

Shelton

A guide to Sportsturf Drainage Techniques for Sports Pitches



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Sports Pitch Drainage

The advanced Shelton drainage techniques available today can be installed speedily with little disruption to the playing surface, such that 'drain today, play tomorrow' becomes a reality. Cost effectiveness is uppermost in our minds, also. But the timing of the drainage works needs to be selected with care for optimum results – some drainage techniques are best undertaken when soils are relatively dry, others when soil moisture levels are relatively high. Plan long-term to get the backing of the players and create minimum disruption to the course.

The first step is to try and identify the reasons for the excessively wet area. Perhaps it is naturally slow draining clay soil, maybe substantial rainfall over a short period, possibly soil water rising from below, or run-off from adjoining higher ground. It may be caused by excessive thatch or capping of usually well draining soil by heavy pedestrian or mechanical traffic. Is it a broken land drain or a damaged irrigation pipe? Until the reasons for the problem are identified the best and most cost-effective solution cannot be formulated.

Some clubs choose to let their own groundsman rectify the problem; a significant number of them have been trained in basic techniques of land drainage. But can they be spared from other duties for a few days and have they the specialist up to date equipment that will allow them to undertake the work quickly and without substantial disruption of the playing schedule? Do they know the best layout of the primary drainage system and when a secondary drainage scheme may be advantageous and save money?

Before we get into the detail it must be recognised that a ground used for premier division matches is going to require a more intensive drainage system than that required by the local football club. However, basic rules apply to both.

Primary Drainage

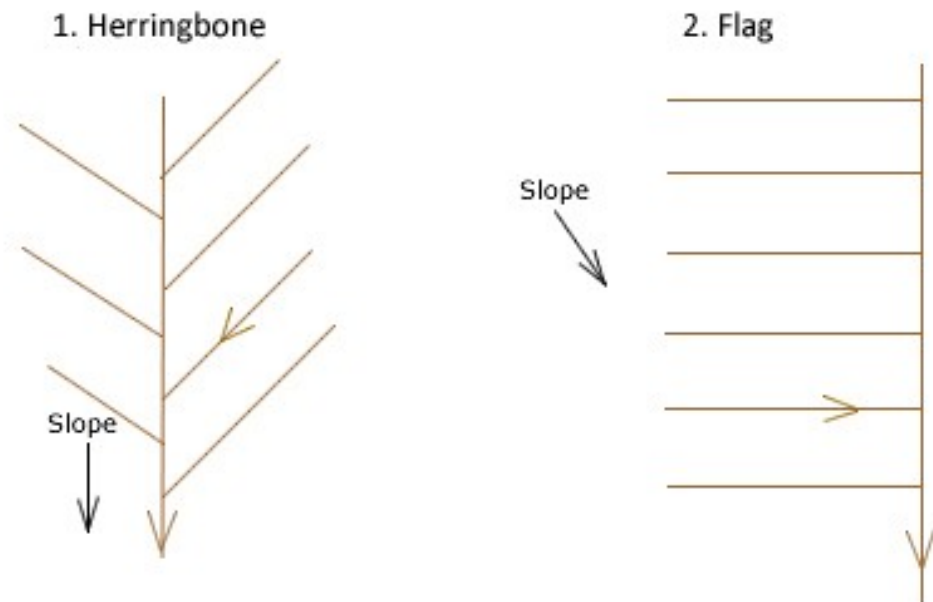
To remove excess soil water from an area is going to require the use of perforated land drainage pipes. It is important not to over-size these pipes: bigger is not necessarily better! The reason for this is that very small soil particles pass through the slots in the drainage pipes and are flushed out by the flow of water. The bigger the pipes the slower the flow of water: if the flow is too slow then the fine particles build up in the pipe and quickly reduce its effectiveness.

Correct pipe sizing is very important; the designer of the system will take a number of variables into account in deciding the appropriate sizes for a particular installation. Substantial sums of money can be saved by getting things right at this stage.

To minimise disruption the layout of the lateral piped system must connect with a main drain or drains off the playing area. The herringbone system is 'out' for the pipe junctions are sited down the centre of the pitch resulting in big scars in the most-used part of the pitch.

With pitches that are crowned run a main drain down each side of the pitch – if space allows some two metres away from the playing area. With other pitches run the main drain down the lower side similarly just off the playing surface.

In the case of crowned pitches, the lateral drains will run across the pitch connecting to both main drains. With other pitches the laterals will be in the flag layout. In both cases the lateral/main drain connections will be off the playing area. Ensure a laser is used to get the correct falls.



Spacing of the lateral drains will be determined, most likely, by the budget. On a premier league pitch 3-5 metre spacing is likely. Whereas 7 or 10 metre spacing is more common where budgets are tight. 10 metre spacing should be considered the maximum. Laser guided equipment would ensure an even fall on these pipes.

But pipe sizes and consequently trench width are major cost considerations also. Big diameter pipes do not necessarily give the best results. The smaller the pipe, the faster the flow, which helps keep them running clear.

Also, the larger the pipe, the wider the trench, and hence larger quantities of aggregate are required to backfill the trenches. Narrower trenches also heal quicker. Main drains would typically be 100mm in 118mm trench, laterals being 60mm in a 78mm trench or 80mm in a 97mm trench.



80mm pipe fits snugly in a 97mm trench

Primary drainage schemes on their own rarely give the speed of drainage required by today's footballers. Hence a secondary drainage scheme needs to be superimposed over them. The choice of secondary systems will be covered later on.

Aggregates

The selection of these aggregates needs to be understood. Spherical materials are the preferred choice as they leave air spaces for water to flow through. Angular gravels tend to run together over time leaving no such spaces. Materials with lots of fines should also be avoided to prevent pipes from becoming blocked.



Lytag has eight times greater hydraulic conductivity than gravel

A crushed 8-10mm gravel may be inexpensive but a product such as Lytag – pulverised fuel ash – could drain up to ten times faster and carries no Government Aggregate Tax. The advantages of using Lytag are many, including faster drainage, the ability to retain water in dry conditions which reduces the striping that can occur when gravel is used. It is half the weight of gravel per volume, which reduces the weight of material being carted across the site. It also shatters on contact with mowers, where gravel will not. The latter could be the more cost-effective material to use; it will depend on your circumstances.

Secondary Drainage Techniques (See also Appendix I)

Before I describe the various secondary systems of drainage available we should consider the role of the secondary system. Piped land drains remove excess soil water off the pitch and whilst it might be desirable to put these close together the cost, in most cases, would be prohibitive. Therefore, it is usual to space them at 3, 5, 7 or 10 metres apart depending on the status of the pitch. (Some of the excess water in the soil therefore has to travel 1½ to 5 metres to the nearest land drain and this takes time.)

To speed up this water movement through the soil a secondary drainage system is superimposed over the primary system, usually at 90° to it.

Sand Slitting

One of the commonest systems has been sand slitting or slit trench drainage. This consists of 50mm wide gravel/sand filled trenches installed using a Supertrencher, spaced one to two metres apart. They are typically 250mm deep, backfilled with 100mm of gravel, and topped off with 150mm of coarse sand. These are best installed in dry conditions.



Sand Slits installed at 2 metre centres at 90 degrees to primary drainage.

Gravel Banding

Shelton Gravel Band Drainage consists of gravel bands, usually 25mm wide and 250mm deep. The soil is opened up by a vibrating stainless steel tine and the gravel fed immediately into the slot. A wheel or roller on the back of the machine partly closes the band to enable use of the pitch immediately afterwards. This system has to be installed when the soil is moist throughout the working depth. This gravel banding is low cost,, yet very effective indeed. Because the bands are close together and half the width of the slit trench drainage technique only rarely do they open up to such an extent that remedial work is required. In such cases an overall surface dressing of a free draining sand suffices.

It is a one-person operation to install and with one tonne and three tonne capacity machines available to suit the circumstances big outputs per day are possible. It is little wonder that gravel banding has become a popular technique on pitches from those in the premier division to those in small towns and villages.



3 Tonne Gravel Band Drainer for large areas



Mounted model useful where space is limited

System 25

System 25™ is a trenching technique where 25mm wide trenches are dug by a high speed wheel. The arisings are conveyed into a trailer running alongside. Coupled to the rear of which is a vibrating hopper immediately back-filling the trench with a permeable aggregate. It is a one-pass operation.

These micro trenches are usually installed at depth of 300mm and are usually spaced between 500mm and 2m apart depending on the speed of drainage required, and the budget available. Shelton System 25™ is best installed when the soil is on the dry side. It entails the use of more equipment and operators than gravel banding hence the cost is somewhat higher. Disruption to the playing surface is minimal and use may be resumed immediately if necessary.



System 25 installing secondary drainage, Gravel Cart keeps hopper topped up

Lightening Drain

There are situations where very speedy drainage is required. To meet this demand we have recently introduced our Lightening-drain™ system; the world's fastest drainage system.

Lightening Drain™ is very similar to System 25™, using the same equipment, except the trenches are dug 35mm wide and a 25mm perforated land drainage pipe is installed prior to backfilling with Lytag. We know of no faster land drainage system when the pipes are spaced at 500mm centres.



25mm perforated drainage pipe

With all secondary drainage systems maintenance is required. A common failing arises because the pitches drain well. As a result they are used by all and sundry both for matches and for training. The grass turns to mud and the effectiveness of the secondary system is thereby reduced.

After the installation of secondary drainage and in years two and three it is advisable to apply 100tonnes of a free draining sand to the pitch in the growing season – preferably in two applications of 50 tonnes so as not to suppress grass growth.

The professional footballer will no longer tolerate playing on a poorly drained, muddy pitch.

The amateur plays football for enjoyment, so why should he? The latest drainage techniques and equipment have revolutionised pitch preparation. Are you part of that revolution?

Options for getting the work done.

Employing a contractor.

Sportsturf drainage calls for specialist skills and specialist machinery. Drainage techniques have advanced considerably in recent years and it is essential to employ only those who have the expertise and specialist equipment to work efficiently and effectively. It is likely to be the most expensive of the options considered here, but should ensure a high quality of workmanship.

Hiring-in specialist equipment, trenchers, backfillers, and possibly tractors.

Consider – has the club got staff skilled in the operation of specialist equipment? Can it spare skilled staff for a few days from their routine duties? Have we got detailed plans for the drainage works? If the answers are yes this option is worthy of an in-depth study.

Hiring-in specialist equipment with trained operator(s)

This approach can show significant savings over using contractors. It is a form of partnership working. However the club must remember it is making the decisions, formulating the plans and directing the team of workers. It usually means there must be a senior member of the staff on site throughout the working day assisted by two or three skilled workers.



Specialist equipment ensures high work rates

Purchasing new or rebuilt equipment.

If the club has a substantial amount of work to do, then purchasing new maybe an option. The equipment will also have a resale value at the end of the project. Pre-owned equipment may also be an option, this initially may be cheap but reliability may be compromised and it can be more expensive in the long run. Refurbished equipment is also worthy of consideration.

Some clubs have taken the middle route – having the primary drainage system installed by a contractor, and installing the secondary drainage system in-house. Each club will have their own preferred route to carrying out the works, which can depend upon many factors, including budget, existing labour and machinery resources.

Appendix I.

A comparison of secondary drainage systems:			
Shelton Gravel Band Drainage	Shelton System 25™	Slit trench drainage sand slitting	Shelton Lightning-drain™
One pass operation	One pass operation	Two or three pass operation	One pass operation
Trench width 25mm	Trench width 25mm	Trench width 50mm	Trench width 35mm
Trench depth 300mm	Trench depth 350mm	Trench depth 250mm	Trench depth 450mm
Spacings usually 400mm to 1,000mm	Spacings usually 400mm to 1,000mm	Spacings usually 1,000mm to 2,000mm	Spacings usually 500mm to 1,000mm
Aggregate brought close to surface	Aggregate brought close to surface	Aggregate brought up to 2" of surface, topped off with free draining sand	Aggregate brought close to surface
Cost per linear unit = x	Cost per linear unit = 2x	Cost per linear unit = 3x	Cost per linear unit = 4-5x
Negligible chance of trench opening-up in dry weather	Little chance of trench opening-up in dry weather	Moderate risk of trench opening-up in dry weather	Little chance of trench opening-up in dry weather
Safety: Excellent	Safety: Good	Safety: Some risks	Safety: Good
Must be undertaken when soils are moist to very moist	Best undertaken when soils are on the dry side	Best undertaken in dry conditions	Best undertaken when soils are on the dry side
Minimum labour requirement: one person	Minimum labour requirement: two persons, preferably three	Minimum labour requirement: two persons, preferably three	Minimum labour requirement: three persons
Output per day: circa 6000 metres	Output per day: circa 3000 metres	Output per day: circa 3000 metres	Output per day: circa 1500-2000 metres

Important Points to Consider

- Remember to take precautions in the vicinity of trees and growing shrubs to prevent roots growing into land drainage pipes.
- One inch of rain on one acre is 22,610 gallons; can it be re-circulated.
- Rats and other vermin can block pipes; ensure vermin guards are fitted
- To avoid damage to irrigation pipes and control wires mark all underground services in the vicinity of the drainage works with a white line.
- Check tyre pressures on tractors and trailers before commencing work to ensure they comply with manufacturer's recommendations.
- Remember the risk assessment.

About Sheltons

Shelton specialises only in the drainage of fine turf. We have over 100 years of experience in the sportsturf drainage industry. Our equipment and techniques have been used to drain many prestigious sporting venues around the world.


We design, manufacture and sell the Shelton range of land-drainage machinery worldwide; new, used and refurbished. We have a contracting department operating throughout the U.K. We have equipment for hire – including tractors and operators.

Shelton can guide you as to which may be the best way to go to rectify your land drainage problems and indicate likely costs.

For more information please call us, or see our website: www.sheltonsdrainage.com



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