from a quarter million dollars to well over one million dollars. Estimates should include the cost per irrigation head and the cost per foot of pipe and wire. Controllers are so elaborate today that virtually anything can be done. Make sure that you get what you pay for, and that the system is installed to grade and tested prior to seeding.

Sand bunker construction should be straightforward enough, but shortcuts and unnecessary expenditures for designer sands are not uncommon. Make sure drains are installed in each bunker and that they do not exit the bunker and end up in a low-capacity dry well. Bunker sands are available in all types of colors and prices. It is not necessary to have sand flown in from the Sahara Desert via the Flying Tigers on 747s to satisfy the whims and desires of the architect. Often, there are many good sands available at reasonable prices. Choose carefully.

Cart paths are just a way of life on golf courses today. If you want to have carts and good-quality turf, then paths are needed. They can be constructed from many suitable materials, including crushed stone over geotextile fabric, asphalt, or concrete. A typical course would have between 21,000 and 25,000 linear feet of cart paths. They should be at least eight feet wide because it is less expensive to install with large equipment and because this width can accommodate maintenance equipment as well as golf carts. When the paths are installed prior to the final seedbed preparation and seeding, the contractor can use the paths and avoid the need for service roads on the course. Cart path installation at an early stage on a new course also allows for incorporating them into the design with greater aesthetic concern.

THESE ARE the major facts of constructing a golf course. Please remember that some golf course superintendent has to maintain what an architect designs and a contractor builds. Consider the maintenance costs prior to construction to be sure that there is enough money to maintain what will be built.

Golf course construction is not some magical operation that transforms a piece of ground into a golf course. It is a step-by-step operation that should be accounted for in numbers and procedures. Make sure that you get what you pay for, and do not be mesmerized by a personality. There are many architects and contractors in the business who can design and build a golf course to suit your budget; the open-checkbook approach, which greatly inflates the cost of golf course construction, should not be part of the project.

Editor's Note: *Mr. Miller is well qualified to write on the subject of golf course and putting green construction. He has built more than 50 putting greens to USGA specifications and has recently finished building a new golf course, Quail Chase Golf Club, in Louisville, Kentucky. Two other courses, the Oxmoor Golf and Steeple Chase Club and the Glen Mary Golf Course, are currently under construction.*

ALL THINGS CONSIDERED

Consider *Poa annua* For Your New Green

by PAUL VERMEULEN
Agronomist, Western Region, USGA Green Section

ESTABLISHING a new putting green with *Poa annua* might not seem like sound agronomy, but when the concern is consistency, it would have great appeal to the average golfer. Even though the serious turf student would probably not agree, I think a newly built green on an old golf course should be planted with the grass that exists on the remaining 17 greens, even if it happens to be *Poa annua*.

You are likely asking yourself how the decision to plant *Poa annua* on a new green can have any merit when practically everything that has been written says otherwise. The answer is that one of the fundamentals of golf course management, not necessarily turfgrass science, is to try to maintain all 18 greens of the same general character and putting quality. Reestablishing a new green with a foreign-looking turfgrass, such as bentgrass, is a problem if this is your philosophy.

First of all, bentgrass looks different, not better or worse, but different from *Poa annua*. I admit that an average golfer usually can't distinguish *Poa annua* from bentgrass on a bent/*Poa* putting green, but put a bentgrass green in the middle of 17 bent/*Poa* greens, and they can pick it out every time.

Second, a bentgrass green has different playing characteristics because it must be kept on the dry side if you truly intend to maintain bentgrass properly. This makes the green firmer than the others, and perhaps a little faster. Again, consistency is jeopardized for the sake of *pure* turfgrass science.

This philosophy of establishing *Poa annua* instead of bentgrass should also carry over to the putting green nursery. In this way, repairs that must be made using sod from the nursery will heal without notice. If repairs are made with bentgrass sod in a predominantly *Poa annua* green, the scar will not disappear for several years.

Even though this opinion may never appear in the textbooks, I feel strongly about not sacrificing the consistency of the greens for the sake of growing bentgrass in the middle of a *Poa annua* golf course.

Editor's Note: *Be sure to consider regional concerns, such as severe winter weather or extreme summer heat, when selecting a grass for establishing a new green.*