Ham Close Regeneration

Planning Application:

BREEAM Pre-Assessment

Author: Energist
April 2022

BREEAM Pre-Assessment Report

Ham Close BREEAM

On behalf of Hill Residential

R03

Date: 27th April 2022

Revision History

Revision	Issue date	Description	Issued by	Checked by
R01	11/04/2022	First Issue	JM	EW
R02	12/04/2022	Second Issue	JM	EW
R03	27/04/2022	Third Issue: Updated Masterplan	WOB	

Calculations contained within this report have been produced based on information supplied by the client and the design team. Any alterations to the technical specification on which this report is based, will invalidate its findings.

College Farm
Tetbury Road
Cirencester
GL7 6PY

Tel: 08458 386 387

info@energistuk.co.uk

www.energistuk.co.uk

CONTENTS

1. EXECUTIVE SUMMARY

Energist UK has been appointed by Hill Residential to carry out a BREEAM 2018 New Construction Assessment for the proposed Community/Leisure Facility (Class F2) of up to 3 storeys in height, and "Maker Labs" (sui generis) of up to 2 storeys which form part of the mixed-use Ham Close development, located at Ham, Richmond Upon Thames, TW10 7PG. The proposed non-residential buildings development are required to achieve a BREEAM rating of 'Excellent' in order to satisfy the planning requirements set out by the Local Planning Authority: London Borough of Richmond upon Thames (LBRuT).

This report details the Pre-Assessment Stage performance of the aforementioned non-residential buildings measured against the BRE Environmental Assessment Method, BREEAM 2018 New Construction (SD5078 Issue 3.0). The site is to be registered with Building Research Establishment, BREEAM UK registration type: Non-residential institution (community centre) and Bespoke (Maker Labs).

The report demonstrates that the development has the potential to achieve BREEAM Excellent with an overall score of 74.80% This score is subject to complying with all the detailed requirements during the formal assessment stage and providing documentation in line with BREEAM criteria.

Building name	Ham Close
BREEAM rating	Excellent
Total Score	74.80%
Min. standards level achieved	Excellent Level

(Figure 1.1: Showing performance of development)

2. INTRODUCTION

Site description

The proposed development comprises demolition of existing buildings on-site and phased mixed-use development comprising 452 residential homes (Class C3) up to six storeys; a Community/Leisure Facility (Class F2) of up to 3 storeys in height, a "Maker Labs" (sui generis) of up to 2 storeys together with basement car parking and site-wide landscaping.

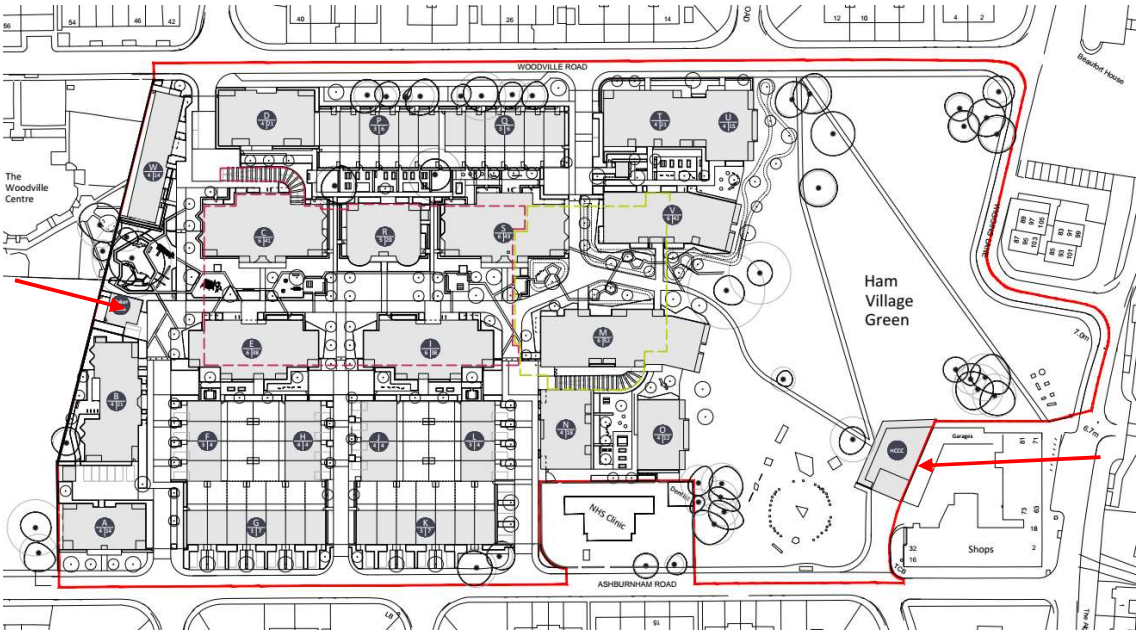

Figure 2.1: Proposed Master Plan (Source BPTW Planning Issue Masterplan)

3.METHODOLOGIES

The Building Research Establishment Environmental Assessment Method ('BREEAM' hereafter) is an environmental assessment method for rating and certifying the performance of new construction projects. It is a national standard for use in the design and construction of all new developments with a view to encouraging continuous improvement in sustainable building techniques.

The BREEAM Scheme is designed to evolve with increasingly tightening Building Regulations, and the development of technology and innovations, with the most recent version of BREEAM released in March 2018, placing a greater emphasis on overall life cycle efficiencies and stakeholder participation, with updated standards in most sections.

The BREEAM Scheme covers nine categories of sustainable design (each of which contains a number of environmental issues), comprising:

- Management;
- Health & Wellbeing;
- Energy;
- Transport;
- Water;
- Materials;
- Waste;
- Land Use and Ecology; and
- Pollution.

A further 'Innovation' section is provided to award developments that exceed the levels set out in the standard criteria, where exemplary performance levels are achieved. Each issue is a source of environmental impact which can be assessed against a performance target and awarded one or more credits.

In addition to meeting minimum standards (which vary according to the BREEAM rating sought), achievement of the requirements in each design category scores a number of percentage points. The overall total percentage 'score' then determines the BREEAM Rating achieved by the assessed development.

Scoring system

Credits are available for each category meeting the specified levels of performance. The number of credits available in each category does not necessarily reflect the relative importance of the issues being assessed, and will

vary depending on the developments' Scheme type. Before the final score is calculated, each of the scores in the nine categories is multiplied by an 'Issue Weighting Factor' before the final score is calculated.

The BREEAM Rating is awarded on the basis of achieving both a set of mandatory minimum standards and a score level as set out above. The minimum standards vary depending on the rating required.

Minimum standards

Before the development can start to be awarded points under BREEAM 'Excellent' it must achieve minimum standards in the following categories highlighted below:

Minimum standards for each rating level					
	Pass	Good	Very Good	Excellent	Outstanding
MAN 03: Responsible construction practices	None	None	None	One credit (responsible construction management)	Two Credits (responsible construction management)
MAN 04: Commissioning and handover	None	None	One Credit (commissioning-test schedule and responsibilities)	One Credit (commissioning-test schedule and responsibilities)	One Credit (commissioning-test schedule and responsibilities)
MAN 04: Commissioning and handover	None	None	Criterion 11 (Building User Guide)	Criterion 11 (Building User Guide)	Criterion 11 (Building User Guide)
ENE 01: Reduction of energy use and carbon emissions	None	None	None	Four credits (Energy performance)	Six credits (Energy performance) and four credits (energy modelling and reporting)

ENE 02: Energy monitoring	None	None	One credit (First sub-metering credit)	One credit (First sub-metering credit)	One credit (First sub-metering credit)
WAT 01: Water consumption	None	One credit	One credit	One credit	Two credits
WAT 02: Water monitoring	None	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only
MAT 03: Responsible sourcing of materials	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only	Criterion 1 only
WST 01: Construction waste management	None	None	None	None	One credit
WST 03: Operation waste	None	None	None	One credit	One credit

(Figure 3.1: Table showing minimum standards required for each level of the BREEAM assessment)

BREEAM assessment - a two stage process

The BREEAM scheme allows for a building to be assessed at the design stage and post-construction stage before the formal BREEAM Certification (and Rating) is awarded; this will ensure that the completed development meets sustainability performance as designed. During the certification assessment, which will lead to a formal BREEAM rating and certificate, the assessment stages are as follows:

The initial Design Stage certification – at this stage an Interim Certificate is issued, based on a provisional rating. A Post-Construction check is required to verify the rating in the 'as constructed' state before a Final BREEAM Certificate can be issued.

The Design Stage assessment and post-Construction check must be carried out by a licensed assessor, who registers the assessment with the BRE.

This report forms the Pre-Assessment which is the initial stage of the Design Stage Certification process. Energist UK has verified with BRE that the development will be assessed under the BREEAM 2018 New Construction Non-residential institution (community centre) and Bespoke (Maker Labs) scheme once the planning application is approved.

Approach and Methodology

In order to gain an understanding of the achievable BREEAM rating for the application Site, Energist UK were appointed by Hill Residential to undertake a BREEAM Pre-Assessment for the development.

The purpose of this Pre-Assessment report is to identify the strengths and weaknesses of the proposals in relation to the BREEAM criteria, and to identify appropriate opportunities to achieve the aspired 'BREEAM' rating.

The Pre-Assessment is intended to identify how the development will score when the current designs are formally assessed under the BREEAM Scheme. This BREEAM Pre-Assessment was conducted under the New Construction 2018 scheme with manual version SD5078: 3.0 – 2018.

BREEAM rating	**% score**
Outstanding	≥ 85
Excellent	≥ 70
Very good	≥ 55
Good	≥ 45
Pass	≥ 30
Unclassified	< 30

(Figure 3.2: Table showing BREEAM rating and score)

RIBA Stages 1&2 (Pre-Planning Requirements)

BREEAM assessments cover all RIBA stages, including Preparation and Brief (Stage 1) and Concept Design (Stage 2). These pre-planning stages have a number of highly weighted credits requiring action prior to stage completion. It is important that these credits are addressed so as to avoid unnecessary costly credits at later stages. The table below lists all of the credits either requiring action or completion at RIBA Stages 1 and 2. This table is for reference of all pre-planning credits only; not all credits will necessarily be targeted.

Issue	Name	RIBA Stage 1	RIBA Stage 2
Man01	Appointment of BREEAM AP		
Mat06	Complete a Material Efficiency Analysis		
Wst05	Complete a climate Change Adaption Strategy Appraisal		
Le01-Le05	Appointment of Suitably Qualified Ecologist		
Le02	Completed Ecology Report		
Wst06	Complete a Functional Adaptability Study		
Man01	Completed schedule of consultant responsibilities for each project stage		
Man01	Complete public consultation exercises		
Man01	Completed BREEAM Pre-assessment with targets		
Man02	Completed Elemental Life Cycle Cost Exercise		
Hea06	Completion of Security Needs Assessment		
Ene04	Completion of Passive Design Analysis		
Ene04	Completion of LZC Feasibility Study		
Tra01	Completed Transport Assessment and Travel Plan		
Tra02	Consultation with Local Authority on most appropriate improvement to local pedestrian and cyclist access		
Wst01	Complete a pre-demolition audit of any existing structures or hard landscaping		
Mat01	Completed Life Cycle Assessment		
Mat03	Ensure Sustainable Procurement Plan is in place		

(Figure 3.3: Table RIBA stage 1&2 Credits)

4. DEVELOPMENT SUMMARY AND RATINGS

During the Pre-Assessment, the viability of credits was assessed with the aim of achieving BREEAM rating of Excellent. The Pre-Assessment identified that BREEAM Excellent Rating is achievable for this project. The table below shows in "Targeted credits" how many credits are likely to be achieved with design in its current form. The column "Max credits" are the number of credits that are available for this particular development.

The Minimum Standards that are required for BREEAM rating of 'Excellent' have been assessed as being achievable.

Reference	Credit title	Max credits	Targeted credits	Comments
Management				
MAN 01	Project brief and design	4	4	Project delivery stakeholders will meet to define roles and responsibilities for each RIBA stage. Third-party consultation will be undertaken to meet the minimum consultation requirements. BREEAM AP appointed
MAN 02	Life cycle cost and service life planning	4	1	The capital cost will be reported in £/m2 at design stage and post-construction stage.
MAN 03	Responsible construction practices	6	6	It is mandatory that all timber will be 'Legally harvested and traded timber'. 2 credits are assumed for responsible construction management, this requires achievement of 35 CCS points and

				achievement of the 3 additional items within Table 1 of BREEAM guidance note GN33. BREEAM Site AP; The Principal Contractor required to hold EMS certificate, and will be required to monitor electricity and water usage during construction and record material and waste transport mileage.
MAN 04	Commissioning and handover	4	3	A Commissioning and Testing Schedule will be produced, and a Specialist Commissioning Manager will be appointed. Building User Guides will be produced in line with BREEAM criteria. Commissioning - testing schedule and responsibilities and Building User Guide are mandatory requirements.
Health and Wellbeing				
HEA 01	Visual comfort	3	2	External lighting levels, and controls will be designed and installed in accordance with industry best practice guidelines. The layout of each unit will provide compliant view out for occupants.
HEA 04	Thermal comfort	2	2	Thermal modelling will be completed in line with CIBSE Guide A plus an allowance for climate change.

HEA 05	Acoustic performance	1	1	Acoustic testing will be undertaken to meet BREEAM requirements for indoor ambient noise levels
HEA 06	Security	1	1	Security Needs Assessment will be undertaken
HEA 07	Safe and healthy surroundings	2	1	The buildings are accessed directly from the public highway with pedestrianised internal links providing safe access. Landscaped space is accessible by the building user.
Energy				
ENE 01	Reduction for energy use and carbon emissions	13	4	Credits are targeted for Excellent Rating
ENE 02	Energy monitoring	2	2	BREEAM compliant Energy metering will be installed in the building.
ENE 03	External lighting	1	1	The average initial luminous efficacy of the external light fittings within the construction zone will not be less than 70 luminaire lumens per circuit watt. The external lighting circuit will include automatic controls.
ENE 04	Low carbon design	3	2	Passive Design Analysis and Low Zero Carbon Feasibility study will be carried out prior to the end of RIBA Stage 2.

Transport				
TRA 01	Transport assessment and travel plan	2	2	A Travel Plan has been developed based on a BREEAM compliant Transport Assessment.
TRA 02	Sustainable transport measures	10	8	Credits targeted for providing public transport information, cycle spaces, and cycle facilities. The design team consults with the local authority on the state of the local cycling network and public accessible pedestrian routes and implements improvements that are deemed necessary.
Water				
WAT 01	Water consumption	5	3	Water efficient fittings and flow restrictors will be installed, and the toilets will be dual flush.
WAT 02	Water monitoring	1	1	A compliant water meter with a pulsed output will be installed to ensure compliance and gain one credit.
WAT 03	Water leak detection	2	2	A Leak detection system will be installed to the buildings. In addition, flow control devices such as time controller, volume controller, or presence detectors to each WC area.
WAT 04	Water-efficient equipment	1	1	It is assumed that rainwater harvesting system will be designed for irrigation.

Materials				
MAT 01	Environmental impacts from construction products- building life cycle assessment (LCA)	7	5	Building Life Cycle Assessment (LCA) options appraisal of 2 to 4 significantly different superstructure design options will be carried out at pre-planning stage.
MAT 02	Environmental impacts from construction products- Environmental Product Declarations (EPD)	1	0	This credit is not targeted as this restricts procurement routes and is typically onerous for fitted out projects to achieve.
MAT 03	Responsible sourcing of construction products	4	2	One credit on a Sustainable Procurement Plan will be used to guide specification towards sustainable construction products. All materials will be responsibly sourced, with a view to achieving 2 credits in this section.
MAT 05	Designing for durability and resilience	1	1	The design will incorporate suitable durability and protection measures and solutions to prevent damage to the vulnerable parts of the building from damage and exposed parts from material degradation.
MAT 06	Material efficiency	1	1	A Material Efficiency Study will be prepared at every RIBA Stage.

Waste				
WST 01	Construction waste management	5	4	A Resource Management Plan (RMP) will be developed and aim for a construction waste resource efficiency benchmark of 7.5m^3/100m2. At least 70% by volume (or 80% by tonnage) of non-demolition waste and 80% by volume (or 90% by tonnage) of demolition waste will be diverted from landfill to be reused or recycled.
WST 03	Operational waste	1	1	Dedicated space to cater for the segregation and storage of operational recyclable waste volumes generated by the assessed building, its occupants and activities will be designed for the development.
WST 05	Adaptation to climate change	1	1	An Adaption to Climate Change Study will be completed prior to the end of RIBA Stage 2.
WST 06	Design for disassembly and adaptability	2	2	A Functional Adaptation Appraisal will be carried out at RIBA Stage 2.

Land use and ecology				
LE 01	Site selection	2	1	One credit is targeted for reusing previously occupied land. Contaminated Land credit is not sought.
LE 02	Identifying and understanding the risks and opportunities for the project	2	2	An Ecologist has been appointed to complete a Preliminary Ecology Appraisal for the site.
LE 03	Managing negative impacts on ecology	3	3	Plans will be put in place to minimise negative impacts on the ecological value of the site. The plans will be implemented by the Principal Contractor.
LE 04	Change and enhancement of ecological value	4	3	Solutions for enhancing ecological value on site will be identified and implemented leading to an increase in biodiversity value.
LE 05	Long term ecology management and maintenance	2	2	A Landscape and Ecology Management Plan will be developed covering the first five years after project completion. Opportunities for managing the ecological value during and post construction will be identified and implemented.
Pollution				
POL 01	Impact of refrigerants	3	1	One credit is targeted based on using refrigerants that have DELC CO2e of less than 1000kgCO2e/kW cooling capacity.

POL 02	Local air quality	2	2	ASHP is proposed, two credits are targeted by default for a fully electric system.
POL 03	Flood and surface water management	5	4	The development is situated in a medium flood zone area. It's assumed that SuDs, green roof and permeable pavement will used to achieve runoff rate and volume credit.
POL 04	Reduction of night time light pollution	1	1	External lighting will be designed and installed in line with the ILP Guidance notes and will include time controllers.
POL 05	Reduction of noise pollution	1	1	An acoustician will be appointed to confirm that there will be no detrimental impact from building services noise on the surrounding buildings.
Innovation				
	Innovation	10	3	All of the Man03 Considerate Constructor checklist items will be achieved. LCA on building Core services and third-party verification

(Figure 4.1: Table showing the targeted credits of the development)

5. CONCLUSIONS

Energist UK has carried out a Pre-Assessment to determine the viable BREEAM rating that can be achieved by both the proposed Non-residential institution (community centre) and Bespoke (Maker Labs) at the proposed Ham Close redevelopment.

The Pre-Assessment has determined that the development has the potential to achieve an overall score of 74.80% which equates to a BREEAM rating of 'Excellent' as shown in the table below. Additional credits have been targeted for the development in order to provide a suitable buffer above the Excellent threshold. This satisfies the anticipated requirement set by London Borough of Richmond upon Thames (LBRuT).

BREEAM Section	Credits available	Credits achieved	% of credits achieved	Section weighting (fully fitted) %	Section score (%)
Management	18	14	77.78	11.00	8.55
Health and wellbeing	10	7	70.00	14.00	5.60
Energy	19	9	47.37	16.00	6.63
Transport	12	10	83.33	10.00	9.58
Water	9	7	77.78	7.00	5.44
Materials	14	9	64.29	15.00	11.25
Waste	10	8	80.00	6.00	5.60
Land use and Ecology	13	11	84.62	13.00	12.69
Pollution	12	10	83.33	8.00	7.50
Innovation	10	2	20.00	10.00	2.00
Final BREEAM Score					**74.80%**
BREEAM rating					**Excellent**

(Figure 5.1: Calculations for score)

6. NEXT STEPS

Design Stage Assessment

The first stage of the BREEAM assessment is carried out on the detailed design. It is possible to undertake the design stage assessment during the period up to the issue of tender documents. However, the evidence base is required to demonstrate that each credit can be awarded; therefore, to gain the greatest number of credits it is advisable to undertake the design stage assessment once the required information is available. For example, details of all the sanitary fittings are required to be specified to calculate the score for the water consumption efficiency under BREEAM.

When the Assessor is satisfied with the performance under the BREEAM for the design stage assessment a report will be submitted to BRE to receive an 'Interim' BREEAM certification. This report will contain some documentary evidence together with an 'audit trail' for all specification, clauses, drawings, letters and reports.

Post Construction Stage Assessment

This can be carried out on the completed development. As part of this process, the Assessor will collate evidence (either documentary, photographic, or site survey evidence) to demonstrate that the development has been built in accordance with the details given at the Design Stage. This assessment is called a Post Completion Review Assessment (PCR).

If changes have been made to the design following the design stage assessment (during the construction phase), that affects the BREEAM score, the Assessor will re-calculate the Final score. This may be different to the Interim score. When the Assessor is satisfied with the performance under the BREEAM Scheme, they will submit a report to BRE to receive a Final BREEAM Certification for the development

Ongoing Consultation

Although this report provides recommendations, specific requirements of BREEAM can easily be misinterpreted or excluded at design stage, particularly in relation to the numerous standards with which the client must demonstrate compliance (such as CIBSE / ILE standards etc.) and the requirement to consult with various specialists (such as LZC / renewables' consultants, ecologists, acousticians etc.). It is therefore recommended that the relevant, competent third parties are engaged throughout all design stages in order to ensure the development proceeds in a manner that complies with the relevant requirements.

7. APPENDICES

Appendix 1

Glossary of terms

Accredited Energy Assessor: A person registered with an accredited energy assessment scheme provider. The scheme provider will be licensed by Communities and Local Government to accredit competent persons to assess the CO2 emission rates of domestic buildings for the purposes of demonstrating compliance with *Building Regulations*.

Actual Case CO2 Emissions: CO2 emissions from the dwelling (Kg CO2/m2/year) accounting for the input from specified/installed low and zero carbon technologies.
The standard case dwelling model must be used as the basis for the calculation of actual case emissions. However, where eligible low or zero carbon technologies are specified in the dwelling they can replace the standard systems assumptions from table Cat 1.2 for the purposes of the actual case calculation. Actual case CO2 emissions must be calculated in accordance with the methodology defined in table Cat 1.3.

(AD F) Approved Document F1: The Building Regulations for England and Wales Approved Document F1: Means of Ventilation (2010 Edition).

(AD L1A) Approved Document L1A: The Building Regulations for England and Wales Approved Document L1A: Conservation of Fuel and Power in New Dwellings (2010 Edition).

(ALO) Architectural Liaison Officer: This is the same as the Crime Prevention Design Advisor (see definition below) and is the title given to the same role in some police forces. Taken from www.securedbydesign.com

Angle of visible sky: The angle of visible sky u is the angle subtended, in the vertical plane normal to the window, by the visible sky from the centre of the window

Annual flood probability: The estimated probability of a flood of given magnitude occurring or being exceeded in any year. Expressed as a 1 in *x* year event. This is the equivalent to 1-in-x, 1:x or x% chance of a flood event occurring in any one year.

Annual flow rate probability: The estimated probability of a flow rate of given magnitude occurring or being exceeded in any year. Expressed as a 1 in x year event. This is the equivalent to 1-in-x, 1:x or x % chance of the flow rate being exceeded in any one year.

Appropriately qualified professional: A professional or team of professionals with the skills and experience to champion the use of SUDs within the overall design of the development at an early stage.

Approved Document E (AD E): The Building Regulations for England and Wales Approved Document E: Resistance to the Passage of Sound, 2003 edition incorporating 2004 amendments.

Average daylight factor: The average daylight factor is the average indoor illuminance (from daylight) on the working plane within a room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed CIE 'standard overcast sky'.

Basic building elements: Basic building elements are defined as follows; *Frame,* Ground floor, Upper floors, Roof, External walls, Internal walls, Foundation/substructure, Staircase (includes the tread, risers and stringers).

BES 6001:2008 Framework Standard for Responsible Sourcing of Construction Products: BES 6001:2008 is a BRE Global standard that provides a framework for the assessment of responsible sourcing schemes and provides a route to certification of construction products.

Blowing agents: Any material used to produce a cellular structure in either a plastic or other foam insulation used in either manufacture or installation.

Boiler class: An indication of a boiler's NOX emissions. Boilers are classified on a scale of 1 to 5, with 1 indicating high NOX emissions through to relatively low NOX emissions for a class 5.

Brownfield site: Land which is or was occupied by a permanent structure, including the curtilage of the developed land and any associated hard surfaces.

Building Regulations: Building Regulations apply in England and Wales and promote standards for most aspects of a building's construction, including structure, fire safety, accessibility, sound insulation, drainage, energy efficiency, ventilation and electrical safety.

Building Envelope: For the purpose of issue Mat 1, the building envelope is defined as the overall superstructure of the particular building. Each building envelope may contain single or multiple dwellings.

Catchment: The area contributing surface water flow to a drainage point or a point on a watercourse. It can be divided into sub-catchments

Central rainwater collection system: A system which will collect and store rainwater for use across the development. This could be a large storage tank or other form of surface water system.

Chain of custody (CoC): This is a process used to maintain and document the chronological history of the evidence/path for timber products from forests to consumers.

Compliant test body: Those organisations or individuals having UKAS accreditation or accredited by a European equivalent of UKAS, as well as organisations or individuals registered with the Association of Noise Consultants (ANC) Registration Scheme.

Composting: Composting is a natural process which converts organic waste into an earth-like mass by means of bacteria and micro-organisms. The composting process is also supported by larvae, wood lice, beetles, worms and other such creatures.

Considerate Constructors Scheme (CCS): The Considerate Constructors Scheme is a UK certification scheme that encourages the considerate management of construction sites.

Construction zone: The construction zone includes any land used for buildings, hard-standing, landscaping, site access or where construction work is carried out (or land is being disturbed in any other way), plus a 3m boundary in either direction around these areas. It also includes any areas used for temporary site storage and buildings. If it is not known exactly where buildings, hard-standing, site access and temporary storage and buildings will be located, it must be assumed that the construction zone is the development site.

Contaminated land: A site can be defined as contaminated land where the level of site contamination prevents development unless decontamination is carried out.

Control systems (lighting): A method for controlling the external lighting to ensure that it will not operate unnecessarily, e.g. during daylight hours or when a space is unoccupied. Control systems that can be considered are passive infrared (PIR), 'dusk to dawn' daylight sensors and time switches.

(CPDA) Crime Prevention Design Advisor: "The Crime Prevention Design Advisor (CPDA) is a specialist crime prevention officer, trained at the Home Office Crime Reduction College, who deals with crime risk and designing out crime advice for the built environment. In addition to physical security measures the officer will consider defensible space, access, crime and movement generators all of which can contribute to a reduction in crime and disorder." Taken from www.securedbydesign.com

Dedicated energy efficient light fittings: Fittings that comprise the lamp, base, control gear and an appropriate housing, reflector, shade or diffuser. The fitting must be dedicated in that it must be capable of only accepting lamps

having a luminous efficacy greater than 40 lumens per circuit watt. A light fitting may contain one or more lamps.

Design flood level: The maximum estimated water level during the design storm event. A site's design flood level can be determined through known historical data or modelled for the specific site.

(DER) Dwelling Emission Rate: The DER is the estimated CO2 emissions per m2 per year (KgCO2/m2/year) for the dwelling as designed. It accounts for energy used in heating, fixed cooling, hot water and lighting.

Direct Supply: The carbon benefit of energy generated by low or zero carbon technologies can only be allocated to dwellings that are directly supplied by the installation via dedicated supplies.

Discharge point: The point of discharge into watercourses and sewers (see definition of 'Watercourses and sewers')

Dry NOX: The NOx emissions (mg/kWh) resulting from the combustion of a fuel at zero per cent excess oxygen levels. If electricity is sourced from the national grid, the associate Dry NOx emissions are approximately 1200 mg/kWh.

Ecological features: Ecological features are defined in Checklist Eco 1 – Land of Low Ecological Value, and include trees, hedges, ponds, streams, rivers, marshes, wetlands, meadows, species-rich grassland, heath land and heather.

Environmental performance indicators (EPIs): When operated as part of a measuring-to-manage programme, environmental performance indicators allow companies to track how well they are doing and to identify opportunities to: save money and increase profits; use resources more efficiently; minimise waste (raw materials, product, energy, water, packaging, etc); and prevent pollution. For more information see http://envirowise.wrap.org.uk

EMS: Environmental management system.

EMAS: Eco-Management and Audit Scheme

(EPC) Energy Performance Certificate: This is a certificate that confirms the energy rating of the dwelling from A to G, where A is the most efficient and G is the least efficient.

EU Energy Efficiency Labelling Scheme: The EU energy label rates products from A (the most efficient) to G (the least efficient). For refrigeration, the scale now extends to A++. It is a legal requirement for the label to be shown on all

refrigeration and laundry appliances, dishwashers, electric ovens and light bulb packaging at point of sale.

(FEE) Fabric Energy Efficiency: Energy demand for space heating and cooling expressed in kilowatt-hours of energy demand per square metre per year (kWh/m2/year).

Finishing elements: For the purpose of this issue, the assessed finishing elements are defined as: Stairs, Windows, External and internal doors, Skirting, Panelling (including any other trim), Furniture, Fascias and any other significant use.

Flood probability: The estimated probability of a flood of given magnitude occurring or being exceeded in any specified time period. For example, the 100-year flood has a 1-in-100 or 1% chance of occurring in any given year.

Flood Risk Assessment (FRA): A study to assess the risk of a site flooding and the impact that any changes or development on the site will have on flood risk on the site and elsewhere. A flood risk assessment must be prepared according to good practice guidance as outlined in PPS25 *Development and Flood Risk: Practice Guide* (available from www.communities.gov.uk).

Flood storage: The temporary storage of excess run-off or river flow in ponds, basins, reservoirs or on a flood plain during a flood.

Global Warming Potential (GWP): Global Warming Potential is defined as the potential for global warming that a chemical has relative to 1 unit of carbon dioxide, the primary greenhouse gas. In determining the GWP of the blowing agent, the Intergovernmental Panel on Climate Change (*IPCC*) methodology using a 100-year Integrated Time Horizon (ITH) must be applied.

Green Dragon Environmental Standard® (Safon Amgylcheddol Y Ddraig Werdd®): A stepped standard used to accredit compliance with the Green Dragon environmental management scheme. Depending on the content of the EMS being assessed, a level of 1, 2, 3, 4 or 5 may be achieved. At level 4 and above, the Green Dragon Environmental Standard® can be used as evidence of a compliant EMS for small companies being considered under the Mat 2 and Mat 3 issues.

Greenfield run-off rate: The rate of run-off that would occur from the site in its undeveloped state.

The Green Guide to Specification: The Green Guide to Specification is an easy to use comprehensive reference website and electronic tool, providing guidance for specifiers, designers and their clients on the relative environmental impacts for a range of different building elemental specifications. The ratings

within the Guide are based on Life Cycle Assessment, using the Environmental Profile Methodology.

Grey-water recycling: The appropriate collection, treatment and storage of used shower, bath and tap water for use instead of potable water in WCs and/or washing machines. Grey-water recycling systems normally collect used shower, bath and tap water and recycle it for toilet flushing.

Habitable space: A space typically occupied for more than 30 minutes during the day with safe access by a permanent stairway or other means of entrance which complies with the requirements of relevant national Building Regulations and where the space is 'finished' with floor, walls, lighting and electric sockets.

Net internal floor area: The area of all *habitable spaces*, including the area taken up by halls, stairwells, cupboards, internal partitions, habitable loft spaces and basements. This also includes common areas of blocks of flats and apartment buildings, including stairwells, circulation spaces and entrance lobbies.

Inclusive access and usability: The purpose of the Code is not to deliver purpose-designed wheelchair housing but rather inclusive general needs housing that caters for the widest possible segment of the population (including older people), and which can easily be adapted to meet the needs of wheelchair users.

Infiltration techniques: Techniques which allow the passage of water into the ground. Techniques used purely for infiltration purposes would typically involve soakaways or pervious paving. Other SuDS techniques, such as swales and filter strips, will also achieve a level of infiltration but, unlike soakaways, they also normally function as a conveyance mechanism for transporting run-off.

Key processes: These are the final major aspects of processing that are carried out. There may be a single process or multiple processes requiring assessment, depending on the end product.

Limiting discharge: The limiting discharge is based upon the calculated pre-development flow rate at a discharge point, but may be increased to 5 l/s.

Low and Zero Carbon Technologies: Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Low ecological value: Land defined as having low ecological value using Checklist Eco 1 or defined by a suitably qualified ecologist as having low or insignificant ecological value.

(MCS) Microgeneration Certification Scheme: The Microgeneration Certification Scheme (MCS) is an independent scheme that certifies microgeneration products and installers in accordance with consistent standards. It is designed to evaluate microgeneration products and installers against robust criteria, and provides consumers with an independent indication of the reliability of products, assurance that the installation will be carried out to the appropriate standard and a route for complaints should there be any issues.

MTCC: Malaysian Timber Certification Council.

Net CO2 Emissions: The annual dwelling CO2 emissions (KgCO2/m2/year) from space heating and cooling, water heating, ventilation and lighting, and those associated with appliances and cooking.

No-sky line: The no-sky line divides those areas of the working plane which can receive direct light from the sky, from those which cannot. It is important as it indicates how good the distribution of daylight is in a room. Areas beyond the no-sky line will generally look gloomy.

Non-native invasive species: These are non-indigenous species (e.g. plants or animals) that adversely affect the habitats they invade economically, environmentally or ecologically. For the purposes of the Code, this currently includes only Japanese Knotweed and Giant Hogweed. Further information on their control and disposal and how this fits into the legislative framework relating to such species can be obtained from DEFRA.

Peak rate of run-off : Referred to as Qp [m^3/sec], this is the highest rate of flow from a defined catchment area assuming that rainfall is uniformly distributed over the drainage area, considering the entire drainage area as a single unit and estimation of flow at the most downstream point only.

PEFC: Programme for the Endorsement of Forest Certification Schemes.

Post-consumer waste stream: Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

Potable water: Drinking quality water that is taken from a connection to the mains water supply in the dwelling, which may be from the public water supply or a private supply such as from groundwater via a borehole.

Pre-consumer waste stream: Waste material generated during manufacturing processes. Excluded is reutilisation of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Probability of flooding – Low (Zone 1): Low annual probability of flooding is an area where the chance of both river and sea flooding each year is <0.1% (1 in 1000) or less.

Probability of flooding – Medium (Zone 2): An area where the chance of river flooding in any year is 1% (1 in 100) or less but greater than 0.1% (1 in 1000), and the chance of flooding from the sea is 0.5% – 0.1% (between 1 in 200 and 1 in 1000).

Probability of flooding – High (Zone 3a): An area where the chance of river flooding in any year is >1% (1 in 100) and the chance of flooding from the sea is >0.5% (1 in 200) or greater.

Probability of flooding – Functional flood plan (zone 3b): The land where water flows or is stored in times of flood.

Qbar: An estimation of the mean annual flood flow rate from a catchment (see Report IH124 *Flood estimations for small catchments*).

Rainfall intensity: Depth of rain falling in a period of time, e.g. mm/hour, sometimes given in l/s/m2.

Rainwater discharge: Rainwater discharge is the rainwater which flows from the development site to watercourses and sewers. It is also referred to as run-off.

Residual risk: The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented.

Robust details: Robust details (RDs) are construction solutions that provide an alternative to pre-completion sound insulation testing as a method of complying with Requirement E1 of Approved Document E (2003 Edition) of the Building Regulations (England and Wales). Robust details must be approved by Robust Details Ltd (RDL) and all development sites must be registered with RDL and built in accordance with the RD specification.

Run-off rate: The rate of flow of water from a surface.

(SAP) Standard Assessment Procedure for Energy Rating of Dwellings: The Government's approved methodology for assessing the energy performance of new dwellings. The current version is SAP 2009 version 9.90, dated March 2010, rev October 2010. The procedure accounts for energy used in space heating and cooling, hot water provision and fixed lighting.

(SBD) Secured by Design: This is a police initiative to encourage the building industry to adopt crime prevention measures in the design of developments to

assist in reducing the opportunity for, and fear of, crime, creating a safer and more secure environment. Secured by Design is owned by the Association of Chief Police Officers (ACPO), and has the support of the Home Office Crime Reduction & Community Safety Group and the Planning Section of the Department for Communities and Local Government.

Security lighting: Security lighting is provided to protect property. There are two types of security lighting commonly used in dwellings – high wattage intruder lights that are operated via PIR sensors which only switch on for a short time, and low wattage lighting that is controlled by time switches and daylight sensors.

SFI: Sustainable Forestry Initiative.

Site Inspection Report: A report prepared by the Code assessor during a post construction stage assessment and provided as evidence with the assessment.

Site Waste Management Plan Regulations 2008: Powers were included in the Clean Neighbourhoods and Environment Act 2005 for regulations requiring a SWMP for works involving construction or demolition waste. The regulations, which came into force in April 2008, mean that any construction project in England costing over £300,000 will require an SWMP. See www.environment-agency.gov.uk/business and www.defra.gov.uk.

Soakaway: Underground structure designed to permit infiltration into permeable/slightly permeable ground. They can be grouped and linked together to drain large areas including highways.

Space lighting: The normal lighting required to illuminate a space when in use. It can be used outside the entrance to the home, in outbuildings such as garages and cycle stores, and for external spaces such as paths, patios, decks, porches, steps and verandas.

Staggered dwellings: These are dwellings on several levels which are of unequal floor area. For example, a dwelling with a first floor area greater than the ground floor area which may overhang the ground floor.

Standard Case CO2 Emissions: CO2 emissions from the dwelling (Kg CO2/m2/year) assuming a standard systems specification, based on the Domestic Building Services Compliance Guide 2010 Edition.
Standard case CO2 emissions create the baseline against which the contribution of low and zero carbon technologies is measured. They represent the common scenario where a gas boiler is installed and ensure a 'level playing field' to allow a fair comparison of the contribution of low and zero carbon technologies, regardless of the carbon intensity of the actual heating fuel specified.

Statutory safety lighting: Safety lighting is usually provided in multi-residential buildings such as blocks of flats to illuminate stairwells and exit routes when the main lighting system fails. Its design is specified by regulation (BS 5266) and is therefore outside the scope of the Code.

SuDS: As defined in the SuDS manual, sustainable drainage systems are an approach to surface water management that combines a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.

Suitably qualified ecologist: A suitably qualified ecologist is defined as an individual who: Holds a degree or equivalent qualification (e.g. N/SVQ Level 5) in ecology or a related subject
Is a practising ecologist, with a minimum of three years' relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting ecology in relation to construction and the built environment, including acting in an advisory capacity to provide recommendations for ecological protection, enhancement and mitigation measures. Examples of relevant experience are ecological impact assessments, Phase 1 and 2 habitat surveys, and habitat restoration
Is covered by a professional code of conduct and subject to peer review.

Supply Chain EMS: This covers all the major aspects of processing and extraction involved in the supply chain for the end product. Note: *Recycled materials* are not required to demonstrate a supply chain EMS. If EMS certification is provided for the key processes for recycled materials, this is assumed by default.

(TER) Target Emission Rate: The target emission rate is the maximum allowable CO2 emissions per m2 (KgCO2/m2/year) arising from energy used in heating, cooling, hot water and lighting which would demonstrate compliance with Criterion 1 of AD L1A.
The TER is calculated using the SAP methodology according to the requirements defined in AD L1A.

Treatment (water): Improving the quality of water by physical, chemical and/or biological means.

Verified ecological report: A verified ecological report is a report carried out by an ecologist who does not fully meet the requirements of a suitably qualified ecologist.

Volume of run-off: The volume of run-off that is generated by rainfall occurring on the site. This is typically measured in cubic metres.

Working plane: The working plane is a notional surface, typically at about desk or table height, at which daylight factor or the 'no-sky line' is calculated or plotted.