The new SuDS Construction Guidance was launched on 1 November 2017 as document C768, which can be downloaded from the Susdrain website.
This document has been supported by the collaborative funding of the companies shown above, without whose backing, it would not have happened.
Whilst the original handbook for SuDS Construction (C698) has been around for a long time, the understanding of SuDS design and construction has moved on, and is now much more comprehensive and robust, reflected in the new SuDS Construction Manual, published in 2015. This guidance is therefore intended to be a companion document to the SuDS Manual. It was also felt that to be effective, then the guidance needed to be appropriate for the audience who would get most benefit from it, and is therefore written explicitly for all those likely to be directly involved in their construction.

The need for this guidance has also been acknowledged widely in the industry, as it is understood that many instances of poor construction have occurred.
To ensure that the new guidance fulfilled the knowledge gap in the construction industry, a detailed questionnaire was sent around all those known to be involved in SuDS construction, to understand the problems that were experienced on site, and both the nature of the challenges that had arisen, and the context within which they had happened. The responses showed a very high level of consistency throughout, and a great sense of frustration from those involved in the construction process.

The main challenges arose from 3 causes: level changes (from the design drawings), cut and fill issues not be resolved prior to construction, and conflicts with services once the works started on site. Problems frequently cited included inadequacies in the design drawings (full details of levels throughout the system, capacity, flow controls etc not provided), existing site information not comprehensively recorded, and the implications of that information included within the drawings, the need for additional hard surfaces being added during the contract, but their drainage requirements not addressed, changes of materials (which did not have the same functionality), changes on site or poor construction arising from a lack of knowledge of the implications of change, or merely, not understanding what ‘good construction’ meant. This final point highlighted that many projects are still undertaken by contractors who may never have built a SuDS previously, and therefore do not understand either what it is crucial to get right, or how
to do it.
Interestingly challenges around building SuDS in areas of ecological importance or in proximity to existing trees did not arise frequently.

Overall, the consequence of these various issues resulted in either poor visual quality, physical construction or their functionality, or a combination of those factors.
Many people had not encountered these specific problems, or only very occasionally, with the most common being contaminated land.
As this document is seen as a companion to the SuDS Manual, it has been laid out and styled in a similar manner, and the contents reflect the way that information has been provided in the Manual in terms of the list of SuDS components, how they are constructed, and what needs to be checked to ensure they are built to fulfil their design purpose. However, its approach is entirely different, as it does not deal with design and is not presented in a highly technical manner.
The guidance is written to make it as easy to understand as possible, by anyone regardless of their prior knowledge of SuDS. It deliberately uses simple English, text is kept to a minimum, with pictures used wherever possible to illustrate and explain the issues being discussed. Symbols are also used to show whether the images are illustrating good or bad practice. Knowledge that has been developed in the industry through building SuDS is also shared to help the readers, and technical jargon avoided.
Where jargon has to be used, the words are explained in a ‘jargon buster’ at the end of each chapter. In the main this amounts to around 3 or 4 terms in any chapter. The word that occurs most frequently is ‘component’, and is repeated in almost every chapter. Dealing with jargon in this way ensures that readers can ‘dip into’ any chapter without needing to read introductory chapters first.
As part of the initial industry survey and through the Project Steering Group a wide range of ‘good advice’ was received. This is presented through a ‘traffic light system’ relevant to the chapter in which it is found. Handy Hints anticipate problems, so they can be avoided, or offer a simple solution to a common problem, which may be useful. Watch points identify potential problems to be particularly aware of, as they frequently occur on site. Hold points identify points in the construction process where the works must be inspected prior to continuing with their construction.

Handy Hint

Undertake a visual survey (including photographs or videos) of the site to ensure that what is shown on the topographic survey appears the same as seen on the ground, as there may have been site activity between the time of the survey and when work starts.

Watch point

Be aware that service plans from the utility companies are rarely accurate. Service locations will need to be confirmed on site before excavations (this should have been undertaken as part of the detailed design process).

Hold point

Starting work without all the necessary information creates risk for the project’s successful delivery.

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Industry experience is also shared through a wide range of case studies. Most chapters have ‘mini-case studies’ at the end, which explore a specific issue that has occurred on site. Towards the end of the Guidance there are five major case studies that explore an entire project. In both types of case study, the range of problems that have arisen on site are reviewed to identify what lessons can be learnt from them, and how these challenges can be avoided in the future.
Whilst the 4 pillars of SuDS should underpin every SuDS project, unless the practical requirements of successfully constructing SuDS are understood these principles can easily be undermined. The key lies in understanding the ways in which SuDS construction requires a different approach to ensure that the soils are maintained in good condition, so their structure will still sustain plant life, will drain effectively, and does not become polluted with silts or sediments, as trying to reinstate damaged soils can be very difficult to do. Similarly, protecting and maintaining the existing trees and vegetation resource and/or specific habitats must be understood and planned, as they are very difficult to replace.
The guidance has therefore sought to address these constructional challenges by working through the typical construction contract from the early planning stages through to completion and handover, but reconsidering it to understand what need to be done differently to enable the SuDS to be constructed successfully.
The initial chapters briefly explain what SuDS are, and what makes them different to traditional drainage. The fact that soft SuDS can use vegetation to deliver surface water drainage can be a challenge to those only familiar with laying pipes and manhole chambers. The need for care in their construction is explained alongside the way that they may affect the construction planning process, especially when the weather conditions and seasons affect their completion.
The second chapter considers the information that needs to be gathered and the issues that need to be understood prior to construction.
Being properly prepared means assembling and understanding all the relevant information about the site that may affect the construction of the SuDS. Then understanding how the scheme design works as a whole and how each part of the system relates to each other. This is particularly relevant to levels and regarding. The scheme design should then be cross-referenced to the specification to ensure that the materials used will deliver the volumes, storage and control flows as designed. Consideration should also be given to the land, vegetation, habitats or other factors on the surrounding land, as these could affect the construction work either directly (through flooding/overland flows or services) or through constraints such as the timing of the works due to protected species.
Chapter C considers the ‘who does what and when’ of SuDS construction planning, and why getting the right materials is so important.

Team work between various professionals is important and also between the designer and contractor.
This considers the ‘who does what, why and when’ of SuDS construction planning, and why getting the right materials is so important.
The typical roles of both the design team and site construction team are analysed to explain their roles in a traditional contract and SuDS contract to explain how they differ.

<table>
<thead>
<tr>
<th>TABLE 7.1 Roles within the SuDS construction team both pre-contract and during construction</th>
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</thead>
<tbody>
<tr>
<td>From design through</td>
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<tr>
<td>Site designer</td>
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<tr>
<td>Pre-construction</td>
</tr>
<tr>
<td>Site designer is mostly involved in traditional drainage construction?</td>
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<tr>
<td>Site designer is responsible for the design of the site layout and ensuring SuDS is incorporated effectively, and SuDS is designed for ease of construction?</td>
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<tr>
<td>Site designer is involved in SuDS planning and work planning?</td>
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<tr>
<td>Site designer is responsible for site safety?</td>
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<tr>
<td>Site designer is responsible for SuDS design and specification?</td>
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<tr>
<td>Site designer is responsible for SuDS installation?</td>
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<tr>
<td>Site designer is responsible for SuDS monitoring?</td>
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[Table with details of roles and responsibilities]
Phasing of works is one of the most important factors in site planning, and is influenced by a wide range of factors. A housing site in particular is used to demonstrate the issues involved, many of which are not SuDS related (such as the desire to have the show homes at the front entrance), but the way in which they influence the delivery of the SuDS is important. The example shows (for example) how the final SuDS retention ponds are used for materials storage and parking during all phases of the works, and are only able to be constructed, and therefore used, in the final phase, requiring temporary surface water measures to be put in place in the meantime.
Chapter 4 considers how a number of key site issues need to be managed to enable the SuDS to be delivered successfully.
These are the four key problems that arise on site and can ultimately affect the ability of the site to deliver the designed scheme.
This style of presentation about soils is typical of the way the document is arranged, and uses the universal ‘thumbs up’ (in green) and ‘thumbs down’ (in red) to explain what ‘getting it right’ means, and if not ‘what can go wrong’. Ideally, each of the identified problems are illustrated by either an example of things being done incorrectly, or if not, an example of good practice.
Site access is known to be a major problem on site, and is seen as a factor as to why pervious paving can’t be used due to the mud and silt that will be deposited on site roads. This section therefore explains how this can be done effectively.
Managing soil erosion and silt is also seen as fundamental to the successful delivery of SuDS due to their potential to block or damage systems if not properly managed, resulting in both delays and additional costs to reinstate the works properly.
Establishing planting within soft SuDS was also seen as a challenge by many, mainly due to a lack of understanding of their needs in terms of soil condition. Knowing that the right plants are being delivered and used in the right place (for their functionality and their appearance) and that they are supplied to the right specification also presented challenges.
Section E considers the factors around constructing SuDS and the issues that need to be managed to ensure their successful delivery.
Variations that are not considered for potential impact on the SuDS, can make a significant change to the ability of the scheme to deliver its intended design function (whether quantity, quality, amenity or biodiversity). Additional areas of hard surfaces, changes to cut and fill volumes or specification changes to materials were frequent examples of where problems arose.
Industry standard tolerances particularly relevant to SuDS are identified.
The standards generally relate to paving falls and levels, materials, such as aggregate sizes, and the geomembranes, or the porosity values/infiltration rates for geotextiles or soils.
Various factors that could make construction of SuDS difficult are discussed. One example is high groundwater. This requires adequate forward planning to manage water inflows to excavations.
The presence of contamination will also require forward planning to avoid adverse impacts on remediation schemes and management of excavated soils that are contaminated.
There are a wide range of different soils that can be used in SuDS, and the choice of soil relates to their function within the system. Using the wrong type of soil or soil mix will affect its ability to either drain freely or retain moisture, affecting the ability of plants to thrive within the system and their ability to improve water quality.
Inlets and outlets should be constructed exactly as shown on the design drawings. The specified size of flow control should be provided. They should be finished in an aesthetically pleasing manner.
Geosynthetics are complex materials. Many appear to be similar on visual inspection but could have widely varying performance. Substitution of products should only be done with the agreement of the designer. Some geosynthetics are prone to damage during construction if not protected (e.g., geomembrane liners).
Chapter F then deals with the specific challenges for each individual SuDS component. The component list is the same as the SuDS Manual.
Bioretention systems have been used to illustrate the way that the construction of each component is dealt with in the individual chapters. The introduction explains what the component is, how it functions, and the different ways that the component can be designed.
Here the different types of bioretention system are illustrated to show the wide variety of application, with disconnected downpipes draining to in-ground systems or raised planters, road drainage systems adjacent to the highway or more simple trenched components within an overall green system. The diagrams explain the key parts of each system and how it connects back into the drainage network.
The next section then identifies the challenges that typically arise in constructing bioretention planters with the images of either good practice or what can go wrong.
The end section contains a ‘mini-case study’ related that each particular component and the lessons learned from the challenges that arose in building it. The chapter ends with a checklist for its construction. The checklists are not intended to be exhaustive, but to identify the key issues. It is expected that people will use these as the basis for compiling their own checklists that are related to their own particular project. All the checklists provided within the guidance are collected as individually downloadable Word files at the end of the document.
In summary, the guidance seeks to help deliver better quality construction for SuDS. Understanding how to build SuDS correctly, can then help inform the design of SuDS generally. The team working necessary to build SuDS successfully will help improve communications both within the design and construction team, and encourage them to work together to overcome the problems that will inevitably arise. Ultimately this should ensure that better outcomes are achieved, and that the full design intent is realised on the ground, thereby delivering better water management and helping to reduce surface water flooding.