

Highlights of the 2004 Revision of the United States Golf Association Specifications for Putting Green Construction



Since their release in 1960, the USGA's specifications for green construction have been the standard in the golf industry across North America and many other areas of the world. The purpose of the specifications is to provide a consistent, high quality golf green. They are also often used as specifications for high end sports fields. The specifications are reviewed periodically and updated as new construction techniques and products become available and as scientific research proves them reliable. The last updates to the USGA Recommendation for Putting Green Construction were in 1993.

Increasing demands on putting greens coupled with volumes of research into new construction techniques and amendments for golf greens have prompted a review of research findings and incorporation of those techniques and products which have proven effective. Over a hundred scientists, agronomists and industry experts reviewed the scientific literature to incorporate some of these research findings into the recommendations. In April 2004, the revised *USGA Recommendations for a Method of Putting Green Construction* were released.

One main change deals with the addition of the recommendation to include the use of a flat pipe in addition to round PVC drain pipe. As well, there are changes in gravel size recommendations for greens where an intermediate layer is not used. As an alternative to round pipe placed in a trench, flat pipe placed directly on the prepared subgrade may be used, provided the flat pipe conforms to ASTM D 7001, is a minimum of 30 cm in width, and is not covered by a geotextile sleeve. The flat pipe should be stapled to the subgrade, or otherwise held in place to prevent shifting during construction.

In addition, there are changes in gravel size recommendations for greens without an intermediate layer. In previous recommendations, the bridging factor specified that the D15 of the gravel be less

than or equal to 5 times the D85 of the rootzone. This has changed to the D15 of the gravel to be less than or equal to 8 times the D85 of the rootzone. The permeability factor remains the same. The uniformity factor specified that the D90 of the gravel to D15 of the gravel must be

diatomites and zeolites can be used in place of or in conjunction with peat in root zone mixtures, provided that the particle size performance criterion of the mix are still met. The performance criteria are represented by the physical properties of the root zone mix. The USGA also

Table 1. Size Recommendations for Gravel When Intermediate Layer is Not Used.

Performance Factors	Recommendations
Bridging Factor	D15 (gravel) less than or equal to 8 X D85 (rootzone)
Permeability Factor	D15 (gravel) greater than or equal to 5 X D15 (rootzone)
Uniformity Factors	D90 (gravel)/D15 (gravel) is less than or equal to 3.0 No particles greater than 12 mm Not more than 10% less than 2 mm Not more than 5% less than 1 mm

less than or equal to 2.5. That has changed to have the D90 of the gravel to the D15 of the gravel to be less than or equal to 3.0. There are additional uniformity factors. No particles in the intermediate layer can be greater than 12 mm diameter. Not more than 10% of the particles can be less than 2 mm diameter and not more than 5% can be less than 1 mm. These changes are summarized in Table 1.

The key to the success of these new recommendations is to work closely with soil testing laboratories to select the gravel. These changes will make materials that comply with the specifications easier to obtain and reduce construction costs.

Secondly, porous inorganic amendments such as calcined clays, calcined

Table 2. Physical Properties of the Root Zone Mix.

Physical Properties	Recommended Range
Total Porosity	35-55%
Air-filled Porosity	15-30%
Capillary Porosity	15-25%
Saturated Hydraulic Conductivity	Minimum of 150 mm/hr (6 inches)

specifies that it requires that any of these amendments be incorporated throughout the whole 30 cm depth of the rootzone mixtures. The physical properties of the root zone mix are presented in Table 2. These have not changed from the previous recommendations.

For a complete copy of the 2004 recommendations, visit the USGA web site at <http://www.usga.org/green/coned/greens/recommendations.html>. ♦