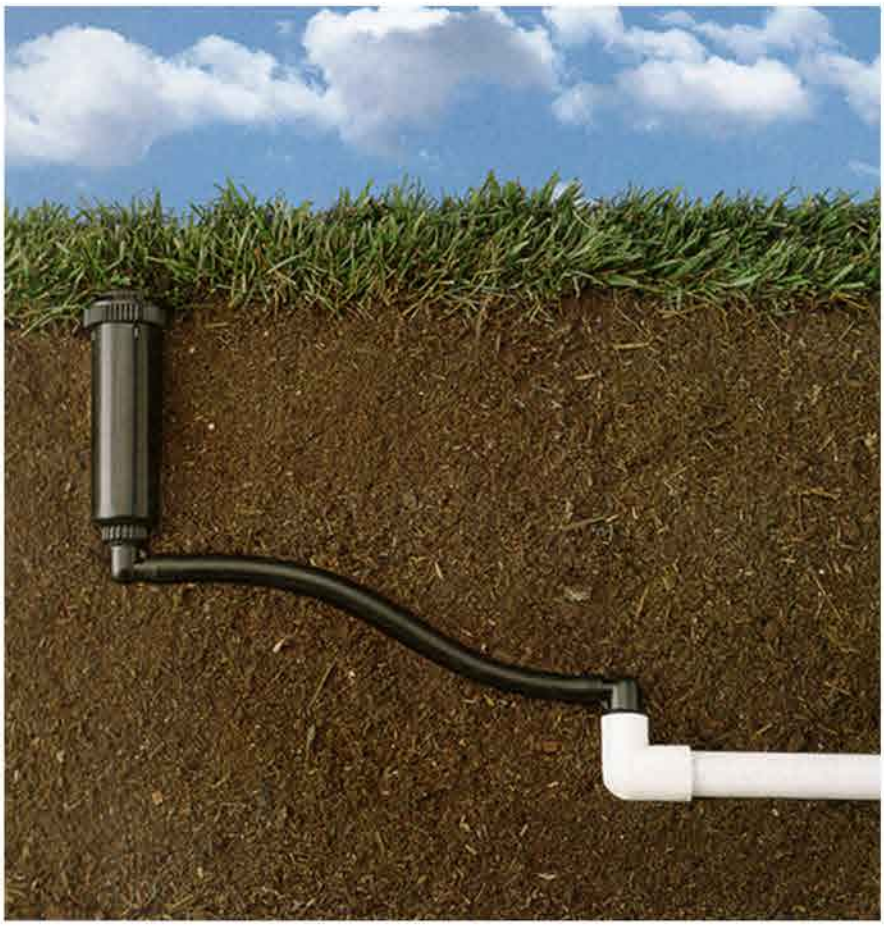
Pipe Reducing Set: Used to convert MDPE fittings to fit smaller pipe sizes.

Pop Up Sprinkler Systems for Beautiful Gardens

Understanding Sprinkler System Components cont.



Swing Pipe and Fittings: Swing pipe is a tough and highly flexible poly pipe. It allows you to create a flexible connection between your header pipe and your sprinkler body inlet. By using swing pipe, you can fine-tune the installation of your sprinklers, and to add some give so the impact of foot traffic and lawn mowers will not damage the sprinkler or the connection.



Swing pipe fittings come with different thread sizes to suit differnet adaptors and pop up sprinkler inlets. The size of the pipe is 13mm, and the swing pipe fittings have a spiral barb to ensure a tight connection is made with the pipe and reduces the risk of leaks or disconnection.

Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan

It is important to have our parts list on hand as you work through the design of your pop up sprinkler system. This can be found in the "Building a Shopping List" part of this guide. This will help you determine the minimum and maximum spacing of heads, the flow in litres per minute, and the spray pattern for each sprinkler. The parts list is arranged according to type and includes a list of sprinklers, valves, fittings, timers, and other parts.

Your plan should already show the buildings, plantings, walkways, and other landscape elements. It should also show basic information that needs to be considered during the design process (underground cabling, obstacles etc.). These factors will help you determine your final irrigation plan.

Choosing a Water Source

Using a mains water supply

** Note: We recommend the use of a water storage tank and an irrigation pump for all pop up sprinkler system installations as per water regulations and for optimum system performance. Although we have tried to provide the best advice possible using a mains water supply, we still recommend against it whenever possible as there are too many variables that can affect the performance of the system, and your local water authority may disapprove of such an installation. It is your responsibility to check the level of protection required in your area.*

Having completed the Irrigation Design Pack, you should know what the pressure and flow of your homes water supply is. If you haven't measured this yet, do so now as you will not be able to properly plan a pop up sprinkler system. A pop up sprinkler requires a bare minimum of 2 bar pressure, and at least 15 litres per minute flow to operate properly. If you have less than this, then skip to the next step - Using a pump and a water storage tank. If the installation is for a commercial project, then a pump and water storage tank needs to be used.

If you choose to run a pop up sprinkler system from your main water supply, there are some plumbing considerations you must be aware of. Firstly, you will need to install a backflow preventer to ensure no dirty water is able to get in to your main water supply. You will also need to take into consideration that the flow and pressure of you mains water supply could change in the future and any significant drop could result in poor performance of your pop up sprinkler system. The last thing to take into consideration is the need to split a pop up sprinkler system into multiple zones. Generally in the UK, the mains water pressure and flow is sufficient to operate on or two pop up sprinklers at a time. It may be more cost effective to purchase a water storage tank and pump to supply a large pop up sprinkler system than splitting a system into lots of small zones. We will discuss this later in the guide.

Pop Up Sprinkler Systems for Beautiful Gardens

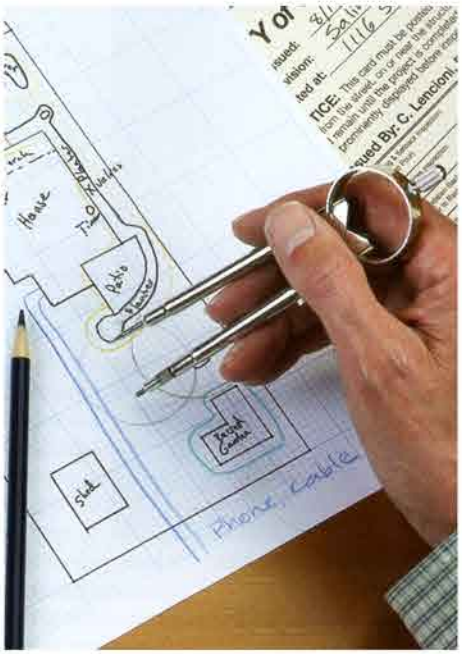
Drawing the Plan cont.

Using a pump and water storage tank

In most cases, a water storage tank and irrigation pump will need to be installed. This is also the preferred option with us and many professional irrigation installers as it allows for precise planning, and ensures consistent performance of a pop up sprinkler system for years to come. It is a good idea to get in touch with one of our pump specialists to help you make the right choice for your system. You could use a rainwater harvesting system, a water butt, or just a small water storage tank. If you plan to use a small water storage tank, you will need to have a method to refill this regularly/automatically. A connection to the main water supply with a float valve is the typical choice. Selection of an irrigation pump comes after the completion of the system design to ensure the correct capacity and pressure output to accommodate the various flow and pressure demands of each zone are met.
Generally we recommend using a submersible pump positioned inside the storage tank.

Homeowners with their own water source (i.e. well, river, borehole) are allowed to extract 20 cubic metres per day for domestic use without a license. This can be a great way to save on water bills.

Sprinkler Head Placement



Plot sprinkler head placement using a drawing compass to indicate the pattern each head will cover. For example, if your drawing scale is 1 metre equals one square on your map and the sprinkler you are drawing has a throw radius of 5 metres, adjust the compass so its radius is equivalent to 5 squares on your map (5 metres). To cover the most surface with the fewest sprinklers, use the maximum recommended spacing for the water pressure available to your sprinklers. To compensate for wind or low water pressure, move the sprinklers closer together.

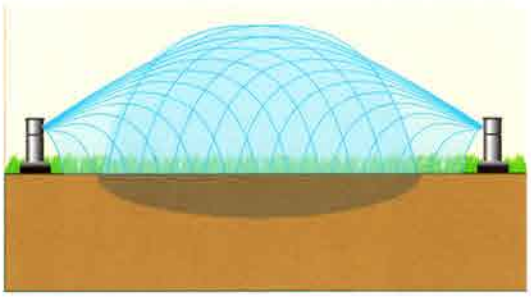
Begin placing sprinklers in the corners of the squares and rectangles you have drawn on your plan using a quarter-circle pattern in each one. Use head to head coverage (see Head to Head coverage), in which the spray from each sprinkler just touches each sprinkler head adjacent to it. Position sprinklers evenly along the sides, drawing a half-circle around each. If this doesn't cover the entire area, place sprinklers in the center and draw a full circle around each. This will give you equidistant, or square, spacing.

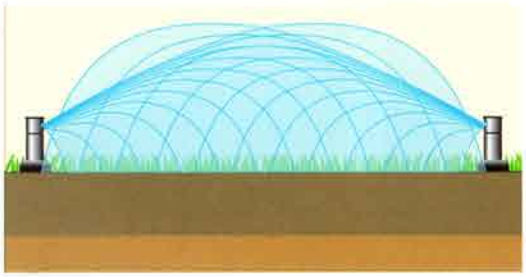
Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

Step by Step Planning: Start with the largest of the squares or rectangles on your plan, leaving the smaller and odd-shaped sections for last. When you've completed the larger rectangles, begin positioning heads in small lawn areas, such as parking strips. These are usually watered by one or two rows of partial circles. Narrow spaces can be watered with strip nozzles. If you intend to use pop up sprinklers for watering shrub areas, flower beds, and planters, add these in now. We would however recommend using drip irrigation for these areas. Where possible, set sprinklers at the back of the bed or along the periphery. As you position sprinklers, jot down the details you'll need later to finalise your zones: Use symbols to indicate the pattern, and write in the LPM rating for each sprinkler. You can find LPM ratings on the manufacturer's chart.

Head to Head Coverage: The heart and soul of efficient sprinkler layout and watering is head to head coverage. The concept is simple: Position sprinklers so the spray from every head touches all the adjacent sprinkler heads.





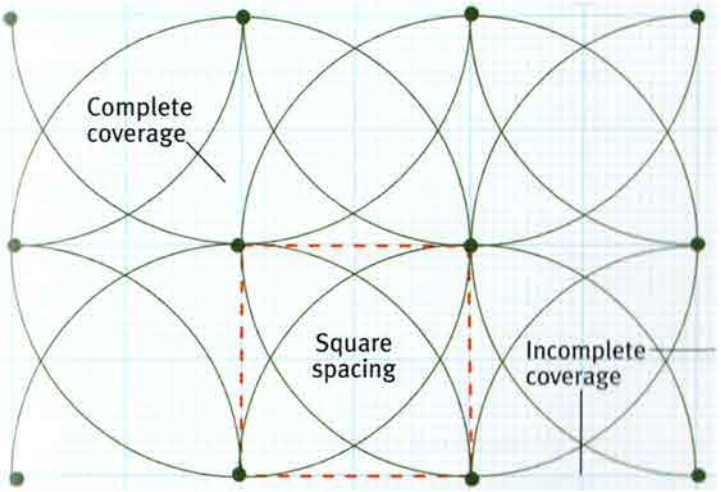
To irrigate adequately, spray patterns must overlap. When they overlap, they compensate for coverage problems that often arise along the edges of a coverage area. Because water naturally loses force as it leaves a sprinkler head and less water is applied, the opposite sprinkler compensates and provides even coverage. The wind or the sprinklers placement on a slope may distort the sprinkler pattern edges. When a sprinkler pattern includes a steep trajectory, the sprinkler head may throw water beyond the pattern edges and leave the area near the sprinkler head itself dry. Head to head coverage takes care o all these problems.

The distance a sprinkler can propel water is called the radius, or throw. For example, a full-circle fan spray that produces a spray diameter of 10 metres has a radius of 5 metres. To create correct coverage, it should be placed 5 metres (50% of 10 metres) from the heads adjacent to it on the same zone. Heads on different zones may end up beside each other.

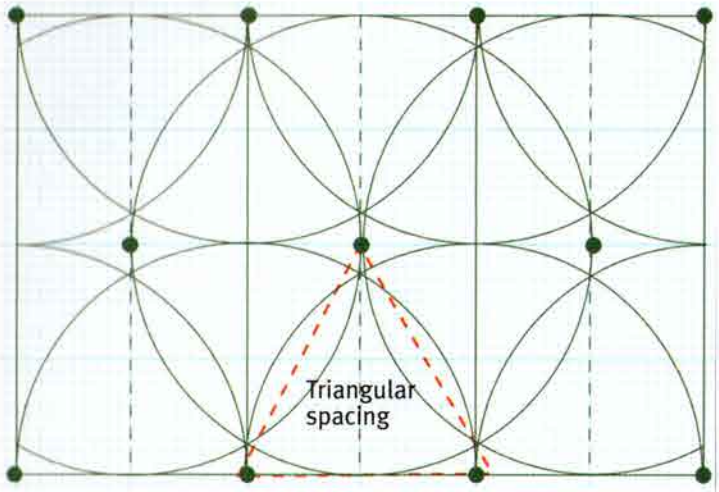
If your static water pressure is lower than normal (2.5 bar or less), the radius of your sprinklers spray pattern may be shorter than expected. The sprinkler manufacturers supply pressure versus radius information with the sprinklers. To create proper head to head coverage, use the pressure reading you took of your water supply and the manufacturer's information to determine the correct spacing for your sprinklers.

Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.



Square spacing: Irrigation plans are usually drawn using square spacing or triangular (staggered) spacing. Square spacing, with heads located at each of the four corners, is the easiest to plot. However, it does result in excessive overlap, because some spots inevitably are watered by four sprinklers. Also, because sprinklers have to be placed relatively close together (usually at 50% of their spray diameter), more sprinkler heads are needed.



Triangular spacing: Triangular spacing is hard to fit into the house lot edges but easy in open spaces such as large lawns. In triangular spacing, heads are located at each of the three points formed by a triangle. This means that you need fewer heads because more surface area is covered with less overlap. You can place them farther apart (usually 80% of the diameter, or throw, or even slightly more) using fewer heads. For example, spray heads are typically placed at 4.5 metres or less in square spacing, and 5.5 metres in triangular spacing.

To plot triangular spacing, first choose one side of a rectangular or square are as a baseline, then plot the two corner quarter-circle sprinklers, followed by equidistant half-circle sprinklers in between them as needed. (So far, this is the same as square spacing Next, draw lines from the midpoints between the sprinklers. Place the next row of sprinklers on these midpoint lines. Continue to alternate the sprinkler heads between half-space and full-space lines. This will give you a triangular spacing.

While triangular spacing can save you installation costs, it can cause overshoot on outside edges, such as onto paths, fences etc. Typically triangular spacing is difficult to use in gardens and is generally only used in sports and golf irrigation.

Special Situations

It's rare when the zones of a home landscape fall into neatly, square packages just right for symmetrical sprinkler patterns. Planting beds are usually organically curved - and lawns often have angles and shapes to fit around lot lines and buildings. So there are usually a few areas that call for special planning. Here are some ideas for coping with the inevitable nonstandard garden elements.

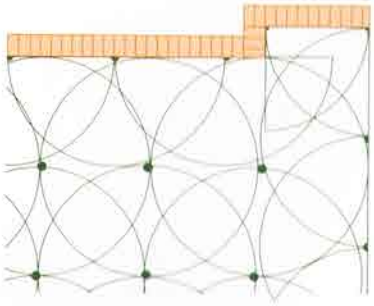
Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

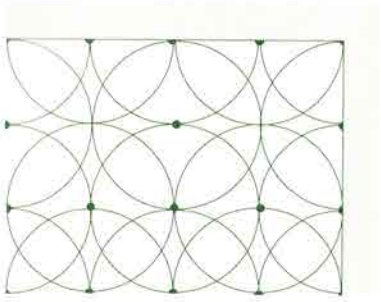
Adjustable pattern heads: Rotary heads are generally fully adjustable, but most fan spray heads have fixed static spray patterns such as full-circle, three-quarter-circle, or half-circle. If you have an awkward angle to cover, you may be able to find a fan spray head that will work - there are myriad patterns available. You can also look at adjustable pattern nozzles, called variable arc nozzles (VANs). These can be adjusted to cover anything from a sliver of circle to nearly a complete circle.

Fill-in heads: When an irrigation layout has equally spaced heads, a few spots are often under watered. Rather than struggling to modify the layout to achieve a perfect match, it's easier to add a fill-in head. This is a sprinkler that is not located in the same symmetrical pattern as the other or has a coverage area that is smaller or greater than the others. Sometimes such heads cause significant overlap, but this is better than leaving a dry spot in a corner of the lawn.

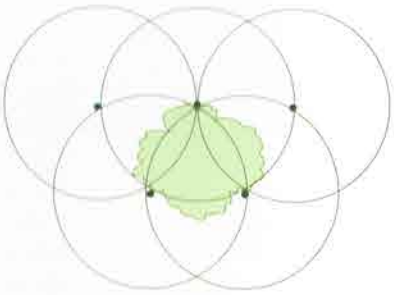
Undesirable overthrow: There are always areas that you want to keep dry, such as patios and public sidewalks. Some overthrow is inevitable, especially with triangular spacing. But you can plan where the overthrow will occur. To keep an area spray-free, use it as the baseline for a triangular or square pattern. With a combination of quarter and half-circle heads, you can usually design an area so that two or more sides have no overspray. If an area has two or more lines that need to be spray-free (for instance, an intersection of two paths), you may need to add some fill-in heads and part-circle nozzles. Rotary heads are also available with spray deflectors that shield the spray from an unwanted area.



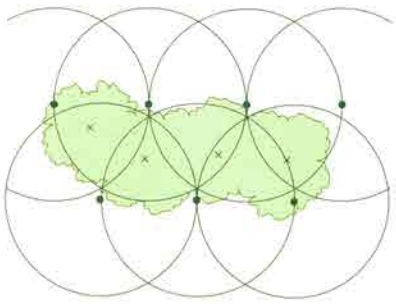
Working around a building



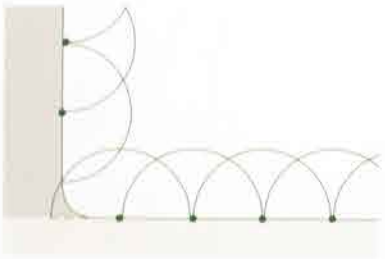
Avoiding watering a public sidewalk



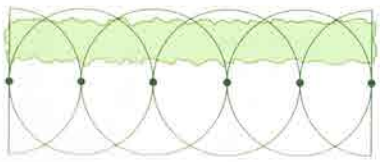
Using triangular spacing to work around an obstacle



Using triangular spacing for an irregular group planting



Reducing water loss at a rounded corner



Watering hedges and lawns with a sprinkler on a riser

Irrigating around inside and outside corners

Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

Obstacles: Water must reach all parts of the garden in spite of obstacles. Even a flagpole can block enough spray to leave a dry area on its far side.

To solve this problem, use triangular spacing of sprinkler heads placed so the obstacle is at the approximate center of the spray throw. Sometimes this is not possible because the tree or other obstacle may not be suited at a point that is easily watered by an otherwise symmetrical spray area. Try adjusting the plotting. You will probably need fill-in heads with smaller ranges to cover everything evenly. Always remember to plot your sprinkler locations to allow for future growth so plants don't become obstacles a few years down the road.

Plant groupings, such as clusters of shrubs, can be watered by outside heads positioned around them in a triangular pattern. Make sure at least part of the trajectory reaches all spots. Trees and shrubs need less water than grass, so you might want to put them on a separate zone and provide them with micro-irrigation.

Rounded corners and curves: It is difficult to avoid overthrow at a rounded corner, such as the curved entrance to a driveway. You can reduce this with careful placement of sprinkler heads or use of adjustable heads. Creating correct coverage is difficult, but a little too much overlap is preferable to leaving dry spots.

Plotting Valves

Having determined the location of your water source and how many/which type of sprinkler heads you will be using, it is time to determine a path for bringing in water to supply the sprinkler heads.

Main Shutoff Valve: You will need to install a main irrigation shut off valve in between the water source and the solenoid valves. This manual valve will allow you to turn the entire system on and off for maintenance. Mark the planned main irrigation shut off valve on your irrigation plan.

Master Valve: Not to be confused with the main irrigation shutoff valve, the master valve is an automatic irrigation valve just like the ones controlling each of your irrigation zones. It opens and closes each time the rrigation system is activated so the water supply to the zone valves is turned off when the system is not in use. It is not mandatory, but is an inexpensive fail-safe in the event of an unseen zone valve failure. We would recommend its use with automatic pressurised irrigation pumps. If you are going to use a master valve, locate it between the main irrigation shut off valve and the first zone manifold, or tee, in the irrigation mainline pipe. Remember, the master valve needs to control water to the entire system.

Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

Zone Control Valves: Each zone will be operated by a separate zone control valve. To simplify installation, zone control valves are usually installed together in groups using a manifold. Place each manifold in an accessible outdoor location, such as near a door or patio, but away from heavy foot traffic. Another great place to position a manifold is in beds or borders. Locating each grouping of valves in the area of the garden that the valves will be watering makes maintenance and manual operation easier and is a logical approach. There is no limit to how many manifolds you can have. Strive for simplicity, using as few as you can, and keep them close to the water source. Be sure to mark the manifold locations and control valves on your plan.

When it comes to installation, using a valve box assembly to house the manifold and solenoid valves is common because they provide protection and easy access.

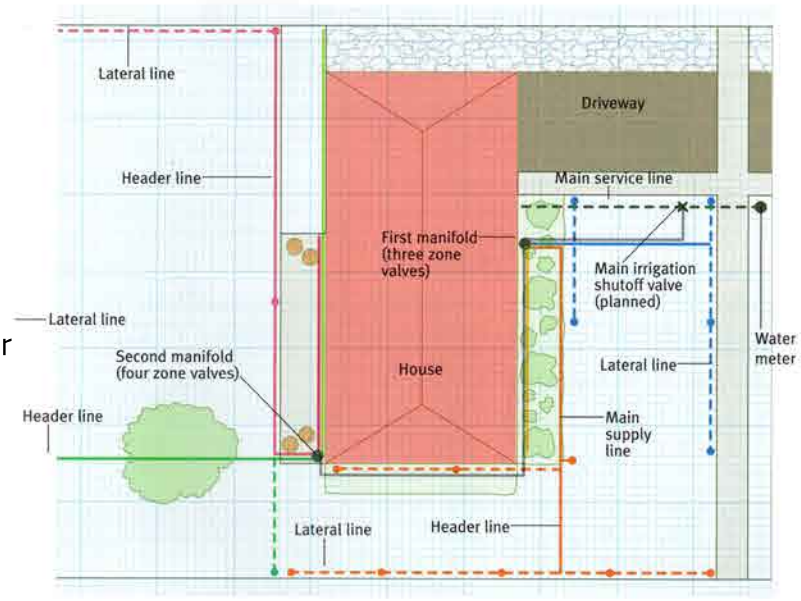
Plotting Water Lines

The next stage is to establish where the pipes will be installed. On the majority of projects it is possible to run the pipes around the edges of lawns and borders. On commercial projects, the routing of pipes through or around buildings/structures will normally require the input of the Project Manager.

The mainline pipe is run from your water source to the location of your manifolds/valve box assembly. On commercial projects, it is common to have a pump, tank, controls and all solenoid valves located in one location, and then to run all pipework from there.

When the mainline pipe is connected to the inlet of the manifold, we then run mainline pipe from the outlet of each valve along a path that passes each sprinkler head within its zone. Because each zone is independent and has its own control valve, you will have a separate mainline pipe coming from each control valve. Start by drawing one mainline per zone, using a different coloured pencil for each zone. This line carries water to the lateral lines, so be sure not to have the pipe too close to the sprinkler heads. The following tips will help you plan.

- Avoid forcing water to make too many turns to minimise loss of pressure.
- Avoid running lines under established driveways and sidewalks, if possible.
- Run more than one mainline pipe in a trench whenever possible to reduce digging.
- Place lines 30cm-60cm outside established flower beds and shrub plantings to avoid damaging roots when digging the trenches.
- Place lines no less than 1 metre away from the house and other structures to avoid construction backfill and inadvertent damage to pipes.



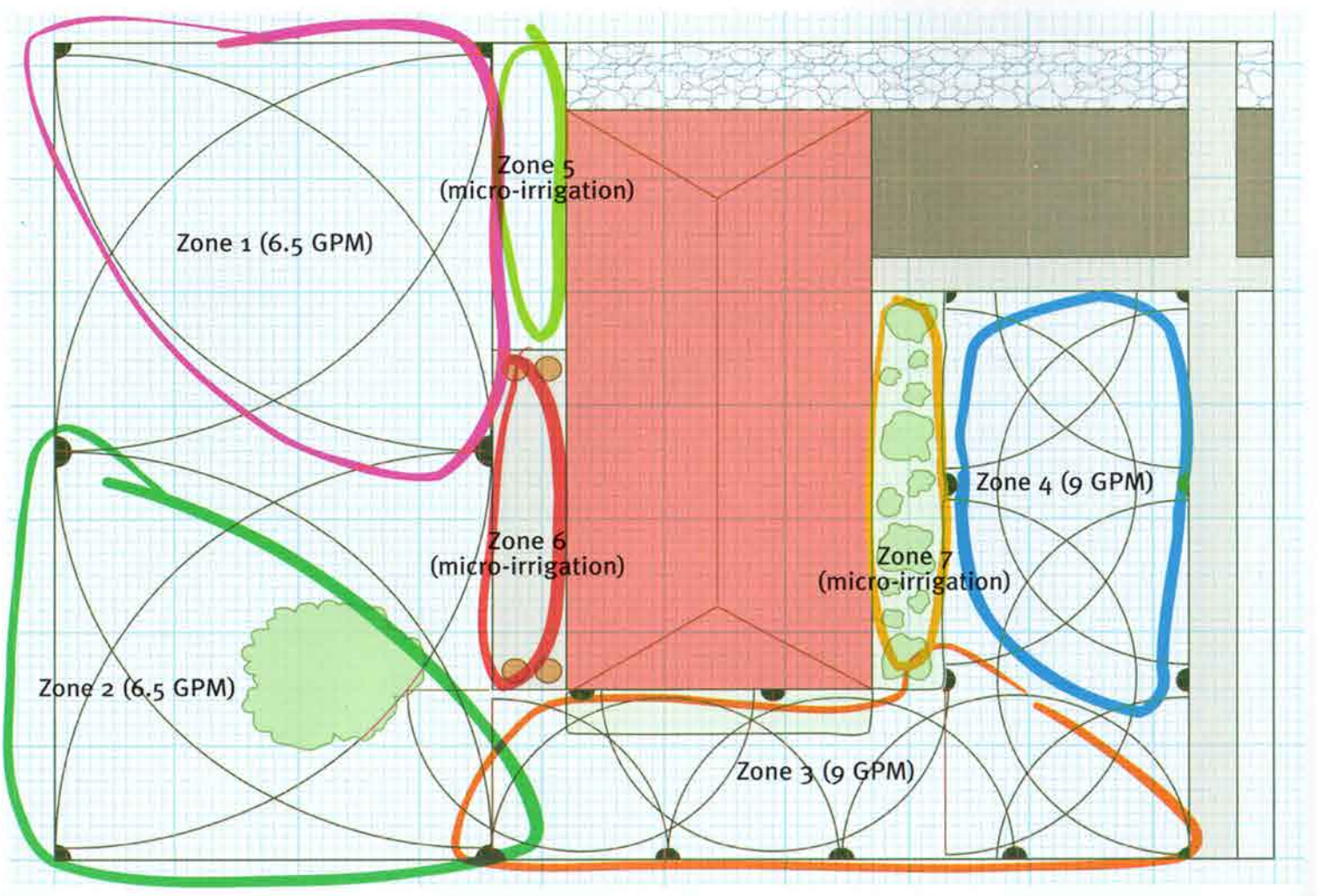
Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

Finishing Your Zones

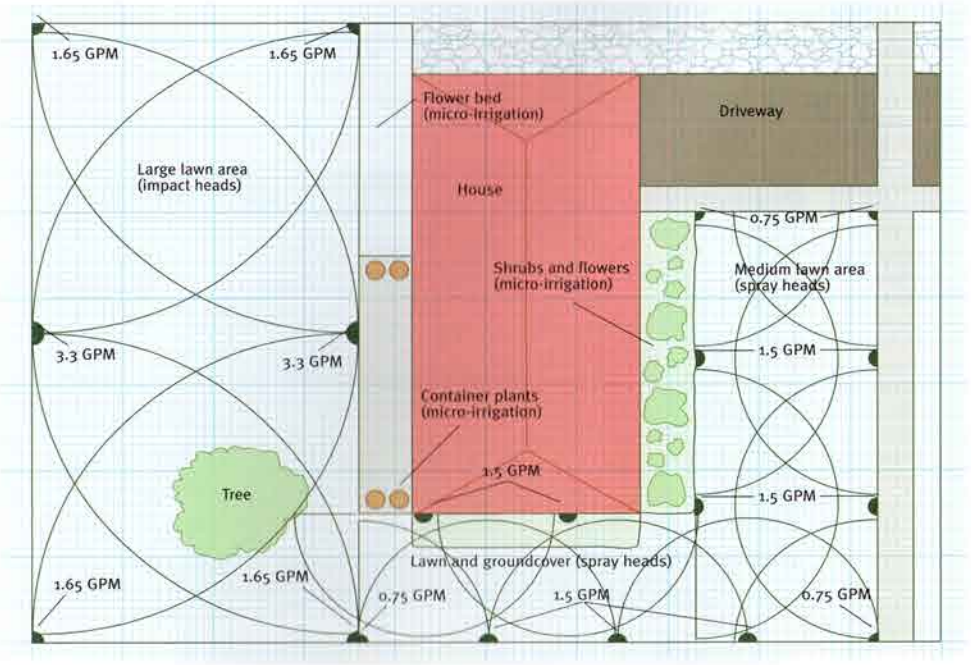
Once your landscape plan has all the sprinklers, spray patterns and main pipelines drawn in and you are satisfied that all your plant areas will receive adequate coverage, it's time to divide the plan into finalised zones. Remember, a single control valve controls the sprinklers heads in each zone, and all heads must be of the same type (rotary, fan spray, or drip/micro irrigation).

Calculating and dividing: Unless you have a very small garden, the normal operating water pressure for your home's water supply/irrigation pump will not allow you to run all of your irrigation components at the same time. Even if it did, you probably wouldn't want to. You don't want a shady lawn that stays relatively moist to be watered as often as a planter box in full sun, for instance. So as you divide your irrigation plan into individual zones, make sure each has a total operating pressure no greater than the water supply can support. Now you need to evaluate each of the preliminary zones or areas you created earlier (measuring and mapping), based on plant type and environmental factors, to see that the total water demand for the area does not exceed the limits of the water supply.



Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.



Using a calculator, add up the total litres per minute (LPM) for each zone. Add the LPM needs of each sprinkler of the same type, and then add 10% to compensate for pressure loss to the pipes and fittings. If an areas total LPM does not exceed the total flow available from the water supply (see measuring and mapping), that area can remain on a single zone. For instance, if the LPM of all sprinkler heads in a proposed zone adds up to 9, you would add 0.9 (or 10%) to get a total of 9.9 LPM for the area. If the water supply's maximum LPM were 12, the zone would be fine. However, if the total sprinkler LPM is close to 12 or exceeds it, you need to divide the zone to leave a little breathing room.

Once you have the zones broken up into sizes that the water supply can handle and that serve the needs of the plants being watered, go back and add the needed valves and plumbing parts to your plan. You may need to revise previous pipe lines drawn in to accommodate.

When you have the mainline pipework drawn out, now is the time to draw in the laterals. Simply draw the shortest distance possible from the sprinkler heads to the mainline. This will show you where you need to install pipe saddles on the mainline. As a common rule, we plan for 1 metre of swing pipe (the lateral line) per sprinkler head we have planned for.

Planning tips: If you subdivide a proposed zone, consider the following factors.

- Take into account any future expansion you might need for future planting areas.
- Look for the simplest, most clear-cut places to break up a zone. You want each zone to be as inclusive as possible, not scattered around the garden.
- Leave extra capacity in each zone so a sprinkler head or two can be added without causing overload.
- Create zones for plants with similar water needs.
- Give parts of the lawn that may be shadier and need less irrigation a separate zone.
- Group sprinklers together according to elevation. If you garden is hilly, group together sprinklers that are at about the same elevation. Otherwise, the water in the system will drain out through the lowest sprinkler each time the sprinkler is turned off, possibly causing flooding and overwatering. This can be avoided using SAM sprinklers.

Pop Up Sprinkler Systems for Beautiful Gardens

Drawing the Plan cont.

Planning for Cold Weather

For those living in cold climates (like the UK), there is one more thing to consider; winter. Before the cold weather comes, you must completely drain irrigation systems to prevent damage caused by the expansion of freezing water within pipes and components. There are two ways to get your system ready for winter: Pay someone to do it for you, or do it yourself.

Either way, you will need to install additional valves at the low spots of each zone of your system to allow for draining. You can either install an automatic valve, or manual draining valves.

Building a Shopping List

With a detailed plan in hand, you're ready to begin creating a comprehensive parts list. If you would like help with your shopping list, you can get in touch with one of our specialists, who can calculate your needs. This service is completely free and usually takes just a day or so.

If you'd rather list the parts on your own, go over your plan carefully, measuring the length of pipe work being used. Note both the number and sizes of heads, couplings, tees, elbows, clamps, and other fittings that you will need. Remember to include the parts needed for making the main connection to the irrigation line. It might be worth looking at our typical shopping list to check with your own to ensure you have included everything necessary.

Pumps and storage tanks

If you require to install a pump and a water storage tank for your irrigation system, take the following into consideration

What type of water storage tanks are available?

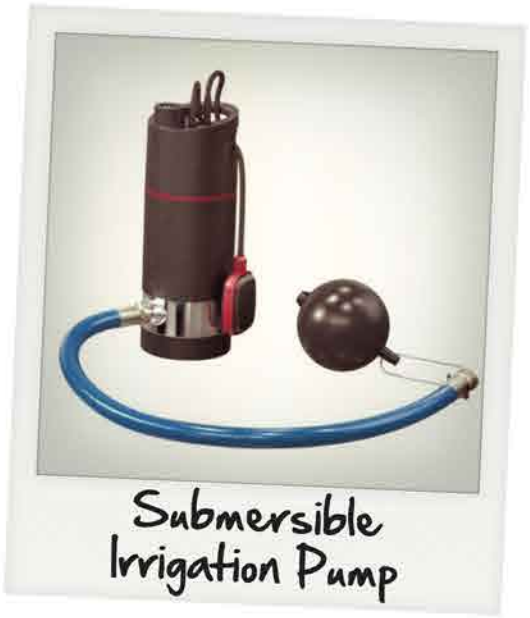
Water Storage Tanks: Water tanks (aka water butts) are relatively inexpensive, and can easily be installed to collect rainwater from gutter downpipes. Typically, standard sizes available range from 200 litres to 800 litres. Installing a standard water butt will make installation easier, and access for cleaning and maintenance easier too. The drawback is having it in plain sight, usually placed near a drain pipe and against a wall. Larger sizes are available, going up to 10’000 litres.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

Underground Storage Tanks: Underground water storage tanks can be used for rainwater harvesting systems and are typically made from tough material with reinforced walls to prevent collapse. The sizes available are massive, ranging from a simple 300 litre water tank right up to 40'000 litre water tanks. Installation is relatively straight forward, but heavy machinery may be required to save on labour.

Dry periods: Irrigation systems generally use more water during dry periods, and a 200 litre water tank could easily be used within just a couple of minutes for larger systems. It is important to take this into consideration when choosing a storage tank for irrigation purposes. It is also important to ensure that you have a backup source of water for you irrigation system to ensure that you can keep your irrigation system going, even during dry periods. The best method is to refill your water storage tank via the mains water supply.



How do I choose the right pump to use?

We would recommend you speak to a pump specialist for help choosing the right pump for your irrigation system. You will need to provide information about the systems requirements. We have pump specialists on hand to answer your questions, so feel free to give us a call, or drop us an email.

Choosing the right sprinkler heads

During the planning stage, we already determined which heads we will be using and specifically which nozzles we would be using too. As a recap, this is what we need to take into consideration.

The types of heads utilized on a specific project are determined by the dimensions of the area being covered, the water pressure available for operation, and a variety of other factors. Choose between a spray or rotor.

Spray heads spray water in circular patterns (some specific and some variable) and can be changed at your discretion. Spacing between sprinklers varies depending upon the specific nozzle that is installed in the head. To operate efficiently, units should rarely be spaced further than 5m apart and should be supplied with 1.5-2.1 bar of water pressure. Ideal for smaller, fragmented, hard-to-reach areas, these heads discharge 2-3 times the water of a rotor.

Pop Up Sprinkler Systems for Beautiful Gardens

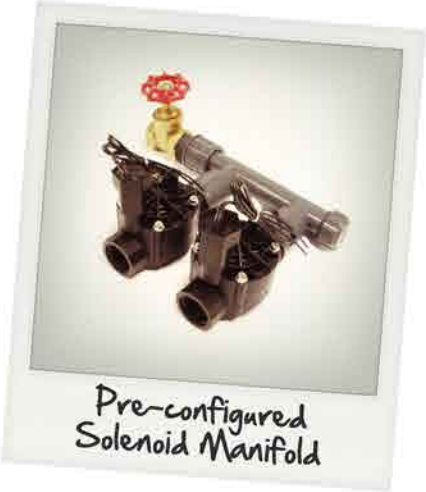
Building a Shopping List cont.

Rotor heads also disperse water in circular patterns. However, these are used to cover larger areas of un-interrupted space. Small rotors tend to cover radii of 5-15 metres and large rotors can be designed to cover radii of up to 30 metres. To operate efficiently, rotors need to be supplied with more water pressure than spray heads.

During the planning process, you would have referred to the performance charts of different sprinklers to choose the right head to match your requirement. Jot these down in your shopping list.

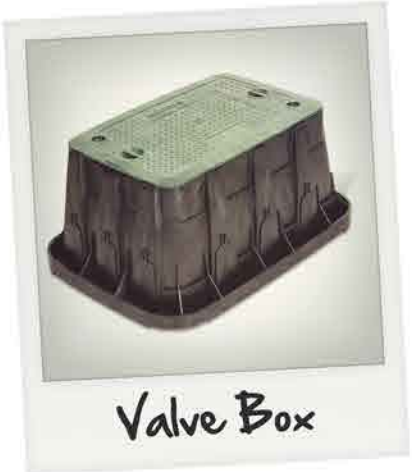
Valves, manifolds and valve boxes

During the planning process, you would have determined how many zones you require for your irrigation system. We would recommend purchasing one of our pre-configured valve manifolds. All the parts required to build valve manifolds are available to purchase separately if you choose to do so. All the manifolds can be extended for future expansion easily with just the purchase of an additional manifold. Aim for no more than 5 valves per manifold.



Valve Boxes: Using a valve box assembly to house the manifold and solenoid valves will provide protection and easy access. You will need to choose one large enough to house the valve manifold you choose to use. Details of the size of each valve box can be found in the respective product description. The largest valve box available can house 5 valve manifolds.

Signal Cable: Signal cable is used to send signal and power from the irrigation timer to the solenoid valves. The type of signal cable you choose will depend on how many valves you plan to have in each group of manifolds. Signal cable consists of multiple coloured wires. Typically, signal cable is available in 3, 5, 7, 9 or 13 core variations. To choose how many cores you require, total up how many valves you have, and then add one more for the common wire.



Waterproof Wire Connectors: These are very important for reliable systems and are used to seal the connection between the solenoid valves wires to the signal cable. Use the small size wire connectors to join two wires together, and the larger size to join multiple together (usually the common wire – up to 4). Typically you would purchase a small wire connector for each valve, and a large wire connector for every 4 valves you have.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

Mainline Pipe and Swing Pipe

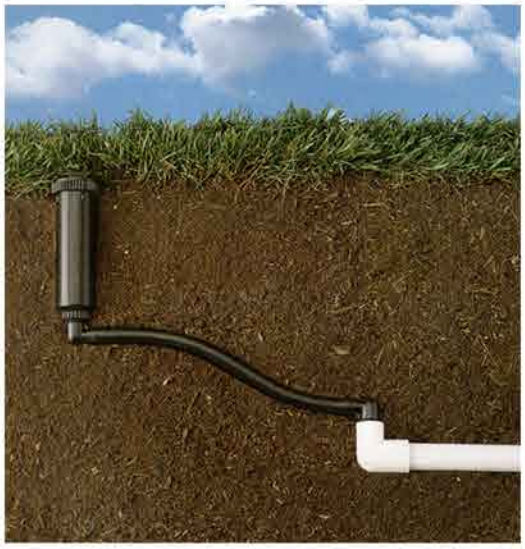
Mainline Pipe: For the mainline pipe, we would usually recommend using either 25mm or 32mm MDPE pipe, but the choice will be determined by the flow and pressure requirement of the system. For smaller systems, you could use 20mm MDPE pipe, but again, the flow and pressure requirements dictate the choice. See the table below. MDPE pipe is a tough poly pipe that is well suited for underground installation and for high pressure systems (withstands up to 12 bar pressure). MDPE pipe can be purchased in lengths of 25 metres, 50 metres and 100 metres. We would generally recommend against purchasing 100 metre coils as it can be difficult to handle by hand during installation.

To the right is a table representing the recommended pipe size based on the flow requirement of each zone in your system. An example would be a zone within a system that requires 28 litres per minute (LPM). We would need to use 25mm MDPE pipe to ensure enough water can travel around the system.

20mm ⌀	< 16 LPM
25mm ⌀	< 32 LPM
32mm ⌀	< 48 LPM

Swing Pipe: Swing pipe is a highly flexible poly pipe used to make a connection from the mainline pipe to the pop up sprinklers. It allows you to make fine-tune your sprinkler installations. The flex of the pipe lets you move the sprinkler head several inches in any direction without the use of additional fittings. This is helpful for fine-tuning head-to-head coverage.

Swing pipe comes in one size of pipe diameter (13mm), and we recommend purchasing approximately 1m for each sprinkler head planned for.



Other Components

Using your irrigation plan as a reference, determine how many of the components on the follwing page you require to install your irrigation system. It is worth buying more parts than you need to make the installation process quicker. You can always return extras by taking advantage of our extended returns policy.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

MDPE Pipe Fittings:

Standard MDPE Fittings: These fittings are used to navigate the garden. Use the Elbow to turn corners and navigate obstacles, the Tee to split the pipe in two directions, the Joiner to extend or fix pipe and the End Cap to terminate a pipe line.

Saddle Clamps: The Saddle Clamps are used to quickly and easily create a threaded outlet from MDPE pipe. Ideal for connecting the swing pipe (mentioned later) to the mainline.

To use, start by clamping these around the outside of the pipe, then drill a hole through the pipe where the threaded fitting is.

Self tapping versions do not require the use of a drill, and pierce a hole by hand using the tap.

Threaded MDPE Fittings: Used to adapt other fittings and components to the MDPE pipe line. For instance, the male threaded connectors is used with the solenoid valves, and the female threaded connectors to attach the automatic drain valves.

MDPE Pipe Liners: These are used to stiffen the MDPE pipe at the point of connection with any of the fittings. By doing so, it ensures a tight connection and reduces the risk of leaks and disconection.

Plastic Stop Cock: This is used to isolate certain zones within the MDPE pipe line. Ideal for creating a manual drain valve, or for isolating the irrigation system from the mains water supply.

MDPE Pipe Clamps:
Use these to secure MDPE pipe to walls, fences and posts.

Understanding BSP sizing

British Pipe Standard fittings are amongst the most popular of all threads in the world today. For pop up sprinkler systems, the common imperial sizes used are 1/2", 3/4" and 1". You need to make sure that you match the female and male thread sizes together when selecting parts, otherwise you won't be able to make a connection. This is particularly important when purchasing the swing fittings to be used with the pop up sprinklers you plan to install, as well as any other fittings you require elsewhere in the system. The thread size will always be stated in the product description/user manual for reference.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

Choosing an Irrigation Timer

When you shop for a programmable multi-zone timer, you'll encounter a baffling number of possible features from which to choose. Each feature not only addresses a specific irrigation need. So assess your needs realistically before you take the plunge. And remember: The most important feature is ease of use. You should be able to read the controls easily and even figure out some of them without having to read the instructions. Several popular features are available.

Typical Timer Features for Mains Powered Controllers

Run times: Check the timers minimum and maximum run times to be sure these will suit your needs. If you are using drip irrigation, for instance, you may need to run that zone for an hour. At the other extreme, sprinklers watering clay soil may need to run only a minute or so at a time so the water can soak in. Your timer should be able to handle both situations.

Multiple start times: Some timers offer only one start time per zone per day. This may be acceptable if you are watering only one kind of plant (grass, for example), but it will not do for most gardens. Variables such as plant type, sloping lawns, or slow draining soil may demand several short watering cycles during the same day. This requires several start times. Look for a timer with three or more start times.

Watering schedules: There are dozens of possibilities: seven-day, odd-even day, and interval watering are just a few. Because each type of plant has unique requirements at different times of year, being able to schedule by season means less work for you in the future.

Rain sensor terminals: A rain sensor feature allows you to cancel watering when it rains. Some even allow you to program several days without irrigation - ideal when enough rain falls in one day to keep plantings watered for a week. These are typically bought separately.

Manual override: This common feature allows you to water outside the normally programmed hours. It is useful for spot watering and for adjusting your spray patterns.

Pump start/master valve control: This feature allows the timer to control an irrigation pump or irrigation master valve, if you use one. Some even allow the pump to start several minutes before the sprinklers do, in order to build system pressure.

Multiple programs: This feature lets you create more than one watering program to run from the same irrigation timer. It allows different combinations of zones, start times, and run timers, on the watering days you select.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

Choosing a Timer

Choosing an irrigation timer may seem a daunting task, given the number of available options available. However, if you ask yourself the following five questions, the answers will likely narrow the options considerably.

How many zones should the timer cover? This is the easiest question to answer. Always select a timer with more zones than your irrigation system calls for. So once you have figured out the number of zones you will need to install in your garden, just add one or two to that total. This will give you the option to extend your system in the future without any difficulties.

How many different programs do you need? Look for a timer with three or more programs. Multiple programs allow you to separately water the different areas of your landscape (lawn, flower beds, vegetable gardens, for example) at different intervals. Having only one program requires that you run all your zones every time you water. Even in the simplest of landscapes, this is not efficient.

Indoor Irrigation Timer

How many start times do you need? By having more than one start time per day, you increase your ability to tailor your watering schedule to the unique conditions in your garden. With multiple start time, you could decide to irrigate at 6 a.m., 4 p.m., and 9 p.m. instead of only at 6 a.m. The correct number of applications per day depends on the needs of your garden and the plants you are watering, not what the timer can do. So save water and money by using multiple start times whenever you can.

Outdoor Irrigation Timer

Do you need an indoor or an outdoor timer? Make this choice based on the most convenient location for you. In a city, or if children wander through your garden, you may want to keep the timer inside. There are models available for indoor and outdoor use, as well as weatherproof cabinets to accommodate any model.

Do you want Mains Powered or Battery Powered? It is very rare that someone would look to choose a battery powered timer as a mains powered timer is more reliable and more cost effective. A battery powered timer however allows users to position a timer and set of manifolds far away from any power source, making installation more flexible.

Pop Up Sprinkler Systems for Beautiful Gardens

Building a Shopping List cont.

Typical Shopping List for an Example Garden

We have put together a common shopping list for a full pop up sprinkler system based on a lawn area measuring 20 m x 20 m. This is to act as a guide only.

Note: We have assumed the system water source is a water tank and an irrigation pump, the preferred water source of professionals. This means we do not require a backflow prevention valve with our irrigation system. We have also assumed that you do not own some of the specialist tools required, so have included these in the shopping list. If you get stuck putting together a shopping list of your own, you can always speak to one of our friendly specialists for help.

Irrigation Components

Water Storage Tank, Irrigation Pump and Filter

- 500 Litre Water Tank with a rainwater diverter and float valve kit.
- Grundfos SBA3-35 Submersible Irrigation Pump
- Rain Bird 1" BSP Large Capacity Disc Filter – 130 Micron

Solenoid Valves, Manifolds and Valve Boxes

- Rain Bird Pre-Configured 3 Solenoid Manifold
- Rain Bird Standard Valve Box – 21" x 16"

Programmable Irrigation Timer, Cable and Connections

- Rain Bird RZX 4 Zone Outdoor Irrigation Timer with Rain Sensor
- Rain Bird 5 Core 0.8mm Irrigation Control Cable - 5 Metre Length
- Waterproof Control Wire Connectors – 3 x Small and 1 x Large

Pop Up Sprinklers

- 5 x Rain Bird 5004 Pop Up Sprinklers

Mainline Pipework, Pipe Saddles and Pipe Fittings

- 50 Metres of 25mm Black MDPE Pipe
- 4 x MDPE Elbow Connector 25mm
- 5 x MDPE Male Threaded Connector 25mm x 1"
- 3 x MDPE Elbow with Female Thread 25mm x 1/2"
- 16 x 25mm MDPE Pipe Liners
- 5 x 25mm x ¾ Saddle Clamps Self Tapping
- 3 x Automatic Drainage Valves

Swing Pipe and Fittings

- 5 Metres x Rain Bird Swing Pipe
- 5 x Rain Bird Swing Pipe Threaded Straight 3/4"
- 5 x Rain Bird Swing Pipe Threaded Elbow 3/4"

Tools/Sundries

- Rain Bird Pop Up Sprinkler Rotor Tool
- MDPE Fittings Wrench
- Vinyl Pipe Cutters
- PTFE Tape

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System

With a detailed plan in hand, you're ready to begin the multistep process of installing your watering system. First the preliminary work: You will need to mark your garden based on the dimensions from your drawing. As you mark the garden, you are marking the foundation for the watering system, so work slowly and carefully to get it just right.

If your system calls for trenching, pace the digging so it does not get too far ahead of the pipe installation. Trenches left unfilled are hazardous and can fill with water, which will complicate the installation when the next weekend arrives. It's better to rent a trencher twice (if using one), if need be.

Carefully follow the plumbing techniques outlined on the following pages. Because it may be difficult for you to get to buried system connections if they spring a leak, you want to make sure your joints are solid.

The installation of your system requires careful planning and attention to detail, but is not difficult.

Required Tools and Materials

Shown below are useful tools for laying out and installing a pop up sprinkler system.

- Vinyl Cutters
- MDPE Wrench
- Rotor Tool
- Cable Cutter/Stripper
- Phillips/Standard Screwdriver
- Tape Measure
- Spirit Level
- Flags
- Wooden Stakes
- Layout String

The materials you will need in addition to the irrigation system components include:

- Sand
- Gravel
- Electrical Tape
- PTFE Tape
- Zip Ties

Plumbing Considerations

Climate is the first factor to consider when deciding how deep to lay pipe. In regions with freezing winters, burying all water lines below the frost line extends down 1 metre or more, and digging that deep would be impractical. Fortunately, placing pipes below the frost line is not necessary if you install automatic or manual drain valves so that pipes can be completely drained before cold weather sets in. In that case, burying pipes in a trench about 30cm deep is sufficient to protect pipes from physical damage.

What is slope?: A gradual downward slope - also called the pitch - of pipes, usually 12.5cm per metre, prevents unwanted low spots that may hold water and contribute to many problems, including clogged sprinkler heads and accumulated debris inside of pipes. Slope is essential if your system has drain valves for winterisation. Automatic drain valves protect your system from winter damage by automatically draining pipes when the pressure is off. If your system is properly sloped, there will be no standing water in the pipes that, in cold weather, could freeze and cause damage. See later in the guide for installing automatic drain valves.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Check for buried utilities

WARNING! Before you start marking the locations of trenches, be sure your local utility companies have located and marked all buried utility lines. Remember: You may be held responsible for damage to unmarked lines and pipes.

Laying/Marking out your system

To transfer your plan from paper to your garden, it's useful to have an assistant to help you mark the garden. You'll be using several supplies: string, wooden stakes, marking flags (available in several colours), cans of marking paint, and a tape measure. If possible, colour code stakes, flags, and paint to match the colours used in your plan. That way, you will know at a glance which zone you are working on.

This is where you need patience. Don't be surprised if unexpected obstacles require you to alter your plan slightly.

Marking your plan: Start by marking the main supply line and valve manifold locations.

Next, mark all the mainlines of the irrigation system.

Finally, mark the position of each sprinkler riser with a wooden stake. Check the sprinkler spacing using string cut to the length of each sprinkler's radius. The string should just touch each sprinkler head adjacent to it.

Run string between the stakes to indicate the trenches for your pipes. Once the strings are in place, you will be able to visualise the layout and maybe improve it. For instance, you might see a place where you could use a common trench to save digging work, or you might notice an overlooked obstacle.

Finally, stake out a trench leading from the zone valve manifolds to the irrigation control box. You will need to bury wiring here.

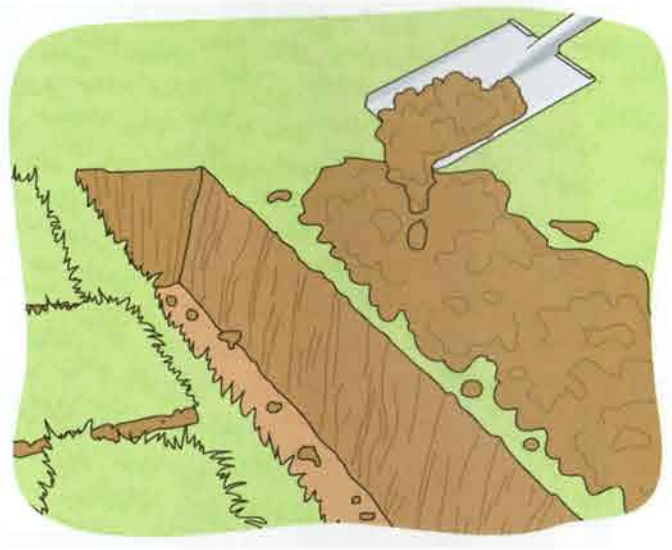
Once you have laid out the project, use spray paint to mark the ground; then remove the string and stakes. Although this step is not absolutely necessary, it makes trenching much more accurate. You also won't have to worry about tripping over the strings.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Trenching the Garden

When it comes to trenching, you have two options. Either hire a turf stripper and power trencher to handle the bulk of the work, or dig all the trenches by hand. Either way, this is the toughest job when it comes to installing a pop up sprinkler system. Hiring a turf stripper and a power trencher will save time and spare your back. Use the turf stripper to remove wide strips of turf quickly (and also makes reinstating a breeze too). The power trencher looks like a big chainsaw, piles soil neatly to one side of the trench. Use it only on lawns. The hire company will provide instructions for correct usage. You will still need to do digging by hand around buildings, flower beds, and other obstacles. The work will be easier if you soften the soil by moderately watering the area for a few days before using a shovel. Before digging, make sure you have marked all buried utilities. Striking a gas or water line can be hazardous. Hitting underground phone or cable lines is more likely because these are often near the surface.



To dig trenches by hand, use a sharp straight-edged garden spade and dig trenches to the required depth - typically 30-50 cm down. Dig the trenches as wide as the spade blade. In lawn areas, first remove the turf and put it to one side of the trench. As you dig, place the soil on a tarp on the other side. Replacing soil is then a simple matter of raking it back into the trench and setting the turf on top.

Installing valves

Before installing the valves for your irrigation system, check your water system calculations (Measuring & Mapping). If your home's water supply is greater than 5.5 bar pressure, you must first install a pressure reducer to lower the water pressure coming into the irrigation system. You should not add valves or drains to the main irrigation supply line until you have installed a pressure reducer if needed.

Note: As every home's plumbing varies, we will not include instructions on connecting to your mains water supply. The same goes for making a connection to an irrigation pump. You may need to contact a plumber for advice with this, or one of our pump specialists. If connecting to a mains water supply, you will need to also install an anti-siphon valve and a main shutoff valve before any other valves. Whether installing an irrigation system to a mains water line or to an irrigation pump, you will need to use the mainline pipe to service your irrigation system.

The irrigation system's valves will include the master irrigation system control valve, a drain valve for servicing or winterisation, the irrigation zone control valves, which deliver water to the individual zones as mapped on your irrigation plan, and the automatic drainage valves to each of the water lines.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Configuring a Valve Manifold

We like to recommend to keep things simple, and the easiest way to install and maintain valves is to have them all kept in one place. Installing valve manifolds inside protective plastic valve boxes makes future access for maintenance quick and easy.

Start the installation by digging a drainage ditch for the location of the valve manifold and valve box, ensuring that it is deep enough for the valve box lid to be flush with the ground and 20cm of gravel for drainage. Next, fill the ditch with 20cm of gravel.

The next step is to build the valve manifold ready for installation. You can purchase these pre-configured from our store, but here are the instructions if you wish to build it yourself.

If using a master control valve, install it to the inlet of the manifold, then install the connection from the main shutoff valve to the mainline pipe. Next, install each of the zone control valves on the outlets of the manifold, then install the connections required to connect to the mainline pipes running to the irrigation system's zones. Finally, if required, install the drain valve on the final outlet of the manifold. Below is a picture of the final configuration of a valve manifold.

You are now ready to connect the mainline pipe to the inlet and outlets of the valve manifold. Do not install the valve box at this point. Generally, you will install the valve box last, after all connections and wiring have been made and confirmed to be leak/problem free. The box itself sits in the hole you dug for your manifolds and has notches that fit over the water lines. Set the box into the hole and backfill with dirt to hold the box in position. Then add about 5cm to 10cm of extra gravel, slide on the lid, and lock it in place.

Valve Wiring

Once you have installed the manifold, you will need to wire each valve in the manifold and run the bundle of wires to the location where you plan to install your timer.

For each manifold location, you will need a wiring bundle that consists of multiple coloured wires, and one white wire known as the common wire. Use 0.8mm²-gauge wire approved for underground use. A different-colour wire notes each valve to make identification at the timer easier.

For each valve, attach one coloured wire to one lead coming from the valve solenoid. To make the connection, you must use a special waterproof grease cap connector, so named because it is filled with silicone grease to seal the connection from moisture.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Connect the remaining leads from each valve to the white common wire using another waterproof connector. If the wires are not long enough to reach, add a length of white wire, splicing it onto the lead and the common wire. Be sure to use a waterproof grease cap for each connection.

Run the valve wire bundles along the bottom of the trenches under the irrigation pipes. Install the pipes on top of the wire bundles for added protection from shovels, hoe blades, or other garden tools. Once you have the pipes in place, secure the wires to them with electrical tape.

Be sure the wires will be buried at least 30cm deep. If they need to be run up the wall of a structure to reach you timer, secure them with plastic electrical staples. Leave them untrimmed until you are ready to make the final connection to the timer.

Automatic Drain Valves

Drain valves are always installed at the lowest point in the zone as they are intended to drain water, otherwise standing water may be trapped in the pipes. It is important to drain water in pipes during cold months to protect them from frost damage. Automatic drain valves installed on each zone are a convenient way to drain the system when it is not in use. An automatic drain valve is a small threaded device designed to remain shut when water under pressure is in the line. When the pressure is removed (as when the zone or system is turned off), the valve opens and lets any remaining water drain.

Automatic drain valves attach easily to any underground line by means of a threaded elbow at the end of each mainline. Install them at a downward angle of about 45 degrees to allow for proper drainage. Add at least one automatic drain valve per zone, inserting it at the lowest point in the zone so that all the water in the pipes will drain between watering cycles. Beneath each drain valve location, dig a dry well at least 20cm deep and fill it with gravel. This will give the drained water a place to go so the valve won't be resting in the water. You can also add a short length of pipe as a protective mainline that can be slipped over the drain valve to prevent clogging.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Laying the mainline pipe

Begin by installing the mainline for each zone. Each mainline will travel from the valve manifold as far as it needs to go to service all the pop up sprinklers in each zone. Keep your runs as straight as possible, and give the lines a constant pitch (slope) of 12.5cm per metre to facilitate drainage and protect against freeze damage. Use elbows to navigate obstacles and tees to split the pipe in different directions. When you reach the final sprinkler on the run of the mainline pipe, cut the pipe about 30 cm beyond its position, and install a drainage valve.

Next, install the pipe saddles at the location of each of the sprinklers on the line. The pipe saddles will enable you to connect the pop up sprinklers to the mainline pipe using swing pipe and its respective fittings.

Using Swing Pipe

For each sprinkler head, cut a 1m length of swing pipe. Attach threaded swing pipe fittings to both ends of the swing pipe relative to the fitting and sprinkler head inlet/outlet size you are connecting to. You will notice there is a spiral barb on the fittings; twist the pipe onto the fitting. There is no need to use glue or clamps. Next, connect the swing pipe to the mainline pipe via the pipe saddle you previously installed. Finally, connect the sprinkler head to the other end of the swing pipe. We would recommend using PTFE tape on the thread to minimise leaking.

Now that you have your sprinkler heads connected to the swing pipe, you can continue to install the sprinkler heads in their desired locations.

Installing sprinklers

Once the swing pipe and drains are in place, you're finally ready to install the sprinkler heads and nozzles that will create your final spray patterns.

Thread the correct fitting into the sprinkler body. Adding a few wraps of PTFE tape over the threads before inserting the fitting makes it easier to tighten and seal the connection against leaks. Finish tightening the fitting with a wrench.

Next, hold the sprinkler in approximately the correct position and backfill around it just enough so it stays in place.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Final Positioning

Once the sprinkler is freestanding, check its position is relative to adjacent sprinklers and adjust as needed. Also, using a short spirit level, check that it is vertical. Hold the level against the side of the sprinkler body and adjust as needed. It may be necessary to place a small block of wood under one end of the level to compensate for the overhang of the sprinkler body cap. Once the sprinkler is close to vertical, fill in with the rest of the dirt and tamp it down to secure the sprinkler in position.

Once all the sprinklers for a zone are in place, briefly turn on the water to that zone to flush out any dirt from the sprinkler. Check to be sure the sprinklers don't shift position as you flush them. If some do, you may need to reset and re-tamp the dirt.

Fill in the trenches for each zone as it is finished. Be sure you have laid all pipes and created any needed drainage pits. Shovel dirt into the trench, and then smooth the residue with a leaf rake. Reset the turf.

Installation on slopes: There are two rules for installing sprinklers on slopes.

- Position heads closer together on the uphill side of the pattern, because gravity will shorten the spray throw.
- Always align sprinkler heads perpendicular to the slope to prevent erosion and uneven watering uphill.

Installing Sprinkler Nozzles

Before installing nozzles into sprinkler heads, make sure you flush the sprinkler bodies of dirt. Many fixed-spray sprinklers come with flush plugs that make this process less messy. If flush plugs are lacking, turn on the water and flush out the sprinklers without the nozzles installed. Rotary sprinklers usually have the nozzles supplied separately, but only a small outlet. Flush the pipes without the rotary sprinklers installed.

Once you have flushed the system, use your plan as a guide to thread on/insert in the correct nozzles one zone at a time. If a head comes with a flush plug, remove the plug and save it for future use. Rotary sprinklers also require you to secure the nozzles in place by tightening a nozzle screw. Ensure you do this correctly as you may lose the nozzle if you do not. Instructions will be provided with the sprinkler.

Now it is time to check your installation. This usually involves getting a bit wet, so dress accordingly. Equip yourself with the tools needed for adjusting spray heads - typically, a rotor tool, screwdriver, or key provided by the manufacturer.

To check each zone, first be sure you water source is on (whether a

Pop Up Sprinkler Systems for Beautiful Gardens

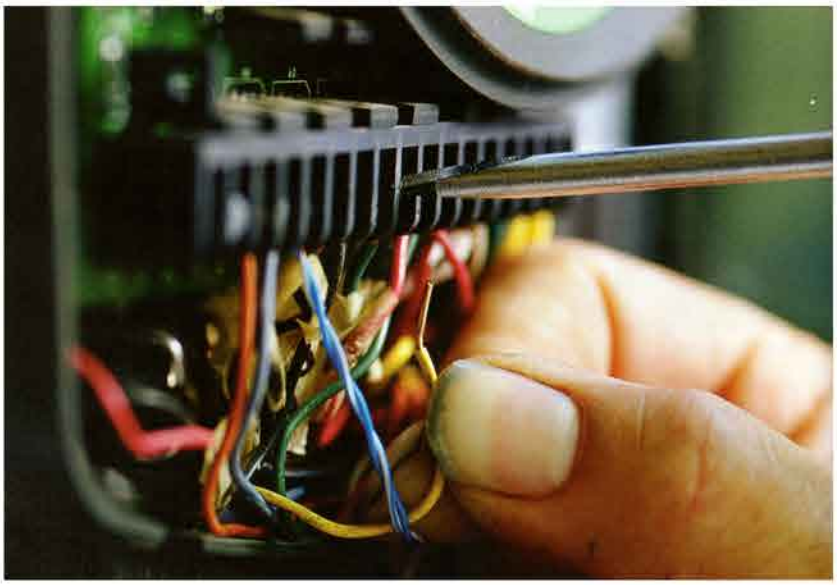
Installing Your Pop Up Sprinkler System cont.

pump or mains water). If using mains supply, be sure no water is running in the house. Taps, toilet tanks and dishwashers should all be off. If using a pump, ensure there is power for the pump and plenty of water in the storage tank. Then, turn on the water for each of the system zones and check for leaks. This is usually done with a quarter turn of the solenoid coil.

Make adjustments to spray patterns as needed, following the manufacturer's instructions. Start with the sprinkler closest to the control valve. You may need the special key supplied by the manufacturer to adjust the pattern of rotary heads.

Note: To maximise your system's efficiency, be sure to install the correct nozzle for the job. You may need to change nozzles after your system is up and running.

Installing an Irrigation Timer



You will need to follow the manufacturer's instructions for the correct installation of your chosen timer. To install most timers, you will need a pair of wire cutters and strippers, a straight-bladed screwdriver, a Philips screwdriver, a pencil, a tape measure, a spirit level and electrical tape. You may also need an electric drill/driver and bits.

Choosing a location

You can mount your irrigation timer just about anywhere that is convenient for you. Many people mount their timers inside a garage to keep themselves and the timer out of the weather and inside the garage to have an available receptacle. If possible, choose a location that affords you a view of the garden. This will make it easier to check the operation of specific valves and zones. Fastening a timer directly to a wall stud is a much more secure base than simply using drywall anchors.

If it suits your plan better, you can mount the timer outside the house on an exterior wall. There are weatherproof enclosures available that will fit any timer. There are also timers already enclosed in weather proof boxes for quick installation. They simply mount to the side of the house and are adapted to brick, wood, or other sidings.

Wiring

Making the wiring connections at the timer is a relatively easy process. You will need a Philips screwdriver for attaching the wires to the wiring blocks of most timers. If you haven't already done so, lay the valve wires in the bottom of the trenches beneath the pipes. You can secure the bundle to the pipes with plastic tape.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Remember to install a few extra strands from each manifold now to make future expansion easier.
Next, connect the valve wires to the timer by taking the white common wire and attaching it to the COM terminal as marked on the timer. The take each of the coloured valve wires and connect it to one of the timer terminals in sequence. Finally, plug in the timer.

Warning: Always use waterproof wire connectors on all exterior connections that you make to your timer.

Checking timer function

Before you can begin filling in the trenches, check the operation of all your zone valves from the timer.
To do so, confirm that the system water is turned on. Check that there is power to the timer and the battery (if needed) is in place.

Use the timer to activate each valve manually according to the timer manufacturer's instructions. It is easy to get wires mixed up and attach them to the wrong terminals on the timer. When you turn on each valve, look at the garden to be sure the proper zone is running.

Finishing Up

Once you have tested all the zones and have confidence that there are no leaks in any of your connections, finish refilling the trenches and resetting the turf. However, be sure you have allowed the entire system – and any last minute repairs – 3 hours to settle and test again to ensure there are definitely no leaks.

A note on filling trenches: Begin by covering the pipes with sand. This layer of sand will protect the pipes from damage caused by compaction from above. Fill the trench with soil you originally removed. Remember to fill the trenches high because the dirt will settle over time.

Next, carefully replace the turf that you cut out of the lawn. Be careful to match the direction of growth to the turf around it; otherwise, the patch may be visible. Gently hand tamp it into place as you go.
Once you have removed all the excess soil from the garden and replaced all the turf, you are ready to complete any final adjustments.

Adjusting the System

Turn on your sprinkler system and give it a careful inspection. The spray and water marks will make it easy to see whether the water is reaching the intended areas.

Be sure to check all the wiring on any rain sensors or other accessories you have hooked into your system. It's best to get in the habit of doing this. You should check the wiring at least once a year.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Adjusting Coverage and Pattern

Walk around the garden with the sprinkler system running to see how everything is working. As you inspect, look for the following:

- Is there any overspray on areas that need to stay dry?
- Is there even coverage?
- Are all the sprinklers pointed in the correct direction?
- Are the sprinklers high enough above the ground to clear the plants they need to water?

At this point, you are somewhat limited in how far you can physically move the sprinkler heads. You will only be able to move them a few inches in any direction with the flexible swing pipe staying connected – unless of course you dig down and replace the swing pipe and readjust its position.

Although you are limited in how much you can change the physical layout, you can still adjust the radius, the pattern direction, and the pattern itself in order to fix any holes or misalignments in your coverage.

Note: No system is perfect the first time it is run. You can always finely tune some system parts. Taking the time to adjust for small problems, such as overspray onto a pavement, will save you water – and money down the road.

Adjusting Fan Spray Sprinklers

Of the head types, fan sprays are the easiest to adjust. You simple change the nozzle on the sprinkler body. You will have to pull up the pop up sprinkler riser, hold it in place, then unscrew the old nozzle and replace with the new. It may be necessary to clean or change the filter when switching between nozzles.

Nozzles generally come with the radius set in 60 cm increments. For adjustments of less than 60 cm, some nozzles have an adjustment screw that allows for fin-tuning of the coverage by allowing you to reduce the radius by up to 25%. You can do this by means of a small screw on top of the nozzle that you turn clockwise or counter clockwise, depending on which way you need the radius to adjust. You cannot increase the radius to exceed the specified radius – a nozzle with a 3 metre radius will always spray no more than 3 metres.

Adjustable-pattern fan spray nozzles are also becoming increasingly common place (aka Variable Arc Nozzles). They generally have an adjustment ring on top of the nozzle that you can twist to set the pattern anywhere from 30 – 360 degrees.

If you replace the nozzle, or if you installed the sprinkler with the pattern facing the wrong way, most pop up fan sprays incorporate a riser that you can rotate within the sprinkler body to set the spray in the precise direction it needs to go. You can change the spray direction by small increments using these ratcheting risers, making it possible to set the pattern perfectly. Just pull the riser up out of the body with one hand, hold the sprinkler body in place with the other, and twist the riser into the correct position. Remember, not all fan sprays have this feature.

Pop Up Sprinkler Systems for Beautiful Gardens

Installing Your Pop Up Sprinkler System cont.

Adjusting Rotor Sprinklers

The adjustment of gear-drive rotors is not nearly as standardised as with fan spray sprinklers. For specific information and instruction on final adjustments, you'll have to consult the manufacturers materials supplied with your sprinkler.

You can handle small directional adjustments by rotating the entire sprinkler on its riser, similar to how you would adjust the fan spray. You have to be careful when doing this because the potential for leaks increases when you twist the sprinkler body. Attempt only small changes at a time.

Also like fan sprays, most rotor sprinklers have a radius reduction screw on the top of the sprinkler for trimming some distance off their throw to facilitate pattern matching. As with the fan sprays, reductions of up to 25% throw are possible. You can also change the nozzle in the sprinkler. Do this as a last resort. Unless your rotor has specifically designed matched precipitation rate nozzles, swapping nozzles will affect the precipitation rate relative to the other sprinklers on the same zone.

Using your Irrigation System

The purpose of irrigation is to get the right amount of water to the right plants, at the right time. To do so, you have to analyse the garden's needs, prepare a watering schedule, then adjust the schedule as needed.

Now that your irrigation system is installed - the pipes are buried, the valves are working, and the sprinkler heads are all adjusted - it is time to set up the whole system so it does what you want it to do. This may be simple or complex, depending on the number of zones, the type of irrigation timer, and how precise you feel you need to apply water.

You will need to decide how much water to apply to your plants and when to apply it for maximum effect. This section of the guide looks at the major factors to take into consideration when deciding both "how much" and "when". If you have a sophisticated timer, you can program it with virtually all of your watering information; if you have a simple timer, you'll just stick to the basics. No matter what timer you use, the process of setting it up is similar. The assumptions here are that you are using a programmable timer for your system.

Basic annual maintenance procedures keep your system "well-oiled" and is the best way to save water, avoid inconvenience, and keep everything running and growing right for years to come.

Note: Scheduling your irrigation times correctly is the key to getting the efficiency and savings you should from your sprinklers.

Pop Up Sprinkler Systems for Beautiful Gardens

Using your Irrigation System cont.

Scheduling

Traffic Lights for Watering

Check these signals for planning your watering schedule:

Red (10 a.m. to 5 p.m.) Avoid watering in the heat of the day - too much water is lost to the sun's evaporation. (The opposite is true too. Avoid watering during or after a rainstorm.)

Amber (5 p.m. to 8 p.m.) Watering in the evening is acceptable but may cause plant diseases because foliage tends to stay wet overnight.

Green (4 a.m. to 7 a.m.) Watering just before dawn is best for your plants. There's far less evaporation.

Watering Terms Worth Knowing

Start time: The time of day that your irrigation system starts to water. Most timers give you more than one start time per day.

Run time: The amount of time, in minutes, that each zone applies water.

Watering days: The actual calendar days on which the irrigation system runs.

Rain sensors: Rain Sensors tell when it is raining and turn off your irrigation system when it does. They are inexpensive, pay for themselves quickly, and protect plants from overwatering.

Irrigation scheduling is simple in concept. Regardless of how sophisticated or simple your system, scheduling is just a matter of when and for how long you run your irrigation system. In execution, however, this can get complex.

To arrive at a schedule, you need to know the following things about your garden, most of which you already know from doing your irrigation plan.

- The soil type
- The plant types you will be watering
- The weekly water needs of each plant type
- The precipitation rate of each of your zones
- The watering restrictions, if any, that are in force in your area

Armed with this information and the information presented in the following pages, you will be able to develop and implement a basic watering schedule for your garden. First you will create a simple schedule and program your timer accordingly. Then you will track how well the program waters your garden. This will allow you to make adjustments over the course of a few weeks to achieve maximum efficiency. And you can do all this using almost no math!

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Using your Irrigation System cont.

How much to water

The goal of any irrigation system is to replace the water lost from the soil to evaporation and transpiration, and to supply additional water for plant growth. For non-commercial applications, determining how much water to give the plants is not overly complicated but requires some figuring and testing. In the past, watering to the point of saturation and not watering again until the soil was dry became a common practice. This practice is no longer recommended. It results in irregular growth, and much of the water doesn't even get to the plant but goes to rehydrate the parched soil around it.

Watering needs change over time. So be ready to make adjustments to avoid either over or under watering. Overwatering is wasteful and can lead to disease or rot; under watering stunts growth and can kill sensitive plants. Fortunately, there is ample room between these two extremes. Most plants will not only survive, but also grow and thrive even if the ground varies between very moist and almost dry.

The goal is to keep the soil around the root zone of the plant moist at all times. Follow these guidelines for various plant types in your garden:

- For grass, the root zone depth is 10 – 15 cm.
- For small flowering plants, the depth of the root zone may be only 5 – 7 cm.
- Many groundcovers have a root zone depth of about 10 – 20 cm.
- For mature trees, the root zone depth is 50 – 100 cm.

Take time to fine tune your system to give your plants the water they need without wasting water that drains lower than the root zone.

When to water

One of the reasons you divided your irrigation system into zones was to meet the needs of individual plant types. To give all the plants the water they need when they need it, each zone in your system must run independently of the other zones. These various irrigation schedules can be hard to keep track of and are the best reason for choosing a programmable timer that runs them for you.

For most plants, the ideal time of day for sprinkler irrigation is just before dawn (4 a.m. to 7 a.m.). There is usually little wind to divert spray, and water pressure is at its maximum in the morning. Because there is no direct sun to cause water to evaporate, more water enters the soil and the plants' cells than during the heat of the day.

The second best choice is in the evening. This is often the time people with manual systems choose to run them – nobody wants to get up at 4 a.m. to turn on the sprinklers one zone at a time. Evening irrigation, however, has two disadvantages: Water pressure is usually slightly lower than before dawn, and diseases are more likely to infect susceptible plants when leaves stay wet all night. With early morning watering, the leaves soon dry under the heat of the sun.

The least efficient time of day to water is midday. On a hot, dry day, much of the water applied evaporates

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Using your Irrigation System cont.

before it enters the soil, especially if there is wind.

Avoid watering when it is raining. Combining natural precipitation with irrigation greatly increases the chances of overwatering you plants. Attaching a rain sensor to your automatic timer will take care of this problem by turning off the system during the rain.

Also, avoid watering during high winds. This creates excess evaporation as well as water spray blown onto areas such as paths, driveways – even the neighbour's garden. Finally, set your system based on the absorption and holding qualities of your soil so you are confident you are watering only when the root zone of the plant is almost dry.

Soil Basic Intake Rate

Soil water intake, or infiltration, tells you how fast, in cm of water per hour, the soil can absorb the water you apply. Knowing this helps you determine how long you can run your sprinklers before you start wasting water.

Soil Texture Class	*Basic Intake Rate (cm per hour)*
Clay	0.25
Silty Clay	0.37
Clay Loam	0.50
Loam	0.87
Sandy Loam	1.00
Loamy Sand	1.25
Sand	1.50

Calculating Weekly Needs

Most people simply turn on the sprinklers when the plants look as though they need water and off when the soil appears wet enough. Often this gets the job done. However, this approach is always slightly irregular. As a result, plant growth will be uneven. It is much better to have a schedule that provides your plants with fairly even soil moisture at all times.

One approach is to use a few simple figures to approximate watering needs, and then use the estimates to develop a weekly watering schedule that you can program into a timer. For example, most lawn areas need about 2.5 cm of water a week to maintain healthy growth. However, the other plant types in your garden will have different needs. Consult your local garden centre to find out how much water these various plantings need. In hot, dry weather you might have to double that, or in cool weather cut that time in half. Typically, most fan spray sprinklers deliver 2.5 cm of water in about 60 minutes, and rotor sprinklers need about 180 minutes to deliver the same. Check the manufacturer's nozzle data for specific volumes.

If you can't find generalised weekly watering rates for your plants, you can experiment with your system and fine tune based on how well you think your plants are doing.

Once you know how much water your plants need per week and how fast your sprinklers can apply it, plan watering days, start time, and run times to arrive at a final irrigation schedule that gets the correct amount of water to the plants. Do this for each zone you are watering. Once you have built a schedule based on your estimates, adjust it up or down to account for the other microclimate elements unique to each zone, such as shade, sun, and wind exposure.

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Using your Irrigation System cont.

Assigning Watering Days

Once you have figured out how much water each zone needs every week, you have to decide how best to get it into the ground. A watering schedule will give the watering days, start times, and run times. The start time and run time are closely related. Together they tell the timer when and how long to water on the days you have chosen.

The watering days are the days of the week that your irrigation system actually waters, using the start times and zone run times you have selected. Choose you watering days to meet your landscape's weekly water needs and to apply that water as evenly as possible. For instance, avoid bunching the days in one part of the week. Instead, space them out for even coverage. The moisture level in the ground should remain as even as possible. It should not be wet for three days, then dry for four. A multiple-program timer lets you create, store, and run more than one set of these variables, allowing for different zone combinations and schedules.

For example, suppose you need to put 2.5 cm of water on your garden every week. If you have well-drained soil, you could do it all on one day. However that would probably cause the soil in the root zone to dry out before the next watering day. Watering three or four days a week is preferable. Sandy soil dries out even more quickly, so you may need to water every day. With heavy clay soil, the ground might stay moist all week using just two or three watering days.

Assigning Start Times

Once you know how many days you will be watering per week, you can decide how many start times to use on each watering day.

For example, assume that the plants in a zone in your garden need 2.5 cm of precipitation per week. Also assume that the precipitation rate of the system is 2.5 cm per hour. Because you know you want to water three days a week. Because you need a total of 60 minutes each week to apply enough water to your zone, watering on three days means you need to water for 20 minutes on each of the days.

However, you'll also have to factor in the soil type, the plants' root zone depth, and the other variables discussed before. If the zone has clay soil, it can't absorb more than about half a cm in 15 minutes. So you'll need at least two different start times per watering day to get a cumulative total of 20 minutes per day. (And you'll want to leave at least 60 minutes between the watering cycles to allow for absorption.)

If the plants in your zone have shallow root zone, watering for more than just a few minutes at a time will flush water past the roots. The remedy is to reduce the amount of water applied at one time. You can accomplish this by adding an additional start time and running the sprinklers for fewer minutes each time they turn on. This means three start times per watering day.

One, maybe even two, of these start times can be in the early morning although you need to avoid start times that coincide with household activity. For example, you may not want the system running when you leave for work or when the kids play in the garden. You may have to schedule a watering or two in midmorning. Obviously it is not a problem running the watering system to coincide with household activities when using a pump and tank.

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Using your Irrigation System cont.

Determining Run Times

The run times you select are adjusted according to the number of start times you use. Run times are set for each zone, whereas start times and watering days are for the whole system. The net result will be the total number of minutes of watering per day required by your plants. Run times also need to take into account any microclimate features present in your garden, such as slope, shade, and soil infiltration rates.

If you have three watering days and two start times per day, it means six irrigation cycles on that zone per week. In order for the irrigation cycles to be even, you need to know the run times – i.e. how many minutes each irrigation cycle on that zone should last. Divide 60 minutes by irrigation cycles and you get 10 minutes per irrigation cycle. – the run time you need to use for that zone.

The equation works out like this: Multiply the number of watering days (3) by the number of daily start times (2). Divide the result (6) into the weekly watering need (60 minutes) to get a run time of 10 minutes for each watering cycle.

Double check the figures to make sure you end up with the correct amount of weekly water – 1 cm per week is a common requirement (3mm per day if watering 3 times per week). If the number of irrigation cycles is changed, the run times will need to change to compensate.

Finally, remember that start times and watering days affect every zone in the system. Run times address the individual water needs of each zone. Therefore, each zone must run by itself. Modern timers will prevent two zones coming on at one time, thus preventing any problems.

See the next page for a sample watering schedule.

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Using your Irrigation System cont.

Sample Watering Schedule

This is an example of one type of simple irrigation schedule.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
First Cycle Start Time	5:00 am			5:00 am			
Zone 1	10 mins			10 mins			
Zone 2	10 mins			10 mins			
Zone 3	10 mins			10 mins			
Second Cycle Start Time	6:10 am			6:10 am			
Zone 1	10 mins			10 mins			
Zone 2	10 mins			10 mins			
Zone 3	10 mins			10 mins			
Third Cycle Start Time	7:20 am			7:20 am			
Zone 1	10 mins			10 mins			
Zone 2	10 mins			10 mins			
Zone 3	10 mins			10 mins			

Note that the second and third cycles don't start until at least one hour after the previous cycle on their zone is completed. An automatic system will not repeat irrigation on the same zone until one hour has elapsed to allow time for water to soak into the soil. For example, the first cycle of Zone 1 ends at 5:10 a.m., and the second cycle doesn't begin until 6:10 a.m.

Evaluating and Adjusting

No matter how you create your schedule, you will need to evaluate it and make changes over the course of a few days to get the watering just right. There are several simple ways to evaluate your schedule. One of the most basic is the runoff test (see next page). If your system produces puddles or runoff, you need to reduce the run times for those zones and perhaps even add a new start time.

Don't overlook natural precipitation. If it is raining more than you anticipated, you may be able to shorten the run times of your system. Conversely, if it has hot and windy, you may have to add to the run times of all your zones. A timer with a seasonal adjustment or a "water budget" feature can make this simpler.

There is no way to evaluate the efficiency of your schedule without some first-hand observation on your part. If there is a problem, make modest adjustments. Drastic changes may just create other problems. Take several weeks to fine tune your watering gradually. The goal is to have no runoff or standing water, with the soil in each zone staying slightly moist until the sprinklers come back on.

See the next page for runoff tests.

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Using your Irrigation System cont.

Method One

Manually run the zone you want to test. Watch the zone, and keep track of how many minutes the system has run. When you see any puddles or water runoff from that zone, note how long it took to reach that point. This tells you the maximum number of minutes you can run your zone before you start wasting water.

Method Two

Activate your irrigation program for the zone you want to test. After the zone program has turned off, inspect for puddles and runoff in that zone. Any puddles and runoff indicate that the run times on the zone need to be reduced, or you will be wasting water. It may also mean adding an additional cycle to get the proper amount of water on the plants without oversaturation.

Moisture Sensors and Probes

The most precise way to evaluate your irrigation schedule is to use a moisture sensor or probe to measure the water content below the surface. Either device will give you a reading that you can use to make timing adjustments to the schedule.

To use the soil probe, simply push it into the ground until you feel increasing resistance. That resistance tells you where moist soil ends and dry soil begins. Measure the distances the probes has gone into the ground, and compare this to the root zone depth you desire. If you need water to sink deeper, you will need to adjust your schedule.

A moisture sensor is an inexpensive investment that will prove valuable when you fine tune your irrigation schedule. Simply push into the soil and the reading will give you an indication of saturation.

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Using your Irrigation System cont.

Watering Suggestions

Figuring how often and how much to water your garden isn't always easy. However, most problems can be solved with a bit of patience and careful observation. A very simple rule to follow when experimenting is to under water initially and build up over time. This means you won't run the risk of over watering, and allows you to make small adjustments.

Follow the instructions in the first part of this section to water root depth, then reapply moisture just before the root zone dries out. A moisture sensor or probe is your most useful tool for checking this.

To further evaluate and fine tune your system's efficiency and coverage, keep in mind the specific needs of various types of plants. This section will help you do just that.

No matter how many sophisticated tools you have at your disposal, a basic understanding of your garden and the plants in it is the most useful tool of all. It is well worth your time to consult gardening books that describe plants and their needs in detail. Remember, the more you know about your plants, the easier it will be to use your watering system to full advantage.

Tips for watering lawns

You know your grass needs water if you walk across the lawn and your footprints remain visible for more than a few seconds. Another sign of thirst is a dull appearance, caused by the grass blades folding up and exposing their base.

During warm weather, most lawns demand abundant water – between 1 – 3 cm per week – for healthy growth. During the heat of summer, you must supply the necessary water. If the summer is rainy, you will have to irrigate only when rain doesn't come abundantly enough or at the right time.

Maintenance

A properly designed and installed irrigation system requires only minimal maintenance. However, periodic upkeep is vital. And as time passes, you may find that you want to adapt or update your system.

Seasonal Adjustments

At the beginning of each growing season, turn on your system and check that each spray head is delivering the desired coverage. The heads may have been knocked out of alignment by foot traffic, a wayward lawn mower, or a snow shovel. This can cause them to spray paths or other unintended surfaces while leaving part of the garden without water.

You might find there is too much or not enough overlap between heads. To adjust this, move the nozzle to redirect its spray, turn the spray-reduction adjustment screw on the top of the nozzle. In the case of a ratcheting riser, turn the riser.

Sometimes spray heads produce a mist or fogging action rather than the larger drops necessary for watering. This indicates that the water pressure is too strong. Adjust it at the main shut off valve. Manually turn the valve clockwise until you see large drops. Some automatic valves have a special knob for this

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adjustment called a flow control that adjusts the flow to minimise misting and fogging.

Adapting to Changing Needs

Your garden and its watering needs will probably change over time. Usually this will require no more than readjusting the watering schedule or the flow rate of sprinklers. But, if you've added new beds or radically altered the use of any part of the garden, significant changes may be needed.

Adding on to sprinkler systems is not complicated as long as you have left space on each manifold and zone for future expansion. Before adding an extra sprinkler head or new mainline pipe to a zone, check that enough flow and water pressure is available. When adding whatever trenches are necessary for the new pipes and sprinklers, dig carefully so you don't break the pipe or other fixtures already in place. For future reference, be sure to draw any new components and pipes onto your plan.

Sprinklers, risers and MDPE fittings can be reused, but make sure you have all the extra parts needed before you start rearranging the plumbing. Changing nozzles may be the only adjustment needed; a full circle nozzle can be replaced with a part circle or even s strip nozzle in a matter of seconds. When converting lawns to shrubs or flower beds, the system change can be as simple putting the sprinklers on taller risers. However, be certain that any sprinklers that will be added or changed are compatible with others in that zone.

If you didn't leave room for expansion on your valve manifold, you may need to rebuild the whole manifold and install a larger valve box.

Cleaning and Flushing

You need to clean all irrigation systems occasionally to remove dirt, debris, or plant materials that have built up over the months. And there are a few basic steps that you can take at any time of the year to be sure the water can always get through your system unfettered.

Using a filter can prevent the build-up in the pipes, risers, and nozzles of organic particles and makes for easy cleaning.

It is also worth following these instructions to flush each zone in the system at least once per year.

- Turn off water to one zone, and remove all of that zones individual nozzles and/or sprinkler heads if possible.
- Run water through the zone for a few minutes until clean, clear stream of water flows from each sprinkler.
- Turn off the water.
- Take apart the nozzles (depending on the type, you can do this by hand or with a screwdriver or special key). Clean them to remove any dirt or deposits.
- Rinse out the filter screen or basket.
- Reassemble and replace all the parts.
- Turn on the zone again to check that everything is leak free and operating properly.

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Be sure to keep the grass around the pop up sprinklers trimmed back from the head; overhanging grass can interfere with the spray pattern. Also, prune vegetation growing around pop up spray heads in garden, groundcover and shrub areas.

Clean the mesh filter each month. You can clean most filters simply by turning on the flush outlet (dump valve). If your system has no dump valve, take out the filter and rinse it through thoroughly. At least once a year take apart, clean, and inspect even filters that have a dump valve. If the filter screen shows any sign of damage, replace it.

Winterisation

To cope with sustained freezing temperatures, you must completely drain and dry your system to prevent damage to the components. You should have installed drain valves in each zone to allow for this.
To winterise a system using manual drains, begin by shutting off the irrigation water supply. Open all the manual valves downward from the zone valves to allow the lines to drain. Leave the valves open for a few days to be sure all the water has escaped, and then close them again. Finally, open the manual drains ahead of your zone valves to allow the main irrigation supply line to drain. (Even if this line terminates in your basement, you should drain it.)

With automatic drains, all you need to do is close the main water supply valve. The lines down from the automatic zone valves will drain by themselves. To check that the drains are working, remove a sprinkler from its riser and check that there is no water in the pipe.
Be sure to drain the main irrigation supply line as well. To check that the supply has drained, remove the valve bonnet (cover) and look inside. The valve should be dry.

Spring Start-Up

Neglecting to properly start up your irrigation system in spring can cause damage to the system. Fortunately, a few simple steps before you start watering again will protect you system and keep it reliable year after year.

The greatest threat to your irrigation system is water hammer. It is produced by a pressure spike caused by water rushing into an empty pipe, giving air in the pipes no time to escape. When this happens, the pressure inside the pipe can reach 15 times normal operating pressure. This is enough to burst fittings and even blow sprinklers out of the ground.

Before refilling your system, use a shovel to confirm that the soil is frost free to a full 30 cm below the surface. Filling your system while the ground is still frozen can cause unseen and hard to fix freeze damage to your pipes.

If your irrigation system isn't equipped with automatic drain valves, remove the nozzle or sprinkler head located at the highest point of each zone. Start filling the system very slowly, beginning with the main line of the irrigation system (located between the water source and the zone valves). Slowly open the shutoff valve that controls the water supply to the entire system – just a quarter turn at a time is enough. Take your time;

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remember that the water has to travel the entire length of the main line.

Next, slowly fill each zone by manually opening the zone valve using the bleed on the valve. When the water pouring out of the open riser (where you removed the nozzle) runs free of air bubbles, close off the zone valve.

It may take as long as 30 minutes to fill a zone carefully. Once the zone is filled, replace the sprinkler head you removed. Repeat the process for each zone. Once you have filled the entire irrigation system, run each zone for two minutes. This lets you test your automatic timer, flush out any remaining air, and check that all the heads are spraying properly.

Be sure you have a collection of spare irrigation parts on hand before turning the water back on. Include some extra pipe and fittings as well. Finally, if you have an automatic controller, replace the batteries and make sure your timer programs are still accurate.

This concludes our complete guide to planning and installing a Pop Up Sprinkler System. If you get stuck with any aspect, you are more than welcome to give our friendly team a call to ask any questions you may have.

For troubleshooting and repair, we have a comprehensive FAQ in the help section of our website. If you still can't find the answer to your question, again you are more than welcome to call our technical support.

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