

I don't want to create the false impression that we can ignore our irrigation and just let the machinery take care of it. This is no more true than saying that every inch of the course needs water every day. What our setup does do for us is to give us a norm we can depart from in various orderly ways. It takes care of most situations for us automatically, so we can concentrate on finding and correcting the trouble spots.

Emergency measures

There are two quick couplers on every green, one on every tee, and additional ones every 150 to 200 feet down the fairways. These are under pressure and even if something happened to the system, they could be used. The Bermuda grass on the fairways could miss watering a few days during a dry spell but, of course, the greens and tees are more critical.

If we were at the far end of the golf course and saw a green that needed a little watering, we could hook up a quick coupler. But there is an easier way. We have underground control boxes to which we can connect portable units. If the manual override button has been pushed before we left the central programmers, the portable units can be used to set off groups of sprinkler heads for time periods of up to a half-hour. We can set them and go about other business.

Bel Air has obtained a new piece of equipment which permits us to override the central programmers without setting the manual button ahead of time. This takes power from the battery terminals or cigarette lighter of a truck or other vehicle to run the portable units.

Bel Air put in all new sprinkler heads and valves, and virtually all new piping: it is a new system from underground up. We were looking for dependability, important when you can go seven months with little more than a half-inch of rain, as we did recently.

The course has more than 1,300 sprinkler heads. More than 1,100 are full-coverage heads. The other 200 or so are part-circle sprinkler heads for placement near adjoining property and roads, where it is vital not to let water go outside our boundaries.

We installed 135,200 feet — more

than 25 miles — of new pipe. We put in 72,000 feet of 200-pounds-per-square-inch PVC solvent-weld pipe ranging from 1¼ to 2½ inches in diameter; 63,200 feet of 160-psi Ring-tite PVC pipe ranging from 1½ to 6 inches; and 1,100 feet of 10-inch Transite asbestos cement pipe to supplement existing Transite pipe on the number 4, 7, and 14 fairways. We put in 90,000 feet of Binar cable for the control system.

Los Angeles city water comes in to the course at three points: a six-inch meter by the number 3 hole; a four-inch meter between 11 and 14; and a three-inch meter near the suspension bridge by the clubhouse. In our old system, the four-inch meter, which irrigated the number 11 through 16 holes, was isolated from the rest of the irrigation system. If something happened to it, we were in deep trouble — there was no other way to get water there. But now they are all tied together. If the six-inch and the four-inch were both out we would still have enough water in the line to take care of our greens. As long as we still have the six-inch, we can irrigate the whole course.

Bel Air also kept dependability in mind while installing the irrigation system. The very first thing put in was the Binar control system. By running the control system 24 hours a day before the pipes were in, we were able to make sure there were no problems. There were none, so when the piping was finished for any portion of the system we were able to use it immediately. This was generally none too soon; each portion would have been without water for a few days during the transition.

Part of the Bel Air grounds crew was always available to help with the installation, which took five months, from November to April. This way, I think we got a better job — and when we were finished we had three or four men who knew where every valve was.

Construction would have been faster except we determined to keep the course open throughout construction. Friday afternoons we tried to clean up as much as possible for the weekends, but we let people play weekdays as well. Nine holes had to be closed one day, but that was all.



Before we started, people told us that this kind of automated irrigation would never work in Southern California: "You'll never be able to get as much water as you need." We did have to be careful. Instead of the 40 decoders on each central programmer allowed by the manufacturer's design, which would probably be fine for New England or the middle West, we only put on 26 to 28. Since we have to give each location a half-hour per night frequently, 40 locations on a programmer would take 20 hours to go through.

But we have found that the automatic system will do anything we want it to do, providing it is installed properly and we don't ask it to do too much. Having just gone through a seven-month drought, we can safely say we've proved it will operate in California. □



TOP PHOTO shows typical difficulty encountered in trenching coral rock in the Florida Keys. It's not hard to imagine the work necessary to turn that rock pile into a lush looking golf course. BOTTOM PHOTO gives a look at the results of all that hard work, as well as illustrating one of the main reasons for the courses' beautiful appearance: automatically controlled sprinkler rotors. Turf gets very thirsty off the tip of Florida, but automatic irrigation takes good care of its needs.



ABOVE: Getting enough water to feed a golf course — let alone three of them — can be even a bigger problem than distributing it. The Ocean Reef Club had plenty of water available, but it all had salt in it. So a desalinization plant was built, complete with the million-gallon-capacity holding pond shown.

Irrigation conquers coral on the Keys

On the Ocean Reef Club's golf courses on Key Largo, the northern-most of the Florida Keys, golfers play on coral — but they would never know it from the way the ball behaves. The gently undulating fairways are lush with grass, and the greens are smooth and true.

All of which took pioneer planning and landscape engineering to retain the special beauty of the coral country — with its white rocky texture, lagoons, and lush mangrove swamps — and at the same time develop and maintain courses that pass the muster of the discriminating golfer.

Creating a golf environment on Florida coral requires overcoming a

variety of rather unique problems. Coral itself can be a formidable base for growing grass, and the Keys have more than their share of lightning which can damage automatically controlled irrigation systems.

Fortunately, these unusual difficulties have been mastered at Ocean Reef, as has an additional one that is common to golf establishments — that of acquiring plenty of good water. Golf courses have tremendous thirsts off the south tip of Florida, where temperatures are in the 70's and 80's in winter and in the 80's and 90's during summer. Although humidity averages 75 to 90 percent year-round, the rainfall of about 30 inches a year isn't nearly enough. That, of course, is because of the consistently high temperatures.

Why build on the northern Keys?

Because nature has made them a beautiful, remote setting which is ideal for the kind of living demanded by members of the exclusive Ocean Reef Club.

The club has two courses in operation now and is laying out a third. The original 18 holes are called the Dolphin Course. It is built on solid coral rock, the prevalent soil of the Keys. The fact that there's no topsoil on the fairways has put the hybrid bermuda to a severe test. However, coral has advantages as a medium on which to grow plant life. It is a fine absorber of

organic material and particulates that are good plant food, and it provides unexcelled drainage.

At one time the bermuda was maintained by Ocean Reef Superintendent Tom Grondski on only 50,000 gallons of water a week. The one water source was a main line from the city of Homestead, which also supplied the resort's homes, condominiums, clubhouses, and other facilities — as well as cities all the way down to and including Key West.

When construction began in 1973 on the second 18 holes, the 6,600-yard Barracuda Golf Course, a seep well was drilled and a desalinization plant was built that has a capacity of 900,000 gallons a day. A million-gallon water tank was assembled beside it. The desalted water is mixed in the big tank with fresh water from Homestead. The combination provides the entire Ocean Reef complex, not alone the Barracuda Golf Course. The well water contains up to 15,000 parts per million of salt, but the reverse-osmosis desalinization plant takes this salt content way down.

Incidentally, some land plants do well in ocean water which averages 30,000 parts per million of salt. The mangrove trees that are native to the Florida Keys grow in it. University of Arizona plant scientists have found an alfalfa seed that tolerates 16,000 ppm of salt. And some other plants can tolerate salinity up to 15,000 ppm.

Water may not be plentiful at ground level in the Keys, but it is abundant in the depth of the coral reefs. The difficulty lies in the fact that it is ocean water. However, paleoecologist Heinz Lowenstam of Caltech points out that the rain water which percolates through the coral forms a lens on top of the subterranean ocean water. Salt water, being heavier, will remain beneath the fresh water unless a disturbance mixes them. Careful extraction of water in the lens area could further reduce the salt problem.

Irrigation helps

The Barracuda Course, designed by golf course architects Von Hagge & Devlin, Inc, also was laid out on solid coral rock. However, Karl Litten, the chief designer of Barracuda and the third course — the Harbour Course, which is under construction — put in a



Ocean Reef Superintendent Tom Grondski, course designer Karl Litten, and maintenance crew foreman Kathy Austin discuss operation of the programmable sprinkler controller.

mixture of native muck and imported sand as a topsoil mix for the tees, greens, and fairways.

A fully automatic, electric, double-row Rain Bird sprinkler system was installed on the Barracuda Course by Camstaff Construction Co., the general contractors for all construction at Ocean Reef. Superintendent Grondski described the job as excellent, even though it was the first installation of a golf course irrigation system ever attempted by the firm. The 12-inch, cement-asbestos mains were laid in sand to prevent the coral from scratching or cutting them. The sprinklers are all pop-ups, located 65 to 75 feet apart. The close spacing virtually eliminates dry spots which might otherwise develop due to the prevailing winds typical of Florida's Keys.

The irrigation equipment is completely protected from lightning, which is common in the Keys. Arrestors and other devices have been developed by the manufacturer to do that job. The equipment never has been damaged by lightning.

Superintendent Grondski finds that because of the versatility of the controllers and the uniformity of distribution of water by the rotary pop-up sprinklers, he is able to make maximum use of his limited water supply. In addition, his assistant finds the system easy to understand and simple to program. The sprinklers are all operated automatically and electrically from field controllers located strategically throughout the course.

This, plus the very low upkeep and maintenance costs incurred with the sprinkler system on the Barracuda Course, is the reason Grondski chose the same kind of system for his third course — the Harbour Course.

The new Harbour Course will have Tifgreen bermuda grass on the greens and No. 419 bermuda on the tees and fairways. The roughs will be common bermuda. It will also use some 100,000 cubic yards of imported marl for turf-grass topsoil to prevent drainage into the surrounding mangrove swamps. The greens will have 12 inches of marl; the tees and fairways, three to four inches. The mangrove trees, 30 to 50 feet high, border parts of the course and are so dense that you can't penetrate a grove of them. Ecologists want to preserve the groves to keep the balance of native wildlife undisturbed. Ocean Reef and Camstaff Construction are cooperating fully in that program.

With the help of irrigation and desalinization, the coral reefs will stay green for golfers. □