Golf Green Construction
A Review of the UC Method

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During the mid-1960s, Dr. John Madison and Bill Davis from U.C. Davis began to look at the problems associated with heavy use of golf greens, including failure due primarily to compaction of the growing media. They studied all types of amendments with various sand gradations and concluded that the "right" sand, unamended, can produce the most acceptable golf greens.

There are two potential problems with the pure-sand green concept, which must be addressed before superintendents and golf course architects are willing to accept it. First, sands are droughty and do not hold sufficient water to make them suitable as a field-growing medium. Secondly, sands have very poor cation exchange capacity and, therefore, do not hold nutrients needed for plant growth.

These two objections to the concept are valid for sand as a general soil medium. However, the sand recommended for golf green construction is a specific sand that, under conditions of extensive use, will not compact. This sand is uniform on the fine side and retains moisture in the root zone sufficient for two to three days between irrigation events at normal summer evapotranspiration rates. Such a sand drains excess water from the root zone in less than 15 minutes, no matter how much water it receives in a short period of time.

The real key to selection of the right sand is a medium in which 90% to 100% of the particles are no larger than 1 mm in diameter and no finer than 0.1 mm, with the dominant fraction between 0.5 and 0.25 mm.

As for nutrients, problems with fertility management are no greater for pure-sand greens than they are for other putting green media. However, during establishment, greater attention to fertility is required. Sands that meet the above specifications are becoming more available as the golf market continues to grow.

Most greens are graded evenly at the subbase to have a 2% to 4% slope from back to front. Since water reaching the green will infiltrate readily, surface drainage is not needed.

At most construction sites, the parent soil has a very low water infiltration rate, less than an inch per hour. The infiltration rate of sand (always test yours before construction) varies from 10 to 50 inches per hour when compacted. A sand green does not depend on surface drainage to remove water.

A perched water table can be produced at the interface between the sand and the subbase soil during heavy rains or excessive irrigation. Therefore, a tile system is recommended to remove this excess water. The most important drain tile location on the green is the lowest area, generally the front of the green. Water must be removed so that it does not produce a soft approach into the green. The spacing and need for additional tile depends on the size of the green, the slope of the soil around it and the rate of excess water falling on the green.

Nutrients in sand vary depending on whether or not the sand contains any secondary minerals or is pure quartz. Thirty-five suitable sands for golf green construction have been tested by the University of California. All sands were deficient in nitrogen and sulfur. Turf would die without supplemental nitrogen and sulfur applications. Nitrogen and sulfur should be supplied every two to three weeks until the green is well established.

Fifty percent of sands had adequate phosphorus and only nine percent had a severe deficiency when supplemental phosphorus was withheld. Fifty-three percent of the sands had a naturally adequate supply

of potassium, with only three percent severely deficient. Even though many of the sands appeared to need only nitrogen and sulfur, a starter fertilizer containing phosphate and potassium is recommended.

After many years of study and observation of sand greens, it appears that they are effective solutions to problems associated with high-use putting greens, particularly when coupled with a program of light, frequent sand topdressing.

Like any green, a sand green can be mismanaged by daily irrigation during periods of low evapotranspiration, causing excess leaching of nitrogen and potassium. Overuse of all nutrients produces excess thatch. Use of natural organic fertilizers (particularly sewage sludges) can seriously reduce infiltration. Furthermore, overuse of herbicides and fungicides can be toxic to roots. Diseases are generally reduced due to the rapid drainage characteristics of sand greens.

Properly managed sand greens are firm, fast greens when cut at normal height and frequency. For the golfer, sand greens can provide a quality putting surface 365 days per year, even under high use.

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[Dr. Harivandi recommends superintendents and sports turf managers obtain a copy of *"Sand Putting Green Construction and Management"* by Bill Davis, environmental horticulturist emeritus, University of California, Davis. The price is $10 and is available from ANR Communication Services, University of California, 6701 San Pablo Ave., Oakland, CA 94608. You can call in your order to (800) 994-8849. Ask for publication number 21448.]

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