Greening Supplementary Planning Document

June 2021

THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Key information about this Supplementary Planning Document

What is the Greening SPD?	The Greening Supplementary Planning Document (SPD) has been written so that new and existing buildings can deliver the best possible standards to reduce harmful carbon emissions. It covers a range of planning policies and guidance to improve energy standards, reduce pollution, promote future clean technologies, minimise flood risk, deliver urban greening and biodiversity net gain.

Contents

Executive Summary

We live in a dense urban borough where the vibrancy and busy pace of life contribute to Climate Change. Indeed, cities are homes to half the world's population and are big producers of greenhouse gas emissions. The Borough has some of the main arterial roads of London running through it, with associated poor air quality. By contrast, we also have some of the best open spaces such as Holland Park and Kensington Palace Gardens which offer respite, but these are not within easy walking distance of all our communities. The restrictions imposed by the pandemic have brought to the fore the value of green open spaces, even when they are small, as they are still very effective in providing an oasis in a city.

Climate Change is one of the greatest challenges of our times and in October 2019, the Council declared a Climate Change Emergency. The Council is on a mission to reduce carbon emissions not only through its own operations but also tackling this challenge holistically. This means that there must be a step change in how we, and our businesses, residents and local organisations, operate so the Council is carbon-neutral by 2030 and that the Borough can become carbon-neutral by 2040.

Our planning policies are part of this holistic approach and must promote and require best practice in the built environment. This Greening Supplementary Planning Document (SPD) covers all facets of planning that can contribute towards reducing carbon emissions and promoting a healthier borough. It includes guidance on our energy policies both for new build and retrofitting the substantial historic stock that we have, guidance on the reduction of toxic emissions and controlling air pollution, urban greening, flooding and biodiversity. A summary of the actions that we will require for each of these is provided below.

Circular Economy

The SPD supports all developments to use Circular Economy principles with major developments required to demonstrate how this has been considered.

"**Circular Economy** is one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste. For the built environment this is about prioritising retention and refurbishment over demolition and rebuilding."

Whole Life-Cycle Approach

This will require major development to not only consider their carbon footprint when the building is complete and is in operation but at all stages from inception to completion and dismantling. This approach recognises the carbon inherent in materials as well as their transport and manufacturing. Therefore, it will promote local sourcing and procurement. It will also help us reduce construction waste or enable it to be disposed of in a sustainable way.

Energy Hierarchy

We require the energy hierarchy to inform the design, construction and operation of new buildings. This is a sequential approach with four essential strands presented in the diagram below. The key elements are then described in more detail in the text.

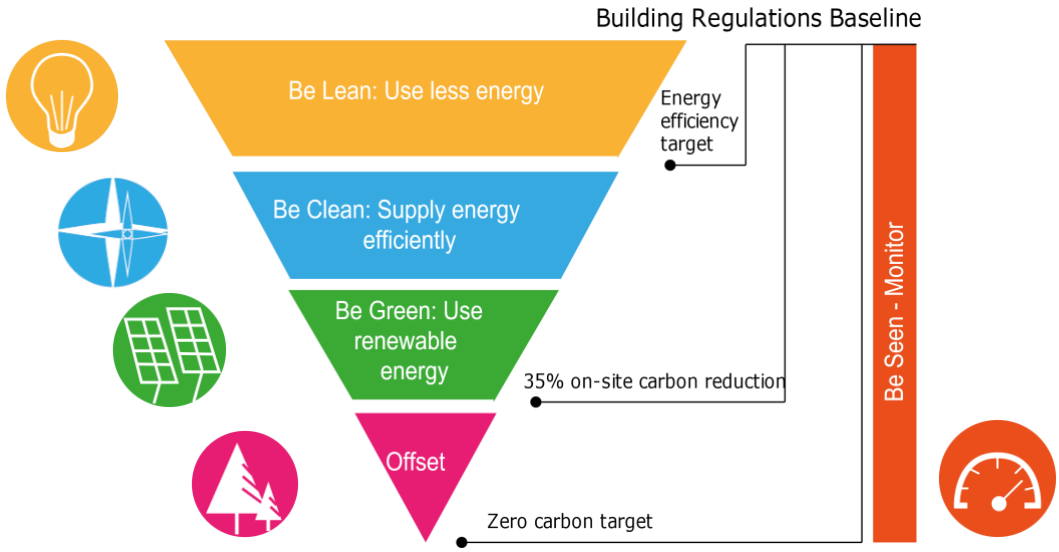


Figure 1: Energy Hierarchy showing how new buildings can meet net zero carbon by following this sequential approach

Be Lean: Reducing Energy Demand

As the first step in the sequential approach described above, we will aim to reduce the energy demand of new buildings. This will be done by optimising the design of buildings to take full benefit of sun orientation or natural ventilation for example. We are also setting high energy standards and will require 'Net Zero Carbon' from all our major developments both residential and non-residential. In addition, we are encouraging applicants to adopt even higher voluntary standards and deliver exemplary standards. The Council is aiming to deliver these voluntary standards in a resident led refurbishment of the Lancaster West Estate.

*"**Zero carbon**: Zero carbon requires no net release of carbon dioxide and other greenhouse gas emissions into the atmosphere. Net-zero carbon refers to balancing the amount of emitted greenhouse gases with the equivalent emissions with no reliance on fossil fuels, using on-site renewable or offsetting elsewhere as a last resort.*

Be Clean: Supply energy efficiently

This is about reducing dependency on fossil fuels and promoting more localised heat networks particularly for larger schemes.

Be Green: Use Renewable Energy

The Government's recent Ten Point Plan for a Green Industrial Revolution declares the phasing out of gas boilers. This section of the SPD provides guidance on using alternative means such as heat pumps and other forms

of renewable energy which are suitable in the Borough such as photo voltaic solar panels.

***"Heat pumps:** These are classed as renewable because it uses natural elements. There are two main types – air-source and ground-source heat pumps. An air-source heat pump extracts warmth from the air, it is a box that can be fixed to an exterior wall or roof or stand alone. A ground-source heat pump requires generous outside space and is buried under the soil."*

Be Seen: Monitor
Applicants will be required to provide details of the actual performance of a building via a GLA portal so any discrepancies between design and implementation can be monitored.

Retrofitting existing buildings
A key component of the SPD is to provide guidance to householders about suitable interventions that they can make to upgrade the energy standards of their homes. The principles of the Energy Hierarchy described above are used. The buildings are categorised as one of three – 1. Non-heritage buildings 2. Conservation Area buildings and 3. Listed Buildings. Clear guidance is provided on each of these buildings types for example double glazing is recommended for non-heritage buildings and suitable in conservation areas as long as they are slim line and fit the age and style of building but are unlikely to be acceptable in a listed building.

Air Quality
There is a clear recognition that development proposals need to consider the air quality given that the whole Borough is in an air quality management area. We will require Air Quality Assessments as part of major developments. Amongst other measures to improve air quality developments should contribute to supporting active and sustainable transport options, such as walking, cycling and public transport. We also support the provision of electric vehicle charging points. For all new developments where parking is proposed, applicants should seek to provide on-site charging points to accommodate the current and future requirements of the occupants. We also recognise the benefits of retrofitting charging points to existing parking spaces and support this.

Urban Greening
Green infrastructure provides wide ranging benefits including reducing pollution, climate change and its impacts and supporting a circular economy. To secure some form of greening in all our major developments we use a new approach called the Urban Greening Factor (UGF). This will require both residential and non-residential development to score a prescribed level of UGF. We have over 8,000 street trees in the Borough and will support developments to provide more.

***"Urban Greening:** Urban greening describes the act of adding green infrastructure elements. Due to our dense built environment, green roofs, street trees, and additional vegetation are the most appropriate elements of green infrastructure.*

Urban Greening Factor: *This is a land-use planning tool to help determine the amount of greening required in new developments."*

Minimising Flood Risk

The two most prevalent flood risk sources for the Borough are surface water and sewer water. Therefore, new developments should both be protected from flood risk and minimise it. We require an overall reduction in surface water run off so once developed there is an improvement. For the largest schemes we will require Integrated Water Management Strategies at an early stage to consider and address local sewerage capacity issues, so flood risk is not increased.

Biodiversity

We are looking to use the opportunities available in new development to improve biodiversity so there is a net gain.

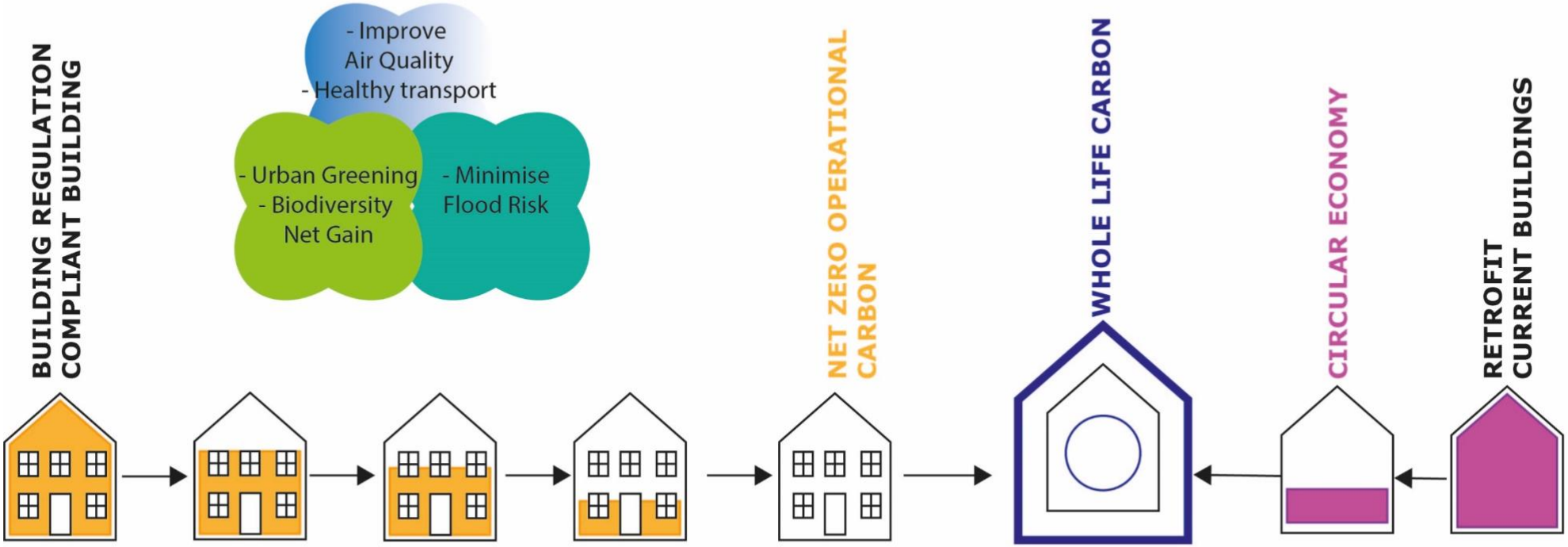
These measures will make a significant contribution in tackling Climate Change and meet the targets we have set ourselves in the Borough. We will continue to monitor the effectiveness of what has been proposed and be fully aware of advancements in technology over time. This will enable us to understand and learn where we can further improve our policies in addressing this challenge.

Greening Supplementary Planning Document (SPD) on a page

"Zero and net zero carbon: Zero carbon, requires no net release of carbon dioxide and other greenhouse gas emissions into the atmosphere. Net-zero carbon refers to balancing the amount of emitted greenhouse gases with no reliance on fossil fuels, using on-site renewable or offsetting elsewhere as a last resort."

"Circular Economy: is one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste. For the built environment this is about prioritising retention and refurbishment over demolition and rebuilding."

"Whole Life Carbon: considers the carbon footprint not only when the building is complete and is in operation but at all stages from inception to completion and dismantling."



1 Introduction

Background

1.1 We live in a dense urban borough where the vibrancy and busy pace of life contribute to Climate Change. Indeed, cities are homes to half the world's population and are big producers of greenhouse gas emissions. The Borough has some of the main arterial roads of London running through it, with associated poor air quality. By contrast, we also have some of the best open spaces such as Holland Park and Kensington Palace Gardens which offer respite, but these are not within easy walking distance of all our communities. The restrictions brought about by the pandemic have brought to the fore the value of green open spaces, even when they are small, as they still very effective in providing an oasis in a city.

1.2 Climate Change is one of the greatest challenges of our times and in October 2019, the Council declared a Climate Change Emergency. The Council is on a mission to reduce carbon emissions not only through its own operations but also tackling this challenge holistically. This means that there must be a step change in how we, and our businesses, residents and local organisations, operate so that the Council is carbon-neutral by 2030 and that the Borough can become carbon-neutral by 2040.

1.3 Our planning policies are part of this holistic approach and must promote and require best practice in the built environment. This Greening Supplementary Planning Document (SPD) covers all facets of planning that can contribute towards reducing carbon emissions and promoting a healthier Borough. It includes guidance on our energy policies both for new build and retrofitting the substantial historic stock that we have, guidance on the reduction of toxic emissions and controlling air pollution, urban greening, flooding and biodiversity.

Objectives of this SPD

1.4 The SPD has the following objectives:

- Setting out clearly that the Council's ambitions to meet its target to be a carbon neutral Borough by 2040 requires that the built environment holistically makes its contribution to achieving this aim.
- Using Circular Economy principles. For the built environment this is about prioritising retention and refurbishment over demolition and rebuilding.
- Ensuring that reducing carbon emissions is considered from a very early stage in designing developments. A Whole Life-Cycle approach is followed.

- Encouraging all development to follow the energy hierarchy which prioritises minimising energy demand, and then applicants address how energy will be supplied and renewable technologies incorporated. Monitoring is also built into this process.
- Providing clear guidance to householders and those looking to retrofit existing buildings with a particular focus on the historic context.
- Applicants demonstrating how they will improve air quality by incorporating various measures including support for electric vehicle charging infrastructure.
- Providing guidance on how developments should be protected from flood risk and how this should be minimised. This includes incorporating sustainable urban drainage systems.
- Ensuring that developments contribute to urban greening and provide a biodiversity net gain.

1.5 The Council has also produced a separate Householder Guide to the Greening SPD, which collates all the guidance found throughout this SPD that is applicable to householders.

2 Policy context

2.1 This section briefly sets out the relevant national, London level and Local planning policy framework which the document conforms with. A more detailed list is presented in Appendix 1.

The Ten Point Plan for a Green Industrial Revolution (2020) [1]

2.2 The Government plans to invest £12 billion in green technologies with the aim of faster reaching net zero. The Ten Point Plan focuses on increasing ambition in the following areas (those most applicable to our borough are highlighted in bold):

- advancing offshore wind
- driving the growth of low carbon hydrogen
- delivering new and advanced nuclear power
- **accelerating the shift to zero emission vehicles**
- **green public transport, cycling and walking**
- 'jet zero' and green ships
- **greener buildings**
- investing in carbon capture, usage and storage
- **protecting our natural environment**
- green finance and innovation

National Planning Policy Framework (NPPF)

2.3 The NPPF establishes principles, policies and procedures to guide preparation of Local Plans and SPDs, it sets out at range of policies on, and relevant to, climate change and other greening issues. Of particular note are requirements to: *"contribute to radical reductions in greenhouse gas emissions"; "increase the use and supply of renewable and low carbon energy and heat"; "minimise vulnerability and improve resilience" (including in respect of flood risk, over-heating and biodiversity); and "encourage multiple benefits from… urban… land, including through mixed use schemes and taking opportunities to achieve net environmental gains".*

Planning for the Future White Paper (August 2020)

2.4 The Planning for the Future White Paper (August 2020) is also relevant context to this SPD. The White Paper is notable for its focus on securing improved design and sustainability outcomes via Local Plans, and for its view of Local Plans as, "a good foundation on which to base reform, as they provide a route for local requirements to be identified and assessed,

[1] The Ten Point Plan for a Green Industrial Revolution (publishing.service.gov.uk)

a forum for political debate and for different views on the future to be heard."

Building Regulations

2.5 Building Regulations are also key as highlighted by the Government consultation on the Future Homes Standard: (changes to Part L and Part F of the Building Regulations for new dwellings). The Future Homes Standard proposes '*options to increase the energy efficiency requirements for new homes in 2020. The Future Homes Standard will require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency; it will be introduced by 2025'*.[2]

The London Plan 2021

2.6 The London Plan 2021[3] was formally adopted on 2 March 2021 and is part of our development plan. Therefore, its policies are used alongside our own local policies when determining planning applications. This SPD has been produced in conformity with the policies in the London Plan 2021 and these are referenced throughout.

Local Plan 2019

2.7 A number of policies within the Council's adopted Local Plan 2019 are relevant to this SPD, in particular Chapter 24 Respecting Environmental Limits includes a suite of policies to mitigate climate change. A list of all relevant policies is included in Appendix 1.

[2] https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings
[3] https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

3 Circular Economy

Key guidance

- Circular Economy is one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste.
- For the built environment circular economy means prioritising retention and refurbishment over demolition and rebuilding. It means designing buildings that can be adapted, reconstructed and deconstructed to extend their life and that allow components and materials to be salvaged for reuse or recycling.
- Applicants for major developments and those that are referable to the Mayor should submit a Circular Economy Statement.
- Applicants for developments of all scales are encouraged to incorporate the circular economy principles to reduce, reuse and recycle at the design, construction and operation phases.

What is Circular Economy?

Circular economy will help achieve good growth by design in the Borough, growth which produces no waste or pollution. For the built environment this means that a development should incorporate the circular economy principles to reduce, reuse and recycle at the design, construction and operation phases. A Circular Economy is defined in London Plan 2021 Policy SI 7 as *"Reducing waste and supporting the Circular Economy' as one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste.*"

Figure 3.1: Circular Economy
Source: GLA, Circular Economy Statement Guidance, October 2020

3.1 The London Plan 2021 has taken steps to drive a circular built environment by introducing new policy requirements. In particular, London Plan 2021 Policy D3 'Optimising site capacity through the design-led approach', and SI 7 'Reducing waste and supporting the Circular Economy' set out the underlying policy objectives.

"Circular Economy is a new economic model that moves away from this current linear economy, where materials are mined, manufactured, used and thrown away, to a more circular economy where resources are kept in use and their value is retained.

For buildings, this means creating a regenerative built environment that prioritises retention and refurbishment over demolition and rebuilding. It means designing buildings that can be adapted, reconstructed and deconstructed to extend their life and that allow components and materials to be salvaged for reuse or recycling."[4]

Circular Economy Principles

3.2 For our Borough using circular economy principles makes perfect sense at all scales of development. This is because we have a high concentration of heritage assets which have been reused and refurbished over a long time. Much of our development takes place via changes of use and upgrading existing buildings.

3.3 Applying Circular Economy thinking to the built environment is highly complex, with many overlapping issues and trade-offs to consider. However, there are some core guiding principles that promote a

[4] Design for a Circular Economy Primer, GLA 2020

regenerative and restorative whole systems approach and should be applied from the top down[5]. **These principles should be considered by all scales of development.**

Principle	Develop Commitments to
1. Conserve resources, increase efficiency and source sustainably	1.1 Minimise the quantities of materials used 1.2 Minimise the quantities of other resources used 1.3 Specify and source materials and other resources responsibly and sustainably
2. Design to eliminate waste (and for ease of maintenance)	2.1 Design for longevity, adaptability or flexibility and reusability or recoverability 2.2 Design out construction, demolition, excavation and municipal waste arising
3. Manage waste sustainably and at the highest value	3.1 Manage demolition waste 3.2 Manage excavation waste 3.3 Manage construction waste 3.4 Manage municipal waste (and industrial waste, if applicable)

Source: GLA, Circular Economy Statement Guidance, October 2020

3.4 The table below sets out our requirements for Circular Economy and what the applicant can do to meet these requirements.

Our requirements

- Applicants of major development should submit Circular Economy Statements in-line with the above policy.
- All scales of development should consider the circular economy principles set out above from the very beginning of their project.

[5] The principles are consistent with implementing the EU waste hierarchy and with the circular economy systems thinking approach developed by the Ellen MacArthur Foundation (EMF).

How do I do it?

- To identify the appropriate strategic approach, applicant teams are encouraged to use the 'Decision Tree' below. It prompts designers and developers to consider opportunities for maximising the residual value of any buildings, materials or elements on site, before considering strategies for adding value over the lifetime of the development.
- The Circular Economy Statements must set out how materials arising from demolition/excavation will be reused/recycled and opportunities for managing as much waste as possible on-site.
- The GLA has produced a Circular Economy Statement Guidance, Consultation Draft, October 2020[6]. Section 3 of the document sets out the structure and content of Circular Economy Statement. This or any update to this guidance must be followed by applicants.
- Applicants must describe and justify their strategic approach in the Circular Economy Statement using the template (Table 1) provided in Appendix A of the above guidance.
- In summary the production of a Circular Economy Statement involves three stages:
    - Step 1: Pre-application/Outline application stage → submit a Draft Circular Economy Statement
    - Step 2: Full application stage → submit a detailed Circular Economy Statement
    - Step 3: Post-Completion Updates (specific to each project)

[6] https://ehq-production-europe.s3.eu-west-1.amazonaws.com/d434c5ed7276a3f93441593d6f6f254be25052ba/original/1601641590/Circular_Economy_Statement_Guidance_October_2020.pdf_6e78b5f8744559b14cc13317c61c7ffb?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIBJCUKKD4ZO4WUUA%2F20210423%2Feu-west-1%2Fs3%2Faws4_request&X-Amz-Date=20210423T150818Z&X-Amz-Expires=300&X-Amz-SignedHeaders=host&X-Amz-Signature=bc24aa561a6ae09e6020fecf8b8056c8305a38f67d088bf40cf6a1e568facaab

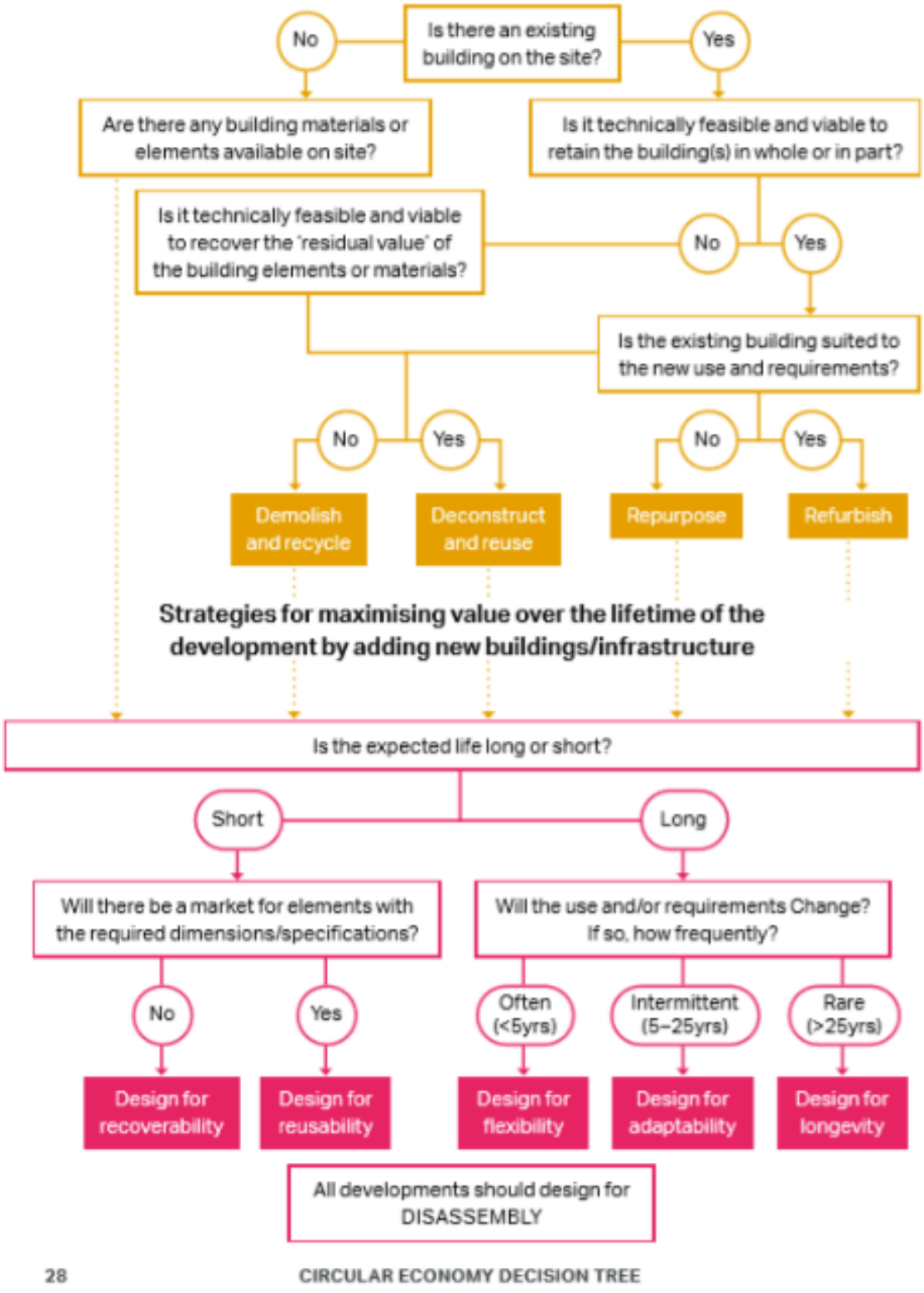


Figure 3.3: Circular Economy Decision Tree

Council Waste and Recycling

3.5 Management of our waste is an important aspect of a Circular Economy and this is also considered within London Plan 2021 Policy SI 7. Policy SI 7(4) sets a municipal[7] waste recycling target of 65 per cent by 2030. To achieve this new development must be designed with appropriate and adequate waste and recycling storage facilities.

3.6 The table below sets out our requirements for food and recyclable waste storage in new residential development.

Our Requirements

- All development should provide adequate waste storage facilities.
- Homes should be built with enough storage inside and outside for both waste and recycling (including food waste).

How do I do it?

Self-contained Homes:

Internal Storage:

- Provide enough space to accommodate at least a 7-litre food waste caddy. This should be located near the area of high food waste production and raised from the floor.
- Provide enough space for an 80-litre bag of mixed recycling in the same location as the receptacle for general waste. The council provides reusable bags for residents to store and transport recyclable waste to external bins/communal storage areas.

External Storage:

- Provide a dedicated bin storage area with enough space for at least one 23-litre food waste caddy and 60 litres of mixed recycling in addition to the general waste.

Development with Communal Waste Storage Facilities:

[7] Based on the EU definition of municipal waste being household waste and other waste similar in composition to household waste. This includes business waste collected by local authorities and by the private sector.

Internal Storage:

- Provide enough space to accommodate at least a 7-litre food waste caddy.

- Provide enough space for a 50-75-litre bag of mixed recycling in the same location as the receptacle for general waste.

External Storage:

- General waste chutes should be avoided. Instead dedicated waste and recycling storage areas should be provided. These can be located inside or outside the building, but should include the following:

    - Enough space for an equal amount of general waste and recycling bins.
    - Enough space for food bins to accommodate at least 5 litres of food waste per household (e.g. for 55 households, this would equal 275 litres and be rounded up to enough space for 2 x 140-litre food waste bins).
    - Enough space for each food waste bin to be stored inside a protective housing (measurements are provided in figure 3.3 below).
    - Signage explaining what can and can't be recycled.
    - External waste storage areas should be screened.

- For developments where a general waste porterage service is proposed, the service should also include the porterage of recyclable waste.

Other Measures

- On site composting should be considered for sites with green space.

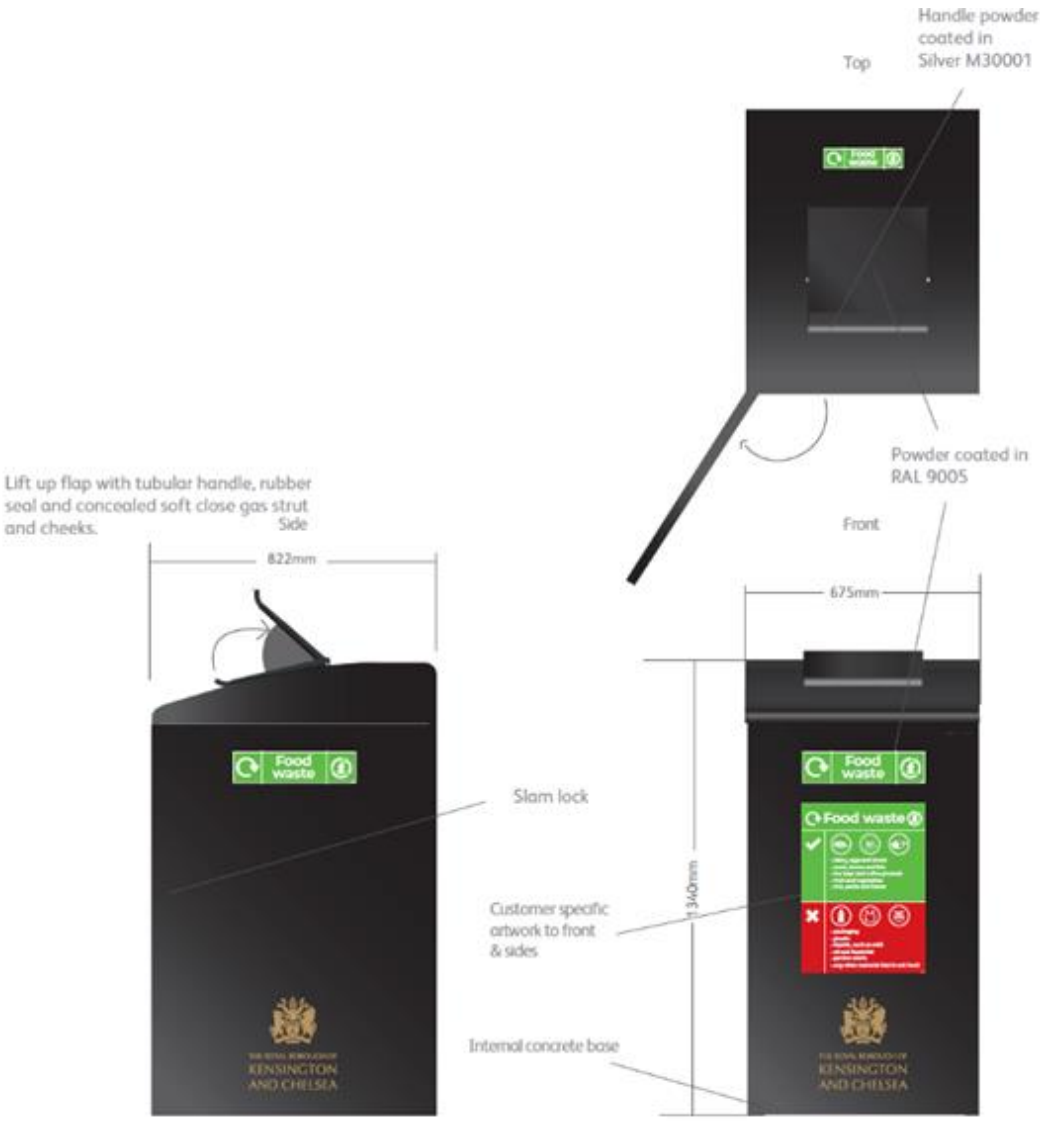


Figure 3.3: Food waste bin housing

4 Energy Hierarchy and Whole Life-Cycle Approach

Key guidance

Energy hierarchy

- The energy hierarchy should inform the design, construction and operation of new buildings.
- All development should follow the energy hierarchy to reduce carbon emissions.

Whole Life-Cycle Approach

- Strategic development referable to the Mayor of London should undertake a Whole Life-cycle Carbon Assessment.
- Applicants for major development are encouraged to undertake a Whole Life-Cycle Carbon Assessment.
- All developers are encouraged to follow the principles for reducing whole life-cycle carbon emissions.
- An important principle in the whole life-cycle assessments will be to minimise construction waste and where waste is unavoidable, the designers should establish the suppliers' processes for disposal or preferably reuse of waste.

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4.1 To meet our ambitions for reducing the carbon footprint of the Borough, we need to approach the use of energy through the entire lifecycle of a development from design to post implementation. To this end the London Plan's energy hierarchy – Be Lean, Be Clean, Be Green and Be Seen provides the overarching principle. This is shown in Figure 4.1 below. The London Plan 2021 states that (para 9.2.2) *"The energy hierarchy should inform the design, construction and operation of new buildings. The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings."*

4.2 The following sections set out further guidance on our sequential approach to decarbonisation in new buildings. These are inherently linked to the energy hierarchy. Most importantly, this SPD is aligned with the London Plan 2021 policies to enable us to meet our commitment to be a carbon neutral borough by 2040.

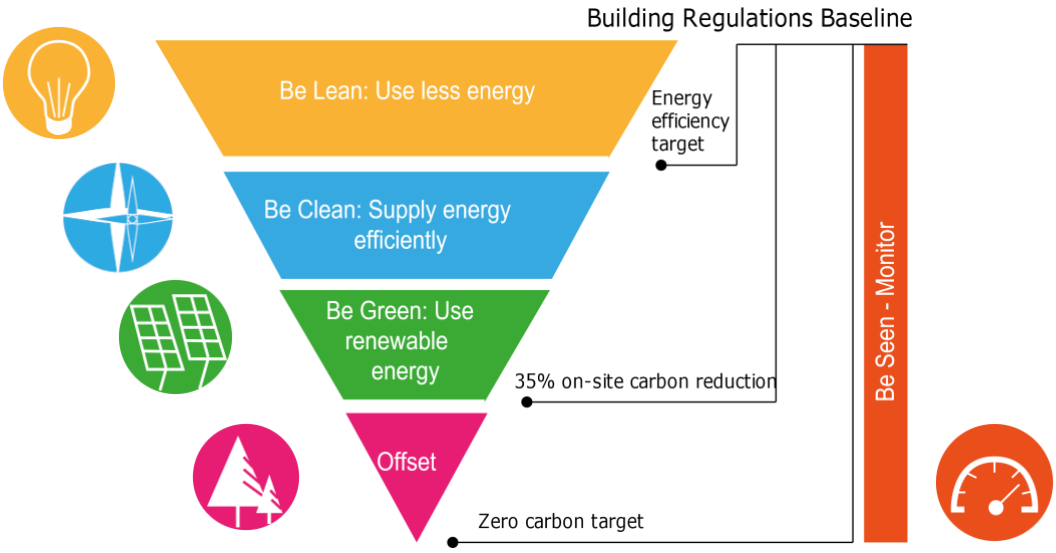


Figure 4.1: Energy Hierarchy showing how new buildings can meet net zero carbon by following this sequential approach

Our requirements

- All developments should follow the energy hierarchy.

How do I do it?

- Follow the guidance in this SPD to – Be Lean, Be Clean, Be Green and Be Seen appropriate to the scale of development.
- Details of what to do at each stage of the hierarchy are set out in the following sections of the SPD.

Whole Life Cycle Approach

4.3 In addition to the running of a building during its operation, emissions are produced during a building's construction and later during maintenance. These are technically known as **embodied emissions** which are non-operational greenhouse gas emissions associated with a building's lifecycle, covering: A) the emissions that have already happened before a building is completed such as during construction and B) other 'locked in' non-operational emissions associated with subsequent stages of the building lifecycle (maintenance, repair, retrofitting, demolition and disposal). It is estimated that about half of global cumulative CO_2 emissions associated with new development between now and 2050, will be from embodied emissions, arising even before a building comes into use.

4.4 This is a significant proportion, but such emissions are not covered by current Building Regulations. To ensure that we capture the opportunity to reduce the impact of such sizeable emissions we need a whole life-cycle approach as set out in paragraph 9.2.11 of the London Plan 2021. This states, *"a whole life-cycle approach is needed to capture… unregulated emissions (i.e. those associated with cooking and small appliances)… embodied emissions (i.e. those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal."* Therefore, we will require –

Our requirements

- Applicants for major development should undertake and submit a whole lifecycle assessment.
- The information will be required at the pre-application, full application and post-construction stage.
    - Pre-application stage – this should set out the principles which are informing the development of the site.
    - Application stage – Assessment against each life-cycle module as shown in figure 4.1 will be expected. This stage also requires two assessments: the first accounts for the current status of the electricity grid and the second for its expected decarbonisation. Applicants may determine which assessment is to form the basis of design decisions.
    - Post-construction stage – this is an important stage so any performance gaps between design and delivery can be understood. This should be undertaken within three months of completion. This will require an update of the information provided at the planning stage and for the actual whole life-cycle emission figures to be reported.
- All developments should bear in mind the potential to minimise embodied emissions by following the principles set out in Table 2 of the GLA Whole Life-Cycle Carbon Assessments Guidance, Consultation Draft, October 2020[8]. This or any update to this guidance should be followed by applicants.

[8] https://consult.london.gov.uk/5627/widgets/16756/documents/6852

How do I do it?

- The GLA template for Whole Life-Cycle Carbon Assessment[9] must be used.
- The template sits alongside the GLA Whole Life-Cycle Carbon Assessments guidance which must be understood and read before filling in the template.
- The GLA template has separate tabs for each stage from pre-app to post construction and these assessments should be undertaken at each stage.
- The Council will include the requirement to submit the post - construction assessment in a legal agreement.

4.5 Life-cycle Assessment is a multi-step procedure through the life stages of a building. In the UK the BS EN 15978: 201110 standard is typically used to define the different life cycle stages – see fig 4.2.

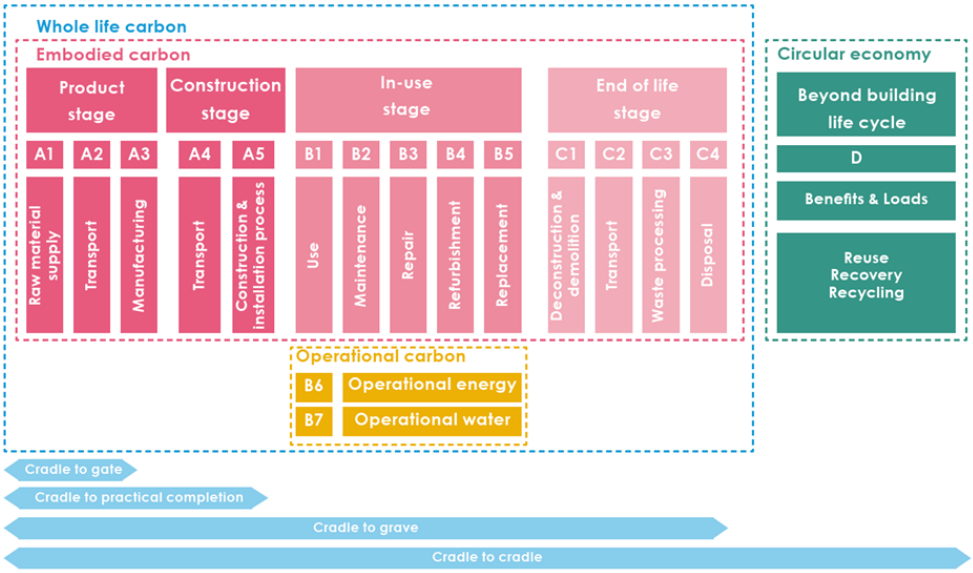


Figure 4.2: Whole life-cycle carbon modules
The various component A to D under each module are further explained in the principles set out in Table 2 of the Draft GLA Whole Life-Cycle Carbon Assessments Guidance, October 2020

4.6 Table 2 of the Draft GLA Whole Life-Cycle Carbon Assessments Guidance, October 2020 sets out the principles of reducing Whole Life-Cycle Carbon emissions. One of these principles is related to waste which

[9] https://consult.london.gov.uk/whole-life-cycle-carbon-assessments
[10] BS EN 15978: 2011: Sustainability of construction works - environmental performance of buildings - Calculation method.

has been a particular issue in the Borough with the prevalence of basement development and a dense urban environment.

4.7 Waste represents an unnecessary and avoidable carbon cost. Buildings should be designed to minimise fabrication and construction waste, and to ease repair and replacement with minimum waste, which helps reduce initial and in-use costs. This can be achieved through the use of standard sizes of components and specification and by using modern methods of construction. Where waste is unavoidable, the designers/developers should establish the suppliers' processes for disposal or preferably reuse of waste. Natural and traditional materials are often more easy to recycle – for instance brickwork which has been bonded with lime mortar is much easier to dismantle for the re-use of the bricks, and second hand stocks are often used for the construction of extensions to existing buildings. Timber windows can be repaired and re-used with the insertion of new timber elements, whereas PVCu windows only work as a unit, and have to be replaced in their entirety when they fail'

5 Reduce Energy Demand (Be lean)

Key guidance

Energy (Be Lean)

- Applicants for developments of all scales must optimise building design to reduce energy demand.
- We will continue to require net zero carbon for major residential development and extend this to major non-residential development.
- This means a minimum on-site reduction of at least 35 per cent beyond Building Regulations 2013 Part L for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures.
- Applicants for major development must submit a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy using the Energy Assessment guidance produced by the GLA.
- Use of voluntary industry standards and assessment methods are strongly encouraged to achieve carbon reductions beyond building regulations. These include Passivhaus, EnerPHit and Energiesprong.

5.1 Be Lean is about using less energy by minimising energy demand. We want to promote the highest possible energy efficiency standards reflecting the latest available technologies in all new developments. This will help reduce “regulated” carbon emissions.

Key terms

Zero and net zero carbon: Zero carbon requires no net release of carbon dioxide and other greenhouse gas emissions into the atmosphere. Net-zero carbon refers to balancing the amount of emitted greenhouse gases with the equivalent emissions with no reliance on fossil fuels, using on-site renewable or offsetting elsewhere as a last resort.

Regulated carbon emissions: These are the carbon emissions arising from energy used by fixed building services, which are defined in Approved Document Part L of the Building Regulations. These include heating and cooling, hot water, ventilation and lighting.

Unregulated carbon emissions: These result from processes that are not covered by building regulations, i.e. ICT equipment, lifts, refrigeration systems, cooking equipment and other 'small power'.

Building Research Establishment Environmental Assessment Method (BREEAM): BREEAM is a holistic approach on environment standards that goes beyond carbon emissions, and supports quality assurance, i.e. can help to avoid a 'performance gap' between modelled and actual emissions in practice.

Building Design

5.2 Building design can play a critical role in reducing energy demand and is the first step in following the principle of the Energy Hierarchy. Some key concepts and terms are set out below.

What does 'fabric' mean and what is important?

5.3 The building 'fabric' is made up of the materials used in walls, floors, roofs, windows and doors. The more insulation contained within these elements, the better their thermal performance. However, 'fabric' also includes the building's overall airtightness, as well as the impact of thermal bridges (see paragraph 9.13) where the insulation layer is not continuous.

Why concept design is critical

5.4 The specification of the fabric, materials and heating and cooling systems will all have a significant impact on the energy demand of a building. However, even more fundamental are some key design decisions which are typically shaped very early on. These are:

- Orientation
- Glazing ratio
- Form factor

5.5 A building's orientation combined with its glazing ratio is key to minimising energy demand. In the UK over the course of a year, north facing windows nearly always lead to net heat loss, whereas south facing ones can normally be designed to achieve a net heat gain. However, the amount of south facing glazing should also be optimised to prevent the risk of summer overheating. An analysis of the risk of overheating should be included as part of the Energy Assessment (see paragraph 5.11 below). Although east/west windows can provide useful gains, they can often lead to overheating due to the low angle of the sun at the start/end of the day.

5.6 Policy SI 4: Managing Heat Risk of the London Plan 2021 must be followed to manage heat risk. The London Plan suggests that there are a number of low energy measures that can mitigate overheating risk. These include solar shading, building orientation and solar-controlled glazing.

5.7 Clearly in the dense built environment of the Borough, the plot may not allow the flexibility to orientate in the most optimum way, but these simple principles should be borne in mind.

5.8 The optimum glazing ratios for the UK climate are up to 25 per cent glazed on the southern elevation, no more than 20 per cent on the east/west elevations and as little as possible on the northern elevation. The diagram below shows the impact on space heating demand as the same building is rotated to place its originally south facing glazing in a northerly direction. It shows that purely by changing the building's orientation, the space heating demand increases from 13kWh/m^2/yr to 24kWh/m^2/yr.

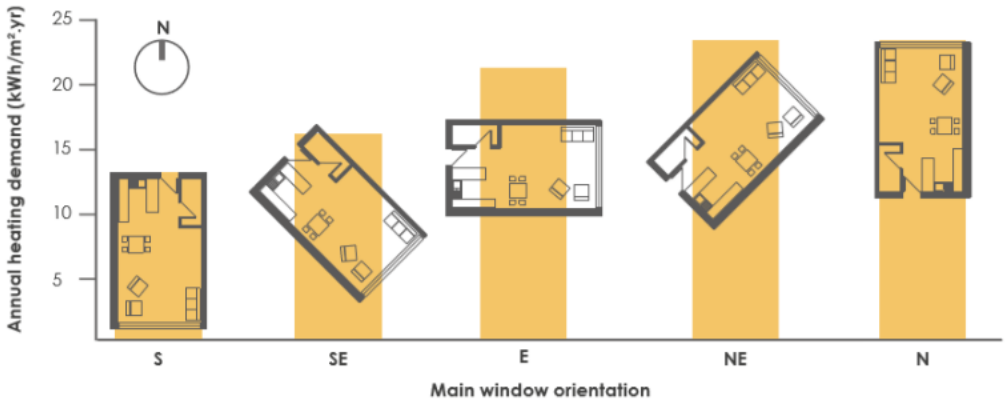


Figure 5.1: Why orientation is important *(source: LETI Guide, 2019)*

5.9 A building's form factor is the ratio of its external surface area (i.e. the parts of the building exposed to outdoor conditions) to the internal floor area. The greater the ratio, the less efficient the building and the greater the energy demand. Detached dwellings will have a high form factor, whereas flats will have a much lower form factor and thus will tend to be more energy efficient. The figure below shows the typical form factors associated with different design configurations. Again, often the site context, particularly as three-quarters of the Borough is within conservation areas, will define the building form and massing. However, this is a useful consideration.

5.10 If a building is designed with a poor form factor, then the fabric efficiency will need to be increased significantly to achieve the optimum levels of performance. This will increase costs as more insulation and more efficient systems will be required.

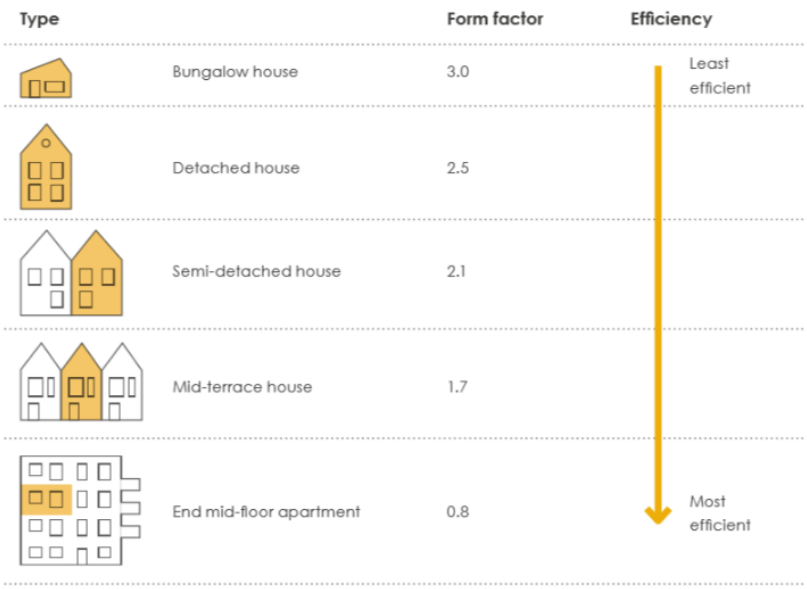


Figure 5.2: Types of homes and their form factors *(source: LETI Guide, 2019)*

Future Homes Standard

The Government has consulted on Future Homes Standard which will change Part L of the current Building Regulations. The Future Homes Standard is expected to be introduced in 2025 and will require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency. Development will be required to meet these standards once they are adopted.

Our requirements

- Applicants for developments of all scales must reduce energy demand by optimising building design.

How do I do it?

- Use the simple concepts in particular orientation, glazing ratios and form factor in the design of the scheme.
- Submit this information as part of the energy strategy (described in more detail in the following section) or in the design and access statement.

Energy Standards

5.11 Our requirements for developments to meet high energy standards are set out below.

Our requirements

- Applicants of major development should be net zero carbon. The Local Plan Policy CE1 will be extended to include a requirement for net zero carbon not only from major residential development but also to major non-residential development. To achieve this, the Council will apply London Plan Policy SI2 C, this requires:

  A minimum on-site reduction of at least 35 per cent beyond Building Regulations 2013 Part L[11] for major development.

  Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the Borough, either:

  1) through a cash in lieu contribution to the Borough's carbon offset fund, or

  2) off-site provided that an alternative proposal is identified, and delivery is certain.

- The London Plan 2021 encourages boroughs to include BREEAM targets in their Local Plans where appropriate. Therefore, in addition to the net zero requirement for major non-residential developments, we will also apply Local Plan Policy CE1 b. This requires an assessment to demonstrate that non-residential development meets BREEAM very good with 60 per cent of the unweighted credits available in the energy, water and materials sections.

- Achieving BREEAM 'very good' standard has the added benefit that it will involve external third-party validation and auditing of modelling.

How do I do it?

- Applicants for major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

[11] Building Regulations 2013. If these are updated, the policy threshold will be reviewed. https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

- Paragraph 9.2.12 of the London Plan 2021 sets out the minimum information to be included in an energy strategy. This includes a calculation of the energy demand and carbon emissions covered by Building Regulations and, separately, the energy demand and carbon emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (i.e. the unregulated emissions), at each stage of the energy hierarchy.

- The GLA has produced detailed guidance on Energy Assessments[12] and the latest guidance should be followed. Paragraph 1.7 of the GLA's Draft Energy Assessment Guidance, April 2020 provides a useful checklist, which includes:

    - that it should be submitted at the planning application stage, we will not be dealing with this via condition,

    - report estimated site-wide regulated CO_2 emissions and reductions (broken down for the residential and non-residential elements of the development), expressed in tonnes per annum, after each stage of the energy hierarchy,

    - demonstrate how the net zero carbon target for major residential and non-residential development will be met, with at least a 35per cent on-site reduction beyond Part L 2013 and proposals for making up the shortfall to achieve net zero carbon, where required,

    - commit to reducing regulated CO_2 emissions by 10 percent for residential and 15 per cent for non-residential applications through energy efficiency measures alone, and;

    - include information demonstrating that the risk of overheating has been mitigated through the incorporation of passive design measures.

- For schemes proposing homes, submit full calculation worksheets for:

    - target emission rate (TER) (the baseline) and dwelling emission rate (DER) (the actual emissions of the proposed design).

    - Standard Assessment Procedure (SAP) compliance reports should also be provided. Current Building Regulations 2013 Part L for new domestic buildings set specific targets for fabric energy efficiency for dwellings through the Standard Assessment Procedure (SAP) which must be met to achieve compliance.

[12] GLA Guidance on Energy Assessments, 2020

- In addition, Building Regulations Part L compliance sheets should also be provided both for residential and non-residential.
- The Council prefers that the zero-carbon requirement is met on-site and carbon offset is the last resort but where it cannot, we have a carbon offset fund. The residual carbon to be offset must be included in the energy assessment. You will need to make a payment which at present is £60 per tonne of carbon over 30 years or £1,800 per tonne of carbon. This will increase to £95 per tonne of carbon or £2,850 per tonne of carbon now that the London Plan 2021 has been adopted.
- You can propose offsetting the carbon on another site, but this must be in the Borough, have wider public benefits and the delivery will be secured by including this in a legal agreement.

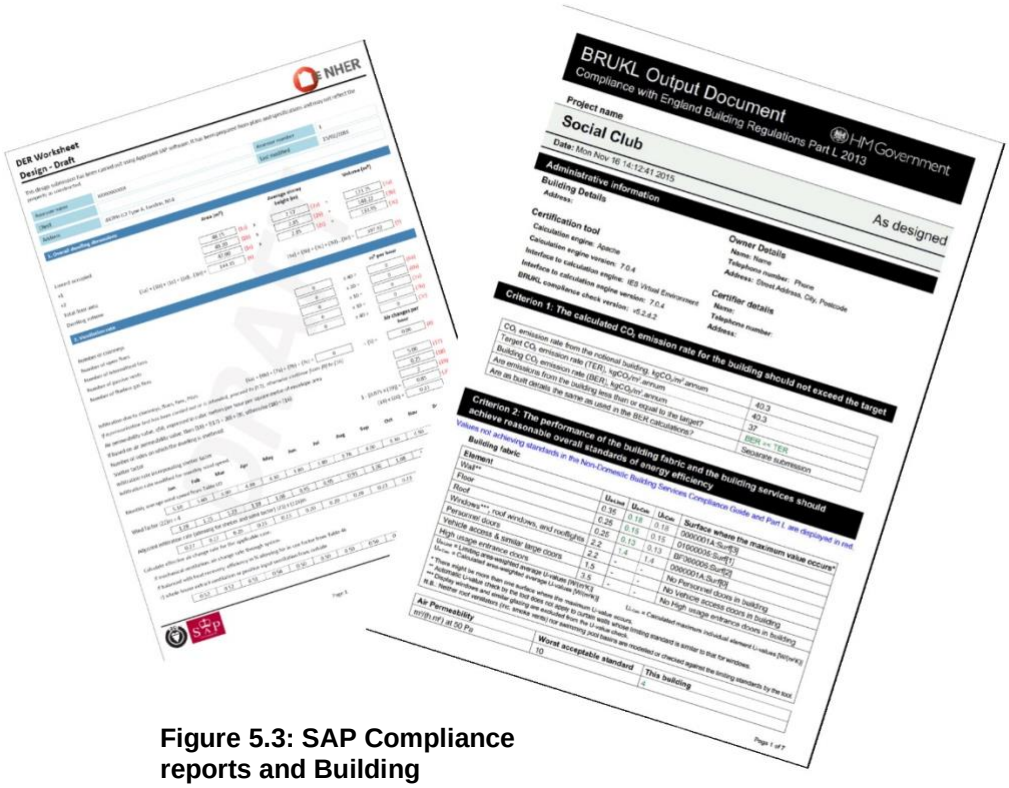


Figure 5.3: SAP Compliance reports and Building Regulations Part L Compliance Sheets

Offsetting

5.12 Where an energy assessment demonstrates that the carbon savings required cannot be delivered on-site, the remaining regulated emissions will incur a charge in the form of a cash in lieu payment to the Council's carbon offset fund which will be secured through a legal agreement.

5.13 The Council has adopted the Mayor's current carbon offset price. For all major developments the payment required is based on the nationally recognised 'Zero Carbon Hub' price per tonne of carbon dioxide of £60, offset over 30 years. At present, this gives an overall price of £1,800 (£60 x 30 years) per tonne of carbon to be offset. The tonnes of carbon that will need to be offset should be clearly set out in the applicant's energy strategy.

5.14 The London Plan 2021 includes a new carbon offset price based on a nationally recognised non-traded price of £95 per tonne, which was tested as part of the London Plan viability assessment. The Mayor has prepared Carbon Offset Funds guidance[13] and intends the updated carbon offset price to be the price boroughs adopt, unless they have set their own local price. The Mayor will review the carbon offset price regularly and the most recently updated price will apply in this Borough. Now that the London Plan 2021 is published the price per tonne of carbon will change from the current £60 to £95 or £2,850 per tonne of carbon over 30 years.

Voluntary Standards and Assessment Methods

5.15 In addition to environmental assessment methods that cover a broad range of environmental issues there are also a range of voluntary energy standards that have been developed that focus on improving building energy performance, these include the Passivhaus Standard developed by the Passivhaus Trust, and its equivalent EnerPHit for retrofit projects, the AECB Silver Standard and Energiesprong an established standard for the whole house refrofit of existing homes.

5.16 Case study evidence suggests that accredited Passivhaus or EnerPHit projects can result in a 75 per cent - 90 per cent reduction in heating demands. The Energiesprong retrofit method goes even further, seeking to ensure that a house operates with net zero energy demands over the course of a year.

Our requirements

- We strongly support use of voluntary industry standards and assessment methods to demonstrate achievement of carbon reductions beyond Building Regulation requirements.
- Applicants for minor development are encouraged to adopt low carbon heating.

How do I do it?

[13] Carbon Offset Funds: GLA guidance for London's Local Planning Authorities on establishing carbon offset funds (October 2018)
https://www.london.gov.uk/sites/default/files/carbon_offsett_funds_guidance_2018.pdf

- Use Passivhaus standards for new build. This standard can be used for both residential and non-residential schemes.
- Use EnerPHit standard for refurbishment projects.
- Use Energiesprong standard which can be used for new build as well as refurbishment projects but applies to residential development only.

5.17 The following section briefly explains these voluntary standards:

Passivhaus Standard

5.18 Originally developed in Germany, this is a performance standard that aims to meet annual heating requirements with very low energy input. It can apply to both residential and non-residential development but only for new build. It involves a focus on taking steps to ensure very high thermal efficiency and comfort, particularly through 'passive' measures relating to building form and fabric, and therefore very low energy inputs for heating. Importantly, the method takes account of both regulated and unregulated energy use, and therefore gives a truer picture of actual energy use than is the case when applying the Building Regulations Part L methodology. The method is based on energy demand rather than CO_2 emissions so does not focus on low carbon heating sources.

5.19 To meet the Passivhaus standard buildings must achieve a number of pre-determined performance metrics, these include a space heating demand of less than 15 kWh/m^2/yr, and less than 10 kW/m^2/yr, internal surface temperatures of no less than 17^{o}C and an air permeability rate of less than 0.6 air changes per hour at a pressure of 50 Pascals. The total Primary Energy Renewable use must also be less that 60kWh/m^2/yr. The London Energy transformation Initiative (LETI) launched their Climate Emergency Design Guide, in 2020. This Guide also specifies that space heating demand in all new building types (domestic and non-domestic) should be limited to 15 kWh/m^2/yr.

<< 100 Princedale Road
The first Victorian residential retrofit in the UK to be certified to the Passivhaus standard, 100 Princedale Road was part of an initiative to address the challenge of how to reduce carbon emissions in existing housing stock. The project was a government led competition in 2010. The property is owned by Octavia Housing. In a post-occupancy comparison evaluation with a typical house, Princedale Road consumed 83per cent less energy.

Suffolk Close, Bristol
Low energy council housing designed by Emmett Russell architects using Passivhaus principles. Photograph: Craig Auckland/Fotohaus

Goldsmith Street, Norwich
Stirling Prize winning Passivhaus social housing scheme

5.20 The key changes in performance this would introduce beyond the London Plan 2021 would effectively be a requirement for triple glazed windows, much higher levels of air-tightness, and use of mechanical ventilation with heat recovery (MVHR).

5.21 One of the key recognised benefits of third-party certification under Passivhaus is that it imposes rigorous scrutiny at the detailed design stage as well as the construction stage, with Passivhaus certified buildings typically achieving energy use in operation that is close to the predictions made at the design stage14.

EnerPHit

5.22 The Passivhaus Trust have also developed the EnerPHit standard which can be applied to refurbishment schemes. This standard allows a slight relaxation in the space heating targets (20-25 kWh/yr depending on location), recognising that the form of the building cannot easily be changed in refurbishment, it also allows a slightly higher air permeability rate of 1 air change per hour at 50Pa.

5.23 As part of the commitment outlined in the Council Plan to deliver a resident-led refurbishment of the Lancaster West Estate, we will aim for refurbished homes to meet EnerPHit standards, in line with the goal for all social homes to be carbon neutral by 2030.

5.24 We are also exploring the feasibility of a renewable heat network in Notting Dale, that could potentially harness environmental energy to eventually provide heating and hot water up to 2,000 Council homes.

[14] The performance of Passivhaus in new construction: Post occupancy evaluation of certified Passivhaus dwellings in the UK: Early Results. University of Bath for Passivhaus Trust. July 2017. https://www.passivhaustrust.org.uk/UserFiles/File/Technical%20Papers/The%20performance%20of%20Passivhaus%20in%20new%20construction_July%202017%20V2.pdf

Energiesprong

5.25 Originally developed by the Dutch government to promote energy efficient retrofitting, this is a performance standard for new build and refurbishment thatis suitable for residential development. The methodology involves a focus on achieving minimum performance standards for building elements and fixed services and, like the Passivhaus methodologies, account is taken of both regulated and unregulated emissions.

Performance gap

5.26 The performance gap is defined as the difference between predictions of energy consumption from building compliance tools and actual measured energy use during operation. This determines whether a building and its systems work as expected when occupied, as well as the extent of the gap where not.

5.27 The current national regulatory approach is based on modelling for compliance rather than performance. Independent research carried out by the UK Passivhaus Trust determined an average performance gap of 40 per cent between the overall energy use of a new build house when compared to its EPC modelling and other evidence suggests that it can be up to 500 per cent.

5.28 Reasons for performance gap as discussed in the London Energy Transformation Initiative (LETI) Guide for Climate Emergency Design Guide, 2019[15] are as follows. They include errors in design calculations, substitution of material between design and build, poor insulation, poor co-ordination between designers and contractors, poor standard of installation and overheating due to sub-optimal design.

5.29 LETI recommend three pillars to close the performance gap. These recommendations are aimed at developers/designers to – (i) set realistic targets (ii) monitor on-going performance and (iii) put in place a process to reduce energy use against target. They also recommend a body directly accountable for performance should be mandated, similar to the reform for the building safety regulatory regime. This is clearly beyond the scope of this SPD to address. However, applicants must consider the measures to meet the standards in this SPD not just at the design and planning application stage but also in practice once the building is complete. The "Be Seen" strand of the energy hierarchy also seeks to address this aspect.

Unregulated carbon

5.30 This also contributes to the performance gap issue discussed above. A documented shortcoming of the current Building Regulations Part L calculation methodology is its omission of unregulated energy loads. Although it can vary considerably by building type, unregulated energy can form up to 50 per cent of total operational energy. The lack of

[15] https://www.leti.london/cedg

consideration of unregulated energy at a regulatory level can lead to drastically different consumption to that estimated at the design stage.

5.31 Unregulated carbon calculations are to be included in energy strategies referred to in our requirements in paragraph 5.11 above.

Managing heat risk

5.32 In recent years we have experienced extreme temperatures in the summer. These are further exacerbated in London with its dense built up environment contributing to an urban heat island effect. Building design must manage this risk. As a minimum London Plan 2021 Policy SI 4: Managing heat risk must be followed.

5.33 Many aspects of building design can lead to increases in overheating risk, including high proportions of glazing and an increase in the air tightness of buildings. Single-aspect dwellings are more difficult to ventilate naturally and are more likely to overheat and should normally be avoided, in line with London Plan 2021 Policy D6 Housing quality and standards. There are a number of low energy measures that can mitigate overheating risk and include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk.

5.34 Passive ventilation should be prioritised, taking into account external noise and air quality considerations in determining the most appropriate solution. The increased use of air conditioning systems is not desirable as these have significant energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. If active cooling systems, such as air conditioning systems, are unavoidable, these should be designed to reuse the waste heat they produce.

Our requirements

- Development proposals should minimise adverse impacts of the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. Applicants for minor development are encouraged to adopt low carbon heating solutions.

How do I do it?

- Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure

2) minimise internal heat generation through energy efficient design

3) manage the heat within the building through exposed internal thermal mass and high ceilings

4) provide passive ventilation

5) provide mechanical ventilation

6) provide active cooling systems.

6 Heat networks (Be clean)

Key guidance

- On larger schemes Local Plan Policy CE1 requires decentralised energy through Combined Heat and Power (CHP). However, fossil fuel fired CHPs are not supported and where used should be low emission in-line with London Plan 2021 Policy SI 3 (D).
- There is a lack of decentralised energy networks in the Borough and major developments should instead deliver low temperature communal distribution systems served by heat pumps, or ensure development is designed with the capability to connect to new/future heat networks.
- Opportunity area sites should develop energy masterplans in-line with London Plan 2021 Policy SI 3.

6.1 Be Clean is about supplying energy efficiently. On larger schemes this could be possible by using heat networks (or district heating) connections, which is a priority in both the Council's and London Plan policy.

What are heat networks?

6.2 **Heat networks or district heating** is a way of distributing heat (and more rarely, power) generated from a given energy source(s) across multiple buildings or sites. The heat may come from boilers, heat pumps, Combined Heat and Power (CHP) (explained below), heat pumps elevating heat in the ambient environment (air, ground or water) or waste heat sources. A network of pipes carrying hot water or steam, usually underground, connects heat production equipment with heat customers. They can range from several metres to several kilometres in length.

6.3 **Combined Heat and Power** The combined production of electricity and usable heat is known as Combined Heat and Power (CHP) where these forms of energy are supplied to buildings or a network. In practice it is often combined with a heat network, as it works best with a constant, large demand for heat. Steam or hot water, which would otherwise be rejected when electricity alone is produced, is used for space or process heating.

6.4 However, the Local Plan Policy CE1 requiring this decentralised energy through fossil fuel fired CHP for our larger strategic sites is no longer considered fit for purpose. This is because CHPs using solid or liquid fuels are not a low carbon solution. The carbon savings from fossil (methane) gas CHP engines are now declining as a result of decarbonising the

national grid electricity supply, and there is increasing evidence of adverse air quality impacts. Instead we will support communal low-temperature heating systems using the heating hierarchy in New London Plan 2021 Policy SI 3 (D).

Our requirements

- Major development proposals within Heat Network Priority Areas[16] (the entire Borough is within this area) should have a communal low-temperature heating system:

  1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

  a) connect to local existing or planned heat networks

  b) use zero-emission or local secondary heat sources (in conjunction with heat pumps, if required)

  c) use low-emission combined heat and power (CHP)[17] (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

  d) use ultra-low NOx gas boilers

- There are a limited number of heat networks in the Borough. However, opportunities for their development are being considered Therefore, applicants should explore designing in the ability to connect to a future and/or proposed heat network.

- As most applicants for new development will not be in a position to connect into an existing heat network, the Council will expect major development to deliver low temperature communal distribution systems served by heat pumps in-line with criteria b. above.

How do I do it?

- Submit the Energy Assessment using the latest Energy Assessment Guidance[18] produced by the GLA. The 2020 update provides guidance on heating hierarchy. Paragraph 1.7 of the

[16] The GLA has identified Heat Network Priority Areas (HNPA) which can be found on the London Heat Map website. The London Heat Map indicates the whole of RBKC is in a HNPA. These identify where in London the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers.
[17] Low emission CHP refers to those technologies which inherently emit very low levels of NOx.
[18] https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/pre-planning-application-meeting-service-0

GLA's Draft Energy Assessment Guidance, April 2020 provides a useful checklist, which includes:

  - demonstrate that connection to existing or planned district heating networks has been prioritised and provide correspondence to support this
  - commit to a communal heat network to allow connection to existing or planned district heating networks identified in the area
  - minimise the number of energy centres and provide a single point of connection to the District Heating Network (DHN)
  - investigate suitable low carbon and/or renewable heating plant for installation within the energy centre if connection can't be made to an area wide network
  - minimise the number of energy centres and provide a single point of connection to the District Heating Network (DHN)
  - investigate suitable low carbon and/or renewable heating plant for installation within the energy centre if connection can't be made to an area wide network

- Future proofing the development to connect to a wider heat network in the future (scenario 2 of the guidance).
- To meet criteria b. requirement, secondary heat includes environmental sources: air, water and ground; and waste sources: such as heat from the sewerage system, sewage treatment plants, the tube network, data centres and chiller systems. The applicant should investigate waste heat sources of heat on or adjacent to the site. This waste heat, especially if it is low-grade heat, can be re-used to meet demand for low quality energy such as space heating and hot water. Many secondary heat sources will be low-grade heat, i.e. below 30ºC, and depending on the flow temperature of the heat network that it is being put into, it may need elevating using a heat pump either at source, before going into the network, or at the point of use.

6.5 In addition, London Plan 2021 Policy SI 3: Energy Infrastructure (B) states that energy masterplans should be developed for large-scale development locations, such as opportunity areas. We have two such areas - Kensal Canalside and Earl's Court. Heat networks or district heating must be explored for our opportunity area sites. Policy SI 3 further lists what an energy masterplan should contain, and this includes identifying major heat supply plants, including opportunities to utilise heat from energy from

waste plants as well as secondary heat sources. This would include both environmental and waste heat.

7 Renewable Energy (Be green)

Key guidance

Energy (Be Green)

- Applicants for development at all scales should consider on-site renewable energy sources.
- The key renewable energy sources that will work in the context of the Borough are solar PVs and heat pumps.

7.1 In addition to realising strategic heat network opportunities ('be clean'), there is also a need to 'be green' by realising onsite renewable heat/ power generation opportunities. However, the use of renewables must follow the energy hierarchy by first reducing the energy demand as much as possible.

7.2 Local Plan Policy CE1 (c)(ii), and the London Plan 2021 support maximising the opportunities for renewables.

7.3 Renewable energy technologies or improvements to the fabric of Listed Buildings and buildings in Conservation Areas are also possible. Further guidance on historic buildings is provided in section 9. On such schemes a bespoke solution may be needed which can be worked on in conjunction with design and heritage officers. Where carbon dioxide reduction targets cannot be met due to the designated status of the building, then the applicant will need to provide evidence that this is the case.

Our requirements

- Applicants for development of all scales should consider on-site renewable energy sources.
- Maximising opportunities for renewable energy by producing, storing and using renewable energy on-site is a key strand of the energy hierarchy as set out in Policy SI 2 of the London Plan 2021.
- Local Plan Policy CE1 (c)(ii), also includes the provision of on-site renewable and low-carbon energy generation as part of the energy hierarchy.

- Submit a noise and vibration assessment where an air source heat pump is proposed, and planning permission is required.

How do I do it?

- Energy assessments required for major developments must explain how the opportunities for producing, storing and using renewable energy on-site will be maximised.
- Paragraph 9.3.8 of the London Plan 2021 supports increasing the amount of renewable and secondary energy. Development proposals should demonstrate opportunities to maximise both secondary heat sources and renewable energy production on-site. This includes (both on buildings and at a larger scale on appropriate sites):
    - Solar photovoltaics - both minor and major developments should be designed to maximise solar availability through their massing and roof design.
    - Heat pumps – applicants for minor developments are strongly encouraged to use heat pumps rather than fossil fuel heat. Major developments should first consider connecting to an existing or future heat networks or communal low-temperature heating system.

7.4 Further guidance on these renewable sources is provided below.

Heat Pumps (Renewable Heating)

What is a heat pump?

7.5 A heat pump is classed as renewable because it uses natural elements. There are two main types – air-source and ground-source heat pumps. An air-source heat pump extracts warmth from the air, it is a box that can be stand alone or fixed to an exterior wall or roof. A ground-source heat pump requires generous outside space and is buried under the soil. Larger scale heat pumps, suitable for heat networks, have a higher coefficient of performance (heat to electricity ratio) than smaller units typically used in individual buildings. The Government's Ten Point Plan for a Green Industrial Revolution, November 2020 has pledged 600,000 heat source pump installations per year by 2028.

7.6 While gas boilers currently offer lower operational costs per unit of heat provided compared to heat pumps, higher insulation standards and other demand reduction measures will help to address issues of affordability. The Government Ten Point Plan has also announced that gas boilers will be phased out over the next 15 years. In the longer-term heat pumps are considered to be effective both in reducing emissions as well as becoming

more affordable. Therefore, applicants for both minor and major developments are strongly encouraged to use heat pumps rather than fossil fuel heat. This will be highly beneficial to both lifetime carbon saving as well as improving air quality.

How does it work?

7.7 The diagram below explains how heat source pumps work.

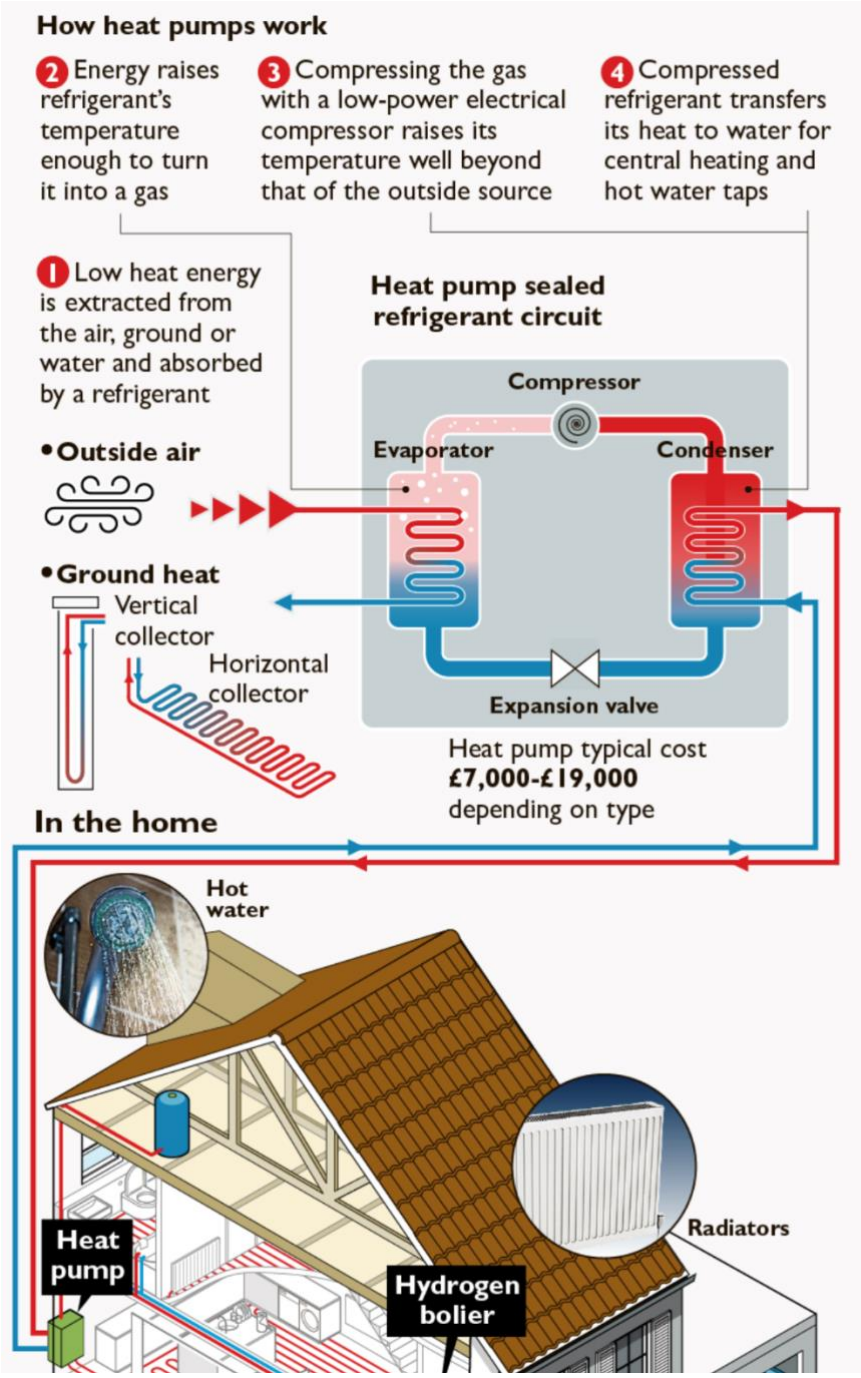


Figure 7.1: Working of air source and ground source heat pumps

What do I need to consider?

- Broadly speaking, air source heat pumps are usually more practical to install than ground source heat pumps.
- Heat pumps are significantly cheaper to operate than direct electric heating.
- The potential noise and visual impact of air source heat pumps will need to be mitigated through careful design.
- A noise and vibration assessment will be required for air source heat pumps where planning permission is needed.

Solar PV (Renewable Energy Generation)

What is Solar PV?

7.8 A photovoltaic (PV) cell is a device that converts sunlight into electrical energy. Unlike solar thermal panels the size of the system is not limited by the building's energy demand as excess electricity can be exported to the grid. Instead, the potential for CO_2 emission improvements will be largely determined by the amount of suitable roof space that is available.

How does it work?

7.9 The PV cell has one or two layers of a semi-conducting material so when light shines on the cell it creates an electric field across the layers causing electricity to flow. The greater the intensity of sunlight the greater the flow of electricity.

1 Fox Primary School, RBKC
2 Example of integrated tiled PVs
3 Solar PV on a flat roof integrated with a green roof, University of Greenwich

What do I need to consider?

- Solar PV works best in full sunlight so consider the positioning on the roof. South facing roofs or walls are best.
- While PV may be constrained in conservation areas or on listed buildings, it is still typically possible to integrate PV where it is not visually prominent from street level (see section 8 below).
- Consider if there is any shading from nearby buildings or trees.
- Consider the movement of the sun throughout the day and over the year. Overshadowing can impact on the overall performance.
- Proposals should maximise solar availability through their massing and roof design and by selecting heating solutions that limit competition for roof space (for example use of ground source heat pumps in place of air source heat pumps where feasible).
- There are increasingly recognised design solutions that can address Competing requirements for accessible roofs or provision of green roofs alongside PV.
- Use of battery storage (batteries can be used to store the electricity generated for use later when it is needed) can help to maximise the proportion of generated electricity from solar PV that can be used on-site and reduce wider constraints in terms of connection to the distribution network. This is expected to make a further contribution as to the costs of storage reduce.

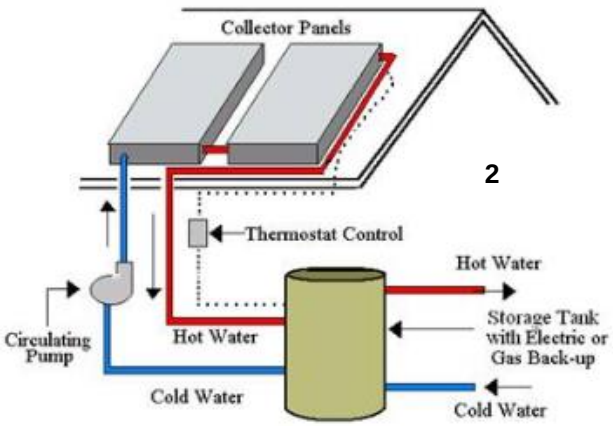
Solar water heating systems/ solar thermal systems (Renewable Heating)

What is solar thermal?

7.10 Solar thermal is a system made of flat plate collectors or tubes which allow water to flow through and be heated by the sun's rays.

How does it work?

7.11 A solar water heating system has three main steps. First, sunlight is captured by solar collectors outside, heating liquid inside the collector. Second, heat from the liquid is transferred into hot water. Third, the heated water is stored in an insulated tank until you need it.



1 Example solar thermal
2 Basic working of a solar thermal water heating system

What do I need to consider?

7.12 Solar Thermal is an appropriate technology for buildings where there is a year round hot water demand such as a residential development and leisure centres.

7.13 Positioning these on south facing roofs at an angle of 30-40 degrees is best but they do not rely on direct sunlight and can still be efficient at other angles.

7.14 Additional weight must be considered when fitting to existing roofs.

7.15 Solar thermal may not be sufficient by itself to meet the hot water demand and an additional heat generating technology is invariably required to meet peak loads and instances when solar energy is low in winter months.

7.16 While more difficult to integrate into development than solar PV, solar water heating systems can meet 50 per cent of the hot water demands in residential properties.

Wind Power (Renewable Energy Generation)

7.17 Wind turbines generate renewable electricity by harnessing energy from wind. The amount of electricity that a wind turbine can generate is dependent on the wind speed of the site and the size of the turbine. In general, the potential for incorporating wind turbines in urban environments is limited due to low average wind speeds and turbulence caused by neighbouring buildings. For building integrated wind turbines there are also planning restrictions on height that will limit the potential power output of the system, and further restrictions may also apply for developments in conservation areas that cover much of the Borough or those that include listed buildings. As such the potential for significant CO_2 emission savings through integrating wind turbines is considered to be very limited in the Borough.

8 Monitoring (Be Seen)

Key guidance

- Applicants will be required to report back on the performance of completed buildings using a portal which will be run by the GLA.

8.1 It is important that the performance of buildings, once occupied is monitored so we can understand what has worked well and what has not and learn from this.

8.2 London Plan 2021 Policy SI 2 introduces a new Be Seen level to the net zero carbon policy and associated energy hierarchy. This requires major developments to be verified so a report is provided on energy performance. The GLA's 'Be Seen' Energy Monitoring Guidance, Consultation Draft, October 2020.[19] sets out the detail of how the Be Seen level of the hierarchy should be assessed and reported. The GLA guidance sets out requirements for a design team to make more accurate assessments of the expected as built regulated and unregulated energy performance.

8.3 Data must be reported at the planning stage, then refined and reported in more detail based on the as built design. In use data will need to be reported for 5 years after initial occupancy. Developers will be expected initially to complete a reporting spreadsheet but with the aim that the GLA will subsequently establish a portal to which data will be uploaded.

8.4 **Planning stage requirements -** At the planning stage predicted energy use and CO_2 emissions for homes can be based on Part L SAP calculations, for non-residential development developers must use Part L calculations plus carry out a more accurate prediction using the methodology prescribed in the CIBSE Technical Memorandum (TM) 54.

8.5 **As built requirements -** At the as built stage (RIBA Stage 6) the developer will be expected to make more accurate predictions of the energy use and CO_2 emissions of the development based on the detailed designs and to provide further detail of how this is aggregated across the development.

8.6 **Monitoring and reporting -** The applicant for the development is required to monitor and report annual energy performance data for each qualifying Reportable Unit (RU) via the GLA's 'be seen' spreadsheet for at least five

[19] https://www.london.gov.uk/sites/default/files/be_seen_guidance_consultation_version_oct_2020_final.pdf

years once the defects liability period (DLP) is complete. As noted above this will require the applicant to pass on these requirements onto subsequent building owners, operators and tenants. This will require information to be built into leases etc.

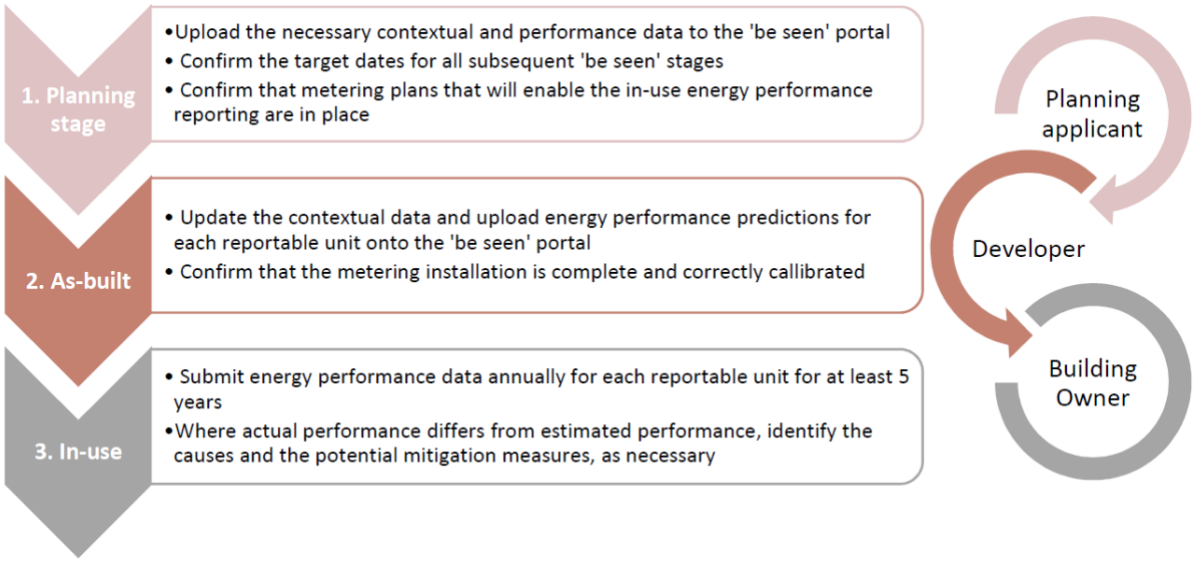


Figure 8.1: Reporting requirements from planning to in-use (source GLA be seen guidance)

Reporting to the GLA

8.7 *Applicants will need to report against performance indicators at each stage of the process by downloading the 'be seen' reporting spreadsheet from the 'be seen' webpage[20] of the GLA's website. Once the information has been completed the spreadsheet should be emailed back to: ZeroCarbonPlanning@london.gov.uk. The same spreadsheet will be used for all stages of the process featuring separate tabs for each reporting stage (i.e. planning stage, as-built stage, in-use stage).*

8.8 There are five performance indicator groups. These are, contextual data, building energy use, renewable energy, energy storage equipment, plant parameters and carbon emissions.

8.9 When the portal is available, applicants will be able to report on the portal instead of emailing performance indicators to the GLA. The 'GLA be seen energy monitoring guidance' will also be updated to explain how to report through the portal.

[20] https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance-and-spgs/be-seen-energy-monitoring-guidance

Our requirements

- For major development applicants should, where applicable, build reporting requirements into their agreements with building owners, tenants and energy system operators.
- Applicants for minor development are encouraged to follow the same process where possible. As a minimum, it is recommended to introduce smart energy and water metering that will allow occupants to monitor their own consumption of energy and water.

How do I do it?

- Applicants will need to report against performance indicators at each stage of the process by downloading the 'be seen' reporting spreadsheet from the 'be seen' webpage[21] of the GLA's website.
- Reporting will be able to be done through a portal once available.
- Figure 8.1 above shows the process and responsibilities at each stage of development.
- Guidance on the process can be found through the 'Be seen' energy monitoring guidance produced by the GLA.
- The Council will include the requirement for post-construction monitoring information to be submitted to the GLA in legal agreements.

[21] https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/planning-guidance/be-seen-energymonitoring-guidance-pre-consultation-draft

9 Retrofitting existing buildings

Key guidance

- Sensitive retrofitting of historic and other traditionally constructed buildings should be able to secure some improvements in energy efficiency, and these will be expected to be delivered in whole-building refurbishment schemes.
- Any retrofit process should include a detailed condition survey which identifies construction details and includes an analysis of the way in which the building is used.
- Check if a property is a listed building, in a conservation area or if there are any other restrictions such as an Article 4 Direction.
- Applicants for proposals which might affect a listed or conservation area building, should identify its heritage significance, including any contribution made by its setting.
- Repair works which make the building weather tight will improve its energy efficiency, so always consider these before designing retrofitting measures.
- Evidence of the approach to whole life-cycle carbon and Circular Economy measures should be provided as for new buildings.
- A Design and Access Statement, Sustainability Strategy or Energy Strategy should show how sustainability measures have been incorporated into the scheme.
- Manage any risks to historic fabric, e.g. through reduced ventilation or potential build-up of condensation.

9.1 This section briefly describes measures that should be considered when a programme for increasing energy efficiency is being designed for an existing building. Most of these measures have already been discussed in detail, so the aim is to highlight key opportunities and challenges associated with retrofitting existing buildings for this purpose. Information is presented according to the GLA Energy Hierarchy, outlining measures that are broadly applicable for the existing building stock. It also looks at the special considerations that are particularly relevant to historic buildings, including Listed Buildings and those in Conservation Areas. The emphasis is on the works which householders may wish to carry out to achieve a more comfortable home environment and more economic fuel costs.

9.2 A very high proportion of buildings in the UK are of traditional construction. These buildings were built to be wind- and weather-tight, but they pre-date current standards in respect of energy efficiency[22]. Retrofitting these buildings to use energy more efficiently therefore has a vital role alongside the installation of low carbon heating. It is important to recognise that, while retrofitting can achieve improvements, it is unlikely to achieve the standards that can be met in a new building. This is recognised in Part L of the Building Regulations 2013.

9.3 The Borough is characterised by a rich historic environment with nearly three quarters of it protected by 38 separate conservation areas and over 3,800 listed buildings. These are designated in recognition of their architectural or historic interest (listed buildings) or their special character and appearance (conservation areas). Many other buildings, while not listed or in a conservation area, are traditionally constructed. The Council is committed to working with building owners to identify ways in which these buildings can benefit from improved energy efficiency, while maintaining what is special about them. We will expect, where whole-building refurbishment schemes are being carried out, that the improvements will lead to some improvements in energy efficiency.

9.4 Changes in building techniques over centuries and decades mean that many of the sustainability measures that are commonly recommended for modern or new buildings are not suitable for historic properties and might harm what is special about them. Nonetheless, following the right approach, the twin objectives of protecting significance and improving energy performance to some extent can be met if changes are sensitively designed, and there are a number of low-intervention measures that can be chosen. Furthermore, the retention and improvement of existing buildings, particularly older building stock of the nineteenth century and earlier, retains the value of the often high-quality materials used, and so fits well with the objectives of achieving a Circular Economy and adopting a whole life-cycle carbon approach to the use of resources.

9.5 Historic buildings are generally of a solid wall construction and are vapour permeable / 'breathable', whereas modern buildings generally have cavity walls and are vapour impermeable. The fabric of historic buildings such as brick and lime-based plaster, mortars and renders breathe through the absorption and ready evaporation of moisture and so there are inherent risks in failing to retain their vapour permeability / 'breathability'. Alterations which create vapour barriers (e.g. cementitious renders, cement mortars and damp-proofing treatments) or decrease air flows (e.g. removing / blocking chimneys, blocking vents to floor voids or replacing suspended floors with solid floors) can lead to the physical decay of the building. This also means that approaches to energy efficiency which rely

[22] Historic England cites research indicating that the UK has the oldest housing stock in Europe, while in England, about 20% of homes – nearly 5 million – were built before 1919. https://historicengland.org.uk/whats-new/statements/modifying-historic-windows-as-part-of-retrofitting-energy-saving-measures/

on airtight construction and mechanical ventilation may actually encourage the harmful accumulation of moisture.

9.6 Therefore, prior to contemplating the retrofit of a historic building, it is important to understand the building's age, construction (including materials) and location (including exposure, orientation and degree of sheltering). This will provide an understanding of the way in which the building behaves and how susceptible it is to the elements.

9.7 As with any other changes, proposals for energy-saving measures are more likely to be acceptable if they are designed with the knowledge and understanding of the building's significance. It is important at the outset to assess the nature and level of significance (including the contribution made by its setting), so that the potential impact of the energy-saving measures on this significance can be understood. Assessments of character and significance can vary considerably in scope and detail but need to be proportionate to a heritage asset's importance and the potential impact of any changes[23].

9.8 Normally, historic buildings are robust and adaptable, and their construction materials can in many cases be easily repaired and maintained. British Standard BS 7913:2013: 'Guide to the Conservation of Historic Buildings', points out that good maintenance both avoids wasting the energy embodied in the building and can lead to lower energy needs: "The most effective way of ensuring energy efficiency and sustainability is to keep historic buildings in good repair so that they last as long as possible, do not need replacement and do not suffer from avoidable decay that would require energy and carbon to rectify… Using natural ventilation and light, and proper temperature and humidity control for individual rooms are ways of minimising energy usage that respect the building's material characteristics." (BS 7913:2013 Section 5.3.1).

9.9 Managing moisture is essential and the British Standard points out that a damp building could be up to 30 per cent less energy efficient than one which is dry. This is because the thermal resistance of porous building materials reduces when they are damp, and building defects, such as leaking gutters and defective drains, which encourage damp, will reduce thermal performance. Draughts coming in through cracks and poorly maintained doors and windows contribute further to heat loss.

9.10 So maintenance and control of damp may, alongside some relatively simple, non-intrusive changes may, taken together, make a significant impact in terms of energy saving, without the need for any major intervention which might be harmful to the historic building. Such changes are discussed below, and are also covered by Historic England in their document Energy Efficiency in Historic Buildings (2018), which includes a step-by-step guide for identifying suitable intervention measures, along with a rating system which indicates the level of cost and risks that these might incur.

[23] National Planning Policy Framework (NPFF) section 189.

Reducing Demand by Upgrading Existing Buildings

Insulation

9.11 The opportunity for installing insulation will depend on the building's construction. It may not be practicable in existing buildings to improve insulation levels to match the performance of new build standards due to their spatial limitations (e.g. insufficient gap in a cavity wall or no cavity wall) and practical considerations (e.g. cost or disruption to occupants). Part L of the Building Regulations for existing buildings recognises this in minimum standards that are much less onerous than those for new buildings.

9.12 Roof insulation is worth considering as it may be done with little intervention into the building fabric, for instance by laying insulating materials between the rafters in the roof space. Roof insulation may also be applied to the underside of the roof itself, but care should be taken to ensure that it will not trap or lead to the build-up of moisture. Further information on roof insulation may be found in detailed advice from Historic England[24], [25], [26].

9.13 Any upgrade in insulation needs to comply with Building Regulation fire risk standards. It should also avoid increasing the risk of condensation - Part C of the Building Regulations should be consulted to ensure appropriate provision is made.

9.14 Insulation of roof areas can make a significant impact in terms of energy saving and keeping summer temperatures lower. In addition, measures such as laying insulation on the floor of the loft would have minimal impact in heritage terms. Insulation applied under the roof covering to make a warm roof space can have more intrusive effects on the fabric or appearance of the building, for instance through raising the ridge height, and will be looked at on its merits.

Improving thermal bridging

9.15 Any form of insulation must be carefully designed in order to reduce or avoid thermal bridging. A thermal bridge occurs where there is a direct connection between the inside and outside through one or more building elements which are more thermally conductive than the rest of the building envelope, resulting in heat loss outwards, and a local internal surface which is cooler than other, better-insulated internal surfaces, which encourages condensation, and potentially the growth of mould. Thermal bridges can occur in areas such as floor/wall junctions and at door and window surrounds.

[24] https://historicengland.org.uk/images-books/publications/eehb-insulating-pitched-roofs-ceiling-level-cold-roofs/
[25] https://historicengland.org.uk/images-books/publications/eehb-insulating-pitched-roofs-rafter-level-warm-roofs/
[26] https://historicengland.org.uk/images-books/publications/eehb-insulating-flat-roofs/

9.16 In existing buildings there are relatively few opportunities to improve thermal bridging unless there is a significant revision to the construction detailing. Nonetheless, potential reductions in thermal bridging should be considered as part of the design strategy to avoid the risk of localised condensation, thermal discomfort or other issues.

Windows

9.17 Changes to windows, in particular the addition of double glazing can be seen as a quick win in improving the thermal efficiency of buildings. However, traditional windows and their glazing make an important contribution to the significance of historic buildings. They are an integral part of the design and can be important features in their own right. They were often made with great skill using materials of a higher quality than is typically available today. In addition, the distinctive appearance of historic hand-made glass is not easily imitated in modern glazing.

9.18 Windows are also particularly vulnerable elements of a building as they are relatively easy to replace or alter. Such alterations often have a significant impact, not only on the building itself but on the appearance of the group, street and local area.

9.19 Historic windows and glass which survive in listed buildings should be retained and repaired where possible. Traditional windows can usually be simply and economically repaired, typically at a cost significantly less than replacement. For timber windows this is largely due to the high quality and durability of the timber that was used in the past (generally pre-1919) to make windows. Properly maintained, old timber windows can survive for hundreds of years, thus reinforcing the whole-life energy efficiency of the building. Traditional metal windows can also usually be economically repaired, and their thermal performance improved without the need for replacement. Historic England has produced detailed advice on the repair of traditional windows, '*Traditional Windows: their care, repair and upgrading*'.

9.20 If historic windows are beyond repair, they should be replaced with accurate single glazed copies, which could, achieve improved thermal insulation capacity through the glass, subject to appropriate design details. Where historic windows or replacement windows of a suitable design survive without the historic glass, then it is usually possible to introduce new single glazing with an improved thermal insulation capacity without harming the significance of the building, again, subject to detail.

9.21 Existing windows within modern extensions or within the main building where the materials and/or design do not follow the historic finishes and patterns are unlikely to contribute to significance. Replacing such windows with new windows of a sympathetic historic design, whether single glazed or incorporating slim-profile double glazing, may be acceptable, subject to appropriate detailing.

Windows in Conservation Areas

9.22 The retention and repair of historic windows on unlisted buildings within conservation areas is strongly encouraged for the reasons outlined above. However, the introduction of suitably designed replacement windows, with either single glazing or slim-profile double glazing, may also be acceptable, subject to the circumstances and detailing.

9.23 Planning permission will be required for replacing windows in flats, and in some conservation areas, an Article 4 Direction means that it will also be needed for replacement windows in houses

Other options

9.24 The introduction of simple draught proofing strips is an effective and affordable means of substantially improving energy efficiency of existing retained windows involving minimal alteration. The addition of curtains and blinds can also help significantly in this respect.

9.25 Another effective means of cutting draughts and reducing heat loss through windows is by introducing secondary glazing. This is an independent window system which is installed to the room side of existing windows. The original windows remain in position in their unaltered form. Secondary glazing, which is available as openable, removable or fixed units, can usually be installed in listed buildings, subject to detail. In order to limit visual impact, any new secondary glazing should normally be set within the window reveal and any sub-divisions should respond to the glazing pattern of the adjacent window. Impact on existing historic shutters needs to be carefully considered.

9.26 Shutters were originally made to suit almost every type of window. Well-fitted external or internal wooden shutters also dramatically decrease heat loss through windows. Redundant shutters should certainly be brought back to use wherever possible and if missing, consideration given to reinstating them. Where there is no clear evidence of previous shutters then the merits of installation will be weighed against the impact on the significance of the building if it is listed.

Damp Proofing in Historic Buildings

9.27 Appropriate damp-proofing measures can enhance the energy efficiency of historic buildings. Prior to considering any damp-proofing measures, the source(s) of the problem should be investigated and dealt with. Relatively simple measures, such as maintenance of pipes / gutters, the repair of defective flashings, re-pointing of brickwork using a lime mortar, etc, can reduce moisture ingress and improve the energy efficiency of a historic building. Such remedial works should be considered in the first instance. The replacement of pipes / gutters and the re-pointing of brickwork may require consent if the building is listed, but are usually acceptable, subject to details. It is also important to consider the ways in which the building is being used and if this is contributing to the damp problem.

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9.28 Any damp-proofing measures which inhibit the ability of the fabric to 'breathe' and release moisture in the way it was designed and contribute to the build-up of moisture within the structure are unlikely to be acceptable. For this reason, the application of cementitious render, particularly to historic brickwork is usually unacceptable.

9.29 By sealing internal spaces, it is likely that any moisture, which historically, would have been lost passively, will build up internally. For example, unventilated kitchens or bathrooms can result in dampness and mould. It is therefore important to ensure that internal spaces are sufficiently ventilated and heated, and that alterations, such as the sealing of chimneys, the replacement of suspended timber floors with concrete, impermeable solid wall insulation, etc. are avoided.

9.30 Any application for damp-proofing works to a historic building should include a survey by an independent damp specialist. The damp-proofing measures should be designed on the basis of a clear understanding of traditional buildings; and based upon correct building diagnostics and pathology. Consideration must be given to the fabric of the building to which the treatments / interventions are being applied; and not just to the creation of dry internal spaces.

9.31 Chemical damp-proof courses may further exacerbate damp issues as the associated creation of holes in the brickwork is damaging and potentially increases the vulnerability of the brick to moisture.

9.32 Cavity membrane systems are a less harmful option as they do not seal the brickwork but allow the masonry to 'breathe' and facilitate the removal of moisture. Such works require consent in listed buildings. Clear and convincing justification is required for a membrane system and it must be designed in a sensitive manner as the linings can distort the original form of a room and any window / door openings. A membrane system is more likely to be acceptable where there aren't any historic architectural features or historic brickwork (e.g. in vaults) which would be concealed or harmed.

9.33 Whilst the replacement of suspended timber floors with concrete may reduce the risk of moisture moving through the floor, it is likely to push the moisture to the perimeter of the floor and into the walls. Retrofitting a damp-proof course will deal with the symptoms but not with the cause. In such cases, the replacement of a concrete floor with permeable limecrete is likely to be a preferable option.

Upgrading services

9.34 The Government's Building Services Compliance Guides for domestic[27] and for non-domestic[28] development provide guidance on complying with Building Regulations for refurbishments. The guidance includes minimum performance standards for upgrades to space heating and hot water

[27] Domestic Building Services Compliance guide 2013 edition (incorporating 2018 amendments)
[28] Non-Domestic Building Services Compliance Guide 2013 Edition

systems, mechanical ventilation, comfort cooling, fixed internal and external lighting and renewable energy systems.

9.35 Replacing existing building services with energy efficient upgrades should be considered, particularly where the existing services are close to the end of their economic life. Where systems are not close to the end of their economic life, careful consideration should be given as to whether it is beneficial in terms of whole life-cycle carbon to replace with more efficient plant. CIBSE's Guide M gives guidance on economic life for different types of systems.

9.36 Whilst air conditioning systems are at the bottom of the cooling hierarchy (see paragraph 5.34), proposals for new air conditioning or 'comfort cooling' systems will be considered in relation to their impact on heritage assets. In the current climate, despite some exceptional warm spells, they are not necessary for more than a few weeks every year. Alternative measures such as closing curtains or blinds, including solar reflecting blinds, during the day are low impact but can keep internal temperatures down. Internal shutters can also be effective in keeping the heat out in hot weather and for acoustic insulation. External shutters or awnings may be acceptable in certain circumstances, depending on their effects on the heritage interests of listed buildings or conservation areas.

Upgrading gas boilers

9.37 It will be necessary to eliminate the use of individual gas boilers for the Borough to reach Net Zero emissions. Ideally gas boilers would be replaced with heat pumps, or a connection to a low carbon network, but this will not always be feasible.

9.38 For domestic refurbishments, Part L recommends that replacement gas boilers meet an Energy-related Products (ErP) efficiency of 92 per cent (broadly in line with new build requirements). This would require a condensing boiler. For non-domestic refurbishments, the Building Services Compliance Guide recognises that there may be limitations for incorporating condensing boilers due to potential spatial constraints for additional flues. The minimum recommended efficiency is a gross efficiency of 84 per cent (significantly below the minimum standard for new buildings).

Mechanical Ventilation

9.39 The importance of ventilation in historic buildings cannot be over-stressed. Draughts can be reduced in traditional buildings but maintaining adequate ventilation is vital to ensuring that the building fabric remains in good condition.

9.40 Mechanical ventilation systems do require energy to run, so they are less inherently efficient anyway in the context of a traditionally designed building where there is passive ventilation through windows which are not sealed to be airtight.

Lighting

9.41 It should normally be possible for existing buildings to utilise the same low energy light fittings as new build development. Existing internal light fittings, such as incandescent and fluorescent (T12 and T8) lamps, could be replaced with low energy fittings. In addition, automatic lighting controls can be installed as part of either domestic or non-domestic building refurbishment schemes.

Heating controls

9.42 Including heating controls, such as a time programmer and weather compensation, will help to reduce heat energy use. When a boiler is replaced, boiler controls should be incorporated regardless of whether they were originally included.

Supplying Energy Efficiently through Heat Networks

Connect to local existing or planned heat networks

9.43 As with new build the potential for a retrofitting scheme to connect to a heat network will be dependent on the availability of such networks in the area. See section 6 of the SPD for further details.

Making Use of Renewable Energy

9.44 Of the options available, Photovoltaic panels are likely to be the most easily adapted to use on existing buildings, including listed buildings and buildings in conservation areas. This is particularly worth exploring for houses with traditional ‘London’ or ‘butterfly’ roofs which sit concealed behind parapet walls. Further details can be found in Part 7 of the SPD and consideration is given in the table below.

Retrofitting Existing Buildings

Key		
Acceptable and no Planning Permission (PP) or Listed Building Consent (LBC) needed.	Likely to be acceptable - PP or LBC likely to be needed	Permission/consent needed, but not likely to be acceptable.

	Non-Heritage Building	Conservation Area Building	Listed Building
Reduce Energy Demand - Be Lean			
Insulation			
Cavity Wall	Acceptable if the construction allows.	Acceptable if the construction allows.	If construction allows, but LBC likely to be needed.
Solid Wall Insulation Internal	Need to avoid impermeable materials which will trap moisture and cause condensation.	Need to avoid impermeable materials which will trap moisture and cause condensation.	Likely to be unacceptable in most circumstances.
Solid Wall Insulation Internal External	Depends on the effect on the building's appearance and on the surrounding townscape. Need to avoid material which will trap moisture and cause condensation.	Will affect external appearance and affect the character of the CA. May be limited circumstances in which part of a building could be treated.	Likely to be unacceptable in most circumstances.
Floors - suspended	Can be installed between joists or above floorboards.	Can be installed between joists or above floorboards.	LBC may be needed. Avoid installing below a suspended timber floor if it requires removal of existing floorboards. Minimise thickness to avoid harm to the appearance or integrity of architectural features, such as skirting boards, doors, architraves, panelling, fireplaces and stairs. Ensure that air movement in the floor void is not inhibited.
Floors – solid	Insulating solid floors can include adding a floating floor above or	Insulating solid floors can include adding a floating floor above or	LBC needed. For floating floor insulation, attention

	digging out and replacing the floor.	digging out and replacing the floor.	needed to the depth and associated impact on other areas or adjacent architectural features. The replacement of modern concrete floors may be acceptable
Carpets and Rugs	Adding (permeable) carpets or rugs to suspended timber floors or solid floors reduces radiant heat loss and draughts through floorboards. Sensitive and low-cost solution.		
Roof – pitched	Above ceiling joists (cold roof) or between rafters (warm roof).	Above ceiling joists (cold roof) or between rafters (warm roof).	May need LBC, but simply laying glass wool, mineral wool or sheep's wool between joists will not. An air gap or breathable system should be used in order to manage moisture.
Roof – flat	Below roof covering or between/below ceiling joists.	Below roof covering or between/below ceiling joists.	Likely to require LBC.
	Non-Heritage Building	**Conservation Area Building**	**Listed Building**
Reduce Energy Demand - Be Lean			
Windows			
Repair of Original Windows	No pp required. Welcomed on traditional buildings particularly with additional measures to increase energy efficiency such as draft proofing.	No pp required. Welcomed on traditional buildings particularly with additional measures to increase energy efficiency such as draft proofing.	Like for like, localised repairs will not require LBC.
Replacement of Original Windows – single glazing	Planning permission not required for houses. Energy efficient replacements will be supported where permission is needed. Recommend following a design appropriate to the age and style of the building.	Preferably only if beyond repair. Strongly recommend design relates to the age and style of the building. Planning permission not normally required for houses. Replacements incorporating energy efficiency measures such as draft proofing will be supported where permission is needed, provided the design is appropriate.	Only if beyond repair. Will need LBC. Single glazing to match original design.

		Otherwise, strongly recommend design which relates to the age and style of the building.	
Replacement of Original Windows - double glazing	Planning permission not required for houses. Energy efficient replacements will be supported where permission is needed. Recommend following a design appropriate to the age and style of the building.	Preferably only if beyond repair. Planning permission not normally required for houses. Energy efficient replacements will be supported where permission is needed provided the design is appropriate. Otherwise, slimline double glazing to a design appropriate to the age and style of the building is strongly recommended.	Unlikely to be acceptable.
Replacement of Non-Original Windows	PP not required in houses. Energy efficient replacements are will be supported where permission is needed.		LBC needed. Single glazing will be required on historic elevations. Double glazing only likely to be acceptable where slimline and replacing inappropriate replacement windows and on non-historic elevations.
Secondary glazing	This is an alternative to double glazing which retains the external appearance of the building and would normally be supported. No planning permission required.		LBC needed. Subject to appropriate detailing likely to be acceptable.
Installation of draft-proofing strips	A sensitive and low intervention approach. No planning permission required.		May need LBC if needs to be chased into windows or frames.
Reinstatement of historic internal shutters	A sensitive and low intervention approach. No planning permission required.		Will need LBC but likely to be acceptable if replicates original design.
Thick curtains or blinds	Sensitive and low cost solution		

	Non-Heritage Building	Conservation Area Building	Listed Building
Reduce Energy Demand - Be Lean			
Damp Proofing works			
Maintenance & Repairs	**Maintain pipes and gutters** **Repair defective flashings** **Repoint brickwork**	**Maintain pipes and gutters** **Repair defective flashings** **Repoint brickwork**	**Localised and like for like repairs will not require LBC.**
Cementitious render	**No PP required but recommend this is avoided as it will contribute to a harmful build-up of moisture within the structure.**	**No PP required but recommend this is avoided as it will contribute to a harmful build-up of moisture within the structure.**	**Likely to cause harm to the historic structure.**
Chemical damp-proof course	**No PP required but recommend this is avoided as it may make damp worse long term.**	**No PP required but recommend this is avoided as it may make damp worse long term.**	**Likely to cause harm to the historic structure.**
Cavity Membrane System			**LBC needed. Justification of the need will be required, and acceptability will depend on the existing features (e.g. exposed brickwork in front coal vaults) and on design details.**
	Non-Heritage Building	**Conservation Area Building**	**Listed Building**
Reduce Energy Demand - Be Lean			
Upgrading			
Services [29]	**Might include space heating and hot water systems, mechanical ventilation, comfort cooling, fixed internal and external lighting and renewable energy systems. Particularly appropriate where the**	**Might include space heating and hot water systems, mechanical ventilation, comfort cooling, fixed internal and external lighting and renewable energy systems. Particularly appropriate where the**	**LBC may be required depending on the impact on fabric and internal spaces. Ensure that existing routes and voids accommodating wiring, pipes, etc are re-used and intrusive**

[29] See Government's Domestic Building Services Compliance guide 2013 edition (incorporating 2018 amendments) and Non-Domestic Building Services Compliance Guide 2013 Edition.

	existing services are close to the end of their economic life.	existing services are close to the end of their economic life.	interventions such as visible service ducts, openings through ceilings and cornices are avoided.
Gas boilers			Provided existing pipe runs or risers are used, no LBC will be needed.
	Non-Heritage Building	Conservation Area Building	Listed Building
Reduce Energy Demand - Be Lean			
Mechanical Ventilation with Heat Recovery (MHVR)			
MHVR	More likely in buildings which already have mechanical ventilation, commonly commercial and industrial buildings. Size or location of air handling units or heat recovery units may mean that PP is required.	In conservation areas, the installation of external units to support the system will need careful consideration.	Introduction of mechanical ventilation is likely to need interventions in the fabric and internal appearance of rooms which could be problematic in the context of listed buildings. LBC needed.
Lighting[30]			
Fittings	Normally possible for existing buildings to use low energy light fittings.	Normally possible for existing buildings to use low energy light fittings.	Unlikely to need LBC if existing wiring runs used.
Controls	Automatic lighting controls can be installed.	Automatic lighting controls can be installed.	Unlikely to need LBC if existing wiring runs used.
Improvements to Natural light	May be able to be improved, but largely set by location, orientation and number, size and orientation of windows. Any change which affects the external appearance may require PP.	May be able to be improved, but largely set by location, orientation etc. of building. Any change which affects the external appearance may require PP and will be resisted if there is harm to the character/appearance of the CA.	May be able to be improved, but largely set by location, orientation etc. of building. Changes which affect number or size of windows likely to harm the special interest and will be resisted.

[30] Lighting standards should as a minimum follow the applicable Building Services Compliance Guide.

	Non-Heritage Building	Conservation Area Building	Listed Building
Reduce Energy Demand - Be Lean			
Heating			
Heating Controls	E.g. a time programmer or weather compensation.	E.g. a time programmer or weather compensation.	Unlikely to need LBC if wired into existing system.
Connect to Existing or Planned Heat Networks – Be Clean			
Connection to Heat Network	As with new build the potential for a retrofitting scheme to connect to a heat network will be dependent on the availability of such networks in the area.	Applications will be looked at on their own merits, taking into account the effects on the character and appearance the conservation area.	Applications will be looked at on their own merits, taking into account the degree of intervention in the fabric of a listed building and the effects on its internal and external appearance.
	Non-Heritage Building	**Conservation Area Building**	**Listed Building**
Make Use of Renewable Energy – Be Green			
Solar			
Photovoltaic Panels	Subject to ensuring the load on the roof can safely be carried, and there is suitable safe access for installing and maintaining. Modestly sized solar equipment is allowed on houses and flats without planning permission but subject to conditions.[31]	PP needed in conservation areas if installed on an elevation facing a highway. Need to ensure that the visual effects are limited. Appropriate locations might include a roof slope set behind a significant parapet, or the flat area of a replacement or altered roof, or on a flat-roofed extension.	PP needed if the building is listed or in the curtilage of a listed building. LBC needed. Need to ensure that there is no harm to the fabric, appearance or any other aspect of the special interest of the building. Appropriate locations might include a roof slope set behind a significant parapet, or the flat area of a replacement or altered roof, or on a flat-roofed extension. Careful attention will be given to how they are fixed to original fabric.

[31] Check the General Permitted Development Order 2015 (GPDO 2015) for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-a-installation-or-alteration-etc-of-solar-equipment-on-domestic-premises/made

			Details of the associated wiring, etc. will be needed.
Stand alone Solar Equipment	Subject to loading and access capacity. Allowed within the curtilage of houses and flats without PP, but subject to conditions.[32]	Subject to loading and access capacity. Allowed within the curtilage of houses and flats without PP if not closer to the highway than the building, but subject to conditions.[33]	PP required in the curtilage of a listed building. Need to consider the effect on the setting of the listed building. Details of the associated wiring, etc. will be needed.
	Non-Heritage Building	**Conservation Area Building**	**Listed Building**
Make Use of Renewable Energy – Be Green			
Wind			
Wind Turbines	Allowed on <u>detached</u> houses or detached buildings within the curtilage of a house or block of flats, subject to conditions.[34]	PP needed in conservation areas if installed on an elevation or land facing a highway. Need to ensure that the visual effects are limited.	PP needed if in the curtilage of a listed building, and LBC will be needed if attached to the listed building. Details of the associated wiring, etc. will be needed.

[32] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-b-installation-or-alteration-etc-of-standalone-solar-equipment-on-domestic-premises/made

[33] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-b-installation-or-alteration-etc-of-standalone-solar-equipment-on-domestic-premises/made

[34] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-h-installation-or-alteration-etc-of-wind-turbine-on-domestic-premises/made

	Non-Heritage Building	Conservation Area Building	Listed Building
Make Use of Renewable Energy – Be Green			
Heat Pumps			
Air Source Heat Pumps[35]	**Installation on a house or block of flats or building within the curtilage of a house or block of flats does not require PP, subject to conditions.**[36]	**Subject to loading and access capacity. Allowed within the curtilage of houses and flats without PP if not closer to the highway than the building, but subject to conditions.**[37]	**PP required in the curtilage of a listed building. Need to consider the effect on the setting of the listed building. LBC needed if attached to the listed building.** **Effects on the internal and external appearance of the listed building and any interventions in its fabric will be critical factors in determining acceptability.** **Homeowners should be mindful that internal units can produce noise.**
Ground Source Heat Pumps	**Installation within the curtilage of a house or block of flats does not require PP.**[38]	**Installation within the curtilage of a house or block of flats does not require PP, notwithstanding location within a conservation area.**	**LBC needed. Acceptability will largely depend on the impact of the pump and all associated pipes and fittings on the appearance and fabric of the building.** **The impact of the collector loop on the landscape, including archaeology, underground services**

[35] Heat pumps are generally well-suited to historic buildings as they work efficiently when run on a constant low temperature. These buildings generally have thick masonry walls that can retain heat and release it slowly. Running heating on a constant low temperature can also be beneficial for historic buildings because they will heat up and cool down slowly. This means there will be less thermal movement caused by expansion and contraction, thereby reducing potential damage to the building such as shrinkage cracks.

[36] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-g-installation-or-alteration-etc-of-air-source-heat-pumps-on-domestic-premises/made

[37] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-b-installation-or-alteration-etc-of-standalone-solar-equipment-on-domestic-premises/made

[38] Check GPDO 2015 for details - https://www.legislation.gov.uk/uksi/2015/596/schedule/2/part/14/crossheading/class-c-installation-or-alteration-etc-of-ground-source-heat-pumps-on-domestic-premises/made

		and curtilage structures, also needs to be considered. Where there is known or suspected buried archaeology present, the project should include a Written Scheme of Investigation (WSI) for an archaeological watching brief in support of any application.
	Non-Heritage Building	**Conservation Area Building**	**Listed Building**
Other		
Living Walls		
Livings Walls	**Likely to need planning permission – each case will be considered on its merits.**	**Likely to need listed building consent – each case will be considered on its merits.**

Planning your Retrofitting Works

Identify what consents you need

9.45 Because listed buildings and buildings in conservation areas are nationally protected, this means that legally they have to be approached differently from other buildings. There are also different requirements for flats and houses. If you are planning retrofitting measures and you live in flats, a listed building or a conservation area you may require planning permission and/or listed building consent to ensure that the changes do not harm the townscape, character of the conservation area or special interest of the listed building. So before carrying out any retrofitting or installing renewable energy proposals to your property check if it is a listed building, in a conservation area or if there are any other restrictions such as an Article 4 Direction. The table above gives headlines for where consents are needed, but for more detailed information you can follow the links given with the table or consult the Council's website. Changes to listed historic churches currently in use for worship by the 'exempt denominations' are governed by the internal systems of these bodies under the Ecclesiastical Exemption (refer to Historic England advice, and guidance from the Department for Digital Media and Sport for further information.

9.46 In all cases, any refurbishment work must also ensure that it does not compromise the building's original fire safety strategy or introduce fire safety risks. Given the evolving nature of fire safety standards advice should be obtained from a fire safety specialist early in any retrofitting or refurbishment project. A key issue will be avoiding the use of combustible materials in the facades of buildings.

Identify repairs needed

9.47 The next stage is to consider the ways in which the building can be brought into good repair.

9.48 All repair works should be carried out properly to address problems and not simply cover them over, otherwise problems of water ingress will recur eventually. Investing in thorough, regular and timely maintenance is advised as it optimises building performance. Dealing with faults before they develop into major defects should avoid the need for larger, more costly and invasive programmes of repair and conservation. In terms of reducing carbon footprint, it increases the benefits and reduces the technical risks of any additional energy efficiency improvements. Superimposing energy efficiency measures on a building which is in need of repair is likely to be far less effective.

Identify the heritage values and identify suitable interventions

9.49 In line with paragraph 189 of the NPPF, the place to start in developing proposals which might affect a listed or conservation area building, is identifying its heritage significance, including any contribution made by its setting. Historic England in Planning Advice Note 2: Managing Significance in Decision-Taking in the Historic Environment sets out more information on how to do this. The purpose of doing so is to understand the potential impacts of the proposals, and so the level of detail you need to go into should be enough to explain this. If any ground works are proposed, you should also identify whether there is any archaeological interest.

9.50 Any retrofit process should also include a detailed condition survey, including an analysis of the way in which the building is used. For example: is the building sufficiently ventilated? Does the use result in the production of high levels of humidity?

9.51 You can then move on to considering possible improvements. As a starting point, follow the process set out in *'How to Improve Energy Efficiency in Historic Buildings'*. You can also refer to the STBA publication, *'Planning Responsible Retrofit of Traditional Buildings'* (2015) for guidance on how to develop a whole building sustainability strategy. The STBA Responsible Retrofit Wheel is another useful tool for identifying potential unintended consequences.

9.52 To identify potential opportunities for installing solar energy technologies, refer to the London Solar Opportunity Map which is intended to provide a rough initial indication of the potential resource that is available on a given site. To identify potential opportunities for connecting to an existing or planned heat network, refer to the London Heat Map, but please note that

there are currently no existing heat networks in RBKC. If solar energy technologies or district heating connections have been considered for the scheme, provide evidence that you have consulted these resources by showing an extract with the site location.

Evidence your approach

9.53 Explain in your Design and Access Statement, Sustainability Strategy or Energy Strategy how sustainability measures have been incorporated into the scheme. Sustainability measures should also be addressed in any Heritage Impact Assessment or similar document as applicable.

9.54 Evidence of the approach to whole life carbon and Circular Economy measures should be provided as for new buildings. Projects where some or all of the existing building will be retained are likely to perform better in these areas than demolition and rebuilding, and so you should highlight areas where you have actively sought to improve performance in other ways, rather than just relying on the fact that it is a refurbishment scheme.

Demonstrate the energy and CO_2 performance standards to be achieved

9.55 Parts L1B and L2B of the building regulations require that when existing buildings are extended or renovated it is done in a way which means they use no more fuel and power than is reasonable in the circumstances. There is an exemption from this requirement for dwellings (L1B) and non-dwellings (L2B) which are listed buildings, conservation area buildings and scheduled ancient monuments if the energy efficiency requirements would unacceptably alter their character or appearance. Special considerations are also applied to non-designated historic buildings and buildings of traditional construction, where works to improve energy efficiency should not prejudice the character of the building or increase the risk of long-term deterioration of the fabric or fittings. Nonetheless, the Council will seek the highest standards of energy conservation that can be achieved within these limits. Approved documents LB1 and LB2 set out the calculations that need to be made in order to understand whether any improvements have been achieved. Advice on the application of these can be found on the Planning Portal website, or from the Council's Building Control Service or other approved inspector. The Historic England publication 'Building Regulations and Energy Efficiency' (2017) provides advice on 'resolving potential conflicts between the requirements of Part L and the conservation of historic buildings'.

9.56 The GLA has produced guidance on how to produce Energy Statements for planning[39] and it is recommended that you follow the same approach to evidence the carbon savings that are achieved for existing buildings – recognising that the GLA targets will not necessarily apply. If you are proposing to take part in a third-party assessment scheme (e.g. BREEAM,

[39] GLA Guidance on Energy Assessments, 2020

Passivhaus, EnerPHit, Energiesprong) then proof of certification should be provided.

Identify potential risks

9.57 You should carry out a condensation risk assessment if the proposed interventions would impact ventilation of the building (e.g. secondary glazing, blocking up chimneys) or insulation. This is particularly important where a historic building is involved. It is also recommended that you should undertake an overheating assessment in the case of whole-building refurbishments.

10 Air Quality

Key guidance

- Applicants for all development should consider air quality as part of their proposals and assess any impact there may be on local air quality.
- Developments are expected to minimise increased exposure to existing poor air quality and make provision to address local air quality and promote greater use of sustainable transport modes through travel plans.
- Major developments are required to submit an Air Quality Assessment (AQA).
- For residential development, applicants should assess the proposed design of homes following the best practice guidance set out in CIBSE TM59, avoiding air conditioning, in line with the cooling hierarchy.

10.1 The Borough is an Air Quality Management Area (AQMA) as levels of pollution exceed some of the National Air Quality Objectives and World Health Organisation Guideline Values for nitrogen dioxide and particulate matter. In addition, the London Plan 2021 identifies three Air Quality Focus Areas (AQFA) within the Borough. AQFAs are locations that not only exceed the EU annual mean limit value for nitrogen dioxide (NO_2) but are also locations with high human exposure. AQFAs have been defined to identify areas where currently planned national, regional and local measures to reduce air pollution may not fully resolve poor air quality issues. The three of AQFAs located in Kensington and Chelsea are: Notting Hill Gate, Knightsbridge/Kensington Gore/Kensington High Street, and A4 Cromwell Road from Talgarth/Earls Court/Gloucester Roadd/Thurloe Pl/Knightsbridge.

Air Quality and Health

10.2 Poor air quality has been associated with a number of health problems and there is extensive evidence that long-term exposure to common air pollutants contributes to the development of cardiovascular cancer and respiratory diseases. It affects the health of all Londoners; however, certain groups are more likely to be affected than others. People in the lowest socio-economic groups are more likely to be exposed to poor air quality and that exposure is more likely to result in poor health.

10.3 The issue of air quality is recognised at both regional and national level. The Government understands that poor air quality is the largest environmental risk to public health in the UK. Improving air quality is a key

objective in both the Mayor of London's Health Inequalities Strategy[40] and Environment Strategy[41], where the ambition is for London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities.

10.4 Air Quality is currently high on the public agenda following a series of national and localised lockdowns. A recent study has estimated that during April 2020, due to the lockdown restrictions and subsequent improvement in air quality, there has been 11,000 fewer deaths from pollution in the UK and elsewhere in Europe. The fall in road traffic and industrial emissions resulted in 1.3 million fewer days of work absence, 6,000 fewer children developing asthma, 1,900 avoided emergency room visits and 600 fewer preterm births.

Air Quality and Climate Change Action Plan

10.5 Although air quality has improved significantly over recent decades through policies, action, behaviour change and new technologies. However, levels of pollution (particularly in urban centres) remain at higher concentrations. The Council produced a five-year combined Air Quality and Climate Change Action Plan (2016-2021) which included a dynamic list of measures to reduce pollution, reduce exposure and help meet its aims by the installation of green infrastructure.

10.6 There is a need to build upon this positive change, recognising that Kensington and Chelsea has one of the highest proportions of deaths associated with air quality of all the London Borough's[42]. The combined Air Quality Climate Change Action Plan[43] has three overarching aims to reduce emissions, which are:

1. Reduce Pollution
2. Reduce Exposure and Increase Resilience
3. Influence Change

10.7 The Council is in the process of producing a new standalone five-year Air Quality Action Plan (2021 – 2026) document, which will be available in a draft form in spring 2021. Building on the previous work, the new plan will outline the steps the Council will take from mid-2021 to 2026 to continue to improve air quality across the Borough.

10.8 This section of the SPD summarises the importance of incorporating Air Quality into the planning and development process to help reduce public exposure to air pollution in the urban environment. It provides information on options developers can incorporate into their development to ensure that emissions are reduced from the outset and public exposure minimised.

[40] Mayor of London. (2018). The London Health Inequalities Strategy. London. Greater London Authority.
[41] Mayor of London. (2018). The London Environment Strategy. London. Greater London Authority.
[42] Gowers, A., Miller, B., Stedman, J., et al. (2014). Estimating Local Mortality Burdens Associated with Particulate Air Pollution. London. Public Health England.
[43] https://www.rbkc.gov.uk/environment/air-quality/air-quality-and-climate-change-action-plan-2016-2021

Reduction of Pollution through the planning process

10.9 Air Quality is a material consideration in the determination of planning applications and therefore must be considered at all stages of the planning process.

10.10 It is expected that all developments within the Borough will consider air quality and assess any impact they may have on the local air quality. The impact is to be considered at all stages of the development, from demolition and construction through to operation.

10.11 Developments are expected to minimise increased exposure to existing poor air quality and make provision to address local air quality. They are also expected to promote greater use of sustainable transport modes through travel plans. Proposals will be required to promote sustainable design and construction methods, to reduce the emissions produced from the demolition and construction phases following the best practice guidance listed below.

10.12 Green Infrastructure should be considered from the outset of a development project as set out in section 11 below.

Our requirements

- Applicants for major development are required to submit an Air Quality Assessment (AQA) as part of the planning application.
- Developments are required to be at least 'Air Quality Neutral' and not lead to further deterioration of existing poor air quality.
- This requirement is soon to be superseded by the 'Air Quality Positive' policy that seeks to ensure new buildings contribute actively to a progressive reduction in the total amount of London's emissions and associated exposure. The GLA produced a Pre-Consultation Draft of the Air Quality Positive Guidance[44] in March 2021. It is recognised that this guidance is likely to change subject to the consultation outcome. The latest GLA guidance should be followed.
- Developments in Air Quality Focus Areas, or that are likely to be used by large numbers of people, should demonstrate that design measures have been used to minimise exposure.
- Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach.

[44] https://www.london.gov.uk/sites/default/files/air_quality_positive_lpg_pre-consultation_draft.pdf

- Applicants for small scale development are also encouraged to consider air quality at all stages from design to operation stage.

How do I do it?

- Where an AQA is needed, it will need to be determined whether a Simple or a Detailed Assessment is required. Guidance on when an AQA is required and how to undertake an assessment has been produced by the Institute of Air Quality Management (IAQM) and the GLA.
- To achieve an 'Air Quality Positive' approach a statement should be submitted demonstrating:
    - how proposals have considered ways to maximise benefits to local air quality, and
    - what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.
- Air quality is a material planning consideration. It is expected that developers follow the recommendations and guidance set out in the following documents:
    - EPUK & IAQM. (2017). Land-Use Planning & Development Control: Planning for Air Quality[45]
    - EPUK & IAQM. (2018). Air Quality Monitoring in the Vicinity of Demolition and Construction Sites[36]
    - GLA. (2014). The Control of Dust and Emission during Construction and Demolition[46]

Encouraging Active and Sustainable Travel

10.13 Within the Royal Borough, 55 per cent of nitrogen dioxide in our air, 54 per cent of particulate matter (PM10) and 11 per cent of carbon dioxide emissions, come from road transport. Ensuring the local highway network is attractive for walking and cycling and helping to engender better travel choices is therefore a key focus for improving Local Air Quality.

Our requirements

- Local Plan Policy CT1 requires that walking, cycling and public transport are safe, easy, attractive and inclusive for all.

[45] https://iaqm.co.uk/guidance/
[46] https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance-and-spgs/control-dust-and

- All development proposals should seek to support sustainable and active transport options and minimise any increase in traffic congestion or on-street parking pressure.

How do I do it?

- All new high trip-generating development proposals are required to be located in areas well-served by public transport where there is sufficient public transport capacity or will be as a result of committed infrastructure improvements. We protect existing footways and cycle routes as well as existing public rights of way, resisting new development which unduly compromises the attractiveness of these areas for walking and cycling. Where development proposals include new streets or footpaths, we will expect these to deliver improvements for pedestrian and cycling permeability through the site.

- In assessing developments, where appropriate, we will require improvements to public transport services and access to them, giving priority to areas that currently have lower levels of accessibility. This includes the provision of step-free access as part of development proposals at or in the vicinity of Underground stations. All new Development should include the provision of cycle parking provision for both long-stay and short-stay in line with London Plan standards as well as meeting the Council's requirements as laid out within the Council's transport and Streets SPD. For education-related development and larger scale residential and commercial proposals we also require Travel Plans to promote and encourage active travel with consequential benefits for air quality.

10.14 The Council aims to improve the active travel environment through continued improvement to existing footways and crossings, increasing pedestrian permeability, continuing to open up one-way streets to two-way cycling and building upon our existing cycleway network. To help encourage cycling, we will also focus on installing short and long-stay cycle parking within the public realm, including in carriageway cycle-parking for all land uses. We will also continue to work with TfL to expand the Santander cycle hire scheme to the north of the Borough. Subject to engagement with local communities, the Council may also consider opportunities to introduce new restrictions to remove through traffic from residential roads. This will be considered where the impact on those roads is disproportionate and where conditions would be improved by displacing some traffic to our principal road network and the TLRN, with permeability for Active Travel Modes maintained.

Electric Vehicle infrastructure

10.15 Expanding the network of electric vehicle (EV) charging infrastructure across the Borough is essential to the necessary shift away from more polluting petrol and diesel vehicles to cleaner hybrid and electric vehicles. Residents, businesses and visitors to the Borough must have access to quick and convenient charging opportunities by means of a varied and widespread offer of EV charging points, including electric boat charging points, if they are to have the confidence to adopt cleaner vehicles. In light of the Government's stated intention to bring forward a ban on the sale of petrol and diesel vehicles by 2030 it will be necessary that sufficient infrastructure is made available to support this ambitious transition and the Council is committed to supporting this shift to electric vehicles for all users of the Borough road network.

10.16 For all new developments where parking is proposed, applicants should seek to provide onsite charging points to accommodate the current and future requirements of the occupants. This is recognised through Council Policy CT1 and the Transport and Streets SPD which requires a minimum of 40 per cent on-site spaces to be equipped with EV charging points and with passive provision provided for all other spaces to maximise the potential for future provision. This exceeds the London Plan 2021 requirements. The Council's development standards for vehicle charging points will remain under review to ensure that they are set to enable a timely transition to the widespread adoption of vehicles free of exhaust emissions.

10.17 Retrofitting charging points to existing parking spaces offers significant potential to improve the stock of off-street charging points. In many instances where passive provision has not been provided it may not be practicable to retrofit charging points to existing parking spaces. However, where large scale renovations are proposed, we will strongly encourage scheme sponsors, including on Council owned sites, to provide future proofed electric charging infrastructure

10.18 Much of the Borough is characterised by dense development with relatively few off-street parking spaces. Accordingly, a significant proportion of electric vehicle charging infrastructure will be located on the public highway. In the short term to encourage the prompt adoption of EVs, from 2021 all Borough residents will live within 200m of at least one EV charging point. We will seek to rapidly grow this network to meet future demands, narrowing gaps in coverage through responsive and pro-active provision. This will include the provision of new standalone charging points as well as expanding the network of retrofitted lamp column charging points which provide a cost-effective and less intrusive opportunity to strengthen the network.

Development Construction

10.19 Offsite modular construction can provide multiple benefits however the Royal Institute of Chartered Surveyors report on Modern Methods of Construction (2018) found a range of benefits for air quality. The report

found “Benefits of offsite modular construction include 80 per cent less construction waste (with 95 per cent of that waste being recycled), up to 80 per cent fewer vehicle movements to site, equating to less noise, dust and transport-related emissions in the area, and 50 per cent less CO_2 produced during construction.

10.20 Non-Road Mobile Machinery (NRMM), particularly from the construction sector, is a significant contributor to London’s air pollution. The NRMM Low Emission Zone uses the Mayor and London boroughs’ planning powers to control emissions from NRMM used on construction sites. Section 12 of the Councils Code of Construction Practice provides an overview of the requirements relating to Air Quality and Dust that must be adhered to, to reduce the impact of nuisance on residents.

10.21 Through the planning process new developments are conditioned to meet the NRMM Low Emission requirements via adherence to the Code of Construction Practice and other actions. Construction Managers or developers are required to sign up to the NRMM website and provide a detailed list of the machinery being used on site for review. As part of the Pan-London NRMM scheme, NRMM Compliance Officers regularly visit active sites to ensure compliance with the requirements or provide assistance to help sites reach compliance.

Green Infrastructure

10.22 The installation of green infrastructure such as trees, green walls and roofs, has multiple environmental and health benefits including the improvement and protection against air pollution, increased biodiversity, reduction of climate change gases and providing mitigation against urban flooding. This is explained in more detail in section 11 below.

10.23 At regional and national scales, vegetation plays an important part in removing air pollutants by the process of deposition to leaf surfaces. However, at the street scale deposition is of limited benefit. The main value of green infrastructure for urban air quality is not its ability to remove pollutants, but its ability to control their flow/distribution.

10.24 There are two key processes that explain how green infrastructure can protect people from pollution, dispersion and deposition.

Dispersion: Urban vegetation can greatly reduce the amount of emissions people are exposed to. It does this by changing the speed and distance pollutants travel before they reach people. The further the distance the more the pollution is diluted with cleaner air – this process is known as dispersion.

Deposition: Urban vegetation typically removes a few per cent of emissions by a process called deposition. This refers to when pollution lands on the surface of the leaf and is removed from the air. This process is less important for reducing exposure to air pollutants in the urban environment than dispersion.

There are particular urban greening opportunities associated with larger scale developments, both at ground and at roof level. The benefits of green roofs include sustainable urban drainage, mitigation of the urban heat island effect (cooling buildings and reducing energy used for air conditioning) and increased biodiversity. Green walls (if they are dense enough and well maintained) can be used instead of hedges as effective vegetation barriers between pedestrians and busy roads. When they are mounted on building facades, green walls have some potential to reduce public exposure to road transport pollution.

10.25 Such schemes may enable an “Air Quality Positive” approach (London Plan, Policy SI 1), including by maximising “benefits to local air quality through consideration of measures and features to reduce exposure to pollution.” In particular, carefully selected and located trees can act to remove pollutants from the air, and well located new areas of greenspace can ensure that people spend time away from sources of pollution.

10.26 The effectiveness of green infrastructure in mitigating the impacts of pollution can depend on the scenario where the development is taking place. The GLA produced the planning guidance ‘Using Infrastructure to Protect People from Air Pollution’, published April 2019, to provide direction on where different green infrastructure should be implemented for the greatest benefit. The following table summarises the benefits of certain infrastructure in difference scenarios.

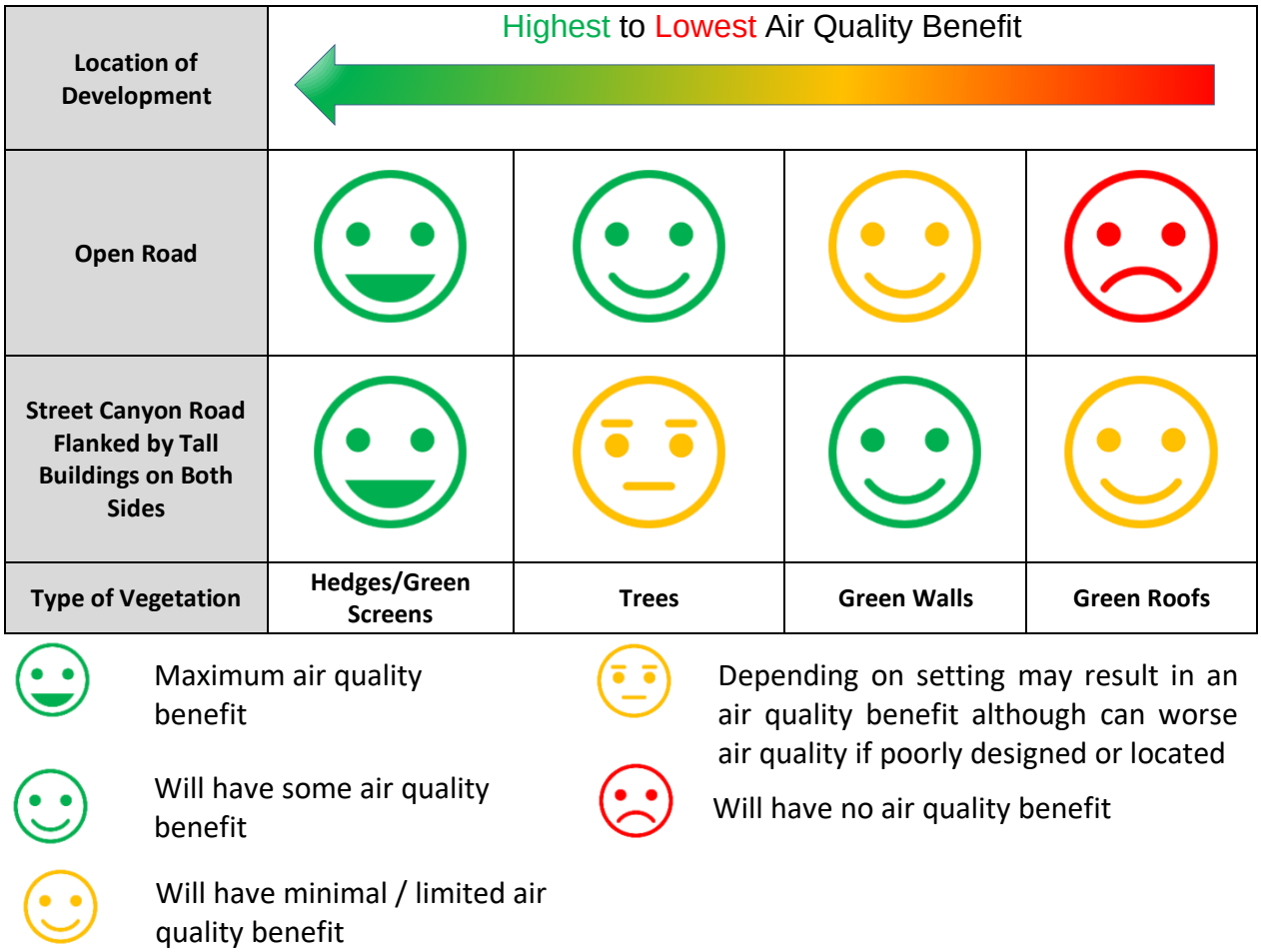


Figure 10.1: Air Quality Benefit

10.27 However, a possible concern is that a focus on applying the Urban Greening Factor (UGF) is at the expense of a more strategic green infrastructure approach that includes a focus on developments delivering off-site enhancements, in-line with the Healthy Streets strategy.

11 Urban Greening

Key guidance

- The Urban Greening Factor (UGF) is required for major development in line with London Plan 2021 Policy G5. The GLA has published guidance on the UGF.
- The UGF is not required for small-scale developments but applicants should consider how to green their sites to achieve a betterment.

Key terms

Green Infrastructure: The multifunctional, interdependent network of open and green spaces and green features (e.g. green roofs). It includes the Blue Ribbon Network but excludes the hard surfaced public realm. This network lies within the urban environment and the urban fringe, connecting to the surrounding countryside. It provides multiple benefits for people and wildlife. **Biodiversity:** This refers to the variety of plants and animals and other living things

Biodiversity net gain: This refers to the 10 per cent increase in biodiversity which will be required by the Environment Bill 2019-21 once it receives royal assent.

Sustainable Drainage Systems (SuDS): Using sustainable drainage techniques and managing surface water run-off from buildings and hardstanding areas in a way that reduces the total volume, flow and rate of surface water that runs directly into drains and sewers.

Urban Greening Factor: This is a land-use planning tool to help determine the amount of greening required in new developments.

Green infrastructure

11.1 Green infrastructure provides wide ranging benefits including reducing pollution, reducing climate change and its impacts, as well as supporting a circular economy.

Green infrastructure benefits	
Pollution & noise	Reduction and dispersion of pollutants Improve air and water quality Screening noise
Climate change	Enhance biodiversity Enhance ecological resilience Combat heat island effect/ thermal conform (shading) Carbon Storage / insulation Enhance natural drainage and reduce flood risk Enhance renewables performance
Wellbeing	Recreation Education Exercise Mental and physical heath
Economy	Locally grown foods Timber Supporting landscape and heritage conservation Increase the value of the development Provide insulation (green walls)

Figure 11.1: Green infrastructure benefits

11.2 Green infrastructure can be natural rear and front gardens, parks of different sizes, grassed areas, street trees, allotments, hedges, green roofs, green walls etc. Not all green infrastructure provides the same benefits (natural capital) as these are linked with its type, extent, depth of soil, linkages with other green spaces, etc. However, all green infrastructure, public and private, is important for our collective wellbeing so we should increase both its cover and quality.

11.3 Recent studies have highlighted the importance of boosting green urban areas and connecting fragments of green space with ecological corridors

to improve biodiversity and animal species dispersal within the urban landscape. If adequately designed, green corridors can improve urban ventilation, allowing for cooler air to penetrate into the more densely built areas, and reducing the urban heat island effect[47].

11.4 New development provides an opportunity to increase and enhance green infrastructure and build upon its natural capital. We should look at green infrastructure in development as key, rather than a 'nice to have' or an 'add on'. Therefore, we need to think about it at the beginning of the development, early in the design stage to ensure the layout and design provides opportunities to include good quality green infrastructure. It is important that all specialists involved in development (architects, landscape architects, ecologists, energy assessors, drainage engineers, environmental health specialists, heritage and conservation officers) get together from the beginning. In that way they will not have to retrofit environmental and sustainability aspects to a finalised design. Greening meanwhile uses are also encouraged as some sites could take long to be developed.

11.5 The setting of the development and opportunities given by existing infrastructure (parks, canals, etc) should be considered when planning and designing green infrastructure. For example, where developments are next to the canal, canal side greening interventions may have a positive impact in increasing habitat and biodiversity, including aquatic ecosystems.

11.6 A key factor for the success of any green infrastructure element is its maintenance. An appropriate maintenance regime should be thought of at an early stage to understand the maintenance activities needed and when.

Urban Greening Factor

11.7 The Urban Greening Factor (UGF) allows us to understand the quality of the green infrastructure proposed in a development. The UGF was introduced by Policy G5 (Urban Greening) of the London Plan[48]. This is also supported by our Local Plan policies CE4 (Biodiversity) and CR6 (Trees and Landscape).

11.8 Before an UGF is set locally, the GLA recommend a target score of 0.4 for developments that are predominantly residential, and a target score of 0.3 for predominantly commercial development. We have adopted the London Plan 2021 targets until we have a local UGF. For mixed use developments, the target will be that of the predominant land use. In phased developments, each phase should demonstrate compliance on its own. Outline applications should also show compliance with final details submitted as part of reserved matters. These target scores are a

[47] https://climate-adapt.eea.europa.eu/metadata/adaptation-options/green-spaces-and-corridors-in-urban-areas
[48] https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance-and-spgs/urban-greening-factor-ugf-guidance-pre-consultation-draft

minimum, so higher scores are encouraged. Existing green cover retained on-site also counts towards developments meeting the target.

11.9 Although the UGF has been developed for major, strategic planning applications, the Council receives a large number of minor planning applications a year which could potentially enhance the Borough's green infrastructure. Currently, there is no requirement to provide an UGF for minor applications, but we encourage applicants to consider increasing it in their proposals.

Our requirements

- Applicants for major development should submit an assessment showing the UGF score.
- The UGF score should achieve at least 0.4 for residential and of 0.3 for commercial developments.
- Achieving an improved UGF score is encouraged for small-scale developments. It is encouraged that applications for minor development include a calculation of the existing and proposed UGF.

How do I do it?

- Applicant teams are encouraged to consider incorporating green infrastructure at the beginning of the design stage. This will improve its quality and maximise its benefits.
- Green infrastructure can be provided at different levels across the development including grounds, roofs and walls. Green infrastructure can enhance renewable energy.
- The UGF analysis and score can be included in a separate document or as part of the Planning or Design and Access Statements.
- The analysis should include a colour-coded masterplan, a competed UGF table and the UGF calculation. The UGF table should show the surface cover types, their extent in m^2 and their scores.
- The UGF should always be calculated on the total site area, equivalent to the red line.
- The UGF analysis should be given at outline stage and provide a more detailed UGF analysis at reserved matters.

- To calculate the UGF score you should follow the following steps:
    - Step 1 - identify the types of surface cover suitable for the site and their extent.
    - Step 2 – look up in table 11.2 below the score (factor) assigned to each surface cover (looking at subcategories when necessary).
    - Step 3 – multiply each factor by the area extent of each type of surface cover and divide it by the total site area. Green cover retained on site should also count the score.
- The UGF is calculated as follows:

  (Factor A x Area) + (Factor B x Area) + (Factor C x Area) etc./ divided by Total Site Area.
- Applicants must describe and justify in their analysis the type of surface cover and the score assigned to each type. This is even more important when the surface cover is not exactly as described in figure 11.1.
- Providing surface covers with higher UGF scores will also enhance the Biodiversity Net Gain of the site.

Urban Greening Factor surface cover types

11.10 There are four broad surface cover types that, if delivered as part of any scheme, can contribute toward meeting the UGF target score:

- Semi-natural vegetation and wetlands
- Ground level landscaping
- Green roofs
- Green walls

11.11 Semi-natural vegetation will typically comprise woodland, wildflower rich grassland or wetland habitat. Given the densely built-up character of the Borough it is unlikely that many opportunities will present themselves, but where it is feasible, such features contribute significantly to the achievement of strategic green infrastructure objectives and are assigned a UGF score of 1 within the London-wide UGF methodology. The creation of semi-natural vegetation should also be carefully targeted, both in respect of type and location within the site, to maximise benefits to residents / businesses and the wider green infrastructure network.

How to calculate the Urban Greening Factor

11.12 The Urban Greening Factor considers all types of surface cover types in the developed and their score. It is calculated as follows:

UGF calculation

(Factor A x Area) + (Factor B x Area) + (Factor C x Area) etc. / divided by Total Site Area.

11.13 So, for example, an office development with a 600 sqm footprint on a site of 1,000 sqm including a full roof coverage of extensive green roof, 250 sqm car parking, 100 sqm of open water and 50 sqm of amenity grassland would score the following:

(0.7 x 600) + (0.0 x 250) + (1 x 100) + (0.4 x 50) / 1000 = 0.54

11.14 The Urban Greening Factor assessment should be included as part of a Planning Statement. It should contain a list of the different types of surfaces, their cover and the final calculation to give a score. Details of the landscaping categories are needed to show that the correct score has been given. This is even more important when the surface cover is not exactly as described in table 11.2.

11.15 Ground level landscaping covers a range of detailed land-cover type categories listed as part of the UGF methodology. The table below includes the scores for all surface cover types including ground level landscaping, green roofs and green walls. Green walls have the potential to increase the score and achieve scores over 1. This is because their vertical surface area should be included in the UGF calculation but should not be added to the site's total area.

Semi-natural vegetation and wetland habitat	1
Planted trees	0.8 (connected, high soil volume)[49] / 0.6 (not connected; lower soil volume)
Green roofs	0.8 Intensive[50] / 0.7 Extensive[51] / 0.3 Extensive or sedum[52]
Flower-rich perennial planting[53]	0.7
Rain gardens and other vegetated sustainable drainage elements[54]	0.7
Green walls[55]	0.6
Hedges (line of mature shrubs one or two shrubs wide)[56]	0.6
Standard ground cover planting	0.5
Amenity grassland	0.4
Water features (chlorinated or unplanted)	0.2
Permeable paving[57]	0.1
Sealed (impermeable surfaces)	0

Table 11.2: Landscape categories and score for the UGF.

11.16 Delivery of rain gardens as part of a wider surface water management plan, can be a particularly effective strategy, to achieve both a UGF target score and wider climate change and sustainability objectives. Rain

[49] http://www.tdag.org.uk/trees-in-hard-landscapes.html
[50] https://livingroofs.org/intensive-green-roofs/
[51] https://livingroofs.org/wp-content/uploads/2016/03/grocode2014.pdf
[52] https://livingroofs.org/wp-content/uploads/2016/03/grocode2014.pdf
[53] https://www.rhs.org.uk/advice/profile?pid=868
[54] http://www.susdrain.org/case-studies/
[55] https://www.thenbs.com/knowledge/the-nbs-guide-to-facade-greening-parttwo
[56] https://www.rhs.org.uk/advice/profile?pid=351
[57] https://www.susdrain.org/delivering-suds/using-suds/suds-components/source-control/pervious-surfaces/pervious-surfaces-overview.html

gardens are relatively small depressions in the ground that can act as infiltration points for roof water and other 'clean' surface water (i.e. water that is low in contamination levels). As the Borough suffers from a lack of sewerage capacity, the provision of green infrastructure which could drain water naturally will help reduce flood risk and will be particularly welcome (refer to SuDS, in section 12).

Figure 11.3: Raingardens with play area. *(GLA SuDS guidance[58]).*

Green and blue roofs

11.17 The London-wide methodology makes a distinction between green roofs:

- Intensive green roofs with a substrate depth of 150mm - UGF score of 0.8;
- Extensive green roof with substrate depth of 80mm (or 60mm beneath vegetation blanket) - UGF score of 0.7; and
- Extensive green roofs comprising of sedum mat or other lightweight systems - UGF score of 0.3.

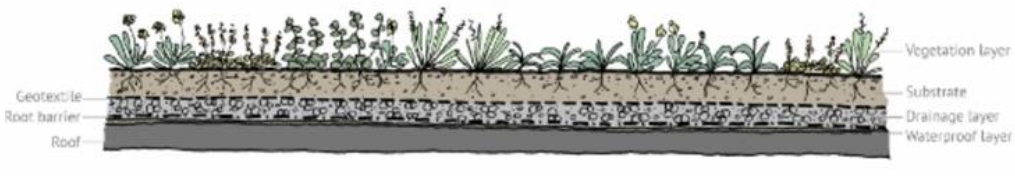


Figure 11.4: Green roof section profile *(Susdrain website[59]).*

[58] https://www.london.gov.uk/sites/default/files/reimagining_rainwater_in_social_housing_v1.pdf
[59] https://www.susdrain.org/delivering-suds/using-suds/suds-components/source-control/source-control.html

11.18 The difference between a UGF score of 0.7 and 0.3 is significant, so higher quality green roofs should be implemented wherever possible. In the Borough the preference is for green roofs to be designed for biodiversity, which maximises the extent of a green roof across the roof with the added benefit of creating habitat for biodiversity at a rooftop level.

What are biodiversity green roofs and beneficial features?

- Substrate depth: between 80mm and 150mm. The depth should vary across the roof area, creating an undulating appearance.
- Additional materials such as sand and shingle can be incorporated to create micro habitats for burrowing insects and provide greater benefits to biodiversity.
- Additional habitat features can also be incorporated such as individual logs or log piles.
- Planting: a wide range of wildflowers should be planted, with a preference for species prevalent within the Borough and London as a whole. Where brownfield land is lost then wildflower assemblages associated with these should be encouraged.
- The use of native plants and shrubs, species that provide nectar year-round is encouraged
- Semi-intensive and intensive green roofs can also be designed for biodiversity.

11.19 Blue roofs are encouraged as a way of reducing flood risk. A blue roof is designed to manage rain at its source. It includes an extra layer to increase water storage which is then released at a controlled rate. Guidance on designing, installing and maintaining blue roofs is provided by the National Federation of Roofing Contractors[60]. CIRIA (Construction Industry Research and Information Association) is also preparing guidance on blue roofs[61].

11.20 Green and blue roof considerations include:

- **space for plant and renewables.** Any plant sited on the roof particularly on taller buildings can be a constraint. “Bio-solar”, roofs that combine PV with green roofs, are now recognised as potentially

[60] https://www.nfrc.co.uk/blue-roofs
[61] https://www.ciria.org/Research/Projects_underway2/Guidance_on_the_delivery_of_blue_roofs_RP1099.aspx

beneficial creating beneficial micro-climates for the plants on the roof and reducing the temperature of the PV panels improving efficiency.

- **Accessibility**: accessible green roofs add amenity and recreational value. Offices can represent an opportunity to deliver high quality green roofs, given popularity amongst staff, recognising that there will typically be little opportunity for ground level landscape intervention and given that overlooking in employment areas is less likely to be a concern (relative to residential neighbourhoods). However, amenity and overlooking should be considered to reduce negative impacts on neighbours. **Historic environment**: green roofs should typically be set back from any historic façade, as the appearance of a green roof could be considered incongruous with the building character, when viewed from the street. If delivered sympathetically to their context they can add support to the historic environment.
- **Structural issues:** the slope of the roof and the loading requirements of green and blue roofs mean that there may be implications for structural design, which should be considered at an early stage in the design process. Costs often increase when green roofs are considered in later stages.
- **Maintenance**: is key to ensure the roof's performance. CIRIA SuDS Manual C753[62] provides all the technical information needed for green roofs, including maintenance.




[62] https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

Green walls

11.21 Green walls can make a useful contribution to site-wide UGF where ground and roof level space is limited. Green walls may be implemented through the installation of living wall systems, or the use of climbing plants rooted in the ground. Innovative systems now available include walls constructed from trays of plants that have been pre-grown off-site and slotted together on a steel frame, then connected up to an internal irrigation system.

11.22 When considering the inclusion of a green wall it is important to consider its **orientation** within the development (to access the light needed) and the **overarching character of the local context**. Where a green wall would be incongruous with the prevailing townscape character, it may be appropriate to consider installation at a podium level which would be less visible from the public realm at ground level. Green walls may also be provided on external boundary walls. Green walls are likely to need listed building consent or planning permission where they relate to designated heritage assets, and each case will be considered on its merits. More information is provided in the table in section 9.

11.23 The Royal Horticultural Society has provided guidance on green walls (including species and construction).[63] CIRIA has also produced guidance on building greener (C644[64] and C644D[65]). The acceptability of green walls in heritage terms should be considered at an early stage.

[63] https://www.rhs.org.uk/advice/profile?pid=547
[64] https://www.ciria.org/ItemDetail?iProductCode=C644&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
[65] https://www.ciria.org/ItemDetail?iProductCode=C644D&Category=DOWNLOAD&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91

Figure 11.6: Green wall at 32 Kensington Park Road (photo credit: photoBECKET)

11.24 Finally, it is important to note that green wall options must have a robust maintenance plan, so they do not dry out which could damage their performance and pose a fire risk. The maintenance plan should include the differing needs for watering and lighting throughout the seasons. Light pollution should also be considered in the maintenance plan.

11.25 Fire safety must be considered, and early advice sought from a fire specialist. In 2013 the Government produced guidance[66] regarding fire performance on green roofs and green walls. This guidance provides recommendations for both green roofs and green walls in order to comply with Building Regulations and inhibit the spread of fire within the building

[66] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/230510/130819_SW3529R_-_Issue_3_-_Green_Roofs_and_Walls_Project_web_version_v3.pdf

and between adjoining buildings. Some of the recommendations regard the soil or growing medium and include:

- increasing the non-combustible content of the soil
- decreasing the organic content
- preventing the system from drying out.

How to enhance UGF in development

11.26 Large-scale developments can provide the opportunity for delivery of strategic scale and coordinated green infrastructure that is well integrated within the wider green and blue infrastructure network. They can be flag-ship schemes that generate attention from the local community, and potentially more widely. As such, they provide an opportunity to stimulate debate in respect of climate change and other greening issues, which, in turn, can motivate the developer to demonstrate good practice.

11.27 The Council receives a large number of applications for minor development every year which could potentially enhance the Borough's green infrastructure. Local Plan Policy CE2(g) requires a betterment or reduction of surface water run-off for minor development (ground and lower level extensions). Green infrastructure could link into this and provide more natural drainage reducing flood risk locally.

11.28 When designing green infrastructure, it is important to differentiate between real and perceived constraints. For example, just because a building is within a conservation area does not mean that green/blue roofs are not possible. When refurbishing historic buildings we need to protect the historic fabric of the building but this could be done in a sympathetic way which may also allow for green infrastructure.

How to enhance the UGF in developments

Early involvement of all the specialists will maximise the quality and benefits of the green infrastructure.

Major development

- Increase the space available at ground level at the outset of the design process.
- Integrate greening within the site with greening along streets.
- Include high scoring surface cover types where space is limited, namely trees planted in connected tree pits, flower rich perennial planting and rain gardens.
- Consider the roof space and integration with renewables.

Small-scale development

- Consider the site as a whole and not only the area to be developed (i.e. existing flat roofs, paved areas).
- Retrofit green infrastructure when possible.
- Consider that green roofs, green walls, rainwater gardens, planters, tree pits may be feasible in very small sites.
- Paved patios can be repaved with permeable surfaces or landscaped with vegetation.

Links to Biodiversity Net Gain

11.29 UGF refers to the final level of greenery onsite and although the better the quality, the higher the score, there is no requirement for a biodiversity measurement. Biodiversity Net Gain (BNG) is explained in section 13: Biodiversity. Providing surface covers with higher UGF scores will enhance the BNG of the site.

Streetscape Greening

11.30 The Royal Borough is characterised by a rich and varied streetscape with over 8,000 street trees which are key elements of the local green infrastructure network. Where developments include new streets, we expect new street trees to be planted to match the high standards set by the Council, in accordance with Policy CR6.

Figure 11.7: Freeman Maples *(Acer freemanii's)* planted by the Council in Norland Road in 2012

Figure 11.8: Example of intervention - Introducing greenery into the streetscape in place of asphalt

Trees

11.29 Trees are an important aspect of urban greening, bringing numerous benefits to our environments, as well as our health and wellbeing. For example, trees act as a physical filter, trapping dust and absorbing pollutants from the air. Trees also absorb carbon dioxide as they grow; reduce wind speeds; cool the air as they lose moisture; reflect heat from their leaves; help prevent flooding and soil erosion; and support healthy biodiversity.

11.30 The London Environment Strategy 2018 sets out several ambitions in relation to trees and woodlands. These include the protection and management of the existing urban forest (a forest or collection of trees that grow within a city, town or urban area); increasing canopy cover by 10% of current levels; and creating 200 hectares of species-rich woodland by 2050. These objectives are supported by the London Urban Forest Plan (2020) and the London Plan 2021, which promote planting of trees and woodlands in new developments, and where loss of trees is unavoidable, requires replacement based on the existing value of the trees removed.

11.31 Policy CR6 of our Local Plan sets out that the Council will require the protection of existing trees and the provision of new trees that complement existing or create new, high quality green areas, in conformity with the London Plan 2021. The Council plants additional trees in feasible locations where there are recognised gaps in planting, and as such is actively contributing to achieving the aims of the London Environment Strategy and London Urban Forest Plan. At the time of writing there are already over 8,000 street trees located in the borough.

11.32 Some locations and streets do not provide obvious planting opportunities as a result of challenging street layouts, pavement vaults and the essential utilities below our footways. In such circumstances the Council may consider changing the street layout to create new planting sites. Interventions will be prioritised in areas where additional street trees would bring disproportionate greening gains to the immediate and surrounding areas. We will consider a range of interventions within identified areas aiming for all additional planting to provide material improvements to the wider network of green infrastructure.

Private gardens and permeable surfaces.

11.33 Private front and rear gardens are very important, not only to allow for natural drainage and cooling but also to support biodiversity, wellbeing and enhance the setting of the built environment.

11.34 Their management and maintenance are key to maximise their benefits. The use of impermeable surfaces in front and rear gardens and landscaped areas should be avoided in line with policy CE2i. Planning permission is required to pave an area bigger than 5 sq m in front gardens. Planning permission is not needed in the following cases:

- if you use porous materials for paving.

- or make provision to direct water run-off from the hard surface to a permeable or porous area or surface within your property boundary.

11.35 The Planning Portal[67], the Government[68] and Susdrain[69] have produced guidance on permeable surfacing in gardens. Natural planting and permeable surfaces such as pebbles and gravel will allow for natural drainage. Whilst porous material or permeable paving may not need planning permission, we strongly encourage householders to use natural planting where possible. This has many benefits and could also have a role enhancing wildlife[70]and carbon sequestration.

[67] https://www.planningportal.co.uk/info/200130/common_projects/45/paving_your_front_garden
[68]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/7728/pavingfrontgardens.pdf
[69] https://www.susdrain.org/delivering-suds/using-suds/suds-components/source-control/pervious-surfaces/pervious-surfaces-overview.html
https://www.susdrain.org/delivering-suds/using-suds/suds-components/source-control/other-permeable-surfaces/index.html
[70] https://www.rhs.org.uk/advice/design/design-with-plants/wildlife-friendly-garden-plants

12 Minimising flood risk

Key guidance

Flood Risk

- Ensure that flood risk assessments support planning applications to ensure development is safe from flooding and will not exacerbate flood risk.

Water Infrastructure

- Major development should protect water supplies and resources and improve water infrastructure.

Sustainable Drainage (SuDS)

- SuDS are required for most development at ground and below ground level throughout the Borough.
- Defra non-statutory SuDS standards, the London Plan SI 13 – Sustainable Drainage.

Both, flood risk measures and SuDS should be maintained throughout the lifetime of the development.

Part G of Building Regulations (Sanitation, hot water safety and water efficiency)

Part H of Building Regulations (Drainage and Waste Disposal)

12.1 This section explains the types of flood risk that development can suffer from and worsen it if not addressed properly. It also explains how risk of surface water flooding could be reduced through the use of Sustainable Drainage Systems (SuDS).

Key terms

Critical Drainage Areas: The Surface Water Management Plan of the Borough identified critical drainage areas which show a complex interaction of surface and sewer water flooding.

Flood Risk Assessment: A study to assess the flood risk to and from a development site.

Flood Risk Asset: features with a flood risk management role and which can influence the effects of flooding events. These are, for example, the embankment of the River Thames and Thames Water pumping stations.

Flood Zone: A geographic area within which the flood risk is in a particular range, as referred to in the National Planning Practice Guidance.

Sustainable Drainage Systems (SuDS): Using sustainable drainage techniques and managing surface water run-off from buildings and hardstanding areas in a way that reduces the total volume, flow and rate of surface water that runs directly into drains and sewers.

Surface water: rainfall that collects on the ground.

Flood risk sources

12.2 The Borough suffers from different sources of flood risk due to its location and infrastructure. Two of the Borough's boundaries are formed by water bodies: The Grand Union canal to the north and the River Thames in the south.

12.3 In the past, the Counters Creek ran to the west forming a natural boundary with Hammersmith and Fulham. The creek was culverted over in the Victorian period becoming one of the 'lost rivers' in London and a key part of the Borough's sewerage system. The sewer system is combined and takes both foul and rain (surface) water. Our sewer system is at the lower end of a catchment which drains northern Boroughs such as Camden and Brent. Therefore, when it rains it can overflow and flood lower ground floors or basements.

12.4 The Serpentine reservoir, in Hyde Park, in the unlikely event of a breach could also be a source of flooding to the Knightsbridge area. In addition, groundwater can seep through the lower levels of buildings (if not protected) in areas where the water table is high. Those areas are likely to be located closer to the River Thames and lost rivers (Counters Creek and those small streams contributing to it).

12.5 The two most prevalent flood risk sources for the Borough are surface water and sewer water. Climate change means that we should expect more intense rainfall and severe weather potentially increasing flooding in the Borough. To reduce the likelihood and consequences of flooding in new development we need to address it at the planning application stage. The Council has a wealth of online information for residents and business can do before[71] and after[72] a flooding event.

[71] https://www.rbkc.gov.uk/environment/dealing-flooding
[72] https://www.rbkc.gov.uk/environment/after-flood

Addressing flood risk

Our requirements

Flood risk

- Major and most minor developments at ground level will require Flood Risk Assessments in Flood Zones 2, 3 and Critical Drainage Areas.
- Sequential and exception tests may be needed for some developments.
    - The sequential test compares the proposed site with other available sites to find out which has the lowest flood risk.
    - The exception test demonstrates that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- Flood risk measures and flood risk assets should be shown on plans and maintained to ensure they are in working condition through the development's lifetime.

Water Infrastructure

- Development in opportunity areas should produce an Integrated Water Management Strategy at an early stage.
- Major development:
    - Residential development should achieve water consumption of 105l/day per head (excluding 5l external water allowance).
    - Commercial development to achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent.

How do I do it?

Flood risk

- If your development is within the area shown in figure 12.1, follow the guidance in table 12.1 below which shows which developments will need to undertake a FRA.

- Follow the flood risk assessment guidance and standing advice by the Environment Agency available on the gov.uk pages[73].
- Check the Surface Water Management Plan (SWMP), the Strategic Flood Risk Assessment (SFRA) and the Sequential Test for strategic sites, available online[74].

Water Infrastructure

- Major development: This could be achieved through the incorporation of measures such as smart metering, water saving and recycling measures, including retrofitting.
- Check Building Regulations:
    - Part G of Building Regulations (Sanitation, hot water safety and water efficiency)[75].
    - Part H of Building Regulations (Drainage and Waste Disposal)[76].

12.6 Those submitting planning applications must consider flood risk from all sources as stated in the National Planning Policy Framework (NPPF). The Council has designated Critical Drainage Areas[77] or local flood risk areas where there could be flooding due to a combination of surface water and foul water from the sewer. The Environment Agency have designated Flood Zones which take account of flood risk from the Thames (tidal and fluvial flood risk). The Environment Agency have developed a policy requiring all sleeping accommodation to be located at or above the modelled tidal breach flood level. This is unless it can be demonstrated that a permanent fixed barrier is in place to prevent floodwater entering any sleeping accommodation located below this level.

12.7 Flood Risk Assessments (FRA) are important documents to identify and address flood risks to and from a new development. They will help to ensure that a proposed development is protected from flood risk and will not cause flooding elsewhere. If an FRA is required and it is not submitted the relevant planning application is likely to be refused as it is contrary to the Local Plan Policy CE2b.

12.8 It is important that the need for an FRA is considered at an early stage. The need for an FRA depends on the location of the development (in terms of flood risk zones) and also the use of the development (in terms of vulnerability to flooding and compatibility with flooding). Information on

[73] https://www.gov.uk/guidance/flood-risk-and-coastal-change#planning-and-flood-risk
[74] https://www.rbkc.gov.uk/planning-and-building-control/planning-policy/flooding/flooding-planning-policies
[75] https://www.planningportal.co.uk/info/200135/approved_documents/69/part_g_-_sanitation_hot_water_safety_and_water_efficiency
[76] https://www.planningportal.co.uk/info/200135/approved_documents/71/part_h_-_drainage_and_waste_disposal
[77] https://www.rbkc.gov.uk/planning-and-building-control/planning-policy/flooding/critical-drainage-areas

flood risk zones, flood risk vulnerability and compatibility is available from the Government's website[78]. The FRA should be proportionate to the proposed development and risk. Figure 12.1 below shows the locations where an assessment will be needed for most development.

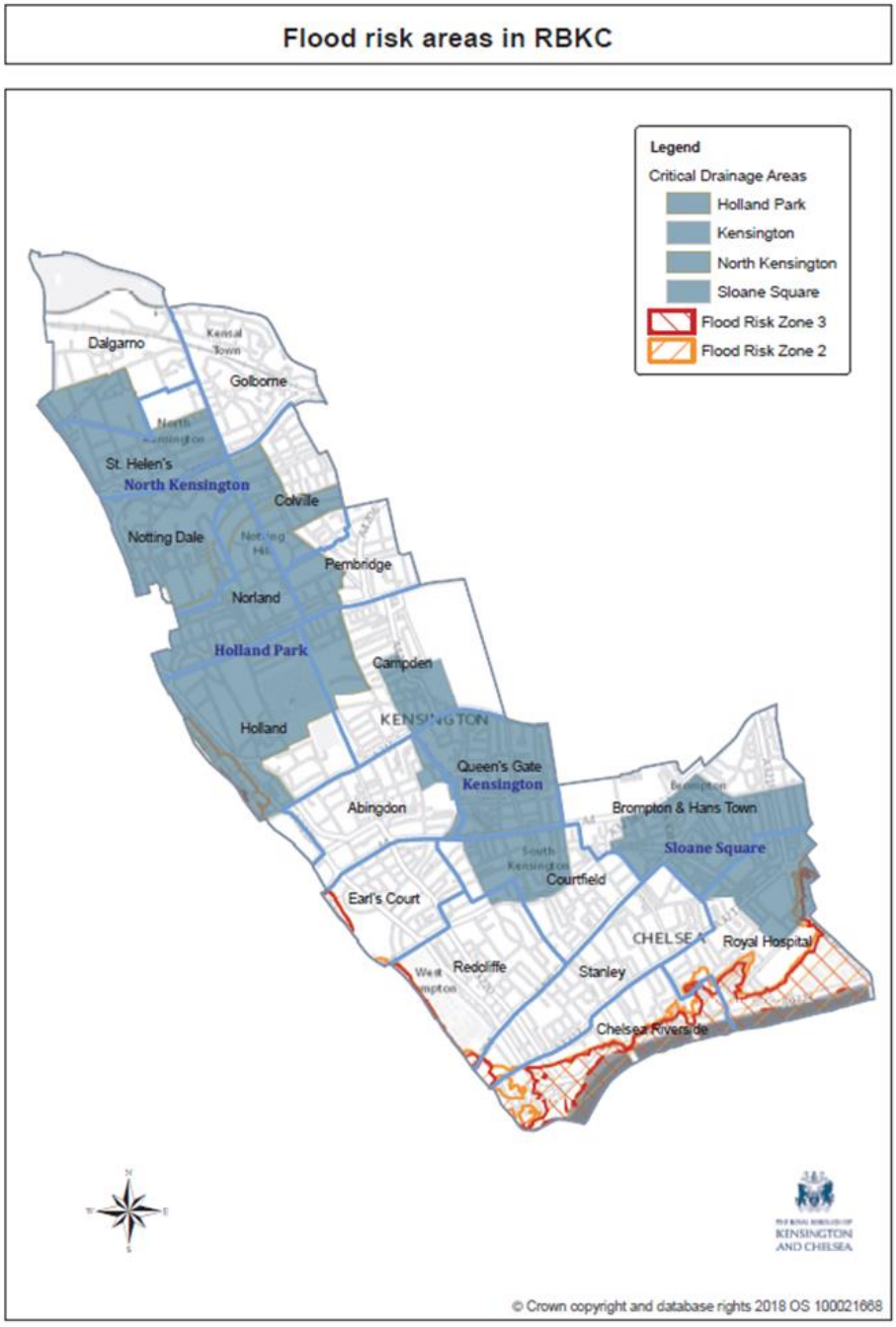


Figure 12.1: Flood risk areas where a flood risk assessment is required.

[78] https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables

When is an FRA needed?

- When the proposed development is in Flood Zone 1 (only if the site area is bigger than 1 Ha).
- For all development in Flood Zone 2 and Flood Zone 3.
- For a change of use in Flood Zone 2 or Flood Zone 3 to a higher vulnerable use.
- In the Council's Critical Drainage Areas:
    - if the development could lead to flooding elsewhere;
    - if the proposed land use is more vulnerable;
    - if there is an effect on potential flood risk assets.
    - For example:
        - basement applications;
        - development at ground level which will increase impermeability or vulnerability to flooding;
        - development which could impact on flood risk assets (physical structures which could reduce the effect of flooding in the area).
    - Most development at first floor level and above is unlikely to require an FRA.

12.9 The Environment Agency has produced standing advice[79] for FRAs for minor extensions, change of use and different uses in Flood zones 2 or 3. The Government has published useful guidance on how to prepare flood risk assessments[80], how to assess them[81] and flood resilience and resistance measures[82].

12.10 In some cases, other flood risk tests may also be needed. The sequential test compares the proposed site with other available sites to find out which has the lowest flood risk. If the sequential test shows that it is not possible to use an alternative site, an exception test may be required. The Government has published detailed guidance[83] for these tests.

12.11 The Council has published flood risk evidence base reports: The Surface Water Management Plan (SWMP), the Strategic Flood Risk Assessment

[79] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
[80] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications
[81] https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities
[82] https://www.gov.uk/guidance/flood-risk-and-coastal-change#Flood-resilience-and-flood-resistance
[83] https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

(SFRA) and the Sequential Test for strategic sites. This information, available online[84], will be useful when producing flood risk assessments.

Flood risk measures

- Should be clearly shown on the plans supporting the planning application.
- Should take into consideration the predicted flood depth in different storm scenarios.
- Should reflect site conditions in relation to contributing to, or suffering from, flooding (or both).
- Should consider flood risk assets (which could protect the development or surrounding areas from flooding: garden walls, embankments, etc).
- Should be considered at design stage as they can affect the materials, layout and design of buildings.
- Flood risk measures and assets should be protected and maintained to remain in good working order. They should also be built to a standard which provides adequate protection for the lifetime of the development.
- Examples of flood risk measures:
    - raising floor levels;
    - the use of water-resistant materials;
    - measures to ensure safe access and exit of buildings;
    - suitable pump devices to protect lower levels from sewer flooding;
    - cavity drainage and sump pumps to remove excess groundwater and reduce seepage in basements and lower ground levels.
    - Sustainable drainage systems.
    - Plant rooms and electrical equipment should not be located in lower floors (basements, lower ground floors) where feasible or be suitably protected against flooding.

Water infrastructure

12.12 Policy SI 5 of the London Plan 2021 aims to protect water supplies and resources and improve water infrastructure through development. It is expected that major development minimises the use of mains water in line

[84] https://www.rbkc.gov.uk/planning-and-building-control/planning-policy/flooding/flooding-planning-policies

with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres or less per head per day (excluding allowance of up to five litres for external water consumption). For commercial development, the requirement is to achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent (commercial development). This could be achieved through the incorporation of measures such as smart metering, water saving and recycling measures, including retrofitting. Water management standards could drive improvements in water efficiency, uptake in SuDS and property level flood resilience[85].

12.13 As the Borough suffers from lack of sewerage capacity, large-scale development in Opportunity Areas should be informed by Integrated Water Management Strategies at an early stage. This should help address capacity issues but also consider the water cycle holistically to ensure water re-use at source (where it falls) and a reduction of the use of mains water.

Sustainable Drainage Systems (SuDS)

12.14 SuDS are an alternative approach from the traditional ways of managing rain/surface water. They can reduce the total amount and speed of water that gets into the sewers. SuDS could include the storage of water for later use, the use of infiltration techniques, such as rainwater gardens, planters, green roofs and porous surfaces. Rain can also be stored in ponds, swales and in other, more engineered features such as blue roofs and tanks. More natural SuDS could provide multiple benefits such as water quality and contribute towards green infrastructure provision as explained in section 10 of this SPD. National[86], regional[87] and local[88] SuDS standards and guidance should be followed to maximise the SuDS benefits, The design and implementation of SuDS should account for the site's constraints such as: sub-surface infrastructure, space, building layout, orientation, land uptake and soil condition, including land contamination.

[85] https://www.policyconnect.org.uk/research/bricks-water-building-resilience-englands-homes
[86] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[87] https://www.london.gov.uk/what-we-do/environment/climate-change/surface-water/sustainable-drainage-london
[88] http://online.flipbuilder.com/mccloy.consulting/psjg/mobile/index.html

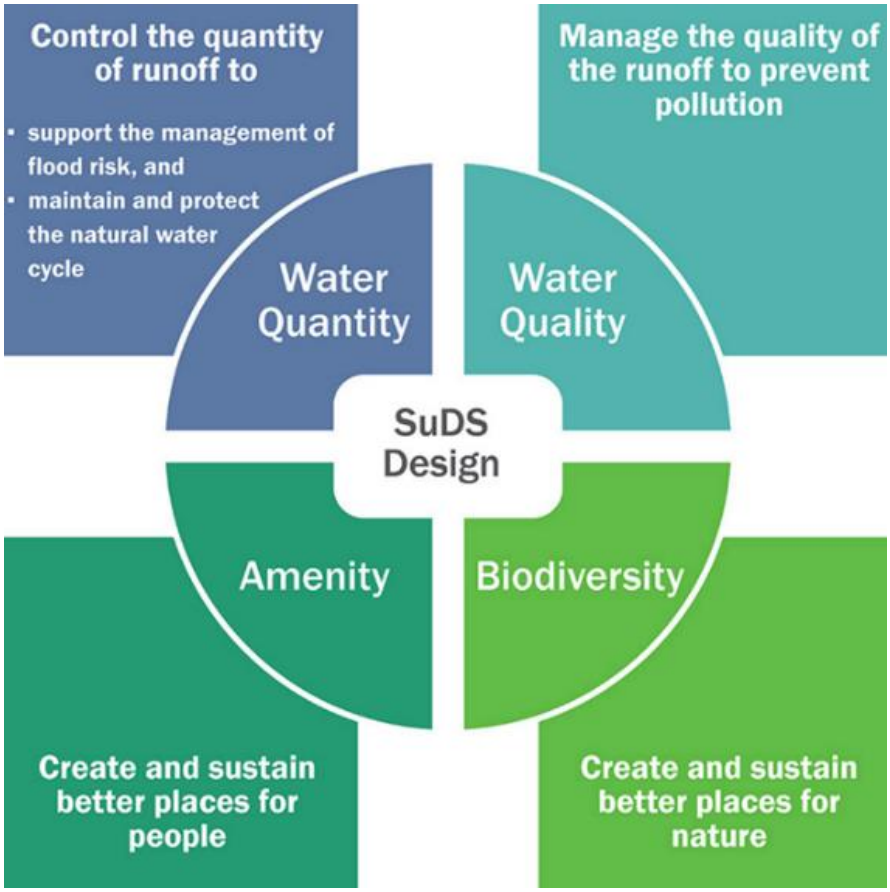


Figure 12.2: The four pillars of SuDS. *(GLA SuDS guidance)*[89]

Figure 12.3: Example of SuDS in Holland Park (shallow attenuation basin above and award-winning adventure playground which incorporates SuDS)

12.15 The reduction of surface water is required by Local Plan Policy CE2g for all major developments and for minor development at ground and below level. The aim of this policy is to reduce the pressure in the combined

[89] https://www.london.gov.uk/sites/default/files/reimagining_rainwater_in_schools_v1_.pdf

sewer system which runs close to capacity in the Borough. As the sewer system is combined (takes both, surface and foul water) any flows into the sewer should be factored in the calculations. This includes groundwater and flows from swimming pools. The retrofitting of SuDS is encouraged even if the development will not have drainage implications. Further guidance is found on the Council's SuDS webpage[90].

Our requirements

SuDS

- SuDS are required throughout the Borough for all major development and for small-scale development at ground and below ground levels.
- Major development should achieve greenfield run-off whereas small-scale development should provide a 50 per cent betterment.
- The retrofitting of SuDS is encouraged even if the development will not have drainage implications
- Green SuDS which allow for natural drainage and provides multiple benefits are preferred as they provide multiple benefits.
- Attenuation tanks (tank which store rainwater below ground and which require pumping) and other grey infrastructure which only store water are not encouraged.
- It is encouraged that a drainage engineer is engaged to design the SuDS and ensure compliance with Building Control regulations.

How do I do it?

SuDS

- SuDS are required throughout the Borough for all major development and for small-scale development at ground and below ground levels.
- A SuDS strategy should be provided and include the following details:
    - ✓ An analysis of surface water run-off and attenuation volume required. Groundwater and swimming pool flows should be reflected in the calculations.

[90] https://www.rbkc.gov.uk/planning-and-building-control/planning-policy/flooding/sustainable-drainage-systems

- ✓ Information about the proposed SuDS types, their sustainability, location, attenuation capacity, specification, and maintenance.
- ✓ Section/profile drawings of the SuDS.
- ✓ Drainage plans to show clearly how surface water will be directed to the SuDS and any connections to the sewer system.
- ✓ Compliance with the Council's SuDS pro-forma[91].
- ✓ Major development should also provide information on phasing, management of run-off during construction and consultation with relevant bodies: Thames Water and the Environment Agency (if relevant).

- Check Building Regulations to ensure compliance.
  - Part G of Building Regulations (Sanitation, hot water safety and water efficiency)[92]
  - Part H of Building Regulations (Drainage and Waste Disposal)[93]

12.16 SuDS are most beneficial when they manage water naturally where it falls. The easiest way of reducing surface water run-off is to redirect water from the rainwater pipes and impermeable areas into landscaping areas, planters or permeable surfaces. Obviously, the higher the drained area, the higher the volume of water redirected and the space needed to drain or store that water.

12.17 Soil permeability is important when proposing natural drainage. Most of the Borough has clay soils (except from the south, closer to the Thames or in areas where lost rivers flowed in the past – see figure 12.4). However, the soil composition can be modified through the addition of permeable layers (sand, gravels) to enhance natural drainage. This means that natural soakaways are possible in clay soils if the right soil layers are implemented.

[91] https://www.london.gov.uk/what-we-do/environment/climate-change/surface-water/london-sustainable-drainage-proforma
[92] https://www.planningportal.co.uk/info/200135/approved_documents/69/part_g_-_sanitation_hot_water_safety_and_water_efficiency
[93] https://www.planningportal.co.uk/info/200135/approved_documents/71/part_h_-_drainage_and_waste_disposal

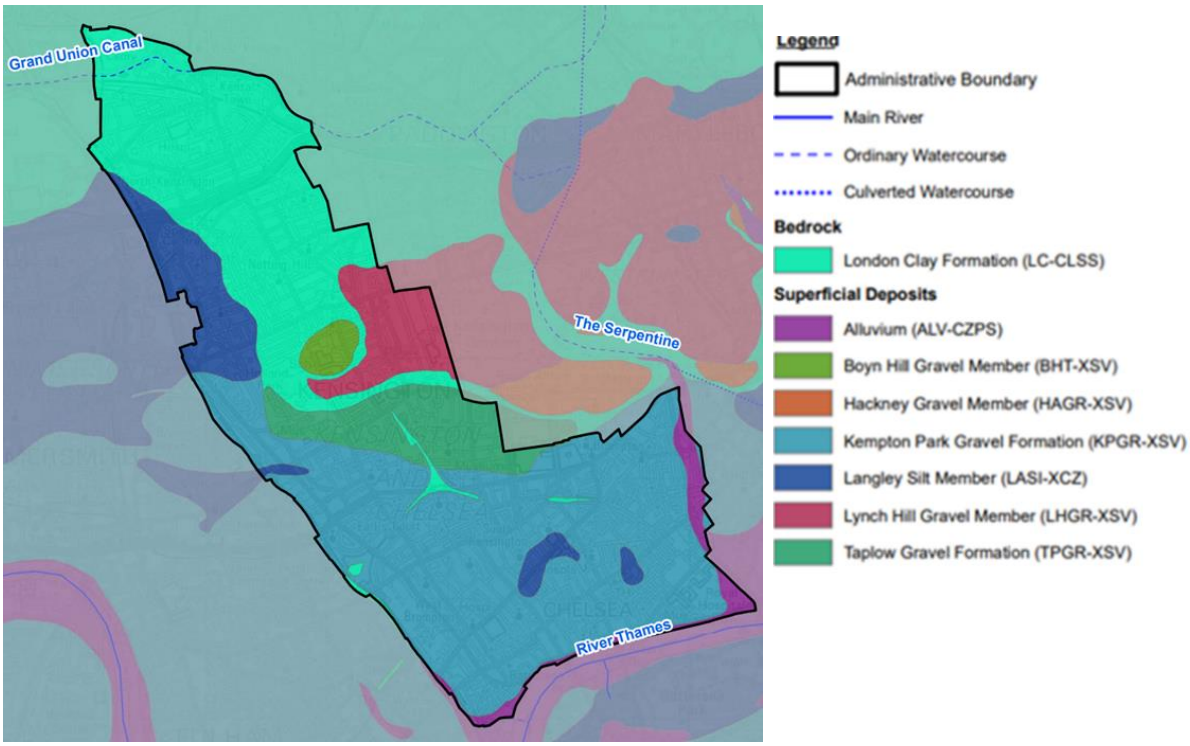


Figure 12.4: The Borough's geology

12.18 Another misconception regarding soakaways is that Building Regulations prevent them to be implemented close to buildings. Building Regulations do require locating soakaways 5m from buildings to protect the foundations from water damage. However, soakaways could incorporate a protective/impermeable membrane to stop water filtering towards the foundations of the building. This should make the soakaway compliant with Building Regulations. When designing and building SuDS please obtain Building Control advice.

12.19 The Council has a Sustainable Drainage Design and Evaluation guide[94] which explains the design and evaluation process. Early stakeholder engagement is recommended so that SuDS are not retrofitted to a fixed design. Otherwise, this could potentially lead to a lack of space for more sustainable or green SuDS which could provide multiple benefits. Detailed guidance on designing rain gardens has been produced by UDL[95].

[94] http://online.flipbuilder.com/mccloy.consulting/psjg/mobile/index.html
[95] https://www.urbandesignlondon.com/library/sourcebooks/designing-rain-gardens-practical-guide/

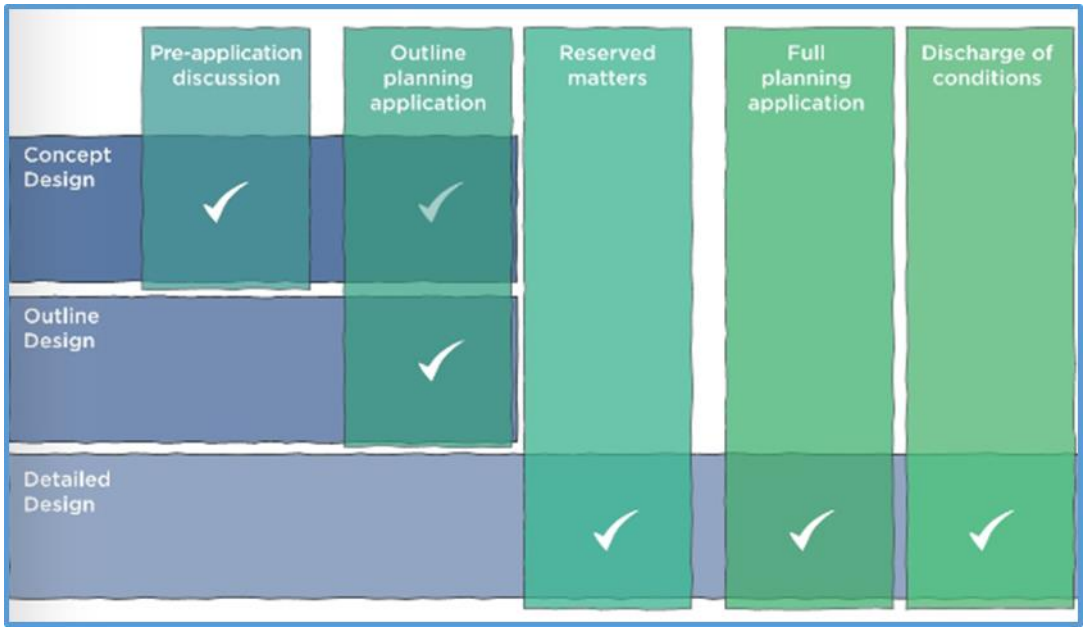


Figure 12.5: The design stages for SuDS within the planning stages (Source: RBKC Sustainable Drainage Design and Evaluation guide).

Major development

12.20 Policy CE2(g) requires major development to achieve greenfield run-off rate (which means natural run-off with rates between 5 to 8l/ha). If greenfield run-off cannot be achieved this should be explained with calculations of different run-off rates, the volume of attenuation needed and the SuDS options to achieve it. As with green infrastructure, SuDS can be provided at different levels of the development: from green/blue roofs at roof level to green walls, rainwater gardens, permeable paving and rainwater harvesting at ground level. Attenuation tanks which require pumping and only store water are not encouraged as they do not provide other benefits. In fact, if the development can maximise more natural green SuDS, the requirement of achieving greenfield run-off rates could be relaxed.

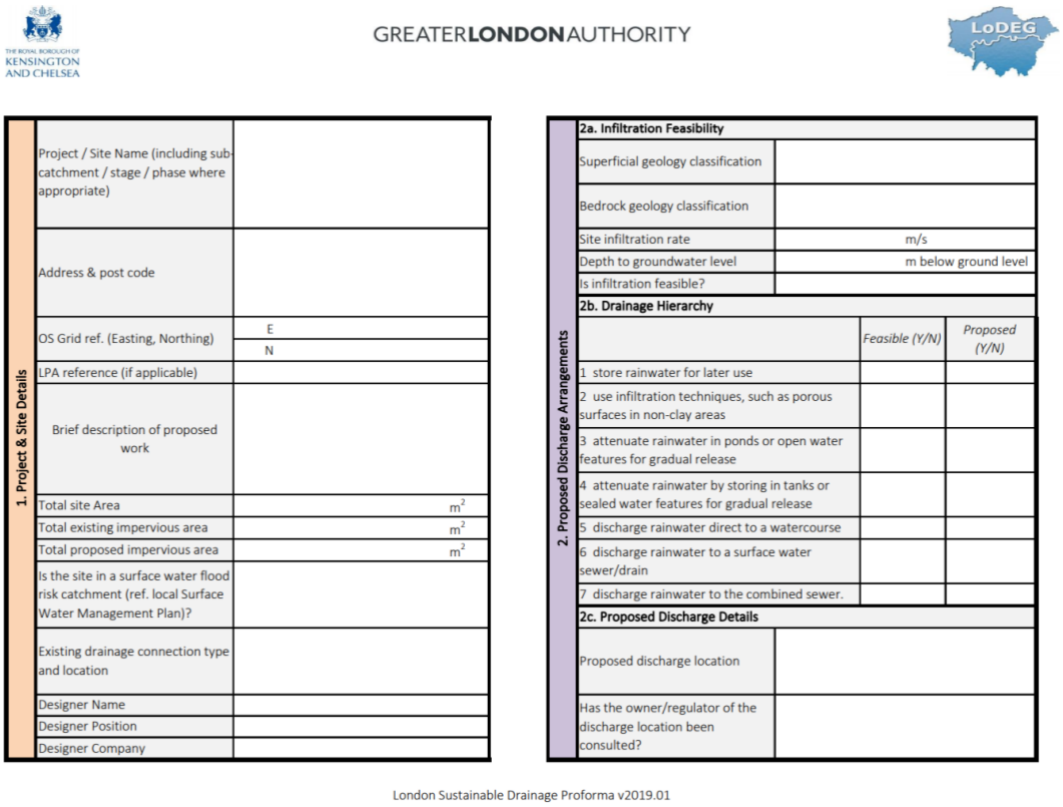
Figure 12.6: Grounds of the Natural History Museum SuDS proposal. It includes a range of SuDS measures including dry and wet swales, ponds, and permeable surfaces.

12.21 The Council and GLA developed a SuDS proforma[96] which will help preparing the SuDS/surface water drainage strategy. The strategy should follow the Government non-statutory SuDS standards[97] and include the following:

- Drainage layout: type of SuDS, layout and land take
- Landscape integration strategy
- Details of surface water management during construction
- Run-off before and after construction, overland flow paths and proposed flow control (including different storm scenarios), aiming to achieve greenfield runoff. SuDS should provide attenuation for all rainfall events.
- Foul drainage
- Details on SuDS: type extent/coverage and discharge quantity

[96] https://www.london.gov.uk/what-we-do/environment/climate-change/surface-water/london-sustainable-drainage-proforma
[97] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

- Adoption of SuDS (ownership), long-term maintenance regime (including maintenance schedule, costs) and communication to residents
- Compliance with the non-statutory SuDS Standards
- Records of relevant consultations with other interested parties (Thames Water, Canal and River Trust, the Environment Agency when relevant)
- A phasing plan if the scheme is delivered in different phases.



THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details		
	Project / Site Name (including sub-catchment / stage / phase where appropriate)	
	Address & post code	
	OS Grid ref. (Easting, Northing)	E N
	LPA reference (if applicable)	
	Brief description of proposed work	
	Total site Area	m^2
	Total existing impervious area	m^2
	Total proposed impervious area	m^2
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	
	Existing drainage connection type and location	
	Designer Name	
	Designer Position	
	Designer Company	

2. Proposed Discharge Arrangements			
	2a. Infiltration Feasibility		
	Superficial geology classification		
	Bedrock geology classification		
	Site infiltration rate	m/s	
	Depth to groundwater level	m below ground level	
	Is infiltration feasible?		
	2b. Drainage Hierarchy		
		Feasible (Y/N)	*Proposed (Y/N)*
	1 store rainwater for later use		
	2 use infiltration techniques, such as porous surfaces in non-clay areas		
	3 attenuate rainwater in ponds or open water features for gradual release		
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release		
	5 discharge rainwater direct to a watercourse		
	6 discharge rainwater to a surface water sewer/drain		
	7 discharge rainwater to the combined sewer.		
	2c. Proposed Discharge Details		
	Proposed discharge location		
	Has the owner/regulator of the discharge location been consulted?		

London Sustainable Drainage Proforma v2019.01

Figure 12.7: RBKC SuDS proforma (for major development)

Small-scale development

12.22 For minor developments (up to a maximum of 10 dwellings or 1,000m² of non-residential property) the policy requires SuDS to achieve a reduction of 50 per cent of existing run-off rates. This reduction could be relaxed if the chosen SuDS are greener. The Council has specific online guidance to meet the policy[98]. The Council SuDS proforma could be used although it is not compulsory for small development as run-off calculations may not be needed.

12.23 Reduction of surface water can be achieved by increasing vegetation cover, implementing permeable surfaces in front and rear gardens and

[98] https://www.rbkc.gov.uk/planning-and-building-control/planning-policy/flooding/sustainable-drainage-systems

draining roof down pipes into these areas. Flat roofs (existing or proposed) or roofs with slight slopes (low pitch) could be used to provide green/blue roofs. Water butts attached to rainwater pipes can also store water but they need to be regularly emptied to have a positive effect during a storm.

12.24 The information required to ensure policy compliance is as follows:

- An analysis of surface water run-off and attenuation volume required to achieve 50 per cent reduction of existing rates including climate change in the calculations and factoring in all flows into the sewer system including swimming pool and groundwater.
- Information about the proposed SuDS types, their location, attenuation capacity, specification, and maintenance.
- Section/profile drawings of the SuDS when relevant (green roofs, blue roofs, sub-base attenuation, permeable paving, planters).
- Drainage plans to show clearly how surface water will be directed to the SuDS and any connections to the sewer system.

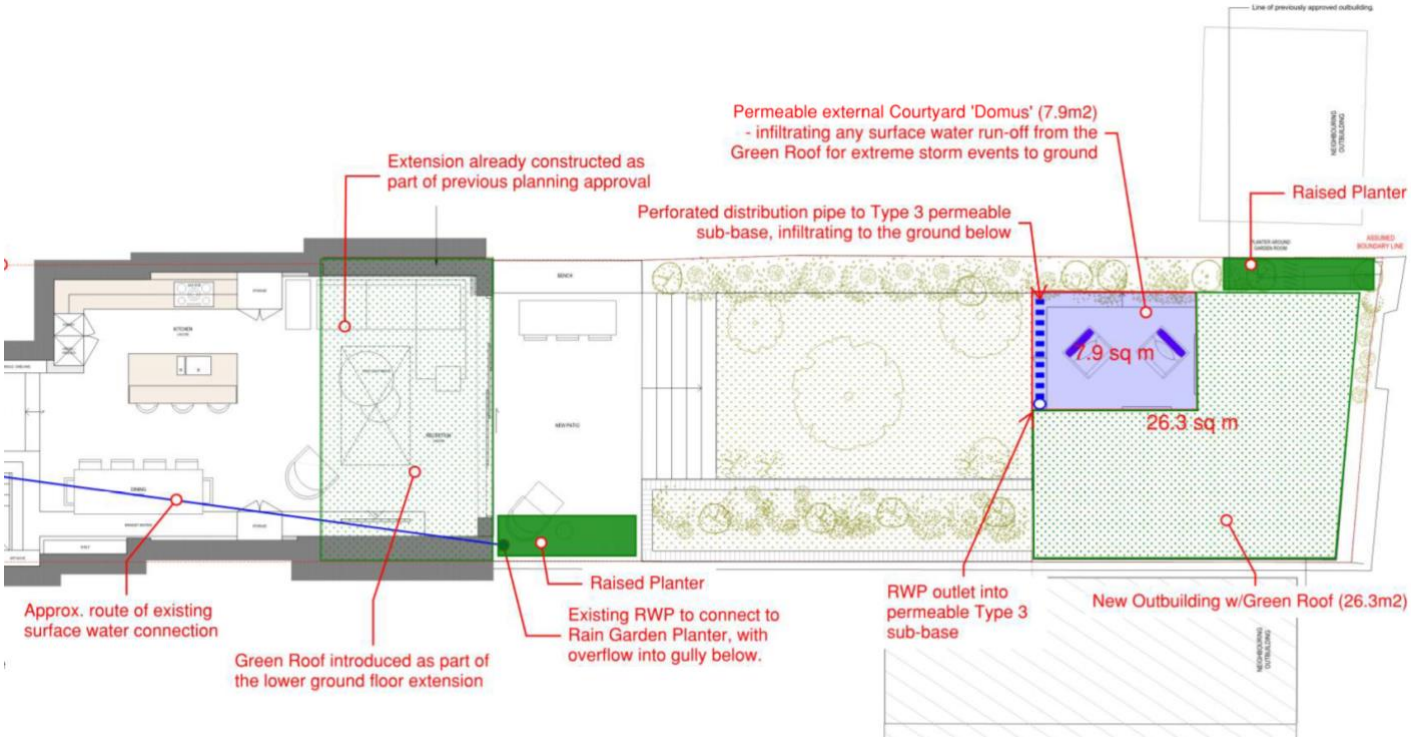


Figure 12.8: Part of a drainage plan showing the proposed SuDS for a small ground floor extension and garden outbuilding. The SuDS include permeable paving, green roofs and raised planters.

SuDS considerations

- Early involvement of a drainage engineer to consider the best SuDS solutions for the site.
- Combine SuDS with Green Infrastructure to maximise the benefits provided.
- Physical constraints: space, buildings layout, orientation, land uptake, soil conditions should all be considered to design the correct SuDS.

Major development

- Maximise green SuDS at ground level if possible (rainwater gardens, swales, ponds, permeable paving, rainwater harvesting, etc).
- SuDS could be provided at roof level (green/blue roofs), and within the building (green walls).

Small-scale development

- Increase vegetation cover.
- Implement permeable surfaces in front and rear gardens.
- Green/blue roofs.
- Rainwater planters connected to rainwater pipes.

13 Biodiversity

Key guidance

- It is expected that developers follow the guidance of British Standards for Biodiversity: BS42020.
- All developments are expected to follow the mitigation hierarchy and submit ecological and other relevant assessments.
- Major Developments are expected to achieve an UGF score of at least 0.4 for residential developments and of 0.3 for commercial as well as at least a 10% net gain.
- Small-scale developments should consider the protection and enhancement of the site's biodiversity.

13.1 Biodiversity is a material consideration in determining planning applications, and therefore must be considered at all stages of the planning process. It is expected that developers follow the recommendations and guidance set out in the British Standards for Biodiversity: BS42020, to ensure that best practice can be implemented at each stage of the planning process and that developments are informed by sufficient and appropriate ecological information.

13.2 All developments should also contribute to the enhancement of biodiversity through habitat creation, improved connectivity of ecological features and greening, helping to achieve a biodiversity net gain as well as meeting Urban Greening Factor targets. These should be proportionate to the scale and impact of the development.

13.3 All developments should be achieving biodiversity net gain, whereby habitats for wildlife are enhanced and left in a measurably better state than they were pre-development.

13.4 Before making an application, you should:

- Determine whether the proposal is likely to affect biodiversity; and
- Establish what information needs to be submitted. Information should be provided on existing biodiversity interests and possible impacts on them.

13.5 We have designated sites in the Borough which contain important ecological features, remnant or fragmented habitats of natural communities, small vulnerable species communities or form part of a

network, which together provides a significant ecological network. Developments that negatively impact the Borough's designated Sites of Importance for Nature Conservation (SINCs) may be refused planning permission.

13.6 The RBKC Biodiversity Action Plan (BAP) provides a framework for protecting and enhancing biodiversity through more and better-connected habitats and creation of resilient green infrastructure. There are species and habitats identified as priorities that, although may not have legal protection, are still a material consideration.

13.7 It is expected that developments follow the principles set out below, in order to meet policy requirements, protecting and enhancing the Borough's Biodiversity.

Assessment - Surveys and Information Gathering

13.8 Applicants for major development should undertake ecological surveys or appraisals to assess their impact on biodiversity. This should be done early in the process and recommendations should inform the design and implementation of a proposal to enhance biodiversity. Minor developments must still have regard for biodiversity and applicants may therefore be required to undertake ecological surveys, so check in advance.

Ecological surveys should

- Follow the Chartered Institute of Ecology and Environmental Management (CIEEM) best practice guidance for ecological surveys (weather conditions, appropriate time of year, duration and frequency).
- Be undertaken and reported by an CIEEM registered ecologist who must hold the relevant protected species licenses where applicable.
- Identify existing habitats and wildlife features (including trees) on and adjacent to a development, making clear impacts including proposed losses and/or gains.
- Assess the presence or likely absence of protected or priority species on and nearby a development.
- Identify the location of any designated local sites such as Sites of Importance for Nature Conservation or other statutory designated sites.
- Assess impact on green corridors, waterways, or general habitat connectivity within the Borough.
- Identify other local habitat and wildlife features in the nearby vicinity, including parks, open spaces and gardens. Assessing impacts on them through, for example, increased lighting or shading.
- Provide details of mitigation and compensation measures.
- Be current and submitted at validation process.

13.9 A search of the Local Biological Records Centre for London[99] will show if a development is in or adjacent to a Site of Nature Conservation Importance, historical information about habitats and species presence. Any site or building may have important biodiversity or contain nature conservation features, and proposals for development should consider the quality of the existing biodiversity, and the potential for enhancement.

13.10 Designated Local Sites or development adjacent to them or areas that form part of a Green Corridor or Blue-Ribbon network should receive special attention proportionate to the weight afforded by these designations.

13.11 ALGE (Association of Local Government Ecologists) provides guidance on when a survey and assessment are required. Please refer to Table 1 in

[99] https://www.gigl.org.uk/

the case of Protected Species and Table 2 for designated sites and priority habitats[100].

13.12 Ecological surveys will be used to assess the development's impacts and contribution towards enhancing biodiversity. Ecological surveys should also be submitted to Greenspace Information for Greater London (GiGL www.gigl.co.uk) so that the results can contribute to building up the biodiversity information for the Borough and for Greater London.

13.13 For major applications an Ecological Constraints and Opportunities Plan (ECOP) is also required – please see further guidance below.

Avoidance, Mitigation and Compensation

13.14 All developments are expected to follow the mitigation hierarchy, which will help to achieve no overall negative impact on biodiversity or achieve a measurable net gain. Applicants should ensure that trees are included when considering the mitigation hierarchy below.

13.15 **Avoid**: Avoid biodiversity harm. Avoidance can be achieved through site selection, alternative design or layout or completing works at an alternative time of year when vulnerable species are least likely present.

13.16 **Mitigation**: Where impacts are unavoidable, specific mitigation measures must be designed to significantly reduce the impacts to biodiversity in or next to the site. Mitigation measures must be realistic and effective, based on sound ecological information. Mitigation schemes should be submitted as an integral part of the proposed development plans and planning application.

13.17 Mitigation must be designed around the specific ecological systems on the site and impacts of the development, avoiding the use of broad brush "worst case scenario" solutions. The mitigation must be designed to maintain and improve the environmental conditions that exist at the site, which support the site's habitats and species.

13.18 A monitoring schedule should detail how often and for how long the mitigation will be monitored. It must include prescriptions for review of monitoring data and a mechanism by which the mitigation can be altered if found to be ineffective. All mitigation measures should be secured through use of planning conditions/obligations.

13.19 **Compensation**: This should only be considered as a last resort for unavoidable residual impacts that remain after avoidance and mitigation measures. It should only be considered in exceptional circumstances. All options for onsite compensation should be investigated and given preference over offsite compensation options.

13.20 The basis of ecological compensation will be to achieve a net gain rather than seek no net loss and should produce an improved habitat. It will not

[100] Validation of Planning Applications Pilot Draft (2007) available from https://www.alge.org.uk/publications-and-reports/

be acceptable, for instance, to create an area of chalk grassland in compensation for an area of woodland lost to development.

13.21 The location of compensation sites must be appropriate to the habitats and species they are designed to support, taking into account the soil substrate, slope aspect etc., and the long-term integrity of the location. Compensation sites must be subject to management agreements as part of a legal document, to ensure the long-term integrity of the site for wildlife benefit.

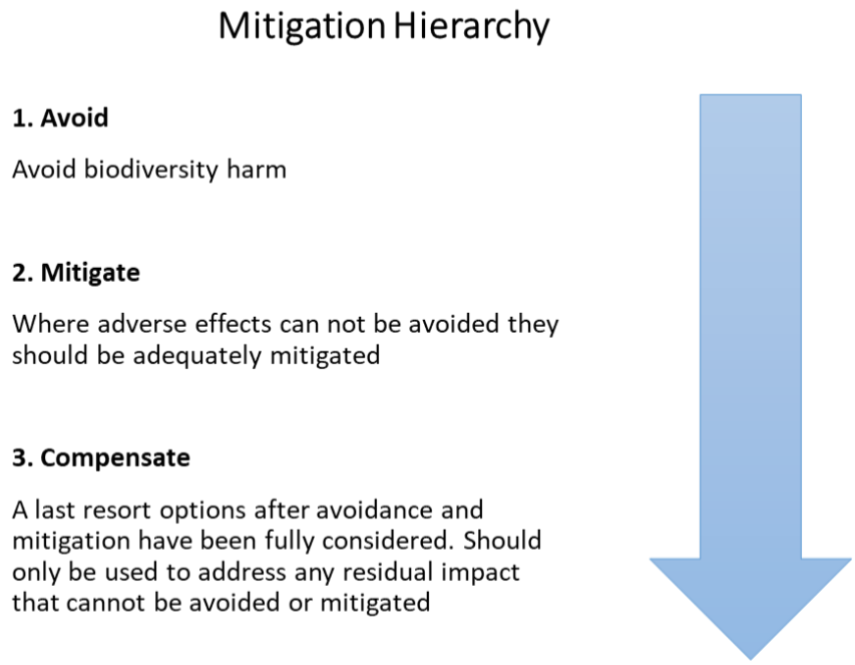


Figure 13.1: Mitigation hierarchy

Enhancement and Biodiversity Net Gain

13.22 Biodiversity Net Gain (BNG) will be a requirement of the Environmental Bill. The goal is to leave the biodiversity environment in a better state by providing a 10 per cent uplift. This is defined as a 10per cent increase in biodiversity units, calculated using the Biodiversity Metric.

13.23 BNG takes into consideration the existing biodiversity onsite (baseline position) and aims to provide a quantifiable improvement. This should not simply equate to an increase in the number of species on a site. There is a need to account for the value of the species supported and enhancement of the quality of habitats.

13.24 A net gain for biodiversity will usually result from protecting existing biodiversity and:

- Increasing the area of existing habitat(s) and /or;
- Creating new habitat(s) and /or;

- Implementing specific measures that will benefit particular species.

13.25 All development has the potential to leave biodiversity in a better state than before, by following the above principles of the 'Mitigation Hierarchy' and understanding the ecological constraints and opportunities from the early stages of design. We expect developments to achieve at least a 10 per cent net gain in biodiversity as well as achieving the target UGF scores recommended by the Mayor (0.4 for residential developments and of 0.3 for predominately commercial). Considering biodiversity when preparing the Urban Greening Factor is likely to achieve higher scores for both.

13.26 In order to measure biodiversity enhancements, the most updated methodology determined by Defra should be followed. A range of inputs, from geographical information, architectural plans, habitat surveys and local and regional strategies for biodiversity should be taken into account.

Major development

13.27 Major developments are expected to include Ecological Impact Assessments (EcIA) as part of Environmental Impact Assessments (EIA). Where EIA is not required, an EcIA or Preliminary Ecological Assessment (PEA) should be prepared at the early design phase. These assessments will allow ecological features to be taken into account and allow developments to avoid and mitigate impacts early on. They will also highlight earlier additional surveys that may be needed.

13.28 For major applications we will require an Ecological Constraints and Opportunities Plan (ECOP) and a balance table setting out habitats lost and gained as well as their relative importance as detailed in the British Standard (BS42020:2013). The ECOP report can be used to help guide the design of the different elements of a development whilst taking account of its impacts on biodiversity.

13.29 Major Developments are expected to achieve an UGF score of at least 0.4 for residential developments and 0.3 for commercial as well as at least a 10 per cent net gain.

Our requirements

- Applicants for major development should submit an ecological survey and assessment to identify existing biodiversity features and likely impacts. Minor developments should have regard for biodiversity and applicants should check if an ecological survey is required.

- Applications for major development should also include:

    - an Ecological Impact Assessment or Preliminary Ecological Assessment;
    - an Ecological Constraints and Opportunities Plan (ECOP);
    - a balance table showing habitats lost, gained and their importance.
- Major Developments are expected to achieve an UGF score of at least 0.4 for residential developments and of 0.3 for commercial as well as at least a 10 per cent biodiversity net gain.

- Small-scale developments should consider the protection and enhancement of the site's biodiversity.

How do I do it?

- Engage a registered ecologist to produce an ecological survey, assessment and plans.

- Follow the mitigation hierarchy.

    - Avoid biodiversity harm.
    - Include mitigation measures to reduce the impacts. Use a monitoring schedule.
    - Compensation should only be considered as a last resort for unavoidable residual impacts.

- Calculate the UGF as follows:

  (Factor A x Area) + (Factor B x Area) + (Factor C x Area) etc. / divided by Total Site Area.

- Providing surface covers with higher UGF scores will also enhance the Biodiversity Net Gain of the site.

- Follow up to date DEFRA guidance and available information to measure biodiversity enhancements.

13.30 Habitat creation – based on the habitat typologies present in the Borough major developments should seek to enhance and increase areas of habitat that form part of the ecological network. The Council has a commitment to increasing habitats for pollinators and is creating a pollinator network 'The Bee-Superhighway'. Applicants of developments should consider this as part of their planting and landscaping schemes.

13.31 New tree planting/landscaping should be recognised from the outset as an integral part of any development. It should have regard to the national, regional and local Biodiversity Action Plans. New planting should be

purposefully designed to complement the proposed features of the development and those existing features intended for retention.

Small-scale development

13.32 Ecological surveys should support planning applications and also be submitted to Greenspace Information for Greater London (GiGL www.gigl.co.uk).

13.33 In urban areas living roofs provide valuable habitats in areas that are often lacking in biodiversity. Living walls provide opportunities for wildlife such as foraging habitats for birds and bats, and can also provide nesting opportunities for birds as well as look very attractive, softening concrete landscapes and improving the environmental properties of a building (improving insulation air quality and cooling).

13.34 Gardens are important habitats for a range of wildlife. However, private gardens are often little high-sided boxes which prevent wildlife from easily moving around in search of food for example. Householder's can help by creating safe corridors from your garden to the one(s) next door. These corridors are called nature highways and byways. The RSPB has published guidance for householders to create these corridors[101].

Trees

13.35 As outlined in section 11, trees are a critical component of our green infrastructure, providing a wide range of benefits including support for the biodiversity.

13.36 Tree retention - The Council's policy is generally to resist the loss of trees and there is a presumption towards retention backed up by appropriate protection. Generally, the more prominent the tree the greater the likelihood it should be protected and retained. This approach conforms with the London Plan 2021, London Environment Strategy and London Urban Forest Plan, which all aim to protect, manage and grow the urban forest.

[101] https://www.rspb.org.uk/get-involved/activities/nature-on-your-doorstep/garden-activities/createnaturehighwaysandbyways/

Glossary

Terminology	Description
Air Quality Assessment (AQA)	Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific.[102]
Air Quality Focus Area (AQFA)	Air Quality Focus Areas (AQFA) are locations that not only exceed the EU annual mean limit value for nitrogen dioxide (NO2) but are also locations with high human exposure. AQFAs are not the only areas with poor air quality but they have been defined to identify areas where currently planned national, regional and local measures to reduce air pollution may not fully resolve poor air quality issues. There are currently 187 AQFAs across London. The list of Air Quality Focus Areas is updated from time to time as the London Atmospheric Inventory is reviewed and the latest list in the London Datastore should always be checked. AQFAs are defined based on GLA modelling forecasts that incorporate actions taken by the GLA and others as well as broader changes in emissions sources.
Air Quality Management Area (AQMA)	Air Quality Management Areas (AQMAs) are declared by the London boroughs in response to modelled or measured existing exceedances of legal air quality limits. The analysis underpinning AQMAs is often more spatially detailed than London-wide modelling and may include the identification of additional air quality hot spots or other local issues.
Biodiversity Net Gain (BNG)	This refers to the 10 per cent increase in biodiversity which will be required by the Environment Bill 2019-21 once it receives Royal Assent.
Building Services Compliance Guide	For domestic and for non-domestic development provide guidance on complying with Building Regulations for refurbishments.

[102] Air quality - GOV.UK (www.gov.uk)

Building Research Establishment Environmental Assessment Method (BREEAM):	BREEAM is a holistic approach on environment standards that goes beyond carbon emissions and supports quality assurance.
CIBSE TM59	Chartered Institution of Building Services Engineers. Design methodology for the assessment of overheating risk in homes (2017)[103]
CIRIA	The Construction Industry Research and Information Association, a neutral, independent and not-for-profit body. (CIRIA)
Circular Economy	Reducing waste and supporting the Circular Economy as one where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste.London Plan 2021
Combined Heat and Power (CHP)	The combined production of electricity and usable heat is known as Combined Heat and Power (CHP) and is supplied to buildings or a network.
Critical Drainage Areas	The Surface Water Management Plan of the Borough identified Critical Drainage Areas which show a complex interaction of surface and sewer water flooding.
District Heating Network (DHN)	A network of pipes carrying hot water or steam, usually underground, that connects heat production equipment with heat customers. They can range from several metres to several kilometres in length. (London Plan 2021)
Ecological Constraints and Opportunities Plan (ECOP)	Can be used to help guide the design of the different elements of a development whilst taking account of its impacts on biodiversity.
Ecological Impact Assessments (EcIA)	Process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components, and usually performed as one element of an environmental impact assessment (EIA). (BS42020:2013 Biodiversity)
Energy hierarchy	Shows how new buildings can meet net zero carbon by following a sequential approach.

[103] CIBSE - Building Services Knowledge

EnerPHit	Energy performance standard that allows a slight relaxation in the space heating targets (20-25kWh/year depending on location), recognising that the form of the building cannot easily be changed in refurbishment, it also allows a slightly higher air permeability rate of 1 air change per hour at 50Pa.
Energiesprong	A performance standard for new build and refurbishment. It is suitable for residential development. The methodology involves a focus on achieving minimum performance standards for building elements and fixed services and, like the Passivhaus methodologies, account is taken of both regulated and unregulated emissions.
Embodied emissions	Non-operational greenhouse gas emissions associated with a building's lifecycle.
Environmental Impact Assessments (EIA)	The aim of an Environmental Impact Assessment is to protect the environment by ensuring that a local planning authority when deciding whether to grant planning permission for a project, which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision making process.[104]
Flood Risk Assessment	A study to assess the flood risk to and from a development site.
Flood Risk Asset	Features with a flood risk management role which can influence the effects of flooding events. These are, for example, the embankment of the river Thames and Thames Water pumping stations.
Flood Zone	A geographic area within which the flood risk is in a particular range, as referred to in the National Planning Practice Guidance.
Green Infrastructure	The multifunctional, interdependent network of open and green spaces and green features (e.g. green roofs).

[104] Environmental Impact Assessment - GOV.UK (www.gov.uk)

Heat networks or district heating	A way of distributing heat (and more rarely, power) generated from a given energy source(s) across multiple buildings or sites.
Heat Network Priority Areas (HNPA)	These identify where in London the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers.
The London Energy Transformation Initiative (LETI)	LETI is a network of over 1000 built environment professionals that are working together to put London on the path to a zero carbon future. The voluntary group is made up of developers, engineers, housing associations, architects, planners, academics, sustainability professionals, contractors and facilities managers.
Life-cycle Assessment	Is a multi-step procedure through the life stages of a building. In the UK the BS EN 15978: 2011 standard is typically used.
Major Development	Generally, major developments are: • Development of dwellings where 10 or more dwellings are to be provided, or the site area is 0.5 hectares or more; • Development of other uses, where the floor space is 1,000 square metres or more, or the site area is 1 hectare or more. For a full definition, see Part 1 of The Town and Country Planning (Development Management Procedure) (England) Order 2015. (London Plan 2021).
Non-Road Mobile Machinery (NRMM)	Is a broad category which includes mobile machines, and transportable industrial equipment or vehicles which are fitted with an internal combustion engine and not intended for transporting goods or passengers on roads.[105]
Passivhaus	A voluntary energy standard that has been developed to focus on improving building energy performance
Preliminary Ecological Assessments (PEAs)	The initial scoping assessment of an area of land, for its potential to support protected species, based on the habitats it supports and

[105] Non-Road Mobile Machinery (NRMM) | London City Hall

	signs of protected species. PEA's are required to inform what further surveys for protected species are required, as part of the planning process.[106]
Regulated carbon emissions	These are the carbon emissions arising from energy used by fixed building services, which are defined in Approved Document Part L of the Building Regulations 2013.
Surface water	Rainfall that collects on the ground.
Sustainability Appraisal	Sustainability Appraisal (SA) is a tool used to appraise planning policy documents in order to promote sustainable development. Social, environmental and economic aspects are all taken into consideration. Sustainability Appraisal is a compulsory requirement under the 2004 Planning and Compulsory Purchase Act and the 2001/42/EEC European Directive. This means that Stafford Borough Council must carry out a Sustainability Appraisal.
Sustainable Drainage Systems (SuDS)	Using sustainable drainage techniques and managing surface water run-off from buildings and hardstanding areas in a way that reduces the total volume, flow and rate of surface water that runs directly into drains and sewers.
Sustainable Sourcing	Sustainable sourcing, or 'responsible sourcing' as it is also commonly known, addresses a range of issues, including but not limited to material traceability, health and safety, and environmental management through the supply chain; energy, resource and water use, greenhouse gas emissions, and ecotoxicity. Responsible sourcing is described in standard BES 60012[107]. (GLA Circular Economy Statement Guidance, Consultation Draft, October 202).
Tidal Breach flood levels	The potential flood levels which could occur as a result of a breach of the tidal defences. The breach modelling data was produced by the EA in 2017 and carried out by Atkins. Information for the Borough can be accessed

[106] https://ecologytraining.co.uk/2019/04/28/what-is-a-preliminary-ecological-appraisal-pea/
[107] https://www.bsigroup.com/en-GB/bes-6001-responsible-sourcing-of-construction-products/

	here[108] (please choose the flood risk – breach level no bedroom accommodation – tab).
Thermal bridging	Occurs where there is a direct connection between the inside and outside through one or more building elements which are more thermally conductive than the rest of the building envelope, resulting in heat loss outwards.
The Government's Building Services Compliance Guides	Guidance on complying with Building Regulations for refurbishments.
Unregulated carbon emissions	These result from processes that are not covered by building regulations, i.e. ICT equipment, lifts, refrigeration systems, cooking equipment and other 'small power'.
Urban Greening Factor	This is a land-use planning tool to help determine the amount of greening required in new developments.
Whole Life-Cycle Carbon Approach	To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e. those associated with cooking and small appliances), its embodied emissions (i.e. those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal). (London Plan 2021)
Zero and net zero carbon	Zero carbon, requires no net release of carbon dioxide and other greenhouse gas emissions into the atmosphere. Net-zero carbon refers to balancing the amount of emitted greenhouse gases with the equivalent emissions with no reliance on fossil fuels, using on-site renewable or offsetting elsewhere as a last resort.

[108] https://lbhf.maps.arcgis.com/apps/webappviewer/index.html?id=931fa3b3294b4147a518648579b12d4a

Appendix 1 – Further Policy Context

There are numerous policies within the London Plan 2021 that are relevant to this SPD and these are listed in full in the below table. The following policies are of particular relevance:

- **Policy D3 Optimising site capacity through the design-led approach** requires a design led approach that optimises the capacity of sites. This includes aims for high sustainability standards and takes into account the principles of the circular economy. Spaces and buildings should also maximise opportunities for urban greening to create attractive resilient places that can also help the management of surface water.
- **Policy G1 Green infrastructure,** states that development '*should incorporate appropriate elements of green infrastructure that are integrated into London's wider green infrastructure network.'*
- **Policy G5 Urban greening** requires '*Boroughs should develop an Urban Greening Factor (UGF) to identify the amount of urban greening required by new developments.'* The intention is that only major developments should be required to achieve a specified UGF, but the plan explains that the UGF may eventually be applied to smaller scaled development as Boroughs develop their own models.
- **Policy G6 Biodiversity and access to nature** requires development to be informed by the best ecological information and proposals should manage biodiversity impacts and secure net biodiversity gain.
- **Policy SI 1 Improving air quality,** requires that development '*not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*.'[109]
- **Policy SI 2 Minimising greenhouse gas emissions**, requires major development should be net zero-carbon. Specifically, the requirement is to achieve a minimum 35 per cent reduction in emissions on-site and at least 10 per cent (residential) or 15 per cent (non-residential) of the overall reduction achieved through energy efficiency measures, in-line with an Energy Hierarchy approach.
- **Policy SI 3 Energy infrastructure**, there is a focus on 'energy masterplanning' when planning for *"large scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development… and other opportunities"*. This primarily involves exploring opportunities for making use of existing heat sources and sharing heat between buildings (i.e. heat networks), but there is also a focus on

[109] Air Quality Standards Regulations 2010, or subsequent revisions thereof http://www.legislation.gov.uk/uksi/2010/1001/contents/made

renewable electricity generation, battery storage and support for demand-side response measures.

- **Policy SI 4 Managing Heat Risk**, this requires proposals to minimise internal heat gain and the impacts on the urban heat island through design, layout, orientation and materials in accordance with the following cooling hierarchy: 1) Reduce the amount of heat entering a building through orientation and other steps; 2) Minimise internal heat generation and heat within the building; 3) Provide ventilation – with a preference for passive ahead of mechanical; and then 4) Provide active cooling systems.
- **Policy SI 12 Flood risk management** requires that flood risk '*sources across London to be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.*' '*Proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed.'*
- **Policy SI 13 Sustainable drainage** aims for developments to '*achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible'*. Impermeable surfaces should also be resisted.
- **Policy SI 17 Protecting and enhancing London's waterways** supports river restoration and biodiversity improvements. The policy aims to '*facilitate river restoration, including opportunities to open culverts, naturalise river channels, protect and improve the foreshore, floodplain, riparian and adjacent terrestrial habitats, water quality as well as heritage value, would be supported*.'

Mayor's Environment Strategy (2018)

1.6 Identifies priorities including:

- Climate Change and Energy – London will be a zero carbon city by 2050, with energy efficient buildings, clean transport and clean energy;
- Adapting to Climate Change – London and Londoners will be resilient to severe weather and longer-term climate change impacts. This will include flooding, heat risk and drought;
- Green Infrastructure – London will be the world's first National Park City, where more than half of its area is green, where the natural environment is protected, and green infrastructure is managed to benefit all Londoners;
- Air Quality – London will have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities;
- Noise – Londoners' quality of life will be improved by reducing the number of people adversely affected by noise and promoting more quiet and tranquil spaces; and
- Waste – by 2026 no biodegradable or recyclable waste will be sent to landfill and by 2030 65 per cent of London's municipal waste will be recycled.

Local Plan 2019

1.7 The following suite of policies within the Council's adopted Local Plan 2019 are relevant to this SPD.

1.8 *An Engaging Public Realm* – recognises the benefit of open space is wider than pure aesthetics, it also provides a valuable recreational resource, and contributes to wildlife habitats and biodiversity and has benefits in minimising noise and air pollution.

- Policy CR5 Parks, Gardens, Open Spaces and Waterways requires development to protect, enhance and make the most of existing parks, gardens and open spaces, and require new high-quality outdoor spaces to be provided.
- Policy CR6 Trees and Landscapes protects existing trees and seeks the provision of new trees that complement existing or create new, high quality green areas which deliver amenity and biodiversity benefits.

1.9 *Renewing the Legacy* – seeks to ensure no diminution in the excellence we have inherited, but to pass to the next generation a Borough that is better than today.

- Policy CL2 Design Quality requires require development to be of the highest architectural and urban design quality, and specifically sustainable in the use of resources, including energy, in construction and operation.
- Policy CL3 Heritage Assets – Conservation Areas and Historic Spaces requires development to preserve and to take opportunities to enhance.
- Policy CL4 Heritage Assets – Listed Building, Scheduled Monuments and Archaeology requires all development and any works for alterations or extensions related to listed buildings, scheduled ancient monuments and Archaeological Priority Areas. This is particularly important when upgrading buildings for energy efficiency, the works need to be carried out in appropriate and sensitive manner.

1.10 *Respecting Environmental Limits* – The aim of these policies is to mitigate climate change.

- Policy CE1 requires development to make a significant contribution towards meeting the target of an 80 per cent carbon dioxide emissions reduction by 2050.
- Policy CE2 relating to flooding requires development to address and reduce flood risk and its impacts. This is through assessing flood risk and providing for Surface Water Run-off and Sustainable Drainage Systems (SuDS).
- Policy CE3 seeks to plan for the sustainable management of waste streams.

- Policy CE4 protects the biodiversity of the Borough's Sites of Nature Conservation Importance and requires opportunities to be taken to enhance and attract biodiversity.
- Policy CE5 controls the impact of development on air quality, including the consideration of pollution from vehicles, construction and the heating and cooling of buildings. Its required that developments are 'air quality neutral' and biomass combustion and combined heat and power technologies/CCHP are resisted.

Climate Change Declaration

1.11 In October 2019 the Council recognised climate change as one of the world's biggest challenges and joined other authorities in declaring a Climate Emergency. The Council aims as an organisation to be carbon neutral by 2030 leading by example to significantly reduce emissions. This will be achieved by:

- Upgrading energy efficiency in all Council-owned buildings
- Retrofitting the Council's housing stock to make homes energy efficient and making all new domestic developments net-zero carbon
- Investing in low emission, hybrid and electric vehicles for the Council's fleet, from bin lorries to housing and parks maintenance cars
- Encouraging staff to cycle and walk on their commute and between meetings
- Developing more community energy schemes

Air Quality and Climate Change Action Plan 2016 – 2021

1.12 The Council has decided to tackle the twin challenges of climate change and poor air quality together. Emissions of these air pollutants and greenhouses gases come from common sources such as vehicles, buildings, power generation and industry[110].

Environment Bill/Act 2020

1.13 The Environment Bill 2020[111] sets out how we plan to protect and improve the natural environment in the UK.

25 Year Environment Plan 2018

1.14 The 25 Year Environment Plan[112] sets out government action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species

[110] https://www.rbkc.gov.uk/sites/default/files/atoms/files/Air%20Quality%20and%20Climate%20Change%20Action%20Plan%202016%20-%202021.pdf
[111] https://www.gov.uk/government/publications/environment-bill-2020
[112] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first.

London Environment Strategy 2018

1.15 The London Environment Strategy[113] sets out an ambitious vision for improving London's environment for the benefit of all Londoners. The strategy provides a holistic plan for tackling the city's environmental challenges.

London Urban Forest Plan 2020

1.16 The London Urban Forest Plan[114] sets out the goals and priority actions needed to protect, manage and expand the capital's urban forest.

Topic	London Plan 2021 Policy	Local Plan Policy
Circular Economy	Policy D3 Optimising site capacity through the design-led approach Policy SI7 Reducing waste and supporting the circular economy	Policy CE1 Climate Change
Whole Life-cycle Approach	Policy SI8 Waste capacity and net waste self-sufficiency	Policy CE1 Climate Change
Energy efficiency (Be lean)	Policy SI2 Minimising greenhouse gas emissions	Policy CE1 Climate Change
Heat networks (Be clean)	Policy SI2 Minimising greenhouse gas emissions	Policy CE1 Climate Change
Renewable Energy (Be green)	Policy SI2 Minimising greenhouse gas emissions	Policy CE1 Climate Change
Retrofitting existing buildings	Policy D3 Optimising site capacity through the design-led approach Policy SI6 Digital connectivity infrastructure	Policy CL2 Design Quality Policy CL3 Heritage Assets – Conservation Areas and Historic Spaces Policy CL4 Heritage Assets – Listed Building, Scheduled Monuments and Archaeology
Air Quality	Policy G1 Green infrastructure Policy G7 Trees and woodlands Policy SI1 Improving air quality	Policy CE5 Air Quality

[113] https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf
[114] https://www.london.gov.uk/sites/default/files/londonurbanforestplan_final.pdf

	Policy SI2 Minimising greenhouse gas emissions Policy SI3 Energy infrastructure Policy SI4 Managing heat risk	
Urban Greening	Policy G1 Green infrastructure Policy G5 Urban greening Policy G7 Trees and woodlands Policy G8 Food growing Policy SI16 Waterways – use and enjoyment	Policy CR5 Parks, Gardens, Open Spaces and Waterways
Minimising flood risk	Policy G1 Green infrastructure Policy SI5 Water infrastructure Policy SI12 Flood risk management Policy SI17 Protecting and enhancing London's waterways	Policy CE2 Flooding
Biodiversity	Policy G1 Green infrastructure Policy G3 Metropolitan Open Land Policy G4 Open space Policy G6 Biodiversity and access to nature Policy G7 Trees and woodlands Policy SI13 Sustainable drainage Policy SI14 Waterways – strategic role Policy SI16 Waterways – use and enjoyment Policy SI17 Protecting and enhancing London's waterways	Policy CE4 Biodiversity Policy CR5 Parks, Gardens, Open Spaces and Waterways
Transport	Policy D3 Optimising site capacity through the design-led approach Policy SI6 Digital connectivity infrastructure Policy SI15 Water transport	Policy CT1 Improving alternatives to car use

Appendix 2 - Sources of information

Below is a list of resources containing further guidance and information:

- *'Energy Efficiency and Historic Buildings: How to Improve Energy Efficiency'* (2018). Available at: https://historicengland.org.uk/images-books/publications/eehb-how-to-improve-energy-efficiency/
- *'Energy Efficiency and Traditional Homes'* (2020). Available at: https://historicengland.org.uk/images-books/publications/energy-efficiency-and-traditional-homes-advice-note-14/
- 'Energy Efficiency and Historic Buildings - Application of Part L of the Building Regulations to historic and traditionally constructed buildings' (2017). Available at: https://historicengland.org.uk/images-books/publications/energy-efficiency-historic-buildings-ptl/
- Guidance on roof insulation: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/insulating-roofs-in-historic-buildings/
- Guidance on wall insulation: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/insulating-walls-in-historic-buildings/
- Guidance notes on windows and doors: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/windows-and-doors-in-historic-buildings/
- Guidance on floor insulation: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/insulating-floors-in-historic-buildings/
- Guidance on LZC technologies: https://historicengland.org.uk/advice/technical-advice/energy-efficiency-and-historic-buildings/low-and-zero-carbon-technologies/

- STBA, *'Planning Responsible Retrofit of Traditional Buildings'* (2015). Available at: https://historicengland.org.uk/images-books/publications/planning-responsible-retrofit-of-traditional-buildings/responsible-retrofit-trad-bldgs
- STBA, *'Responsible Retrofit Guidance Wheel'* (2014). Available at: http://responsible-retrofit.org/wheel/
- Westminster City Council, *'Retrofitting Historic Buildings for Sustainability'* (2013). Available at: https://www.westminster.gov.uk/retrofitting-historic-buildings
- GLA London Solar Opportunity Map: https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/london-solar-opportunity-map
- GLA London Heat Map: https://www.london.gov.uk/what-we-do/environment/energy/london-heat-map
- UK Green Building Council, *'Circular economy guidance for construction clients'* (2019). Available at: https://www.ukgbc.org/ukgbc-work/circular-economy-guidance-for-construction-clients-how-to-practically-apply-circular-economy-principles-at-the-project-brief-stage/

- GLA, *'Design for a Circular Economy'* (2019). Available at: https://www.london.gov.uk/sites/default/files/design_for_a_circular_economy_web.pdf