Melbourne Road, Teddington
Sustainability Report

FEBRUARY 2012

CLIVE CHAPMAN
ARCHITECTS
SUSTAINABILITY CONSULTANTS

4 EEL PIE ISLAND
TWICKENHAM MIDDX
TW1 3DY
TELEPHONE 0208 891 4837
FACSIMILE 0208 744 1152
E MAIL CC@CCAR.CO.UK

CONTENTS

	Name	**Title**
Prepared by	Phil Davies	
Revision Log		
First Issue	24st February 2012	Sustainability Report

Our ref: MR_ pd_Melbourne Road, Teddington/reports/sustainability/Sustainability Report February 2012

1.0 Introduction

Clive Chapman Sustainability Consultants have been appointed to carry out a sustainability assessment of 19 & 21 Melbourne Road, Teddington, Richmond upon Thames, for the construction of 2no 4 bedroom houses, each with a private garden. This report uses data from the "worst case" dwelling in the calculations.

The London Borough of Richmond upon Thames requires assessment of the environmental sustainability of the proposed development.

A detailed study has been carried out to comply with the London Borough of Richmond upon Thames Sustainable Construction Checklist, including:

a) How the proposed dwellings can achieve a Code for Sustainable Homes (CSH) 2010 Level 3. The assumptions have been stated within the CSH Pre-Assessment and the energy consumption and CO_2 emissions have been modeled using SAP 2009.
b) How the proposed dwellings can reduce the carbon dioxide emissions by at least 25% over Building Regulations Part L 2010.
c) How the proposed dwellings offset the predicted carbon dioxide emissions by at least 20% renewable energy technologies.

2.0 Code For Sustainable Homes

2.1 CSH Requirements:

The Code has six levels, 1 to 6, representing sustainable building design from pass level (above regulatory standards) to aspirational standard (zero carbon emissions) and some of the categories have mandatory minimum standards that must be achieved, particularly for carbon emissions and water consumption.

The minimum requirement for Code Level 3 is 57%.

2.2 CSH Pre-Assessment with Assumptions and Evidences required

This following pre-assessment estimate confirms how a rating of Code Level 3 can be achieved.

Code Level:	**3**
Predicted Score:	**57.17%**
Mandatory Requirements	**All met**

Note: The Pre-Assessment is based on the CSH Technical Guide November 2010. The CSH guidance is continuously updated by BREEAM. It may therefore be necessary to update the pre-assessment with current guideline when registering with BREEAM at the Design Assessment Stage

The Assessor (for itself and as an agent for its staff) and its staff shall not be liable whether in contract or in tort or otherwise for any loss or damage sustained as a result of using or relying on the information given in this report

breglobal

Results

Development Name:	21 Melbourne Road, Teddington
Dwelling Description:	1 no.4 Bed, Three storey dwelling with private garden and parking space
Name of Company:	Clive Chapman Architects
Code Assessor's Name:	Sidonie Kade
Company Address:	4 Eel Pie Island, Twickenham, Middlesex, TW1 3DY
Notes/Comments:	21st December 2011

PREDICTED RATING - CODE LEVEL: 3

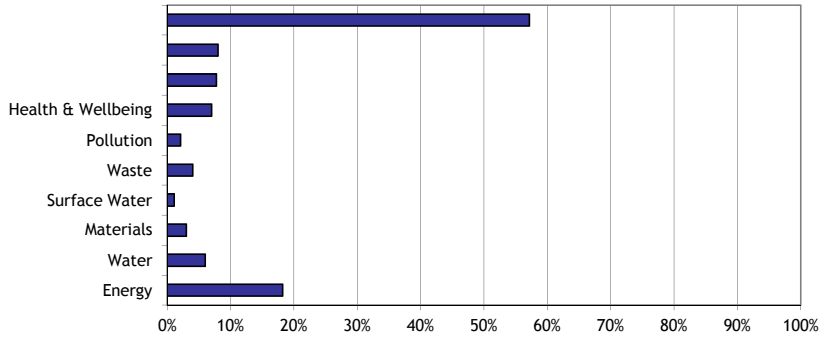
Mandatory Requirements: **All Levels**

% Points: **57.17%** **- Code Level: 3**

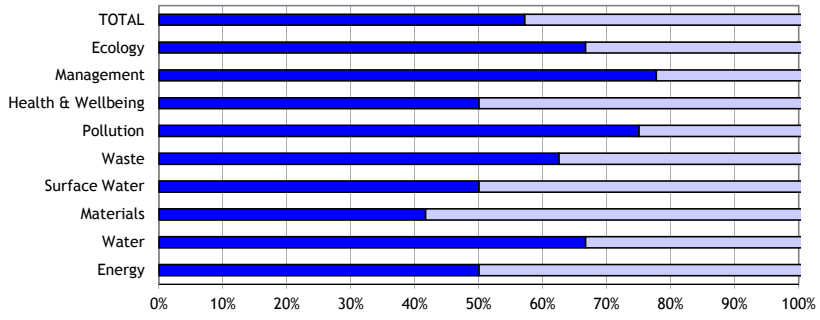
Breakdown: **Energy** **- Code Level: 4**

Water **- Code Level: 4**

Graph 1: Predicted contribution of individual sections to the total score and percentage of total achievable score



Graph 2: Predicted percentage of credits achievable: Total and by Category



NOTE: The rating obtained by using this Pre Assessment Estimator is for guidance only. Predicted ratings may differ from those obtained through a formal assessment, which must be carried out by a licensed Code assessor.

CATEGORY 1 ENERGY	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 50.00		Credits	Level		
Contribution to Overall % Score: 18.20 points		15.5 of 31 Credits	Level 4		
Ene 1 Dwelling Emission Rate	Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER) as calculated using SAP 2009. Minimum standards for each Code level apply. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score What is the predicted number of credits? 3.5 OR Are zero net CO_2 emissions achieved? ☐	3.5 of 10 Credits	Level 4	Assumed that the Dwelling Emission Rate (DER) will achieve a 30.5% improvement on the Target Emission Rate (TER) of a notional dwelling of the same shape and size and standard levels of insulation, glazing and active systems for heating and ventilation (ENE 1&2 Reults).	SAP ASSESSOR: SAP Worksheet for each energy type and list of specifications from accredited energy assessor; specification text confirming intention where SAP cannot be produced at Design Stage; the Design Stage Part L1A Building Regulations Compliance Checklist; .CODE ASSESSOR: outputs from Ene 1, Ene 2 & SAP input tool; DESIGN TEAM: plans, elevations and sections as designed and construction details sufficient to check building details; copies of utilities location maps;
Ene 2 Fabric Energy Efficiency	Credits are awarded based on the Fabric Energy Efficiency ($kWh/m^2/yr$) of the dwelling. Minimum standards apply at Code levels 5 and 6. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score Apartments, Mid-terrace ○ OR End terrace, Semi and Detached ◉ OR Staggered Mid terrace ○ What is the predicted number of credits? 0.0	0.0 of 9 Credits	-	The building heat loss parameter as currently designed is 71.9 kWh/m2/yr (HER Plan Assessor Results page. FEE/ ENE1&2 Results Section)	SAP ASSESSOR: SAP Worksheet; specification text confirming intention where SAP cannot be produced at Design Stage; the Design Stage Part L1A Building Regulations Compliance Checklist showing full compliance for each Energy Type. DESIGN TEAM: plans, elevations and sections as designed and construction details to check building details.
Ene 3 Energy Display Devices	Credits are awarded where a correctly specified Energy Display Device is installed monitoring electricity and/or primary heating fuel consumption. Select whether the EDD monitors electricity and/or fuel None Specified ○ Primary Heating only ○ OR Electricity only ○ OR Electricity and primary heating fuel ◉	2 of 2 Credits	-	It has been assumed that a correctly specified Energy Display Device will be installed, monitoring current electricity AND primary heating fuel consumption data, displayed to occupants.	

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 4 Drying Space	One credit is awarded for the provision of either internal or external secure drying space with posts and footings or fixings capable of holding 4m+ of drying line for 1-2 bed dwellings and 6m+ for dwellings with 3 bedrooms or greater. **Will drying space meeting the criteria be provided?** Yes ◉ OR No ○	**1 of 1 Credits**	-	Assumed that Code Compliant Internal drying space or External drying space with rotary dryer will be provided. The minimum drying length required is 6m in 3 bed (or more)dwellings.	DESIGN TEAM: relevant drawings showing location/details of drying fixings; spedification text confirming intention where drying space spec. is not known at DS; letter to contractor/supplier; letter to assessor giving the specific undertaking.
Ene 5 Energy Labelled White Goods	Credits are awarded where each dwelling is provided with either information about the EU Energy Labelling Scheme, White Goods with ratings ranging from A+ to B or a combination of the previous according to the technical guide. **Select the appropriate option below** EU Energy labelling information only ☐ A+ rated appliances ☑ A+, A and B rated appliances ☑ Combination of compliant rated white goods with EU Energy Labelling Scheme ☐	**2 of 2 Credits**	-	It has been assumed that each dwelling will be provided with fridges/freezers or fridge-freezers with an A+ rating, washing machines and dishwashers with an A rating, tumble dryers or washer dryers with a B rating if supplied. If tumble dryers or washer dryers will not be supplied, an EU Energy Efficiency Labelling Scheme Information will have to be provided.	If white goods are provided: DESIGN TEAM: text in the specification and drawings describing details of all white goods to be provided; copy of EU Energy Efficiency Labelling scheme energy rating. If no white goods are provided: DESIGN TEAM: copy of a leaflet describing the EU Energy Efficiency Labelling Scheme; text on specification and drawings confirming that leaflets are going to be provided; letter to contractor/supplier; letter to assessor giving the specific undertaking.
Ene 6 External Lighting	Credits are awarded based on the provision of space lighting* with dedicated energy efficient fittings and security lighting fittings with appropriate control gear.. **Space Lighting** None provided ○ OR Non Code compliant lighting ○ OR Code compliant lighting ◉ **Security Lighting** None provided ◉ OR Non Code compliant lighting ○ OR Code compliant lighting and controls ○ **Dual lamp luminaires** Compliant with both above criteria ☐ * Statutory safety lighting is not covered by this requirement	**2 of 2 Credits**	-	It has been assumed that Code compliant energy efficient space lighting will be provided, and that there will be no security lighting.	DESIGN TEAM: drawings clearly showing location/details of all external light fittings and confirmation of the types of light fittings and efficacy, in lumens per circuit watt for all lamps; spec. text confirming intention where external lighting spec. is not known at DS; letter from developer to assessor giving the specific undertaking.

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 7 Low or Zero Carbon Technologies	Credits are awarded where there is a 10% or 15% reduction in CO_2 emissions resulting from the use of low or zero carbon technologies. Select % contribution made by low or zero carbon technologies Less than 10% of demand ○ OR 10% of demand or greater ○ OR 15% of demand or greater ◉	**2 of 2 Credits**	-	The borough of Richmond Upon Thames requires at least a 20% reduction in carbon dioxide emissions from on-site renewable energy,therefore it has been assumed that at least 15% Low or Zero Carbon Technologies will be provided	CLIENT: confirmation that a feasibility study has been carried out by an independent energy specialist. SAP ASSESSOR: SAP 2005 DER Worksheet and specifications showing the carbon emissions; for LZC technologies and fuels not covered by SAP, manufacturer's technical data/details.CODE ASSESSOR: copy of Ene 7 tool; confirmation that the spec. LZCs will be funded by LCBP. DESIGN TEAM: drawings showing location/details of LZC equipment; spec. text confirming intention where details of LZCs are not known at DS
Ene 8 Cycle Storage	Credits are awarded where adequate, safe, secure and weather proof cycle storage is provided according to the Code requirements. Fill in the development details below Number of bedrooms: 4 Number of cycles stored per dwelling* 4.0 * if you have storage for 1 cycle per two dwellings insert 0.5 in number of cycles stored per dwelling	**2 of 2 Credits**	-	It has been assumed that an adequatelty sized, secure and convenient communal bike storage will be provided for at least 1 per bedroom. The storage will include an area of at least 1m2 for garden tools.	DESIGN TEAM: drawings showing location/details of provided cycle storage; notes and calculations showing the bedrooms served by the cycle storage; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking.
Ene 9 Home Office	A credit is awarded for the provision of a home office. The location, space and services provided must meet the Code requirements. Will there be provision for a Home Office? Yes ◉ OR No ○	**1 of 1 Credits**	-	It has been assumed that a Home Office will be provided, offering sufficient space (minimum 1.8m wall length, to allow a desk, chair and filing cabinet, with space to move around the front and side of the desk, use the ahir appropriately and operate thefining cabinet savely) and services (two double power sockets, two telephone points, window minimum 0.5sqm, daylight factor 1.5%, adequate ventilation).	DESIGN TEAM: drawings showing location/details of the provided home office; details confirming adequate ventilation; text confirming broadband availability to each dwelling; average daylight calculations; spec. text confirming intention where details are not known at DS; letter of instruction to supplier; letter to assessor giving the specific undertaking.

CATEGORY 2 WATER	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.66		Credits	Level		
Contribution to Overall Score: 6.00 points		4 of 6 Credits	Level 4		
Wat 1 Indoor Water Use	Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply. Select the predicted water use / Mandatory Requirement greater than 120 litres/ person/ day ○ OR ≤ less than 120 litres/ person/ day ○ OR ≤ less than 110 litres/ person/ day ○ OR ≤ less than 105 litres/ person/ day ◉ OR ≤ less than 90 litres/ person/ day ○ OR ≤ less than 80 litres/ person/ day ○	3 of 5 Credits	Level 3 AND Level 4	Internal water needs to be <105 litres per person per day to achieve Code Level 3. To meet this requirement the following fittings will be installed: Kitchen basin taps to have flow rate of <4litres/min Bathroom taps to have flow rate of <4litres/min Dual Flush WC's (4/2 Litre) Best Practice washing machine (if installed) Best Practice Dishwasher (if installed) AND/OR Grey water recycling providing water for toilet flushing and/ or Rainwater harvesting system providing water for washing machines.	DESIGN TEAM: specification text and drawings showing location/details of appliances/fittings that use water in the dwelling, and of rainwater and greywater collection systems; manufacturers' literature; spec. text confirming intention where details of water fittings are not know at DS; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: completed Code Water Calculator Tool.
Wat 2 External Water Use	A credit is awarded where a compliant system is specified for collecting rainwater for external irrigation purposes. Where no outdoor space is provided the credit can be achieved by default. Select the scenario that applies No internal or communal outdoor space ○ OR Outdoor space with collection system ◉ OR Outdoor space without collection system ○	1 of 1 Credits	-	It has been assumed that a 200 litre water butt, connected to the rainwater downpipe with a removable lid for cleaning and tap for drawing off water will be installed on the site.	DESIGN TEAM: specification text and drawings showing location/details of any rainwater collection system; spec. text confirming intention where details are not known at DS; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking.

CATEGORY 3 MATERIALS	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 41.66		Credits	Level		
Contribution to Overall Score: 3.00 points		10 of 24 Credits	All Levels		
Mat 1 Environm-ental Impact of Materials	Mandatory Requirement: At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D. Tradable Credits: Points are awarded on a scale based on the Green Guide Rating of the specifications. The Code Materials Calculator can be used to predict a potential score. Mandatory Requirement Will the mandatory requirement be met? ☑ Enter the predicted score What is the predicted number of credits? 10	10 of 15 Credits	All Levels	It is assumed that at least 3 out of 5 key elements will achieve a rating of A+ to D from the Green Guide 2008. The following materials have been assumed: • Roof–Timber trussed rafters and joists with insulation, roofing underlay, counterbattens, battens and reclaimed clay tiles - A+ • External walls- Cement rendered aircrete blockwork outer leaf, insulation, medium dense solid blockwork inner leaf, cement mortar, plaster, paint A+ • Internal walls -Lightweight solid blockwork - B • Windows –Hardwood, double glazed - A+	DESIGN TEAM: specification text and drawings showing location/details of the elements; note to explain why a bespoke element is used instead of the available rating stated in the Green Guide; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: completed Code Mat 1 Calculator Tool.
Mat 2 Responsible Sourcing of Materials - Basic Building Elements	Credits are awarded where materials used in the basic building elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits?	0 of 6 Credits	-	No proof of responsible sourcing of materials.	DESIGN TEAM: specification text/drawings showing location/details of the elements/materials specified; letters. CODE ASSESSOR: completed Code Mat 2 Calculator Tool. CONTRACTOR: documentation for re-used and recycled materials; letter of intent for EMS certified materials and certified timber to use suppliers capable of providing certification to the level.
Mat 3 Responsible Sourcing of Materials - Finishing Elements	Credits are awarded where materials used in the finishing elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits?	0 of 3 Credits	-	No proof of responsible sourcing of materials.	DESIGN TEAM: specification text/drawings showing location/details of the elements/materials specified; letters. CODE ASSESSOR: completed Code Mat 3 Calculator Tool. CONTRACTOR: documentation for re-used and recycled materials; letter of intent for EMS certified materials and certified timber to use suppliers capable of providing certification to the level.

CATEGORY 4 SURFACE WATER RUN-OFF	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted:	50.00%	Credits	Level		
Contribution to Overall Score:	1.10 points	2 of 4 Credits	All Levels		
Sur 1 Management of Surface Water Run-off from developments	Mandatory Requirement: Peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. Desiging the drainage system to be able to cope with local drainage system failure. Tradable Credits: Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters. Mandatory Requirement Will the mandatory requirement be met? ☑ Select the appropriate option No SUDS ☐ No runoff into watercourses for the first 5 mm of rainfall ☑ Runoff from hard surfaces will receive an appropriate level of treatment ☑	2 of 2 Credits	All Levels	It has been assumed that peak runoff rates and annual run-off post development must be no greater than the previous conditions for the Peak runoff rates. No discharge from the developed site for rainfall depths up to 5mm will be ensured. SuDS systems will provide suitable treatment to minimise the risk of pollution.	CLIENT: confirmation of the appointment of an appropriate consultant. FLOOD RISK CONSULTANT: report and Flood Risk Assessment; plans of proposed operation and maintainance; report, calculations and drawings to support awarding credits; proposed operation and maintenance plans. DESIGN TEAM: drawings/specification necessary to support the claims made.
Sur 2 Flood Risk	Credits are awarded where developments are located in areas of low flood risk or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide. Select the annual probability of flooding (from PPS25*) Zone 1 - Low ○ OR Zone 2 - Medium ○ OR Zone 3 - High ◉ Select the apropriate option(s) Low risk of flooding from FRA** ☐ All measures of protection are demonstrated in FRA ☐ Ground floor level and access routes are 600 mm above design flood level ☐ * Planning Policy Statement 25 - Planning and Flood Risk ** FRA - Flood Risk Assessment	0 of 2 Credits	-	The site is characterized as High Flood Risk Zone based on the Strategic Flood Risk Assessment for The London Borough of Richmond upon Thames. Therefore no credit can be targeted.	FLOOD RISK CONSULTANT: Flood Risk Assessment; written confirmation of Environment Agency in case of reduction in flood risk category, manufacturer's data covering details of any flood protection. DESIGN TEAM: site plans or drawings showing necessary details.

CATEGORY 5 WASTE	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted:	62.00%	Credits	Level		
Contribution to Overall Score:	4.00 points	5 of 8 Credits	All Levels		
Was 1 Storage of non-recyclable waste and recyclable household waste	Mandatory Requirement: The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906. Tradable Credits are awarded for adequate internal and/ or external recycling facilities. **Mandatory Requirement** Will the minimum space be provided and be accessible to disabled people? ☑ **Internal Recyclable household waste storage** Where there is no external recyclable waste storage and no Local Authority collection scheme Internal storage (capacity 60 litres) ☐ **Local Authority collection Scheme** Post Collection sorting Internal storage (capacity 30 litres) ☐ Pre-collection sorting Internal storage (3 separate bins, capacity 30 litres) ☑ **External Storage, no Local Authority collection scheme** 3 separate internal storage bins (capacity 30 litres) ☐ **AND** Houses External Storage(capacity 180 litres) ☐ Flats Private recycling operator ☐ 3 or greater types of waste collected ☐	0 of 2 Credits 4 of 4 Credits 0 of 4 Credits	All Levels	Storage of household waste: the minimum recommended volume (310l) or the volume requested by the LA has to be met. Recyclable waste: a combination of internal storage capacity (30l total, each bin at least 7l) provided in an adequate internal space with a Local Authority collection scheme will be provided.	CODE ASSESSOR: supplementary Information Sheet; Checklist Was 1. CONTRACTOR: confirmation from the Local Authority or a private recycling scheme operator; confirmation from LA detailing container spec./frequency and waste streams of collection. DESIGN TEAM: drawings or specification text of location/details of provided elements; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking.

Issue		Credits	Level	Assumptions Made	Evidence Required
Was 2 Construction Site Waste Management	A credit is awarded where a compliant SWMP is provided with targets and procedures to minimise construction waste. Credits are available where the SWMP include procedures and commitments for diverting either 50% or 85% of waste generated from landfill. SWMP details Does the SWMP include: + No SWMP ◉ + SWMP with targets and procedures to minimise waste? ○ + SWMP with procedures to divert 50% of waste ○ + SWMP with procedures to divert 85% of waste ○	**0 of 3 Credits**		It has been assumed that no commitments to Construction Site Wast Management will be made.	CONTRACTOR: copy of SWMP or documentary legal evidence confirming the agreed cost of small developments; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: Checklist Was 2a, 2b, 2c and 2d.
Was 3 Composting	A credit is awarded where individual home composting facilities are provided, or where a community/ communal composting service, either run by the Local Authority or overseen by a management plan is in operation. Select the facilities available No composting facilities ○ Individual composting facilities ◉ OR Communal/ community composting*? ○ Local Authority ☐ OR Private with management plan ☐ * including if an automated waste collection system is in place	**1 of 1 Credit**	-	It has been assumed that a composting facility will be provided in combination with a LA scheme.	CODE ASSESSOR: Checklist Was 1. DESIGN TEAM: specifications and drawings of location/details of storage; confirmation that information booklet will be supplied; manufacturers' details; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CONTRACTOR: details of the communal/community composting scheme or the Local Authority or the automated waste collection system.

CATEGORY 6 POLLUTION	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 75.00%		Credits	Level		
Contribution to Overall Score: 2.10 points		3 of 4 Credits	All Levels		
Pol 1 Global Warming Potential (GWP) of Insulants	A credit is awarded where all insulating materials only use substances (in manufacture AND installation) that have a GWP of less than 5. Select the most appropriate option All insulants have a GWP less than 5 ◉ OR Some insulants have a GWP of less than 5 ○ OR No insulants have a GWP of less than 5 ○	1 of 1 Credits	-	It has been assumed that all insulants will have a GWP of less than 5 (roofs, walls, floors, hot water cylinder, cold water storage tanks - where provided, external doors).	CODE ASSESSOR: Checklist Pol 1. DESIGN TEAM: drawings showing location/details of all insulation materials; manufacturer's details; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CONTRACTOR: specifictaion clause of intent to meet the requirements.
Pol 2 NOx Emissions	Credits are awarded on the basis of NOx emissions arising from the operation of the space and water heating system within the dwelling. Select the most appropriate option Greater than 100 mg/kWh ○ OR Less than 100 mg/kWh ○ OR Less than 70 mg/kWh ○ OR Less than 40 mg/kWh ○ OR Class 4 boiler ○ OR Class 5 boiler ◉ OR All space and hot water energy requirements are met by systems who do not produce NOx emissions ○	2 of 3 Credits	-	It is assumed that a gas boiler of at least class 5 will be incorperated.	DESIGN TEAM: text and drawings with details of heating systems; manufacturer's details; confirmation of dry NO x levels and/or boiler class; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: SAP worksheet; calculations of dry NO x.

CATEGORY 7 HEALTH & WELLBEING	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 50.00%		Credits	Level		
Contribution to Overall Score: 7.00 points		6 of 12 Credits	No level		
Hea 1 Daylighting	Credits are awarded for ensuring key rooms in the dwelling have high daylight factors (DF) and a view of the sky. Select the compliant areas Room Kitchen: Avg DF of at least 2% ☐ Living Room*: Avg DF of at least 1.5% ☐ Dining Room*: Avg DF of at least 1.5% ☐ Study*: Avg DF of at least 1.5% ☑ 80% of working plane in all above rooms receive direct light from the sky? ☑ Any room used for Ene 9 Home Office must also achieve a min DF of 1.5%.	1 of 3 Credits	-	It is assumed that the study will have an average daylightfactor of 1.5%. It is assumed that 80% of the working plane of kitchen/dining room/ living room receive direct light from the sky. To be confirmed by the design team.	DESIGN TEAM: calculations with details; manufacturer's confirmation; drawings showing details; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: Hea 1 Tool.
Hea 2 Sound Insulation	Credits are awarded where performance standards exceed those required in Building Regulations Part E. This can be demonstrated by carrying out pre-completion testing or through the use of Robust Details Limited. Select a type of property Detached Property ◉ Attached Properties: - Separating walls and floors only exist between non habitable spaces ○ - Separating walls and floors exist between habitable spaces ○ Select a performance standard Performance standard not sought ◉ Airborne: 3db higher; Impact: 3dB lower ○ OR Airborne: 5db higher; Impact: 5dB lower ○ OR Airborne: 8db higher; Impact: 8dB lower ○	4 of 4 Credits	-	The dwelling is a detached property, therefore the credits can be assumed by default.	DESIGN TEAM: confirmation that site is registered by RDL; confirmation that Robust Details chosen will achieve the required preformance standards for sound insulation; details of separating walls; letter of instruction to contractor; letter to assessor giving the specific undertaking. CONTRACTOR: confirmation of commitment to meet the relevant sound insulation performance levels; sound testing details; confirmation of commitment to carry out remedial work where necessary; Compliant Test Body accreditation details.

Issue		Credits	Level	Assumptions Made	Evidence Required
Hea 3 Private Space	A credit is awarded for the provision of an outdoor space that is at least partially private. The space must allow easy access to all occupants. Will a private/ semi-private space be provided? Yes, private/semi-private space will be provided ◉ OR No private/semi-private space ○	**1 of 1 Credits**	-	It has been assumed that at least 1.5m2 per bedroom of private outdoor space will be provided. To be designed to allow all occupants of the designated dwelling inclusive access in line with Checklist IDP.	DESIGN TEAM: drawings or specification text confirming requirements; details of the security/control arrangements for access of shared outdoor space; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking.
Hea 4 Lifetime Homes	Mandatory Requirement: Lifetime Homes is mandatory when a dwelling is to achieve Code Level 6. Tradable credits: Credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Mandatory Requirement Dwelling to achieve Code Level 6? ☐ Lifetime Homes Compliance All Lifetime Homes criteria will be met ○ OR Exemption from LTH criteria 2/3 applied ○ Credit not sought ◉	**0 of 4 Credits**	**No level**	It is assumed that no Lifetime Homes criteria will be met.	DESING TEAM: completed Checklist Hea 4.

CATEGORY 8 MANAGEMENT	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 77.00%		Credits	Level		
Contribution to Overall Score: 7.77 points		7 of 9 Credits	All Levels		
Man 1 Home User Guide	Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code requirements. Tick the topics covered by the Home User Guide Operational Issues? ☑ Site and Surroundings? ☑ Is available in alternative formats? ☑	3 of 3 Credits	-	It has been assumed that a Home User Guide will be produced that will cover operational issues, sites and surroundings and will be available in alternative formats.	CLIENT: confirmation that the guide will be supplied to all dwellings; letter to assessor giving the specific undertaking. CODE ASSESSOR: Checklist Man 1; summary of Home User Guide content.
Man 2 Considerate Constructors Scheme	Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme. Select the appropriate scheme and score No scheme used ◉ Considerate Constructors OR Best Practice: Score between 24 and 31.5 ○ OR Best Practice+: Score between 32 and 40 ○ Alternative Scheme* OR Mandatory + 50% optional requirements ○ OR Mandatory + 80% optional requirements ○ * In the first instance, contact a Code Service Provider if you are considering to use an alternative scheme.	0 of 2 Credits	-	It has been assumed that no credits will be targeted under this criteria.	CONTRACTOR: confirmation of commitment; letter of instruction/intent to assessor giving the specific undertaking. CODE ASSESSOR: Checklist Man 2.
Man 3 Construction Site Impacts	Credits are awarded where there is a commitment and strategy to operate site management procedures on site as following: Tick the impacts that will be addressed Monitor, report and set targets, where applicable, for: - CO_2/ energy use from site activities ☑ - CO_2/ energy use from site related transport ☑ - water consumption from site activities ☐ Adopt best practice policies in respect of: - air (dust) pollution from site activities ☑ - water (ground and surface) pollution on site ☑ 80% of site timber is reclaimed, re-used or responsibly sourced ☐	2 of 2 Credits	-	It has been assumed that there is a commitment and strategy to operate site management procedures on site in terms of CO_2 /Energy use from site activites,CO_2 /Energy use from site related transport,air (dust) pollution from site activities, water (ground and surface) pollution on site.	CONTRACTOR: commitment to meet either, two or more, or four or more items in Checklist Man 3; Checklist Man 3; letter of instruction / intent from developer to contractor or assessor giving specific undertaking.

Issue		Credits	Level	Assumptions Made	Evidence Required
Man 4 Security	Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated. Secured by Design Compliance Credit not sought ○ OR Secured by Design Section 2 Compliance ◉	**2 of 2 Credits**	-	It is assumed that an Architectural Liaison Officer (ALO) will be appointed after planning and that their recommendations will be incorporated. The dwelling will comply with Section 2 of the Secured by Design - New Homes.	CLIENT: confirmation that ALO/CPDA has been or will be appointed; letter of instruction to contractor; letter to assessor giving the specific undertaking. CONTRACTOR: confirmation of commitment to meet Section 2 of Secured by Design; confirmation that the advice of the ALO/CPDA will be followed.

CATEGORY 9 ECOLOGY	Overall Level: 3	Overall Score	57.17	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.00%		Credits	Level		
Contribution to Overall Score: 8.00 points		6 of 9 Credits	All Levels		
Eco 1 Ecological Value of Site	One credit is awarded for developing land of inherently low value. Select the appropriate option Credit not sought ○ OR Land has ecological value ◉ OR Land has low/ insignificant ecological value* ○ * Low ecological value is determined either a) by using Checklist Eco 1 across the whole development site; or b) where an suitably qualified ecologist is appointed and can confirm or c) produces an independent ecological report of the site, that the construction zone is of low/ insignificant value; AND the rest of the development site will remain undisturbed by the works.	0 of 1 Credits	-	The site meets the requirements of Land with ecological value as determined by Checklist Eco 1 therefore no credit can be tageted under this criteria.	DESIGN TEAM: plans of the site and surrounding area prior to development; site visit reports; Checklist Eco1; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. ECOLOGIST: report; text or illustrations; confirmation that ecologist's qualifications meet requirements.
Eco 2 Ecological Enhancement	A credit is awarded where there is a commitment to enhance the ecological value of the development site. Tick the appropriate boxes Will a *Suitably Qualified Ecologist* be appointed to recommend appropriate ecological features? ☑ AND Will all key recommendations be adopted? ☑ AND 30% of other recommendations be adopted? ☑	1 of 1 Credits	-	It has been assumed that an Ecologist will be appointed to recommend appropriate ecological features to enhance the ecological value of the site, and that all key recommendations will be adopted and 30% of other recommendations will be incorporated.	ECOLOGIST: report; planting schedule; confirmation that Ecologist qualifications meet the requirements; confirmation ecologist made site visit prior to commencement of initial site work. DESIGN TEAM: confirmation how key recommendations will be incorporated into the design; letter of instruction to contractor/supplier; letter to assessor giving specific undertaking.
Eco 3 Protection of Ecological Features	A credit is awarded where there is a commitment to maintain and adequately protect features of ecological value. Type and protection of existing features Site with features of ecological value? ◉ OR Site of low ecological value (as Eco 1)? ○ AND All* existing features potentially affected by site works are maintained and adequately protected? ☑ *If a suitably qualified ecologist has confirmed that a feature can be removed due to insignificant ecological value or poor health conditions, as long all the rest have been protected, then this box can be ticked.	1 of 1 Credits	-	It has been assumed that the site is either of low / insignificant ecological value OR the features of ecological value potentially affected by site works will be maintained and adequatly protected.	DESIGN TEAM: site visit reports; drawings or specifications how ecological features will be protected; plans of the site prior to construction with necessary details of any requirement to remove any feature; confirmation that all EU and UK laws to protect species have been adhered to; letter of instruction to contractor/supplier; letter to assessor giving specific undertaking. ECOLOGIST: report.

Issue		Credits	Level	Assumptions Made	Evidence Required
Eco 4 Change of Ecological Value of Site	Credits are awarded where the change in ecological value has been calculated in accordance with the Code requirements and is calculated to be: Change in Ecological Value Major negative change: fewer than -9 ○ Minor negative change: between -9 and -3 ○ OR Neutral: between -3 and +3 ◉ Minor enhancement: between +3 and +9 ○ Major enhancement: greater than 9 ○	**2 of 4 Credits**	-	It has been assumed that the change of ecological value of the site will beneutral, that is between -3 amd +3. This assumption will have to be confirmed by the Ecologist.	DESIGN TEAM: drawings showing pre-development site; illustrations how the ecologist's recommendations will be implemented; letter of instruction to contractor/supplier; letter to assessor giving the specific undertaking. CODE ASSESSOR: calculations showing proposed change in ecological value. ECOLOGIST: report; planting schedule.
Eco 5 Building Footprint	Credits are awarded where the ratio of combined floor area of all dwellings on the site to their footprint is: Ratio of Net Internal Floor Area: Net Internal Ground Floor Area Credit Not Sought ○ OR Houses: 2.5:1 OR Flats: 3:1 ○ OR Houses: 3:1 OR Flats: 4:1 ◉ OR Houses & Flats Weighted (2.5:1 & 3:1) ○ OR Houses & Flats Weighted (3:1 & 4:1) ○	**2 of 2 Credits**		It has been assumed that the ratio of the combined floor area of all dwellings on site to their footprint is greater than 4:1 and will therefroe meet the requirements to score maximum credits. TBC by the Design Team.	DESIGN TEAM: general layout drawings showing the NIFA and NIFGA and elevations; calculations of the building footprint.

3.0 LBRUT Sustainable Construction Checklist

3.1 SCC Requirements:

The Sustainable Construction Checklist states that all developments and applications undertaken in the London Borough of Richmond will be expected to be assessed against the following 7 checklist items:

3.2 SCC Assumptions and Compliance:

Category	Description	Score
Minimum Policy Compliance	Environmental Rating system of the development. Accredited Assessors. Energy Assessment	4
Energy Use and Pollution	Need for Cooling. Heat Generation, Pollution: Air, Noise and Light	6
Transport[1]	Provision for the safe efficient and sustainable movement of people and goods	7
Biodiversity	Minimizing the threat to biodiversity from new buildings, lighting, hard surfacing and people	8.5
Flooding and Drainage	Reducing and mitigating the risks of flooding and other impacts of climate change in the borough	7
Improving Resource Efficiency	Reduce waste generated and amount disposed by landfill through increasing level of re-use and recycling. Reducing levels of water waste.	4
Design Standards and Accessibility	Ensure flexible adaptable and long-term use of structures	1
	TOTAL	37.5

An overall score of 37.5 credits will be achieved. This equals a C Rating of the LBRUT Sustainable Construction Checklist and makes "minimal effort to increase sustainability beyond general compliance".

[1]TRANSPORT STATEMENT

Following public transport links are available:

Buses: 281, 285 & R68 bus stops all within walking distance.

Trains: Over ground rail connections are available from Teddington (1.2 miles) and Hampton Wick (0.9 miles). The Underground District Line is available from Richmond Rail Station (4 miles).

Following weblinks provide details about cycling and walking routes in London:
http://www.tfl.gov.uk/http://walkit.com/cities/london/
roadusers/cycling/11607.aspx

4.0 Renewable Energy Options

4.1 Suitable Renewable/Low or Zero Carbon Technologies:

The London Plan was published in 2004 and requires the development plans for all London Boroughs to eventually comply with the requirements. The Mayor's Energy Hierarchy, described in the London Plan, comprises three stages of application: use less energy, use renewable energy and supply energy efficiently. This hierarchy has been adopted for this project and various high efficiency communal services systems and renewable energy systems have been investigated.

The London Borough of Richmond Upon Thames Sustainable Construction Checklist (SCC) requires the development to reduce the predicted site CO_2 emissions by at least 20% through the use of site renewable energy. The feasibility of renewable energy systems for this development has been investigated using the broad guidelines published by the Mayor of London in the document *Integrating Renewable Energy into New Developments: A toolkit for planners, Developers and Consultants*. This document is normally referred to as *The Toolkit*. The Toolkit includes a list of renewable energy system options which should be considered for specific building types in London.

The table below summarizes the systems available and their suitability for this project:

System	*Preliminary Assessment*	*Decision*
Wind generators	Planning and local community issues associated with noise and visual obstruction. Average wind speeds in urban/suburban locations unlikely to achieve the required speed of 6 m/s.	Rejected.
Photovoltaic, roof top	Building has a pitched roof which can be free of overshading for most of the day from other buildings or structures.	Likely to be suitable for this site.
Solar water heating	The building has a year-round hot water demand. It has a pitched roof which can be free of overshading for most of the day from other buildings or structures.	Likely to be suitable for this site.
Biomass heating – Fuels – wood, woodchips, pellets, some industrial waste products.	Biomass heating is a renewable energy technology. However, the system requires extensive space for storing the fuel (chips/pellets).	Rejected.
Biomass CHP	Limited suppliers to the London area. Biomass CHP is a renewable and energy efficient system to provide electricity and space and hot water heating. However, the small scale of the development is not suitable for a communal biomass CHP. Micro biomass CHPs are not available on the open market.	Rejected.
Ground source heat pumps for heating (space and hot water)	Ground may be accessible for vertical pipe system. Most appropriate use would be a low temperature system such as underfloor heating. However, because of financial reasons this option will not be considered.	Rejected
Ground sourced inc. borehole cooling, either direct or via a chiller	There is no need of a mechanical cooling system.	Rejected.

Renewable energy technologies suitable for London

System	*Preliminary Assessment*	*Decision*
Micro-hydro, small and low head	Some limited applications in London.	Rejected
Gas from anaerobic digestion	Technology being developed.	Rejected

Geothermal heat, hot rocks	Could be available in London but unlikely due to geology under London.	Rejected
Solar air collectors	Very small energy contribution and difficult to calculate and measure.	Rejected
Ground cooling air systems	No experience currently in the UK.	Rejected
Fuel cells using hydrogen from renewable sources	Not currently commercially available.	Rejected

Acceptable renewable energy technologies (not covered in detail in the toolkit);
'London renewables, Toolkit for planners, developers and consultants' September 2004

System	*Preliminary Assessment*	*Decision*
External and Exhaust Air source heat pumps for heating (space and hot water)	Air is an easily accessible means of heating. Most appropriate use would be low temperature system such as under floor heating. However, as it runs on electricity and is less efficient than Ground Source Heat Pumps the contribution of the system to the 20% renewable requirement is very low.	Rejected
Micro Combined Heat and Power (CHP)	Micro CHP units are energy efficient systems generating electricity and providing space and hot water heating. These gas fired systems are available for domestic use, however, the units are too small for the proposed development.	Rejected

LZC technologies (not covered in the toolkit; www.lowcarbonbuildings.org.uk/micro/);

4.2 Renewable Energy Technologies, Supporting Data:

Photovoltaic Panels:

Photovoltaic systems convert sunlight into electricity through semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn their direct current (DC) output into alternating current (AC) electricity for use in the home and / or to export to the national grid. PV systems require only daylight, not sunlight to generate electricity, so energy can still be produced in overcast or cloudy conditions.

PV collectors can be 'bolted on' to a suitable roof, be integrated into the fabric of the roof and to the façade. In order to achieve the optimum results, any obstructions should be minimized, the cells should face south-east and south-west, and be placed on a pitch between 30-40˚.

Typical domestic systems range from 1 – 3.5kW_p (1 kW_p system (mono crystalline) requires 8m^2 of panels) rating and can provide between 750 and 3,000kWh per year. From the DTI (domestic field trial performance analysis) domestic systems contribute on average 43% of the electrical load. Depending on the system, the efficiency of PVs range up to 15%.

In addition to PV panels, solar roof tiles are available that can be integrated into a new roof. Therefore, they do not dominate the appearance of the building. However, because a smaller number of cells can be mounted on one tile compared to the equivalent panel area, tiles are less efficient per m^2 than panels. Therefore, if the roof space is limited, it is recommended to install PV panels rather than tiles.

Fully installed the costs for roof mounted systems are £4,000 /$kW_{p,}$.
There should be very little maintenance required as the technology has no moving parts. Technically reliable, they are generally guaranteed to last between 20-25 years.

Feed-In Tariffs and Selling Electricity:

In order to incentivise the generation of low carbon electricity, the Government launched the Feed-In-Tariff in April 2010. The tariff is a guaranteed payment which will be received for every kWh produced by an eligible technology (Photovoltaic, Wind Turbine, pilot scheme for Combined Heat and Power units, Hydro Systems, Anaerobic Digestion). The amount received depends upon the type of technology and the date of installation, details of which are set-out at www.fitariffs.co.uk.

The technologies eligible for FITs include: wind; solar photovoltaics; hydro; anaerobic digestion; and a pilot range of domestic scale microCHP units.
In addition to the guaranteed FITs, producing electricity from renewable sources reduces the amount of conventionally generated electricity that needs to be bought from suppliers, further reducing costs.
Any electricity produced in excess of the user's requirements can be sold back to the grid.

Unfortunately due to government cut backs tariffs were reduced from 12th December 2011. New PV systems <4kWmay be reduced from 37.8p per kWh generated to 21p per kWh generated.
The payback period is therefore increased from approx 10-12 years to 20-25years.

Solar Hot Water Panels

Solar water heating systems use the energy from the sun to heat water for hot water needs. The systems use a heat collector (flat plate or evacuated tube), generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hat water cylinder inside the building.

The flat plate collector is cheaper, more robust but about 5% less efficient than the evacuated tube collector. With flat plate collectors temperatures up to 50˚C, with evacuated tubes up to 70˚C can be achieved.

Ideally the collectors should be mounted on a south-facing roof at an elevation of between 10-60˚. Due to collectors the carbon emissions of a household can be reduced by about 350-400kg CO_2.

For domestic use costs are approximately £1500/m^2. The Energy Efficient Commitment Scheme bases savings from solar water heating on an average figure of 454kWh/yr saving per m^2 of flat plate collector or 582kWh/yr per m^2 for an evacuated tube system.

A service check should be done every year, ensuring that the collector surface is clean, there is no corrosion, and sensors and fixings are properly in place.

The lifespan of solar water heating systems is expected to be more than 20 years. SHW systems have no noise impact.

Renewable Heat Premium Payment (for heat generating technologies):

The RHPP scheme is a government scheme that gives money to householders to help them buy renewable heating technologies. Solar thermal panels, heat pumps and biomass boilers are eligible for this one-off payment. From 1st August 2011 anyone can apply for the payment.

Conditions to apply for the payment are:

- The dwelling must be owned by the applicant,
- A minimum of 250mm loft insulation must be installed,
- The renewable heat product must be listed under Microgeneration Certification Scheme (MCS) and be installed by a MCS certified installer,
- For heat pumps and biomass boilers the household must be without gas grid connection,
- All installations must be complete and vouchers must be redeemed before the expiry date on the voucher or 31st March 2012; no voucher will be valid beyond 31st March 2012.

Solar Hot Water Panels are eligible for a one-off payment of £300 under the Renewable Heat Premium Payment. For detailed information please refer to http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/factsheet/factsheet.aspx.

4.3 Options tested:

Three options have been modeled using NHER SAP 2009 to predict the reductions of CO_2 emissions achieved through the application of renewable energy technologies.

Option	*Specification*	*DER / TER VARIANCE (%)*[a]	*% reduction through Renewables*
Base Case (BC)	-External walls: cavity wall, 0.26W/m²K -Roof: pitched roof 37° and flat roof, timber trusses. Insulation within rafters 0.15W/m²K -Windows: double glazed argon filled aluminum 1.4W/m²K, -Upper ground floor: suspended not timber 0.20W/m²K -Air tightness 6m³/m²hr, natural ventilation, -5 intermittent low energy extract fans, -Secondary heating system: closed wood burner, exempt appliance for smoke control area -75% energy efficient lighting, -Accredited construction details, -Gas Condensing Combi Boiler, 89.2% efficiency. -100% energy efficient lighting. *(for further details see Appendix A)*	5.00%	0%
1	**BC + PV (0.43kWp)** [b] Photovoltaic Panels, southwest facing, mounted on a pitched roof at an angle of 36°, requiring for example 2x 215W Panels, which equals approx. 2.5m²	-0.92%	3.5%
2	**BC + PV (2.58kWp)** Photovoltaic Panels, southwest facing, mounted on a pitched roof at an angle of 36°, requiring for example 12x 215W Panels, which equals approx. 15m²	-30.45%	21.5%
3	**BC + PV(2.365kWp) + SHW (6m2)** -Photovoltaic Panels, southwest facing, mounted on a pitched roof at an angle of 36°, requiring for example 11x 215W Panels, which equals approx. 13.75m² -Photovoltaic Panels, southwest facing, mounted on a pitched roof at an angle of 36°, requiring for example 6m2	-34.42%	20.5%

Table 4: Tested Options

It can be seen that options 2 and 3 achieve:

- The LBRUT requirement to reduce the carbon dioxide emissions by at least 25% over Building Regulations 2010.
- The LBRUT requirement to offset the predicted carbon emissions by at least 20% Renewable Energy Technolgies.
- The mandatory "Energy 1- Dwelling Emission Rate" requirement for the targeted CSH Level 3.

[a] The minimum requirement for CSH Level 3 is a DER/TER Variance of 0%. The LBRUT requirement is to achieve a DER/TER variance of maximum -25%

[b] This is the amount of Photovoltaic Panels required to meet CSH Level 3. However this amount does not achieve the 20% reduction through renewable, nor the LBRUT requirement of a DER/TER variance of a maximum -25%.

4.4 Estimated Cost of Options

To analyse the cost and size of each technology we have looked at a variety of sources including the following: the Energy Savings Trust (EST), London Renewables: Toolkit for planners, developers and consultants, BECO Solar, Energi, ZedFactory, Dulas Solar, Segen, Greener Energy Systems Ltd, Kensa Engineering, Solar Century and iceenergy.

Photovoltaics

- 1kW$_p$ system fully installed approximately £4,000.

Solar Hot Water

- 1m^2 fully installed solar panel system approximately £1,500.

Option 2 – PV Panels
Capital costs:

- 2.58kWp 215W system requires 15m^2 of panels and supply and installation would cost approximately **£10,320**

Option 3 – PV panels + Solar Hot Water Panels
Capital costs:

- 2.365kWp 215W system requires 13.75m^2 of panels and supply and installation would cost approximately **£9,460**
- 6m^2 fully installed solar panel system would cost - **£9,000**

- The total area of both technologies would be **19.75m^2**, and would cost about **£18,460.**

The financial viability will need to be assessed against the available financial incentives and the overall development proposal.

4.5 Fuel Prices:

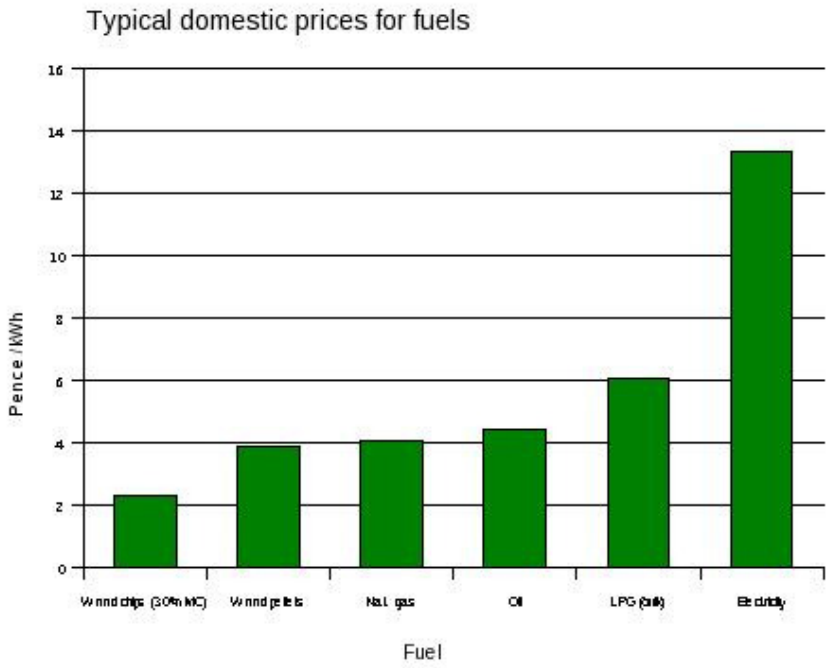


Table 5: Fuel Prices excluding VAT, January 2010, based on data from biomassenergycentre.org.uk

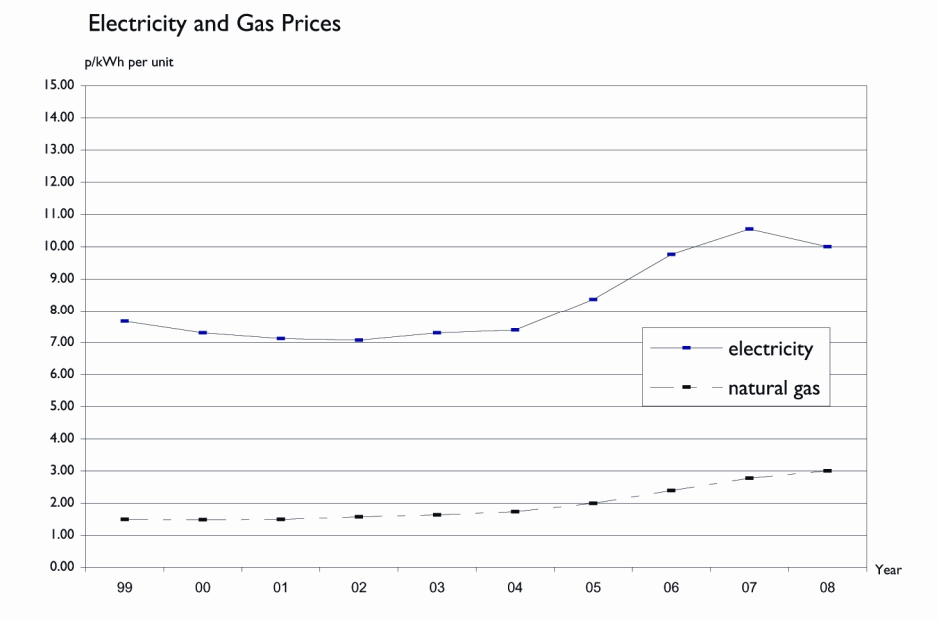


Table 6: Electricity and Gas Prices, based on BERR, Department for Business and Enterprise & Regulatory Reform

As table 6 indicates, the prices for gas and electricity have been augmented rapidly during the last three years. Therefore, with the support of grants and with the rising fuel costs, the payback period can be expected to shorten significantly.

4.6 Conclusion

Three options have been tested to meet the sustainability requirements of the London Borough of Richmond Upon Thames. The renewable technologies tested include Photovoltaic and Solar Hot Water Panels.

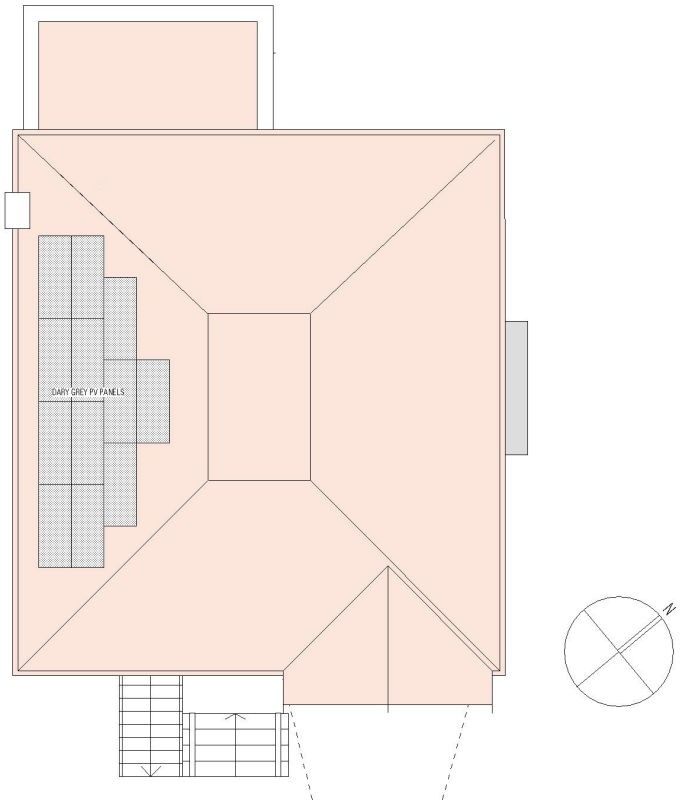
We recommend incorporating approximately 15m^2 of Photovoltaic Panels (option no. 2).

This option can achieve LBRUT requirement:

- To reduce the carbon dioxide emissions by at least 25% over Building Regulations 2010.
- To offset the predicted carbon emissions by at least 20% Renewable Energy Technolgies.
- The mandatory "Energy 1- Dwelling Emission Rate" requirement for the targeted CSH Level 3.

PVs are eligible for the Feed-In-Tariff. Therefore, for each kWh of electricity generated, a guaranteed tariff will be paid, which will reduce the payback periods of the technology.

The following image shows the PV layout assumed for the preliminary SAP 2009 calculations. The layout will have to be confirmed by the manufacturer.



Appendix

Appendix A – Preferred Option 2 – SAP worksheet, L1A Compliance Report (indicating u-values and systems specified).

SAP 2009 Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Ms Sidonie Kade	Assessor number	1031
Client		Last modified	13/12/2011
Address	21 Melbourne ROAD, Teddington, Middlesex, TW11		

1. Overall dwelling dimensions

		Area (m²)		Average storey height (m)		Volume (m³)	
Lowest occupied		92.35	(1a) x	2.42	(2a) =	223.49	(3a)
+1		79.64	(1b) x	3.43	(2b) =	273.17	(3b)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	171.99	(4)				
Dwelling volume					(3a) + (3b) + (3c) + (3d)...(3n) =	496.65	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	1	x 20 =	20	(6b)
Number of intermittent fans	5	x 10 =	50	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) = 70	÷ (5) =	0.14	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	6.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.44	(18)

Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used

Number of sides on which dwelling is sheltered	2	(19)
Shelter factor	1 - [0.075 x (19)] = 0.85	(20)
Adjusted infiltration rate	(18) x (20) = 0.37	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1...12 =		54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
										∑(22a)1...12 =		13.52	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m													
(22b)m	0.51	0.48	0.48	0.42	0.38	0.37	0.35	0.35	0.39	0.42	0.45	0.48	
										∑(22b)1...12 =		5.07	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	N/A	(23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) | N/A | (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = | N/A | (23c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m ≥ 1, then (24d)m = (22b)m; otherwise (24d)m = 0.5 + [(22b)m2 x 0.5]

(24d)m	0.63	0.61	0.61	0.59	0.57	0.57	0.56	0.56	0.58	0.59	0.60	0.61	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m	0.63	0.61	0.61	0.59	0.57	0.57	0.56	0.56	0.58	0.59	0.60	0.61	(25)

3. Heat losses and heat loss parameter

The κ-value is the heat capacity per unit area, see Table 1e.

Element	Gross Area, m²	Openings, m²	Net area A, m²		U-value, W/m²K		A x U, W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Doors			4.00	x	1.50	=	6.00	N/A	N/A	(26)
Window*			31.93	x	1.33	=	42.33	N/A	N/A	(27)
Ground floor			92.35	x	0.20	=	18.47	N/A	N/A	(28a)
External wall			180.92	x	0.26	=	47.04	N/A	N/A	(29a)
Roof			125.70	x	0.15	=	18.86	N/A	N/A	(30)
Total area of external elements ∑A, m²			434.90	(31)						

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) | (26)...(30) + (32) = | 132.69 | (33)

Heat capacity Cm = ∑(A x κ) | (28)...(30) + (32) + (32a)...(32e) = | N/A | (34)

Thermal mass parameter (TMP) in kJ/m²K | Calculated separately = | 250.00 | (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K | 34.79 | (36)

if details of thermal bridging are not known then (36) = 0.15 x (31)

Total fabric heat loss | (33) + (36) = | 167.49 | (37)

Ventilation heat loss calculated monthly 0.33 x (25)m x (5)

(38)m	102.93	100.66	100.66	96.52	94.04	92.89	91.80	91.80	94.64	96.52	98.52	100.66	(38)

Heat transfer coefficient, W/K (37)m + (38)m

(39)m	270.41	268.15	268.15	264.00	261.53	260.38	259.28	259.28	262.13	264.00	266.01	268.15	

Average = ∑(39)1...12/12 = | 264.29 | (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

(40)m	1.57	1.56	1.56	1.53	1.52	1.51	1.51	1.51	1.52	1.53	1.55	1.56	

Average = ∑(40)1...12/12 = | 1.54 | (40)

4. Water heating energy requirement

kWh/year

Assumed occupancy, N | 2.97 | (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 104.62 | (43)

Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)													
(44)m	115.09	110.90	106.72	102.53	98.35	94.16	94.16	98.35	102.53	106.72	110.90	115.09	

∑(44)1...12 = | 1255.49 | (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

(45)m	171.08	149.63	154.40	134.61	129.16	111.46	103.28	118.52	119.93	139.77	152.57	165.68	

∑(45)1...12 = | 1650.08 | (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(46)m	25.66	22.44	23.16	20.19	19.37	16.72	15.49	17.78	17.99	20.97	22.89	24.85	(46)

Water storage loss:

b) If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same cylinder 230.00 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see SAP 2009 section 4.3

Volume factor from Table 2a 0.81 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) 1.24 (54)

Enter (49) or (54) in (55) 1.24 (55)

Water storage loss calculated for each month = (55) x (41)m

(56)m	38.54	34.81	38.54	37.29	38.54	37.29	38.54	38.54	37.29	38.54	37.29	38.54	(56)

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

(57)m	38.54	34.81	38.54	37.29	38.54	37.29	38.54	38.54	37.29	38.54	37.29	38.54	(57)

Primary circuit loss (annual) from Table 3 360.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m	240.19	212.05	223.51	201.49	198.27	178.34	172.39	187.63	186.81	208.88	219.45	234.79	(62)

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

(64)m	240.19	212.05	223.51	201.49	198.27	178.34	172.39	187.63	186.81	208.88	219.45	234.79	

∑(64)1...12 = 2463.80 (64)

if (64)m < 0 then set to 0

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

(65)m	112.17	99.69	106.63	98.26	98.23	90.56	89.63	94.70	93.38	101.76	104.23	110.38	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	177.91	177.91	177.91	177.91	177.91	177.91	177.91	177.91	177.91	177.91	177.91	177.91	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m	77.87	69.16	56.25	42.58	31.83	26.87	29.04	37.74	50.66	64.32	75.07	80.03	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m	512.80	518.12	504.71	476.16	440.13	406.26	383.63	378.31	391.72	420.27	456.30	490.17	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m	55.76	55.76	55.76	55.76	55.76	55.76	55.76	55.76	55.76	55.76	55.76	55.76	(69)
Pumps and fans gains (Table 5a)													
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evaporation (negative values) (Table 5)													

(71)m	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	-118.61	(71)

Water heating gains (Table 5)

(72)m	150.77	148.35	143.32	136.48	132.04	125.78	120.47	127.28	129.70	136.78	144.77	148.36	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m	866.49	860.69	829.33	780.28	729.05	683.98	658.20	668.39	697.14	746.43	801.21	843.62	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Access factor Table 6d		Area m²		Solar flux W/m²		g Specific data or Table 6b		FF Specific data or Table 6c		Gains (W)	
Southeast	1.00	x	11.11	x	37.39	x 0.9 x	0.76	x	0.70	=	198.81	(77)
Southwest	0.77	x	2.06	x	37.39	x 0.9 x	0.76	x	0.70	=	28.33	(79)
Northwest	0.77	x	2.35	x	11.51	x 0.9 x	0.76	x	0.70	=	9.99	(81)
Northwest	0.54	x	12.18	x	11.51	x 0.9 x	0.76	x	0.70	=	36.24	(81)
Northeast	0.77	x	3.71	x	11.51	x 0.9 x	0.76	x	0.70	=	15.75	(75)
Southeast	0.77	x	0.52	x	37.39	x 0.9 x	0.76	x	0.70	=	7.22	(77)

Solar gains in watts, calculated for each month ∑(74)m...(82)m

(83)m	296.34	526.36	749.36	1013.80	1193.83	1246.19	1207.71	1066.44	858.27	612.98	359.20	250.68	(83)

Total gains - internal and solar (73)m + (83)m

(84)m	1162.83	1387.04	1578.69	1794.08	1922.88	1930.16	1865.91	1734.83	1555.40	1359.41	1160.41	1094.30	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, η1,m (see Table 9a)													
(86)m	1.00	0.99	0.98	0.96	0.88	0.74	0.54	0.58	0.85	0.97	0.99	1.00	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
(87)m	20.38	20.43	20.51	20.60	20.71	20.77	20.79	20.79	20.74	20.62	20.47	20.39	(87)
Temperature during heating periods in the living area from Table 9, Th2(˚C)													
(88)m	19.64	19.65	19.65	19.67	19.68	19.68	19.69	19.69	19.67	19.67	19.66	19.65	(88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)													
(89)m	0.99	0.99	0.98	0.94	0.83	0.63	0.38	0.41	0.76	0.95	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m	18.79	18.87	18.99	19.14	19.29	19.37	19.39	19.39	19.34	19.17	18.95	18.82	(90)

Living area fraction fLA 68.00 ÷ (4) = 0.40 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

(92)m	19.42	19.49	19.59	19.72	19.85	19.92	19.95	19.95	19.89	19.75	19.55	19.44	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m	19.27	19.34	19.44	19.57	19.70	19.77	19.80	19.80	19.74	19.60	19.40	19.29	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)

Utilisation factor for gains, ?m

(94)m	0.99	0.99	0.97	0.94	0.83	0.64	0.40	0.42	0.77	0.95	0.99	1.00	(94)

Useful gains, ?mGm, W = (94)m x (84)m

(95)m	1156.47	1371.44	1537.16	1681.46	1603.88	1233.98	739.83	736.46	1190.58	1288.99	1148.73	1089.01	(95)

Monthly average external temperature from Table 8

(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)

Heat loss rate for mean internal temperature, Lm, W

(97)m	3993.41	3844.32	3390.09	2869.76	2092.35	1346.72	750.97	750.74	1426.64	2322.19	3298.02	3857.58	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m

(98)m	2110.68	1661.78	1378.58	855.58	363.42	0.00	0.00	0.00	0.00	768.70	1547.49	2059.81	

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 10746.05 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 62.48 (99)

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:

Fraction of space heating from secondary/supplementary system (Table 11) 0.10 (201)

Fraction of space heating from main system(s) 1 - (201) 0.90 (202)

Fraction of main heating from main system 2 0.00 (203)

Fraction of total space heat from main system 1 (202) x [1 - (203)] 0.90 (204)

Fraction of total space heat from main system 2 (202) x (203) 0.00 (205)

Efficiency of main space heating system 1 (%) 93.20 (206)

(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)

Efficiency of secondary/supplementary heating system, from Table 4a or Appendix E (%) 75.00 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement, kWh/month (as calculated above)													
(98)m	2110.68	1661.78	1378.58	855.58	363.42	0.00	0.00	0.00	0.00	768.70	1547.49	2059.81	
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)													
(211)m	2038.21	1604.72	1331.25	826.20	350.94	0.00	0.00	0.00	0.00	742.31	1494.36	1989.09	

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 10377.08 (211)

Space heating fuel (secondary), kWh/month = (98)m x (201) x 100 ÷ (208)													
(215)m	281.42	221.57	183.81	114.08	48.46	0.00	0.00	0.00	0.00	102.49	206.33	274.64	

Total per year (kWh/year) = ∑(215)1...5, 10...12 = 1432.81 (215)

Water heating:

Output from water heater, kWh/month (calculated above)													
(64)m	240.19	212.05	223.51	201.49	198.27	178.34	172.39	187.63	186.81	208.88	219.45	234.79	

∑(64)1...12 = 2463.80 (64)

Efficiency of water heater per month													
(217)m	88.86	88.72	88.38	87.75	85.84	79.50	79.50	79.50	79.50	87.47	88.58	88.86	
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m													
(219)m	270.31	239.02	252.89	229.62	230.98	224.32	216.84	236.01	234.99	238.80	247.75	264.24	

Total per year (kWh/year) = ∑(219)1...12 = 2885.76 (219)

Annual Totals Summary:	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		10377.08	(211)
Space heating fuel used, secondary		1432.81	(215)
Water heating fuel used		2885.76	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):			
mechanical ventilation fans - balanced, extract or positive input from outside	0.00		(230a)
warm air heating system fans	0.00		(230b)
central heating pump	130.00		(230c)
oil boiler pump	0.00		(230d)
boiler flue fan	45.00		(230e)
maintaining electric keep-hot facility for gas combi boiler	0.00		(230f)
pump for solar water heating	0.00		(230g)
Total electricity for the above	∑(230a)...(230g)	175.00	(231)
Electricity for lighting (calculated in Appendix L):		550.07	(232)

Energy saving/generation technologies (Appendices M, N and Q):

Electricity generated by PVs (Appendix M) (negative quantity)	-2119.73	(233)

10a. Fuel costs - Individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price (Table 12)		Fuel cost £/year	
Space heating - main system 1	10377.08	x	3.10	x 0.01 =	321.69	(240)
Space heating - secondary	1432.81	x	3.42	x 0.01 =	49.00	(242)
Water heating cost (other fuel)	2885.76	x	3.10	x 0.01 =	89.46	(247)
Pumps, fans and electric keep-hot	175.00	x	11.46	x 0.01 =	20.06	(249)
Energy for lighting	550.07	x	11.46	x 0.01 =	63.04	(250)
Additional standing charges (Table 12)					106.00	(251)
Energy saving/generation technologies (Appendices M, N and Q):						
PV savings (negative quantity)	-2119.73	x	11.46	x 0.01 =	-242.92	(252)
Total energy cost			(240)...(242) + (245)...(254)		406.32	(255)

11a. SAP rating - Individual heating systems including micro-CHP

Energy cost deflator (Table 12)	0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] = 0.88	(257)
SAP value	87.72	
SAP rating	88	(258)
SAP band	B	

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)	
Space heating - main system 1	10377.08	x	0.198	=	2054.66	(261)
Space heating - secondary	1432.81	x	0.008	=	11.46	(263)
Water heating	2885.76	x	0.198	=	571.38	(264)
Space and water heating			(261) + (262) + (263) + (264) =		2637.51	(265)
Pumps, fans and electric keep-hot	175.00	x	0.517	=	90.48	(267)
Lighting	550.07	x	0.517	=	284.38	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-2119.73	x	0.529	=	-1121.34	(269)
Total carbon dioxide emissions				∑(261)...(271) =	1891.03	(272)
Dwelling carbon dioxide emissions rate				(272) ÷ (4) =	10.99	(273)
EI value					88.32	
EI rating (see section 14)					88	(274)
EI band					B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year		Primary Energy Factor		Primary Energy	
Space heating - main system 1	10377.08	x	1.02	=	10584.62	(261*)
Space heating - secondary	1432.81	x	1.05	=	1504.45	(263*)
Water heating	2885.76	x	1.02	=	2943.48	(264*)
Space and water heating			(261*) + (262*) + (263*) + (264*) =		15032.55	(265*)
Pumps, fans and electric keep-hot	175.00	x	2.92	=	511.00	(267*)
Lighting	550.07	x	2.92	=	1606.19	(268*)
Energy saving/generation technologies:						

PV primary energy savings (negative quantity)	-2119.73	x	2.92	=	-6189.61	(269*)
Total primary energy kWh/year				∑(261*)...(271*) =	10960.14	(272*)
Primary energy kWh/m2/year				(272*) ÷ (4) =	63.73	(273*)

L1A 2010 - Regulations Compliance Report
Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Ms Sidonie Kade	Assessor number	1031
Client		Last modified	13/12/2011
Address	21 Melbourne ROAD, Teddington, Middlesex, TW11		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg $CO_2/m^2.a$)	Fuel = Mains gas Fuel factor = 1.00 TER = 18.39	Authorised SAP Assessor	
DER for dwelling as designed (kg $CO_2/m^2.a$)	DER = 12.79	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 12.79 < TER 18.39	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.26 (max 0.30) / 0.26 (max 0.70) Party wall: (no party wall) Floor: 0.20 (max 0.25) / 0.20 (max 0.70) Roof: 0.15 (max 0.20) / 0.15 (max 0.35) Openings: 1.41 (max 2.00) / 1.50 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated using user-specified y-value of 0.08, with reference: Accredited Construction Details	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Regular boiler from database Worcester Greenstar 24 Ri Efficiency = 89.20% - SEDBUK 2009 Minimum = 88.00% Secondary heating system: Room heaters - Wood logs Data from manufacturer, tested to BS EN 13229 Efficiency = 75.00% Minimum = 37.00%	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	Cylinder volume = 230.00 litres Nominal cylinder loss = 2.30kWh/day Maximum permitted cylinder loss = 2.43kWh/day Primary hot water pipes are insulated	Authorised SAP Assessor	Passed
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control Hot water control: Boiler interlock (main system 1) Cylinder thermostat Separate water control	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 45 Percentage of low energy lights = 100 % Minimum = 75 %	Authorised SAP Assessor	Passed
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant Overheating risk (July) = Slight Overheating risk (August) = Not significant Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 4.00 ach Blinds/curtains = None	Authorised SAP Assessor	Passed
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 6.00 Max air permeability = 10.00	Authorised SAP Assessor	Passed
Mechanical ventilation system Specific fan power (SFP)	Not applicable	Authorised SAP Assessor	
Have the key features of the design been included (or bettered) in practice?	The following openings have a U-value less than 1.5W/m^2K: • Window reference 3 (1.40) • Window reference 4 (1.40) • Window reference 5 (1.40) • Window reference 6 (1.40) • Window reference 7 (1.40) • Window reference 8 (1.40) • Window reference 9 (1.40) • Window reference 10 (1.40) • Window reference 11 (1.40) • Window reference 12 (1.40) • Window reference 13 (1.40) • Window reference 15 (1.40) • Window reference 16 (1.40) • Window reference 17 (1.40) • Window reference 18 (1.40) • Window reference 19 (1.40) Secondary heating system present - Wood logs Use of the following low carbon or renewable technologies: • Wood logs used for secondary heating • Photovoltaic array	Authorised SAP Assessor	

Appendix B – CSH Report (to confirm % of Renewables)

The reductions of CO_2 emissions achieved through the application of renewable energy technologies have been calculated in accordance with LBRUT'S SCC guidance adopted in August 2011.

Base Case (BC) (SAP 2009, NHER 5.4.1, Vx)

Type		Associated $kgCO_2/yr$
Regulated	Space Heating *(261 + 263)*	2,066
	Hot Water Heating *(264)*	571
	Fixed Electrical *(267)*	90
	Lighting *(268)*	284
Unregulated	Cooking & Appliances *(Ene7)*	2,220
Total		5,231
CO_2 displaced **by renewable energy**		**0%**

Option 1: BC & 0.43kWp PVs (SAP 2009, NHER 5.4.1, Vx)

Type	Associated $kgCO_2/yr$
Savings achieved by PVs *(269)*	-187
CO_2 displaced **by renewable energy**	**3.5%**

Option 2: BC & 2.58kWp PVs (SAP 2009, NHER 5.4.1, Vx)

Type	Associated $kgCO_2/yr$
Savings achieved by PVs *(269)*	-1121.34
CO_2 displaced **by renewable energy**	**21.55%**

Option 3: Revised Base Case with 6m2 Solar Hot Water System & 2.365 kWp PVs

(SAP 2009, NHER 5.4.1, Vx)

Type		Associated $kgCO_2/yr$
Regulated	Space Heating *(261 + 263)*	2,072
	Hot Water Heating *(264))*	307
	Fixed Electrical *(267)*	129
	Lighting *(268)*	284
Unregulated	Cooking & Appliances *(Ene7)*	2,220
Total		5,012

Type	Associated $kgCO_2/yr$
Savings achieved by PVs *(269)*	-1027
CO_2 displaced **by renewable energy**	**20.5%**