S104 SuDS Guidance Document

Filter Drains

Version 1 (October 22)

(This document should be read in conjunction with S104 SuDS Technical appraisal form for Filter Drains)

Comment no.	Technical Guidance
Types of filter drain & adoptability	
1	We will adopt communal systems serving two or more properties located outside of domestic property curtilage. If the system is at the start or 'head' of the adopted network, domestic flows must enter via a point inlet so as to provide a point of demarcation for adoptable network. Filter drains do not offer water quality benefits when used in isolation. In order to meet the requirement of the CIRIA guidance United Utilities will only accept a filter drain when it forms part of a SuDS management train. Systems primarily used for highway drainage or accepting continuous over land flows or ground water it cannot be adopted. If infiltration is the primary outlet the infiltration viability document must be completed prior to the full application It's essential that it is made clear what type of filter drain is being utilised within the design at an early stage to enable an effective assessment to be completed and this must be referenced correctly on the S104 Agreement Plan.
High level considerations, location & layout	
2	**Topography:** Filter drains are generally not appropriate for steep sites unless they can be placed parallel to contours. The longitudinal slope must be laid between 1:50-1:400 to ensure stable conveyance through filter media and for the removal of pollutants **Shape, location & Maintenance considerations:** Where the Filter drain component is not located in a verge, other public open space or the boundary between the highway and a private garden, provision should be made for access including any specific features that are likely to pose maintenance difficulties and any associated mitigation measures that have been put in place – see chapter 32 of CIRIA C753 for guidance. Consideration should be given to planting of trees etc. which may hinder access for the maintenance particularly around ancillaries and access points
3	**Flood risk to existing features**: No surrounding properties or features should be at risk – see chapter 36 of CIRIA C753 for guidance
Design requirements	
4	Dimensions of the component see chapter 16 of CIRIA C753 • **Length** should be a minimum of 5m. • **Depth** of a filter drain should be 1m minimum • **Width** should be triple the diameter of the incoming pipe with bedding and surround. For example 150 pipe is given 150 bedding surround giving a width of 450mm • Distance between any pipework and the bed of filter trench should be a minimum of 500mm

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5	**Hydraulic assessment information criteria;** **Representing component for hydraulic calculations**: Components must be labelled correctly in the model as part of the online piped network. If labelled as a storage component then it must be explained how this is linked in the model as part of the online network. Any impermeable areas around the component need to be included within the design. **Inflow velocities** in full flow conditions are below 0.5m/s and do not exceed 1.5m/s in the 1:100yr event. Any catch pits must be reflected in the hydraulic model by applying a head loss of 0.5 at the applicable point **Underdrain / perforated pipes** should be sufficient to deal with design storm event (2yr event). Pipe roughness of 0.35 should be used to accommodate for the perforations to the pipework, this will confirm the complex network is adequate providing a factor of safety. **Storage** within the trench and aggregate is dependent on the void ratio of the aggregate and the downstream throttle rate calculation methods are set out in Section 20.5 of CIRIA C753 and show in the model. **Flow control diameter should** usually be a minimum of 100mm, however if the flow control has robust upstream protection which prevents debris this could be reduced to a minimum of 50mm **Component drain down time** must be within 24hrs and will need to be supported with calculation. For infiltration systems, this is 48hrs (or half drain down within 24hrs) **Designing for exceedance & considering overland flow** Overland flows from surrounding land must be considered particularly if adoptable components are designed to accept surface inflow. Flow routes for significant offsite flow paths must be provided as part of the overall site design and should be separated from any new adoptable network design See chapter 36 (table 36.1) of CIRIA C753 for guidance on acceptable velocities for exceedance.
6	Inflow into an adoptable SuDS feature must have appropriate **pre- treatment**. United Utilities will only adopt pre-treatment associated with domestic run-off as part of the in-line system. If United Utilities allow highway drainage run off to enter the adopted network upstream pre-treatment measures for the highway runoff such as filter strips, sediment forebays will need to be adopted by the highway authority as part of the section 38 adoption agreement. For systems with multiple inlets distanced apart, pre-treatment should be provided at or upstream of each inlet. Adoptable pre-treatment can be provided in the form of forebays and catch-pit details, or in the case of infiltration systems proprietary treatment systems such as vortex separators. Catch pit manholes, must be sufficiently sized and representative of the upstream catchment with sump depths between 300-500mm. Suitable access should be provided for maintenance and the management and maintenance document must consider potential increase for maintenance activities. Ideally sediment should be managed by an upstream component management train – see chapters 18.8.1, 26 & 28.4.8 of CIRIA C753 for further guidance.
7	**Protection measures** vehicles running off the carriageway and scattering the filter material are the main causes of damage to filter drains. Barriers such as bollards, large rocks or low railings should be used to prevent traffic from running on or parking on the component. These protection measures will not be adopted by United Utilities.
8	**Inlet and outlet connections** Inflow for these components could enter laterally at surface along its length or via a point inlet. Lateral surface inflow details are usually relevant to highway flows, pre-treatment details are provided in the SuDS manual in the relevant sections. There are various point inlet details within the DCG and CIRIA SuDS manual which can differ based on pipe size, component type and application, if discharging via piped network inlets up to 350mm diameter, are to be constructed as per the standards set out in the Design & Construction Guidance (DCG) or our inlet headwall details drawing located within our SuDS technical library on our website Inlets greater than 350mm diameter, are to be constructed as per our inlet headwall details drawing or our standard detail drawings which can be found within our S104 technical library on our website. For **lateral flow connections** into the component, considerations need to be made to ensure there's minimal risk of deterioration in performance or failure of the component - See chapter 28.4.3 of CIRIA C753 along with some images of lateral connections extracted from figures 28.3 & 28.4 below for further guidance.

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9	**Overflow & outlet pipes** The over flow pipe should be fitted within the upper layers of the drain and outlet in the lower layers. The over flow must have a separate outfall with a planned flood route. **Outlet Pipes** should use PVC perforated pipes (min. 100mm dia) with 150mm clean gravel above the pipe. The gravel and pipe should be enclosed by geotextile fabric. The underdrain should infiltrate into the subsoils or drain freely to an acceptable discharge point. Perforated pipe should start and end in line with the component, non-perforated pipework to be utilised as rocker pipes into and out of the traditional/catch pit manholes or connection to an upstream or downstream sewers. Inspection points should be provided to underdrains via an access chamber for performance observations and cleaning. Detailed underdrain design guidance is set out in CIRIA C753 chapter 18.8.2 and guidance for the materials for underlying filter media / underdrains is set out in CIRIA C753 chapter 18.9. There isn't a specific detail for these inspection chambers. A chamber would be required at any intermediate point linking a chain of systems together and this would be located in a raised culverted section. Connections from sewers should not be made into an underdrain.
10	**Aggregates consideration** A filter drain contains two areas of aggregate, both shall be Type B (BS EN 13242) material described in table 5/5 of clause 505 of HA (2009a. The sacrificial layer contains 40mm clean stone. The main filter aggregate shall be a single size between 20mm and 60mm with a void ration of 20% to 40%
11	**Lining considerations:** Below is a list of information/considerations required when lining is proposed; Unlined components should not be used on brownfield sites unless it has been demonstrated that the risks posed by leaching of contaminants is managed to acceptable levels. Specification of chosen liner will be required. Geosynthetic barriers should be designed in accordance with BS EN 13361 or BS EN 13362 (see section E2.45 of Design & Construction Guidance), this includes tensile load, tear resistance and puncture resistance. These should have welded joints, taping would not be acceptable.
12	The **full design detail** can consist of the following; inlet, lateral connections, silt traps, outlet pipes, over pipes, outlet etc. as applicable. **Materials** should be shown on the **sectional drawing** i.e. Filter media, geosynthetic barrier etc. as applicable. See CIRIA C753 chapters 16 (Filter Drains), 30 (Materials including specification for liners – see 30.5.4) and 31 (Construction) along with chapter 22 (Materials) of CIRIA C768 for further guidance

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Construction

Construction of filter drains should be in accordance with the guidance provided in the appropriate chapters of CIRIA C753 (16.11) and CIRIA C768 chapter 29 along with CIRIA C753 Appendix B: Construction assessment checklist.

An example cross section for a filter drain is given in Figure 16.2. The upper sacrificial stone layer may only be required where upstream sediment removal is considered insufficient.

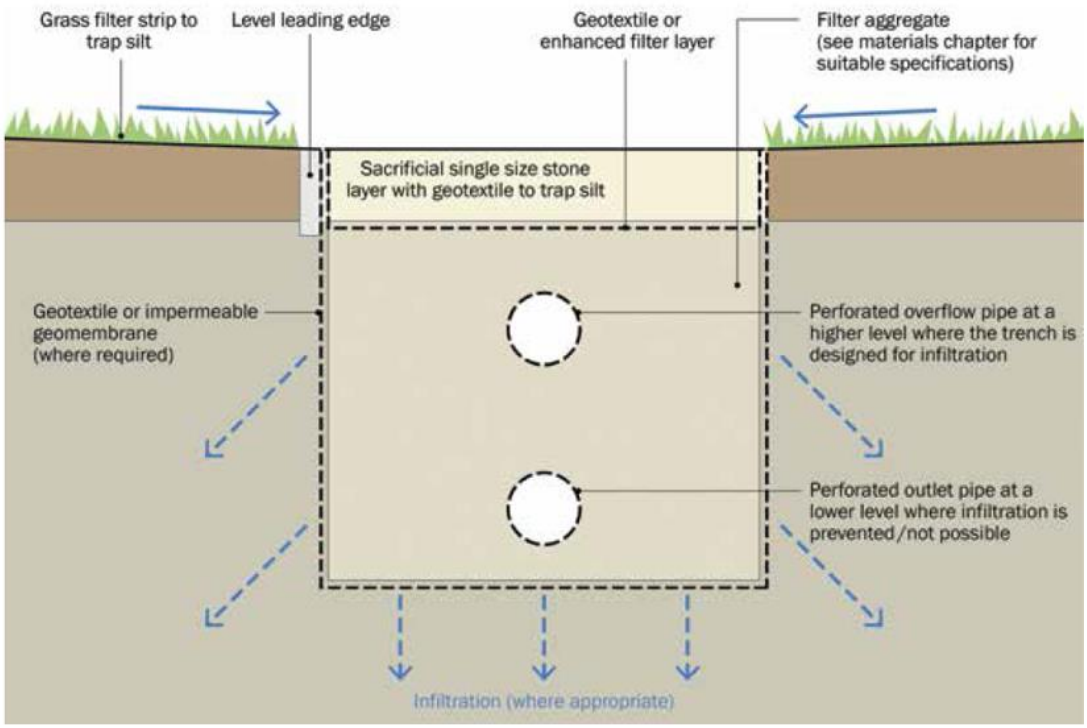

Figure 16.2 Filter drain schematic

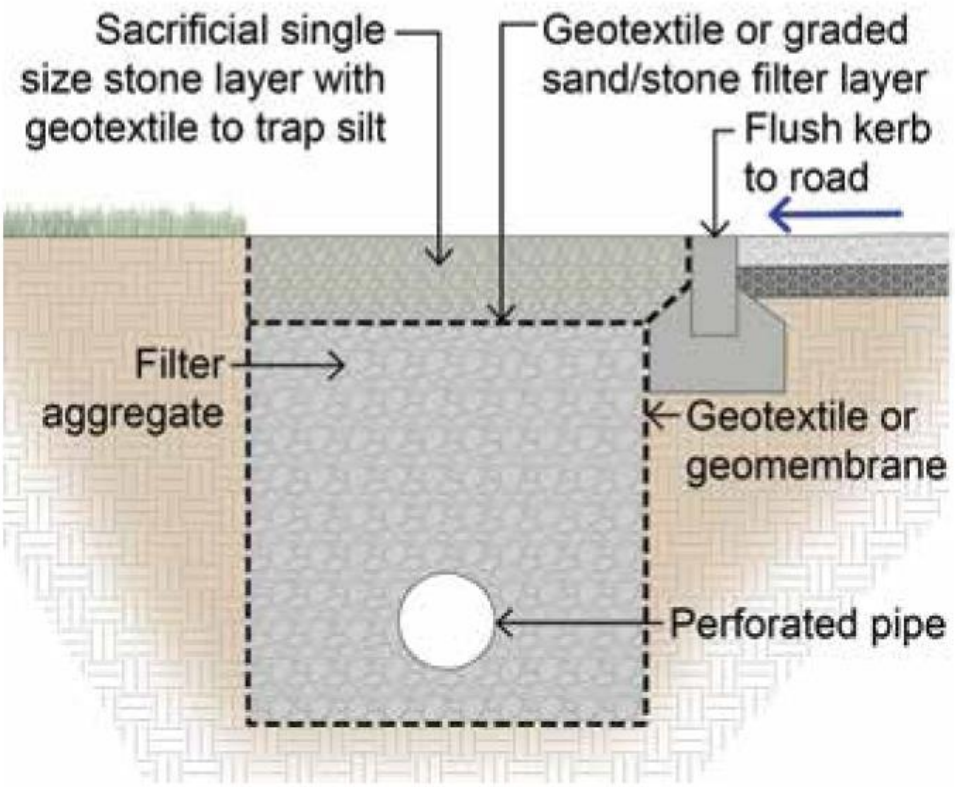

Figure 29.2 Indicative section through roadside filter drain