USGA SPECIFICATIONS

PROPER GREEN CONSTRUCTION SOLVES PROBLEMS LATER

By BRIAN SILVA

Soil compaction is the most serious problem of intensively used turfgrass sites.

Brian Silva is a USGA Green Section agronomist for the Northeast region. He was graduated from the University of Massachusetts and taught at Lake City Community College in Florida prior to joining USGA.

An ideally completed round of golf on a par 72 golf course would find one using 36 of these strokes on the putting green. In addition to the time spent during play on the greens in a round, a similar amount of time is often spent discussing characteristics such as speed, color, shot holding capacity, surface grain and contours, and the like.

Certainly greens receive the closest scrutiny of any feature on the golf course. This attention requires that great care be taken in the design and construction of putting greens and their immediate surroundings.

Architecturally, a putting green should appear natural, as if it were part of the original site. Putting surfaces and collars should be designed so that surface water is drained away rapidly and efficiently. Contouring of the green should provide a minimum of two, and preferably, three or four directions in which surface water can flow. No more than 60% of the surface run-off should be drained in a single direction. Water should be directed away from the normal line of play, yet all too often greens are designed with a single surface drainage pattern which directs the water to the approach area of the

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front of the green. This approach area is perennially wet and susceptible to mower damage, disease incidence, compaction and annual weed encroachment. In cold climates, these back-to-front drainage greens are susceptible to ice cover formation as snow cover melts at the rear of the green during the warm part of a winter day. The water then has to travel the length of the green in leaving the putting surface and often refreezes as temperatures drop in the late afternoon and early evening. Additionally, low spots and pockets should be avoided as should channeling of the water over restricted portions of the green collar.

Contemporary greens are raised above fairway level as opposed to the fairway-type greens found on many older courses. The raised green offers greater visibility and shot holding characteristics, allows improved surface drainage and also permits better air drainage and circulation.

The architectural tenet "form follows function" can well be applied to putting green design. For example, a green on a long par 4, where a golfer would be expected to play the approach shot with a fairway wood or long iron, should be designed with a long axis. If bunkered, the bunkers should be wide set, allowing the golfer the opportunity to roll the shot to the green. Conversely, on a short approach, the golfer is expected to hit a high shot and the green can be fronted with bunkers and possess a relatively short axis. An approach shot of intermediate length would dictate a compromise of these two green designs.

While there are various methods of putting green and collar construction, there is general agreement on a number of points. First of all, a means must be provided for the removal of excess water. This removal will help to prevent the waterlogged conditions conducive to disease incidence, shallow rooting, inadequate aeration and overall poor turf condition. Secondly, the green must retain sufficient moisture and nutrients in the rootzone. Lastly, the putting green and collar should be resistant to compaction. Soil compaction is the most serious problem encountered on intensively used turfgrass sites.

The United States Golf Association Green Section Specifications for Putting Green Construction represent the most thoroughly researched and tested method of putting green construction. Originally proposed in 1960, the Green Section specifications have been refined as a result of additional research and in-field experience.

This method of putting green and collar construction details a process by which the green and its immediate surroundings are constructed in layers. Subsurface drainage tile lines are covered with a four-in. blanket of pea gravel. An intermediate layer of coarse sand to a two-in. depth is spread evenly over the pea gravel and followed by a 12 to 14-in. layer of topsoil mixture.

Close adherence to these specifications will result in the formation of a perched water table. This perched water table will permit the relatively coarse textured topmix to markedly increase its water holding capacity. However, under conditions of heavy rainfall, the topmix of a green constructed in this manner will drain excess water rapidly. In short, the topmix can be made to hold more water than it would were layering not involved, but it cannot be made to retain water in sufficient quantities to be deleterious to plant growth.

Recent research has shown that the coarse sand layer can be omitted during construction under certain conditions. This intermediate layer functions mainly to prevent the washing of finer soil particles into the drainage system of the green and to assist in water retention in the topmix. Close to ten years of research has shown that a proper particle size relationship between the topmix and gravel can eliminate the necessity for the coarse sand layer without significantly reducing the water retention capacity of the topmix or damaging the gravel layer through particle migration during drainage. The decision regarding the necessity for the coarse sand layer can only be made through particle size analysis of the topmix and gravel to be used in construction.

The drainage tile is inset in four-inches of pea gravel, which is then covered with a layer of coarse sand and a foot of topsoil.

The success of any method of putting green and collar construction depends greatly upon the physical and chemical characteristics of the soil mixture or topmix in which the turf will be growing. The heavy traffic received by greens and collars requires that the topmix be sufficiently resistant to compaction in order to retain the aeration essential to the growth and development of a healthy root system. A proper infiltration rate will allow for the rapid movement of excess water into and through the soil profile. Again, the soil mixture should be able to retain moisture and nutrients in quantities sufficient for plant growth.

Native soils which provide these characteristics to the proper degree are almost nonexistent. In order to assure the proper characteristics, a soil mixture must be developed through the aid of physical soil analysis. The variability of available construction materials such as sand, soil and organic matter, and the required physical and chemical characteristics, rule out the determination of a topmix by any other means. Too many greens have been constructed, with less than desired results, from a soil mixture that "looked good" or was fine for growing agricultural crops.

Once the proper blend of materials has been determined for the topmix through extensive testing, the proper mixing of these materials becomes the next step in construction. Off-site mixing is essen-

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tial to the success of this step. Mixing materials on-site with a rototiller or similar machine simply proves to be an inadequate method of properly mixing soil. Attempts to uniformly rototill diverse materials such as sand, soil and organic matter to the depth required in putting green and collar construction fall short of the desired goals.

The initial USGA Green Section Specifications recommended that material to be used in construction of the collar be in place and shaped before the prepared topmix was placed on the green. However, this recommendation has been refined and now calls for the collar to be constructed to the same specifications as the green. The collar is subjected to levels of traffic and management similar to those imposed on the putting surfaces. Exacting construction specifications will permit the turf on the collars to respond positively to these conditions.

The final step in the construction process involves turf establishment. In many cases, the desire to get the green back into play as soon as possible results in establishment by sodding. This is acceptable only if the sod has been grown on a topmix that is exactly the same as that used in construction of the green. Sodding under any other circumstance results in a soil interface just below the turf which decreases the chances of success. In such instances, seeding or vegetative propagation by sprigging or stolonizing is certainly the preferred method of establishment from an agronomic point of view.

The specifications outlined here are somewhat exacting. Soil testing is essential to the success of this method. Many clubs choose not to construct putting greens to these specifications because they believe construction costs will be excessive. A properly constructed putting green is an investment that will pay dividends over many years. Proper soil and drainage characteristics will yield a healthy turf less susceptible to disease and annual weed encroachment. Problems associated with wet wilt and greens too wet to play should be minimized. Resistance to compaction will result in a healthier, more extensive root system which is able to exploit a greater volume of the soil profile in search of water and nutrients.

In situations where accepted specifications are not followed, no degree of maintenance expenditure will produce greens offering consistently good putting characteristics and agronomic conditions conducive to desirable plant growth. Green construction involving less expensive and less effective method can end up being more costly in the long run. Certainly there can be nothing more expensive than rebuilding a green.

Any method of putting green and collar construction will involve a sizable expenditure of funds. The USGA Green Section Specifications put the odds for success in such an endeavor well in your favor. **WTT**