

The construction of golf greens

WHAT is the best type of construction? To understand this better, it will help to discuss the recent history of green construction on the less than ideal sites which are all that is generally available today. It is rare to be given an ideal links or sandy heathland site for a new course. Generally it is a stretch of heavy agricultural land which is hardly either ideal golfing country, nor particularly well drained naturally.

My involvement in golf course construction goes back to the late 1940s working with that genius of an architect Mackenzie Ross, first in Scotland then in Belgium. There was then a long period when few new courses were built in Britain, until the boom starting in the sixties, when I returned full-time to golf advisory work.

I was horrified at what I found - even in those days I advised that greens sited on heavier land be built on stone carpets, though this was regarded as an expensive and generally unnecessary luxury. The usual method then was to lay down a herring bone drainage system, if anything, topped with local soil, finishing with 2" seed bed compost. No wonder we have so many poor courses with even worse draining greens. Even when stone carpets became more generally used - as opposed to using them only on wet sites, mistake followed mistake. Earth moving equipment was used, with no regard for its destructive effect on soil structures in root zones; churning up approaches and causing insoluble problems with drainage. Even then much too heavy soils were used - always on the grounds of expense. Some of those early courses twenty five years ago were built for under £10,000 - and never was soil imported. Worse still, the wrong 'stone'

was used - and the fatal results of using limestone or lump chalk particularly, on acid heathland sites, was proven when greens had to be lifted and relaid within a few years of construction. The chalk fizzed away quietly to itself, breaking down into a wet, plastic and totally impermeable base, with obvious results on drainage and turf.

cheap construction

These errors were made in the interests of cheap construction on the false grounds that what one did not spend, one did not have to earn. Yet correct construction, though more costly, always turns out to be cheaper in the long run.

It bears constant repetition that drainage is our main problem but this must be achieved without creating an unnatural ecology, which has to be maintained artificially and very expensively - and which, as in all knife edge situations, is bound to come apart at the joints sooner rather than later. The two extremes can be reconciled by proper specifications, selection of special sandy soils for the root zone and avoidance of compaction during construction. Merely running a series of drains under a green is no answer. At best the drain lines show in a drought and at worst they drain only a narrow zone on each side of the drain. Therefore, logically the green must be built on a raft or stone carpet which is itself efficiently under-drained but the surface effect of such drains is masked by the raft.

Constructional compaction is still the prime fault of many courses built in the past twenty five years. Building by hand e.g. with wheelbarrows and spades is obviously out, if only because of the high cost, yet it is fatal to use earth moving equipment in



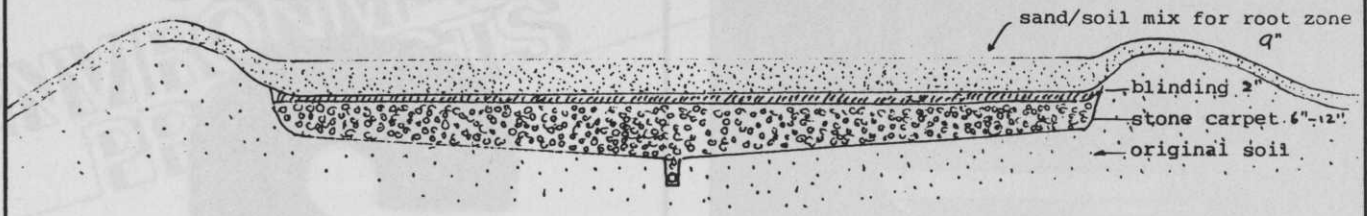
by Jim Arthur

areas where special drainage is essential. It has always been the most important constraint in my specifications that no wheeled or tracked vehicle must be used on future putting surfaces or aprons. However this increases costs. Therefore a compromise has been successfully reached in recent years - and it is significant that no greens built to these specifications have proved to be unsatisfactory, in contrast to others.

no argument

There is generally no argument about basal construction - namely that the base of the green should be excavated with a valleyed contour to shed any water which reaches it, laterally, to a shallowly inserted central spine and alternate and opposite herring bone drainage system, with flexible perforated plastic drains and pre-formed junction units, run to a proper outfall and not just, as so often happens to a small sump sited in the most important area of all, five yards in front of the green, creating a soggy bog and giving impossible run-up conditions. This excavation and construction can safely be carried out with earth moving equipment as the base does not need to be permeable and indeed it is an advantage for it to be consolidated and stable. The arguments start with the selection of material for the stone carpet. Whilst various grades of gravel may be theoretically effective as drainage they fail the practical construction test because gravel is so 'fluid' that it moves under

CROSS SECTION OF A GREEN (note vertical scale exaggerated)



Note valleyed base shedding water to the centre drain.

traffic, and sinks into the base of the green. It is essential for the success of this method of construction that angular stone be used because of its stability.

heap of stone

Once the base is graded out, and the drains inserted and topped by hand with the same stone as for the carpet, after blinding them with finer stone or gravel, then a heap of the specified stone is dropped into the centre of the green, with a Hymac or similar long jibbed excavator. This machine is then moved, sitting stationary on that levelled pile, to introduce and level the rest of the stone carpet to conform to the finished contours of the green.

In many cases, there is limited local choice about the stone, but it must never be decomposable, soft sandstone and certainly never lump chalk or limestone. A size between 2"-3" or 3"-4" depending on availability, is ideal. Hard sandstone, gritstone, whinstone, granite, 'main-line ballast', flint reject from crusher-run have all proved successful. Small gravel has not, as it is unstable, and the only way for it to give good results would be to use a drag-line excavator to introduce it! Of course, there are large voids - intentionally - and of course the stone must be blinded, with a material naturally varying with the stone used, so as to be compatible and preventing infiltration of the root zone mix, again ranging from clean 'sharp' ash, clinker or smaller grades of stone or coarse gravel - and even to the extent of using two, compatible, graded blinding layers in the case of large stone.

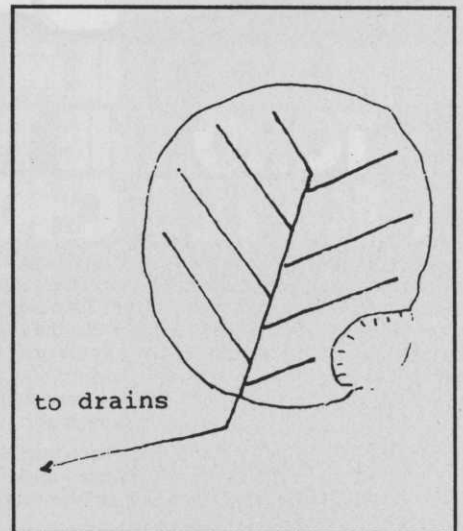
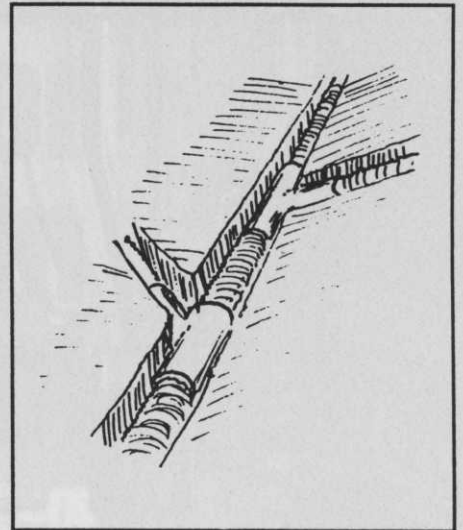
The secret of good greens is to try to copy what is under the

best natural turf - virtually a humus enriched light sandy 'soil' - but containing within the meaning of the Act no clay and very little silt. This does not mean mixing peat and sand! The ideal mix comes from deep alluvial deposits in East Anglia's often overlying gravel and derived from old, long since drained, lakes. It has been shipped in bulk to Ireland, the north of Scotland and the extreme South West. This fen soil is diluted with 70% - 80% sand of a specified grain size and uniformity and produces a consistent uniform root zone. More importantly, the subsequent top dressing can be carried out with exactly the same material.

uniform layer

It is vital that the root zone layer is absolutely uniform if roots are to develop to its full depth. This means mixing the fen soil and sand off site, and never on the green site itself. Rotavating in peat or even fen soil into sand already introduced will never achieve the homogenous mix which is vital to success.

Pockets of sand, or worse still, peat or humus-rich soil can have disastrous effects on the overlying turf. The sketch shows the methods - but experience influences the results. This is a vast improvement on the old method of using local soil however much diluted with sand. Clay plus sand makes bricks. Only a decade ago some advisors were still recommending 2" of 'seed bed compost' over a local soil base (with or without stone carpets). Needless to say the roots never ventured into the unfriendly world below, and with this



encouragement surface rooting annual meadow grass soon displaced the sown grasses. If golf courses are to be built well and cheaply they must be built quickly. Of course, if you can afford to spend six weeks or more building one green, using hand work only, then gravel may be one answer but the end result is the needless spending of money. Courses costing £1 million and more, even if most of this has been spent in massive earth-moving of the

Continued on page 26 >>

the construction of golf greens

<<

site to make it conform to the so called architects preconceived ideas ('Identikit courses' I call them), will certainly never see a satisfactory financial return on the expense. To build well and cheaply means building quickly and this means mechanisation. This is impossible on gravel - and even less so with pure sand.

very few courses

There are in fact very few courses where the greens have been built with *pure* sand - most are with humus-enriched sand or a sandy soil - and not one of these pure sand greens has stood up to the test of time. It is fashionable to claim it was the use of the wrong materials or bad specification which was responsible for the poor results with sand greens, but whilst the use of binding angular, concreting sands made disaster inevitable, it is the concept that is wrong in the first place, and with it, the management which is enforced by this type of construction, virtually hydroponics i.e. growing plants without soil. This ensures that in the absence of any limiting climatic factors e.g. very hot summer temperatures, annual meadow grass is bound to dominate and under our climatic conditions we can never produce the superb pure bent (*Agrostis*) putting surfaces, which are such an attractive feature of the best desert courses in the States.

show me!

I would be more easy to convince if anyone could show me a good green more than two years old, subject to even modest play in the UK, built on pure-sand. Let it be clearly understood - it is pure, not 'dirty' sand I am criticising - and even if we had - (which we have not) - the need for intensive irrigation in the UK,

annual meadow grass is bound to dominate as a direct result of NPK manurial treatment, without which even the fine grasses would die, on sand alone.

our main enemy

Annual meadow grass is still our main enemy. We do not have to live with it. It is not inevitable unless management (past or present) is or has been wrong. But if you build greens the wrong way you have lost the battle before you start. There are of course many finer points of construction - and one is the need to insert the horse-shoe main serving the pop-ups into the base of the green (the perimeter of the stone carpet) without risking subsequent damage to the pipes, and at the same time avoiding unacceptable disturbance of the prepared seed beds. A plea is made to Architects not to indulge in flights of fancy with exaggerated contours. Mackenzie greens are all very well, but their inventor, who used the two-tier green to accommodate a green into a steep slope, stated that such greens must be at least 800 sq. yards in extent, to compensate for the fact that well over a third of the green area was not available as pin space.

always difficult

Management of the slope is always difficult, not just mowing and the attendant risk of scalping, but also because everything sheds to the lower level - fertilizer, top dressing and above all water. With such greens pop-ups can at best provide only the basic minimum needs of the low wet areas and the ridges have to be topped up by hand-held open hose, with penetration aided by hand aeration and the use of wetting agents. Common errors with this construction are in the depth of the root zone which must vary no more than between 9" - 10" - just deep enough to sink a hole cup. One contractor who skimped construction costs and ended up with 6" soil, tried to resolve the problem by supplying 18 shallow hole-cups

on the course he built some years ago! This of course emphasises the need for constant and regular site supervision and total trust between architect and contractor if success is to be assured.

Surrounds to greens must also receive almost as much attention as the putting surfaces, though they are not normally built on stone carpets. Common faults are artificially steep, skimped mounds instead of bold but gentle contours, mowable by triple mower; coupled with false economy in soil preparation. Improved soil must be used, at least 4" in depth, after constructing the mounds integrally with the green.

care & protection

Approaches - perhaps second in importance in turf quality only to the greens - need care and protection to ensure perfect run-up conditions - with virtually no botanical difference between them and the green itself - only in the height of cut. This means not only keeping all construction machinery off these vulnerable areas, by working from the back and sides of greens wherever contours or site boundaries permit, but in much more attention to seed bed preparation.

I prefer seeding to turfing though in case of need e.g. the course having to be ready for play when an hotel opens or investors wanting to see the quickest return on their money, turfing is feasible now that we have better quality-control on 'cultivated' turf. When seeding, use the newest strains of *Agrostis* and fescue as they are proven to be so much better - (see the STRI Turf Grass Seed 1988 lists) and if you must economise use less, not cheaper, seed. We generally seed too heavily - which can help to keep out stray grasses - but the best method is of course to sow only when the soil is warm and moist (i.e. late July to mid September), as a quick establishment will produce the best results - well worth waiting a few weeks for - especially if the intervening time is spent on

cleaning the seed bed. I recommend that surrounds and approaches are sown with exactly the same (expensive!) mixture as the putting surfaces, since after all we want no difference in the end result. How often one sees quite good greens and yet a foot off the putting surface, there is a thin open poor sward, with severe contamination from rakings pulled off the green and not collected! I cannot stress too much the importance of perfect marrying-in between apron and green itself.

I am sure there will be many who will push rival claims for

alternative construction methods, but do remember one thing! This method is not only proven, but by far and away the largest numbers of courses in *good order* were built to this specification in the past decade and more, and none has needed lifting and all have given satisfaction as well as fine grass dominance, where management has been correct. I fully admit that not every new course with which I have been involved in the past twenty years is still successful but in every such case, my advice was over-ridden for the sake of saving perhaps £5-10,000 in

original construction costs, we are now faced with costs in excess of £100,000 for rebuilding them (and all the disruption). It pays handsomely to do it right first time. There is no mystery about good course construction any more than with good greenkeeping - just a case of using logic and commonsense to achieve the right end. There seems to me to be neither logic nor commonsense in using systems that have been devised to meet the special needs of arid desert areas totally different from anything found in the U.K.

RFE - RFE - RFE - RFE - RFE - RFE -

R
F
E

RFE

Murray Wardrop

Turf Machinery to the Professionals

Colhook Industrial Estate, Petworth, West Sussex GU28 9EJ Tel: 042878 532

NEW & USED TRACTORS AND GRASS CUTTING MACHINERY

R
F
E

ALLEN NATIONAL 68" NEW

ALLEN NATIONAL 68"

RANSOMES MOTOR 180 FLOATING &

FIXED HEADS (CHOICE OF 3)

RANSOMES HYDRAULIC 5

RANSOMES HYDRAULIC 214 SPORTS CUTTER &

VERTI-DRAIN CUT HEADS

RANSOMES HYDRAULIC 3 SPORTS CUTTERS

RANSOMES TRAILED 3 SPORTS CUTTERS

RANSOMES MOUNTED 3 MAGNAS

RANSOMES TM80

RANSOMES AUTO CERTES 20"

CUSHMAN TRUCKSTER 3 WHEEL COMPLETE WITH CAB

CUSHMAN CYCLONE (NEW)

CUSHMAN TOP DRESSER

SISIS HYDROMAIN 14

SISIS SLITTER

TORO 70

TORO GM3 (CHOICE OF 4)

TORO 52 OUT FRONT (NEW ENGINE)

TORO 84 (EXCELLENT)

HUXLEY TR66

ISEKI SWEEPER (NEW)

WOODS REAR MOUNTED ROTARY MOWER

TRACTORS

ISEKI 2160 (CHOICE OF 4)

ISEKI 2160 (NEW)

FORD 4610

FORD 3600

MASSEY FERGUSON 135

ISEKI 3500 4 W/D COMPLETE WITH LOADER

ISEKI 2140 COMPLETE WITH LOADER & BACK HOE

KUBOTA 8 200 4 W/D COMPLETE WITH 60" DECK

R
F
E

R
F
E

R
F
E

**WE BUY AND SELL MACHINERY - ALWAYS WILLING TO TAKE PART
EXCHANGE**

TEL: 042878 532

RFE - RFE - RFE - RFE - RFE - RFE -

R
F
E

R
F
E

R
F
E

R
F
E

R
F
E