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Proposed Residential Redevelopment – Broom Road, Teddington TW11 9BE

Teddington Riverside

Energy & Sustainability Statement

February 2014

CUNDALL

Haymarket Media Group

Teddington Riverside

Energy and Sustainability Statement

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-	01/11/2013	Draft for Comment
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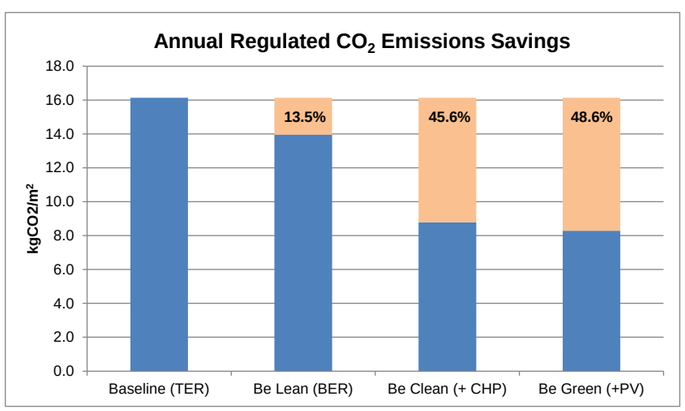
B	2/12/2013	Updated Planning Issue			
			Prepared by	Checked by	Approved by
		Name	PG	RP	
		Signature			

Contents

Total CO_2 Emissions	Absolute ($kgCO_2$ pa)	per sqm	Reduction
Baseline Emissions	499,816	20.0	-
Be Lean	445,368	17.8	10.9%
Be Clean (+CHP)	315,753	12.6	29.1%
Be Green (+PV)	303,422	12.1	3.9%



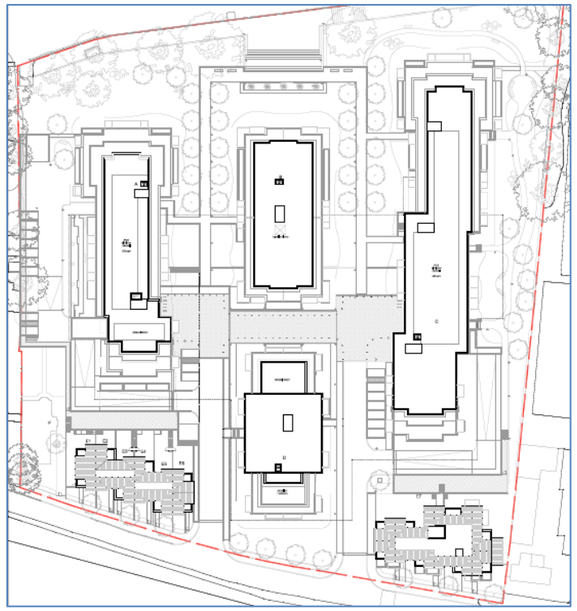
Regulated CO_2 Emissions	Absolute (tonnes/CO_2 pa)	% Reduction
Saving from Energy Efficiency	54	13.5%
Saving from CHP	130	37.1%
Saving from PV	12	5.6%
Total Cumulative Saving	196	48.6%
Total Target Saving	161	40.0%
Annual Surplus	35	

Predicted Annual CO_2 Emissions and Savings

1. Executive Summary

In accordance with the London Borough of Richmond upon Thames's Planning requirements and the GLA's London Plan the following energy and sustainability strategy has been developed for the proposed Teddington Riverside residential development.

- The building's envelope will be designed to perform significantly better than the Building Regulation standards, with extremely low U-values, accredited construction details and low design air leakage rates.
- Natural daylighting will improve occupancy comfort and reduce the requirement for artificial lighting.
- Good solar control will be provided by the selection of glazing/shading so as to avoid overheating in summer and increase passive gains in winter.
- The development will use low energy lighting together with occupant and daylight linked lighting controls.
- The use of efficient control systems will minimise energy wastage.
- All energy supplies will be metered using smart meters to enable residents and tenants to be responsible for their own consumption and hence CO_2 emissions.
- The London heat map indicates that there are no existing or proposed district heating networks in the vicinity of the site.
- As part of the energy centre design the feasibility of incorporating a Combined Heat & Power (CHP) has been investigated.
- The analysis indicates that a single 95kWe/160kWth natural gas-fired CHP engine could potentially satisfy up to 87% of the residential development's heat load This would result in a potential reduction of 37% in the development's regulated CO_2 emissions and 29% in the development's total annual CO_2 emissions.
- An analysis of renewable technologies has identified an area of roof space that could be used to accommodate approximately 200m^2 of Photovoltaic panel. This would result in a potential reduction of 5.5% in the development's regulated CO_2 emissions and 3.9% in the development's total annual CO_2 emissions
- **The total annual CO_2 savings for the development from the proposed measures is 48.6% over the base line Building Regulations 2010 target, which meets policy 5.2 of the London Plan.**
- A Code for Sustainable Homes Pre-Assessment has been conducted by a certified assessor for the proposed development and this indicates that a Level 4 rating can be achieved.



Proposed Site Location

2. Introduction

This Energy and Sustainability Statement has been prepared in support of the planning application for the proposed residential Teddington Riverside development in the London Borough of Richmond upon Thames. It aims to meet the energy and climate change planning requirements of the London Borough and the Greater London Authority.

The format of this statement is intended to reflect and respond to the issues raised in the GLA's 'Spatial Development Strategy for Greater London' - the 'London Plan'.

The structure is in accordance with the 'GLA's Guidance on preparing energy assessments' document September 2013, which provides detail on addressing the London Plan's energy hierarchy.

The principal objectives are to reduce the site's contribution to the causes of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and providing some of the requirement by renewable/sustainable means.

To guide and benchmark this process, the Building Research Establishment's Code for Sustainable Homes (CfSH) methodology has been used to assess the development. A preliminary assessment indicates that the development is likely to achieve a CfSH level 4 rating.

The CfSH considers the broad environmental concerns of climate change, pollution, impact on residents and the wider community. They balance these with the need for high-quality, safe and healthy internal living and working environment. These standards go beyond the requirements of the Building Regulations.

2.1 Description of Development

Full planning permission for the redevelopment of the Teddington Studio site. The proposed residential development incorporates a range of unit sizes across a number of buildings. A schedule of the proposed accommodation, used for the energy assessment, is given opposite.

Residential:

Building	Residential Area (m^2)
Building A	4,713
Building B	5,566
Building C	9,333
Building D	3,396
Building E7	1,156
Houses	854
Total	**25,018**

	Number
1 Bed Unit	45
2 Bed Unit	103
3/4 Bed Unit	71
Total	**219**

3. Planning Policy

The National Planning Policy Framework (NPPF) was published in March 2012 and states a clear presumption in favour of sustainable development. The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourages the use of renewable resources.

The NPPF replaces PPS22 and in Section 10 outlines its energy and climate change policies. To support the move to a low carbon future, local planning authorities should:

- Plan for new development in locations and ways which reduce greenhouse gas emissions;
- Actively support energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

In determining planning applications, local planning authorities should expect new developments to:

- Comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption;
- Have a positive strategy to promote energy from renewable and low carbon sources;
- Identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

The key focus of the NPPF is to support local and regional planning authorities.

3.1 The London Plan

The GLA London Plan and GLA Energy Strategy are considered to be the benchmark for local planning regulation. Together they provide a useful tool against which to undertake energy and sustainability assessments. For the purpose of this assessment they have been used in conjunction with the requirements of the London Borough of Richmond upon Thames, to help incorporate a number of energy efficiency measures into the proposed development. The key requirements of the London Plan (2011) for new developments are:

Policy 5.2 - requires that major developments, received after 1St October 2013, achieve a 40% improvement over the 2010 Building Regulation CO_2 Emission Target:

- 2010 – 2013 25 per cent
- 2013 – 2016 40 per cent
- 2016 – 2031 Zero carbon

Policy 5.6 - requires all major developments to evaluate the feasibility of connecting to existing or proposed district heating networks and where no opportunity exists to consider a site wide Combined Heat and Power (CHP) system.

Policy 5.7 - requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation, wherever feasible.

3.2 Local Policy – London Borough of Richmond upon Thames

The London Borough of Richmond upon Thames planning requirements related to the energy strategy of developments are addressed in the following sections.

The Council's development plan comprise the London Plan, the adopted Development (core) Strategy (April 2009) and the adopted Development Management Plan (November 2011), which replaces the UDP policies. In addition to these documents there is also a Supplementary Planning Document (SPD) called Sustainable Construction Checklist Guidance Document (August 2011).

The relevant energy policy contained within the core strategy is *CP2 Reducing Carbon Emissions*, which requires:

2.A The Borough will reduce its carbon dioxide emissions by requiring measures that minimise energy consumption in new development and promoting these measures in existing development, particularly in its own buildings.

2.B The Council will require the evaluation, development and use of decentralised energy in appropriate development.

2.C The Council will increase the use of renewable energy by requiring all new development to achieve a reduction in carbon dioxide emissions by 20% from on-site renewable energy generation unless it can be demonstrated that such provision is not feasible, and by promoting it use in existing development.

The Development Management Plan expands upon some of these policies, as detailed below.

Policy DM SD1 – Sustainable Construction requires that:

They must also achieve a minimum 25 per cent reduction in carbon dioxide emissions over building regulations (2010) in line with best practice from 2010 to 2013, 40 per cent from 2013 to 2016, and 'zero carbon' standards from 2016.

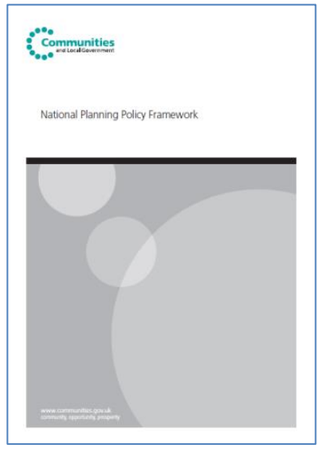
Policy DM SD2 - Renewable Energy and Decentralised Energy Networks requires development to conform with the Sustainable Construction Checklist and:

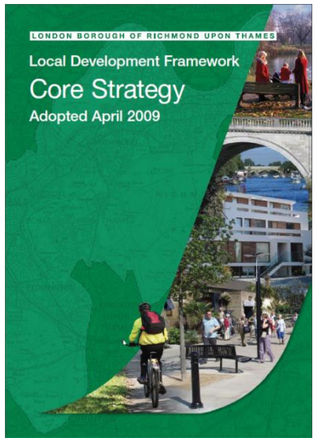
a) Maximise opportunities for the micro-generation of renewable energy. Some form of low carbon renewable and/or de-centralised energy will be expected in all new development.

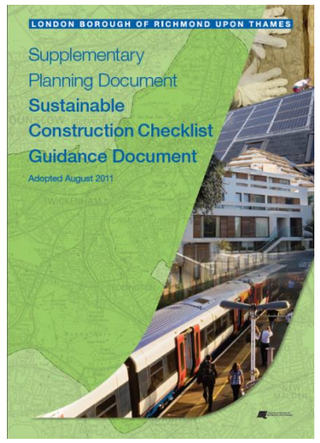
b) Developments of 1 dwelling or more, or 100 sqm of non-residential floor space or more will be required to reduce their total carbon dioxide emissions by following a hierarchy that first requires an efficient design to minimise the energy used, secondly, by using low carbon technologies and finally, where feasible and viable, including a contribution from renewable sources.

c) Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged where there is no over-riding adverse local impact.

d) All new development will be required to connect to existing or planned decentralised energy networks where one exists. In all major developments and large Proposal Sites identified in the Site Allocations DPD, provision should be made for future connection to a local energy network should one become available.

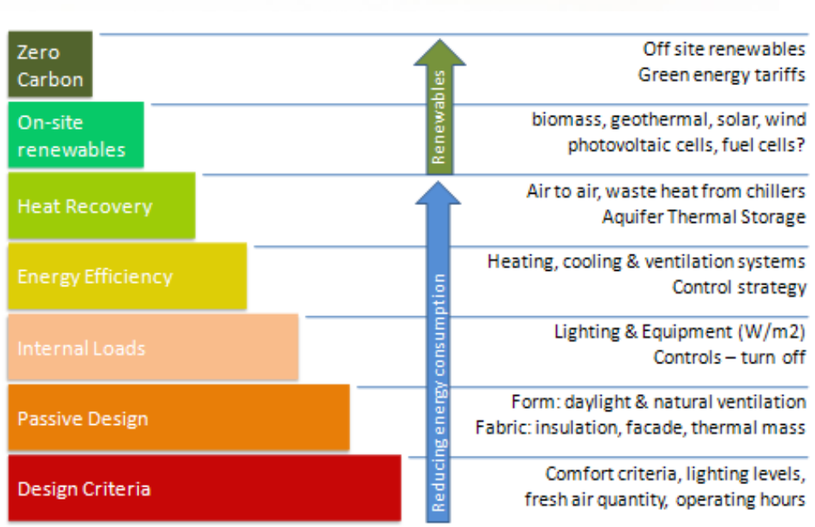






CP1 Sustainable Development

e) 1.A The policy seeks to maximise the effective use of resources including land, water and energy, and assist in reducing any long term adverse environmental impacts of development. Development will be required to conform to the Sustainable Construction checklist, including the requirement to meet the Code for Sustainable Homes level 3 (for new homes), Ecohomes "excellent" (for conversions) or BREEAM "excellent" (for other types of development).



Cundall's "Steps to low carbon"

4. Energy Strategy

The design of the proposed Teddington Riverside development has been developed to reduce its annual energy consumption, whilst providing energy in the most environmentally friendly way to reduce its annual CO_2 footprint. In order to achieve this, Cundall's "Steps to low carbon" methodology has been applied.

4.1 Passive Design

Substantial reductions in energy usage for the scheme will be achieved through consideration of the passive elements of the design, together with improved occupancy comfort. The aim for the design of the proposed development is to optimise the passive building elements, where practicable and hence reduce the energy consumption associated with the mechanical systems, whilst maintaining a balance between a range of requirements and accounting for factors such as site constraints and acoustic considerations.

4.1.1 Passive Solar Design

Glazing types and window locations have been considered, so that low angle winter solar gains and sun light are able to enter the space providing 'free' heating and lighting in winter, but are limited in summer so as to reduce the risk of 'overheating' and demand for cooling.

In the residential units the design of the living spaces will have large areas of glazing to open up the building to the landscape and allow light penetration, whilst in the bedroom areas the glazing areas have been reduced for privacy and reduced solar gains. The quantities of solar radiation entering the dwellings have been limited by the areas of glazing and by the glazing specification, which will call for glass with high light transmission (70%), but limited solar transmission (60%).

4.1.2 Building Envelope

Improving the thermal insulation standards beyond the minimum Building Regulation standards will help to reduce the annual CO_2 emissions associated with all of the building's heating and cooling systems, by limiting the heat loss though the building's fabric. The following improvements over the Building Regulation minimum standards are being sought for the development:

Building Element	Part L minimum standard U-value	Residential Design U-values
Floors	0.25 W/m^{2}K	0.15 W/m^{2}K
Roofs	0.25 W/m^{2}K	0.13 W/m^{2}K
Walls	0.35 W/m^{2}K	0.20 W/m^{2}K
Glazing	2.20 W/m^{2}K	1.40 W/m^{2}K
Doors	2.20 W/m^{2}K	1.40 W/m^{2}K

Proposed U-Value Table

4.1.3 Accredited Construction Details

With the introduction of the revised Building Regulations Part L 2010, the calculation and assessment of thermal bridge performance has greater impact than previously. Linear thermal bridge Ψ values if not considered carefully will have a high conductivity which will require a greater enhancement of the other elements of the building envelope to compensate. Where this is not possible, all architectural details will be in accordance with the enhanced construction details listed on the Energy Trusts website or as an absolute minimum as per the requirements of Accredited Construction Details document.

Accredited Construction Details (ACD's) have been developed to assist the construction industry to comply with the performance standards in Part L of the Building Regulations. They focus on issues concerning insulation continuity and airtightness and suggest a common approach to design, construction and testing methodology, and general improvements of the process.

4.1.4 Air Permeability

An air leakage rate of 3m^3/hr/m^2 at 50Pa is being target for the proposed development, in comparison with the Building Regulation minimum standards of 10m^3/hr/m^2 at 50Pa.

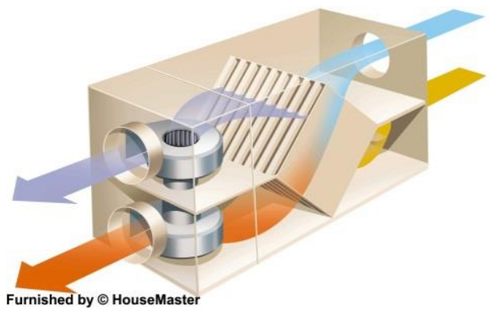
With these improved air tightness levels, it is important that the all of the ventilation systems are sized and installed correctly.

Good air tightness could be achieved by prefabrication of a number of key building components under factory conditions, robust detailing of junctions and good building practices on site.

4.1.5 Ventilation - MVHR

All elements of the development will be mechanically ventilated with heat recovery, substantially reducing their heating requirements.

Historically, fresh air in dwellings was supplied through window openings and trickle vents, but as these are uncontrolled systems they result in large amounts of wastage. In order to minimise the heating load associated with the fresh air, a controlled Mechanical Ventilation with Heat Recovery (MVHR) system is proposed for each dwelling. MVHR uses the heat in the extract air to pre-warm the incoming air, thereby reducing the heating load. The design of an MVHR system will need to ensure that the fan powers are minimised and that the ductwork is insulated to avoid heat losses to unconditioned spaces.



Furnished by © HouseMaster

The MVHR system is designed to provide fresh air for the occupants NOT air condition the space. Therefore the flats will have openable windows to enable them to be naturally ventilated in summer to avoid the risk of overheating.

4.2 Energy Efficient Systems & Appliances

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation.

4.2.1 Eco-Labelled Goods

As lights and appliances account for about a third of the CO_2 emissions in dwellings, where domestic appliances are installed energy efficient units will be incorporated, including A and A+ rated appliances.

4.2.2 Low-Energy Lighting

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual CO_2 emissions. The development will reduce the energy consumption by the specification of low energy luminaires with high frequency ballasts.

4.2.3 HVAC Plant Efficiencies

The design team will specify all equipment and plant to exceeded the minimum requirements of the domestic and non-domestic Building Services Compliance guides. They provide guidance on the means of complying with the requirements of both Part L1a and Part L2a of the Building Regulations for conventional space heating systems, hot water systems ventilation systems. In the commercial areas local on floor AHUs with heat recovery and VRF heat rejection units will serve each tenanted floor, with electric points of use water heaters.

4.2.4 Variable Speed Pumps and Drives

All fans and pumps will be specified with variable-speed drives, which will reduce their energy consumption by more than two-thirds compared with equivalent non variable speed alternatives, by only supplying the required flow rate to meet the demand.

4.2.5 Controls

The heating/cooling systems shall be appropriately zoned, with local fast responding thermostatic controls. Appropriate lighting controls, including timers, occupancy controls, daylight sensors and dimming shall be specified where applicable for all internal and external lighting

4.2.6 Energy metering

Metering of the separate energy uses within the development will help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems.

All electrical, gas and heat supplies will be metered using smart meters to enable residents and tenants to be responsible for their own consumption and hence CO_2 emissions. There will be central display areas for tenants and utility companies to view the meter readings.

4.3 Estimated Annual Energy Consumption

In accordance with the London Borough of Richmond upon Thames and the Mayor's Energy Hierarchy, the estimated energy consumption for the development has been based on the National Calculation Methodology (NCM).

The energy assessments have been carried out for the proposed scheme with the aforementioned passive and energy efficient measures.

4.3.1 Residential

In order to achieve the GLA and London Borough of Richmond upon Thames's planning requirement the residential development is required to achieve at least a 40% overall reduction in CO_2 over the Building Regulations Part L (2010) minimum standards.

Individual energy assessments have been carried out for typical dwellings to determine their estimated energy consumption and associated CO_2 emissions, using the SAP 2009 methodology. (All SAP calculations have been carried out using the approved software Elmhurst Energy and verified by an On Construction Domestic Energy Assessor).

The analysis indicates that the proposed dwellings are all performing significantly better than the minimum requirements of the Building Regulations and achieving improvements of between13% and 15% dependant on the dwelling. With an area weighted improvement for the residential development of 13.5% based on the design parameters listed opposite.

As stated the site is required to achieve a 40% reduction in CO_2 emissions. In order to achieve the required reduction in annual CO_2 emissions a proportion of the development's energy requirements will need to be meet by on-site energy generation and/or renewable energy technologies.

Residential Part L1a 2010 Results

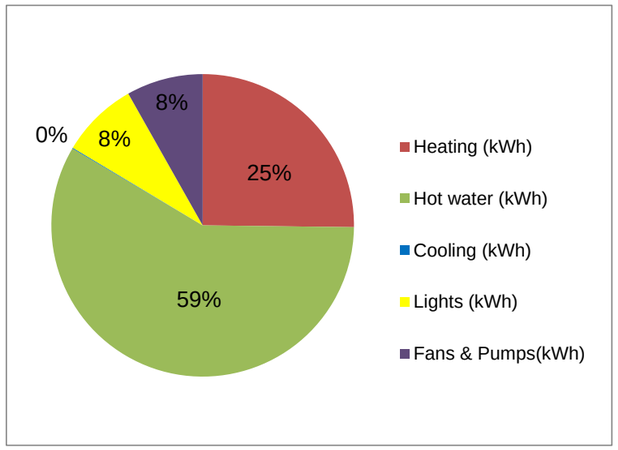
Detail	Design
Heating type	Combi boiler
Heating fuel	Natural gas
Gross boiler seasonal efficiency	90.00%
Boiler compensator	Load
Heat emitters	LTHW Radiators
Heating system controls	Time, Temp. & TRVs
MVHR Heat recovery efficiency	91%
MVHR Specific Fan Power (SFP)	0.41 W/l/s
MVHR Ductwork type	Rigid
Low energy light fittings	100%
Hot water daily usage	< 125 l/p/day

SAP Input Data

System	Energy Consumption (kWh)	
	Absolute	per sqm
Heating	342,255	13.7
Hot water	817,490	32.7
Cooling	1,225	0.05
Lights	115,452	4.6
Fans & Pumps	114,728	4.6
Total Energy	1,391,150	55.6

Part L1a 2010 CO_2 Emissions Results	
TER	16.14
DER	13.96
Pass Rate	13.5%
Status	PASS

Part L1a Assessment Results



Breakdown of Energy Consumption by Use

4.3.2 Site Wide CO_2 emissions

The estimated CO_2 emissions rates from the Building Regulations assessments for the residential accommodation is summarised in the table below and equates to a 13.4% reduction through energy efficiency measures.

The Building Regulation software does not include for all of the building's energy consumptions, as it does not allow for any CO_2 emissions from small power and catering. As these can be a substantial proportion of a building's annual CO_2 emissions, they have been estimated to be 7.43 kWh/m^2/year.

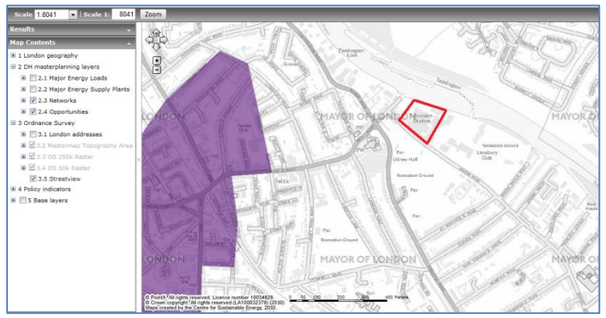
	$KgCO_2$	per sqm
Heating	67,767	2.71
Hot water	161,863	6.47
Cooling	633	0.03
Lights	59,689	2.39
Fans & Pumps	59,314	2.37
Regulated Emissions	**349,266**	**13.96**
Equipment*	96,102	3.84
Total Emissions	445,368	17.80

Be Learn - Combined CO_2 Emission

5. Decentralised Energy

5.1 District Heating Networks

The feasibility of connecting to an existing district network has been investigated for the site in accordance with Policy 5.6 of the London Plan. An analysis of the London Heat Map (www.londonheatmap.org) has shown there are no existing or proposed district heating schemes in the vicinity of the site.



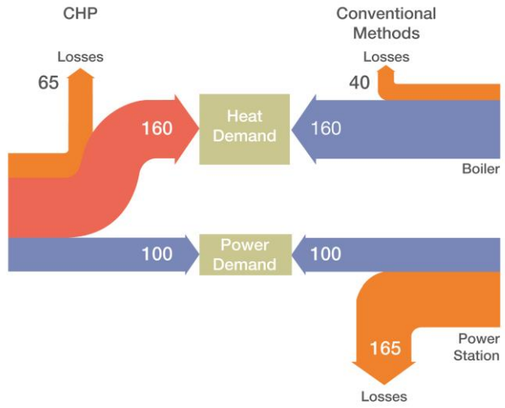
London Heat Map of the Surrounding Areas

However, an area to the west of the site has been identified as an opportunity area for the development of District Heating Scheme. The size of the proposed development would warrant the consideration of a site wide heating network, which could be connected to a wider district heating network if one is progressed in future.

It would therefore be proposed that all the residential accommodation is connected to a site wide heating network, which is served from a central energy centre.

5.2 Combined Heat & Power (CHP)

As part of the residential energy centre design the feasibility of incorporating a Combined Heat & Power (CHP) has been investigated in accordance with the GLA's Decentralised Energy Hierarchy in Policy 5.6.



CHP Efficiency Diagram

The analysis indicates that a single 95kWe/160kWth natural gas-fired CHP engine could potentially satisfy up to 87% of the residential development's heat load (including 100% of the base load). The electricity will be used within the development with the remainder being exported to the national grid for use in the rest of the development . This would result in a potential reduction of 37% in the development's regulated CO_2 emissions and 29% in the development's total annual CO_2 emissions. The CHP would operate in a modular arrangement with a number of high efficiency gas boilers and buffer vessels, supplying a LTHW system serving all of the residential units.

The inclusion of CHP and the provision for future connection to a district heating scheme, means that other low and zero carbon technologies such as biomass boilers and solar thermal collectors are no longer viable as they would compete for the development's base heat load.

5.3 Residual Emissions

After the application of the site wide heating network served by a CHP unit the site has the following residual CO_2 emissions.

	Annual CO_2 Emissions	
Total Site Emissions	445368 $kgCO_2/yr$	17.6 $kgCO_2/m^2$
+CHP Natural Gas Emissions	342931 $kgCO_2/yr$	13.6 $kgCO_2/m^2$
-CHP Dispaced Heat Emissions	200545 $kgCO_2/yr$	7.9 $kgCO_2/m^2$
-CHP Grid Displaced Electric Emissions	272001 $kgCO_2/yr$	10.8 $kgCO_2/m^2$
Residual Emissions	**315,753 $kgCO_2/yr$**	**12.5 $kgCO_2/m^2$**

6. Low and Zero Carbon Energy Sources

Policy 5.7 of the London Plan requires that all major developments seek to reduce their CO_2 emissions by at least 20% through the use of onsite renewable energy generation wherever feasible.

This equates to 63.2 tonnes of CO_2 target for the development, based on the residual emissions rate of the development after the application of decentralised energy sources:

CO_2 Emissions	Absolute ($kgCO_2$ pa)	per sqm
Residual Emissions	315,753	12.6
20% Renewables Target	63,151	2.5

The following technologies have been considered for supplying a proportion of each development's energy demand. The feasibility of each of the energy sources listed has been assessed with regard to the potential contribution each could make to supply a proportion of the development's delivered energy requirement, whilst considering the technical, planning, land use and financial issues, (a summary table outlining the findings of the assessments is contained in appendix A).

6.1.1 Biomass Heating

Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy due to the fact that the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing and transporting the fuel they will typically reduce net CO_2 emissions by over 90%.

In accordance with the London Plan's energy hierarchy a central energy centre is already proposed for the development. The CHP scheme will provide the development's base heat load and hence installing a biomass boiler has not been considered as a viable solution, as it would compete with the CHP to meet the base load.

6.1.2 Solar Thermal

Solar thermal collectors utilise solar radiation to heat water for use in buildings. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. For residential development this usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load.

However, as the base heat load is being provided from the central energy centre, the feasibility of installing solar thermal collectors has not been considered as viable, as it would compete with the CHP in the central energy centre.

6.1.3 ASHP (Air Source Heat Pump)

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems are inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

Typically there are two main types of air sourced heat pump systems, one which is refrigerant-based system (VRF) and one which is water based system (Air to water heat pumps).

VRF system transfer heat from one location another using refrigerant. The volume or flow rate of refrigerant is accurately matched to the required heating or cooling loads thereby saving energy and providing more accurate control.

Due to the fact that energy centre is already proposed for the development, using a VRF system has not been considered as a viable solution, as it would compete with the CHP to meet the base load.

6.1.4 Ground Source Heat Pumps (GSHP)

Ground sourced heat pumps differ from air source heat pumps in that they extract heat from the ground and pump it into a building to provide space heating and to pre-heat domestic hot water. In the summer months this process can be reversed, rejecting heat to the ground, to meet the cooling requirements of a building.

GSHPs rely on the stable temperature of the ground of between 10-14^{o}C. In winter when the ambient air temperatures are below this ground source heat pumps have higher CoPs than air source heat pumps (as there is more energy in the ground).

GSHP system only really work when there is a reasonably balanced heating and cooling requirement, so as not to heat up or cool down the ground around the piles. Additionally, the proposed site is fairly constrained and would not be able to accommodate enough energy piles to meet the peak summer cooling loads or the peak winter heating loads and hence would need to be installed in conjunction with a secondary heating and cooling system.

6.1.5 Wind Turbines

The output from wind turbines are highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind.

In urban environments it is difficult to achieve high wind speeds that would make the operation of turbines viable, unless they are located at a site where there is locally high wind speed or located on the roof of tall buildings, where obstructions and surrounding buildings would not interfere with the wind flow.

The location of the site coupled with the retained trees on site may result in a turbulent flow regime across the site. As such

it is not proposed to include wind turbines as part of the development.

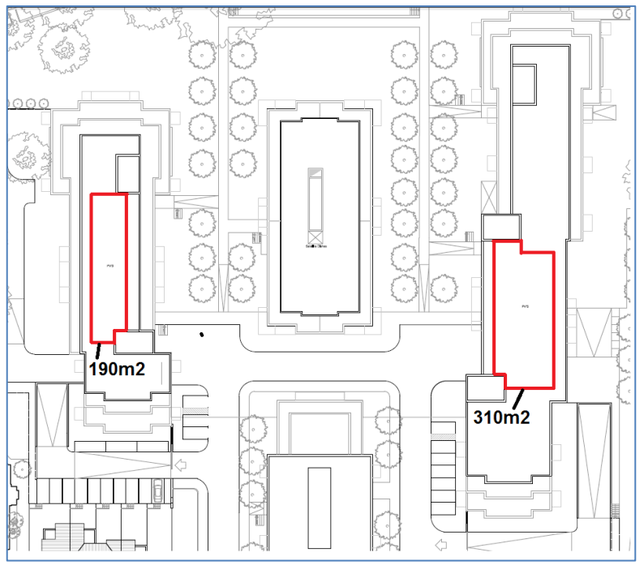
6.1.6 Photovoltaics

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

The advantage of photovoltaic cells is once they are installed they require minimal maintenance over their operational life and have no primary fuel requirements.

The roof spaces of the various buildings are being used for green roofs. However, an area has been identified on Buildings A and C that could be used to accommodate Photovoltaics cells, as shown in the image opposite. The areas identified provide approximately 500m^2 of roof space which, once access and spacing to avoid self-shading are accounted for, could accommodate approximately 200m^2 of Photovoltaic panels.

If 200m^2 of polycrystalline PV panels were provided with optimal orientation and inclination then they could provide a 3.9% reduction in the site's total residual CO_2 emissions.



7. Proposed Energy Strategy

In accordance with the London Borough of Richmond upon Thames's and the Mayor's Energy Hierarchy the estimated energy consumption for the development has been based on the National Calculation Methodology (NCM).

Policy 5.2 of the London Plan requires a carbon dioxide reduction target for new development of 40% over the current 2010 Building Regulations target. Energy assessments have been carried out for the proposed development based on the following energy strategies:

7.1 Residential Energy Strategy

The residential units will be well insulated with accredited and/or enhanced construction details ensuring heat losses are kept to a minimum. Mechanical Ventilation Heat Recovery (MVHR) units will provide the apartment's minimum fresh air requirements whilst recovering heat from the stale exhaust air.

The heating in the individual dwellings will be provided by a Low Temperature Hot Water (LTHW), connected up to site wide heating system via individual heat interface units, with heat meters, in the dwellings.

Domestic Hot Water (DHW) will be produced instantaneously by the individual heat interface units with no storage.

7.2 Renewable Energy Strategy

The feasibility of connecting to an existing or proposed district network has been investigated for the site in accordance with Policy 5.6 of the London Plan. The London heat map indicates that there are no existing or proposed networks within the vicinity of the site. However, the size of the proposed development would warrant consideration of a site wide heating network.

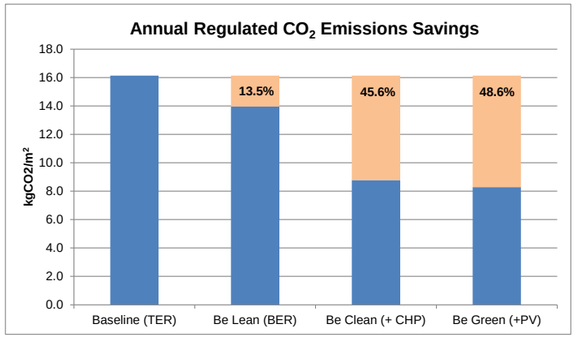
As part of the design the feasibility of incorporating a Combined Heat & Power (CHP) has been investigated. The analysis indicates that a single 95kWe/160kWth natural gas-fired CHP engine could potentially satisfy up to 87% of the development's heat load (including 100% of the base load). This would result in a potential reduction of 37% in the development's regulated CO_2 emissions and 29% in the development's total annual CO_2 emissions.

The inclusion of CHP and the provision for future connection to the proposed district heating scheme, means that other low and zero carbon technologies such as biomass boilers and solar thermal collectors are no longer viable as they would compete for the development's base heat load.

The application of Photovoltaic panels has been considered with an area identified on Buildings A and C that could be used to accommodate Photovoltaics cells. If 200m^2 of polycrystalline PV panels were provided with optimal orientation and inclination then they could provide a 3.9% reduction in the site's residual CO_2 emissions.

The tables below gives the reduction in the total CO_2 emissions, regulated and unregulated , of the site at each stage of the energy hierarchy.

The total annual CO_2 savings for the development from the proposed measures is 48.6% over the base line Building Regulations target.



Regulated CO_2 Emissions	Absolute (tonnes/CO_2 pa)	% Reduction
Saving from Energy Efficiency	54	13.5%
Saving from CHP	130	37.1%
Saving from PV	12	5.6%
Total Cumulative Saving	196	48.6%
Total Target Saving	161	40.0%
Annual Surplus	35	

Total CO_2 Emissions	Absolute (kgCO_2 pa)	per sqm	Reduction
Baseline Emissions	499,816	20.0	-
Be Lean	445,368	17.8	10.9%
Be Clean (+CHP)	315,753	12.6	29.1%
Be Green (+PV)	303,422	12.1	3.9%

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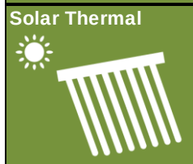
Appendix A – LZC Summary Table

	Equipment	Estimated Capital Cost (£)	Payback Period (yrs)	Annual CO_2 Emissions Savings	20 year life cycle cost	Feasibility (yes/no)	Physical,Spatial & land use Impact	Noise Impact	Additional Comments
VAWT 	**14No 6kW quietrevolution wind turbine(s)**	**£420,000**	**14**	**9.2%**	**-£169,820**	**NO**	Turbines must be sited away from obstructions. Above building roof heights and spaced at least 3 x their diameters apart horizontal	Wind turbines generate noise that can be heard, dependent on wind speed and direction, a few hundred metres away. However this level is normal only marginal greater than the actual wind noise itself (2-12 dB) and is hence not considered to be a problem	Built up area, estimated average windspeeds unlikely to be met for the majority of the year. Noise, safety and location all preclude wind turbines for this site.
HAWT 	**1No 15kW Proven 35 wind turbine(s)**	**£39,000**	**6**	**2.0%**	**-£99,678**	**NO**	Turbines must be sited away from obstructions. Above building roof heights and spaced at least 5 x their diameters apart horizontal	Wind turbines generate noise that can be heard, dependent on wind speed and direction, a few hundred metres away. However this level is normal only marginal greater than the actual wind noise itself (2-12 dB) and is hence not considered to be a problem	Built up area, estimated average windspeeds unlikely to be met for the majority of the year. Noise, safety and location all preclude wind turbines for this site.
Photovoltaics 	**200m² of Yingli Solar (235 W) Polycrystalline PV panels**	**£100,800**	**17**	**3.9%**	**-£16,680**	**YES**	Panels must be mounted on an area free from overshadowing	None	The initial analysis indicates that an area of the roof can be used to accommodate a PV arrray of 200m²
Solar Thermal 	**235m² of Evacuated Tubes Collectors**	**£117,500**	**19**	**8.0%**	**-£7,674**	**NO**	Collectors must be mounted on an area free from overshadowing	None	The inclusion of CHP and the provision for future connects to the proposed district heating scheme, means that other low and zero carbon technologies such as biomass boilers and solar thermal collectors are no longer viable as they would compete for the development's base heat load.
Biomass Boiler 	**100kW boiler burning Wood Chips (25% MC)**	**£42,000**	**1**	**41.2%**	**-£666,918**	**NO**	Potential issue of smoke & smell from boiler depending on moister content of fuel. ~ 30m³ fuel storage areas required with access for fuels deliveries.	Normal noises associated with boiler plant, noise convinced within the dedicated plant room. Potential additional noise generation associated with the fuel deliveries.	The inclusion of CHP and the provision for future connects to the proposed district heating scheme, means that other low and zero carbon technologies such as biomass boilers and solar thermal collectors are no longer viable as they would compete for the development's base heat load.
Heat Pumps - VRF 	**VRF heat pump(s): 147kW heating / 88kW cooling**	**£102,667**	**384**	**0.7%**	**£97,325**	**NO**	Minimal visual impact to site, will require additional plant space for heat pumps and external heat rejection units	Normal noises associated with HVAC plant, noise convinced within the dedicated plant areas	The development does not have anycooling demand and the heating demand will be served by the CHP.
Heat Pumps - GSHP 	**22No of 100m deep vertical boreholes**	**£137,500**	**12**	**6.3%**	**-£96,463**	**NO**	No visual impact to site, will require additional plant space for heat pumps and well heads.	Normal noises associated with HVAC plant, noise convinced within the dedicated plant areas	The proposed site is fairly constraint and would not be able to accommodate enough energy piles to meet the peak summer cooling loads or the peak winter heating loads and hence would need to be installed in conjunction with a secondary heating and cooling system.
CHP 	**1No of 95kWe / 160kWth gas-fired CHP engine**	**£73,815**	**10**	**29.1%**	**-£81,197**	**YES**	No visual impact to site, will require additional plant space for CHP engine	Normal noises associated with HVAC plant, noise contained within the dedicated plant areas	The analysis indicates that a single 95kWe/160kWth natural gas-fired CHP engine could potentially satisfy up to 87% of the residential development's heat load (including 100% of the base load).

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Appendix B – CfSH Pre-Assessment

Code for Sustainable Homes (Nov 2010 version)

Job Number: *1008572*
Building Name: *Teddington Riverside*

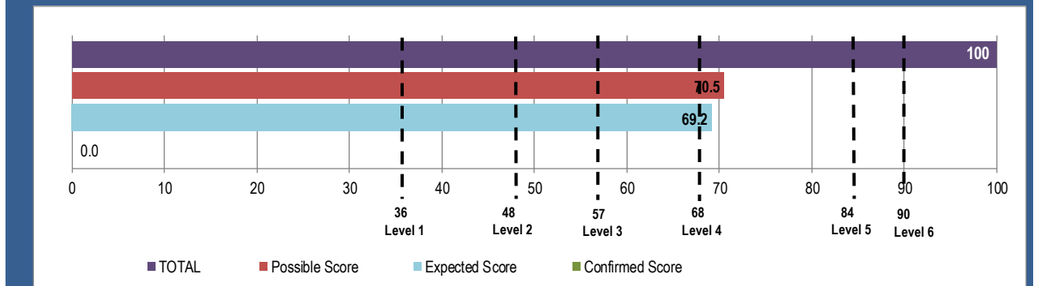
CSH Ref No: *tbc*
Assessor: *RP (STRO007484)*
Issue: *2*

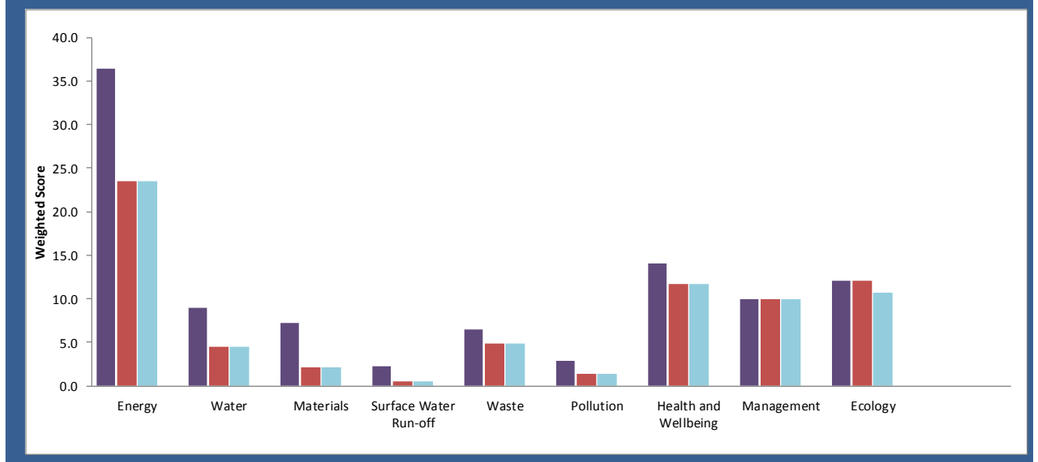
Code Levels

Rating	Score
Level 1	36
Level 2	48
Level 3	57
Level 4	68
Level 5	84
Level 6	90

SUMMARY CODE 2010 SCORE

Category	Total credits	Total weighted available score	Possible Score	Expected Score	Confirmed Score
Energy	31.0	36.4	23	23	0
Water	6	9.0	5	5	0
Materials	24	7.2	2	2.1	0
Surface Water Run-off	4	2.2	1	1	0
Waste	8	6.4	5	5	0
Pollution	4	2.8	1	1	0
Health and Wellbeing	12	14.0	12	12	0
Management	9	10.0	10	10	0
Ecology	9	12.0	12	11	0
TOTAL	**-**	**100**	**70.5**	**69.2**	**0.0**





Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Energy			**36.4%**			
Ene 1	**Dwelling Emission Rate**	**Ten credits** available – % improvement 2010 DER/TER				
		≥ 8%	**1**			
		≥ 16%	**2**			
		≥ 25% **Mandatory for Code Level 4**	**3**			
		≥ 36%	**4**			
		≥ 47%	**5**		**5**	
		≥ 59%	**6**			
		≥ 72%	**7**			
		≥ 85%	**8**			
		≥ 100% **Mandatory for Code Level 5**	**9**			
		Zero Net CO2 Emissions **Mandatory for Code Level 6**	**10**			
Ene 2	**Fabric Energy Efficiency**	**Nine credits** available for fabric energy efficiency (kWh/m2/yr) (figure taken from SAP2009 calculations)				
		Dwelling type: Apartment Blocks, Mid-Terrace				
		≤ 48	**3**			
		≤ 45	**4**		**4**	
		≤ 43	**5**			
		≤ 41	**6**			
		≤ 39 **Mandatory for Code Levels 5 &6**	**7**			
		≤ 35	**8**			
		≤ 32	**9**			
		OR Dwelling type: End Terrace, Semi-Detached & Detached				
		≤ 60	**3**			
		≤ 55	**4**			
		≤ 52	**5**			
		≤ 49	**6**			
		≤ 46 **Mandatory for Code Levels 5 &6**	**7**			
		≤ 42	**8**			
		≤ 38	**9**			
Ene 3	**Energy Display Devices**	**Two credits** available:				
		Where current electricity **OR** primary heating fuel consumption data are displayed to occupants by a correctly specified energy display device.	**1**			
		Where current electricity **AND** primary heating fuel consumption data are displayed to occupants by a correctly specified energy display device.	**2**		**2**	
Ene 4	**Drying Space**	**One credit** available to provide a reduced energy means of drying clothes				
		Where space and equipment are provided for drying clothes: • For 1 – 2 bed dwellings, drying equipment capable of holding 4m+ of drying line • For 3+ bed dwellings, drying equipment capable of holding 6m+ of drying line The drying space (internal or external) must be secure	**1**		**1**	
Ene 5	**Energy Labelled White Goods**	**Two credits** available:				
		All fridges, freezers, fridge-freezers are provided and have an A+ rating	**1**		**1**	
		All washing machines and dishwashers are provided and have an A rating **AND EITHER:** Washer-dyers or tumble dryers where provided have a B rating or higher **OR:** EU Energy Efficiency Labelling Scheme Information is provided to each dwelling in place of a tumble dryer or a washer dryer	**1**		**1**	
		Where no white goods are provided but EU Energy Efficiency Labelling Scheme Information is provided to each dwelling	**1**			
Ene 6	**External Lighting**	**Two credits** available:				
		Space Lighting Where all external space lighting, including lighting in common areas, is provided by dedicated energy efficient fittings with appropriate control systems. Note: Statutory safety lighting is not covered by this requirement	**1**		**1**	
		Security Lighting All burglar security lights have: • A maximum wattage of 150 W AND • Movement detecting control devices (PIR) AND • Daylight cut-off sensors All other security lighting: • Is provided by dedicated energy efficient fittings AND • Is fitted with daylight cut-off sensors OR a time switch	**1**		**1**	
		Default cases: If no security lighting is installed, the security lighting credit can be awarded by default, provided all the requirements related to space lighting have been met. Dual lamp luminaires with both space and security lamps can be awarded both credits provided they meet the criteria				

Ene 7	Low or Zero carbon (LZC) Technology	**Two credits** available:				
		Where energy is supplied by low or zero carbon technologies **AND** There is a 10% reduction in CO2 emissions as a result	1		1	
		OR There is a 15% reduction in CO2 emissions as a result	2		1	
		Note: Eligible technologies for this credit must meet any additional requirements defined in Directive 2009/28/EC as applicable, and be certified under the Microgeneration Certification Scheme, OR certified under the CHPQA standard				
Ene 8	Cycle Storage	**Two credits** available:				
		Individual or communal cycle storage provided, that is adequately sized, secure and convenient, for the following number of cycles: Studios or 1bed - 1 cycle for every two dwellings, 2 and 3bed dwellings - storage for 1 cycle per dwelling, 4beds and above - storage for 2 cycles per dwelling	1		1	
		OR Studios or 1bed - 1 cycle for per dwelling, 2 and 3bed dwellings - storage for 2 cycles per dwelling, 4beds and above - storage for 4 cycles per dwelling	2			
Ene 9	Home Office	**One credit**available: Where *sufficient* space and services have been provided which allow occupants to set up a home office in a *suitable* room. The space dedicated for use as a home office must have *adequate* ventilation and achieve an average daylight factor of 1.5%. Sufficient space: Min 1.8m wall length to allow a desk, chair and filing cabinet or bookshelf, with space to move around and use those properly Sufficient services: 2 double power sockets; 2 telephone points (or double), or one point where cable or broadband is available); a window; adequate ventilation Adequate ventilation: openable window (min. openable casement 0.5m2) or alternative e.g. passive stack	1		1	
		Total Credits	31	0.0	20.0	20.0
		Category Score		0%	65%	65%
		Weighted Points	1.17 per credit	0.0	23.5	23.5

Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Water			9.0%			
Wat 1	Indoor water use	**Five credits** available (assessed using Water Efficiency Calculator, taking into account sanitary fittings specifications, and any rain/grey water recycling systems)				
		≤ 120 l/p/day **Mandatory for Code Levels 1 & 2**	1			
		≤ 110 l/p/day	2			
		≤ 105 l/p/day **Mandatory for Code Levels 3 & 4**	3		3	
		≤ 90 l/p/day	4			
		≤ 80 l/p/day **Mandatory for Code Levels 5 & 6**	5			
Wat 2	External water use	**One credit** available: Where a correctly specified and sufficient sized system to collect rainwater for external/internal irrigation/use has been provided to a dwelling with a garden, patio or communal garden space (examples of such systems include rainwater butts and central rainwater collection systems) *Default case: If no individual or communal garden spaces are specified or if only balconies are provided, the credit can be awarded by default.*	1			
		Total Credits	6	0.0	3.0	3.0
		Category Score		0%	50%	50%
		Weighted Points	1.50 per credit	0.0	4.5	4.5

Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Materials			7.2%			
Mat 1	Environmental Impact of Materials	**Mandatory** requirement for at least 3 of the 5 following key elements to achieve A+ to D rating, from the 2008 version of the BRE Green Guide to Specification:				
		Fifteen credits available (assessed using the Code Mat1 Calculator):				
		Roof	15		2	
		External walls			1	
		Internal walls (including separating walls			3	
		Upper and Ground floors (including separating floors)			0	
		Windows			1	
		Credits are awarded on the basis of the Green Guide rating as follows: A+ rating = 3 credits; A rating = 2 credits; B rating = 1 credit; C rating = 0.5 credits; D rating = 0.25 credits; E rating = 0 credits				
Mat 2	Responsible Sourcing of Materials - Basic Building Elements	**Six credits** available (assessed using the Code Mat2 Calculator): Where 80% of the assessed materials in the following Building Elements are responsibly sourced: a. Frame b. Ground Floor c. Upper Floors (including separanting floors) d. Roof e. External Walls f. Internal Walls (including separating walls) g. Foundation/substructure (excluding sub-base materials) h. Staircase 100% of any timber in these elements must be legally sourced. Other materials - based on compliance accreditation under EMS/BES6001 etc for key and supply chain processes	6			
Mat 3	Responsible Sourcing of Materials - Finishing Elements	**Three credits** available (assessed using the Code Mat3 Calculator): Where 80% of the assessed materials in the following Finishing Elements are responsibly sourced: a. Stair b. Window c. External and Internal door d. Skirting e. Panelling f. Furniture g. Fascias h. Any other significant use 100% of any timber in these elements must be legally sourced. Other materials - based on compliance accreditation under EMS/BES6001 etc for key and supply chain processes	3			
		Total Credits	24	0	7.0	7.0
		Category Score		0%	29%	29%
		Weighted Points	0.30 per credit	0.0	2.1	2.1

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Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Surface Water Run-off			2.2%			
Sur 1	**Management of Surface Water Run-off from developments**	**Mandatory** requirements (see guidance, detailed requirements apply): 1) Peak Rate of Run-off - Ensure that the peak rate of run-off allowing for climate change, will be no greater for the developed site than it was for the pre-development site, at the 1 and 100 yr return events. Where there is a post-development flow rate, ensure that the limiting discharge is <5l/s at a discharge point 2) Volume of Run-off - A. Ensure that the additional predicted volume of run-off for the 100 year event of 6 hour event is prevented from leaving the site using infiltration or other SUDS techniques (see definitions) B. If A cannot be satisfied (full justification provided), then reduce the post development peak run off rate to the limiting discharge (equivalent to the 1-year peak flow rate, mean annual flood flow rate 2l/s/ha, whichever is highest. Other details apply, see guidance 3) Demonstrate that the flooding of property would not occur in the event of local drainage system failure (caused by extreme rainfall or lack of maintenance)				
		Note: If there is no increase in the man-made impermeable area as a result of the new development, then the above criteria do now apply.				
		One credit available by ensuring there is no discharge from the developed site for the rainfall depths up to 5mm (see calculation procedures)	1		1	
		One credit available by ensuring that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with the SUDS Manual to minimise the risk of pollution.	1			
Sur 2	**Flood Risk**	**EITHER:**				
		Two credits available for developments situated in Zone 1 - low annual probability of flooding (as defined in PPS25) and where the site specific Flood Risk Assessment (FRA) indicates that there is low risk of flooding from all sources **OR**	2			
		One credit is available for developments situated in Zones 2 and 3a and the finished ground floor level of all habitable parts of dwellings and access routes to the ground level and the site, are placed at least 600 mm above the design flood level of the flood zone.	1			
		Total Credits	4	0.0	1.0	1.0
		Category Score		0%	25%	25%
		Weighted Points	0.55 per credit	0.0	0.6	0.6

Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Waste			6.4%			
Was 1	**Storage of non-recyclable waste and recyclable household waste**	**Mandatory** requirements: Space allocated for waste storage to be sized to accommodate containers with the largest of the two following volumes: 1) the minimum volume recommended by BS5906(2005) based on a max collection frequency of once per week: 100 ls volume for a single bed dwelling with further 70 ls for each additional bedroom. 2) the total volume of external waste containers provided by the Local Authority. In either case, the storage space must provide inclusive access and usability (checklist IDP) and containers must not be stacked.				
		Up to four credits available:				
		Two credits available where internal recyclable storage is provided, where there is no (or insufficient) dedicated external recyclable storage, no Local Authority collection scheme, and the following are met: At least 3 internal bins; located in adequate internal space (requirements apply); minimum total capacity of 60ls	2			
		Four credits for providing both internal and external recyclable storage space. Combination of adequate internal storage with either: 1) a Local Authority collection scheme, or 2) no Local Authority collection scheme but adequate external storage capacity. For 1) collection at least fortnightly, recyclables sorted after collection, single bin of at least 30ls provided internally; recyclables sorted before collection, 3 bins provided internally, total capacity 30ls, no bin <7ls; an automated waste collection system for at least 3 types of recyclable waste. For 2) at least 3 internal recyclable bins total capacity 30ls, no bin <7ls AND externally 3 bins total cacacity 180ls, no bin <40ls OR (for flats), externally 3 bins, pricate recycling scheme operator to collect waste regularly and maintain bins, bins sized according to frequency of collection	4		4	
Was 2	**Construction Site Waste Management**	**One credit** available: where there is a compliant Site Waste Management Plan (SWMP) (see guidance)	1			
		Where there is a compliant SWMP including procedures and commitments to sort and divert waste from landfill, through either; a. Re-use on site (in situ or for new applications) b. Re-use on other sites c. Salvage/reclaim for re-use d. Return to the supplier via a 'take-back' scheme e. Recovery and recycling using an approved waste management contractor f. Compost **AND** One of the following has been achieved: **Two credits:** where at least 50% by weight or by volume of non-hazardous construction waste generated by the project has been diverted from landfill.	2		2	
		Three credits: where at least 85% by weight or by volume of non-hazardous construction waste generated by the project has been diverted from landfill.	3			
Was 3	**Composting**	**One credit** available: Individual home composting facilities **OR** Local communal or community composting service **OR** Local Authority green/kitchen waste collection system. All facilities must: be in a dedicated position; provide inclusive access and usability (Checklist IDP); have an information leaflet provided to each dwelling	1			
		Total Credits	8	0	6	6
		Category Score		0%	75%	75%
		Weighted Points	0.80 per credit	0.0	4.8	4.8

Pollution

Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
			2.8%			
Pol 1	Global Warming Potential (GWP) of Insulants	**One credit** where all insulating materials in the building fabric and services only use substances that have a GWP<5 5 (manufacture AND installation). Elements included: roof, internal and external walls, floors, hot water cylinders, pipe insulation, cold water storage, external doors (see guidance for detailed list).	1		1	
Pol 2	NOx emissions	**Three credits** are available, depending on the average dry NOx emissions of heating systems (space heating/hot water)				
		≤ 100 mg/kWh	1		1	
		≤ 70 mg/kWh	2			
		≤ 40 mg/kWh	3			
		Default cases: Where all the space heating and hot water energy requirements are fully met by systems which do not produce Nox emissions (3 credits)				
		Total Credits	4	0.0	2.0	2.0
		Category Score		0%	50%	50%
		Weighted Points	0.70 per credit	0.0	1.4	1.4

Health & Wellbeing

Credit Ref	Title	Credit Criteria	Available credits	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
			14.0%			
Hea 1	Daylighting	**Three credits** available: Kitchens must achieve a min. average daylight factor of at least 2%	1			
		All living rooms, dining rooms and studies (include any room designated as home office under Ene 9) must achieve a minimum average daylight factor of at least 1.5%	1		1	
		80% of the working plane in each kitchen, living room, dining room and study (include any home office room under Ene9) must receive direct light from the sky	1			
Hea 2	Sound Insulation	**Four credits** available, regarding sound insulation. All three can be demonstrated through **EITHER** A programme of pre-completion testing based on the Normal programme of testing described in Approved Document E, for every group or sub-group of houses or flats, demonstrating that the above standard or standards are achieved **OR** Use of constructions for all relevant building elements that have been assessed and approved as Robust Details by Robust Details Limited (RDL) and found to achieve the performance standards stated above. All relevant dwellings must be registered with RDL.				
		• airborne sound insulation values are at least 3dB higher • airborne sound insulation values are at least 3dB higher than the performance standards of Building Regulations Approved Document E(2003, with amendments 2004)	1			
		• airborne sound insulation values are at least 5dB higher • airborne sound insulation values are at least 5dB higher than the performance standards of Building Regulations Approved Document E(2003, with amendments 2004)	3			
		• airborne sound insulation values are at least 8dB higher • airborne sound insulation values are at least 8dB higher than the performance standards of Building Regulations Approved Document E(2003, with amendments 2004)	4		4	
		Default cases: Detached dewllings (4 credits). Attached dwellings where separating walls or floors only occur between non habitable rooms (3 credits).				
Hea 3	Private Space	**One credit** available, for providing outdoors space (private or semi-private) that is: of minimum size that allows all occupants to use the space; provided with inclusive access and usability (checklist IDP); accessible only to occupants of designated dwellings	1		1	
Hea 4	Lifetime Homes	**Four credits** are available where all the principles of Lifetime Homes have been complied with - **Mandatory for Code Level 6** (**OR** where an exemption from Lifetime Homes criteria 2 and/or 3 is applied to selected pathways subject to a steeply sloping plot gradient, but all other principles of Lifetime Homes, applicable to the dwelling being assessed, have been complied with - 3 credits)	4		4	
		Total Credits	12	0.0	10.0	10.0
		Category Score		0%	83%	83%
		Weighted Points	1.17 per credit	0.0	11.7	11.7

Management

Credit Ref	Title	Credit Criteria	Available credits (10.0%)	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Man 1	Home User Guide	**Two credits** available: Provision of a Home User Guide, compiled in accordance with Checklist Man1, Part1, together with confirmation that the guide is available in alternative formats.	2		2	
		In addition, **one credit** where the guide includes additional information relating to the site and its surroundings and is compiled in accordance with Checklist Man1, Part 2.	1		1	
Man 2	Considerate Constructors Scheme	**One credit** where there is a commitment to to meet best practice under a nationally or locally recognised certification scheme such as the Considerate Constructors Scheme (score 24 or above - no section <3)	1			
		Two credits where there is a commitment to go significantly beyond best practice under a nationally or locally recognised certification scheme such as the Considerate Constructors Scheme (score 32 or above - no section <3)	2		2	
Man 3	Construction Site Impacts	**One credit** where 2 or more of items a-g (listed below) are achieved. a. Monitor, report and set targets for CO2 or energy arising from site activities b. Monitor, report and set targets for CO2 or energy arising from transport to and from site c. Monitor, report and set targets for water consumption arising from site activities d. Implement best practice policies in respect of air (dust) pollution arising from the site e. Implement best practice policies in respect of water (ground and surface) pollution occurring on the site f. 80% of timber site is reclaimed, re-used or responsibly sourced	1			
		Two credits where 4 or more of items a-f are achieved.	2		2	
Man 4	Security	Two credits where an Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA) from the local police force has been consulted at the design stage and their recommendations incorporated into the design of the dwelling AND Section 2 – Physical Security from 'Secured by Design – New Homes' is complied with (Secured by Design certification is not required).	2		2	
		Total Credits	9	0.0	9.0	9.0
		Category Score		0%	100%	100%
		Weighted Points	1.11 per credit	0.0	10.0	10.0

Ecology

Credit Ref	Title	Credit Criteria	Available credits (12.0%)	Confirmed credits - evidence received	Expected credits - subject to evidence	Possible credits - design team to confirm
Eco 1	Ecological value of site	**One credit** where the development site is confirmed as land of low ecological value EITHER by meeting the criteria of Checklist Eco1 OR by being confirmed by a suitably qualified Ecologist OR confirmed by an independent ecological report prepared by a suitably qualified ecologist AND any land of ecological value outside the construction zone but within the development site will remain undisturbed by the construction works.	1		1	
Eco 2	Ecological Enhancement	**One credit** available where a "Suitably Qualified Ecologist" has been appointed to recommend appropriate ecological features that will positively enhance the ecology of the site AND where the developer adopts all key recommendations AND 30% of additional recommendations	1		1	
Eco 3	Protection of Ecological Features	**One credit** available where all existing features of ecological value on the development site potentially affected by the works are maintained and adequately protected during site clearance, preparation and construction works.	1		1	
		Deafult cases: Credit awarded by default if the site was classified as having low ecological value in Eco1 AND no features of ecological value have been identified. If a suitably qualified ecologist has confirmed a feature can be removed because of its insignificant ecological value or where an arboriculturalist has confirmed a feature can be removed owing to poor health/condition, the credit can be achieved provided all other features are adequately protected in accordance with the ecologist's recommendations.				
Eco 4	Change in Ecological Value of Site	**Four credits** available, depending on the net change in ecological value of the site before and after development. The ecological value before and after development is measured, and the overall change in species per hectare is:				
		Minor negative change: between -9 and less than or equal to -3	1			
		Neutral: greater than -3 and less than or equal to +3	2			
		Minor enhancement: greater than 3 and less than or equal to 9	3		3	
		Major enhancement: greater than +9	4			1
Eco 5	Building Footprint	**Two credits** available depending on the ratio of floor area to building footprint (see details of definitions in the guidance).				
		For houses, where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater than or equal to 2.5:1 **OR** For blocks of flats, where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater or equal to 3:1 **OR** For a combination of houses and flats, a ratio of Total Net Internal Floor Area: Net Internal Ground Floor Area of all houses and flats is greater than the area weighted average of the two target ratios above (see calc.procedures)	1			
		For houses, where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater than or equal to 3:1 **OR** For blocks of flats, where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater or equal to 4:1 **OR** For a combination of houses and flats, a ratio of Total Net Internal Floor Area: Net Internal Ground Floor Area of all houses and flats is greater than the area weighted average of the two target ratios above (see calc.procedures)	2		2	
		Total Credits	9	0	8	9
		Category Score		0%	89%	100%
		Weighted Points	1.33 per credit	0.0	10.7	12.0