Design and construction of garden irrigation system

First: the composition of the garden irrigation system: 1: powered by the pump for example: 200QJ20-108/8 200--- means the frame number 200 QJ--- submersible pump 20 - flow 20m3/h 108--- head 8--- 8 grades 108MThe commonly used models of water supply pipelines (UPVC, PVC) for water supply paths are 20, 32, 25, 40, 50, 63, 75, 90, 110, and the most end of the sprinkler is usually selected Rain Bird Sprinkler 3500 series (model 3504, 7 meters), 5000 series (5004 model), 1800 series (1802 model), connecting pipe fittings have direct (also known as pipe hoops), tees (same diameter tees, different diameter tees), large and small heads, elbows (90 degrees, 45 degrees) , valves, etc. 10m 3.5m

Second: the construction process

1|: Before carrying out construction, it is necessary to ask Party A about the location of the water source and measure the static water pressure.

2: Take a look at the overall layout, do it well, ask the local old farmers about the thickness of the local permafrost, and determine the burial depth of the water supply pipeline.

3: Choose the model of the nozzle, you can check the well-known brand domestic agents on the Internet to ask them for a profile, which clearly indicates the working pressure and water output of each type of nozzle.

4: Pay-off, fixed-point. The spacing between the sprinklers should be 50%-60% of the diameter of the sprinklers, for example, the two spraying radii of 10 meters of the rain bird sprinklers, the spacing between the two sprinklers should be 20 * 50% - 60% is more appropriate, of course, sometimes it depends on the pressure of the water supply, the local climate conditions, etc., when the sprinkler is pointed, the control point, the corner point, the number of pipe fittings. The usual arrangement method is a regular triangle arrangement, the spacing of the nozzles is 50%-60% of the diameter of the nozzle, and the square arrangement pays attention to a limiting factor is the limitation of the maximum spacing diagonal.7500c10 米 12 米

For example, make a sprinkler irrigation system in front of an irregular office building. The length of the two sides of the fan is 40*30 meters each, as shown in the figure

5: Sprinkler irrigation ditch excavation, excavation to the topsoil and the following shade soil or construction waste separately placed, pipe ditch to find a good slope, ditch under the ditch do not have sharp things to do flat and straight.

6: For the connection of the pipe, first polish the interface with large sandpaper, then wipe it clean with a clean rag, evenly apply the PVC water glue to the interface, and then quickly insert it and turn it around forcefully, staying for one minute to prevent the interface from being completely contacted.

7: Pressure test, pipe trench backfill, first backfill a layer of good soil on the pipe, and then backfill the original excavated soil, and clean up the large construction waste.

Third: precautions: 1: Connected to the tools needed in sprinkler irrigation: small brushes, large-scale projects are best to prepare a porcelain bowl or iron cylinder, a handful of steel evidence, gauze

paper, rags, water glue, raw material belt, hammer, wooden board, steel ruler.

2: When choosing PVC water glue, please do not use instant glue, which not only affects the working speed, but also performs poorly.

3: The valve is often used and is a consumable product, sometimes five or six times a day, damaged and not easy to repair, please buy well-known varieties of products, such as the JSC brand valve

produced by Taiwan Plastics Company.

4: The steel pipe should be connected with the PVC flange, the 50 steel pipe should be connected with the PVC flange of 63, and the gasket in the middle must be connected.

5: When connecting the water supply pipe with a diameter of more than 63 pipes, find a small hammer and a thick wooden board. For example, when connecting 90 water supply pipes.

6: The valve well and the water intake joint installed should be close to the hardened area for easy operation, otherwise the valve cannot be closed after the newly sown green space irrigation (the position should be reasonable and easy to use).

7: When installing the sprinkler head, it must be installed on the side, otherwise there will be a large area of dead ends. Sprinklers of different intensities should not be installed on the same control valve controlled branch.

8: The factory setting of each nozzle is 180 degrees, and the method of adjusting the angle is detailed in the appendix.

9: In order to reduce the amount of damaged lawn when repairing damaged sprinkler irrigation, use quick coupling connection. For example: 63 water supply pipe is damaged during the construction of only a small hole, the usual way we have to dig a long section of the ditch, sometimes when there are too many pipelines in the ditch, this method is useless, with a quick connector to easily do.

Appendix:

Appendix 1: 1: Commonly used water pump model code LG----- high-rise building feed pump DL----- multi-stage vertical clean water pump BX------- fire fixed special water pump ISG------ single-stage vertical pipeline pump IS ------- single-stage horizontal clean water pump DA1------- multi-stage horizontal clean water pump QJ------- submersible electric pump

Pump model significance: such as 40LG12-15 40-inlet and outlet diameter(mm) LG-High-rise Building Feed Pump (High Speed)

12-Flow rate(m3/h) 15-Single-stage head(M)

200QJ20-108/8 200 --- means frame number 200 QJ--- submersible pump 20 - flow 20m3/h 108 --- head 8--- 8 stages 108M

The basic composition of the water pump: motor, coupling, pump head (body) and base (horizontal). The main parameters of the pump are: flow rate, expressed by Q, unit is M3/H, L/S. Head, denoted by H, is in M.

For clean water pumps, the required NPSH (M) parameter is very important, especially when used in suction water supply equipment.

For submersible pumps, the rated current parameter (A) is very important, especially when

used in variable frequency water supply equipment.
The main parameters of the motor: motor power (KW), speed (r/min), rated voltage (V), rated current (A)

2. What are the types of pumps commonly used in garden irrigation?
Answer: Commonly used pumps for garden irrigation: IS single-stage single-suction centrifugal pump, BA single-stage single-suction centrifugal pump, SH single-stage double-suction horizontal split centrifugal pump, SA type single-stage double-suction horizontal split centrifugal pump, ISG pipeline centrifugal pump, submersible pump, etc.
3. What working parameters need to be considered when buying a water pump?
Answer: The main working parameters of the pump include: flow, head, speed, power, efficiency, vacuum suction height, etc. The most common parameters we usually use when buying water pumps are flow, head and power.

4. When buying a water pump, is it better to have as much power as possible?
Answer: The purchase of water pump should be based on the design and site conditions, the higher the power is not necessarily better. Too much power, the more power is consumed.
5. What are the benefits of constant pressure inverter water pump?
Answer: The use of constant pressure variable frequency pump, high automation, high efficiency and energy saving, the equipment automatically adjusts the water supply of the pump according to the change of water pressure, and the water supply pressure is constant, which reduces the leakage damage of the pipe network. Appendix II: Specifications for PVC water supply pipes

PVC water supply pipe (GB/T10002.1-96).

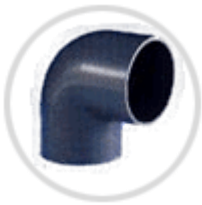
Unit: mm

Nominal outer diameter	Allowable difference in average outer diameter	Allowable difference in wall thickness	1.6Mpa		1.25Mpa		1.0Mpa		0.8Mpa		0.6Mpa		Effective length
			Minimum thickness	Reference weight	Minimum thickness	Reference weight	Minimum thickness	Reference weight	Minimum thickness	Reference weight	Minimum thickness	Reference weight	
20	+0.3	+0.4	2.0	0.178									
25	+0.3	+0.4	2.0	0.227									
32	+0.3	+0.4			2.0	0.297							
40	+0.3	+0.5	3.0				2.0	0.376					
50	+0.3	+0.5	3.0	0.686			2.4	0.567	2.0	0.475			4
63	+0.3	+0.6	3.0	1.090			3.0	0.876	2.5	0.748	2.0	0.604	
75	+0.3	+0.7			4.5	1.535	3.6	1.251	2.9	1.021			
90	+0.3	+0.8			5.4	2.203	4.3	1.790	3.5	1.477			
110	+0.4	+0.9			5.7	2.859	4.8	2.436	3.9	2.004	3.2	1.681	

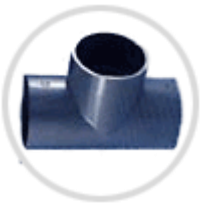
140	+0.5	+0.9					6.1	3.943			4.1	2.721	
160	+0.5	+1.0			7.7	5.613	7.0	5.125			4.7	3.528	
200	+0.6	+1.2			9.6	8.729	8.7	7.956			5.9	5.502	
250	+0.8	+1.4			11.9	13.489	10.9	12.420			7.3	8.519	
315	+1.0	+1.7			15.0	21.382	13.7	19.649			9.2	13.487	6
355	+1.1	+1.9					14.8	23.694			9.4	15.557	
400	+1.2	+2.1			19.1	34.594	15.3	28.035			10.6	19.720	
500	+1.5	+2.9					19.1	43.701			13.3	30.892	
630	+1.9	+3.7					24.1	69.376			16.7	48.733	

2: Adhesive

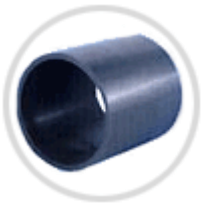
45° Elbow 45°Elbow



90° Elbow 90° Elbow



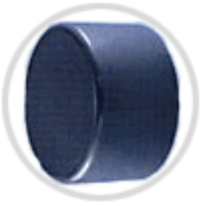
90° tee



Casing Coupling

Reducing Socket(Long Type)

Flange fittings



Pipe plugging Cap

Female Adapters

Appendix III: Selection and Arrangement of Sprinklers

Selection of sprinkler heads

When selecting a sprinkler, in addition to its own performance, such as the working pressure, flow rate, range, combined sprinkler intensity, and whether the spraying fan angle can be adjusted, it is also necessary to consider factors such as the allowable irrigation intensity of the soil, the size and

shape of the plot, the variety of lawn, the water source conditions, and the user's requirements. In addition, in the same project or the same rotation irrigation group of a project, it is best to choose a sprinkler head of one type or similar performance, so as to facilitate the control of irrigation uniformity and the operation and management of the whole system. In the existing projects, some of them have installed a variety of sprinklers with completely different properties in order to pursue the waterscape effect one-sidedly, resulting in the unevenness of irrigation cannot be guaranteed. When choosing a sprinkler, it is important to note that the irrigation system is not a fountain, and its purpose is to compensate for the lack of time and space that plants need water, not to create artificial water features. Therefore, the landscape effect can only be taken care of as much as possible on the premise of satisfying the water needs of the lawn first.

At present, turf sprinkler irrigation systems generally use buried lifting lawn sprinklers.

There are many varieties of such sprinklers, taking the products of RAIN BIRD as an example, according to the range, there are 0.9~6.1 meters of small range sprinklers, 6.4~medium range sprinklers, 11.6~large range sprinklers; According to the adjustment method, there is no tool adjustment and there is a tool to adjust the nozzle, and so on. These sprinklers automatically pop out of the ground when pressurized and retract into the ground when irrigation stops, without affecting the mechanical operation of landscaping and lawns.15.3 米 25.0 米

1.1 Small range nozzles are generally non-rotating scattering nozzles, such as Yuniao 1800 series and UNI-Spray series. These nozzles have a pop-out height of 50 mm 、、、 and can be equipped with a variety of spraying forms or adjustable angle nozzles for high irrigation intensity. It is not only suitable for small lawns, but also for irrigation and dust washing of shrubs and hedges. Most of the nozzles of this type of sprinkler are "matching irrigation intensity nozzles", that is, whether they are sprayed in a full circle, or a semi-circle or 90 degrees and other angles, the irrigation intensity is basically the same. This feature is extremely beneficial for ensuring the uniformity of the system. 75mm100mm150mm300mm

1.2 Most of the medium-range nozzles are rotary nozzles, such as the Rainbird T-Bird series gear-driven toolless adjustment nozzle, R-50 ball-driven toolless nozzle, Maxi-Paw rocker no-tool nozzle, and 5004 gear-driven tool-driven tool-free nozzle. These sprinklers are suitable for irrigation of medium-sized green areas. Among them, the T-Bird, R-50 and 5004 nozzles are equipped with Rain Curtain's unique Rain Curtain nozzles, which greatly improves the uniformity of spraying; The Maxi-Paw nozzle is particularly suitable for poor water quality conditions.

1.3 Large range nozzles, such as the Rainbird Falcon and Talon series, are all driven by rotary gears and have a tool adjustment nozzle on top. It is characterized by high material strength and good impact resistance. In addition to being used for large-area lawn irrigation, it is especially suitable for sports field turf irrigation systems. Due to the special characteristics of golf course lawn compared with general public lawn, golf course turf sprinkler system is unique, such as Rainbird Eagle series and Impact-D series sprinkler, which is specially designed for golf course lawn sprinkler irrigation.

Among the printheads of various ranges, the "non-spill" printhead can be selected. The sprinkler with anti-overflow function is generally installed in the lower part of the terrain in the turf sprinkler irrigation system with large undulations, which can effectively prevent the water in the pipe from overflowing from the low-level sprinkler head when the irrigation stops, affecting the normal growth of the lawn around the sprinkler.

The allowable irrigation intensity of the soil is one of the main factors affecting the selection of

sprinkler heads. Irrigation intensity refers to the depth of water sprayed on the ground per unit of time. We generally consider the combined sprinkler intensity, because the irrigation system is basically composed of multiple sprinklers working at the same time. The requirement for sprinkler irrigation intensity is that the water can immediately penetrate into the soil without water accumulation and surface runoff after falling to the ground, that is, the combined sprinkler intensity (ρ combination) of the sprinkler head should be less than or equal to the water infiltration rate of the soil. The reference values of the allowable sprinkler irrigation intensity (ρ allowable) for each type of soil are shown in the following table:

Allowable irrigation intensity of various types of soil (mm/h)

Soil category	sandy soil	Loamy sandy soil	Sandy loam soil	loam	clay
Allowable irrigation intensity	20	15	12	10	8

The formula for calculating the sprinkler intensity of the sprinkler combination is: ρ combination (mm/h) = 1000q/a

where: q is the flow rate of a single nozzle (m3/h); A is the effective control area (m2) of a single nozzle.

In addition, the allowable irrigation intensity of the soil decreases significantly with the increase of the terrain slope. If the slope is greater than 12%, the allowable irrigation intensity of the soil will be reduced by more than 50%. Therefore, for projects with undulating terrain, special attention should be paid to the selection of sprinkler heads.

2. The arrangement of the sprinkler head

The arrangement of sprinklers in the sprinkler irrigation system includes the combination of sprinklers, the spacing of sprinklers along the branch pipes and the spacing of the branches. The reasonableness of the sprinkler head arrangement is directly related to the irrigation quality of the whole system.

The combination of sprinklers depends mainly on the shape of the plot and the influence of the wind, and is generally rectangular and triangular, or its special case square and regular triangle. Rectangular or square arrangement, suitable for conditions where the plot is regular and the edges are at right angles. This form is simple in design, and it is easy to make the flow of each branch pipe relatively balanced; Triangular or regular triangle arrangement, suitable for irregular plots, or where the plot boundary is open, even if the spraying range exceeds part of the boundary, it will not have a big impact. This arrangement has strong wind resistance, the spraying uniformity is higher than that of rectangles or squares, and the number of sprinklers used is relatively small, but it is not easy to make the flow of each branch pipe balanced. Sometimes the shape of the plot is very complex, or there are obstacles in the plot, so that the combination of sprinklers is irregular. However, in most lawn irrigation systems, square or triangular arrangements can be used as much as possible.

2.1 Square arrangement

When arranged in a square, the spacing of the sprinklers along the branch is equal to the spacing of the branches, but the distance between the diagonal nozzles is 1.41 times the distance between the branches. Taking into account the influence of wind, the recommended sprinkler spacing is 0.9-1.1 times the range (R) of the sprinkler head, as shown in the following table:

Wind speed (km/h)	0-5	6-11	12-20

The maximum spacing between squares	1.1R	1.0R	0.9R

2.2 Regular triangle arrangement

When arranged in a regular triangle, the distance between the nozzles is equal, but the spacing of the branch pipes is 0.866 times the spacing of the nozzles. Taking into account the influence of wind, the recommended sprinkler spacing is 1.0-1.2 times the range (R) of the sprinkler, as shown in the table below:

Wind speed (km/h)	0-5	6-11	12-20
The maximum spacing of regular triangles	1.2R	1.1R	1.0R

After the sprinkler head is arranged, the combined sprinkler irrigation intensity of the system should be checked according to the actual layout results. Especially in the corner area of the plot, because the sprinkler head is often sprayed in a semi-circle or 90 degrees instead of a full circle, if the optional nozzle is the same as the sprinkler head sprayed in the middle of the plot, the intensity of the sprinkler in the area is bound to be much higher than that in the middle of the plot. Therefore, in order to ensure the good spraying uniformity of the system, the nozzle installed in the corner must be equipped with 2-3 levels of nozzles smaller than the nozzle in the middle of the plot.

2. The design of the lawn sprinkler irrigation system

With a high-performance and reliable sprinkler head, the system must also be carefully designed to really play the role of sprinkler irrigation and achieve the desired results. The design of a lawn sprinkler irrigation system generally includes the following steps:

(1) Determination of irrigation water demand

Water demand includes the amount of evaporation from the soil and surface and the amount of transpiration consumed by the plants themselves, also known as plant evaporation. Factors affecting water demand include meteorological conditions (temperature, humidity, radiation, wind speed, etc.), soil properties and water content, plant species and growth stages. Because of the complexity of these influencing factors, the most reliable way to determine irrigation water demand is through physical observations. However, there is often a lack of measured data in the planning and design stage, so it is necessary to estimate according to the factors that affect water demand. There are many ways to estimate irrigation water requirements, which can be calculated using formulas or by referring to the following empirical data:

Meteorological conditions	Clammy	Cold	Wet and warm	Dry warm	Damp heat	Dry heat
Daily water demand (mm)	2.5-3.8	3.8-5.0	3.8-5.0	5.0-6.4	5.0-7.6	7.6-11.4

In the table, "cold" refers to the maximum temperature in midsummer below 21 degrees Celsius; "Warm" means that the maximum temperature in midsummer is between 21 and 32 degrees Celsius; "Hot" means that the maximum temperature in midsummer is higher than 32 degrees Celsius; "Wet" means that the average relative humidity in midsummer is greater than 50%; "Dry" means that the average relative humidity in midsummer is less than 50%.

The design of the irrigation system should meet the daily water demand during the peak period of turf water demand, that is, the design should be based on the most unfavorable conditions, and the

highest daily water demand under specific meteorological conditions should be selected to make the system have sufficient water supply capacity.

Appendix IV: Commissioning of the Sprinkler Head

5000 Series Buried Rotary Sprinklers

Installing and removing the nozzle:

1. Insert the tool into the nozzle and pull out the hole, rotate 90 degrees, and lift the lifting column out. （A）
2. Put the desired nozzle into the nozzle hole, and twist the range adjustment screw clockwise to fix the nozzle. （B）
3. Install the identification number of the selected nozzle at the round hole on the top of the nozzle.
4. To take out the nozzle, first screw out the range adjustment screw, and take out the nozzle by clamping the lower protrusion of the nozzle mouth with needle-nose pliers.

Instructions: It is also possible to insert a tool or flathead screwdriver into the gap between the edges of the rotating tower cap to raise the lifting column.

To set the spray fan angle:

Sector adjustment range from 40 to 360 degrees (adjustable angle nozzle). The spraying fan angle of the sprinkler head is set to 180 degrees at the factory.

Set the left spray edge

1. Pull out the turret and turn it to the left starting point (counterclockwise).

Note: If the sprinkler tower cannot be easily rotated to the left, it can be rotated to the right (clockwise) to the right start point first.

2. Then, rotate the tower so that the direction of the arrow marked on the top of it is in line with the desired set left starting spraying edge.

Increase the angle (C).

1. Keeping the rotating tower at the left starting point, insert a tool or screwdriver into the spray sector adjustment hole.
2. Turn the screwdriver clockwise in the (+) direction to increase the angle.
3. Each full clockwise rotation can increase by 90 degrees.
4. When the maximum 360 degrees are adjusted, a "click" sound of the ratchet mechanism will be heard. The nozzle cannot be adjusted beyond the maximum angle.

Decrease the angle (D).

1. Keeping the rotating tower at the left starting point, insert a tool or screwdriver into the spray sector adjustment hole.
2. Turn the screwdriver counterclockwise in the direction (-) to reduce the angle
3. Each full turn counterclockwise can be reduced by 90 degrees.
4. When the minimum is adjusted to 40 degrees, the "click" of the ratchet mechanism will be heard. The nozzle should not be adjusted beyond the minimum angle.

Range adjustment: (range can be reduced by 25%) (E).

1. Insert the tool or screwdriver into the range adjustment hole.
2. Turn the screwdriver clockwise to reduce the range, and counterclockwise to increase the range.

Appendix V: Model and performance of nozzles

Buried rotary sprinkler

Product Name: Rain Bird 3500 Series Buried Rotary Sprinkler Technical Parameters: Interface: 1/2" Female Thread Range: 4.6-10.7m Working Pressure: 0.17-0.38MPa Flow: 0.12/h Specifications and Dimensions: Overall Height: Ejection Height: Top Exposure Diameter: Synopsis: This series of top adjustment medium and small range rotary sprinkler is suitable for the irrigation of medium-sized lawns such as various parks and public green spaces.-1.04m3168mm102mm29mm

Buried rotary sprinkler

Product Name: Yuniao 5004 Series Buried Rotary Sprinkler Technical Parameters: Interface: 3/4" Female Thread Range: 7.0-15.2m Working Pressure: 0.17-0.45MPa Flow Rate: 0.11/h -1.91m3

Specifications and Dimensions: Overall Height: Ejection Height: Top Exposure Diameter: Introduction: This series of top adjustment medium range rotary sprinkler is suitable for irrigation of medium-sized lawns such as various parks and public green spaces185mm100mm45mm

Buried scattering nozzles

Product Name: Yuniao 1800 Series Buried Scattering Sprinkler Technical Parameters: Contact: 1/2" Female Thread Range: 0.9-6.1m Working Pressure: 0.10-0.48MPa Best Working Pressure: 0.20MPa Flow: 0.01/h Introduction: This series of sprinklers are mainly used to irrigate various small lawns, flowers, shrubs, etc. in parks, streets and courtyards. Available in five ejection heights, the nozzle is common to all nozzles in the Rain Bird UNI-Spray range. Specifications & Dimensions: Overall Height 1802 Ejection Height 1802 Specifications & Dimensions: Overall Height 1803 Ejection Height 1803 Specifications & Dimensions: Overall Height 1804 Ejection Height 1804 Specifications & Dimensions: Overall Height 1806 Ejection Height 1806 Specifications & Dimensions: Overall Height 1812 Ejection Height 1812 Top Exposure Diameter: -1.21m3100mm50mm120mm76mm150mm100mm240mm150mm400mm300mm57mm