

**A bunker according to the new Shorter English Dictionary is a pit containing sand etc. and constituting a hazard trap. In this article Keith Thompson discounts the "etc" and concentrates on the sand...**



# Bunking Off



Right: Bunkers maintained by mechanical process have to be carefully designed and constructed to ensure that the bunker rake performs to maximum efficiency and without damaging the edges

Bunkers originated from the early Scottish Links courses as hollows created by the forces of nature and enhanced by grazing animals. The natural occurrence of these hazards on the early links courses led to some fiendish course designer incorporating the sand trap into his own course design and from there the idea spread. It is reported that there is an 18 hole course that has over 300 bunkers, but this seems to be excessive leaving little room for the grass. The average golf course has four to five bunkers per hole, which in my view can still be too many.

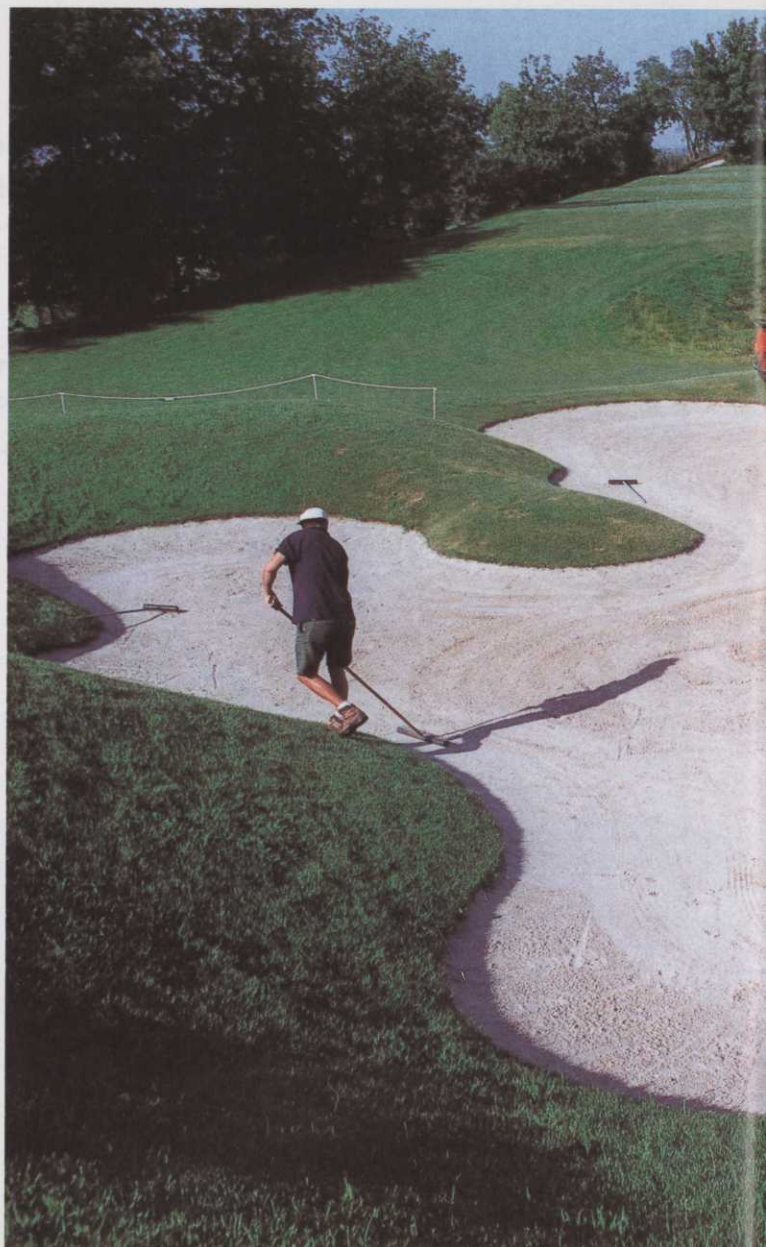
The bunker should not only be strategically positioned to afford the maximum discomfort to the golfer but should also enhance the visual amenity of the course. The design of the bunker will vary from course to course with the greatest marked difference being between Links courses where wind blow is a major factor and inland parkland courses where the wind factor is less but drainage can be the main problem.

The design of a Links bunker generally is small in area, but deep and the sand used will more than likely

be that occurring naturally in the local area. An inland course, unless built on gravelly land will, almost certainly, have a drainage problem. In this case, the bunkers should then be constructed with a comprehensive under-ground drainage system.

This consists of gravel filled channels in the bunker floor falling to a main drainage course piped to a soak away. The gravel layer should be covered with a geotextile membrane to keep the drainage channel free from clogging. The overall bunker should be designed to channel surface run

Right: Bunkers should be strategically positioned, but also enhance the visual amenity of the course.



off water around or away from the bunker. Ideally, the face of the bunker should be no more than 30 degrees from the horizontal, this will enable the sand to hold position and avoid erosion.

Once the bunker has been properly designed and positioned, the final and most important ingredient is the sand. Trying to cut costs at this vital stage is a false economy. Any old builders sand simply will not do; the cheapest

option is almost certainly not the best.

Sand can be too fine resulting in poor drainage and crusting, so a high quality silica sand is essential. The correct grading is also important; if the sand is too coarse the high-pitched ball will plug and the golfer's stance will be unstable. The grit particles from coarse sand in greenside bunkers will be strewn onto the green. Too fine and the sand blows away.

The shape of the particle size is also an important factor and a semi angular grain shape is preferred with not more than 60% of the particles rounded to well rounded. This is to ensure sufficient drainage and improves the stacking angle at the bunker face.

The chemical composition of the sand has also to be considered and the best sands have a high silica content; the higher the percentage the better, as this reduces the impurities. A low lime content of less than 0.5% is considered beneficial; this avoids the possibility of damage to the surrounding grass areas.

Silica sand deposits are the small siliceous fragments resulting from the wearing down action of ice, water and wind. The ideal sands for bunkers

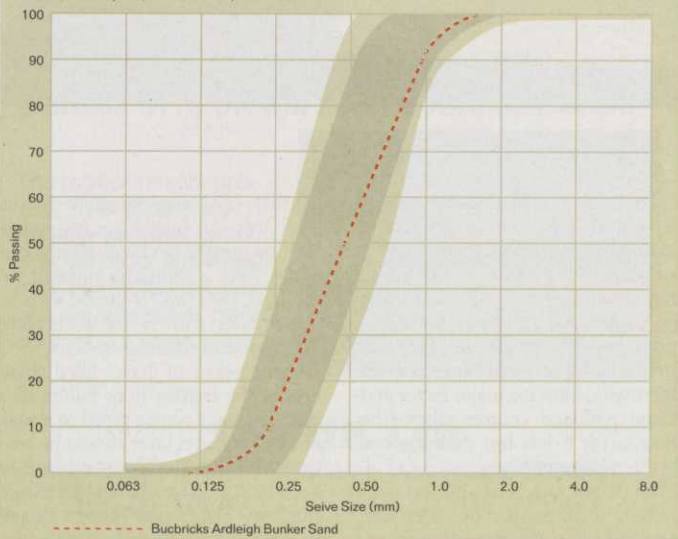
occur in only a few places in the United Kingdom and where these deposits exist, sand and gravel quarries have developed.

The material is excavated from the quarry face and transported to a processing plant. The initial segregation is to separate the gravel particles from the sand by passing them over a large vibrating screen. The sand is washed through the screen and then to a pump which carries the particles to the final selection process which, in most cases, splits the bulk sand into three graded sizes - Soft, Medium and Sharp. Medium sand is the preferred grading for bunker sand and in some cases this sand is re-washed to remove excess fines and discolourants.

There is no perfect grading for bunker sand but the Sports Turf Research Institute has done considerable work on preferred sands and they recommend "at least 95% of the particles in the size range 0.125mm to 1.00mm with the greatest proportion between 0.25mm and 0.5mm. There shall be no more than 2% fine gravel and less than 2% silt and clay". The grading is best shown in the grading curve shown opposite. The most suit-

### Acceptable sand size limits

This grading curve defines recommended and acceptable limits of sand size for golf bunkers on inland courses  
Graph reproduced by kind permission of the Sports Turf Institute





able sands will fall into the darker coloured area of the diagram.

The colour of bunker sand is a matter of taste, but the general trend on inland courses is towards the lighter to white colours. This lighter sand is more likely to occur in the high silica areas, but even here to get the best results selective quarrying at the face is sometimes necessary prior to the grading process.

The depth of sand used in a bunker can be both too great and too small. The recommended compacted depth is 100mm. This provides a firm footing and ensures that the clubface does not impact with the sub-base. Daily maintenance of the surface is required and this can be done either manually or by machine. Bunkers maintained by mechanical process have to be carefully designed.

Specifically, constructed to the correct radius and depth this will enable the machine to rake the bunker with maximum efficiency and without causing damage to the edges.

It is probably more important with a mechanical rake to have clean, high quality silica sand as this prevents clogging of the machine and ensure

the sand in the bunker does not become compacted.

In summary it can be seen that bunkers should be carefully designed and constructed with attention given to adequate drainage, especially on inland courses. Cheap builders sand will almost certainly prove to be a false economy, so adherence to STRI guidelines is strongly recommended to ensure that you provide the optimum facilities for your paying customers. This article has not designed to help those paying customers get out of bunkers, but I hope it has provided some technical reasons for their failure, sometimes, to do so!

**Keith Thompson is General Manager of Bucbricks Co. Ltd of Ardleigh, near Colchester in Essex, who for the past 20 years have supplied high quality bunker and root sands to many major and championship golf courses in the south-east of England.**

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