

Surrounding buildings with SUDS - for a cleaner environment

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What are sustainable drainage systems (SUDS)?

The SUDS philosophy is to mimic as closely as possible the natural drainage from a site before any man made development, to treat the runoff to remove pollutants and if possible provide an environmentally friendly amenity for future generations.

This requires a reduction of both the rate and volume of runoff from developments together with treatment to remove pollutants as close to the source as possible.

There are a number of benefits to using SUDS systems compared to a stormwater piped network;

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of downstream flooding
- Reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources
- Reducing potable water demand through rainwater harvesting
- Improving amenity through the provision of public open space and wildlife habitat
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained

Consequently SUDS are increasingly being used to specifically mitigate the increased flows, volumes and pollution from runoff.

SUDS provide a more flexible approach to drainage, individual techniques range from a soakaway in a back garden to a large scale detention basin or pond for a complete development. The individual techniques are used to meet the site-specific constraints. These techniques are not new and have been successful for at least twenty years.

A wealth of knowledge about their performance has also been developed, during the past five years a comprehensive SUDS research and monitoring programme has been undertaken in the UK, which is yielding a lot of performance data on installed systems.

SUDS should also enhance the local environment. To achieve this a treatment or management train is required comprising of one or more individual techniques that may or may not include soakaways, ponds and wetlands or pipes. It may also include prevention techniques, such as good site management, to prevent pollution occurring

in the first instance. It will require a number of SUDS techniques to reduce the volume of runoff and treat pollution.

Sustainable drainage systems may also incorporate storage for water re-use (ie rainwater harvesting). Further information on the design of systems for rainwater re-use can be found in CIRIA Report C539 (CIRIA, 2001c).

Why bother?

There are a number of requirements that developers now must meet and that SUDS can solve.

At governmental level there are 3 key industry drivers that provide guidance for professionals that are involved with new developments;

- a) Protocol on Design, Construction & Adoption of Sewers in England and Wales (Defra)
- b) Water Framework Directive (2000/60/EC) now transposed into UK national legislation, requires controls to be applied to discharges to the water environment from sources that include all discharges of surface water.
- c) Planning Policy Guidance 25 (PPG 25) – Development and Flood Risk (DETR)

These documents provide guidance and are implemented at Planning Stage, non-compliance could result in a delay to Planning Approval. SUDS are also being encouraged to be used on developments through Regional and Local Plans. All of these are very influential publications but they do not provide detailed design guidance. This is provided through a series of standards or technical guidelines such as;



Part H3 of the Building Regulations

Part H3 is specific to rainwater drainage and prioritises the means of discharge into an adequate soakaway, or some other adequate infiltration system, ie SUDS will be considered first and foremost.

Interim Code of Practice for SUDS July 2004

This document was published in July 2004 and is now being implemented by the Environment Agency and Local Authorities at Planning Stage.

It aims to encourage and facilitate the implementation of SUDS in developments in England and Wales. There are sections on Planning, Legal issues, Adoption & Maintenance of SUDS, Design considerations and SUDS model agreements.

With regard to design considerations, the code highlights the key issues of better managing the impact of increased runoff from new developments on existing watercourses and diffuse pollution from road runoff.

The code refers practitioners to design SUDS systems in accordance with CIRIA C609 – hydraulic, structural and water quality advice.

Climate change is also covered in which an increase in rainfall intensity should be applied to the design storm intensities. We need to design for exceedance (ie flood routing in the event of overland flows), engineers need to show where overland flow will occur for extreme rainfall events to ensure that properties are not inundated. This is also in line with the requirements of Sewers for Adoption, 5th edition. There is a requirement to design for water quality improvement and C609 is again used as a reference. The code also refers to H3 of the Building Regulations, as discussed above.

There is a new requirement to either delay the flow or reduce the volume of runoff, this is covered in a chapter that outlines a procedure for rainfall runoff management for developments.

The objectives of the procedure are;

- for stormwater runoff from a development to replicate or reduce the greenfield response of the site over an extended range of return periods:
- to manage runoff on site for extreme events
- to reduce pollution in receiving waters

This requires engineers to;

- control the peak rate of stormwater runoff over a range of storm probabilities
- reduce the volume of runoff over a range of storm probabilities
- minimise the pollution load into receiving waters from stormwater runoff
- assess overland flows and temporary flood storage across the site

The procedure clarifies how to calculate greenfield runoff and specifies the method to be used based upon the development's size. There is also encouragement for developers to consider rainwater harvesting in consultation with planning authorities.

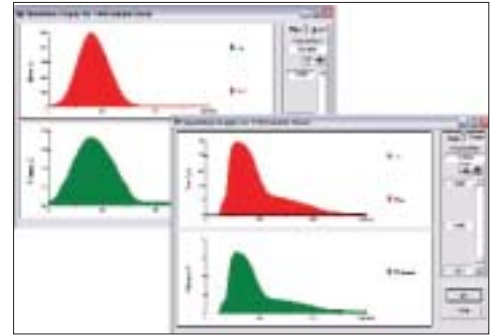
The key technical requirements, covered in the Interim Code of Practice, that engineers are now required to comply with on new developments are:

- a) Check discharges for 1, 30 and 100 year runoff
- b) Treat 90% of average annual rainfall, V_t
- c) No on-site flooding for the 30 year event
- d) Protect Floor slabs to a 100 year RP, up to a 200 year RP
- e) Peak volume - the volume of runoff from a site must be limited to the volume of runoff from the



natural catchment.

f) Climate Change - the best way of catering for climate change in a new development is through sensitivity analysis. Rainfall is typically increased by 10% or, in the case of rivers, flows are typically increased by 20% (CIRIA C609).



How to comply using a Systematic SUDS Design

Help is on hand and the latest industry standard drainage design software, has been further developed to assist engineers with these latest requirements.

The engineer will need to use a systematic design approach and the latest software tools will help you to comply with the new standards.

This software will enable you to:

- Calculate the allowable discharges to demonstrate compliance with ICP SUDS.
- Calculate the Storage & Treatment Volumes for each element of the drainage system.
- Check no on-site flooding for the 30 year event & floor slab protection for 100 year RP. Flood flow paths and areas of ponding are highlighted to check for floor slab protection.
- Runoff parity for pre and post-development can be checked.
- Check the Greenfield Runoff Volume. If the new design for the development does not produce more runoff for the same event then the 100 year greenfield runoff will be permitted as the maximum discharge from the site.
- Peak volume from the new development is compared against the volume of runoff from the natural catchment.
- Check the drainage system for exceedance due to future climate change.

Conclusion

All the latest regulations are driving the requirement to incorporate SUDS on future developments. Failure to comply will result in delays in gaining planning consent. There is software available that provides the tools required to help engineers meet the latest standards.

If you are training for a career in the plumbing and heating industry and wish to know more about membership of the Institute of Plumbing & Heating Engineering, please phone the Membership Department on 01708 463108 or email membership@iphe.org.uk.

