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1 Introduction

This document sets out a series of Sustainability Principles to inform the design, construction and operation of all development projects. Aligned with these principles are a series of KPIs which all development project teams will be required to report against. The aim is to ensure that all Crown Estate development projects achieve a consistently high standard across all aspects of sustainability.

In all cases, project teams are required to set performance targets against each KPI. In a number of cases, this document sets guidelines for minimum and aspirational levels of performance to inform these decisions. Future revisions of this document will update and extend these guidelines, informed by the performance of the range of projects currently in design/construction.

This document will be reviewed annually and updated as required to ensure it drives continual improvement.

2.1 Context

Our commitment is to nurture and grow our business, taking a long-term view of our total contribution and making a positive impact.

To achieve this we have introduced the following philosophy:

• **INTEGRATION**: That there is no separate sustainability strategy, but simply one business strategy incorporating sustainability principles.

• **EMBEDDING**: Business groups take direct responsibility for developing sustainable business objectives and targets that achieve our corporate vision and are relevant to their area of the business.

• **RESPONSIBILITY**: Individual employees are empowered to innovate.

We have identified 14 material issues for our business. Although sustainability runs through all of these, four can be singled out as particularly relevant:

• **The effect of climate change** - Climate change presents physical, financial and regulatory risk and opportunity to our business and society as a whole.

• **Maintaining effective stewardship** - Our responsibility to take care of the long-term management of the assets we look after on behalf of the nation.

• **Successful place-making and creating amenity value** - We aim to create successful places where people want to be.

• Availability of natural resources - There are limited natural resources to supply increasing demand – impacting cost stretching supply chains.

2.2 Integrating Sustainability in the Urban Business

To address The Crown Estate's material issues directly relevant to sustainability, the following Sustainability Principles have been developed for the Urban Business.

Material Issue	Sustainability Principles for the Urban Business
The effect of climate change	Carbon in operation: To not only deliver developments that are low carbon in design, but also to enable them to become low carbon in operation.
Maintaining effective stewardship	Community: To pro-actively engage with our stakeholders and find ways to benefit the local community in terms of both employment and facilities.
Successful place-making and creating amenity value	Landscape: To maximise the positive contribution we can make to public realm, ecology, micro-climate and storm-water attenuation.
Availability of natural resources	 Materials: To minimise the impact of the materials we use, both on our building occupants, and the wider environment. Water: To minimise water demand and maximise opportunities for reuse on-site. Waste: To eliminate waste both in construction and operation.

To support implementation of these Principles we have developed the following tools:

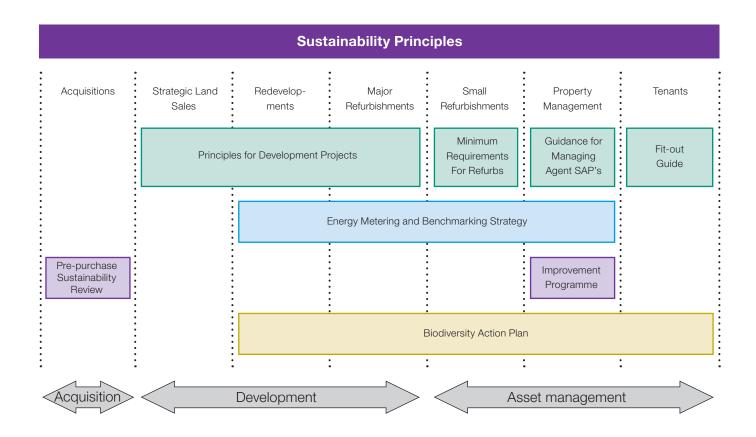


Figure 1 - Sustainability Tools Map

2.3 The Crown Estate's Sustainability Targets

The Crown Estate has set a number of corporate sustainability targets. As per the philosophy, portfolios will develop specific targets relevant to their area of operation. Those relevant to development are listed below:

- 50% carbon emissions intensity (kgCO $_{2}$ /m²) improvement by 2022 on 2011/2012 baseline.
- Zero operational waste to landfill by 2016 where Crown Estate has control.

• Reuse or recycle 90% of non-hazardous waste from all new build and major refurbishment projects overseen by the Development team (ongoing).

• Total waste generated on all development projects over £100,000 will be no greater than 6.5t/100m² (ongoing).

- Minimum of 15% recycled materials (by value) to be used in projects over £300,000 in value (ongoing).
- Continue to place at least 60 unemployed London residents per annum into employment in the West End, London (ongoing).

• Achieve BREEAM 'excellent' rating on all completed new build and major refurbishment projects overseen by the Development Team (ongoing).

3 Reporting Requirements

All project teams will be required to report against the KPIs set down in section 5 of this document at each project stage, as indicated in Figure 2 (numbers refer to the draft 2013 RIBA Stages). Where project stages differ from the below, reporting requirements will be adjusted accordingly with the agreement of the Head of Project Management.

Projects on-going when this document is published will be required to produce an initial report within 3 months.

1. Preparation	Workshop & Targets	Sustainability workshop – client vision, project-specific context, reporting requirements Set project-specific targets against KPIs
2. Concept	Test Impact	Test impact of sustainability requirements on overall project KPIs (cost, programme, etc.) Finalise KPI targets
3. Developed Design	Demonstrate Compliance	Demonstrate compliance with KPI targets
4/5. Technical Design	Specify Contractor Requirements	Include specific contractor requirements in relation to sustainability KPIs within tender documentation
6. Construction (mobilisation)	Contractor Briefing	Include contractor briefing on sustainability vision and KPIs. Confirm reporting procedures during construction stage
6. Construction (completion)	Verification	Final verification of all KPI targets prior to PC
7. Use & Aftercare	Post Occupancy Evaluation	Post-occupancy evaluation / validation of all KPIs. Feedback of lessons learned

Figure 2 - Flowchart of reporting requirements by project stage

4 Responsibility Matrix

The matrix below sets out responsibilities within the design team for setting and reporting on sustainability KPIs.

Corporate Reporting	Overall outcomes collated for inclusion in corporate reports	
Head of Project Management	Responsible for collating and reporting KPI performance across all projects	
Development Manager	Ultimate responsibility for setting and meeting targets sits with The Crown Estate development manager	
Project Manager	Day-to-day responsibility for ensuring that project team reports on KPIs and meets targets set. Issues quarterly report to DM	
Design Team	Responsibility for ensuring and demonstrating compliance in their own areas, and for ensuring all Contractor requirements are fully reflected in Contract Documents	
Contractor	Responsible for compliance with targets as they apply to construction, and providing evidence to the Project Manager as appropriate	

Figure 3 - Roles and responsibilities

Some of the KPIs listed in the following tables apply only to specific types of projects. These types are defined below.

Туре	Description
All projects	All projects handled by The Crown Estate developments team
All New Build	All New Build / Redevelopment projects
All Commercial	All Commercial projects (office & retail)
Commercial New Build	Commercial New Build / redevelopment projects (office & retail)
Commercial Refurb	Commercial Major Refurbishments (office & retail)
Residential	Residential New Build / Redevelopment

Table 1 – List of project types

5.1 Materials

КРІ	Applies To	Minimum	Aspiration
Embodied Carbon, kgCO ₂ /m²/yr ⁽¹⁾	All projects	None (Reporting requirement initially to establish appropriate benchmark)	
% Recycled Materials (by value) ⁽²⁾	All projects over £300,000 contract value	15% (TCE corporate target)	ТВА
Responsible Sourcing of Timber	All Projects	100% of timber to be certified sources	from FSC or equivalent
Compliance with Crown Estate Ethical Procurement Policy	All projects	Full compliance requi	red

(1) The methodology for calculating
embodied carbon follows closely that used
for BREEAM 2011 Credit Mat 01 (Materials
– Life Cycle Impacts), and is described in
Appendix A.

(2) To be calculated with reference to WRAP guidance (www.wrap.org.uk/ wrap_corporate/news/wraps_rules_of.html). Note that this is part of the calculation requirements for BREEAM credit Mat 03.

5.2 Water

KPI	Applies To	Minimum	Aspiration
% Reduction in Mains Water Use ⁽¹⁾	All Commercial	40% (3 Cr)	50% (4 Cr)
Mains Water Use (2)	Residential	< 105 l/p/day	< 80 l/p/day

(1) Compliance to be demonstrated using the BREEAM 2011 Water Use Calculator (Credit Wat 01). Note that the minimum requirement of 40% reduction (3 Credits) is normally achievable through demand reduction alone. (2) Compliance to be demonstrated using the Code for Sustainable Homes Water
Use Calculator (Credit Wat 01). Note that
105 l/p/day is the minimum requirement for
Code level 4.

These KPIs will be evaluated as part of the Post-Occupancy Evaluation of resource use (see Section 7.1).

5.3 Waste

КРІ	Applies To	Minimum	Aspiration
Weight of Construction Waste Generated per 100m ² GIA ⁽¹⁾	All New Build	≤ 6.5t	≤ 3.2t
% Non-Hazardous Construction Waste Diverted from Landfill ⁽²⁾	All New Build	80% non-demo, 90% demo	90% non-demo 95% demo
Extent of Facilities for Waste Collection Streams On or Near Site ⁽³⁾	Waste Collectionfacilities for dry recyclables, compeams On or Nearfood waste and residual. Storage		ables, compostable
Residential Waste Collection (Additional Requirement)	Residential	Provision of storage w waste streams as abc access to communal	

 Detailed definitions and calculation methodology as per BREEAM 2011 Credit Wst 01.

(2) Detailed definitions and calculation methodology as per BREEAM 2011 Credit Wst 01. (3) Refurbishment projects where the minimum level of provision is not already in place shall undertake a study to determine the feasibility of improving the provision to meet this standard. (4) Note that the Code for Sustainable
Homes requirement for 4 credits is more onerous than above, requiring a total of 4 waste streams including residual.
The above is predicated on Residential units provided as part of a commercial development, with a single waste stream for all dry recyclable waste.

5.4 Landscape Strategy

КРІ	Applies To	Minimum	Aspiration
Impact of Landscape Strategy	All New Build	Reporting requiremer	nt only, see below.

Design teams shall provide a short narrative description of the key elements of the landscape and ecology strategy, with particular focus on the four performance elements in Table 2 below. The team shall propose an impact rating of 0 to +3 against each of the elements. This will be reviewed and agreed by The Crown Estate Head of Project Management to ensure consistency between projects.

The minimum requirement is that all projects demonstrate that the landscape strategy will have no negative impact on any of the four performance factors listed.

Score	Minimum	+1	+2	+3
Public Realm Net impact of the scheme on the quality and quantity (amenity value) of the public realm in the locality	No net negative impact	Significant improvement to quality and/or quantity		quality and/or
Biodiversity Change in the total number of plant species on the site, as assessed by a qualified ecologist	No net negative impact on species	e Net increase in species of 6 or greater		6 or greater
Micro-climate Net impact of the scheme on local environment – noise, air quality, heat island effect	No net negative impact on local environment			
Storm-water Attenuation Impact of scheme on peak (1 in 100 year) run-off rate	No negative impact	Significant reduction		

Table 2 - Performance Assessment of Landscape Strategy

5.5 Community

КРІ	Applies To	Minimum	Aspiration
Community Consultation (Man04)	All New Build	1 Credit (Consultation)	
% Site Staff Paid at or Above Living Wage (Contractor) ⁽¹⁾	All projects above £10M contract value	Reporting requirement	
Diversity Works Accreditation (Contractor) ⁽²⁾	All projects above £10M contract value	Working towards accreditation	Achieved accreditation
Local Employment - % Site Staff Employed from the Local Area ^{(1) (3)}	All projects above £10M contract value		
Engagement with Schools & Colleges	All projects above £10M contract value	None (reporting requirement initially to establish appropriate benchmark)	
Number of Local ⁽³⁾ Trainees Taken on During Construction (1) (5)	All projects above £10M contract value	None (reporting requirement initially to establish appropriate benchmark)	
Number of Apprenticeships ^{(1) (6)}	All projects above £10M contract value	None (reporting requirement initially to establish appropriate benchmark)	

(1) Requirement to collect and report data to be included in main contract prelims.

(2) Requirement to be included in main contract prelims.

(3) For projects in central London, "Local Employment" is defined as people living in the boroughs of Westminster, Camden, Islington, Hackney, Tower Hamlets, Southward, Lambeth, Wandsworth, Kensington and Chelsea, and Hammersmith and Fulham. For projects outside of London, an appropriate project specific definition will be required.

(4) Total numbers of educational outreach events with local schools or colleges organised by the project team or contractor. (5) Total number of traineeships provided for local unemployed, providing a minimum of 26 weeks continuous employment.

(6) Total number of apprenticeships offered by the contractor on site during construction.

5.6 Carbon in Operation

KPIt	Applies To	Minimum	Aspiration
EPC	All New Build	В	А
EPC	Commercial Refurb	С	В
Operating Carbon Emissions (Office / retail Developments) ⁽¹⁾	Commercial New Build	75kgCO ₂ /m²/yr	50kgCO ₂ /m²/yr
Operating Carbon Emissions (Office / Retail Refurbishments) ⁽¹⁾	Commercial Refurb	100kgCO ₂ /m²/yr	75kgCO ₂ /m²/yr

 The methodology and assumptions for calculating operating carbon emissions is set down in Appendix B.

Note that operating carbon emissions are not proposed for residential units, where the requirement is limited to an EPC target. The extent of occupant influence over operating consumption, combined with the lack of access to operational data for verification means that operational targets for residential are of little value.

5.7 Sustainability Rating

КРІ	Applies To	Minimum	Aspiration
BREEAM 2011 Rating	Commercial New Build	Excellent	Outstanding
BREEAM 2011 Rating ⁽¹⁾	Commercial Refurb		Excellent
Code for Sustainable Homes	Residential	4	5

(1) Assessed using BREEAM for Refurbishments. There is no minimum requirement set in this case, as the constraints of individual refurbishment projects may make achieving a high BREEAM rating impractical. However, all project teams are required to specifically address this issue and provide commentary to the Development

Project Manager as to the implications of achieving an Excellent rating.

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6 Lifecycle Cost Analysis

Requirements (all projects):

1. To develop a lifecycle cost (LCC) model at Stage 2 ⁽¹⁾ (Concept), and to update at Stages 3 (Developed Design) and 4/5 (Technical / Specialist Design). The Model shall fulfil all the requirements of BREEAM 2011 Credit Man 05 (2 Credits).

2. To report the following financial performance indicators with the aim of benchmarking elements of financial performance across projects:

a. Total LCC/m² GIA

b. Total annualised maintenance cost/m² GIA (sum of PPM and reactive maintenance)

c. Total Utility Cost/m² GIA (landlord direct costs only)

3. To split the overall building model into Landlord and Tenant costs. Costs of tenant services that are apportioned on a fixed (e.g. per m² NIA) basis, such as space heating, shall be treated as Landlord costs.

⁽¹⁾ RIBA 2013 Work Stages

7 Post-occupancy Evaluation

7.1 Summary of Requirements

Post-occupancy performance evaluations are required for all projects. The requirements and responsibility for each element are set down in Table 3 below.

	Applies To	Resource Use	Occupant Satisfaction
End of Year 1	All Projects	Appointed by Development Project Manager, managed by Managing Agent ⁽¹⁾	Appointed by Development Project Manager, managed by Managing Agent ⁽²⁾
End of Year 2	All Projects	Appointed and managed by Managing Agent ⁽¹⁾	Appointed and managed by Managing Agent ⁽²⁾
End of Year 3	All Projects	Appointed and managed by Managing Agent ⁽¹⁾	Appointed and managed by Managing Agent ⁽²⁾

Table 3 - Responsibility for Post-occupancy Evaluations

(1) Resource use PoE studies will be lead by (2) Occupant satisfaction PoE studies will be an independent third party, in collaboration with both the M&E and FM consultants.

carried out by an independent third party. The final recommendations will be put together in collaboration with the Architect.

Note that the requirement for an independent third party to carry out the PoE assessments is a requirement of BREEAM 2011 Credit Man 04.

7 Post-occupancy Evaluation

7.2 Resource Use

Post-occupancy reviews of resource use will provide comparisons between a full year's operational resource consumption (energy and water) and design stage estimates. Operational data, including number of occupants, hours of use and any tenancy voids will be taken into account in the comparison.

If the review highlights a significant discrepancy between design and operational performance, then recommendations shall be made for further diagnosis and/or remedial work to resolve the issues and bring consumption in line with targets.

7.3 Occupant Satisfaction

The appointed consultant shall undertake an occupant satisfaction survey using the BUS⁽¹⁾ methodology. A report will be presented to the operations team with diagnosis of outcomes and recommendations for remedial action where appropriate.

⁽¹⁾ The BUS (Buildings in Use Surveys) was developed by the Usable Buildings Trust and is owned by Arup. It is available to other firms for use under licence.

www.busmethodology.org.uk

8 Strategic Land

The Crown Estate does not take the role of Developer in Strategic Land developments and as a result the detailed requirements in Sections 5 to 7 above would not apply in these cases. However, The Crown Estate will retain an interest in these projects, and is therefore concerned that the developments achieve a good standard of sustainability performance. This aspiration will need to be considered for each project in the context of the particular opportunities and constraints, which will clearly vary considerably between developments.

The Crown Estate will seek, as part of any development agreement for Strategic Land, to set a reasonable standard of sustainability performance for the development. The standard set will take into account the particular circumstances, opportunities and constraints of the site in question, but generally will aim to achieve an agreement that meets the aspiration set down below:

KPI	Applies To	Minimum	Aspiration
BREEAM 2011 Rating	Commercial New Build		Excellent
Code for Sustainable Homes	Residential		4

Appendix A Embodied Carbon Calculations

A1. Embodied Carbon Calculation Methodology

The aim of this methodology is to allow all Crown Estate projects to estimate on a consistent basis the total embodied carbon emissions resulting from the construction of a building. Embodied carbon is a relatively narrow measure of environmental impact of construction materials, although it is considered a good proxy for overall impact. It also has the advantage that it produces a single transparent metric and therefore facilitates comparisons between projects.

In order to simplify the method and avoid additional work, the method follows that required for BREEAM 2011 Credit Mat 01. However, in order to give as true a picture as possible of the total embodied impact, additional elements are required to be assessed, as shown in Table 4.

			Building type			
		Office	Retail	Residential		
Element (BREEAM)	External walls		\checkmark	\checkmark		
	Windows		\checkmark			
	Roof		\checkmark	\checkmark		
	Upper floor slab		\checkmark	\checkmark		
	Internal walls			\checkmark		
	Floor finishes / coverings		\checkmark	\checkmark		
Element (Additional)	Sub-structure			\checkmark		
	Ground Floor		\checkmark	\checkmark		
	Structural frame		\checkmark	\checkmark		

Table 4 - Embodied Carbon - Assessed Building Elements

Appendix A Embodied Carbon Calculations

In the Green Guide to Specification, values for carbon intensity (kg of CO_2 eq. per m²) are provided for a range of specifications for each of the above elements, based on a 60 year life. At its simplest, the total embodied carbon is simply the sum of the total area of each specification for each element, multiplied by its carbon intensity.

However, the specifications available in the Green Guide are limited in some areas, particularly with concrete slabs for example. Designers have three options to obtain more representative ratings where the standard specifications are insufficient:

1. Obtain a bespoke rating from the BRE (via project BREEAM assessor). This may additionally benefit the Mat 01 score, but is more complex because of the range of factors considered.

2. Obtain a specific carbon intensity from the manufacturer if appropriate. Assurance will be required that this is consistent with the BRE methodology.

3. Calculate a specific carbon intensity based on other appropriate published data.

Appendix B Operational Carbon Calculation

B1 Calculation of Operational Carbon Emissions

Generating an estimate of operating carbon emissions at design stage is highly problematic due to the wide range of factors that influence the outcome. However, it is essential that these estimates are put in place, both to enable some degree of forecasting trends in overall Crown Estate carbon emissions and as a first step towards post-occupancy performance evaluation of the building.

It is recognised that operational emissions are strongly influenced by the building operation, and therefore the design team cannot be held solely responsible should a building fail to meet its design stage carbon emissions target in operation.

In order to produce a design stage estimate of operating carbon emissions, it is recommended that design teams follow the method set out in the Technical Memorandum recently published by the chartered Institute of Building Services Engineers (CIBSE). TM54 "Evaluating Operational Energy Performance of Buildings at the Design Stage" (August 2013) sets out a standard method, and identifies a series of specific input assumptions required. The method breaks overall energy consumption down into a series of end-use categories, which are aligned with those set down in CIBSE Guide F. Provision of estimates against each end use category will be particularly helpful as a reference when post-occupancy evaluation of resource use is carried out.

A number of assumptions will need to be made in relation to the operational parameters of the buildings, as identified in TM54. It is intended that these assumptions will be shared between design teams to ensure a common approach, and wherever possible will be based on data from The Crown Estate's operational buildings.

Appendix C Project Reporting Pro-forma

*Electronic version is available to be filled out in Excel

Sustainability Principles - Project Report				
Project Name				
Development Manager				
Project Manager				
Reporting Stage (RIBA 2013)				
Date				
	-			
General Information				
Project Sector			Commercial / residential / reta	ail / other
Project Type			New build / refurbishment	
Gross Internal Floor Area			m ²	
Net Internal Floor Area			m ²	
Estimated project completion date				
КРІ	Relates to	Project Target	Minimum	Aspiration
Materials				
	All Projects	XX	(None - reportir	na requirement)
Embodied Carbon (kgCO2/m²/yr)	All Projects >	~~~~		
% Recycled Materials (by value)	£300,000 contract value		15% (TCE Corporate Target)	
Responsible Sourcing of Timber	All Projects		100% of timber to be from sour	
Compliance with Crown Estate Ethical Procurement Policy	All Projects	Compliant/non- compliant	Required	
Water				
Reduction in Mains Water Use (%)	All Commercial	Χ%	0.4	0.5
Reduction in Mains Water Use (L/pers/day)	Residential	< X	< 105	< 80
Waste				
Weight of construction waste per 100m ² GIA		Xt	6.5t	3.2t
% Non-Hazardous Construction Waste Diverted from Landfill (demolition)	All New Build	Х%	90% demo	95% demo
% Non-Hazardous Construction Waste Diverted from Landfill (non-demolition)		Х%	80% non-demo	90% non-demo
Extent of Facilities for Waste Collection Streams On or Near Site	All projects	Narrative	Provide appropriate and sepa recyclables, compostable Storage areas to co	food waste and residual.
Residential Waste Collection (additional requirement)	Residential	Narrative	Provision of storage withi streams as above (3) plu communa	is appropriate access to
Landscape Strategy				
Teams are required to provide a short nam providing a rating between 0 and +3 agair			o landscape strategy, and the l	key benefits, in additon to

Narrative				
Score	9		0 Points	3 Points
Public Realm				
Net impact of the scheme on the quality and quantity (amenity value) of the public realm in the locality	All New Build	Points Rating 0-3	No net impact	Significant improvement to quality and/or quantity

1	Relates to	Project Target	Minimum	Aspiration
Ecology				
Change in the total number of plant species on the site, as assessed by a qualified ecologist	All New Build	Points Rating 0-3	No net impact on Species	Net increase in species of 6 or greater
Micro-climate				
Net impact of the scheme on local environment – noise, air quality, heat island effect	All New Build	Points Rating 0-3	No net impact on local environment	Significant improvement
Storm-water Attenuation				
Impact of scheme on peak (1 in 100 year) run-off rate	All New Build	Points Rating 0-3	No impact	Significant reduction

Community

Community Consultation	All New Build	Achieved / Not Achieved	BREEAM Credit Man 04 Achieved (1 Credit)	
% Site Staff Paid at or Above Living Wage (Contractor)	All projects above £10M contract value	%		ment initially to establish benchmark)
Diversity Works Accreditation (Contractor)	All projects above £10M contract value	Accreditation Status	Working towards accreditation	Achieved accreditation
Local Employment - % Site Staff Employed from the Local Area	All projects above £10M contract value	%		ment initially to establish benchmark)
Engagement with Schools & Colleges	All projects above £10M contract value	Number of Events		ment initially to establish benchmark)
Number of Local Trainees Taken on During Construction	All projects above £10M contract value	Number of Trainees		ment initially to establish benchmark)
Number of Apprenticeships	All projects above £10M contract value	Number of Apprenticeships		ment initially to establish benchmark)

Carbon

EPC	All New Build	A-G	В	А
EPC	Commercial Refurb	A-G	С	В
Operating Carbon Emissions (Office / retail Developments)	Commercial New Build	XkgCO ₂ /m ² /y	75kgCO ₂ /m²/yr	50kgCO ₂ /m ² /yr
Operating Carbon Emissions (Office / retail Refurbishments)	Commercial Refurb	XkgCO ₂ /m ² /y	100kgCO ₂ /m²/yr	75kgCO ₂ /m ² /yr

Sustainability Rating

BREEAM 2011 Rating	Commercial New Build	Rating	Excellent	Outstanding
BREEAM 2011 Rating	Commercial Refurb	Rating		Excellent
Code for Sustainable Homes	Residential	Rating	4	5
			•	

Lifecycle Cost Metrics

Total LCC/m ² GIA	All Projects	X £/m ²	(Note - reporting requirement)
Total annualised maintenance cost	All Projects	X £/m²/yr	(Note - reporting requirement)
Total Utility Cost	All Projects	X £/m²/yr	(Note - reporting requirement)



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