

The Blackley Philosophy on Drainage Stone

Over the years many products have been used to backfill subsoil drainage pipes ranging from excavated material, stripped turf, wood shavings, cut manuka etc and while there are a lot of theories about what should be used, we would like to share our Philosophy on drainage stone.

Blackley Construction has been installing land drainage systems for more than 50 years and during this time we have carried out a lot of investigation, research and practical trials into the types of materials used and in particular the size of stone used as a stone backfill envelope around a the land drainage pipe.



Why use gravel backfill in the drains in the first place, what's wrong with other backfill materials?

For example if the system is required because the soil is essentially impermeable then installing a pipe network and backfilling it with the excavated impermeable material is not the answer. This material will over time compact back to its original profile and seal off the pipe. This compaction could also be accelerated if you add stock and rain to the situation. Gravel is a porous material which is stable in the trench and if the grading is correct, requires minimal or no compaction. The easiest way to stabilise the trench wall is use a backfill material that will provide lots of points of contact with the trench wall. This material will provide rapid access from the trench surface and walls into the pipe.



Most of the other materials break down and compact with time and this can also cause the drain to fail. Once this type of drain fails because the compaction has reached the pipe, the only solution is a new drain.

It is interesting to note that Blackley's often replace drainage systems that were installed in 1970's with topsoil backfill. The pipes are still clear and the water still gets into them it's just that the water doesn't get into the pipe quick enough to keep up with today's intensive farming systems. Correctly sized aggregate backfill doesn't generally have this problem.

Should we use different grades of gravel on different soil types?

Probably but this then becomes very expensive from a manufacturing perspective. In our view a finer material is more multipurpose than a coarse material because it is more stable, easier to handle, requires less compaction, provides better support for the pipe and is still porous.

How do fines in the soil migrate in the first place?

Fines migrate with the flow of water. Some soils are more prone to the problem than others and as we install drainage system to speed up the removal of water, we will get fines migration at the same time if the soil is prone to it. If the flow speed in the soil can be controlled in some way, then so can fines migration. In our view using the correct grade of backfill material (finer) can help control the speed of the water flow in the soil and thus reduce migrating fines.

Also controlling aeration operations to the right time and right soil moisture content will also help reduce soil particle migration.

Are fines in the pipe a problem?

Yes they are because they can eventually block the pipe. Water will carry the fines unless there are too many of them or the water flow is too little. If the system is designed with cleaning eyes etc the pipe can be cleaned. If the

aggregate gets filled with fines, it cannot be cleaned and the entire drain will block and need to be replaced.

The same can be said for a filter sock around the outside of the pipe or the drain because if this gets blocked and then dries out it will seal up water access to the pipe, the drains performance will slowly decrease with time until it fails to work at all. In our view filter sock still has its place in finer materials but care needs to be taken when using this type of product.

Where is the best place to trap the fines?

In our view the best place is at the interface of the gravel and the soil, otherwise it is in the pipe. If it does cake at the soil interface, any form of mole ploughing and aeration will break up the cake and allow the drain to continue to function. If you have flushing access points in the pipe network you're able to keep the system clean. It is really the only part of the system you can clean.

What issues could you have with large stone?

Large stone usually creates large air spaces between the stones and this in our view would encourage soil movement into the profile from both fines migration and from soil compaction (Stock, tractors etc).

Because the drains are topped with soil you also encourage soil migration from the top which could eventually cause trench slumping and this would lead to drainage system failure. Large stone can also be less stable in the trench (Depending on the grading and could move over time and settle. Larger stone can damage the drainage pipe depending on how it is placed in the trench.

How deep in the trench should the metal be?

In most soil types aeration helps with crop production and it will help with soil drainage. In our view to get the best out of mole draining (or other forms of aeration) the treatment needs to intersect the backfill gravel in the drain. If it doesn't you will have a soil barrier between the surface and the pipe and the drain won't function to its full potential.

The gravel needs to come to around 300mm from the finished surface.

Why use Mole Ploughing and other forms of aeration?

All soils tend to compact with time and when you put stock on them or even drive over them you compact them even more. For example a key piece of earthmoving compaction equipment is called a sheep's foot roller and the name is there for a reason. Cattle are even more efficient at soil compaction and soil moisture also plays a big part. Once the soil is compacted it can't recover naturally and it won't drain effectively (or perhaps at all) and it is difficult for plant life to flourish. Mole ploughing not only relieves compaction but can also create a drainage channel in the soil to improve the soils drainage performance between the pipe drain lines.

We believe using the correct size of gravel in your drainage

trench will improve the performance of the system and extend the life of the system as well.

In some soil types making provision for flushing would also help extend the life of the system.

Don't select your gravel backfill based on cost because if you get the wrong product it could cost you your drainage network.

Make sure you have sufficient depth of gravel in your drainage trenches so you can get the added benefit other farm maintenance operations like mole ploughing.

