

FILTER DRAINS

SOURCE CONTROL



Filter Drain

DESCRIPTION

A filter drain is a gravel filled trench, generally with a perforated pipe at the base. Run-off flows slowly through the granular material, trapping sediments and providing attenuation. Flow is then directed to a perforated pipe, which conveys run-off either back into the sewerage network or into a waterbody. Filter drains are mainly used to drain road and carpark surfaces. Ideally these systems are used as a component of a treatment train.

PRIMARY CONSIDERATIONS

Construction Cost	LOW
Maintenance Requirements	HIGH
Land Take	LOW

BENEFITS

<input checked="" type="checkbox"/> Water Quality Control	YES
<input checked="" type="checkbox"/> Water Quantity Control	YES
<input checked="" type="checkbox"/> Amenity Value	NO
<input checked="" type="checkbox"/> Habitat Creation Value	NO
<input checked="" type="checkbox"/> Biological Treatment	NO

DESIGN

Filter drains are normally situated on the roadside verge or median strip. The perforated pipe is not required along the entire length of the trench, only near the end of the device.

The trench is usually lined with geotextile to prevent ingress of soil and other material into the structure (CIRIA,2000).

Inspection manholes should be located at regular intervals along the length of the device.

Excess flows during extreme rainfall events may be dealt with by overland flooding passing to swales or by an overflow pipe which connects to swales or other parts of the drainage system.

The dimensions of the trench should be selected to meet the level of reduction and attenuation of flows required, the assessment of hydraulic design performance being site specific.

Should only be used to drain areas less than 5 hectares.

Ideally a pre-treatment device (such as a filter strip or grassed area) should be incorporated to increase the longevity of the system.

Construct at least 1.5m above the maximum groundwater level and only where the groundwater classification allows.

Design to avoid flooding for 1:30 year storm event. For 100 year events, property flooding should not take place and overland flows should not pass from the site to cause flooding to other areas.

Filter drains should not be located on common boundaries as construction of fences and hedges will destroy them.

The minimum distance from a property should be at least three times the depth of the trench.

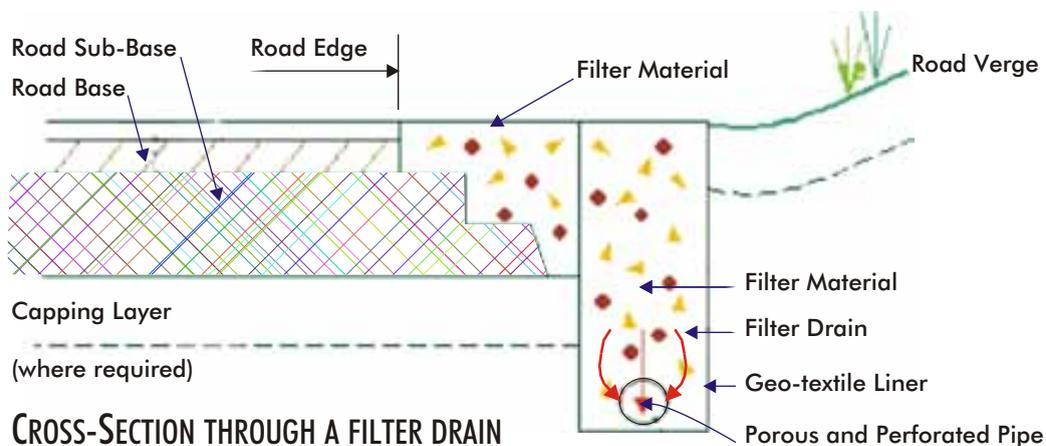
Consideration of topography is important to ensure sub-surface and overland flows are directed away from properties.

When filter drains are used to drain road surfaces, there is a possibility of the stones being scattered when vehicles leave the carriageway. This can be minimised by using crushed rock on the surface layer of the fill material (CIRIA, 2000).

Filter drains can be used in the base of swales to provide additional attenuation and treatment.

When using filter drains, the use of gullypots is not required and should be avoided.

Do not construct near drinking water wells, septic tanks or drain fields, unless fully lined.



CROSS-SECTION THROUGH A FILTER DRAIN

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POLLUTANT REMOVAL

💧 Ideally sediment should be removed in a pre-treatment device, rather than in the filter drain itself.

Pollutant	Removal (%)
TSS	85
Total Lead	83
Total Zinc	81
Oil	70
Nutrients (N & P)	Limited

MAINTENANCE CONSIDERATIONS

🛠️ Regular inspections are required to monitor sediment build-up.

This can involve:

- digging up sections of the trench to check for clogging;
- use of inspection manholes;
- CCTV surveys within the perforated pipe.

🛠️ Remedial work will also be required at intervals to remove sediment from the device. This can be done by replacing the filter material or through cleaning and replacement.

IRISH EXPERIENCE



These drains are used on the National Road Project serving a dual purpose of groundwater control and run-off drainage. The pipe is conservatively sized for the run-off flow assuming negligible attenuation in the media or loss to infiltration.

INTERNATIONAL EXPERIENCE

Scotland



Many of the first filter drains used extensively in Scotland were inappropriately designed as end of pipe features and became clogged at the inlet. Filter drains are meant to be linear features designed to run parallel to the surface they are draining.

Filter drains serving trunk roads and motorways have also occasionally been problematic. Following an accident on the M74 motorway in Scotland, a quantity of fuel oil was spilled onto the road when tanks ruptured on a heavy goods vehicle and this was subsequently discharged into a nearby watercourse through filter drains. The use of above ground structures such as swales and ponds would have minimised the effects of the incident, as measures could have been taken to contain the pollutants within the structures.

Preliminary monitoring results suggest that filter drains have a finite lifespan. Many are prone to clogging due to the absence of some form of pre-treatment device. Rumble strips or other measures can be incorporated to minimise stone scattering by vehicles. They have performed well on major roads, but may receive higher solids in urban use areas.



A Filter Drain under Construction

ADVANTAGES

- ✔ Provides attenuation.
- ✔ Provides limited treatment.
- ✔ Relatively inexpensive.
- ✔ Relatively low land take.
- ✔ Can be used in most soil conditions provided run-off discharges into a perforated pipe rather than to soil.
- ✔ Minimal safety risk.

LIMITATIONS

- ✘ No habitat or amenity value provided.
- ✘ Does not provide biological treatment.
- ✘ Below ground structure therefore operational problems not always visible at surface. Similarly significant pollution events are routed below ground and are difficult to identify.
- ✘ Not suitable where groundwater levels are high, i.e. likely to come within 1.5m of the base of the device.
- ✘ Not suitable for industrial areas unless treatment is provided upstream of the device and operates as part of a treatment train.
- ✘ Regular maintenance required.

