YOUR DRAINAGE ON YOUR GOLF COURSE

By Geoffrey Davison

Neat one-pass slit installation by sand injection

Fine sand slits at close centres

Sports-turf drainage in general, and golf course drainage in particular, has come a long way since the simplistic days of "just putting some pipes in wet areas".

Before making decisions about any drainage problem ask three questions and make sure that the answers are made with full knowledge of up-to-date technology. Only by having this approach can the best results be achieved at the lowest possible costs.

Question 1.

WHY EXACTLY DOES AN AREA HAVE A DRAINAGE PROBLEM?

Answer 1. All wet ground is the result of rainfall, recent or perhaps much earlier. There may be one or more reasons why, at times, this precipitation causes some areas to be unduly wet:

(a) Rainfall in excess of the existing pipe drainage capacity.
(b) Soil Texture not sufficiently permeable.
(c) Soil Structure compacted.
(d) Surface run-off from higher ground.
(e) Sub-surface seepage from higher ground.
(f) "Saucer" surface contours.
(g) Intensive use – eg. Pathways.
(h) High water table.

Until the causes are correctly diagnosed, the most effective cures cannot be established.

Question 2.

WHAT EXACTLY ARE THE MOST EFFECTIVE REMEDIES?

Answer 2. All the eight possible causes listed above have to be taken into account:

(a) Existing pipe drains. Measures such as repairing broken pipes and clearing blocked outlets are sound maintenance. It may be that the existing pipes are working but that there are too few of them. However, if the pipe system is generally mal-functioning the best and most cost effective course may be to leave it to make whatever contribution it can and to install a new well designed pipe system into the area.

(b) Soil Texture. Very few soils have a texture which provides ideally high permeability. The progressive addition of suitable sand does help but basically it is a case of having to accept that the soil texture is what it is!

Sand slits can provide an effective soil by-pass route for excess water.

(c) Soil Structure. Although it is very difficult to change Soil Texture it is possible and very beneficial to create and maintain a good open Soil Structure. Really effective and frequent aeration is essential, not only for drainage but also for healthy root growth and good quality turf.

(d) Surface Run Off. On bare soil, surface run-off from sloping ground is obvious. On grassed areas it may not easily be seen, but it still happens and must be intercepted before it reaches the playing surface. Swales, ditches, pipe-drains with permeable backfill to the surface or combinations of these may be required.

(e) Sub-Surface Seepage. Many thousands of tonnes of water are held within the sub-strata of nearby, or even distant, higher ground. This water is under great pressure especially when it is deep within hills. It may take hours or even centuries to make the, sometimes long, journey, but if it can force its way out, it will do so. Wet areas can be formed at points where this underground water has travelled through the sub-strata and come to the surface. Deep drains are needed to intercept this flow before it reaches the playing surface. Pipes in the actual wet areas may not be the answer.

(f) Surface "Saucers". It is surprising how often it is not appreciated that some wet areas are actually surface "saucers". Surface water cannot escape and the slopes feed it towards the

Profound aeration creates countless millions of tiny cracks and fissures

Trenching to install a pipe drain

One pass narrow sand slitter

Rapid, one-pass installation of small sand slits at close

centre. This is often the case on greens! Adjusting the surface contours to provide run-off points is an effective remedy

(g) Intensive Use. Severe compaction on limited areas such as pathways may require very intensive drainage, or perhaps the turf could be replaced by other material.

(h) High Water Table. This may be a feature of the location. Lowering the level is possible but expensive. A professional survey may be required. Individual wet areas can be isolated by deep ring mains, sometimes with an automatically controlled pump. With the water table height reduced within the ring, normal drainage can be installed.

Question 3.

HOW EXACTLY CAN THESE CURES BE IMPLEMENTED?

Answer 3. These points apply to fairways and rough. "Greens" are dealt with separately as another item at 4 below, as also is "Installation" at 5 below.

(a) Existing pipe drains. If the existing drains are sound but too far apart, new drains can be installed to increase the drainage capacity by bisecting the spacings. On fairways, problem areas will usually need pipes to be at not more than 5m centres.

The overall drainage capacity can be further enhanced by crossing the pipes with sand or sand/gravel slits @ 90degrees to the pipes and @ 1m centres. Wider spacings are proportionately less effective. Such major slits need to be 40mm to 50mm wide by 250mm to 300mm deep. Tested good quality back-fill is essential. Gravel or granules can be used but only if covered by a topping of good sand. Gravel or granule back-fill up to surface level is not cost effective. It is soon in-filled by fines and ceases to function. It is also a playing hazard and detrimental to the texture of the top-soil.

Where new pipe systems or sand slits are to be installed, always bear in mind that the key to modern drainage technology is "intensity". Fewer drains or fewer slits cost less but are less effective. The design of new pipe drainage really needs to be part of a comprehensive plan which includes other measures such as sand slitting, ditching, etc. Sound professional advice about this may be good value.

(b) Soil Texture. Sand top-dressing is beneficial to the playing surface but it takes regular applications over many years for it significantly to change the texture, and therefore the permeability, of the root zone material. Only a suitable depth of a soil with a texture which has a particle size distribution of not less than 75% sand can provide the desired high permeability. Good fertile soil may not be highly permeable, but it can grow good strong turf; let it do that and impose the required permeability by installing a well designed intensive slit drainage matrix.

(c) Soil Structure. The value of creating and maintaining an open soil structure cannot be over-emphasised. It is hugely beneficial to root growth and grass health, and absolutely essential for good drainage.

Yet this prime requirement rarely receives the necessary regular and effective attention. The occasional application of a (perhaps outdated and not very efficient) aeration machine totally fails to achieve what is required. The objective of aeration is to increase the ratio of voids-to-solids within a soil's structure. In order to "make space" for this to happen, an aeration machine must either take out cores or, slightly and evenly, lift the surface. Machines which merely make holes or slits in the turf by poking the surface really achieve very little.

(d) Surface Run-Off. Inspections of individual areas readily show where the water is coming from. Adjusting the surface contours by temporally removing the turf and re-shaping the formation grades can create wide and mow-able interception

Narrow trenching for slit drains

Neat clean trenching

swales. It may be possible for these to lead to discharge points, but in some instances ditches and/or pipe drains with permeable fill to surface level may also be required.

(e) Sub-Surface Seepage. It may be difficult in some cases to know exactly where the seepage is coming from. Trial holes may be required to establish both the direction and depth of the flow.

Interceptor pipe drains need to be appropriately deep and backfilled with suitably permeable back-fill. It also may be necessary to install a full-depth vertical water-proof membrane on the lower side wall of the trench before backfilling it in order to arrest flow which is occurring at various depths.

(f) Surface Saucers. Turf can be neatly cut and placed to one side while formation levels are slightly re-shaped to form one or more run-off points. With the soil cultivated and firmed, the turf can be re-placed immediately so that there is only minimal interruption to play.

(g) Intensively Used Areas. Depending on where it is situated, there is a choice between turf with very intensive localised drainage, or replacing the turf with some other pathway material such as woodchip, finely chipped stone, gravel, etc.

If turf is the choice the drainage pipes would need to be crossed by closely spaced major sand slits which in turn may need to be crossed by minor slits @ 250mm centres.

(h) High Water Table. Where parts of, or even entire, golf courses have been built on areas with a high water table, there is always the temptation to wish that they had been built somewhere else! However, they are where they are and can be very pleasant courses.

A high water table can be a difficult, but not insuperable, problem.

Localised areas such as part, or perhaps all, of a fairway can be dealt with by installing a suitably deep and continuous outer ring drain. Unless a pipe from this can lead to a lower outlet, it will be necessary to construct a deep chamber which is evacuated by a submersible pump controlled by a float switch. The evacuated water will have to be fed into an outlet which discharges outside the ring main. Normal drainage can then be installed within the ringed area which now has a lowered water table. Where larger areas require major works, a professional survey and expert advice is required.

Installation

Who does the work?

Major schemes are best carried out by proven specialised contractors.

They have the required machines and experienced staff. Good contractors will charge fair but competitive prices. Major contracts will require substantial outlay. All quotations must be made to the same detailed design and specification. Any bid which is much lower than the others is always suspect and best not accepted.

Where funds are in short supply, a lot can be achieved by carefully planned in-house operations. This is especially so on smaller areas and where skilled green-keeping care is required to provide a neat finish. Most drainage contractors really do not want this smaller type of work.

A long term in-house programme can be implemented over a period of years as and when the green-keeping staff have the time available. Work need not take place when ground conditions are unsuitable or when it would interfere with the playing schedule.

Suitable equipment can usually be hired, but it is much more convenient and less costly for a club to own at least the one essential small specialist machine. A compact tractor mounted trenching machine which is capable of excavating larger trenches for pipe laying, and also neatly cutting out narrow trenches for sand slits, is always useful on a golf course. Trenching is often also needed for irrigation and other work apart from drainage.

Conclusion.

Pipe drains can take away excess water. Sports-Turf Drainage requires that this water must penetrate down to the pipes much more rapidly than the slow rate which is permitted by permeating through soil.

There are only two options. The soil has to be replaced by a sandy root-zone mixture or it has to be by-passed by an intensive sand slit matrix.

Modern Sports-Turf Drainage is not as complicated as brain surgery but it has now become a fairly complex technology. Scheme design and specification are crucial. Time spent in considering the various points outlined in this article will help to achieve the best results at the lowest costs.

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Please also see Page 61 in the Buyers Guide section for further information