Four Steps to Help Ensure a Successful Green Reconstruction Project

By proceeding step by step, this complex process can be made manageable.

BY JIM MOORE

Many golf courses eventually find it necessary to rebuild some or all of their greens. The impetus for such a major reconstruction effort comes from many sources, including:

- Increased play on greens that are too small to withstand the traffic they receive.
- The desire to change to new turfgrasses that are superior both agronomically and in terms of putting quality.
- A decline in the quality of irrigation water, demanding a better-drained rootzone.
- A desire to upgrade the course architecturally.

Although rebuilding putting greens might seem fairly straightforward to some, it is actually a complex process with many opportunities for problems to arise. Selecting the proper construction materials and making certain those materials remain consistent throughout the project are absolutely critical — regardless of the green construction method chosen. On an existing course about to embark on a green reconstruction project, the golf course superintendent is in the best position to implement and conduct a good quality-control program to help ensure the project's success.

The remainder of this article details four major steps that should be part of every greens reconstruction program.

To identify the best materials to be used in a reconstruction project, visit potential sand and gravel suppliers and learn about their products.

STEP 1
Initial Identification of Suitable Materials

When a course determines that green reconstruction is at least a possibility, the process of identifying prospective rootzone materials should begin. Since materials costs are a major component of the total construction costs, and since the costs of materials vary widely from place to place, an accurate estimate of the total cost of the project cannot be determined without identifying the materials to be used.

To identify the best materials, the golf course superintendent should visit potential sand and gravel suppliers. If organic matter is being considered as an amendment, it may also be possible to visit the supplier, if it is local.

The superintendent should make an effort to get to know each of the suppliers and learn about their products and overall operation. He should share with the supplier information about golf green construction in general and specifics about the project being considered. The USGA Green Section can help by providing technical information regarding golf course construction issues to any interested party, free of charge. The superintendent should question the supplier about issues such as production capability, consistency of particle size distribution (virtually all sand and gravel suppliers regularly screen test their products to meet the requirements of other customers, such as concrete producers and the Department of Transportation), the availability of an area for blending and/or stockpiling, and, of course, cost.

When it has been determined that the supplier can produce the sand and/or gravel in sufficient quantities to meet the needs of the project, samples should be collected for laboratory analysis. The superintendent should collect the samples using a standardized collection procedure (see the USGA Green Section document entitled *Quality Control Sampling of Sand and Rootzone Mixture Stockpiles*).

Suppliers often have more than one product that may be suitable for golf green construction. If the greens are to be built to the USGA's guidelines, the particle size specifications included in these guidelines can be compared to the screen tests performed by the supplier. This preliminary comparison can identify which products should be sampled for more detailed analysis.

Samples should be collected of each product that has a good chance of meeting the guidelines. Each sample should be carefully labeled and packed, then shipped to an accredited physical soil-testing laboratory (the USGA maintains a list of accredited soil-testing laboratories at www.usga.org/green/coned). Select *one laboratory to use for all testing throughout the entire project.* Instruct the laboratory to perform a complete analysis of the submitted materials and to develop various mixtures of the sand and organic matter. Most labs keep commonly utilized organic matter materials (such as peats) on hand and can make a wide variety of mixtures. Some organic matter sources (such as composts) are very specific to small parts of the country and probably wouldn't be kept in storage at the lab.

In summary, this first step is merely to identify suitable materials for the project and in what percentages those materials will be mixed together.

STEP 2
Determine Which Laboratory Mixture Best Fits the Needs of the Project

Ideally, the laboratory will report the results of each of the various combinations of sand and organic matter. They also may recommend the mixture they believe is best for the project. Nevertheless, ultimately it should be the owner's representative (ideally the golf course superintendent) who makes the final decision. Consideration should be given to the type of turfgrass to be maintained, climate, irrigation water quality, as well as the cost of the materials. The USGA Green Section agronomists can provide valuable assistance in this decision-making process.

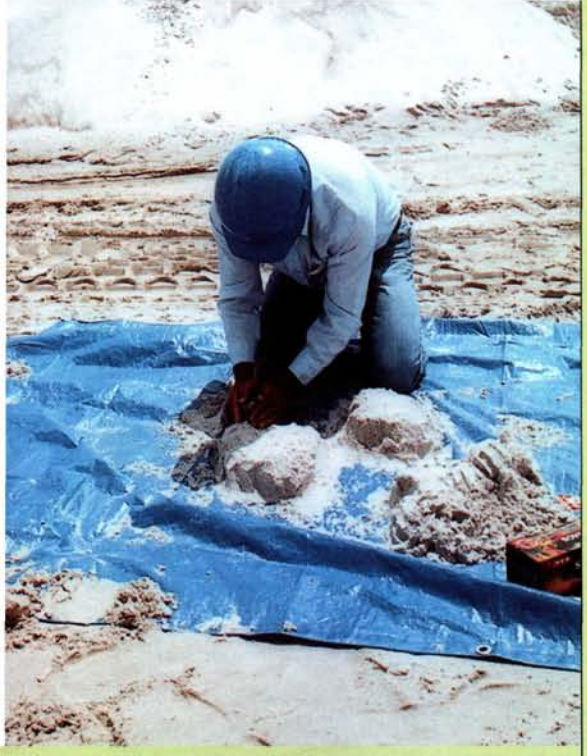
Sampling and testing several candidate materials is the best means to identify the most appropriate and cost-effective products.

STEP 3
Calibration of the Blending Equipment and Development of the Target Values

The next step is to actually begin producing the rootzone material for the greens. It is likely that months will have passed since the first testing process took place in Step 1. By now, the project has been approved, contractors selected, and construction is underway. The sand supplier is ready to provide the sand, the organic matter has been delivered, and the blending contractor is ready to begin producing the mixture to go into the green cavity. The goal now is to produce a mixture that is acceptable to all concerned parties. The blender should be instructed to blend 200 tons of mix, using the materials and mixing ratio identified in Step 1. The superintendent should collect a sample from the 200-ton pile using the standardized sampling procedure. The same laboratory that did the preliminary testing should test the sample. When the lab returns the test results, they should be compared against the results of the preliminary testing. It is unlikely (and unnecessary) that these two tests will be identical.

It is very important to realize that the test results for the 200-ton pile will almost certainly vary from the results of the initial identification phase testing. It is unreasonable to expect the numbers to be identical for the following reasons:

During the identification phase testing, the various mixes were made in the laboratory by hand. Mixing organic matter and sand by hand and in small volumes is a much more gentle process than what occurs when the same materials are blended with large, mechanized augers. During such blending operations, the mix components are literally ground together, which can result in changes in the makeup of the materials.



Collect samples using a standardized collection procedure. The USGA has a publication available that outlines the proper methods.

Even the best sand sources are likely to see some changes in the particle size distribution of the sand harvested from a pit or river. Since months may have elapsed between the initial identification tests and the production of the first 200 tons, the particle size distribution of the sand is likely to have changed.

As mentioned earlier, most laboratories keep on hand caches of the most commonly used organic amendments. Like sand and gravel, organic materials can change from month to month and therefore from lot to lot of the packaged product.

Allowing for these unavoidable variations, if it is determined that the 200-ton pile is of acceptable quality, the blending process can begin on a full-scale basis. The results of the 200-ton pile testing should become the *target values* for all future blending. The USGA Green Section document *Guidelines for Establishing Quality Control Tolerances* outlines the plus or minus values that should be utilized when comparing samples to the target values.

Should the test results of the 200-ton pile prove unacceptable, the testing laboratory should be consulted regarding the best choice of remedial action. If the particle size distribution of the sand and organic matter have remained fairly consistent since the preliminary testing, it may simply be a matter of adjusting the blending ratio to make the mix acceptable. However, if adjusting the blending equipment does not correct the problem, the sand may need to be processed further (through additional washing and/or screening) to achieve a more favorable particle size distribution. It is also possible that the organic material has changed in its composition. Either way, the entire testing process will need to be repeated until a satisfactory 200-ton pile can be achieved. This is critical to establish the target values for the remainder of the blending process.

STEP 4
Production of the Rootzone Mixture

After the physical properties of the target values have been identified, mass production of the rootzone mixture can begin. For most projects, the rootzone mix should be blended in 1,000-ton increments, a quantity acceptable for most projects. However, if the sand and/or organic amendments tend to vary in their makeup, 500-ton lots will provide a greater degree of quality control. Lots of 500 tons are also a good idea when the laboratory test results indicate the materials are borderline in terms of meeting the construction guidelines chosen for the project.

Whether mixed in 500-ton or 1,000-ton increments, each pile of rootzone mix should be sampled using the standardized procedure. The test results of each pile should be compared to the target values. Again, it is highly unlikely that the mass-production samples and the target values will match exactly.

If all of the test results are within acceptable tolerances, the mass-production pile should be marked ready for delivery to the project. However, if any aspect of the testing indicates the pile has deviated from the target values by more than the tolerances identified in the *Guidelines*, and the new properties are unacceptable, the pile should be reblended and retested.

After a mass-production pile has been approved, it can be hauled to the project or stored for later delivery. As each pile is tested and approved, it can be combined with previously approved piles for the sake of storage.

CONCLUSION

By following the above procedure, the golf course superintendent can ensure reasonable consistency of the rootzone mixture throughout the entire blending operation. In addition, most contractual disputes can be avoided by following the five suggestions listed below.

- Select one accredited laboratory and use only that laboratory for all testing.
- Select one sampling procedure and use that procedure for every sample collected.
- One individual (preferably the golf course superintendent or owner's representative) should collect all samples throughout the project.
- Identify a single point at which the rootzone mixture is tested to determine if it meets the requirements of the contract. Ideally, the rootzone mixture should be tested immediately following blending and before it is hauled to the construction site. Note that testing at any other time during the project possibly could result in test results that are significantly different from the target sample and the initial identification samples.
- Prior to blending, all parties should agree on the procedure to follow should a pile fail any part of the quality-control test. The first step should be to repeat the test to ensure a laboratory anomaly has not occurred. Should the second test confirm the results of the first test, options include reblending and/or utilization of the mixture for tee tops or some other area of the course.

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