

The Hazards of Being a Hazard!



The distinctive bunkering on the Par 3 15th at Kingston Heath

Bunkers are an integral component of golf course design providing both an aesthetic dimension and a challenge that can be a curse to both golfers and maintenance staff. Here, golf course architect Ross Watson, AGCSATech manager John Neylan and superintendent and scratch golfer Daryl Sellar look at the role of the modern day bunker and whether maintenance expectations have become unattainable or at the very least unsustainable.

In recent years bunkers seem to have invoked more discussion (or should that be criticism) and comment among golfers than any other part of the golf course. Golfers seem to be most concerned with bunkers being too soft and that buried lies are making shot play too difficult.

The challenge for golf course superintendents has been that as grass surfaces get better they are expected to produce equally high quality playing surfaces in the bunkers, often to an unrealistic unsustainable standard. Consequently,

sand selection, bunker construction and rejuvenation, and on-going maintenance have become significant budgetary items.

Bunkers are defined as hazards and according to the Rules of Golf a bunker is "a hazard consisting of a prepared area of ground, often a hollow from which the turf is removed or replaced with sand or the like."

In several books on golf course architecture there are interesting remarks concerning hazards in general and bunkers specifically.

MacKenzie (1920) refers to hazards in the following terms: "The majority of golfers look upon hazards as a means of punishing a bad shot, when the real object is to make the game interesting."

Hunter (1926) in his book on links golf states that, "... hazards are risks and penalties must come to those who take risks and fail". He goes on to say that "without hazards, golf would be but a dull sport, with the life and soul gone out of it".

Hurdzan (1996) discusses in detail the purpose of bunkers and that they are not strictly used as hazards and can serve any of the following functions:

- Strategy
- Retaining (*keeps the ball from worse fates*)
- Safety
- Directional (*defines direction of play*)
- Aesthetic

He also describes the effects that various sand types have on shot selection but also makes the observation that "... the lie one confronts is often a matter of luck".

The consistency of bunkers is another issue. Many factors affect consistency or performance including shape, size, drainage, irrigation coverage and prevailing winds which combined make each bunker unique (Hartwiger, 2001).

Hartwiger suggests that bunkers are inherently inconsistent because of these factors and that golf is a game of inconsistencies. He further states that golfers have to adjust their game to counter the many challenges on a golf course and the conditions of bunkers is but one of them.

So, are we searching for something that was never to be and have the expectations become unattainable or at the very least unsustainable? Following are the views of a golf course architect, a golf course superintendent and a technical expert that hope to throw some light on the topic.

FROM THE DRAWING BOARD - AN ARCHITECT'S PERSPECTIVE

Ross C. Watson



Ross C. Watson

Bunkers are without doubt the most common, the most interesting and the most debatable of all the hazards in golf. And the key word here is "hazard".

In modern golf where beautifully groomed courses are beamed into living rooms around the world almost daily, it appears

that bunkers have been neutralised in terms of being realistic hazards.

Today we often hear commentators refer to shots finishing in bunkers as being "a good result". This is the case often as bunkers are so

perfectly manicured that top players make a mockery of the recovery shot. It seems more importance is placed on beauty rather than purpose which surely is to defend par by placing a premium on shot making.

The origin of the bunker dates back more than 500 years, or so we are told, either to Prestwick or St Andrews in Scotland. In fact, the beginnings are shrouded in mystery with some historians suggesting that golf actually began in Holland.

Most will agree, however, that the very first bunkers were not designed, they simply happened, and we know for certain that golf was first played on "sandy links land" (dunes) grazed by sheep and rabbits. In bad weather sheep took refuge behind hummocks and in protected hollows, in good weather the surrounding areas were grazed.

So as golf began it was natural to plot the most interesting routes between, over and around the ungrazed areas (hazards) terminating at flattish areas among rabbit warrens where the cup and flagstick were duly placed.

Slowly, these refuge areas where grass did not flourish evolved into the bunker as we know it today. The metamorphosis took place

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firstly as a result of the action of the sheep and weather with further fine-tuning by golfers endeavouring to “hack” their way back to the grazed areas (fairways).

This natural process of evolution had the effect of locating bunkers precisely where golf balls tended to congregate. Such bunkers, students of the game will argue, are often the most perfectly placed.

On this point it is worth noting a few thoughts from the forefathers of golf design. As mentioned earlier, Dr MacKenzie said the real object of hazards was to make the game interesting.

Much earlier, the highly regarded John L. Low was quoted as saying;

“No hazard is unfair wherever it is placed. It ought to be unnecessary to point this out, as it should be perfectly obvious that a hazard is

the wrong spot to place one’s shot. I do not suggest that some situations are not more interesting for hazards than others, but the whole object of golf is to place one’s shot and it is obvious that if a player has put his ball in a hazard he has chosen the wrong spot. This principle particularly applies if the hazard is visible, and if there is room to one side or the other to avoid it.

The great object in placing hazards is to give the players as many thrills as possible. On many inland courses there is not a thrill in the whole round, and yet on most of the championship courses one rarely takes a club out of the bag without having an interesting shot to play.”

These thoughts reflect the essence of what is now commonly referred to as “strategic design

principles” which most modern-day designers practise, although this has not always been the case.

Beyond its humble beginnings and very early in its development, golf by design became somewhat penal in the sense that bunkers and other hazards were placed across the line of play at intervals with little or no option to skirt around the edges.

Additionally, other bunkers were placed along the edges of fairways and often in unsighted locations, so that in the end anything less than a perfectly struck shot was severely penalised. The bunkers were also very deep with little or no hope of forward progress, in fact in many instances the only chance of escape was backwards towards the tee.

This penal style of golf became unpopular and over time gave way to strategic golf. Dr MacKenzie has been given much credit for



This behemoth at the Stuart Appleby-designed The Sands, Torquay swallowed over 660 tonnes of sand

popularising strategic design but in fact, by his own admission, there was no better example of strategic design than the Old Course at St Andrews.

In simple terms, strategic golf by design places bunkers and other hazards on or very near the ideal line of play with ample space to the side for the less gifted or less ambitious. Those who successfully negotiate the risky path to the hole will be rewarded with much easier approach shots, as is the case at St Andrews. In order to create the most excitement it is

paramount that bunkers are highly visible, aesthetically pleasing and fearsome.

In the modern context, the purpose of bunkers extends beyond shot making strategy. The sites designers are given these days for the most part cannot be compared with the "beauties" of yesteryear. They are often degraded with little or no natural features and there are boundary issues and integration with residential areas to be considered, not to mention the hurdles to be jumped in the approval processes.

Bunkers are often used to direct play away from potential danger zones with no reward at all for flirtation, almost the diametric opposite of strategic design.

Designers also use bunkers like the wicketkeeper in cricket, placing them to cut off balls from rolling onto adjacent fairways and tees. In remodelling work in particular, bunkering is more of a balance between creating pleasurable excitement and steering golfers safely around the course.

Either way, the importance of bunkering in any course design should not be underplayed and remains the designer's best opportunity to give each course its individuality, charm and, most importantly, popularity.

We see many bunker styles in modern golf course design and in some instances designers are best known by their particular signature style. Then, on the other hand, there are many designers who vary their bunker styles to compliment each site and set each course apart as a unique entity. Inevitably, the best bunkers are those that excite but are sustainable.

The questions of grassed faces versus highly visible sand faces, flat sand bases versus dished bases, intricate shapes versus simple shapes, big versus small and playability should be analysed in the context of the specific environment, end user profile, and maintenance budget.

If the balance isn't right from the outset and the style opted for not sustainable, bunkering will evolve, mostly badly, in response to the original imbalance. This wastes money and can potentially compromise design integrity, continuity and flow.

On the matter of playability, it will be generally agreed that a well designed strategic

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Table 1: Brown and Thomas (1986)

Criteria	Recommendation	Reason
Particle size distribution	0.05-0.1mm - <5% 0.1-1mm - 78-100% 1-2mm - <15% >2mm - <2%	Sands reported to be satisfactory were typically in this size range, although clay and silt should be <3% as this lessened the incidence of crusting and set up (i.e.; formation of a thick crust as deep as the water penetrates).
Particle shape	Angular - good Sub-angular - fair Round - poor	Angular sands require greater pressure to force the ball into the sand and thus had fewer buried lies. They were also more stable on bunker faces.
Colour	Generally whiter sands are preferred	Aesthetically preferable, however, they stress that white sands can glare and that play conditions are more important.
Crusting	None - good Slight - fair Predominant - poor	Crusting was undesirable as it leads to poor ball lies and deceptive shots.
Penetrometer resistance (kg/cm ²)	>2.4 - good 1.8-2.4 - fair <1.8 - poor	A penetrometer reading >2.4 is desirable as it lessens the likelihood of plugging or buried balls.
Set up	None - good Slight - fair Predominant - poor	Set up was undesirable as it led to undesirable ball lie (i.e.; too high).

bunker should at least impart some degree of penalty when in it, and provoke thought when it comes to options for avoiding it and escaping it once in it. Without these characteristics the value of the bunker will be greatly diminished.

The type of sand and presentation are subjects of eternal discussion and criticism. There are those who feel bunkers should not be raked at all and that plugged balls are all part of the game.

Often bunkers are rendered more penal by the golfers themselves in the way they rake to the edges and blast towards the target effectively digging a hole. On this note, groundstaff who reverse this process in the manner of their maintenance will be well regarded.

In regard to sand quality we are constantly in search of the perfect bunker sand;

- Good colour, white but not too glary
- Firm but not too hard
- Soft but not too fluffy
- Free draining

It is difficult to find such a sand, so to overcome deficiencies we apply wetting agents, gelling agents, we place geotechnical fabrics on bunker faces, we mix sands and organics. We go to inordinate lengths to make the bunker more playable forgetting perhaps that after all it is a hazard.

I certainly do not advocate that we give up on playability and gleefully commit all players to purgatory on every miss-hit. But in the end for the bunker to retain its true importance in the game of golf there must be a sensible degree of understanding and balance between playability, purpose, sustainability and of course aesthetics.

FROM THE LAB – A TECHNICAL PERSPECTIVE

John Neylan



John Neylan

The key issues raised by clubs concerning bunkers relate to drainage and sand selection. As new courses are constructed and older courses remodelled, achieving dry and firm bunkers has been a priority. Where bunkers are constructed on fine

textured or poorly drained soils, drainage is obviously critical, however, there is also the challenge of holding sand on bunker faces.

The traditional roots of the game of golf started on links land with natural sands being the key element and bunkers were natural creations dug out of the native soil.

The indigenous sand on the classic Australian “sand belt” golf courses has an intrinsic

Brown and Thomas (1986) developed a set of standard test procedures by sampling 42 bunkers

Table 2: AGU/ATRI bunker sand specification for Australian golf courses (1995)

Criteria under test	Recommended value
Particle size distribution	Inland courses 0.2-1.0mm Coastal course 0.1-1.0mm
Particle shape	Angular
Surface crusting	< 1.0 kg/cm ²
Angle of repose	>30°
Material composition	Silica
Ball plugging	>2.5 kg/cm ²
Hydraulic conductivity	> 25cm/hr
Colour	Light without glare

The AGCSA has adopted AGU/ATRI specifications for bunker sand selection



Bunker construction at the Bonnie Doon Golf Club in NSW

“something” that provides an ideal bunker. It is a combination of particle size grading, the depth and consistency of the sand and the presence of an almost unperceivable amount of fine organic matter that assists in binding and packing of the sand. It is this something that we try to replicate when importing materials.

The greatest challenge on golf courses constructed on clay soils is the sharp contrast between the clay and sand. This shear plane makes it almost impossible to hold sand on the bunker face without some form of artificial binding.

In my experience the greater the departure from the native sand environments, the more problems arise from erosion, poor drainage and plugged lies. Consequently, in these environments bunker maintenance is considerably greater.

The selection of sands for bunkers has been a major challenge for golf courses in recent

years as bunkers are renovated and golfer expectations increase. To aid the selection of suitable sands, there have been guidelines developed to assist in this process.

Brown and Thomas (1986) developed a set of standard test procedures based on sampling 42 bunkers that were categorised by golfers as good, satisfactory or poor. By testing particle size distribution, drainage rate, ball penetration, crusting and particle shape, a specification was developed (Table 1).

In 1995, the Australian Golf Union (AGU) and the Australian Turfgrass Research Institute (ATRI) completed a project based on Australian soils and produced a set of guidelines for bunker sand selection (Table 2). The Australian Golf Course Superintendents Association (AGCSA) has adopted the specification prescribed in the AGU/ATRI report.

Having tested many sands from around Australia, the most noticeable problem has been trying to achieve acceptable ball penetration. In our testing, ball penetration has rarely exceeded 1.8 kg/cm² and is frequently around 1.6 kg/cm². According to the selection criteria these sands will not have sufficient resistance to ball penetration and ball plugging is more likely to occur.

On occasions when a sand meets the criteria for ball penetration resistance, the sand has an excess of silt and clay, it crusts severely and the drainage rate is unacceptably low. Sands with a wide spread of particles exhibit greater particle interpacking and increased resistance to ball penetration, however, this can also result in a low drainage rate.

Most sand sources in Australia tend to have a very narrow particle distribution and this is the main factor contributing to the high drainage rate of the sand and unfortunately the lack of packing and resistance to ball penetration.

The other influence on particle packing is the shape of the individual soil particles. Sands that are angular exhibit good interpacking and good resistance to ball penetration. Conversely, rounded particles exhibit poor interpacking and tend to be loose and unstable (an experience often observed when these sands are used for greens construction).

Unfortunately our testing indicates that many Australian sands consist mostly of rounded particles and this is contributing to the problems of plugged lies and a lack of “holding” on bunker faces.

Where sands do not have the natural resistance to ball penetration, moisture content appears to be critical in counteracting it to some degree. As these sands dry out they become looser and less stable, particularly after there has been some play in the bunker and the sand is loosened by foot traffic. Dry winters in particular can be problematic because there is no irrigation to stabilise the sand.

Deep working or overworking of the sand is another factor to avoid if possible as this also

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Many hours are spent by groundstaff manicuring bunkers to meet with the demands of members and televised tournament coverage

can destabilise the sand. Hand watering and hand raking bunkers may in part counteract the instability and improve the playability of the bunker.

There are also binding agents that are worth evaluating which glue the sand particles together and assist in reducing their instability.

On clay soil sites, some form of artificial containment system is virtually essential if sand faced bunkers are to be maintained.

Two distinctly different soil types cannot be expected to bind successfully without some form of artificial aid.

Bunkers are in part hazards and there is an element of risk and reward associated with them. To some degree there is an element of luck in what the golfer will find when an errant shot goes into a bunker.

If bunkers are presenting a “problem” they can be improved at a cost and how much are members prepared to pay to avoid what is possibly the occasional bad lie.

FROM THE SHED - A SUPERINTENDENT'S VIEW Daryl Sellar



Daryl Sellar

It is more than well documented how the game of golf has undergone significant changes. Equipment is the most obvious area of change for golfers, but a more subtle change has been in the area of course maintenance and the expectations that have resulted.

Improved turf varieties, maintenance equipment, and turf management knowledge have all led to dramatic advances in the presentation of golf courses around the world.

With it has come an expectation of the golfer for better quality playing surfaces in terms of greens, fairways and tees.

With many lounge rooms now saturated with the images of tournament golf year round,

the weekend golfer has grown to expect that, to some degree at least, this is how his or her course should look when they venture out for their weekly challenge.

There is some debate over who drives the charge in improving course standards.

Is it the avid golfer or is it those entrusted with the maintenance of the course, whose pride and egos keep them striving for that extra edge?

But nonetheless, when one stops to look at how far the standard of course playability has come since the game's humble beginnings, it is quite staggering (even a little frightening?).

So where does the topic of bunkers fit into this discussion? Well, I have been asked to present perhaps the most conflicting of views. That of someone entrusted with their maintenance, and also from the golfer's perspective.

At Glenelg Golf Club we have 94 bunkers, predominantly revetted faced, but of varying dimensions. They are built from native sand,

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effectively a hole in the ground with minimal drainage requirements.

The revetting sod is a mixture of Santa ana and common couch, while the sand is a natural dune sand, orange in colour, and of a fine texture. Although relatively easy to construct, they have their own unique maintenance challenges, but what bunkers don't!

Like all maintenance crews, we are constantly striving for more efficient methods of maintaining our bunkers, through the use of growth regulators, herbicides, different styles of rakes, raking techniques, face maintenance and irrigation.

The practices involved in maintaining and preserving the integrity of the bunker's design

are complex, time consuming, and at times futile in the battle against where nature wants the sand to be. And yet we soldier on, at times adding amendments to faces in an effort to get sand to defy gravity, while at other times moving hundreds of kilograms of sand that golfers have raked out of place.

We consolidate faces, ensuring the ball rolls to the base of the bunker, where the lie should be not too hard, but not too soft, preferably flat, and consistent with the rest of the bunkers on the course. And don't forget, we also like them to look good.

Why so much time on maintaining hazards? The answer to that was made clearer to me a few years ago when, after a lengthy meeting,

I was able to clarify that the group of golfers I was talking to viewed bunkers as a playing surface, not a hazard at all.

The result of this thinking, which I am sure is not unique to Glenelg, is the following:

- Bunker maintenance - 3110 man-hours per year
- Greens maintenance - 2122 man-hours per year.

We spend more time maintaining hazards than we do our greens. Considerably more.

So, how have we come to this? Bunkers were originally wind swept hollows sought by

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"The majority of golfers look upon hazards as a means of punishing a bad shot, when the real object is to make the game interesting" – Alastair MacKenzie

sheep for protection from the elements; no formality, and certainly no maintenance. Surely at a time when the term sustainability is so readily used in golf course maintenance policies, there is an opportunity to make some savings in time and money here?

But is it that simple? What are the repercussions of reducing maintenance on bunkers? Obviously there could be the reallocation of resources to other areas of course maintenance, but there are far greater implications of such a dramatic change in priorities.

Appearance

Suddenly the razor-sharp edges and "polished" sand faces would become a thing of the past. Uniformity of sand colour may be lost, as well as the crisp raking patterns within the bases. Sand may have to stay where nature moves it by wind, rain or gravity, rather than continually being reinstated to original design.

Design

Many of the bunkers constructed today are reliant on regular maintenance to achieve the desired "look". It may be that architects will be challenged to consider bunkering of a style that looks more appropriate when left a little rough around the edges.

Surrounding grass selection plays an important role here too. Some very new courses have adopted this approach with spectacular results.

Number

Pre-MacKenzie courses were likely to have between 150-200 bunkers, a concept that the good Doctor frowned upon. His attitude is said

to have been to use fewer, well placed bunkers to enhance the strategy of a hole. This concept rings true today, especially considering the limited resources of many clubs.

Playability

Through the formative years of the game, it was a question of luck as to what lie you would have in a bunker. Today anything but a perfect lie is frowned upon and in need of urgent attention. A diversion of resources away from bunker maintenance would see a little more luck come into the game, as the playability of bunkers would lose some of its consistency throughout the course.

Golfer attitudes

Perhaps the biggest challenge of all. To educate golfers to appreciate the game for its lack of predictability, the very thing that makes it unique, and that the "restoration" of bunkers as true hazards is an important part of ensuring the sustainability of many golf courses. It is not uncommon for the modern tournament golfer to prefer to finish in a bunker than many other lies, because of their skill at recovering from what are generally very consistent lies. Is this the right message to be sending to the weekend golfer, rather than bunkers being viewed as something to escape from?

It is all well and good for me to put forward these views, but how would I react when it is my ball that finishes in a heel mark on a down slope and costs me two shots? Would I be cursing my bad luck? Absolutely! But would it kill me to be reminded that I should not have been there in the first place? No!

I am no different to any other golfer, I suspect, in that I would have to alter my game plan a little and develop a more strategic approach to my round to avoid the possibility of such rotten luck – the very concept that Dr. MacKenzie and his colleagues advocated years ago was the essence of the game itself.

Golfers may also have one other added responsibility with a change in attitude towards bunker maintenance – etiquette. It would be the responsibility of the golfer to repair any damage for any following player rather than assuming greenkeepers will perform their duty.

As the figures above suggest, bunkers can have a major impact on course maintenance, and the question needs to be asked, 'Is this right?'

There is a lot to consider with any significant change to bunker maintenance standards, and it would take some courage to implement. But it may well be that a move to the past could be a positive step forward. 🏌️

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