Transport for London
Property Development

Sustainable Development
Framework

Dimension #4

Health and Wellbeing

MAYOR OF LONDON

TRANSPORT
FOR LONDON
EVERY JOURNEY MATTERS

Dimension #4 Health and Wellbeing

[HW]

Introduction

Indicators

Appendix

Introduction

The Health and Wellbeing Dimension is concerned with the impacts of our developments on the health and wellbeing not just of their occupants but the local community in general. It therefore puts significant emphasis on finding ways to reduce exposure to harmful pollution across London, minimising disruption during the construction process and tackling health inequality.

For the development, this Dimension emphasises the need for high quality internal spaces to improve people's health, wellbeing and productivity. This is a holistic approach that addresses psychological and physical factors both during construction and in occupation.

Our indicators here are well supported by industry guidance and techniques, with a particular focus on issues associated with transport-oriented development, such as noise, vibration, and air quality.

Our indicators:

- Seek to improve local air quality through the buildings themselves and by encouraging sustainable methods of travel;
- Give occupants the ability to control their indoor environments for maximum comfort;
- Promote attributes such as natural light that have a positive effect on mental and physical health; and
- Minimise the potentially harmful impacts of construction on health and wellbeing.

The increased need for homes and workplaces that support health and wellbeing is well documented, as are the benefits of designing with these principles in mind. This Dimension sets objectives that translate those principles into real environments that have a positive effect on mental and physical wellbeing throughout the lifecycle of a project.

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

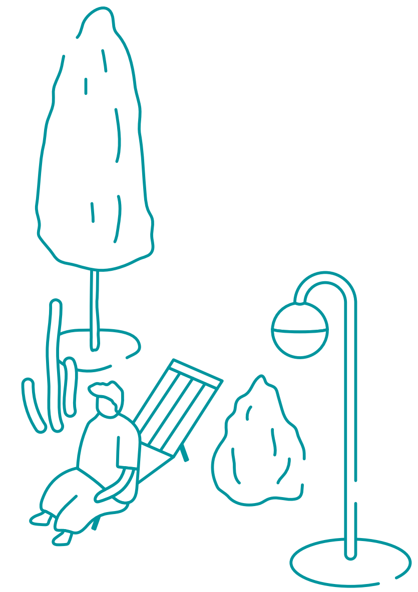
Relevant policy

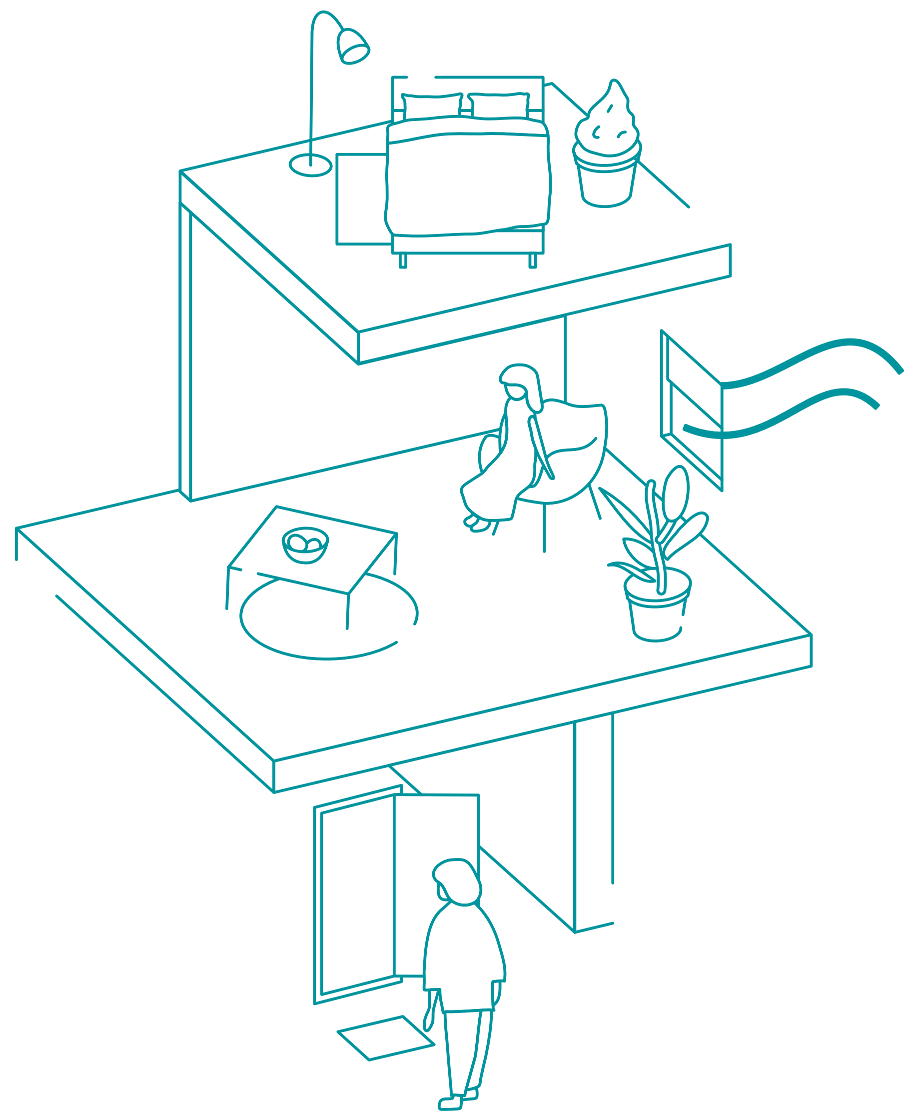
A summary of the key policies that relate to the indicator, and that have helped to shape it. This list is not exhaustive, but provides a useful background.

Further reading

A list of additional sources of information on the indicator.

Indicators





ID no | Key Performance Indicator (KPI) name

HW1 Outdoor Air Quality – Transport – Residential
HW2 Outdoor Air Quality – Transport – Commercial

What is it?

The main sources of air pollution in London are road transport and gas boilers. To help tackle air pollution in the Capital, no development should further deteriorate poor air quality. This means it must be at least 'air quality neutral'.

Furthermore, air quality positive should be applied to masterplans and development briefs for large-scale development proposals subject to an EIA. Air quality positive goes above and beyond air quality neutral, and demonstrates how benefits to local air quality have been maximised, and how measures to minimise pollution exposure will be implemented.

Whilst air quality positive is non-quantifiable, the achievement of air quality neutral can be assessed objectively. To achieve 'air quality neutral' status in regard to transport, transport emissions from a development must not exceed the transport emissions benchmark (TEB) as described in the Air Quality Neutral London Plan Guidance.

Air quality neutral policies and guidelines are set out in the Mayor's London Plan and Air Quality Strategy. Air Quality Neutral London Plan Guidance provides benchmarks and support for assessing whether a development meets the Mayor's air quality neutral policy.

How does it add value?

In London air quality is already poor, and this pollution generally affects the most vulnerable in society, such as children and older people. Addressing this issue at the project planning stages is about long-term improvements to people's health and wellbeing.

Developments can play a huge part in turning this around and, even better, improving air quality for future occupiers of the building(s) and local residents.

By encouraging those involved in the project to use their own vehicles less, transport-related emissions can be massively reduced. By walking, cycling, using public transport or even car sharing, where possible, air quality in the local and wider area will improve.

What type of project does the indicator apply to?

HW1	HW2
☑ Residential	☐ Residential
☐ Commercial	☑ Commercial
☐ Masterplan	☑ Masterplan

Who is responsible?

Air Quality Consultant	●●●	leading
Development Manager	●●○	accountable
Property Manager	●○○	supporting
Transport Planner	●○○	supporting
Engineer – M&E	●○○	supporting
Architect	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
7 Affordable and Clean Energy
13 Climate Action

Connected SDF indicators

- ☑ Carbon Emissions Offset
- ☑ Regulated Emissions – Energy Systems
- ☑ Car Free Living
- ☑ Electric Vehicle (EV) Charging

How is it calculated?

Two main ways to apply an air quality neutral policy are:

- comparing the motor vehicle parking and/or motor vehicle movements from the proposed development with those associated with the previous use of the site
- establishing benchmarks for acceptable emissions from a particular development

For 'replacement use', where the site is already being used, or the previous use can be easily defined, it is possible to estimate the previous trip rate for each land use. If the traffic flows associated with the new development are no higher than the previous use, the development is considered air quality neutral.

Where an increase in traffic flows is anticipated in association with operation of the new development, the trips/m2/year (or trips/dwelling/year for residential use) should be calculated for each land use. If below the Transport Emissions Benchmark, the new development is considered air quality neutral.

The air quality neutral assessment is typically carried out by the air quality consultant as part of an air quality assessment (included in the planning submission).

In theory, 100 per cent improvement of the air quality neutral benchmarks is possible if the project doesn't generate any road traffic trips. In reality, there will always be some trips generated even with a car-free development. For example, through deliveries and taxis. However, delivery and taxi movements, along with heavy vehicle movements from non-occupiers, are not included in the calculation of air quality neutral.

However, within London taxis and delivery vehicles now need to be electric. All new taxis have to be electric and all existing ones have to be replaced by the time they are 12 years old. Certain areas in London only allow electric vehicles for servicing and Amazon now use electric vehicles for the last five miles of the journey in central London.

It's harder to improve the benchmarks for non-residential developments as they're stricter than for retail and residential.

Where the air quality neutral benchmarks can't be met, there needs to be appropriate mitigation, or a contribution to offset the increase in emissions.

Two calculations are needed for an air quality neutral assessment for transport emissions using the benchmarks:

1. calculation of the total annual trip rate for the new development
2. calculation of the total benchmark trip rate for the development

If the anticipated annual trip rate is below the TEB trip rate, the proposed development is considered aqn for transport emissions.

For major schemes which are required to be air quality positive, car-free schemes should become the norm where appropriate and provide a net benefit to local air quality.

Calculating Air Quality Neutral

The number of dwellings (residential use) or GIA (non-residential) for each land use is multiplied by the benchmark trip rate to calculate the benchmark trip rates for each land use. These are then added together to calculate the transport emissions benchmark for the development. Benchmark trip rates can be found in Table 4.2 of the Air Quality Neutral London Plan Guidance.

Metric type

%

Percentage

Units

%

Percentage of Improvement on AQN Benchmark

Range

100%

0% Good Practice

85% Leading Practice

What is the process?

Action

RIBA Stage 0: Optimise

Development manager

Consider the location of the development in relation to sustainable travel links, and whether it could be car-free

Consider whether a net reduction in trips compared with the existing use is possible, resulting in a development that contributes to a reduction in vehicle related emissions

RIBA Stage 1

RIBA Stage 2: Plan / Design

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

Developments should be designed to minimise car parking provision where possible

Electric vehicle charging points should be provided if car parking is proposed

Transport planner

Produce a sustainable travel plan, including measures to reduce the number of private vehicle trips generated by the development

Air quality consultant

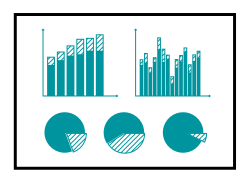
Provide the air quality neutral assessment to support the planning application and an Air Quality Positive Statement, where required

RIBA Stage 3

Action

Documentation

RIBA Stage 2: Plan / Design



Air quality assessment (including air quality neutral assessment), transport assessment (including trip generation)

Documentation

What is the process? (continued)

	RIBA Stage 4	RIBA Stage 5: Deliver	RIBA Stage 6	RIBA Stage 7: Monitor
Action		<u>Development manager</u> Remove all surplus parking provision from the site and provide electric vehicle charging facilities for any remaining parking spaces		<u>Property manager</u> Apply the sustainable travel plan Carry out periodic reviews to ensure it remains effective
Documentation				

Relevant policy

London Environment strategy

Proposal 4.3.3a states that the London Strategy provides policies in which all new large-scale developments can not only become 'Air Quality Positive', but also maintain Air Quality Neutral requirements for all other developments. Within the planning guidance for building operations and transport emissions, information about emission benchmarks for 'Air Quality Neutral' developments are set out. Any development that either meets or exceeds the benchmarks is considered Air Quality Neutral as they avoid any increase in PM and NOX emissions. In order for the benchmarks to remain relevant, the Mayor will continue to review them. To ensure that the requirements are met, execution of the Air Quality Neutral policy will be monitored by utilising both the LLAQM and the London Plan monitoring report.

Publication London Plan (2021) Policy SI 1

Development proposals must be at least Air Quality Neutral.

Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

Further reading

London Plan 2021
The London Environment Strategy 2018
Air Quality Neutral London Plan Guidance 2023
Air Quality Positive London Plan Guidance 2023

ID no

HW3

Key Performance Indicator (KPI) name

Outdoor Air Quality – Buildings

What is it?

To help tackle air pollution and improve air quality in the Capital, no development should lead to any further deterioration of the existing poor air quality. This means it must be at least 'air quality neutral' (AQN). Furthermore, air quality positive should be applied to masterplans and development briefs for large-scale development proposals subject to an EIA. Air quality positive goes above and beyond air quality neutral, and demonstrates how benefits to local air quality have been maximised, and how measures to minimise pollution exposure will be implemented.

Whilst air quality positive is non-quantifiable, the achievement of air quality neutral can be assessed objectively. To achieve air quality neutral status in regard to building emissions, building emissions from a development must not exceed the building emissions benchmark (BEB) as described in the Air Quality Neutral London Plan Guidance.

This indicator measures the impact of a development on local air quality. A 100 per cent improvement is considered Leading Practice, and can be achieved with an all-electric energy strategy, using zero emission technologies and no combustion sources. However, if the benchmark cannot be achieved this way, mitigation measures to offset emissions are acceptable providing the equivalent air quality benefits can be shown in the area affected by the development.

How does it add value?

Air pollution generally affects the most vulnerable in society, such as children and older people.

The main sources of air pollution in London are road transport and gas boilers. Developments can play a huge part in turning this around and, even better, improving air quality for future occupiers of the building(s) and local residents. By aiming to eliminate combustion sources and use renewable energy instead in all its development proposals, TfL will play a major role in improving air quality.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Air Quality Consultant	●●●	leading
Development Manager	●●○	accountable
Engineer – M&E	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
7 Affordable and Clean Energy
13 Climate Action

Connected SDF indicators

- ☑ Carbon Emissions Offset
- ☑ Regulated Emissions – Green Energy
- ☑ Regulated Emissions – Energy Monitoring
- ☑ Bio-Solar Roof Area

How is it calculated?

An air quality neutral assessment is only necessary for residential developments of more than 9 dwellings, or where the total site area is greater than 0.5 hectares, of where the total additional floor space to be built is greater than 1000 m^2.

There are two main ways to apply an air quality neutral policy:

- A comparison of emissions from the proposed development with those associated with the site's previous use
- The establishment of benchmarks for acceptable emissions from a particular development

For 'replacement' use, where the new development does not include new combustion plant such as gas-fired boilers, the scheme is to be all-electric (utilising zero emissions technology), or the new heating system includes one or more individual gas boilers with NO_x emissions rated less than 40mg/kWh, the development can be considered air quality neutral in regard to building emissions.

For greenfield developments, or brownfield developments on disused or derelict land, it can be more challenging to calculate the emissions of the previous use, so the air quality neutral benchmarks can be used. The benchmarking method is considered the most feasible approach to the air quality neutral policy.

The AQN assessment is typically undertaken by a consultant as part of an air quality assessment included in the planning submission.

To carry out an air quality neutral assessment for building emissions using the benchmarks, there are two parameters that need to be calculated, the Building emissions benchmark (BEB) and benchmark NO_x emission rate. These two parameters are then compared.

Where the total predicted building emissions for the development are less than the building emissions benchmark, the proposed development is considered air quality neutral for building emissions.

The parameters required to assess air quality neutral are typically calculated using the plant emission data sheets in correspondence with the project's mechanical engineers and/or the plant supplier.

The BEB is defined in grams (g) of nitrogen oxides (NOx) emitted per square metre (m^2) of floorspace over a year ($g\,NO_x/m^2/annum$). The floorspace is defined as the gross internal area (GIA). The benchmark NO_x emission rates are defined for different land uses and are dependent on the characteristics of the energy strategy adopted for the development. These are based on achievable emission rates for the type of technology used. The benchmark NO_x emission rates are defined in Table 3.1 of the Air Quality Neutral London Plan Guidance.

The GIA for each land use is multiplied by the corresponding benchmark NOx emission rate in Table 3.1 to calculate the benchmark NOx emissions for each land use in the development proposal. These are then added together to calculate the BEB for the development.

Metric type

%

Percentage

Units

%

Percentage of Improvement on AQN Benchmark

Range

0% Good Practice

100% Leading Practice

What is the process?

Action

RIBA Stage 0: Optimise

Development manager

Consider whether there are any existing energy systems, such as district heating networks, in the vicinity of the development that could be used

RIBA Stage 1

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E) engineer

Design an all-electric energy strategy, removing any existing combustion plant from the site. Where this is not possible, low emission plant, such as low NO_x boilers, should be specified. Back-up power systems should use batteries, rather than diesel generators, wherever possible

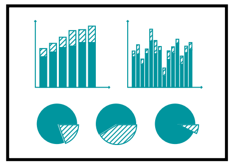
Other specialist (air quality consultant)

Produce air quality assessment including AQN status

RIBA Stage 3

Documentation

RIBA Stage 2:



Air quality assessment including AQN, mechanical, electrical and plumbing (MEP) Stage 2 report including details on energy provision

What is the process? (continued)

	RIBA Stage 4	RIBA Stage 5: Deliver	RIBA Stage 6	RIBA Stage 7: Monitor
Action		Mechanical and electrical systems (M&E) engineer Install the development's energy plant, maximising the use of zero-emission technologies		Property manager Ensure the plant is properly tested and maintained, including any emission monitoring required through environmental permit obligations
Documentation				

Relevant policy

London Environment strategy

Proposal 4.3.3a states that the London Strategy provides policies in which all new large-scale developments can not only become 'Air Quality Positive', but also maintain Air Quality Neutral requirements for all other developments. Within the planning guidance for building operations and transport emissions, information about emission benchmarks for 'Air Quality Neutral' developments are set out. Any development that either meets or exceeds the benchmarks is considered Air Quality Neutral as they avoid any increase in PM and NOX emissions. In order for the benchmarks to remain relevant, the Mayor will continue to review them. To ensure that the requirements are met, execution of the Air Quality Neutral policy will be monitored by utilising both the LLAQM and the London Plan monitoring report.

Publication London Plan (2021) Policy SI 1

Development proposals must be at least Air Quality Neutral.

Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.

Further reading

London Plan 2021
The London Environment Strategy 2018
Air Quality Neutral London Plan Guidance 2023
Air Quality Positive London Plan Guidance 2023

ID no

HW 4

Key Performance Indicator (KPI) name

Thermal Comfort – Homes: glazing ratio

What is it?

Overheated homes can have a direct and negative impact on both physical and mental health of the residents, and this could be exacerbated as the climate continues to warm and heatwaves become more frequent.

One of the primary contributors to the risk of overheating in residential design is solar gain. The proportion of glazing in a home is a critical parameter that influences the amount of solar gain entering the space. Therefore, reducing the glazed area can be an effective strategy for mitigating this risk. However, it is important to strike a balance when limiting the total amount of glazing, as the glazing ratio has a direct impact on access to daylight, sunlight, ventilation levels, and the ability to enjoy a view, all of which impact the health and wellbeing of occupants.

To address this issue, the indicator sets a limit for the overall glazing ratio. This approach restricts solar gain while providing designers with the flexibility to create a facade that allows sufficient daylight, sunlight, and views. By striking a balance between these factors, it is possible to create comfortable and healthy living environments that are resilient to climate change.

The indicator is designed to work alongside more detailed assessment processes, such as Part O compliance, and help embed overheating mitigation solutions early in the design process.

How does it add value?

The Department for Environment, Food & Rural Affairs reports that there are currently approximately 2,000 heat-related deaths in the UK each year. Overheating not only causes discomfort, illness, and reduced productivity, but it also has a significant economic cost. By 2080, this cost is projected to reach £350 million. If left unaddressed, these social and economic concerns will continue to worsen.

Taking overheating into account during the design stage of a home can offer notable benefits. For instance, retrofitting cooling systems is far more expensive and less energy-efficient than incorporating passive measures into the initial design. Additionally, overheated buildings are not attractive places to live and will become increasingly unprofitable for developers in the long term. As people avoid such buildings, residential developments will lose value. By implementing passive measures to mitigate the risk of overheating, designers can create projects that are not only habitable but also sustainable and profitable for generations to come.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Sustainability Consultant	●○○	supporting
Facade Consultant	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	☐	
1	■	Optimise
2	■	Plan / Design
3	■	Plan / Design
4	☐	
5	☐	
6	☐	
7	☐	

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Daylight Residential
- ☑ Noise and Vibration – Residential
- ☑ Post Occupancy Evaluation

How is it calculated?

The KPI is in line with criteria #6 of Good Homes Alliance (GHA) Overheating in New Homes Tool and Guidance, and as a result, the calculation methodology is also aligned with the GHA guidance.

The KPI score is determined by calculating the approximate proportion of glazing on all solar-exposed elevations of each individual home, which includes south, east, and west-facing elevations and those in between. North-facing elevations, including any elevations in the 90 degrees from due NE to due NW, are excluded from the calculation, as they do not receive direct sunlight.

The percentage of glazing should be estimated as follows:

- In the initial stages of design before layouts are fixed, (RIBA Stages 0–2) it is recommended that the percentage of glazing for each solar exposed facade is measured for the building as a whole. Non residential areas (such as retail, bikes, bins) should be excluded from the calculation. Residential circulation can be included.
- Once layouts are fixed (RIBA Stage 3 onwards) calculation will be undertaken for one dwelling at a time. The entire area of the dwelling's solar exposed façade will be included in the calculation, as visible from the occupied areas.
- Ideally, the score should be based on the proportion of the facade visible from the occupied areas, without the slab. However, this can also be difficult to evaluate accurately. As a rough estimate, the glazing proportion seen from the inside is typically around 10% higher than what's seen from the outside (in proportion, not percentage points). For instance, if the total facade from the outside is about 50% glazed, this would be equivalent to roughly 55% glazing when seen from the inside (50% + 10% of 50%, or 1.1 × 50%).
- Technically, solar gains only occur through glazed areas and not the frame. However, this can be challenging to evaluate in the early stages of design, so the KPI score can be based on the "total glazed area," including the frame. This approach provides a conservative estimate and errs on the side of caution.
- Attention should be paid to corner rooms with windows on adjacent facades, as these spaces could be exposed to high solar gains even if each facade glazing ratio is still modest.

The calculation can be undertaken on the sample of units used for Part O compliance. The designers would need to provide evidence that the façade and glazing ratio in the sample units are representative and implemented for the entire design.

Where calculations are undertaken for individual units, a dwelling can be excluded from the KPI criteria if it complies with HW5 and HW6 leading practice in terms of maximising the openable area and providing external shading, and it shows through Part O calculations that the additional glazed area is required for ventilation purposes.

Metric type

%

Percentage

Units

%

Glazing ratio of the solar exposed façade as seen from inside the dwelling

Range

Assessment criteria

Good Practice

Glazing ratio < 50% of the solar exposed façade as seen from inside the dwelling.

The calculation will be undertaken for all the solar exposed façades of the building or each dwelling (glazed areas between compass points north-east and north-west via the south)

The measurement of the external wall should be done on internal dimensions, but at early stages a proportion factor of 10% can be used, as per the calculation methodology.

Where whole facades are assessed a glazing ratio of ≤50% achieves Good Practice (min 50% score).

Where dwellings are assessed, the percentage of units achieving Good Practice are scored with a factor of 0.5.

Leading Practice

Glazing ratio < 35% of the solar exposed façade as seen from inside the dwelling.

The calculation will be undertaken for all the solar exposed façades of the building or each dwelling (glazed areas between compass points north-east and north-west via the south).

The measurement of the external wall should be done on internal dimensions, but at early stages a proportion factor of 10% can be used, as per the calculation methodology.

Where whole facades are assessed a facade glazing ratio of ≤35% achieves Leading Practice (100% score).

Where dwellings are assessed, the percentage of units achieving Leading Practice are scored with a factor of 1.

Scoring Example for dwellings assessed: 67% of units achieve Good Practice, 31% achieve Leading Practice and 2% fail. (67% × 0.5) + (31% × 1) + (2% × 0) = 64% score

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Select the orientation of the homes to allow for a balance of sun and shade: ideally homes would be designed to receive low level sun in winter and block out high level sun in summer

Select a façade design that maximises openable area for ventilation and daylight access, while reducing the overall glazing ratio

Architect / facade engineer

Consider the size and specification of windows in relation to orientation and thermal comfort. Large windows facing south or west will have high heat gains unless measures such as external shading or solar control glazing are used to reduce the impact. Conversely large windows on north facing elevations will contribute to additional heat loss

RIBA Stage 2: Plan / Design

Architect

Design for a well-insulated building fabric, including enhanced insulation (improved u-values, which keep heat out in summer and heat in during winter), reduced heat loss at element junctions (thermal bridging) and improvement in air leakage (air tightness) beyond that required by building regulations

Sustainability engineer

Carry out overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

RIBA Stage 3: Plan / Design

Architect

Include in façade specification and tender package for the contractor all envelope performance parameters including u-values, g values, minimum openable areas, nigh time restrictors requirements and shading specifications.

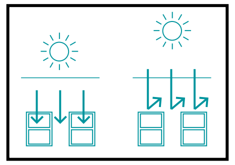
Sustainability engineer

Update overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

Action

Documentation



Documentation

Documentation

What is the process? (continued)

	RIBA Stage 4	RIBA Stage 5	RIBA Stage 6	RIBA Stage 7
Action	/	/	/	/
Documentation				

Relevant policy

Building Regulations Approved Document Part O

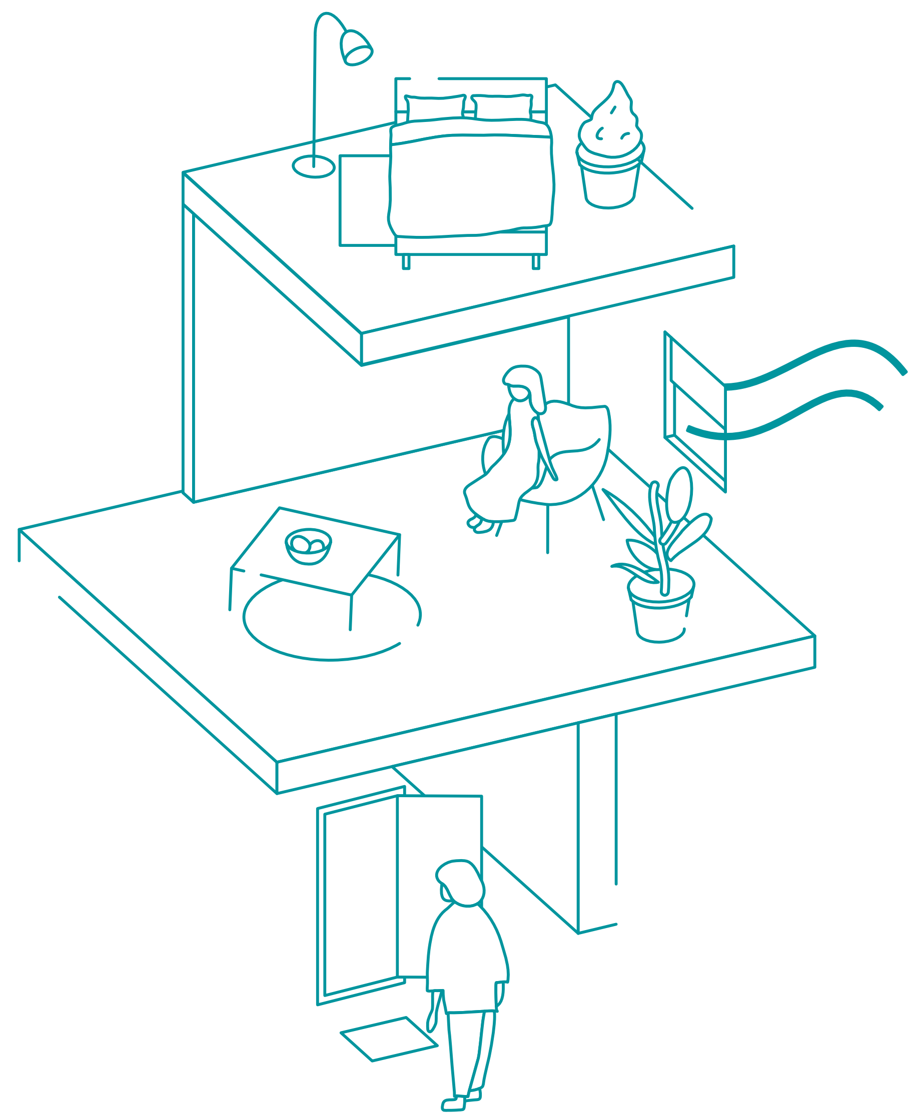
Solar gains in summer should be limited by any of the following means. a. Fixed shading devices, comprising any of the following. i. Shutters. ii. External blinds. iii. Overhangs. iv. Awnings. b. Glazing design, involving any of the following solutions. i. Size. ii. Orientation. iii. g-value. iv. Depth of the window reveal. c. Building design – for example, the placement of balconies. d. Shading provided by adjacent permanent buildings, structures or landscaping.

The London Plan, Policy SI 4

Many aspects of building design can lead to increases in overheating risk, including high proportions of glazing and an increase in the air tightness of buildings. Single-aspect dwellings are more difficult to ventilate naturally and are more likely to overheat, and should normally be avoided in line with Policy D6 Housing quality and standards. There are a number of low energy measures that can mitigate overheating risk. These include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk. The Mayor's London Environment Strategy sets out further detail on actions being taken to address this.

Further reading

CIBSE TM59: Design methodology for the assessment of overheating risk in homes
Good Homes Alliance (GHA) Overheating in New Homes Tool and Guidance
CIBSE TM49: Design Summer Years for London
Assessing Overheating Risk by Zero Carbon Hub
Health and Wellbeing in Homes by UK Green Building Council



ID no | Key Performance Indicator (KPI) name

HW 5 Thermal Comfort – Homes: Openable Window Area

What is it?

Overheated homes can have a direct and negative impact on both physical and mental health of the residents, and this could be exacerbated as the climate continues to warm and heatwaves become more frequent.

Effective purge ventilation is a critical method for mitigating overheating risks in residential buildings. The size and openable area of windows are key parameters that influence airflow and effective natural ventilation. Providing secure openings that enable increased ventilation rates can help dissipate heat and maintain comfortable indoor temperatures.

This indicator establishes a minimum requirement for openable area that must be achieved. This target exceeds the minimum openable area specified in the Approved Document Part F, which sets the minimum openable area that a dwelling needs to provide for purge ventilation. By exceeding this minimum threshold, designers can help mitigate against the risks of overheating.

The KPI is designed to work alongside more detailed assessment processes, such as Part O compliance, and help embed overheating mitigation solutions early in the design process.

How does it add value?

The Department for Environment, Food & Rural Affairs reports that there are currently approximately 2,000 heat-related deaths in the UK each year. Overheating not only causes discomfort, illness, and reduced productivity, but it also has a significant economic cost. By 2080, this cost is projected to reach £350 million. If left unaddressed, these social and economic concerns will only continue to worsen.

Taking overheating into account during the design stage of a home can offer notable benefits. For instance, retrofitting cooling systems is far more expensive and less energy-efficient than incorporating passive measures into the initial design. Additionally, overheated buildings are not attractive places to live and will become increasingly unprofitable for developers in the long term. As people avoid such buildings, residential developments will lose value. By implementing passive measures to mitigate the risk of overheating, designers can create projects that are not only habitable but also sustainable and profitable for generations to come.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Sustainability Consultant	●○○	supporting
Facade Consultant	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Daylight Residential
- ☑ Noise and Vibration – Residential
- ☑ Post Occupancy Evaluation

How is it calculated?

The KPI aligns with Criteria #14 of the Good Homes Alliance (GHA) Overheating in New Homes Tool and Guidance, and its calculation methodology follows suit.

The openable area requirement applies to all windows in each dwelling, regardless of orientation, even when mechanical ventilation is provided. This is to ensure that occupants have the option of natural purge ventilation.

The calculation is based on the Approved Document Part F, which requires that each room can achieve 4 air changes per hour (ach) when windows are open. Part F provides guidance on how this can be typically satisfied:

- Wide openings, e.g. hinged or pivot windows with angle over 30 degrees: total opening provision per room of at least 1/20th of the floor area.
- Narrow openings, e.g. hinged or pivot windows with angle of 15-30 degrees: total opening provision per room of at least 1/10th of the floor area.

Where windows have restrictors that cannot be safely overridden by occupants, the area would be based on the restricted opening.

The design team are expected to provide 50% or 100% more than the minimum Part F provision for all habitable rooms.

It is expected that the façade design will not be developed at very early stages of design (eg. Stage 2) and detailed calculations are not expected before the façade design has been developed. However, key considerations to enable maximising the openable areas should be included in the design process from an early stage, while balancing these with design and safety, security and air quality issues. Such considerations should include the orientation and area of the opening, the number of openings, and the opening types (windows, secure acoustic vents, balcony doors, Juliette balconies etc).

Dual aspect units are required to provide a 50% improvement on Part F to achieve Good Practice. The definition of dual aspect should comply with the GLA definition (in Appendix 3 of Housing Design Standards LPG).

It should be noted that purge ventilation is particularly effective in buildings that have high exposed thermal mass and a means for secure and quiet night ventilation.

While it's important to have adequate openable window sizes to mitigate against overheating, this should not supersede any safety considerations. All openings and particularly full height openings will need to comply with safety guidance and Building Regulations Part K requirements.

The calculation can be undertaken on the sample of units used for Part O compliance. The designers would need to provide evidence that the façade and openings conditions in the sample units are representative and implemented for the entire design.

Metric type

%

Percentage

Units

%

Minimum openable window area for purge ventilation

Range

Dual Aspect Dwellings

0% | +50% Good Practice | + 100% Leading Practice

Single Aspect Dwellings

0% | + 100% Good and Leading Practice

Assessment criteria

Good Practice	Minimum openable area to be provided: Habitable rooms in Dual Aspect dwellings: purge ventilation minimum as per Part F +50% Habitable rooms in Single Aspect dwellings: purge ventilation minimum as per Part F + 100% The percentage of dwellings achieving Good Practice are scored with a factor of 0.5 Note all habitable rooms must pass the criteria to achieve the rating
Leading Practice	Minimum openable area to be provided: Habitable rooms in all dwellings: purge ventilation minimum as per Part F + 100% The percentage of dwellings achieving Leading Practice are scored with a factor of 1 Note all habitable rooms must pass the criteria to achieve the rating

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Design windows to maximise the openable area. Key principles to enable maximising the openable areas should be included in the design process from an early stage, while balancing these with design and safety/ security issues:

- Prioritising dual aspect flats
- Selecting windows' locations to maximise uniform distribution of daylight and reduce direct solar gain
- Safety considerations for full height windows
- Security requirements such as restrictors, particularly for windows that might be left open at night
- Identify acoustic, air quality and safety considerations

Architect / facade engineer

Natural ventilation through openable windows can be used to help cool homes, or at least provide a breeze on a hot summer's day. The most effective form is cross ventilation, with openable windows on opposite sides of the building (dual aspect homes)

Using thermal mass (heavyweight materials such as brick, stone, block and concrete) inside homes can help regulate internal temperatures, especially in summer

Night-time ventilation should be considered to cool the thermal mass overnight ready to absorb heat the following day, although security and noise must be considered

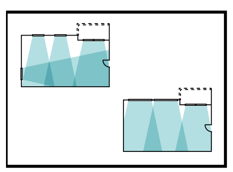
RIBA Stage 2: Plan / Design

Architect

Design windows to maximise the openable area. Key principles to enable maximising the openable areas should be included in the design process from an early stage, while balancing these with design and safety/ security issues:

- Prioritising dual aspect flats
- Selecting windows' locations to maximise uniform distribution of daylight and reduce direct solar gain
- Safety considerations for full height windows
- Security requirements such as restrictors, particularly for windows that might be left open at night
- Identify acoustic, air quality and safety considerations
- Maximising openable areas
- Review of direction in which the window opens

Documentation



Documentation

Action

Documentation

What is the process? (continued)

RIBA Stage 2: Plan / Design (continued)

Action

Architect to ensure all openings and particularly full height openings comply with safety guidance and Building Regulations Part K requirements.

Particular attention should be paid to ensure designers account for the Approved Document Part K guarding design requirement for dwellings, which stipulates that external balconies including Juliette balconies' guarding need to have a minimum height of 1100mm. It also notes that to prevent children from readily being able to climb guarding, horizontal rails need to be avoided and a 100mm sphere cannot pass through any openings in the guarding.

Sustainability engineer

Carry out overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

Mechanical and electrical (M&E) engineer

Where mechanical ventilation with heat recovery (MVHR) is used to efficiently retain heat in winter, it should be installed with a summer bypass mode to ensure internal heat is expelled rather than recirculated in the hotter months

Heating and ventilation controls should be easy to use and understand, allowing occupants to adjust temperatures and ventilation rates to suit their preferences

Avoid unnecessarily adding heat internally from hot water storage or poorly insulated heating pipes. Insulate pipework to a high standard of workmanship

Documentation

RIBA Stage 3: Plan / Design

Action

Architect

Design windows to maximise the openable area. Key principles to enable maximising the openable areas should be included in the design process from an early stage, while balancing these with design and safety/ security issues:

- Safety considerations for full height windows
- Security requirements such as restrictors, particularly for windows that might be left open at night
- Identify acoustic, air quality and safety considerations
- Maximising openable areas
- Review of direction in which the window opens and the type of opening mechanism (side-hung, top-hung etc)
- Considerations on how the windowpanes are divided
- Consideration of how restrictors are used (if required) to allow for purge ventilation
- Security considerations, particularly for windows that might be left open at night

Include in façade specification and tender package for the contractor all envelope performance parameters including u-values, g values, minimum openable areas, nigh time restrictors requirements and shading specifications.

Sustainability engineer

Update overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Design windows to maximise the openable area. Key principles to enable maximising the openable areas should be included in the design process from an early stage, while balancing these with design and safety/ security issues:

- Security requirements such as restrictors, particularly for windows that might be left open at night
- Review of direction in which the window opens and the type of opening mechanism (side-hung, top-hung etc)
- Considerations on how the windowpanes are divided
- Consideration of how restrictors are used (if required) to allow for purge ventilation
- Security considerations, particularly for windows that might be left open at night

Include in façade specification and tender package for the contractor all envelope performance parameters including u-values, g values, minimum openable areas, nigh time restrictors requirements and shading specifications.

Sustainability engineer

Update overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

RIBA Stage 5

RIBA Stage 6

Documentation

What is the process? (cont'd)

Action

RIBA Stage 7

Documentation

Relevant policy

Building Regulations Approved Document Part O

The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings.

Building Regulations Approved Document Part K

In a building that may be used by children under five years of age during normal use, guarding should be constructed in accordance with both of the following: a) to prevent children being held fast by the guarding ensure that a 100mm sphere cannot pass through any openings in the guarding. b) To prevent children from readily being able to climb the guarding: avoid horizontal rails.

The London Plan, Policy SI 4

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

Further reading

- CIBSE TM59: Design methodology for the assessment of overheating risk in homes
- Good Homes Alliance (GHA) Overheating in New Homes Tool and Guidance
- CIBSE TM49: Design Summer Years for London
- Assessing Overheating Risk by Zero Carbon Hub
- Health and Wellbeing in Homes by UK Green Building Council
- Royal Society for the Protection of Accidents and Environmental Health officers, including sill heights

ID no   Key Performance Indicator (KPI) name

HW 6   Thermal Comfort – Homes: Solar Shading

What is it?

Overheated homes can have a direct and negative impact on both physical and mental health of the residents, and this could be exacerbated as the climate continues to warm and heatwaves become more frequent.

Solar gain is a significant factor that contributes to the risk of overheating in residential buildings. In addition to the amount of glazing used, incorporating external shading is an effective strategy for managing solar gain and reducing the risk of overheating.

Designers can choose from a range of options for external shading, including balconies, articulation of the façade, overhangs, and external devices such as awnings, venetian blinds, roller binds or shutters. The effectiveness of the shading strategy can be optimized by considering the orientation of the building and the placement of the appropriate type of shading device. Horizontal shading is most effective for South facing facades, while vertical shading works best for East and West facing facades.

The indicator sets a threshold for the proportion of the solar exposed windows that need to have effective external shading.

How does it add value?

The Department for Environment, Food & Rural Affairs reports that there are currently approximately 2,000 heat-related deaths in the UK each year. Overheating not only causes discomfort, illness, and reduced productivity, but it also has a significant economic cost. By 2080, this cost is projected to reach £350 million. If left unaddressed, these social and economic concerns will only continue to worsen.

Taking overheating into account during the design stage of a home can offer notable benefits. For instance, retrofitting cooling systems is far more expensive and less energy-efficient than incorporating passive measures into the initial design. Additionally, overheated buildings are not attractive places to live and will become increasingly unprofitable for developers in the long term. As people avoid such buildings, residential developments will lose value. By implementing passive measures to mitigate the risk of overheating, designers can create projects that are not only habitable but also sustainable and profitable for generations to come.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Sustainability Consultant	●○○	supporting
Facade Consultant	●○○	supporting
Property Manager	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
☐	■	■	■	■	☐	☐	☐
	Optimise	Plan / Design	Plan / Design	Specify			

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Daylight Residential
- ☑ Noise and Vibration – Residential
- ☑ Post Occupancy Evaluation

How is it calculated?

The indicator is aligned to the Good Homes Alliance (GHA) Overheating in New Homes Tool and Guidance Criteria #13, as well as the GHA Shading for Housing – Design Guide for a Changing Climate. As such, the calculation methodology is also aligned with the GHA guidance.

The indicator takes into account the glazing ratio, as estimated for HW4, since larger glazed areas increase the importance of effective shading features. After evaluating the glazing ratio, the level of external shading provided needs to meet the defined requirements. Designers can incorporate a range of external shading solutions, such as balconies, facades with varied depths, overhangs, and shading devices like awnings, venetian blinds, roller blinds, or shutters. It is important to note GHA guidance that dynamic shading products are more effective at reducing the risk of overheating than fixed alternatives because residents can adjust them in response to seasonal weather changes.

The KPI is relevant only to solar-exposed areas, glazed areas between compass points north-east and north-west via the south. Shading should be appropriate to facade orientation; for example overhang shading provided by a balcony is more effective on south elevation than on east or west.

Metric type

%

Percentage

Units

%

Percentage of homes meeting standard

Range

Glazing ratio < 35%

0%

85% of units Good and Leading Practice

Glazing ratio > 35%

0%

90% of units Good Practice

100% of units Leading Practice

Assessment criteria

Good Practice

The following provision should be made for solar exposed facades:

(i) Effective external shading provided, or

(ii) No windows installed below 800mm

Effective external shading includes but are not limited to external roller shutters, external shutters, external venetian blinds, external awnings, overhang shading, including balconies if positioned fully above the window.

Solar-exposed areas are defined as glazed areas between compass points north-east and north-west via the south.

The following minimum provision should be met for solar exposed façade areas:

- If the glazing ratio is < 35%: 85% of units would need to provide external shading or horizontal windows for solar exposed façade areas.
- If the glazing ratio is > 35%: 90% of units would need to provide external shading or horizontal windows for solar exposed façade areas.

All units that have no shading provision need to be shown to comply with Part O overheating criteria.

Leading Practice

The following provision should be made for solar exposed facades:

(i) Effective external shading provided, and

(ii) No windows installed below 800mm

Effective external shading includes but are not limited to external roller shutters, external shutters, external venetian blinds, external awnings, overhang shading, including balconies if positioned fully above the window.

Solar-exposed areas are defined as glazed areas between compass points north-east and north-west via the south.

The following minimum provision should be met for solar exposed façade areas:

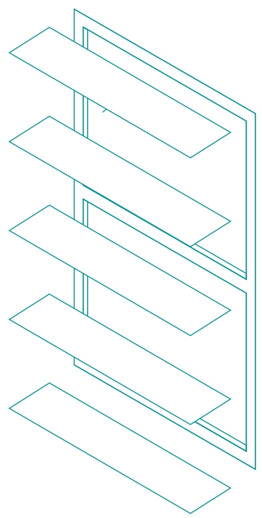
- If the glazing ratio is < 35%: 85% of units would need to provide external shading and horizontal windows for solar exposed façade areas.
- If the glazing ratio is > 35%: 100% of units would need to provide external shading and horizontal windows for solar exposed façade areas.

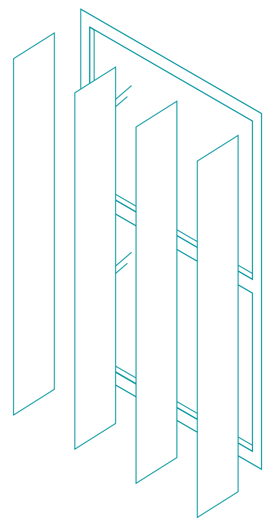
All units that have no shading provision need to be shown to comply with Part O overheating criteria.

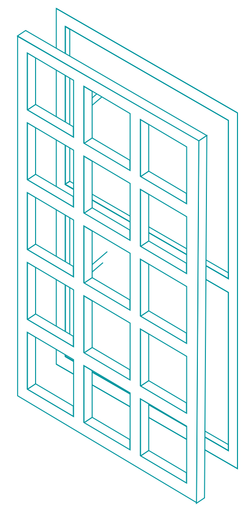
How is it calculated? (continued)

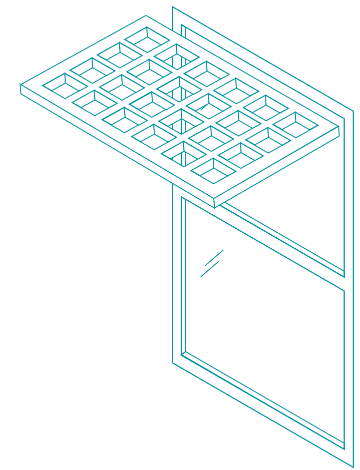
Types of external shading devices (refer to the GHA *Shading for Housing – Design Guide for a Changing Climate* for more examples)

Fixed

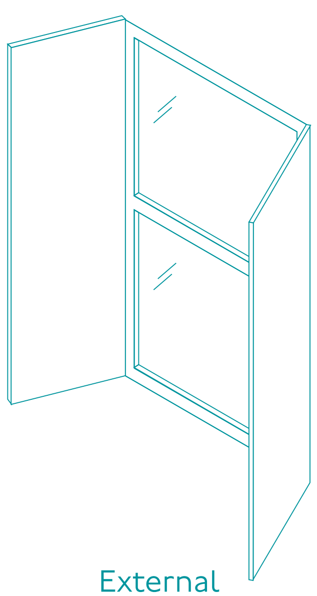

Horizontal fixed shade

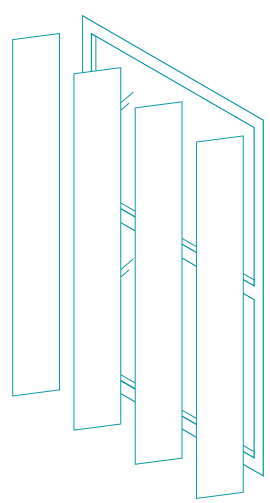

Vertical fixed shade

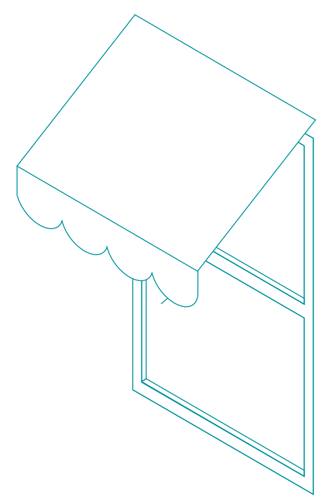

Fixed screen / Trellis

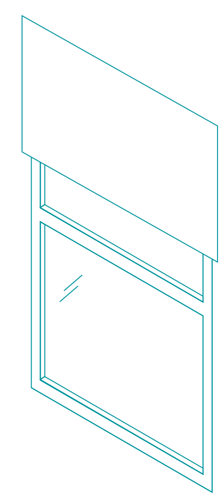

Perforated horizontal overhang

Dynamic

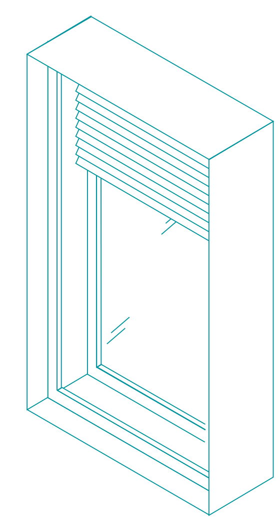

External hinged shutter


Vertical movable shade


Moveable awning


External adjustable shutter

Alternative


Closed cavity façade

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Decide on the main shading strategies and design the building massing to respond to these:

- Self-shading
- Overhangs such as balconies
- External shading devices

Architect / facade engineer

Consider the selected shading methods in relation to orientation and thermal comfort and select the most appropriate strategy for each orientation.

RIBA Stage 2: Plan / Design

Architect

Select the specific shading method, including which external shading devices are used (awnings, venetian blinds, roller binds or shutters).

Engage with manufacturers to:

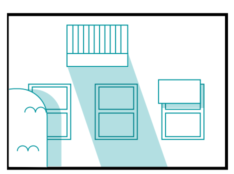
- Understand the technical requirements to integrate external shading devices in the design.
- Ensure the impact on energy of external shading devices (any additional thermal bridges) is mitigated against.
- Review material selection to ensure all impact are accounted for such as the radiant effect of metals in the summer.

Sustainability engineer

Carry out overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved.

Documentation



Documentation

What is the process? (continued)

Action

RIBA Stage 3: Plan / Design

Architect

Select the specific shading method, including which external shading devices are used (awnings, venetian blinds, roller binds or shutters).

Engage with manufacturers to:

- Understand the technical requirements to integrate external shading devices in the design.
- Ensure the impact on energy of external shading devices (any additional thermal bridges) is mitigated against.

Review material selection to ensure all impact are accounted for such as the radiant effect of metals in the summer

Include external shading devices in the building details, such as lintel details. Ensure the impact on energy (thermal bridges) is mitigated against.

Include in façade specification and tender package for the contractor all envelope performance parameters specifications for external shading devices, including colour, opacity and materiality.

Sustainability engineer

Update overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

RIBA Stage 4: Specify

Architect

Include external shading devices in the building details, such as lintel details. Ensure the impact on energy (thermal bridges) is mitigated against.

Include in façade specification and tender package for the contractor all envelope performance parameters specifications for external shading devices, including colour, opacity and materiality.

Sustainability engineer

Update overheating analysis (Part O), energy and daylight sunlight assessment, and ensure results are used to shape the façade design process.

Ensure potential conflicts with regards to relevant design issues/factors, namely daylighting, heat loss, air quality, acoustics, thermal comfort, etc., are balanced and/or resolved

RIBA Stage 5

Action

Documentation

Documentation

What is the process? (continued)

	RIBA Stage 6	RIBA Stage 7
Action		
Documentation		

Relevant policy

Building Regulations Approved Document Part O

Solar gains in summer should be limited by any of the following means. a. Fixed shading devices, comprising any of the following. i. Shutters. ii. External blinds. iii. Overhangs. iv. Awnings. b. Glazing design, involving any of the following solutions. i. Size. ii. Orientation. iii. g-value. iv. Depth of the window reveal. c. Building design – for example, the placement of balconies. d. Shading provided by adjacent permanent buildings, structures or landscaping.

The London Plan, Policy SI 4

Many aspects of building design can lead to increases in overheating risk, including high proportions of glazing and an increase in the air tightness of buildings. Single-aspect dwellings are more difficult to ventilate naturally and are more likely to overheat, and should normally be avoided in line with Policy D6 Housing quality and standards. There are a number of low energy measures that can mitigate overheating risk. These include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk. The Mayor's London Environment Strategy sets out further detail on actions being taken to address this.

Further reading

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- Assessing Overheating Risk by Zero Carbon Hub
- Health and Wellbeing in Homes by UK Green Building Council
- Royal Society for the Protection of Accidents and Environmental Health officers, including sill heights
- GHA Shading for Housing – Design Guide for a Changing Climate

ID no

HW 7

Key Performance Indicator (KPI) name

Thermal Comfort – Commercial

What is it?

Effective temperature control is essential for a healthy and comfortable environment in commercial buildings. Good thermal comfort is achieved when a building design allows for seasonal changes, occupier preferences and future temperature changes. This indicator is based on BREEAM UK NC 2018 Hea 04, Thermal Comfort. It aims to make sure that buildings can provide the right level of thermal comfort to their users. It should be warm enough in the winter and cool enough in summer. Moreover, the control systems should be easy to understand and use so the occupants can adjust their own heating. This indicator is split into three parts, each representing a credit to show compliance:

- Thermal modelling
- Design for future thermal comfort
- Thermal zoning and controls

How does it add value?

With a changing climate, both under and overheating are an increasing problem in commercial buildings. In many countries, heating and cooling accounts for around 50 per cent of a building's energy consumption. A well-controlled thermal environment will create a positive effect on a development's energy footprint. For example, it reduces the impact on running costs and the environment, by cutting wasted heat and/or the need for air-conditioning systems, and avoids overly complex and costly servicing systems. Effective thermal control also helps to future-proof buildings and reduce the risk to occupier health and wellbeing in the face of extreme winter and summer temperatures.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

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

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Well being
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Daylight Commercial
- ☑ Noise and Vibration – Commercial
- ☑ Post Occupancy Evaluation

How is it calculated?

This indicator follows the criteria set out by BREEAM Hea 04, Thermal Comfort. See BREEAM UK NC 2018 manual (page 102 of 392).

Thermal modelling
(one credit)

This must be carried out using software in accordance with CIBSE AM11 Building energy and performance modelling. The software must carry out full dynamic thermal analysis for more complicated buildings. Alternative, less complex means of analysis may be used for basic building designs with less complex heating or cooling systems.

For both air-conditioned and naturally ventilated buildings, the BREEAM NC UK 2018 manual sets out criteria that must be met to achieve credits. These criteria must be demonstrated by thermal modelling.

Design for future thermal comfort
(one credit)

To achieve this credit, the first credit for thermal modelling must be fulfilled.

The modelling must demonstrate that the building meets thermal comfort requirements set out in the BREEAM NC 2018 manual for a projected future climate change environment. If this cannot be achieved, the project team must explain how the building could be adapted in future using passive solutions, to meet the stated requirements.

Thermal zoning and controls
(one credit)

To achieve this credit, the first credit for thermal modelling must be fulfilled.

The thermal modelling analysis must then inform the temperature control strategy for the building and its users.

The strategy for the proposed heating or cooling must show that it has addressed the following:

- Zoning within the building
- The degree of occupant control required for these zones
- How the proposed systems will interact with each other and how this may affect the thermal comfort of the building occupants
- The need or otherwise for an accessible building-user actuated manual override for any automatic systems

Metric type

Points

Units

Number of credits – BREEAM Hea 04

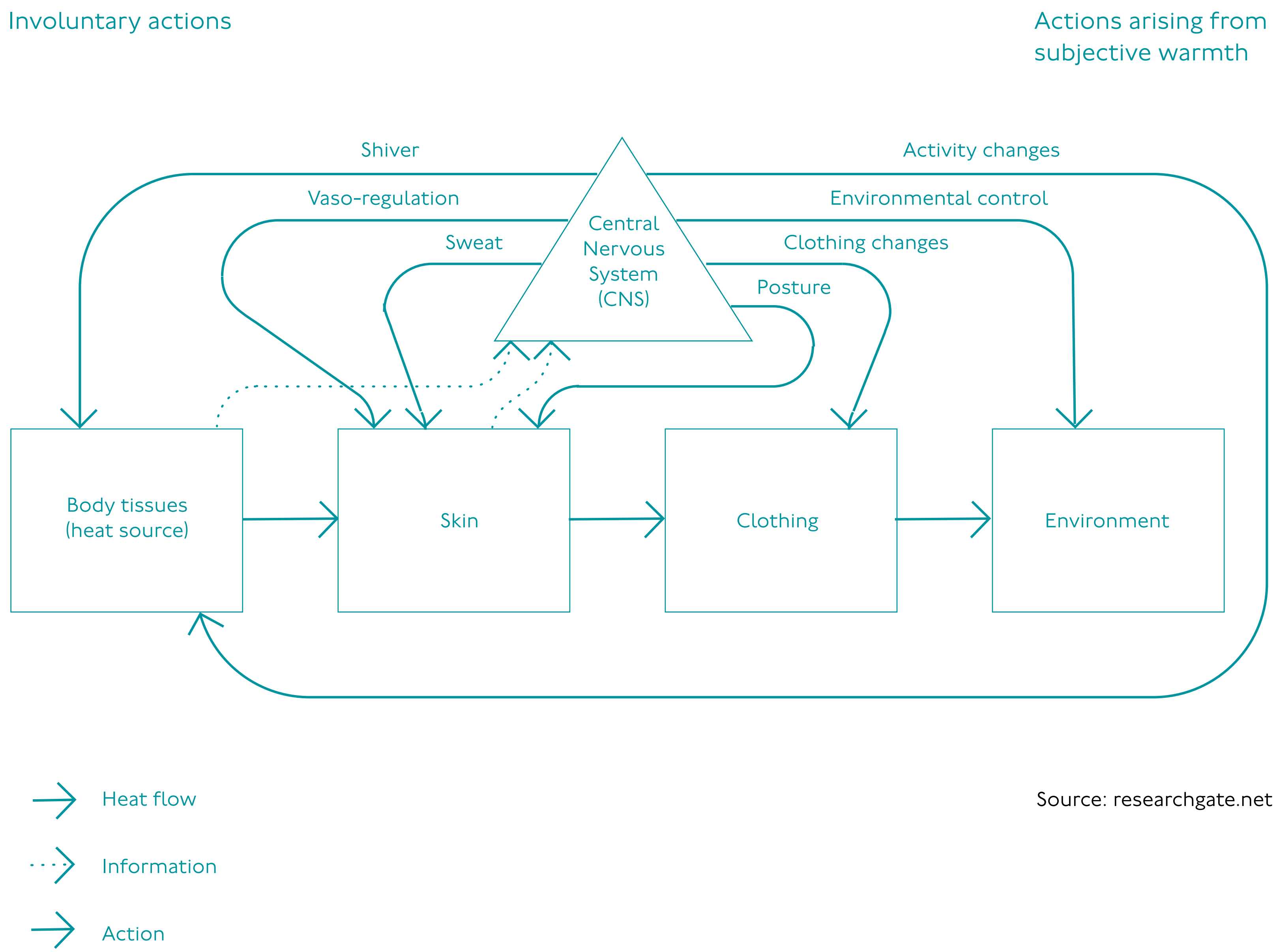
Range

2 credits
Good Practice

3 credits
Leading Practice

How is it calculated? (continued)

The thermal regulatory system

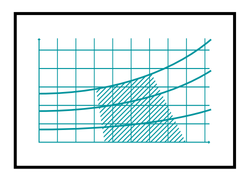
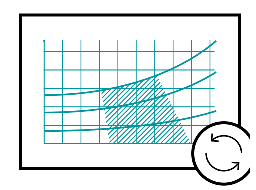


Source: researchgate.net

Table I.8: Maximum temperatures for indoor spaces

Type and use of space	Assumed activity level (/met)	Maximum temperature for stated clothing level: Winter clo = I.0	Summer clo = 0.5
Residential (sedentary)	I.2	24.0	26.0
Residential (active)	I.5	22.0	–
Offices	I.2	24.0	26.0
Public spaces (auditoria, café, etc.)	~ I.2	24.0	26.0
Classrooms	I.2	24.0	26/0
Kindergarten	I.4	22.5	25.5
Shops	I.6	22.0	25.0

What is the process?

	RIBA Stage 0: Optimise	RIBA Stage 1: Optimise	RIBA Stage 2: Plan / Design	RIBA Stage 3: Plan / Design
Action	<u>Development manager</u> Thermal comfort criteria clearly stated as part of the client and design brief	<u>Architect</u> Careful consideration of site/building location, surroundings and passive design measures that could contribute to achieving thermal comfort in the buildings. For example, orientation (in the case of new builds), eaves, overhangs, glazing ratios, appropriate shading devices (internal and external), bioclimatic measures, thermal performance of glazing, namely g-values, as well as passive cooling strategies, such as use of the building's thermal mass, night-time purging, phase change materials, etc	<u>Architect</u> Further consideration of passive design measures highlighted above	<u>Sustainability engineer</u> Detailed modelling and analysis to confirm (i) compliance with thermal comfort criteria, (ii) most appropriate solutions/ strategies for particular building/site using CIBSE AM11 compliant software, for example, IES v2018 1.0.0
Documentation			 Thermal comfort assessment report to be provided in support of planning application	 Same as above (if planning at Stage 3) otherwise, updated thermal comfort assessment to reflect developed design

Action

Documentation

What is the process? (continued)

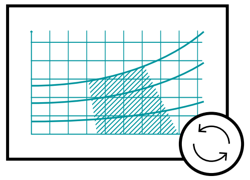
Action

RIBA Stage 4: Specify

Sustainability engineer

Detailed modelling and analysis to confirm (i) compliance with thermal comfort criteria, (ii) most appropriate solutions/strategies for particular building/site using CIBSE AM11 compliant software, for example, IES v2018 1.0.0.

Documentation



Updated thermal comfort assessment to reflect detailed design thermal control strategy

RIBA Stage 5

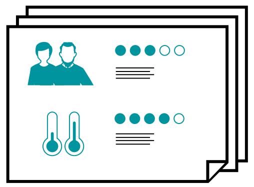
RIBA Stage 6

RIBA Stage 7: Monitor

Sustainability engineer

Post occupancy evaluation to assess occupant comfort levels and satisfaction

Documentation



Post occupancy evaluation (POE) report confirming user satisfaction levels

Relevant policy

The London Plan, Policy D3

Policy D3 Optimising site capacity through the design-led approach

D (10). Development proposals should 'achieve indoor and outdoor environments that are comfortable and inviting for people to use'.

The London Plan, Policy SI 4

a) Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials, and the incorporation of green infrastructure.

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

Further reading

CIBSE TM59: Design methodology for the assessment of overheating risk in homes
Assessing Overheating Risk by Zero Carbon Hub
Health and Wellbeing in Homes by UK Green Building Council
BREEAM Thermal comfort
CIBSE TM52
CIBSE AM11: Building performance modelling (2015)

ID no

HW 8

Key Performance Indicator (KPI) name

Indoor Air Quality – Residential

What is it?

Building materials, coatings and furnishings at home can be a significant source of indoor air pollution, especially formaldehyde and total volatile organic compounds (TVOCs). A wide range of these may be released by materials used in a new building during its first two years. These toxic substances can make occupants ill, create discomfort and result in poor indoor air quality. This indicator focuses on the five main indoor air pollutant sources in residential developments:

- Space and water heating
- Cooking
- Building product types
- Emissions of airborne formaldehyde
- Total organic compounds

The indicator aims to improve occupants' comfort and wellbeing, and minimise the negative effects of indoor air pollutants emitted from a new building and its materials.

We are following the criteria and credits set out in BRE's Home Quality Mark HQM 4.1, Indoor Pollutants.

How does it add value?

By taking steps to curb the sources of indoor air pollutants being released into new homes, the risk to occupants' health is reduced and their quality of life improved. By raising awareness about these pollutants, people can make informed and better choices about their building materials, decorative products, furnishings, household cleaning products and cosmetics.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Engineer – M&E	●○○	supporting
Air Quality Consultant	●○○	supporting
Engineer – Sustainability	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
9 Industry, Innovation, and Infrastructure

Connected SDF indicators

- ☑ Responsible Sourcing of materials
- ☑ Post Occupancy Evaluation
- ☑ Thermal Comfort – Homes – DSY 1, 2 & 3
- ☑ Internal Air Quality – Commercial
- ☑ Responsible Construction

How is it calculated?

This indicator follows the criteria set out by HQM 4.1, Indoor Pollutants. See: Home Quality Mark ONE England (page 71 of 256).

Home information (prerequisite)

Home information as required in the HQM ONE England manual must be provided.

Minimising emissions from space and water heating (prerequisite)

All combustion appliances within the home must have flues that discharge outdoors.

Minimising the effects of cooking (up to two credits)

One credit is awarded based on the cooker hood within the home. For naturally ventilated homes, a cooker hood must be extractive, while mechanically ventilated homes must have a cooker hood which is recirculating. One credit is awarded if cooking appliances are zero emissions from the fuel specified.

Minimising emissions from building product types (up to four credits)

Credits are awarded where building product types meet the emission limits, the testing requirements and the additional ones listed in table 17 in the HQM ONE England manual. The quantity of credits awarded is based on how many products types in table 17 meet these requirements, as shown in table 16 below.

Minimising airborne formaldehyde from all sources (three credits)

Credits are awarded for minimising the formaldehyde concentration in indoor air post construction to below 0.1 mg/m^3 (100 µg/m^3), averaged over 30 minutes. Where levels are found to exceed these limits, measures must be taken to reduce the formaldehyde levels to within the above limits.

Minimising airborne TVOCs from all sources (three credits)

Up to three credits are awarded for minimising the indoor TVOC concentration to below 0.5mg/m^3 (500µg/m^3), averaged over eight hours. Where levels are found to exceed these limits, measures must be taken to reduce the TVOC levels to within the above limits.

Table 16: Quantity of building product types that need to meet the requirements in order to receive credits.

Quantity of building products types	Credits
1	1
3	2
All	4

Metric type

Points

Units

Number of credits – HQM 4.1

Range

0

6 Good Practice

12 Leading Practice

How is it calculated? (continued)

Emission criteria by building product type

Building product type[1]	Emission limits[2] formaldehyde	Total volatile organic compounds (TVOCs)[3]	Category IA and IB carcinogens	Testing requirement	Additional requirements
See Accreditation of organisations performing sampling or laboratory analysis				See Accreditation of organisations performing sampling or laboratory analysis and Testing requirements for emission limits	
Interior paints and coatings	0.06 mg/m³	1.0 mg/m³	0.001 mg/m³	BS EN 16402 **(55)** or BS EN ISO 16000-9 **(56)** or BS EN 16516 **(57)** or CDPH Standard Method v1.1 **(58)**	Meet TVOC content limits. Paints used in wet areas (eg bathrooms, kitchens, utility rooms) should protect against mould growth
Wood-based products (including wood flooring)	0.06 mg/m³ (Non-MDF) 0.08 mg/m³ (MDF)	1.0 mg/m³	0.001 mg/m³	BS EN ISO 16000-9 **(59)** or BS EN 16516 **(60)** or CDPH Standard Method v1.1 **(61)** or BS EN 717-1 **(62)** (formaldehyde emissions only)	N/A
Flooring materials (including floor levelling compounds and resin flooring)	0.06 mg/m³	1.0 mg/m³	0.001 mg/m³	BS EN ISO 10580 (63) or BS EN ISO 16000-9 (64) or BS EN 16516 (65) or CDPH Standard Method v1.1 (66)	N/A
Ceiling, wall and acoustic and thermal insulation materials	0.06 mg/m³	1.0 mg/m³	0.001 mg/m³	BS EN ISO 16000-9 (67) or BS EN 16516 (68) or CDPH Standard Method v1.1 (69)	N/A
Interior adhesives and sealants (including flooring adhesives)	0.06 mg/m³	1.0 mg/m³	0.001 mg/m³	BS EN 13999 (Parts 1-4) (70) or BS EN ISO 16000-9 (71) or BS EN 16516 (72) or CDPH Standard Method v1.1 (73)	

1 The emission limits in this table apply to the finished product, ie after any coating or other treatment process has been applied.

2 Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard. The emission rate obtained from the chamber test method must be extrapolated to predict what the concentration would be in the air of the theoretical model or reference room (as detailed in the respective testing standard) and this extrapolated concentration compared with the emission limit in this table. Emission limits are for individual building products and not cumulative for all building products that are part of a building product type group.

3 Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.

What is the process?

Action

Action

RIBA Stage 0: Optimise

Development manager

Consider the location of the homes in respect of the existing external air quality. Are they located within an Air Quality Management Area (AQMA), Air Quality Focus Area (AQFA), or close to a major source of pollution? Review London Atmospheric Emissions Inventory (LAEI) pollution maps

RIBA Stage 1: Optimise

Landscape architect

Homes should be orientated with openings and outdoor spaces away from pollution sources. Design should consider how landscaping, internal courtyards, 'green screening' or other measures be used to reduce the impact of the poor air quality

RIBA Stage 2: Plan / Design

Architect

Homes should be designed with dedicated, well-ventilated, low energy drying spaces such as covered outdoor areas, indoor drying cupboards, or communal drying facilities to alleviate health risks from moisture

Ensure windows are accessible and can be partially opened for trickle ventilation or opened wide for purge. To provide adequate ventilation overnight, it is recommended that a window is left open: if this is not possible due to local security issues, other means of secure night-time ventilation should be provided

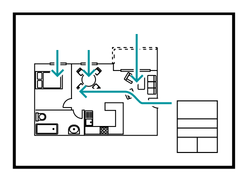
Mechanical and electrical (M&E) engineer

If the provision of fresh air at a sufficient rate to dilute and remove airborne pollutants is not possible via natural means, mechanical ventilation with heat recovery (MVHR) or mechanical extract ventilation (MEV) could be considered

When specifying mechanical systems, air intakes should be located as far as possible from sources of external air pollution, and from exhaust points, to avoid recirculation

Documentation

Documentation



Ventilation layout / schematic confirming dwelling ventilation strategy.
Mechanical, electrical and plumbing (MEP) specification confirming requirements

What is the process? (continued)

Action

RIBA Stage 3: Plan / Design

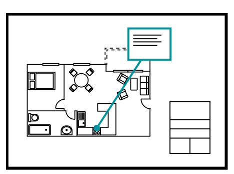
Architect

Early consideration is required to avoid internal build-up of pollutants: construction materials, fittings and finishes with a low air quality impact should be used, (consult various British and European standards regarding VOC and formaldehyde emissions from products)

Mechanical and electrical (M&E) engineer

Ensure specification of cooker hood meets requirements of HQM credit 4.1

Documentation



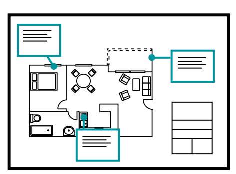
Specification confirming cooking appliances are all electric or specified with zero emissions fuel

RIBA Stage 4: Specify

Architect

Ensure requirements for construction materials, fittings and finishes with a low air quality impact are embedded into the tender documents

Documentation



Architectural specification confirming all relevant building product types must meet emission limits and testing requirements

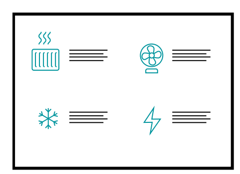
RIBA Stage 5: Deliver

Contractor

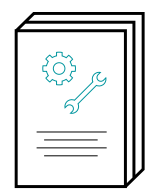
Collate indoor air quality (IAQ) testing results for formaldehyde and TVOC. Also, manufacturer product information or declaration of building products detailing emission limits and testing requirements

Completed Home Information

Documentation



Product data sheets of as built materials



Operation and maintenance (O&M) manual

RIBA Stage 6: Monitor

Property manager

Provide a Home User Guide to help occupiers understand how to establish and maintain good internal air quality. The first two years of a building's operation are the most important in terms of VOC emissions, when the effect of fittings and finishes is strongest

Carry out air quality testing of VOCs and formaldehyde after the completion of flush-out to ensure pollutant concentrations are within the recommended limits

Documentation

Home User Guide

What is the process? (c'd)

RIBA Stage 7

Relevant policy

The London Plan, Policy D3

Development proposals should:
… help prevent or mitigate the impacts of noise and poor air quality … achieve indoor and outdoor environments that are comfortable and inviting for people to use.

Measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly located emission sources, street canyons and noise sources should also be designed out wherever possible.

Further reading

Home Quality Mark ONE England Manual
WHO guidelines for indoor air quality
CIBSE TM40: Health and wellbeing in building services
Health and Wellbeing in Homes by UK Green Building Council

ID no

HW 9

Key Performance Indicator (KPI) name

Indoor Air Quality – Commercial

What is it?

Poor indoor air quality in commercial buildings can affect the physical health and wellbeing of the occupants and their productivity. This can be improved by taking steps to remove common pollutants such as carbon dioxide, nitrogen dioxide and volatile organic compounds (VOCs) from the building. This indicator focuses on managing indoor air pollution early in the building design process. With the right strategies in place, for example, by specifying appropriate ventilation, and managing harmful emissions from construction materials by only using finishes and products that comply with approved standards, good indoor air quality can be maintained.

For this indicator, we are following the criteria of BRE's BREEAM UK NC 2018 Hea 02, Indoor Air Quality.

How does it add value?

By replacing potentially toxic building materials and finishes that contain VOCs, with those that have been tested and meet approved standards before construction and installation, it is possible to cut the risk of pollutants being released from a new building. A strategy that reduces indoor air pollution from a variety of sources will help protect the occupants' physical health, lessen valid concerns associated with air pollution and sustain productivity.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Architect	●●●	leading
Development Manager	●●○	accountable
Engineer – M&E	●○○	supporting
Air Quality Consultant	●○○	supporting
Engineer – Sustainability	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
9 Industry, Innovation, and Infrastructure

Connected SDF indicators

- ☑ Responsible Sourcing of materials
- ☑ Post Occupancy Evaluation
- ☑ Thermal Comfort – Commercial
- ☑ Air Quality Neutral – Buildings
- ☑ Responsible Construction

How is it calculated?

This indicator follows the criteria set out by BREEAM Hea 02, Indoor Air Quality. See: BREEAM UK New Construction 2018 Manual (page 90 of 392).

Indoor air quality (IAQ) plan (prerequisite)

A site-specific indoor air quality plan must be produced and implemented in accordance with Guidance Note GN06. The indoor air quality plan must consider all points provided within the BREEAM 2018 NC Manual.

Ventilation (one credit)

To achieve this credit, the building must be designed to minimise the indoor concentration and recirculation of pollutants in the building. The building must meet the criteria set out in the BREEAM UK NC 2018 Manual, including providing fresh air and designing ventilation pathways to minimise the ingress and buildup of air pollutants inside.

Emission from construction products (two credits)

To achieve one credit, three of the five product types listed in table 5.11 in BREEAM 2018 NC Manual (below) must meet the emission limits, testing requirements and any additional requirements provided. All wood-based products used for internal fixtures and fittings must also be tested and classified as formaldehyde E1 class as a minimum.

To achieve two credits, all the product types listed must meet the emission limits, testing requirements and any additional ones listed in table 5.11.

Post construction indoor air quality (one credit)

The formaldehyde concentration in indoor air should be measured post construction (but pre-occupancy) and not exceed $100 \mu g/m^3$ averaged over 30 minutes. The formaldehyde sampling and analysis is performed in accordance with ISO 16000-2 and ISO 16000-3.

The total volatile organic compound (TVOC) concentration in indoor air is measured post construction (but pre-occupancy) and does not exceed $500 \mu g/m^3$ over eight hours. The TVOC sampling and analysis is performed in accordance with ISO 16000-5 and ISO 16000-6 or ISO 16017-1.

Where levels are found to exceed these limits, the project team confirms the measures that have, or will be, undertaken in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels to within the above limits.

Minimising sources of air pollution – emissions from construction products (exemplary credit)

To achieve the exemplary credit, three of the product types listed must meet the emission limits, testing requirements and any additional ones listed in table 5.12 in the BREEAM UK NC 2018 Manual. Where wood-based products are not one of the three selected product types, all wood-based products used for internal fixtures and fittings must be tested and classified as formaldehyde E1 class as a minimum.

Metric type

Points

Units

Number of credits – BREEAM Hea 02

Range

0

4 Good Practice

5 Leading Practice

How is it calculated? (continued)

Table 5.11: Emission criteria by product type

Emission limit[1] formaldehyde	Total volatile organic compounds (TVOC)	Category 1A and 1B carcinogens	Testing requirement	Additional requirements
Interior paints and coatings				
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 16402 (47) or ISO 16000-9 (48) or EN 16516 (49) or CDPH Standard Method v1.1 (50)	Meet TVOC content limits (See BREEAM UK NC 2018 Manual, table 5.13 on page 97). Paints used in wet areas (eg bathrooms, kitchens, utility rooms) should protect against mould growth (See Methodology on page 95).
Wood-based products(including wood flooring)				
≤ 0.06 mg/m³ (Non-MDF) ≤ 0.08 mg/m³(MDF)	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1 or EN 717-1 (formaldehyde emissions only) (51)	N/A
Flooring materials (including floor levelling compounds and resin flooring)				
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 10580 (52) or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Ceiling, wall, and acoustic and thermal insulation materials				
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Interior adhesives and sealants (including flooring adhesives)				
≤ 0.06 mg/m³	≤ 1.0 mg/m³	≤ 0.001 mg/m³	EN 13999 (Parts 1-4) (53) (54) (55) (56) or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A

1 Compliance with emission limits shall be demonstrated after 28 days in an emission test chamber or earlier as stipulated by the relevant testing requirements standard. The emission rate obtained from the chamber test method must be extrapolated to predict what the concentration would be in the air of the theoretical model or reference room (as detailed in the respective testing standard) and this extrapolated concentration compared with the emission limit in this table.

How is it calculated? (continued)

Table 5.12: Exemplary level emission criteria by product type

Formaldehyde	Total volatile organic compounds (TVOC)[2]	Total semi-volatile organic compounds (TSVOC)	Category 1A and 1B carcinogens	Testing requirement	Additional requirements
Interior paints and coatings					
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	EN 16402 or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	Meet VOC content limits (BREEAM UK NC 2018 Manual, table 5.13 on page 97). Paints used in wet areas (eg bathrooms, kitchens, utility rooms) should protect against mould growth (see Methodology on the facing page).
Wood-based products (including wood flooring)					
≤ 0.02 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1 or EN 717-1 (formaldehyde emissions only)	N/A
Flooring materials (including floor levelling compounds and resin flooring)					
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 10580 or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Ceiling, wall, and acoustic and thermal insulation materials					
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	ISO 10580 or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A
Interior adhesives and sealants (including flooring adhesives)					
≤ 0.01 mg/m³	≤ 0.3 mg/m³	≤ 0.1 mg/m³	≤ 0.001 mg/m³	EN 13999 (Parts 1-4) or ISO 16000-9 or EN 16516 or CDPH Standard Method v1.1	N/A

2 Where test results for a product exceed the TVOC emission limit, compliance with the above requirements can still be achieved where the test results demonstrate an R-value ≤ 1 after 28 days.

What is the process?

Action

RIBA Stage 0: Optimise

Development manager

Consider the location of the building in respect of the existing external air quality. Are they located within an Air Quality Management Area (AQMA), Air Quality Focus Area (AQFA), or close to a major source of pollution? Review London Atmospheric Emissions Inventory (LAEI) pollution maps

RIBA Stage 1: Optimise

Architect / landscape architect

Development should be orientated with openings and outdoor spaces away from pollution sources. Design should consider how landscaping, internal courtyards, 'green screening' or other measures be used to reduce the impact of the poor air quality

RIBA Stage 2: Plan / Design

Mechanical and electrical systems (M&E) engineer

If fresh air at a sufficient rate to dilute and remove airborne pollutants is not possible via natural means, mechanical ventilation with heat recovery (MVHR) or mechanical extract ventilation (MEV) could be considered

When specifying mechanical systems, air intakes should be located as far as possible from sources of external air pollution, and from exhaust points, to avoid recirculation

RIBA Stage 3: Plan / Design

Architect

Early consideration is required to avoid internal build-up of pollutants: construction materials, fittings and finishes with a low air quality impact should be used (consult various British and European standards regarding VOC and formaldehyde emissions from products)

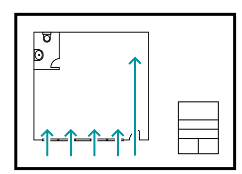
Air quality consultant

Produce indoor air quality plan (IAQP) in compliance with the BREEAM requirements

Action

Documentation

RIBA Stage 2: Plan / Design



Ventilation layout/ schematic confirming the building's ventilation strategy.
Mechanical, electrical and plumbing (MEP) specification confirming requirements.
Indoor air quality plan

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect

Ensure requirements for construction materials, fittings and finishes with a low air quality impact are embedded into the tender documents

RIBA Stage 5: Deliver

Contractor

IAQ testing to be carried out

RIBA Stage 6: Monitor

Property manager

Provide a building user guide to help occupiers understand how to establish and maintain good internal air quality. The first two years of a building's operation are the most important in terms of VOC emissions, when the effect of fittings and finishes is strongest

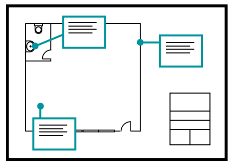
RIBA Stage 7: Monitor

Property manager

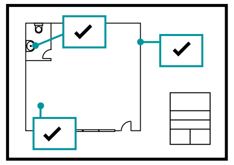
Carry out air quality testing of VOCs and formaldehyde after the completion of flush-out to ensure pollutant concentrations are within the recommended limits

Action

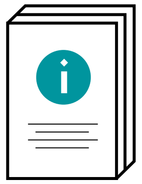
Documentation



Architectural specification confirming all relevant building product types must meet emission limits and testing requirements



IAQ testing results for formaldehyde and TVOC. Manufacturer product information or declaration of building products detailing emission limits and testing requirements



Building User Guide

Documentation

Relevant policy

The London Plan, Policy D3

Development proposals should: … help prevent or mitigate the impacts of noise and poor air quality … achieve indoor and outdoor environments that are comfortable and inviting for people to use.

Measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly located emission sources, street canyons and noise sources should also be designed out wherever possible.

Further reading

BREEAM UK New Construction Manual 2018
WHO guidelines for indoor air quality
CIBSE TM40: Health and wellbeing in building services

ID no

HW10

Key Performance Indicator (KPI) name

Noise and Vibration – Residential

What is it?

The aim of this indicator is to keep noise disturbance for residents to a minimum. It's made up of two components: reducing noise sources and improving sound insulation.

Reducing noise sources that create disturbance can be achieved by addressing the acoustic reductions provided by the building's construction, by reducing disturbance from sources outside the building, and by making sure internal sources of sound, such as ventilation and heating systems, do not contribute to the disturbance.

Improving sound insulation internally looks to reduce noise disturbances for residents and neighbours by encouraging the use of good levels of insulation between neighbouring homes and different rooms inside the home.

For this indicator, we're following the criteria of the BRE's Home Quality Mark (HQM) 4.3, Noise Sources, and 4.4, Sound Insulation.

How does it add value?

Noise affects our mental and physical health, quality of life and the extent to which we enjoy our homes.

Achieving credits for this indicator keeps these impacts to a minimum, which can improve the health and wellbeing of residents and the surrounding community. This, in turn, can help bring a community together.

Lower risk of noise complaints can also lead to cost savings for local authorities.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☐ Masterplan

Who is responsible?

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

RIBA Stages

	0	1	2	3	4	5	6	7
Applies	☐	■	■	■	■	■	■	☐
		Optimise	Plan / Design	Plan / Design	Specify	Deliver	Optimise	

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities

Connected SDF indicators

- ☑ Responsible Sourcing of materials
- ☑ Post Occupancy Evaluation
- ☑ Thermal Comfort – Homes – DSY 1, 2 & 3
- ☑ Responsible Construction
- ☑ Internal Air Quality – Residential

How is it calculated?

We will follow the criteria set out by HQM 4.3, Noise Sources, and 4.4, Sound Insulation. See Home Quality Mark ONE England (pages 84 to 90 of 256).

Up to four credits can be awarded for HQM 4.3, Noise Sources.

Internal noise levels (two credits)

The home must be designed and built to meet internal noise requirements as outlined in Table 20. A suitably qualified acoustician (SQA) must be appointed, to confirm that these requirements have been met.

External noise levels (up to two credits)

The noise levels of external functional spaces must not exceed the requirements set out in table 21. An SQA must be appointed, to confirm that these requirements have been met.
Up to nine credits can be awarded for HQM 4.4, Sound Insulation

Table 20: Internal noise levels

Time of day	Habitable rooms L Aeq, T	Kitchens L Aeq, T	Open plan rooms that a kitchen is part of L Aeq, T
Day (07:00-23:00)	35 dB	35 dB	Lower target: 35 dB Upper target: 45 dB
Day (07:00-23-00)	30dB (Bedrooms only)	35 dB	35 dB

Table 21: Noise levels of external functional space

Time of day	Credits	Requirements L Aeq, T
Day (07:00-23:00)	1	55dB
Day (07:00-23-00)	2	50dB

Metric type

Points

Units

Number of credits – HQM 4.3 and HQM 4.4

Range

0

9 Good Practice

13 Leading Practice

How is it calculated? (continued)

Sound Insulation between homes (up to five credits)

Homes must achieve targets set out in table 22 below for airborne sound insulation and impact sound insulation. This can be done by considering both separating walls and floors between homes either through pre-completion compliance testing with a registered body or where all relevant building elements have been registered with Robust Details Limited (a company that assesses standards of sound insulation in new homes).

Sound insulation levels for internal walls and floors (up to four credits)

The targets set out in table 23 (below) for airborne sound insulation must be met. This should be demonstrated through testing within an acoustic laboratory.

The SQA must pass on critical information to relevant construction professionals, outlining the main issues that have the potential to reduce sound insulation during the construction process. This includes minimum requirements as set out in the HQM ONE England manual.

Table 22: Sound insulation levels for internal walls and floors.

Credits	**Airborne sound insulation Rw (dB) (minimum values)**
2	44
3	45
4	48

Table 23: Sound insulation levels for separating walls and floors

Credits*	**Airborne sound insulation requirement 1 DnT,w+ Ctr (dB) (minimum values)**	**Airborne sound insulation requirement 2 DnT,w (dB) (minimum values)**	**Impact sound insulation L'nT,w (dB) (maximum values)**
	Separating walls and floors between homes	Separating walls and floors between homes	Separating floors only between homes
1	48	56	56
3	50	58	54
5	53	60	52

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Consider acoustics at the start of the project with the aim of making the most of external areas and enabling residents to open windows and/or have fixed natural ventilation paths without unacceptable levels of noise

Review the building layout to locate sensitive rooms away from internal and external sources of noise if possible, as recommended by BS 8233. In homes, this includes locating bedrooms on the facades with lower noise levels, which can often be helped by designing dual-aspect apartments. Bathrooms and toilets in flats should not be situated above living rooms or bedrooms.

Development Manager

Appoint acoustician and set targets for acoustics in accordance with KPI requirements for Good or Leading Practice

RIBA Stage 2: Plan / Design

Architect

Windows are one of the weakest parts of a facade in terms of noise. They should be positioned away from sources of noise. Plus, fewer larger windows are better than a higher number of smaller ones. This is because the frames will usually be the main sources of noise ingress (as they are for heat losses)

Equipment that might be noisy (such as heating pumps, boilers and underfloor heating) should be located away from bedrooms

Sustainability engineer

External noise ingress must be limited to the recommendations supported by the British Standard. In general, bedrooms need to be quieter, particularly at night, whereas living spaces can be slightly noisier

Pay close attention to

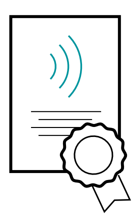
- internal temperature gains
- the number of days in a year when windows might need to be open for comfort reasons
- the significance of the resulting acoustic compromise

A case can be made for mechanical ventilation and comfort cooling where the number of times a window needs to be opened isn't ideal

Where circumstances allow, passive cooling systems could provide a better and sustainable solution

Documentation

RIBA Stage 1: Optimise



Confirmation that the appointed acoustician meets SQA requirements

What is the process? (continued)

Action

RIBA Stage 2: Plan / Design (continued)

Mechanical and electrical (M&E) engineer

Consider noise levels generated indoors by ventilation, heating, water and cooling systems, as well as lifts and escalators, to make sure that they're not disruptive

For ventilation systems, design measures must include specifying ducts and attenuators

Acoustician

Make sure that the minimum standards in building regulations or brief for improvement on building regulations as identified at RIBA Stage 1 for sound insulation between homes are achieved to avoid residents being affected by sound travelling between homes

RIBA Stage 3: Plan / Design

Acoustician

Compile acoustic report and make recommendations for updates to design as required to achieve acoustic brief identified at RIBA Stage 1

RIBA Stage 4: Specify

Architect

Specify soft furnishings to avoid excessive reverberance and improve additional acoustic control

In areas with primarily hard finishes, consider using sound-absorbent finishes to reduce noise build-up and help reduce sounds transmitting to other parts of the building

Specify doors for good sound insulation properties – for example, non-hollow core, gaskets and sweeps, and sealed across the frame

Acoustician

Report and include recommendations (as well as a programme of post-completion testing) to be included in the tender documents

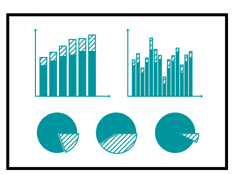
RIBA Stage 5: Deliver

Air quality consultant

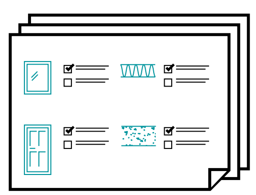
Testing results from the SQA, demonstrating that the noise limits presented in tables 20 and 21 are achieved.

Action

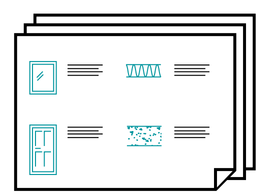
Documentation



Noise Impact assessment report confirming the calculation of external noise levels (including from building services)



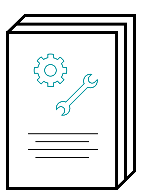
Acoustic report addressing how each indicator requirement is met

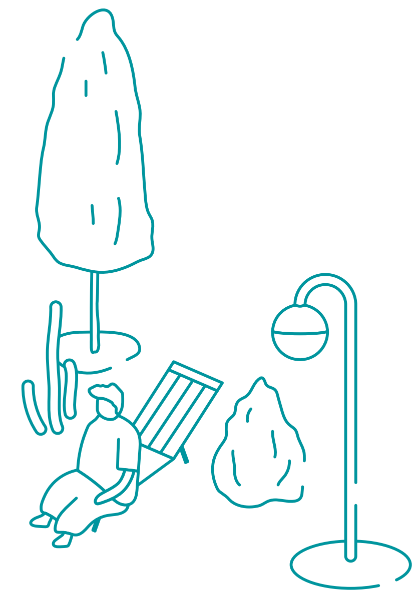


Acoustic specification detailing mitigation and abatement requirements to achieve the requirements for the indicator

Documentation

What is the process? (continued)

	RIBA Stage 6: Optimise	RIBA Stage 7
Action	Air quality consultant A noise management plan must detail how noise impacts from freight, servicing and deliveries will be managed.	
Documentation	 O&M manual including noise management plan	



Relevant policy

The London Plan, Policy D3

Development proposals should:
… help prevent or mitigate the impacts of noise and poor air quality … achieve indoor and outdoor environments that are comfortable and inviting for people to use.

… Measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly located emission sources, street canyons and noise sources should also be designed out wherever possible.

Policy D6

Single aspect dwellings that are north facing, contain three or more bedrooms or are exposed to noise levels above which significant adverse effects on health and quality of life occur, should be avoided …

… The site layout, orientation and design of individual dwellings and, where applicable, common spaces should:
… help reduce noise from common areas to individual dwellings.

Policy D13

Development proposals should manage noise and other potential nuisances by

1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area.

2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations

3) separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.

Policy D14

Proposal should manage noise by

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

Further reading

Home Quality Mark One England Manual
BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings
CIBSE TM40: Health and Wellbeing in building services
Health and Wellbeing in Homes by UK Green Building Council

ID no — Key Performance Indicator (KPI) name

HW 11 Acoustic Performance – Commercial

What is it?

The aim of this indicator is to make sure a building creates the best acoustic environment for occupants, ensuring comfort, efficiency and privacy.

For this indicator, we're following the criteria of the BRE's BREEAM Hea 05, Acoustic Performance.

How does it add value?

A building that's capable of providing an appropriate acoustic environment keeps internal noise disturbance to a minimum. Limiting noise being transferred between spaces and providing an appropriate acoustic environment for the different functions of buildings and spaces can, for example, improve workers' productivity.

What type of project does the indicator apply to?

- [ ] Residential
- [x] Commercial
- [x] Masterplan

Who is responsible?

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

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities

Connected SDF indicators

- [x] Responsible Sourcing of materials
- [x] Post Occupancy Evaluation
- [x] Thermal Comfort – Commercial
- [x] Responsible Construction
- [x] Internal Air Quality – Residential

How is it calculated?

We will follow the criteria set out by BREEAM Hea 05, Acoustic performance in commercial developments.
See BREEAM UK NC 2018 manual (page 108 of 392).

Acoustic performance (up to three credits)

The building must meet the appropriate acoustic performance standards and testing requirements defined in the relevant table in the BREEAM 2018 UK NC 2018 Manual. Table 5.68 below provides an example of requirements for office buildings. Please refer to the BREEAM 2018 Manual for other building types. These tables define criteria for the acoustic principles of:

1 Sound insulation

2 Indoor ambient noise levels

3 Room acoustics

Table 5.16: BREEAM acoustic criteria for office buildings

Office buildings (three credits)	
First credit – Sound insulation formaldehyde	
Criteria	The sound insulation between rooms and other occupied areas complies with the performance criteria given in Section 7 of BS 8233:2014(90). This should be based on the layout and function of the different spaces within the building.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in Methodology on page 113 section of this BREEAM issue.
Notes	If testing is to be carried out where the office is not yet furnished, then section 7.5 of BS 8233:2014 should be referred to when determining the performance criteria. Where the office is to be furnished at the time testing is carried out, then refer to section 7.7.6 of BS 8233:2014 for the relevant performance criteria.
Second credit – Indoor ambient noise levels	
Criteria	Achieve indoor ambient noise levels that comply with the design ranges given in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in Methodology on page 113.
Third credit – Room acoustics	
Criteria	Acoustic environment (control of reverberation and sound absorption): Achieve the requirements relating to sound absorption and reverberation times, where applicable, set out in Section 7 of BS 8233:2014.
Testing requirement	A programme of pre-completion acoustic testing is carried out by a compliant test body in accordance with the acoustic testing and measurement procedures outlined in Methodology on page 113. For spaces where the acoustic environment is controlled through the use of defined amounts of sound absorption, installation of a specification compliant with the BS 8233:2014 criteria demonstrates compliance. A site inspection by the developer or SQA is required to confirm that a compliant specification has been installed.

Metric type

Points

Units

Number of credits – BREEAM Hea 05

Range

1

2 Good Practice

3 Leading Practice

What is the process?

Action

RIBA Stage 0

RIBA Stage I: Optimise

Architect

Review the building layout to locate sensitive rooms away from internal and external sources of noise if possible, as recommended by BS 8233

Development manager

Appoint acoustician with brief to advise design team on achievement of good or leading practice for the project

RIBA Stage 2: Plan / Design

Architect

Identify loud and quiet zones, taking account of areas such as printing equipment, break-out and eating spaces

In open-plan offices, incorporate dedicated quiet and/or enclosed areas for phone calls, private conversations or concentration. This can be part of a broader workplace strategy offering a choice and variety of workstation types to better respond to people's needs and preferences

Identify options for future mitigation of noise for shared/open spaces, such as atria and open staircases, as these can be a source of noise to the adjacent areas

Mitigation options include: different finishes or acoustic baffles; partitioning; and operational restrictions on the timing and frequency of events. These should be considered early in the design as part of the briefing process

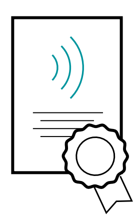
Performance criteria for internal noise levels and external noise intrusion should be set by the team once the desired facade functions are established. Prioritise the windows, doors, roof and ventilation openings, as these will have less sound insulation properties

Windows are one of the weakest parts of a facade in terms of noise. They should be positioned away from sources of noise. Plus, fewer and larger windows are better than a higher number of smaller ones. This is because the frames will usually be the main source of allowing noise in (as they are for heat loss)

Services that might be noisy (such as heating pumps, boilers and underfloor heating) should be located away from noise-sensitive spaces such as meeting rooms

Action

Documentation



Confirm that the appointed acoustician meets SQA requirements

Documentation

What is the process? (continued)

RIBA Stage 2: Plan / Design (continued)

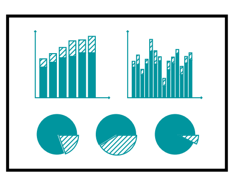
Action

Mechanical and electrical (M&E) engineer

To minimise/eliminate disruptions, specify design measures such as specifying ducts and attenuators for ventilation systems

Noise levels generated indoors by ventilation, heating, water and cooling systems, as well as lifts and escalators, should be considered in order

Documentation



Noise Impact assessment report confirming the calculation of external noise level (including from building services)

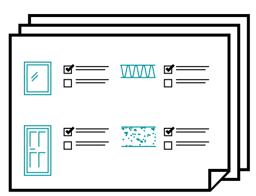
RIBA Stage 3: Plan / Design

Action

Acoustic consultant

Compile acoustic report addressing how the requirements for each Indicator are met and advising design team on any recommendations to achieve the target of Good or Leading Practice as set by the Development Manager in project brief

Documentation



Acoustic report

RIBA Stage 4: Specify

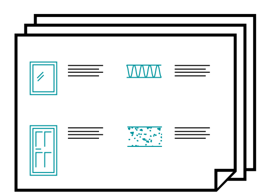
Action

Architect

Surface materials selection should take account of the targets set for reverberation times, especially in rooms where communication is important and that are likely to contain many people or other sources of sound. This includes meeting rooms, classrooms, lecture rooms, school and sports halls, theatres and concert halls and atria. Be aware that dominance of hard surfaces can seriously affect speech intelligibility, sound quality in performance spaces and overall acoustic comfort levels

Doors to be specified for good sound insulation properties – for example, non-hollow core, gaskets and sweeps, and sealed across the frame

Documentation



Acoustic specification detailing mitigation and abatement requirements to meet the requirements of the indicator

RIBA Stage 5: Deliver

Action

Air quality consultant

Testing results from SQA, showing that noise limits have been met

Documentation

What is the process? (continued)

Action

RIBA Stage 6

RIBA Stage 7

Documentation

Relevant policy

Policy D3

Development proposals should: … help prevent or mitigate the impacts of noise and poor air quality … achieve indoor and outdoor environments that are comfortable and inviting for people to use.

Measures to design out exposure to poor air quality and noise from both external and internal sources should be integral to development proposals and be considered early in the design process. Characteristics that increase pollutant or noise levels, such as poorly located emission sources, street canyons and noise sources should also be designed out wherever possible.

Policy D6

Single aspect dwellings that are north facing, contain three or more bedrooms or are exposed to noise levels above which significant adverse effects on health and quality of life occur, should be avoided …

… The site layout, orientation and design of individual dwellings and, where applicable, common spaces should: … help reduce noise from common areas to individual dwellings

Policy D13

Development proposals should manage noise and other potential nuisances by

1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area.

2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations

3) separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures

Policy D14

Proposal should manage noise by

3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses

4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)

5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation

6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles

7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

Further reading

BREEAM 2018 New Construction Manual
BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings
CIBSE TM40: Health and Wellbeing in building services

ID no Key Performance Indicator (KPI) name

HW 12 Daylight, Sunlight and Overshadowing

What is it?

Evidence shows that good levels of daylight are one of the qualities people look for most in a home. Not only does it have important health benefits, it saves energy too.

This indicator aims to encourage leading practice in visual performance and comfort by making sure that daylight is considered during the design and construction of homes.

For daylighting, we're using the BRE guide "Site Layout Planning for Daylight & Sunlight", 2022.

How does it add value?

There are mental and physical benefits to having good levels of daylight in a home.

Exposure to high levels of daylight during the day helps maintain circadian rhythms, especially in older people. Circadian rhythms are physical, mental and behavioural changes, which mainly respond to light and dark. They affect sleep, body temperature, appetite and other bodily functions. Good levels of daylight in a home is known to improve the quantity and quality of sleep and may also benefit the cardiovascular system.

Daylight has also been shown to improve people's mood and reduce depression and stress-related symptoms, including seasonal affective disorder (SAD). One of the reasons for this is the importance of views from windows, which can make people feel connected to nature and improve their sense of wellbeing.

Natural light in a home also provides free heat and reduces the amount of artificial light needed and energy bills.

What type of project does the indicator apply to?

- ☑ Residential
- ☐ Commercial
- ☑ Masterplan

Who is responsible?

Daylight Consultant	●●●	leading
Development Manager	●●○	accountable
Architect	●●○	accountable
Engineer – M&E	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Thermal Comfort – Homes – DSY 1, 2 & 3
- ☑ Post-occupancy Evaluation

How is it calculated?

There are three elements to consider, and these will be taken in turn:

1. Daylight quantity
2. Direct sunlight
3. Access to sunlight in external amenity spaces

Criteria	Points
All living rooms and bedrooms have a daylight illuminance of 150 lux and 100 lux respectively, to be achieved across at least 50% of the room for at least 50% of daylight hours	1 point
All apartments have at least one habitable room that can receive at least 1.5 hrs of direct sunlight on 21 March	1 point
Outdoor amenity spaces within the development can receive a minimum of 2 hours of direct sunlight across 50% of their area on 21 March	1 point

Daylight quantity

For daylight quantity, this KPI follows the criteria set out by BRE's "Site layout planning for daylight and sunlight" (2022), and the metric median daylight illuminance.

Direct sunlight

In addition to the daylight criteria, the guidance asks that at least one habitable room can receive at least 1.5 hours of direct sunlight on 21 March. It is preferable that one of these rooms is the living room.

It is important that the sunlight study accounts for wall thickness, window framing and all surrounding massing, not just that of the proposed development. Sunlight hours should be measured at the centre point of the window and on its interior face.

Access to sunlight in external amenity spaces

The BRE guidance also recommends that outdoor spaces within new developments, such as communal gardens and private rear gardens, can receive adequate levels of direct sunlight. This criterion given is that at least 50 per cent of the area can receive at least two hours of direct sunlight on the 21st March to appear adequately sunlit throughout the year. This can be demonstrated by providing a sunlight study of outdoor spaces on 21 March, showing the area that can receive direct sunlight for more than two hours. Note that this criterion is an absolute minimum standard, and developments that exceed this target are encouraged.

Daylight Criteria

Daylight illuminance (50% of room for 50% of daylight hours)	Room type
150 lux	Living rooms
100 lux	Bedrooms

Where at least 90 per cent of apartments meet all three criteria the project will score 50 per cent on a sliding scale to 100 per cent where all apartments meet all three criteria.

Where less than 90 per cent of apartments meet all three criteria, the project will score on a sliding scale from 0 to 50 per cent.

Metric type

Points

Units

Number of points met

Range

1

3 points

Good & Leading Practice

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Make sure there is good daylight potential in homes through the careful design of the building, orientation and space planning

Higher level glazing should be optimised as this allows much more daylight than low level. Also, glazing primarily for daylight should be as high as possible on the wall (or skylights in the ceiling), and balanced with the need for a view out. When optimising glazing, architects and MEP (mechanical, electrical and plumbing engineering) designers must pay careful attention to the risk of overheating)

Designers should consider the use and layout of the space, as well as where daylight and sunlight would be most useful or preferred

In order to achieve the daylight targets in all living rooms and bedrooms throughout the development, it may be necessary to implement strategies to increase daylight provision in apartments that are more challenged by overshadowing from surrounding buildings and the development itself, such as those on lower floors. These include dual aspect rooms, larger glazing areas, increased floor to ceiling heights, and shallower room depths. This may necessitate having different floor layouts and fewer apartments on lower floors compared with higher floors where there is more daylight available

Assess the availability of direct sunlight on the facades of the development to ensure that every apartment has at least one habitable room that can receive direct daylight and sunlight

Carry out an initial study of sunlight within outdoor amenity areas within the development. Use this to inform the design development and massing.

RIBA Stage 2: Plan / Design

Architect & mechanical and electrical (M&E) engineer

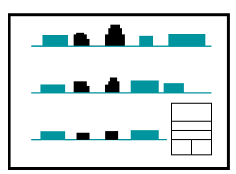
Designers should consider the balance between thermal, daylight and sunlight requirements. During the heating season, glazing is usually a significant source of heat loss from a building. During warm weather, if unshaded, it can be a source of unwanted solar heat gain

Daylight consultant

Undertake a daylight and sunlight study of apartments to determine their performance against the BRE daylight criteria. The results of these studies should be used to inform design development including glazing size and placement, balcony design and interior layout configuration.

Carry out a sunlight study of outdoor spaces to ensure that the targets for direct sunlight are being met.

Documentation



Massing study highlighting orientation of development and daylight and sunlight availability

What is the process? (continued)

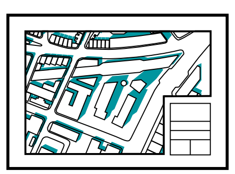
RIBA Stage 2: Plan / Design (continued)

Action

Facade engineer

Facade engineer to advise on glazing specification to balance daylighting with the risk of overheating

Documentation



Daylight and sunlight study assessing performance against the BRE criteria

RIBA Stage 3: Plan / Design

Action

Daylight consultant

Carry out a daylight and sunlight study of habitable rooms to inform detailed design of proposed development. Undertake one final check of external amenity spaces to ensure that they can still meet the criteria for direct sunlight potential.

Documentation

Daylight and sunlight study predicting performance against the guidance for all relevant building areas. Evidence needs to be provided in a format applicable to BRE guidance

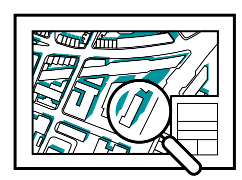
RIBA Stage 4: Specify

Action

Architect / daylighting consultant

Recommendation: check to make sure that the daylight and sunlight values predicted at Stage 3 can still be achieved, eg taking account of updates to glazing spec or interior layout. As this is post planning, facades should be fixed

Documentation



Confirmation that daylight study provided at RIBA Stage 3 is still relevant – for example, no major changes to design

RIBA Stage 5

What is the process? (continued)

Action

RIBA Stage 6

RIBA Stage 7

Documentation

Relevant policy

Policy C4 (emerging LPG)

New homes should be dual aspect unless exceptional circumstances make this impractical or undesirable …

All homes should allow for direct sunlight to enter as many rooms as possible. As a minimum, at least one habitable room should receive direct sunlight – preferably the living area and/or the kitchen and dining space.

All habitable rooms (including a kitchen/dining room) should receive natural light and have at least one openable window which provides a view out when seated.

Further reading

Home Quality Mark One England
WELL, v2
Health and Wellbeing in Homes by UK Green Building Council
Site Layout Planning for Daylight & Sunlight, BRE, 2022
BS EN 17037: 2018 Daylighting of Buildings

ID no | Key Performance Indicator (KPI) name

HW 13 Access to Daylight – Commercial

What is it?

Evidence shows that exposure to natural daylight in a building has both health and energy-saving benefits.

This indicator aims to encourage Leading Practice in visual performance and comfort by ensuring daylight is considered during design and construction.

For this indicator, we're using the BRE's BREEAM Hea 01, Visual Comfort.

How does it add value?

Access to daylight in a building supports occupants' health, mental wellbeing, and productivity.

Daylight has been shown to improve people's mood and reduce depression and stress-related symptoms, including seasonal affective disorder (SAD). It can help make people feel connected to nature and improve their sense of wellbeing.

Evidence also shows that lots of daylight helps people to be more productive at work. This is because people are able to adjust their field of vision to reduce eye strain and discomfort, improving productivity.

It can also help to reduce energy costs and environmental impacts by reducing the need for artificial lighting.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Daylight Consultant	●●●	leading
Development Manager	●●○	accountable
Architect	●○○	supporting
Engineer – Sustainability	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

- 3 Good Health and Wellbeing
- 11 Sustainable Cities and Communities
- 13 Climate Action

Connected SDF indicators

- ☑ Regulated Emissions – Energy Efficiency
- ☑ Thermal Comfort – Commercial
- ☑ Post-occupancy Evaluation
- ☑ View Out Commercial

How is it calculated?

We will follow the criteria set out by BREEAM Hea 01, Visual Comfort, in commercial developments. See BREEAM UK NC 2018 Manual (page 74 of 392).

Please be aware that this indicator only refers to the Daylighting criteria sections within Hea 01, and the other criteria sections should be ignored for this assessment.

Daylighting
(up to two credits)

Credits can be achieved by making sure that all relevant building areas meet Good Practice daylight factors and other criteria outlined in table 5.1 below, which provides an example of requirements for retail buildings. For information on requirements for other building types, see the BREEAM NC 2018 Manual.

Credits can also be achieved by making sure the relevant building areas meet Good Practice average and minimum point daylight illuminance criteria as outlined in table 5.3, which provides an example of requirements for retail buildings. For information on requirements for other building types, see the BREEAM UK NC 2018 Manual.

The BREEAM UK NC 2018 manual also gives information on an alternative route that healthcare buildings can take to achieve daylighting credits.

Metric type	Units	Range	
Pass / Fail	BREEAM Hea 01 – Daylighting	1 credits Good Practice	2 credits Leading Practice

Table 5.1: Minimum values of average daylight factor required

Area type	Credits	Average daylight factor required	Minimum percentage area (m^2) to comply	Other requirements
Retail buildings				
Sales areas	1	-	35%	Point daylight factors of 2% or more
Other occupied areas	1	2%	80%	Either (a) or (b) and (c) in Table 5.2

Table 5.3: Space type and illuminance requirements – both criteria (average illuminance and minimum point illuminance) should be met

Area type	Credits	Minimum area to comply	Average daylight illuminance (averaged over entire space)	Minimum daylight illuminance at worst lit point
Retail buildings				
Sales areas	1	35%	At least 200 lux point daylight illuminances for 2650 hours per year or more	
Other occupied areas	1	80%	At least 200 lux for 2650 hours per year or more	At least 60 lux for 2650 hours per year or more

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Make sure there is good daylight within developments through the careful design of the building, orientation and space planning

Higher level glazing should be prioritised as this allow much more daylight than low level. Also, glazing primarily for daylight should be as high as possible on the wall (or skylights in the ceiling), and balanced with the need for a view out. Architects and MEP engineers need to make sure that excessive glazing doesn't create overheating issues. And that orientation and suitable shading measures are considered to balance daylighting with the potential for overheating

Consider the use and layout of the space as well as where daylight and sunlight would be most useful or desirable

RIBA Stage 2: Plan / Design

Architect engineer – M&E

Designers should consider the balance between thermal, daylight and sunlight requirements for the development. During the heating season, glazing is usually a significant source of heat loss from a building. During warm weather, if unshaded, it can be a source of unwanted solar heat gain

Daylight consultant

Carry out a climate-based daylight modelling of the entire development to inform detailed design of proposed development

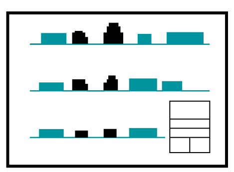
RIBA Stage 3: Plan / Design

Daylight consultant

Carry out a climate-based daylight modelling of the entire development to inform detailed design of proposed development

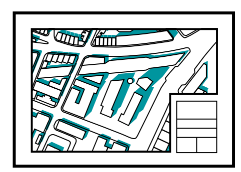
Documentation

RIBA Stage 1:



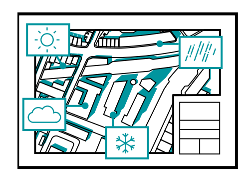
Massing study highlighting orientation of development and sunlight availability

RIBA Stage 2:



Daylight study assessing daylight performance for all relevant building areas. Results should align with Good Practice metric

RIBA Stage 3:



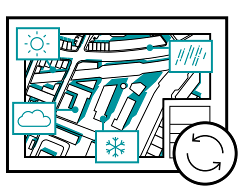
Climate based daylight modelling results which confirm Leading Practice metrics are achieved

What is the process? (continued)

Action

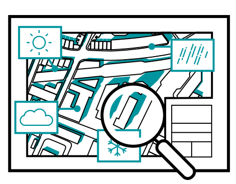
RIBA Stage 4

Documentation

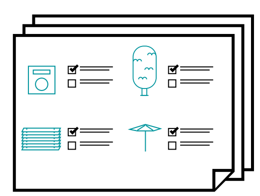


Climate-based daylight modelling results that confirm Leading Practice metrics are achieved

RIBA Stage 5



Confirmation that daylight study provided at RIBA Stage 3 is still relevant – for example, no major changes to design



Commissioning reports of daylighting devices such as sensors, blinds and external shading

RIBA Stage 6

RIBA

Action

Documentation

Relevant policy

Policy D6

… The site layout, orientation and design … where applicable, common space should provide privacy and adequate daylight …

Further reading

BREEAM 2018 New Construction manual
BS EN 17037:2018 Daylighting of buildings
WELL, v2
CIBSE TM40: Health and wellbeing in building services

ID no Key Performance Indicator (KPI) name

HW14 Views of Sky – Commercial

What is it?

Providing an adequate view out is considered essential for the comfort of occupants.

This indicator aims to encourage views to the outside to be considered during the design and construction of commercial buildings. This breaks the monotony of the indoor environment and provides an opportunity for the eyes to relax and readjust, as well as reducing the risk of eye strain.

For this indicator, we're following the criteria of BRE's BREEAM tool Hea 01 for Visual Comfort

How does it add value?

Providing views of the outside helps to improve the health, mental wellbeing and the productivity of occupants.

Particularly in areas designed for work, looking at views outside means that people are able to adjust their field of vision to reduce eye strain and discomfort. This helps to improve productivity levels.

It also makes people feel more connected to nature, which improves occupants' sense of wellbeing and reduces depression and stress-related symptoms, including seasonal affective disorder (SAD).

Views out also help to reduce energy costs and environmental impacts by minimising the need for artificial lighting.

What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

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

RIBA Stages

0	1	2	3	4	5	6	7
■	■	■	■	■	□	□	□
Optimise	Optimise	Plan / Design	Plan / Design	Specify			

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Urban Greening
- ☑ Daylight Commercial
- ☑ Access to Nature

How is it calculated?

We will follow the criteria set out by the 'Views out' section of BRE's BREEAM Hea 01 for Visual Comfort in commercial developments. See BREEAM UK NC 2018 manual (page 74 of 392).

Views out (one credit)

A total of 95 per cent of the floor area in 95 per cent of spaces for each relevant building area must be within eight metres of an external wall with a window or permanent opening that provides an adequate view out. An adequate view out is defined in the BREEAM UK NC 2018 Manual.

Further asset-specific criteria can also be found in the BREEAM NC 2018 manual.

Note:

For a commercial building, such as an office/workspace, where there are 20 desk spaces in the relevant building area, 19 of these spaces need to demonstrate that, independently, 95 per cent of their floor area is within eight metres of an external wall with a window/opening that provides an adequate view out.

Metric type	Units	Range
Points	Number of Credits – BREEAM Hea 01	1 credit Good & Leading Practice

What is the process?

Action

RIBA Stage 0: Optimise

Development manager

An adequate view of sky to be clearly stated as part of the client and design brief

RIBA Stage 1: Optimise

Architect

Careful consideration of site/building location, surrounding trees, buildings and any potential obstructions to views of nature, as well as size and location of windows. This can be done via two/three-dimensional architectural drawings or using simulation software. The view out needs to be properly balanced with the need to keep solar gain/glare to a minimum and provide natural daylight

RIBA Stage 2: Plan / Design

Architect

Further consider the measures highlighted above

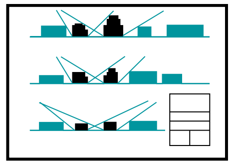
A design and access statement must provide qualitative, and possibly quantitative, information on providing views of the sky

RIBA Stage 3: Plan / Design

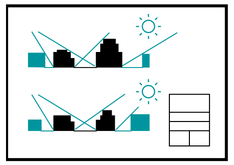
Sustainability engineer

Calculations and/or modelling and analysis to confirm compliance with the views out criteria

Documentation



Design and access statement highlighting the potential of views out (including connections to nature)



Drawings and calculations confirming levels of view out in line with the BREEAM Hea 01 criteria

What is the process? (continued)

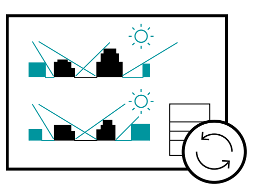
Action

RIBA Stage 4: Specify

Sustainability engineer

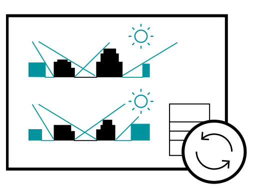
Calculations and/or modelling and analysis to confirm compliance with the views out criteria

Documentation



Drawings and calculations confirming levels of view out in line with the BREEAM Hea 01 criteria

RIBA Stage 5



Drawings and calculations confirming levels of view out in line with the BREEAM Hea 01 criteria

RIBA Stage 6

RIBA Stage 7

Relevant policy

Publication London Plan (2020) Policy D1

Policy D1 London's form, character and capacity for growth

A (12). Boroughs should undertake area assessments to define the characteristics, qualities and value of different places within the plan area to develop an understanding of different areas' capacity for growth. Area assessments should cover various elements including views and landmarks.

Publication London Plan (2020) Policy HC4

Policy HC4 London View Management Framework

K. Development proposals should not harm, and should seek to make a positive contribution to, the characteristics and composition of Strategic Views and their landmark elements.

Further reading

BREEAM New Construction 2018 – Hea 01
Workplace greenery and perceived level of stress: Benefits of access to a green outdoor environment at the workplace
BS 8206-2:2008 Lighting for buildings. Code of Practice for daylighting
The London View Management Framework (LVMF) Supplementary Planning Guidance (SPG)

ID no

HW 15

Key Performance Indicator (KPI) name

Access to Nature

What is it?

Designing natural elements into buildings and the spaces around them helps people feel connected to nature, and improves health and wellbeing.

These elements can range from prioritising the views from windows and adding plenty of natural light to introducing plants and water features inside buildings and using natural materials.

To assess how these principles are applied in commercial projects, we use the 'Enhanced Access to Nature' feature of the WELL Building Standard.

WELL is a performance-based system that measures and monitors features of the built environment that impact human health and wellbeing.

How does it add value?

With people in the UK now spending an average of 90 per cent of their time indoors, spaces must be designed to promote health, wellbeing and productivity.

We know that access to plants, daylight and other natural elements in buildings helps people thrive. These design features in buildings and the spaces around them are known to:

- Relieve stress and mental fatigue
- Improve overall mental wellbeing
- Reduce blood pressure, depression and anxiety
- Increase people's ability to focus and improves memory
- Help people recover from job stress and illness
- Boost pain tolerance

Research has also shown that access to views of landscapes and natural environments help to improve recovery rates in hospitals, productivity in workplaces and students' performance in schools.

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What type of project does the indicator apply to?

- ☐ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Architect	●●●	leading
Landscape Architect	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
Ecologist	●○○	supporting

RIBA Stages

0	1	2	3	4	5	6	7
■	■	■	■	■	□	□	□
Optimise	Optimise	Plan / Design	Plan / Design	Specify			

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
11 Sustainable Cities and Communities
13 Climate Action

Connected SDF indicators

- ☑ Urban Greening
- ☑ Future Proof Landscaping
- ☑ Biodiversity
- ☑ Daylight, Sunlight and Overshadowing
- ☑ Public Realm Accessibility

How is it calculated?

Calculations are made based on the WELL feature – M09 Enhanced Access to Nature. There are two parts to this – with one point available for each:

Part 1: Provide nature access indoors (one point)

The project's floorplan must meet one of the following:

A) At least 75 per cent of all workstations and seating within conference rooms, lecture halls and/or classrooms have a direct line of sight to indoor plant(s), water feature(s) and/or nature view(s).

B) All workstations and seating within conference rooms, lecture halls and/or classrooms are within 33ft (10 metres) of indoor plant(s), water feature(s) and/or nature view(s).

Part 2: Provide nature access outdoors (one point)

It must also meet one of the following requirements:

A) Access to nature outside a building:

- all occupants must have access to outdoor space (the size of at least 5 per cent of the building's area); or
- as viewed from above, at least 70 per cent of the accessible outdoor space must include plants or natural elements, including trees

B) Access to nature nearby:

- At least one green space (such as a park or field) or blue space (such as a river or pond) must be within walking distance (200 metres) from the project boundary, and available to all occupants while the building/ space is open; or
- Total combined green space must be at least 1.25 acres

The project must also meet this requirement:

Encourage occupants to access outdoor nature spaces. For example, making breaks available during the work day to go visit these outdoor spaces, or providing maps or signs to them.

Metric type

Points

Units

Number of credits – WELL v2 M09

Range

1 credit – Good Practice

2 credits – Leading Practice

What is the process?

Action

RIBA Stage 0: Optimise

Development manager

Incorporate access to nature design principles into the client and design brief

RIBA Stage 1: Optimise

Architect & landscape architect

Assess opportunities to incorporate access to nature design principles

Include these into the design brief, and the project's aims and objectives

RIBA Stage 2: Plan / Design

Architect & Landscape architect

Assess opportunities to incorporate access to nature design principles

Include these into the design brief, and the project's aims and objectives

RIBA Stage 3: Plan / Design

Architect & Landscape architect

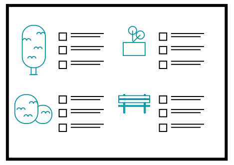
Design workshops to be carried out throughout the design developments stages, to continuously assess the access to nature design strategies/measures to be used

Development manager

Include in tender specification requirements for planting and water feature technology (if included)

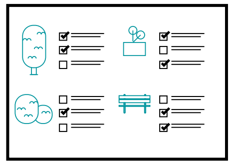
Documentation

RIBA Stage 1:



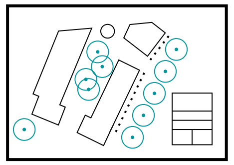
Client / project brief specifying access to nature design principles as an aspiration/requirement

RIBA Stage 2:



Design and Access Statement highlighting nature design measures/strategies to be adopted.

RIBA Stage 3:



Landscape drawings and internal layouts confirming location and percentage of planting inside and outside the building.

What is the process? (continued)

Action

RIBA Stage 4: Specify

Architect and landscape architect

Design workshops to be carried out throughout the design developments stages, to continuously assess the access to nature design strategies/ measures to be used

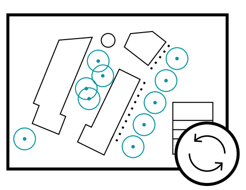
RIBA Stage 5

RIBA Stage 6

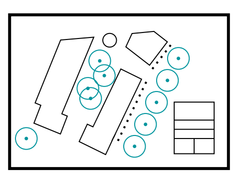
RIBA Stage 7

Action

Documentation



Landscape drawings and internal layouts confirming location and percentage of planting inside and outside the building



'As-built' drawings to confirm the location and percentage of planting, planting schedule and pictures of planting

Documentation

Relevant policy

Publication London Plan (2020) Policy G6

G6 Biodiversity and access to nature

B(2). Identify areas of deficiency in access to nature (i.e. areas that are more than 1km walking distance from an accessible Metropolitan or Borough SINC) and seek opportunities to address them.

B(4). Seek opportunities to create other habitats, or features such as artificial nest sites, that are of particular relevance and benefit in an urban context.

E. Proposals which reduce deficiencies in access to nature should be considered positively.

Further reading

14 Patterns of Biophilic Design: Improving Health & Well-Being in the Built Environment

The WELL Building Standard v2 (Feature M09)

Creating + Positive spaces using Biophilic Design

ID no Key Performance Indicator (KPI) name

HW 16 Considerate Constructors Scheme

What is it?

The Considerate Constructors Scheme (CCS) was set up to raise standards in the construction industry.

It encourages businesses to manage construction sites competently and efficiently – keeping workforces and communities safe and environmental impact to a minimum.

Members commit to meet the minimum requirements of its Code of Considerate Practice.

The CCS monitors and manages responsible constructions practices, and has a system for rating the best ways of working.

The scheme supports the government's vision to improve the image of the construction industry in the UK, as set out in its Construction 2025 strategy document.

How does it add value?

There are a range of environmental, social and economic benefits to adopting responsible construction practices.

By signing up to the CCS, businesses demonstrate their commitment to minimising their impacts on the environment during construction, and improving the health and wellbeing of:

- The construction workforce
- Occupants and visitors to the building(s)
- The local community

Safety is an important factor. Businesses have a duty of care to do all they can to keep everyone safe during a construction project – including residents, people who work in the area, and those who travel through.

All those who sign up to the CCS and make this commitment are helping to improve the reputation and acceptability of construction with neighbours, the general public, regulators and others.

It also helps encourage communities to accept a new development, during the construction phase.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Contractor	●●●	leading
Development Manager	●●○	accountable
Engineer – Sustainability	●○○	supporting
Project Manager	●○○	supporting

RIBA Stages

0		not applicable
1	Optimise	applicable
2	Plan	applicable
3	Plan	applicable
4	Specify	applicable
5	Deliver	applicable
6		not applicable
7		not applicable

Connected UN Sustainable Development Goals

3 Good Health and Wellbeing
9 Industry, Innovation, and Infrastructure
12 Responsible Consumption and Production

Connected SDF indicators

- ☑ Responsible Sourcing of Materials
- ☑ Secure Development
- ☑ Energy and Water Consumption during Construction
- ☑ Construction Waste Recovery
- ☑ Engagement during Construction

How is it calculated?

To monitor compliance with the scheme and recognise performance, CCS monitors visit offices, depots and individual projects or work areas. They use a checklist to confirm a score against each of the five Code of Considerate Practice sections:

- Appearance
- Community
- Environment
- Safety
- Workforce

Each section of the checklist is scored out of nine points. A score of five indicates compliance, however a minimum of seven points is required for this framework.

Monitors not only assess compliance with the scheme's code and checklist, they also look to identify measures that are above and beyond these requirements. An extra five points are available, at the discretion of the monitors, to reward those sites, companies or suppliers that have developed innovative ways of addressing CCS expectations.

Metric type

Points

Units

CCS Score

Range

0

40 Good Practice

45 Leading Practice

50

Descriptor	Explanation of score descriptor	Score
Gross failure	Most items on the Checklist haven't been satisfactorily addressed, demonstrating a gross failure to achieve compliance with the scheme's Code of Considerate Practice.	1
Failure	Several bold items on the Checklist haven't been satisfactorily addressed, demonstrating a failure to achieve compliance with the scheme's Code of Considerate Practice.	2
Major non-compliance	More than one bold item on the Checklist hasn't been satisfactorily addressed, demonstrating major non-compliance with the scheme's Code of Considerate Practice.	3
Minor non-compliance	A bold item on the Checklist hasn't been satisfactorily addressed, demonstrating minor non-compliance with the scheme's Code of Considerate Practice.	4
Compliance	When all bold compliance requirements in a section of the Checklist are addressed, but none of the applicable non-bolded areas have been addressed to the monitor's satisfaction, that section will be deemed as compliant.	5
Good	When 'compliance' is demonstrated in a section and some of the applicable non-bolded areas have also been addressed to the monitor's satisfaction, the level of performance against that section will be considered to be good.	6
Very good	When 'compliance' is demonstrated in a section and most of the applicable non-bolded areas have also been addressed to the monitor's satisfaction, the level of performance against that section will be considered to be very good.	7
Excellent	When 'compliance' is demonstrated in a section and all the applicable non-bolded areas have also been addressed to the monitor's satisfaction, the level of performance against that section will be considered to be excellent.	8
Exceptional	When 'compliance' is demonstrated in a section and all of the applicable non-bolded areas have also been addressed to the very highest of standards, the level of performance against that section will be considered to be exceptional. The differentiator between eight points and nine points is the standard to which the items are addressed.	9
Additional points	Innovation can be defined simply as the demonstration of original thinking relevant to the scheme's Code of Considerate Practice that, if replicated across the industry or sector, would give a real improvement to the overall performance or image of construction.	+1

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Development manager

Include CSS requirements in the project brief

RIBA Stage 2: Plan

Sustainability engineer

Include CCS targets in the BREEAM assessment strategy, with responsibilities assigned to the project manager (specification in Tender packs) and contractor (implementation during construction)

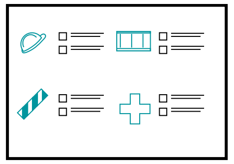
RIBA Stage 3: Plan

Project manager

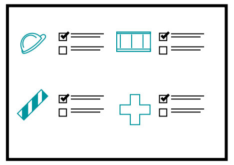
Include CCS targets in the Employer's Requirements and Contractor Preliminaries

Action

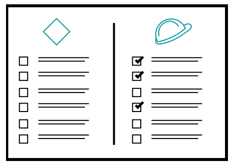
Documentation



Client/project brief specifying CCS targets



BREEAM Pre-assessment reports with CCS targeted for the project



Employer's Requirements and Contractor Preliminaries specifying CCS targets

Documentation

What is the process? (continued)

Action

RIBA Stage 4: Specify

Project manager

Include CCS targets in the Employer's Requirements and Contractor Preliminaries

RIBA Stage 5: Deliver

Contractor

Register site with the CCS

Ensure relevant procedures are in place to achieve the required CCS score target

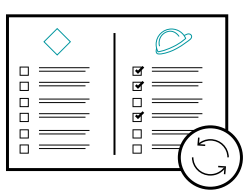
Put in place relevant strategy/measures

Report site visit monitor scores

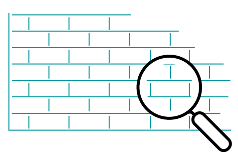
RIBA Stage 6

RIBA Stage 7

Documentation



Employer's Requirements and Contractor Preliminaries specifying CCS targets



CCS Monitoring / Site Visit Reports and Compliance Certificate

Relevant policy

Publication London Plan (2020) Policy T7

Policy T7 Deliveries, servicing and construction

K. During the construction phase of development, inclusive and safe access for people walking or cycling should be prioritised and maintained at all times.

Further reading

Considerate Constructors Scheme, 2017. Considerate Constructors Scheme – Code of Considerate Practice

Construction 2025, Industrial Strategy: government and industry in partnership

ID no | Key Performance Indicator (KPI) name

HW 17 Wind Microclimate

What is it?

The design of buildings in urban areas can create wind that affects the quality of the built environment. In extreme cases, gusts and high wind speeds generated by some buildings can lead to serious safety issues. However, in more frequent cases, these effects usually result in uncomfortable conditions that reduce the opportunity to use outdoor amenity spaces.

This indicator aims to encourage the assessment of wind conditions to avoid any unwelcome effects in new developments. These can include wind accelerations linked to downdrafts of upper-level winds, especially if high-rise buildings are present; corner accelerations, especially around sharp corners; and funnelling between building blocks.

How does it add value?

Wind microclimate assessments around buildings check that urban outdoor spaces are suitable for their intended activities like sitting, standing, strolling, and walking. This type of assessment offers many benefits, for example, it creates pleasant outdoor areas shielded from wind for local people with a positive impact on their wellbeing. For developers, as comfortable spaces offer the correct conditions for the best use of the designed activities, the intrinsic value of the development is increased. By encouraging an assessment of the wind conditions produced by new buildings, any negative effects can be resolved at an early stage in the design process, reducing the need for expensive, bolt-on mitigation strategies at a later stage.

What type of project does the indicator apply to?

- ☑ Residential
- ☑ Commercial
- ☑ Masterplan

Who is responsible?

Wind Engineer	●●●	leading
Development Manager	●●○	accountable
Architect	●○○	supporting
Landscape Designer	●○○	supporting

RIBA Stages

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

Connected UN Sustainable Development Goals

- 11 Sustainable Communities and Cities
- 3 Good Health and Wellbeing
- 15 Life on Land

Connected SDF indicators

- ☑ Healthy Streets
- ☑ Child Friendly Design
- ☑ Age Friendly Design
- ☑ Active Public Spaces
- ☑ Tree Canopy Cover

How is it calculated?

The Building Research Establishment (BRE) Digest 520, titled 'Wind microclimate around buildings', is the current UK guideline document for the assessment of wind environment for pedestrian comfort. This publication stresses that there are not currently wind assessment statutory requirements in the UK, and the methodologies proposed should be regarded as Good Practice. The Lawson criteria, recommended in Digest 520, is the UK industry standard for wind assessment and will be used as the basis for this indicator. The criteria establish the probability of exceedance of wind thresholds for each outdoor activity category at selected locations.

The indicator is scored by carrying out at least one wind assessment at different RIBA stages, addressing any wind concerns and implementing recommended wind mitigation measures identified in the report. If only one assessment is carried out, this will need to be scored at RIBA Stage 2 or at Stage 3. The assessment can include qualitative visual assessments, or quantitative wind desktop, computational fluid dynamics (CFD) or wind tunnel assessments, and will depend on the stage of the design, the type of building, including its function and form, the sensitivity of the surroundings, and location in the London area. It is therefore recommended that the assessment is carried out following the requirements of each council and discussed beforehand with the relevant planning office.

Table 0.I below provides guidance on the requirements for wind microclimate assessment divided by location and by stage of the design. These credits apply to all developments that have the potential to influence the wind microclimate in their surroundings.

Metric type

Points

Units

Credits based on number of wind assessments

Range

1 credit	2 credits	3 credits
Good Practice (it is mandatory this credit is scored at RIBA Stage 2 or Stage 3)	75%	Leading Practice

How is it calculated? (continued)

Table 0.1: Requirements for wind microclimate assessment

		Optional credits		At least one wind assessment in either Stage 2 or Stage 3 is required			
Location	**Building height**	**Stage 1**		**Stage 2**		**Stage 3**	
		Assessment type	**Credit**	**Assessment type**	**Credit**	**Assessment type**	**Credit**
London	Tall building*	Visual assessment	1	Wind desktop study or CFD**	1	CFD or wind tunnel	1
City of London	Up to 25 metres	Visual assessment	1	Wind desktop study or CFD**	1	Wind desktop study or CFD**	1
	25–50 metres	Visual assessment	1	CFD or wind tunnel	1	CFD or wind tunnel	1
	50–100 metres	Visual assessment	1	CFD or wind tunnel	1	CFD or wind tunnel	1
	Above 100 metres	CFD or wind tunnel	1***	CFD or wind tunnel	1	CFD or wind tunnel	1

* Policy D9 Tall buildings of the London Plan 2021 states that: 'Based on local context, Development Plans should define what is considered a tall building for specific localities, the height of which will vary between and within different parts of London but should not be less than 6 storeys or 18 metres measured from ground to the floor level of the uppermost storey'. The definition of 'tall building' depends on the context height of an area in which the building is proposed. Context height is intended as the typical height that characterises a particular area. This can be interpreted as the average height of a group of buildings or in general as the most commonly occurring building height. If a building is significantly taller than its surroundings or it has a significant impact on the skyline, it is then considered a tall building. Local council guidance will provide indication on the definition of 'tall building' that will help identifying whether the proposed building can be categorised as such.

** Based on sensitive location and/or the level of risk identified by early wind studies.

*** Buildings above 100 metres within the City of London (CoL) area may require the wind assessment at RIBA Stage 1 too.

The Lawson criteria

These form the bases of the quantitative assessments and the building should satisfy the appropriate safety and comfort conditions set out in the criteria. Credits can be achieved by making sure all relevant outdoor areas, including ground level amenity spaces and entrances, as well as spaces at elevated levels such as balconies and terraces, comply with the criteria.

The Wind Microclimate Guidelines for the City of London, (2019), present a more stringent set of thresholds for the Lawson criteria. The modified version of Lawson referred to as the City Lawson Criteria is required for all wind studies in the city. This area of London represents a challenging urban context from a wind microclimate perspective, and the use of a more rigorous approach highlights the importance of creating outstanding public spaces for pedestrians in the city. Even if the urban context of the city is not replicated in other parts of London, aspects of the guidelines will be used in this indicator, as the approach arguably represents 'best practice' in the UK.

The Lawson City Criteria also introduce a separate threshold for the calculation of safety risks. This new threshold requires that wind accelerations should not be higher than 15 m/s for 0.022% of the time.

How is it calculated? (continued)

Table 0.2: Lawson criteria

Lawson activity category [1]	Wind description	Predominant activity	Mean hourly wind speed exceeded less than 5% of the time
Long-term sitting	Light breeze	Desired for outdoor restaurants and seating areas where you can read a newspaper or comfortably eat and drink	0–4 metres per second (m/s)
Standing or short-term sitting	Gentle breeze	Appropriate for bus stops, window shopping and building entrances	4–6 m/s
Pedestrian walking or strolling	Moderate breeze	Appropriate for a stroll along a city/town street, plaza or park	6–8 m/s
Business walking	Relatively high speeds	Conditions that can be tolerated if your objective is to walk, run or cycle without lingering	8–0 m/s
Uncomfortable	Strong wind	Wind of this magnitude is considered a nuisance for most activities; a wind mitigation is typically recommended	>10 m/s

Table 0.3: Lawson city criteria

Lawson city activity category	Wind description (acceleration of the wind caused by wind-structure interaction)	Predominant activity	Mean hourly wind speed exceeded less than 5% of the time
Frequent sitting	Light breeze	Acceptable for frequent outdoor sitting use, for example, restaurants, cafés	0–2.5 m/s
Occasional sitting	Gentle breeze	Acceptable for occasional outdoor seating, for example, general public outdoor spaces, balconies and terraces intended for occasional use, etc	2.5–4 m/s
Standing	Moderate breeze	Acceptable for entrances, bus stops, covered walkways or passageways beneath buildings	4–6 m/s
Walking	Relatively high speeds	Acceptable for external pavements, walkways	6–8 m/s
Uncomfortable	Strong wind	Not comfortable for regular pedestrian access	>8 m/s

Figure 0.1: Illustration of 'downwash', 'corner acceleration' and 'funnelling'.

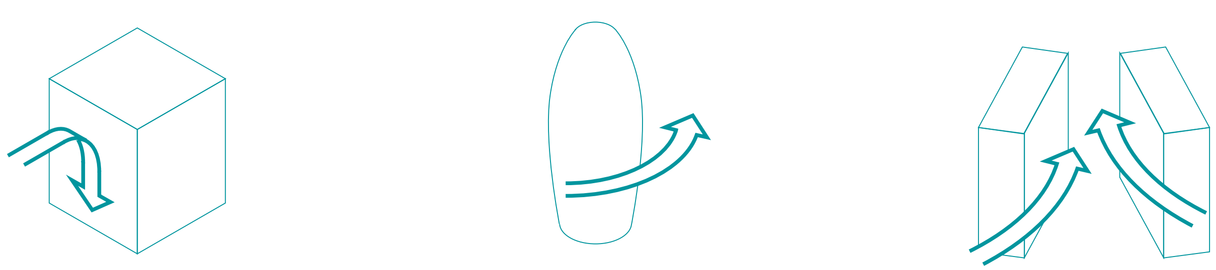


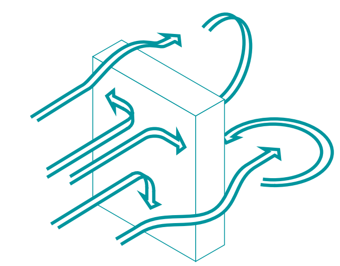
Table 0.4: Lawson city criteria – wind safety criteria

Lawson city activity category	Wind description (Acceleration of the wind caused by wind-structure interaction)	Predominant activity	Mean and Gust Equivalent Mean (GEM) wind speed from any wind direction (0.022% exceedance)
Pedestrian safety limit	Equivalent to near gale	Presents a safety risk for pedestrians, especially to more vulnerable members of the public	15 m/s

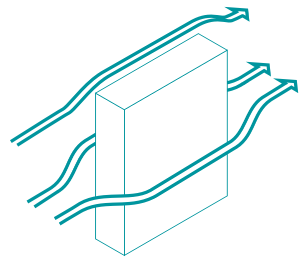
1 Lawson, T. (2001). *Building Aerodynamics.* New Delhi: Cambridge University Press.

How is it calculated? (continued)

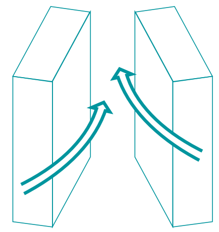
Figure 0.2: Example of wind flow around buildings and how to minimise the impact



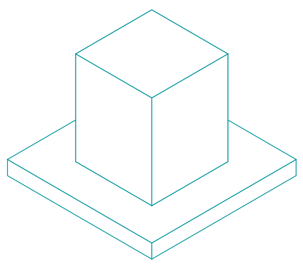
Avoid large flanking walls facing the prevailing wind



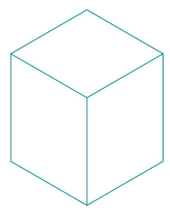
Orientate the long axis parallel to the prevailing wind



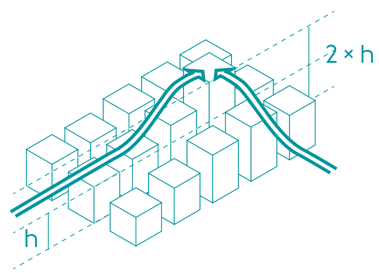
Avoid funnel-like gaps between buildings



Use podiums to prevent downwash reaching ground level

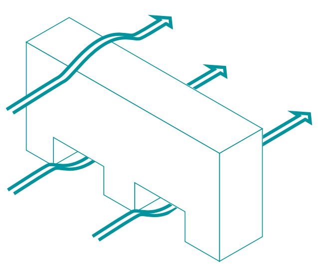


Avoid large cubical buildings with plain facades

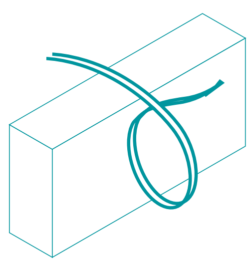


Group buildings so that the height differential is minimised;

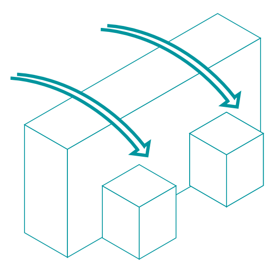
ideally the protruding building height should be less than twice the average height



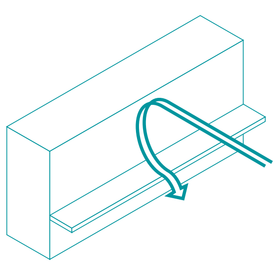
Avoid passageways beneath buildings at ground level



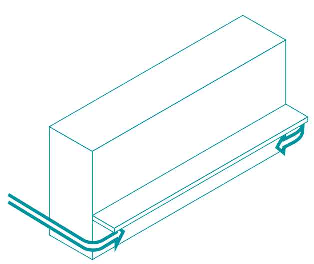
Avoid potential issues with transverse wake flow …



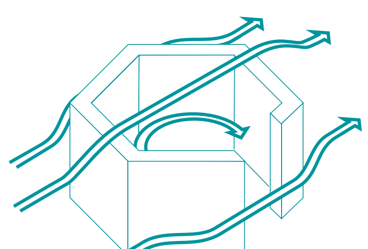
… by using finger blocks on the rear face



Use large canopies to mitigate downwash …

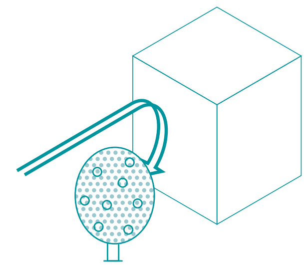


… but be aware that this can trap and accelerate horizontal flows

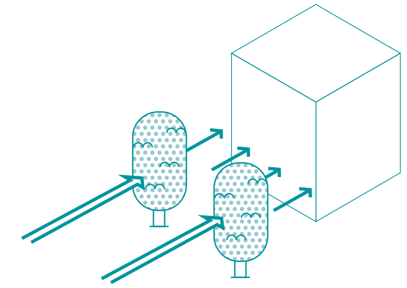


Shelter in courtyards depends on area, gap width and building height

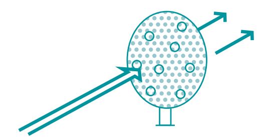
Figure 0.3: Use of trees to mitigate adverse wind effects produced by developments if massing is already fixed



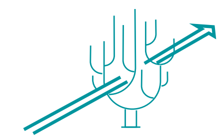
Mitigation of 'Downwash Effects'



Mitigation of horizontal wind



Beneficial effect of evergreen tree species in winter



Deciduous trees offer limited or negligible wind mitigation in winter

What is the process?

Action

RIBA Stage 0

RIBA Stage 1: Optimise

Architect

Make sure that early guidance (BRE Digest 520) on wind microclimate is followed. Elements of the design to consider at this stage are the effect of building shape and height, interaction of the proposed building with its surroundings, position of passageways and courtyards, funnelling, street canyon and location of entrances

Wind engineer, building physicist or modelling specialist

Provide advice on the adoption of the early-stage guidance referred to in the above actions, using professional judgement and experience. The early-stage wind study may be conducted as a visual assessment where diagrammatic two/three-dimensional study can be used. Computer simulation tools could also be used at this stage to assess initial massing options, especially if the complexity of the development requires a more in-depth analysis to capture all possible wind-buildings interactions. In the case of high-rise buildings designed in the City of London, the use of CFD tools or wind tunnel studies can be requested at this stage

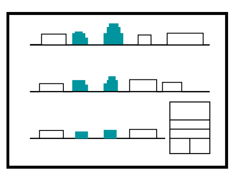
RIBA Stage 2: Plan / Design

Architect

As the design evolves, and more details are included in the initial massing model, focus on the location of outdoor amenity spaces and their exposure to prevailing winds, and take into account the outcomes of the Stage 1 wind studies (if conducted). Collaborate with the wind engineer, and coordinate actions on critical wind microclimate design solutions as frequently as possible at this stage

Documentation

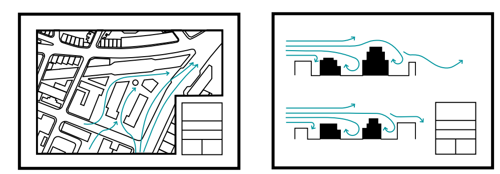
RIBA Stage 1:



Documentation

Massing study highlighting possible wind-structure effects and identification of areas of potential concern

RIBA Stage 2:



Wind desktop assessment for planning application or CFD / wind tunnel studies

What is the process? (continued)

RIBA Stage 2: Plan / Design (continued)

Action

Wind engineer, building physicist or modelling specialist

Assist the design team by carrying out an iterative assessment of the main selected design options using various means, for example, visual qualitative assessment, analytical tools and computational three-dimensional tools. Produce a wind statistical analysis at this stage, indicating the annual/seasonal frequency and intensity of wind by direction. Coordinate with the architect to set up a list of receptors where wind conditions can be assessed to verify compatibility with the activity category thresholds (Lawson criteria). Issue a wind desktop assessment to provide a semi-quantitative study of the impact of the new development on local wind conditions, and deliver an initial coarse set of results to satisfy the planning requirement of Stage 2. Consider the use of early-stage CFD study at this stage to better capture the wind effects and apply the findings of the wind desktop assessment.
In complex developments, or high-rise buildings, the use of CFD tools or wind tunnel studies may be required

Landscape designer

Usually, a wind microclimate assessment does not account for existing or proposed landscaping or planting solutions. However, to ensure a safe approach and consider a worst-case scenario, join the discussions around landscaping and/or planting with the design team at this stage. Ensure regular involvement in the discussions on building massing and wind studies. Early-stage study on the possible distribution of the landscape and the type of solution proposed can be conducted as a qualitative two/three-dimensional study

Documentation

RIBA Stage 3: Plan / Design

Action

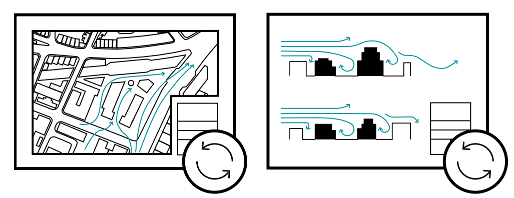
Architect

Make sure the outcomes of the wind microclimate studies carried out at Stage 2 have been incorporated into the design, and if so, the design should not change significantly. If a second planning application is required, conduct a further wind microclimate assessment. Provide a design and access statement to include qualitative and quantitative information on the location of amenity spaces. Aspects such as building shape and height, location and sizes of balconies and terraces, including height of solid balustrades, position of passageways and courtyards, and location of entrances should all be specified

Wind engineer, building physicist or modelling specialist

If the design has significantly changed, reassess the wind microclimate. In coordination with the architect and landscape designer, collect and process the necessary design input to provide a quantitative assessment of wind conditions on site. A wind desktop analysis is the minimum requirement, however, depending on the extent of design changes, complexity and height of the proposed building, the use of CFD or wind tunnel approach is recommended. If detrimental wind conditions are identified in the assessment, study the mitigation strategies and integrate these into the design. If the assessment identifies high-risk areas, the mitigation strategies must be validated and assessed as part of the CFD/wind tunnel study

Documentation



Wind desktop assessment for planning application or CFD / wind tunnel studies.

What is the process? (continued)

	RIBA Stage 3: Plan / Design (continued)	RIBA Stage 4	RIBA Stage 5	RIBA Stage 6
Action	Landscape designer Following coordination of the landscape design with the architect and wind engineer, should significant changes to the architectural design arise, the landscape design may require redesign at Stage 3. If the wind microclimate needs to be reassessed, produce the relevant quantitative documents to illustrate the landscape intervention. If the landscape design forms part of the mitigation strategies, accurately describe and incorporate the design into the CFD/ wind tunnel study	Architect Make sure that the Stage 3 design proposals for wind impact mitigation are maintained in the Stage 4 building and landscaping details		
Documentation				

What is the process? (c'd)

RIBA Stage 7

Action

Documentation

Relevant policy

Wind microclimate around buildings. BRE Digest 520

… Architects, developers and planners must aim to provide a safe and comfortable wind microclimate in open-air pedestrian areas around buildings …

City of London Wind Microclimate Guidelines

… Developers are encouraged to address wind microclimate matters at an early stage before their designs are finalized. Using these guidelines, appointing experienced consultants, having dialogue with officers of the City and commissioning early-stage studies to quantify the wind microclimate conditions will help ensure good pedestrian comfort conditions around proposed development sites …

The London Plan (2021), Policy D9 Tall buildings

… Based on local context, Development Plans should define what is considered a tall building for specific localities, the height of which will vary between and within different parts of London but should not be less than 6 storeys or 18 metres measured from ground to the floor level of the uppermost storey …

Further reading

Lawson, T. (2001). Building Aerodynamics. New Delhi: Cambridge University Press

Contributors

HW 1 Outdoor Air Quality – Transport – Residential: Hoare Lea
HW 2 Outdoor Air Quality – Transport – Commercial: Hoare Lea
HW 3 Outdoor Air Quality – Buildings: Hoare Lea
HW 4 Thermal Comfort – Homes – DSY 1: Hoare Lea
HW 5 Thermal Comfort – Homes – DSY 2: Hoare Lea
HW 6 Thermal Comfort – Homes – DSY 3: Hoare Lea
HW 7 Thermal Comfort – Commercial: BRE
HW 8 Indoor Air Quality – Residential: BRE
HW 9 Indoor Air Quality – Commercial: BRE
HW 10 Noise and Vibration – Residential: BRE
HW 11 Accoustic Performance – Commercial: BRE
HW 12 Daylight, Sunlight and Overshadowing: Hoare Lea
HW 13 Access to Daylight – Commercial: BRE
HW 14 Views of Sky – Commercial: BRE
HW 15 Access to Nature: BRE
HW 16 Considerate Constructors Scheme: Hoare Lea
HW 17 Wind Microclimate: Hoare Lea

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