clearly understood, and it is certainly desirable, but it should be used more discriminately. Sand can be used to enhance both play and course beauty without compounding maintenance problems."

The golf course superintendent of today must ask himself when preparing his budget, "Am I kidding myself about the constant shoveling of sand in the 16th green bunker after each rainstorm or should the bunker be rebuilt to correct the condition of improper construction and drainage?"

Frequency of weeding, edging and raking a bunker is easily determined by the demand of manicuring that is desired by the particular club. Mowing around a bunker with a triplex or rotary mower will take a certain amount of time and should be planned in the budget. Frequency will depend upon climate, irrigation and feeding practices within the bunker area.

Often it may not be too steep a bank but rather, the consistency of the sand being used that makes the sand come rolling down during a rainstorm.

Green Section Recommendations For Sand Particle Size Range for Bunker Use

ASTM Mesh 16 to 60
Millimeter 1.00 to .25
Sieve Opening—inches 0.0394 to 0.0098

Sand explosion out on the collar or into the green in time leaves a very droughty condition to sustain plant life. Hand watering may be required to correct this condition, but time and money may not be available. Sand that has built up should be removed and replaced with new soil and sod.

Each bunker has its priorities. Examine the bunker to determine what measures are needed to correct problems and ease your cost of maintenance. As one Superintendent described his bunker situation to me recently, "It is my opinion, we will always have second class bunkers unless we can completely rebuild them from the bottom up, by installing the proper drains and slopes. Perhaps reducing the overall size by increasing the shaping or scalloping of the present 'monsters' would make the bunkers more playable and give the course more eye appeal and depth. Only in this way will be have first class bunkers."

RAIN SHELTERS

By LOUIS F. OXNEVAD

The old rain shelters at Riviera Country Club in Coral Gables, Fla., were built in the 1940s and were sized to hold one golf cart plus riders. By 1974, they were in need of replacement. I presented pictures to the Green Committee of rain shelters I had built at other courses. They could accommodate more than one golf cart and were more attractive than our existing shelters. The Green Committee agreed to the addition; I drew several sketches and submitted them for bids. The lowest bid for three new shelters, which did not include the final roofing material was $9,800. This was more than the budget would allow, so I asked for $3,800 and began making plans and investigating materials and costs. By using the golf course crew, I could reduce labor costs.

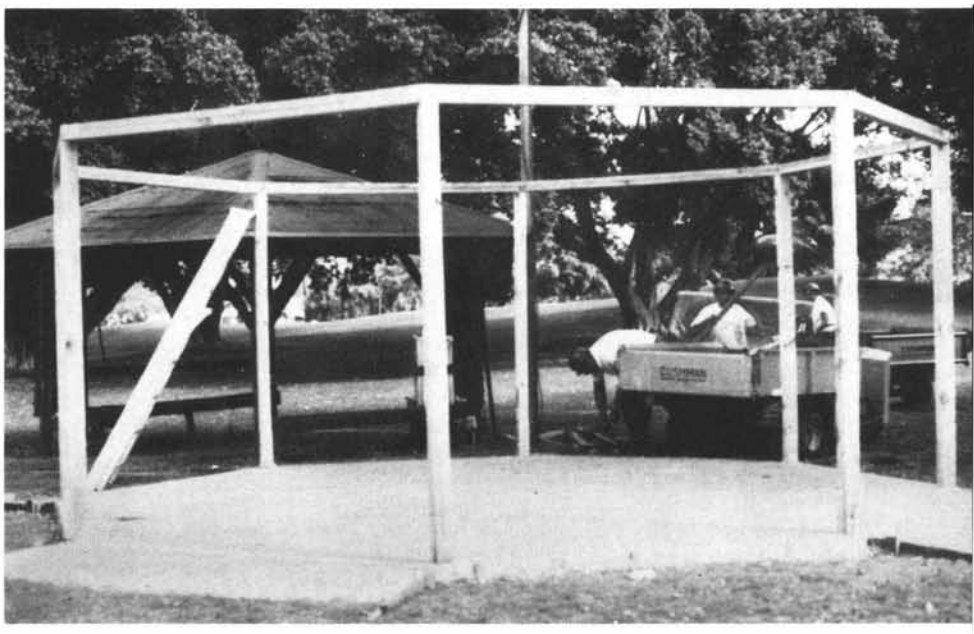
The first consideration was the size of golf carts and the number each shelter could accommodate in the smallest amount of space. An octangular shape seemed the most sensible. This would allow four carts to enter from four directions and also give protection from wind and rain on all four sides. Selection of the material was the second consideration. We chose pressure treated lumber that would withstand all types of weather. Galvanized nails were used throughout.

Steel wire was placed within the octangle to reinforce the concrete. We used four cubic yards of 2,800 pound strength and poured the concrete four inches thick, sloping it slightly from the center to the outer edge and filling the eight footing holes.

Before the concrete set we placed metal channels into the eight corner footing holes. These metal channels were made by a local metal shop to our specifications of 24-inches long and wide enough to hold a 4" x 4" stud. Three sets of holes were drilled into the metal channels at distances of four inches from the bottom, four inches from the top and eight inches from the top. An eight-inch bolt was placed through the bottom set of holes for an anchor in the concrete that filled the footing holes.

We let the concrete cure for 36 hours and then removed the 2 x 4's that formed the original shape from the outer edges. The 4 x 4 corner studs were then bolted to the eight metal channels using the

The old and beginning of the new.



Taking shape.

other two sets of predrilled holes.

At the top of each corner stud, 4 x 4 headers were bolted for the outer edge support of the roof. We framed in the four areas for walls, which were seven feet high and eight feet wide. Two ½-inch pieces of 4' x 8' rough sawn cedar plywood were used for each wall area.

The rafters were 12-foot long 2 x 4's which gave us an 18-inch overhang. We used a 4 to 1 pitch for the roof framing. The most difficult part of the construction was securing the first four roof rafters. These were cut on an angle for joining at the center of the roof. The peak of the roof measured 12 feet from the concrete floor slab. Galvanized metal rafter plates were used to secure all rafters to the headers. The other 12 rafters were cut on angles to fit in the center and secured to the headers. Two sets of braces were used between each rafter at distances of three feet and seven feet from the center. The braces nearest the center were cut to form a 16-sided star. We used ½-inch 4' x 8' plywood for the roof sheeting and topped it with two layers of 30-pound felt.

To finish the overhang, 1 x 8 redwood was used as a facer board. This extended ½-inch above the roof sheeting. At this point, a lightning rod was installed with copper cable attaching it to a copper pile driven 12 feet into the ground.

The final roofing material was red river gravel mixed with epoxy, the same mixture I had used for cart paths in the past. This mixture was spread ½-inch thick, beginning at the center roof and working

The rafters

toward the outer edge. The strength of this roof should support heavy snow as well as withstand any strong Florida winds. The mixture of red river gravel and epoxy makes the roof sparkle in the sunlight which is most attractive.

Even though we used durable type wood materials, we stained all wood areas with a mixture of 2 gallons wood preservative to 1 gallon of redwood stain. This gave a light reddish brown color that blended with the gravel roof and made the shelter blend more naturally with the surroundings.

The interior of the shelter contains two benches and an electric water cooler. Mounted near the top rafters are three of our automatic irrigation controllers. This does not detract from the inside appearance and keeps the controllers protected as well as giving the members something to talk about while using the shelter.

The total cost of all three shelters was less than the $3,800 allocated. Keep in mind though, this was for materials only and did not include labor. Knowing that it was something that didn't have to be mowed, raked, swept or picked up every day gave the golf course crew a sense of pleasure as well as pride in a task well done.

Around the outside of the four outer walls we planted fern and red flowering shrubs. The planting helped tie the new building into the landscaping scheme of the golf course.

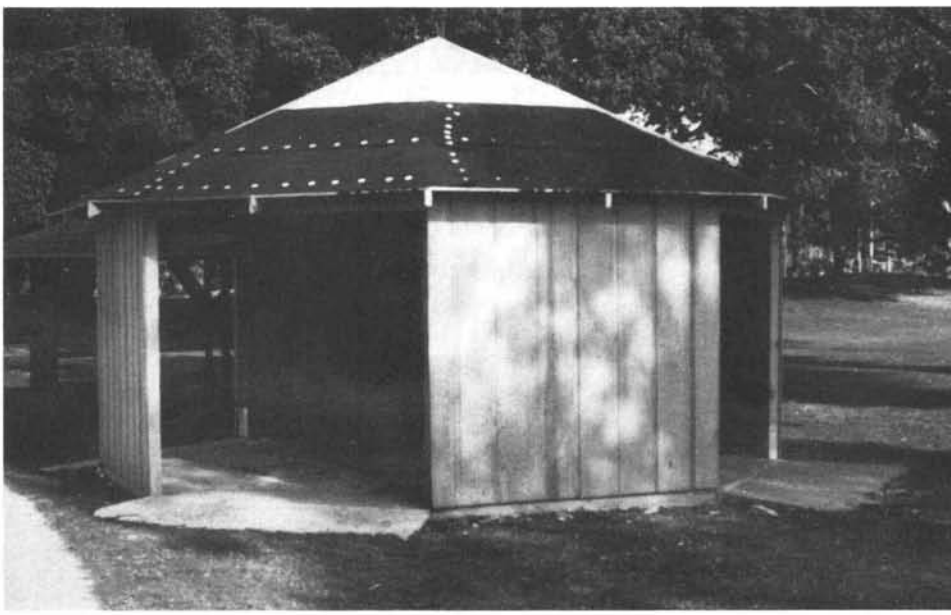
If we were doing it again, we would use 4.5 cubic feet of concrete and form and pour the cart ramps into the shelter at the same time as the floor slab. We had to tie the ramps in later.

We had so many compliments on this project that one of our members, Darrell McQueen, drew up a set of plans for our future use.

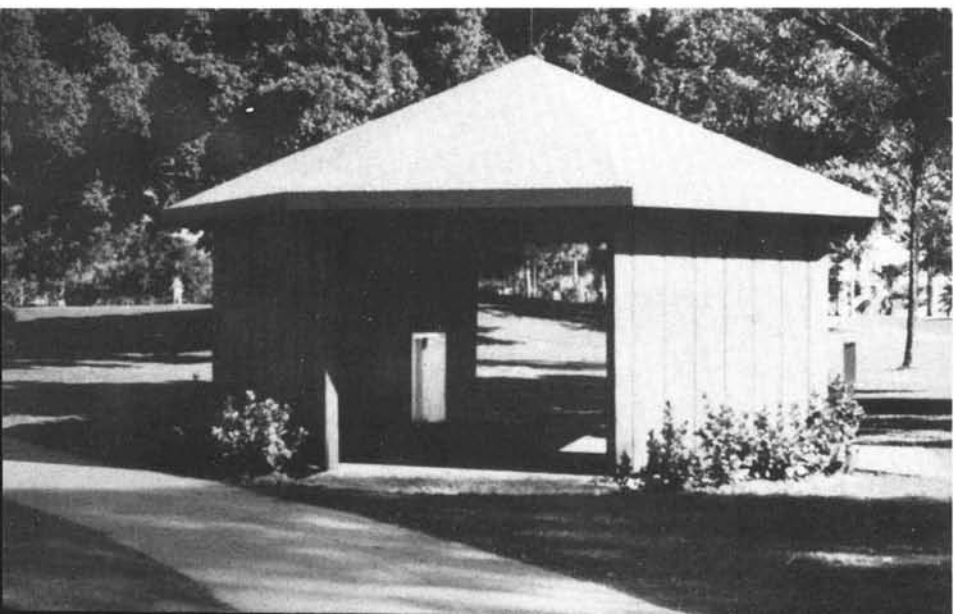
ABOUT THE AUTHOR

Louis F. Oxnevad majored in Horticulture at North Carolina State University and has served as golf course Superintendent at Riviera Country Club, Coral Gables, Florida and as a USGA Green Section Committeeman for many years. His contributions to his profession include President of the Florida Superintendents Association, Triangle Turfgrass Association and South Florida Superintendents Association. He currently is serving on the Board of the Florida Turfgrass Association.

The dome.



The roofing.



The finished product; landscaping, water cooler and all.