



6. Water management and irrigation

The long-term availability and quality of water for irrigation and water features are critical factors in the development of any golf course. A course needs a reliable supply of water of sufficient quality to irrigate turfgrass, ensuring that playing conditions meet the expectations of the developer and their clients. Early in the development process, water quality and availability must be confirmed by the technical team.

The irrigation designer is highly valuable in the development process. They will evaluate a wide range of criteria, including budget, climate, soil type, grass type, water quality and supply, slope, course layout and design, elevation changes and desired course playing conditions. Based on these, they will develop an irrigation layout and water budget (use/projections) for the golf course.

A properly designed irrigation system should provide a highly efficient network that applies water very uniformly across the course. This ensures that only the minimum amount of water will be used to maintain the desired playing conditions and to maintain plant health. The irrigation designer will consider a wide range of design factors in the selection of materials best suited to the golf course in development and ideally should have knowledge of local best practices and needs.

Sourcing water

A reliable source of irrigation water is essential to ensure that the course will have enough to sustain healthy turfgrass. Water sources vary widely depending on the location and geography of the site: they typically include lakes, rivers, streams and wells. Usually, government permits are required to take water from these sources, and the permitting process can be lengthy and time-consuming. Developers should expect to work closely with hydro-geologists and other professionals qualified to evaluate the supply and the impact of seasonal water withdrawals for golf course applications.

In recent years the use of reclaimed water (sometimes referred to as effluent, reuse or recycled water) has become much more common and viable for golf course irrigation. A development generates a considerable amount of reclaimed water from normal human activities. This wastewater can go through various degrees of treatment before being suitable for use for irrigation on the course.

Treated reclaimed water can be an excellent water source for irrigation, and the golf course can be a good place to dispose of it. Careful analysis and monitoring of reclaimed water

sources is required to ensure that the water is effectively treated and of sufficient quantity for the course, especially during peak turfgrass water requirements.

It's estimated that approximately 12 percent of golf courses in the United States use reclaimed water for irrigation purposes. Lack of availability is cited as the main reason why more courses are not using reclaimed water.

Lake management

Golf course architects often use lakes not only as design features but also as holding reservoirs for the irrigation water supply. In addition to maintaining water level for aesthetic reasons, it's highly desirable to have extra water available as back-up to meet potential seasonal drought conditions that can occur during periods of peak high-season demand on the golf course. This ensures water is available during an extended drought or if the usual source becomes temporarily unavailable.

Site topography, both natural and designed, will generally dictate the number and location of lakes on the course. During the golf course design process, one lake will be selected as the primary irrigation source and the main irrigation pump station will be located adjacent to it.

The lakes will often be interconnected by a network of pipes and possibly transfer pump stations to maximize the availability of the stored water for irrigation. This allows water to be moved from other lakes to the irrigation reservoir. If desired, the water level can be monitored and adjusted automatically through this network, ensuring that lake levels and course aesthetics are maintained.

Pump stations, sprinklers and other key components

Sprinklers, pipes, wire, a pump station and control components all act together to deliver water uniformly to the irrigated areas of the course. All of these components must be properly designed and installed to provide an efficient irrigation system that minimizes waste and conserves water, energy and labor.

The pump station is the heart of the irrigation system, delivering water through the pipe network to the sprinklers. Pump stations are usually custom-designed to meet the criteria of the site and ensure that sprinklers receive water at the right pressure in sufficient volume.

Sprinklers are spaced in a specific pattern across the course based on the size and type of sprinkler and the course conditions. In a properly designed layout, highly efficient sprinklers can deliver water distribution uniformities of 85 percent or higher. Maintaining a high degree of uniformity ensures that each area of the golf course receives the same amount of water during normal sprinkler operation.

Sprinklers that operate at lower efficiency, or that are not properly

spaced or installed, will take a longer period of time to apply the required amount of water. This causes uneven water application – wet and dry spots – and wastes water. High uniformity and control in the sprinkler system is extremely desirable to conserve water and provide quality playing conditions.

In the cooler, wetter climates of northern Europe, fewer sprinklers are needed to supplement rainfall – perhaps only 350 to 400 on an average golf course, depending upon whether or not the course has fairway irrigation. In arid, desert-like climates you may need 3,000 sprinklers on a course of similar size. Careful selection, location and spacing of sprinklers is particularly important. When sprinklers are operating inefficiently, dry spots can appear, causing uneven grass quality and color. This is difficult to manage after the golf course is built.

The control system

The irrigation control system incorporates highly customized computer software that helps to manage sprinkler operation during a watering cycle. On a typical day, the course superintendent will evaluate the climatic and golf course conditions and decide how much water should be applied during the upcoming water cycle. The software takes this information and automatically calculates when each of the sprinklers will operate and for how long. A modern control system will have an easy-to-use software interface that makes it easy to adjust sprinkler run times. Used by an experienced operator, the control system can be a highly effective tool, conserving a considerable amount of water, energy and labor.

Installation

The golf course irrigation system is a complex network that must be properly designed and installed using high quality components to ensure it operates efficiently throughout its life. Proper installation is a key component for the long-term success of the course. A properly installed, efficient system will operate with minimal maintenance for many years and reduce long-term costs.

The irrigation industry has many qualified professionals, including designers and installers, with years of experience on golf course irrigation systems. Qualified companies will have a strong list of references from their golf course clients. You should not cut corners to save money when selecting an irrigation designer or installer. Doing so is likely to lead to higher maintenance costs that will require more water, energy and labor to operate and maintain the irrigation system over the long term.

The key questions

How much water will I need to irrigate my course?

Calculating water use is very important in the initial design of an irrigation system. Water use will vary greatly depending on site-specific factors including geography and climate, soil and grass type, course design and layout, and desired playing conditions. You need to evaluate water supply based on the worst-case drought scenario, ensuring you have enough water to keep the grass alive during peak plan water requirements.

Golf courses in cooler climates like northern Europe, where rainfall is plentiful, use irrigation systems only in drier periods as a supplement to rainfall.

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As a result, the course may only use several million gallons (approximately 70,000m³) of water in an average year.

Courses built in desert-like conditions such as those in Arizona or Dubai, where there can be fewer than 10 inches (254mm) of rainfall per year, may use 150 million gallons (568,000m³) or more per year. Desert golf courses rely completely on the irrigation water source to maintain healthy turfgrass.

An experienced professional can evaluate the site and climatic conditions to develop a water budget for the planned golf course based on the geographical location and other factors.

Does water quality matter?

Water quality is critical for turfgrass health and vigor. A wide variety of turfgrass species and cultivars are available for use on golf courses around the world. Each cultivar has a specific water quality requirement, and the irrigation water must be matched to the appropriate grass type to ensure it will thrive in the local site conditions and environment.

Evaluating water quality early in the development process will enable planners to understand the challenges associated with water supply on the site. A number of remedial treatments are available to help manage poor water quality. The cost and viability of these will need to be considered during the planning process.



Executive Summary

- Water quality and availability must be confirmed early in the development process
- Treated reclaimed water can be an excellent water source for irrigation, and the golf course can be a good place to dispose of it
- The irrigation designer will create an irrigation layout and water budget for the golf course based on climate, soil type, grass type, water quality and supply, slope, course layout and design and desired course playing conditions
- Lakes are not just design features, they can be holding reservoirs for the irrigation water supply
- Government permits are usually required to take water from natural sources, and the permitting process can be lengthy and time-consuming
- The pump station, usually custom designed, is the heart of the irrigation system, ensuring sprinklers receive water at the right pressure in sufficient volume
- A computerized control system will help conserve a considerable amount of water, energy and labor.

Sustainability in water management and irrigation

The earth's water resources are increasingly stretched, with all arid, semi-arid and even temperate regions effectively reporting significant water deficits. With world water use expected to triple by 2060, the next phase of golf's development will happen against a backdrop of diminishing supplies and increasing public, agricultural and industrial demand.

Successful golf developments must be highly efficient water users, using the full range of recycled and harvested sources, with minimal dependency on potable supplies. Working with the principles of natural watershed management is key to future success. Natural drainage systems and hydrological processes should be embraced and integrated into development plans. Hard water engineering should be minimized, with energy-intensive pumping and purification systems considered

only as a last resort, after gravity and wetlands have been utilized.

Golf developments should harness the highly valuable ecosystem services that percolation, detention and natural treatment provide, using those ecosystems in turn as landscape features that can become authentic signatures for the development.

In arid regions, especially, golf development can only be justified if modeled to minimize demand and maximize recycled self-sufficiency.

Golf Environment Organization

Rain Bird Corporation

Rain Bird understands the vital role water plays in a healthy, sustainable environment. We take the challenge of using water responsibly very seriously. That's why our overarching philosophy, The Intelligent Use of Water™, guides everything we do.

Since our beginnings in 1933, we've built a reputation on delivering irrigation systems that combine performance with efficiency. Rain Bird leverages state-of-the-art technologies to develop products that apply water in the most effective and efficient manner possible. From highly efficient sprinkler nozzles to cutting-edge control systems, Rain Bird's products use less water to maintain beautiful golf courses and landscaped areas.

Rain Bird is widely recognized as the leader in golf course irrigation control system technology. The revolutionary Integrated Control System™ provides innovation at a lower overall cost to golf courses, enabling the user to maximize system efficiency and conserve water. Rain Bird golf irrigation

products are used widely on golf courses around the world, including six of the top 10 golf courses in the United States, as recognized by Golf Digest™ magazine.

Our commitment to The Intelligent Use of Water extends beyond our products to initiatives aimed at educating industry and the wider community on best practices. For example – through the annual Intelligent Use of Water Summit Rain Bird brings together some of the world's leading experts on water, irrigation and conservation to debate water-related issues. Similarly, our Intelligent Use of Water Awards recognize contributions in outdoor water conservation. Rain Bird constantly seeks out new ways to build a better understanding of water's economic and environmental roles.

At Rain Bird we also believe that building partnerships with like-minded individuals and organizations is a powerful way to inspire change. To promote responsible water management, Rain Bird partners with organizations like KPMG, the American Society of Golf Course Architects, the European Institute

of Golf Course Architects, the GCSAA's Environmental Institute for Golf and the American Public Gardens Association.

We will continue to develop both products and initiatives that have the potential to inspire responsible, informed choices about the way we all use water each and every day.

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