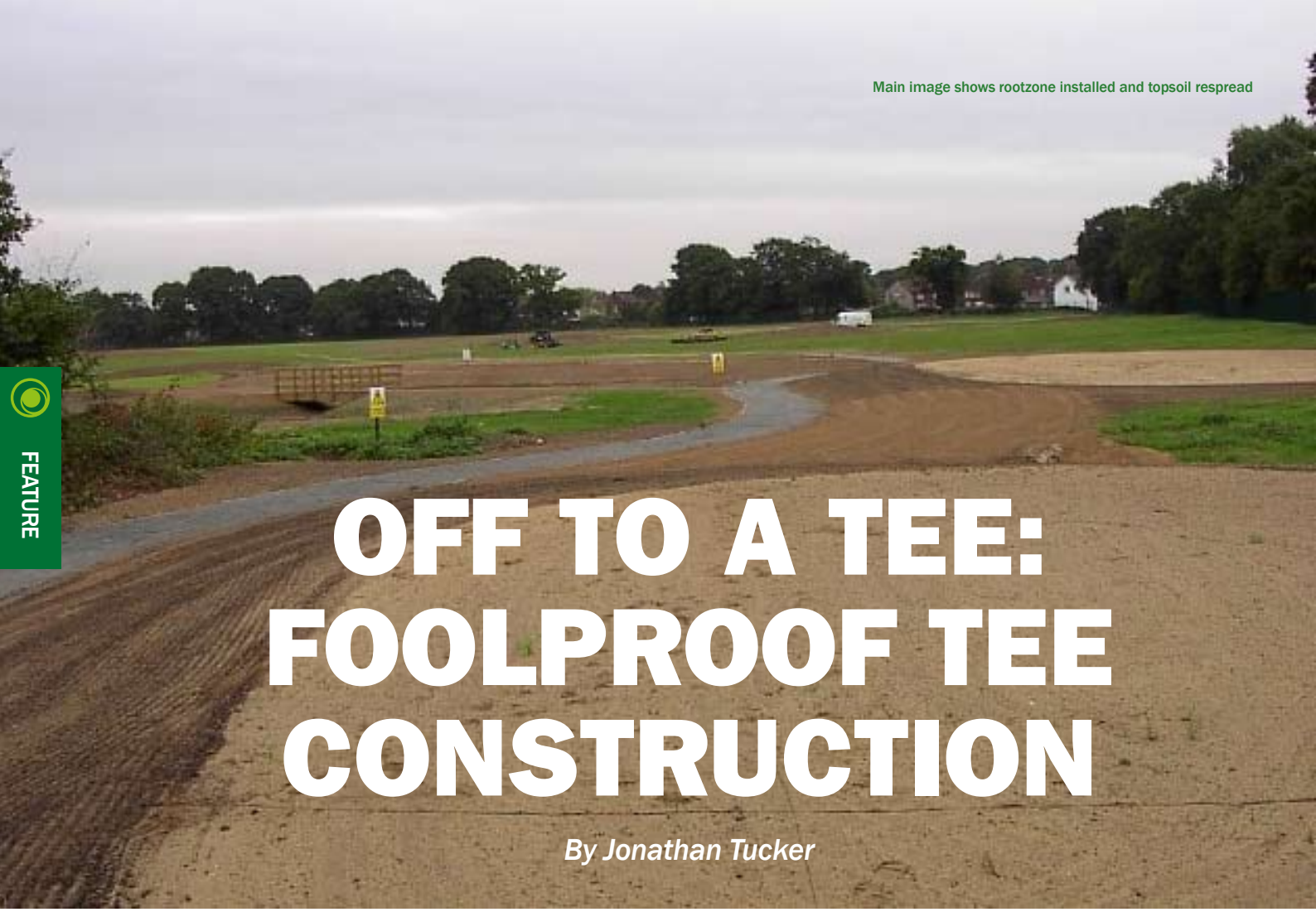


Main image shows rootzone installed and topsoil respread

FEATURE

OFF TO A TEE: FOOLPROOF TEE CONSTRUCTION

By Jonathan Tucker

Plenty has been written on green construction and the various methods commonly employed (most recently STRI Guidelines for Golf Green Construction in the United Kingdom), but for tee construction a standard method is more elusive. This is perhaps understandable given the tees' lesser status, and while high quality tees are a major asset on any golf course, the standard of the greens is, more often than not, the main focus of attention.

However, all would agree that nothing beats a firm, level, well grassed and maintained tee which provides a hard-wearing surface for year-round playability.

Size matters

Design of the teeing ground has a major influence on performance and a simple checklist would include the following requirements:

- Adequate size – around 400 m² for par 4 and 5 holes and 500-600 m² to cope with the ravages of play at par 3 holes. This will be partitioned between the various categories of tee depending on the weight of play expected. There is a trend towards a greater number of dedicated tees to cope with the broad spectrum of golfers and under these circumstances it would be sensible to increase the total tee surface area.
- Ease of access is very important and therefore surrounding banks need to be eased out to maximum 1:3 slope and preferably 1:4 to 1:6 where space and topography permit.

This may not always be possible but installation of steps should be avoided if at all practical as these focus wear and tear on localised sections of tee.

Importance of surface drainage

Tees should not be completely level but formed with a gradient to assist surface drainage. On reasonably level ground a front to back fall is preferred but the direction of slope should generally mirror the natural gradient of the land. Therefore, if tees are cut into a bank, the design slope will ensure that water is channelled away from the tee and not back into the toe of the bank!

The magnitude of the slope must be sufficient to get water moving across the surface but without being obvious to the golfer.

Generally, 1:70 to 1:80 provides a reasonable compromise with an absolute minimum of 1:100.

The need for good surface drainage can be partially linked to the permeability of the rootzone and construction method adopted; as with reduced permeability of the rootzone, the requirement for improved surface drainage and hence adequate slope increases.

Get the foundation right

The base of the tee must be adequately consolidated, shaped and trimmed to reflect the final surface slope. There are situations where tees need to be well elevated above surrounding ground, for example, where it is desirable to improve visibility of landing areas and in extreme terrain, greater fill may be needed to achieve a suitable tee platform. However, as a rule of thumb, high vertigo-inducing tees are more difficult to maintain and are literally a waste of space.

Where significant fill is required, imported subsoil material must be tracked and consolidated thoroughly in layers of no more than 225 mm. Do not incorporate organic materials such as old tree stumps which will rot and leave voids leading to settlement, and if there is significant large stone this must be covered by a minimum 300 mm depth of clean subsoil.

Choice of construction profile

While there are other derivatives, there are essentially three types of tee construction currently employed:

1. Topsoil over existing subsoil
2. Imported rootzone over a pipe drained base
3. Rootzone over a pipe drained base with gravel carpet

Option 1

This is the most economic but it is limited to sites where subsoil and topsoil drain naturally well (i.e. sandy loams), as well as there being sufficient reserves of topsoil to provide 200 mm firmed depth on completion. Links courses are obvious candidates for this approach, although even here natural topsoils are often augmented.

Option 2

The majority of golf courses unfortunately are not endowed with topsoil of sufficient quality or quantity to incorporate in tee construction. In these circumstances, rootzone is imported to ensure adequate drainage and provide a suitable foundation for cultivating a hard-wearing grass cover. It is rarely worthwhile making up a mix on site, obtaining a consistent product from a commercial supplier is invariably a wiser choice.

The formulation selected must provide a satisfactory balance between sufficient resistance to compaction and a reasonable degree of moisture retention. Where effective automatic irrigation is available a high sand rootzone can be employed. The physical characteristics of this material can be similar to a USGA green construction rootzone, but near to the lower end of the recommended limits. Therefore, a minimum of 60% particles would be expected in a medium to coarse sand fraction (0.25-1.00 mm) and maximum of 10% "fines" (very fine sand, silt and clay).

Where water is limited, it makes sense to increase the proportion of amendment (e.g. a stone-free sandy loam soil/fensoil or finely graded PAS100 compost) in relation to sand to make the rootzone more forgiving, but without compromising drainage or making it difficult to push a tee peg into the surface.

Regardless of material selected it still makes sense to test rootzones and implement quality control to ensure that the material selected conforms to the approved blend.

Install rootzone to sufficient depth to provide a layer of 200 mm following firming. For surrounds and banks, topsoil should be respread to 200 mm depth on completion of grading. On surround areas subject to intensive golf traffic, particularly on the main entry and exit points, there would be benefit from incorporating additional sandy loam or rootzone to enhance the durability of these vulnerable sections, particularly where existing topsoil is inadequate in quality and/or quantity.

If the base of the tee drains adequately and is not influenced by a fluctuating water table, pipe drainage may be surplus to requirements but usually internal pipe drainage is a pre-requisite.

A simple system can be installed at sub-formation stage, consisting of 80 mm diameter lateral perforated plastic pipe drains placed in trenches (minimum 350 mm depth) at 3.5-4.0 m centres with a gradient no less than 0.5% (1:200). Increase to 100 mm diameter for the main outfall drain along the low side of the tee.

Ensure that intercept drains are installed strategically to protect tees from run off from higher ground – bringing permeable backfill close to the surface to maximise effectiveness.

If it is difficult to achieve smooth, uniform drainage trenches, bed the pipes on a layer of gravel spread to 50 mm depth.

For simplicity, a 2-6 mm sized gravel provides a suitable material for backfilling of drainage trenches provided its physical characteristics are comparable to those outlined in Table 1 and is compatible, i.e. "bridges", with the rootzone to be used.

If it is impractical to secure a material at reasonable cost, the alternative is to backfill with a coarser gravel (5-10 mm gauge) blinded with 50 mm depth of a coarse sand or fine grit to formation surface level.

As with greens, surrounding environment has a major influence on tee performance. Narrow tees hemmed in by trees are unlikely to perform well regardless of construction method

In difficult terrain tee areas may need to be split up

Single Drainage Layer

When the intermediate blinding layer is not incorporated, the gravel must meet the following criteria:

Performance Factor		Recommendation
Bridging Factor	*	D15 (gravel) ≤ 8 x D85 (rootzone)
Permeability Factor	*	D15 (gravel) ≥ 5 x D15 (rootzone)
Uniformity Factors	*	D90 (gravel)/D15 (gravel) ≤ 3.0

Also:

* No particles greater than 12 mm
* Not more than 10% less than 2 mm
* Not more than 5% less than 1 mm

Rolls Royce versus Volvo
Option 3

This is similar in some respects to option 2 but drainage is effectively extended to encompass the entire base with introduction of an emptying drainage layer above the pipe drain network.

As a consequence, pipe distances can be relaxed to 5 m and depth of installation of the lateral drains reduced to 250 mm to invert (minimum).

This type of construction is most appropriate where a high quality surface is demanded for maximum year-round playability, or for dedicated winter tees where provision of a firm, dry, natural grass surface is a prerequisite.

While this method provides rapid removal of water through gravitational flow in "saturated" conditions it also serves to retain moisture ("capillary") in unsaturated conditions, i.e. a "perched" or "suspended" water table.

Therefore, depth of rootzone may have to be increased from 200 mm to 225-300 mm depending on the moisture release characteristics of the rootzone selected. This applies to high sand rootzones, but for topsoil-based mixes, which rely more on the structural properties of the topsoil for good drainage, allied to mechanical aeration to bypass the topsoil, this phenomenon is less pronounced.

A 2-6 mm stone carpet of 100 mm depth is again simpler to install and usually cheaper than a 2-layer system of coarser gravel with intermediate blinding layer. Compatibility with the rootzone above must, however, be proven.

Finishing it off

Appropriate establishment of the tee can make or break the finished product.

Seeding is the preferred method if time permits, but if this is not practical, turfing is the only option. Grass species composition is related to intensity of play and degree of damage expected, size of tee and management issues.

A blend of fescue and bent grasses provides a top-class playing surface but incorporation of fine-leaved, dense cultivars or perennial ryegrass and smooth-stalked meadow-grass confers greater wear tolerance.

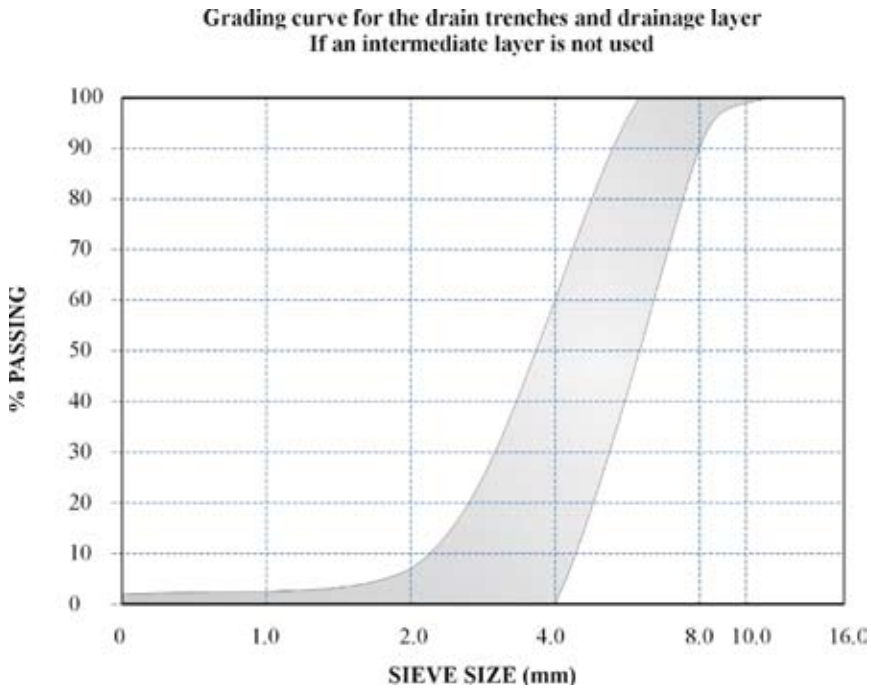
Apart from the obvious requirement for a clean vigorous and dense grass cover, the composition of the turf base, i.e. what it has been grown in, must also be checked.

Turf cultivated in exceedingly fine, silt/clay or organic rich soils should be rejected. The objective should be to try and match the rootzone under the tee with the turf foundation.

The ideal in this regard is a custom grown or "rootzone" turf which is grown on the same rootzone or rootzone sand to that used in the construction.

From a practical and financial viewpoint, a turf grown in a good sandy topsoil usually does the job with appropriate aftercare notably where less free draining rootzones are employed with higher fines content.

Turf grown on compatible rootzone eases future maintenance



The choice of roll size is less important than ensuring that the turf is cut uniformly and thatch depth does not exceed 6 mm. Raking and heeling still provides the best method of preparing a uniformly firm and level seed or turf bed. Finally, a pre-turfing fertiliser will provide an early kick-start to establishment.

A light rolling treatment can help to settle the turf after laying and, thereafter, further light top dressing will be required to perfect the final surface.

About the Author

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