

Does Construction Relate to Maintenance Costs?

Don't Underestimate Irrigation, Drainage, and Soil Systems

by RICKY J. KROEGER, CGCS

Director of Agronomy, Golfplan — The Ronald Fream Design Group, Ltd., Santa Rosa, California

ALL NEW golf course entrepreneurs recognize the necessity of completing construction of their golf course with a minimum of costs. Avoiding excessive construction costs leaves enough money to allow construction of a more elaborate clubhouse area or, better yet, to decrease the amount of investment necessary. Financial rewards go to developers who are prudent enough to build the best possible course at a reasonable price.

Through our professional involvement with investors/developers of more than 125

golf courses in over 50 countries spanning 20 years, we have seen projects completed with both a minimum of investment and an excess. While most have thrived, others have floundered after opening, in part due to excessive maintenance costs and poor-quality turf. At fault was a lack of appreciation of what it takes to keep golf course turf healthy, attractive, and playable for the customers who pay the bills.

Although opinions vary regarding the creative architectural strategies and artistic values that stimulate golfers to return over

the life of a course, it should not be forgotten that few will return if the course is not green and playable. The three critical physical factors affecting cost-effective maintenance — soil, drainage, and irrigation — have interrelationships sufficient to confuse most investors/developers and many golf course operators. In fact, many course architects don't sufficiently understand the agronomic and hydrologic principles necessary to minimize operational expenses after construction. If the architect cannot explain (or the investor/developer

Drainage installation occurring 18 months after construction. Malaysia.



will not agree to provide) the necessary soil, drainage, and irrigation resources for a given course, there is a real likelihood of excessive maintenance costs in the future. Insufficient priority allocated to these three major factors creates additional annual expenditures that offset income. Rarely do the savings in initial investment justify the expense of fixing it later. It is always better to *build it right the first time!*

The best golf course architects have an extensive background in landscape architecture, civil engineering, agronomy, hydrology, and horticulture, combined with a solid knowledge of golf course maintenance. The unwitting investor/developer who retains a golf course architect because he has won several golf tournaments sometimes trades name recognition for excessive maintenance costs and weak design. Although a certain amount of initial play is attracted by the pro's name, players do not return if the turf is not attractive and playable or if the design is not enjoyable to players of all abilities. Soil, drainage, and irrigation problems, when built into the golf course, require the type of ongoing expenditure that few new courses can afford after opening.

When those responsible for the maintenance of the completed course find themselves reseeded and resodding the same areas over and over again, it becomes obvious to them that the problem is with the soil, drainage, or irrigation system. Looking back, it often is painfully clear that the solution could have been done during construction and at a minimal price. To rework an area after opening often requires triple the original cost investment, inevitable golfer inconvenience, and the loss of potential return customers. Cash flow drops as golfers decide to play elsewhere during the repair of the same mistake on each hole of the golf course.

It is no wonder that many of the owners of these courses choose instead to manage what they have, increase the maintenance budget, and hope for the best. Money that should have remained as profit instead gets put into maintenance.

The Soil

The best soils for the growth of turfgrasses are not always available on the site. It is prudent, then, to involve an architect who has a good agronomic background. Although most soils can be managed to adequately support golf turf, the expense of doing so can vary greatly. Careful consideration must be given to adapt the irrigation and drainage systems to the existing soils. These two factors strongly affect the day-to-day expense of course operations. While sand may drain well, it requires very uniform distribution of

water by the sprinklers to avoid dry, brown, or dead areas. Clay, however, drains very poorly and requires very uniform distribution of water by the sprinklers to avoid wet areas.

Compaction of the soil during construction and use of the course after opening must be considered as significant factors that will affect the cost of maintenance. Compaction on a golf course is created when the weight of construction equipment, golfers, mowing equipment, golf carts, and water all combine to squeeze the air out of the soil. Water is the lubricant and weight is the force that packs the soil tightly together. When too much of this occurs, roots have no place to grow, drainage slows, the course stays wet longer after rainfall, and irrigation is plagued by wet and dry spots. As golfers play, and as maintenance equipment and golf carts are driven over these compacted areas, the entire situation gets much worse because there is now more water/lubricant available to promote additional compaction. In the end, the turf declines and affects playability. For golfers who continue to play the course, further inconvenience occurs as areas are disrupted for repair.

Compaction on new golf course greens has been greatly reduced since the advent of the USGA Method for Putting Green Construction. Now decades old since its first publication, and recently modified to increase options and reduce costs, this method is based on time-proven scientific principles. Once understood, these principles

can be applied in situation after situation around the golf course.

This has been accomplished in many high-rainfall areas of the world. Resistance to compaction, good drainage, root zone moisture retention, acceptable nutrient retention, and ease of handling are important assets when seven feet of rainfall occur during the playing season! In these cases, we construct a sand/humus root zone mixture, which holds to these principles, over all of the greens, tees, fairways, and roughs. Imagine 38 hectares (95 acres) of a sand/humus mix 30 cm (12 inches) deep, with 20 kilometers (12.5 miles) of drain piping. At \$5.00 per cubic meter (or cubic yard), the cost for the sand alone is \$700,000! These savvy developers do it because they recognize the problems that the existing poorly drained clay would cause and the number of days the course would be closed because of waterlogged conditions.

Clearly, the impact of soil quality on the financial well-being of the golf course cannot be overestimated. Specialized expertise is necessary to assess the soil to provide a reasonably accurate estimate of the cost of maintaining a site following construction.

Drainage

Anyone involved in a golf course construction project should recognize that nature can intervene at the worst possible times during construction and establishment. The potential effects of wind and water must be

Golfe de Fregate, Bandol, France (before and after photos). While good soil is not always available, it always pays off to seek the expertise of a golf course agronomist. The best time to consider annual maintenance costs is during planning, not after construction.



given due consideration from the initial planning of the course in order to minimize the negative financial impact of which these forces are capable. Most important, the speed with which excess water is removed from the soil significantly affects the profitability of the project and its annual operation expenses.

One of our island golf courses in the Pacific Rim was recently subjected to a typhoon that dropped more than 25 cm (10 inches) of water in less than 12 hours. The typhoon occurred a few months after planting the course, just prior to opening. During planning and design, the owner approved the installation of a comprehensive drainage system that we designed as an alternative to importing tremendous quantities of soil. In communications after the storm, the owners quite happily informed us that the drainage system worked so well that the course could have been opened on the day following the storm.

Excess water is a foe capable of eroding profits. It causes courses to choose between closing to avoid damage or risking the expense of repairing the damage caused by players. Unfortunately, grass does not stop growing during wet periods — on the contrary, it grows all the more. Mowing equipment used at this time causes compaction, rutting, and the resulting loss of playability. Those who choose to avoid mowing during wet periods find themselves with dissatisfied golfers. Long grass is difficult to play from, and waiting to mow until the ground

firms can cause scalping injury. Eventually, labor is diverted from routine maintenance to course repairs or drainage installation.

Drainage systems do not need to be expensive to work. They must, however, be well conceived and effectively built. Skimping on this vital element during construction eventually means either increasing the maintenance staff (with attendant increasing costs) or accepting lower standards of playability and risking loss of income.

Irrigation

The demand for irrigation water is directly influenced by soil texture, soil salinity, monthly rainfall, irrigation water quality, the total area to be irrigated, air temperature, relative humidity, and grass species. The architect of the course must consider all of these factors, as well as the source and availability of water throughout the year, when designing the total watered area.

The engineering involved in designing an irrigation system must take into account every square meter of irrigated area on the property. It starts at the water source and ends when the water leaving the sprinklers lands on the ground, uniformly distributed so as to minimize wet and dry areas. The quality of the installed system is often gauged by its ability to:

- operate efficiently given the skill of locally available labor

- evenly distribute water over the wide range of golf course conditions
- accept additional sprinklers in the future
- allow individual control of sprinklers in a specialized situation
- operate throughout the season with a minimum of repairs

Accomplishing these few objectives requires expertise and experience. Every deviation from prudent engineering increases both the daily maintenance and repair costs and potential golfer dissatisfaction due to inconvenience, lack of playability, and poor visual quality.

State-of-the-art irrigation equipment that is appropriate for the specific region may appear expensive, but it can pay for itself many times over. One such component is the fertilizer injector, which is used to inject liquid nutrients into the pipeline at the pumping station, eliminating the need for frequent trips across the course with tractors and spreaders. At a cost of \$10,000 to \$20,000, they pay for themselves within a few years through labor savings, reduction of equipment-related damage, and the shorter time period from turfgrass seeding/stolonizing to the opening of the course. Each irrigation system must be engineered to accommodate the specific labor conditions and level of worker/user sophistication in the local area.

Summary

It is imperative that the irrigation, drainage, and soil systems be integrated and carefully designed. As cost estimates are scrutinized to remove what may seem to be luxuries, extreme caution is in order. Typically, dollar-driven reductions in the irrigation, drainage, and soil systems erode future operational profits. The annual cost of maintenance necessary to overcome the effects of weaknesses in any of these elements is often greater than the initial savings generated.

The new golf course entrepreneur in the process of a pre-construction cost control review would do well to utilize an experienced agronomist or golf course superintendent before finalizing the construction budget. A lack of consideration for the soils involved, uniform water distribution, and adequate drainage will cause wet and dry areas to occur. These areas require triple the investment of time and money to repair after completion as compared with the cost of proper construction. Care must be taken to insure that future problems are not built into the course during the design and construction process!

