High Performance Buildings

MAYOR OF LONDON

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

Dimension #6
High Performance Buildings

[HPB]

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Introduction

As the name suggests, the aim of this Dimension is to make the environmental performance of our buildings exceptional.

Several areas of the lifecycle of a building are underrepresented in current policy and standard industry practice; this Dimension seeks to address this, at the same time as emphasising how we might holistically reduce carbon emissions as part of the fight against climate change. To reduce energy and water use, buildings might incorporate smart technologies and green energy generators.

Many of the indicators within this Dimension work together to ensure we achieve net zero carbon by 2030 – not just in terms of design intent, but in practice and operation. They also seek to minimise what can often be a large gap between the theoretical performance of a building and its performance in practice.

For us, a High Performance Building is one that:

- Allows us to achieve net zero carbon by 2030 at the latest;
- Is considerate of resources such as water and energy, and minimises waste;
- Promotes circular economy principles and the use of sustainable and responsible materials;
- · Adapts to future demands and where possible generates its own energy; and
- Is easy to operate and performs as designed, in ways that can be monitored in the long term.

These highly quantitative indicators provide us with a clear path to net-zero emissions and help ensure our buildings perform at the highest level in practice.

How to use this guidance

The TfL Sustainable Development Framework (SDF) is designed to be applied to any form of development, from small sites to large regeneration master plans and from housing projects to mixed-use and commercial schemes. The Framework's strength lies in its ability to highlight synergies that would ordinarily go unseen or opportunities that could otherwise be overlooked. It does this by providing the technical tools to measure and balance performance sustainably at every stage of delivery, and we recommend that the SDF be built into a development project as early as possible.

These technical guidance documents provide the detail that sits alongside the Sustainable Development Framework Handbook. Together, they create a freely available tool to be accessed and used by anyone building sustainably.

The technical documents are designed to help a project team calculate and manage individual indicators effectively, and include an explanation of how each indicator is calculated and how it can be used in parallel with the RIBA Stages of Work. The initial part of the guidance offers an overview of the particular Dimension, and is followed by detail on each indicator.

The initial part of this guidance is designed to be accessible to everyone involved in a development project. It offers an overview of the particular Dimension and detail on each indicator, setting out the essential elements you will want to know to understand how the indicator works, the ways in which it can add value to a project, and how it is calculated. The later sections are more technical with a step-by-step approach to implementing the SDF in practice.

As we consider the SDF to be a living document, we continue to test, balance and refine the Framework on our projects, and alongside best practice research and industry standards. Throughout a project's lifecycle therefore, performance data for relevant indicators in terms of targets, policy and process should be collected regularly, recorded and kept up-to-date.

The aim is to gain an understanding of the opportunities and constraints within a development site. By using the indicators to help identify a project's strengths and weaknesses, strategies, interventions and design tactics can be adjusted to deliver the best overall results. Adopting a holistic approach to the indicators will identify the cases where improving or reducing the performance of one indicator may affect the performance of another. By taking into account how indicators relate to each other, more can be made of the process to find efficiencies and balance, and to optimise projects.

Each indicator in the technical guidance document is presented in the same easy-to-follow format, under the following headings:

Introduction section

What is it?

A summary of what the indicator is and what it aims to achieve and measure, with some background information.

How does it add value?

A synopsis of the importance of the indicator and the benefits it brings to a project.

From the summary and synopsis, the reader should be able to understand the context of the indicator, and also describe why it is an important component of sustainable development.

Infographic overview

What type of project does the indicator apply to?

Each indicator is categorised according to whether it is to be used for residential, commercial and/or masterplan projects. There may also be a threshold of project size for applicability.

Who is responsible?

It is assumed that the development manager for the project is responsible overall, and this list outlines which professionals or consultants lead and/or support the delivery of the indicator.

RIBA stages

The RIBA Plan of Work organises the process of briefing, designing, constructing and operating building projects into stages from zero to seven. This illustration identifies when the indicator is relevant during a project's lifecycle, as well as the types of action that happen at each RIBA stage.

Connected UN Sustainable Development Goals

Identifies linkages between the SDF and the United Nations (UN) Sustainable Development Goals.

Connected SDF indicators

A useful list of other indicators that have a relationship with the indicator being described.

Methodology section

How is it calculated?

This section details the way in which each indicator can be calculated. It is often accompanied by an illustration, or a direct link to a relevant external methodology. This may be written in more technical language and is intended for the relevant project consultant to understand exactly what information is required by the indicator.

Scoring infographic

A summary of the metric type, its units, and the targets for Good and Leading Practice. Some indicators will have a pass/fail metric, in this instance a pass would be Leading Practice.

What is the process?

Following the eight RIBA Plan of Work stages, this part describes the key actions that need to take place, and who is best positioned to carry them out. This is accompanied by a summary of the documents and reports that support the work.

The SDF process assumes that a full planning application would be submitted at the end of RIBA Stage 2 and that tender would happen at the end of RIBA Stage 4.

Actions should be adjusted as needed for projects working to alternative programmes.

Additional information section

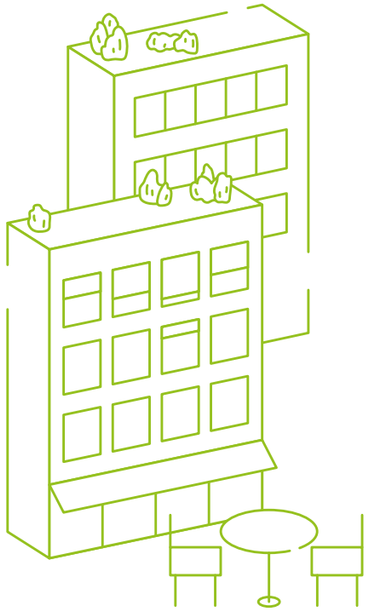
Relevant policy

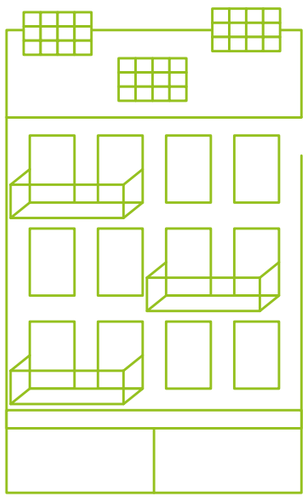
A summary of the key policies that relate to the indicator, and that have helped to shape it. This list is not exhaustive, but provides a useful background.

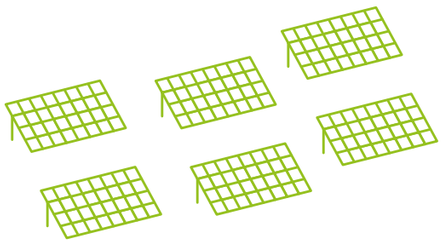
Further reading

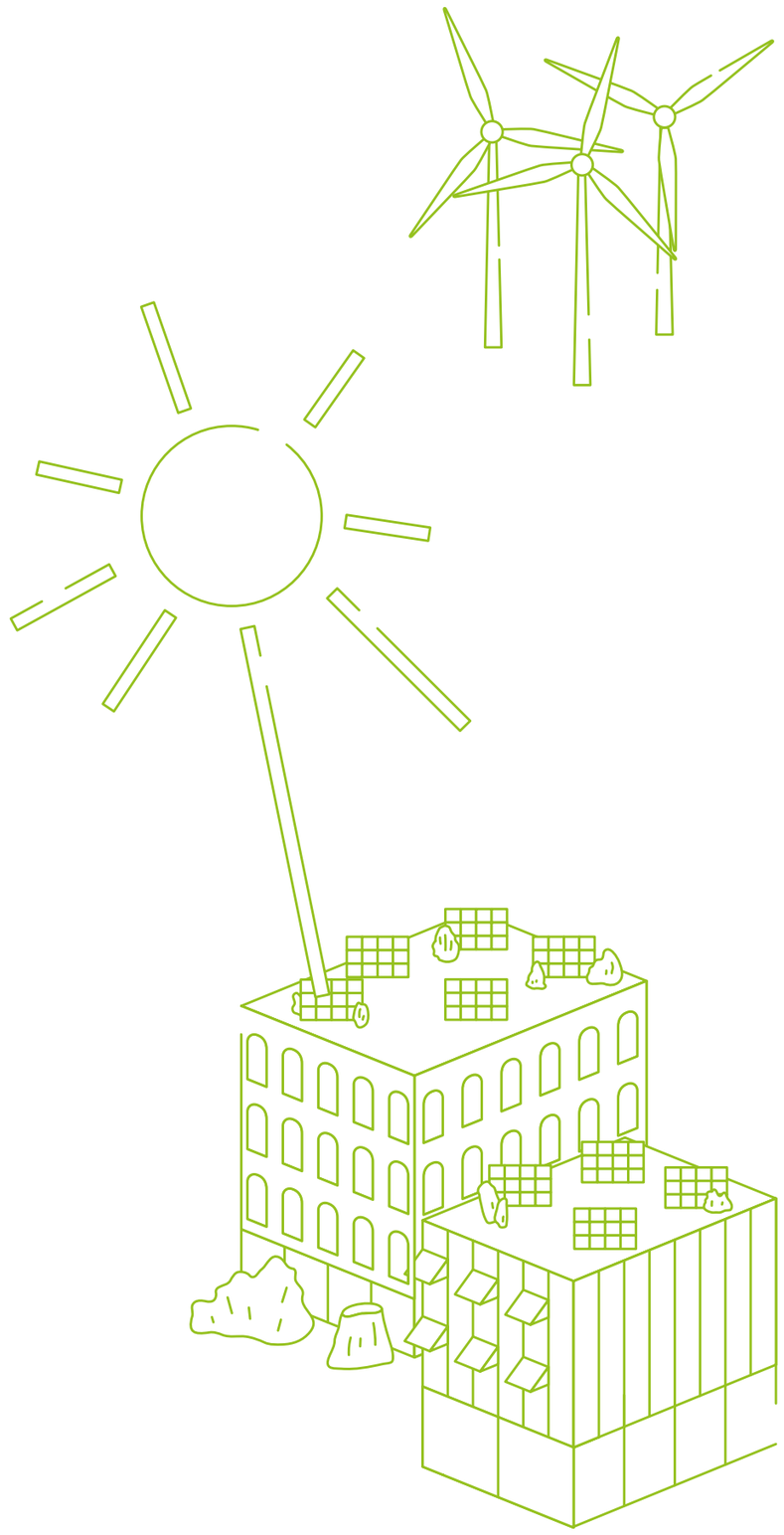
A list of additional sources of information on the indicator.

Indicators









ID no | Key Performance Indicator (KPI) name

HPB1 Embodied Carbon Intensity – Residential
HPB2 Embodied Carbon Intensity – Commercial

What is it?

Embodied carbon is the carbon dioxide produced in constructing buildings. This includes mining, manufacturing, transporting and installing materials.

In the UK, construction is responsible for 49 per cent of carbon emissions. We need to do all we can to lower the embodied carbon of our building projects.

We can do this by:

- Incorporating 'Lean Design' – focusing on reducing waste and maximising value helps improve quality and productivity at every stage.
- Designing for disassembly – materials need to be recycled efficiently when buildings reach the end of their lives, reused and recycled rather than going to landfill.
- Making our buildings flexible, so they can adapt to occupants' changing needs.
- Making reducing embodied carbon a priority when choosing materials and products.

Whole Life Carbon (WLC) emissions are the carbon emissions from the materials, construction and use of a building, including its demolition and disposal. WLC assesses a building's carbon impact on the environment.

How does it add value?

Reducing embodied carbon plays a huge role in helping to tackle climate change. We must reduce the greenhouse gases emitted in constructing buildings – embodied carbon – to help meet our climate targets.

Businesses and organisations are becoming increasingly aware of this need to prioritise sustainability. Many are now working towards, and achieving, net zero status. This means putting reducing carbon emissions at the heart of all design decisions.

The reason embodied carbon is so important is that it is estimated to contribute to around 40 per cent of a building's WLC.

Considering the world's population is approaching 10 billion and more housing is needed to accommodate this, the need to reduce carbon emissions has never been greater.

What type of project does the indicator apply to?

HBP1

- ☑ Residential
- ☐ Commercial
- ☑ Masterplan
- ☐ Industrial

HBP2

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Who is responsible?

Life Cycle Assessment (LCA) Specialist	●●●	leading
Development Manager	●●○	accountable
Engineer – Structural	●○○	supporting
Engineer – M&E	●○○	supporting
Architect	●○○	supporting

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Responsible Sourcing of materials
- ☑ Recycled Materials
- ☑ Carbon Emission Offsets
- ☑ Soils Protection

How is it calculated?

Embodied carbon intensity is calculated by finding the quantity of all materials needed for the building's life and multiplying this by the carbon factor (CO_2e per kilogram of product or material).

This takes into account the carbon emissions associated with the energy used to extract, manufacture, transport, assemble and construct all materials and products.

The Embodied Carbon Intensity targets include:

- Substructure
- Superstructure
- Mechanical, electrical and plumbing (MEP)
- Facade and internal finishes in Building Life Cycle Stages A1-A5.

To get an estimate of the quantities of materials and products used in the building project, you can use:

- a Building Information Model (BIM) – a process to create and manage across the construction project lifecycle; or
- a Bill of Quantities – a document, often produced by a quantity surveyor, that provides the quantities of products and materials needed for the project, based on the designs.

The RIBA stage you are at will affect that accuracy of your estimate. The earlier in the project this assessment is made, the better the results will be.

The estimate should cover the full RICS categories as specified in the GLA Whole Life Carbon Assessment (WLCA) guidance.

A Life Cycle Assessment (LCA) specialist calculates embodied carbon intensity. They should use an IMPACT compliant tool such as One Click LCA, eTool or ADW Developments.

The stages of the calculation process are:

1. Set targets according to the KPI benchmark confirming whether targets are Good or Leading Practice.
2. Estimate quantities of materials, products and processes in the building at two levels: overall building level and material product level.
3. Assess the environmental impact for each material/product.
4. Calculate the overall carbon footprint from all building materials and products. A consistent and solid baseline model is essential to calculate the reductions resulting from carbon reduction measures.

Metric type

#

Numerical

Units

kg CO_2e / m²

Embodied Carbon Intensity

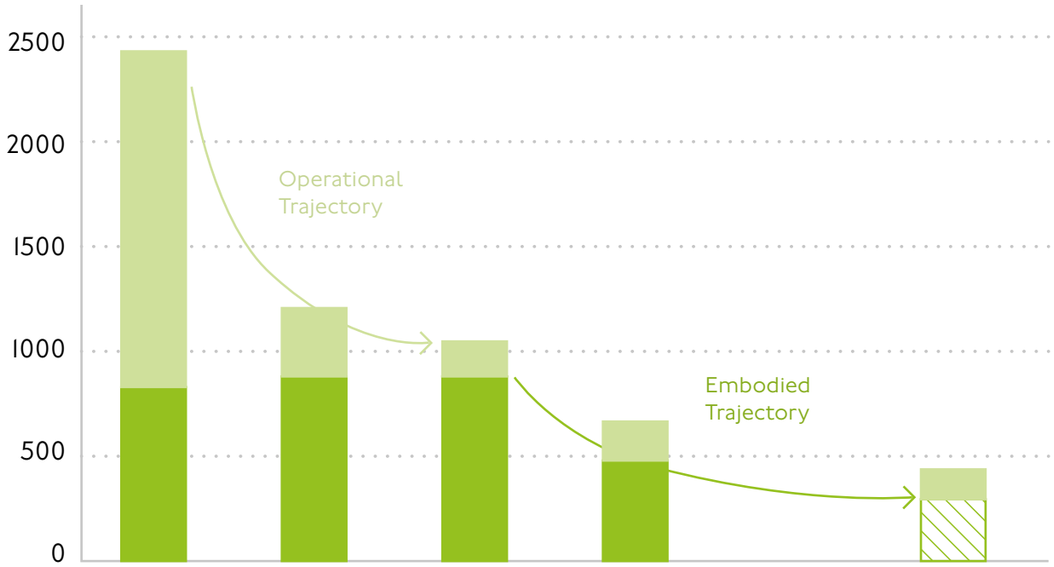
Range

HPB 1 – Residential

HPB 2 – Commercial

How is it calculated? (continued)

Operational and embodied carbon and trajectories



Operational Carbon Scenario	Current Building Regulations	Ultra-low energy with Gas boiler	Ultra-low energy with Heat Pump	Ultra-low energy with Heat Pump	Ultra-low energy with Heat Pump
Embodied Carbon Scenario	Not considered	Not considered	Not considered	Embodied Carbon Reductions	Future Embodied Benchmark
Total Split					

Currently Achievable

2030 Target

Project lifecycle showing scope of the definition and need for whole life consideration

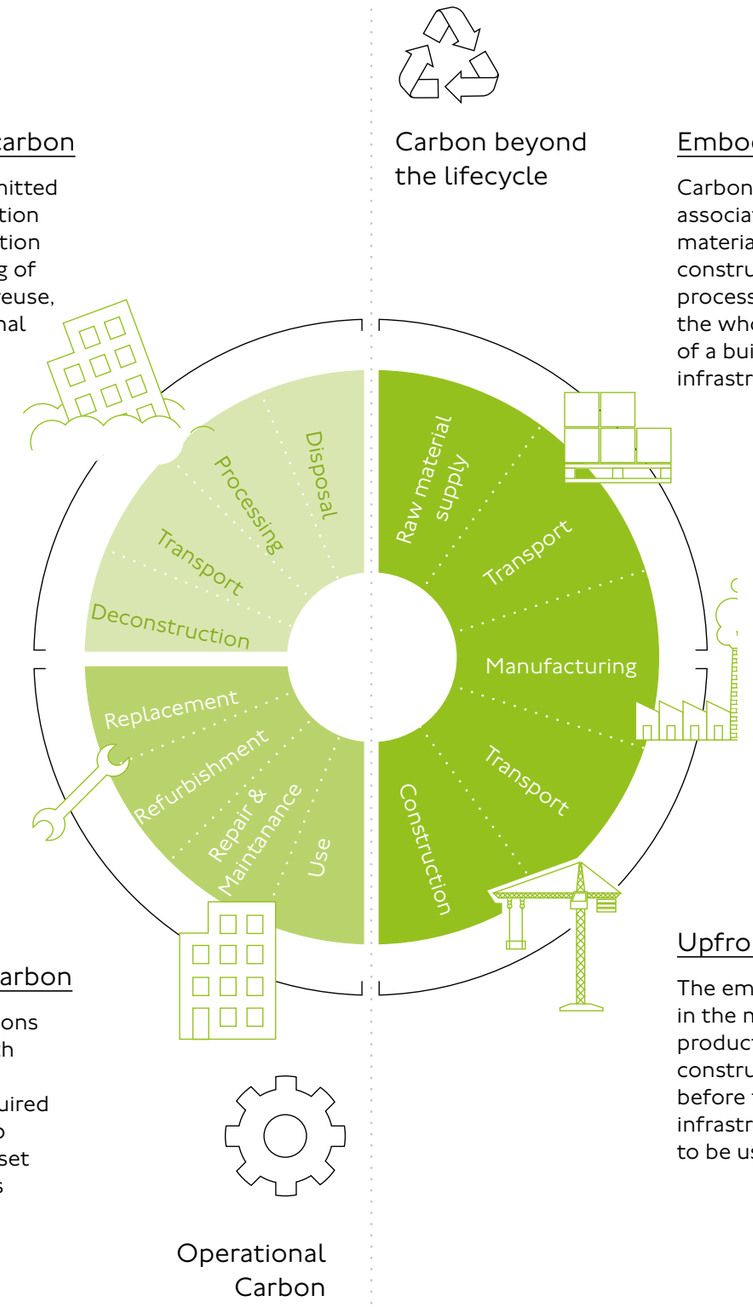
End of life carbon

The carbon emitted during demolition or deconstruction and processing of materials for reuse, recycling or final disposal

Carbon beyond the lifecycle

Embodied carbon

Carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure



Use stage embodied carbon

Carbon emissions associated with materials and processes required for the upkeep of the built asset throughout its lifecycle

Upfront carbon

The emissions caused in the materials production and construction phases, before the building or infrastructure begins to be used

Operational Carbon

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

LCA specialist

Set initial embodied carbon targets using rule of thumb guidance and benchmarks

Development manager

Agree the targets being set and include these in the brief

Appoint an LCA (life cycle assessment) specialist, who will be responsible for the whole life carbon assessment

RIBA Stage 2: Plan / Design

Engineer – structural

Be a part of initial discussions/ workshops and sharing early design structural layouts, for the LCA specialist to include in their calculations

Mechanical and electrical (M&E) engineer

Be a part of initial discussions/ workshops, informing the design team of the possible MEP system strategies. Some assumptions may have to be made at early design stages

Architect

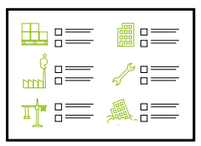
Analyse carbon reduction options for building elements using numerical analysis

LCA specialist

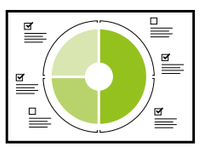
As the design develops, provide more detailed analysis of the options around the key building systems: frame, floors, envelope. This is discussed with the design team through workshops

Action

Documentation



Targets in project brief (development manager)



Planning Stage Whole Life-Cycle Carbon Assessment (LCA Specialist)

Documentation

What is the process? (continued)

Action

RIBA Stage 3: Plan / Design

Architect

Include requirements and targets for whole life carbon in specifications and tender documents at the start of the procurement process

Have discussions with the potential contractors around whole life carbon targets. Include carbon questions on tender return forms

Continue numerical analysis and use material guides to specify the best materials for the project

Engineer – structural

Confirm the updated structural design and circulate the latest structural layouts

Engineer – M&E

Confirm the system design strategy

LCA specialist

Carry out in-depth analysis of the elemental and component parts of the entire building. This includes identifying specific materials, products and lifespans, to generate a baseline

Assess low carbon alternatives to the baseline. Agree a carbon reduction target – either a percentage or absolute

RIBA Stage 4: Specify

Architect

Finalise requirements and targets for whole life carbon in specifications and tender documentation at start of the procurement process

Finalise requirements with the potential contractors and subcontractors around whole life carbon targets, asking for options for improvement and including carbon questions on tender return forms

LCA specialist

Update the whole life carbon budget to include design development and finalise the carbon reduction options list, to define the final specifications

Send pre-procurement request for information (RFI) forms to suppliers to collect carbon data, to provide information for supplier selection. Review returned RFIs and analyse the environmental credentials

RIBA Stage 5: Deliver

Architect

Work with contractors to reduce waste. Review alternative products and materials selections proposed by the contractor against technical and performance standards and against the whole life carbon requirements

LCA specialist

Send RFIs to suppliers, which will provide construction carbon data and verify the environmental credentials

Carry out building site monitoring through monthly site logs and construction progress reporting

Action

Documentation

Pre-procurement RFIs (LCA specialist)

RFIs to suppliers (LCA specialist)

Construction materials logs (contractor)

Documentation

What is the process? (continued)

Action

RIBA Stage 6: Deliver

Architect

Carry out post-completion analysis using ‘as-built’ information to assess upfront embodied carbon

LCA specialist

At the end of site works, the contractor should confirm the final carbon-related data to the LCA specialist

Develop the practical completion carbon report

Align the design stage carbon targets with what was achieved at the end of construction

RIBA Stage 7: Monitor

Architect

Offer recommendations regarding an embodied carbon reduction strategy for the in-use stage. This should be followed throughout the building life cycle, including at the end of its life

LCA specialist

Ensure embodied carbon reduction strategy is included in-use and end of life stages

Documentation

Post construction whole life cycle carbon assessment and report (LCA specialist)

Relevant policy

The London Plan, SI 2 minimising greenhouse gas emissions

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

LETI Embodied Carbon Primer, 2.2 Embodied Carbon

The embodied carbon emissions need to be considered within national and regional carbon budgeting. This means the carbon emissions themselves need to be reduced which is why LETI has set embodied carbon targets for the upfront embodied carbon emissions (Building Life Cycle Stage A1-A5). In addition, the material resources used need to be kept in the circular economy. This means the building re-uses materials and products from demolished buildings, and is designed for disassembly, so that materials and products within the building can be re-used in future buildings.

GLA, Whole Life Cycle Carbon Assessments Guidance, 1.2.1

WLC emissions are those carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal. They capture a building's operational carbon emissions from both regulated 1 and unregulated 2 energy use, as well as its embodied carbon emissions, ie those associated with raw material extraction, manufacture and transport of building materials, construction and the emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal. A WLC assessment also includes an assessment of the potential carbon emissions 'benefits' from the reuse or recycling of components after the end of a building's useful life. It provides a true picture of a building's carbon impact on the environment.

Further reading

The London Plan
LETI, embodied carbon primer
GLA, Whole life Cycle Carbon Assessments Guidance

ID no

HPB 3

Key Performance Indicator (KPI) name

Embodied Carbon Offset

What is it?

Carbon offsetting is a way of compensating for carbon dioxide emissions arising from one activity by participating in schemes designed to make equivalent reductions elsewhere. As a result, offsetting offers a solution to capturing residual carbon from building developments.

Carbon offsetting falls into two categories, voluntary and compliance. Compliance offsets are used by governments, local planning authorities and other organisations to legally comply with emissions reduction, while voluntary offsets are used by individuals and businesses at their own discretion.

Voluntary offsetting is a fast-growing market and not governed by national or international regulation but manged by private and third-party organisations. There are hundreds of projects worldwide for a developer or building owner to choose from once the offset provider is verified and the effectiveness of a project established. These range from tree planting and peat preservation to clean energy generation.

How does it add value?

To eliminate residual emissions, voluntary carbon offsetting allows a developer or owner to pay someone, somewhere else to save the equivalent emissions. This emission saving is known as a carbon offset credit.

Each credit is a certified transferable instrument representing an emissions reduction of one metric tonne of CO_2 or equivalent amount of other greenhouse gases (GHGs). For the purchaser to claim the related reduction towards their reporting goals, the offset credits must be 'retired' in a registry. This way, only the purchaser of the carbon credit can claim to have reduced emissions.

As the voluntary offset market grows, to avoid 'greenwashing' and ensure offset projects are verified, the UK offers three main crediting mechanisms: Gold Standard (VGS), The Verified Carbon Standard (VCS) and the UN Clean Development Mechanism (CDM). Investing in offset projects around the world, be they nature or technology based, also creates important co-benefits improving the social, health and wellbeing of local communities.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Asset Manager	●○○	accountable
LCA Specialist	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Optimise	Optimise	Specify	Deliver	Deliver	Deliver

Connected UN Sustainable Development Goals

7 Affordable and Clean Energy
12 Responsible Consumption and Production
13 Climate Action

Connected SDF indicators

- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Green Energy
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Regulated Emissions Offset – Operational Net Zero
- ☑ Green Energy

How is it calculated?

The metric for this indicator is the percentage of residual embodied carbon from a development that needs to be removed through carbon offsetting. ‘Regulated Emissions Offset – Operational Net Zero’ KPI addresses the offset of operational carbon emissions.

To assess upfront embodied carbon developers should engage a life cycle assessment (LCA) specialist to carry out post completion analysis using as-built information. The results of this analysis will provide the quantity of upfront embodied carbon emissions that need to be offset.

Identified emissions should be removed by carbon offsets made through carbon credit purchases. The credits should be reported and publicly disclosed, along with information about the quality of the offset.

Energy Assessment Tool Matrix

Calculation	Emission type	Objective
Building Regulations Methodology	Regulated Carbon	To meet 100% reduction targets
Predictive Energy Modelling / Metered Energy Use	Operational Carbon	To achieve operational net zero
Life Cycle Assessment (LCA) Calculation	Embodied Carbon	To achieve whole life net zero

Metric type

%

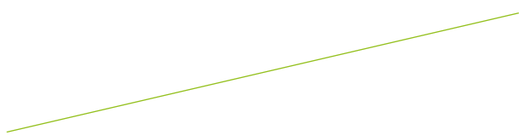
Percentage

Units

%

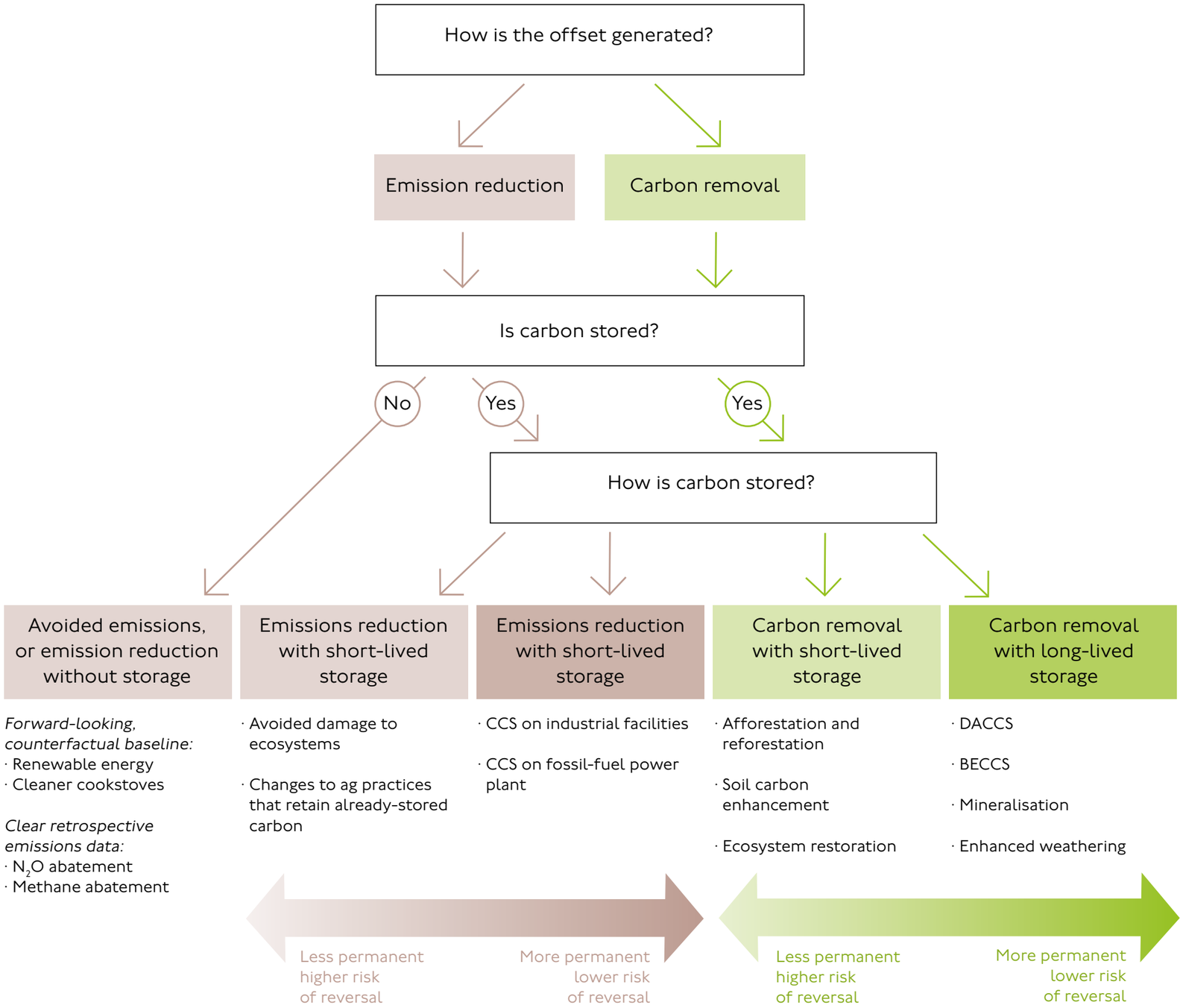
Percentage of of remaining emissions offset

Range



How is it calculated? (continued)

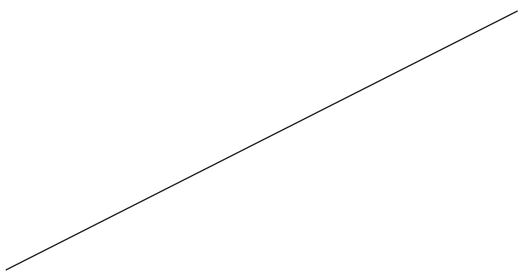
Figure 14: Taxonomy of carbon offset credits; reproduced from the Oxford Principles for Net Zero Aligned Carbon



What is the process?

Action

RIBA Stage 0



RIBA Stage 1: Optimise

Development manager

Set ambition for carbon offsetting in the brief

Sustainability engineer

Review policies, targets and mechanisms regarding carbon offsetting

RIBA Stage 2: Optimise

Sustainability engineer

Track estimated energy use intensity (EUI), upfront embodied carbon, onsite renewable energy, and off-site renewable energy procurement, to gauge carbon emissions to be offset

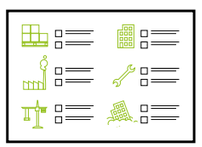
RIBA Stage 3: Optimise

Sustainability engineer

Track estimated EUI, upfront embodied carbon, onsite renewable energy, and off-site renewable energy procurement, to gauge carbon emissions to be offset

Action

Documentation



Targets in project brief (development manager)

Referenced in: Planning stage whole life-cycle carbon assessment (LCA specialist)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Sustainability engineer

Track estimated EUI, upfront embodied carbon, onsite renewable energy, and off-site renewable energy procurement, to gauge carbon emissions to be offset

Development manager

Finalise requirements and targets for carbon offsetting, and engage with voluntary market to identify offsetting options

RIBA Stage 5: Deliver

LCA specialist

Liaise with contractor for monthly site logs and construction progress reporting

RIBA Stage 6: Deliver

LCA specialist

At the end of site works, confirm as-built information with contractor to assess and determine upfront embodied carbon emissions to be offset

Asset manager

Establish contracts for carbon offset credits

RIBA Stage 7: Deliver

Property manager

Track and monitor operational energy not met through renewables to be offset

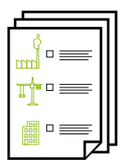
Track and monitor in-use embodied carbon emissions from repair and maintenance

Asset manager

Maintain contracts and registry entry for carbon offset credits

Action

Documentation



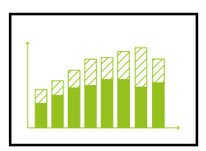
Requests for information (RFIs) to voluntary offset organisations (asset manager)

Contracts for carbon offset credits (asset manager)

Referenced in: Post construction whole life-cycle carbon assessment and report (LCA specialist)

Ongoing contracts and registry entry for carbon offset credits (asset manager)

Referenced in: Annual building performance audit and report (building manager)



Corporate sustainability and GHG emissions report (asset manager)

Documentation

Relevant policy

GLA The London Plan 2020 Policy SI 2

Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved onsite, any shortfall should be provided …

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.

GLA The London Plan 2020 Policy SI 2

Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

Further reading

Renewable Energy Procurement & Carbon Offsetting, Draft guidance – for Industry Consultation, UKGBC 2020

Carbon Offset Funds, GLA 2018

The Carbon Trust three stage approach to developing a robust offsetting strategy, Carbon Trust 2006

The Oxford Principles for Net Zero Aligned Carbon Offsetting, University of Oxford 2020

ID no

HPB 4

Key Performance Indicator (KPI) name

Reused and Recycled Materials

What is it?

Recycled materials are new products that have been created by reprocessing or remanufacturing waste materials.

They include:

- recycled plastic, glass and steel
- all materials from other building sites to be reused, such as wood, insulation, bricks and building blocks
- recycled aggregates made from demolition materials

Sustainable development is increasingly becoming a priority; buildings not only have to look good, they must be as environmentally friendly as possible too. Natural resources are limited and when you consider the energy that goes into extracting new materials, using recycled and reused products in construction projects is vital. It also demonstrates an environmentally responsible approach to developing and building.

Whole Life Carbon (WLC) assesses a building's carbon impact on the environment.

This is an emerging KPI which will be monitored over the next 12 months while more project data is gathered to adjust benchmarks accordingly

How does it add value?

Given that the construction sector is the largest consumer of materials in the UK, and the largest producer of waste, using recycled materials makes a huge contribution to reducing its environmental impacts.

It helps reduce carbon emissions and the amount of waste going to landfill, saves energy and keeps global warming to a minimum. It also conserves our limited natural resources.

Incorporating sustainable practices in projects, such as using a percentage of reused and recycled materials and sending as little to landfill as possible, brings a range of other benefits too. This can include costs savings, tax incentives and even grants.

These materials can also give buildings a unique look, are often low maintenance and more likely to be able to be repurposed or recycled when a building reaches the end of its life.

And with so many varieties of beautiful and innovative materials out there, it's not hard to switch.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Architect	●○○	supporting
Engineer – Structural	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Responsible Sourcing of Materials
- ☑ Responsible Construction Practices
- ☑ Construction Waste
- ☑ Soils Protection

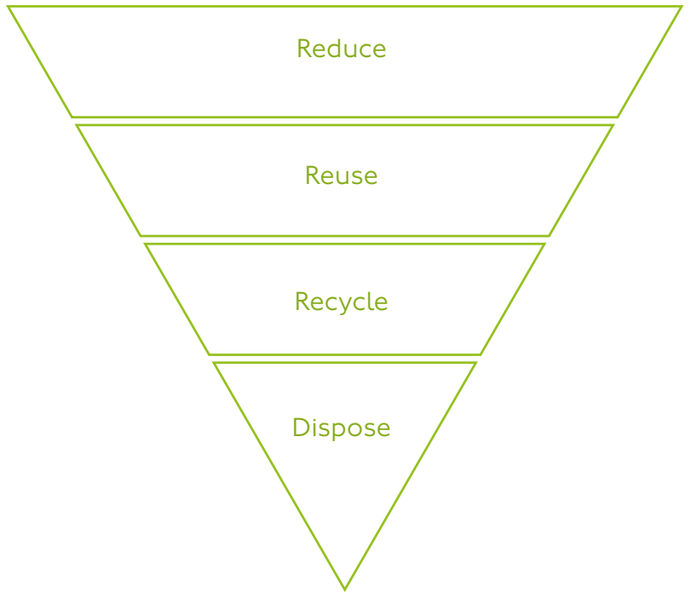
How is it calculated?

This KPI assesses the percentage of construction materials that have been reused and/or recycled within a project. It separates these from the ones that are being newly extracted and manufactured.

We're following the guidance for reused and recycled materials set out by leading sustainability charity WRAP, and using its Excel calculation template.

Architects and sustainability engineers should consider reused and recycled materials at the design stage. At this stage, a sustainability consultant should be appointed to identify the 10 highest priced items in a project. These should be based on the highest value from the cost plan, and the recycled content calculated, by value, of the specified materials. They can use industry-wide average recycled content values – generic environmental product declarations (EPD) are a good source of information.

The sustainability consultant should report this information in the circular economy statement, to support the planning application, and provide an update during RIBA Stage 6.



Metric type

%

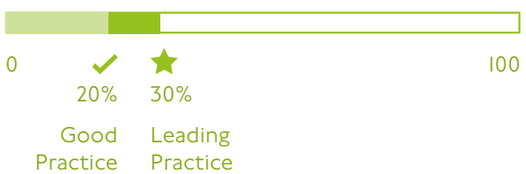
Percentage

Units

%

Materials percentage reused and recycled content, by value

Range



How is it calculated? (continued)

How is the reused and recycled content of a building measured by value?

Reused and recycled content by value is a function of the material value of a component, the quantity used and the percentage of the component by mass that is derived from recycled content. Thus, if a material costs £100 per m^2 and has 20 per cent reused and recycled content by mass, the reused and recycled content by value of 10 m^2 would be:

£100 (per m^2) × 10 (m^2) × 20% = £200

By summing up the reused and recycled content by value of all the components in a building and dividing this by the total material value of all the components in the building, it is possible to estimate the total percentage of reused and recycled content by value for the building.

Example of how recycled content is calculated for a building

Component	Quantity	Material rate (exluding labour)	Material value	Recycled content by mass	Reused content by mass	Recycled content by value	Reused content by value
Bricks	2,000	£250 / 1000	£500		15%		£75
Dense blocks	50 m^2	£8 / m^2	£400	50%		£200	
Plasterboard	50 m^2	£2 / m^2	£100	80%		£80	
Insulation	20 m^2	£10 / m^2	£200	80%		£160	
Type 1 fill [1]	100 m^3	£10 / m^3	£1,000	100%		£1000	
Other items			£2,000	0%		£0	
Total (£)			£4,200			£1,515	
Total (%)				36% (£1,515 / £4,200)			

1 In this example the Type 1 fill used in the project is from reused demolition waste; it is therefore considered to be 100% 'recycled' and its cost is taken as being equal to the purchase price of an equivalent quantity of the produce from the open market.

(Units and prices are purely illustrative)

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Development manager

Set initial reused and recycled material targets as the brief is being developed

Sustainability engineer

Review the policies and targets needed for the agreed percentage of reused and recycled materials to be used

RIBA Stage 2: Plan / Design

Sustainability engineer

Agree targets for the percentage of reused and recycled materials to be used with the architects and design team

Identify the top 10 big-ticket items, based on highest value in the cost plan

Then calculate the percentage of reused and recycled content based on average reused and recycled content as widely available in the market. Generic EPDs are a good data source

RIBA Stage 3: Plan / Design

Architect

Discuss reused and recycled material targets with the potential contractors

Contractor

Aim for contractors to be involved by Design Stage 3

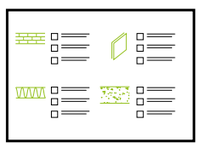
All contractor tender documents should include the reused and recycled content targets being considered and a plan on how to help achieve this

Structural engineer

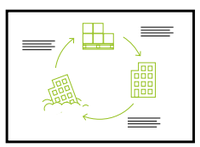
Review recommendations, and advise on structural implications and material selection

Action

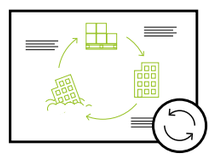
Documentation



Targets in project brief (development manager)



Detailed circular economy statement, pre-application stage (sustainability engineer)



Detailed circular economy statement, planning application stage (sustainability engineer)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Finalise requirements and targets for reused and recycled materials in specifications and tender documents at the start of procurement

RIBA Stage 5: Deliver

Contractor

Specify relevant reused and recycled materials to achieve targets set in initial brief

Monitor and report updated bill of quantities during construction

Architect

Work with contractors to monitor the amount of reused and recycled materials being used in the project

RIBA Stage 6: Deliver

Contractor

At the end of site works, confirm the final percentage of r reused and ecycled materials being used in the building construction

Sustainability engineer

Update and recalculate the percentage of reused and recycled content in the building materials based on forecast figures. This should be reported in the post-completion circular economy statement

RIBA Stage 7: Monitor

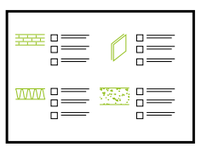
Property manager

Track and monitor all reused and recycled materials being used for future maintenance and replacement

Make sure that any new material for replacement has the same, or more, reused and recycled content than the material being replaced

Action

Documentation



Requirements in tender documents (development manager)

Post-construction circular economy statement (sustainability engineer)

Operations and maintenance (O&M) manual (building manager)

Documentation

Relevant policy

WRAP – Setting a requirement for recycled content in building projects

While the 10% benchmark could be considered modest … levels exceeding 15–20% are common.

GLA Whole Life-Cycle Carbon Assessments Guidance

Identifying the carbon benefits of using recycled material and the benefits of designing for future reuse and recycling to reduce waste and support the circular economy.

GLA New London Plan

… meet or exceed the targets for each of the following waste and material streams: construction and demolition – 95% reuse/recycling/recovery

Tower Hamlets Local Plan 303I: Policy D.SG4

Development is required to employ the highest standard of sustainable construction including … the use of sustainably sourced materials …

Further reading

Ellen MacArthur Foundation, Circular Economy

Circular Economy in the Construction Industry

ID no

HPB 5

Key Performance Indicator (KPI) name

Responsible Sourcing of Materials – Residential

What is it?

Sourcing materials responsibly is about understanding where the products and services we use in construction come from, and what their environmental impact is. It means checking that suppliers are working in a way that's sustainable, environmentally friendly, and socially and economically responsible. Having this information means you can choose products where sustainable development principles have been followed across the supply chain, including extraction, processing and manufacture.

It's also about taking into account how materials can be reused, recycled or disposed of when they reach they end of their life.

Responsible sourcing should feature in every element of a construction project.

How does it add value?

The construction industry is one of the main users of the world's natural resources – from the building materials we use, to the carbon emissions released during projects and the energy consumed by our homes. So we need to do all we can to help conserve our natural resources and protect the environment.

Responsible sourcing helps to address social and economic inequalities too, such as creating work for local suppliers and buying fair trade materials.

The benefits of using responsibly sourced materials are:

- To promote economically, socially and environmentally responsible practices in the supply chain and manufacturing processes of construction, and reduce their environmental impacts
- To encourage using credible and comparable schemes to evaluate responsible sourcing decisions
- To help manufacturers and developers show that they're managing their business fairly and ethically
- To help residents understand the environmental, economic, and social issues in the construction products used in their homes

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☑ Masterplan
- ☐ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
HQM Assessor	●○○	supporting
Architect	●○○	supporting
Engineer – Sustainability	●○○	supporting
Quantity Surveyor / Cost Consultant	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Responsible Construction Practices
- ☑ Recycled Materials
- ☑ Construction Impacts on Ecology

How is it calculated?

We will follow the criteria set out by HQM 6.1 for Responsible Sourcing of Materials. See: Home Quality Mark ONE England (page 127 of 256).

Legally harvested and traded timber (prerequisite)

It's important to make sure that all timber and timber-based products used meet the HQM definition of legally harvested and traded timber.

Product procurement policy (two credits)

By the end of the early design stage (typically RIBA Stage 2 or equivalent), the client or developer must have a documented policy and procedure that:

- Sets out the procurement requirements for all suppliers and trades to follow that relates to sourcing construction products responsibly
- Makes sure that these requirements are communicated to all relevant internal and external people involved in the project
- Requirements are included in the construction contract to make sure that they're enforceable when assessing the project
- Encourage specifying products with responsible sourcing certification instead of similar products without certification

It's recommended that the procurement policy follows the principles of BS 8900-1:2013 or BS ISO 20400:2017.

Responsible sourcing of construction products assessment (23 credits)

The rest of the credits are awarded at a building level for the use of materials that have been covered by the environmental management system (EMS) or a responsible sourcing certification scheme (RSCS) recognised by BREEAM.

The number of credits is calculated using the tool used by HQM assessors. The information needed includes:

- Quantities of materials used
- Location of the materials
- Quantities of materials assessed to recognised schemes (EMS or RSCS) – see table (ref. GN18) for the summary score level associated with BREEAM-recognised EMS or RSCS.

Metric type

Numerical

Units

Number of credits HQM 6.1

Range

13 credits

Good Practice (must achieve 2 credits under Criteria 02 and 11 credits under Criteria 03)

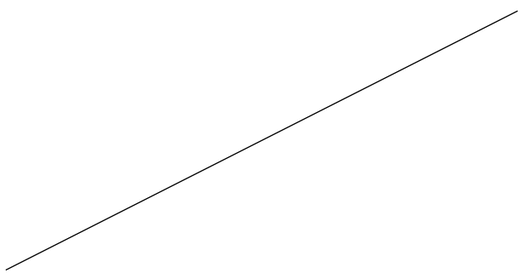
25 credits

Leading Practice

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

<u>All disciplines</u>

All disciplines to agree and sign a procurement policy document

<u>Development manager</u>

Highlight in the brief an intention to specify materials that are responsibly and sustainably sourced

Appoint sustainability engineers to oversee all sustainable targets, including choosing materials

RIBA Stage 2: Plan / Design

<u>Sustainability engineer</u>

Put together a sustainability statement, which includes only responsibly sourced materials

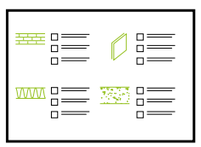
RIBA Stage 3: Plan / Design

<u>Architect</u>

Make sure all materials specified have a responsible and ethical source

Action

Documentation



Product procurement policy (all disciplines)

Targets in project brief (development manager)

Sustainability statement (sustainability engineer)

HQM pre-assessment report (optional) (HQM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Make sure all materials specified in the tender have a responsible and ethical source and set responsible sourcing requirements within tender documentation

HQM assessor

Collect the evidence required for the HQM interim (design stage) assessment

RIBA Stage 5: Deliver

Contractor

Only use materials from suppliers that source their products responsibly

Architect

Engage with contractors to monitor the use and sourcing of materials

RIBA Stage 6: Deliver

HQM assessor

Collect evidence for the HQM final (post construction) assessment for certification, including RSCS or EMS certificates

Get the certification scheme point score

Complete the HQM responsible sourcing of construction products tool

RIBA Stage 7: Monitor

Property manager

Make sure all new materials used for replacement and maintenance are responsibly sourced and monitored

Action

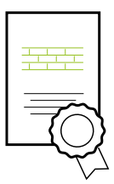
Documentation

Completed copy of HQM materials tool (HQM assessor)

HQM interim (design stage) assessment for certification (HQM assessor)

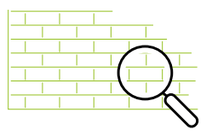
Responsible sourcing and environmental management system (EMS) certificates (contractor)

Tender documents setting responsible sourcing requirements inc. Employers Requirements



Responsible sourcing and EMS certificates (contractor)

Completed copy of HQM materials tool (HQM assessor)



HQM final (post construction) assessment for certification (HQM assessor)

Documentation

Relevant policy

BES 6001 The Framework Standard for Responsible Sourcing

Responsible sourcing involves the promotion and support of broader-scale adoption of responsible practices throughout the supply chain. The organisation shall have a written policy appropriate to the purpose and activities of the organisation … An independent responsible sourcing policy is not necessary, if principles are covered in existing policies eg, sustainability policy

Merton Local Plan – Climate Change Poly CC8.14

To minimise the environmental impact of materials by specifying sustainably sourced, low impact and re-used or recycled materials; this should include identifying opportunities for the retention and reuse of existing materials on site (eg, re-using demolition material on site). Materials should be locally sourced wherever possible to minimise transport emissions.

Tower Hamlets Local Plan 2031 – Policy D.SG 4

Development is required to employ … Sustainable construction methods, such as the use of sustainably sourced and recycled materials …

British Land Material Schedule

Project teams working for British Land are required to report on third party certification and transparent chain of custody – British Land Material Schedule

TfL Sustainable Timber Policy

Can be found here: TfL Sustainable Timber Policy

GLA Group Responsible Procurement Policy

Can be found here: GLA Group Responsible Procurement Policy

Further reading

World GBC Bringing Embodied Carbon Upfront – "Responsible Steel operating companies are committed to 12 principles for the responsible sourcing and production of steel"

ID no

HPB 6

Key Performance Indicator (KPI) name

Responsible Sourcing of Materials – Commercial

What is it?

Sourcing materials responsibly is about understanding where the products and services we use in construction come from, and what their environmental impact is. It's checking that suppliers are working in a way that's sustainable, environmentally friendly, and socially and economically responsible. Having this information means you can choose products where sustainable development principles have been followed across the supply chain, including extraction, processing and manufacture.

It's also about taking into account how materials can be re-used, recycled or disposed of when they reach the end of their life.

Responsible sourcing should feature in every element of a construction project.

How does it add value?

The construction industry is one of the main consumers of the world's natural resources – from the building materials we use, to the carbon emissions released during projects and the energy use in our buildings. So we need to do all we can to help conserve our natural resources and protect the environment.

Responsible sourcing helps to address social and economic inequalities too, such as creating work for local suppliers and buying fair trade materials.

The benefits of using responsibly sourced materials are:

- To promote economically, socially and environmentally responsible practices in the supply chain and manufacturing processes of construction, to reduce their environmental impacts
- To encourage using credible and comparable schemes to evaluate responsible sourcing decisions
- To help manufacturers and developers show that they're managing their business fairly and ethically
- To help occupants understand the environmental, economic, and social issues in the construction products used in the buildings they use

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
BREEAM Assessor	●○○	supporting
Architect	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Responsible Construction Practices
- ☑ Recycled Materials
- ☑ Construction Impacts on Ecology

How is it calculated?

We will follow the criteria set out by BREEAM Mat 03, Responsible Sourcing of Construction Products in commercial developments. See the BREEAM New Construction 2018 manual (page 239 of 403)

Legal and sustainable timber (prerequisite)

All timber and timber-based products must be 'legal' and 'sustainable' as per the UK Government's Timber Procurement Policy.

Enabling sustainable procurement (two credit)

The design team must use a sustainable procurement plan to guide specification towards sustainable construction products. To achieve this credit, the plan must meet the requirements set out in the BREEAM NC 2018 Manual.

Measuring responsible sourcing (up to three credits)

An extra three credits can be achieved using the Mat 03 calculator tool. Credits are awarded in proportion to the scope of the assessment.

The credits are awarded where products used in the building have been certified using schemes listed in GN18.

The Mat 03 calculator tool should be used to assess how many credits can be achieved. Each construction product used in a different location/use category must be entered into the tool separately. Two routes can be followed; Route 1 is used when the quantity of the product has not been worked out, otherwise Route 2 should be used. Using a combination of the two routes is also possible, but only one route can be used per materials category. It's important to get any applicable responsible sourcing certification scheme (RSCS) or environmental management system (EMS) certificates.

Metric type

Points

Units

BREEAM Mat 03

Range

3 credits

Good Practice (Must achieve 1 credit for enabling sustainable procurement and 2 credits for measuring responsible sourcing)

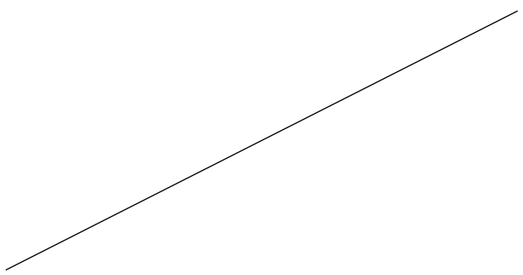
5 credits

Leading Practice (Includes exemplary credit)

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

<u>All disciplines</u>

All disciplines to agree and sign a procurement policy document

<u>Development manager</u>

Highlight in the brief an intention to specify materials that are responsibly and sustainably sourced

Appoint sustainability engineers to oversee all sustainable targets, including choosing materials

RIBA Stage 2: Plan / Design

<u>Sustainability engineer</u>

Put together a sustainability statement, which includes only responsibly sourced materials

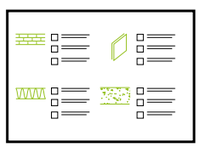
RIBA Stage 3: Plan / Design

<u>Architect</u>

Make sure all materials specified have a responsible and ethical source

Action

Documentation



Product procurement policy (all disciplines)

Targets in project brief (development manager)

Sustainability statement (sustainability engineer)

BREEAM pre-assessment report (optional) (BREEAM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Make sure all materials specified in the tender have a responsible and ethical source and set responsible sourcing requirements within tender documentation

BREEAM assessor

Collect the evidence to complete the BREEAM interim assessment. This includes any available EMS and RSCS certificates, and the information needed for the Mat 03 calculator

RIBA Stage 5: Deliver

Contractor

Only use materials from suppliers that source their products responsibly

Architect

Engage with contractors to monitor the use and sourcing of materials

RIBA Stage 6: Deliver

BREEAM assessor

Collect evidence for BREEAM final (post construction) assessment for certification, including all RSCS or EMS certificates

Compare the certification with BREEAM Guidance Note 18 (GN18):BREEAM Recognised Responsible Sourcing Certification (available to assessors through BREEAM projects)

Get the certification scheme point score

Complete and include the credit result produced by the BREEAM UK Mat 03 tool in the submission to BRE

RIBA Stage 7: Monitor

Property manager

Make sure all new materials used for replacement and maintenance are responsibly sourced and monitored

Action

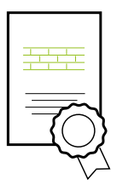
Documentation

Completed copy of HQM materials tool (HQM assessor)

HQM interim (design stage) assessment for certification (HQM assessor)

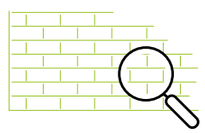
Responsible sourcing and environmental management system (EMS) certificates (contractor)

Tender documents setting responsible sourcing requirements inc. Employers Requirements



Responsible sourcing and EMS certificates (contractor)

Completed copy of the Mat 03 calculator (BREEAM assessor)



BREEAM final (post construction) assessment for certification (BREEAM assessor)

Documentation

Relevant policy

BES 6001 The Framework Standard for Responsible Sourcing

Responsible sourcing involves the promotion and support of broader-scale adoption of responsible practices throughout the supply chain. The organisation shall have a written policy appropriate to the purpose and activities of the organisation … An independent responsible sourcing policy is not necessary, if principles are covered in existing policies eg, sustainability policy

Merton Local Plan – Climate Change Poly CC8.14

To minimise the environmental impact of materials by specifying sustainably sourced, low impact and re-used or recycled materials; this should include identifying opportunities for the retention and reuse of existing materials on site (eg, re-using demolition material on site). Materials should be locally sourced wherever possible to minimise transport emissions.

Tower Hamlets Local Plan 2031 – Policy D.SG 4

Development is required to employ … Sustainable construction methods, such as the use of sustainably sourced and recycled materials …

Further reading

World GBC Bringing Embodied Carbon Upfront – "Responsible Steel operating companies are committed to 12 principles for the responsible sourcing and production of steel"

BREEAM UK New Construction 2018

ID no

Key Performance Indicator (KPI) name

HPB 7 Operational Energy Use – Residential
HPB 8 Operational Energy Use – Commercial

What is it?

Operational energy is the total amount of energy used to run lighting, heating, air-conditioning and ventilation in buildings.

We use an Energy Use Intensity (EUI) target rather than a percentage carbon emissions target to understand a building's performance. This is because an EUI more accurately predicts both energy and carbon emissions. Whereas energy modelling for Building Regulations calculations does not include the full amount of energy used, such as for hot water, washing machines and other appliances. Carbon factors are also often out of date in Building Regulation modelling.

EUI measures the total energy used in a building annually. This includes heating, hot water, cooling, ventilation and lighting systems, as well as energy from equipment, appliances and cooking.

EUI should be used to determine if a building is net zero as it's a much clearer measurement than percentage carbon reduction.

How does it add value?

The UK government has committed to achieving net zero emissions by 2050. Given that the construction industry is responsible for 49per cent of carbon emissions in the UK, it's generally agreed that to meet our climate change targets, all new buildings must operate at net zero carbon by 2030 and all buildings to achieve this by 2050.

The less energy we use in our buildings, the more we reduce operational carbon emissions. This makes it easier to achieve net zero-carbon.

Looking holistically at energy use in the design stages of a project means we can accurately predict how our buildings will perform.

Plus, EUI includes all the energy used in a building – this makes it possible to understand if a building can achieve net zero (rather than simply looking at reducing carbon, which only considers regulated energy).

.

What type of project does the indicator apply to?

HPB 7
- ☑ Residential
- ☐ Commercial
- ☑ Masterplan
- ☐ Industrial

HPB 8
- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
Asset Manager	●○○	supporting
Contractor	●○○	supporting
M&E Engineer	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Plan / Design	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
7 Affordable and Clean Energy

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Green Energy
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Financial Futureproofing
- ☑ Regulated Emissions – Green Energy

How is it calculated?

EUI is measured in kilowatt hours per square metre per year (kWh/m²/yr) and assesses a building's annual operational energy use. This includes both regulated energy (including heating, hot water, cooling, ventilation and lighting) and unregulated energy (such as cooking, lifts and computers).

It can be estimated at the design stage using predictive energy modelling. This allows designers to make informed choices and make sure this indicator is met.

EUI should also be measured using energy metering when the building is in use.

For design stage calculations, an energy consultant usually carries out the predictive energy modelling by following either:

- CIBSE TM54: 2013 Evaluating operational energy performance of buildings at the design stage; or
- PHPP Passive House Planning Package

Most of the calculation is done using Dynamic Simulation Modelling (DSM) software, such as IES Virtual Environment or EDSL Tas. This uses information such as the geometry, fabric, operating profiles and occupancy, systems and equipment. The design team and client will have this data.

Some elements of operational energy can also be calculated manually. It's important to not use SAP/SBEM (calculations for Building Regulations) for calculating operational energy as these are for compliance only and don't predict energy consumption.

Metric type

#

Numerical

Units

kWh/m²GIA/yr

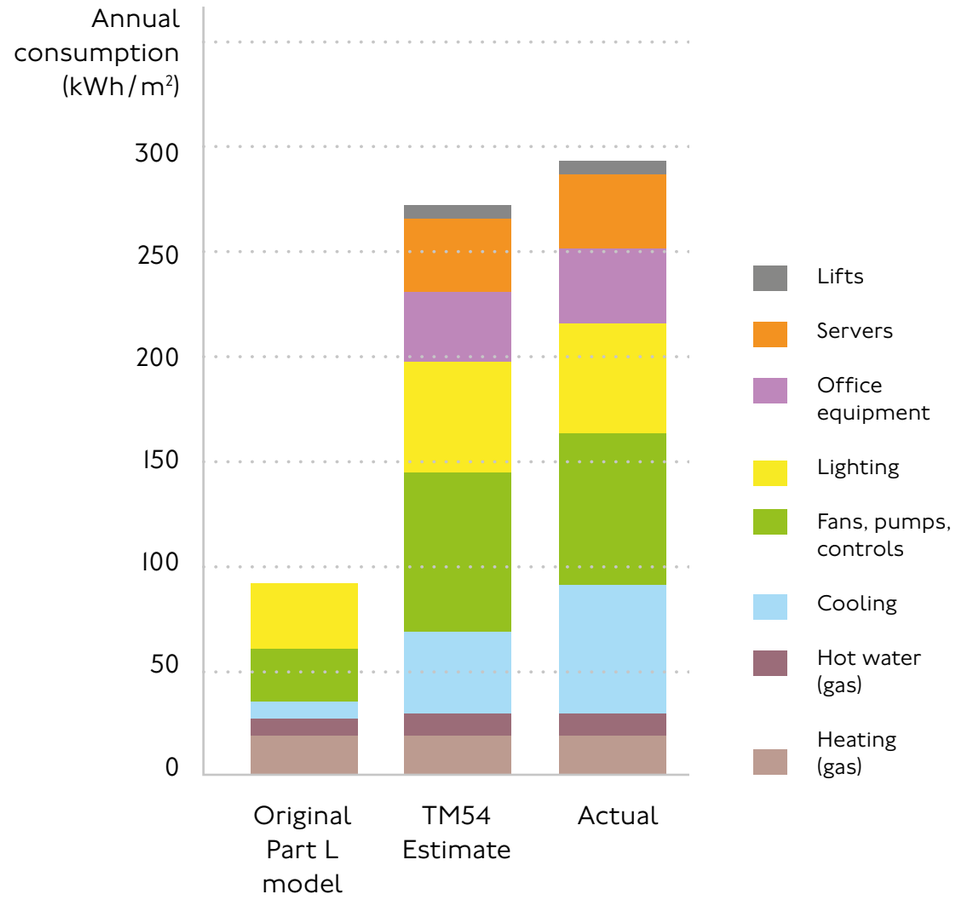
Metered Energy Use Intensity

Range

HPB 7 – Residential

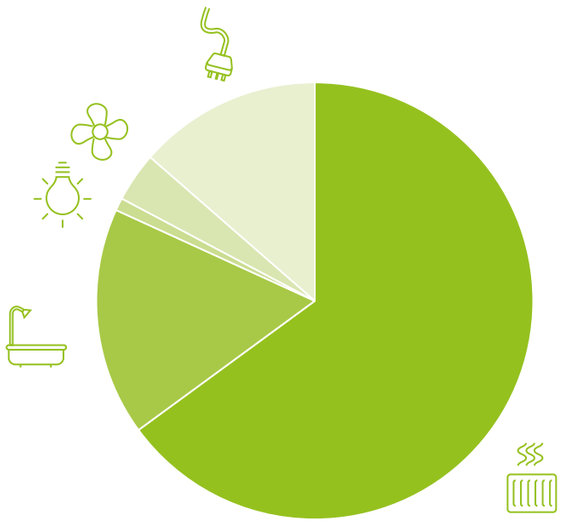
HPB 8 – Commercial

Part L model versus TM54 estimate versus actual

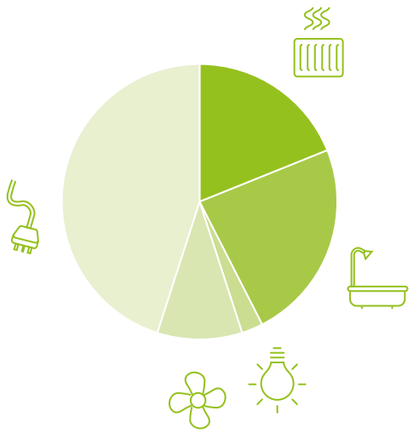


How is it calculated? (continued)

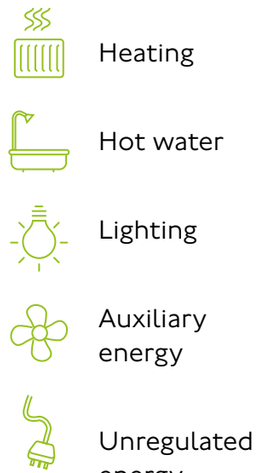
Residential energy breakdown



Part L compliant building



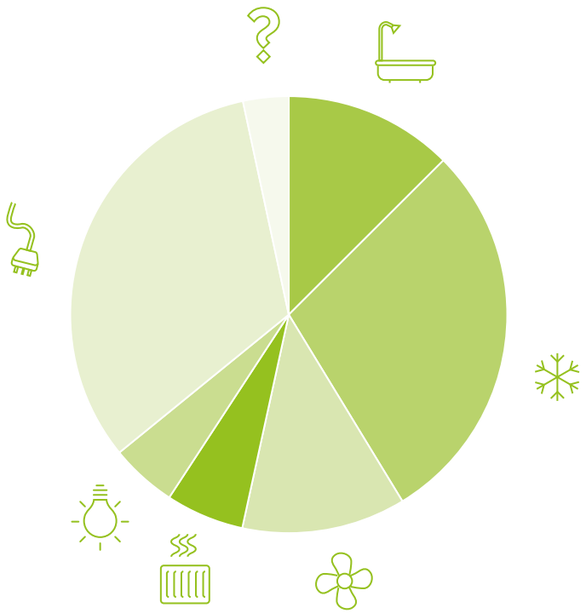
Low energy building



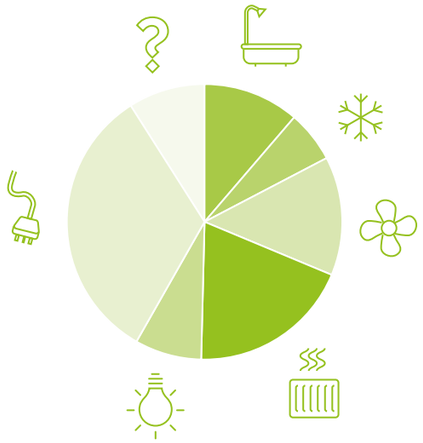
Energy Assessment Tool Matrix

Calculation	Emission type	Objective
Building Regulations Methodology	Regulated Carbon	To meet 100% reduction targets
Predictive Energy Modelling / Metered Energy Use	Operational Carbon	To achieve operational net zero
LCA Calculation	Embodied Carbon	To achieve whole life net zero

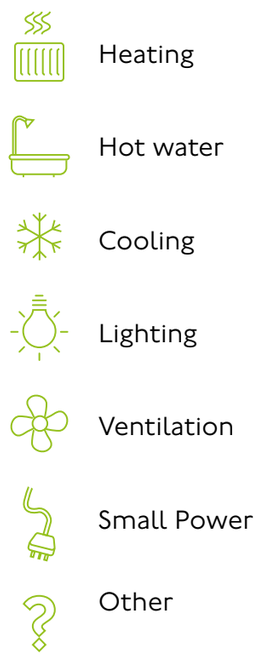
Commercial energy breakdown



Part L compliant building



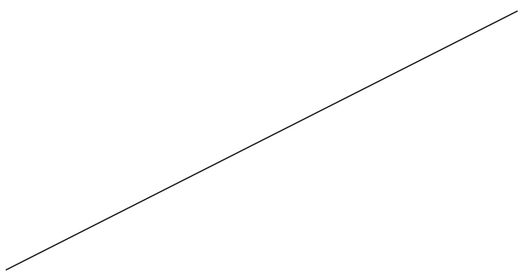
Low energy building



What is the process?

Action

RIBA Stage 0



RIBA Stage 1: Optimise

Development manager

Identify project team responsibilities to achieve operational energy use targets, including calculating operational targets, documenting the assumptions behind these, managing risks and validating in-use performance

Set an EUI target and incorporate into the brief

RIBA Stage 2: Plan / Design

Sustainability engineer

Establish clear EUI targets

Document these targets and the strategies needed to achieve them, and share with all stakeholders

Develop a preliminary operational energy model aligned to the EUI targets

Use this model to guide design throughout this stage

Produce a draft predictive energy modelling report

RIBA Stage 3: Plan / Design

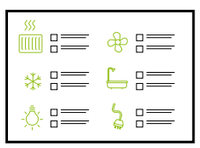
Sustainability engineer

Refine a full operational energy model for evaluating predicted energy demand Make sure this simulation goes beyond regulated energy and considers energy use from all items in the building

Produce a detailed energy modelling report

Action

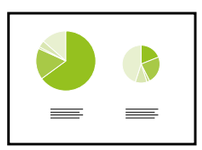
Documentation



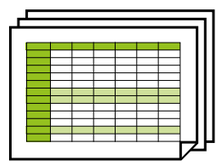
Targets in project brief (development manager)

Draft predictive energy modelling report (sustainability engineer)

Planning stage whole life-cycle carbon assessment (sustainability engineer)



Detailed predictive energy modelling report (sustainability engineer)



Reference in planning stage ‘Be Seen’ reporting spreadsheet (development manager)

Documentation

What is the process? (continued)

RIBA Stage 4: Plan / Design

Action

Sustainability engineer

Update the building energy model with the latest design amendments

Make sure that operational energy targets are still being achieved

Document the EUI targets, and the strategies needed to achieve them

Update the predictive energy modelling report

Develop a demand response model to investigate demand response impact

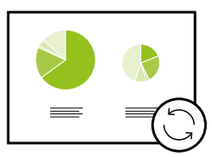
Development manager

Include EUI targets in the construction tender package, such as using a 'Design for Performance' type of target and feedback loop

Incorporate in contractors' prelims guarantees to recalculate the energy model if items in the register are changed or value engineered, to show that 'as-built' project meets agreed operational targets

Create a risk register and confirm whose responsibility it is to manage this during construction and commissioning

Documentation



Updated predictive energy modelling report (sustainability engineer)

RIBA Stage 5: Deliver

Contractor

Run an onsite workshop that gives an introduction to low-energy construction

Sustainability engineer

Develop a Stage 5 in-use predicted energy model, which will be incorporated into the final 'as-built' model

RIBA Stage 6: Deliver

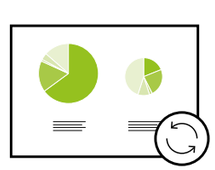
Action

Sustainability engineer

Finalise the as-built energy model to account for any changes in the design or assumptions behind it

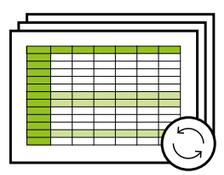
Update the predictive energy modelling report

Documentation



Updated predictive energy modelling report (sustainability engineer)

Reference in the 'as-built' stage



'Be Seen' reporting spreadsheet (development manager)

Post-construction stage WLC assessment (sustainability engineer)

What is the process? (c'd)

Action

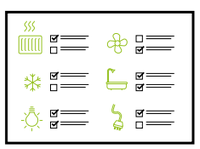
RIBA Stage 7: Monitor

Property manager

Track and monitor operational energy use

Upload total energy and heating energy consumption data to a public data platform for the first five years after completion

Documentation



Reference in the annual building performance audit and report (building manager)

Corporate sustainability and greenhouse gas emissions report (asset manager)

Relevant policy

Merton Draft Local Plan, London Borough of Merton, 2021, Policy CC8.12

LETI's Climate Emergency Design Guide, which sets out a roadmap to net-zero carbon, recommends the use of Energy Use Intensity (EUI) targets in regulations, policy and design decisions to drive energy efficiency … The council expects all new development to make reasonable endeavours to achieve these EUI and space heating demand targets to future-proof their development … and will enforce EUI targets from 2025.

GLA The London Plan 2020, Policy SI 2

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand.

Further reading

LETI Climate Emergency Design Guide, 2020
UKGBC Net Zero Carbon Buildings: A Framework Definition, 2019
RIBA 2030 Climate Challenge, 2019
Climate Change Act, 2008

ID no

Key Performance Indicator (KPI) name

HPB 9 Regulated Emissions – Energy Efficiency – Be Lean – Residential
HPB 10 Regulated Emissions – Energy Efficiency – Be Lean – Commercial

What is it?

The more energy efficient our buildings are, the more we reduce regulated carbon emissions. We can achieve this through something called 'passive design' and energy efficiency measures.

Passive design relates to the fabric of the building and its architecture. This includes its location, position on a site, window design, natural ventilation and insulation.

Energy efficiency measures include high-efficiency lighting, efficient mechanical ventilation with heat recovery and wastewater heat recovery.

The Mayor's London Plan sets out an energy hierarchy to inform the design, construction and operation of new buildings to reduce carbon emissions. The priority is to minimise energy demand, then address how to supply energy, and finally how to incorporate renewable technologies.

The energy hierarchy is:

1 Be Lean: use less energy and manage demand

2 Be Clean: supply energy efficiently and cleanly

3 Be Green: maximise opportunities for renewable energy by producing, storing and using it onsite

4 Be Seen: monitor, verify and report on energy performance

How does it add value?

The Mayor of London has declared a climate emergency and set a target for the city to reach net zero-carbon by 2030. This means all new buildings must be net zero-carbon. Currently, London's homes and workplaces are responsible for around 78% of its greenhouse gas emissions.

A net zero-carbon building is an energy efficient one. The less energy we use in our buildings, the more we reduce operational carbon emissions. This makes it easier to achieve net zero-carbon.

Although the definition of net zero in the London Plan is based on percentage carbon reduction and only considers regulated energy, the energy hierarchy still provides a good and robust approach to reducing energy and carbon emissions.

Given that developers must submit energy assessments that follow the GLA London Plan requirements, applying the hierarchy approach is vital when improving the energy efficiency of buildings.

What type of project does the indicator apply to?

HPB 9
- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

HPB 10
- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Architect	●○○	supporting
Contractor	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Plan / Design	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
7 Affordable and Clean Energy

Connected SDF indicators

- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Systems
- ☑ Regulated Emissions – Green Energy
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Residential Overheating (DSYI)

How is it calculated?

We follow the GLA's energy hierarchy to assess carbon reduction.

At the 'Be Lean', 'Be Clean' and 'Be Green' stages, percentage reduction relates to the regulated carbon emission reduction over an established baseline. This is aligned with Part L of the Building Regulations. A sustainability engineer usually makes these calculations.

For residential development areas, a Dwelling Emissions Rate (DER) is calculated using SAP 2012 methodology.

For commercial development areas, a Building Emissions Rate (BER) is calculated using a Simplified Building Energy Model (SBEM) or a Dynamic Simulation Model (DSM), following the National Calculation Methodology (NCM).

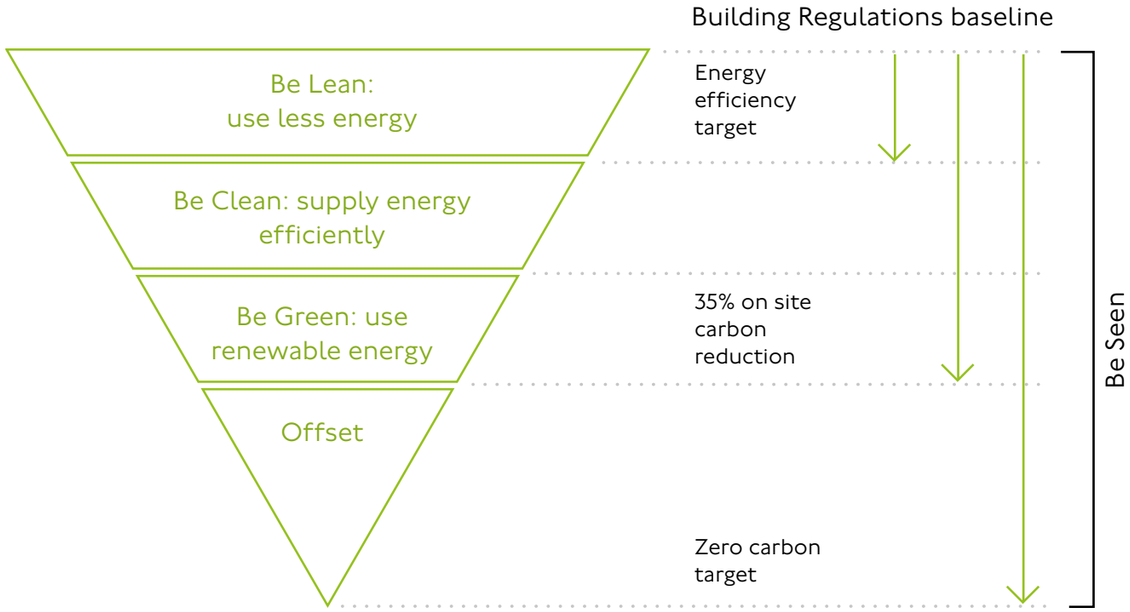
These first establish a baseline for the building's regulated CO_2 emissions. This uses a 'notional' building, which uses Part L-compliant notional values for fabric performance and building systems.

The building must perform better than this baseline to be compliant with Part L 2013 of the Building Regulations.

Regulated CO_2 emissions are then calculated for 'Be Lean', 'Be Clean' and 'Be Green' cases, with carbon emission reduction reported against the baseline for each step:

- At the 'Be Lean' stage, inputs reflect the proposed fabric performance and energy efficient equipment. (At this stage, heating and hot water are assumed to be from a notional gas boiler.)
- At the 'Be Clean' stage, heating and hot water modelling inputs are then updated to reflect the proposed systems design for heating and hot water. For our SDF framework, include heat pumps at this stage.
- At the 'Be Green' stage, any proposed renewable technologies are then added.

The energy hierarchy and associated targets



Metric type

%

Percentage

Units

%

Percent Reduction – 'Be Lean' Stage of GLA Energy Hierarchy

Range

HPB 9 – Residential

HPB 10 – Commercial

Energy Assessment Tool Matrix

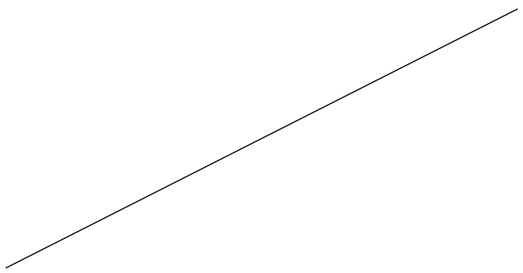
Calculation	Emission type	Objective
Building Regulations Methodology	Regulated Carbon	To meet 100% reduction targets
Predictive Energy Modelling / Metered Energy Use	Operational Carbon	To achieve operational net zero
LCA Calculation	Embodied Carbon	To achieve whole life net zero

What is the process?

Action

Documentation

RIBA Stage 0



RIBA Stage 1: Optimise

Architect

Consider building orientation and form factor in feasibility study

RIBA Stage 2: Plan / Design

Architect and sustainability engineer

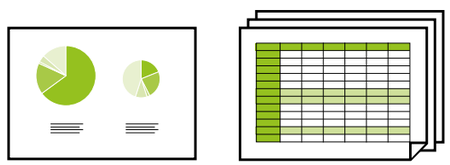
Develop concept design, considering these critical design parameters (using industry guidance targets to inform decisions):

- building orientation
- building form factor
- facade glazing ratio
- likely operating scenarios
- technical systems integration

Sustainability engineer

Incorporate into the design the most significant carbon/energy reduction measures, including demand response and energy storage opportunities

Make sure there's adequate provision for these measures, such as construction thicknesses, fenestration on facades and planted areas



Detailed energy assessment report and GLA carbon emission reporting spreadsheet (for full planning application) (sustainability engineer)

RIBA Stage 3: Plan / Design

Architect

Make sure the proposed construction details are robust and support low energy and airtightness performance, including details of thermal bridging and u-value calculations

Development manager

Define the airtightness testing requirements for the contractor

Action

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Plan / Design

Architect

Confirm envelope specification and complete detail design, ensuring good insulation and airtightness continuity

Ensure requirements for u-values and airtightness are fully captured in tender documentation

Review the airtightness line on each drawing and airtightness requirements for service penetrations

RIBA Stage 5: Deliver

Contractor

Carry out training for site managers and teams on construction quality requirements, covering insulation and airtightness

Run an onsite workshop that gives an introduction to low-energy construction

RIBA Stage 6: Deliver

Development manager

Review final construction, including correction work, for quality. This must include in-situ thermal performance tests, thermographic and air tightness testing

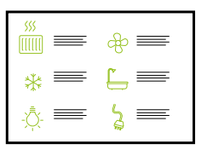
RIBA Stage 7: Monitor

Property manager

Make sure replacements and maintenance to building envelope and systems meet, or exceed, the original performance

Action

Documentation



Tender documentation

Documentation

Relevant policy

GLA The London Plan 2020, Policy SI 2

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions … in accordance with the following energy hierarchy:

I) be lean: use less energy and manage demand during operation.

GLA The London Plan 2020, Policy SI 2

Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures.

Requirement L1 of the Building Regulations

Reasonable provision shall be made for the conservation of fuel and power in buildings by limiting heat gains and losses through thermal elements and other parts of the building fabric … provide fixed building services which are energy efficient.

Regulation 25A of the Building Regulations

Minimum energy performance requirements shall be … calculated and expressed … for

(a) new buildings (which shall include dwellings), in the form of targets CO_2 emission rates;

(b) new dwellings in the form of target fabric efficiency rates.

Further reading

GLA Energy Assessment Guidance, 2020
GLA Zero Carbon London:
A 1.5°C compatible plan, 2018
Climate Change Act, 2008
Achieving greater carbon reductions on site – The role of carbon pricing

ID no | Key Performance Indicator (KPI) name

HPB I1 Regulated Emissions – Green Energy – Be Green – Residential
HPB I2 Regulated Emissions – Green Energy – Be Green – Commercial

What is it?

Renewable energy, often referred to as 'green energy', comes from sources that are constantly and naturally renewed, such as wind power and solar. By using onsite renewable energy, we can reduce regulated carbon emissions.

This KPI encourages projects to produce, store and use renewable energy onsite. For example, using solar panels on roof spaces to power heating and hot water systems.

The energy hierarchy set out in the Mayor's London Plan can help guide decisions on how to keep energy demand to a minimum, supply energy and incorporate renewable technologies. The energy hierarchy is:

1 Be Lean: use less energy and manage demand

2 Be Clean: supply energy efficiently and cleanly

3 Be Green: maximise opportunities for renewable energy by producing, storing and using it onsite

4 Be Seen: monitor, verify and report on energy performance

While most green energy sources are also renewable, not all renewable energy sources are considered entirely green, for example, hydropower.

How does it add value?

The benefits of making the most of onsite renewables can be looked at from both the carbon and energy perspective.

Firstly, they reduce onsite carbon emissions. This is part of a much bigger effort to achieve net zero-carbon at both a city and a national level. Considering that the Mayor of London has set a target for the city to reach net zero-carbon by 2030, this is now more important than ever. On a wider scale, all energy used by our buildings must be renewable to achieve net zero across the UK. To achieve this, we need to cut the energy we use and focus far more on renewable energy sources.

Moving in this direction, and away from fossil fuels, also reduces greenhouse gas emissions, and as a result, some types of air pollution. And it means we depend far less on imported fuels. Plus, it eases demand on the national grid, improving its reliability and providing other sources of electricity.

What type of project does the indicator apply to?

HPB I1
- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

HPB I2
- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Engineer – M&E	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
		Plan / Design	Plan / Design	Specify		Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
7 Affordable and Clean Energy

Connected SDF indicators

- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Efficiency
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Bio-Solar Roof Area

How is it calculated?

We follow the GLA's energy hierarchy to assess regulated carbon reduction.

At the 'Be Lean', 'Be Clean' and 'Be Green' stages, the percentage relates to the reduced regulated carbon emissions compared against an established baseline. This is aligned with Part L of the Building Regulations. A sustainability engineer usually makes these calculations.

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For commercial development areas, a Building Emissions Rate (BER) is calculated using a Simplified Building Energy Model (SBEM) or a Dynamic Simulation Model (DSM), following the National Calculation Methodology (NCM).

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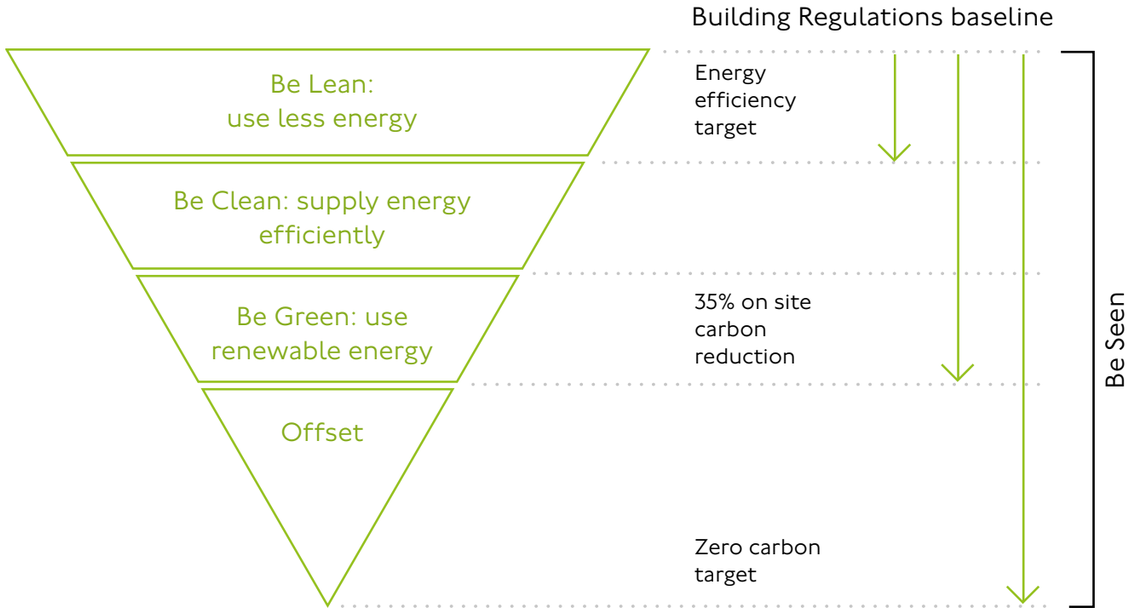
- At the 'Be Green' stage, any proposed renewable technologies are then added

The energy hierarchy and associated targets



Metric type

%

Percentage

Units

%

Percent reduction – 'Be Green' Stage of GLA Energy Hierarchy

Range

HPB I1 – Residential

HPB I2 – Commercial

Energy Assessment Tool Matrix

Calculation	Emission type	Objective
Building Regulations Methodology	Regulated Carbon	To meet 100% reduction targets
Predictive Energy Modelling / Metered Energy Use	Operational Carbon	To achieve operational net zero
LCA Calculation	Embodied Carbon	To achieve whole life net zero

How is it calculated? (continued)

Table 2: The London Plan energy hierarchy

	Carbon dioxide emissions (tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	A	
After energy demand reduction (be lean)	B	
After heat network connection (be clean)	C	
After renewable energy (be green)	D	

Source: GLA Energy Assessment Guidance, reporting tables

Table 3: Regulated carbon dioxide savings from each stage of the energy hierarchy

	Regulated carbon dioxide savings	
	tonnes CO_2 per annum	**%**
Be lean: Savings from energy demand reduction	A–B	(A–B) / A × 100
Be clean: Savings from heat network	B–C	(B–C) / A × 100
Be green: Savings from renewable energy	C–D	(C–D) / A × 100
Cumulative onsite savings	A–D = E	(A–D) / A × 100
	tonnes CO_2	
Cumulative savings for offset payment	F × 30 years = G	
Cash-in-lieu contribution	G × carbon dioxide offset price = H	

Source: GLA Energy Assessment Guidance, reporting tables

What is the process?

Action

RIBA Stage 0

RIBA Stage 1

RIBA Stage 2: Plan / Design

Sustainability engineer

Establish the feasibility of low and zero carbon (LZC) technologies

Document targets and strategies, and share with all stakeholders

RIBA Stage 3: Plan / Design

Mechanical and electrical systems (M&E) engineer

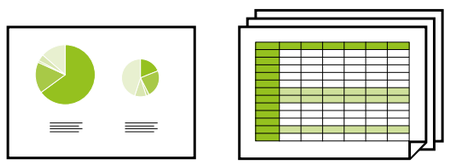
Develop a sub-metering strategy, which includes provisions to separately meter onsite renewable energy generation

Sustainability engineer

Develop a strategy for onsite LZC technologies, reporting estimated energy savings in energy assessment

Action

Documentation



Detailed energy assessment report and GLA carbon emission reporting spreadsheet (for full planning application) (sustainability engineer)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Plan / Design

Mechancial and electrical systems (M&E) engineer

Make sure specified metering and LZC technologies are incorporated

RIBA Stage 5

RIBA Stage 6: Deliver

Development manager

Review final construction, including correction work, for quality and complete in-situ performance tests

RIBA Stage 7: Monitor

Property manager

Track and monitor energy generation from onsite renewables

Action

Documentation

Documentation

Relevant policy

GLA The London Plan 2020, Policy SI 2

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions … in accordance with the following energy hierarchy: …

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy onsite.

GLA The London Plan 2020, Policy SI 2

A minimum onsite reduction of at least 35 per cent beyond Building Regulations is required for major development.

Regulation 25A of the Building Regulations

Minimum energy performance requirements shall be … calculated and expressed … for

(a) new buildings (which shall include dwellings), in the form of targets CO_2 emission rates;

(b) new dwellings in the form of target fabric efficiency rates.

Tower Hamlets Local Plan 2031 Policy D.ES7

Zero carbon to be achieved through a minimum 45% reduction in regulated carbon dioxide emissions … seek to provide up to 20% reduction of carbon dioxide emissions through onsite renewable energy generation

Further reading

GLA Energy Assessment Guidance, 2020
GLA Zero Carbon London: A 1.5°C compatible plan, 2018
Climate Change Act, 2008

ID no

Key Performance Indicator (KPI) name

HPB 13 Regulated Emissions – Monitoring – Be Seen – Best Practices

What is it?

To ensure new building developments live up to their net zero credentials, we need to better understand the actual operational energy performance of our buildings. To do this we must measure and report energy consumption on a far larger scale than we do now. Energy monitoring therefore requires that energy consumption is assessed and analysed at the planning stage by the applicant, at the as-built stage by the developer, and monitored and disclosed at the in-use stage by the legal building owner. Effective energy monitoring will therefore involve several people at each stage of any new development.

How does it add value?

Accurately collecting, monitoring and analysing energy data will help close the 'performance gap' between how we estimate the energy consumption of new buildings (design theory) and how they perform once they are in use (measured reality). By collecting performance data, a full picture of energy use can be seen. This provides an evidence base to inform future benchmarks, metrics and policies.
At a building level, accurate energy data will help developers and owners to better understand, control and manage their estate. With insight into when and where energy is being used, waste can be pinpointed and performance fine-tuned.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
Engineer – M&E	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify		Deliver	Monitor

Connected UN Sustainable Development Goals

7 Affordable and Clean Energy
12 Responsible Consumption and Production
13 Climate Action

Connected SDF indicators

- ☑ Post Occupancy Evaluation
- ☑ Smart Building Technologies
- ☑ Energy Use Intensity
- ☑ Sustainable Operations Management

How is it calculated?

The GLA 'Be Seen' energy monitoring guidance sets out six groups of performance indicators. At each stage of the process (planning stage, as-built stage, and in-use stage), there are specific requirements under each of these groups that should be reported. All reporting will be done through a 'Be Seen' reporting spreadsheet provided by the GLA.

The three main reporting stages are:

- Planning: Once planning approval is granted, the applicant must provide estimates of each of the performance indicators. For residential uses, this can be done using information from the energy assessment, which follows Building Regulations Part L compliant methodology. For non-residential uses, as well as estimates from the energy assessment, applicants must carry out CIBSE TM54 analysis. This follows the guidance of a Technical Memorandum, giving more accurate predictions of a building's energy use
- As-built: Once the building is complete, the developer must provide an update of the estimated energy performance indicators submitted at planning stage. Developers also need to confirm that verified metering plans have been produced. And that metering installation is complete and correctly calibrated to allow for the measured data to be monitored
- In-use: During this stage, the building owner is responsible for monitoring and reporting energy performance. They must monitor and report annual data for at least five years once the defects liability period is complete

On top of these requirements, the GLA 'Be Seen' energy monitoring guidance sets out six additional Leading Practices. These include using integrated smart energy systems and occupant overheating feedback. Under our Sustainable Development Framework, Good Practice and Leading Practice is defined by the number of these extra practices adopted. These are performance-focused, metric driven and span the full range of social impact, economic prosperity and environmental stewardship.

Possible Leading Practices (this list is not exhaustive)

1. Setting a display energy certificate (DEC) target rating at planning stage (non-residential developments)
2. NABERS UK: Design for Performance (DfP) – office developments
3. Advanced modelling simulation
4. CIBSE TM63 Operational performance: Modelling for evaluation of energy in-use
5. Integrated smart energy systems
6. Occupant overheating feedback
7. CIBSE TM22I8 Energy Assessment and Reporting Methodology in use
8. Following 'Soft Landings'

Metric type	Units	Range					
○	○	●	●	○	○	○	
		✓	★				
Points	Pass / Fail – 'Be Seen' Energy Monitoring Requirements	Good Practice: Pass 'Be Seen' Requirements	Leading Practice: Pass 'Be Seen' Requirements and follow at least 2 Leading Practices				

How is it calculated? (continued)

Table 1: 'Be Seen' performance indicator groups

Performance indicator group	Description
Contextual data	Applicants will be expected to provide contextual data relating to the development's reportable units (RUs) (see section 3.4). This includes non-energy information such as data on location and typology of buildings.
Building energy use	Applicants will be expected to report on the energy and fuel imports into each RU of a development. This includes data from national energy grids (eg electricity, gas etc.) and district heating connections. This information will enable the building owner to report on the amount of energy being consumed onsite for distinct building uses.
Renewable energy	Applicants will be expected to report on the renewable energy generation within the development to identify how much energy is being generated onsite and where this is used.
Energy storage equipment	Applicants will be expected to report on building energy storage equipment data.
Plant parameters	Applicants will be expected to report on parameters that relate to the performance of heat or cooling generation plant within energy centres that form part of a development. This will include energy inputs and outputs of energy centres, energy use and contribution of heating and cooling technologies, and network efficiency data to monitor losses in district and communal energy networks.
Carbon emissions	Applicants will be expected to report on the development's estimated carbon emissions at planning stage based on the appropriate carbon emission factors, as set out in the GLA's Energy Assessment Guidance. When onsite carbon reductions have been maximised, but a carbon shortfall still exists, applicants will be expected to report on and confirm the carbon offsetting contribution to the relevant local authority's fund in line with the net zero carbon target.

Figure 1: 'Be seen' process and responsibilities

1. Planning stage

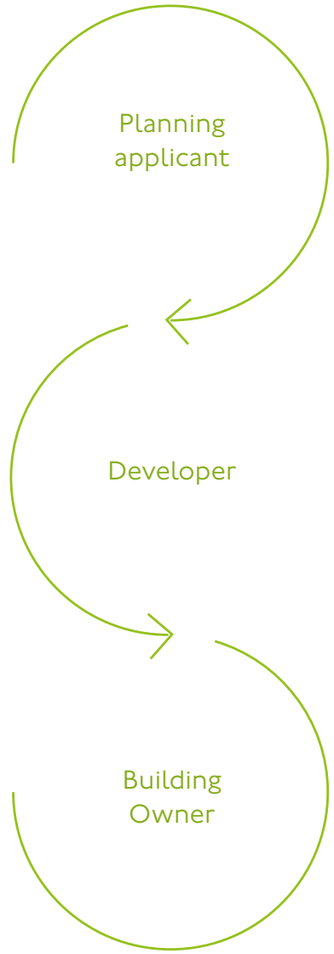
- Upload the necessary contextual and performance data to the 'be seen' portal
- Confirm the target dates for all subsequent 'Be Seen' stages
- Confirm that metering plans that will enable the in use energy performance reporting are in place

2. As built

- Update the contextual data and upload energy performance predictions for each reportable unit onto the 'Be Seen' portal
- Confirm that the metering installation is complete and correctly callibrated

3. In use

- Submit energy performance data annually for each reportable unit for at least five years
- Where actual performance differs from estimated performance, identify the causes and the potential mitigation measures, as necessary



What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Development manager

Incorporate data disclosure into building information modelling (BIM) requirements

RIBA Stage 2: Plan / Design

Development manager

Highlight the roles and opportunities for overcoming the performance gap. For example, by following the BSRIA Soft Landings framework.

RIBA Stage 3: Plan / Design

Mechanical and electrical systems (M&E) engineer

Develop a sub-metering strategy. Heating and cooling energy consumption (kWh) should be metered separately so fabric performance can be assessed

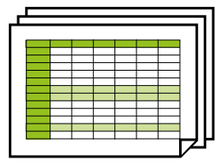
Establish a secure remote source for metered data to be transmitted over a communications network for aggregation and storage

Sustainability engineer

Provide predictive energy modelling results and support to the development manager by completing the 'Be Seen' reporting spreadsheets

Action

Documentation



Planning stage 'Be Seen' reporting spreadsheet (development manager)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Plan / Design

Mechanical and electrical systems (M&E) engineer

Make sure specified metering is incorporated in tender documentation

RIBA Stage 5

RIBA Stage 6: Deliver

Sustainability engineer

Provide predictive energy modelling results and support the development manager in completing the ‘Be Seen’ reporting spreadsheets

Contractor

Make sure that performance data from sensors and meters are reconciled with main meter, spot meter and building management system (BMS) readings, and that logs are set up in BMS to enable building performance to be monitored long-term

Development manager

Make sure the metering system is operating correctly and is regularly validated against utility meters

RIBA Stage 7: Monitor

Property manager

Upload all energy and heating energy consumption data to a public data platform for the first five years after completion

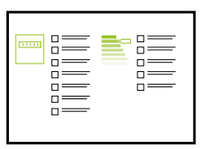
Assign an annual budget for monitoring energy use and tuning controls in response

Aim for monthly review and quarterly ‘deep dive’ analysis

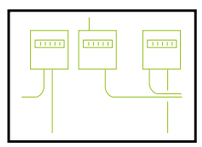
Undertake reporting under property management agreement if applicable

Action

Documentation



Tender documentation



Verified metering plans (contractor)

Draft DEC certificate (development manager)

As-Built stage ‘Be Seen’ reporting spreadsheet (development manager)

Official tenant and whole building DECs (asset manager)

Reference in annual building performance audit and report (building manager)

Corporate sustainability and GHG emissions report (asset manager)

In-use Stage ‘Be Seen’ reporting spreadsheet (every year for five years) (asset manager)

Relevant policy

GLA The London Plan 2020, Policy SI 2

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions …
in accordance with the following energy hierarchy:

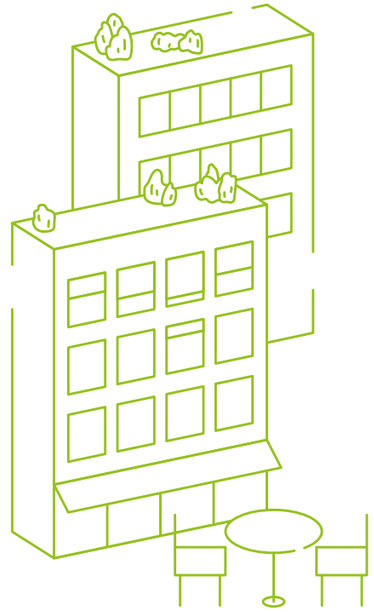
4) be seen: monitor, verify and report on energy performance.

GLA The London Plan 2020, Policy SI 2

The move towards zero-carbon development requires comprehensive monitoring of energy demand and carbon emissions to ensure that planning commitments are being delivered. Major developments are required to monitor and report on energy performance … for at least five years via an online portal …

Further reading

GLA ‘Be Seen’ Energy Monitoring Guidance – Pre-consultation Draft, 2020
GLA Energy Assessment Guidance, 2020
LETI Climate Emergency Design Guide, 2020



ID no

HPB14

Key Performance Indicator (KPI) name

Regulated Emissions Offset – Operational Net Zero

What is it?

Under the London Plan all major developments are required to be net-zero carbon. In this context, it means a 100 per cent reduction in a development's regulated carbon emissions arising from its annual energy consumption. This indicator relates to the regulated carbon emissions, after all possible onsite reductions have been made, that cannot be eliminated. The shortfall must therefore be met through carbon offsets, in the form of a payment (referred to as cash-in-lieu payment) to the relevant borough's carbon offset fund or to an offsite carbon offset project in agreement with the borough.

How does it add value?

Carbon offset payments made to local authorities are ring fenced and provide a source of funds for other carbon reduction projects. These include funding emission reductions from existing buildings, generating renewable energy, and supporting low carbon heat networks. Equally, developers can choose to directly fund an offsite carbon offset project. Either way, the net result is further emission reduction beyond what has been achieved for the development.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – Sustainability	●●●	leading
Development Manager	●●○	accountable
Project Manager	●○○	supporting
Engineer – M&E	●○○	supporting
Architect	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design		Specify	Deliver		Monitor

Connected UN Sustainable Development Goals

7 Affordable and Clean Energy
12 Responsible Consumption and Production
13 Climate Action

Connected SDF indicators

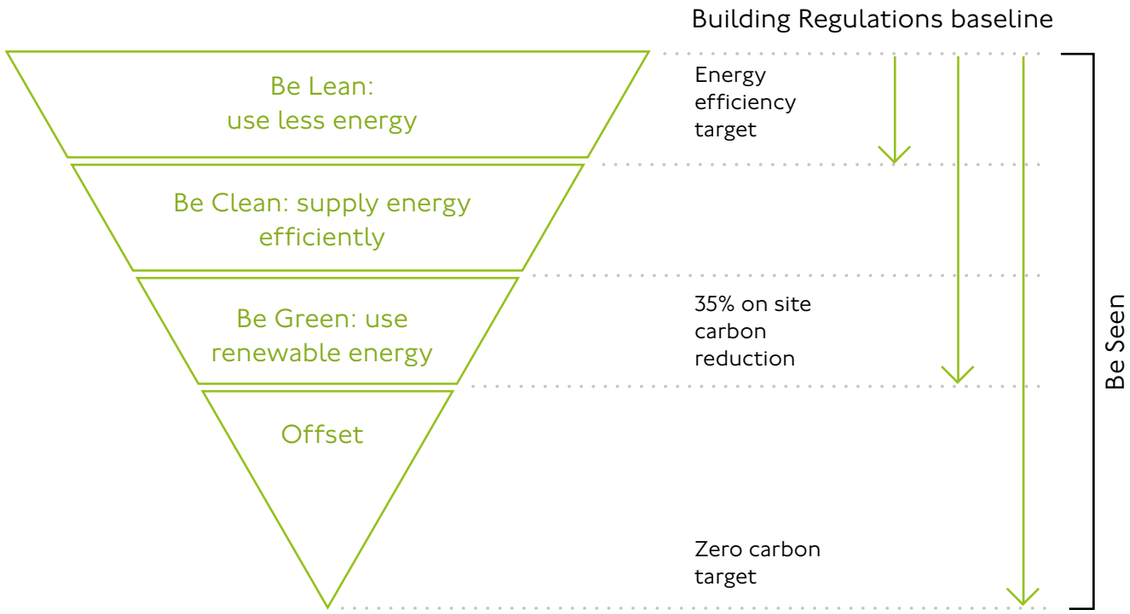
- ☑ Operational Energy Use Residential
- ☑ Operational Energy Use Commercial
- ☑ Regulated Emissions – Green Energy – Be Green
- ☑ Regulated Emissions – Monitoring – Be Seen
- ☑ Carbon Emissions Offsets

How is it calculated?

Where onsite carbon reductions have been maximised and the net zero-carbon target cannot be achieved onsite, the shortfall must be met through carbon offsets, in agreement with the relevant London borough.

After achieving the 'Be Green' stage set out in the London Plan's energy hierarchy, the onsite regulated carbon dioxide (CO_2) emission reduction will be determined. If a 100 per cent regulated CO_2 emission reduction is not achievable onsite, a cash-in-lieu payment is calculated by multiplying the remaining annual carbon emissions figure, the assumed lifetime of the development (30 years) and the carbon dioxide offset price. The typical carbon offset price is £95 per tonne of CO_2, but some boroughs have set their own prices that must be met.

The energy hierarchy and associated targets



Metric type

£

Financial

Units

£

Financial
Contribution

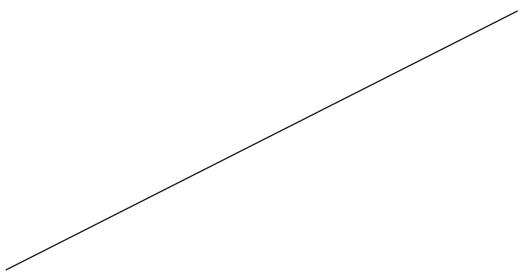
Range

✔★ Pass

What is the process?

Action

RIBA Stage 0



RIBA Stage 1: Optimise

Sustainability engineer

Review all the policies, targets and mechanisms regarding carbon offsetting

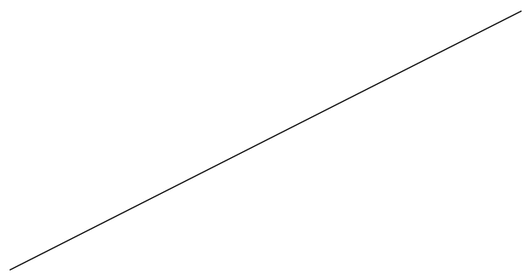
RIBA Stage 2: Plan / Design

Sustainability engineer

Calculate the carbon shortfall and cash-in-lieu payment based on the draft energy assessment

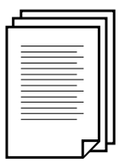
Calculate the carbon shortfall and cash in-lieu payment based on the detailed energy assessment

RIBA Stage 3



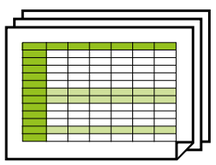
Action

Documentation



Documentation

Draft energy assessment report and GLA carbon emission reporting spreadsheet (for outline planning only) (Sustainability engineer)



Detailed energy assessment report and GLA carbon emission reporting spreadsheet (for full planning application) (Sustainability engineer)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Plan / Design

Sustainability engineer

Calculate the carbon shortfall and cash in-lieu payment if affected by changes made during the technical design

Development manager

Explore the opportunities for payment to be made to an off-site project and obtain agreement from the LPA (local planning authority)

RIBA Stage 5: Deliver

Development manager

Make payment as agreed with LPA. Some LPAs require 100 per cent payment at the start of onsite construction, others may request 50 per cent prior to construction and 50 per cent post construction

RIBA Stage 6

RIBA Stage 7: Monitor

Development manager

If payment is made to a carbon offset fund, request to see how the payment has been used

If payment has been made to an off-site project, track the progress and savings achieved

Action

Documentation

Documentation

Relevant policy

GLA, the London Plan 2020, Policy SI 2

A major development should be net zero-carbon …

(C) Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved onsite, 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

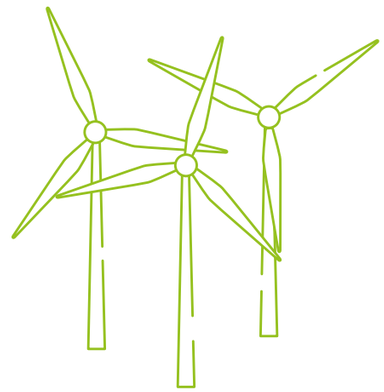
2) off-site provided that an alternative proposal is identified and delivery is certain.

GLA, the London Plan 2020, Policy SI 2

(D) Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

Further reading

GLA, Energy Assessment Guidance, 2020
GLA, Carbon Offset Funds, 2018
GLA, Zero carbon London:
A 1.5°C compatible plan, 2018
Climate Change Act, 2008



ID no

HPB15

Key Performance Indicator (KPI) name

Bio-Solar Roof Area

What is it?

Bio-solar roof technology combines solar (photovoltaic) panels and a green roof system to create clean and affordable energy. This cuts energy bills in buildings and helps reduce carbon emissions – the more rooftop space is made available for this, the greener the building is.

The solar panels produce electricity, while solar heating technologies collect the thermal energy from the sun and use this heat to provide hot water or heating.

Incorporating this clean and renewable solar and thermal technology into designs plays an important part in helping to meet the Mayor's target for a zero carbon London by 2050.

How does it add value?

If the micro-climate around the solar panels is too hot, the panels may not work as well. But the green roof can have a cooling effect, especially in the summer, helping to keep temperatures around the panels lower.

Shaded areas under the panels and rainwater run-off creates damper areas to the front and drier areas behind. This allows a wider variety of vegetation to flourish, which in turn can attract a range of butterflies, bees, beetles and other species.

So not only does this technology help London meet its carbon reduction targets, it also promotes bio-diversity.

To help achieve London's zero carbon target by 2050, it is estimated that around 1 gigawatt (GW) of solar energy needs to be installed in the city by 2030, and up to 2 GW by 2050.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Architect	●●●	lead
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
Engineer – M&E	●○○	supporting
Engineer – Structural	●○○	supporting
Landscape Architect	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Plan / Design	Plan / Design	Specify	Specify	Deliver	Monitor	Monitor

Connected UN Sustainable Development Goals

7 Affordable and Clean Energy
13 Climate Action
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Carbon Emissions Offset
- ☑ Green Energy
- ☑ Regulated Emissions – Green Energy
- ☑ Urban Greening

How is it calculated?

The percentage of space that can be made available for bio-solar roof (rooftop solar-thermal and/or photovoltaic (PV) cells) can be calculated by following these steps:

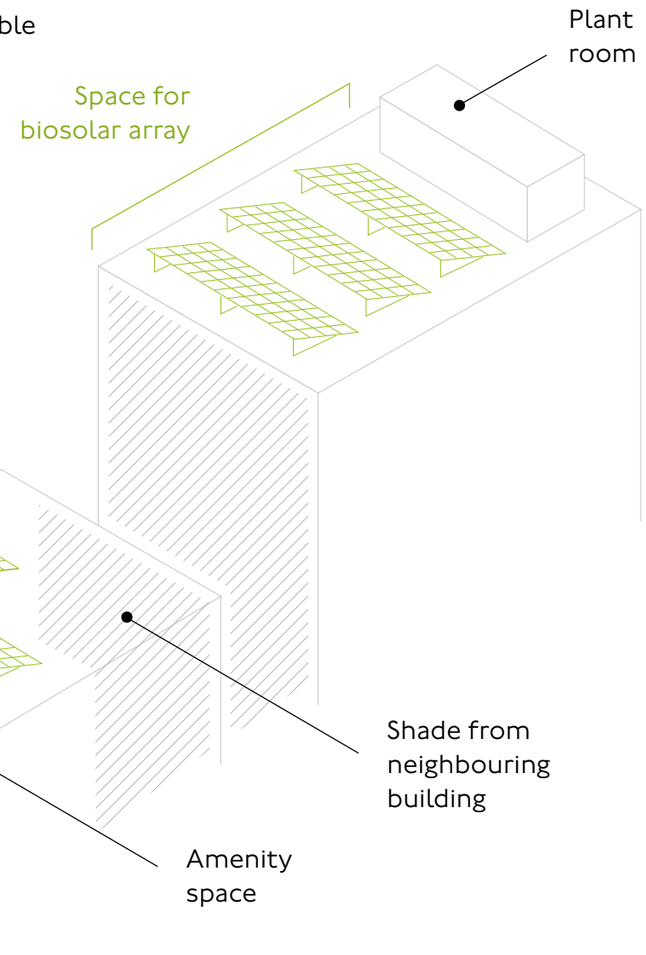
1 The architect determines the amount of roof space available for solar energy. This should exclude areas for equipment, amenity and parts that are heavily shaded.

2 Working together, the architects and landscape architects agree which planted spaces are suitable for solar energy. This information must be included in the Planning Statement and Energy Strategy.

3 The results of steps 1 and 2 set the baseline for the area available for bio-solar roofs.

4 A specialist consultant should make sure that the layout is being used most effectively, making sure it includes all necessary maintenance paths, access and space that's needed to operate the system (such as areas to store adaptors and cables).

5 To achieve Good Practice, all available space should be used for bio-solar roofs.



Metric type

%

Percentage

Units

%

Percentage of available area

Range

0

100%

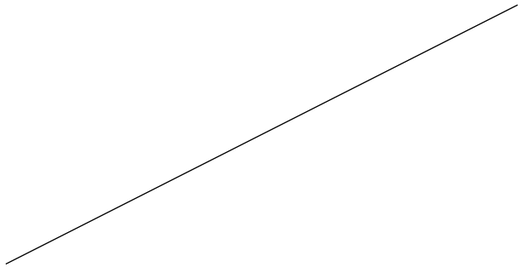
Good & Leading Practice

What is the process?

Action

Documentation

RIBA Stage 0



RIBA Stage 1: Plan / Design

Architect

Architect gathers initial information on the amount of roof space available for solar power generation

RIBA Stage 2: Plan / Design

Development manager

Ensure that bio-solar roof area is included as part of the project brief

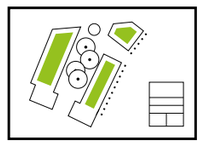
Architect

Actions should include designing buildings from the start to minimise the impact of the shadow created by new buildings, rather than just looking to see what roofs would be suitable for solar energy once the site layout has been designed

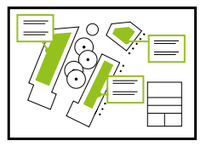
Incorporate designs for using solar energy alongside other measures (such as green roofs), to maximise the potential sustainable benefits from roofspace

Landscape architect

Work with the architect/MEP engineer to draw up a solar energy strategy that incorporates biodiversity and green roof elements



Pre-planning – Planning Statement / outline site plans and/or Energy Statement.



Detailed planning – Planning Statement / detailed site plans and/or Energy Statement, detailed drawings and roof plans

RIBA Stage 3: Specify

Sustainability engineer

Ensure both the quality and quantity of rooftop solar-thermal and/or PV cells maximise efficiency. Avoid inefficient solar-thermal or PV cells

Structural engineer

Check loadings for proposed solar-thermal / PV array

Action

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Mechanical and electrical (M&E) engineer

Emphasise the importance of both the quality and quantity of rooftop solar-thermal and/or photovoltaic (PV) cells to maximise efficiency. Highlight the importance of providing the most efficient solar-thermal or PV cells

RIBA Stage 5: Deliver

Project manager

Make sure that the ‘as built drawings’ meet the requirements of this indicator

RIBA Stage 6: Monitor

Property manager

Commission the installation of rooftop solar-thermal and/or PV cells

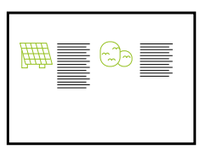
RIBA Stage 7: Monitor

Property manager

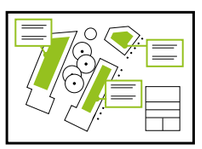
Check that the solar energy rooftops and green roofs are being maintained correctly and operating at maximum capacity

Action

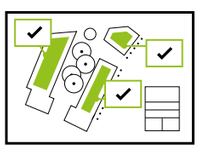
Documentation



Tender documentation



Building contract and construction programme with bio-solar roof information included



‘As built’ drawing showing the final, built design

Documentation

Relevant policy

National Planning Policy Framework

Para 8 Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways. One of these objectives includes …

c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

The London Plan 2011 Policy 5.3 Sustainable Design and Construction

Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

The London Plan 2011 Policy 5.7 Renewable Energy

Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of onsite renewable energy generation, where feasible.

The London Plan 2011 Policy 5.2 Minimising Carbon Dioxide Emissions

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1 Be Lean: use less energy

2 Be Clean: supply energy efficiently

3 Be Green: use renewable energy

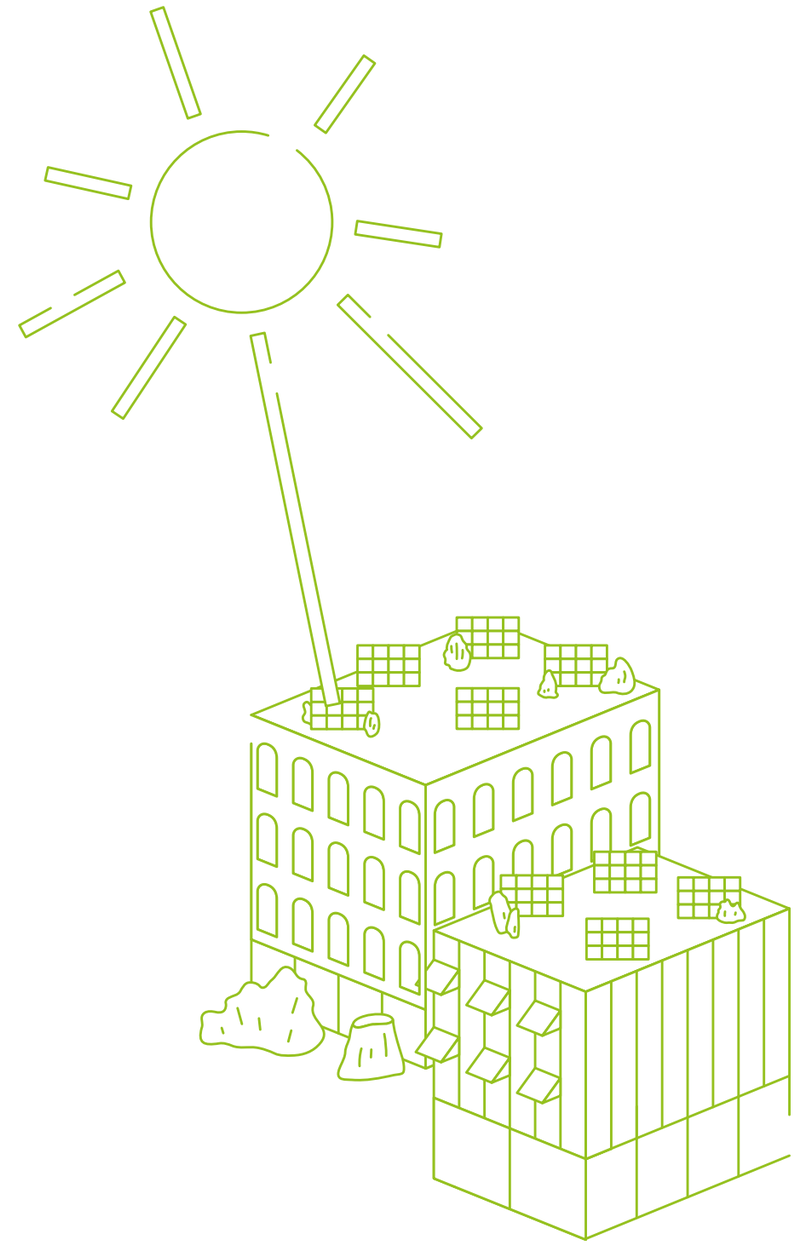
Further reading

Sustainable Design and Construction – Supplementary Planning Guidance (April 2014)

Low energy building database

Solar Action Plan for London (June 2018)

London Plan topic paper: Energy (December 2017)



ID no

HPB16

Key Performance Indicator (KPI) name

Green Energy

What is it?

For new developments to be operational net zero, they must be 100 per cent powered by renewable energy. Preferably this should be generated onsite, for example, by using solar panels. For larger developments, this may not be an option. This indicator focuses on ensuring that where onsite generation is not possible, the energy required by the building is supplied from off-site renewable sources.

At present, this green energy can be bought through green tariffs or Power Purchase Agreements (PPAs). These are long-term contracts with energy generators that guarantee energy is supplied by renewable sources, such as wind and solar power. With a green energy tariff, the supplier promises to 'match' all or some of the electricity used with renewable energy. While this option offers flexibility through tariff switching, the green tariff electricity is supplied from the National Grid and not all electricity here comes from green sources.

How does it add value?

Green energy is outperforming fossil fuels for the first time. In 2020 renewables generated 43 per cent of the UK's electricity, helping to cut emissions. Driving the increasing use of green energy is the understanding that we are actively reducing our own emissions, and contributing to a national reduction and wider systemic changes.

Encouraging renewable energy procurement, for example, through a more favourable regulatory environment, tariff transparency, flexibility and incentives will help encourage this growing market and close the national renewable energy supply gap. At TfL, for example, we are one of the largest consumers of electricity in the UK, we have announced public-private financing to fund London's green future with new wind and solar farms, and to buy up to 20 per cent of our energy solely through renewable PPAs.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Asset Manager	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Optimise	Optimise	Specify		Deliver	Deliver

Connected UN Sustainable Development Goals

7 Affordable and Clean Energy
12 Responsible Consumption and Production
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Green Energy
- ☑ Energy Use Intensity
- ☑ Bio-Solar Roof Area
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Carbon Emission Offsets

How is it calculated?

Annual electricity consumption (kWh/year), the proportion attributed to each procurement route, and associated reporting requirements should be reported by the asset manager in the annual building performance audit and report, and the corporate sustainability and greenhouse gas (GHG) emissions report.

It is important to report and disclose how energy is provided to the building once the renewable procurement contract has been mandated or recommended by the site developer. This is carried out by an asset manager who should finalise the requirements and targets for buying renewable energy and send out requests for information (RFI) on the proposed PPAs or green tariffs. The RFI is used to get information from the market and support the manager's sourcing strategy. They must then make sure the procurement contracts are in place and supply is ready for handover. The asset manager is also responsible for maintaining the contracts.

Renewable electricity procurement routes are outlined in the adjacent table. These routes all have different merits and requirements for data disclosure. The asset manager will need to demonstrate that renewable energy is procured from routes that meet the three key principles defined in the UKGBC's Renewable Energy Procurement & Carbon Offsetting: Guidance for net zero carbon buildings. These principles are:

- Energy attribute
- Renewable sourced
- Additionality

Tenanted areas relate to commercial space and not homes, where a development is entirely residential, Leading Practice is met by meeting the requirements for all communal areas.

Energy Assessment Tool Matrix

Calculation	Emission type	Objective
Building Regulations Methodology	Regulated Carbon	To meet 100% reduction targets
Predictive Energy Modelling / Metered Energy Use	Operational Carbon	To achieve operational net zero
Life Cycle Assessment (LCA) Calculation	Embodied Carbon	To achieve whole life net zero

Metric type

%

Percentage

Units

%

Percentage of remaining energy met through power purchase agreements (PPAs) and green tariffs

Range

0 ✓ Good Practice

Covers energy use from all communal areas

★ 100% Leading Practice

Covers energy use from communal and tenant areas

How is it calculated? (continued)

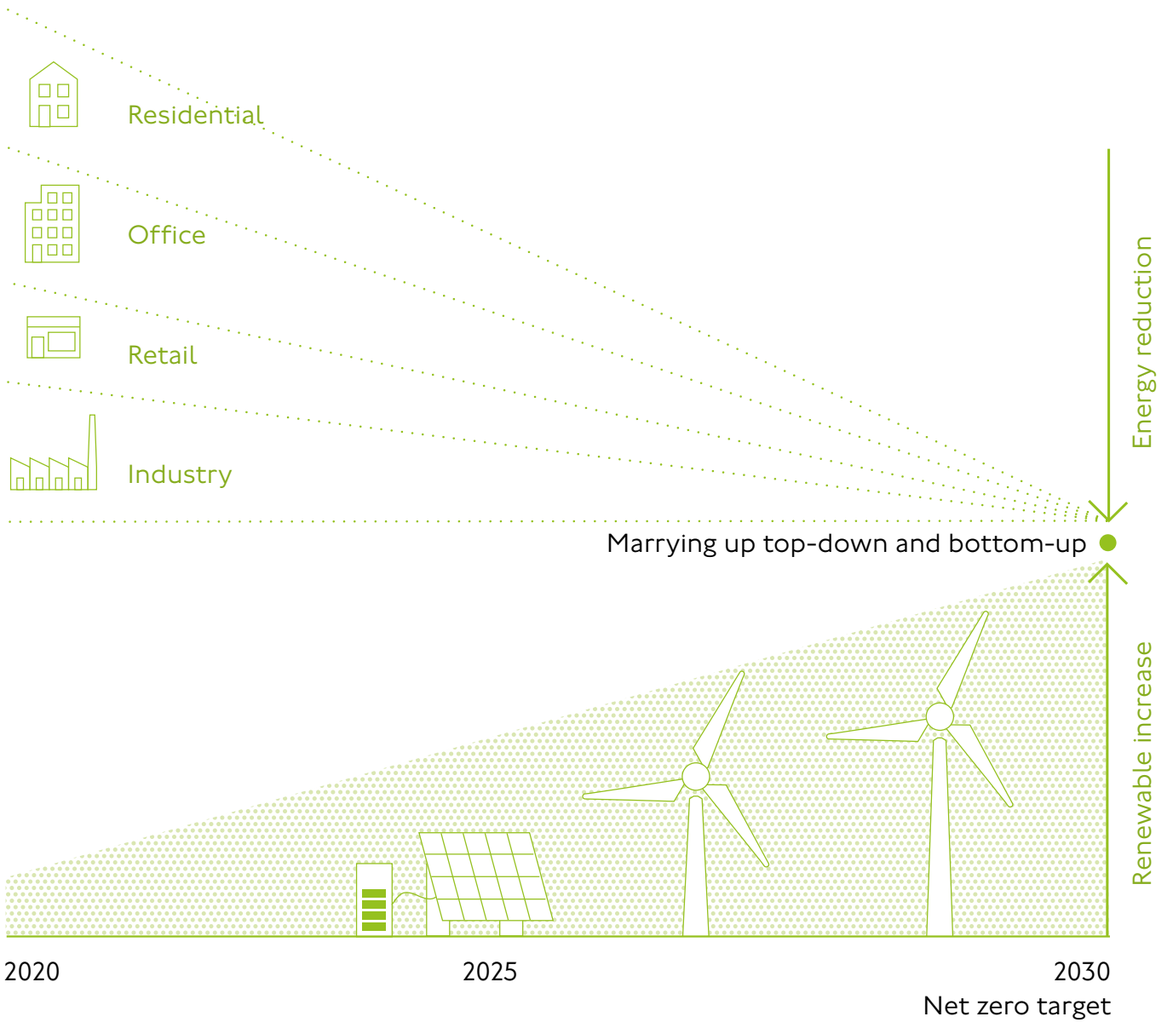
Table 9: Renewable electricity procurement routes

		Key principles			To align with the net zero carbon buildings (NZCB) framework definition	
Renewable electricity procurement routes		**Energy attribute**	**Renewable sourced**	**Additionality**	**Reporting required**	**Carbon offsetting required**
Onsite	Owned (eg rooftop PVs)	✓	✓	✓ now	Renewable electricity generation metered and annually disclosed	No carbon offsetting required Zero emissions can be claimed through use of market-based factors
	PPA – w/New unsubsidised (inc. private wire)	✓	✓	✓ now	Generator name, location and PPA length. Renewables and CHIP Register REGO entry confirming retirement of certificates on behalf of the consumer	
Off-site	PPA – w/New unsubsidised	✓	✓	✓ now		
	Green tariff from supplier with 100% renewable sourced tariffs only – 'high quality green tariffs'	✓	✓	✓ future	Supplier and tariff name	

Source: UKGBC renewable energy procurement carbon offsetting guidance for net-zero carbon buildings

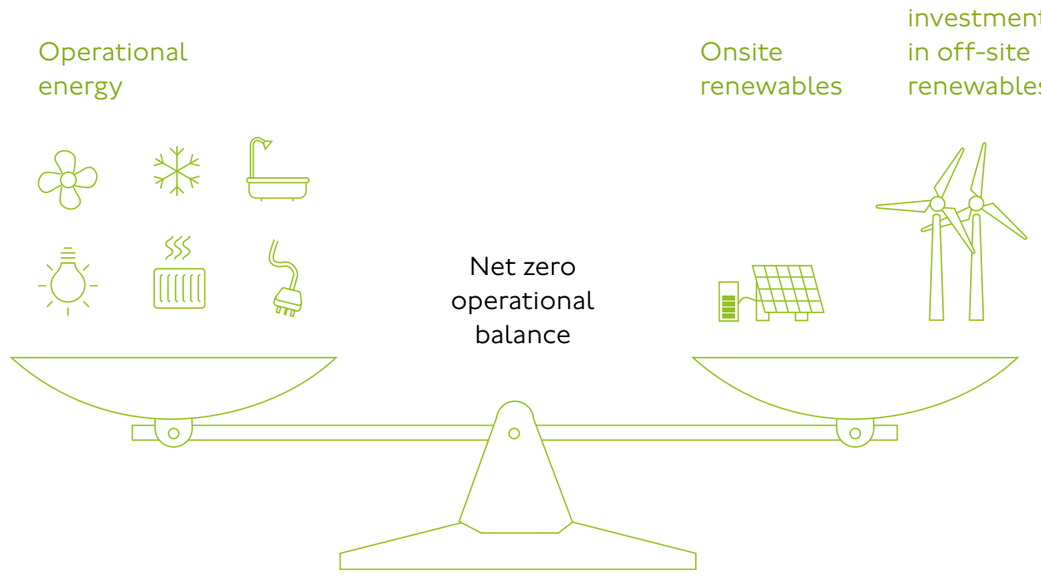
How is it calculated? (continued)

Figure 1.3: Top-down meets bottom-up approach to energy



Source: LETI Climate Emergency Design Guide

Figure 0.3: Net zero operational balance – at the building scale



What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Development manager

Set ambition for renewable energy procurement in the brief

Sustainability engineer

Review policies, targets and mechanisms regarding renewable energy procurement

RIBA Stage 2: Optimise

Sustainability engineer

Track estimated energy use intensity (EUI) and onsite renewable energy to gauge requirements for renewable energy procurement

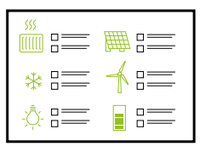
RIBA Stage 3: Optimise

Sustainability engineer

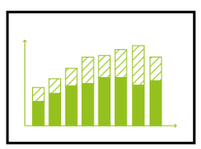
Track estimated EUI and onsite renewable energy to gauge requirements for renewable energy procurement

Action

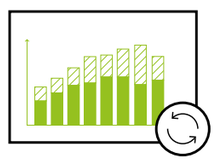
Documentation



Targets in project brief (development manager)



Draft predictive energy modelling report (sustainability engineer)



Detailed predictive energy modelling report (sustainability engineer)

Documentation

What is the process? (continued)

RIBA Stage 4: Specify

Action

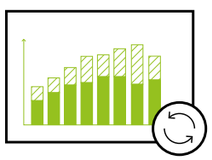
Sustainability engineer

Track estimated EUI and onsite renewable energy to gauge requirements for renewable energy procurement

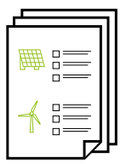
Asset manager

Finalise requirements and targets for renewable energy procurement, and send out requests for information (RFI) on PPAs and green tariffs

Documentation



Updated predictive energy modelling report (sustainability engineer)



RFIs for power purchase agreements (PPAs) and green tariffs (asset manager)

RIBA Stage 5

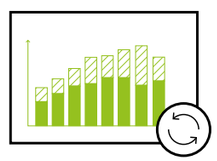
RIBA Stage 6: Deliver

Asset manager

Ensure renewable energy procurement contracts are in place and supply is ready for handover

Documentation

Contracts for power purchase agreements (PPAs) and green tariffs



Updated predictive energy modelling report (sustainability engineer)

RIBA Stage 7: Deliver

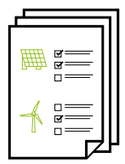
Property manager

Track and monitor operational energy use

Asset manager

Maintain renewable energy procurement contracts

Documentation



Referenced in: annual building performance audit and report (building manager)

Corporate sustainability and GHG emissions report (asset manager)

Relevant policy

Renewable energy Procurement & Carbon Offsetting, draft guidance – for Industry Consultation, UKGBC 2020

Net-zero compatible scenarios as modelled by the National Grid's Future Energy Scenarios and the CCC have highlighted the importance of the grid rapidly decarbonising to reach net zero by 2050. To do so, the UK must increase its total supply of renewable electricity whilst simultaneously reducing demand on the electricity grid. As per the current NZCB Framework, onsite renewable energy generation is prioritised over off-site procurement as it achieves both of these aims

Renewable Energy Tariffs: The problem of Greenwashing, Good Energy 2020

In the context of energy tariffs, greenwashing is the act of purchasing certificates (known as REGOs) by a supplier without buying the power they relate to. These certificates are then combined with power bought from the wholesale market (an anonymous mix or fossil, renewable, and nuclear power), to make a supplier look green, when they may not have actually bought a single unit of power from a renewable generator.

Corporate Procurement of Renewable Energy: Implications and Considerations

An energy tariff is essentially how an energy provider charges a customer for their gas and electricity. Customers – consumers, businesses, and other entities – can choose a fixed or variable tariff, but increasingly they can also choose a green tariff which specifies that some or all of the energy and/or electricity is 'matched' by purchases of renewable energy that the energy supplier makes on a customer's behalf.

Further reading

- Renewable Energy Procurement & Carbon Offsetting, Draft guidance – for Industry Consultation, UKGBC 2020
- Corporate Procurement of Renewable Energy: Implications and Considerations, CCC 2020
- Renewable Energy Tariffs: The Problem of Greenwashing, Good Energy 2020
- Introduction to Corporate Sourcing of Renewable Electricity in Europe, Re-Source 2019

ID no

HPB 17

Key Performance Indicator (KPI) name

Water Efficiency – Residential

What is it?

A wide range of fittings, systems and technology can help to use water efficiently and avoid waste.
This includes:

- Harvesting rainwater – such as leading gutters and drainpipes to water barrels
- Greywater recycling – treating waste water from appliances such as showers, baths, sinks and dishwashers, and feeding back into homes to flush toilets, for example
- Water meters – as they measure the exact amount of water used in a house rather than using estimates
- Irrigation systems
- Pressure-reducing valves
- Water-efficient fittings, such as toilets, taps and showers

For this Indicator, we're using the BRE Home Quality Mark (HQM) 8.1 for water efficiency.

How does it add value?

Lowering the amount of mains water used in homes reduces the cost of water and energy bills (through heating water) for residents.

It also lessens the environmental impact of buildings by making sure that this valuable resource is used efficiently. Using water-efficient technology in homes has a huge impact on reducing waste and energy use.

An additional benefit is that lower water consumption puts less strain on mains water systems. This reduces the need for disruptive upgrade works, and can increase the number of homes the local infrastructure can support.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Engineer – M&E	●●●	leading
Development Manager	●●○	accountable
HQM Assessor	●○○	supporting
Architect	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

- 12 Responsible Consumption and Production
- 11 Sustainable Cities and Communities
- 6 Clean Water and Sanitation

Connected SDF indicators

- ☑ Energy and Water Consumption during Construction
- ☑ Smart Building Technologies
- ☑ Sustainable Drainage

How is it calculated?

We follow the criteria set out by HQM 8.1 for water efficiency, set out in the Home Quality Mark ONE England manual (page 162 of 266).

HQM builds on Approved Document G of the Building Regulations by encouraging people to use water efficiently, and then to recycle greywater and rainwater.

The optional fittings standard (see table 52) is from Approved Document G in the Home Quality Mark ONE England). Credits in the water efficiency section are awarded for:

- Using water-efficient fittings – up to II credits are available
- Using water-recycling systems – up to six credits are available (see tables 50 and 5I)

Water efficient fittings (up to II credits)

Credits for water-efficient fittings are based on the number of them that meet the standards set out in HQM ONE England (see table 52). The water efficiency of fittings should be determined from the figure quoted on the European Water Label.

Table 52: Water fittings standards

Water fitting	Optional fittings standard	Advanced fittings standard
WCs	≤ 4 / 2.6 litres dual flush	4 / 2 litres dual flush (maximum 3 litres effective flushing volume)
Showers	≤ 8L / min	≤ 6L / min
Baths	≤ I70 litres	≤ I70 litres
Basin taps	≤ 5L / min	≤ 5L / min
Kitchen sink taps	≤ 6L / min	≤ 6L / min
Dishwashers	≤ I.25L / place setting	≤ I.25L / place setting
Washing machines and washer dryers	≤ 8.I7L /kilogram	≤ 8.I7L /kilogram

Metric type

Points

Units

Number of credits – HQM 8.1

Range

I — 8 credits — I7 credits

I — Good Practice (Must achieve five credits under Criteria 0I and three credits under Criteria 02) — Leading Practice

How is it calculated? (continued)

The number of credits awarded are based on information set out in table 50:

Table 50: Water efficient fittings

Credits	Water fittings standard (see table 52)	Modelled water consumption (l/p/d) calculated in accordance with Appendix A of Approved Document G
5	6 water fitting categories in the Optional fittings standard	I10
8	All water fitting categories in the Optional fittings standard	II0
II	All water fitting categories in the Advanced fittings standard	I00

Water recycling (up to six credits)

Water recycling credits are based on the percentage of total demand for toilet flushing that uses rainwater or greywater (see table 5I). For compliance, water collected by rainwater or greywater recycling systems must be reused in the home, reducing consumption. These must also be designed and installed in line with BS 85I5:2009+AI:20I3 and BS 8525-I:20I0 respectively.

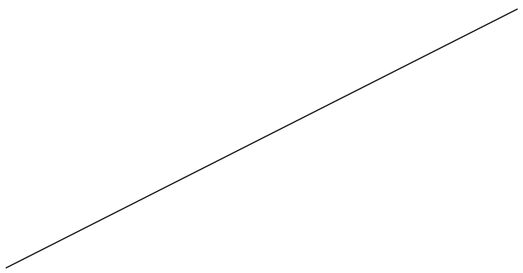
Table 5I: Demand for WC flushing met by rainwater or greywater.

Credits	Percentage of total demand for WC flushing met by rainwater or greywater
3	≥50
6	I00

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

Development manager

Set a target for water efficiency in the brief

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E engineer)

Review policies, targets and mechanisms for water efficiency

Public health design to be based on water consumption and recycling targets

RIBA Stage 3: Plan / Design

M&E engineer

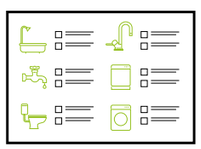
Public health design to be based on water consumption and recycling targets

Architect

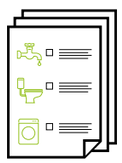
Specify sanitary appliances and brassware in line with the HQM 8.I water efficiency requirements

Action

Documentation



Targets in project brief (development manager)



Stage 2 MEP report with public health/ water specifications (M&E engineer)

HQM pre-assessment report (optional) (HQM assessor)

Stage 3 MEP report with public health/ water specifications (M&E engineer)

Documentation

What is the process? (continued)

RIBA Stage 4: Specify

Action

HQM assessor

Complete the information needed for the HQM water efficiency calculator

Collect evidence for the HQM interim (design stage) assessment for certification

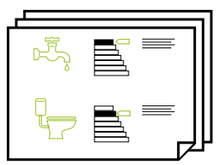
Mechanical and electrical systems (M&E) engineer / architect

Specify fittings, components and water recycling systems to be finalised

Documentation

Stage 4 MEP report with public health/ water specifications (M&E engineer)

Tender documentation



Completed copy of the HQM water efficiency calculator (HQM assessor)

HQM interim (design stage) assessment for certification (HQM assessor)

RIBA Stage 5: Deliver

Contractor

Install and commission the specified fittings, components and water recycling systems

RIBA Stage 6: Deliver

Property manager

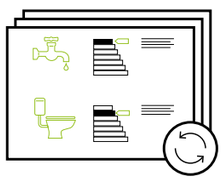
Learn how to use the systems effectively

HQM assessor

Complete the information needed for the HQM water efficiency calculator

Collect evidence for the HQM final (post construction) assessment for certification

Documentation



Completed copy of HQM water efficiency calculator (HQM assessor)

HQM final (post construction) assessment for certification (HQM assessor)

RIBA Stage 7: Monitor

Property manager

Track and monitor water consumption

Action

Documentation

Annual building performance audit and report (building manager)

Relevant policy

GLA The London Plan 2020 Policy SI 5

Development proposals should … minimise the use of mains water …, achieving mains water consumption of 105 litres or less per head per day, … achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent (commercial development), … incorporate measures such as smart metering, water saving and recycling measures …

Requirement G2 of the Building Regulations

Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.

Regulation 36 of the Building Regulations

The potential consumption of wholesome water by persons occupying a new dwelling must not exceed … 125 litres per person per day or, … the optional requirement of 110 litres per person per day.

London Environment Strategy 2016 Objective 8.3

In order to ensure an efficient, secure, resilient, and affordable water supply for London, water demand must be managed through water efficiency, leakage reduction and metering, and increased public awareness of water usage.

Further reading

AECB Water Standards, Delivering buildings with excellent water and energy performance, AECB 2009

Meeting our future water needs: a national framework for water resources, Environment Agency 2020

Preparing for a drier future: England's water infrastructure needs, National Infrastructure Commission 2018

Approved Document G – Sanitation, hot water safety and water efficiency, HM Government 2015

ID no

HPB 18

Key Performance Indicator (KPI) name

Water Efficiency – Commercial

What is it?

Water efficiency in commercial buildings focuses on reducing how much drinking (potable) water is used for purposes where this quality of water is not required. This involves using water-efficient components and recycling systems to supply water to non-drinking systems such as irrigation or WCs. This includes:

- Efficient plumbing fixtures
- Regulating water pressure
- Harvesting rainwater – such as leading gutters and drainpipes to water barrels
- Greywater recycling – treating waste water from appliances such as showers, baths, sinks and dishwashers, and feeding back into the building to flush toilets, for example.

How does it add value?

Reducing the amount of mains water used in buildings reduces the cost of water and energy bills (through heating water) for occupants.

It also reduces the environmental impact of these buildings by making sure that this valuable resource is used efficiently. Using water-efficient technology has a huge impact on reducing waste and energy use.

Reducing the amount of potable water use also helps to conserve water reserves at times of shortages.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Engineer – M&E	●●●	leading
Development Manager	●●○	accountable
BREEAM Assessor	●○○	supporting
Architect	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
11 Sustainable Cities and Communities
6 Clean Water and Sanitation

Connected SDF indicators

- ☑ Energy and Water Consumption during Construction
- ☑ Smart Building Technologies
- ☑ Sustainable Drainage

How is it calculated?

We will follow the criteria set out by BREEAM Wat 01 for water efficiency. See BREEAM New Construction 2018 Manual (page 202 of 403).

Water efficiency (up to five credits)

Credits are awarded on percentage improvement over a baseline of building water consumption. This is based on components in the building that use water. If a greywater or rainwater system is specified, its yield can be used to offset potable water consumption.

For offices, retail, industrial and educational buildings, a BREEAM accessor uses the Wat 01 calculator, with input from the M&E engineer. This method uses the building's actual component specification and default use patterns for the building type to determine water efficiency. It's measured in litres/person/day and m³/person/year.

The modelled output is compared with the output for a baseline component specification aligned with minimum requirements from the Water Supply Water Fittings Regulations and Part G of the Building Regulations.

The tool also requires the specification of any rainwater and greywater systems, showing that they comply with BS EN 16941-1:2018 and BS 8525-1:2010 greywater systems respectively. Other types of building use another method, which is described in the BREEAM NC 2018 Manual.

NOTE: For industrial projects this covers domestic scale fittings only, not industrial processes.

Table 8.1:
BREEAM credits available for percentage improvement over baseline building water consumption

No. of BREEAM credits	% improvement
1	12.5%
2	25%
3	40%
4	50%
5	55%
1 exemplary performance credit	65%

For some building types an alternative approach to compliance must be used to award credits

(for further information please refer to Methodology on the next page and the BREEAM Wat 01 calculator).

Metric type

Points

Units

Number of credits – BREEAM Wat 01

Range

1

3 credits

Good Practice (50% improvement over baseline building water consumption) – see table 8.1

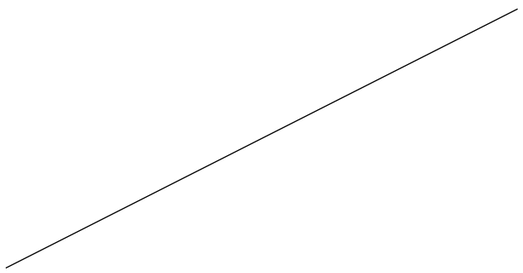
6 credits

Leading Practice (65% improvement over baseline building water consumption, includes exemplary credit) – see table 8.1

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

Development manager

Set a target in the brief for water efficiency

Sustainability engineer

Review policies, targets and mechanisms for water efficiency

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E engineer)

Base public health design on water consumption and recycling targets

RIBA Stage 3: Plan / Design

M&E engineer

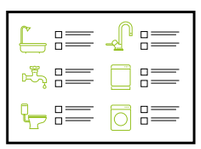
Base public health design on water consumption and recycling targets

Architect

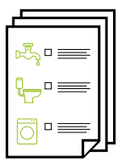
Specify sanitary appliances/brassware in line with the BREEAM WAT 01 water efficiency requirements

Action

Documentation

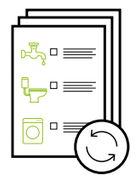


Targets in project brief (development manager)



Stage 2 MEP report with public health/water specifications (M&E engineer)

BREEAM pre-assessment report (optional) (BREEAM assessor)



Stage 3 MEP report with public health/ water specifications (M&E engineer)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

BREEAM assessor

Complete BREEAM Wat 01 calculations

Collect evidence for BREEAM interim (design stage) assessment for certification

M&E engineer / architect

Finalise specifications of fittings, components and water recycling systems

RIBA Stage 5: Deliver

Contractor

Install and commission specified fittings, components and water recycling systems

RIBA Stage 6: Deliver

BREEAM assessor

Complete BREEAM Wat 01 calculations

Collect evidence for BREEAM final (post construction) assessment for certification

Property manager

Learn how to use the systems effectively

RIBA Stage 7: Monitor

Property manager

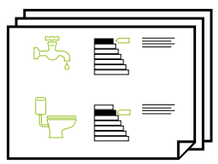
Track and monitor water consumption

Action

Documentation

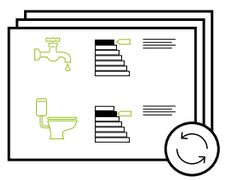
Stage 4 MEP report with public health/ water specifications (M&E engineer)

Tender documentation

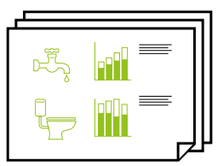


Completed copy of BREEAM Wat 01 calculator (BREEAM assessor)

BREEAM interim (design stage) assessment for certification (BREEAM assessor)



Completed copy of BREEAM Wat 01 calculator (BREEAM assessor)



BREEAM final (post construction) assessment for certification (BREEAM assessor)

Annual building performance audit and report (building manager)

Documentation

Relevant policy

GLA The London Plan 2020 Policy SI 5

Development proposals should … minimise the use of mains water …, achieving mains water consumption of 105 litres or less per head per day, … achieve at least the BREEAM excellent standard for the 'Wat 01' water category or equivalent (commercial development), … incorporate measures such as smart metering, water saving and recycling measures …

Requirement G2 of the Building Regulations

Reasonable provision must be made by the installation of fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water.

Regulation 36 of the Building Regulations

The potential consumption of wholesome water by persons occupying a new dwelling must not exceed … 125 litres per person per day or, … the optional requirement of 110 litres per person per day.

London Environment Strategy 2016 Objective 8.3

In order to ensure an efficient, secure, resilient, and affordable water supply for London, water demand must be managed through water efficiency, leakage reduction and metering, and increased public awareness of water usage.

Further reading

AECB Water Standards, Delivering buildings with excellent water and energy performance, AECB 2009

Meeting our future water needs: a national framework for water resources, Environment Agency 2020

Preparing for a drier future: England's water infrastructure needs, National Infrastructure Commission 2018

Approved Document G – Sanitation, hot water safety and water efficiency, HM Government 2015

ID no

HPB 19

Key Performance Indicator (KPI) name

Smart Building Technologies – Residential

What is it?

Smart buildings use technology to manage resources. This means that they can automatically sense, communicate and respond to changing conditions to operate as efficiently as possible. This includes adapting to changes in the weather and residents' needs.

The technology can monitor changes in movement, temperature and light in a home, and reduce levels of power in line with demand. For example, setting thermostats remotely and blinds automatically shutting to provide shade and regulate temperature. This increases energy efficiency and reduces running costs.

As we use more digital devices in our everyday lives, smart buildings are able to connect to more of them. This not only helps make our homes more environmentally friendly, but means they are able to meet our ever-increasing demand for digital connectivity.

Benchmarks for this KPI will be kept under review over the coming months.

How does it add value?

Smart buildings ease pressure on the national grid and energy systems, such as gas, by being flexible in their demand.

They can do this by:

- Storing (and generating) energy
- Using resources efficiently to reduce waste

If the UK is to achieve net zero carbon by 2030, we have to significantly reduce carbon dioxide emissions. Using low-carbon power sources reduces the level of greenhouses gases (this is decarbonisation). Smart buildings – with their efficiency and use of renewable energy resources – help speed up decarbonisation.

Smart buildings give people a better idea of how much energy their home uses. By linking mobiles and other devices to smart technology, occupants can control how they use energy to suit their needs. This provides a more comfortable environment (helping to improve health and wellbeing), is more energy efficient and cuts the costs of bills.

With the ability to connect to the most up-to-date digital services, smart buildings also meet our ever-increasing demands for high-speed internet connectivity – whether that's working from home or digital entertainment.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Engineer – M&E	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
HQM Assessor	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

11 Sustainable Cities and Communities
12 Responsible Consumption and Production
3 Good Health and Wellbeing

Connected SDF indicators

- ☑ Electric Vehicle (EV) Charging
- ☑ Sustainable Operations and Maintenance
- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Post Occupancy Evaluation

How is it calculated?

We will follow the criteria set out by HQM 11.3, Smart Building Technologies. See: Home Quality Mark ONE England manual (page 220 of 256).

Home information (prerequisite)

The prerequisite for this KPI is to provide home information in accordance with HQM 11.2 Home information section of the Home Quality Mark ONE England Manual.

Connectivity to the home (up to two credits)

A network infrastructure provider must be contacted during the planning phase and a list of criteria, as set out by the HQM ONE England Manual, must be met to achieve this credit.

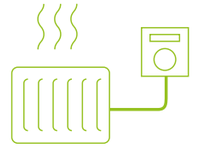
Credits are awarded depending on the download speed of the broadband available to the home:

One credit for superfast broadband (24Mbit/s)

Two credits for ultra-fast broadband (100Mbit/s)

Connectivity within the home (one credit)

The criteria listed in the HQM ONE England Manual relates to the connectivity and cabling within the home must be met to achieve this credit.



Basic smart heating (one credit)

The criteria listed in the HQM ONE England Manual related to smart heating must be met to achieve this credit.

Metric type

Points

Units

Number of credits – HQM 11.3

Range

1

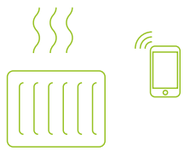
3 credits

Good Practice (Must achieve a minimum of one credit under Criteria 02, one credit under Criteria 03, and any one others)

6 credits

Leading Practice

How is it calculated? (continued)



Advanced smart heating (one credit)

An expanded criteria listed in the HQM ONE England Manual related to smart homes devices must be met to achieve this credit.

Basic smart lighting (one credit)

The criteria listed in the HQM ONE England Manual related to smart lighting must be met to achieve this credit.

Smart energy management (one credit)

The criteria listed in the HQM ONE England Manual related to smart energy must be met to achieve this credit.

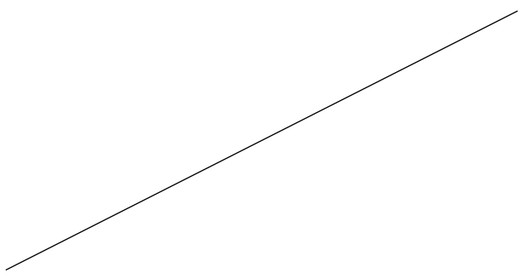
Additional smart solutions (one credit)

The criteria listed in the HQM ONE England Manual related to additional smart solutions must be met to achieve this credit.

What is the process?

Action

RIBA Stage 0



RIBA Stage 1: Optimise

Development manager

Set ambition for smart building technologies in the brief

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E) engineer

Mechanical, electrical and plumbing (MEP) design to consider smart building technologies, assessing the feasibility of all items on in the HQM criteria

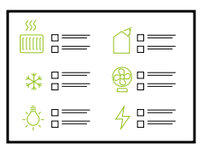
RIBA Stage 3: Plan / Design

M&E engineer

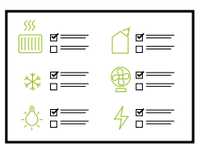
MEP design to detail smart building technologies

Action

Documentation

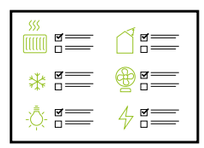


Targets in project brief (development manager)



Stage 2 MEP report with smart ready service specifications (M&E engineer)

HQM pre-assessment Report (Optional) (HQM Assessor)



Stage 3 MEP report with smart ready service specifications (M&E engineer)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

M&E engineer

Finalise specifications for smart building technologies

Ensuring that smart technologies are as simple and easy to understand as possible for all users

HQM assessor

Collect evidence for HQM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Contractor

Install and commission components and systems as specified, provide information for Operation and Maintenance (O&M) Manual.

RIBA Stage 6: Deliver

Property manager

Learn the proper and effective use of systems

HQM assessor

Collect evidence for HQM final (post construction) assessment for certification

RIBA Stage 7: Monitor

Property manager

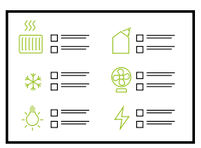
Track and monitor the effectiveness of smart building technologies

Action

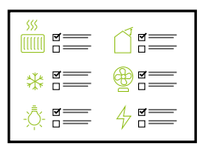
Documentation

Stage 4 MEP report with smart ready service specifications (M&E engineer)

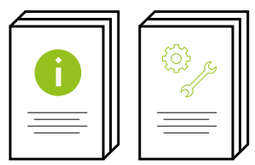
HQM interim (design stage) assessment for certification (HQM assessor)



Tender documentation



HQM final (post construction) assessment for certification (HQM assessor)



Home information pack (development manager)

As Built O&M Manual

Documentation

Relevant policy

EPBD [2018/844] - Article 8

The Commission shall [establish] an optional scheme for rating the smart readiness of buildings. The rating shall be based on an assessment of the capabilities of a building … to adapt its operation to the needs of the occupant and the grid and to improve its energy efficiency and overall performance.

GLA The London Plan 2020 Policy SI 6

To ensure London's global competitiveness now and in the future, development proposals should … meet expected demand for mobile connectivity generated by the development and … support the delivery of full-fibre or equivalent digital infrastructure, with particular focus on areas with gaps in connectivity and barriers to digital access.

GLA The London Plan 2020 9.2.12

As a minimum, energy strategies should contain the following information …

g. proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible.

Further reading

- Smart Buildings Decoded, BPIE 2017
- Final report on the technical support to the development of a smart readiness indicator for buildings, European Commission 2019
- Smart Buildings and the Internet of Things: Unlocking Value, Schnieder Electric
- Wired Score certification
- Smart buildings: How IoT technology aims to add value for real estate companies, Deloitte University Press 2016

ID no

HPB 20

Key Performance Indicator (KPI) name

Smart Building Technologies – Commercial

What is it?

Smart buildings use technology to manage resources. This means that they can automatically sense, communicate and respond to changing conditions to operate as efficiently as possible. This includes adapting to changes in the weather and occupants' needs. For example, if a building is empty for a certain period of time, lights could turn off automatically.

The technology can monitor changes in movement, temperature and light in a building, and reduce levels of power in line with demand. This increases energy efficiency and reduces running costs.

As we use more digital devices in our everyday lives, smart buildings will be able to connect to more of them, helping to increase the environmental performance of our buildings. This includes setting thermostats remotely and blinds automatically shutting to provide shade and regulate temperature.

The more of this type of technology a building uses, the 'smarter' it is. These smart buildings are vital in helping to reduce carbon emissions and tackle climate change but it is important to ensure future-proofing mechanisms are built in.

How does it add value?

Smart buildings ease pressure on the national grid and energy systems, such as gas, by being flexible in their demand.

They can do this by:

- Storing, and where possible, generating energy
- Using resources efficiently (such as water and energy) to reduce waste, and, in turn, demand

If the UK is to achieve net zero carbon by 2030, we have to significantly reduce carbon dioxide emissions. Using low-carbon power sources reduces the level of greenhouses gases being released into the atmosphere (this is decarbonisation). Smart buildings – with their use of renewable energy resources and higher efficiency – help speed up decarbonisation.

Smart buildings can also give people a better idea of how much energy they, and the building, uses. By linking their mobiles and other devices to smart technology, occupants can use energy more efficiently. Setting timers remotely, for example, is better for the environment and means lower energy bills.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☐ Industrial

Who is responsible?

Engineer – M&E	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

11 Sustainable Cities and Communities
12 Responsible Consumption and Production
3 Good Health and Wellbeing

Connected SDF indicators

- ☑ Electric Vehicle (EV) Charging
- ☑ Sustainable Operations and Maintenance
- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Post Occupancy Evaluation

How is it calculated?

We will use a Smart Readiness Indicator (SRI) to assess this type of technology in buildings.

This tool is being developed by the European Commission. Although it's still under consultation, we are adopting it on our projects. It measures :

- how technology responds to occupants' needs
- energy use in response to signals from the National Grid (reducing demand on the grid when necessary)

The SRI is still under consultation and yet to be adopted in practice. But, as it's likely to become an important tool, we're using the 'smart ready services' developed for the SRI to monitor smart building technologies.

We have identified 38 smart-ready services to use in our framework.

These are split into 10 areas:

Two points are available for each service, depending on its level of smartness and functionality.

Not all services apply to all buildings so the overall smartness of the building is shown as a percentage, representing the number of points achieved against the maximum for that building.

Metric type

%

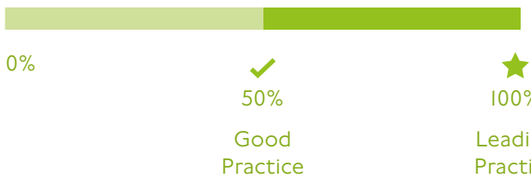
Percentage

Units

%

Percentage of applicable smart ready services incorporated

Range



1 responding to changing conditions and needs, such as letting in or shutting out the sun, light, breezes and sounds

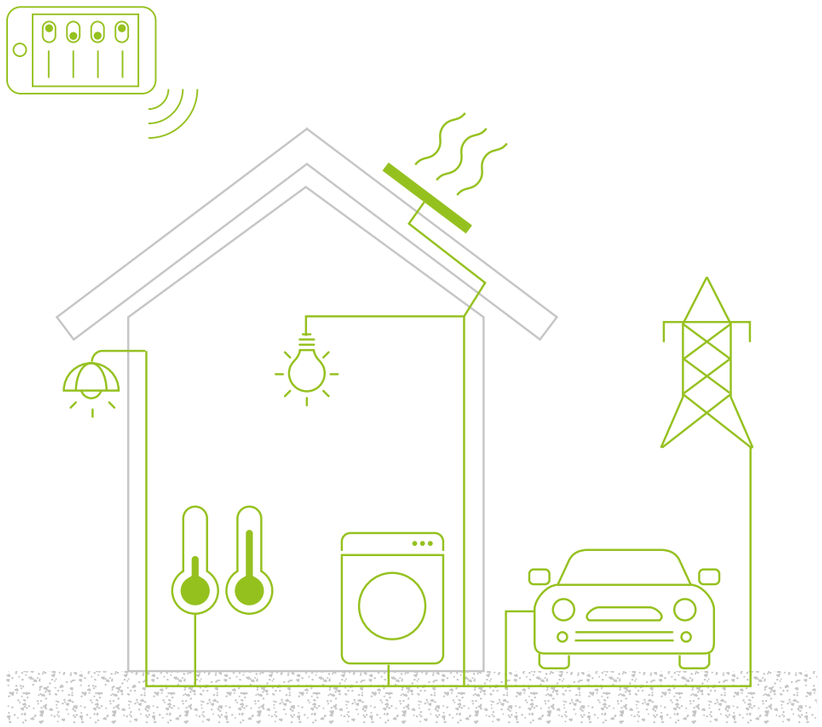
2 network availability across the building, such as phone signal and wifi connection

How is it calculated? (continued)

Example of domains structuring the SRI catalogue

Domain	Smart Ready Service	Functionality Level 0 (non-smart default)	Functionality Level 1	Functionality Level 2	Functionality Level 3	Functionality Level 4
Heating	Heat emission Contol	No automatic control	Central automatic control (eg central thermostat)	Individual room control (eg thermostatic valves, or electronic controller)	Individual room control with communication between controllers and to building automation and control system (BACS)	Individual room control with communication and presence control

Expected advantages of smart technologies in buildings



Optimised energy as a function of (local) production

Optimised local (green) energy storage

Automatic diagnosis and maintenance prediction

Improved comfort for residents via automation

The key functionalities of smart readiness in buildings

Readiness to adapt to the needs of the occupant

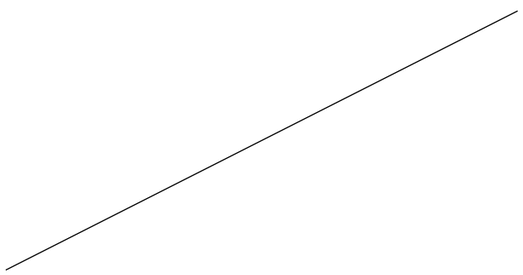
Readiness to facilitate maintenance and efficient operation

Readiness to adapt to the situation of the energy grid

What is the process?

Action

RIBA Stage 0



RIBA Stage 1: Optimise

Development manager

Set aims and targets for smart building technologies in the brief

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E) engineer

MEP (mechanical, electrical and plumbing) design must consider smart building technologies. It must assess the feasibility of all the items on the TfL Smart Building Requirements Checklist

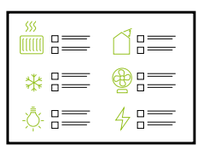
RIBA Stage 3: Plan / Design

M&E engineer

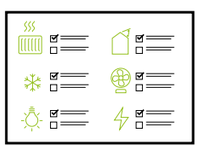
MEP design to include details of smart building technologies

Action

Documentation

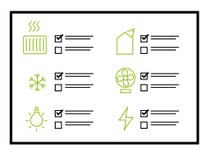


Targets in project brief (development manager)



Stage 2 MEP report with smart ready service specifications (M&E engineer)

TfL Smart Building Requirements Checklist (development manager)



Stage 3 MEP report with smart ready service specifications (M&E engineer)

TfL Smart Building Requirements Checklist (development manager)

Documentation

What is the process? (continued)

RIBA Stage 4: Specify

Action

M&E engineer

Finalise specification for smart building technologies

Ensuring that smart technologies are as simple and easy to understand as possible for all users

Documentation

Stage 4 MEP report with smart ready service specifications (M&E engineer)

TfL Smart Building Requirements Checklist (development manager)

RIBA Stage 5: Deliver

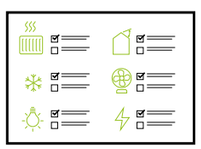
Contractor

Install and commission specified components and systems

RIBA Stage 6: Deliver

Property manager

Learn how to use the systems effectively



BREEAM final (Post Construction) Assessment for Certification (BREEAM Assessor)

RIBA Stage 7: Monitor

Property manager

Track and monitor the effectiveness of smart building technologies

Action

Documentation

Relevant policy

EPBD [2018/844] - Article 8

The Commission shall [establish] an optional scheme for rating the smart readiness of buildings. The rating shall be based on an assessment of the capabilities of a building … to adapt its operation to the needs of the occupant and the grid and to improve its energy efficiency and overall performance.

GLA The London Plan 2020 Policy SI 6

To ensure London's global competitiveness now and in the future, development proposals should … meet expected demand for mobile connectivity generated by the development and … support the delivery of full-fibre or equivalent digital infrastructure, with particular focus on areas with gaps in connectivity and barriers to digital access.

GLA The London Plan 2020 9.2.12

As a minimum, energy strategies should contain the following information …

g. proposals for demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible.

Further reading

Smart Buildings Decoded, BPIE 2017
Final report on the technical support to the development of a smart readiness indicator for buildings, European Commission 2019
Smart Buildings and the Internet of Things: Unlocking Value, Schnieder Electric
Smart buildings: How IoT technology aims to add value for real estate companies, Deloitte University Press 2016

ID no

HPB 21

Key Performance Indicator (KPI) name

Responsible Construction Practices – Residential

What is it?

Responsible construction practices are those that manage construction sites in an environmentally and socially considerate and accountable way. This indicator is based on Home Quality Mark ONE (HQM ONE) 10.1, 10.2 and 10.3 standard which promotes Responsible Construction Practices, Construction Energy Use and Construction Water Use. It also encourages a reduction in water and energy consumption and associated carbon emissions onsite during construction and demolition activities.

How does it add value?

By following responsible construction practices, this indicator aims to avoid wasting energy and water onsite, and to reduce energy consumption and associated carbon emissions during the construction and demolition processes. This approach also helps to control construction costs. By being environmentally and socially considerate, the reputation and acceptability of construction with neighbours, the general public, regulators and others is improved. It also encourages the community to accept new developments before occupants move in.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
LCA Specialist	●○○	supporting
HQM Assessor	●○○	supporting
Asset Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Optimise	Optimise	Specify	Deliver	n/a	n/a

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
13 Climate Action
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Regulated Emissions – Energy Systems
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Recycled Materials
- ☑ Responsible Sourcing

How is it calculated?

We will follow the criteria set out by HQM ONE 10.1, 10.2 and 10.3 for Responsible Construction Practices, Construction Energy Use and Construction Water Use. See the Home Quality Mark ONE England manual (pages 186 of 256 onwards).

Credits are awarded as follows:

HQM 10.1 – Responsible construction management (five credits)

The first two credits are awarded for achieving the items specified in table 57 overleaf

A further two credits can be achieved if a further six additional items from table 57 are met

A final credit can be achieved if all remaining items in table 57 are met

HQM 10.2 – Weekly detailed monitoring and reporting of metered energy (one credit)

Credit is awarded where the monitoring and reporting of energy consumption is done on a weekly basis – see table 57 and 58 overleaf

HQM 10.2 - Contractor's energy efficiency checklist (two credits)

Credits are awarded where the contractor's energy efficiency checklist has been completed with a full record of decisions, actions or justifications for all points.

HQM 10.2 Energy monitoring and reporting (two credits)

Credits are awarded for targeting, monitoring and reporting data on the principal contractor's and sub-contractors' metered energy consumption as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation

HQM 10.3 – Contractor's water efficiency checklist (two credits)

Credits are awarded where the contractor has completed a water efficient checklist (see table 59 on page 199 of Home Quality Mark ONE England Manual) with a full record of decisions and actions or justifications for all points

HQM 10.3 – Water monitoring and reporting (two credits)

Credits are awarded where targets have been set on the principal contractor's and subcontractors' potable water consumption using construction plant, equipment (mobile and fixed) and site accommodation, and the consumption is monitored and reported

HQM 10.3 – Weekly detailed monitoring and reporting of metered water (one credit)

Credit is awarded where the monitoring and reporting of water consumption is done weekly

General evidence requirements relevant to this indicator are listed in Appendix C of the Home Quality Mark ONE England Manual.

Metric type

Points

Units

Number of credits – HQM 10.1 + 10.2 + 10.3

Range

1 — 10 credits (Good Practice (Must achieve two credits under Criteria 01 for HQM 10.1, 10.2 and 10.3 and two credits under Criteria 02 for HQM 10.2 and 10.3)) — 15 credits (Leading Practice)

How is it calculated? (continued)

Table 57: Responsible construction management items

Ref.	Criteria	Required for one credit
	Risk evaluation and implementation: The principal contractor evaluates the risks (on site and off site), plans and implements actions to minimise the identified risks, covering the following, where appropriate:	
	Vehicle movement	
a	Manage the construction site entrance to minimise the impacts (eg safety, disruption) arising from vehicles approaching and leaving the development footprint. In particular this should consider the risks for vulnerable road users and local communities.	✓
b	Ensure the development footprint is accessible for delivery vehicles fitted with safety features (eg side under run protection) to remove or limit the need for on-street loading or unloading. Where on-street loading is unavoidable, this should be appropriately managed.	
c	Manage access routes to the development footprint, including for heavy vehicles to minimise traffic disruption and safety risks to others.	
	Pollution management	
d	Minimise the risks of air, land and water pollution.	✓
e	Minimise the risks of nuisance from vibration, light and noise pollution.	
f	Implement practices to ensure the development footprint is safe, clean and organised at all times. This includes, but is not limited to, facilities, materials and waste storage.	✓
g	Ensure clear and safe access in and around the buildings at the point of handover.	✓
	Health and wellbeing	
h	Provide processes and equipment required to respond to medical emergencies.	✓
i	The principal contractor identifies and implements initiatives to promote and maintain the health and wellbeing of all site operatives within the development footprint. This can be via site facilities, site management arrangements, etc.	
j	Establish management practices and facilities encouraging equality, fair treatment and respect of all site operatives.	✓
k	Provide secure, clean and organised facilities (eg changing and storage facilities) for site operatives within the development footprint.	
	Security processes	
l	Minimise risks of the site becoming a focus for antisocial behaviour in the local community (eg robust perimeter fencing, CCTV, or avoid creating dark corners).	

How is it calculated? (continued)

Table 57: Responsible construction management items (continued)

Ref.	Criteria	Required for one credit
Training, awareness and feedback		
The principal contractor is responsible for ensuring:		
m	Aspects of the construction process that might impact the community are communicated regularly, ensuring that nuisance and intrusion are minimised.	
n	Ongoing training is provided, and up-to-date, for personnel and visitors (covering items a to l, as appropriate.)	✓
o	The principal contractor ensures that site operatives are trained for the tasks they are undertaking (including any site-specific considerations).	✓
p	The fleet operators undertakes driver training and awareness to promote safety within the development footprint and off-site.	
Monitoring and reporting		
The principal contractor ensures::		
q	The fleet operators capture and investigate any road accidents, incidents and near misses, and reports them to the principal contractor. The principal contractor analyses these items.	
r	All visitor, workforce and community accidents, incidents and near misses are recorded and action is taken to reduce the likelihood of them reoccurring.	✓
s	Processes are in place to facilitate collecting and recording feedback from the community and to address any concerns related to the development footprint.	

HQM 10.3 Credits

Criterion number	Title	Credits
crit 1	01 Contractor's water efficiency checklist	2
crit 2	02 Water monitoring and reporting	2
crit 3	03 Weekly detailed monitoring and reporting of metered water use	1
Total credits available		**5**

How is it calculated? (continued)

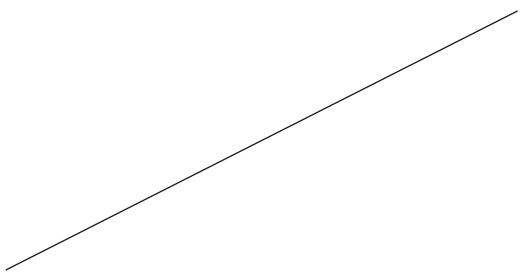
Table 58: Contractor's energy efficiency checklist

Stage	Energy efficiency action (see Definitions for further details on where to find more information about what each title entails)	Record of decisions and actions taken
Pre-construction phase	Plan the energy requirements of the project	To be completed by the contractor or the appointed individual. For example, at design stage monitoring was established on a weekly basis. For example, at post-construction monitoring was carried out on the first working day of the week throughout the project. Not applicable is not valid for this point.
	Procure low CO_2 site accommodation	To be completed by the contractor or the appointed individual. For example, obtain EPC rating of C or higher for site accommodation.
	Specify energy efficient plant	To be completed by the contractor or the appointed individual.
	Secure early, high capacity, electricity grid connection	To be completed by the contractor or the appointed individual.
	Co-ordinate monitoring with phasing programme of work and set the intervals at which the reporting will be taken at.	To be completed by the contractor or the appointed individual. The action against this point will determine eligibility for crit 3
	*Other energy efficiency actions can be added to this checklist	
Construction phase	Deploy the right size generators (if generators are needed)	To be completed by the contractor.
	Manage energy in a site office efficiently	To be completed by the contractor.
	Consider energy saving measures	To be completed by the contractor.
	Consider installing intelligent and efficient temporary electrics	To be completed by the contractor.
	Consider techniques which avoid forced drying of wet trades	To be completed by the contractor.
	Monitor and manage energy use	To be completed by the contractor. The action against this point will determine eligibility for crit 2 – crit 3
	*Other energy efficiency actions can be added to this checklist	

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

<u>All disciplines</u>

All to agree and sign a procurement policy document

<u>Development manager</u>

Specify targets in the brief to reduce operational carbon and water consumption during construction stage

RIBA Stage 2: Plan / Design

<u>Sustainability engineer</u>

Appointed to assist in setting targets for energy and water consumption during construction

RIBA Stage 3: Plan / Design

<u>Life cycle assessment (LCA) specialist</u>

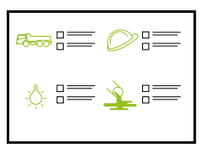
Provide insight on construction methods that can be used to reduce the energy consumption during construction

<u>Contractor</u>

Early on align and specify targets to be achieved during construction. Set intent to monitor and report this information

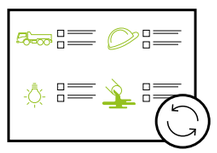
Action

Documentation



Targets in project brief (development manager)

Product procurement policy (all disciplines)



HQM pre-assessment report (optional) (HQM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Contractor

Outline targets in tender documents and provide specification of the procedures in place to monitor and report energy consumption, including the names and job titles of responsible individuals

Complete HQM contractors' energy efficiency checklist – pre-construction, and submit before construction starts on site

Development manager

Ensure the contractor tender documents are in line with HQM target requirements of energy and water consumption during construction

HQM assessor

Collect evidence for HQM interim (design stage) assessment for certification including responsible construction management checklist

RIBA Stage 5: Deliver

Contractor

Construction team to monitor and report energy and water use during construction stages. Including fuel types and recorded energy consumption for each use

Sustainability engineer

Review and ensure that targets are being met

RIBA Stage 6

Contractor

Complete HQM contractor' energy efficiency checklist – post completion

HQM assessor

Collect evidence for HQM final (post construction) assessment for certification including responsible construction management checklist

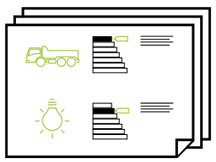
RIBA Stage 7

Asset manager

In view of any future renovations, they must ensure similar or improved targets are set for energy and water consumption during construction

Action

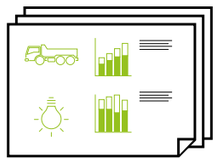
Documentation



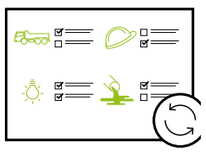
Energy efficiency checklist (HQM assessor)

HQM interim (design stage) assessment for certification (HQM assessor)

Requirements in tender documentation (development manager)



Detailed monitoring and reporting data (contractor)



Energy efficiency checklist (HQM assessor)

QM final (post construction) assessment for certification (HQM assessor)

Documentation

Relevant policy

Tower Hamlets Local Plan 2031 – Policy D.SG.4

All major development should sign up to the considerate constructors scheme and where appropriate a constructors forum. During construction, major development is required to consider the impact of construction on the water supply, flood risk and drainage and implement suitable mitigation measures where required.

Camden Local Plan 2017, Paragraph 8.17

All proposals for substantial demolition and reconstruction should be fully justified in terms of the optimisation of resources and energy use, in comparison with the existing building. Where the demolition of a building cannot be avoided, we will expect developments to divert 85% of waste from landfill and comply with the Institute for Civil Engineer's Demolition Protocol and either reuse materials onsite or salvage appropriate materials to enable their reuse off-site. We will also require developments to consider the specification of materials and construction processes with low embodied carbon content.

Home Quality Mark One England Manual

It is well recognised that the energy efficiency of homes has significant impact on human health. It is estimated that in 2013, in England alone, around 2.5 million households were suffering from fuel poverty (95). Energy use is also a major contributor to global carbon dioxide (CO_2) emissions, with homes contributing a significant proportion of the UK's total carbon emissions (13% of UK greenhouse gas emissions in 2015(96)). This makes reducing CO_2 emissions and energy costs a key challenge for homes in the UK and an essential part of meeting the Government's target to reduce CO_2 emissions by 80% by 2050(97) (against 1990 levels).

Further reading

Camden Local Plan
SmartSite
Considerate Contractors Checklist
Home quality Mark ONE England Manual

ID no

HPB 22

Key Performance Indicator (KPI) name

Responsible Construction Practices – Commercial

What is it?

Responsible construction practices are those that promote and manage construction sites in an environmentally and socially considerate and accountable way. This approach also encourages the reduction of energy and water consumption during construction and demolition activities.

This indicator is based on BREEAM Man 03, Responsible Construction Practices.

How does it add value?

By following responsible construction practices, the indicator aims to avoid wasting energy and water onsite, and to reduce energy consumption and associated carbon emissions during the construction and demolition processes. This also helps to control construction costs. By being environmentally and socially considerate, the reputation and acceptability of construction with neighbours, the general public, regulators and others is improved. It also encourages the community to accept new developments before occupants move in.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
LCA Specialist	●○○	supporting
BREEAM Assessor	●○○	supporting
Asset Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Optimise	Optimise	Specify	Deliver	n/a	n/a

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
13 Climate Action
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Regulated Emissions – Energy Systems
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Recycled Materials
- ☑ Responsible Sourcing

How is it calculated?

Our Sustainable Development Framework aims to follow the criteria set out by BREEAM Man 03, Responsible Construction Practices. See the BREEAM UK New Construction 2018 Manual (page 50 of 392).

Legal and sustainable timber (prerequisite)

All timber and timber-based products used during construction must be 'legal' and 'sustainable' as per the UK Government's Timber Procurement Policy. See the BREEAM UK New Construction 2018 Manual for further information.

Environmental management (one credit)

Credit is awarded when all parties who manage the construction site operate an EMS (Environmental Management System) covering their main operations.

The EMS must satisfy a criteria of requirements listed in the BREEAM UK New Construction 2018 Manual.

BREEAM AP (accredited professional) (one credit)

As a prerequisite for this credit, the client and contractor must formally agree performance targets.
The credit is achieved with the involvement of a BREEAM AP in the project to work with the project team, monitor construction progress and identify risks and opportunities. This credit also requires the contractor and client to formally agree performance targets.

Responsible construction management (up to two credits)

Up to two credits are awarded based on the items from table 4.1 completed.

This includes demolition and construction activities onsite, from the start of demolition to the completion of construction. One or two credits are awarded depending on the items from the checklists that are met.

- Meeting the required criteria achieves one credit
- Meeting an additional six criteria achieves two credits

Monitoring of construction site impacts (up to two credits)

Two credits are awarded for setting targets and monitoring construction site impacts related to energy consumption, water consumption, and transport of construction materials and waste. One of those credits is awarded based on energy and water consumption monitoring, while the second is based on the transport of construction materials and waste. Targets should be set in advance and the utility consumption must be monitored and reported in total $kgco_2$/project value for energy, and cubic metres (m^3) for net water consumption. Transport movement targets should be reported in $kgco_2e$, plus total distance travelled (km). Note that credits are awarded for the setting, monitoring and reporting of targets rather than meeting them.

Exemplary level criteria (one credit)

An exemplary credit can be achieved if all criteria are met as listed in table 4.1: Responsible construction management items (as shown overleaf).

Metric type

Points

Units

Number of credits – BREEAM Man 03

Range

1 — 4 credits: Good Practice (any combination of credits) — 7 credits: Leading Practice (any combination of credits)

How is it calculated? (continued)

Table 4.1: Responsible construction management items

Ref.	Criteria	Required for one credit
Risk evaluation and implementation: The principal contractor evaluates the risks (on site and off site), plans and implements actions to minimise the identified risks, covering the following, where appropriate:		
Vehicle movement		
a	Manage the construction site entrance to minimise the impacts (eg safety, disruption) arising from vehicles approaching and leaving the development footprint.	✓
b	Ensure the development footprint is accessible for delivery vehicles fitted with safety features (eg side under run protection) to remove or limit the need for on-street loading or unloading. Where on-street loading is unavoidable, this should be appropriately managed.	
c	Identify access routes to the development footprint, including for heavy vehicles to minimise traffic disruption and safety risks to others.	
Pollution management		
d	Minimise the risks of air, land and water pollution.	✓
e	Minimise the risks of nuisance from vibration, light and noise pollution.	
Tidiness		
f	Practices ensure the development footprint is safe, clean and organised at all times. This includes, but is not limited to, facilities, materials and waste storage.	✓
g	Ensure clear and safe access in and around the buildings at the point of handover.	✓
Health and wellbeing		
h	Provide processes and equipment required to respond to medical emergencies.	✓
i	The principal contractor identifies and implements initiatives to promote and maintain the health and wellbeing of all site operatives within the development footprint. This can be via site facilities, site management arrangements, staff policies etc.	
j	Establish management practices and facilities encouraging equality, fair treatment and respect of all site operatives.	✓
k	Provide secure, clean and organised facilities (eg changing and storage facilities) for site operatives within the development footprint.	
Security processes		
l	Minimise risks of the site becoming a focus for antisocial behaviour in the local community (eg robust perimeter fencing, CCTV, or avoid creating dark corners).	

How is it calculated? (continued)

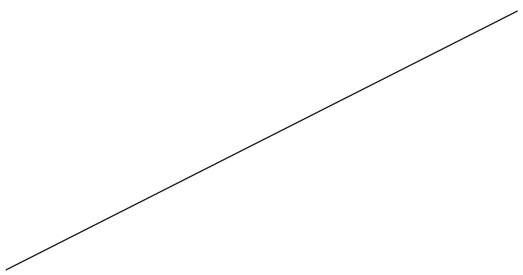
Table 4.I: Responsible construction management items (continued)

Ref.	Criteria	Required for one credit
	Training, awareness and feedback	
	The principal contractor is responsible for ensuring:	
m	Aspects of the construction process that might impact the community are communicated regularly, ensuring that nuisance and intrusion are minimised.	
n	Ensure ongoing training is provided, and up-to-date, for personnel and visitors (covering items a to l, as appropriate.)	✓
o	The principal contractor ensures that site operatives are trained for the tasks they are undertaking (including any site-specific considerations).	✓
p	The fleet operators (see definitions on page 56), undertakes driver training and awareness to promote safety within the development footprint and off site.	
	Training, awareness and feedback	
	The principal contractor ensures:	
q	The fleet operators capture and investigate any road accidents, incidents and near misses and reports them back to the principal contractor. The principal contractor analyses these items.	
r	All visitor, workforce and community accidents, incidents and near misses are recorded and action is taken to reduce the likelihood of them reoccurring.	✓
s	Processes are in place to facilitate collecting and recording feedback from the community and to address any concerns related to the development footprint.	

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

All disciplines

All to agree and sign a procurement policy document

Development manager

Specify targets in the brief to reduce operational carbon and water consumption during construction stage

RIBA Stage 2: Plan / Design

Sustainability engineer

Assist in setting targets for energy and water consumption during construction

Project manager

Appoint BREEAM AP to work with the design team to provide advice on BREEAM issues, monitor construction process against the requirements, and proactively identify opportunities and risks related to procurement and construction process

RIBA Stage 3: Plan / Design

Life cycle assessment (LCA) specialist

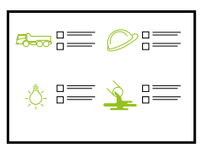
Provide insight on construction methods that can be used to reduce the energy consumption during construction

Contractor

Engage early on to align and specify targets to be achieved during construction. Set intent to monitor and report this information. All timber should be legal and sustainably sourced

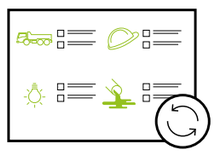
Action

Documentation



Targets in project brief (development manager)

Product procurement policy (all disciplines)



BREEAM pre-assessment report (optional) (BREEAM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Contractor

Outline energy and water consumption targets in tender documentation and provide specification of the procedures in place to monitor and report energy consumption, including the names and job titles of responsible individuals. This could be the BREEAM AP

Development manager

Ensure that the contractor's tender documents are in line with BREEAM target requirements of energy and water consumption during construction

BREEAM assessor

Collect evidence for BREEAM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Development manager

Appoint a BREEAM approved professional to monitor, record and report energy use, water consumption and transportation data (where measured) resulting from all onsite construction processes (and dedicated off-site manufacturing) throughout the build programme. Data should be recorded against 'BREEAM projects'

Sustainability engineer

Review and ensure that targets are being met

RIBA Stage 6

BREEAM assessor

Review and compete BREEAM Man 03, table 4.1 based on the management of the principal contractor

Collect evidence for BREEAM final (post construction) assessment for certification including material certificates and a copy of the principal contractor's EMS/EMAS or BMS 8555 evidence

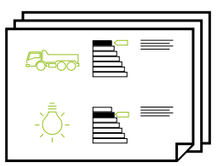
RIBA Stage 7

Asset manager

In view of any future renovations, they must ensure similar or improved targets are set for energy and water consumption during construction

Action

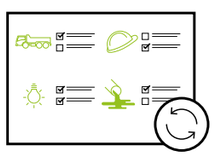
Documentation



BREEAM interim (design stage) assessment for certification (BREEAM assessor)

Requirements in tender documentation (development manager)

Detailed monitoring and reporting data (contractor)



BREEAM final (post construction) assessment for certification (BREEAM assessor)

Documentation

Relevant policy

Tower Hamlets Local Plan 2031 – Policy D.SG.4

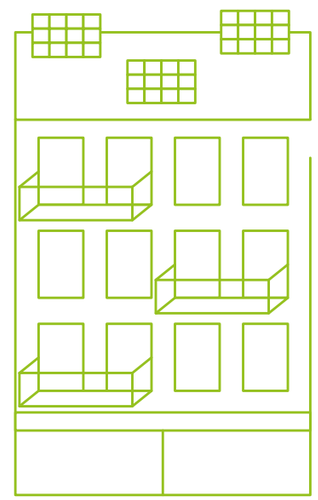
All major development should sign up to the considerate constructors scheme and where appropriate a constructors forum. During construction, major development is required to consider the impact of construction on the water supply, flood risk and drainage and implement suitable mitigation measures where required.

Camden Local Plan 2017, paragraph 8.17

All proposals for substantial demolition and reconstruction should be fully justified in terms of the optimisation of resources and energy use, in comparison with the existing building. Where the demolition of a building cannot be avoided, we will expect developments to divert 85% of waste from landfill and comply with the Institute for Civil Engineer's Demolition Protocol and either reuse materials onsite or salvage appropriate materials to enable their reuse off-site. We will also require developments to consider the specification of materials and construction processes with low embodied carbon content.

Further reading

Camden Local Plan
Considerate Contractors Checklist



ID no

HPB 23

Key Performance Indicator (KPI) name

Construction Waste – Residential

What is it?

Construction work generates large amounts of waste. This ranges from packaging and demolition debris to surplus materials as a result of over ordering. These include soil, glass, plastics, piping, concrete, mortar, bricks and green waste (such as bushes and trees).

Considering that around a third of landfill sites worldwide are made up of construction and demolition waste, this is becoming a serious environmental problem.

This indicator focuses on monitoring and reducing the amount of waste that's produced during construction and looking at alternatives to landfill. It encourages reusing and recovering materials, and following Leading Practice in waste management, to keep waste going to landfill to a minimum.

Leading practices include: reusing materials currently on site, optimising material use through considering sheet sizes when designing to reduce cut-off waste and specifying materials with supplier 'take-back' schemes.

How does it add value?

Reducing the amount of waste that goes to landfill lessens the environmental impact as well as the cost of construction.

Reusing and recovering construction materials also avoids unnecessarily extracting and processing of natural resources, as well as the associated vehicle movement – all of which have an environmental and economic cost.

Incorporating waste management into projects at the design stage, following Leading Practice on site and regular monitoring will all help to cut waste, protect the environment and save money. For example, ordering the right amount of materials saves money and avoids surplus that's then wasted. Storing everything correctly also avoids products degrading, and then going to waste. And choosing products with minimal packaging also makes a difference.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
LCA Specialist	●○○	supporting
HQM Assessor	●○○	supporting
Asset Manager	●○○	supporting
Project Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	n/a	n/a

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Responsible Construction
- ☑ Sustainable Operations and Maintenance
- ☑ Recycled Materials
- ☑ Responsible Sourcing

How is it calculated?

We will follow the criteria set out in HQM 10.4 for construction site waste management. See Home Quality Mark ONE England manual (page 200 of 256). HQM 10.4 awards up to 16 credits for construction waste recovery. See the Home Quality Mark ONE England Manual for details.

Credits are awarded as follows:

Product procurement policy (one credit)

The client or developer must have a documented policy and procedure in place by the end of RIBA Stage 2 (or equivalent). This sets out procurement requirements relating to opportunities for keeping construction waste onsite to a minimum, for all suppliers and trades (see the documented product procurement policy in HQM ONE England Manual, p202 of 256).
The documented policy and procedure must be circulated to everyone involved in the project, alongside encouragement to specify products that help keep waste to a minimum.

Construction resource efficiency (up to eight credits)

A number of criteria need to be met to be awarded up to eight credits:

1 Complete a pre-demolition audit of any existing buildings, structures or hard surfaces to be demolished, if feasible.

2 Develop a resource management plan (RMP) covering the non-hazardous waste related to onsite construction and, where applicable, dedicated off-site manufacture or fabrication (including demolition and excavation waste) generated by the building's design and construction.

3 Credits can be awarded where construction waste related to onsite construction and dedicated off-site manufacture or fabrication (excluding demolition and excavation waste) meets, or is lower than, the benchmarks identified in table 60 (see page 201 of 256 of the Home Quality Mark ONE England Manual).

Table 60: Site Waste Reduction Performance credit allocation

Waste generated per 100m² (project wide gross internal floor area (GIFA)) for new build residential projects

m³ per 100m²	Tonnes per 100m²	Credits
≤ 13.9	≤ 8.5	2
≤ 8.1	≤ 4.9	4
≤ 4.8	≤ 2.9	6
≤ 3.5	≤ 1.9	8

Metric type

Points

Units

Number of credits – HQM 10.4

Range

1

10 credits
Good Practice (Must achieve one credit under Criteria 01, four credits under Criteria 02, two credits under Criteria 03, three credits under Criteria 04)

16 credits
Leading Practice

How is it calculated? (continued)

Diverting construction waste from landfill (up to four credits)

Credits can be achieved where waste materials are sorted into the main waste groups – see table 62 (page 204 of 256 of the Home Quality Mark ONE England). Credits are also awarded for the project's performance in diverting non-hazardous construction and demolition waste, where applicable, from landfill. The associated benchmarks are outlined in table 61 (page 202 of 256 of the Home Quality Mark England ONE).

Table 61: Diversion from landfill credit allocation.

Type of waste	Percentage diverted from landfill (by volume)	Percentage diverted from landfill (by tonnage)	Credits
Construction	70%	80%	2
Demolition	80%	90%	
Construction	85%	90%	4
Demolition	85%	95%	

Diverting excavation waste from landfill (three credits)

Credits can be achieved where at least 95 per cent (either by volume or tonnage) of excavation waste is diverted from landfill – see table 61 (page 202 of 256 of the Home Quality Mark ONE England Manual).

Waste hierarchy

The order of priority for the management of waste where waste generation could or does occur. This is listed in descending order of environmental preference in The Waste (England and Wales) Regulation 2011 (159) as:

Prevention

Reuse

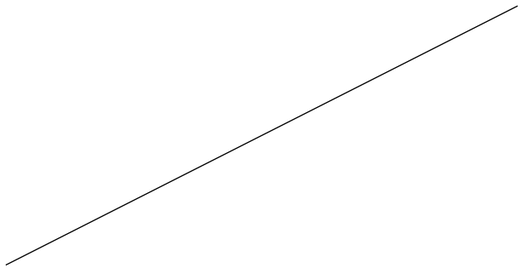
Recyle

Recover

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

<u>All disciplines</u>

All to agree and sign a procurement policy document

<u>Development manager</u>

Specify in the brief targets to reduce the construction waste generated

RIBA Stage 2: Plan / Design

<u>Development manager</u>

Appoint a demolition contractor to complete a pre-demolition audit, if feasible

<u>Sustainability engineer</u>

Help set specific targets for the waste generated during construction

RIBA Stage 3: Plan / Design

<u>Development manager / project manager</u>

Early on in the project, align and specify projected benchmarks of waste generation during construction in a resource management plan (RMP), including waste diversion figures

Set intent to monitor and report this information

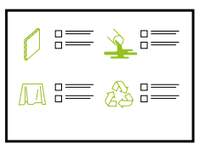
<u>Life-cycle analysis (LCA) specialist</u>

Advise on ways to reduce material use and waste generation during construction

Engage with the contractor to advise on ways to recycle materials already on site

Action

Documentation



Targets in project brief (development manager)

Procurement policy document (all disciplines)

Product procurement policy (development manager)

Sustainability statement (sustainability engineer)

Pre-demolition audit (if applicable) (development manager)

HQM pre assessment report (optional) (HQM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Contractor

Finalise the method of monitoring construction waste generation in the RMP

HQM assessor

Collect evidence for the HQM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Sustainability engineer

Review to make sure that targets are being met

Contractor

A waste contractor can be appointed to separate and process recycled waste off site, if there's limited space on site

Construction team to monitor and report waste generation during construction

RIBA Stage 6

HQM assessor

Collect evidence for the HQM final (post construction) assessment for certification

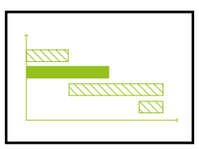
RIBA Stage 7

Asset manager

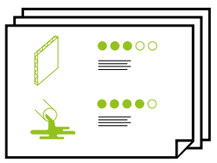
In relation to any future renovations, make sure similar or improved targets are set for construction waste generation

Action

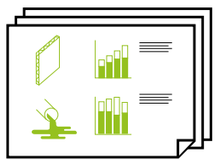
Documentation



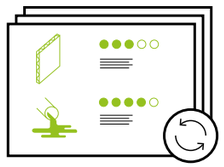
RMP (development manager/contractor)



HQM interim (design stage) assessment for certification (HQM assessor)



Detailed monitoring and reporting data (contractor)



HQM final (post construction) assessment for certification (HQM assessor)

Documentation

Relevant policy

Merton Local Plan – Climate Change Policy CC8.14

The council will require all development proposals to adopt a circular economy approach to building design and construction to reduce waste, to keep materials and products in use for as long as possible, and to minimise embodied carbon.

Tower Hamlets Local Plan 2031 – Policy D.SG4

Major developments must employ the highest standards of sustainable construction, including … The use of demolished material from the development site, where practicable, in order to minimise the transportation of waste and reduce carbon dioxide emissions.

Further reading

WRAP – Reducing your construction waste
LETI Embodied Carbon Primer
Camden Local Plan

ID no

HPB 24

Key Performance Indicator (KPI) name

Construction Waste – Commercial

What is it?

Construction work generates large amounts of waste. This ranges from packaging and demolition debris to surplus materials as a result of over ordering. These include soil, glass, plastics, piping, concrete, mortar, bricks and green waste (such as bushes and trees).

Considering that around a third of landfill sites worldwide are made up of construction and demolition waste, this is becoming a serious environmental problem.

This KPI focuses on monitoring and reducing the amount of waste that's produced during construction and looking at alternatives to landfill. It encourages reusing and recovering materials, and following Leading Practice in waste management, to keep waste going to landfill to a minimum.

How does it add value?

Reducing the amount of waste that goes to landfill reduces both the environmental impact as well as the cost of construction.

Reusing and recovering construction materials also avoids unnecessarily extracting and processing natural resources, as well as the associated vehicle movement – all of which have an environmental and economic cost.

Incorporating waste management into projects at the design stage, following Leading Practice on site and regular monitoring will all help to cut waste, protect the environment and save money. For example, ordering the right amount of materials saves money and avoids surplus that's then wasted. Storing everything correctly also avoids products degrading, and then going to waste. And choosing products with minimal packaging also makes a difference.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
LCA Specialist	●○○	supporting
BREEAM Assessor	●○○	supporting
Asset Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	n/a	n/a

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Responsible Construction
- ☑ Sustainable Operations and Maintenance
- ☑ Recycled Materials
- ☑ Responsible Sourcing

How is it calculated?

We will follow the criteria set out by BREEAM Waste 01 for construction waste management. See BREEAM UK New Construction 2018 Manual (page 270 of 403).

Pre-demolition audit (one credit)

Credit is awarded for a complete pre-demolition audit at concept design of any existing buildings, structures or hard surfaces. This determines whether refurbishment or reuse is feasible. In the case of demolition, this should maximise recovering materials for subsequent high grade or value applications.

Construction resource efficiency (up to three credits)

Credits are given depending on the amount of waste generated per 100m^2 of gross internal floor area (see table 10.1 below).

To achieve these credits, a resource management plan (RMP) must also be prepared, covering non-hazardous waste materials and accurate data records of waste arisings and waste management routes.

Table 10.1: Construction waste resource efficiency benchmarks

BREEAM credits	**Amount of waste generated per 100m² (gross internal floor area)**	
	m³ (actual, not bulk volume)	**tonnes**
One credit	≤ 13.3	≤ 11.1
Two credits	≤ 7.5	≤ 6.5
three credits	≤ 3.4	≤ 3.2
four credits	≤ 1.6	≤ 1.9

Metric type

Points

Units

Number of credits – BREEAM Wst 01

Range

1

4 credits

Good Practice (Any combination of credits)

7 credits

Leading Practice (Includes exemplary credit)

How is it calculated? (continued)

Diverting resources from landfill (one credit)

The last credit is achieved depending on the demolition, excavation and non-hazardous waste diversion from landfill (see table 10.2).

Waste materials should also be sorted into the main waste groups, as indicated in the BREEAM NC 2018 Manual.

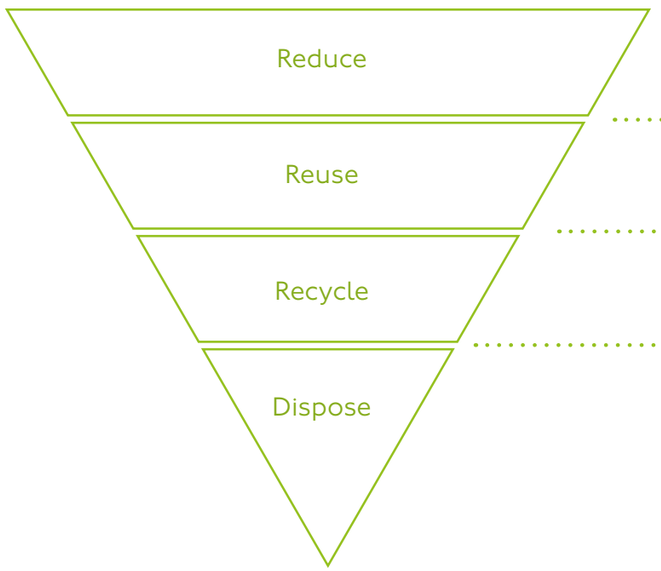
Table 10.2: Diversion from landfill benchmarks

BREEAM credits	Type of waste	Volume	Tonnage
One credit	Non-demolition	70%	80%
	Demolitiom	80%	90%
	Excavation	n/a	n/a
Exemplary level	Non-demolition	85%	90%
	Demoltion	85%	95%
	Excavation	95%	95%

Exemplary-level criteria (one credit)

An exemplary credit can be achieved if non-hazardous, demolition and excavation waste generated and diverted from landfill all meet the exemplary level required by the BREEAM NC 2018 Manual, while all the main waste groups indicated by the BREEAM NC 2018 manual are covered in the RMP. Waste data obtained by external waste contractors must also be reliable and verifiable.

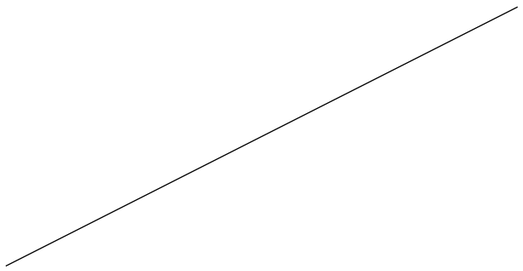
Waste hierarchy



What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

All disciplines

All to agree and sign a procurement policy document

Development manager

Specify targets in the brief to reduce the construction waste generated

RIBA Stage 2: Plan / Design

Sustainability engineer

Appoint a sustainability engineer to help set specific targets for waste generated during construction

Contractor

Carry out a pre-demolition audit

RIBA Stage 3: Plan / Design

Contractor

Early on in the project, align and specify projected benchmarks of waste generation during construction in an RMP, including waste diversion figures

Set intent to monitor and report this information

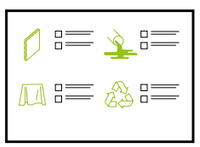
Life-cycle analysis (LCA) specialist

Review the pre-demolition audit results and advise on ways to reduce material use and waste generation during construction

Engage with the contractor to advise on ways to recycle materials already on site

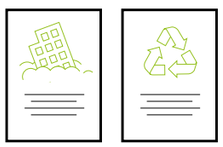
Action

Documentation



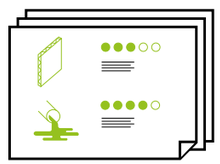
Targets in project brief (development manager)

Procurement policy document (all disciplines)



Pre-demolition audit (if applicable) (development manager)

Sustainability statement (sustainability engineer)



BREEAM pre-assessment report (optional) (BREEAM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Contractor

Finalise the method of monitoring construction waste generation

BREEAM assessor

Collect evidence for BREEAM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Sustainability engineer

Review to make sure that targets are being met

Contractor

Construction team to monitor and report waste generation during construction in the updated RMP, meeting diversion from landfill targets

RIBA Stage 6

BREEAM assessor

Collect evidence for BREEAM final (post construction) assessment for certification

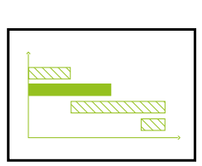
RIBA Stage 7

Asset manager

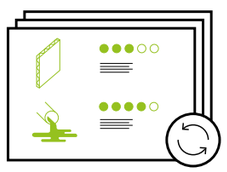
In relation to any future replacements or repairs, make sure similar or improved targets are set for construction waste generation

Action

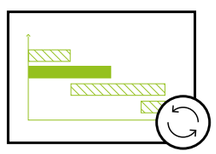
Documentation



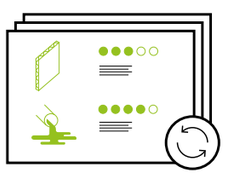
RMP (development manager/contractor)



BREEAM interim (design stage) assessment for certification (BREEAM assessor)



Updated RMP (development manager/contractor)



BREEAM final (post construction) assessment for certification (BREEAM assessor)

Documentation

Relevant policy

Merton Local Plan – Climate Change Policy CC8.14

The council will require all development proposals to adopt a circular economy approach to building design and construction to reduce waste, to keep materials and products in use for as long as possible, and to minimise embodied carbon.

Tower Hamlets Local Plan 2031 – Policy D.SG4

Major developments must employ the highest standards of sustainable construction, including … The use of demolished material from the development site, where practicable, in order to minimise the transportation of waste and reduce carbon dioxide emissions.

Further reading

WRAP – Reducing your construction waste
LETI Embodied Carbon Primer
Camden Local Plan

ID no

HPB 25

Key Performance Indicator (KPI) name

Operational Recycling and Composting – Residential

What is it?

This is about providing residents with dedicated spaces and facilities in suitable locations to store, and dispose of, their recycling and compost waste at home before it's collected and to ensure that the provision for waste separation and storage is aligned to the local authority waste collection provision.

How does it add value?

Providing well-designed storage and spaces to store, and dispose of, this type of waste is the most efficient way to encourage residents to recycle at home. This reduces the amount of waste that goes to landfill, helping to help protect the environment.

Convenient and segregated waste storage areas for food waste and compost, for example, also ensures that health and safety isn't affected within the home.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
HQM Assessor	●○○	supporting
Asset Manager	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Recycled Materials
- ☑ Healthy Streets
- ☑ Post Occupancy Evaluation
- ☑ Sustainable Operations Management

How is it calculated?

We will follow the criteria set out in HQM 7.3, Recycling Waste. See the Home Quality Mark ONE England manual (page 158 of 256).

Home information (prerequisite)

A prerequisite credit is awarded when adequate home information is provided, as set out by HQM 11.2 Home Information of Home Quality Mark ONE England.

Consultation with the waste collection authority (two credits)

Credits are awarded following a consultation with the waste collection authority to determine:

- How often waste is collected
- The number of types of items that can be recycled, such as paper, plastic, glass, food waste, composting and general waste
- The type and size of waste collection containers, such as dedicated wheelie bins, boxes and communal bins
- Design should reflect the information determined in the consultation

Internal waste storage (five credits)

Credits are awarded for the design of a dedicated internal space to store recyclable waste. The number of internal recyclable waste facilities should reflect the types of recyclable items the waste authority collects.

The HQM One England Manual sets out the minimum recycling waste facilities volume a home should have, depending on the number of bedrooms it has.

Composting facilities and management (three credits)

Credits are awarded for providing composting facilities for garden or food waste. This can be:

- An individual home-composting facility
- A local communal facility within 50 metres of the home's main entrance
- A composting collection service run by the waste authority

The spaces must be measured to make sure that they meet the required targets. Targets must be set and specified during design stage.

Metric type

Points

Units

Number of credits – HQM 7.3

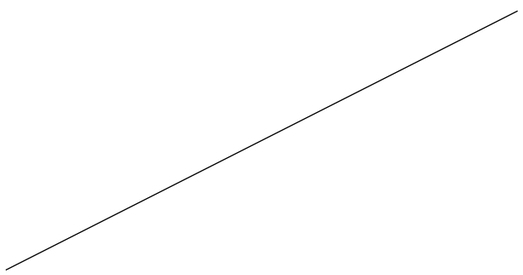
Range

1 — 7 credits: Good Practice (Must achieve two credits under Criteria 02 and five credits under Criteria 03) — 10 credits: Leading Practice

What is the process?

Action

RIBA Stage 0



RIBA Stage I: Optimise

<u>All disciplines</u>

Agree and sign a procurement policy document

<u>Development manager</u>

Set a goal for operational recycling and composting in the brief

Make sure targets are in place to include enough recycling and composting spaces

RIBA Stage 2: Plan / Design

<u>Sustainability engineer</u>

Review local and national policies, and make sure that architectural design is in line with these targets – primarily the HQM credit requirements

Consult with the waste collection authority to determine waste collection patterns

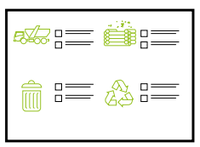
RIBA Stage 3: Plan / Design

<u>Architect</u>

Design recycling and composting spaces in line with HQM requirements

Action

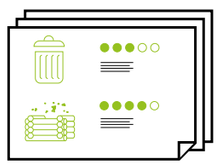
Documentation



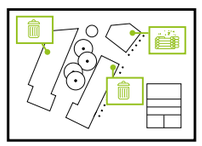
Targets in project brief (development manager)

Procurement policy document (all disciplines)

Sustainability statement (sustainability engineer)



HQM pre assessment report (optional) (HQM assessor)



Architectural drawings, including well-designed recycling and composting spaces (architect)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Design and optimise recycling and composting spaces in line with the HQM requirements and ensure any requirements are embedding in the tender documents

HQM assessor

Collect evidence for the HQM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Contractor

Oversee the construction of all spaces, including for recycling and composting

RIBA Stage 6: Deliver

HQM assessor

Collect evidence for the HQM final (post construction) assessment for certification

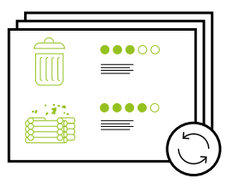
RIBA Stage 7: Monitor

Asset manager

Development management to appoint people to maintain the communal recycling and composting spaces

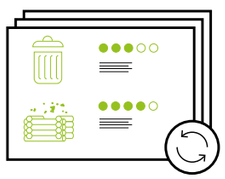
Action

Documentation



HQM interim (design stage) assessment for certification (HQM assessor)

Tender documentation



HQM final (post construction) assessment for certification (HQM assessor)

Home information pack (development manager)

Documentation

Relevant policy

GLA New London Plan 3.3.18

Shared and easily accessible storage space supporting separate collection of dry recyclables, food waste and other waste should be considered in the early design stages to help improve recycling rates …

GLA New London Plan SI 7

This includes London achieving a 50 per cent reduction in food waste and associated packaging waste per person by 2030 … To achieve these recycling targets, it will be important that recycling, storage and collection systems in new developments are appropriately designed.

Tower Hamlets Local Plan 2031: Policy D.DH2

Development is also required to … integrating refuse and recycling facilities within the building envelope.

Further reading

Camden Local Plan

ID no

HPB 26

Key Performance Indicator (KPI) name

Operational Recycling and Composting – Commercial

What is it?

This is about providing areas for people using the buildings with dedicated spaces to store, and dispose of, their recycling.

How does it add value?

Providing well-designed storage and spaces to store, and dispose of, this type of waste is the most efficient way to encourage residents to recycle. This reduces the amount of waste that goes to landfill or for incineration, helping to protect the environment.

Convenient and segregated waste storage areas for food waste and compost, for example, also ensures that health and safety isn't affected in buildings.

It also helps to meet corporate and statutory waste recycling targets, and reduces the environmental impacts and costs of disposing of operational waste. By having facilities for occupants to sort waste at source, cost savings can be made by not having to pay for this to be carried off site.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
BREEAM Assessor	●○○	supporting
Asset Manager	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design	Plan / Design	Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Recycled Materials
- ☑ Healthy Streets
- ☑ Post Occupancy Evaluation
- ☑ Sustainable Operations Management

How is it calculated?

We will follow the criteria set out in BREEAM Wst 03, Operational Waste of the BREEAM New Construction 2018 Manual (page 275 0f 403).

Operational waste (one credit)

This credit is awarded for providing a dedicated space for separating and storing operational recyclable waste. It must be clearly labelled, accessible to occupants and big enough for the building size and type.

For larger amounts of operational waste generated, there must be static waste compactors or balers, vessels for composting suitable organic waste or enough space for storing food and organic waste separately, ready for collection. There must also be a water outlet next to, or within, the facility for cleaning and hygiene purposes.

The BREEAM New Construction 2018 Manual also lists the criteria that must be met for specific building types, including multi-residential buildings.

The spaces must be measured to make sure that they meet the required targets. Targets should be set and specified during the design stage.

The characteristics of the waste facilities are specific to the type of building. The minimum storage provision when project teams can't determine what's needed is:

- At least 2m^2 per 1,000m^2 of net floor area for buildings less than 5,000m^2
- A minimum of 10m^2 for buildings more than 5,000m^2
- An extra 2m^2 per 1,000m^2 of net floor area where catering is provided (with an extra minimum of 10m^2 for buildings more than 5,000m^2)

The net floor area should be rounded up to the nearest 1,000m^2.

NOTE: For an industrial building or development site consisting of a number of smaller units, each ≤ 200m^2 floor area, shared facilities that meet the above criteria for the building or site as a whole are sufficient to achieve this credit.

Metric type	Units	Range
Points	Number of credits – BREEAM Wst 03	1 credit Good & Leading Practice

What is the process?

Action

RIBA Stage 0

RIBA Stage I: Optimise

All disciplines

Agree and sign a procurement policy document

Development manager

Set a goal for operational recycling and composting in the brief

Make sure targets are in place to include enough recycling and composting spaces

RIBA Stage 2: Plan / Design

Sustainability engineer

Review local and national policies, and make sure that the architectural design is in line with these targets – primarily the BREEAM credit requirements

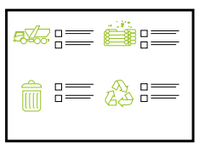
RIBA Stage 3: Plan / Design

Architect

Design recycling and composting spaces in line with BREEAM requirements (clearly labelled, accessible and well-sized facilities with a water outlet installed)

Action

Documentation

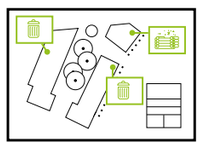


Targets in project brief (development manager)

Procurement policy document (all disciplines)

Sustainability statement (sustainability engineer)

BREEAM pre-assessment report (optional) (BREEAM assessor)



Architectural drawings, including well-designed recycling and composting spaces (architect)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Design and optimise recycling and composting spaces in line with BREEAM requirements and ensure any requirements are embedding in the tender documents

BREEAM assessor

Collect evidence for the BREEAM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Contractor

Oversee the construction of all spaces, including for recycling and composting

RIBA Stage 6: Deliver

BREEAM assessor

Collect evidence for the BREEAM final (post construction) assessment for certification

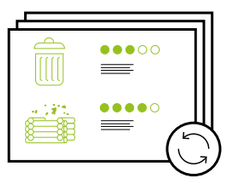
RIBA Stage 7: Monitor

Asset manager

Development management to appoint people to maintain the communal recycling and composting spaces

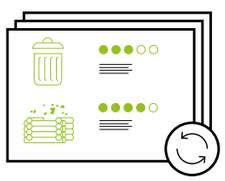
Action

Documentation



HQM interim (design stage) assessment for certification (HQM assessor)

Tender documentation



HQM final (post construction) assessment for certification (HQM assessor)

Home information pack (development manager)

Documentation

Relevant policy

GLA New London Plan 3.3.18

Shared and easily accessible storage space supporting separate collection of dry recyclables, food waste and other waste should be considered in the early design stages to help improve recycling rates …

GLA New London Plan SI 7

This includes London achieving a 50 per cent reduction in food waste and associated packaging waste per person by 2030 … To achieve these recycling targets, it will be important that recycling, storage and collection systems in new developments are appropriately designed.

Tower Hamlets Local Plan 2031: Policy D.DH2

Development is also required to … integrating refuse and recycling facilities within the building envelope.

Further reading

Camden Local Plan

ID no

HPB 27

Key Performance Indicator (KPI) name

Post Occupancy Evaluation – Residential

What is it?

Post occupancy evaluation (POE) aims to improve feedback on the performance and occupants' experience of a new home. This information is collected to help with the design and construction of future residential developments and to reduce performance gaps in existing homes.

For this indicator we are following the criteria of BRE's Home Quality Mark (HMQ) 11.4, Post Occupancy Evaluation.

How does it add value?

POEs collect 'real life' data which is used to demonstrate the value of high performing homes and aid future design, construction and management. Importantly, POEs provide valuable information about how people use their home. These evaluations also help to improve future performance of homes and guide policy, tools and industry standards.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Development Manager	●●● / ●●○	leading accountable
Property Manager	●○○	supporting
HQM Assessor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Optimise		Specify	Deliver	Deliver	Deliver

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
13 Climate Action
3 Good Health and Well-being

Connected SDF indicators

- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Smart Building Technologies
- ☑ Thermal Comfort – Homes – DSY 1,2 & 3
- ☑ Sustainable Operations Management

How is it calculated?

We will follow the criteria set out by HMQ 11.4, Post Occupancy Evaluation. See the Home Quality Mark ONE England manual (page 224 of 256).

Occupant satisfaction feedback and bill data (two credits)

The credits can be achieved if the resident is formally invited to be involved with a post occupancy evaluation within six weeks of them living there, and if the feedback is collected between 12 and 18 months afterwards. The HQM One England Manual lists sub-criterion that need to be met to achieve these credits, including a requirement to analyse occupant feedback, as well as water and energy bills.

Energy and temperature monitoring (three credits)

A further three credits can be achieved for the collection and monitoring of energy consumption and internal temperature data.

Advanced POE (two credits)

These credits can be achieved if an appropriately qualified professional undertakes at least one other POE method as part of the data being collected and analysed in the previously mentioned criteria. The previous credits in this indicator must also be met.

Other POE methods include:

1 Occupant feedback
2 Energy audit
3 Water audit
4 Forensic walk-through
5 Low and zero carbon technology (LZCT) performance monitoring
6 Humidity monitoring

Independent third party (three credits)

The final three credits can be achieved if an independent third party is appointed as the appropriately qualified professional to carry out POE commitments for the credits mentioned above.

In the HQM One England Manual under each criterion there is a list of requirements and information that should be collected.

Credit Summary

Criterion number	Title	Credits
crit 1 – crit 2	01 Occupant satisfaction feedback and bill data	2
crit 3 – crit 4	02 Energy and temperature monitoring	3
crit 5 – crit 6	03 Advanced POE	2
crit 7 – crit 8	04 Independent third party	3
Total credits available		**10**

Metric type

Points

Units

Number of credits – HQM 11.4

Range

5 credits

Good Practice (Must achieve 2 credits under Criteria 01)

10 credits

Leading Practice

What is the process?

Action

RIBA Stage 0

RIBA Stage I: Optimise

Development manager

Set ambition for POE and aftercare in brief

RIBA Stage 2: Optimise

Development manager

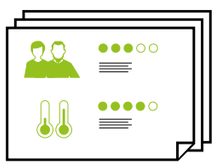
Highlight the roles and opportunities for overcoming performance gap, for example, by following the BSRIA Soft Landings Framework

RIBA Stage 3

Action

Documentation

Targets in project brief (development manager)



HQM pre-assessment report (optional) (HQM assessor)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

HQM assessor

Collect evidence for HQM interim (design stage) assessment for certification

RIBA Stage 5: Deliver

Development manager

Ensure the contractors understand commissioning requirements

RIBA Stage 6: Deliver

Development manager

Ensure commissioning and testing is fully completed and witnessed and that the 'as installed' controls strategies, setpoints, commissioned flow rates, metering etc, are in line with the energy model

Ensure the building user is trained and understands how to use the building systems, with all relevant information provided in home information pack

Ensure that planned demand response activities occur correctly as part of the commissioning process, and that the initial setup parameters are recorded

Ensure a suitably qualified individual understands the energy management and measurement systems

HQM assessor

Collect evidence for HQM final (post construction) assessment for certification

RIBA Stage 7: Deliver

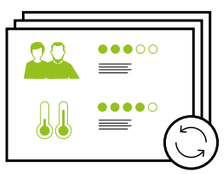
Property manager

Make sure a qualified professional carries out POE within 18 months of occupation, including occupant satisfaction feedback and bill data

Ensure all records of POE and commissioning is updated in home information pack

Action

Documentation

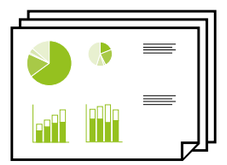


HQM interim (design stage) assessment for certification (HQM assessor)

HQM final (post construction) assessment for certification (HQM assessor)

Home information pack (development manager)

POE report (development manager)



Performance audits as per HQM requirements (qualified professional)

Documentation

Relevant policy

RIBA, Post occupancy Evaluation and Building Performance Evaluation Primer

Helping clients' get the best out of their projects is the main reason for evaluating a building. Beginning by looking at a client's motives for embarking on a project – their desired Project Outcomes – evaluations can get to the core of the client's and occupants' needs and fine tune the way the building delivers these. Evaluations also help designers to close the performance gap, that of designed energy and organisational performance and the actual measured performance of these areas. The more designers, clients and other members of project teams learn about how their buildings perform in use, the better their next buildings are likely to meet the complex needs of the clients and occupants – completing a virtuous circle of learning.

RIBA, Building Knowledge: Pathways to Post Occupancy Evaluation

POE can support the design of better, more appropriate buildings that add value in tangible ways such as reduced environmental impact, reduced running costs and less tangible ways such as wellbeing, identity, community and atmosphere. This knowledge can directly contribute to a better understanding of the value of the architecture profession to the built environment

Building Performance Evaluation Guide

Setting performance targets for a scheme is an important step. Going above and beyond the base level required by regulation states intentions towards build quality, recognising the climate emergency, enabling health, comfortable and satisfied inhabitants etc. It is vital that performance objectives are agreed early in the design process and are communicated effectively throughout the build program, including how they are to be checked in use.

Further reading

Post Occupancy Evaluation and Building Performance Evaluation Primer, RIBA 2016
Building Knowledge: Pathways to Post Occupancy Evaluation, RIBA 2017
Building Performance Evaluation Guide, Woodknowledge 2021
Soft Landings Framework, BSRIA 2018

ID no

HPB 28

Key Performance Indicator (KPI) name

Post Occupancy Evaluation – Commercial

What is it?

Post occupancy evaluation (POE) focuses on aftercare. It aims to ensure a commercial building operates as designed and meets its operational demands, while providing aftercare for the occupants during their first year of occupation. For many reasons buildings may not perform as they were intended to at the design stage. The collection of POE information can therefore be used to inform stakeholders in the future and reduce any performance gaps.

For this indicator we are following the criteria of BRE's BREEAM Man 05, Aftercare, which covers POE, support for occupiers and commissioning in commercial developments.

How does it add value?

Aftercare helps to improve the building's performance by continuously monitoring and commissioning it in the early stages of occupation. The information collected during the aftercare phase also helps to reduce the performance gap between how the building performs and how it was intended to perform during design. The occupants' comfort and indoor environmental conditions are also monitored to maximise health and wellbeing, and ensure end user requirements are met. Additionally, the information collected provides an opportunity to learn and inform future procurement, design, construction and management practices, while enhancing asset value and satisfaction.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan
- ☑ Industrial

Who is responsible?

Development Manager	●●● / ●●○	leading accountable
Property Manager	●○○	supporting
BREEAM Assessor	●○○	supporting
POE Consultant	●○○	supporting

RIBA Stages

Connected UN Sustainable Development Goals

12 Responsible Consumption and Production
13 Climate Action
3 Good Health and Wellbeing

Connected SDF indicators

- ☑ Energy Use Intensity
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Smart Building Technologies
- ☑ Thermal Comfort – Homes – DSY 1,2 & 3
- ☑ Sustainable Operations Management

How is it calculated?

We will follow the criteria set out by Man 05, Aftercare. See the BREEAM UK New Construction 2018 Manual (page 77 of 403).

Aftercare support (one credit)

This credit is awarded for the aftercare provided to the building occupier or management team post occupancy. The BREEAM NC 2018 Manual stipulates the criteria which need to be met. These include:

- Onsite facilities management training, aftercare support requirements within a month and 12 months of building occupation
- Establishing operational infrastructure and resources to coordinate the collection and monitoring of water and energy consumption for 12 months after occupation

For further information on the criteria which need to be met to achieve this credit, refer to the BREEAM NC 2018 Manual.

Seasonal commissioning – implementation (one credit)

The credit is achieved by completing a set of criteria, listed in the BREEAM NC 2018 manual, which relate to commissioning activities over a minimum of 12 months. The manual lists criteria that must be met for both complex and simple, naturally ventilated systems.

Complex systems – specialist commissioning manager

Testing of all building services under full load conditions

1 Testing during periods of extreme (high or low) occupancy
2 Interviews with building occupants
3 Recommissioning of systems and incorporating any revisions into the operations and maintenance (O&M) manuals

4 Simple systems (naturally ventilated) – external consultant or aftercare team or facilities manager
5 Review thermal comfort, ventilation, and lighting, at three, six and nine month intervals after initial occupation
6 Recommission systems following review and incorporate revisions in operating procedures into the O&M manuals.

Post occupancy evaluation (POE) (one credit)

The final credit is awarded if a POE exercise is carried out one year after the building is substantially occupied. An independent party must carry out the assessment and provide a report with lessons learned to the client and building occupier. The client or building occupier must also commit funds to pay for the POE in advance.

Metric type	Units	Range		
Points	Number of credits – BREEAM Man 05		2 credits	3 credits
			Good Practice (Must include 'POE' Credit)	Leading Practice

Relevant policy

RIBA, Post occupancy Evaluation and Building Performance Evaluation Primer

Helping clients' get the best out of their projects is the main reason for evaluating a building. Beginning by looking at a client's motives for embarking on a project – their desired Project Outcomes – evaluations can get to the core of the client's and occupants' needs and fine tune the way the building delivers these. Evaluations also help designers to close the performance gap, that of designed energy and organisational performance and the actual measured performance of these areas. The more designers, clients and other members of project teams learn about how their buildings perform in use, the better their next buildings are likely to meet the complex needs of the clients and occupants – completing a virtuous circle of learning.

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POE can support the design of better, more appropriate buildings that add value in tangible ways such as reduced environmental impact, reduced running costs and less tangible ways such as wellbeing, identity, community and atmosphere. This knowledge can directly contribute to a better understanding of the value of the architecture profession to the built environment

Building Performance Evaluation Guide

Setting performance targets for a scheme is an important step. Going above and beyond the base level required by regulation states intentions towards build quality, recognising the climate emergency, enabling health, comfortable and satisfied inhabitants etc. It is vital that performance objectives are agreed early in the design process and are communicated effectively throughout the build program, including how they are to be checked in use.

Further reading

Post Occupancy Evaluation and Building Performance Evaluation Primer, RIBA 2016
Building Knowledge: Pathways to Post Occupancy Evaluation, RIBA 2017
Building Performance Evaluation Guide, Woodknowledge 2021
Soft Landings Framework, BSRIA 2018

ID no

HPB 29

Key Performance Indicator (KPI) name

Sustainable Operations Management

What is it?

Sustainable operations management (SOM) is a key part of responsible property management. It includes keeping up-to-date information about a property and its systems, and collecting data linked to sustainability-related targets to identify and reduce performance gaps. This indicator focuses on improving the management and reporting of a property's sustainability credentials, including how it operates in real time, and helps to diagnose and rectify underperformance.

How does it add value?

It makes sure that buildings perform as intended once they are in operation, and that gaps in performance are resolved where possible. As the costs of operating a building over its lifetime are significantly higher than the upfront costs, good sustainable operations management helps reduce these. It also plays an important role in reaching net zero, and provides sustainability future proofing to ensure buildings are equipped to adapt to changes in climate. Moreover, if a building's performance operation is properly captured this can be used to inform new projects, making sure that lessons learnt are incorporated into future developments.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☐ Masterplan
- ☐ Industrial

Who is responsible?

Asset Manager	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
Facilities Manager	●○○	supporting
Contractor	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
	Optimise	Plan / Design		Specify	Deliver	Deliver	Monitor

Connected UN Sustainable Development Goals

13 Climate Action
12 Responsible Consumption and Production
7 Affordable and Clean Energy

Connected SDF indicators

- ☑ Regulated Emissions – Monitoring – Be Seen Best Practices
- ☑ Post Occupancy Evaluation
- ☑ Smart Building Technologies

How is it calculated?

Four practices in sustainable operations management have been identified for this indicator, these are:

1 Detailed property asset register

2 Integrated data collection systems

3 Performance review – predicted vs actual

4 Mitigate performance gaps

To achieve Good Practice, practices one and two must be met and to attain Leading Practice, all four should be met.

Practice one: Detailed property asset register

Precise information about the building should be maintained, stored and easily accessible. Asset and property managers should be clear on their role and responsibility for providing and tracking this information, identifying where information is missing and establishing ways to find it. An asset register should be created during the design stage, updated in the construction phase, and maintained in-use by the development manager. After handover, the register is the responsibility of the asset manager and property manager.

It is recommended to use the Chartered Institution of Building Services Engineers (CIBSE) DE5T: Asset Information Requirements Template as the basis for the asset register and to follow BS ISO 55000 and PAS 1192-3 standards. The DE5T template consists of four sections: facility, space, system and component. Under each of these sections additional detailed information relating to sustainable operations will be required.

Asset managers and property managers will need to identify any missing information and decide on how to source it. This might include commissioning surveys or installing further monitoring and metering equipment.

Practice two: Integrated data collection systems

The collection of building data such as utilities data, waste, occupancy and internal environmental quality relating to emissions and pollutants, is becoming increasingly automated. This automated data shows how a property is operating in real time and helps to diagnose areas of underperformance. Asset managers and property managers should establish which data is already automated, where gaps are present and identify opportunities for further automation. They should also make sure that the relevant stakeholders are aware of the potential for data automation and its benefits, and establish and integrate the technologies, processes and contracts necessary to automate. In this instance, stakeholders would include person(s)/ company(ies) that own the building, while others who may be influenced include the asset and property managers themselves, construction partners, facilities managers etc.

Metric type

✓

Points

Units

n/a

Number of practices met

Range

●	● ✓ 2 practices met Good Practice	●	● ★ 4 practices met Leading Practice

How is it calculated? (continued)

Useful questions to consider include:

- What data points are available?
- What is the frequency of data collection?
- How is data currently collected?
- Where is data currently stored?
- What data could be automated?
- What is the data format?
- How frequently should that data be collated?
- What is the benefit to automating, collating, and reporting on the data?
- What technologies and processes are needed to automate that data?
- What contracts need to be in place?
- What finance and sign-off is required for those systems and processes?

Examples of data that can be automated are listed in the following table:

Automating property level data

Sustainability element	Example data types
Utilities data	Energy and water utility supply data, including: · Manual and automatic meter readings · Billing data · Tenant on charges
Environmental management systems	Outcomes and findings from energy, environmental and sustainability audits, including: · Action trackers · Management action plans · Sustainable travel plans · Building user guides · Health, safety and environmental procedures
Waste	Key waste documentation and arrangements, including: · Waste Transfer Notes · Environmental Permits · Waste management procedures
Building management system (BIM)	Critical BIM documentation, including: · Control strategy · Temperature set points · Run times · Faults
Maintenance and reporting	A range of information relating to asset maintenance and reporting faults or incidents, including: · Operational & maintenance manuals · Building logbook · Planned preventative maintenance schedules · Life cycle assessments · Cleaning regimes · Maintenance procedures and logs · Contractor guides
Internal environmental quality	Information relating to emissions and pollutants in the internal environment including: · CO_2 · CO · NO · VOC · Temperature · Humidity · $PM_{2.5}$
Leases	Contractual requirements, services provisions and performance thresholds, including: · Leasing arrangements · Clauses · Letters of Authority
Acquisition, development and design documentation	Documentation developed for the acquisition, development or refurbishment of the asset, including: · Design briefs · Design performance standards · License to Alter
Building control & planning	Documentation used to confirm compliance with national and local Building Regulations and Planning Policy, including: · Energy Performance Certificates · Display Energy Certificates
Environmental reporting & certification	Documentation needed for assessments, including: · GRESB · BREEAM · WELL · NABERS

Source: Better Building Partnership, Automating Property Level Data

How is it calculated? (continued)

Practice three: Performance review – predicted vs actual

Asset managers and property managers should be able to pinpoint performance gaps and the potential causes of underperformance by reviewing all available automated and manual data. They should work with the development manager, design teams and contractors to establish the reasons for underperformance, and identify strategies to diagnose and confirm the causes and level of impact. The findings should be reported and relevant stakeholders informed of any performance gaps and the causes.

Common causes of underperformance and diagnostic tools is provided by Appendix I.2: The Performance Gap within the London Energy Transformation Initiative (LETI) Climate Emergency Design Guide.

Common causes of underperformance

Causes of underperformance	Diagnostic tools
Building fabric	
Flawed design calculations (assumptions, inputs inaccuracies). · Workmanship · Poor handling and storage of materials on site, no understanding of their energy impact · Low quality of materials compared to design specifications · Value engineering in favour of lower performance cost-engineered alternatives · Poor insulation detailing in particular at the interface, both design (use of default thermal bridging coefficients) and construction phase · No airtightness strategy · Services penetrations interrupting the continuity of the airtightness layer	· Fabric in-situ testing – stand-alone (heat flow meter) or whole envelope (co-heating test) · In-situ airtightness tests – stand-alone (pressurisation equipment, smoke test) or whole envelope (hot wire anemometer, tracer gas · Inspection of construction quality (infrared thermography + expert diagnostic investigation) · Installation quality checks (photographs during construction)
Building services	
· Lack of commissioning of services and suboptimal controls zoning / system communication · Over-sized systems · Controls unfit for intended users of the building · Poor coordination between designers and contractors · Poor standard of installation / commissioning / handover / maintenance	· Installation and commissioning checks – evaluation of operation and settings of the system · Measurement and verification. In particular mechanical ventilation (power measurement + volumetric airflow measurement · Utilities metering, ideally sub-metered energy use
Indoor environmental quality	
· Overheating due to suboptimal environmental design (orientation, thermal inertia, glazing ratio, solar shading etc.), fabric and systems design (glazing specifications eg, total solar energy transmittance, ineffective ventilation strategy, space heating controls difficult to operate or faulty, uninsulated pipework contributing to unwanted heat gains.) · Poor indoor air quality due to ineffective ventilation mechanisms, including poor maintenance of mechanical ventilation · Design is not user-centric (health and wellbeing not central in design)	· Services' visual inspection and performance testing · Moisture monitoring (protimeter) · Temperature, relative humidity and CO_2 / VOCs / NO_x monitoring · Occupant surveys using standardised questionnaire eg Building Use Studies (BUS) surveys · Qualitative semi-structured interviews with the occupants

Practice four: Mitigate performance gaps

Once performance gaps and their causes are identified, remedial action should be taken. Asset managers and property managers should work with consultants to establish the measures needed to address the causes. Any recommendations should be presented to property owners and key stakeholders detailing the intended benefits and improvements in performance. Where the cost of these measures is beyond ongoing maintenance and management budgets, finance should be agreed with the property owner, for example, in the form of capital expenditure programmes or service charges.

Asset and property managers should tender and agree contracts for the installation and implementation of measures. They should also understand how to operate the building correctly once new measures are introduced and be aware of any new maintenance requirements. Following the new measures, a monitoring strategy should be introduced to track the improvements in performance. Finally, the asset register and building operations and maintenance (O&M) manual should be updated by the asset manager and property manager to capture changes to the property and its operations.

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Development manager

Make sure sustainability-related targets are integrated into the brief

Check that sustainability-related data is incorporated into the building information modelling (BIM) requirements

RIBA Stage 2: Plan / Design

Development manager

Highlight the roles and opportunities for overcoming a performance gap, for example, by following the building delivery process provided by the Building Services Research and Information Association (BSRIA) Soft Landings Framework

RIBA Stage 3

Action

Documentation

Targets in project brief (development manager)

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Development manager

Establish an asset register using the Chartered Institution of Building Services Engineers (CIBSE) DE5T: Asset Information Requirements Template and following the provided guidance

RIBA Stage 5: Deliver

Development manager

Make sure the contractors understand the commissioning requirements

Confirm the necessary information is collated for the asset register

RIBA Stage 6: Deliver

Contractor

Make sure that the performance data from sensors and meters are checked against the main meter, spot meter and building management system (BMS) readings, and that logs are set up in the BMS to allow for long-term monitoring of building performance

RIBA Stage 7: Monitor

Asset manager and property manager

Maintain a detailed asset register that includes sustainability-related targets, metrics, and data

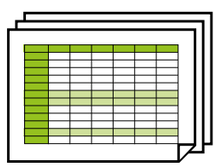
Identify and integrate technologies to automate the collection of sustainability-related data

Review actual performance against design and predicted performance to identify performance gaps and the causes of underperformance

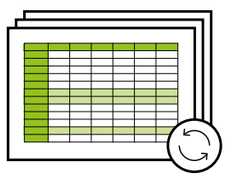
Identify and implement measures to reduce the performance gap

Action

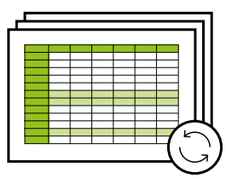
Documentation



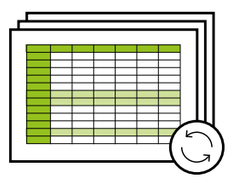
Asset register



Updated asset register



Updated asset register



Updated asset register

Updated operations and maintenance (O&M) manual

Documentation

Relevant policy

GLA London Plan 2021, Policy D3, (13)

Aim for high sustainability standards (with reference to the policies within London Plan Chapters 8 and 9) and take into account the principles of the circular economy.

GLA London Plan 2021, Policy SI 2, (A)

Major development should be net zero-carbon. This means reducing greenhouse gas emissions … in accordance with the following energy hierarchy:

4) Be Seen: monitor, verify and report on energy performance.

GLA London Plan 2021 Policy SI 2, (9.2.10)

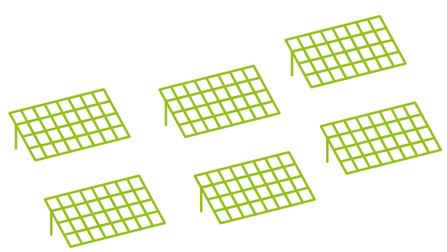
The move towards zero-carbon development requires comprehensive monitoring of energy demand and carbon emissions to ensure that planning commitments are being delivered. Major developments are required to monitor and report on energy performance … for at least five years via an online portal'

Further reading

- Better Building Partnerships (BBP) Responsible Property Management Toolkit
- BSRIA Soft Landings Framework (2018)
- CIBSE guidance document DE5T: Asset Information Requirements Template (2017)
- HM Government Environmental Reporting Guidelines (2019)

Contributors

HPB 1 Embodied Carbon – Residential: Elementa
HPB 2 Embodied Carbon – Commercial: Elementa
HPB 3 Embodied Carbon Offset: Elementa: BRE
HPB 4 Reused and Recycled Materials: Elementa: BRE
HPB 5 Responsible Sourcing – Residential: BRE
HPB 6 Responsible Sourcing – Commercial: BRE
HPB 7 Operational Energy Use – Residential: Elementa
HPB 8 Operational Energy Use – Commercial: Elementa
HPB 9 Regulated Emissions – Energy Efficiency – Be Lean – Residential: Elementa
HPB 10 Regulated Emissions – Energy Efficiency – Be Lean – Commercial: Elementa
HPB 11 Regulated Emissions – Green Energy – Be Green – Residential: Elementa
HPB 12 Regulated Emissions – Green Energy – Be Green – Commercial: Elementa
HPB 13 Regulated Emissions – Monitoring – Be Seen – Best Practices: Elementa
HPB 14 Regulated Emissions – Operational Net Zero
HPB 15 Bio-Solar Roof Area: Elementa
HPB 16 Green Energy: Elementa
HPB 17 Water Efficiency – Residential: BRE
HPB 18 Water Efficiency – Commercial: BRE
HPB 19 Smart Building Technology – Residential: BRE
HPB 20 Smart Building Technology – Commercial: Elementa
HPB 21 Responsible Construction Practices – Residential: BRE
HPB 22 Responsible Construction Practices – Commercial: BRE
HPB 23 Construction Waste – Residential: BRE
HPB 24 Construction Waste – Commercial: BRE
HPB 25 Operational Recycling and Composting – Residential: BRE
HPB 26 Operational Recycling and Composting – Commercial: BRE
HPB 27 Post Occupancy Evaluation – Residential: BRE
HPB 28 Post Occupancy Evaluation – Commercial: BRE
HPB 29 Sustainable Operations Management: Elementa



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Theme illustrations:
Gilbert Leung

Design and infographics:
Objectif

Copy editor:
ETC Communications