CIRIA proposal 3084
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Guidance on the delivery of blue roofs

Summary

A blue roof provides the attenuation and management of rainfall at its source. They are becoming a common approach to deliver SuDS and manage local flood risk, particularly in dense urban environments where space is at a premium. Despite their popularity there is a lack of high quality, independent guidance. This project will provide guidance on blue roofs to improve confidence in their specification, design, delivery and approval.

Background and justification

A blue roof is specifically designed to provide source control, managing rainfall where it falls by temporarily storing and attenuating it on a roof as part of Sustainable Drainage Systems (SuDS). It mimics the natural environment by managing the discharge of rainwater from roofs at a controlled rate in line with a drainage strategy and overall site flood risk assessment.

Discharges from a blue roof can either be into a downstream SuDS component, or following approval from the Lead Local Flood Authority and/or sewerage undertaker into watercourses or the sewer system.

Blue roofs are installed either at roof or podium level above the structural waterproofing membrane and are a space efficient way of providing source control, without any additional land-take for infiltration, storage and attenuation. There are a variety of different approaches to the design and delivery of blue roofs. However, they commonly attenuate and treat rainfall within various proprietary elements and they can also be combined with more traditional green roof elements.

With the increasing challenges around urbanisation, urban retrofitting, building densities and climate change those working in the built environment need to expand their approaches to managing flood risks and urban sewer systems. Blue roofs are becoming a more popular option for providing attenuation and temporary storage within the building footprint without the associated headaches of land-take issues.

Although there is some limited advice on blue roofs in guidance on sustainable drainage (CIRIA 753 the SuDS Manual) and green roofs, there is an over-reliance on the technical and performance information from blue roof manufacturers. As a result, there is fragmentation of the industry and differences and potential conflicts with definitions and approaches amongst different parts of the built-environment sector that need explanation and resolution.

Professionals managing risks both at a building (surveyors, insurers etc) and city levels (flood risk managers) need to have the confidence that blue roofs have been specified, designed, constructed and maintained in accordance with regulations, standards and good practice.

There is an exciting opportunity to consider how blue roof design can deliver better water management and benefits around the provision of biodiversity and amenity. Making buildings more functional, attractive and also reducing resource and cost implications. This should assist with delivering attractive buildings and improved ratings for BREAM and LEED and lower costs.

Blue roofs could also be part of an approach that delivers greater resilience, particularly around climate change as well as promoting attractive buildings and liveable, healthier cities.

The guidance will provide a consolidated approach based on consensus and will give professionals the competence and confidence to cost effectively deliver and assess blue roofs. This should improve the quality of design and process of approval as well as the overall acceptance and specification of blue roofs. Key elements that the guidance will consider include:

- **Design framework** – this will include an overall framework for the design, that includes principles supported by design criteria and methods for delivering (and assessing) them.
- **The lifecycle of the building** – this will consider the interaction of blue roof delivery with planning requirements, its design, construction, operation and maintenance as well as any requirements for inspections and approvals.
- **Retrofitting blue roofs** – this will cover the structural considerations and other opportunities and challenges.
- **Roof deck construction** – consideration of various options and structural loading during construction, operation and building maintenance.
- **Waterproofing specification and construction** – the consideration of the main waterproofing options, with an overview of the delivery, application, compliance testing and performance against set criteria.
- **Blue roof components** – ensuring these are appropriately specified including insulation, barriers, outlets etc
- **Designing for multi-functionality –** this will focus on water management (flood risk management and rainwater harvesting) biodiversity and amenity.
- **Resilience of components** – this will consider the impact of extreme weather on blue roof components, including snow loading and wind stresses.
- **Maintenance of the blue roof system** – including activities to support the roofs primary drainage function as well as any designed multiple benefits.

Objectives

The overall objective of the project is to provide guidance on the planning, design, construction and management of blue roofs to help manage local flood risk and also provide multiple benefits.

Specific objectives are to:

1. Engage with relevant stakeholder to understand the challenges and opportunities of delivering blue roofs
2. Undertake a review of literature, evidence, practices and experiences covering the delivery of blue roofs
3. Align good practice guidance with the needs of relevant stakeholders supporting greater compliance with regulation, approvals and delivery of good practice
4. Provide guidance that delivers design criteria for managing runoff and delivery of multiple benefits through blue roofs.
5. Develop good practice guidance that covers the planning, design, construction and management of blue roofs (drawing on international good practice and UK experiences).
6. Disseminate the guidance to a wide audience, raising awareness of blue roofs, as well as competency and confidence across the industry.

Project benefits and outcomes

There are a number of potential beneficiaries of the guidance, those designing and approving blue roofs will have greater confidence. The reputation for those involved in the blue roof supply chain will also benefit from greater confidence and maintaining a good reputation for the approach. Other benefits include:

1. **Confidence in blue roof design** – the guidance will provide a number of different disciplines the confidence to design blue roofs, with specific consideration given structural loading, waterproofing and hydraulic control.
2. **Confidence in blue roof approval** – this will give those professionals (surveyors, flood risk managers, insurers) involved in managing risks associated with blue roofs assurance that there long term performance enables blue roofs to meet the necessary standards and regulatory requirements.
3. **Improving water management** – the guidance will ensure that a well-designed blue roof manages the flow rates and volumes of runoff, providing source control of runoff, rainwater harvesting and effective attenuation often in dense and challenging environments.
4. **Delivery for biodiversity and amenity** – the guidance will enable designers and engineers to deliver green roofs to design criteria that ensures they are functional provide biodiversity value and attractive spaces.
5. **Supporting cost effective blue roof delivery and maintenance** – the guidance will underpin a logical framework for delivery that enables considerations of initial specification, construction and maintenance to be incorporated into the process for implementation

Outputs

The main output will be guidance on the delivery of blue roofs. The key elements mentioned above will be covered, however the exact content will be informed by engagement with those involved in blue roof delivery, the collation of evidence and guidance and the availability of funds. The guidance will be image-rich, full of illustrations and case studies. A summary presentation will also be produced to help disseminate the value of blue roofs and the guidance.

The anticipated target audiences include:

- Developers
- Architects and landscape architects
- Engineers – primarily structural engineers and drainage engineers but also public health engineers.
- Approvers/regulators – those managing risks, like insurers and flood risk managers.
- Supply chain – this will include the manufacturers and designers involved in the specification of blue roofs and relevant components.

Approach and methodology

The project will be managed by CIRIA, guided by an independently chaired Project Steering Group (PSG) that represents the target audience, key stakeholders groups and funders. The project will be undertaken collaboratively to develop consensus. It is envisaged that the project will include:

1. **Development and fundraising** – CIRIA working with interested parties will develop and fundraise the proposal (including the development of the PSG).
2. **Research contractor appointment** – this will be based on ensuring they have the right skills and approach to delivering collaboratively and consensus-based outputs.

3. **Engagement** – this will be undertaken with the potential target audience and will include a survey and workshop to understand the challenges and opportunities to deliver blue roofs. It will identify critical success factors, good practice and case studies.
4. **Literature review** – A thematic review of the drivers, relevant standards and guidance (primarily internationally) and manufacturers information will be undertaken.
5. **Scoping report** – this will essentially focus on the challenges, opportunities (relating to functionality and the benefits) and suggestions for design criteria to overcome challenges and deliver opportunities. It will present the structure and contents of the guidance and explain how it relates with existing processes.
6. **Production of guidance** – the guidance will be developed with input from the PSG, who will review and comment on drafts.
7. **Dissemination** – Once the guidance has been reviewed by the PSG and an external reviewer, it will be edited, desktop-published and produced for sale. Dissemination activities will include a webinars.

Progress against an agreed programme will be driven by milestones based on project deliverables and co-ordinated with four project steering group meetings. Meetings will advise CIRIA and the research contractor on the technical quality of outputs.

Benefits of involvement

At this stage CIRIA is primarily looking for funds to enable the project to start. There are a number of benefits of this kind of involvement, this includes:

- Guaranteed membership of the Project Steering Group with the chance to:
    - Obtain early and privileged access to draft outputs enabling members to proactively respond to emerging good practice
    - Influence the direction of the project
    - Sharing experiences and networking with peers from the supply chain
    - Sharing experiences and networking with key approval bodies, as well as decision and policy makers
- Demonstrate thought leadership by showcasing commitment to the development of good practice on blue roof delivery
- Raise the organisation's profile through acknowledgement and inclusion of logos on the cover of the guidance. Reference to funders will also be made in CIRIA's newsletters with a circulation of around 50,000 readers.
- Contribute to the project at a fraction of the overall project cost, potentially benefiting from at least a 1:10 rate of leverage.

Project information

Once funded, the project will take between 12 - 18 months to complete. The overall budget is estimated to be between £75,000 and £115,000. The variation is dependent on scope of content.

For further information please contact Paul Shaffer (paul.shaffer@ciria.org, 0207 549 3309).